Appendix 18 Wetland Related Reports

Appendix 18.1 NorthMet Project – Wetland Replacement Plan

Appendix 18.2 Biological Opinion

Appendix 18.1 NorthMet Project – Wetland Replacement Plan



NorthMet Project

Wetland Replacement Plan

Issue Date: October 2016

This document was prepared for Poly Met Mining, Inc. by Barr Engineering Co.

Project Name and/or Number: NorthMet Project/ USACE File # 1999-5528-JKA

PART ONE: Applicant Information

If applicant is an entity (company, government entity, partnership, etc.), an authorized contact person must be identified. If the applicant is using an agent (consultant, lawyer, or other third party) and has authorized them to act on their behalf, the agent's contact information must also be provided.

Applicant/Landowner Name: Jennifer Saran

Mailing Address: Poly Met Mining, Inc. Suite 2060, 444 Cedar Street, St. Paul, MN 55110

Phone: 651-389-4108

E-mail Address: jsaran@polymetmining.com

Authorized Contact (do not complete if same as above):

Mailing Address:

Phone:

E-mail Address:

Agent Name:

Mailing Address:

Phone:

E-mail Address:

PART TWO: Site Location Information

County: St. Louis

City/Township:

Parcel ID and/or Address:

Legal Description (Section, Township, Range):

Please see Section 3 of the wetland permit application for location

information

Lat/Long (decimal degrees):

Attach a map showing the location of the site in relation to local streets, roads, highways. Please see Large Figure 1 of the wetland permit application

Approximate size of site (acres) or if a linear project, length (feet): 7,660 acres

If you know that your proposal will require an individual Permit from the U.S. Army Corps of Engineers, you must provide the names and addresses of all property owners adjacent to the project site. This information may be provided by attaching a list to your application [Please see Section 7 and Large Table 4 of the wetland permit application] or by using block 25 of the Application for Department of the Army permit which can be obtained at:

http://www.mvp.usace.army.mil/Portals/57/docs/regulatory/RegulatoryDocs/engform 4345 2012oct.pdf

PART THREE: General Project/Site Information

If this application is related to a delineation approval, exemption determination, jurisdictional determination, or other correspondence submitted *prior to* this application then describe that here and provide the Corps of Engineers project number. USACE File # 1999-5528-JKA

Describe the project that is being proposed, the project purpose and need, and schedule for implementation and completion. The project description must fully describe the nature and scope of the proposed activity including a description of all project elements that effect aquatic resources (wetland, lake, tributary, etc.) and must also include plans and cross section or profile drawings showing the location, character, and dimensions of all proposed activities and aquatic resource impacts.

Please see Sections 4, 5, and 11 of the wetland permit application.

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PART FOUR: Aquatic Resource Impact¹ Summary

If your proposed project involves a direct or indirect impact to an aquatic resource (wetland, lake, tributary, etc.) identify each impact in the table below. Include all anticipated impacts, including those expected to be temporary. Attach an overhead view map, aerial photo, and/or drawing showing all of the aquatic resources in the project area and the location(s) of the proposed impacts. Label each aquatic resource on the map with a reference number or letter and identify the impacts in the following table.

Please see Section 11 and Large Table 1 of the wetland permit application.

Aquatic Resource ID (as noted on overhead view)	Aquatic Resource Type (wetland, lake, tributary etc.)	l drain or	Impact	Size of Impact ²	Overall Size of Aquatic Resource ³	Existing Plant Community Type(s) in Impact Area ⁴	County, Major Watershed #, and Bank Service Area # of Impact Area ⁵

¹If impacts are temporary; enter the duration of the impacts in days next to the "T". For example, a project with a temporary access fill that would be removed after 220 days would be entered "T (220)".

If any of the above identified impacts have already occurred, identify which impacts they are and the circumstances associated with each:

PART FIVE: Applicant Signature

	equesting a <u>pre-application</u> consultation with the Corps and LGU based on the information you have ses will not initiate a formal application review if this box is checked.
By signature below, I attest authority to undertake the	that the information in this application is complete and accurate. I further attest that I possess the work described herein.
Signature:	Date: 10-13-1 b
I hereby authorize	to act on my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this application.

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²Impacts less than 0.01 acre should be reported in square feet. Impacts 0.01 acre or greater should be reported as acres and rounded to the nearest 0.01 acre. Tributary impacts must be reported in linear feet of impact and an area of impact by indicating first the linear feet of impact along the flowline of the stream followed by the area impact in parentheses). For example, a project that impacts 50 feet of a stream that is 6 feet wide would be reported as 50 ft (300 square feet).

³This is generally only applicable if you are applying for a de minimis exemption under MN Rules 8420.0420 Subp. 8, otherwise enter "N/A".

⁴Use Wetland Plants and Plant Community Types of Minnesota and Wisconsin 3rd Ed. as modified in MN Rules 8420.0405 Subp. 2.

⁵Refer to Major Watershed and Bank Service Area maps in MN Rules 8420.0522 Subp. 7.

¹ The term "impact" as used in this joint application form is a generic term used for disclosure purposes to identify activities that may require approval from one or more regulatory agencies. For purposes of this form it is not meant to indicate whether or not those activities may require mitigation/replacement.

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Attachment C Avoidance and Minimization

Project Purpose, Need, and Requirements. Clearly state the purpose of your project and need for your project. Also include a description of any specific requirements of the project as they relate to project location, project footprint, water management, and any other applicable requirements. Attach an overhead plan sheet showing all relevant features of the project (buildings, roads, etc.), aquatic resource features (impact areas noted) and construction details (grading plans, storm water management plans, etc.), referencing these as necessary:

Please see Sections 4 and 5 of the wetland permit application.

Avoidance. Both the CWA and the WCA require that impacts to aquatic resources be avoided if practicable alternatives exist. Clearly describe all on-site measures considered to avoid impacts to aquatic resources and discuss at least two project alternatives that avoid all impacts to aquatic resources on the site. These alternatives may include alternative site plans, alternate sites, and/or not doing the project. Alternatives should be feasible and prudent (see MN Rules 8420.0520 Subp. 2 C). Applicants are encouraged to attach drawings and plans to support their analysis:

Please see Section 6 of the wetland permit application.

Minimization. Both the CWA and the WCA require that all unavoidable impacts to aquatic resources be minimized to the greatest extent practicable. Discuss all features of the proposed project that have been modified to minimize the impacts to water resources (see MN Rules 8420.0520 Subp. 4):

Please see Section 6 of the wetland permit application.

Off-Site Alternatives. An off-site alternatives analysis is not required for all permit applications. If you know that your proposal will require an individual permit (standard permit or letter of permission) from the U.S. Army Corps of Engineers, you may be required to provide an off-site alternatives analysis. The alternatives analysis is not required for a complete application but must be provided during the review process in order for the Corps to complete the evaluation of your application and reach a final decision. Applicants with questions about when an off-site alternatives analysis is required should contact their Corps Project Manager.

Please see Section 6 of the wetland permit application.

Project Name and/or Number: NorthMet Project /USACE File # 1999-5528-JKA

Attachment D Replacement/Compensatory Mitigation

Complete this part *if* your application involves wetland replacement/compensatory mitigation <u>not</u> associated with the local road wetland replacement program. Applicants should consult Corps mitigation guidelines and WCA rules for requirements.

Replacement/Compensatory Mitigation via Wetland Banking. Complete this section if you are proposing to use credits from an existing wetland bank (with an account number in the State wetland banking system) for all or part of your replacement/compensatory mitigation requirements.

Wetland Bank Account #	County	Major Watershed #	Bank Service Area #	Credit Type (if applicable)	Number of Credits

Applicants should attach documentation indicating that they have contacted the wetland bank account owner and reached at least a tentative agreement to utilize the identified credits for the project. This documentation could be a signed purchase agreement, signed application for withdrawal of credits or some other correspondence indicating an agreement between the applicant and the bank owner. However, applicants are advised not to enter into a binding agreement to purchase credits until the mitigation plan is approved by the Corps and LGU.

Project-Specific Replacement/Permittee Responsible Mitigation. Complete this section if you are proposing to pursue actions (restoration, creation, preservation, etc.) to generate wetland replacement/compensatory mitigation credits for this proposed project.

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

WCA Action Eligible for Credit ¹	Corps Mitigation Compensation Technique ²	Acres	Credit % Requested	Credits Anticipated ³	County	Major Watershed #	Bank Service Area #

¹Refer to the name and subpart number in MN Rule 8420.0526.

Explain how each proposed action or technique will be completed (e.g. wetland hydrology will be restored by breaking the tile......) and how the proposal meets the crediting criteria associated with it. Applicants should refer to the Corps mitigation policy language, WCA rule language, and all associated Corps and WCA guidance related to the action or technique:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

Attach a site location map, soils map, recent aerial photograph, and any other maps to show the location and other relevant features of each wetland replacement/mitigation site. Discuss in detail existing vegetation, existing landscape features, land use (on and surrounding the site), existing soils, drainage systems (if present), and water sources and movement. Include a topographic map showing key features related to hydrology and water flow (inlets, outlets, ditches, pumps, etc.):

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

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²Refer to the technique listed in St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota.

³If WCA and Corps crediting differs, then enter both numbers and distinguish which is Corps and which is WCA.

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Attach a map of the existing aquatic resources, associated delineation report, and any documentation of regulatory review or approval. Discuss as necessary:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

For actions involving construction activities, attach construction plans and specifications with all relevant details. Discuss and provide documentation of a hydrologic and hydraulic analysis of the site to define existing conditions, predict project outcomes, identify specific project performance standards and avoid adverse offsite impacts. Plans and specifications should be prepared by a licensed engineer following standard engineering practices. Discuss anticipated construction sequence and timing:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

For projects involving vegetation restoration, provide a vegetation establishment plan that includes information on site preparation, seed mixes and plant materials, seeding/planting plan (attach seeding/planting zone map), planting/seeding methods, vegetation maintenance, and an anticipated schedule of activities:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

For projects involving construction or vegetation restoration, identify and discuss goals and specific outcomes that can be determined for credit allocation. Provide a proposed credit allocation table tied to outcomes:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

Provide a five-year monitoring plan to address project outcomes and credit allocation:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

Discuss and provide evidence of ownership or rights to conduct wetland replacement/mitigation on each site:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

Quantify all proposed wetland credits and compare to wetland impacts to identify a proposed wetland replacement ratio. Discuss how this replacement ratio is consistent with Corps and WCA requirements:

Please see Sections 14 and 15 and Attachments C, D, and E (mitigation plans) of the wetland permit application.

By signature below, the applicant attests to the following (only required if application involves project-specific/permittee responsible replacement):

- All proposed replacement wetlands were not:
 - Previously restored or created under a prior approved replacement plan or permit
 - Drained or filled under an exemption during the previous 10 years
 - Restored with financial assistance from public conservation programs
 - Restored using private funds, other than landowner funds, unless the funds are paid back with interest to the individual
 or organization that funded the restoration and the individual or organization notifies the local government unit in
 writing that the restored wetland may be considered for replacement.
- The wetland will be replaced before or concurrent with the actual draining or filling of a wetland.
- An irrevocable bank letter of credit, performance bond, or other acceptable security will be provided to guarantee successful completion of the wetland replacement.
- Within 30 days of either receiving approval of this application or beginning work on the project, I will record the Declaration of
 Restrictions and Covenants on the deed for the property on which the replacement wetland(s) will be located and submit proof
 of such recording to the LGU and the Corps.

Applicant or Representative:	Title: DIRECTOR OF ENU. PERMITTING
Signature:	Date: 10-13-16
_ 2	Project Name and/or Number: NorthMet Project /USACE File # 1999-5528-JKA

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JENNIFER SARAN

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Acronyms, Abbreviations, and Units

Acronym, Abbreviation, or Unit	Description
ACHP	Advisory Council on Historic Places
APE	Area of Potential Effect
ВМР	Best Management Practices
BSA	Bank Service Area
BWSR	Board of Water and Soil Resources
CIR	Color Infrared
CPS	Central Pumping Station
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
EAW	Environmental Assessment Worksheet
ECS	Ecological Classification System
EIS	Environmental Impact Statement
ECS	Ecological Classification System
ELT	Ecological Landtype
ELTP	Ecological Landtype Phase
FEIS	Final Environmental Impact Statement
FSA	Farm Services Agency
FTB	Flotation Tailings Basin
GIS	Geographic Information System
GPS	Global Positioning System
HRF	Hydrometallurgical Residue Facility
kV	kilovolt
LEDPA	Least Environmentally Damaging Practicable Alternative
LTVSMC	LTV Steel Mining Company



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Acronym, Abbreviation, or Unit	Description
MDNR	Minnesota Department of Natural Resources
MEPA	Minnesota Environmental Policy Act
MOA	Memorandum of Agreement
MPCA	Minnesota Pollution Control Agency
MSFMF	Mine Site Fueling and Maintenance Facility
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OSLA	Overburden Storage and Laydown Area
OSP	Ore Surge Pile
PGEs	Platinum Group Elements
RFSS	Regional Forester Sensitive Species
RTH	Rail Transfer Hopper
SDEIS	Supplemental Draft Environmental Impact Statement
SDS	State Disposal System
SEIS	Supplemental Environmental Impact Statement
SGCN	Species of Greatest Conservation Need
SNF	Superior National Forest
SWPPP	Stormwater Pollution Prevention Plan
TWP	Treated Water Pipeline
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service



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Acronym, Abbreviation, or Unit	Description
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WCA	Wetland Conservation Act
WWTF	Waste Water Treatment Facility
WWTP	Waste Water Treatment Plant



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Executive Summary

Poly Met Mining, Inc. (PolyMet) is applying for a wetland permit to construct the NorthMet Mine and Ore Processing Facilities Project (Project). The Project, located near Hoyt Lakes Minnesota, will include a Mine Site, a Plant Site, and connecting corridors. PolyMet has leased the mineral rights at the Mine Site, but the U.S. Forest Service (USFS) currently owns surface rights to the majority of the land. PolyMet has purchased or retains options to purchase several privately-held parcels of land within the Superior National Forest (SNF) and proposes to exchange that land with the USFS for land at the Mine Site. The Plant Site is the former LTV Steel Mining Company (LTVSMC) taconite processing facility and Tailings Basin, which PolyMet has acquired from Cliffs Erie. PolyMet has also acquired the necessary easements and rights-of-way for the Transportation and Utility Corridors connecting the Mine Site and the Plant Site. The wetland permit application form is found inside the front cover of this report. Additional details on property ownership are presented in Section 1.0.

PolyMet initially submitted its wetland permit application for the Project to the U.S. Army Corps of Engineers (USACE) in July 2004. This permit application was part of an assessment of the potential scope of environmental review under the National Environmental Protection Act (NEPA) and the Minnesota Environmental Protection Act (MEPA). A joint state and federal Environmental Impact Statement (EIS) was initiated under the authority of NEPA (United States Code 1976, title 42, sections 4321 to 4361) and MEPA (Minnesota Rules, chapter 116D). The NEPA/MEPA activities are collectively referred to in this application as the Environmental Review Process. Because the Project was modified significantly after publication of a Draft Environmental Impact Statement in 2009, PolyMet submitted a revised wetland permit application to the USACE in August 2013. A Supplemental Draft Environmental Impact Statement (SDEIS) was issued in November 2013 and a Final Environmental Impact Statement (FEIS) was issued in November 2015 (Reference (1), Reference (2)). This Wetland Replacement Plan is being submitted to the Minnesota Department of Natural Resources (MDNR) to fulfill its requirements under the Wetland Conservation Act (WCA) of 1991 (Minnesota Rules, chapter 8420) and the Permit to Mine (Minnesota Rules, part 6132.5300). The Wetland Replacement Plan provides updated information that is consistent with the FEIS (Reference (2)).

Information, in addition to that provided in this application, can be found in the environmental impact statement (EIS) (and record thereof) prepared by the MDNR, the USACE, and the USFS, in cooperation with the U.S. Environmental Protection Agency, Bois Forte Band of Chippewa (Bois Forte Band), Grand Portage Band of Chippewa (Grand Portage Band), and the Fond du Lac Band of Lake Superior Chippewa (Fond du Lac Band) under the authority of NEPA (United States Code 1976, title 42, sections 4321 to 4361) and MEPA (Minnesota Rules, chapter 116D). The EIS was jointly prepared with the MDNR under Minnesota Rules, part 6132.1100.

Summary of Wetland Impacts

The Project is expected to result in direct and fragment (indirect) impacts to 129 wetlands as identified in the wetland delineation (Large Table 1), covering a total of approximately 940.7



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acres (Large Table 2). The wetlands were described in Reference (3) and the delineation was discussed with the Wetland IAP Workgroup and approved by the co-lead agencies on March 30, 2011. Wetlands are counted as directly impacted if they will be excavated or filled by Project activities or located between the toe of the Tailings Basin and the Flotation Tailings Basin (FTB) Seepage Containment System. The majority of wetland impacts will occur at the Mine Site (83%) followed by the Plant Site (16%) (Large Table 2). Road, railroad, and utility corridors account for less than 1% of wetland impacts. The types of wetlands that will be impacted include: coniferous bog (56%), shrub swamp (12%), coniferous swamp (9%), shallow marsh (8%), deep marsh (8%), sedge/wet meadow (4%), hardwood swamp (1%), and open bog (1%). Additional details on direct wetland impacts are presented in Section 11.4.

Project Location and Setting

The Project is located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, 6 miles south of Babbitt. The Project location is shown on Large Figure 1, and the Project areas, including the Mine Site and the Plant Site, are shown on Large Figure 2. The Mine Site is located within the SNF and drains to the Upper Partridge River. A small portion of the Plant Site also falls in the Upper Partridge River watershed, but most of the Plant Site drains to the Embarrass River. The Upper Partridge River and the Embarrass River are tributaries of the St. Louis River. Large Figure 3 shows Project area watersheds.

In the Project areas, a thin veneer of heterogeneous unconsolidated deposits is underlain by bedrock. The depth to groundwater is typically less than 10 feet, and wetlands are common. Large Figure 4 shows wetlands in the Project vicinity. The Mine Site has been extensively logged, and is currently in varying stages of regeneration. The Plant Site includes the former LTVSMC taconite processing plant and Tailings Basin, which includes the LTVSMC tailings basin and the proposed NorthMet Flotation Tailings Basin (FTB). Most of the surface area at the Plant Site has been previously disturbed by mining activities and is largely devoid of natural vegetation. Additional details on Project location are presented in Section 3.0 and are shown on the general environmental setting are presented in Section 11.1.

Project Purpose

The Project purpose is to develop a mining facility using the existing LTVSMC infrastructure that will extract and process polymetallic ore from the NorthMet ore body, to supply copper, nickel, cobalt, gold and Platinum Group Elements (PGEs), such as platinum and palladium, to the world market. The Project is needed to exercise valid mineral rights and help meet domestic and international demand for these metals which are used in the electrical power, steel, aircraft, automotive, electronics, and medical device industries. The Project will provide substantial economic benefits to the local and state economy, providing an estimated 360 full-time jobs, more than 600 indirect jobs, and tens of millions of dollars annually in taxes. Additional detail on the purpose of the Project is presented in Section 4.0 of this document and Section 1.3 of Reference (2).



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Project Description

PolyMet expects to mine a total of 225 million tons of ore and 308 million tons of waste rock over 20 years. Ore will be excavated at the Mine Site and hauled by railroad approximately 6 miles west to the Plant Site for processing. Corridors for roads, railroad, utilities, and water pipelines will connect the Mine Site and the Plant Site. Project areas are shown on Large Figure 2.

The Mine Site will occupy approximately 3,015 acres. The Project will develop open mine pits (up to 528 acres), stockpiles (up to 740 acres), and supporting infrastructure (up to 451 acres). The location and dimensions of Mine Site features are shown on Large Figure 5. Mine Site environmental controls will include, among other features, liners, and containment systems to collect seepage from stockpiles, a cover to limit infiltration through the permanent stockpile after closure, and a Waste Water Treatment Facility (WWTF) to treat water that comes in contact with mining features. Water collected from pit dewatering will be treated, then pumped to the Plant Site for use in ore processing. During operations, there will be no direct discharge of treated waste water from the Mine Site to waters of the U.S. or Minnesota public waters.

The Plant Site is a "brownfields" location which occupies approximately 4,417 acres. At the Plant Site, the Project will upgrade existing facilities (Beneficiation Plant, Tailings Basin, Area 1 Shop, Sanitary Treatment Plant, rail connections, access roads) and construct new facilities, including Hydrometallurgical Plant, Hydrometallurgical Residue Facility (HRF), Concentrate Dewatering/Storage Building, and Waste Water Treatment Plant (WWTP) on previously disturbed areas. The Flotation Tailings will be placed atop the existing LTVSMC tailings basin by staged construction of new dams. The location and dimensions of Plant Site features are shown on Large Figure 6.

Plant Site environmental controls during mining operations will include: cover systems to limit infiltration of oxygen and water through the Tailings Basin dams and seepage capture systems to collect seepage from the Tailings Basin. During reclamation and long-term closure, these environmental controls will continue to operate, and additional cover systems will be added to the Tailings Basin beaches and pond bottom. Most water used in processing will be recycled from the Tailings Basin Pond for use. A reverse osmosis WWTP will be constructed to treat any water that cannot be recycled prior to discharge to the environment. If makeup-water is needed for processing, it may be provided via the Colby Lake Pipeline Corridor. Additional detail on the Project description is presented in Section 5.0 of this document and Chapter 3 of Reference (2).

Project Alternatives

Project alternatives have been described in detail in the documents prepared during the Environmental Review Process. The No Action Alternative was evaluated during the Environmental Review Process. Under the No Action Alternative, PolyMet will be required to reclaim surface disturbances at the Mine Site associated with exploratory and development drilling. At the Plant Site, Cliffs Erie will be required to complete closure and reclamation



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activities. PolyMet did not prefer the No Action Alternative as it does not fulfill the purpose of the Project.

The Environmental Review Process resulted in Project modifications that avoid and minimize impact to aquatic resources and other environmental concerns. The Project, as initially proposed for the scoping Environmental Assessment Worksheet (EAW) in 2005, was estimated to result in 1,257 acres of direct wetland impacts. PolyMet has modified the Project considerably since that time, incorporating multiple changes for avoiding and minimizing wetland impacts. The changes incorporated into the refined Project include: avoiding wetlands by using brownfield lands at the Plant Site; avoiding water quality impacts by the collection and treatment of contact waters; minimizing the footprint and optimizing the placement of mining features such as the mine pits, stockpiles, and haul roads; increased in-pit stockpiling.

Large Table 3 summarizes the reduced aquatic ecosystem impacts based on the refinements completed during the evaluation of Alternatives. The cumulative effect of Project modifications is that wetland impacts have been reduced from 1,257 acres to 914 acres. Large Figure 7 and Large Figure 8 illustrate how Project modifications have evolved at the Mine Site and Plant Site, respectively. Additional detail on the Alternatives Analysis is presented in Section 6.0 of this document and in Chapter 3 of Reference (2). Ownership of the Project site and adjacent property owners is provided in Large Table 4.

Description of Wetland Impacts

Project direct wetland impacts will occur at the Mine Site (Large Figure 9), the Plant Site (Large Figure 10), and in the Transportation and Utility Corridors (Large Figure 11). Impacts from wetland fragmentation will occur at the Mine Site (Large Figure 9) and the Plant Site (Large Figure 10). The Project will result in impacts to 59 wetlands covering approximately 785 acres at the Mine Site, 45 wetlands covering a total of approximately 149 acres at the Plant Site, and 25 wetlands covering a total of approximately 7 acres in the Transportation and Utility Corridors connecting the Mine Site and Plant Site. Impacts are due to fill (101 acres), excavation (137 acres), both fill and excavation (592acres), or installation of the Tailings Basin seepage capture system (85 acres). Twenty-nine percent of the directly impacted wetlands at the Mine Site and Plant Site also are also impacted by wetland fragmentation. Approximately 65% of the directly impacted wetlands are rated high quality, 5% are rated as moderate quality, and 30% are rated as poor quality. The inventory of all wetlands in the Project areas is presented in Large Table 1 and direct wetland impacts are detailed in Large Table 2.

The Project may also cause indirect wetland impacts due to potential change in wetland watershed areas, stream flow, groundwater drawdown, wetland fragmentation, or wetland water quality related to dust or rail car spillage. The documents prepared during the Environmental Review Process describe the range of possible indirect impacts and indicate that the Project could potentially indirectly impact up to approximately 7,694 acres of wetlands located within and around the Project area based on the method of wetlands crossing analog impact zones, or potentially indirectly impact up to 6,567 acres of wetlands located within and around the Project



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area based on the method of wetlands within analog impact zones. Additional detailed descriptions of direct and potential indirect wetland impacts are presented in Sections 11.4 and 11.5 of this document and in Section 5.2.3 of Reference (2).

Special Considerations

PolyMet conducted database searches and field surveys to evaluate the presence of protected wildlife and plant species in the vicinity of the Project, and to identify any locations of cultural resources.

Wildlife species of special interest in the Project area are Northern goshawk, boreal owl, gray wolf, mountain lion, Canada lynx, and northern long-eared bat. During wildlife surveys in 2000 and 2004, gray wolf and mountain lion tracks were observed, and Northern goshawk was heard during calling surveys. Boreal owls and Canada lynx were not observed. In 2006, a Canada lynx field survey was conducted because a portion of the Project is located within the U.S. Fish and Wildlife Service (USFWS) designated critical habitat area. No Canada lynx or sign of Canada lynx were observed within the Project area. However, the survey identified four female Canada lynx within the larger study area. Surveys conducted in 2014 found northern long-eared bats present in the Project area but no evidence of northern long-eared bat hibernacula, or conditions suitable for hibernacula were identified. As part of the Section 404 permit review process, Section 7 Endangered Species Act consultation has been conducted between the USFWS and USACE. The USFWS issued a Biological Opinion (BO) in February of 2016 (Reference (4)). Additional details on protected wildlife species are presented in Section 12.1 of this document and Section 5.2.5 of Reference (2).

Sixteen plant species listed by the State of Minnesota as endangered, threatened, or special concern, or listed by the USFS Region 9 as a Regional Forester Sensitive Species (RFSS) were identified in the Project area during surveys conducted between 1999 and 2011. Additional details on protected plant species are presented in Section 12.1 of this document and Section 5.2.4 of Reference (2).

The Co-lead Agencies have conducted a review of effects on historic properties in the Area of Potential Effect (APE) under Section 106 of the National Historic Preservation Act (NHPA). After historical research, archaeological and architectural history surveys, oral interviews to identify historical properties of religious and cultural significance to the Bois Forte Band of Minnesota Chippewa, the Fond du Lac Band of Lake Superior Chippewa, and the Grand Portage Band of Lake Superior Chippewa (Consulting Bands) and extensive consultation, the Co-lead Agencies determined that the following historic properties in the APE are eligible for listing in the National Register for Historic Places (NRHP) and will be adversely affected by the NorthMet Project: the Erie Mining Company Hoyt Lakes Mining Landscape Historic District, which includes multiple contributing mining features within the APE (such as the Concentrator Building), as well as areas outside of the APE, such as Hoyt Lakes and Taconite Harbor, the Partridge River Segment of the Beaver Bay to Lake Vermillion Trail, the Partridge River Section of Mesabe Widjiu, and the Spring Lake Mine Sugarbush. An MOA resolving adverse effects to



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eligible properties will be executed and the NHPA process completed prior to issuance of federal approvals for the Project. Additional details on historic properties are presented in Section 12.2 of this document and Sections 4.2.9 and 5.2.9 of Reference (2).

Wetland Mitigation

Mitigation wetlands will be developed to compensate for the wetlands directly impacted by the Project. PolyMet will develop 1,581 wetland mitigation credits from off-site mitigation. The onsite wetland mitigation credits will occur later in the Project and therefore are not shown as mitigation credits in Large Table 5 through Large Table 7. Replacement wetlands will be restored and preserved developed at three off-site locations: the Zim, Hinckley, and Aitkin sites. Off-site replacement wetland locations and watersheds are shown in Large Figure 12. Acreages and credits from each of these sites are summarized in Large Table 5 through Large Table 7.

The proposed mitigation is expected to compensate for all of the direct wetland impacts and the potential indirect fragmentation impacts, with the majority of credits from in-kind mitigation and nearly one-third of the credits from within the Project watershed. The value of mitigation credits, relative to the impacts, has been calculated in accordance with the St. Paul District USACE policy and the State Wetland Conservation Act (WCA) replacement standards. The proposed wetland mitigation package described in this application is expected to result in an excess of approximately 47 credits under the USACE policy and 403 credits under the WCA. Additional details on wetland mitigation are presented in Section 15.0 of this document and Section 5.2.3 of Reference (2).

Wetland Mitigation Monitoring Plan

Monitoring at off-site wetland mitigation sites will assess whether or not the restored wetlands meet agreed upon performance standards. Monitoring will evaluate each wetland community type at the mitigation sites, and also evaluate at least one reference wetland near the restoration site which has relatively natural hydrologic conditions similar to that of the proposed target communities. Detailed vegetation surveys will be conducted each year (typically August) to evaluate the success of the restoration or preservation for each community type. Hydrology will also be monitored, using shallow water table monitoring wells, to measure the success of hydrologic restoration. If the restored wetland communities do not meet performance standards, PolyMet will propose remedial actions to meet the standard. The USACE and MDNR retain authority, if necessary, to require additional mitigation credits if remedial actions are not successful. Additional details on wetland mitigation monitoring are presented in Section 16.0.

Wetland Monitoring Plan

Wetland monitoring is being conducted at the NorthMet Site to provide baseline data to use in identifying potential indirect impacts to wetlands caused by mining activities. Monitoring is currently being conducted within all wetlands containing a potential indirect wetland impact factor rating of 3-5 and a sampling of those wetlands with factor ratings of 1-2 as shown in



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Large Figure 9 through Large Figure 11 and described in Section 11.5. To determine if indirect impacts occur, hydrology, vegetation, and wetland boundaries will be monitored, documented, and compared with baseline monitoring and reference wetlands. A total of 56 monitoring wells and five reference wells have been installed to collect baseline hydrology data and to document potential indirect wetland impacts. The monitoring protocol is described in Section 17.0. Hydrologic monitoring will continue at these 61 monitoring locations every year throughout the growing season for the life of the mine operation. If it is determined that certain wells are not providing useful information, the monitoring may be modified with the concurrence of the USACE and MDNR.



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1.0 Introduction

Poly Met Mining, Inc. (PolyMet) is a private Minnesota corporation that is the wholly-owned subsidiary of PolyMet Mining Corporation. For additional information, please see Chapter 2 of the Permit to Mine Application (Reference (5)).

PolyMet initially submitted its wetland permit application for the Project to the U.S. Army Corps of Engineers (USACE) in July 2004 (USACE File # 1999-5528-JKA) to fulfill the requirements of Sections 401 and 404 of the Clean Water Act (CWA). This wetland permit application initiated an assessment of the potential scope of environmental review under the National Environmental Protection Act (NEPA) and the Minnesota Environmental Protection Act (MEPA). A joint state and federal Environmental Impact Statement (EIS) was conducted under the authority of NEPA (United States Code 1976, title 42, sections 4321 to 4361) and MEPA (Minnesota Rules, chapter 116D). The NEPA/MEPA activities are collectively referred to in this application as the Environmental Review Process.

The Environmental Review Process produced a Draft Environmental Impact Statement (DEIS) in 2009. Because the Project was modified significantly after publication of the DEIS (Reference (6)), a revised wetland permit application was submitted to the USACE in August 2013 (Reference (7), which supplemented the 2004 application with the updated Project plans. A Supplemental Draft Environmental Impact Statement (SDEIS) was issued in November 2013 and a Final Environmental Impact Statement (FEIS) was issued in November 2015 (Reference (2)). The Wetland Replacement Plan is being submitted to the Minnesota Department of Natural Resources (MDNR) to fulfill its requirements under the Wetland Conservation Act (WCA) of 1991. The Wetland Replacement Plan provides updated information that is consistent with the FEIS (Reference (2)) and PolyMet's application for a Permit to Mine.

PolyMet proposes to construct an open pit, low grade, polymetallic mineral mine in northern Minnesota. The project, called the NorthMet Mine and Ore Processing Facilities Project (Project), is located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, and 6 miles south of Babbitt, Minnesota. The Project location is shown on Large Figure 1 and the Project areas are shown on Large Figure 2. The Project is located in the Partridge River and Embarrass River watersheds (Large Figure 3). Wetlands within the Project are identified on Large Table 1 and shown on Large Figure 4.

The Project will mine and process polymetallic ore from the northwest portion of the Duluth Complex, which is an ore complex that forms much of the bedrock of northeastern Minnesota. The ore contains copper, nickel, cobalt, gold, and Platinum Group Elements (such as platinum and palladium, known collectively as PGEs). PolyMet plans to refurbish and operate the former LTV Steel Mining Company (LTVSMC) taconite processing facility near Hoyt Lakes, Minnesota to produce copper concentrates, nickel concentrates, and base and precious metal precipitates for off-site shipment and processing.



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A brief history of the Project site is provided here. The NorthMet deposit has been subject to several episodes of exploration and drilling since its discovery in 1969 by U.S. Steel. Fleck Resources Ltd. (a precursor to PolyMet Mining Corporation) undertook exploration of the deposit in 1989. PolyMet (first generation) commissioned a pre-feasibility study in 2001 which did not contemplate reusing the LTVSMC facilities. The Project was restarted in 2003 when PolyMet (2nd generation) secured an option to buy the LTVSMC plant, which it subsequently exercised.

At the Mine Site, PolyMet has leased the mineral rights that are needed for the Project, but the USFS currently owns surface rights to the majority of the land. PolyMet and the USFS disagree on whether PolyMet can exercise the mineral rights. In part to avoid this disagreement, the USFS has initiated a land exchange with PolyMet under which PolyMet would provide surface rights to several privately-held parcels of land within the SNF which the USFS would exchange for land at the Mine Site (Reference (2)). The USFS has already issued a Draft Record of Decision (ROD), and is expected to issue a Final ROD that will provide their decision on the land exchange. Additional details on the land exchange are presented in Section 3.1.2, 4.3, and 5.3 of Reference (2).

For the Plant Site, PolyMet has acquired surface ownership of approximately 7,000 acres of real property and portions of the former LTVSMC taconite processing facility and approximately 8,000 additional acres from Cliffs Erie. Some of this land is additional acreage that would serve as buffer beyond the Project boundary. As described in Section 6.3, under the No Action Alternative, current permits with Cliffs Erie as the permittee would remain in effect. PolyMet also acquired the necessary surface licenses, easements and rights-of-way (e.g., roadways, railroad, electrical service, gas pipeline and water facilities) to enable production at the Plant Site.

To connect the Plant Site and the Mine Site, PolyMet has acquired the necessary easements and rights-of-way to use an 8-mile segment of Dunka Road. PolyMet has also acquired ownership or the right to use additional lands and other railroad assets to secure the rail access between the Mine Site and the Plant Site.



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2.0 Summary of Wetland Impacts

The Project is expected to result in direct and fragment (indirect) impacts to 129 wetlands, covering a total of approximately 940.7 acres (Large Table 2). Wetlands are directly impacted if they will be excavated or filled by Project activities or located between the toe of the Tailings Basin and the Flotation Tailings Basin (FTB) Seepage Containment System. The majority of direct wetland impacts will occur at the Mine Site (83%) followed by the Plant Site (16%). Road, railroad, and utility corridors account for less than 1% of direct wetlands impacts.

Using the Eggers and Reed Wetland Plant Community type (Reference (8)) and the Circular 39 wetland type (Reference (9)), the types of wetlands that will be directly impacted include: coniferous bog (Type 8; 56%), shrub swamp (Type 6; 12%), coniferous swamp (Type 7; 9%), shallow marsh (Type 3; 9%), deep marsh (Type 5; 8%), sedge/wet meadow (Type 2; 4%), hardwood swamp (Type 7; 1%), and open bog (Type 8; 1%).

Direct wetland impacts, the methods used to determine the impacts, and the estimated timing of impacts are detailed in Section 11.4



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3.0 Project Location

The Project is located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, and 6 miles south of Babbitt, Minnesota. The Project location is shown on Large Figure 1, and the Project areas, including the Mine Site and the Plant Site, are shown on Large Figure 2. The Project areas include 7,600 acres.

The NorthMet ore body (Mine Site) is in the SNF near the western end of a belt of copper-nickel deposits on the northwestern contact of the Duluth Complex. The NorthMet ore body is in relative proximity to a number of existing mines including the Peter Mitchell open pit taconite mine, which is located approximately 2 miles north of the Mine Site. The Plant Site, which is the former LTVSMC taconite plant property, is located approximately 8 miles west of the ore body. The Mine Site and Plant Site are connected by the existing Dunka Road. Access to the Project area is located approximately 5 miles northeast of Hoyt Lakes at the intersection of Country Road 666 and Dunka Road.

Specifically, the Project is located in Sections 5 and 6, Township 58 North, Range 14 West; Sections 1, 2, 3, 4, 9, 10, 11, 12, 16, 17, and 18, Township 59 North, Range 13 West; Sections 2, 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 20, 23, 24, 29, and 32, Township 59 North, Range 14 West; and Sections 32, 33, and 34, Township 60 North, Range 14 West, in St. Louis County, Minnesota.

The Project is located near the headwaters of the Partridge River and Embarrass River watersheds (Large Figure 3). The Partridge River and the Embarrass River are both tributary to the St. Louis River, which is located within the Lake Superior Basin. The Mine Site, a portion of the Plant Site, Dunka Road and Utility Corridor, Railroad Connection Corridor, and Colby Lake Pipeline Corridor are located within the Upper Partridge River Watershed (Large Figure 3). The majority of the Plant Site is located in the Embarrass River Watershed (Large Figure 3). Additional details on the Project area hydrology and hydrogeology are found in Section 11.1.1.



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4.0 Project Purpose and Need

The Project purpose is to develop a mining facility using the existing LTVSMC infrastructure that will extract and process polymetallic ore from the NorthMet ore body, to supply copper, nickel, cobalt, gold and Platinum Group Elements (PGEs), such as platinum and palladium, to the world market. The Project is needed to exercise valid mineral rights and will help meet domestic and international demand for these metals which are vital in the electrical power, steel, aircraft, automotive, electronics, and medical device industries. The mining activities will result in long-term jobs for the region. Environmental objectives are also intrinsic to the Project, which has been modified to avoid, minimize, and mitigate environmental impacts by reusing previous mining facilities, and constructing state of the art environmental controls.

The Project is needed for many reasons. The U.S. is a major importer of all the metals that PolyMet plans to extract from the NorthMet ore body. According to numbers from the U.S. Department of the Interior's Geological Survey National Minerals Information Center, the U.S. imports approximately 30-40% of its copper (comparable to the percentage of oil imported) – the annual numbers vary because there is an efficient copper recycling business in place. There are currently no operating nickel or cobalt mines in operation in the U.S., although recycled metal represents a significant supply source. The U.S. also imports 75-95% of its PGEs – there is only one PGE mining operation in the U.S. despite the critical need for PGEs in environmental control technologies and other strategic technological applications. The PGEs are regarded as strategic metals because of their specialized applications in the automotive, agriculture, chemical, petroleum, electrical, electronic, dental, medical, and aerospace industries. They also have important uses in environmentally-related technologies, such as catalytic converters and fuel cells.

On an annual basis, PolyMet expects to produce approximately:

- Copper 36,000 tons of concentrate will be produced. Copper is an extremely good conductor of electricity and heat. Its major use is in power generation and transmission (including renewable energy), and in residential, commercial, industrial and automotive electrical systems.
- Nickel 7,700 tons of concentrate will be produced. Nickel is used in production of stainless steel, high quality corrosion resistant steel alloys, rechargeable batteries, and in high-tech engineering applications such as aerospace.
- Cobalt 360 tons of concentrate will be produced. Cobalt is a hardening agent in steel alloys and is used in super alloys, aircraft engines, rechargeable batteries, and common hand tools.



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- PGEs 97,000 troy ounces of concentrate will be produced. The primary use of PGEs is in catalytic converters which clean-up car exhaust emissions. The PGEs are also used in electronics, medical devices, fuel cells, and jewelry.
- Gold 9,000 troy ounces of concentrate will be produced. Gold is primarily used for jewelry, investment, and electronics.

The Project will provide substantial economic benefits to the local and state economy, providing hundreds of jobs, millions of dollars of indirect economic activity, and tens of millions of dollars in taxes. The construction phase will engage the equivalent of about 500 skilled construction workers over a three-year period (Reference (2)). Over approximately 20 years of planned operations, the Project will create approximately 360 full-time jobs with an estimated annual payroll and benefits of \$36 million. In addition to the direct economic benefits, a study by the University of Minnesota-Duluth Labovitz School of Business and Economics (Reference (10)) estimates that more than 600 indirect jobs will be created in St. Louis County alone, generating annual economic benefit of about \$515 million including products and services. Furthermore, the Project is expected to generate tens of millions of dollars annually in federal, state, and local taxes.

PolyMet has evaluated and developed the Project using very conservative assumptions about metals prices. The Definitive Feasibility Study completed in 2006 (Reference (11)) and updated in 2008 demonstrated that the Project will be sustainable even during downturns in the global metal markets. These conservative assumptions help buffer the community from potential economic impacts associated with volatility in the metals markets.

Society's continuing need for copper, nickel, cobalt, gold, and PGEs, combined with use of proven mining techniques and processing methods, reuse of previous mining facilities, and installation of extensive environmental controls, make the Project economically feasible and environmentally responsible. The Project is designed to generate sufficient income to cover operating cost (which includes but is not limited to the cost of mining, processing, transportation, and waste management), capital cost (needed to build and sustain facilities), an adequate return to investors, reclamation and closure costs, and taxes. The open pit mining plan applies best engineering practices based on the size, shape, geometry, grade, location, and geotechnical characteristics of the ore body and the site such that the highest degree of operational certainty is achieved. Ore processing and tailings storage will make use of the existing LTVSMC plant and tailings basin, minimizing impacts to previously disturbed land. Extensive environmental controls will be installed at both the Mine Site and the Plant Site, focused on avoiding, minimizing, and mitigating water impacts, including wetlands impacts.



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5.0 Project Description

This section describes specific Project features that will potentially result in wetland impacts. Additional Project features that have no potential wetland impacts are listed in this section, but are not described in detail. For a detailed description of all Project features, refer to the FEIS, Reference (2) and PolyMet's application for a Permit to Mine.

The Project includes five areas:

- Mine Site
- Plant Site, including the processing facilities area, the Tailings Basin and the Hydrometallurgical Residue Facility (HRF)
- Dunka Road and Utility Corridor
- Railroad Connection Corridor
- Colby Lake Pipeline Corridor

These areas are shown on Large Figure 2. For each of these Project areas, specific features that will potentially result in wetland impacts are described.

5.1 Project Schedule

Table 5-1 provides a summary of the Project schedule.

Table 5-1 Summary of Project Schedule

Time period	Description of Activities
Construction Phase (18-24 month period prior to Mine Year 1)	Mine Site land clearing and overburden removal, Plant Site renovation and construction, construction associated with the Tailings Basin, Mine Site construction, construction and renovation along the Transportation and Utility Corridors, and utility upgrades
Mine Year 1	Production begins
Mine Years 1-2	Gradual ramp-up of ore output for 6-12 months
Mine Years 1-20	Mining of waste rock and ore
Mine Years 1-8	Build out Mine Site as necessary: remove additional overburden from the pit areas and other areas on - site as necessary for foundation construction; construct extensions to the liners and containment systems for OSP and waste rock stockpiles; construct additional water management features (WWTF, dikes, ditches, ponds); build out additional haul roads; build out FTB dams and HRF



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Time period	Description of Activities
Mine Years 1-11	Mining in the East Pit
Mine Years 2-20	Mining in the West Pit
Mine Years 1-10	Mine water will be pumped to the Plant Site FTB Pond for reuse
Mine Year 11	East Pit mining ends; Category 4 Waste Rock stockpile is completely backfilled into the East Pit
Mine Year 11	Some WWTF treated effluent will be sent to the East Pit to augment flooding as the pit is backfilled
Mine Years 11-16	Mining in the Central Pit; the Central Pit will converge into the East Pit, the combined pit will be called the East Pit; excavated Category 2, 3, and 4 waste rock will be placed directly in the East Pit
Mine Years 12-19	Category 2/3 Waste Rock Stockpile is backfilled into the East Pit
after Mine Year 13	All additional Category 1 waste rock excavated from the pits will be placed in the East Pit; Cover system will incrementally be added to the Category 1 Waste Rock Stockpile
Mine Years 16-20	Temporarily-stockpiled Category 2/3 and 4 waste rock will be placed in the Central Pit

5.2 Mine Site

The Project will use open pit mining methods, similar to those used at nearby taconite mines. The location and dimensions of Mine Site features are shown on Large Figure 5. The Project features at the Mine Site will include:

- supporting infrastructure (such as roads, electrical supply, rail connections, fueling facilities, and maintenance facilities)
- an Overburden Storage and Laydown Area (OSLA) to provide space to sort and store overburden used for construction and reclamation
- mine pits
- ore handling facilities, including an Ore Surge Pile (OSP) and a Rail Transfer Hopper (RTH)
- waste rock stockpiles with engineered systems to manage potential water resource impacts (such as liners, covers, and a Groundwater Containment System)



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- a Waste Water Treatment Facility (WWTF) and mine water collection systems to collect and treat water from the mine pits, the stockpiles, the ore handling facilities, and the haul roads
- a Central Pumping Station (CPS) and Treated Water Pipeline (TWP) to transport water from the Mine Site to the Plant Site
- stormwater management systems

5.2.1 Construction Phase

Mine Site infrastructure will be constructed over an estimated 18 to 24 months. As described in Section 3.2.2.1.3 of Reference (2), these activities will include:

- infrastructure upgrading the existing Dunka Road, constructing site access and haul roads, installing railroad connections and spur, and constructing the Mine Site Fueling and Maintenance Facility (MSFMF)
- removing overburden from the pit area and other areas on-site, as necessary
- constructing the RTH
- constructing the liners and containment systems for the OSP and waste rock stockpiles
- constructing water management features, including the WWTF, CPS, and TWP, as well as dikes, ditches, and ponds to manage stormwater
- constructing the substation drop from the 138 kilovolt (kV) transmission line and installation of a 13.8 kV Mine Site power distribution system

Most of the direct wetlands impacts at the Mine Site will occur during construction. When blasting begins, in Mine Year 1, ore output will gradually ramp-up over 6 to 12 months.

5.2.2 Mining Activities

PolyMet expects to mine a total of 533 million tons of waste rock and ore over 20 years, which will include 225 million tons of ore and 308 million tons of waste rock. After the initial ramp up period, the planned maximum annual average ore production rate will be 32,000 tons per day. Ore will be shipped to the Plant Site, as described below, and waste rock will be managed as described in Section 5.2.3.

Mining activities include overburden removal (pre-stripping), open pit mining, pit dewatering, drilling and blasting, excavation and haulage, stockpiling, ore loading for transport to the Process Plant via the RTH, and temporary ore storage in the OSP. Drilling, blasting, excavation, haulage,



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and ore loading for transport to the Process Plant via the RTH are mining activities that will not result in wetland impacts, and are not discussed further here. Overburden removal, open pit mining, temporary ore storage, and waste rock and overburden stockpiles will result in wetland impacts, and are described further below.

5.2.2.1 Overburden Removal

The marketable timber will be cleared and the overburden removed from the footprints of the mine pits, the OSP, and the waste rock stockpiles, as necessary.

Overburden will be stripped incrementally as needed for mine development in order to minimize the amount of bedrock exposed at any one time. After removal of overburden from the initial mining area, additional overburden stripping could take place concurrently with the mining of ore and waste rock.

The OSLA will be constructed to temporarily store Peat and Unsaturated Overburden while it is screened and sorted prior to being used for construction, wetland restoration, or reclamation. Overburden has been defined for this Project as the material that lies on top of the underlying bedrock.

5.2.2.2 Open Pit Mining

The Project will use open pit mining methods similar to those currently in use at ferrous metallic mining operations on the Iron Range. The mine will consist of three separate open pits known as the East, Central, and West Pits, as shown in Large Figure 5. For approximately the first 10 years of operations, mining will take place in the East and West Pits simultaneously, with the East Pit mining ending in Mine Year 11. The Central Pit mining will occur between Mine Years 11 and 16. During Central Pit mining, the East and Central pits will converge into one pit which will then be referred to as the East Pit.

At maximum size, each pit is projected to have the approximate maximum area and depth as shown in Table 5-2.



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Table 5-2 Maximum Pit Dimensions - Approximate

Mine Pit	Area (acres)	Maximum Depth (feet below ground surface)
West	321	696
Central	52	356
East	155	630

5.2.2.3 Ore Surge Pile (OSP)

The OSP will be constructed near the RTH to store ore temporarily until it can fit into the processing schedule or as needed based on operational delays (Large Figure 5). Use of the OSP will allow for delivery of a steady annual flow of ore and assist in providing a uniform grade of ore to the Plant Site. Ore will flow into and out of this pile during the life of the mine as needed to meet mine and plant operating conditions.

The OSP will be constructed with an engineered foundation system comprised of, from the bottom up, a foundation underdrain system, an impermeable composite liner barrier, and an overliner drainage layer. Drainage from the OSP will be collected on the liner and routed to a sump for pumping to the WWTF. The OSP will be removed at the completion of mining activities.

5.2.3 Waste Rock and Overburden Management

5.2.3.1 Overburden Management

Three types of overburden are present at the Mine Site; Unsaturated Overburden, Saturated Overburden, and Peat. Each type of overburden will be managed according to its characteristics.

Unsaturated Overburden is the mineral material located above the natural water table surface. Waste characterization studies have demonstrated that Unsaturated Overburden has been weathered long enough for geochemical reactions to be relatively complete, so it will be usable for general on-site construction material. Excess Unsaturated Overburden that is not needed for immediate construction and reclamation needs will be stored in unlined overburden stockpiles at the OSLA.

Saturated Overburden is the mineral material located below the natural water table surface. It has not been exposed to air and is therefore not weathered; so it will only be usable for specific onsite construction applications as approved by the MDNR. Saturated Overburden not used for construction will be combined with waste rock in the membrane-lined temporary waste rock stockpiles.



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Peat, which is an organic soil, will be used for restoration and reclamation activities at the Mine Site. This may include the development of wetlands in the East Pit and within the reclaimed temporary stockpile footprints. Peat will also be mixed with Unsaturated Overburden to increase the organic content for restoration soil material across the Mine Site, including over the geomembrane cover of the Category 1 Waste Rock Stockpile. Peat that is not needed for immediate construction and reclamation needs will be stored in unlined overburden stockpiles at the OSLA.

5.2.3.2 Waste Rock Management

Waste rock will be managed according to its geochemical properties as determined using a sampling and analysis program approved by the MDNR. PolyMet has categorized waste rock into four categories defined according to the geochemical and associated acid-producing and metals-leaching properties of the waste rock, in ascending order of reactivity. These waste rock categories are summarized in Table 5-3.

Table 5-3 Summary of Waste Rock Properties

Waste Rock Categorization	Sulfur Content (%S) ⁽¹⁾	Approximate % of Waste Rock Mass	Applications ⁽²⁾
Category 1	%S ≤ 0.12	70%	Construction and East Pit Backfill
Category 2	0.12 < %S ≤ 0.31	24%	East Pit Backfill
Category 3	0.31 < %S ≤ 0.6	3%	East Pit Backfill
Category 4 ⁽³⁾	%S > 0.6	3%	East Pit Backfill

⁽¹⁾ In general, the higher the rock's sulfur content, the higher its potential for generating acid rock drainage (ARD) or leaching heavy metals.

The Category 1 Waste Rock Stockpile will be the only permanent stockpile for the Project. During Mine Years 1 through 11, Category 2, 3, and 4 waste rock will be placed on the temporary Category 2/3 or Category 4 Waste Rock Stockpiles (Large Figure 5). When at its maximum size, each stockpile is projected to have the approximate area, height, and elevation shown in Table 5-4.

⁽²⁾ Applications include uses of the material other than stockpile storage

⁽³⁾ Includes all Virginia formation rock



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Table 5-4 Maximum Stockpile Dimensions - Approximate

Stockpile	Mine Year of Maximum Footprint	Max Footprint (acres)	Max Height (feet)	Max Elevation (feet above sea level)
Category 1 Waste Rock	21	526	240	1,880
Category 2/3 Waste Rock	6	180	200	1,770
Category 4 Waste Rock	3	57	180	1,790
Ore Surge Pile	N/A ⁽¹⁾	31	120	1,690

⁽¹⁾ The ore surge pile will have ore moving in and out as needed to meet mine and plant conditions.

Starting in Mine Year 11, when mining in the East Pit ends, the temporary Category 2/3 and Category 4 Waste Rock Stockpiles will be relocated to the East Pit, and all future Category 2, 3, and 4 waste rock will be placed in the East Pit or the Central Pit, once mining ceases in the Central Pit after Mine Year 16. By placing Category 2, 3, and 4 waste rock into the East Pit and Central Pit, it will be stored in a subaqueous environment to reduce the environmental impact associated with further oxidation and dissolution of sulfide minerals. Furthermore, this in-pit stockpiling avoids and minimizes wetland impacts. Most of the Category 1 waste rock mined after Mine Year 12 will also be placed in the East Pit. Ultimately, approximately 45% of the total waste rock mined will be backfilled to the East and Central pits.

All waste rock stockpiles will be engineered to manage water resource impacts. The temporary Category 2/3 and Category 4 Waste Rock Stockpiles, which have the potential to generate acid rock drainage, will have liner systems to capture water passing through the stockpile. The permanent Category 1 Waste Rock Stockpile, which does not have the potential to generate acid rock drainage, will be constructed with a Groundwater Containment System to collect stockpile drainage from around the entire stockpile. The containment system will consist of a cutoff wall (a low permeability compacted soil cutoff wall) combined with a drainage collection system surrounding the perimeter of the stockpile near the stockpile toe. A cover system will be added incrementally on the Category 1 Waste Rock Stockpile starting in Mine Year 13 to reduce the volume of stockpile drainage.

5.2.4 Mine Site Water Management

Water management at the Mine Site will include pit dewatering, stormwater dikes and ditches, the stockpile liners, a stockpile cover, a Groundwater Containment System, and the WWTF. During operations, the WWTF will treat mine water from the waste rock stockpiles, haul roads, OSP, and mine pits. For the first approximately 10 years, all WWTF effluent will be pumped to the Plant Site FTB Pond for reuse in the beneficiation process. Reuse of the treated mine water at the Plant Site will eliminate the need to discharge any WWTF effluent to surface waters at the Mine Site during operations. Starting in Mine Year 11, some WWTF effluent will be sent to the



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East Pit to augment flooding as the pit is backfilled, with the remainder of the effluent continuing to go to the FTB.

Mine Site water will be managed in accordance with a future Minnesota Pollution Control Agency (MPCA) National Pollutant Discharge Elimination System (NPDES)/ State Disposal System (SDS) permit, which will include a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP will identify and describe Best Management Practices (BMP) for the Mine Site to minimize the discharge of potential pollutants in stormwater runoff. For a detailed discussion of Mine Site water management, refer to Reference (2), as well as PolyMet's permit to mine and NPDES/SDS permit applications.

5.3 Plant Site

The Plant Site was previously used as a taconite processing facility by LTVSMC. The Project will upgrade existing facilities and construct new facilities within the existing brownfield facility. The location and dimensions of Plant Site features are shown on Large Figure 6. Plant Site features are grouped into three areas for the wetlands analysis and Wetland Replacement Plan, as follows:

• Processing Facilities Area

- o supporting infrastructure (e.g., roads, electrical supply, rail connections, Area 1 Shop, and Area 2 Shop)
- o a Beneficiation Plant which will use existing buildings for crushing and concentration operations and new buildings for flotation and concentrate dewatering
- o a Hydrometallurgical Plant
- o a Waste Water Treatment Plant (WWTP)

FTB Area

- the existing former LTVSMC tailings basin (Tailings Basin), with a new FTB constructed atop the east side
- o FTB seepage capture systems

HRF Area

The FTB and the HRF are located within the LTVSMC Permit to Mine Ultimate Tailings Basin Limit boundary. When LTVSMC ceased production in January 2001, the mining related assets were transferred to Cleveland Cliffs, Inc. which formed Cliffs Erie LLC. The wetlands located within the Cliffs Erie LLC (formerly LTVSMC) Permit to Mine Ultimate Tailings Basin Limit



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boundary are not regulated by state and federal wetland regulations so were not included in this analysis (Attachment A).

5.3.1 Flotation Tailings Basin (FTB)

Flotation Tailings from the flotation process at the Beneficiation Plant will be pumped to the FTB, which will be constructed on top of cells 1E and 2E of the existing former LTVSMC tailings basin. (Large Figure 6). In this document, the "FTB" means the newly constructed NorthMet Flotation Tailings Basin, the "LTVSMC tailings basin" means the existing former LTVSMC tailings basin, and the "Tailings Basin" means the combined LTVSMC tailings basin and the FTB. Treated water from the WWTP and WWTF will also be pumped to the FTB, enabling the FTB to serve as the primary source of water for the Beneficiation Plant.

The LTVSMC tailings basin is unlined and was constructed in stages beginning in the 1950s. It has been inactive since LTVSMC operations were shut down in January 2001, except for reclamation activities consistent with an MDNR-approved Closure Plan currently managed by Cliffs Erie.

The future FTB perimeter dams will be raised using upstream construction methods. The dams will be constructed using compacted LTVSMC tailings borrowed from the existing LTVSCM tailings basin. As necessary, off-site borrow from MDNR-approved sources will be utilized. Material from LTVSMC Area 5 will be a likely source, but other sources could also be considered.

Emergency overflow channels will be provided to protect the dams in the unlikely event that freeboard within the FTB is not sufficient to contain all water from an extreme storm event. Analysis indicates that such extreme rainfall events have a low likelihood of occurring during the life of the basin (Reference (2)). Even though there is a low likelihood of overflow, it is standard practice in dam design to accommodate overflows in a manner that protects the integrity of the dams.

5.3.2 Flotation Tailings Basin Seepage Capture Systems

Seepage from the Tailings Basin will be collected by the FTB Seepage Containment System located around the northern, western, and portions of the eastern sides of the Tailings Basin, and the FTB South Seepage Management System located south of Tailings Basin Cell 1E; these two systems are collectively referred to as the FTB seepage capture systems. The FTB Seepage Containment System will be the primary cause of direct wetland impacts at the Plant Site. The FTB Seepage Containment System will consist of a cutoff wall (a low permeability cutoff wall) combined with a seepage capture system. The cutoff wall will minimize the amount of water that the seepage capture system draws into the seepage capture system from adjacent wetlands.

5.3.3 Hydrometallurgical Residue Facility (HRF)

The HRF will be constructed to manage residues generated by the hydrometallurgical process. The HRF will consist of one lined cell located adjacent to the southwest corner of Tailings Basin



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Cell 2W, at the site of the Emergency Basin used in the former LTVSMC operations (Large Figure 6).

The HRF will be double-lined to minimize release of water that has contacted the hydrometallurgical residue. The composite liner system will consist of a geomembrane liner above a geosynthetic clay liner with a second geomembrane/geosynthetic clay liner placed above the first, separated by a leakage collection system, this system will substantially remove all hydraulic head from the lower liner; therefore virtually eliminating leakage from the HRF.

The HRF will be filled by pumping the combined hydrometallurgical residue (Residue) as slurry from the Hydrometallurgical Plant. A pond will be maintained within the HRF so that the solids in the slurry will settle out. Most of the liquid will be recovered by a pump system and returned to the plant for reuse.

5.3.4 Plant Site Water Management

Water management at the Plant Site will include the FTB, the HRF, stormwater dikes and ditches, FTB seepage capture systems, the WWTP, and stream augmentation. With the exception of the FTB Seepage Containment System, all Plant Site water management features will be located on previously disturbed areas.

A portion of the tailings basin seepage collected by the seepage capture systems will be returned to the FTB Pond for reuse in mineral processing, and a portion will be routed to the WWTP. WWTP effluent will be treated to meet appropriate discharge limits, then discharged beyond the FTB seepage capture systems to wetlands in the headwater areas of Trimble Creek and Unnamed Creek and to the headwaters segment of Second Creek, to replenish the flow to the surrounding wetlands and streams. This discharge strategy will limit the potential for indirect wetland impacts due to reduced seepage from the Tailings Basin to the wetlands.

Construction of the FTB seepage capture systems will reduce the amount of seepage that currently flows from the existing LTVSMC tailings basin to the headwater areas of Unnamed Creek, Trimble Creek, Unnamed (Mud Lake) Creek, and Second Creek. Reduced streamflow levels could affect ecological functions, and during environmental review, the agencies indicated that PolyMet will be required to maintain streamflow within $\pm 20\%$ of baseline flow levels on an average annual basis.

To meet this requirement, PolyMet will distribute treated effluent from the WWTP to the headwater areas of Trimble Creek, Unnamed Creek, and Second Creek in proportion to the amount of water that the FTB seepage capture systems will block from flowing to each creek's watershed. A Drainage Swale will be constructed east of the Tailings Basin to route non-contact stormwater to Unnamed (Mud Lake) Creek. These water management activities, referred to as "stream augmentation," are designed to prevent significant ecologic impacts in wetlands and creeks that currently (or previously) received flow of seepage from the LTVSMC tailings basin.



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The Plant Site water will be managed in accordance with a future MPCA NPDES/SDS permit, which will include a SWPPP. The SWPPP will identify and describe BMPs at the Plant Site to minimize the discharge of potential pollutants in stormwater runoff. For a detailed discussion of Plant Site water management, refer to Reference (2), as well as PolyMet's Permit to Mine and NPDES/SDS permit applications.

5.4 Road, Utility, Railroad, and Water Pipeline Corridors

The remaining Project components are linear corridor features, including the following:

- Dunka Road and Utility Corridor
- Railroad Connection Corridor
- Colby Lake Pipeline Corridor

5.4.1 Dunka Road and Utility Corridor

Dunka Road is an existing, compacted-gravel, private road that extends from near the existing LTVSMC Plant Site to the Mine Site, then continues roughly northeast toward Babbitt, Minnesota. The portion of Dunka Road that connects the Plant Site to the Mine Site will be widened and a pipeline will be constructed parallel and adjacent to the existing Dunka Road. Dunka Road will be utilized to transport mine equipment between the Mine Site and the Area 1 Shop, as well as mine personnel between the Mine Site and the Area 2 Shop (Large Figure 2).

The TWP will be constructed in the Utility Corridor to transport treated mine water from the Mine Site to the Plant Site. During operations, the effluent from the WWTF and runoff from the OSLA will be pumped from the Mine Site through the TWP to the FTB for use as plant make-up water.

5.4.2 Railroad Connection Corridor

An approximately 1.1 mile length of new railroad will be constructed to connect the existing Cliffs Erie private railroad to the existing PolyMet railroad track that serves the Coarse Crusher Building at the Process Plant (Large Figure 2).

5.4.3 Colby Lake Pipeline Corridor

The FTB Pond will supply most of the water needed for the milling and flotation circuits. Makeup water for the Beneficiation Plant and the Hydrometallurgical Plant will be drawn from the Plant Reservoir which is supplied from Colby Lake using an existing pump station and pipeline. The Colby Lake Pipeline will be evaluated and repaired if necessary before it is recommissioned (Large Figure 2).

6.0 Project Alternatives: Avoiding and Minimizing Wetland Impacts



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Regulations implementing the federal CWA and the WCA require that impacts to wetlands be avoided and minimized to the extent practicable. Avoiding and minimizing wetland impacts accordingly was one of the objectives of Project during the Environmental Review Process.

This section analyzes the alternatives considered during the Environmental Review Process that affect the Project's direct wetland impacts. For a comprehensive analysis of the full range of alternatives explored and evaluated during the Environmental Review Process, see Section 3.0 of Reference (2).

This section first outlines the sequencing of steps taken by PolyMet to modify the project to avoid adverse impacts, and incorporate measures to minimize adverse impacts. It then discusses how alternatives were developed and evaluated. Finally, it describes the alternatives, including the No Action Alternative, and minimization alternatives at the Mine Site, the Plant Site, and in the Transportation and Utility Corridors.

6.1 Sequencing

This section describes the reasonable and practicable avoidance, minimization, and compensatory mitigation practices that have been and will be implemented as part of the Project.

The Project was modified through the process described above to have the fewest impacts practicable to waters of the U.S., as well as to other biological resources (e.g., vegetation, wildlife, threatened and endangered species, etc.). In addition, to assess alternatives and possible additional environmental management and mitigation measures, the co-lead agencies prepared a final FEIS for the project in November of 2015 (Reference (2)).

Final regulations and guidelines associated with Section 404 of the CWA require that project proponents eliminate or reduce adverse impacts to waters of the U.S. by taking certain specific steps during the project planning:

- Modify the project to avoid adverse impact
- Incorporate measures to minimize adverse impacts;
- Compensate for unavoidable adverse impacts through restoration, enhancement, creation, or in-lieu fee.

In addition to the off-site mitigation credits that will be developed, PolyMet may develop wetlands on some impacted Project areas in the future. Because the development of these on-site wetland mitigation credits will occur later in the Project, they are not included in the mitigation credits, as discussed in Section 14.0 of this document and Section 5.2.3.3 of Reference (2).



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6.1.1 Avoidance

The Project is not a water dependent project; however, it is not possible to avoid all waters of the U.S., including wetlands. The project has been modified to avoid wetlands to the extent practicable.

Geology dictates the location and dimension of the mine pits. The polymetallic ore bodies of the NorthMet deposit can be developed only where the mineral resource exists in economically minable quantities. Extensive exploration programs have been conducted to define the resource, which has allowed a refinement of the pit locations. These studies indicate that the ore reserves identified as the East Pit, Central Pit, and West Pit are the areas where polymetallic ore quality and the distribution and amount of waste rock make mining economically feasible. Mining in other areas of the deposit cannot currently be supported based on these studies.

6.1.2 Minimization

Although avoidance of impacts to waters of the U.S. is impossible, the project will employ numerous methods to minimize impacts.

Alternatives to minimize wetland impacts at the Mine Site, Plant Site, and Transportation and Utility Corridors are described in Sections 6.4, 6.5, and 6.6 respectively. Minimization alternatives use the following general strategies:

- minimize the footprint and optimize the placement of mining features, mainly at the Mine Site
- maintain a smaller disturbance footprint by re-using existing infrastructure, mainly at the Plant Site brownfield site
- utilize existing facilities and structures, to the extent practicable, to support ongoing activities
- maintain future tailings disposal in a single location and within the existing watershed where the current facility is located
- expand the existing tailings disposal site upward, to the extent geotechnically practicable, thus disturbing less surface area while allowing more material to be placed in the same footprint
- divert runoff upgradient of facilities into undisturbed drainages
- install culverts to facilitate flow across wetland areas
- maintain a SWPPP, using BMPs, to prevent site erosion and subsequent downstream sedimentation



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- collect and treat runoff and other contact water
- implement interim, concurrent (as practicable) and permanent reclamation at the site

6.1.3 Reclamation

After Project closure, Project areas will be reclaimed according to the approved reclamation plans (Reference (2)). The Reclamation Plans for the Mine Site include creation of wetlands in areas where some wetlands were directly impacted (Reference (2)). For example, at the Mine Site, wetlands may be developed in the footprints of the temporary Category 2/3 Waste Rock Stockpile and the OSLA (Section 15.1).

6.1.4 Compensation

Wetland mitigation projects will be completed to compensate for the direct wetland impacts and potential indirect fragmentation impacts, as detailed in Sections 14.0 and 15.0 of this document and Section 5.2.3.3 of Reference (2).

6.2 Alternative Development and Evaluation

Alternatives were developed and evaluated in four stages during the Environmental Review Process; the scoping stage, the DEIS stage, the SDEIS stage, and the FEIS stage. Aspects of the proposed action that were considered included alternate locations, alternate configurations of Project features and alternate mitigation measures and summarized in Sections 6.4, 6.5, and 6.6. The alternatives are discussed in the FEIS (Reference (2)). Some alternatives would have less adverse impacts to waters of the U.S., including wetlands, and some would have greater adverse impacts. Alternatives with smaller and larger areal coverage, as well as alternatives sited in different locations were considered. The Environmental Review Process evaluated the potential environmental impacts of the alternatives, including wetland impacts, during each stage of alternative development.

The practicability of the alternatives, including cost, technical factors, and logistical factors were evaluated. Practicable alternatives and mitigation measures that were identified to offer substantial environmental benefits, and to meet the Project purpose and need, were incorporated into the draft alternative (Project Proposed Action).

Alternatives were eliminated if they failed to meet one of the following criteria:

- meet the Project purpose and need
- technical feasibility
- economic feasibility
- availability of resources (e.g., surface rights, mineral rights, technologies)



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• significant environmental or socioeconomic benefits compared to other alternatives

The first stage of alternative development and screening took place during project scoping in 2005. The second stage of alternative development and evaluation took place with the 2009 Draft EIS (DEIS) (Reference (6)). Alternatives considered during project scoping and DEIS development are summarized in the 2009 DEIS (Table 3.2-4 of Reference (6)). For each alternative that was eliminated, this table indicates the rationale.

In June 2010, the co-lead agencies decided that a SDEIS would be completed for the Project in order to build upon the alternatives and issues identified in the 2009 DEIS, to address subsequent public comments, and to incorporate new information.

The third stage of alternative development and evaluation was completed for the SDEIS (Reference (1)). As an initial step in developing the SDEIS, the co-lead agencies developed and approved a process to identify, analyze, and assist PolyMet in developing revisions to its proposal that responded to the concerns raised under the Environmental Review Process. The objective of this process was to have a revised draft alternative that would minimize potential environmental impacts to the extent practicable. An additional goal of the draft alternative development was to support federal and state permitting decision making, including the USACE's need to identify a Least Environmentally Damaging Practicable Alternative (LEDPA) for the Section 404 Wetland Permit Record of Decision and the Section 7 Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS).

The process for evaluating the draft alternatives was included in the SDEIS and involved topic-focused workgroups which discussed key issues that needed to be closely examined. These workgroups included representatives from the co-lead agencies, cooperating agencies, other regulating agencies, and PolyMet. These workgroups participated in the impact assessment planning process, which led to the development of work plans for data packages and management plans. The workgroups discussed evaluation criteria, methodologies for analysis, potential effects, and possible mitigation measures.

A workgroup was also established to discuss issues related to the project modifications, alternatives (predominantly the Mine Site and Tailings Basin Alternatives addressed in the DEIS), the wild rice standard, and various potential mitigation measures identified by the topic-focused workgroups. PolyMet modified the Project in response to workgroup discussions, comments on the DEIS and evolving MPCA water quality guidance (Reference (12)), resulting in the development of a draft Project alternative that the co-lead agencies felt was appropriate for the SDEIS. Throughout 2011, the co-lead agencies sought input from the cooperating agencies, other involved agencies, and PolyMet and its consultants.

Impact analysis was performed for the draft alternative (as the Project) in the SDEIS using probabilistic modeling programs, GIS and special data analysis and other impact assessment calculations. These estimated effects are described in Section 5 of Reference (2).



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Alternatives considered during the development of the Project are summarized in the SDEIS (Reference (1)). For each alternative that was eliminated, Table 3.-2.17 of Reference (1) indicates the rationale for why it was eliminated from further consideration. This alternatives evaluation included both evaluation of new alternatives developed subsequent to the DEIS, and re-evaluation of several alternatives that had been eliminated. After the 2013 SDEIS, the Project was further refined, as described in Section 3.2.3.3.4 of Reference (2). Large Table 3 shows a summary of the refinements to the Project that occurred based on the alternatives considered, evaluated, and incorporated into the draft alternative. For each refinement, the associated reduced environmental impact is noted. Additional information is provided in Chapter 3 of Reference (2).

6.3 No Action Alternative

The No Action Alternative was evaluated during the Environmental Review Process. The FEIS addressed the No Action Alternative and described the consequences to the applicant and to the public of not implementing the Project (Reference (2)). Under the No Action Alternative, PolyMet would be required to reclaim surface disturbances at the Mine Site associated with exploratory and development drilling. At the Plant Site, Cliffs Erie would be required to complete closure and reclamation activities. PolyMet did not prefer the No Action Alternative as it would not fulfill the purpose of the Project.

6.4 Mine Site Minimization Alternatives

The Mine Site will be developed at a greenfield site that has previous disturbance from logging and mining exploration activities. Alternatives for avoiding and minimizing wetland impacts at the Mine Site use various strategies to minimize the footprint and optimize the placement of mining features such as the mine pits, waste rock and overburden stockpiles, haul roads, water management systems, and supporting infrastructure.

6.4.1 Mining Method Alternatives

The alternative of conducting underground mining, rather than open pit mining, was considered during the Environmental Review Process for the DEIS, the SDEIS, and FEIS, as it could have minimized wetland impacts at the Mine Site. As part of the Environmental Review Process, the co-lead agencies eliminated the underground mining alternative, however, finding that, among other things, it would not be economically viable, and would not meet the Purpose and Need for the Project (Reference (13)). The same information supports the conclusion that underground mining is not a practicable alternative under the Section 404 regulations. Therefore, there are no further practicable or feasible alternatives for avoiding or minimizing the impacts to wetlands that occur within the limits of the economically minable polymetallic ore reserves.

6.4.2 Alternative Mine Site Layouts

Given that underground mining was found not to be a practicable alternative, the Environmental Review Process evaluated numerous alternatives for open pit mining with the objective of



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avoiding and minimizing wetland impacts. Through the Environmental Review Process, the mine site minimization alternatives have been configured into three alternative Mine Site layouts, which vary in the extent to which they incorporate the minimization strategies described in Sections 6.4.2.1 and 6.4.2.2. Large Figure 7 illustrates the three alternative Mine Site layouts.

- Scoping EAW Mine Site Layout: One large open pit with three permanent stockpiles occupying most of the site surface area east and west of the pit. Another stockpile placed southeast of the pit.
- DEIS Mine Site Layout: Three distinct pit areas. Six smaller, permanent stockpiles, with waste rock segregated by type. Southeast stockpile eliminated. Haul roads planned to connect mine pits and stockpiles were more localized on the Mine Site.
- SDEIS and FEIS Mine Site Layout: Three pit areas including the East Pit, Central Pit, and West Pit. One permanent stockpile (Category 1 Waste Rock Stockpile). Three temporary stockpiles: Category 4 Waste Rock Stockpile is sited on the area that will become the Central Pit; and Category 2 and Category 3 waste rock are combined in one temporary stockpile that will later be relocated to the mined out Central and East Pits. After Mine Year 13, The Category 1, 2, 3 and 4 materials mined from the West Pit would be directly placed into the Central and East Pits as backfill. With this more compact layout, the haul roads are located within a smaller area so avoid wetland impacts.

Direct wetland impacts at the Mine Site have been reduced in the FEIS (Reference (2)) alternative, compared to the EAW and DEIS alternatives, as shown in Table 6-1.

Table 6-1 Summary of Direct Wetland Impacts Throughout Project

Proposed Mine Site Layout	Direct Wetland Impacts at Mine Site (acres)
Scoping EAW Project	1,257
DEIS Project	804
FEIS Project	758

6.4.2.1 Minimization Strategies for Mine Pits and Supporting Infrastructure

Mining will necessitate construction of new haul roads and ore handling facilities. As Project modifications have progressed since the Scoping EAW, the road and facility layouts have been altered as shown in Large Figure 7 to reduce the direct wetland impacts, as well as the fragmentation and water quality impacts to the wetlands. The water containment system along the haul roads and at the ore handling facilities will capture runoff and transport it to the WWTF. Overall, PolyMet has located Mine Site infrastructure in order to extract the ore efficiently and minimize wetland impacts to the extent possible.



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PolyMet will rely on the advantages obtained by operating large-scale mining equipment. Utilizing large-scale mining equipment minimizes costs, but also requires that adequately sized working areas be maintained for loading faces, haul roads, and stockpile sites. In most cases, the operation of large-scale mining equipment makes it necessary to use contiguous tracts of land. This reduces the direct wetland impact by consolidating the operations in select areas rather than throughout the Mine Site, as was the case with the EAW Mine Site Project layout as shown in Large Figure 7.

6.4.2.2 Minimization Strategies for Stockpiles

Mining economics dictate that surface overburden, lean ore, and waste rock materials be removed and stockpiled in the proper sequence to allow efficient access to the underlying polymetallic ores. In order to minimize haulage costs and maintain operating efficiencies, surface overburden, lean ore, and waste rock stockpiles must be located in or adjacent to the mining area.

Because previously it has not been economically feasible to make use of the polymetallic ore resource at the NorthMet Site, there are no existing stockpiles in the vicinity of the site. Alternatives for stockpiling within the mine pits, stockpiling on disturbed areas, and alternative stockpile designs are addressed in the sections that follow.

In-Pit Stockpiling

Stockpiling lean ore, waste rock, and possibly surface overburden in mined-out pits has benefits in that it involves short haul distances and minimizes impacts to undeveloped lands and wetlands. This method is also favorable with respect to the requirements of the CWA, the WCA and portions of the MDNR reclamation rules.

The Project in the Scoping EAW did not include in-pit stockpiling. The Project evaluated in the DEIS included in-pit stockpiling, proposing that Category 1 and 2 waste rock generated after Mine Year 11would be backfilled directly to the East Pit. All other overburden and waste rock was to be placed in three permanent, lined/covered stockpiles as shown in Large Figure 7.

For the FEIS Project, in-pit stockpiling is considerably expanded from the Project evaluated in the DEIS. All of the Category 2, 3, and 4 waste rock, along with some Category 1 Waste Rock and Saturated Overburden, will be placed in the East Pit for subaqueous storage. Two temporary stockpiles will be created, however one of them will be placed in a location that will subsequently be mined as the Central Pit (Category 4 Waste Rock Stockpile). This alternative inpit stockpiling plan increases the volume of waste rock placed in mine pits, and reduces direct wetland impacts. It has been identified as a reasonable and practical alternative to the original plan, and is currently incorporated in the Project as shown in Large Figure 7.

Another in-pit stockpiling alternative was evaluated during the Environmental Review Process that called for placing Category 1 waste rock in a temporary stockpile, then relocating it to the West Pit during reclamation. This approach would not have reduced direct wetland impacts, although it would have offered the opportunity to restore wetlands during reclamation. This



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alternative was eliminated by the co-lead agencies because, among other things, it would encumber deeper mineral resources in violation of PolyMet's mineral leases (page 8-10 and 8-11 in Reference (2)).

Stockpiling on Disturbed Areas

Disturbed areas are favorable for stockpiling activities because impacts to previously undeveloped lands will be minimized, including wetlands; however, existing stockpiles and tailings disposal areas are not present at the Mine Site. Mine development will result in some disturbance to lands outside of the actual mine pit areas for construction of haul roads and other infrastructure as well as stockpiles. The Environmental Review Process evaluated the alternative of using some Saturated Overburden and Category 1 Waste Rock during Mine Site construction, as approved by the MDNR. This alternative minimizes wetland impacts because it reduces the volume of material to be stockpiled on undeveloped areas, and it has been incorporated in the Project.

The Project also developed an alternative location for the Category 4 Waste Rock Stockpile. Originally, it was proposed as a permanent stockpile located on an undeveloped area located south of the East Pit (Large Figure 7). An alternative approach was identified, which temporarily stockpiles the Category 4 waste rock in the area that will subsequently be mined as the Central Pit (see Large Figure 2 and Large Figure 5). This alternative eliminates one stockpile from undeveloped areas, and has been incorporated into the project.

6.4.3 Dewatering

It is necessary to dewater the pits during operation to remove groundwater and runoff and maintain safe access to the mine pits and ore. Therefore, no alternatives to the mine pit dewatering were proposed during the Environmental Review Process. Dewatering has been identified as a factor that may potentially indirectly impact wetlands. Wetland hydrology will be monitored to document any potential indirect wetland impacts from dewatering activities.

Water generated by dewatering will be treated at the WWTF and pumped to the Plant Site for use in mineral processing. This alternative, which reuses groundwater that must be extracted to facilitate mining, is environmentally beneficial because it avoids the need to appropriate water from other waters of the state for use in mineral processing.

6.5 Plant Site Minimization Alternatives

The Plant Site will use the existing LTVSMC facility which is located on a brownfield site. There are no wetlands on the processing facilities area of the Plant Site. An alternative process plant site would not have environmental benefits over the existing plant site. Reuse of an existing plant site and infrastructure reduces environmental impacts. An evaluation of alternative plant sites was not proposed by the USACE and MDNR during the Environmental Review Process.



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Plant Site minimization alternatives generally involve balancing direct wetland impacts with indirect wetland impacts and overall impacts on the environment. Minimization alternatives for some Plant Site features slightly increase direct wetland impacts, but they are included in the Project because they were identified to offer substantial overall environmental benefits.

6.5.1 Flotation Tailings Basin (FTB)

Minimization alternatives evaluated for the FTB include options for alternative locations, alternative sources for dam construction materials, and alternative environmental controls.

Two alternative locations were considered for the FTB, a greenfield site to the west of the existing LTVSMC tailings basin, and vertical expansion atop the existing LTVSMC tailings basin. The alternative of constructing the FTB on a greenfield site to the west of the existing LTVSMC tailings basin was considered during the Environmental Review Process. This alternative was eliminated early in the process because of the additional environmental and wetland impacts associated with it. PolyMet proposes to place the Flotation Tailings atop the existing LTVSMC tailings basin by building the basin vertically as tailings are produced. Use of the existing brownfield site for the FTB significantly reduces the acreage of direct wetland impacts. The development of alternative layouts for the FTB is illustrated in Large Figure 8. Vertical expansion will require an expansion of the active tailings basin footprint for additional buttressing to reinforce the tailings basin dams as required by the MDNR to address dam stability requirements. The slightly expanded footprint of the FEIS Tailings Basin layout is shown in right panel of Large Figure 8.

One concern about a taller Tailings Basin is that it may generate more fugitive dust because of greater wind erosion across the surface of the basin. However, the Project has incorporated measures to minimize fugitive dust from the Tailings Basin, as described in Section 5.2.7.5.3 of Reference (2).

Construction material for the FTB dams will be borrowed from the existing LTVSMC tailings basin. Buttress material will be sourced from the former LTVSMC waste rock stockpiles. These alternatives avoid procuring construction materials from more distant sources with potentially greater adverse environmental impacts.

Environmental controls proposed for the FTB also affect wetland impacts. The FEIS alternative plant layout includes the addition of the FTB Seepage Containment System. The FTB Seepage Containment System consists of a cutoff wall and a collection trench. As described in Section 5.3.2, the FTB Seepage Containment System offers significant overall environmental benefits. It will reduce surface water impacts and minimize potential indirect impacts to wetlands north of the Plant Site due to seepage from the FTB. This approach was selected during the Environmental Review Process because it has environmental benefits of limiting ground and surface water impacts, however it does result in the expansion of the Tailings Basin footprint into previously undeveloped areas. The combined effects of the FTB Seepage Containment System



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and the expanded buttress footprint result in direct impacts to approximately 140 acres of wetlands (Attachment A).

An alternative containment system design, using groundwater extraction wells instead of the cutoff wall, was eliminated because the well pumping tests indicated the number of wells needed to collect the volume of seepage necessary to limit water quality impacts was infeasible and there was a potential for indirect wetland impacts by drawing down water levels in adjacent wetlands. The proposed FTB Seepage Containment System is expected to decrease groundwater flow from the existing Tailings Basin to the adjacent wetlands and streams. To mitigate these potential indirect impacts, PolyMet will supplement wetland water levels and stream flow using treated water from the WWTP.

6.5.2 Hydrometallurgical Residue Facility (HRF)

Minimization alternatives evaluated for the HRF include options for alternative locations. The originally proposed location of the HRF was atop the existing LTVSMC Tailings basin Cell 2W (see Large Figure 8 for the location of Cell 2W). This alternative of siting the HRF within the existing Tailings Basin was eliminated during the Environmental Review Process due to concerns over constructability and HRF liner issues. An alternative HRF location was identified in the existing Emergency Basin southwest of Cell 2W (Large Figure 8). A portion of the existing wetland in the alternative HRF area is identified as not subject to this Wetland Replacement Plan because wetlands located within the Cliffs Erie LLC (formerly LTVSMC) Permit to Mine Ultimate Tailings Basin Limit boundary are not regulated by state and federal wetland regulations. Locating the HRF within the Cliffs Erie LLC (formerly LTVSMC) Permit to Mine Ultimate Tailings Basin Limit boundary minimizes direct wetland impacts, as well as avoiding additional impacts to undeveloped areas.

6.6 Transportation and Utility Corridors Minimization Alternatives

Two corridors are needed to connect the Mine Site and the Plant Site. The Rail Connection Corridor will permit rail transport of ore to the Plant Site. The Dunka Road and Utility corridor will contain the TWP alongside the existing Dunka Road.

To transport ore from the Mine Site to the Plant Site, PolyMet will use the existing Cliffs Erie (former LTVSMC) railroad. Trains will run on a new spur developed on the Mine Site to the existing railroad. There will be a new approximately 5,750-foot connecting track constructed between the Cliffs Erie railroad and existing PolyMet railroad that serves the Process Plant. Reuse of the existing railroad minimizes direct wetland impacts. The configurations for the new spur and the connector track were selected to avoid sensitive wetland areas, and while the layout was modified from the DEIS to the FEIS, the direct wetland impact is similar (0.3 acres and 0.44 acres, respectively). The alternative of ore transport by truck to the Plant Site was evaluated during Project scoping, but eliminated by the co-lead agencies in the Final Scoping Decision (Reference (14)) because it would not likely provide significant environmental benefit over rail transport.



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The project will upgrade the existing Dunka Road and install the TWP alongside it. The layout of the TWP was refined from the DEIS to the FEIS, which reduced the direct wetland impacts from 10.2 acres to 6.76 acres. The FEIS alternative reuses previously disturbed areas and minimizes impacts to wetlands while providing access necessary for mining operations.



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7.0 Adjoining Property Owners

There are 39 property owners adjacent to the Project. Large Table 4 identifies the complete mailing addresses of all the property owners.



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8.0 Portion of Work Completed

Project work has not commenced. Project activities will not be initiated until appropriate approvals and permits have been obtained.



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9.0 Status of Other Approvals

Other permits, reviews, and approvals related to the Project are currently in progress (Table 9-1 and Section 1.4.4 of Reference (2). The MDNR will review this Wetland Replacement Plan concurrently with the submittal of the Permit to Mine application, which was also submitted to the MDNR, pursuant to the Minnesota Nonferrous Metallic Mineral Mining Rules (Minnesota Rules, part 6132). The Permit to Mine will also include a wetland mitigation plan.

The Permit to Mine and WCA are administered by the MDNR Division of Lands and Minerals, Section 404 of the CWA is administered by the USACE, and Section 401 of the CWA (Water Quality Certification) is administered by the MPCA. PolyMet's mining plans will also take into account the MDNR Nonferrous Metallic Mineral Mineland Reclamation Rules (Minnesota Rules, chapter 6132).



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Table 9-1 Summary of Project Permits and Approvals

Unit of Government	Type of Permit/Approval/Action	Status
Federal		
LLC Army Corno of	Section 404 Permit for Wetland Impacts	Submitted August 2013
U.S. Army Corps of Engineers	Section 106 Consultation (MN Historic Preservation Office)	Consultation in progress
U.S. Fish and Wildlife Service	Section 7 Endangered Species Act (ESA) Consultation	Consultation completed February 2016
	Land Exchange	In progress
U.S. Forest Service	Section 106 NHPA Compliance	Consultation regarding resolution of adverse effects in progress
State		
	Permit to Mine	Submitted September 2016
	Endangered Species Taking Permit (if required)	To be applied for if needed
	Water appropriations permit for pits and tailings basins, and mine dewatering	Submitted July 2016
	Water appropriations permit for plant makeup-water	To be applied for or transferred
Minnesota Department of	Water appropriations permit for potable water well for mine site administration building	To be applied for if needed
Natural Resources	Dam Safety Permit	Submitted July 2016
	Permit for work in public waters, possible modifications and diversions of local streams	To be applied for
	Permit for wetland modifications under Wetland Conservation Act (as part of Wetland Mitigation Plan for Permit to Mine)	Submitted September 2016
	Burning Permit (possibly needed for construction or land clearing)	To be applied for if needed



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Unit of Government	Type of Permit/Approval/Action	Status
	Section 401 Water Quality Certification/Waiver	Reinitiated August 2016
Minnesota Pollution Control	SDS/NPDES permit for site operations (discharge to surface or groundwater), construction stormwater (activity that would disturb one acre or more of land), and industrial stormwater activity	Submitted July 2016
Agency	Solid Waste Permit for construction debris	To be applied for
	Minnesota Air Emissions Permit	Submitted August 2016
	Minnesota Waste Tire Storage Permit	To be applied for
	General Storage Tank Permit (fuel tanks)	To be applied for
	Radioactive Material Registration (for low-level radioactive materials in measuring instruments)	To be applied for if needed
Minnesota Department of Health	Permit for Non-Community Public Water Supply System (serving an average of at least twenty-five individuals daily at least 60 days out of the year) and wellhead protection plan	To be applied for if needed
	Permit for Public On-site Sewage Disposal System	To be applied for if needed
Local		
St. Louis County	Zoning Permit – to acknowledge Project is an allowable use within the zoned district	To be applied for
City of Hoyt Lakes	Zoning Permit – to acknowledge Project is an allowable use within the zoned Mining District	To be applied for
City of Babbitt	Building Permit - for new construction on Project areas within the incorporated Babbitt City limits.	To be applied for



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10.0 Signed Signature Blocks

The signed signature blocks are in Part Five and Attachment A of the Minnesota Local/State/Federal Application for Water/Wetland Projects, which is located inside the front cover of this Wetland Replacement Plan.



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11.0 Description of Wetlands and Wetland Impacts

This Section provides a description of the overall environmental setting, including hydrogeology, vegetation, and soils for the Project. The methods used to delineate, classify, and assess the wetlands are documented and wetlands are described for each Project area. An accounting of the direct and potential indirect wetland impacts is provided for the Project and shown in Large Figure 9, Large Figure 10, and Large Figure 11. Mitigation for these impacts is discussed in Section 14.0 with the mitigation sites shown in Large Figure 12, with crediting information provided in Large Table 5, Large Table 6, and Large Table 7.

11.1 General Environmental Setting

The Project is located at the foot of the Laurentian Divide, within the Nashwauk Uplands and Laurentian Uplands subsections of the Northern Superior Uplands section in the Laurentian Mixed Forest Province, as described in the Ecological Classification System (ECS) developed by the MDNR and USFS (Reference (15)). Landforms in both subsections are characterized by till and outwash plains and moraines, with peatlands also common in the Laurentian Uplands subsection.

Historically, the Nashwauk Uplands subsection consisted of forested communities dominated by red and white pine, balsam fir, white spruce, and aspen and birch. The Laurentian Uplands subsection historically consisted of forests dominated by aspen and birch, jack pine, red pine, and white pine in the uplands, and coniferous bogs and swamps in the lowlands. At present, aspen is the most dominant tree species in both the Laurentian Uplands and Nashwauk Uplands subsections (Reference (15)). Elevations within the Project range from approximately 1,475 feet to 1,850 feet above mean sea level.

11.1.1 Hydrology and Hydrogeology

The Project area is located near the headwaters of the Partridge River and Embarrass River watersheds (Large Figure 3). The Partridge River and the Embarrass Rivers are both tributary to the St. Louis River, which is located within the Lake Superior Basin. The Mine Site, portions of the Plant Site, Dunka Road and Utility Corridor, Railroad Connection Corridor, and Colby Lake Pipeline Corridor are located within the Upper Partridge River Watershed. The majority of the Plant Site is located in the Embarrass River watershed (Large Figure 3).

11.1.1.1 Partridge River Watershed

The Partridge River upstream of the St. Louis River flows through Colby Lake and Whitewater Reservoir, both of which are located in the Colby-Whitewater Watershed (Large Figure 3). Watersheds upstream of Colby Lake include the Upper Partridge River and Wyman Creek. Watersheds downstream of Colby Lake include Second Creek and the Lower Partridge River.

The Mine Site is located in the Upper Partridge River watershed approximately 17 miles upstream of Colby Lake. Upstream of the U.S. Geological Survey (USGS) gage 04015475



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(located above Colby Lake and Wyman Creek), the Partridge River watershed covers approximately 103 square miles, including portions of the Peter Mitchell Mine. Tributaries to the Partridge River upstream of Colby Lake and Wyman Creek include Wetlegs Creek, Colvin Creek, Longnose Creek, Yelp Creek, Stubble Creek, and the South Branch of the Partridge River (Large Figure 3).

Under existing conditions, runoff from the northernmost area of the Mine Site generally drains north into the One Hundred Mile Swamp and associated wetlands along the Partridge River. These wetlands form the headwaters of the Partridge River, which meanders around the east end of the Mine Site before turning southwest. Runoff from the majority of the Mine Site naturally drains to the south through culverts under Dunka Road and the adjacent rail line, into the Partridge River downstream of the Dunka Road crossing. The Partridge River hydrology is affected by the periodic and variable dewatering of the Peter Mitchell Mine near the headwaters of the Partridge River, upstream of the proposed Mine Site.

The railroad corridor connecting the Mine Site and Plant Site crosses Wetlegs Creek, Longnose Creek, and Wyman Creek. Small portions of the Plant Site are located in the headwaters of Second Creek. Second Creek drains to the Partridge River downstream of Colby Lake, approximately 3 miles upstream of the confluence with the St. Louis River (Large Figure 3).

The hydrogeologic setting of the Partridge River watershed consists of a thin veneer of heterogeneous unconsolidated deposits (glacial till) underlain by fractured bedrock (Duluth Complex in most of the Mine Site area and Virginia Formation in the northern portion of the area). In the Mine Site area, saturated conditions exist within the unconsolidated deposits and bedrock and the depth to groundwater is typically less than 10 feet. The water table is generally a subdued replica of the land surface, with groundwater divides in the area expected to roughly coincide with surface water divides. Wetlands are common, covering approximately 43% of the Mine Site.

The degree of hydraulic connection between the wetland areas and adjacent unconsolidated deposits and bedrock at the Mine Site is expected to be variable, depending on the characteristics of the wetlands and the localized hydraulic conductivity and degree of bedrock fracturing. The hydraulic conductivity of the bedrock and surficial deposits have been estimated at the Mine Site by a variety of methods, including conducting aquifer tests and using grain-size distribution data from soil borings and ranges over several orders of magnitude. Data collected during a 30-day pumping test at the Mine Site showed a small amount of drawdown in the deep wetland piezometer nearest the pumping well, but no detectable drawdown at other water table or deep wetland piezometers, indicating that the connection between the bedrock, unconsolidated deposits, and wetlands may be relatively weak. Virtually all water movement in peat wetlands occurs horizontally in the upper layers of peat. The deeper, more decomposed peat soils limit vertical seepage because of the low hydraulic conductivities (~0.0028 feet/day) and the wetland hydrology is simply perched on the relatively impermeable peat layer. Vertical seepage losses from wetlands without peat soils will only have the potential to occur in isolated areas of contiguous, high hydraulic conductivity bedrock faults and fracture zones located under isolated



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areas of high hydraulic conductivity glacial till and aligned with wetlands containing high hydraulic conductivity soils.

11.1.1.2 Embarrass River Watershed

The Plant Site is primarily located within the Embarrass River watershed, upstream of the Embarrass River chain of lakes (Large Figure 3). The FTB occupies approximately 4 square miles along the southern side of the watershed. A small portion of the Plant Site, including stormwater from the Process Plant Area, drains south to Second Creek.

The Embarrass River watershed covers approximately 88 square miles upstream of USGS gage 04017000 (Large Figure 3) and approximately 112 square miles upstream of Project monitoring location PM-13 (the downstream extent of the Plant Site water quality monitoring). Tributaries to the Embarrass River, located between the Tailings Basin and the Embarrass River, which may potentially be affected by the Project, include (east to west) Unnamed (Mud Lake) Creek, Trimble Creek, and Unnamed Creek. Other tributaries located between the Tailings Basin and the Embarrass River that are not expected to be affected by the Project include (east to west) Spring Mine Creek, which drains LTVSMC's former Mine Area 5N, an unnamed creek, and Heikilla Creek (Large Figure 3). Bear Creek drains to the Embarrass River from the north, and is not anticipated to be impacted by the Project.

Under existing conditions, groundwater and surface water seepage from the FTB drain towards Unnamed (Mud Lake) Creek to the north, Trimble Creek to the northwest, and Unnamed Creek to the west. Runoff from the outer slopes of the FTB is tributary to the surrounding creeks; precipitation falling within the FTB is contained in the basin.

The hydrogeologic setting of the Embarrass River watershed is broadly similar to the Partridge River watershed, although the unconsolidated deposits are generally thicker and more continuous north of the Plant Site area along the Embarrass River valley. The Plant Site is located north of the Laurentian Divide and the area is underlain by granitic rocks of the Giants Range batholith. Although these rocks may be fractured to some extent, they are expected to have significantly lower hydraulic conductivity than the bedrock units at the Mine Site. As is the case at the Mine Site, wetlands are abundant in the Plant Site and saturated conditions generally exist less than 10 feet below the ground surface. As at the Mine Site, the degree of hydraulic connection between the wetland areas and adjacent unconsolidated deposits and bedrock at the Plant Site is expected to be variable, depending on the characteristics of the wetlands and the localized hydraulic conductivity and degree of bedrock fracturing. Given the very low hydraulic conductivity of the underlying bedrock, there is minimal potential for hydraulic connection between bedrock and wetlands.

11.1.2 Vegetation

Vegetation communities in much of the Project area have been altered by previous mining and logging activities. In addition, beaver activities have led to the transition of some forested



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wetlands to open, emergent marshes and wet meadows. Aside from areas disturbed from mining and logging activities, the Project vicinity is currently a mosaic of upland and wetland native vegetation community types, which is typical of northeastern Minnesota.

While the Mine Site is located in an area that has not been directly disturbed by previous mining activities, extensive logging has occurred throughout the area. The USFS owns the surface rights at the Mine Site, and has managed the area for timber production. Logging activities have changed the vegetative character across the Mine Site, with shrublands and/or early and mid-successional forest replacing mature upland forest. These logged areas are currently in varying stages of regeneration and consist mostly of young aspen stands. Aside from logging and associated roads, the Mine Site is largely undeveloped, with a variety of natural vegetation communities present. These communities include coniferous and deciduous forests in the uplands and wetlands such as shrub swamps, marshes, forested swamps, and bogs in the lowlands. The more mature upland forested areas at the Mine Site are dominated by quaking aspen, jack pine, balsam fir, black spruce, and white spruce with lesser amounts of paper birch, red pine, and white pine.

The Plant Site was previously used as a taconite processing facility by LTVSMC and is largely devoid of natural vegetation. In addition, the road and railroad corridors are existing infrastructure and therefore previously disturbed areas.

11.1.3 Soils

The Mine Site is situated on land mapped by both the USFS SNF (94% of the area) and the St. Louis County Natural Resources Conservation Service (NRCS) (6% of the area) (Large Figure 13). The USFS mapped soil types are based on the Ecological Land Classification System, which divides land areas into Ecological Landtypes (ELT). The ELTs are areas of land with a distinct combination of natural, physical, chemical, and biological properties. In the hierarchical framework, ELTs are further broken down into Ecological Landtype Phases (ELTPs); these ELTPs can be correlated to NRCS mapping units (Reference (16)).

Approximately 55% of the Mine Site is mapped as ELT 16 (Upland Shallow Loamy Dry). Within ELT 16, soils are mapped as ELTPs 18A (1% to 6% slopes, well drained) and 18B (6% to 18% slopes, well drained) (Large Figure 13). The second most dominant soil type at the Mine Site is ELT 6 (Lowland Organic Acid to Neutral), which represents approximately 30% of the Mine Site. Within ELT 6, soils are primarily mapped as ELTP 24 (poorly drained) (Large Figure 13). Additional, less dominant soil types are also mapped at the Mine Site, as shown on Large Figure 13 and in Large Table 8. Poorly drained/Hydric and somewhat poorly drained/partially hydric soils make up approximately 43% of the Mine Site (Large Figure 13, Large Table 8).

The Plant Site is primarily situated on land disturbed from previous mining activities. As such, almost 80% of the soils in the Plant Site are mapped by the St. Louis County NRCS soil survey as the two disturbed soils, "Tailings Basin" map unit (1050; hydric status is unknown) and



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"Udorthents, loamy" map unit (1003B; hydric status is unknown) (Large Figure 13), Large Table 9). Udorthents are areas that have been stripped and are highly disturbed, such as cut-and-fill operations. Only 9% of the soils in the Plant Site are mapped as hydric or partially hydric; the hydric soil status is unknown for approximately 90% of the Plant Site (Large Table 9).

The St. Louis County NRCS mapped two soil types in the Railroad Connection Corridor. The Udorthents, loamy NRCS soil map unit (1003B, hydric status is unknown) represents approximately 79% of the Railroad Connection Corridor and the Pits, iron mine soil map unit (1049, hydric status is unknown) represents the remaining 21% of the Railroad Connection Corridor (Large Figure 13).

Five St. Louis County NRCS soil map units comprise over 70% of the Dunka Road and Utility Corridor, these include the Eaglesnest-Babbitt complex (F12B, partially hydric), Pits, iron mine (1049, hydric status is unknown), Eaglesnest-Wahlsten complex (F2B, hydric status is unknown), Dumps, iron mine (1048, hydric status is unknown), Udorthents, loamy (1003B, hydric status is unknown), and Babbitt boulder-Aquepts rubbly complex (F13A, partially hydric) (Large Table 10, Large Figure 13). Approximately 40% of the soils mapped within the Colby Lake Pipeline Corridor are hydric or partially hydric; the hydric soil status is unknown for approximately 54% of the corridor (Large Table 10).

Three main St. Louis County NRCS soil map units comprise over 75% of the Colby Lake Pipeline Corridor, these include the Eaglesnest-Babbitt complex (F12B, partially hydric), Udorthents, loamy (1003B, hydric status is unknown), and Tailings Basin (1050, hydric status is unknown) (Large Table 11, Large Figure 13). Additional soils mapped in the Colby Lake Pipeline Corridor units were found within this project area (Large Table 11, Large Figure 13). Approximately 40% of the soils mapped within the Colby Lake Pipeline Corridor are hydric or partially hydric; the hydric soil status is unknown for approximately 51% of the corridor (Large Table 11).

11.2 Wetland Delineation and Classification Methods

Delineation and functional assessment of wetlands were conducted within each of the following Project areas: the Mine Site, Plant Site, Dunka Road and Utility Corridor, Railroad Connection Corridor, and the Colby Lake Pipeline Corridor (Large Figure 4).

Wetlands were delineated across the Project areas between 2004 and 2012; the following references summarize wetland delineations conducted throughout this time period (Reference (17), Reference (18), Reference (19), Reference (20), Reference (21), Reference (22), Reference (23), Reference (24), Reference (25)). Wetland delineations were performed according to the Routine On-Site Determination Method specified in the USACE Wetlands Delineation Manual (1987 Edition) (Reference (26)). The wetlands were described in Reference (3) and the delineation was discussed with the Wetland IAP Workgroup and approved by the co-lead agencies on March 30, 2011.



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Prior to conducting the various field delineations, numerous sources of existing information were gathered and reviewed to assist in developing a strategy for evaluating wetlands within the Project areas (Reference (23), Attachment A). Aerial photographs and other data were compiled for the area, some of which included:

- Farm Services Administration (FSA) true color aerial photographs between 2003 and 2010.
- FSA color infrared aerial photographs (2003 and 2008)
- USFWS National Wetland Inventory (NWI) Maps
- USFS Ecological Landtype soils data (where available)
- NRCS soils data for St. Louis County (where available)
- SNF USFS stand data Geographic Information System (GIS) shapefile (for the Mine Site)
- USGS topographic maps and digital elevation models
- MDNR 2005 Color Infrared (CIR) photography stereo pairs with 60% overlap

Topographic contours and NWI maps were overlaid on true color and CIR FSA aerial photographs along with previously completed off-site preliminary wetland mapping. Attempts were made to field evaluate all areas mapped as wetlands by the NWI or by preliminary off-site mapping. Depressional areas and areas with relatively flat slopes were also evaluated to determine if wetlands were present.

Soil borings were placed in most of the wetlands to a depth of 6 to 18 inches below the ground surface. Representative soil samples from each boring were examined for hydric soil indicators. Soil colors (e.g., 10YR 4/2, etc.) were determined with the aid of a Munsell® soil color chart and noted on the Wetland Data Forms. In addition, vegetation data were collected within each wetland and adjacent upland.

Wetland boundaries were mapped in the field on large-scale (1-inch = 600 feet) FSA true color and CIR aerial photographs. Data points were collected with a Global Positioning System (GPS) where possible to verify wetland delineation locations, particularly in areas where aerial photo signatures were not distinct. The wetland boundaries were later digitized using ArcView© Geographic Information System software.

The delineated wetlands were classified using the Eggers and Reed Plant Community Classification System (Reference (8)), the USFWS Circular 39 Classification System (Reference (27)), and the USFWS Cowardin Classification System (Reference (9)).



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11.3 Wetland Descriptions and Functional Assessment

Approximately 1,586 acres of wetland were identified across the Project areas (Mine Site, Plant Site, Railroad Connection Corridor, Dunka Road and Utility Corridor, and Colby Lake Pipeline (Large Table 1; Large Figure 4; Attachment A). The percentage (based on acreage) of Eggers and Reed (Reference (8)) wetland types identified in the Project areas include: coniferous bog (55%); alder thicket (12%); shallow marsh (11%); coniferous swamp (9%); deep marsh (7%); sedge meadow (2%); open bog (1%); wet meadow (1%); hardwood swamp (1%); shallow, open water (less than 1%); and shrub-carr (less than 1%) (Reference (28)).

11.3.1 Mine Site

A total of 87 wetlands covering approximately 1,298 acres have been identified within the Mine Site (Large Table 1; Large Figure 4; Attachment A). A total of seven wetlands, each over 50 acres in size within the Project area, comprise approximately 774 acres of wetlands within the Mine Site. There are an additional five wetlands, each over 20 acres in size within the Mine Site. Together, these 12 wetlands comprise 72% of the wetland area within the Mine Site.

Approximately 79% of the wetlands (based on acreage) in the Mine Site are coniferous swamp/bog and open bog communities. Shrub swamp wetland communities comprise 13%, shallow marshes comprise about 3%, sedge/wet meadow communities make up 3%, and hardwood swamp communities comprise 1% of the wetlands in the Mine Site. Deep marshes comprise less than 1% of the wetland area in the Mine Site.

Approximately 92% of the wetlands in the Mine Site are of high quality and 8% of wetlands are of moderate quality. High quality wetlands have low disturbance levels and high vegetative diversity and integrity. Moderate quality wetlands have impounded open water because of beaver dams and downstream culverts under Dunka Road or the railroad, are located adjacent to USFS roads, the Dunka Road Corridor, or the Railroad Connection Corridor.

11.3.2 Plant Site

Nearly the entire Plant Site has been disturbed by past mining activities. No wetlands are present in the processing facilities area, although there is a Plant Reservoir located east of the concentrator that is not regulated as a wetland (Reference (23)).

11.3.2.1 Flotation Tailings Basin Area

A total of 52 wetlands covering approximately 238 acres were identified within the FTB Area (Large Table 1; Large Figure 4). The wetlands (based on acreage) in the FTB Area include deep marsh (45%), shallow marsh (42%), coniferous swamp (6%), shrub swamp (6%), sedge/wet meadow (less than 1%), open water (less than 1%), and hardwood swamp (less than 1%).

There is a 0.03 acre portion of the sedge/wet meadow wetland identified as not subject to this Wetland Replacement Plan because the wetlands are located within the Cliffs Erie LLC



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(formerly LTVSMC) Permit To Mine Ultimate Tailings Basin Limit boundary and are not regulated by state and federal wetland regulations (Section 11.3.2).

The wetlands in the FTB Area have been previously impacted by LTVSMC tailings deposition, roads, and impoundment. The majority (90%) of wetlands within the FTB Area are currently rated as low quality with low vegetative diversity/integrity. Approximately 10% of the wetlands are rated as moderate quality.

11.3.2.2 Hydrometallurgical Residue Facility

A total of two shallow marsh wetlands, covering 36.07 acres, were identified within the HRF Area (Large Table 1; Large Figure 4). There is a 28.56 acre portion of the shallow marsh wetland identified as not subject to this Wetland Replacement Plan because wetlands located within the Cliffs Erie LLC (formerly LTVSMC) Permit to Mine Ultimate Tailings Basin Limit boundary are not regulated by state and federal wetland regulations (Section 11.3.2).

An unpaved, gravel road is located along the north side of these wetlands along with small buildings and associated facilities used in the former LTVSMC operations.

11.3.3 Railroad Connection Corridor

A total of four wetlands covering 0.44 acres have been identified within the Railroad Connection Corridor (Large Table 1; Large Figure 4). Based on acreage, a total of 68% of the wetlands are shrub swamp, 16% are coniferous swamp, and 16% are shallow marsh.

All of the wetlands in the Railroad Connection Corridor are high quality. While these wetlands are moderately impacted by either a haul road or an existing railroad, they have high vegetative diversity/integrity.

11.3.4 Dunka Road and Utility Corridor

A total of 21 wetlands, encompassing 6.76 acres, have been identified within the Dunka Road and Utility Corridor (Large Table 1; Large Figure 4). The wetlands in the corridor (based on acreage) include shrub swamp (56%), coniferous swamp (23%), coniferous bog (13%), and shallow marsh (8%).

These wetlands are currently located adjacent to Dunka Road and some of the wetlands have been previously logged. Wetlands in the western half of the corridor are located within areas previously disturbed by mining activities in the former LTVSMC operations. All of the wetlands are of high quality.

11.3.5 Colby Lake Pipeline Corridor

A total of 14 wetlands covering 6.99 acres were identified within the Colby Lake Pipeline Corridor (Large Figure 4). The wetlands in the corridor (based on acreage) include shallow marsh (37%), shrub swamp (30%), wet meadow (19%), and deep marsh (14%).



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The wetlands are located adjacent to an unpaved, gravel road and within a previously disturbed corridor. The majority of wetlands in this corridor are rated as low quality (93%), with the remaining wetland rated as moderate quality (7%).

11.3.6 Second Creek Area

The Second Creek Area is not included as part of the Project area. However, an analysis was completed in this area at the request of the Co-Lead Agencies. A total of 30 wetlands covering 298.91 acres were identified within the Second Creek area of analysis (Large Figure 8 of Attachment A). The wetlands include alder thicket or shrub-carr (44%), shallow marsh (35%), hardwood swamp (7%), deep marsh (7%), coniferous swamp (6%), wet meadow (less than 1%), and shallow, open water (less than 1%).

Of these 30 wetlands in the Second Creek analysis area, only 22 wetlands are unique to this area. One of these wetlands is located in the FTB area, and 7 wetlands are located in the Colby Lake Pipeline Project area. To avoid double counting those areas, the analysis of potential indirect impacts in the Second Creek area excluded areas that fell within the FTB or Colby Lake Pipeline Project areas.

11.4 Wetland Impact Areas

Direct wetland impacts are defined as activities that result in filling or excavation within the boundaries of a wetland. Direct wetland impacts are summarized in this section; additional information is provided in Attachment A, Attachment B, and in the FEIS.

Features within each Project area have been buffered with various distances; these buffers represent areas of potential additional disturbance within each Project area. The additional disturbance may include additional structures (e.g., access roads) that will be developed during the design phase of the Project. Wetlands that were within the buffers were identified in the total acres of direct impacts for the Project.

Direct impacts are expected to occur in 129 wetlands, covering approximately 914 acres (Large Table 2; Attachment A). The Mine Site will contain the majority of direct wetland impacts (83%), followed by the FTB Area (15%), HRF (less than 1%), Dunka Road and Utility Corridor (less than 1%), and the Railroad Connection Corridor (less than 0.1%). No direct impacts are associated with the processing facilities area, the Colby Lake Pipeline Corridor, or the Second Creek area.

The direct wetland impacts will occur in the following Eggers and Reed wetland types (Reference (8)): coniferous bog (56%), shrub swamp (12%), coniferous swamp (9%), shallow marsh (9%), deep marsh (8%), sedge/wet meadow (4%), hardwood swamp (1%), and open bog (1%).

Indirect wetland impacts from wetland fragmentation by Project features (open pits, stockpiles, haulroads, etc.) were determined based on an analysis of the various factors that may contribute



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to potential fragmentation (Attachment A). Approximately 26.4 acres of wetland fragments were identified in the Mine Site and 0.5 acres of wetland fragments were identified in the FTB area (Table 5-1 and Table 5-2).

The majority of the wetland fragments in the Mine Site consist of coniferous bog (79%), followed by alder thicket (14%), coniferous swamp (7%), and sedge meadow (less than 1%). (Large Table 2). The majority of wetland fragments in the FTB Area consist of shallow marsh (61%), followed by deep marsh (35%), coniferous swamp (4%), and alder thicket (less than 0.01%).

The Project is expected to result in direct and fragment (indirect) impacts to 129 wetlands, covering approximately 940.7 acres (Large Table 2). The wetland impacts within the Project areas consist of coniferous bog (56%), shrub swamp (12%), coniferous swamp (9%), shallow marsh (9%), deep marsh (8%), sedge/wet meadow (4%), hardwood swamp (1%), and open bog (1%).

11.4.1 Mine Site

The Project features within the Mine Site were buffered up to 100 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown in Large Figure 9. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There are 59 directly impacted or fragmented wetlands located in the Mine Site covering approximately 785 acres (Large Table 2; Large Figure 9). The total directly impacted wetlands include fill (39%), excavation (24%), or both fill and excavation (37%). Thirty-seven percent of the directly impacted wetlands are also impacted by wetland fragmentation. Three wetland types comprise 90% of the direct wetland impacts in the Mine Site and include 529 acres of coniferous bog (67%), 101 acres of shrub swamp (13%), and 72 acres of coniferous swamp (9%). In addition, 38 acres of sedge/wet meadow (5%), 23 acres of shallow marsh (3%), 13 acres of hardwood swamp (2%), 8 acres of open bog (1%), and 0.1 acre of deep marsh (less than 1%) will also be directly impacted.

Approximately 99% of the impacted wetlands are rated high quality. Approximately 1% of the impacted wetlands are rated as moderate quality with the disturbances in these wetlands related to impoundment and proximity to roads.

11.4.2 Plant Site

Wetlands at the Plant Site that are located within the Cliffs Erie LLC (formerly LTVSMC) Permit to Mine Ultimate Tailings Basin Limit boundary are classified as not subject to this Wetland Replacement Plan and not regulated by state and federal wetland regulations (Attachment A). Exempt wetlands are not included in the direct wetland impact analysis.



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11.4.2.1 Flotation Tailings Basin Area

The Project features within the FTB Area were buffered up to 25 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown in Large Figure 10. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

Wetlands located outside of the Cliffs Erie LLC Permit to Mine Ultimate Tailings Basin boundary but within the FTB Area are included in the wetland impact analysis (Large Figure 10). The wetland in the FTB Area that is not subject to state and federal regulations includes 0.03 acres of Wetland ID T8.

There are 41 directly impacted or fragmented wetlands located in the FTB Area covering approximately 141 acres (Large Table 2). The total directly impacted wetlands include fill (35%), excavation (2.5%), excavation and fill (2.5%), and the FTB Seepage Containment System (60%). Nineteen percent of the directly impacted wetlands are also impacted by wetland fragmentation. The wetland types that will be directly impacted include 74 acres of deep marsh (53%), 45 acres of shallow marsh (32%), 11 acres of coniferous swamp (8%), 9 acres of shrub swamp (6%), and 1 acre of fresh/wet meadow (1%).

Wetlands in this area have been disturbed by previous mining activities in the former LTVSMC operations or by impoundments caused by beaver activity throughout the area. All of the directly impacted wetlands are disturbed by impoundment, fill, or ditches, and are low or moderate quality wetlands.

11.4.2.2 Hydrometallurgical Residue Facility

The Project features within the HRF were buffered up to 50 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown Large Figure 10. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

Wetlands located outside of the Cliffs Erie LLC Permit to Mine Ultimate Tailings Basin boundary but within the HRF Area are included in the direct wetland impact analysis (Large Table 2; Large Figure 10). The wetland in this Project area that is not subject to state and federal regulations includes 28.56 acres of Wetland ID 1155.

There are two directly impacted wetlands located in the HRF covering 7.51 acres (Large Figure 10). The type of direct wetland impact includes fill (100%). The wetland type that will be directly impacted includes shallow marsh (100%) which is currently a low quality wetland.



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11.4.3 Railroad Connection Corridor

The proposed area of disturbance for the Railroad Connection Corridor includes the entire area shown in Large Figure 11. The Project features within the Railroad Connection Corridor were buffered up to 10 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown on Large Figure 11. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There are four directly impacted wetlands located in the Railroad Connection Corridor covering 0.44 acres (Large Table 2; Large Figure 11). The type of direct wetland impact is fill (100%). The wetland types that will be directly impacted include shrub swamp (68%), coniferous swamp (16%), and shallow marsh (16%).

All of the wetlands in this area are high quality and have high vegetative diversity/integrity. These wetlands have been moderately impacted by either a haul road or an existing railroad.

11.4.4 Dunka Road and Utility Corridor

The Project features within the Dunka Road and Utility Corridor were buffered up to 10 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown in Large Figure 11. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There are 21 directly impacted wetlands located in the Dunka Road and Utility Corridor covering 6.76 acres (Large Table 2; Large Figure 11). The type of direct wetland impact is fill (100%). The wetland types that will be directly impacted include shrub swamp (56%), coniferous swamp (23%), coniferous bog (13%), and shallow marsh (8%).

Some of the wetlands have been previously logged and wetlands in the western half of the corridor are located within areas previously disturbed by mining activities in the former LTVSMC operations. All of the wetlands are of high quality.

11.5 Potential Indirect Wetland Impacts

Potential indirect wetland impacts are summarized in this section; additional information is provided in Attachment A), and Attachment B, and in Reference (2). An analysis was conducted to establish an estimate of potential indirect wetland impacts; this analysis was based on the following six factors:

- Changes in wetland watershed areas (during operation and long-term closure)
- Groundwater drawdown resulting from open pit mine dewatering



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- Groundwater drawdown resulting from operation of the FTB including groundwater seepage containment
- Changes in stream flow near the Mine Site and FTB and associated impacts to wetlands abutting the streams (during operation and long-term closure)
- Wetland fragmentation from Project elements such as open pits, stockpiles, haul roads, etc.
- Potential change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and FTB operations

The potential indirect wetland impact analysis was completed for the Mine Site, the Plant Site, the Dunka Road and Utility corridor, Railroad Connection Corridor, the Colby Lake Pipeline Corridor, and Second Creek between the toe of the Tailings Basin and County Road 666. Wetlands that were previously identified as directly impacted were excluded from this analysis. The methods used for the potential indirect wetland impact analysis are described in Attachment B and Attachment A. The change in wetland hydrology from groundwater drawdown at the Mine Site was assessed using two different methodologies; potential indirect wetland impacts are presented here using both methodologies. The "Attachment A" method is based on wetlands crossing analog impact zones (Attachment B), while the "Alternate" method is based on wetlands within analog impact zones (Section 5.2.1.2.2 of Attachment A and Section 5.2.3 of Reference (2)).

Each wetland was assessed to determine whether it could potentially be affected by any of the six factors listed above. A wetland could potentially be indirectly impacted by none of the factors, or up to a maximum of six factors. A potential indirect impact rating was developed based on the number of factors that may potentially affect a wetland – from No Impact (0 factors) to 6 (all six factors potentially indirectly impacting the wetland). Using this approach, no wetlands were rated as a 6 in this analysis. Wetlands potentially indirectly impacted by one or more factor are shown on Large Figure 9 through Large Figure 11 and in Section 5.2.3 of Reference (2).

Table 11-1 summarizes the acreages for wetlands potentially indirectly impacted by one or more factor. Depending upon which methodology was used, 53% to 55% of wetlands received a rating of 1, with one factor potentially indirectly impacting the wetland; 41% to 43% of wetlands received a rating of 2, with two factors potentially indirectly impacting the wetland; 3% of wetlands received a rating of 3, with three factors potentially indirectly impacting the wetland; less than 1% of wetlands received a rating of 4, with four factors potentially indirectly impacting the wetland; and less than 0.1% of wetlands received a rating of 5, with five factors potentially indirectly impacting the wetland. Additional information, such as which factors could potentially indirectly impact each particular wetland, is provided in Attachment A and in Section 5.2.3 of Reference (2).



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Table 11-1 Rating for Wetlands Potentially Indirectly Impacted in the Project Area

	Attachment A Method		Alternate Method	
Rating	Wetlands (acres)	Wetlands (% of total acres)	Wetlands (acres)	Wetlands (% of total acres)
1	4,305.94	54.4%	3,466.12	52.8%
2	3,126.77	42.1%	2,888.37	44.0%
3	245.31	3.3%	205.97	3.2%
4	15.89	0.2%	8.11	0.1%
5	0.25	<0.1%	0.25	<0.1%
Total acres of wetland	7,694.16		6,568.82	

The acreages identified in Table 11-1 represent the results of the analysis described in Attachment A and in Section 5.2.3 of Reference (2). The analysis was conducted in order to help identify wetlands that would be the focus of monitoring for potential indirect impacts. Therefore, wetlands selected for inclusion in the monitoring plan for the Project (Section 17.0) reflect the results of the potential indirect wetland impact analysis.



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12.0 Special Considerations

This section provides information regarding the special considerations identified in Minnesota Rules, part 8420.0515.

12.1 Protected Plant and Wildlife Resources

12.1.1 Introduction

PolyMet conducted database searches and field surveys to evaluate the presence of protected wildlife and plant species in the vicinity of the Project. The focus of these studies was to identify species listed: by the USFWS as endangered or threatened; by the State of Minnesota as endangered, threatened or special concern; or by the USFS Region 9 as Regional Forester Sensitive Species (RFSS). Special consideration may be necessary when evaluating Project impacts on individual species and/or their habitats. The database and field wildlife and plant studies conducted for the Project are further described in the following sections.

As part of the Section 404 permit review process, Section 7 Endangered Species Act consultation has been conducted between the USFWS and USACE. The USACE submitted a Biological Assessment (BA) to the USFWS in April 2015. The USFWS issued a Biological Opinion (BO) in February of 2016. As outlined in the BO, the USFWS has determined that the Project as a whole (i.e., mining and processing polymetallic ore), will adversely affect the local population of Canada lynx, gray wolf, northern long-eared bat (*Myotis septentrionalis*), and Canada lynx and gray wolf designated critical habitat but that the Project is not likely to jeopardize the continued existence of these three species or adversely modify designated critical habitat for Canada lynx or gray wolf.

The BO summarizes conservation measures proposed by PolyMet to minimize or avoid potential adverse effects on these species, in addition to USFWS determined reasonable and prudent measures and proposed conservation recommendations. For example, PolyMet intends to clear trees outside of the bat's pup season, which is from June 1 through July 31, to the extent practicable, in order to avoid potential indirect take of the northern long-eared bat, per the final 4(d) rule published on January 14, 2016. In the event that trees need to be cleared during the pup season, PolyMet will contact USFWS prior to any tree clearing, to determine whether any known, occupied maternal roost trees are documented within 150 feet of the proposed tree clearing. PolyMet will not remove trees within 150 feet of a known occupied roost tree during the pup season.

12.1.2 Federal and State Listed Wildlife Species

12.1.2.1 Wildlife Field Surveys

Wildlife surveys were conducted in the vicinity of the Project. The primary focus of the surveys was protected species listed by the USFWS, the State of Minnesota, or the USFS Region 9. Designated species may involve special consideration or permitting if the Project has a direct



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impact on individuals or populations of these species. Studies were also conducted to gain an understanding of how the Project may cumulatively affect wildlife, in the context of other past and future developments on the Iron Range.

Wildlife surveys were conducted in winter 2000 with the following objectives: 1) determine general wildlife use of the Project area; 2) determine the presence of wildlife species of concern; and 3) identify important habitats used by wildlife (Reference (29)). Methods included field and aerial wildlife and wildlife habitat assessments and bait and calling station assessments for the following species of interest including: Northern goshawk, (*Accipiter gentilis*, RFSS), boreal owl (*Aegolius funereu*, RFSS), gray wolf (*Canis lupus*, state special concern), mountain lion (*Puma concolor*, state special concern), and Canada lynx, (*Lynx canadensis*, federally threatened). Assessments were also conducted for dominant prey of these species.

Results of the winter 2000 wildlife surveys indicated the presence of several common mammal and bird tracks throughout the Mine Site; however, no areas were identified with dense concentrations of tracks. For the species of concern, gray wolf and mountain lion tracks were observed, and Northern goshawk was heard during calling surveys. Boreal owls and Canada lynx were not observed.

Wildlife surveys were conducted in June 2004 on the Mine Site, north of Dunka Road to: 1) determine general wildlife use of the Project area; 2) determine the presence of wildlife species of concern; and 3) identify important habitats used by wildlife Reference (30). Methods included transect surveys, calling surveys for Northern goshawk, owls and wolves, and wildlife habitat assessments. During the Northern goshawk calling surveys, no responses were obtained that could positively be identified as a Northern goshawk. Wolf calling surveys determined the presence of several wolves, which were likely located south of the Mine Site.

Prior to 2015, the northern long-eared bat was not listed as a federally threatened species; as such, wildlife studies in the Project area that were conducted in the early 2000's did not include specific surveys for this species. Acoustic surveys for bats were conducted as part of wildlife surveys mentioned above; however, no effort was made to determine the species of bat making the echolocation. As discussed below in Section 12.1.2.3, the USFS Superior National Forest (SNF) staff conducted surveys for the northern long-eared bat at three general locations in the Project area in July and August 2014 (Reference (31)).

12.1.2.2 Canada Lynx Field Surveys

A field survey was completed in 2006 for the federally threatened Canada lynx within a 250 square mile overall study area around the Project area (Reference (32)). A portion of the Project is located within the USFWS designated critical habitat area, shown on Large Figure 14. Large Figure 14 also shows the Canada lynx sightings within the vicinity of the Project area between 2000 and 2006, based on data from the Minnesota Canada Lynx Database. The study gathered baseline information on the abundance, movement, and habitat usage of Canada lynx in the vicinity of Project. The study area was surveyed between January and March 2006.



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No Canada lynx or sign of Canada lynx were observed within the Project area. However, the surveys did identify three female Canada lynx within the overall study area and one female Canada lynx adjacent to the study area (Large Figure 14). Habitat for Canada lynx and their primary prey (snowshoe hare) was identified throughout the study area, except where lands had been disturbed by historic or ongoing mining activity. The Project area contains areas of Canada lynx habitat, including mature jack pine forest with dense balsam fir in the understory.

12.1.2.3 Northern Long-Eared Bat

The USFS SNF staff conducted surveys for the northern long-eared bat at three general locations in the Project area in July and August 2014 (Reference (31)). The three Project areas included the Mine Site, the Plant Site, and the Dunka Road and Utility Corridor. Survey methods utilized passive sonic (Anabat) detectors on the Mine Site and Dunka Road and Utility Corridor. At the Plant Site, the methods were primarily direct observation of bat species, supplemented by passive sonic detectors when feasible. The surveys found northern long-eared bats present at the Mine Site, Plant Site, and the Dunka Road and Utility Corridor.

Survey data confirmed that northern long-eared bats utilize the Mine Site and the Dunka Road and Utility Corridor for foraging and travel to and from foraging and roost sites. The Mine Site may also contain roost sites; however, the 2014 USFS surveys found no conclusive evidence of roost sites. The direct observations and passive sonic survey data suggested that northern long-eared bats used the Plant Site buildings for foraging, and that the Coarse Crusher and Concentrator Buildings "have potential for limited roost sites" (Reference (31)). No conclusive evidence of roost sites was found in the Plant Site buildings.

In addition, the 2014 USFS surveys and examination of the Mine Site, Plant Site buildings, and the Dunka Road and Utility Corridor found no evidence of northern long-eared bat hibernacula, or conditions suitable for hibernacula (Reference (31)).

In the spring of 2014, the USFS SNF staff and MDNR staff, with additional funding from USFWS, conducted a pilot project to describe summer habitat use by northern long-eared bats in Minnesota. Surveys were conducted at 12 sites, five of which were on the SNF. The survey captured six of the seven species of bats known to occur in Minnesota; tri-colored bat was the only species not captured. The most frequently captured bats were little brown bats (45%) and northern long-eared bats (22%) (Reference (31)).

12.1.2.4 Wildlife Corridor Cumulative Effects Analysis

In 2006, Emmons & Olivier Resources (Reference (33)) completed an assessment of the impacts to 13 wildlife habitat and travel corridors from past, present, and reasonably foreseeable projects in the vicinity of ongoing and proposed projects in northeastern Minnesota. In order to conduct this assessment, the study established appropriate spatial and temporal scales and significance thresholds for examining impacts to habitat and travel corridors. Wildlife habitat impacts were evaluated at the scale of the Arrowhead Region. Losses to key habitats for mammalian MDNR



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Species of Greatest Conservation Need (SGCN) at this scale were deemed to be important. Travel corridor impacts were evaluated at the scale of the Mesabi Iron Range mineral deposit formation. The temporal scale of the analysis encompassed both past and future actions that have impacted habitat or travel corridors.

The impacts to travel corridors and habitats were tabulated based on human footprint data for mining, forestry, and regional development, including the 2004 mine features, tax-incentive job development zones, potential four-lane highway corridors, proposed state forestry harvest scenarios, and proposed mining actions. The analysis of wildlife habitats indicated significant impact to habitats used by mammalian SGCN as a result of proposed future urban development, mining, and forestry. For the entire Arrowhead Region, future losses of wildlife habitat were estimated at 8,727 acres, with 913 acres impacted by mining, 498 acres impacted by economic development, and 7,315 acres impacted by forestry.

This analysis of wildlife travel corridors indicated impacts were projected as a result of proposed future urban development, mining and increased highway traffic. Future activities were estimated to impact 11 of the 13 remaining wildlife corridors. The report concluded that there have been notable losses because pre-settlement of upland forest, especially pine forests, as well as loss of lowland conifer and deciduous forest. A major portion of the study area is currently in some type of developed cover. Analysis of the cumulative impacts of future projects indicates that about three-quarters of those impacts will occur in areas that are developed or in aspen/birch and upland shrub cover. Future habitat losses attributable to mining projects will largely avoid upland and lowland forested habitats.

In 2009, Barr completed a cumulative effects analysis of wildlife habitat and threatened and endangered wildlife species that expanded upon the 2006 Emmons & Olivier Resources analysis (Reference (34)). It determined that this 2006 analysis conservatively estimated the number and size of wildlife travel corridors because it treated all historic mining features as lost habitat and did not take into account the ameliorating effects of human re-vegetation efforts, natural succession, and the size and topography of mining impacts.

The 2009 Barr report identified 18 existing wildlife corridors; four of these corridors will likely become completely impassable within the next 25 to 30 years as a result of planned mining activities. In addition, five wildlife corridors will be significantly degraded by future mining plans but will still retain some functionality. Smaller mammal, amphibian, reptile, and insect species live in, rather than pass through, corridors, or take much longer time to traverse a corridor. Therefore, the 2009 Barr report indicates that these species will be most affected by cumulative corridor impacts; however, for listed species and SGCN species, the cumulative effects of mining and other industrial projects are not expected to negatively impact the regional wolf, Canada lynx, or bald eagle populations.



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12.1.3 Federal and State Listed Plants

PolyMet conducted botanical studies in the vicinity of the Project to establish baseline conditions. The primary focus of these studies was the vascular plant species listed by the State of Minnesota as endangered, threatened, or special concern, or by the USFS Region 9 as RFSS. Species with these designations may involve special consideration or permitting if the Project should impact their populations and/or habitats. There are no federally-listed vascular plant species known to occur in northeastern Minnesota.

Foth & Van Dyke and Associates, Inc. conducted a rare plant survey in 1999, prior to on-site mineral exploration by PolyMet (Reference (35)). Two populations from the genus *Botrychium* (moonworts and grape ferns) were documented during this survey. One population was located in the Mine Site and one population was located south of the Mine Site (Sections 11 and 16 of Township 59N and Range 13W). The plants found were not identified to species. In addition, Foth and Van Dyke documented one location of *Eleocharis nitida* (neat spike rush), a state-special concern species and RFSS species, in in the Mine Site (Township 59N, Range 13W, Section 11).

Professional botanist Cindy Johnson-Groh conducted surveys in July 2004 to assess the presence of *Botrychium* species in the vicinity of the Project (Reference (36)). A total of 39 *Botrychium* populations were documented in the Mine Site and six populations of *Botrychium* were identified outside of the Mine Site. Populations ranged in size from one individual to over 500 individuals, and all populations were found in or adjacent to old disturbance sites. Four rare *Botrychium* species were identified during this survey and include the following:

- *Botrychium pallidum*¹ (pale moonwort), a state species of special concern species and RFSS species, was documented in five locations in the Mine Site (Sections 10 and 11 of Township 59N, Range 13W) and two locations south of the Mine Site (Sections 11 and 16 of Township 59N, Range 13W).
- *Botrychium rugulosum* (St. Lawrence grapefern), a state species of special concern and RFSS species, was documented in one location in the Mine Site (Sections 2 and 11 of Township 59N, Range 13W); however, it is not certain that the plants identified at either location are *Botrychium rugulosum*.
- *Botrychium simplex* (least grapefern), a state species of special concern and RFSS species, was documented in 30 locations in the Mine Site (Sections 2, 3, 10, and 11 of Township 59N, Range 13W) and four locations south of the Mine Site (Sections 11 and 16 of Township 59N, Range 13W).

¹ The MDNR is in the process of revising the state endangered and species list and a change in status for *Botrychium pallidum* from endangered to special concern is under consideration.



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• Botrychium michiganense (Hesperium) (Michigan moonwort), a RFSS species, was documented in eight locations in the Mine Site (Sections 2, 3, 10, and 11 of Township 59N, Range 13W) and three locations south of the Mine Site (Sections 11 and 16 of Township 59N, Range 13W).

Deborah Pomroy also completed a rare plant survey of the Project area in spring 2004, focusing on the majority of Sections 3, 4, 9, and 10 of Township 59N and Range 13W (Reference (37)). The following RFSS species were documented as part of Pomroy's survey:

- One population of *Geocaulon lividum* (False Toadflax), a RFSS species, was documented in the Mine Site (Township 59N, Range 13W, Section 3).
- Four populations of *Sparganium glomeratum* (clustered bur-reed), a RFSS species, were documented in the Mine Site (Sections 9 and 10 of Township 59N, Range 13W) and one population was documented south of the Mine Site (Township 59N, Range 13W, Section 16).
- Ten populations of *Scirpus pedicellatus* (pedicellate bulrush), a RFSS species, were documented in the Mine Site (Sections 3, 9, and 10 of Township 59N, Range 13W) and one population was documented south of the Mine Site (Township 59N, Range 13W, Section 16).

Gary Walton also completed a rare plant survey in the vicinity of the Mine Site in 2004 (Reference (38)). This survey documented nine rare plant species, two of which are state-protected, in several locations in and around the Mine Site.

- Caltha natans (floating marsh marigold), a state-endangered species and RFSS species, was documented in five locations in the Mine Site (Sections 1, 10, and 12 of Township 59N, Range 13W) and in eight locations adjacent to the Mine Site (Sections 1, 11, and 12 of Township 59N, Range 13W).
- *Eleocharis nitida* (quill spikerush), a state species of special concern and RFSS species, was documented in 11 locations in the Mine Site (Sections 1 and 11 of Township 59N, Range 13W).
- *Botrychium simplex* (little grapefern), a state species of special concern and RFSS species, was documented in two locations in the Mine Site (Township 59N, Range 13W, Section 1).
- *Geocaulon lividum* (False Toadflax), RFSS species, was documented in 10 locations in the Mine Site (Sections 1, 2, and 11 of Township 59N, Range 13W).
- Ranunculus lapponicus (lapland buttercup) a state species of special concern and RFSS species, was documented in six locations in the Mine Site (Sections 1 and 2 of Township



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59N, Range 13W) and in one location east of the Mine Site (Township 59N, Range 12W, Section 6).

- Sparganium glomeratum (northern bur reed), a RFSS species, was documented in seven locations in the Mine Site (Sections 1, 2, and 11 of Township 59N, Range 13W) and one location south of the Mine Site (Township 59N, Range 13W, Section 11).
- *Torreyochloa pallid*a (pale manna grass), a state species of special concern and RFSS species, was documented in two locations in the Mine Site (Township 59N, Range 13W, Section 1) and in six locations outside of the Mine Site (Township 59N, Range 12W, Section 6 and Township 59N, Range 13W, Section 11).
- *Ranunculus gmelinii* (small yellow water crowfoot), a RFSS species, was documented in three locations in the Mine Site (Sections 1, 2, and 12 of Township 59N, Range 13W) and in four locations outside of the Mine Site (Sections 1, 11, and 12 of Township 59N, Range 13W).
- *Juncus vaseyi* (Vasey's rush), a RFSS species, was documented in three locations in the Mine Site (Sections 1, 11, and 12 of Township 59N, Range 13W).

Daniel Jones of Barr completed an additional field survey for *Botrychium* species at the PolyMet Mine Site in 2007 (Reference (39)). During this survey, one *Botrychium rugulosum* population (consisting of four individuals) was documented in the Mine Site (Township 59N, Range 13W, Section 1).

Daniel Jones of Barr also conducted a sensitive plant survey in June and July 2008 along segments of Dunka Road and the proposed pipeline alignment from the west end of the Mine Site to the Plant Site (Reference (40)). The survey resulted in identification of six locations with populations (consisting of one to five individuals) of the state-endangered and RFSS species *Botrychium pallidum* (pale moonwort) (Township 59N, Range 14W, Section 13 and Sections 17 and 18 of Township 59N, Range 13W). All of the plants observed during the survey were within 25 feet of Dunka Road and generally grew in the transition zone between forest and roadside vegetation.

Midwest Natural Resources Inc. (MNRI) completed rare plant surveys of the area north of the Mine Site in 2008 (Reference (41)). The MNRI surveys identified four state-special concern and RFSS plant species.

• *Juncus stygius var. americanus* (bog rush), a state species of special concern and RFSS species, was documented in 18 locations outside of the Mine Site (Township 59, Range 13, Section 4).



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- *Platanthera clavellata* (club-spur orchid), a state species of special concern and RFSS species, was identified in 15 locations outside of the Mine Site (Township 59, Range 13, Section 4).
- *Pyrola minor* (small shinleaf), a state species of special concern and RFSS species, was identified in one location outside of the Mine Site (Township 59, Range 13, Section 5).
- *Sparganium glomeratum* (clustered bur-reed), a state species of special concern and RFSS species, was identified in four locations, two of which are located in the Mine Site (Sections 3 and 9 of Township 59N, Range 13W) and two of which are located outside of the Mine Site (Township 59, Range 13, Section 4).

In 2011, Barr prepared a memorandum summarizing the results of the 2008 MNRI survey, as well as a sensitive plant species survey completed by ENSR in 1999, but documented only in the NHIS database (Reference (41)). During the ENSR survey, one population of the state-special concern and RFSS species *Eleocharis nitida* (quill spikerush) was identified (Township 59N, Range 13W, Section 9).

Large Table 12 includes a summary of all state threatened, endangered, or special concern species, as well as RFSS plants species described by the above surveys.

12.2 Historic Resources

As part of the NHPA Section 106 review process for the Project, historic properties were identified within the APE (Large Figure 15). All properties identified within the APE have been evaluated to determine their eligibility for inclusion in the NRHP. The Erie Mining Company Mining Landscape Historic District is eligible for inclusion in the NRHP and is generally comprised of Hoyt Lakes (the company town), the Plant Site, the Taconite Harbor shipping facility, as well as other infrastructure such as rail lines. The part of the District that lies within the APE includes contributing and individually eligible properties, such as the Concentrator Building.

Spring Mine Lake Sugarbush, the Partridge River Segment of the Beaver Bay to Lake Vermillion Trail, and the Partridge River Section of Mesabe Widjiu are eligible for inclusion in the NRHP. It has been determined that the Project would have an adverse effect on the Erie Mining Company Mining Landscape Historic District, the Spring Mine Lake Sugarbush, the Partridge River Segment of the Beaver Bay to Lake Vermillion Trail, and the Partridge River Section of Mesabe Widjiu.

Measures to resolve adverse effects are being developed through consultation. An MOA resolving adverse effects will be executed and the NHPA process completed prior to issuance of federal approvals for the Project. Additional details on are presented in Sections 4.2.9 and 5.2.9 of Reference (2).



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12.3 Other Special Considerations

Other special considerations identified in Minnesota Rules, part 8420.0515 are summarized below.

Natural Communities

The Mine Site is located in the Laurentian Mixed Forest Province (Reference (42); Large Figure 16). Within the Laurentian Mixed Forest Province, the Mine Site is situated in the Northern Superior Uplands Section and the Laurentian Uplands Subsection (Reference (42); Large Figure 16). The MDNR has mapped upland and wetland native plant communities across approximately 8% (506,771 acres) of the Northern Superior Uplands Section and approximately 23% (128,142 acres) of the Laurentian Uplands Subsection (MDNR 2015; Large Figure 16). The MDNR has mapped native plant communities across approximately 75% (2,270 acres) of the Mine Site (Reference (43); Large Figure 16).

The MDNR data (Reference (43)) indicates that there are 13 ecological systems (e.g., Acid Peatland System; APn) mapped across the Northern Superior Uplands Section and Laurentian Uplands Subsection. Within those 13 ecological systems, the MDNR has mapped 47 native plant community classes (e.g., APn80) across the Northern Superior Uplands Section and 34 native plant community classes across the Laurentian Uplands Subsection (Reference (43)). The MDNR has also mapped several native plant community complexes (e.g., Alder Swamp/Forested Peatland Complex) across the Northern Superior Uplands Section and the Laurentian Uplands Subsection (Reference (43)).

Within the Mine Site, the MDNR mapped four ecological systems, containing eight native plant community classes, as well as three native plant community complexes (Reference (43)). Table 12-1 summarizes the acreage of each of these native plant community classes and complexes at the Mine Site and across the Northern Superior Uplands Section and Laurentian Uplands Subsection. These eight native plant community classes and three native plant community complexes represent approximately 70% of the native plant communities mapped across the Northern Superior Uplands Section and approximately 87% of the native plant communities mapped across the Laurentian Uplands Subsection.

Table 12-1 Native Plant Community Classes and Complexes Common to the Northern Superior Uplands Section, Laurentian Uplands Subsection, and the Mine Site

Native Plant Community Classes Mapped by MDNR on the Mine Site	Northern Superior Uplands Section (MDNR acres mapped)	Laurentian Uplands Subsection (MDNR acres mapped)	Mine Site (MDNR acres mapped)
APn80/81 (Northern Spruce Bog/Northern Poor Conifer Swamp) ⁽¹⁾	53,040.5	22,045.9	482.3



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APn91 (Northern Poor Fen)	8,377.4	5,317.3	1.6
FDn32/43 (Northern Poor Dry-Mesic Mixed Woodland/Northern Mesic Mixed Forest) ⁽²⁾	197,790.4	44,887.1	1,342.1
FPn62 (Northern Rich Spruce Swamp)	23,602.1	16,223.0	225.0
FPn63 (Northern Cedar Swamp)	19,393.2	6,673.5	0
FPn73 (Northern Rich Alder Swamp)	12,364.7	1,373.8	50.1
WFn55 (Northern Wet Ash Swamp)	4,150.6	340.3	0
WMn82 (Northern Wet Meadow/Carr)	7,924.5	2,309.0	0.2
Complex Community: Beaver Wetland/Marsh ⁽³⁾	12,035.5	1,705.8	59.6
Complex Community: Forested Peatland/Upland Transition	8,703.0	7,367.2	91.9
Complex Community: Alder Swamp/Forested Peatland	8,362.6	3,576.4	17.6
Impervious	0	0	0
Unmapped	5,463,309	439,151	746
Total Area ⁽⁴⁾	5,970,080	567,293	3,015

⁽¹⁾ APn80 and APn81 were grouped during mapping.

Special Fish and Wildlife Resources

The MDNR NHIS database indicates a documented record of a colonial waterbird nesting area east of the Tailings Basin. This nesting area, which was last observed in 1991, was primarily composed of blue heron (*Ardea herodias*).

Groundwater Sensitivity

The water quality model estimates that the Project would not cause any significant water quality impacts (Executive Summary of Reference (2)). For additional details, please see Sections 5.2.2.3.2 and 5.2.2.3.3 of Reference (2)).

Sensitive Surface Waters

No sensitive surface waters are present in the Project area, including designated trout streams and those waters listed under Minnesota Rules, part 7050.0180.

⁽²⁾ FDn32 and FDn43 were grouped during mapping.

⁽³⁾ MDNR complex is mapped as "Beaver Wetland Complex." While Barr mapped these communities as "Marsh Complex".

⁽⁴⁾ Numbers may not total due to rounding.



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Education or Research Use

No educational or research uses have been identified in the Project area.

Waste Disposal Sites

The Plant Site and existing LTVSMC Tailings Basin are located in a brownfield area dominated by the existing facilities and infrastructure of the former LTVSMC taconite processing plant. In 2002, Cliffs Erie conducted a Phase I Environmental Site Assessment (Phase I ESA) of the former LTVSMC taconite processing plant and identified 62 potential Areas of Concern (AOCs). The legacy contamination discussion in Section 4.2.1.4.2 of Reference (2) provides the status of these AOCs.

All Project-related activities involving known or potential hazardous wastes or contaminants would be conducted according to applicable federal and state standards, as discussed in Chapter 3 of Reference (2).

Consistency with Other Plans

Section 4.2.1 of Reference (2) identifies the land use plans within the Project area. Section 5.2.1 of Reference (2) identifies that the Project activities are consistent with the formally adopted local comprehensive land use plans.



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13.0 Shoreline Impact Zones

There are no wetland impacts within 1,000 feet of a lakeshore for the Project. There are three wetlands within the Dunka Road and Utility Corridor located near streams that will be directly impacted. Two alder thicket (Type 6) wetlands are located within 300 feet of Longnose Creek and will have 0.14 acres (Wetland ID 392) and 0.34 acres (Wetland ID 862) of fill. One alder thicket (Type 6) wetland is located within 300 feet of Wyman Creek and will have 0.07 acres (Wetland ID 1124) of fill.



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14.0 Wetland Mitigation Plan Overview

Wetland mitigation will be accomplished with compensatory mitigation credits from both off-site and on-site wetland restoration projects. PolyMet plans to develop approximately 1,581 wetland mitigation credits at three off-site mitigation sites known as the Zim, Hinckley, and Aitkin sites (Attachment C, Attachment D, and Attachment E, respectively; Large Figure 12). A description of the mitigation sites is provided in Table 14-1. The on-site wetland mitigation credits will occur later in the Project and therefore are not shown as mitigation credits in Large Table 5 through Large Table 7.

Table 14-1 Description of Mitigation Sites

Wetland Replacement Site	Watershed Name, Bank Service Area (BSA)	County	Township (T), Range (R), Section (S)	Restored (R), Preserved (P) or Created (C)?
On-Site	St. Louis River #3, BSA #1	St. Louis	T59, R13, S1, 2, 3, 9, 10, and 11	О
Zim Site	St. Louis River #3, BSA #1	St. Louis	T55, R18, S2, 3, 10,11, 26, 27 and 34	R
Hinckley Site	Snake River #36, BSA #6	Pine	T39, R22, S5	R
Aitkin Site	Elk-Nokasippi #10, BSA #5	Aitkin	T47, R27, S1; T47, R26, S6	R

The proposed mitigation is expected to compensate for all of the direct wetland impacts and potential indirect fragmentation impacts, which total 940.7 acres, with the majority of credits for in-kind mitigation and nearly one-half of the credits from within the Project watershed.

Mitigation credits and ratios proposed by PolyMet are shown in Large Table 5, which complies with the St. Paul District USACE policy (Reference (44)) and recent clarifying guidance (Reference (45)). The USACE credits and ratios are shown in Large Table 6. The WCA credits and ratios are shown in Large Table 7. The proposed wetland mitigation package described in this application is expected to result in excess credits according to the St. Paul District USACE Policy and the WCA. Excess credits will be applied toward currently uncalculated potential indirect impacts, if necessary.

14.1 Mitigation Site Selection Process

Compensatory wetland mitigation site selection for the Project began in 2005 with the initial estimates of wetland impacts and a GIS study conducted within BSA #1 (St. Louis River and Lake Superior watersheds) and BSA #4 (Mississippi Headwaters watersheds) to identify potential wetland mitigation sites (Large Figure 12). Over 100 sites were identified within BSA



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#1 encompassing over 175,000 acres of potential mitigation. Those opportunities were primarily in partially-drained wetlands with some farmed and completely-drained wetlands. The sites with the greatest potential for wetland mitigation credits were further evaluated in the field. Meetings were held in the field with agencies on June 14, 2005 and June 30, 2005, to identify issues associated with restoring partially-drained wetlands and to solicit input on other mitigation opportunities. The participants at the meetings included representatives from the USACE, MDNR, USFWS, St. Louis County, and the Minnesota Board of Water and Soil Resources (BWSR) (Reference (46)). Significant issues were raised by the participating agencies regarding sites with partially-drained wetlands. They recommended a focus on wetland restoration on private lands, which were largely unavailable in the Lake Superior watersheds.

Approximately three-fourths of the potential mitigation sites identified were determined not to meet the federal and state mitigation guidelines based on more detailed evaluations. Detailed GIS evaluations and site investigations were conducted for the remaining 25 potential mitigation sites identified based on input received from the agency representatives. In addition, PolyMet inquired with numerous public agencies and private natural resource entities in search of mitigation opportunities, resulting in no new leads. The majority of the potential mitigation sites identified in 2005 were deemed infeasible for several reasons including the following:

- potential flooding impacts to public roads and upstream properties
- insufficient wetland drainage or other wetland alterations to meet eligibility requirements
- presence of public ditches that could not be abandoned
- likely soil contamination
- unwilling landowners
- permanently encumbering valuable public resources (i.e., timber, peat, gravel)
- presence of public recreation areas

Based on that extensive mitigation site search within BSA #1, two potential mitigation sites were identified for the Project, one agricultural site and one partially-drained wetland site located on a tax-forfeited property. The agricultural site (Zim Sod) contained over 400 acres, was under sod production, and was owned by two separate landowners. No agreement could be reached with the landowners due to complications related to a long-term lease between the parties and a landowner expectation of compensation far exceeding market value. The second potential mitigation site was located near Floodwood, Minnesota on land that was predominantly County-controlled tax forfeit property with some State-owned land. PolyMet developed an agreement with St. Louis County to allow them to study the site and develop wetland mitigation plans along with a structure for allocating monetary and wetland credit compensation to the county upon final execution of the agreement. A preliminary wetland mitigation plan for the Floodwood site



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was submitted in March 2006 for agency review. Planning, agency review, and public meetings to identify public concerns continued for the Floodwood site through early 2007. Significant public opposition to the wetland restoration plans surfaced in 2006 along with technical concerns over whether or not wetland hydrology could be adequately restored. In April 2007, the District Court nullified PolyMet's agreement with St. Louis County. The site was deemed infeasible due to that legal action, public opposition, agency concerns regarding crediting, technical issues regarding restoration feasibility, and concerns over the ability to restore hydrology and wetland functions.

After PolyMet thoroughly pursued practicable wetland mitigation opportunities within the Project BSA and when their preferred wetland mitigation opportunity was deemed infeasible in early 2007, wetland mitigation opportunities within neighboring BSAs were pursued. One site was secured within the Snake River watershed (BSA #6), the Hinckley wetland mitigation site (Hinckley) and one site was secured within the Mississippi River Headwaters watershed (BSA #5), the Aitkin wetland mitigation site (Aitkin) (Large Figure 12). The mitigation site plans for the Hinckley and Aitkin sites were submitted in August 2007, the plans went through agency review, and plan revisions were completed in August 2016 (Attachment D, Attachment E) to address agency comments. Both sites occur on properties that are still actively farmed for sod and other crops; PolyMet has retained options for the sites to be used for wetland mitigation. A summary of estimated credits available from each site is provided in Large Table 5.

The mitigation plan supplement (Reference (46)) included an extensive evaluation of on-site mitigation opportunities at the Project site, as requested by the USACE.

After years of effort, in 2010, PolyMet was able to successfully negotiate rights to a site with a high potential for the development of wetland mitigation credits in the St. Louis River watershed, the Zim Sod wetland mitigation site (Zim). The Zim mitigation site plan was submitted in April 2011 for review and revisions were completed in August 2016 to address agency comments (Attachment C). Hydrology monitoring started at the Zim site in May 2012 to document wetland drainage and provide justification for the proposed mitigation credits. Hydrology monitoring will continue at the site to document pre-restoration conditions until the permits are issued for the Project and the restoration begins. A summary of estimated credits proposed for the Zim site is included in Large Table 5.

PolyMet's wetland mitigation planning efforts helped identify the difficulties in conducting wetland mitigation in northeastern Minnesota to meet federal and state initial mitigation siting preferences. Both state and federal agencies have considerable discretion and flexibility in review and approval of mitigation sites. After the completion of a majority of PolyMet's wetland mitigation planning, the Northeastern Minnesota Wetland Mitigation Inventory and Assessment project was completed by the BWSR in January 2010 (Reference (47)). The goals of the project were to conduct a more thorough mitigation opportunity search than that conducted by PolyMet and to conduct a mitigation siting study to curtail the level of effort required by individual project proponents to meet state and federal wetland siting standards.



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The BWSR study concluded that only about 10% of the private landowners may be willing and interested in wetland restoration. According to the study, approximately 13% of potential mitigation sites in northeastern Minnesota have a high potential for mitigation, but only 5% of the opportunities identified within the Lake Superior watersheds were completely-drained or farmed wetlands, the types of sites that are most likely to yield sufficient compensatory mitigation credits. In the Lake Superior watersheds, 18% of the opportunities identified were partially-drained wetlands, which have been determined to have significant issues regarding regulatory applicability. Approximately 77% of opportunities identified in the Lake Superior watersheds represent preservation methods; these are considered to be the lowest priority for mitigation and few preservation projects have been completed in Minnesota. Although some possible new mitigation opportunities were identified by this project, PolyMet had already secured and planned the majority of the wetland mitigation for the Project. In the event that additional wetland mitigation is needed, PolyMet will utilize the information resulting from the BWSR project (Reference (47)) in planning that mitigation.



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15.0 Description of Mitigation Wetlands

15.1 Summary of Wetland Mitigation Ratios

The credits proposed for each mitigation site are consistent with WCA and Section 404 of the CWA, as discussed in the mitigation plans (Attachment E, Attachment D and Attachment C). However, the value of those credits, relative to the impacts, differs because the mitigation requirements differ between the WCA and the CWA. PolyMet proposes wetland mitigation that meets the WCA replacement standards and the St. Paul District USACE policy (Reference (44)). The on-site wetland mitigation credits will occur later in the Project and therefore are not shown as mitigation credits in Large Table 5 through Large Table 7.

15.1.1 Federal CWA Wetland Mitigation Summary

Based on the St. Paul District USACE policy for wetland mitigation (Reference (44)), the base ratio for compensation of wetland impacts is 1.5 mitigation credits to one acre of impact (1.5:1). A draft memorandum from the USACE (Reference (45)) states that an increase in the base ratio to 2:1 may be required considered for the following wetland types:

- Difficult-to-replace wetland communities, which include coniferous and open bogs (Type 8) and forested wetlands (Type 7)
- High quality wetland communities, as determined based on previous studies

The St. Paul District USACE policy for wetland mitigation (Reference (44)) provides incentives to reduce the recommended base ratios. All of the credits at the three mitigation sites fulfill at least one of the three incentive criteria required to reduce the base mitigation ratio by 0.25:1 (e.g., from 1.5:1 to 1.25:1) for each of the following provisions that apply, with a minimum ratio of 1:1:

- The restoration work is expected to begin on each of these sites after permit issuance. Therefore, it is expected that this will qualify for the "in-advance" incentive (a reduction of 0.25:1) for the impacts to shallow marsh (Type 3) communities; it is assumed that the fresh (wet) meadow (Type 2) and deep marsh (Type 4) communities (not discussed in the draft memorandum from the St. Paul District USACE (Reference (45)) also qualify for this incentive.
- Most of the credits will qualify for the "in-kind" incentive because the wetland communities restored at each mitigation site will replace similar impacted community types at a minimum ratio of 1:1. One exception is that the deep marsh (Type 4) community impacts will not be fully replaced "in-kind" because this community type cannot be replaced with a similar high quality community at the mitigation sites. A deep marsh community is not appropriate for the landscape and geomorphic context of the mitigation sites. Therefore, in-kind compensation for this wetland type is not practicable



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for these sites and no incentives are applied to the portion of deep marsh impacts not replaced in-kind at a 1:1 ratio (Large Table 5).

• All credits from the Zim site qualify as "in-place" because this site is located within the same 8-digit HUC watershed as the Project impacts (Large Figure 12) and the mitigation siting sequence was followed to maximize mitigation possibilities on-site and within the same 10-digit HUC watershed (Attachment C).

15.1.2 State WCA Wetland Mitigation Summary

Based on the WCA wetland replacement standards (Minnesota Rules, part 8420.0522, subpart 4), the mitigation credits will qualify at a ratio of either 1:1 or 1.5:1. The mitigation credits developed on-site and at the Zim site will qualify for the minimum replacement ratio of 1:1, because they are located within the same major watershed and the majority of the replacement credits are planned in-kind. The credits from the Aitkin and Hinckley sites will qualify for a replacement ratio of 1.5:1 because they are outside the major watershed of the impacts.

15.1.3 On-Site Wetland Mitigation

Upon mine reclamation, approximately 102 acres of wetlands will be created at the temporary mine stockpile areas after removal of the Category 2/3 Waste Rock Stockpile and the OSLA as described in Section 7.0 of Reference (48) and shown in Large Figure 6 of Reference (49). Because it may not be feasible to construct wetlands on the entire footprint of these temporary areas, it was assumed that only the area equivalent to the directly impacted wetlands within the footprints will be viable for wetland mitigation (Attachment A). Design of wetland mitigation areas will be further evaluated in the detailed reclamation design as described in Section 7.0 of Reference (48).

The design will include the preservation of upland buffer around the perimeter of the wetland mitigation areas. Approximately 102 acres of on-site wetland mitigation is proposed to be reestablished (Large Table 6 and Large Table 7). Because some of the existing watershed and soil conditions are not expected to remain in the same condition as prior to the project, this wetland establishment is proposed to be most similar to a wetland creation. Consistent with St. Paul District USACE policy (Reference (44)), the mitigation wetlands are expected to be hydrologically connected to other wetlands to support their development; therefore, this is a lower risk wetland creation and qualifies for 75% credit. Similarly, in accordance with the WCA rules in Minnesota Rules, part 8420.0526, subpart 7, this qualifies for 75% credit for the proposed wetland mitigation area. Establishment of these wetlands is expected to occur during reclamation.

15.2 Off-Site Wetland Mitigation

The off-site wetland restoration projects that will provide required mitigation for the Project wetland impacts are summarized below and provided in Attachment C, Attachment D and Attachment E. The three off-site mitigation projects include the Zim, Hinckley, and Aitkin sites.



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Site locations and watersheds are shown in Large Figure 12. Acreages and credits from each of these sites are summarized in Large Table 5. These three sites were selected considering the potential for each to mitigate for impacted community types. Based on the anticipated credits from each site, only the deep marsh (Type 4) community will not be fully compensated in-kind at a 1:1 ratio. The bog and forested (Type 7 and 8) community types will be mitigated at a higher ratio based on Reference (45).

15.2.1 **Zim Site**

Attachment C details the proposed Zim site. The site was a sod farm that has been drained by ditches and sub-surface drain tiles. This site is located in two separate ownership units on approximately 532 acres of land located southwest of the city of Eveleth, Minnesota on the east side of County Road 7 as shown in Large Figure 12. The site is located in St. Louis County in the St. Louis River major watershed (#3) within the Lake Superior basin (BSA #1) (Large Figure 12).

Restoration methods on the site are designed to restore a Type 8 coniferous bog community; however, developing a bog community is highly dependent on soil and groundwater parameters that may be difficult to control. Therefore, a coniferous swamp community will be the contingent community if the soil and groundwater conditions are not adequate for bog regeneration. Coniferous bog or swamp is the target for the whole site, however, where trees do not successfully establish; the target community will be an open bog or sedge meadow. If the target community changes, the credit ratios would be recalculated as discussed for the contingencies in Section 16.2. A total of 504 acres of wetland restoration and 10 acres of upland preservation are proposed (Attachment C; Large Table 5). A total of 480 compensatory wetland mitigation credits are proposed from this site (Attachment C).

The credits calculations are shown in Large Table 5 following the St. Paul District Policy (Reference (44)) and the draft guidance document from the St. Paul District USACE (Reference (45)). This site is located within the same watershed as the Project so the credits from the site qualify for the in-place incentive, a credit reduction of 0.25:1. Wetlands on the site will replace wetlands of the same type, so these credits will qualify for the in-kind incentive, a credit reduction of 0.25:1. Most of the credits from the site will be developed as bog (Type 8) and/or forested wetland (Type 7) communities and, therefore, will meet the minimum replacement ratio of 1.5:1 for those communities.

Under the WCA, the replacement ratio for credits at the Zim site will be 1:1 ratio because the impacted wetlands will be replaced within the same watershed, the majority of which are to be replaced in-kind (Large Table 7).

Mitigation credits from the Zim site are summarized in Large Table 5 based on actions eligible for credit in the St. Paul District USACE policy (Reference (44)) and in the WCA rules. Proposed actions eligible for credit include the following with references to the applicable St. Paul District USACE policy and under the WCA in Minnesota Rules, part 8420.0526:



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- Restoration of completely drained wetlands are eligible for credit for 100% of the area restored [Section 404 (restoration via reestablishment) and Minnesota Rules, part 8420.0526, subpart 3]. This is applied to the majority of the fields on the site that are drained by sub-surface drain tiles and will be restored to coniferous bog communities.
- Restoration of partially-drained wetlands are eligible for credit for 50% of the area restored [Section 404 (restoration via rehabilitation) and Minnesota Rules, part 8420.0526, subpart 4)]. This applies to the hydrologic restoration of partially-drained wooded wetlands and the restoration of the natural surface grade and wetland conditions in ditches.
- The upland areas restored and maintained in native vegetation are eligible for credit for 25% of the area [Section 404 (upland buffers) and Minnesota Rules, part 8420.0526, subpart 2]. The uplands at the Zim site occur in drained fields and filled ditches that will remain effectively drained due to open ditches that cannot be filled.

The majority of the wetland mitigation at the Zim site is proposed through the restoration of drained wetlands. Those areas are currently managed for sod production, so conditions range from open soil to a fully developed turf grass mat that is regularly mowed and herbicides are applied to control weeds. The historic wetland hydrology has been removed from those areas by an extensive drain tile and ditch system. Therefore, the sod production areas of the site currently serve no natural wetland functions. The restoration of forested wetland communities within the site will restore wetland functions over the course of many years. Hydrologic and water quality functions such as water storage, hydrologic regime, and maintenance of water quality will be restored to a higher functioning level soon after the initial restoration activities are completed and to natural conditions within several years following initial restoration. Other wetland functions that rely on the reestablishment of natural wetland vegetation, such as vegetative diversity, wildlife habitat, and aesthetics/recreation will take longer to become fully restored. However, substantial improvements in those functions will occur during the first several years of restoration because permanent, native vegetation will begin to develop rapidly, the site will not be tilled, seeded, or regularly mowed, and human activity within the site will be minimal.

Hydrologic restoration of partially-drained wooded wetlands qualifies for 50% credit based on the St. Paul District USACE policy (Reference (44)) for rehabilitation of an existing, degraded wetland. The 50% credit is based on the lowest percentage available for rehabilitation, despite the anticipated improvement of wetland functions to these communities. Benefits from this restoration will include an increase in the water storage capacity of the wetland, improved water quality, and increased soil saturation. The saturated soil is an important factor in maintaining a healthy bog plant community and associated wetland functions.

Restoring the natural hydrology to the wooded communities at the Zim site is anticipated to facilitate the return of critical components of the bog community and halt peat subsidence. Presently, the wooded communities subjected to partial drainage are degraded woodlands that lack critical bog community vegetation components such as low-growing ericaceous shrubs, a



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continuous layer of *Sphagnum* moss, and abundant sedges (i.e., *Carex lasiocarpa*). Furthermore, exposed tree roots at the base of tree trunks is evidence that the soil in these areas is likely subsiding due to increased decomposition of the peat, likely caused by reduced surface saturation. Increasing soil saturation in this area will enable this community to re-establish.

Monitoring data will be collected after restoration to document the changes in the partially-drained wooded communities. These data will be used to determine potential remedial actions and to document increased hydrology.

The vegetation and hydrology will be restored to the site over a one-year construction period followed by up to 20 years of vegetation management. The restoration work is expected to begin on the site after permit issuance. Attachment C identifies the performance standards that have been developed for the mitigation site to guide the restoration activities and to monitor whether vegetation and hydrology are meeting the design goals. A declaration of restricted covenants to protect the site will be prepared and recorded within one year after initializing the restoration activities. The wetland restoration area will be monitored for up to 20 years beginning in the first full growing season after completing hydrologic restoration and ending upon certification by the USACE and MDNR that the wetlands have met performance standards.

15.2.2 Hinckley Site

Attachment D describes the wetland mitigation potential for the Hinckley site. The site was a sod farm that has been drained by ditches and sub-surface drain tiles. This site is located on approximately 417 acres of land located southwest of the city of Hinckley, Minnesota at the intersection of Sod Road and Highway 107, as shown in Large Figure 12. The mitigation site is located in Pine County in the Snake River major watershed (#36) within BSA #6, adjacent to BSA #1 where the Project is located (Large Figure 12). A total of 348 acres of wetland restoration and 58 acres of upland buffer preservation are proposed (Large Table 5).

Restoration methods on the site are designed to restore sedge meadow (Type 2), shrub-carr (Type 6), alder thicket (Type 6), and hardwood swamp (Type 7); and create sedge meadow (Type 2), shrub-carr (Type 6), and alder thicket (Type 6) (Large Table 5).

Restoration activities at the Hinckley site will qualify for various credit ratios based on the St. Paul District USACE Policy and Guidance (Reference (44) and Reference (45)) depending on community types. The seasonally flooded (Type 1), fresh (wet) meadow (Type 2), and shallow marsh (Type 3) communities will qualify for the in-advance incentive, a reduction of 0.25:1. Also, many credits from the site will qualify for the in-kind incentive, a reduction of 0.25:1. The credits from the site that qualify for both incentives will compensate for low or medium quality non-forested and non-bog wetland impacts at a 1:1 ratio and at a 1.5:1 ratio for impacts to high quality non-forested and non-bog wetlands. The credits from forested and bog wetlands do not qualify for the in-advance incentive (Large Table 5). The majority of the credits from the site qualify for the incentive for in-kind replacement. These credits will be applied as compensation



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at a ratio of 1.25:1 for impacts to non-forested, non-bog, and low or medium quality wetlands and at a ratio of 1.75:1 for impacts to forested, bog, and high quality wetlands.

Under the WCA, the mitigation credits at the Hinckley site will replace Project impacts at 1.5:1 (credit to impact) because the wetlands will be replaced outside of the Project watershed (Large Table 7).

Mitigation credits from the Hinckley site are summarized in Large Table 5 based on actions eligible for credit in the St. Paul District USACE Policy (Reference (44)) and in the WCA rules. Proposed actions eligible for credit include the following with references to the applicable St. Paul District USACE Policy and under the WCA in Minnesota Rules, part 8420.0526:

- Restoration of drained wetlands are eligible for credit for 100% of the area restored [Section 404 (restoration via reestablishment) and Minnesota Rules, part 8420.0526, subpart 3]. This is applied to the fields on the site, the majority of which are drained wetlands.
- Restoration of partially-drained wetlands are eligible for credit for 50% of the area restored [Section 404 (restoration via rehabilitation) and Minnesota Rules, part 8420.0526, subpart 4)]. This applies to the hydrologic restoration of partially-drained wetlands and the restoration of the natural surface grade and wetland conditions in ditches.
- Creation of wetlands are eligible for credit for 75% of the area created [Section 404 (wetland creation) and Minnesota Rules, part 8420.0526, subpart 6)]. This applies to four upland areas on the site that are will excavated to obtain sufficient soils to fill existing ditches. These areas will be contiguous with and surrounded or nearly surrounded by restored wetlands or upland buffers, therefore, integrated into the larger, restored wetland complex.
- The upland areas restored and maintained in native vegetation are eligible for credit for 25% of the area [Section 404 (upland buffers) and Minnesota Rules, part 8420.0526, subpart 2]. This applies to restoration of native vegetation in the uplands adjacent to the restored wetlands.

The vegetation and hydrology will be restored to the site over a one -year construction period followed by up to 20 years of vegetation management. The restoration work is expected to begin on the site after permit issuance. Performance standards have been developed for the mitigation site to guide the restoration activities and to monitor whether vegetation and hydrology are meeting the design goals Attachment D. A declaration of restricted covenants to protect the site will be prepared and recorded within one year after initiating the restoration activities. The wetland restoration area will be monitored for up to 20 years beginning in the first full growing season after completing hydrologic restoration and ending upon certification by the USACE and MDNR that the wetlands have met performance standards.



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15.2.3 Aitkin Site

Attachment E describes the wetland mitigation plans for the Aitkin site. The site is currently an active farm producing sod and row crops that has been drained by ditches and sub-surface drain tiles. The site has been used for sod, wheat, soybeans, sunflowers, and wild rice production. The 1,020-acre site is located north of the city of Aitkin, Minnesota on either side of County Road 1, as shown in Large Figure 5 of Reference (49). The mitigation site is located in Aitkin County in the Elk-Nokasippi major watershed within BSA #5, adjacent to BSA #1 where the Project is located (Large Figure 12).

The proposed wetland mitigation area includes 828 acres of wetland restoration and 65 acres of upland buffer preservation (Attachment E). Restoration methods on the site are designed to restore shallow marsh (Type 3), hardwood swamp (Type 7), and coniferous swamp (Type 7).

Restoration activities at the Aitkin site will qualify for various credit ratios based on the St. Paul District USACE Policy and Guidance (Reference (44) and Reference (45)) depending on community types. The fresh (wet) meadow (Type 2), shallow marsh (Type 3), and deep marsh (Type 4) communities will qualify for the in-advance incentive, a reduction of 0.25:1. Many credits from the site will qualify for the in-kind incentive, a reduction of 0.25:1. The credits from the site that qualify for both incentives will compensate for impacts to low or medium quality non-forested and non-bog wetlands at a 1:1 ratio and at a 1.5:1 ratio for impacts to high quality non-forested and non-bog wetlands. The credits from forested and bog wetlands do not qualify for the in-advance incentive (Large Table 5). The majority of the credits from the site qualify only for the incentive for in-kind replacement. These credits will be applied as compensation at a ratio of 1.25:1 for impacts to non-forested, non-bog, and low or medium quality wetlands and at a ratio of 1.75:1 for impacts to forested, bog, and high quality wetlands.

Under the WCA, the replacement ratio at the Aitkin site will replace Project impacts at 1.5:1, because the wetlands will be replaced outside of the Project watershed (Large Table 7).

Mitigation credits from the Aitkin site are summarized in Large Table 5 based on actions eligible for credit in the St. Paul District USACE Policy (Reference (44)) and in the WCA rules. Proposed actions eligible for credit include the following with references to the applicable St. Paul District USACE Policy and under the WCA in Minnesota Rules, part 8420.0526:

- Restoration of drained wetlands are eligible for credit for 100% of the area restored [Section 404 (restoration via reestablishment) and Minnesota Rules, part 8420.0526, subpart 3]. This is applied to the fields on the site, the majority of which are drained wetlands.
- Restoration of partially-drained wetlands are eligible for credit for 50% of the area restored [Section 404 (restoration via rehabilitation) and Minnesota Rules, part 8420.0526, subpart 4)]. This applies to the hydrologic restoration of partially-drained



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wetlands and the restoration of the natural surface grade and wetland conditions in ditches.

• The upland areas restored and maintained in native vegetation are eligible for credit for 25% of the area [Section 404 (upland buffers) and Minnesota Rules, part 8420.0526, subpart 2]. This applies to restoration of native vegetation in the uplands adjacent to the restored wetlands.

The vegetation and hydrology will be restored to the site over a one -year construction period followed by up to 20 years of vegetation management. The restoration work is expected to begin on the site after permit issuance. Performance standards have been developed for the mitigation site to guide the restoration activities and to monitor whether vegetation and hydrology are meeting the design goals (Attachment E). A declaration of restricted covenants will be prepared and recorded to protect the site within one year after initializing the restoration activities. The wetland restoration area will be monitored for up to 20 years beginning in the first full growing season after completing hydrologic restoration and ending upon certification by the USACE and MDNR that the wetlands have met performance standards.



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16.0 Monitoring Plan for Replacement Wetlands

Monitoring at wetland mitigation sites will assess whether the restored wetlands are in conformance with performance standards as described in each mitigation plan and to determine whether continued monitoring is required (Attachment E, Attachment D, and Attachment C). The wetland mitigation site monitoring will begin during the first full growing season after completing hydrologic restoration. In addition to monitoring of the restored wetlands, at least one reference wetland o will be monitored within the general area of each restoration site in areas with relatively natural hydrologic conditions similar to that of the proposed target communities. A monitoring plan for each site will be submitted for review and approval that will include proposed locations of reference wetlands prior to implementation of the monitoring program.

Detailed vegetation surveys will be conducted each year (typically August) in each wetland mitigation community to evaluate the success of the restoration for each community type.

To monitor hydrology on each site, shallow water table monitoring wells will be installed at multiple locations sufficient to characterize hydrology. Continuous recording wells that record water table elevations multiple times each day will be utilized to the extent feasible. Hydrologic monitoring will be used to measure the success of hydrologic restoration relative to the established performance standards for each community type and to assess the extent of wetlands on each site.

The duration of monitoring will depend on the target wetland communities at each site and the success of establishment of those communities. Bogs and forested wetlands will be monitored for up to 20 years. Monitoring of emergent and shrub-carr wetland communities will continue for up to 5 years and monitoring of forested wetland communities will continue for up to 20 years. Certain components of the monitoring may be discontinued sooner if performance standards are met and approval is provided by the USACE and MDNR.

16.1.1 On-Site

Specific monitoring plans have not been developed for on-site mitigation. However, hydrology and vegetation monitoring is expected to follow the general provisions described for the off-site monitoring, including methods, frequency, and duration. Because on-site mitigation will not occur for many years, specific plans can be developed and submitted in the future.

16.1.2 Zim Site

Shallow water table monitoring wells have been monitored on the Zim site and a reference wetland since May 2012 to characterize the pre-restoration hydrology and will continue until the initiation of restoration. After restoration, the monitoring design may be altered to better characterize restored conditions. Hydrology monitoring will continue for up to 20 years beginning in the first full growing season after completing hydrologic restoration (Attachment C).



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Monitoring reports will be prepared and submitted in Mine Years 1, 2, 3, 5, 8, 12, and 20 following construction. Monitoring results will be included in the reports to assess whether or not the restored wetland are in conformance with performance standards and to determine whether continued monitoring is required. The monitoring reports will describe the status of the wetland mitigation, summarize the results of the vegetative and hydrologic monitoring, discuss management activities and corrective actions conducted during the previous period, and discuss activities planned for the following period. The report will be submitted to the USACE and MDNR by one month after the end of each year.

16.1.3 Hinckley Site

Shallow water table monitoring wells have been monitored on the Hinckley site and reference wetlands since May 2014 to characterize the pre-restoration hydrology and will continue until the initiation of restoration. After restoration, the monitoring design may be altered to better characterize restored conditions. Hydrology monitoring will continue for up to 8 years beginning in the first full growing season after completing hydrologic restoration (Attachment D).

Monitoring reports will be prepared and submitted in Mine Years 1, 2, 3, 4, and 5 for all wetland types and also in Mine Year 8 for shrub communities following construction. Monitoring results will be included in the reports to assess whether or not the restored wetland are in conformance with performance standards and to determine whether continued monitoring is required. The monitoring reports will describe the status of the wetland mitigation, summarize the results of the vegetative and hydrologic monitoring, discuss management activities and corrective actions conducted during the previous period, and discuss activities planned for the following period. The report will be submitted to the USACE and MDNR by one month after the end of each year.

16.1.4 Aitkin Site

Shallow water table monitoring wells have been monitoring on the Aitkin site and a reference wetland since May 2012 to characterize the pre-restoration hydrology and will continue until the initiation of restoration. After restoration, the monitoring design may be altered to better characterize restored conditions. Hydrology monitoring will continue for up to 8 years beginning in the first full growing season after completing hydrologic restoration (Attachment C).

Monitoring reports will be prepared and submitted in Mine Years 1, 2, 3, 4, and 5 for all wetland types and also in Mine Year 8 for shrub communities following construction. Monitoring results will be included in the reports to assess whether or not the restored wetland are in conformance with performance standards and to determine whether continued monitoring is required. The monitoring reports will describe the status of the wetland mitigation, summarize the results of the vegetative and hydrologic monitoring, discuss management activities and corrective actions conducted during the previous period, and discuss activities planned for the following period. The report will be submitted to the USACE and MDNR by one month after the end of each year.



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16.2 Contingencies for Unsuccessful Mitigation

If the restored wetland communities at any of the mitigation sites do not meet performance standards, as described in each plan (Attachment E, Attachment D, and Attachment C), remedial or corrective actions, and possibly additional mitigation credits may be required. Site conditions relative to the performance standards, will be discussed in each monitoring report. If the standards are not met, PolyMet will propose remedial actions to meet the standard. Should performance standards within any planned community type not be met for three consecutive years, PolyMet will analyze the effects on the approved wetland mitigation credits and propose an alteration to the plan, which may include a modification of wetland community type, changes to the proposed credit ratios, and additional wetland mitigation.

Similarly, if any wetland community is not developing as planned and defined in the performance standards after the fifth full growing season after restoration, PolyMet will work with the USACE and MDNR on appropriate, alternative plans, including alternative mitigation or revisions to the overall mitigation ratio based on changes to wetland community types. Any plan revisions will be submitted to the USACE and MDNR for review and approval prior to implementation.

Should additional wetland mitigation be required, after utilizing all of the excess credits presented in Large Table 5 through Large Table 7, PolyMet will first identify and pursue wetland mitigation opportunities, including wetland preservation options, within the Project watershed. PolyMet will utilize information available at that time regarding potential wetland mitigation opportunities available through the BWSR or other relevant entities. Information on the wetland mitigation opportunities identified and pursued will be submitted with the USACE and MDNR for review and approval prior to making final decisions on additional mitigation.

16.3 Mitigation of Indirect Impacts, if Necessary

Wetland monitoring near the Project site will be used to assess potential indirect impacts to wetlands as described in Section 17.0. If wetlands are indirectly impacted by the Project, and depending upon the nature of such impacts, compensatory mitigation credits may be used for replacement. The criteria for determining potential indirect impacts to wetlands are discussed in Section 17.0. If indirectly impacted wetlands require compensatory mitigation, the acreage will be calculated by community type and provided in annual monitoring reports.

The excess wetland mitigation credits proposed are expected to be available to compensate for potential indirect wetland impacts. If necessary in the future, PolyMet will follow the general planning methods described in Section 16.2 and below to identify, plan, and receive the USACE and MDNR approval of mitigation plans to develop additional mitigation credits.

If additional credits will be needed, PolyMet will search for wetland mitigation sites, first within the Project watershed and BSA #1 and if no practicable opportunities are identified, then within other neighboring BSAs to identify that additional credits are available. Specifically, PolyMet



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will first evaluate opportunities in the Meadowlands and Floodwood area on field sites along with opportunities to preserve large areas of threatened, high quality wetland habitat in BSA #1. If credits cannot be developed in those areas, additional wetland restoration sites will be evaluated according to the appropriate criteria and polies of the USACE and the WCA.



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17.0 Wetland Monitoring Plan for Potential Indirect Wetland Impacts

As discussed in section 16.3, wetland monitoring is being conducted at the NorthMet Site to provide baseline data to use in identifying potential indirect impacts to wetlands caused by mining activities. Monitoring is currently being conducted within all wetlands containing a potential indirect wetland impact factor rating of 35 and a sampling of those wetlands with factor ratings of 1-2 as shown in Large Figure 9 through Large Figure 11 and described in Section 11.5. To determine if indirect impacts occur, hydrology, vegetation, and wetland boundaries will be monitored, documented, and compared with baseline monitoring and reference wetlands. A total of 56 monitoring wells and five reference wells have been installed to collect baseline hydrology data and to document potential indirect wetland impacts. The monitoring protocol is provided in Attachment F and described below, will continue for the life of the Project, though portions of the monitoring design may be altered to improve the design or to eliminate unnecessary data collection.

17.1 Pre-Project Wetland Hydrology Monitoring Sites

Pre-Project hydrology monitoring of wetlands and groundwater within and surrounding the proposed mine has been conducted since 2005 at well locations approved by the USACE and MDNR. Hydrology data collected from 2005-2009 are presented in reports submitted to the USACE and the MDNR (Reference (50), Reference (51), Reference (52)). During 2008 through 2011, there were 21 locations monitored for hydrology (Large Figure 17 and Large Figure 18; Reference (50)). During 2012-2016, there were 61 locations monitored for hydrology (Large Figure 17, Large Figure 18, and Large Figure 19). Baseline vegetation pre-project monitoring was completed in 2015 in the wetlands that are current monitored for hydrology. The hydrology monitoring and vegetation monitoring protocols are described in Attachment F. Pre-Project monitoring did not include collection wetland boundaries other than what was completed in the wetland delineation and baseline wetland type evaluation (Reference (18) and Reference (23)) and in other unrelated studies.

The primary objectives of the Pre-Project wetland hydrology monitoring study since 2005 have been to:

- gain a better understanding of the wetland hydrology at the Project site, i.e., defining whether specific wetlands are recharging the surficial deposits aquifer or are discharging to surface waters
- collect baseline hydrology data that could be used to assess the effect of the Project on wetland hydrology
- review the data collected in the hydrogeologic study along with the wetland hydrology data to determine whether specific wetlands have perched water tables or are in direct hydrologic connection with the surficial deposits aquifer



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• determine the potential for indirect wetland impacts resulting from the Project

The Pre-Project monitoring locations will be utilized for future monitoring during mining activities. At the Mine Site, four existing monitoring wells were removed (Wells 3, 17, 18, and 19; Large Figure 17 and Large Figure 18) because they are either located within areas of direct project impacts.

The pre-project wetland hydrology monitoring study from 2005-2016 has primarily followed the protocols described in the June 24, 2005 *Wetland Hydrology Study Plan* (Reference (53)), the May 13, 2008 *Addendum to Wetland Hydrology Monitoring Plan* (Reference (54)), and the April 12, 2010 *Addendum to Wetland Hydrology Monitoring Plan* (Reference (55)), and Attachment F). Monitoring of the wells started in 2005 and will continue throughout the Project in accordance with the plans (Reference (53), Reference (54), and Reference (55)), and Attachment F).

Monitoring wells include either a recording well with an automatic water level data recorder or a manual well for manual data collection, which were often paired with recording wells. The manual well data were used to validate the general trends of the recording well data. Manual well data were collected twice per month in 2007 and once per month in 2008, 2009, and 2010. Electronic well data were collected every 2 to 4 hours from 2007 through 2010. Starting in 2008, all monitoring locations were instrumented with recording wells so water levels could be recorded every 2 to 4 hours during the growing season. The monitoring wells were typically installed to a depth of 2 to 5 feet below the ground surface; additional details on installation are provided in the monitoring plans (Reference (53), Reference (54), and Reference (55)) and in the monitoring reports (Reference (50), Reference (51), and Reference (52)).

17.2 Wetland Hydrology Monitoring Sites Installed in 2014

In 2014, hydrology monitoring wells were installed at 33 additional monitoring locations that were identified as having the potential for indirect wetland impacts using the potential wetland impact factor rating (from 0-6) in the potential indirect wetland impact analysis discussed in Section 11.5 of this document and Section 5.2.3 of Reference (2).

At the Mine Site, hydrology monitoring wells were installed in 2014 at 24 monitoring locations (Wells 25 through 48; Large Figure 9 and Large Figure 17). These additional wells are located within all wetlands that have impact factor ratings of 2, 3 or 4 near the Project features and many wetlands with impact factor ratings of 1 that are located throughout the Mine Site.

Within the FTB area, hydrology monitoring wells were installed in 2014 at six monitoring locations (Wells TB9 through TB14; Large Figure 10 and Large Figure 18). The monitoring wells were installed within all wetlands with impact factor ratings of 3 and a sampling of wetlands with impact factor ratings of 1 and 2 located throughout the areas of potential indirect wetland impacts. The monitoring locations include a variety of wetland community types and



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occur throughout all areas of potential indirect impact factors (Large Figure 10 and Large Figure 18).

Within the Transportation and Utility Corridors, hydrology monitoring wells were installed in 2014 at three monitoring locations (Wells 41 through 43; Large Figure 11 and Large Figure 19) within wetlands that have impact factor ratings of 1.

Shallow water table monitoring wells were installed in 2014 at each of the wetland monitoring locations depicted in Large Figure 17, Large Figure 18, and Large Figure 19. Each monitoring location has one recording well; if any wells are damaged, those will be replaced as soon as practical to maintain data continuity.

Hydrologic monitoring will continue at the monitoring locations and at reference wetland locations every year throughout the growing season for the life of the mine operation. If it is determined that certain wells are not providing useful information, the monitoring may be modified with the concurrence of the USACE and MDNR. Monitoring wells will be installed following well installation methods described in the *Technical Standard for Water-Table Monitoring of Potential Wetland Sites* (Reference (56)).

17.3 Reference Wetland Hydrology Monitoring Sites

Pre-project monitoring locations include five reference wetlands approved by the USACE and MDNR to document the natural hydrologic fluctuations in wetlands that will not be affected by the Project. The reference wetland data will be used to facilitate interpretation of the Project hydrologic data. Within the Mine Site, hydrology monitoring wells were installed in 2008 and 2014 in reference wetlands (Large Figure 17, Large Figure 19). Within the FTB area, hydrology monitoring wells were installed in 2010 and 2014 in reference wetlands (Large Figure 10).

17.4 Wetland Vegetation Monitoring

In February 2016, a comprehensive monitoring plan for the Project was developed (Attachment F) that describes the monitoring plan for potential indirect wetland impacts, and incorporated the vegetation and hydrology monitoring plans. Pre-project baseline vegetation monitoring was conducted in June 2015 adjacent to each of the 61 hydrology monitoring wells at the Mine Site, Tailings Basin, and reference wetlands. The vegetation monitoring plots are 10-meters by 10-meters in non-forested communities and 20-meters by 20-meters in forested and shrub-dominated communities. Vegetation monitoring plots were located with a hand held GPS unit with sub-foot horizontal accuracy. The plots were located at all monitoring locations, including reference wetlands.

Vegetation monitoring will be conducted every five years by a qualified ecologist or botanist. A vegetation inventory will be conducted within each permanent vegetation monitoring plot during June or July, when most plant species will be identifiable. At least 90% of the plant taxa will be



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inventoried and the percent cover estimated within each plot. All vascular plants occurring within the plots will be identified at least to genus level and preferably to species.

Baseline vegetation data will be used to document potential shifts in vegetation that are inconsistent with changes documented in the reference wetlands.

17.5 Wetland Boundary Monitoring

Wetland boundaries throughout the Project area, including areas of potential indirect wetland impacts, were delineated between 2005 and 2012 and were approved by the USACE and MDNR in 2012. As described in Reference (57) and Attachment F, portions of the monitored wetlands will be reviewed every five years concurrent with the vegetation monitoring to evaluate potential changes in wetland boundaries. Wetland boundaries will be field-delineated and located using a GPS with sub-foot horizontal accuracy. The field-based delineation will map at least 25% of the wetland boundary at each of the wetlands with monitoring locations (Large Figure 17, Large Figure 18, and Large Figure 19). The boundaries will be mapped on a rotating basis to include 25% of the wetland boundary every 5 years, including some overlap every 10 years. A transect composed of at least two wetland delineation sample points will be completed along a sections of the boundary reviewed in each of the monitored wetlands.

The delineation data will be compiled to map the boundary of each of the wetlands with monitoring locations. Based on the portion of the wetland that is delineated, the whole wetland boundary will be mapped using desktop review of current aerial photography, topography (LIDAR or site-specific data), and hydrology monitoring data. The results will be reported to the USACE and MDNR at the end of each year of monitoring.

17.6 Impact Criteria

The hydrology, vegetation, and wetland boundary monitoring data collected as part of this monitoring program will be evaluated to determine if adverse, indirect wetland impacts occur as a result of the Project. Criteria that may indicate an adverse, potential indirect wetland impact are outlined in Attachment F and are based on the following threshold levels:

- A 50% reduction of the baseline wetland hydrology hydroperiod. Antecedent precipitation and reference wetland hydrology will be considered in the evaluation of wetland hydrology hydroperiod. The hydroperiod of a wetland is equal to the length of time and portion of the year the wetland holds ponded water or saturation within 12 inches of the soil surface. This period of time generally varies from year-to-year based on climatic conditions. Therefore, the judgment of surpassing this threshold will be evaluated considering the baseline pre-project monitoring data for each wetland conducted from 2005-2015.
- A change in vegetation species and/or cover, inconsistent with vegetation changes in the reference wetlands, such as: a 25% change in species richness; a 25% change in living



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tree cover; appearance of non-native invasive species where none were previously recorded, or a 25% increase in non-native invasive cover or number of species where non-native invasive species were previously recorded; or a 25% reduction of native hydrophytes. Other factors may contribute to changes in vegetation (disturbances or species introductions) that may be unrelated to changes in wetland hydrology or the nearby Project; such factors would be considered, if appropriate.

• Loss of wetland area (as defined by the wetland boundary determination) that is inconsistent with wetland area loss at reference wetlands.

These criteria will be evaluated with consideration of the Project activities and likelihood that such Project activities are responsible for the changes. Should adverse, indirect wetland impacts be identified during the monitoring program, an estimation of such impacts will be included in the monitoring report in the year that they are first detected. The data for hydrology, vegetation, and wetland boundary monitoring will be compiled in a report, including methods, results, and evaluation of potential adverse indirect wetland impacts, which will be submitted to the USACE and MDNR by the end of each monitoring year.

17.7 Indirect Impact Mitigation

If indirect wetland impacts, based on the criteria of Section 17.6, occur, PolyMet will work with the USACE and MDNR to respond, which may include the option to provide compensatory mitigation for any documented indirect impacts. Compensatory mitigation would be based on the St. Paul District USACE Policy for wetland mitigation (Reference (44)) and as described in Section 16.3 for the USACE and the MDNR. Compensatory loss of wetland area may be mitigated in accordance with the mitigation ratios of direct wetland impacts described in Section 15.0. Partial drainage or other changes to the wetlands, that do not result in the wetland loss but are above the threshold levels established in Section 17.6, may be mitigated at a lower ratio depending on the extent and degree of the changes to wetland function. The minimum ratio of mitigation credit to impact would be 0.25:1.

17.8 Adaptive Plan

An adaptive approach will be used to evaluate the most effective monitoring strategy for potential indirect effects. The monitoring plan will be updated annually based on results from the previous year. The monitoring plan criteria will be included in the Wetland Management Plan, which will contain all criteria and permit conditions. If indirect impacts are observed, additional monitoring may be developed to focus in those areas and/or to focus on a specific impact factor. Additional monitoring may include new monitoring locations in other wetlands and more detailed delineation and vegetation data collection.

The adaptive monitoring plan will be incorporated in two phases. Phase I of the adaptive monitoring plan will be broad-based monitoring to identify changes to wetlands or changes that may affect wetlands or surface waters. Phase II monitoring may be implemented to provide a



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more detailed assessment in a given area to analyze a potential impact factor. If necessary, the Phase II monitoring will be designed and implemented as needed to address the changes identified in Phase I monitoring. Phase II will be used to determine the need for additional mitigation or to develop a plan to control the changes identified in Phase I and minimize future impacts to wetlands.

17.9 Reporting

Monitoring data will be submitted to the USACE and MDNR annually for the life of the mine. Hydrology data will be presented every year to show monitoring locations, hydrographs, and analysis of wetland hydrologic conditions in the context of precipitation conditions. Vegetation and wetland boundary data will be presented every five years and will be used to determine the acreage of impacts and potential indirect impacts that are not evident based on hydrologic data. Indirect impacts will be assessed in the annual reports to the extent possible. Acreage of indirect impacts will be determined, if any, and will be used to determine the requirements for wetland mitigation credits, if such credits are needed. If compensatory mitigation is necessary, credits will be proposed in the annual report as described in Section 15.0.



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Attachment B	NorthMet Project Wetland Analysis Work Plan v3
Attachment C	Zim Wetland Mitigation Site Wetland Mitigation Plan
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Large Tables

Large Table 1 Summary of Wetlands

Project Area ^(1,2)	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Fragmentation Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed Wetland Community	Wetland Quality	Type of Impact ⁽³⁾
Mine Site	1	3	0.42	0.00	0.00	0.42	Shallow marsh	Moderate	
Mine Site	3	3	0.35	0.00	0.00	0.35	Shallow marsh	Moderate	
Mine Site	5	2	0.61	0.61	0.00	0.00	Wet meadow	High	F
Mine Site	6	3	0.62	0.00	0.00	0.62	Shallow marsh	Moderate	
Mine Site	7	2	0.07	0.00	0.00	0.07	Wet meadow	Moderate	
Mine Site	8	2	6.80	6.80	0.00	0.00	Sedge meadow	Moderate	F,E
Mine Site	9	3	1.80	0.07	0.00	1.73	Shallow marsh	High	F
Mine Site	10	2	1.17	0.00	0.00	1.17	Sedge meadow	High	
Mine Site	11	8	8.88	0.00	0.00	8.88	Coniferous bog	High	
Mine Site	12	6	0.13	0.00	0.00	0.13	Alder thicket	High	
Mine Site	13	4	5.03	0.09	0.00	4.94	Deep marsh	High	F
Mine Site	14	2	0.33	0.33	0.00	0.00	Wet meadow	High	F
Mine Site	16	3	0.31	0.00	0.00	0.31	Shallow marsh	High	
Mine Site	18	3	18.90	18.90	0.00	0.00	Shallow marsh	High	E
Mine Site	19	3	1.68	0.05	0.00	1.63	Shallow marsh	High	E
Mine Site	20	2	17.06	16.96	0.10	0.00	Sedge meadow	High	E, Fr
Mine Site	22	3	1.43	0.00	0.00	1.43	Shallow marsh	High	
Mine Site	22A	7	0.89	0.00	0.00	0.89	Coniferous swamp	High	
Mine Site	24	6	0.80	0.39	0.00	0.41	Alder thicket	High	E
Mine Site	25	8	1.95	0.00	0.00	1.95	Coniferous bog	High	
Mine Site	27	8	1.07	1.07	0.00	0.00	Coniferous swamp	Moderate	E
Mine Site	29	3	12.02	0.00	0.00	12.02	Shallow marsh	High	
Mine Site	32	8	73.36	70.99	2.37	0.00	Coniferous bog	High	F,E, Fr
Mine Site	33A	6	18.46	5.77	0.00	12.69	Alder thicket	High	Е
Mine Site	33B	7	4.56	0.00	0.00	4.56	Coniferous swamp	High	
Mine Site	37	6	2.39	2.39	0.00	0.00	Shrub-carr	High	F
Mine Site	43	6	8.29	7.26	0.00	1.03	Alder thicket	High	F
Mine Site	44	6	3.27	1.99	0.00	1.28	Alder thicket	High	E
Mine Site	45	6	37.55	28.83	3.58	5.14	Alder thicket	High	F,E, Fr
Mine Site	47	8	0.54	0.54	0.00	0.00	Open bog	High	F
Mine Site	48	8	89.16	27.80	1.86	59.50	Coniferous bog	High	F,E, Fr

Project Area ^(1,2)	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Fragmentation Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed Wetland Community	Wetland Quality	Type of Impact ⁽³⁾
Mine Site	48A	7	2.65	2.21	0.00	0.44	Coniferous swamp	High	F
Mine Site	51	6	7.47	7.45	0.02	0.00	Alder thicket	High	F, Fr
Mine Site	52	6	3.88	3.88	<0.01	0.00	Alder thicket	High	F,E, Fr
Mine Site	53	6	18.59	0.00	0.00	18.59	Alder thicket	High	
Mine Site	53A	7	2.35	0.00	0.00	2.35	Coniferous swamp	High	
Mine Site	53B	7	0.43	0.00	0.00	0.43	Coniferous swamp	High	
Mine Site	53C	7	2.88	0.00	0.00	2.88	Coniferous swamp	High	
Mine Site	54	7	4.11	0.00	0.00	4.11	Coniferous swamp	High	
Mine Site	54C	6	0.74	0.00	0.00	0.74	Alder thicket	High	
Mine Site	55	6	3.91	3.85	0.06	0.00	Alder thicket	High	F,E, Fr
Mine Site	56	8	2.79	2.79	0.00	0.00	Open bog	High	Е
Mine Site	57	7	78.06	50.49	1.41	26.16	Coniferous swamp	High	F,E, Fr
Mine Site	58	6	34.58	0.00	0.00	34.58	Alder thicket	High	
Mine Site	60	6	6.71	6.71	0.00	0.00	Alder thicket	High	F
Mine Site	61	7	0.45	0.00	0.00	0.45	Coniferous swamp	High	
Mine Site	62	8	12.13	0.00	0.00	12.13	Coniferous bog	High	
Mine Site	64	7	0.31	0.00	0.00	0.31	Hardwood swamp	High	
Mine Site	68	7	23.81	10.89	0.09	12.83	Coniferous swamp	High	F,E, Fr
Mine Site	72	7	1.39	0.00	0.00	1.39	Coniferous swamp	High	
Mine Site	74	7	6.12	6.12	0.00	0.00	Hardwood swamp	High	E
Mine Site	76	8	3.92	2.21	0.00	1.71	Coniferous bog	High	E
Mine Site	77	8	13.01	0.92	<0.01	12.09	Coniferous bog	High	F,E, Fr
Mine Site	78	8	1.75	1.75	0.00	0.00	Coniferous bog	High	F
Mine Site	79	8	2.39	0.00	0.00	2.39	Coniferous bog	High	
Mine Site	80	8	0.29	0.22	0.08	0.00	Coniferous bog	High	F, Fr
Mine Site	81	7	1.68	1.44	0.24	0.00	Coniferous swamp	High	F,E, Fr
Mine Site	82	8	62.40	60.77	1.63	0.00	Coniferous bog	High	F,E, Fr
Mine Site	83	8	3.99	0.00	0.00	3.99	Open bog	High	
Mine Site	84	8	1.33	0.00	0.00	1.33	Coniferous bog	High	
Mine Site	85	8	1.41	1.41	0.00	0.00	Coniferous bog	High	Е
Mine Site	86	8	2.47	2.46	0.01	0.00	Coniferous bog	High	F, Fr
Mine Site	88	8	5.58	5.02	0.00	0.56	Coniferous bog	High	F

Project Area ^(1,2)	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Fragmentation Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed Wetland Community	Wetland Quality	Type of Impact ⁽³⁾
Mine Site	90	8	176.08	34.22	0.00	141.86	Coniferous bog	High	F,E
Mine Site	90A	8	7.91	1.20	0.00	6.71	Open bog	High	F
Mine Site	95	8	2.54	2.54	0.00	0.00	Coniferous swamp	High	Е
Mine Site	96	8	17.30	13.14	0.00	4.16	Coniferous bog	High	F,E
Mine Site	97	8	4.46	2.57	1.89	0.00	Coniferous bog	High	F,E, Fr
Mine Site	98	8	15.50	15.07	0.42	0.00	Coniferous bog	High	F,E, Fr
Mine Site	99	8	1.40	0.49	0.00	0.91	Coniferous bog	High	F,E
Mine Site	100	8	176.19	102.96	3.44	69.79	Coniferous bog	High	F,E, Fr
Mine Site	100A	6	1.66	1.66	0.00	0.00	Alder thicket	High	F
Mine Site	101	8	14.21	11.73	0.08	2.40	Coniferous bog	High	F,E, Fr
Mine Site	103	8	118.84	109.97	8.86	0.00	Coniferous bog	High	F,E, Fr
Mine Site	104	8	3.57	3.47	0.10	0.00	Coniferous bog	High	F, Fr
Mine Site	105	8	15.48	0.00	0.00	15.48	Coniferous bog	High	
Mine Site	107	8	40.92	31.63	0.10	9.19	Coniferous bog	High	F,E, Fr
Mine Site	107A	7	1.74	1.69	0.05	0.00	Coniferous swamp	High	F,E, Fr
Mine Site	107B	3	4.51	2.89	0.00	1.62	Shallow marsh	High	F,E
Mine Site	107C	6	27.60	27.60	0.00	0.00	Alder thicket	High	E
Mine Site	114	8	0.73	0.73	0.00	0.00	Coniferous bog	High	F
Mine Site	120	3	0.58	0.12	0.00	0.46	Shallow marsh	Moderate	E
Mine Site	200	7	6.36	6.36	0.00	0.00	Hardwood swamp	High	F
Mine Site	201	2	13.49	13.49	0.00	0.00	Wet meadow	High	F
Mine Site	202	8	3.11	3.11	0.00	0.00	Open bog	High	F
Mine Site	552	8	8.72	8.72	0.00	0.00	Coniferous bog	High	F
Mine Site	567	3	1.40	1.40	0.00	0.00	Shallow marsh	High	F
MINE SITE SUBTOTAL	87		1297.78	758.19	26.39	513.19		80/87 High 7/87 Moderate	
Railroad Connection Corridor	1038	7	0.07	0.07	0.00	0.00	Coniferous swamp	High	F
Railroad Connection Corridor	R-3	6	0.10	0.10	0.00	0.00	Shrub-carr	High	F
Railroad Connection Corridor	R-4	6	0.20	0.20	0.00	0.00	Alder thicket	High	F
Railroad Connection Corridor	R-5	3	0.07	0.07	0.00	0.00	Shallow marsh	High	F
RAILROAD CONNECTION CORRIDOR SUBTOTAL	4		0.44	0.44	0.00	0.00		4/4 High	
Dunka Road and Utility Corridor	22B	3	0.34	0.34	0.00	0.00	Shallow marsh	High	F

Project Area ^(1,2)	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Fragmentation Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed Wetland Community	Wetland Quality	Type of Impact ⁽³⁾
Dunka Road and Utility Corridor	22C	6	0.38	0.38	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	54A	7	0.60	0.60	0.00	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	54B	6	0.13	0.13	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	54D	7	0.09	0.09	0.00	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	390	6	0.41	0.41	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	392	6	0.14	0.14	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	394	7	0.64	0.64	0.00	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	395	7	0.01	0.01	0.00	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	396	6	0.65	0.65	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	400	8	0.14	0.14	0.00	0.00	Coniferous bog	High	F
Dunka Road and Utility Corridor	553	7	0.09	0.09	0.00	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	554	7	0.11	0.11	0.00	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	569	6	0.68	0.68	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	716	6	0.02	0.02	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	814	8	0.75	0.75	0.00	0.00	Coniferous bog	High	F
Dunka Road and Utility Corridor	862	6	0.78	0.78	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	1034	6	0.02	0.02	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	1035	6	0.16	0.16	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	1124	6	0.44	0.44	0.00	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	R-7	3	0.18	0.18	0.00	0.00	Shallow marsh	High	F
DUNKA ROAD AND UTILITY CORRIDOR SUBTOTAL	21		6.76	6.76	0.00	0.00		21/21 High	
FTB	251	6	1.43	1.43	0.00	0.00	Alder thicket	Moderate	С
FTB	272	4	1.11	1.10	0.01	0.00	Deep marsh	Low	C, Fr
FTB	278	6	1.04	0.23	0.00	0.81	Alder thicket	Low	С
FTB	279	6	4.84	3.33	<0.01	1.51	Alder thicket	Low	C, Fr
FTB	282	3	14.25	7.42	0.00	6.83	Shallow marsh	Moderate	С
FTB	284	6	2.92	2.51	0.00	0.41	Alder thicket	Low	С
FTB	290	7	0.48	0.22	0.02	0.24	Coniferous swamp	Moderate	F,E, Fr
FTB	292	4	1.71	1.29	0.00	0.42	Deep marsh	Low	С
FTB	307	3	0.78	0.77	<0.01	0.00	Shallow marsh	Low	C, Fr
FTB	308	4	7.17	1.95	0.00	5.22	Deep marsh	Low	С

Project Area ^(1,2)	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Fragmentation Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed Wetland Community	Wetland Quality	Type of Impact ⁽³⁾
FTB	309	2	0.02	0.02	0.00	0.00	Wet meadow	Low	С
FTB	312	6	1.98	1.33	0.00	0.65	Shrub-carr	Low	С
FTB	314	3	24.87	5.70	0.00	19.17	Shallow marsh	Low	С
FTB	573	3	0.12	0.00	0.00	0.12	Shallow marsh	Low	
FTB	582	4	27.49	8.11	0.00	19.38	Deep marsh	Low	С
FTB	585	6	1.58	0.00	0.00	1.58	Alder thicket	Low	
FTB	586	4	1.89	1.53	0.00	0.36	Deep marsh	Low	С
FTB	587	3	0.97	0.17	0.00	0.80	Shallow marsh	Low	С
FTB	590	3	5.43	5.38	0.00	0.05	Shallow marsh	Low	С
FTB	591	4	2.71	0.70	0.00	2.01	Deep marsh	Low	С
FTB	593	4	9.80	8.47	0.15	1.18	Deep marsh	Low	C, Fr
FTB	594	4	0.06	0.00	0.00	0.06	Deep marsh	Low	
FTB	595	4	2.14	1.09	0.01	1.04	Deep marsh	Low	F, Fr
FTB	811	7	0.20	0.20	0.00	0.00	Coniferous swamp	Low	С
FTB	968	7	13.76	10.27	0.00	3.49	Coniferous swamp	Low	С
FTB	1027	6	0.20	0.00	0.00	0.20	Alder thicket	Moderate	
FTB	1125	2	0.07	0.07	0.00	0.00	Sedge meadow	Low	
FTB	1126	7	0.69	0.69	0.00	0.00	Hardwood swamp	Low	
FTB	1134	3	14.45	8.71	0.04	5.70	Shallow marsh	Low	C, Fr
FTB	1135	4	0.51	0.00	0.00	0.51	Deep marsh	Low	
FTB	1139	3	20.25	2.54	0.00	17.71	Shallow marsh	Low	С
FTB	1155	3	0.55	0.41	0.15	0.00	Shallow marsh	Low	C, Fr
FTB	1156	3	15.07	11.08	0.06	3.35	Shallow marsh	Low	C, Fr
FTB	1159	3	0.05	0.00	0.05	0.00	Shallow marsh	Low	Fr
FTB	1160	5	0.85	0.00	0.00	0.85	Deep water	Low	
FTB	1176	7	0.34	0.00	0.00	0.34	Hardwood Swamp	Moderate	
FTB	P10	6	0.34	0.00	0.00	0.34	Alder thicket	Low	
FTB	T1	4	1.93	0.11	0.00	1.82	Deep marsh	Low	F
FTB	T2	4	0.90	0.90	0.00	0.00	Deep marsh	Low	F
FTB	T3	2	0.09	0.09	0.00	0.00	Wet meadow	Low	F
FTB	T4	2	1.02	1.02	0.00	0.00	Wet meadow	Low	F
FTB	T5	2	0.24	0.24	0.00	0.00	Wet meadow	Low	F

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FTB	T6	6	0.07	0.07	0.00	0.00	Shrub-carr	Low	F
FTB	T7	3	0.92	0.92	0.00	0.00	Shallow marsh	Low	F
FTB	T8	2	0.03	0.01	0.00	0.02	Wet meadow	Low	F
FTB	T10	4	1.48	1.48	0.00	0.00	Deep marsh	Low	F
FTB	T11	4	0.95	0.95	0.00	0.00	Deep marsh	Low	F
FTB	T12	3	0.39	0.39	0.00	0.00	Shallow marsh	Low	F
FTB	T13	4	1.05	0.97	0.00	0.08	Deep marsh	Low	F
FTB	T13A	4	0.16	0.16	0	0	Deep marsh	Low	F
FTB	T14	4	45.20	45.20	0.00	0.00	Deep marsh	Low	E
FTB	T15	3	1.70	1.70	0.00	0.00	Shallow marsh	Low	F
FTB SUBTOTAL	52		238.25	140.93	0.49	96.25		5/52 Moderate 47/52 Low	
HRF	1155	3	35.45	6.89	0.00	28.56	Shallow marsh	Low	F
HRF	1159	3	0.62	0.62	0.00	0.00	Shallow marsh	Low	F
HRF SUBTOTAL	2		36.07	7.51	0.00	28.56		2/2 Low	
Colby Lake Water Pipeline Corridor	P1	4	0.23	0.00	0.00	0.23	Deep marsh	Low	
Colby Lake Water Pipeline Corridor	P2	6	0.03	0.00	0.00	0.03	Shrub-carr	Low	
Colby Lake Water Pipeline Corridor	P3	3	0.25	0.00	0.00	0.25	Shallow marsh	Low	
Colby Lake Water Pipeline Corridor	P4	6	1.28	0.00	0.00	1.28	Shrub-carr	Low	
Colby Lake Water Pipeline Corridor	P5-1	4	0.77	0.00	0.00	0.77	Deep marsh	Low	
Colby Lake Water Pipeline Corridor	P5-2	3	0.14	0.00	0.00	0.14	Shallow marsh	Low	
Colby Lake Water Pipeline Corridor	P6	3	0.18	0.00	0.00	0.18	Shallow marsh	Low	
Colby Lake Water Pipeline Corridor	P7-1	3	0.11	0.00	0.00	0.11	Shallow marsh	Low	
Colby Lake Water Pipeline Corridor	P7-2	3	1.90	0.00	0.00	1.90	Shallow marsh	Low	
Colby Lake Water Pipeline Corridor	P8	2	0.07	0.00	0.00	0.07	Wet meadow	Low	
Colby Lake Water Pipeline Corridor	P9	2	1.28	0.00	0.00	1.28	Wet meadow	Low	
Colby Lake Water Pipeline Corridor	P10	6	0.41	0.00	0.00	0.41	Alder thicket	Low	
Colby Lake Water Pipeline Corridor	P11	6	0.03	0.00	0.00	0.03	Shrub-carr	Low	
Colby Lake Water Pipeline Corridor	P12	6	0.31	0.00	0.00	0.31	Shrub-carr	Moderate	
COLBY LAKE WATER PIPELINE CORRIDOR SUBTOTAL	14		6.99	0.00	0.00	6.99		1/14 Moderate 13/14 Low	

Project Area ^(1,2)	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Fragmentation Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed Wetland Community	Wetland Quality	Type of Impact ⁽³⁾
PROJECT TOTAL	180		1,586.29	913.84	26.88	644.99		105/180 High 13/180 Moderate 62/180 Low	

⁽¹⁾ The Project areas include the Mine Site, Railroad Connection Corridor, Dunka Road and Utility Corridor, Flotation Tailings Basin (FTB), Hydrometallurgical Residue Facility (HRF), and Colby Lake Water Pipeline Corridor.

(2) All wetlands are located in St. Louis County, Major Watershed #3 – St. Louis County, and Bank Service Area (BSA) #1.

(3) The duration of all wetland impacts are permanent. The types of wetland impacts include excavation (E), fill (F), fragmentation (Fr), and containment system (C).

Large Table 2 Summary of Wetland Impacts⁽¹⁾

	Circular 39 Wetland Classification	1	2	2	3	4	5	6	6	7	7	8	8		
Project Area	Eggers and Reed Wetland Community	Seasonally Flooded	Fresh (Wet) Meadow	Sedge Meadow	Shallow Marsh	Deep Marsh	Shallow, Open Water	Shrub- Carr	Alder Thicket	Hardwood Swamp	Coniferous Swamp	Open Bog	Coniferous Bog	Deepwater	Total
	Direct Impact (acres)	0.00	14.43	23.76	23.43	0.09	0.00	2.39	95.39	12.48	70.33	7.64	508.25	0.00	758.20
Mine Site	Fragmented (acres)	0.00	0.00	0.10	0.00	0.00	0.00	0.00	3.66	0.00	1.79	0.00	20.84	0.00	26.39
	# of impacted wetlands	0	3	2	6	1	0	1	11	2	7	4	22	0	59
Railroad	Direct Impact (acres)	0.00	0.00	0.00	0.07	0.00	0.00	0.10	0.20	0.00	0.07	0.00	0.00	0.00	0.44
Connection	Fragmented (acres)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corridor	# of impacted wetlands	0	0	0	1	0	0	1	1	0	1	0	0	0	4
	Direct Impact (acres)	0.00	0.00	0.00	0.52	0.00	0.00	0.00	3.81	0.00	1.54	0.00	0.89	0.00	6.76
Dunka Road and Utility Corridor	Fragmented (acres)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cumy Comaco	# of impacted wetlands	0	0	0	2	0	0	0	11	0	6	0	2	0	21
	Direct Impact (acres)	0.00	1.38	0.07	45.19	74.01	0.00	1.40	7.50	0.69	10.69	0.00	0.00	0.00	140.93
FTB Area	Fragmented (acres)	0.00	0.00	0.00	0.3	0.17	0.00	0.00	<0.01	0.00	0.02	0.00	0.00	0.00	0.49
	# of impacted wetlands	0	5	1	12	15	0	2	4	0	3	0	0	0	43
	Direct Impact (acres)	0.00	0.00	0.00	7.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.51
HRF	Fragmented (acres)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	# of impacted wetlands	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Total	(acres)	0.00	15.81	23.93	77.02	74.27	0.00	3.89	110.56	13.17	84.44	7.64	529.99	0.00	940.72

⁽¹⁾ Wetland impacts include direct wetland impacts (913.84 acres) and indirectly fragmented wetlands (26.88 acres).

Large Table 3 Summary of Reduced Aquatic Ecosystem Impacts Based on Draft Alternative Development

Refinement made from Alternatives Evaluation	Project Aspects Changed	Environmental Impact Reduced
	Only Category 1 Stockpile is permanent – all other stockpiles relocated to East Pit	Three permanent stockpiles eliminated and any associated impacts will therefore be temporary. Also, highest sulfur rock backfilled to East Pit and stored subaqueously.
	Move Temporary Category 4 Stockpile to be above Central Pit and Central Pit rescheduled so that floor of pit above East Pit backfill during operations	Reduce wetland impacts
Mine Site Alternative in DEIS adopted as part of Proposed Project and	Eliminate Category 3 waste rock stockpile by combining Category 2/3 waste rock and lean ore stockpiles at the location of the Category 4 and Category 3 waste rock stockpiles.	Reduce wetland impacts
refined based on additional drilling and	Revise haul roads to reduce wetland fragmentation	Reduce wetland impacts
engineering with Cat 1 Stockpile Groundwater Containment System	All Category 1 waste rock in East Pit or Category 1 Stockpile	Category 1 stockpile can be closed and cover system construction begin in Year 14 - less water flow through the pile once cover is constructed
	Replace Category 1 liner with Groundwater Containment System and pump collected water to WWTF	Capture and treat virtually all water from stockpile
	Maximize use of Category 1 rock and overburden for construction in above liner or below the water table applications	Any water that contacts these materials will be captured and treated, or used in an application where the redox conditions will not change
	Minor changes in pit and stockpile footprints due to updated drilling	Reduce wetland impacts
Category 1 Stockpile Cover System	ET cover system replaced with membrane cover system	Minimize long term water flow through the stockpile

Refinement made from Alternatives Evaluation	Project Aspects Changed	Environmental Impact Reduced
Waste Water Treatment Facility (WWTF)	Plan for sulfate treatment during operations and upgrade to Reverse Osmosis (RO) for long term	Project discharge meets wild rice standard
New Concentrate Shipping Building near the Additive Plant with dewatering by filter instead of dryer	New dewatering equipment and required concentrate storage will not fit in existing building; alternate location evaluated	New building on disturbed ground = no wetland impacts
Relocate Hydrometallurgical Residue Facility	Move Hydrometallurgical Residue Facility from south end of Cell 2W to the Emergency Basin	Eliminate concerns about liner failure on location that is still settling and provide a virtually zero leakage liner system
FTB Seepage Containment System	Vertical wells on north side of FTB replaced by trench/barrier system on north and west sides	Capture and treat virtually all groundwater and surface seepage from FTB
Enhanced FTB Pond Cover (liner)	Additional bentonite amendment to further reduce seepage - results in routine overflow in closure	Further reduce seepage
Waste Water Treatment Plant (WWTP)	Pumping of excess water to Partridge River replaced by RO treatment of excess water also cleans up pond to allow overflow in closure	Project discharge meets wild rice standard
Adaptive Water Management Plan (AWMP)	Formal plan to adaptively manage water in operations, reclamation, and long term closure via financially assured fixed and adaptive engineering controls that relies on mechanical treatment but has the ultimate objective of non-mechanical treatment in the long term	Provides a high degree of certainty in achieving water quality objectives based on proactive management; lessens impacts in the long term with low maintenance non-mechanical treatment

Large Table 4 Adjoining Landowners

Owner Name	Mailing Address
Allete Inc.	30 West Superior Street Duluth, MN 55802
Blandin Paper Company	115 Southwest 1st Street Grand Rapids, MN 55744
Cliffs Erie LLC	c/o Cliffs Natural Resources, Inc. 200 Public Square, Suite 3100 Cleveland, OH 44114-2315
Cliffs Mining Services Company	4870 Waisanen Road PO Box 115 Embarrass, MN 55732
Cole, Bill C.	Marjorie A. Contos 129 West Anoka Street Duluth, MN 55803 or Marjorie Alison Contos Living Trust c/o US Bank Duluth-Trust 130 West Superior Street Duluth, MN 55802
Contos, M Alison et al.	NorthShore Mining Company James R. Korpi, CEO 10 Outer Drive Silver Bay, MN 55614
Cyprus Northshore Mining Corporation	115 Southwest 1st Street Grand Rapids, MN 55744
DuNord Land Company, LLC	William Blundin, Manager 138 East 65 th Street New York, NY 10065
Erickson, William	1328 East 41 st Street Hibbing, MN 55746
Glacier Park Company	1011 Western Avenue Seattle, WA 98104
Hilden, Teri	6309 Coyote Trail Lino Lakes, MN 55014
JER Minerals, Inc.	605 West 37 th Street Hibbing, MN 55746
Johnson Minerals, Inc.	Peter J. Johnson, CEO 2214 Birch Point Road Tower, MN 55790

Owner Name	Mailing Address			
Joki, Floyd E.	7607 North Skarp Road Embarrass, MN 55732			
Kainz, Bruce R.	1202 Winton Road Ely, MN 55731			
Lawless, John A. et.al.	7333 Mesaba Road Embarrass, MN 55732			
McLean, C. Russell Jr.	2132 Woodland Avenue Duluth, MN			
Mesabi Mining LLC	6714 Pointe Inverness Way Fort Wayne, IN 46804			
Mesabi Nugget Delaware LLC	Jeff Hansen, Manager PO Box 235 Hoyt Lakes, MN 55750			
Minnesota Power & Light	30 West Superior Street Duluth, MN 55802			
Northshore Mining	James R. Korpi, CEO 10 Outer Drive Silver Bay, MN 55614			
R & R Timber LLP.	Paul Scherer 4734 Byke Road Embarrass, MN 55732			
Robinson Land Trust	c/o Paul Martin 729 Old Stable Place Walnut Creek, CA 94596			
RGGS Land & Minerals Ltd LP	100 Waugh Drive, Suite 400 Houston, TX 77007			
Salo, Robert A. et al.	4510 Kenaitze Court Kenai, Alaska 99611			
Skluzacek, Paul D.	PO Box 157 Afton, MN 55001			
State of Minnesota	DNR Central Office 500 Lafayette Road St. Paul, MN 55155-4040			
Underland, Aaron M.	5326 Road 50 Aurora, MN 55705			
United States Of America	USA, Forest Service Superior National Forest 8901 Grand Avenue Place Duluth, MN 55808			

Owner Name	Mailing Address
Weinert, Christopher	403 8 th Street North Sauk Rapids, MN 56739
Williams, Dorothy	4604 Heights Drive Columbia Heights, MN 55421
William J. Todd Jr. Living Trust	1075 Ortman Road Marquette, MI 49855
Williams, Richard and Beverly	16 Victoria Drive Webster, MA 01570
Youngman, David G.	25 Basswood Circle Babbitt, MN 55706

Large Table 5

Wetland Mitigation Credit Summary⁽¹⁾ Poly Met Mining, Inc.

	Within	Project Wa	tershed		Ou	tside Project	: Watershed ⁽¹)		Total Wetland		Total Wetland
Community / Credit Type	Zim Sod Wetland Mitigation (acres)	Credit Percent	Total Wetland Mitigation Credits	Aitkin Wetland Mitigation (acres)	Aitkin Wetland Mitigation Credits	Hinckley Wetland Mitigation (acres)	Hinckley Wetland Mitigation Credits	Credit Percent	Total Wetland Mitigation Credits	Mitigation ⁽¹⁾ (acres)	Credit Percent	Mitigation Credits ⁽¹⁾
Off-Site Restoration of draine	d wetland (2)											
Type 2 Fresh (Wet) Meadow	0		0	0	0	0	0		0	0		0.0
Type 2 Sedge Meadow	0		0	0	0	56.17	56.17		56.17	56.17		56.17
Type 3 Shallow Marsh	0		0	21.22	21.22	0	0		21.22	21.22		21.22
Type 4 Deep Marsh	0		0	0	0	0	0		0	0		0
Type 5 Shallow, Open Water	0		0	0	0	0	0		0	0		0
Type 6 Shrub-Carr	0	100%	0	0	0	98.43	98.43	100%	98.43	98.43	100%	98.43
Type 6 Alder Thicket	0		0	0	0	98.44	98.44		98.44	98.44		98.44
Type 7 Hardwood Swamp	0		0	147.95	147.95	7.40	7.40		155.35	155.35		155.35
Type 7 Coniferous Swamp	0		0	544.94	544.94	0	0		544.94	544.94		544.94
Type 8 Open Bog	7.54		7.54	0	0	0	0		0	7.54]	7.54
Type 8 Coniferous Bog	443.09		443.09	0	0	0	0		0	443.09		443.09
Off-Site Restoration of partially-drained wetland (3)												
Type 2 Sedge Meadow	0		0	0	0	13.16	6.58		6.58	13.16		6.58
Type 3 Shallow Marsh	0		0	0.30	0.15	0	0		0	0.30		0
Type 7 Coniferous Swamp	0		0	25.15	12.58	0	0		12.58	25.15		12.58
Type 8 Open Bog	2.83	50%	1.42	0	0	0	0	50%	0	2.83	50%	1.42
Type 6 Shrub-Carr	0		0	0	0	62.46	31.23		31.23	62.46		31.23
Type 7 Hardwood Swamp	0		0	73.49	36.75	0.17	0		36.83	73.66		36.83
Type 8 Coniferous Bog	50.45		25.23	0	0	0	0		0	50.45		25.23
Off-Site Site Wetland Creation	1 ⁽⁴⁾			-	•	•						
Type 2 Sedge Meadow	0		0	0	0	7.14	5.36		5.36	7.14		5.355
Type 6 Shrub-Carr	0	75%	0	0	0	2.52	1.89	75%	1.89	2.52	75%	1.89
Type 6 Alder Thicket	0		0	0	0	2.52	1.89		1.89	2.52		1.89
Off-Site Site Wetland Restora	tion that will	not receiv	e credit ⁽⁵⁾		•	•						
Type 3 Shallow Marsh	0		0	14.02	0	0	0		0	14.02		0
Type 7 Hardwood Swamp	0		0	0.02	0	0	0		0	0.02		0
Type 7 Coniferous Swamp	0		0	0.86	0	0	0		0	0.86		0
Off-Site Upland Buffer (6)	9.78	25%	2.45	64.26	16.07	57.31	14.33	25%	30.39	131.35	25%	32.84
Impact ⁽⁷⁾	0.03		-0.03	0.51	-0.51	0.32	-0.32		0.86	0.86		-0.86
No Credit ⁽⁸⁾	18.12			127.60		10.68				156.40		
Upland Buffer Total	9.78		2.45	64.26	16.07	57.31	14.33		30.39	131.35		32.84
Wetland Total	503.91		477.24	827.95	763.07	348.41	307.15		1,070.22	1,680.27		1,547.46
Total	531.84		479.69	1,020.32	779.14	416.72	321.48		1,100.61	1,968.88		1,580.30
(1) Totals may not add exactly due to re	ounding.	•		· ·				1				

⁽²⁾ Credits for restoration of completely drained wetlands are worth 100% of the acreage restored based on USACE St. Paul District Policy (Restoration via re-establishment) and the Minnesota WCA Chap. 8420.0526 Subp. 3

⁽³⁾ Credits for restoration of partially-drained wetlands are worth 50% of the acreage restored based on USACE St. Paul District Policy (Restoration via rehabilitation) and the Minnesota WCA Chap. 8420.0526 Subp. 4

⁽⁴⁾ Credits for wetland creation are worth 75% of the acreage created based on USACE St. Paul District Policy (Wetland Creation) and the Minnesota WCA Chap. 8420.0526 Subp. 7 (per Minnesota Statute 103G.2251 modified August 1, 2011.)

⁽⁵⁾ Wetlands will be restored within areas (e.g., Diversion Channel easement) that will not receive credit.

⁽⁶⁾ Credits for upland buffers are worth 25% of the acreage of native, noninvasive vegetation established or maintained adjacent to the wetland based on USACE St. Paul District Policy (Preservation) and the Minnesota WCA Chap. 8420.0526 Subp. 1

⁽⁷⁾ Negative credits for ditches (wetlands) that are filled within upland buffer which is removed from the credit total.

⁽⁸⁾ Areas within a Site without construction including homesteads, building areas, easements, etc.

Large Table 6

Wetland Mitigation Utilizing USACE Credits⁽¹⁾
Poly Met Mining, Inc.

	Mit	tigation Cı	redits Availa	able	NorthMet Project Prop	oosed Direct Wetland I Acres ^(1,2)	mpacts in	Total Credits	No I	More Than 2 A _l		Total Applied	Applied
Wetland or Credit Type	Zim	Aitkin	Hinckley	Total	Non-forested, Non- bog, and Low or Medium Quality (Base Ratio 1.5:1) ⁽³⁾	Bogs, Forested, and High Quality (Base Ratio 2:1) ⁽⁴⁾	Total Impact Acres	Required for Mitigation at Base Ratio	Incentive for in- kind -0.25:1	Incentive for credits in- place -0.25:1	Incentive for credits in- advance ⁽⁵⁾ -0.25:1	Mitigation Credits ^{(6), (7)}	Mitigation Ratio ⁽⁸⁾
Type 2 Fresh (Wet) Meadow	0	0	0	0	1.38	14.43	15.81	30.93				30.93	1.96
Type 2 Sedge Meadow	0	0	68.11	68.11	6.87	17.05	23.92	44.41	(5.98)			38.43	1.61
Type 3 Shallow Marsh	0	20.86	0	20.86	53.13	23.90	77.03	127.50	(5.22)		(5.22)	117.07	1.52
Type 4 Deep Marsh	0	0	0	0	74.20	0.09	74.29	111.48				111.48	1.50
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0				0	
Type 6 Shrub-Carr	0	0	131.23	131.23	1.40	2.49	3.89	7.08	(0.97)			6.11	1.57
Type 6 Alder Thicket	0	0	100.33	100.33	7.50	103.09	110.59	217.43				217.43	1.97
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	0.69	12.47	13.16	25.98	(3.29)			22.69	1.72
Type 7 Coniferous Swamp	0	557.52	0	557.52	0	84.43	84.43	168.86	(21.11)			147.75	1.75
Type 8 Open Bog	8.96	0	0	8.96	0	7.64	7.64	15.28				15.28	2.00
Type 8 Coniferous Bog	468.29	0	0	468.29	0	529.98	529.98	1,059.96	(117.07)	(117.07)		825.82	1.56
Wetland Impact													
Wetland Total	477.24	763.07	307.15	1,547.46	145.17	795.57	940.74	1,808.90				1,532.97	1.63
Upland Buffer	2.45	16.07	14.33	32.84								9	
Total	479.69	779.14	321.48	1,580.30		940.74		1,808.90	(153.64)	(117.07)	(5.22)	1,532.97	
Total	47 3.03	113.14	321.40	1,500.50	940.74			1,808.90 (275.92)			1,552.97		
Total Surplus Wetland (Total Credit minus T	_		_	Δ/ 33						1.63			

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Base ratio 1.5:1 per USACE St. Paul District Policy for wetlands that are not considered High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁴⁾ Base ratio 2:1 per USACE May 29, 2013 Draft Memorandum for wetlands that are High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁵⁾ Based on USACE May 29, 2013 Draft Memorandum guidance for in-advance qualification assuming all mitigation will be constructed one full growing season before wetland impacts occur.

⁽⁶⁾ Total Applied Mitigation Credits = Total Credits Required for Mitigation at Base Ratio minus Incentive Credits.

⁽⁷⁾ Credits applied may include surplus credits from different wetland types.

⁽⁸⁾ The ratio of applied credits to project impacts (not including the surplus credits).

⁽⁹⁾ Includes 0.5 credit of upland buffer, applied from totals listed above.

Large Table 7

Wetland Mitigation Utilizing WCA Credits⁽¹⁾ Poly Met Mining, Inc.

		Mitigat	ion Credits	3	NorthMet Project Proposed Direct	Credits Applied for	Additional Mitigation	Total Mitigation	Total
Wetland or Credit Type	Zim Sod	Aitkin	Hinckley	Total	Wetland Impacts (acres) ^(1,2)	1:1 Replacement	Required (3)	Credits Applied	Mitigation Ratio
Type 2 Fresh (Wet) Meadow	0	0	0	0	15.81	15.81	7.91	23.72	1.5:1
Type 2 Sedge Meadow	0	0	68.11	68.11	23.92	23.92	11.96	35.88	1.5:1
Type 3 Shallow Marsh	0	20.86	0	20.86	77.03	77.03	38.52	115.55	1.5:1
Type 4 Deep Marsh	0	0	0	0	74.29	74.29	37.15	111.44	1.5:1
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0	1.5:1
Type 6 Shrub-Carr	0	0	131.23	131.23	3.89	3.89	1.95	5.84	1.5:1
Type 6 Alder Thicket	0	0	100.33	100.33	110.59	110.59	55.30	165.89	1.5:1
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	13.16	13.16	6.58	19.74	1.5:1
Type 7 Coniferous Swamp	0	557.52	0	557.52	84.43	84.43	42.22	126.65	1.5:1
Type 8 Open Bog	8.96	0	0	8.96	7.64	7.64	3.82	11.46	1.5:1
Type 8 Coniferous Bog	468.29	0	0	468.29	529.98	529.98	30.85	560.83	1:1 ⁽⁴⁾
Wetland Total	477.24	763.07	307.15	1,547.46	940.74	940.74	236.23	1,176.97	
Upland Buffer	2.45	16.07	14.33	32.84					
Total	479.69	779.14	321.48	1,580.30	940.74	940.74	236.23	1,176.97	
(Total cred		-		_	Credits for Project mitigation required)		403.33		1.25:1 ⁽⁵⁾
		Total W	etland Mitig	gation Cred	its Used for Project		1,176.97		

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Additional required for mitigation out of the watershed at Aitkin and Hinckley sites.

⁽⁴⁾ Assumes 1:1 replacement for 473.3 acres compensated in-kind and in the watershed and 1.5:1 for the remaining 56.7 acres replaced out of the watershed.

⁽⁵⁾ The ratio of applied credits to project impacts (not including the total surplus credits).

Large Table 8 Summary of Soils in the Mine Site

Mapping Entity	Soil ELT/ Map Unit	Soil Name	Soil ELTP (for USFS Soils only)	Area (acres)	Percent of Project Area	Drainage/ Hydric Status	
USFS	16	Upland Shallow Loamy Dry	18Aª	912.1	30.3%	Well drained	
USFS		Upland Shallow Loamy Dry	18B ^a	745.9	24.7%	Well drained	
USFS	6	Lowland Organic Acid to Neutral	24 ^b	887.2	29.4%	Poorly drained	
USFS	0	Lowland Organic Acid to Neutral	32°	10.3	<1%	Poorly drained	
USFS	2	Lowland Loamy Wet	47 ^d	267.6	8.9%	Poorly drained	
USFS	1	Lowland Loamy Moist	7 ^d	7.3	<1%	Somewhat poorly drained	
NRCS	F35D	Eveleth-Conic,, bouldery- Aquepts, rubbly complex	N/A	86.4	2.8%	Partially hydric	
NRCS	F166A	Aquepts, rubbly- Tacoosh-Rifle complex	N/A	46.6	1.5%	Hydric	
NRCS	F6B	Soudan- Eaglesnest- Babbit	N/A	34.7	1.2%	Not hydric	
NRCS	F12B	Eaglesnest- Babbit complex	N/A	12.6	<1%	Partially hydric	
NRCS	F129A	Tacoosh mucky peat	N/A	5.9	<1%	Hydric	
NRCS	Unknown/ not mapped	Unknown/not mapped	N/A	18.2	<1%	Unknown	

^aThis ELTP is comparable to the Whalsten and Conic NRCS St. Louis County map units

^bThis ELTP is comparable to the Rifle NRCS St. Louis County map unit

[°]This ELTP is comparable to the Cathro NRCS St. Louis County map unit

 $^{^{\}rm d}{\rm This}~{\rm ELTP}$ is comparable to the Babbitt NRCS St. Louis County map unit

Large Table 9 Summary of Soils in the Plant Site

Soil Map Unit	Soil Name	Area (acres)	Percent of Project Area	Hydric Status
1050	Tailings basin	3040.0	68.8%	Unknown
1003B	Udorthents, loamy (cut and fill land)	463.1	10.5%	Unknown
F3D	Eveleth-Eaglesnest-Conic complex	157.6	3.6%	Unknown
F4E	Eveleth-Conic, bouldery-Rock outcrop complex	152.3	3.4%	Unknown
F12B	Eaglesnest-Babbitt complex	118	2.7%	Partially hydric
F34A	Cathro muck	89.7	2.0%	Hydric
F30G	Conic, very bouldery-Insula, very bouldery-Rock outcrop complex	72.4	1.6%	Unknown
F13A	Babbitt, bouldery-Aquepts, rubbly, complex	67.1	1.5%	Partially hydric
F22F	Eveleth-Conic complex	58.3	1.3%	Unknown
F35D	Eveleth, bouldery-Conic, bouldery- Aquepts, rubbly, complex	57.3	1.3%	Partially hydric
F1C	Eaglesnest stony loam	42.5	1.0%	Not hydric
1021A	Rifle soils	37.1	<1%	Hydric
F177C	Eveleth-Eaglesnest complex	19.9	<1%	Partially hydric
1048	Dumps, iron mine	16.9	<1%	Unknown
W	Water	8.9	<1%	Hydric
F26E	Shagawa-Beargrease complex	7.4	<1%	Not hydric
F14D	Eveleth stony loam	4.8	<1%	Not hydric
F11B	Eaglesnest stony loam	3.3	<1%	Partially hydric
1049	Pits, iron mine	0.1	<1%	Unknown
F9B	Cloquet loam	0.1	<1%	Not hydric

Large Table 10 Summary of Soils in the Transportation and Utility Corridor

Soil Map Unit	Soil Name	Area (acres)	Percent of Project Area	Hydric Status
F12B	Eaglesnest-Babbitt complex, 1 to 8 percent slopes, bouldery	19.02	17.6	Partially hydric
1049	Pits, iron mine	18.59	17.2	Unknown
F2B	Eaglesnest-Wahlsten complex 2 to 8 percent slopes bouldery	16.57	15.4	Unknown
1048	Dumps iron mine (mostly rock fragments)	13.46	12.5	Unknown
1003B	Udorthents loamy cut and fill (mine iron spoil other disturbed areas)	9.85	9.1	Unknown
F13A	Babbitt bouldery-Aquepts rubbly complex 0 to 3 percent slopes	6.88	6.4	Partially hydric
F14D	Eveleth stony loam 8 to 18 percent slopes bouldery	5.93	5.5	Not hydric
F166A	Aquepts rubbly-Tacoosh-Rifle complex 0 to 2 percent slopes	5.5	5.1	Hydric
F11B	Eaglesnest stony loam 2 to 8 percent slopes bouldery	5.28	4.9	Partially hydric
B147A	Tacoosh mucky peat Upham basin 0 to 1 percent slopes	3.9	3.6	Hydric
B147A	Rifle soils Upham basin 0 to 1 percent slopes	1.7	1.6	Hydric
1020A	Bowstring and Fluvaquents loamy frequently flooded	0.86	<1%	Hydric
1021A	Rifle soils, 0 to 1 percent slopes	0.19	<1%	Hydric
B119A	Tacoosh mucky peat, 0 to 1 percent slopes	0.05	<1%	Hydric

Large Table 11 Summary of Soils in the Colby Lake Pipeline Corridor

Soil Map Unit	Soil Name	Area (acres)	Percent of Project Area	Hydric Status
F12B	Eaglesnest-Babbitt complex	14.9	29.5%	Partially hydric
1003B	Udorthents, loamy	12.8	25.3%	Unknown
1050	Tailings Basin	11.3	22.3%	Unknown
F14D	Eveleth stony loam	2.8	5.6%	Not hydric
F9B	Cloquet loam	1.8	3.5%	Not hydric
F35D	Eveleth, bouldery-Conic, boulder- Aquepts, rubbly, complex	1.4	2.8%	Partially hydric
F34A	Cathro muck	1.3	2.6%	Hydric
F3D	Eveleth-Eaglesnest-Conic complex	1.3	2.6%	Unknown
1021A	Rifle soils	1.0	2.0%	Hydric
F32A	Merwin peat	0.9	1.8%	Hydric
F13A	Babbitt, bouldery-Aquepts, rubbly, complex	0.8	1.5%	Partially hydric
1048	Dumps, iron mine	0.2	<1%	Unknown

Large Table 12 Summary of Federal and State Listed Plants

Scientific Name	Common Name	Status	Location	Reference ⁽¹⁾
Botrychium campestre	Prairie Moonwort	State Special Concern	T59N, R13W, Sec. 13	Barr (2011)
	Michigan Moonwort	RFSS	T59N, R13W, Sec. 2	Johnson-Groh (2004)
			T59N, R13W, Sec. 3	Johnson-Groh (2004)
Botrychium michiganese			T59N, R13W, Sec. 10	Johnson-Groh (2004)
			T59N, R13W, Sec. 11	Johnson-Groh (2004)
			T59N, R13W, Sec. 16	Johnson-Groh (2004)
Botrychium pallidum	Pale Moonwort	State Special Concern RFSS	T59N, R13W, Sec. 10	Johnson-Groh (2004)
			T59N, R13W, Sec. 11	Johnson-Groh (2004)
			T59N, R13W, Sec. 16	Johnson-Groh (2004)
			T59N, R13W, Sec. 17	Barr (2008)
			T59N, R13W, Sec. 18	Barr (2008)
			T59N, R14W, Sec. 13	Barr (2008)
Botrychium rugulosum	St. Lawrence Grapefern	State Special Concern RFSS	T59N, R13W, Sec. 1	Barr (2007)
			T59N, R13W, Sec. 2	Johnson-Groh (2004) ⁽²⁾
			T59N, R13W, Sec. 11	Johnson-Groh (2004) ⁽²⁾

Scientific Name	Common Name	Status	Location	Reference ⁽¹⁾
	Least Grapefern	State Special Concern RFSS	T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 2	Johnson-Groh (2004)
			T59N, R13W, Sec. 3	Johnson-Groh (2004)
			T59N, R13W, Sec. 3	Barr (2011)
Botrychium simplex			T59N, R13W, Sec. 10	Johnson-Groh (2004)
			T59N, R13W, Sec. 11	Johnson-Groh (2004)
			T59N, R13W, Sec. 11	Barr (2011)
			T59N, R13W, Sec. 16	Johnson-Groh (2004)
	Floating Marsh Marigold	State Endangered RFSS	T59N, R13W, Sec. 1	Walton (2004)
Caltha natans			T59N, R13W, Sec. 10	Walton (2004)
Caltria fiataris			T59N, R13W, Sec. 11	Walton (2004)
			T59N, R13W, Sec. 12	Walton (2004)
	Neat Spike Rush	State Special Concern RFSS	T59N, R13W, Sec. 1	Walton (2004)
Eleocharis nitida			T59N, R13W, Sec. 9	Barr (2011)
Eleocharis fillida			T59N, R13W, Sec. 11	Foth Van Dyke(1999)
			T59N, R13W, Sec. 11	Walton (2004)
Geocaulon lividum	False Toadflax	RFSS	T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 2	Walton (2004)
			T59N, R13W, Sec. 11	Walton (2004)
Juncus stygius var. americanus	Bog Rush	State Special Concern RFSS	T59N, R13W, Sec. 4	Barr (2011)
	Vasey's Rush	RFSS	T59N, R13W, Sec. 1	Walton (2004)
Juncus vaseyi			T59N, R13W, Sec. 11	Walton (2004)
			T59N, R13W, Sec. 12	Walton (2004)

Scientific Name	Common Name	Status	Location	Reference ⁽¹⁾
Platanthera clavellata	Club-spur Orchid	State Special Concern RFSS	T59N, R13W, Sec. 4	Barr (2011)
Pyrola minor	Small Shinleaf	State Special Concern RFSS	T59N, R13W, Sec. 5	Barr (2011)
	Small Yellow Water Crowfoot	RFSS	T59N, R13W, Sec. 1	Walton (2004)
Ranunculus gmelinii			T59N, R13W, Sec. 2	Walton (2004)
Nanunculus ymeiinii		KF33	T59N, R13W, Sec. 11	Walton (2004)
			T59N, R13W, Sec. 12	Walton (2004)
Ranunculus lapponicus	Lapland Buttercup	State Special Concern RFSS	T49N, R12W, Sec. 6	Walton (2004)
			T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 2	Walton (2004)
	Pedicellate Bulrush	RFSS	T59N, R13W, Sec. 3	Pomroy (2004)
Scirpus pedicellatus			T59N, R13W, Sec. 9	Pomroy (2004)
Sciipus pedicellatus			T59N, R13W, Sec. 10	Pomroy (2004)
			T59N, R13W, Sec. 13	Pomroy (2004)
	Clustered Bur-reed	RFSS	T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 2	Walton (2004)
Sparganium glomeratum			T59N, R13W, Sec. 3	Barr (2011)
			T59N, R13W, Sec. 4	Barr (2011)
			T59N, R13W, Sec. 9	Pomroy (2004)
			T59N, R13W, Sec. 9	Barr (2011)
			T59N, R13W, Sec. 10	Pomroy (2004)
			T59N, R13W, Sec. 11	Walton (2004)
			T59N, R13W, Sec. 16	Pomroy (2004)

Scientific Name	Common Name	Status	Location	Reference ⁽¹⁾
Torreyochloa pallida	Pale Manna Grass	State Special Concern RFSS	T49N, R12W, Sec. 6	Walton (2004)
			T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 11	Walton (2004)

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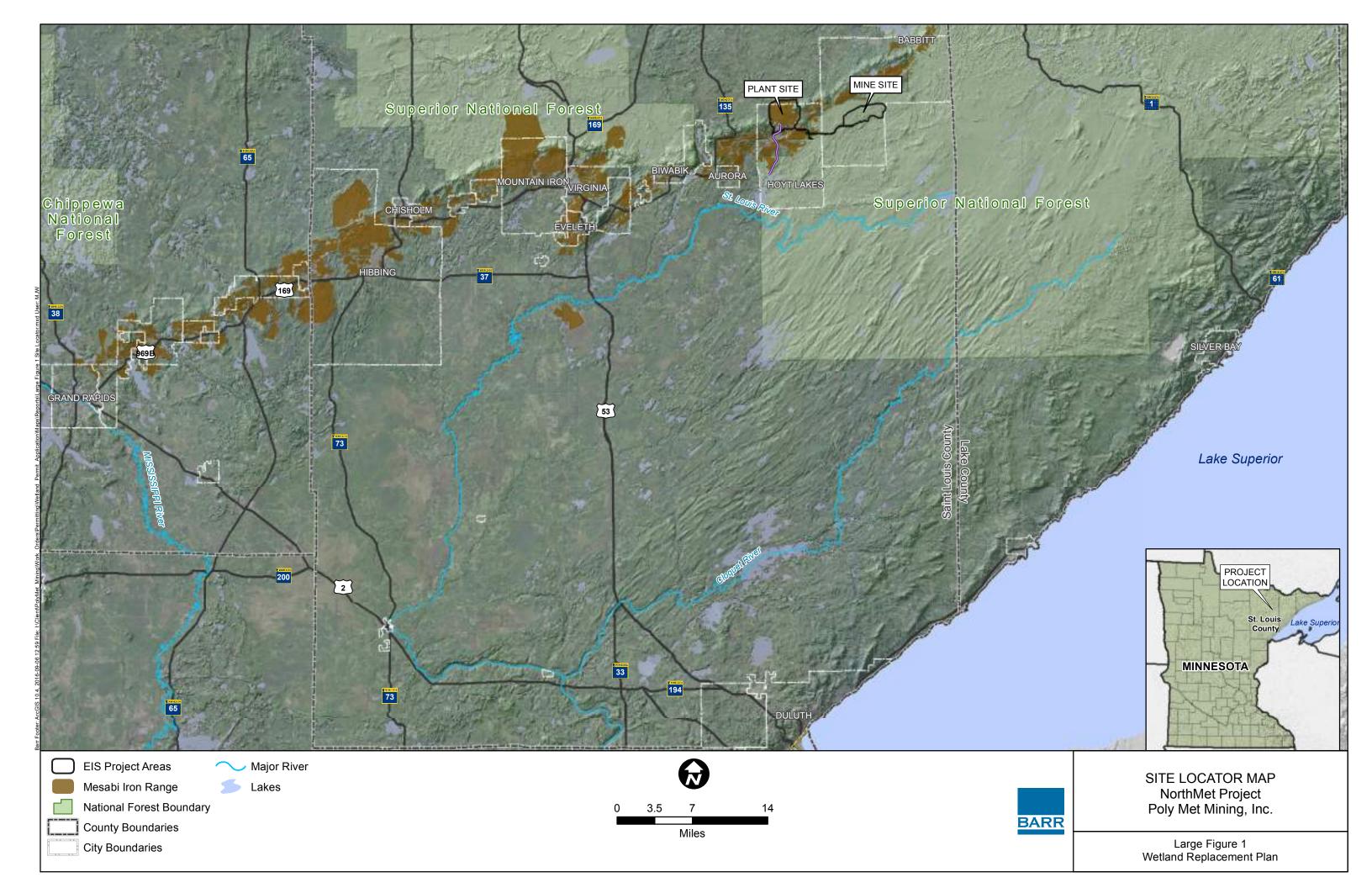
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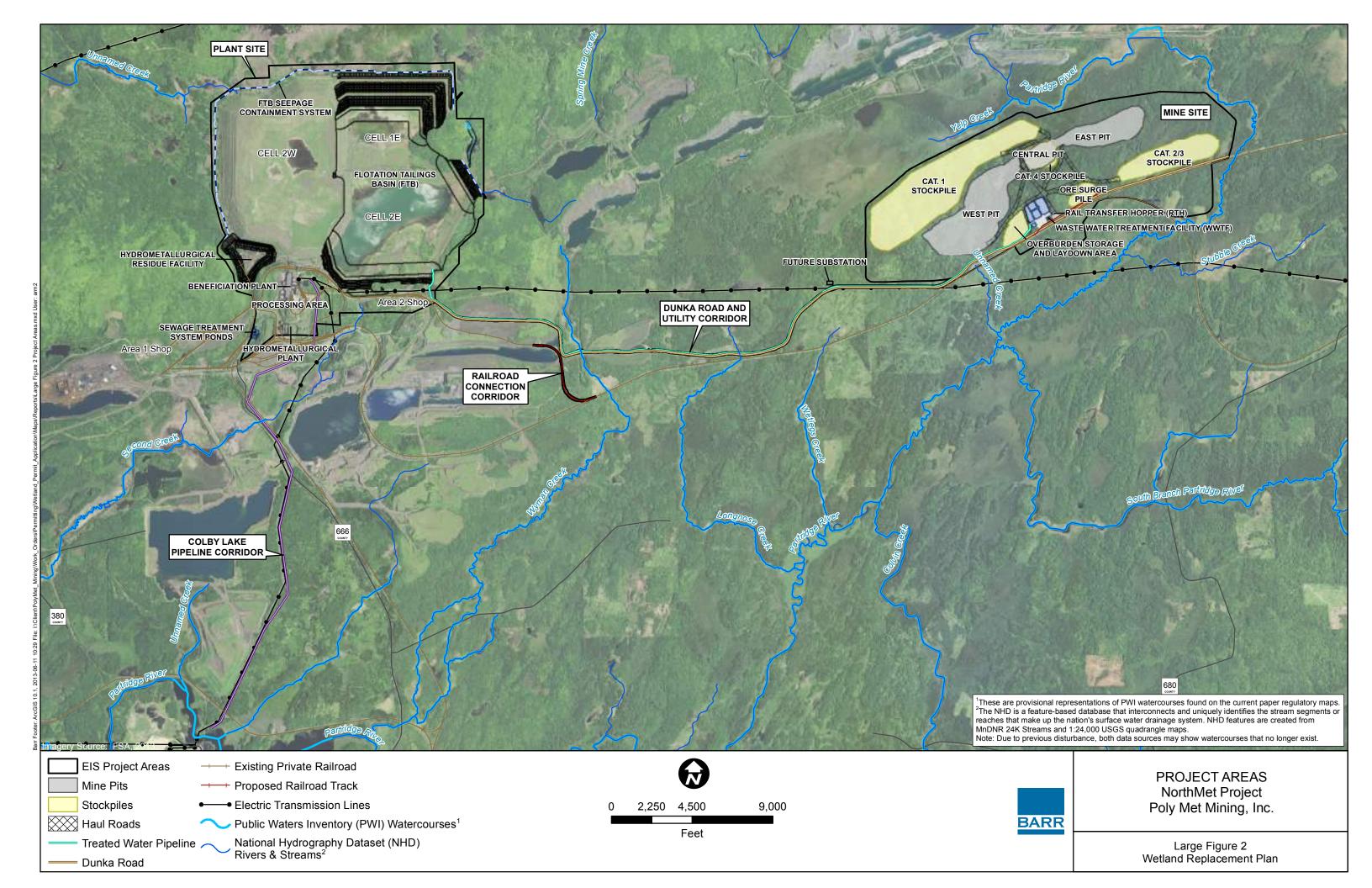
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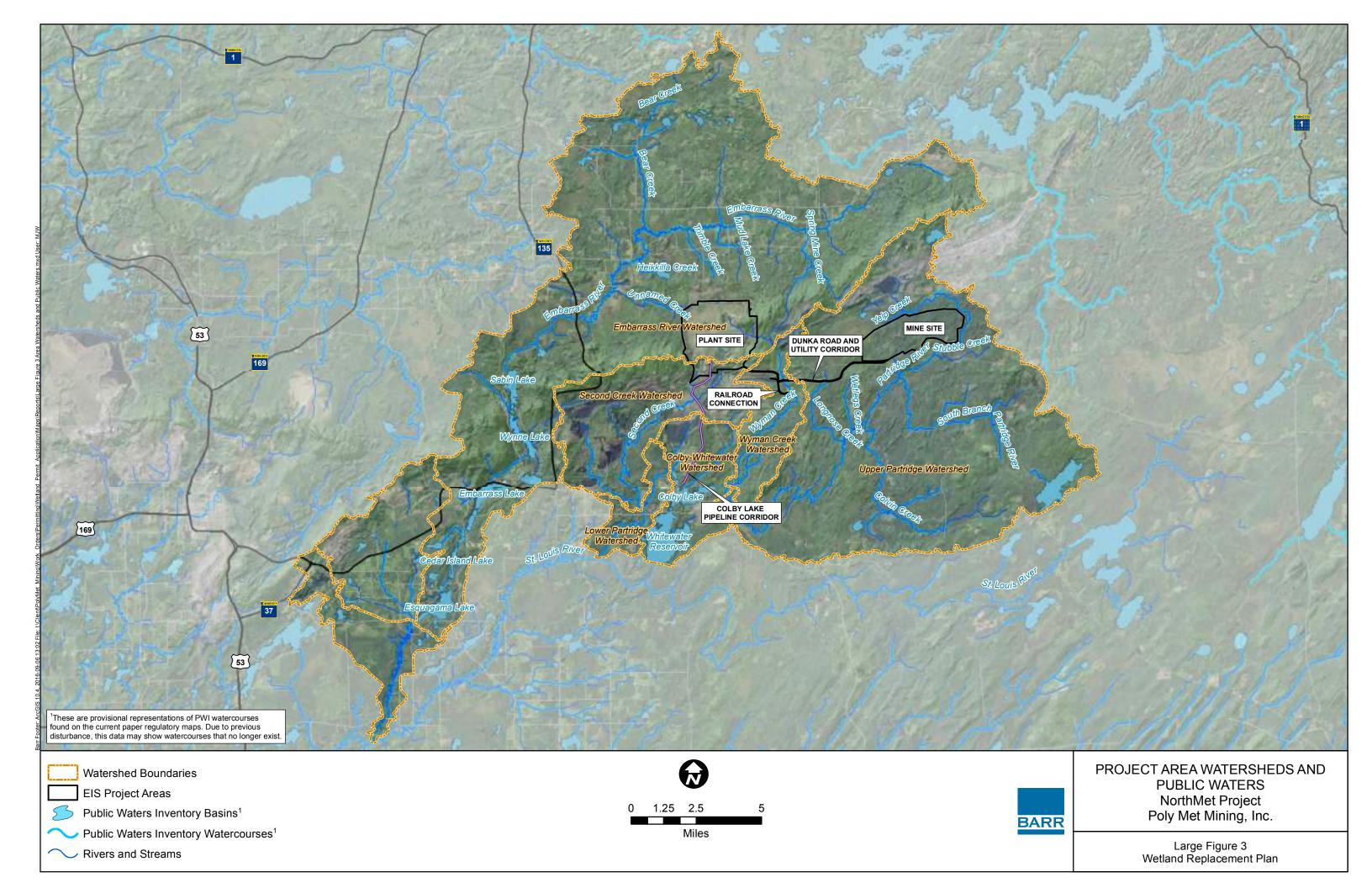
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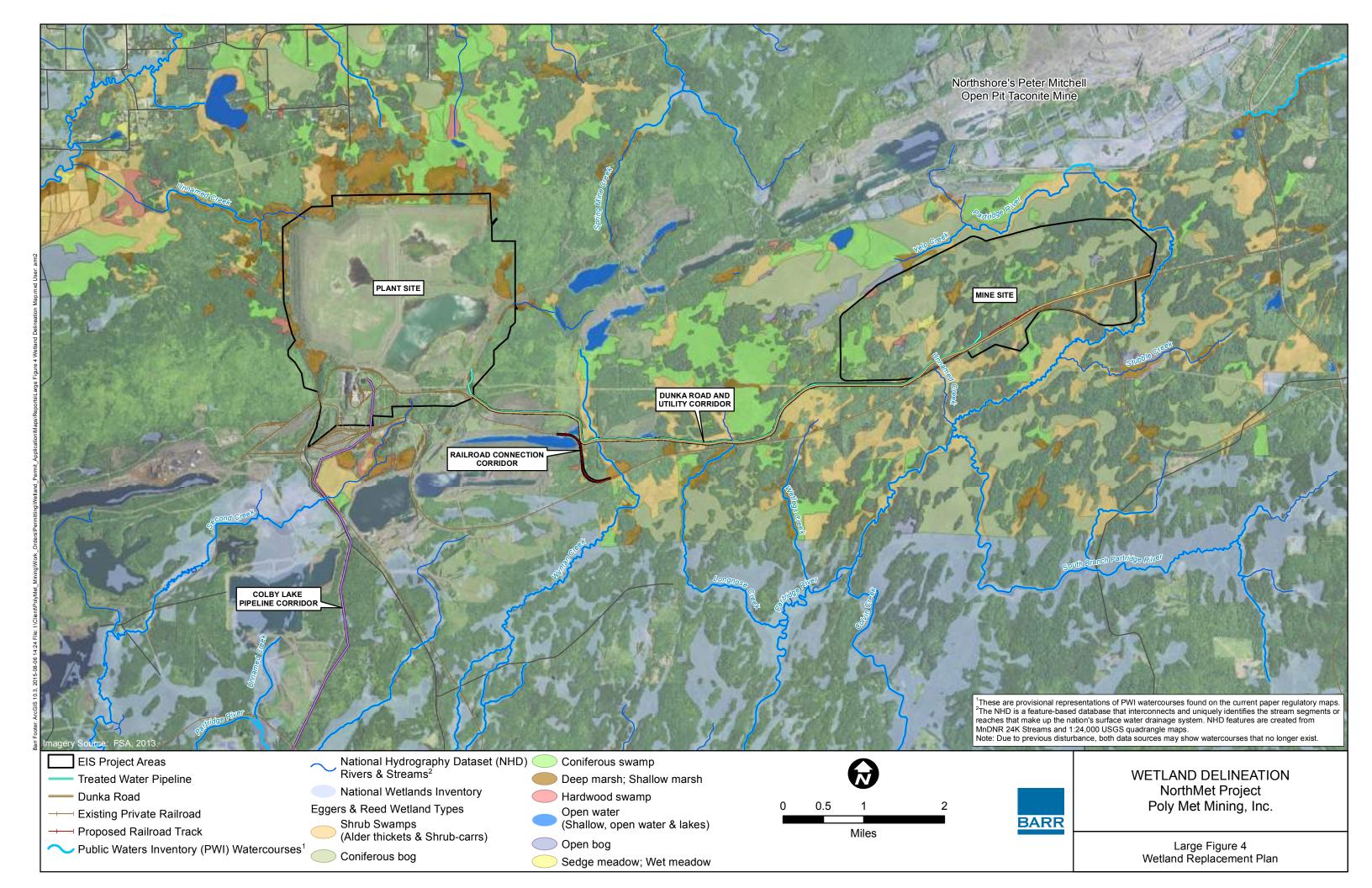
(2) Johnson-Groh Botrychium rugulosum plants were documented in one location in the Mine Site (Sections 2 and 11 of Township 59N, Range 13W); however, it is not certain that the plants identified at either location are Botrychium rugulosum.

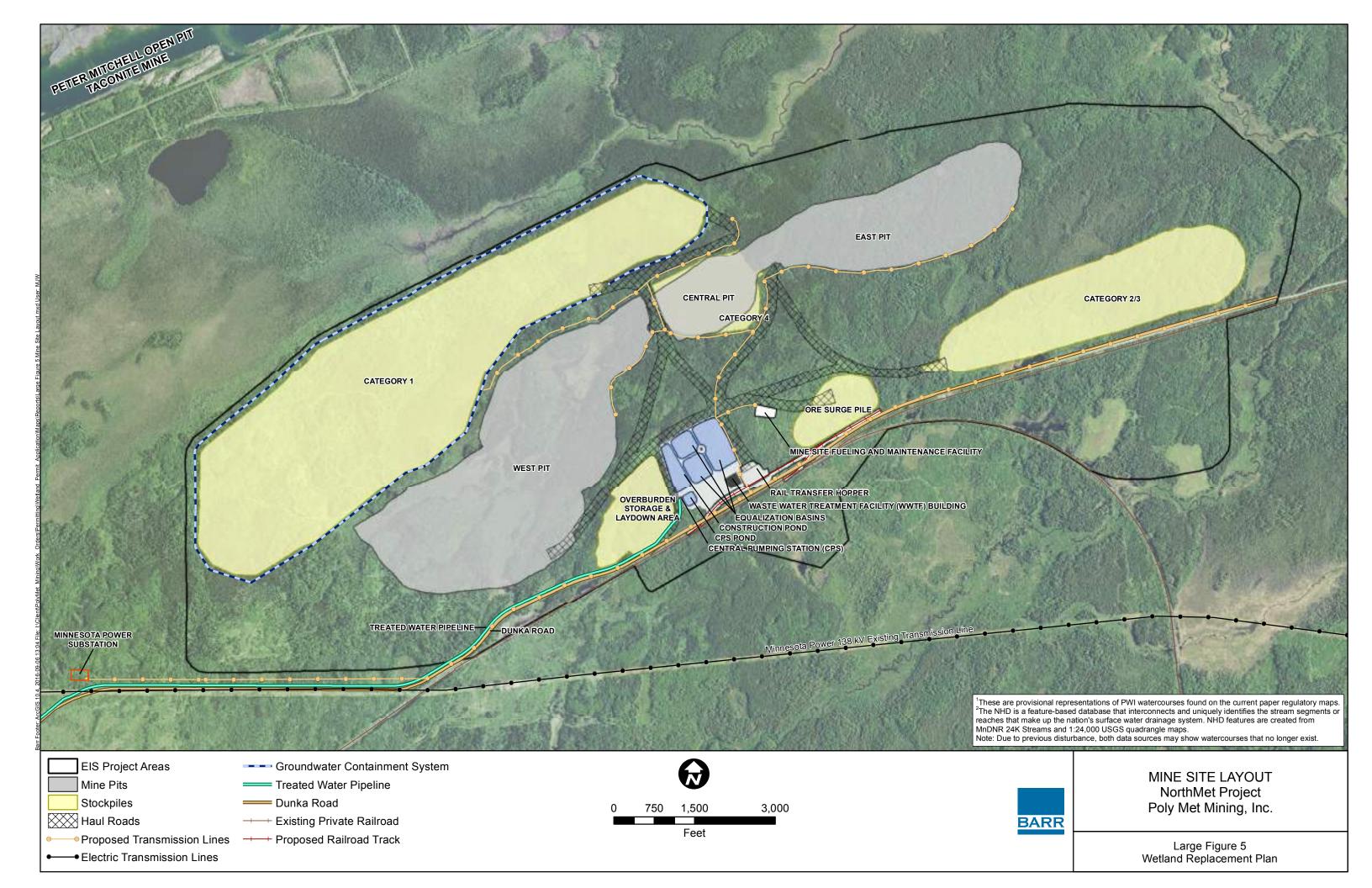
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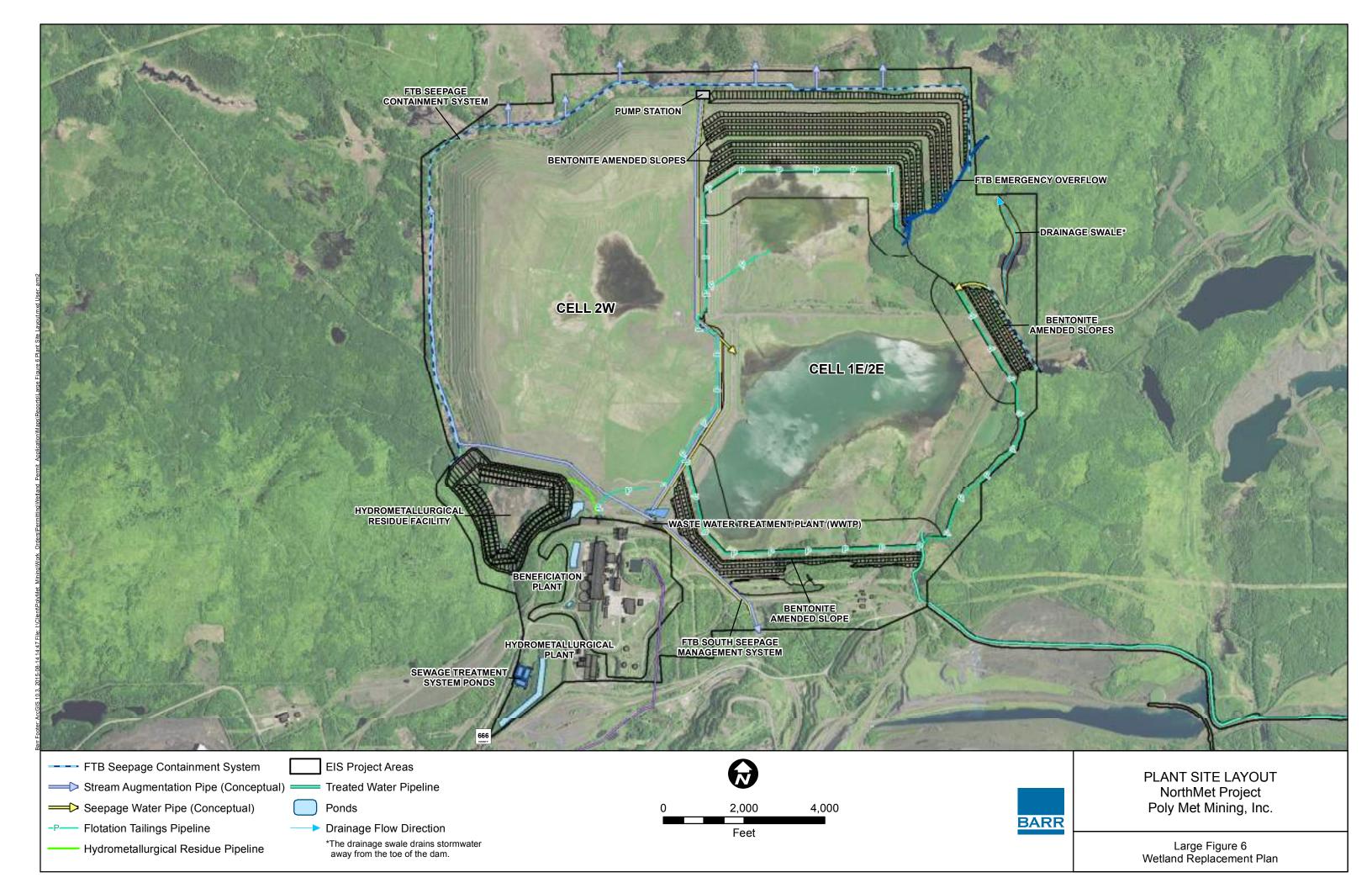


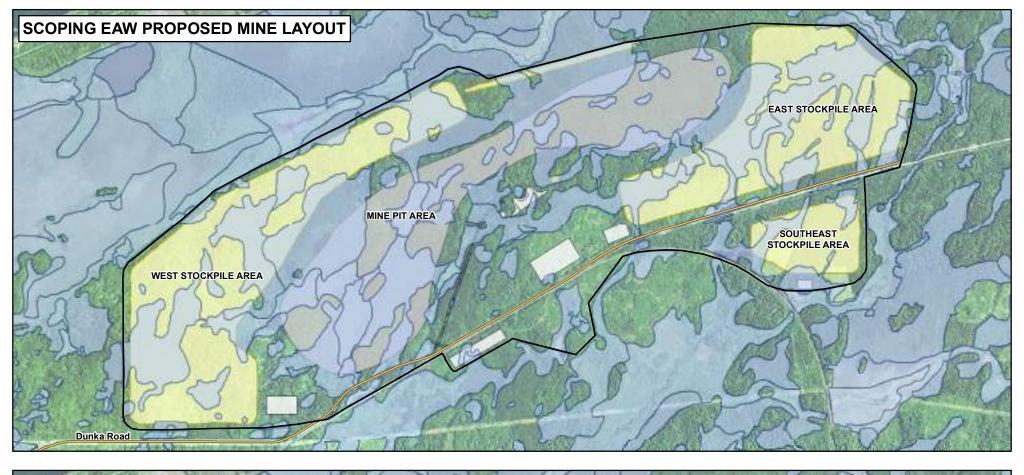


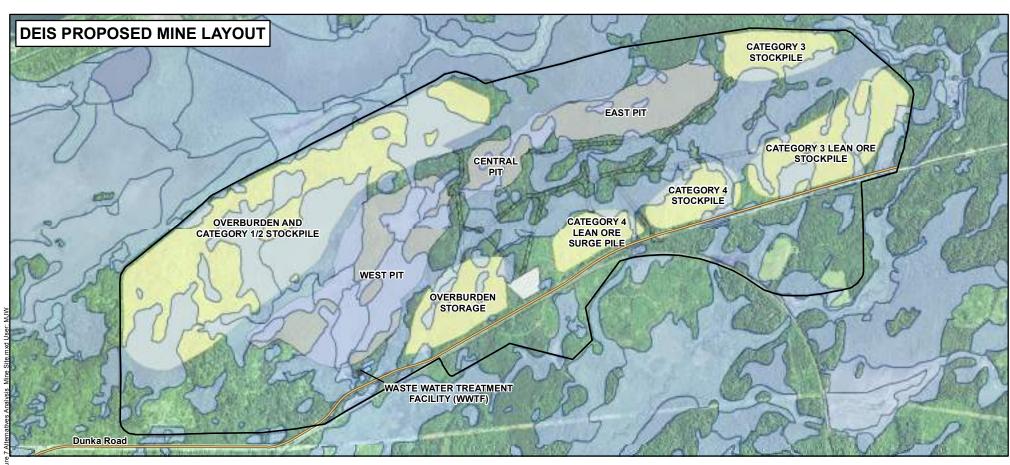


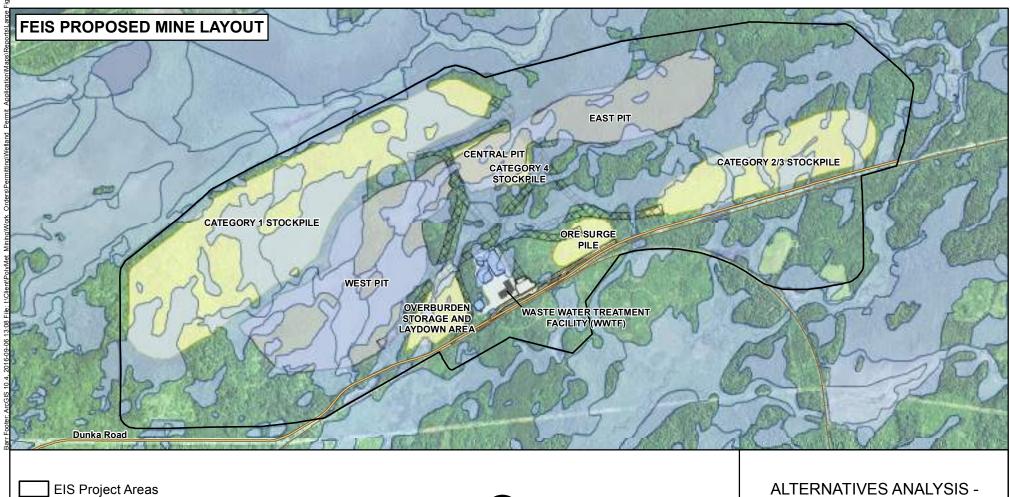




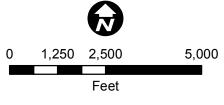








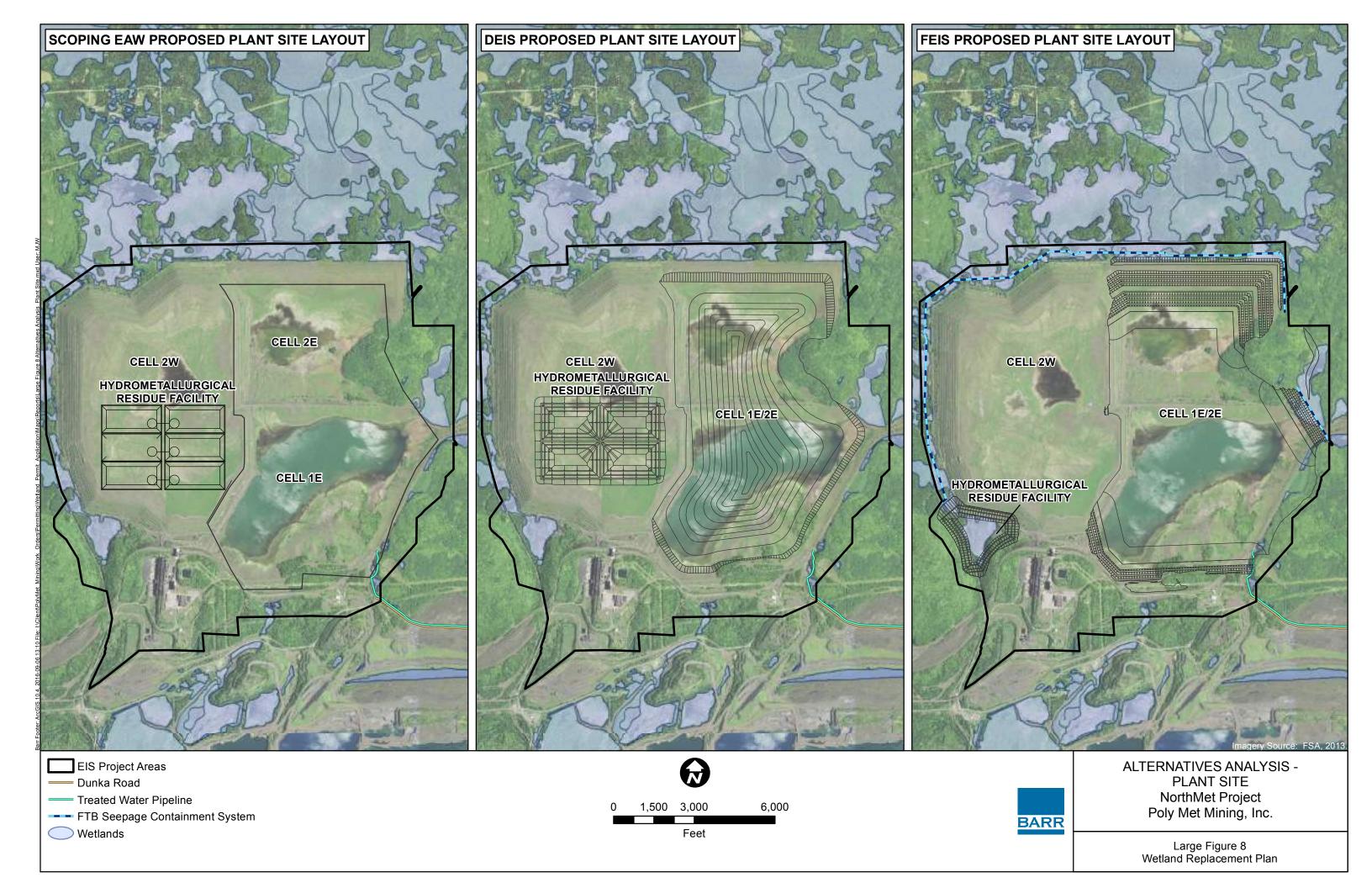
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Dunka Road
Wetlands

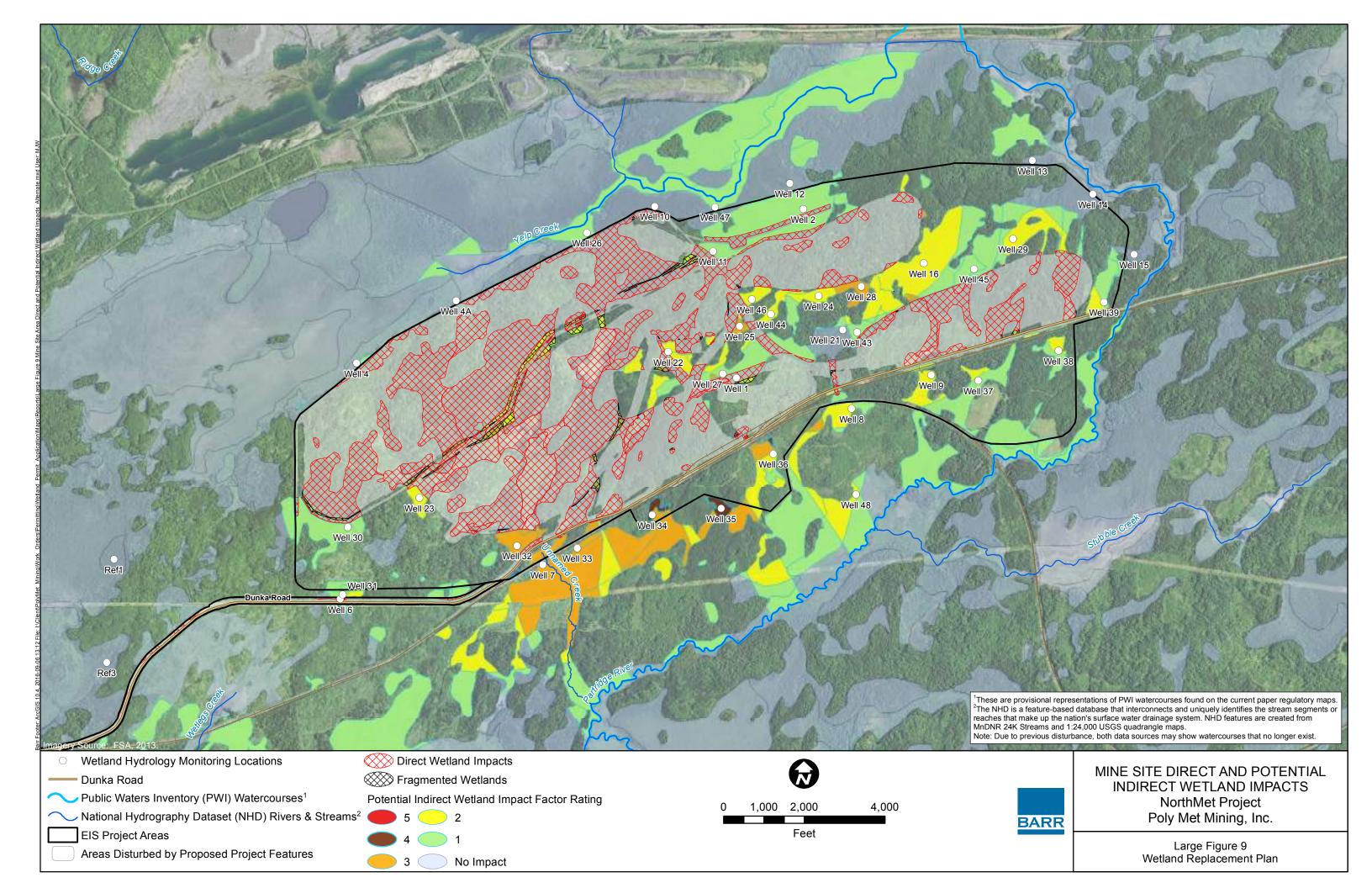


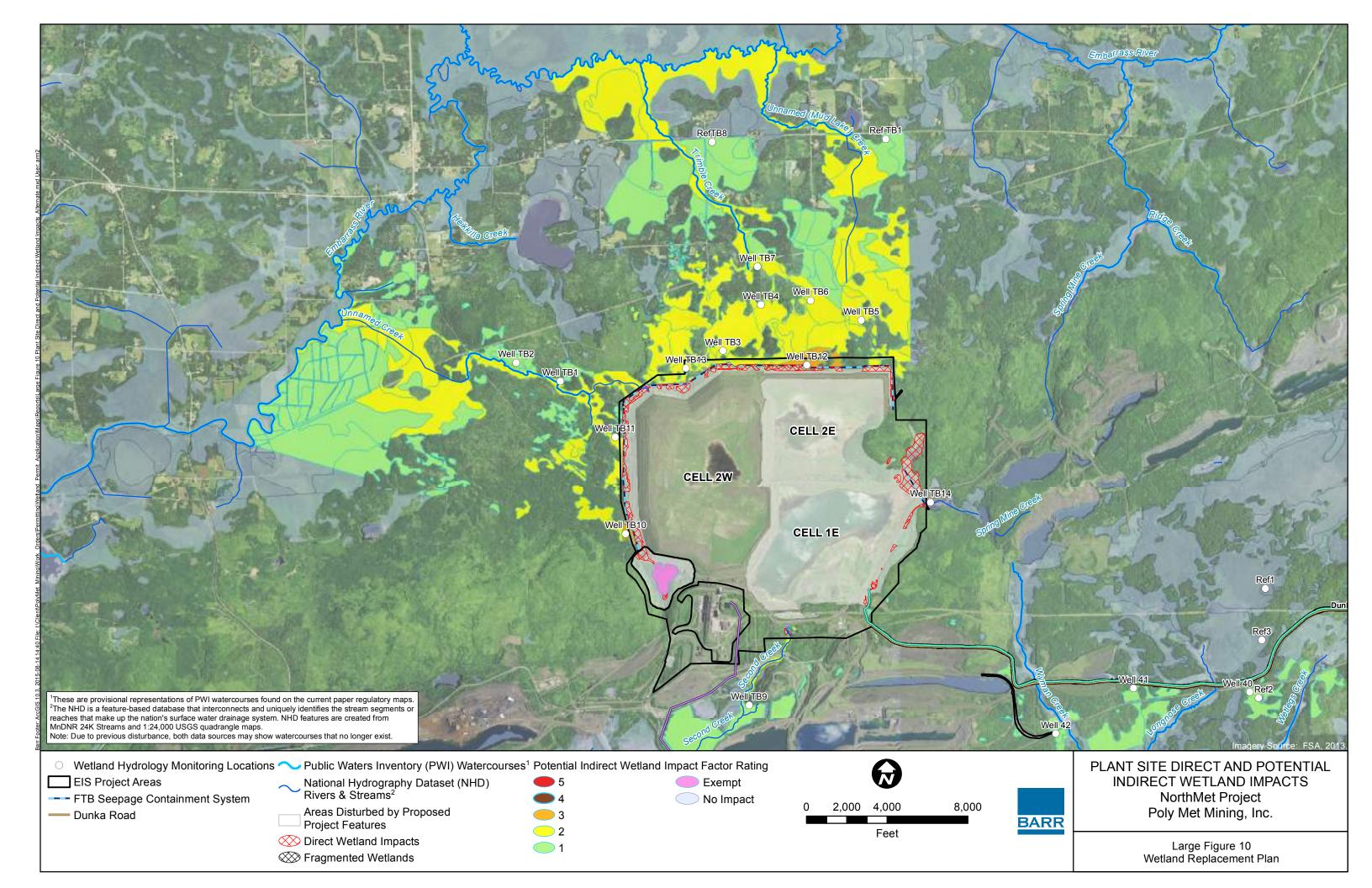
ALTERNATIVES ANALYSIS -MINE SITE NorthMet Project Poly Met Mining, Inc.

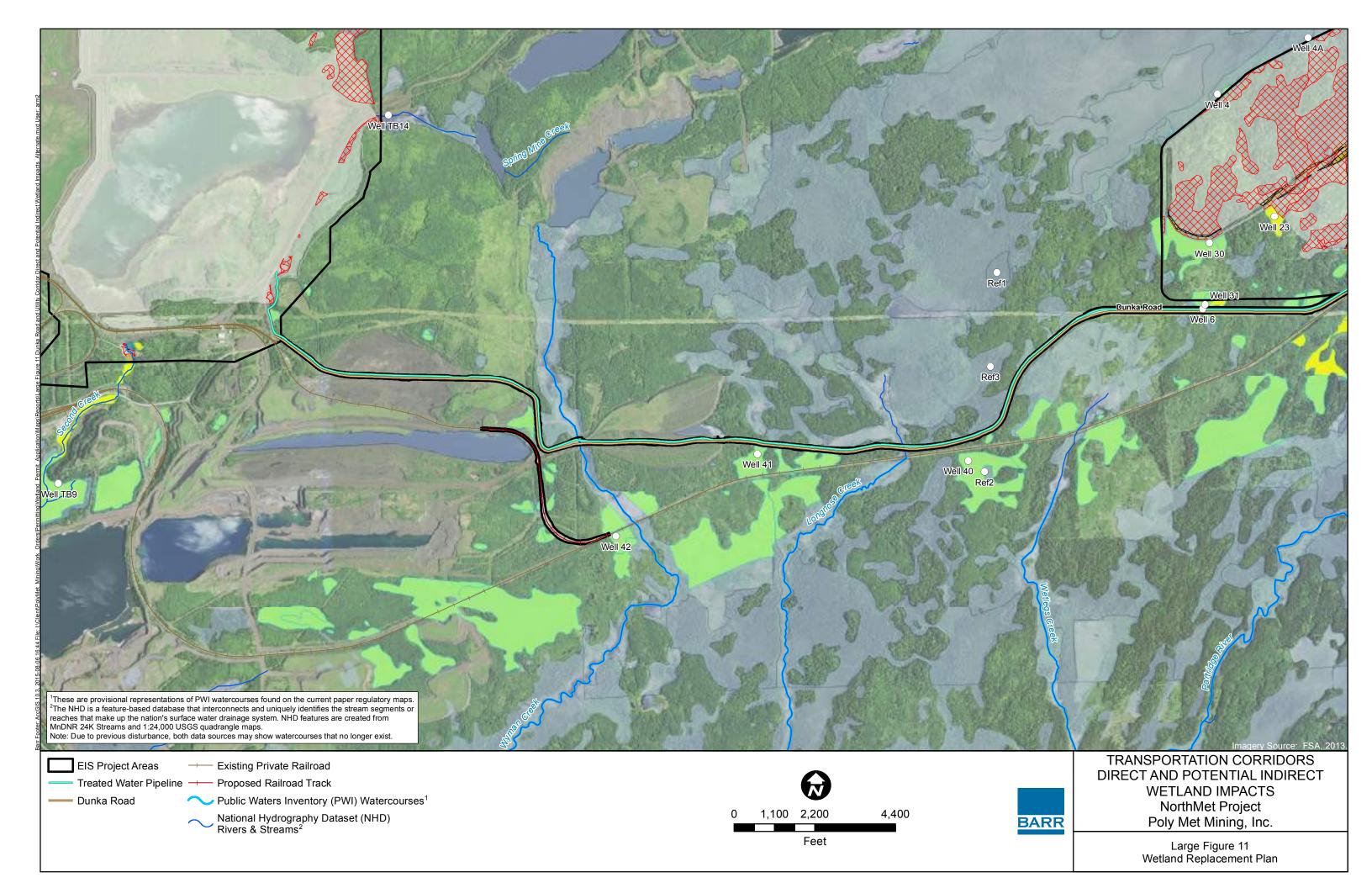
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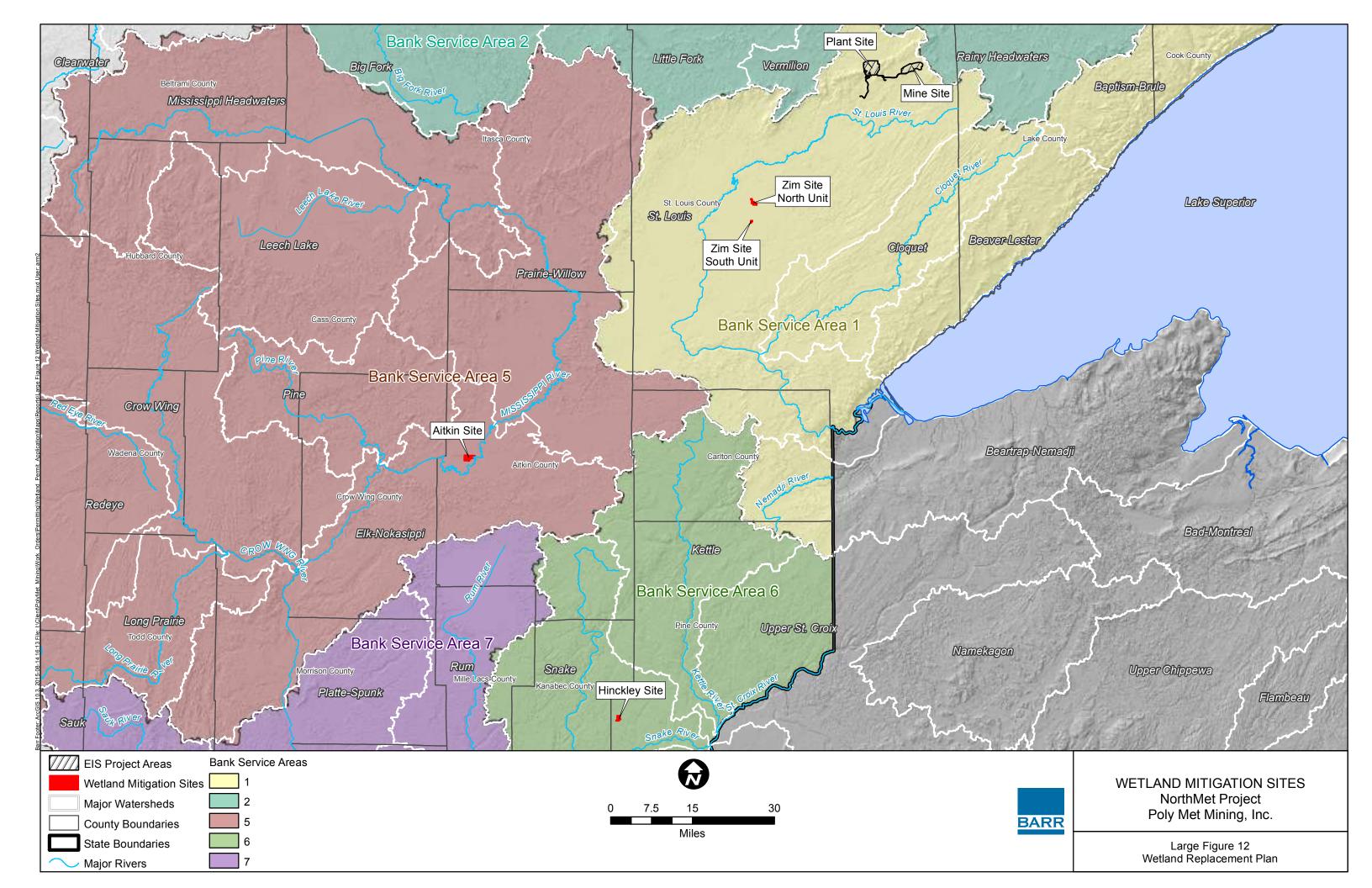
Large Figure 7
Wetland Replacement Plan

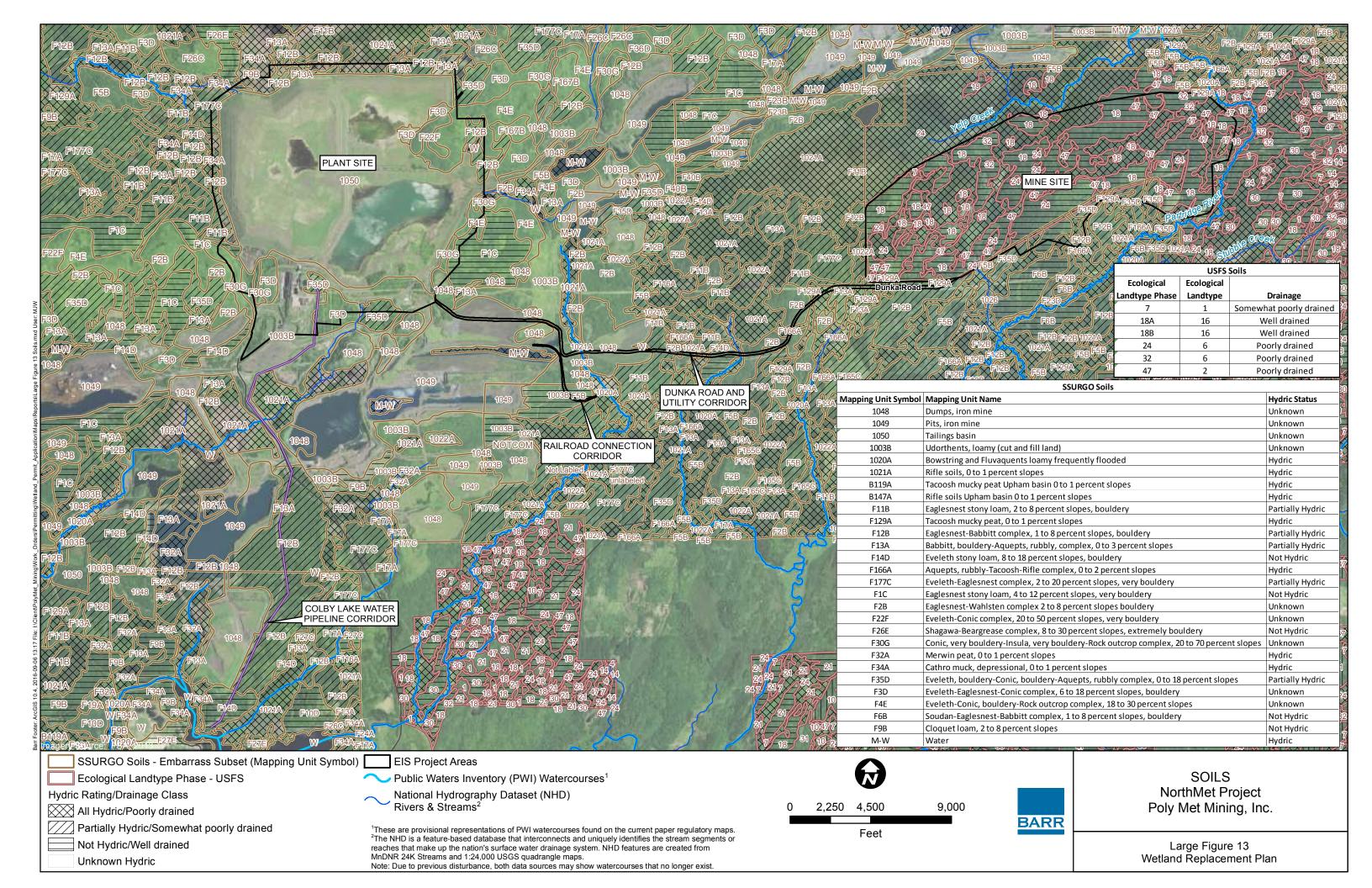


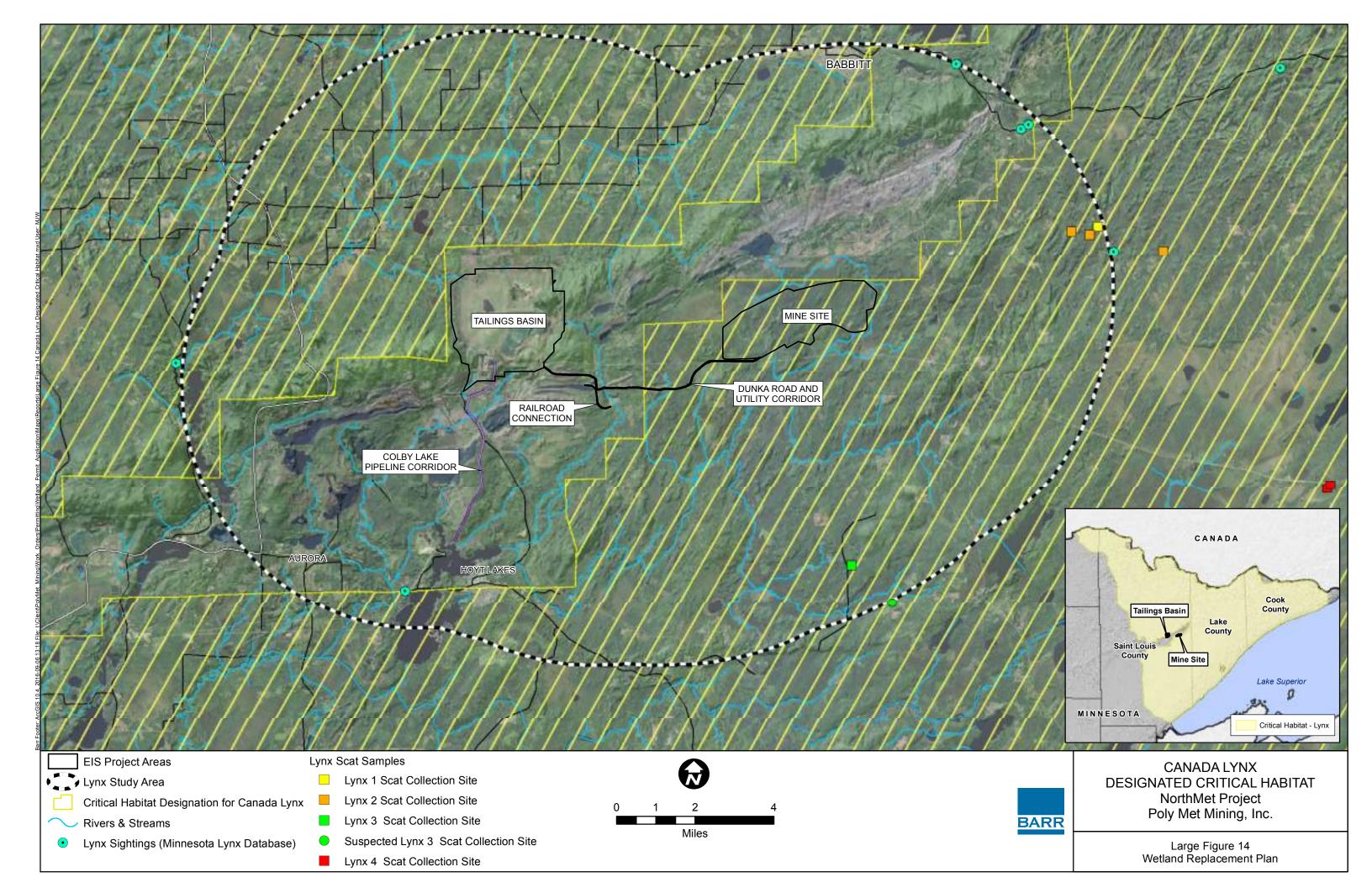


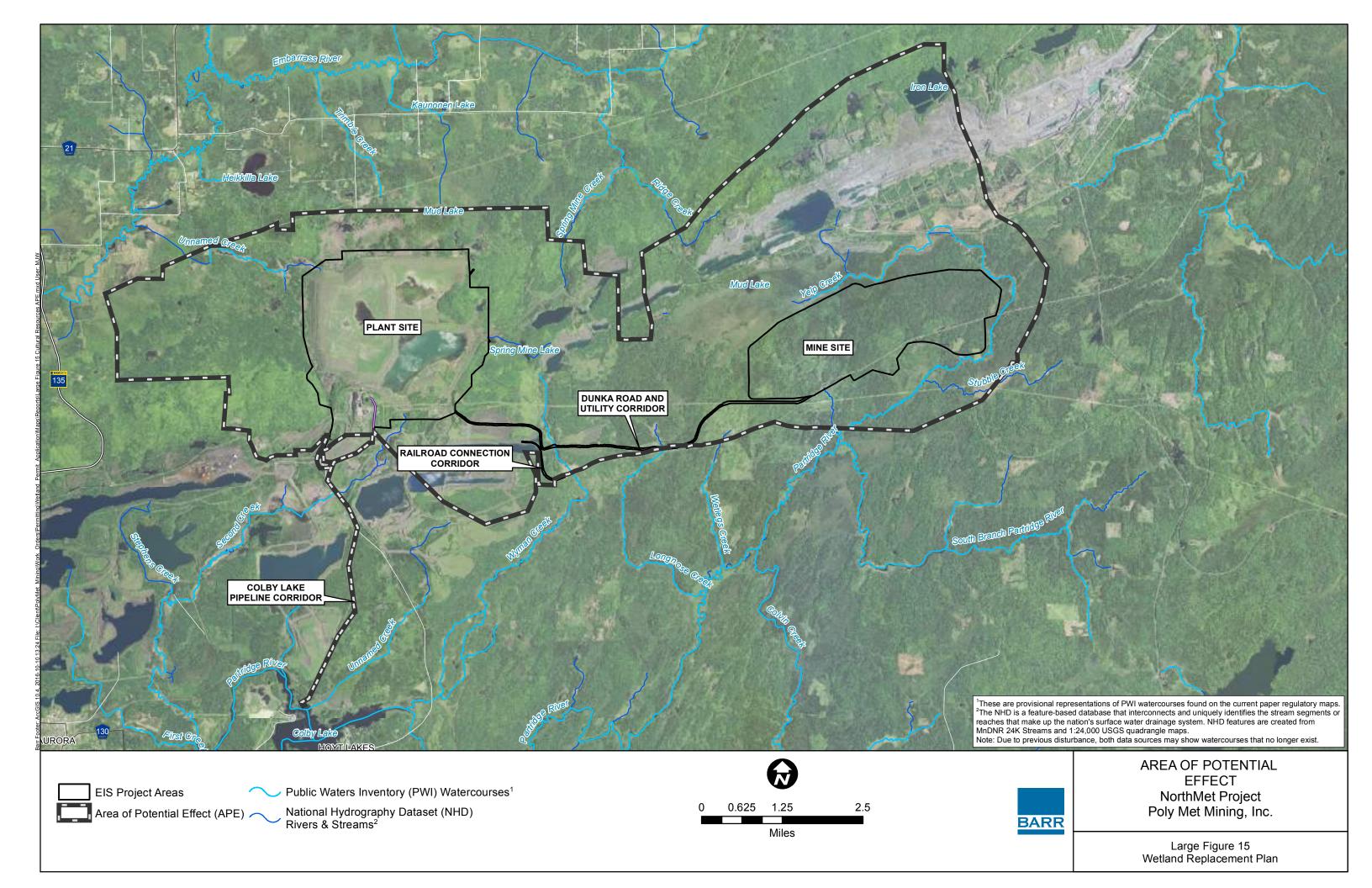


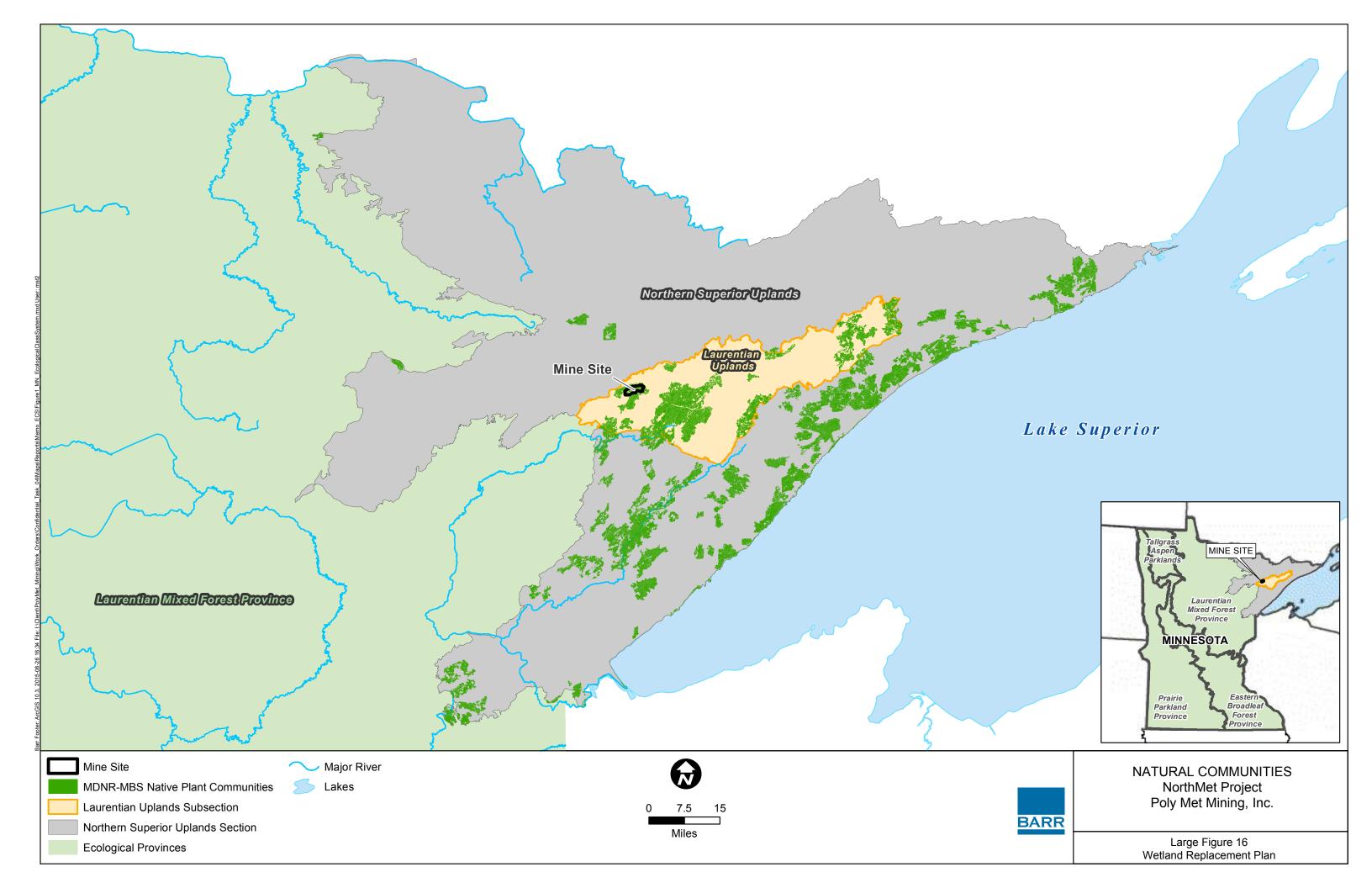


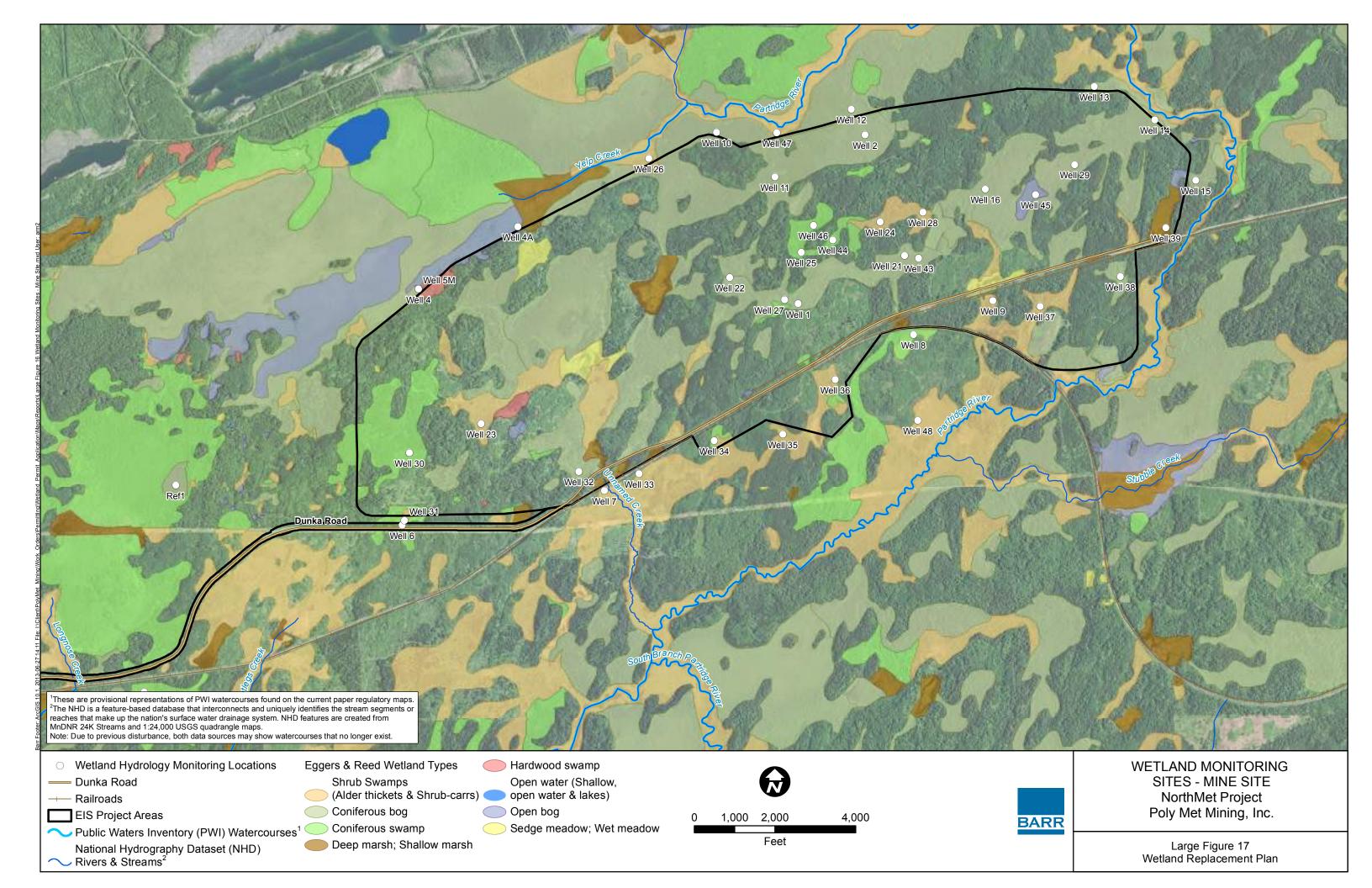


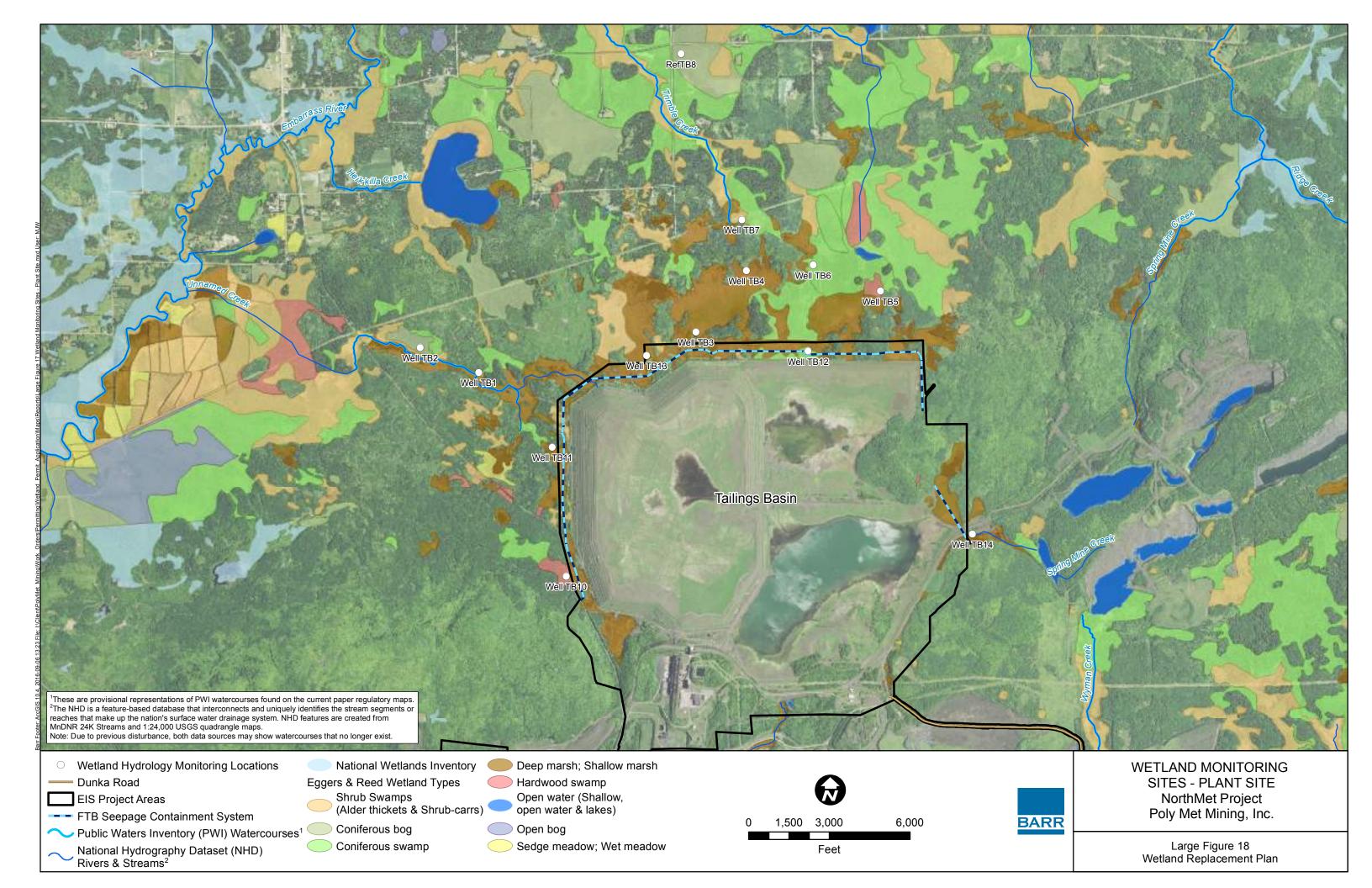


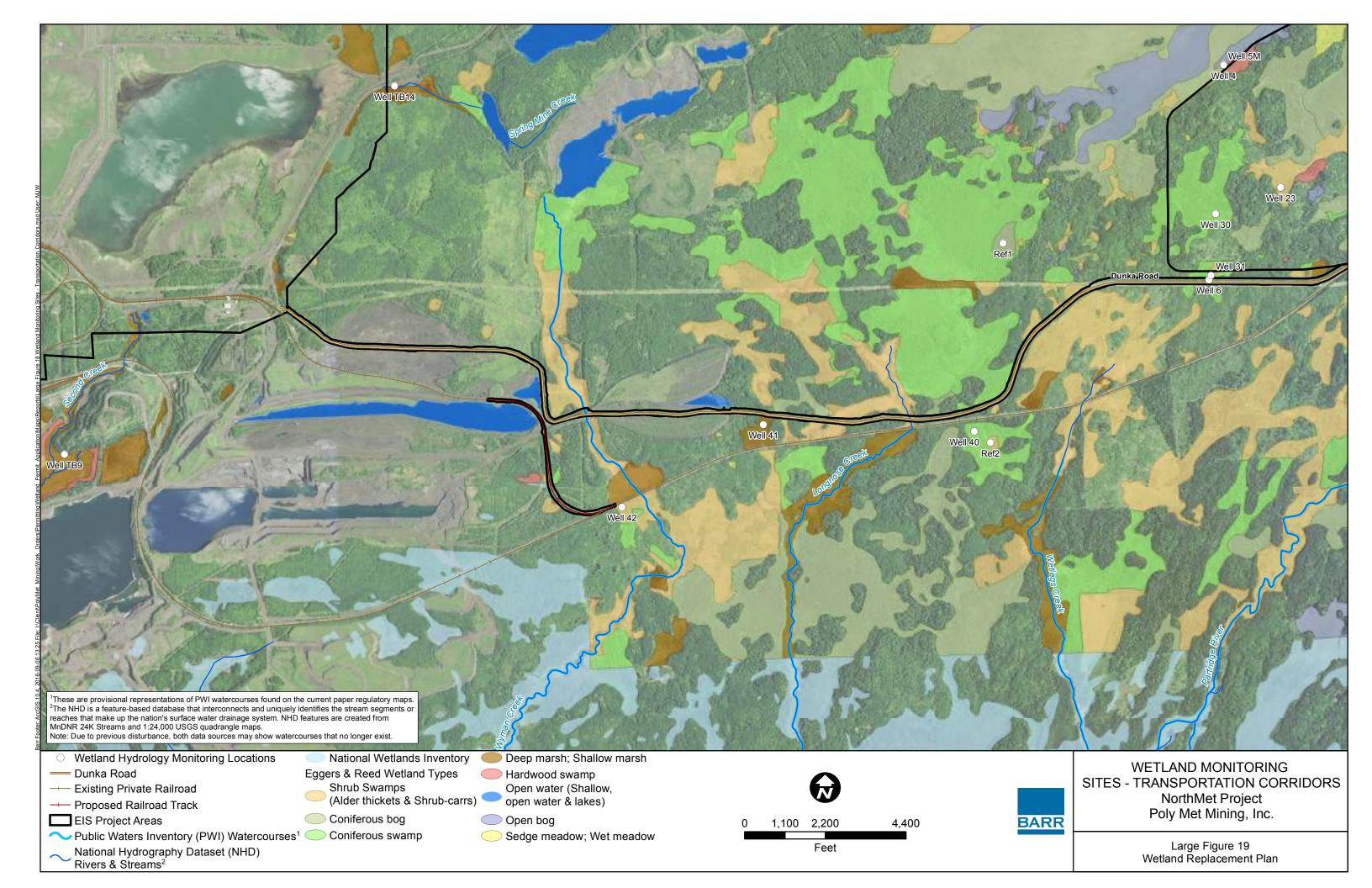












Attachments

Attachment A

NorthMet Project Wetland Data Package v11



NorthMet Project

Wetland Data Package

Version 11

Issue Date: April 8, 2015

This document was prepared for Poly Met Mining Inc. by Barr Engineering Co.



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Acronyms, Abbreviations and Units

Acronym / Abbreviation	Stands For
CWA	Clean Water Act
DA	Department of the Army
FTB	Flotation Tailings Basin
IAP	Impact Assessment Planning
HRF	Hydrometallurgical Residue Facility
LTVSMC	LTV Steel Mining Company
MDNR	Minnesota Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
NADP	National Atmospheric Deposition Program
NEPA	National Environmental Policy Act
NHIS	Natural Heritage Information System
NWI	National Wetland Inventory
OSLA	Overburden Storage and Laydown Area
OSP	Ore Surge Pile
RFSS	Regional Forester Sensitive Species
RTH	Rail Transfer Hopper
SGCN	Species of Greatest Conservation Need
TWP	Treated Water Pipeline
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
WCA	Wetland Conservation Act
WWTF	Waste Water Treatment Facility
WWTP	Waste Water Treatment Plant



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Unit	Description
ac-ft/yr	acre-feet per year
dBA	Decibel
gpm	gallons per minute
g/cm ³	grams per cubic centimeter
g/m²/yr	grams per square meter per year
kg/ha	Kilograms per hectare
mg/L	milligrams per Liter
mi ²	Square miles
μg/L	microgram per Liter
μg/m²/yr	microgram per square meter per year



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1.0 Introduction

This document presents the wetlands data used by the Wetland Management Plan for the NorthMet Project (Project). In cases where a supporting document is referenced, a general description of the supporting document is provided. Information may change during wetland permitting. Permitting decisions cannot be made until the permitting process.

Note that this document uses slightly different terminology to describe areas near the processing plant and Tailings Basin than is used in other documents. Whereas the Supplemental Draft Environmental Impact Statement (SDEIS, Reference (1)) and other Project documents use the term *Plant Site* to refer to the entire Project area where the processing plant and Tailings Basin are located, this document subdivides that area, with separate analyses of the Plant Site area (where processing facilities are located), the Hydrometallurgical Residue Facility (HRF) area, and the Flotation Tailings Basin (FTB) area. Furthermore, this document uses the term *FTB* to refer to the entire area within the boundaries of what is termed the Plant Site in the SDEIS, the minus the areas referred to in this document as the Plant Site and the HRF. This usage is an artifact of the specific way that the term FTB was used when the original wetland delineations and air modeling was done. It is maintained in this document to maintain continuity between the wetland data package and supporting analyses. Large Figure 1 shows the areas of the FTB, Plant Site, and HRF as used in this document.

1.1 Outline

The outline of this document is:

- Section 2.0 Discussion of regulatory basis for wetland management
- Section 3.0 Data on wetlands in the vicinity of the Project
- Section 4.0 Discussion of the approach to evaluating direct, potential indirect, and cumulative wetlands impacts due to the Project
- Section 5.0 Evaluation of direct, potential indirect, and cumulative wetlands impacts due to the Project

This document is intended to evolve through the environmental review, permitting, operating, reclamation, and long-term closure phases of the Project. A Revision History is included at the end of the document.



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2.0 Regulatory Basis

Wetlands are defined by the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Reference (2)) for administration of Section 404 of the Clean Water Act (CWA) and the Minnesota Wetland Conservation Act (WCA) of 1991 (Minnesota Rules, chapter 8420)

2.1 Section 404 of the Clean Water Act

The U.S. Army Corps of Engineers (USACE) has the authority to issue permits for the discharge of dredged or fill material into waters of the United States under Section 404 of the CWA. Because the Project will result in more than minimal adverse impact, the Project will be reviewed under the Department of the Army (DA) individual permit process. The DA Section 404 permits must be consistent with state water quality standards. This is determined through the Section 401 certification process administered by the Minnesota Pollution Control Agency (MPCA).

The U.S. Environmental Protection Agency (USEPA) reviews and comments on Federal Environmental Impact Statements pursuant to their authorities and responsibilities under the National Environmental Policy Act, Section 309 of the Clean Air Act, and Section 404 of the Clean Water Act. The USEPA has additional authorities under Section 404 of the CWA. Under Section 404(c) of the CWA, the USEPA has the authority to prohibit, restrict, or deny the discharge of dredged or fill material at defined sites in waters of the United States (including wetlands) whenever it determines, after notice and opportunity for public hearing, that use of such sites for disposal would have an unacceptable adverse impact on one or more resources, including fisheries, wildlife, municipal water supplies, or recreational areas. The 404(q) Memorandum of Agreement between the USACE and USEPA provides a procedure considering both agencies' views on projects including procedures for elevating unresolved issues to regional and national levels. The 404(q) process is most frequently used by USEPA when they wish to initiate consultation regarding concerns they may have about the impacts of a proposed project.

2.2 Section 401 Water Quality Certification

The MPCA has been delegated the authority by the USEPA to issue Section 401 Water Quality Certifications to ensure a project will comply with state water quality standards. Individual certification will be necessary because an individual Section 404 permit is required for the Project. The MPCA also has administrative authority under Minnesota Rules, part 7050.0186, regarding wetland mitigation.

2.3 Minnesota Wetland Conservation Act

The filling, excavation, and draining of wetlands is also regulated by the WCA, which is administered by a local governmental unit. For mining projects, the designated approving authority is the Minnesota Department of Natural Resources (MDNR) Division of Lands and Minerals. The WCA requires wetland mitigation for Project impacts.



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2.4 Permitting Process

Project proponents that propose to discharge dredge or fill into waters of the United States, including jurisdictional wetlands, must complete a sequencing analysis that demonstrates that they have avoided and minimized impacts to waters of the United States, including flooding, draining or excavating waters, and provided adequate compensation for unavoidable impacts. The following are examples of actions to avoid and minimize impacts to waters of the United States:

- limiting the degree or magnitude of wetland activity
- rectifying temporary impacts by repairing, rehabilitating, or restoring the affected wetland
- reducing or eliminating impacts to wetlands over time by preserving the wetlands through proper maintenance, management, and operation of the Project to avoid further draining or flooding of wetlands

As a final step in the sequencing analysis, the Project proponent must mitigate unavoidable wetland impacts by replacing with wetland areas of equal or greater public value.

Poly Met Mining Inc. (PolyMet) initially submitted a wetland permit application to the USACE and a wetland permit pre-application to the MDNR in July 2004 (Reference (3)). Based on the revised Project plans, PolyMet submitted a revised combined wetland application in 2013, to fulfill the requirements of Sections 404 and 401 of the CWA and the WCA for the Project (Reference (4)). The wetland permit application describes the proposed mining activities that may impact wetlands and identify areas with potential impacts to wildlife, state or federally listed endangered and threatened species, and cultural resources. This revised combined application was sent to the USACE and the MDNR in August 2013. The USACE will send the form to the MPCA as deemed necessary. A permit or certification must be received from each agency before Project work can begin in wetlands.

2.5 Cumulative Wetland Impact Analysis

The cumulative wetland impact study is intended to help satisfy the requirements of Section 3.3.3.2 of the Scoping Decision Document (Reference (5)) to meet National Environmental Policy Act (NEPA) requirements (42 U.S.C. 4321 et seq.). The Council on Environmental Quality (CEQ), which oversees administration of the NEPA process, has defined cumulative effects in its regulations as:

[T]he impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR § 1508.7).



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While Section 404 of the CWA and the WCA provide programs for evaluating project-specific wetland impacts, the NEPA establishes national goals and a process to analyze cumulative effects on protected wetland resources (Section 404 permit authorization). The consideration of resources available in the past compared to those present currently, and the effects of reasonably foreseeable future actions, provides a context for assessing the cumulative impacts on wetland, lake, and deepwater resources.



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3.0 Wetland Data

This section summarizes the wetland resources within the Project. Section 3.1 describes the various assessments of wetland resources that have been conducted for the Project. The wetlands within the Project footprint (Large Figure 1) and within select non-Project areas are presented in Section 3.2.

3.1 Wetland Delineation

Delineation and functional assessment of wetlands that may be impacted by the Project have been conducted as the Project has evolved. This section contains summaries of and references to the reports that have been submitted. Large Table 1 provides details for all wetlands located within the Project areas. For each area, the table provides the total acreage of the wetland, wetland type, total wetland area within the Project area (acres), direct wetland impacts (acres), remaining wetland area (acres), quality rating, and type of direct impact disturbance factor.

3.1.1 Initial Report (RS14 Draft-02)

Reference (3) was submitted in November 2006 and describes wetland delineation activities conducted at the Project site between August 2004 and July 2006 including the methods, findings, and a summary of wetland resources within the Project site. The Project areas have changed since the July 2004 permit application and the wetland resources within the Project areas have been refined based on additional field delineations (Sections 3.1.2 through 3.1.5).

Reference (3) presents the results of an evaluation of wetlands delineated within the following Project areas: mine pits, stockpiles, Tailings Basin, railroad access routes to the Plant Site, the Plant Site, and tailings dam drain system and water pipeline. The Tailings Basin is an actively permitted waste storage facility, and is therefore, not subject to state and federal wetland regulations.

3.1.2 Wetland Impacts – Dunka Road Improvements and Treated Water Pipeline (Technical Memorandum)

Reference (6) was submitted on April 26, 2007 and provides information pertaining to wetlands impacted by the Dunka Road improvements and the Treated Water Pipeline. The pipeline will be constructed adjacent to and north of Dunka Road. A field review was conducted in March 2007 to determine the wetland boundaries and verify wetland types in an area 100 feet south and 100 feet north of the road edge starting at the proposed location of the Minnesota Power Substation and ending just north of the junction of Dunka Road and the road to Area 5.

3.1.3 Wetland Impacts – Tailings Basin Mitigation Alternative (Technical Memorandum)

Reference (7) was submitted on June 2, 2008 and describes potential wetland impacts resulting from the construction of the tailings dam in the FTB area. A wetland delineation



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and functional assessment was conducted in March 2007, November 2007, and May 2008 to identify wetlands not included in prior delineations.

3.1.4 Memo: TB-12 Pipeline Route Threatened and Endangered Species Survey and Wetland Delineation Results for Tailings Basin Alternative

Reference (8) was submitted on December 7, 2009 and describes potential wetland impacts from the construction of the TB-12 pipeline. The construction corridor was 8.4 miles long and 50 feet wide, for a total of 50.6 acres, starting at the Plant Site and ending at the Partridge River. The field delineation was conducted on September 8-9, 2009. The TB-12 Pipeline is also referred to as the Colby Lake Water Pipeline. The Colby Lake Pipeline is not identified as a Project area because no construction will occur in this area.

3.1.5 Project Baseline Wetland Type Evaluation

Reference (9) was submitted in April 2011 and provides baseline data regarding the classification and acreages of wetlands surrounding the Mine Site (Area One) and Tailings Basin (Area Two) (Large Figure 2). Wetlands were evaluated within two areas using data collected from 2004-2010: a 23,927-acre area surrounding the Mine Site (referred to as Area One) and a 19,397-acre area located north and northwest of the Tailings Basin (referred to as Area Two). There were 11,195 acres of wetland identified within Area One (Large Figure 3) and 8,606 acres of wetland identified within Area Two (Large Figure 4). Area One and Area Two include all of the wetland delineations described in Sections 3.1.1 through 3.1.3. The wetlands identified within the TB-12 pipeline (Section 3.1.4) are not found within either Area One or Area Two.

Based on Reference (9), the most common wetland types in Area One include coniferous bog (42%), shrub swamp (30%), and coniferous swamp (18%). In Area Two, the most common wetland types include shrub swamp (34%), coniferous swamp (26%), and coniferous bog (15%). Wetlands across the two areas consist of large wetland complexes that are forested wetland communities dominated by black spruce and tamarack trees.

3.1.6 Updates to Previous Wetland Delineations

Updates to previous wetland delineations were made between April 2011 when Reference (9) was submitted and fall of 2012. Following additional site visits and aerial photograph review, wetland boundaries and types were further refined. Based on these updates, there are approximately 11,201 acres of wetland identified in Area One and 8,622 acres of wetlands identified in Area Two (Table 3-1).



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Table 3-1 Wetland Types within Area One and Area Two

Eggers and Reed Wetland Community	Area One (acres)	Area Two (acres)
Coniferous bog	4,581	1,018
Coniferous swamp	2,072	2,537
Deep marsh	220	514
Hardwood swamp	27	161
Open bog	283	354
Open water (includes shallow, open water and lakes)	245	285
Sedge/wet meadow	46	137
Shallow marsh	359	654
Shrub swamp (includes alder thicket and shrub-carr)	3,368	2,962
Total acres of wetland	11,201	8,622

The wetland types in Area One include coniferous bog (41%), shrub swamp (30%), coniferous swamp (18%), shallow marsh (3%), open bog (3%), open water (2%), deep marsh (2%), sedge/wet meadow (less than 1%), and hardwood swamp (less than 1%). In Area Two, the wetland types include shrub swamp (34%), coniferous swamp (29%), coniferous bog (12%), shallow marsh (8%), deep marsh (6%), open bog (4%), open water (3%), hardwood swamp (2%), and sedge/wet meadow (2%).

3.1.7 Additional Non-Project Areas

Additional non-project areas were evaluated, which included the Colby Lake Water Pipeline and Second Creek (Reference (10)). The purpose of evaluating the Second Creek area was to provide data regarding potential indirect wetland impacts associated with stream flow augmentation activities for Second Creek, which are described in Reference (11). No Project construction is planned in the Second Creek area.

The area of analysis for Second Creek began at its origin, at the south end of Tailings Basin Cell 1E, and ended at the east edge of County Highway 666 (Large Figure 1). The majority of this area of analysis is located outside of the Project Areas (Large Figure 1). The Second Creek area included some areas adjacent to Second Creek that were also assessed within the FTB survey or the Colby Lake Pipeline survey.

3.2 Wetland Summary for the Project Areas

The Project footprint that will be used for this analysis has been defined and detailed in the Project Description (Reference (12)). Wetlands are summarized within the Project footprint, and in select non-Project areas. Project areas for the wetland analysis include the Mine Site,



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Railroad Connection Corridor, Dunka Road and Utility Corridor, Plant Site, FTB, and Hydrometallurgical Residue Facility (HRF). Non-Project areas for the wetland analysis include the Colby Lake Water Pipeline and Second Creek (Large Figure 1).

The Project areas include 166 wetlands covering approximately 1,579 acres (Large Table 1). The percentage (based on acreage) of Eggers and Reed (Reference (13)) wetland types identified in the Project areas include: coniferous bog (55%); alder thicket (12%); shallow marsh (11%); coniferous swamp (9%); deep marsh (7%); sedge meadow (2%); open bog (1%); wet meadow (1%); hardwood swamp (1%); shallow, open water (less than 1%); and shrub-carr (less than 1%).

The overall quality of the wetlands was evaluated using the Minnesota Rapid Assessment Method (MnRAM 3.0). Within the Project areas, 105 of the 166 wetlands (63%) in the Project area are rated as high quality, 11 wetlands (7%) are rated as moderate quality, and 50 wetlands (30%) are rated as low quality (Large Table 1). Low quality wetlands are located at the FTB and HRF. Wetlands at the Mine Site, Dunka Road and Utility Corridor, and Railroad Connection Corridor are ranked as high or moderate quality.

3.2.1 Mine Site

Wetlands were delineated on the 3,014 acre Mine Site (Large Figure 5). Construction of the following systems will occur in the Mine Site: mine pits, stockpiles, haul roads, Rail Transfer Hopper (RTH), Waste Water Treatment Facility (WWTF) and Central Pumping Station (CPS), stormwater ditches and ponds, process water pipes and ponds, culverts, perimeter dike, Category 1 Waste Rock Stockpile Groundwater Containment System, Treated Water Pipeline (TWP), and Dunka Road upgrades (Reference (12)).

A summary of the wetlands, classified by Reference (13) wetland community type, is provided in Table 3-2.



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Table 3-2 Wetland Types within the Mine Site

Eggers and Reed Wetland Community	Mine Site (acres)
Coniferous bog	873.43
Coniferous swamp	128.61
Deep marsh	5.03
Hardwood swamp	12.79
Open bog	18.34
Open water (includes shallow, open water and lakes)	0
Sedge/wet meadow	39.53
Shallow marsh	44.02
Shrub swamp (includes alder thicket and shrub-carr)	176.03
Total acres of wetland	1,297.78

A total of 87 wetlands covering approximately 1,298 acres have been identified within the Mine Site (Large Table 1). A total of 7 wetlands, each over 50 acres in size within the Project area, comprise approximately 774 acres of wetlands within the Mine Site. There are an additional 5 wetlands, each over 20 acres in size within the Mine Site. Together, these 12 wetlands comprise 72% of the wetland area within the Mine Site.

A total of 79% of the wetlands in the Mine Site are coniferous swamp/bog and open bog communities. Shrub swamp wetland communities comprise 13%, shallow marshes comprise about 3%, sedge/wet meadow communities make up 3%, and hardwood swamp communities comprise 1% of the wetlands in the Mine Site. Deep marshes comprise less than 1% of the wetland area in the Mine Site.

Approximately 92% of the wetlands in the Mine Site are of high quality and 8% of wetlands are of moderate quality. High quality wetlands have low disturbance levels and high vegetative diversity and integrity. Moderate quality wetlands have impounded open water because of beaver dams and downstream culverts under Dunka Road or the railroad, are adjacent to U.S. Forest Service (USFS) roads, the Dunka Road corridor, or the Railroad Connection Corridor.

3.2.2 Railroad Connection Corridor

An approximately 1.1 mile length of railroad is proposed to connect two existing rail lines between the Mine Site and the Plant Site (Large Figure 6). A summary of the wetlands, classified by Reference (13) wetland community type, is provided in Table 3-3.



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Table 3-3 Wetland Types within the Railroad Connection Corridor

Eggers and Reed Wetland Community	Railroad Connection Corridor (acres)
Coniferous bog	0
Coniferous swamp	0.07
Deep marsh	0
Hardwood swamp	0
Open bog	0
Open water (includes shallow, open water and lakes)	0
Sedge/wet meadow	0
Shallow marsh	0.07
Shrub swamp (includes alder thicket and shrub-carr)	0.30
Total acres of wetland	0.44

A total of 4 wetlands covering 0.44 acres have been identified within the Railroad Connection Corridor (Large Table 1). A total of 68% of the wetlands are shrub swamp, 16% are coniferous swamp, and 16% are shallow marsh.

All of the wetlands in the Railroad Connection Corridor are high quality. While these wetlands are moderately impacted by either a haul road or an existing railroad, they have high vegetative diversity/integrity.

3.2.3 Dunka Road and Utility Corridor

This Project area will include improvements to Dunka Road and construction of the Treated Water Pipeline (TWP) that will be located adjacent to and north of Dunka Road (Large Figure 7, Reference (6)). Dunka Road is an unpaved gravel road that was used as an active mine road in the former LTV Steel Mining Company (LTVSMC) operations. Dunka Road will be utilized to transport mine equipment between the Mine Site and the Area 1 Shop, as well as mine personnel between the Mine Site and the Area 2 Shop (Large Figure 1). The TWP will carry water from the CPS to the FTB. A summary of the wetlands, classified by Reference (13) wetland community type, is provided in Table 3-4.



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Table 3-4 Wetland Types within the Dunka Road and Utility Corridor

Eggers and Reed Wetland Community	Dunka Road Corridor (acres)
Coniferous bog	0.89
Coniferous swamp	1.54
Deep marsh	0
Hardwood swamp	0
Open bog	0
Open water (includes shallow, open water and lakes)	0
Sedge/wet meadow	0
Shallow marsh	0.52
Shrub swamp (includes alder thicket and shrub-carr)	3.81
Total acres of wetland	6.76

A total of 21 wetlands, encompassing 6.76 acres, have been identified within the Dunka Road and Utility Corridor (Large Table 1). The wetlands in the corridor include shrub swamp (56%), coniferous swamp (23%), coniferous bog (13%), and shallow marsh (8%).

These wetlands are currently located adjacent to Dunka Road and some of the wetlands have been previously logged. Wetlands in the western half of the corridor are located within areas previously disturbed by mining activities in the former LTVSMC operations. All of the wetlands are of high quality.

3.2.4 Plant Site

The Plant Site is the location of the former LTVSMC facilities (Large Figure 8). The existing facilities will be upgraded and construction of the following systems will occur: Flotation Building, Concentrate Dewatering/Storage Building, Hydrometallurgical Plant, Oxygen Plant, and supporting infrastructure (e.g., road, etc.; Reference (12)).

Nearly the entire Plant Site is disturbed by past mining activities. No wetlands are present within the Plant Site, although there is a Plant Reservoir located east of the concentrator that is not regulated as a wetland (Reference (9)).

3.2.5 Flotation Tailings Basin (FTB)

The FTB includes the Tailings Basin cells identified as Cell 1E, Cell 2E, and Cell 2W (Large Figure 9). Construction of the following systems will occur in the FTB area: The FTB, an FTB Containment System to manage FTB seepage along the western, northern, and portions of the eastern sides of the Tailings Basin; a buttress for stability along the northern



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and eastern sides of Cell 2E; a drainage swale located northeast of Cell 2E; and an overflow channel located northeast of Cell 2E.

A summary of the wetlands located within the Project area, classified by Reference (13) wetland community type, is provided in Table 3-5.

Table 3-5 Wetland Types within the FTB

Eggers and Reed Wetland Community	FTB (acres)
Coniferous bog	0
Coniferous swamp	14.44
Deep marsh	106.27
Hardwood swamp	1.03
Open bog	0
Open water (includes deep water, shallow, open water and lakes)	0.85
Sedge/wet meadow	1.48(1)
Shallow marsh	99.79
Shrub swamp (includes alder thicket and shrub-carr)	14.39
Total acres of wetland	238.25(1)

⁽¹⁾ A 0.03 acre area of sedge/wetland meadow is classified as exempt.

A total of 52 wetlands covering approximately 238 acres were identified within the FTB (Large Table 1). There is a 0.03 acre portion of the sedge/wet meadow wetland identified as exempt because the wetlands are located within the Cliffs Erie LLC (formerly LTVSMC) Permit To Mine Ultimate Tailings Basin Limit boundary and are not regulated by state and federal wetland regulations (Section 5.1). The wetlands in the FTB include deep marsh (45%), shallow marsh (42%), coniferous swamp (6%), shrub swamp (6%), sedge/wet meadow (less than 1%), open water (less than 1%), and hardwood swamp (less than 1%).

The wetlands in the FTB have been previously impacted by LTVSMC tailings deposition, roads, and impoundment. The majority (92%) of wetlands within the FTB are currently rated as low quality with low vegetative diversity/integrity. Eight percent of the wetlands are rated as moderate quality.

3.2.6 Hydrometallurgical Residue Facility (HRF)

The HRF will be located near the southwest corner of the Cell 2W, at the site of the Emergency Basin used in the former LTVSMC operations (Large Figure 10, Reference (12)).

A summary of the wetlands located within the Project area, classified by Reference (13) wetland community type, is provided in Table 3-6.



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Table 3-6 Wetland Types within the HRF

Eggers and Reed Wetland Community	HRF (acres)
Coniferous bog	0
Coniferous swamp	0
Deep marsh	0
Hardwood swamp	0
Open bog	0
Open water (includes deepwater, shallow, open water and lakes)	0
Sedge/wet meadow	0
Shallow marsh	36.07 ⁽¹⁾
Shrub swamp (includes alder thicket and shrub-carr)	0
Total acres of wetland	36.07 ⁽¹⁾

⁽¹⁾ A 28.56 acre area of shallow marsh is classified as exempt.

A total of 2 shallow marsh wetlands, covering 36.07 acres, were identified within the HRF (Large Table 1). There is a 28.56 acre portion of the shallow marsh wetland identified as exempt because wetlands located within the Cliffs Erie LLC (formerly LTVSMC) Permit to Mine Ultimate Tailings Basin Limit boundary are not regulated by state and federal wetland regulations (Section 5.1).

An unpaved, gravel road is located along the north side of these wetlands along with small buildings and associated facilities used in the former LTVSMC operations.

3.2.7 Colby Lake Water Pipeline

The Colby Lake Water Pipeline area of analysis contains an existing pipeline that was used to provide makeup water in the former LTVSMC operations (Large Figure 11). There will be no construction within this area as the existing pipeline will be used to provide water for the Project. A summary of the delineated wetlands, classified by Reference (13) wetland community type, is provided in Table 3-7.



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Table 3-7 Wetland Types within the Colby Lake Water Pipeline

Eggers and Reed Wetland Community	Colby Lake Water Pipeline Corridor (acres)
Coniferous bog	0
Coniferous swamp	0
Deep marsh	1.00
Hardwood swamp	0
Open bog	0
Open water (includes deep water, shallow, open water and lakes)	0
Sedge/wet meadow	1.35
Shallow marsh	2.58
Shrub swamp (includes alder thicket and shrub-carr)	2.06
Total acres of wetland	6.99

A total of 14 wetlands covering 6.99 acres were identified within the Colby Lake Water Pipeline area of analysis. The wetlands include shallow marsh (37%), shrub swamp (30%), wet meadow (19%), and deep marsh (14%).

The wetlands are located adjacent to an unpaved, gravel road and within a previously disturbed corridor. The majority of wetlands in this corridor are rated as low quality (93%), with the remaining wetland rated as moderate quality (7%).

3.2.8 Second Creek

The Second Creek area of analysis is located south of the FTB (Large Figure 8). There will be no Project construction in this area.

A summary of delineated wetlands within the Second Creek area of analysis, classified by Reference (13) wetland community type, is provided in Table 3-8.



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Table 3-8 Wetlands within the Second Creek Area

Eggers and Reed Wetland Community	Second Creek Area (acres)
Coniferous swamp	16.82
Deep marsh	19.57
Hardwood swamp	21.05
Open water (includes deep water, shallow, open water and lakes)	1.29
Wet meadow	1.28
Shallow marsh	106.02
Shrub swamp (includes alder thicket and shrub-carr)	132.88
Total acres of wetland	298.91

A total of 30 wetlands covering 298.91 acres were identified within the Second Creek area of analysis (Reference (10)). The wetlands include alder thicket or shrub-carr (44%), shallow marsh (35%), hardwood swamp (7%), deep marsh (7%), coniferous swamp (6%), wet meadow (less than 1%), and shallow, open water (less than 1%). Of these 30 wetlands, only 22 are unique to the Second Creek analysis area. One of these wetlands is located in the FTB area, and 7 are located in the Colby Lake Pipeline area of analysis. To avoid double counting those areas, the analysis of direct and potential indirect impacts in the Second Creek area (Sections 5.1.8 and 5.2.4) excludes areas that fall within the FTB or Colby Pipeline areas.



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4.0 Methods for Impact Evaluation

The Wetland Work Plan (Attachment A) was approved by the Co-lead Agencies on September 16, 2011 and describes the methods that will be used to identify direct wetland impacts and potential indirect wetland impacts for the Project. The Wetland Work Plan was developed as specified in the Wetland Resources Impact Assessment Planning (IAP) Final Summary Memo and Co-lead Agency Final Work Plan Preparation Guidance of July 1, 2011 (Guidance Document) and the Wetland IAP Work Plan Compiled Comments dated August 30, 2011. Wetland impacts for the Project were previously evaluated for the Draft Environmental Impact Statement (DEIS) (Reference (14)) and included direct, potential indirect, and cumulative impacts. The results of the wetland analysis are presented in Section 5.0.



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5.0 Impact Analysis

5.1 Direct Impacts

For this impact analysis, direct impacts are defined as mining-related activities that result in filling or excavation within the boundaries of a wetland. The analysis performed for the DEIS is described in Section 4.2 of Reference (14). The analysis performed for the Supplemental DEIS duplicates that effort using the revised Project Footprint and using accepted tools and protocols as defined in Attachment A. Wetlands within the Project Footprint were classified using Reference (13) wetland community types. The wetland types and acreages were identified in Reference (9), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

The FTB and the HRF are located within the LTVSMC Permit to Mine Ultimate Tailings Basin Limit boundary. When LTVSMC ceased production in January 2001, the mining related assets were transferred to Cleveland Cliffs, Inc. which formed Cliffs Erie LLC. Wetlands located within the Cliffs Erie LLC (formerly LTVSMC) Permit to Mine Ultimate Tailings Basin Limit boundary, are not regulated by state and federal wetland regulations so are not included in this analysis.

The direct impacts associated with each wetland within the Project areas are shown in Large Table 1. The direct wetland impacts are summarized by wetland type using Reference (13) wetland community types as shown in Large Table 2. Of the 166 wetlands in the Project area, 128 wetlands will be directly impacted, totaling 913.84 acres of direct wetland impact. The Mine Site will contain the majority of direct wetland impacts (83%), followed by the FTB (15%), HRF (less than 1%), Dunka Road and Utility Corridor (less than 1%), and the Railroad Connection Corridor (less than 0.1%). No direct impacts are associated with the Plant Site, the Colby Lake Water Pipeline area, or Second Creek area.

The direct wetland impacts within the Project areas will occur in the following wetland types: coniferous bog (56%), shrub swamp (12%), coniferous swamp (9%), shallow marsh (9%), deep marsh (8%), sedge/wet meadow (4%), hardwood swamp (1%), and open bog (1%).

5.1.1 Mine Site

The Project features within the Mine Site were buffered up to 100 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown in Large Figure 5. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There are 59 directly impacted wetlands located in the Mine Site covering approximately 758 acres (Large Figure 5 and Large Table 2). The total wetlands impacted by direct wetland impact include fill (39%), excavation (24%), or both fill and excavation (37%). Three wetland types comprise 89% of the proposed wetland impacts in the Mine Site and include



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508 acres of coniferous bog (67%), 98 acres of shrub swamp (13%), and 70 acres of coniferous swamp (9%). In addition, 38 acres of sedge/wet meadow (5%), 24 acres of shallow marsh (3%), 12 acres of hardwood swamp (2%), 8 acres of open bog (1%), and deep marsh (less than 1%) will also be impacted.

Approximately 99% of the directly impacted wetlands are rated high quality (Large Table 1). One percent of the directly impacted wetlands are rated as moderate quality with the disturbances in these wetlands related to impoundment and proximity to roads.

5.1.2 Railroad Connection Corridor

The proposed area of disturbance for the Railroad Connection Corridor includes the entire area shown in Large Figure 6. The Project features within the Railroad Connection Corridor were buffered up to 10 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown Large Figure 6. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There are 4 directly impacted wetlands located in the Railroad Connection Corridor covering 0.44 acres (Large Figure 6 and Large Table 2). The type of direct wetland impact is fill (100%). The wetland types that will be directly impacted include shrub swamp (68%), coniferous swamp (16%), and shallow marsh (16%).

All of the wetlands in this area are high quality and have high vegetative diversity/integrity (Large Table 1). These wetlands have been moderately impacted by either a haul road or an existing railroad.

5.1.3 Dunka Road and Utility Corridor

The Project features within the Dunka Road and Utility Corridor were buffered up to 10 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown in Large Figure 7. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There are 21 directly impacted wetlands located in the Dunka Road and Utility Corridor covering 6.76 acres (Large Figure 7 and Large Table 2). The type of direct wetland impact is fill (100%). The wetland types that will be directly impacted include shrub swamp (56%), coniferous swamp (23%), coniferous bog (13%), and shallow marsh (8%).

Some of the wetlands have been previously logged and wetlands in the western half of the corridor are located within areas previously disturbed by mining activities in the former LTVSMC operations. All of the wetlands are of high quality (Large Table 1).



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5.1.4 Plant Site

There are no direct wetland impacts in the Plant Site because no wetlands are present. The constructed Plant Reservoir located east of the Concentrator Building is not regulated as a wetland (Large Figure 8).

5.1.5 Flotation Tailings Basin (FTB)

Wetlands located outside of the Cliffs Erie LLC Permit to Mine Ultimate Tailings Basin boundary but within the FTB are included in the direct wetland impact analysis (Large Figure 9). The wetland in the FTB that is not subject to state and federal regulations includes 0.03 acres of Wetland ID T8.

The Project features within the FTB were buffered up to 25 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown in Large Figure 9. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There will be 43 directly impacted wetlands located in the FTB covering 140.93 acres (Large Figure 9, Large Table 2). The total wetlands impacted by direct wetland impact include fill (29%), excavation (2 %), excavation and fill (2 %), and the FTB Containment System (46%). The wetland types that will be directly impacted include deep marshes (53%), shallow marshes (32%), coniferous swamps (8%), shrub swamps (6%), and fresh/wet meadows (1%).

Wetlands in this area have been disturbed by previous mining activities in the former LTVSMC operations or by impoundments caused by beaver activity throughout the area. All of the directly impacted wetlands are disturbed by impoundment, fill, or ditches, and are low or moderate quality wetlands (Large Table 1).

5.1.6 Hydrometallurgical Residue Facility (HRF)

Wetlands located outside of the Cliffs Erie LLC Permit to Mine Ultimate Tailings Basin boundary but within the HRF are included in the direct wetland impact analysis (Large Figure 10). The wetland in this Project area that is not subject to state and federal regulations includes 28.56 acres of Wetland ID 1155.

The Project features within the HRF were buffered up to 50 feet, then the feature and buffer areas were merged, resulting in the proposed area of disturbance as shown Large Figure 10. Creating a maximum area of potential disturbance for the Project features will avoid underestimating the direct wetland impacts in the Project area.

There are two directly impacted wetlands located in the HRF covering 7.51 acres (Large Figure 10, Large Table 2). The type of direct wetland impact includes fill (100%). The wetland type that will be directly impacted includes shallow marsh (100%) which is currently a low quality wetland (Large Table 1).



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5.1.7 Colby Lake Water Pipeline

There are no direct impacts to wetlands along the Colby Lake Water Pipeline because there will be no construction within this area (Large Figure 11).

5.1.8 Second Creek Area

There are no direct impacts to wetlands within the Second Creek area because there will be no construction within this area (Large Figure 8).

5.2 Potential Indirect Impacts

The analysis of potential indirect wetland impacts was completed based on information in Attachment A. The purpose of this analysis is to provide an estimate of potential indirect wetland impacts. The results of these respective analyses and assessments identify areas to be monitored for potential wetland impacts as part of the monitoring plan that is expected to be implemented as part of the Section 404 permit conditions for the Project.

Potential indirect wetland impacts were assessed based on:

- Changes in wetland watershed areas (during operation and long-term closure);
- Groundwater drawdown resulting from open pit mine dewatering;
- Groundwater drawdown resulting from operation of the FTB including groundwater seepage containment;
- Changes in stream flow near the Mine Site and FTB and associated impacts to wetlands abutting the streams (during operation and long-term closure);
- Wetland fragmentation from Project elements such as open pits, stockpiles, haul roads, etc.; and
- Potential change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and FTB operations.

Each analysis in the above list was completed using the same set of wetlands that were not directly impacted (Section 5.1), therefore there are wetlands that may be potentially indirectly impacted by more than one type of assessed source (e.g., Wetland ID X may be impacted by fragmentation, change in watershed, and groundwater drawdown). Therefore, the potential indirect impacts for each wetland cannot be summed across the analysis as this may result in double-counting acres for a wetland.

The potential indirect wetland impact analysis was completed for the Mine Site Area, the FTB Area, the transportation corridors (railroad and Dunka Road), the Colby Lake Water Pipeline area, and the Second Creek area. Wetlands that were identified as directly impacted



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in Section 5.1 were excluded from this evaluation. No potential indirect impacts are identified within the Plant Site due to the lack of wetlands in this area, or in the HRF, because all wetlands in the HRF are directly impacted.

5.2.1 Mine Site Area

Wetlands were identified within 500-feet increments beginning at the edge of the mine pits and continuing out to a total of 10,000 feet (Large Figure 12). The area of evaluation only included wetlands within Area One (Large Figure 12) where wetland type information has been developed and it did not include wetlands identified as directly impacted (Section 5.1). In addition, wetlands in the Peter Mitchell open pit taconite mine and areas north of this mine were excluded from evaluation as described in Attachment A). Large Table 3 identifies each wetland within each of the 500-feet zones and Large Table 4 provides a summary of wetland types within each 500-feet increment.

5.2.1.1 Potential Indirect Impacts – Wetland Fragmentation

For remaining wetlands not directly impacted (Section 5.1), an estimate of potential indirect wetland impacts from wetland fragmentation by Project features (open pits, stockpiles, haul roads, etc.) was determined based on an analysis of the various factors that may contribute to potential fragmentation. Considerations for determining a wetland fragment impact included: wetland type, source of hydrology, size of remaining wetland, location in the current watershed, location in the future watershed, connectivity to other wetlands, and direction of flow in the area. Wetland fragments in the Mine Site are identified in Table 5-1.

Wetlands were determined to be fragmented and their associated remaining acreage included as a potential indirect wetland impact, for example, if they were small remnants of a directly impacted wetland located between Project features (e.g., in the area between the Category 1 Waste Rock Stockpile and the West Pit).

Approximately 26.4 acres of wetland fragments were identified in the Mine Site (Table 5-1). The majority of the wetland fragments in the Mine Site consist of coniferous bog (79%), followed by alder thicket (14%), coniferous swamp (7%), and sedge meadow (less than 1%).



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Table 5-1 Fragmented Wetlands in the Mine Site

Wetland ID	Eggers and Reed Wetland Community	Total Wetland Size (acres)	Direct Impact (acres)	Potential Indirect Impact (acres)
20	Sedge meadow	17.06	16.96	0.10
32	Coniferous bog	73.36	70.99	2.37
45	Alder thicket	37.55	28.83	3.58
48	Coniferous bog	89.16	27.8	1.86
51	Alder thicket	7.47	7.45	0.02
52	Alder thicket	3.88	3.88	<0.01
55	Alder thicket	3.91	3.85	0.06
57	Coniferous swamp	78.06	50.49	1.41
68	Coniferous swamp	23.81	10.89	0.09
77	Coniferous bog	13.01	0.92	<0.01
80	Coniferous bog	0.29	0.22	0.08
81	Coniferous swamp	1.68	1.44	0.24
82	Coniferous bog	62.4	60.77	1.63
86	Coniferous bog	2.47	2.46	0.01
97	Coniferous bog	4.46	2.57	1.89
98	Coniferous bog	15.5	15.07	0.42
100	Coniferous bog	176.19	102.96	3.44
101	Coniferous bog	14.21	11.73	0.08
103	Coniferous bog	118.84	109.97	8.86
104	Coniferous bog	3.57	3.47	0.10
107	Coniferous bog	40.92	31.63	0.10
107A	Coniferous swamp	1.74	1.69	0.05
Total acres of we	etland	789.54	566.04	26.39



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5.2.1.2 Potential Indirect Impacts – Change in Hydrology

5.2.1.2.1 Potential Indirect Impacts – Change in Hydrology due to Change in Watershed Area

Potential for indirect impacts to wetland acreage not directly impacted (Section 5.1) due to change in watershed area were assessed by evaluating the change in watershed area per acre of wetland. Watersheds were defined for each wetland within the Mine Site boundary as well as wetlands outside the Mine Site with watershed area that may be impacted by Project features. Wetland and watershed areas were determined for the following conditions: existing conditions, during operations when the maximum amount of watershed has been removed (i.e., maximum Project extent), and at long-term closure. The analysis was completed using the following steps:

- The watershed area is defined as the sum of the upland area and the wetland area within each watershed. For each wetland in the Mine Site Area, GIS was used to determine the upland area (acres) and wetland area (acres) within each watershed area (acres). Using these acreages, the percentage of a wetland within its watershed was calculated.
- The tributary acres per wetland acre were determined as a proportion of the watershed area (acres) to the wetland area (acres).
- The equivalent watershed yield (acre-feet/year (ac-ft/yr)) was determined for the existing, maximum operational extent, and long-term closure conditions. The average net precipitation rate is 11.77 inches/year, as calculated using the Partridge River streamflow data (Reference (15)). This rate was applied to each watershed to convert the tributary ratio in Step 2 to an equivalent flow (expressed as ac-ft/yr per acre of wetland) and an equivalent yield (expressed as inches/year).
- The change in the equivalent yield (inches/year) estimated over the life of the Project was evaluated relative to existing conditions equivalent yield to calculate a maximum percent change in yield. The change was compared to the range in observed yield estimated from USGS flow data of the Partridge River watershed for the historical period 1978-1988 (USGS gage 04015475).

The existing conditions include the wetlands which represent the existing, relatively undisturbed conditions in the Mine Site Area. Large Table 5 identifies the acreage for each wetland and its associated watershed for the existing conditions. This analysis includes wetlands and associated watersheds that are partially or completely within the Mine Site boundary. There is a total of 3,325 acres of wetlands within 6,287 acres of watershed; this results in about 53% of the analysis area covered by wetlands.

During operations, some watershed areas may be directly impacted by the Project and will no longer be considered as a tributary area to the wetland. Additionally, wetland areas may be



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directly impacted by the Project. As a result, the amount of water potentially contributed by the watershed to support the hydrology of the remaining wetlands may also change. Large Table 5 identifies the acreage for each wetland and its associated watershed for the operational conditions.

There were 20 wetlands that show an increase or decrease of greater than 20% equivalent yield which were identified as potentially indirectly impacted ¹. Ombrotrophic coniferous bogs and open bogs, identified in Large Table 5 were not included in the total wetland acreage because their hydrology is supported by precipitation and not dependent on the size of the watershed. There are 11 wetlands (totaling approximately 35 acres) that have the potential to experience an increase in yield per wetland acre of greater than 20% and 9 wetlands (totaling approximately 15 acres) that may experience a decrease in yield per wetland acre in excess of 20% (Large Table 5; Large Figure 13).

The 49.39 acres of potentially indirectly impacted wetland types include alder thicket (52%), coniferous swamp (34%), minerotrophic coniferous bog (8%), shallow marsh (6%), and sedge meadow (less than 1%).

During reclamation, a portion of the wetlands and wetland watersheds within the Mine Site will be restored to the existing condition. Large Table 5 identifies the acreage for each wetland and its associated watershed for the long-term closure conditions.

5.2.1.2.2 Potential Indirect Impacts – Changes in Hydrology – due to Drawdown

Suggested guidelines for potential wetland indirect impact zones resulting from changes in hydrology associated with the proposed mine development were provided by John Adams, ERM on February 26, 2011 (Reference (16)). Those suggested guidelines were supported by a 2009 position paper by the MDNR (Reference (17)), which provided a scientific analysis and analog data from other sites along the Mesabi Iron Range. The suggested potential impact zones were modified slightly by the Wetland IAP Group and the modified potential impact zones are referenced in Attachment A. The use of the potential impact zones referenced in Attachment A, as supported by the analog information referenced above, is a reasonable approach to estimating potential indirect wetland impacts resulting from hydrologic effects but is likely to overestimate the potential wetland impacts.

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¹ The +/-20% threshold was used to assess impacts to wetland hydrology based on the direction of the Co-Lead Agencies to use this threshold to assess hydrologic changes to surface water resources downstream of the project, including streamflow. The +/-20% threshold, as used for streams, is referenced in in the USEPA's proposed determination on the Pebble Mine in Alaska; that document states: "A compilation of research from around the world indicates that, regardless of geographic location, daily streamflow alterations of greater than 20% can cause major changes in the structure and function of streams (Reference (51))."



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Analog Data

This section discusses the justification for the use of the analog data (Reference (16)) "based upon comparisons of the existing regional and site-specific geologic data (such as bedrock faults, bedrock joint systems, bedrock topography, glacial till hydraulic conductivities, etc.), site-specific engineering controls such as the Category 1 Waste Rock Stockpile Groundwater Seepage Containment System, and the geologic settings of the analog information sites and the Mine Site" per Attachment A.

The analog data was used in place of a numerical model such as MODFLOW, which cannot practically be used to estimate potential indirect wetland impacts at the Mine Site, due to the complex mix of fractured bedrock, glacial deposits, and wetland soils at the Mine Site (Reference (17)) and therefore cannot be used to accurately assess the potential indirect impacts of pit dewatering on wetlands. As stated in Reference (17), previous versions of the MODFLOW model assumed that homogenous vertical and horizontal hydraulic conductivities were present within each model unit (i.e., bedrock, glacial deposits, and wetland soils), which is not the case at the Mine Site. Since the Adams and Liljegren position paper (Reference (17)) was issued, the MODFLOW model calibration was updated and the surficial deposits are represented as heterogeneous in the horizontal direction (Attachment B of Reference (15)). Despite the addition of heterogeneity to the MODFLOW model, the purpose of the model is to provide estimates of groundwater inflow rates to the pits. The model is not intended to represent the complex, localized heterogeneity that will likely exert a significant influence on whether potential indirect wetland impacts will occur.

The hydraulic properties of the bedrock and surficial deposits have been estimated at the Mine Site by a variety of methods, including conducting aquifer tests and using grain-size distribution data from soil borings. The range of hydraulic conductivities are as follows:

- Based on aquifer tests, the hydraulic conductivity of the unconsolidated deposits range from 0.012 to 31 feet/day (Reference (15)). Analysis of grain-size distribution data yielded a range of hydraulic conductivity estimates from 2 to 167 feet/day (Attachment B of Reference (15)).
- The hydraulic conductivity of bedrock of the Duluth Complex ranges from 0.00026 to 0.041 feet/day as measured by single well tests conducted in boreholes (Reference (15)).
- The hydraulic conductivity of bedrock of the Virginia Formation ranges from 0.0024 to 1.0 feet/day as measured by conducting four pumping tests (Reference (15)).
- Undecomposed, surface peat soils have hydraulic conductivities of up to several feet per day (Reference (17)).
- Deep, more decomposed peat layers have hydraulic conductivities on the order of 0.0028 feet/day (Reference (17)).



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Because there is such a wide range in hydraulic conductivity within the natural geologic formations at the Mine Site, each model layer would contain widely variable hydraulic conductivities. Therefore, it is not realistic to model the expected effects of mine dewatering on wetlands in a meaningful fashion.

The Canisteo Pit analog site provides a clear example of how MODFLOW modeling cannot be expected to accurately estimate conditions in areas with highly variable, complex geology. In the Canisteo Pit modeling effort, the difference between simulated and measured water levels ranged from +28 feet to -4 feet and clearly could not accurately estimate water level changes of a few feet or less as would be necessary for estimating wetland impacts resulting from hydrologic changes (Reference (17)).

The low hydraulic conductivities result in most water movement in peat wetlands occurring horizontally in the upper layers of peat. The deeper, more decomposed peat soils limit vertical seepage because of the low hydraulic conductivities (~0.0028 feet/day) (Reference (17)). Increased vertical seepage will not be induced by the lowering of groundwater below such a peat layer, the wetland hydrology is simply perched on the impermeable peat layer as in many perched wetlands with no underlying groundwater. Therefore, hydrologic impacts to peat wetlands have only been observed to occur within 1,000 feet from the edge of the mine pits.

Vertical seepage losses from wetlands without peat soils will only have the potential to occur in isolated areas of contiguous, high hydraulic conductivity bedrock faults and fracture zones located under isolated areas of high hydraulic conductivity glacial till and aligned with wetlands containing high hydraulic conductivity soils. The probability of these three features aligning on a broad scale is extremely low (Reference (17)).

The geologic and hydrogeologic settings of the Mine Site and the analog sites are relatively similar with a thin veneer of heterogeneous unconsolidated deposits underlain by fractured bedrock. The hydraulic conductivity of the unconsolidated deposits and bedrock are lower at the Mine Site than at the analog sites, so it is expected that the stated impact zones will likely overestimate the extent of potential wetland impacts (Attachment A). In addition, due to the thin, discontinuous nature of the surficial deposits at the Mine Site, drawdown effects are expected to be more localized at the Mine Site than at the analog sites. The numerous bedrock outcrops present at the Mine Site are also expected to act as barriers to flow in the unconsolidated aquifer, thereby limiting the area of influence of the pit. The analog sites have fewer or no bedrock outcrops compared to the Mine Site. Finally, the presence of the Partridge River approximately 4,000-6,000 feet south (downstream) of the mine pits, is likely to act as a natural barrier to the expansion of the cone of depression within the surficial aquifer in the zone from 3,500-10,000 feet from the pit.

Prior to conducting the analysis to identify potential indirect wetland impacts resulting from changes in hydrology, bog wetlands within and surrounding the Mine Site were reclassified as either ombrotrophic or minerotrophic consistent with the November 2011, USACE Memorandum (Reference (18)). For purposes of addressing potential indirect impacts for the



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Project, the Wetlands Workgroup recommended that wetlands identified as open bog or coniferous bog, using the Eggers and Reed (Reference (13)) classification system, should be subcategorized as either ombrotrophic or somewhat minerotrophic. This is important because ombrotrophic bogs would likely not be impacted by groundwater drawdown associated with dewatering during the Project, whereas more minerotrophic bogs would have a higher likelihood of being impacted (Reference (18)). Using a conservative approach for the analysis (i.e., one that errs on the side of estimating greater wetland impacts), all bog communities within 0-1,000 feet from the edge of the mine pits were categorized as Low Likelihood of wetland hydrology impact.

Wetlands are identified within four analog impact zones located within 0-1,000 feet, >1,000-2,000 feet, >2,000-3,500 feet, and >3,500-10,000 feet from the edge of the mine pits within Area One (Large Figure 14). Based on Attachment A, wetlands that are located within multiple analog impact zones are included in the analog impact zone that is closest to the edge of the mine pits. The likelihood of wetland hydrology impact is categorized as High, Medium, Low, and No Impact within the analog impact zones. The acreage of each wetland type within these potential impact zones is summarized in Large Table 6 and locations are shown in Attachment B, Large Figures B-1 to B5. Using this analysis, there are 1,328 acres of wetlands in the 0-1,000 feet zone (Large Figure B-2), 619 acres in the >1,000-2,000 feet zone (Large Figure B-3), 1,162 acres of wetlands in the >2,000-3,500 feet zone (Large Figure B-4), and 2,718 acres of wetlands in the >3,500-10,000 feet zone (Large Figure B-5) beyond the edge of the pits.

Large Figure B-5 shows the 5,827 acres of wetlands within these zones, with the likelihood of wetland hydrology impact categorized as: No Impact - 3,679 acres of wetlands (63%); Low Likelihood - 750 acres of wetlands (13%); Moderate Likelihood - 531 acres of wetlands (9%); and High Likelihood - 867 acres of wetlands (15%) (Large Table 6). Within 0-10,000 feet from the edge of the mine pits, wetland types with a High Likelihood of wetland hydrology impact include alder thicket (848 acres), coniferous swamp (19 acres), and sedge/wet meadow (less than 1 acre); with a Moderate Likelihood include alder thicket or shrub-carr (327 acres), coniferous swamp (195 acres), deep marsh (5 acres), shallow marsh (3 acres), and hardwood swamp (less than 1 acre); and with a Low Likelihood include coniferous swamp (223 acres), coniferous bog (453 acres), alder thicket or shrub-carr (68 acres), shallow marsh (4 acres), sedge/wet meadow (2 acres), and hardwood swamp (less than 1 acre).

The wetlands categorized as High Likelihood are dominated by one alder thicket (824 acres; wetland ID 53D) that has approximately 4 acres (less than 1%) within the 0-1,000 feet analog impact zone. The remainder of this wetland (more than 99%) is located more than 1,000 feet away from the edge of the mine pits and extends out to the edge of Area One (Large Figure B-1). Based on the analog data, hydrologic impacts to peat wetlands are only observed to occur within 1,000 feet from the edge of the mine pits. Therefore, wetlands were categorized within the analog impact zones using an alternate method to determine the likelihood of wetland hydrology impact. For this method, wetlands that are located within



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multiple analog impact zones are split along zone edges and acreage is calculated by zone. As a result, the acreage for wetlands crossing zone edges is split among multiple zones, rather than included in the analog impact zone that is closest to the edge of the mine pits (Attachment B, Large Figures B-1 through B5). The acreage of each wetland type within these potential impact zones is summarized in Large Table 7 and locations are shown in Attachment B, Large Figures B-6 through B10. Using this analysis, there are 234 acres of wetlands in the 0-1,000 feet zone (Large Figure B-7), 311 acres in the >1,000-2,000 feet zone (Large Figure B-8), 718 acres of wetlands in the >2,000-3,500 feet zone (Large Figure B-9), and 4,564 acres of wetlands in the >3,500-10,000 feet zone (Large Figure B-10).

Large Figure B-10 shows the 5,827 acres of wetlands within these zones, with the likelihood of wetland hydrology impact categorized as: No Impact - 5,094 acres of wetlands (87%); Low Likelihood - 568 acres of wetlands (10%); Moderate Likelihood - 119 acres of wetlands (2%); and High Likelihood - 46 acres of wetlands (1%) (Large Table 7). Within 0-10,000 feet from the edge of the Mine Pits, wetland types with a High Likelihood of wetland hydrology impact include alder thicket (27 acres), coniferous swamp (19 acres), and sedge/wet meadows (less than 1 acre); with a Moderate Likelihood include alder thicket and shrub-carr (96 acres), coniferous swamp (14 acres), deep marsh (5 acres), shallow marsh (3 acres), and hardwood swamp (less than 1 acre); and Low Likelihood include alder thicket and shrub-carr (247 acres), coniferous swamp (135 acres), coniferous bog (179 acres), shallow marsh (4 acres), sedge/wet meadow (2 acres), and hardwood swamp (1 acre).

Qualitative Discussion

This section includes the general discussion regarding potential indirect wetland impacts that might occur based on hypothetical hydrologic drawdown levels using the hydrologic wetland sensitivity method as described in Attachment A. The potential indirect wetland impacts may include: conversion to other wetland community types, a change in vegetation without a change in community type, conversion to uplands, or other impacts.

Three categories of hydrologic wetland sensitivity, each with associated groundwater drawdown levels for each wetland community type, were defined as follows:

- None-to-Slight: Water level changes in which impact on the community will be slight to none with the potential for slight changes in abundance of various species but no change in species present. Monitoring or mitigation not anticipated.
- **Moderate**: Water level changes that may have a moderate impact on the wetland community with the potential for the loss and addition of some species. Monitoring recommended with mitigation based on monitoring results.
- **Severe**: Water level changes expected to result in severe impacts on the community with the potential for considerable loss of characteristic plant species and invasion by other species, conversion of wetland type or conversion to upland. Monitoring should



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be conducted and mitigation may be required. According to the hydrologic wetland sensitivity method, wetlands in which groundwater is not the principal source of water and in which mitigation of surface water is planned (e.g., streamflow augmentation) should be excluded from this category.

The wetland community sensitivity and estimating of changes to wetland communities as a result of groundwater drawdown for the hydrologic wetland sensitivity method were determined based on evaluating the vegetation characteristics of numerous Minnesota wetlands contained in the MDNR Natural Heritage Information System (NHIS) database (Attachment A). That data was used to develop an ordination, which groups wetlands within the various native plant community system groups (Reference (19)) reflecting differences in the degree of wetness of each community. However, the degree of wetness and the source of wetness information were not well-documented so it is unclear if the wetness parameter is related to persistence of wetness throughout the growing season, the typical maximum depth of water within the wetland, or some other wetness characteristic.

That ordination was then used to estimate how wetland communities will respond to decreasing water levels, with the main assumption that wetlands will move to the drier part of the ordination. The three categories of potential impact to the wetland communities were defined as None-to-Slight, Moderate, or Severe. The method states that the changes in the wetland communities associated with the Severe category are less valid for estimating vegetation changes than wetland communities included in the Moderate or None-to-Slight categories (Attachment A). Therefore, the hydrologic wetland sensitivity method simply estimated how wetland communities will respond to groundwater drawdown by assuming that they will change to drier native plant communities or variants of the original community. No data or research was utilized from actual wetlands responding to groundwater drawdown so this analysis and related data should only be used as an initial estimate of what changes might be expected should groundwater levels actually fall as a result of the proposed mining activities. Monitoring of hydrology and vegetation within potentially impacted wetlands represents the best method for documenting actual community changes resulting from hydrology changes, understanding complex hydrologic conditions, and identifying potential future indirect impacts related from mine features.

The preliminary information developed for the hydrologic wetland sensitivity method was utilized to estimate what type of wetland impacts might occur at the Mine Site assuming various, theoretical groundwater drawdown levels. Large Table 8 provides a summary of the estimated wetland community changes using the groundwater drawdown thresholds for each wetland type as indicated in the hydrologic wetland sensitivity method (Attachment A). The hydrologic wetland sensitivity method did not evaluate shallow marsh, deep marsh, or shallow open water communities, so the groundwater breaks and estimated community changes were developed based on past experience and professional judgment.



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5.2.1.2.3 Quantification of Potential Indirect Impacts due to Change in Hydrology

Large Table 8 shows that for minor groundwater drawdown, ranging from 0.5 feet to 2 feet for the various wetland communities, no substantial wetland community changes are identified. In the moderate impact sensitivity category with water level changes ranging from 0.5 feet to 4 feet, some changes to vegetation are possible in all wetland communities with marshes, open water, and meadow communities potentially resulting in conversion of wetland type and increased shrub and tree growth in shrub and forested wetlands. In the severe impact sensitivity category, nearly all wetland community types are estimated to convert to other wetland types with a few wetlands estimated to convert to upland, including meadow wetlands and possibly hardwood swamps. Monitoring to document impacts to wetlands is recommended for all potential impacts in the moderate and severe impact categories.

Because groundwater modeling cannot reasonably estimate potential indirect wetland impacts, Attachment A concluded that analog impact zones can provide a reasonable estimate of the areal extent of potential indirect wetland impacts resulting from hydrologic effects. In addition, the evaluation of theoretical groundwater drawdown levels can help estimate what types of potential indirect wetland impacts might occur. However, wetland hydrology is a complex mix of precipitation, surface runoff, and in some cases, groundwater. The response of complex natural systems to human disturbances can only be estimated. Therefore, monitoring of wetland hydrology and vegetation communities is the best way to document the extent and magnitude of wetland responses (potential indirect impacts) to human disturbances.

5.2.1.3 Potential Indirect Impacts – Wetlands Abutting the Partridge River

Wetlands abutting the Partridge River within Area One (Large Figure 3) are identified by wetland ID, wetland type using the Eggers and Reed (Reference (13)) wetland community types, and acreage in Table 5-2. There are approximately 1,478 acres of wetlands which include alder thicket or shrub-carr (86% of total acres), coniferous bog (13% of total acres), and shallow marsh (1% of total acres).

Table 5-2 Wetlands Abutting the Partridge River

Wetland ID	Eggers and Reed Wetland Community	Wetland Size (acres)
53D	Alder thicket	885.97
315	Alder thicket or Shrub-carr	322.84
678	Alder thicket	58.42
691	Alder thicket	6.23
708	Shallow marsh	3.92



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Wetland ID	Eggers and Reed Wetland Community	Wetland Size (acres)
709	Shallow marsh	8.14
888	Coniferous bog	192.96
Total acres of wetland		1,478.48

The XP-SWMM model identified that the changes in average annual flow (and therefore stage) of the Partridge River will be within the naturally occurring annual variation for the Partridge River (Reference (15)). Therefore, no potential indirect wetland impacts are identified for the wetlands abutting the Partridge River.

5.2.1.4 Potential Indirect Impacts – Water Quality Changes

5.2.1.4.1 Fugitive Dust / Metals and Sulfide Dust Emissions

As described in Attachment A, a screening analysis was conducted that estimated potential annual deposition of dust, metals, and sulfur to wetlands within and adjacent to the proposed Mine Site and the FTB, respectively, from fugitive dust emissions. Note that this section discusses only the Mine Site and the FTB, unlike other subsections of 5.2.1. Emission rates and particle size distributions were based on total particulate matter. The estimated deposition from fugitive dust emissions is then used to identify those wetlands that have the potential for water quality changes (e.g., potential for water chemistry changes related to sulfide dust deposition).

The potential additions of dust, metals, and sulfur to wetlands from fugitive dust emissions at the Mine Site and the FTB were estimated using air dispersion/deposition modeling. The estimated inputs of the dust, metals, and sulfur to wetlands were evaluated for significance to potential changes in water quality. Specific components of the analysis identified in Attachment A are summarized below.

Sources of Fugitive Dust and Estimated Air Emissions

Sources of dust to be modeled at the Mine Site and at the FTB are identified in Table 5-3 and include the sources specified in Attachment A. One model run was conducted for each area – the Mine Site and the FTB. Each respective model run provided an estimate of potential dust deposition from a number of general fugitive dust sources. The source grouping function within the AERMOD model was used to identify the different sources of metals and sulfur.



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Table 5-3 **Emission Sources Modeled in the Assessment of Potential Indirect Wetland** Impacts Related to Deposition of Dust, Metals, and Sulfur

Fugitive Dust Source ⁽¹⁾	Mine Site Modeling for Dust	Mine Site Modeling for Metals and Sulfur	FTB Modeling for Dust	FTB Modeling for Metals and Sulfur
Overburden and other construction rock screening and/or crushing	Included	Excluded	n/a	n/a
Loading/unloading of tailings from the former LTVSMC operations and construction of dams	n/a	n/a	Included	Included
Dust generation from traffic on unpaved roads at the ground surface (not in mine pits)				
Roads made of general construction material	Included	Excluded	Included	Excluded
Roads made of LTVSMC Tailings	n/a	n/a	Included	n/a ⁽⁴⁾
Handling activities associated with ore and waste rock outside of the pits, includes truck loading and unloading outside of the pits. Activities related to:	Included	Included	n/a	n/a
Category 1 waste rock stockpile	Included	Excluded	n/a	n/a
Category 2/3 waste rock stockpile	Included	Included	n/a	n/a
Category 4 waste rock stockpile	Included	Included	n/a	n/a
Rail car loading (RTH (ore))	Included	Included	n/a	n/a
Rock handling and roads within the pits(2)	Excluded	Excluded	n/a	n/a
Wind erosion				
From stockpiles(3)	Excluded	Excluded	n/a	n/a
From beaches consisting of Flotation Tailings	n/a	n/a	Included	Included
From dams constructed of LTVSMC tailings	n/a	n/a	Included	Included

n/a = not applicable

(1) sources as identified in Attachment A

⁽²⁾ Fugitive dust sources excluded from the analysis per Attachment A include rock handling and roads within the pits as these emissions are expected to be trapped within the respective pits and have minimal contribution to estimated air concentrations.

⁽³⁾ The potential for wind erosion from the stockpiles was evaluated as part of the air emissions inventory and it was determined that wind erosion will not occur through the use of USEPA approved wind erosion calculations procedures in Section 13.2.5 of Reference (20).

(4) General road construction material assumed to be laid over the top of the LTVSMC tailings.



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Potential fugitive dust emissions from the specified sources were calculated based on the following information:

- Particulate matter as Total Particulate Matter (TPM); particles smaller than about 20 to 50 μm (microns) in aerodynamic diameter.
- Current Mine Site layout; Mine Year 8 and Mine Year 13.
- Expected operations at the FTB (e.g., dam construction, wind erosion)

At the Mine Site, the material handling emissions occurring on the stockpiles and at the RTH were modeled as surface-based volume sources. The stockpile volume source dimensions were based on a typical haul truck height of 30 feet and a dumping zone side length of 197 feet, similar to the particulate emissions modeling conducted for Class II areas (Reference (21)).

The RTH volume source parameters were also identical to the parameters used in the particulate modeling conducted for Class II areas (Reference (21)).

For the Class II modeling for the Mine Site (Reference (21)), the maximum emissions were identified to occur in Mine Year 8 and Mine Year 13. Emissions from both years were modeled for this assessment.

For the FTB, the emissions and modeling were based in part on the assumption that non-reactive road construction material will be used to construct a roadbed on top of the LTVSMC tailings and that haul trucks will not be travelling on roads made from LTVSMC tailings.

Modeling with AERMOD in Deposition Mode

Modeling was conducted with the AERMOD model (version 12060) in deposition mode with plume wet and dry depletion to estimate annual particle deposition. Surface meteorological data used in the modeling are for Hibbing, Minnesota (2006-2010) and upper air meteorology from International Falls, Minnesota. Meteorological data were processed using AERMET (version 11059). See Class II Modeling Protocol (Reference (21). Each year of meteorological data was modeled individually and the highest estimated dust deposition rate for each receptor node was brought forward into the mapping of deposition isopleths.

Deposition modeling with AERMOD requires inputs for particle size, particle density, and mass fraction within each particle size category. The modeling for this assessment used one particle size (30 microns) and a particle density of 2.7 grams per cubic centimeter (g/cm³), which is consistent with inputs used for Class II air modeling.



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Receptors

The receptors of interest for this analysis are the wetlands that are not identified as directly impacted (Section 5.1). The respective initial receptor grids for the Mine Site and FTB were set up with near-field and far-field spacing. For the Mine Site, the near-field receptor spacing was 250 meters (within the ambient air boundary and out to 1,000 meters beyond the ambient air boundary). The far-field receptor spacing was 1,000 meters (from 1 kilometer out to 5 kilometers from the ambient air boundary). For the FTB, the near-field receptor spacing was 250 meters within the ambient air boundary. The far-field receptor spacing was 1,000 meters from the ambient air boundary out to 5 kilometers.

At both the Mine Site and the FTB, the fine grid (i.e., near-field grid) receptor spacing of 250 meters generally had at least one receptor being located over the wetlands within the property boundary and out to 1 kilometer beyond the property boundary (Large Figure 15 and Large Figure 16). However, for the area encompassed by the fine grid, a visual check was made using GIS mapping tools to ensure that wetland areas encompassed by the fine grid had at least once receptor within their boundaries. Additional receptors were then included in the grid such that at least one receptor node was specifically located within the area of each wetland. For the coarse grid (i.e., far-field grid), the specific assignment of a receptor to a wetland area was not done for either the Mine Site or the FTB Area. A visual review (again using GIS mapping) identified that most wetland areas for the coarse grid had a receptor within their respective boundaries or relatively close to them. In other words, the coarse grid receptor spacing of 1,000 meters provided good coverage of the wetland areas. In addition, initial modeling of dust deposition identified that deposition rates changed very little beyond about 1 kilometer from the ambient air boundary. Based on these two pieces of information, it was determined that for those wetland areas covered by the coarse grid that did not have a receptor within their respective area, the modeled deposition at the nearest receptor would be used.

Dust Deposition and Speciation to Individual Metals and Sulfur

For the general dust emission sources identified in Table 5-3, total particulate emissions on an annual basis were modeled for the Mine Site and the FTB, respectively. Each year of meteorological data (5 years in total) were modeled individually. The estimated annual dust deposition rate (grams per square meter; $g/m^2/yr$) for each receptor node for each modeled year was then post-processed in a calculation spreadsheet to identify the highest estimated dust deposition rate for each receptor node.

For the dust emission sources identified for assessing potential metals and sulfur deposition at the Mine Site and the FTB, respectively, the highest estimated dust deposition rate for each receptor node was then speciated to the respective metal and sulfur deposition rates based on the contribution of the sources to a receptor node and the metal and sulfur composition identified for each contributing source (ore and waste rock at the Mine Site and tailings at the FTB). The estimated metal or sulfur deposition for each contributing dust



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source at a receptor node was then summed to provide a "total" deposition rate for each respective metal and for sulfur at that receptor location.

Dust deposition rates were speciated for the following metals: arsenic, cadmium, chromium, lead, manganese, nickel, and selenium (Attachment A). Copper and vanadium were added to the evaluation because background deposition estimates were provided in Reference (22). Attachment C provides the chemical composition of ore, waste rock and tailings used in the dust speciation. The maximum concentration for each metal and sulfur was used in the speciation calculations.

For both the Mine Site and the FTB, for each receptor node, the post-processing of the dust deposition rate by source contribution was then summed to provide a "total" metal deposition rate and a "total" sulfur deposition rate.

The speciation of the model-estimated dust deposition rate to the respective metal and sulfur deposition rates is slightly different from the approach identified in Attachment A; page 6 for the Mine Site; page 10 for the FTB) which identified that "... the total particulate emission rates (grams per second) will be speciated and converted to metals and sulfur emission rates based on data on the chemical composition of each material generating dust. ...". However, with regard to estimating a potential deposition rate for the individual metals and sulfur, there is no difference in the two approaches.

Estimates of Rural Background Deposition

Estimates of rural background deposition rates for dust, metals and sulfur are provided in Table 5-4. The background dust deposition rate is based on an effects-level for vegetation (Reference (23), Reference (24)). Background metal deposition rates are estimated from monitoring data collected at a site near the shore of Lake Superior near Eagle Harbor, Michigan (Reference (22)). The background sulfur deposition rate is from data collected at the Fernberg Road Monitoring Site (National Atmospheric Deposition Program, NADP) near Ely, Minnesota (Reference (25)).

For dust, an annual effects-level deposition rate of 365 grams per square meter (g/m²/yr) is compared to modeled annual dust deposition rates. This deposition rate is a potential effects threshold for photosynthesis (i.e., potential for reduced photosynthesis due to "dusting" of the plant surface) (References (23), Reference (24)). However, for this analysis, the vegetative surface area of the wetlands is not calculated or included in the analysis. The modeled dust deposition rate is assumed to be applied to the land surface area which is a smaller area than the vegetative surface area. Vegetative surface area can be up to 13 times greater than the land surface area (Reference (26)). For example, the ratio of leaf area in a forest compared to the ground surface area ranges from 1.4 to 8.4 and for grasslands it can range from 2.5 to 6.3. By only assessing dust deposition to the land surface area instead of the vegetative surface area, it is likely the ratio of modeled deposition rate to the effects level is being overestimated. In other words, the modeled deposition rate is not being spread over the larger surface area of the vegetation which would reduce the effective deposition rate.



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For example, for a minimally vegetated ground surface with a surface area of $1.4~\text{m}^2$, the deposition of 365 g to the $1.4~\text{m}^2$ of vegetation surface results in deposition rate of 261g/m^2 . Because this application does not include the deposition of dust to the vegetative surface area, it is likely that the areas identified to exceed the effects threshold of $365~\text{g/m}^2/\text{yr}$ has been overestimated.

For metals, background deposition is based on the data from Reference (22). Sweet et al. (Reference (22)) indicated that precipitation was under-collected by 45% to 70% when sample volumes were compared to corresponding rain gage amounts. Because wet deposition was considered to be underestimated, the wet deposition component was adjusted upward by a factor of 1.6 (see Attachment D for calculations). Table 5-4 presents the adjusted total deposition estimates.

Table 5-4 Estimated Background Deposition of Metals and Sulfur

Parameter	Background Deposition Rate (wet + dry)	Units ⁽¹⁾	Comments
Arsenic ⁽⁴⁾	216	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Cadmium ⁽⁴⁾	505	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Chromium ⁽⁴⁾	255	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Copper ⁽⁴⁾	3,520	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Dust ^{(2),(3)}	365	g/m²/yr	Dust from total particulate matter (TPM). A "no effects" deposition rate related to photosynthesis.
Lead ⁽⁴⁾	1,800	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Manganese ⁽⁴⁾	5,580	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Nickel ⁽⁴⁾	938	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Selenium ⁽⁴⁾	572	μg/m²/yr	Selenium deposition as reported in Reference (24).



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Parameter	Background Deposition Rate (wet + dry)	Units ⁽¹⁾	Comments
Sulfur ^{(5),(6)}	0.16	g/m²/yr	Wet deposition estimated from 2007-2011 NADP data (Reference (25)); dry deposition estimated to be 22% of total deposition based on recent estimates from Voyageurs National Park and from Reference (26)).
Vanadium ⁽⁴⁾	385	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Zinc ⁽⁴⁾	10,900	μg/m²/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.

- (1) Units are $\mu g/m^2/yr = microgram$ per square meter per year or $g/m^2/yr = grams$ per square meter per year
- (2) Reference (23)
- (3) Reference (24)
- (4) Reference (22)
- (5) Reference (25)
- (6) Reference (26)

Total background sulfur deposition includes both wet and dry deposition. Background wet deposition rates of sulfate are available from the NADP. The NADP maintains a network of monitors throughout the United States to measure wet deposition and includes several monitors in northeastern Minnesota. The closest monitoring site to Hoyt Lakes is the "Fernberg" site (ID: MN18) near Ely, Minnesota. The average annual wet deposition rate of sulfate over the past five years (2007-2011) at the Fernberg site was estimated (3.75 kg/ha), then converted to sulfur (sulfur is 33% of the sulfate; 1.25 kg/ha), and used as the background estimate for the wet deposition rate.

The Clean Air Status and Trends Network (CASTNET) operates a similar monitoring network for dry deposition and coordinates some sites with the NADP, however, this network does not have a site near Ely. The closest CASTNET site to Hoyt Lakes is in Voyageurs National Park near Sullivan Bay. Dry deposition monitored at this site in Voyageurs National Park indicates that dry sulfur deposition is approximately 19% of total (wet+dry) deposition. A 1991-1993 study (Reference (26)) estimated the percentage of dry deposition to total (wet + dry) deposition for various monitoring sites in Minnesota, including the Fernberg site near Ely (22.2%). This percentage of dry sulfur deposition to total (wet + dry) sulfur deposition (22%; average of three years) was used to estimate a total (wet + dry) background deposition of sulfur in the Hoyt Lakes area.

The calculation for background deposition in g/m²/year, the deposition units in AERMOD, is as follows:



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- average wet deposition of sulfate at NADP monitoring station MN18 = 3.75 kg/ha/yr
- sulfur as a percent of sulfate (SO4) = molecular weight of 32 / molecular weight of 96 = 33%
- sulfur content of wet sulfate deposition = $3.75 \text{ kg/ha} \times 0.33 = 1.25 \text{ kg/ha/yr}$
- percentage of dry deposition to total (wet + dry) sulfur deposition at Ely = 22.2%
- total (wet + dry) deposition of sulfur = wet deposition/(100 % dry)/100 = 1.6 kg/ha/yr
- total background deposition of sulfur = 0.16 g/m²/yr

The estimated background deposition for metals and sulfur is from data collected at sites characterized as open areas in rural settings that are reasonably distant from industrial sources and population centers. Reference (27) identifies that for forested areas, dry deposition may be underestimated. Vegetation can effectively scavenge fine particles and aerosols from the atmosphere and this interception can result in dry deposition being 50% or more of the total deposition. As noted for the Fernberg Road monitoring site, dry deposition is assumed to be 22% of total deposition. It is possible that the background sulfur deposition estimated for this analysis may be low due to an underestimation of dry deposition. However, no adjustments were made to the background sulfur deposition estimated for this analysis.

Significance Levels for Estimating the Potential Effects

For dust, metals, and sulfur, the following breakpoints are used for assessing the significance of a modeled deposition rate at a receptor node:

- < 100% of background: no potential for effects expected
- > 100% of the background value: potential for effects, include in future wetland monitoring

These are general categories of potential for effects. As this is a screening analysis to identify wetlands for potential inclusion in a monitoring program, there is some flexibility in identifying a potential level of deposition that suggests a potential for effect. Another consideration for selecting a deposition rate that is a high percent of the background rates is the likely overestimation of modeled deposition and the underestimation of background deposition. For example, with regard to model-estimated metal deposition, this screening evaluation used a maximum concentration from a range of possible values (see Attachment C for metal and sulfur concentrations) to speciate a maximum estimated dust deposition for a receptor node. Using a maximum metal concentration to speciate a maximum modeled deposition rate for each receptor node likely overestimates individual metal deposition. The underestimation of background metal deposition (i.e., wet deposition due to under-collection



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of precipitation) was identified in (Reference (22)). In addition, wet sulfate deposition may be underestimated as well because the NADP data for the Fernberg Road monitoring site (site MN18 in Reference (25)) indicates rainfall in the last 3 years is about 22% below the annual average. If sulfate deposition from 2007 and 2008 is used (both years approximately normal for precipitation amount), a background sulfur deposition rate of 0.23 g/m²/yr is calculated, about 44% higher than the background deposition used in this screening analysis. Also, Reference (27) identifies that for forested areas, dry deposition may be systematically underestimated due to sample collection and analysis methodology. It is possible that the background sulfur deposition estimated for this analysis may be low due to an underestimate of dry deposition.

Given the potential for overestimation of modeled deposition and underestimation of background deposition, and balancing the conservatism when their respective results are combined in this analysis, it seems reasonable to select the wetlands estimated to receive greater than 100% of background deposition (a potential doubling of the background deposition) for consideration in potential future monitoring.

Results (Modeled Deposition Rates Compared to Background Values

Model results in the form of isopleths where model-estimated deposition exceeds background deposition (i.e., modeled deposition is greater than 100% of background deposition) are overlain on the wetlands. For this screening analysis, the maximum extent of potential for effects on the wetlands for dust are presented and then for metals and sulfur at the Mine Site and the FTB, respectively. The model results for the individual metals and sulfur are not presented here, only the maximum area having the potential for effects from one or more the dust constituents.

Dust Deposition

At the Mine Site, dust deposition is concentrated relatively close to the ore loading pocket near the southern portion of the ambient air boundary (Large Figure 17). All receptors have model-estimated dust deposition of 25% or less of the effects-level background of 365 g/m²/yr.

At the FTB, dust deposition is highest in three locations: southwest corner, northwest of the Plant Site; southeast corner; and the northeast corner, towards Area 5. All receptors have model-estimated dust deposition of 50% or less of the effects-level background of 365 g/m²/yr (Large Figure 18).

Overall, model-estimated dust deposition is largely constrained to within the respective ambient air boundaries at the Mine Site and at the FTB and model-estimated deposition is 50% or less of the effects-level background dust deposition.



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Metals and Sulfur Deposition

The highest model-estimated metal and sulfur deposition at the Mine Site are in two defined areas: 1) near the ore loading pocket; and 2) at the east end of the Category 2/3 Waste Rock Stockpile near the eastern portion of the ambient air boundary (Large Figure 19). All of the receptor nodes with the highest model-estimated deposition rates (deposition rates greater than 100% of background) are located within the ambient air boundary.

At the FTB, there are two locations showing model-estimated deposition rates greater than 100% of background deposition: 1) approximately the southern and western two-thirds of the basin; and 2) a small area on the northern and eastern portion of the ambient air boundary (Large Figure 20). Approximately 90% of the receptor nodes with the highest model-estimated deposition rates (rates greater than 100% of background deposition) are located within the ambient air boundary. The remaining 10% of the receptor nodes with the highest-modeled deposition are located to the south and east of the FTB outside of the ambient air boundary.

Summary and Conclusions

There are 19,914 acres of wetlands identified within the receptor grid at the Mine Site. The deposition modeling results indicates that 1.1% of the wetlands within the receptor grid area are identified for consideration in future monitoring. There are 234 acres of wetland potentially indirectly impacted (modeled metal deposition greater than 100% of background), with 228 acres (97%) of the wetlands located within the Mine Site ambient air boundary. Based on the modeling results, approximately 234 acres of wetlands in the Mine Site Area are identified for potential inclusion in future monitoring.

At the FTB, there are 25,846 acres of wetlands identified within the receptor grid. Wetland ID 1155 in the HRF Area, which is not subject to state and federal regulations (Section 5.1.6), and a deepwater pit area located south of the FTB were not included in the total wetland acreage. The deposition modeling results indicates that 0.7% of the wetlands within the receptor grid area are identified for consideration in future monitoring. There are 194 acres of wetland potentially indirectly impacted (modeled metal deposition greater than 100% of background), with 59 acres (31%) of the wetlands located within the FTB ambient air boundary. Based on the modeling results, approximately 194 acres of wetlands in the FTB Area are identified for potential inclusion in future monitoring.

The deposition modeling results for dust, metals and sulfur do not indicate or suggest a degree of impact or that adverse effects will be expected to occur. The modeling only indicates those areas that were estimated to have deposition rates greater than 100% of background deposition. These specific wetland areas are identified for consideration in any future monitoring to be conducted for the Project.



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5.2.1.4.2 Ore Spillage

See Section 5.2.3.2.1 for a discussion of potential indirect wetland impacts as related to ore spillage along the transportation corridors.

5.2.1.4.3 Leakage from Stockpiles/Mine Features and Seepage from Mine Pits

The stockpiles, mine pits, and other mine features (e.g., WWTF) are located within the Partridge River watershed. Water containing constituents generated in the waste rock stockpiles and mine pits has the potential to enter the shallow groundwater system via potential leakage from the liners (stockpiles and WWTF equalization basins) or seepage from the pits (Reference (15)). The leakage or seepage that enters groundwater will then be transported toward the Partridge River along groundwater flow paths. The Groundwater IAP process identified five such groundwater flow paths connecting the mine features to the Partridge River. These flow paths are being considered in the assessment of potential groundwater quality impacts (Reference (15)). The five flow paths are described in (Reference (15)) and include: East Pit – Category 2/3 flow path, Ore Surge Pile (OSP) flow path, WWTF flow path, Overburden Storage and Laydown Area (OSLA) flow path, and West Pit flow path. Because the water quality within these flow paths has the potential to change as a result of the Project, these same flow paths are considered in the assessment of potential indirect wetland impacts associated with leakage or seepage from mine features.

Wetlands within the groundwater flow paths were identified by wetland type using the Eggers and Reed (Reference (13)) wetland community types and acreage in Large Table 9. There are approximately 516 acres of wetlands, which include alder thicket or shrub-carr (56% of total acres), coniferous bog (33% of total acres), coniferous swamp (6% of total acres), open bog (2% of total acres), shallow marsh (2% of total acres), deep marsh (1% of total acres), and sedge/wet meadow (less than 1% of total acres).

Bog wetlands within and surrounding the Mine Site were reclassified as either ombrotrophic or minerotrophic consistent with the November 2011, USACE Memorandum (Large Table 10; Reference (18)). Other wetlands were classified as dominated by groundwater, although all wetlands receive precipitation and, as stated in Section 5.2.1.2.2, virtually all water movement in peat wetlands occurs horizontally in the upper layers of peat. Approximately 66% of the wetlands within the flow paths are classified as dominantly groundwater-fed while 34% of the wetlands are supported only by precipitation (Large Table 9).

The Partridge River currently represents the primary discharge location for shallow groundwater at the Mine Site. During operations, reclamation and long-term closure, groundwater in areas south of the mine pits will continue to discharge to the Partridge River while groundwater in areas north of the mine pits will discharge to the pits. The amount of groundwater discharge to surface water and wetlands between the mine features and the Partridge River is expected to be minimal relative to the amount of groundwater discharge to the Partridge River itself. Significant quantities of groundwater are not expected to discharge to the wetlands because of the very low hydraulic conductivities of the underlying peat



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layers, as cited in Section 5.2.1.2.2. In the water quality model, it is assumed that the leakage/seepage from mine features discharges to the Partridge River; there is assumed to be no groundwater discharge to surface water or wetlands along intermediate portions of the flow paths (Reference (15)). Therefore, the water quality model cannot be used to quantify the amount of leakage/seepage from mine features that discharges directly to individual wetlands. However, the water quality model can be used to provide a conservative estimate of the potential indirect wetlands impacts caused by water quality changes due to leakage/seepage from mine features. This approach and the resulting estimates are described in the following paragraphs.

The water quality model includes groundwater quality evaluation locations within the surficial aquifer and located along the Dunka Road for each of the groundwater flow paths. These evaluation locations are within the PolyMet property boundary, typically within close proximity of the mine features and are located up gradient of most of the groundwater-fed wetlands at the Mine Site. Thus, results of the water quality modeling within these flow paths can be used to evaluate groundwater quality that could flow to down gradient groundwater fed wetlands.

Water quality modeling results indicate groundwater quality along each flow path is likely to change from existing conditions. For this indirect wetland impact analysis, it is conservatively assumed that these changes may cause potential indirect impacts to the character, function, and quality of groundwater fed wetlands. Therefore this analysis also assumes that all down gradient groundwater-fed wetlands located within the five Mine Site surficial aquifer flow paths may have potential indirect wetland impacts related to water quality changes as a result off leakage/seepage from mine features.

The leakage/seepage rates associated the mine features are summarized in Table 5-5. Large Table 9 summarizes the wetland types within the flow paths with potential indirect wetland impacts resulting from mine feature leakage/seepage changes to water quality. Large Table 11 identifies wetlands within the flow path. Consistent with other potential indirect wetland impacts identified in this Data Package, the wetlands identified in Large Table 11 can be used to inform the development of a monitoring plan for potential future indirect impacts related water quality changes resulting from leakage/seepage from mine features.



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Table 5-5 Leakage/Seepage Rates Associated with Mine Features

Mine Feature	Type of Flow	Maximum Rate ⁽¹⁾ (gpm)
East Pit – Category 2/3 Stockpile	Seepage from the Mine Pit	6.5
	Liner Leakage	0.13
OSP	Liner Leakage	0.0062
WWTF	Liner Leakage	0.030
OSLA	Infiltration	32
West Pit	Seepage from the Mine Pit	6.4

⁽¹⁾ Flows shown represent the maximum monthly rate at a 90% probability.

This analysis does not indicate or suggest that actual adverse effects will occur or that adverse effects are expected to occur. The analysis only indicates areas that can be conservatively assumed to have potential indirect impacts due to changes in groundwater quality. These specific wetland areas are identified for consideration in future monitoring to be conducted during facility operations.

5.2.1.5 Potential Indirect Impacts – Wildlife Utilization of Nearby Habitats from Project Noise

The following sections summarize the potential indirect impacts to wildlife utilization of nearby habitats from Project noise. As outlined in Attachment A, the following three steps were used in the potential indirect impact analysis: 1) potential sources and range of Project noise were identified; 2) potential wildlife species and habitat preferences within the area were identified; and 3) potential impacts to wildlife utilization of nearby habitats from Project noise were qualitatively assessed.

5.2.1.5.1 Potential Sources and Range of Project Noise

Existing ambient steady equivalent noise levels for most of the Mine Site are in the range of 35 to 45 decibels (dBA), which is a range comparable to secluded woods or a quiet bedroom (Reference (28)). The Peter Mitchell Mine, north of the Mine Site, and traffic along Dunka Road and the existing railway, along the south edge of the Mine Site, also contribute brief, episodic noise impacts.

The primary sources of Project noise from the Mine Site will be blasting, haul trucks, and train horns, with noise levels ranging from 89-115 dBA. Noise from equipment such as graders, bull dozers, and support trucks will be less dominant sources of noise, ranging from 75-95 dBA (Reference (29). Blasting at the Mine Site is expected to occur once every two to three days. Typically, rock blasting generates a single event noise level ranging from 111-115 dBA at 50 feet from the blasting site (Table 5.5-7 of Reference (30)). Within most of the Mine Site, the sound from the blast will be similar to a loud clap of thunder.



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5.2.1.5.2 General Habitat Types

Vegetation within the Mine Site consists primarily of forested and shrub wetlands, older forested uplands dominated by black spruce and/or jack pine, young aspen stands, and recently logged areas dominated by aspen, ferns, and grasses. Upland areas are likely to be used more by wildlife than wetlands in the Mine Site as preferred habitat, likely because uplands offer more cover and browse during the winter than wetlands.

5.2.1.5.3 Wildlife Species Present

Common wildlife species utilizing the Mine Site include the following (Reference (31), Reference (32)):

- large mammals, including white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), moose (*Alces americanus*), gray wolf (*Canis lupus*), coyote (*Canis latrans*)
- intermediate mammals, including muskrat (*Ondatra zimbethicus*), beaver (*Castor canadensis*), red fox (*Vulpes vulpes*), grey fox (*Urocyon cinereoargenteus*) and woodchucks (*Marmota monax*)
- small mammals, including species of bats, squirrels, voles, and mice
- wetland birds, including ducks and other waterfowl, wading birds, and perching birds with specific wetland habitat preferences
- upland birds, including most perching birds, owls, turkey vultures (*Cathartes aura*), hawks, and other birds of prey
- reptiles and amphibians, including common turtles, frogs, snakes, and lizards
- a wide range of insect species in wetland, upland, and transitional habitats

The MDNR Comprehensive Wildlife Conservation Strategy lists 65 Species of Greatest Conservation Need (SGCN) in the combined Laurentian Uplands and Nashwauk Uplands Subsections, in which the Mine Site is located (Reference (33)). Large Table 12 lists the SGCN species, along with their specific preferred habitat types. Habitat preferences for the SGCN species were reviewed, and the species were sorted in Large Table 12 to separate those species which utilize only wetland habitat types, those species which utilize only upland habitat types, and those species which utilize both wetland and upland habitats.

Based on the preferred habitat utilization, there are ten SGCN species that utilize only wetland habitats and fourteen SGCN species that utilize only upland habitats. The remaining 42 SGCN species utilize both wetland and upland habitats. The wetland habitat types utilized by the most SGCN species are lowland coniferous forest (25 species) and lowland shrub (22 species).



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According to the MDNR NHIS database, the following three state-listed species (Reference (34)) have documented occurrences within ten miles of the Mine Site:

- gray wolf (Canis lupus), special concern
- bald eagle (Haliaeetus leucocephalus), special concern
- wood turtle (*Clemmys insculpta*), threatened

The wood turtle was found approximately 0.8 mile south of the Mine Site in 2004. The bald eagle may also be in the vicinity of the Mine Site, although the MDNR NHIS database has no records for bald eagle nests within 5 miles of the Mine Site. The bald eagle is no longer listed under the Endangered Species Act, but is protected under the Bald and Golden Eagle Protection Act. The habitat preferences for these three species are summarized in Large Table 12.

There are three federally listed species in St. Louis County; they include the Canada lynx (*Lynx canadensis*), a threatened mammal species; the gray wolf (*Canis lupus*), a threatened mammal species; and the piping plover (*Charadrius melodus*), an endangered wading bird species. Canada lynx may occasionally utilize the Mine Site (Reference (32)); however, there is no suitable habitat for piping plover at the Mine Site.

In addition to species listed under State and Federal endangered species acts, some wildlife species are also protected as Regional Forester Sensitive Species (RFSS) by the USFS (Reference (35)). The habitat preferences for these species are summarized in Large Table 12.

5.2.1.5.4 Potential Indirect Impacts to Wildlife Utilization of Nearby Habitats

The impacts of noise on wildlife are largely unknown and the assessment of impacts remains subjective (Reference (36)). Wildlife are receptive to different sound frequency spectrums, many of which may be inaudible to humans. Local wildlife are likely to be accustomed to the sound from mine activities currently found in the area. Noise from sources such as mine construction, mine and plant operations, and ore transport are sources of noise that will be relatively low-toned and constant, consistent with industrial fans, so it should present less annoyance than higher-pitched or variable tones of changing loudness (Reference (36)).

Some animals can adapt to predictable human activities, so if the activity generally occurs at predictable time periods at the same places or along the same routes, animals may become habituated to the activity (Reference (36)). Response of the animal depends on the context within which a human/animal encounter takes place, the behavioral state of the animal, the type of human activity, and the time and location of the activity.

Potential noise-related impacts to wildlife vary between species. The more common wildlife species (deer, small mammals, common birds) are habitat generalists with a relatively high tolerance of disturbance and human presence, and the noise generated by human activities.



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These species may temporarily abandon habitats immediately adjacent to the Mine Site at the onset of the Project, but would likely return to those habitats as they become habituated to the activity.

Wildlife species with more specific habitat needs, and/or those that are more sensitive to proximity to human activities may abandon habitats near the Mine Site and migrate to habitats further from the noise sources. The distances migrated from the Mine Site will vary depending on the sensitivity to noise of each species.

5.2.2 Flotation Tailings Basin (FTB) Area

Wetlands were identified within the 500-feet increments beginning at the FTB boundary and continuing out to a total of 30,000 feet (Large Figure 21). The area of evaluation included only wetlands within Area Two where wetland type information has been developed and it did not include wetlands identified as directly impacted (Section 5.1). Large Table 13 identifies each wetland within each of the 500-feet zones and Large Table 14 provides a summary of wetland types within each 500-feet increment.

5.2.2.1 Potential Indirect Impacts – Wetland Fragmentation

For remaining wetlands not directly impacted as discussed in Section 5.1, an estimate of potential indirect wetland impacts from wetland fragmentation by Project features (i.e., containment system) was determined based on an analysis of the various factors that may contribute to potential fragmentation. Wetland fragments in the FTB Area are identified in Table 5-6.

Approximately 0.5 acres of wetland fragments were identified in the FTB Area. The majority of wetland fragments consist of shallow marsh (61%), followed by deep marsh (35%), coniferous swamp (4%), and alder thicket (less than 0.01%).



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Table 5-6 Fragmented Wetlands in the FTB Area

Wetland ID	Eggers and Reed Wetland Community	Total Wetland Size (acres)	Direct Impact (acres)	Potential Indirect Impact (acres)
272	Deep marsh	1.11	1.10	0.01
279	Alder thicket	4.84	3.33	<0.01
290	Coniferous swamp	0.48	0.22	0.02
307	Shallow marsh	0.78	0.77	<0.01
593	Deep marsh	9.80	8.47	0.15
595	Deep marsh	2.14	1.09	0.01
1134	Shallow marsh	14.45	8.71	0.04
1155	Shallow marsh	0.55	7.30 ⁽¹⁾	0.15
1156	Shallow marsh	14.49	11.08	0.06
1159	Shallow marsh	0.05	0.62(2)	0.05
Total a	cres of wetland	48.69	35.18	0.49

⁽¹⁾ Wetland 1155 is directly impacted by the HRF and FTB.

5.2.2.2 Potential Indirect Impacts – Changes in Hydrology

5.2.2.2.1 Wetlands within the FTB Surficial Groundwater Flow Paths

The three surficial aquifer groundwater flow paths are shown in Large Figure 22 and include Unnamed Creek (west flow path), Trimble Creek (northwest flow path), and Mud Lake Creek (north flow path) (Reference (37). Large Figure 22 also includes several surface water model evaluation locations within these flow paths (e.g., PM-11) and the approximate locations of Project surface water discharges (e.g., SD006). Large Table 15 summarizes the wetland types within the flow paths with potential indirect wetland impacts resulting from changes in hydrology. Large Table 16 identifies wetlands within the flow paths and hydrology source. Consistent with other potential indirect wetland impacts identified in this Data Package, the wetlands identified in Large Table 16 can be used to inform the development of a monitoring plan for potential future indirect impacts related water quality changes resulting from leakage/seepage from mine features.

5.2.2.2.2 Seepage from the FTB

Seepage modeling from the FTB is described in detail in Reference (37). The following discussion is a summary of information regarding seepage that leaves the FTB via the west, northwest, and north flow paths. Seepage from the southern toe of the Tailings Basin, which forms the headwaters of Second Creek, is discussed in Section 5.2.4.

⁽²⁾ Wetland 1159 is directly impacted by the HRF.



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The FTB Containment System, located along the northern and western sides of the Tailings Basin (Reference (37)) will collect approximately 90% of the seepage from the FTB to groundwater and 100% of the seepage from the FTB to surface water. The FTB Containment System located along a portion of the eastern side of the Tailings Basin will collect 100% of the seepage from the FTB (both groundwater and surface water). The seepage water to the west that bypasses the FTB Containment System is described in Reference (37). The seepage to the west is assumed to travel all the way to the Embarrass River via the west flow path. The seepage water to the northwest that bypasses the FTB Containment System is estimated to be about 6 gpm. The seepage to the northwest discharges to Trimble Creek at PM-19 via the northwest flow path. The seepage water to the north that bypasses the FTB Containment System is estimated to be about 4 gpm. The seepage to the north discharges to Mud Lake Creek at MLC-2 via the north flow path. The total amount of groundwater that is estimated to discharge to surface water from the west, northwest, and north flow paths is on average approximately 170 gpm, 85 gpm, and 70 gpm respectively. The total flow discharging to surface water is higher than the seepage flow entering groundwater because of the addition of recharge to the flow paths along the length of each flow path.

The aquifer capacity at the north, northwest, and west toes (which feed the north, northwest, and west flow paths respectively) is estimated to be 44 gpm, 55 gpm, and 110 gpm respectively. Under existing conditions, seepage from the Tailings Basin is in excess of the aquifer capacity at the toes of the Tailings Basin. Therefore, excess seepage that cannot be contained within the aquifer upwells to surface flow near the toes of the Tailings Basin and contributes flow to the nearby tributaries via surface runoff.

Under Project conditions, the FTB Containment System will capture all of the surface flow that is currently upwelling near the northern, northwestern, western, and portions of the eastern toes of the Tailings Basin dams. To prevent significant hydrologic impacts to Trimble Creek and Unnamed Creek due to reduction in flow, the water collected by the FTB Containment System will be treated by the WWTP and discharged to the tributaries. To the west, the discharge(s) will be directed to a location near the existing surface discharge SD006. To the northwest and north, the discharge(s) will be spigotted at multiple locations along the downstream side of the FTB Containment System to add flow to the adjacent wetlands, similar to what is occurring under existing conditions. Flow to Mud Lake Creek will be augmented entirely with off-site runoff diverted toward Mud Lake Creek by a drainage swale constructed northeast of Cell 2E. Augmentation will not be necessary at the eastern segment of the FTB Containment System. This area is currently flowing into the Tailings Basin, thus the collection of seepage will not have hydrologic impacts to the watershed. Reference (37) shows the expected amount of water needed for stream augmentation on an average annual basis.

5.2.2.2.3 Potential Indirect Impacts – Changes in Hydrology due to Drawdown or Surcharge

The augmentation described in Section 5.2.2.2.2 is designed such that the average annual water yield at the toe of the Tailings Basin is within \pm 20% of the No Action condition.



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Plus or minus 20% is within the range of annual variability in precipitation, as well as streamflow, in the Embarrass watershed (Reference (15) and Reference (37)). Therefore, anticipated changes to downstream hydrology, including wetlands, is expected to be within the range of that typically observed due to natural variability.

The potential for indirect impacts due to reduced or increased seepage at the toe of the Tailings Basin is greatest immediately downstream of the toe, where seepage and augmentation account for nearly all the water yield (i.e., there is no upstream watershed). Downstream of the toe, the potential for impact will be reduced as the watershed area tributary to that location increases, and the portion of total water yield derived from runoff increases. That is, the potential for hydrologic impact diminishes radially as distance from the FTB increases. Large Table 13 categorizes wetland areas downstream of the Tailings Basin according to distance from the Tailings Basin. Wetlands located further from the Tailings Basin are anticipated to have less potential for indirect impacts due to hydrologic changes.

Wetland hydrology is a complex mix of precipitation, surface runoff, and in some cases, groundwater. Despite the use of augmentation to mitigate impacts, the response of complex natural systems to human disturbances can only be estimated. Therefore, monitoring of wetland hydrology and vegetation communities is the most appropriate way to document the extent and magnitude of wetland responses (potential indirect impacts) to the Project.

5.2.2.2.4 Quantification of Potential Indirect Impacts due to Change in Hydrology

See Section 5.2.1.2.2 for a discussion of potential indirect wetland impacts due to change in hydrology.

5.2.2.3 Potential Indirect Impacts – Wetlands Abutting Unnamed Creek, Trimble Creek, and Mud Lake Creek

Wetlands abutting Unnamed Creek, Trimble Creek, and Mud Lake Creek within Area Two (Large Figure 4) are identified by wetland ID, wetland type using the Eggers and Reed (Reference (13)) wetland community types, and acreage in Table 5-7 through Table 5-9.

There are approximately 2,576 acres of wetlands which include alder thicket or shrub-carr (63% of total acres), coniferous swamp (24% of total acres), hardwood swamp (5% of total acres), shallow marsh (5% of total acres), deep marsh (2% of total acres), and wet meadow (1% of total acres).

Wetlands abutting Unnamed Creek within Area Two include approximately 527 acres of wetlands which include alder thicket and shrub-carr (52% of total acres), hardwood swamp (19% of total acres), shallow marsh (16% of total acres), deep marsh (10% of total acres), and coniferous swamp (3% of total acres) (Table 5-7).



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Table 5-7 Wetlands Abutting Unnamed Creek

Wetland ID	Eggers and Reed Wetland Community	Wetland Size (acres)
270	Shallow marsh	85.84
593A	Deep marsh	25.73
625	Coniferous swamp	3.70
627	Alder thicket or Shrub-carr	187.09
788	Hardwood swamp	98.13
820	Deep marsh 26.92	
845	Coniferous swamp	12.64
876	Alder thicket 39.13	
1071	Alder thicket or Shrub-carr	29.18
1147	Alder thicket or Shrub-carr	13.46
996	996 Alder thicket or Shrub-carr 4.10	
593	Deep marsh	1.18
	Total acres of wetland	527.10

Wetlands abutting Trimble Creek within Area Two include approximately 886 acres of wetlands which include alder thicket and shrub-carr (78% of total acres), coniferous swamp (15% of total acres), shallow marsh (4% of total acres), wet meadow (2% of total acres), and deep marsh (1% of total acres) (Table 5-8).

Table 5-8 Wetlands Abutting Trimble Creek

Wetland ID	Eggers and Reed Wetland Community	Wetland Size (acres)
253	Deep marsh	5.89
254	Shallow marsh	36.72
953	Alder thicket or Shrub-carr	614.34
955	Alder thicket or Shrub-carr	39.24
956 Wet meadow 1		17.40
989	Coniferous swamp	130.31



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Wetland ID	Eggers and Reed Wetland Community	Wetland Size (acres)
990	Alder thicket or Shrub-carr	42.22
529	Wet meadow	0.30
	Total acres of wetland	886.42

Wetlands abutting Mud Lake Creek within Area Two include approximately 1,162 acres of wetlands which include alder thicket and shrub-carr (56% of total acres), coniferous swamp (41% of total acres), and hardwood swamp (3 of total acres) (Table 5-9).

Table 5-9 Wetlands Abutting Mud Lake Creek

Wetland ID	Eggers and Reed Wetland Community	Wetland Size (acres)
285	Coniferous swamp	364.87
953	Alder thicket or Shrub-carr	614.34
866	Hardwood swamp 31.04	
652	Coniferous swamp 109.44	
986	Alder thicket or Shrub-carr	22.21
988	Alder thicket or Shrub-carr	20.51
	Total acres of wetland	1,162.41

A detailed hydrologic model has not been developed for the streams downstream of the Tailings Basin. Water management at the Plant Site consists of flow augmentation immediately downstream of the FTB Containment System (Section 5.2.2.2.2 and Reference (37)) to minimize hydrologic impacts to downstream watercourses. The hydrologic analysis presented in Reference (37) estimates that the changes in average annual flow (and therefore stage) of Unnamed Creek, Trimble Creek, and Mud Lake Creek will be within the annual variability that naturally occurs in the Embarrass River watershed. Therefore, no potential indirect wetland impacts are identified for the wetlands abutting Unnamed Creek, Trimble Creek, and Mud Lake Creek.

5.2.2.4 Potential Indirect Impacts – Water Quality Changes

5.2.2.4.1 Fugitive Dust / Metals and Sulfide Dust Emissions

The discussion, tables, and figures for this section are found in Section 5.2.1.4.1 which discusses the Mine Site and FTB.



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5.2.2.4.2 Potential Indirect Impacts – Water Quality Changes

The Project will impact water quality downstream of the Tailings Basin by altering the chemistry and volume of seepage and surface water discharges leaving the Tailings Basin. Impacts to surface water and groundwater quality are quantified in (Reference (37)). The collection of existing seepage by the containment system and augmentation with WWTP effluent water will generally improve downstream water quality relative to current conditions. Water quality impacts to receiving waters are described in (Reference (37)). Even if water quality is improved, there is potential for indirect impacts to wetlands due to changes in water quality.

Potential indirect wetland impacts due to water quality changes may occur due to:

- Changes in groundwater quality,
- Changes in surface water quality, or
- Changes in both groundwater and surface water quality.

Wetland areas potentially impacted by water quality changes are shown in Large Figure 22 and listed in Table 5-10. Note that within this section, the term groundwater and surface water refer to the path by which Project water leaves the Tailings Basin (e.g., potential impacts from Tailings Basin groundwater seepage that discharges to surface water at a downstream location are classified as a potential impact due to changes in *groundwater* quality).

Table 5-10 Wetland Area Potentially Indirectly Impacted by Changes in Water Quality

Wetland Area (acres) Potentially Impacted by Changes in Water Quality	Mud Lake Creek (North)	Trimble Creek (Northwest)	Unnamed Creek (West)	Downstream of Groundwater Flow Paths ⁽³⁾	Total
Groundwater Quality ¹	296.50	514.03	1,162.15		1972.68
Surface Water and Groundwater Quality ²	835.77	568.92	690.87	570.16	2665.72
Total	1,132.27	1,082.95	1,853.02	570.16	4638.40

⁽¹⁾ Groundwater refers to water leaving the FTB within the surficial aquifer. Impacts resulting from the discharge of that seepage to surface water are considered an impact due to groundwater in this analysis.

Potential for indirect impacts from changes in groundwater quality may occur anywhere along the modeled groundwater flow paths (Section 5.2.2.2.1). Wetlands that may be

⁽²⁾ All areas potentially impacted by changes in surface water quality are also potentially impacted by changes in groundwater quality

⁽³⁾ Potentially impacted wetlands are located along Trimble Creek and Mud Lake Creek, but outside of groundwater flow paths (see also Footnote (1)).



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impacted in this manner are identified in Large Figure 22 and include a total of 4,068 acres. Potential for impacts to groundwater quality are diminished as distance from the Tailings Basin increases, as the relative portion of total groundwater that originates from the Tailings Basin decreases (Reference (37)). It should be noted that the amount of Tailings Basin seepage remaining in the surficial aquifer is very small (Section 5.2.2.2.1). Thus, the potential for indirect impacts due to changes in groundwater quality is anticipated to be small.

Potential impacts from changes in groundwater quality may also occur in any wetlands abutting tributary streams into which impacted groundwater may discharge. This includes all reaches of Unnamed Creek, Trimble Creek, and Mud Lake Creek (Large Figure 22). Wetlands abutting these streams and outside of the modeled groundwater flow paths add an additional 570 acres of potential indirect impacts due to changes in groundwater quality.

Changes in surface water quality may also potentially indirectly impact wetlands. Potential indirect impacts from changes in surface water quality may occur in wetlands within the surface watersheds immediately downstream of the Tailings Basin (Large Figure 22). This includes watersheds upstream of modeling locations UC-1a, TC-1, and MLC-3. These areas include 1,158 acres of wetlands (all of which may also be potentially indirectly impacted by changes in groundwater quality). Downstream of these locations, potential indirect impacts due to changes in surface water quality are limited to wetlands abutting the tributary streams. These areas include an additional 1,505 acres of wetlands (all of which may also be potentially indirectly impacted by changes in groundwater quality).

As with impacts from changes in groundwater quality, potential impacts due to changes in surface water quality are expected to diminish as distance from the Tailings Basin increases and flows originating from the Project are diluted by natural runoff.

The wetland hydrology downstream of the Tailings Basin is too complex to be accurately incorporated into the Plant Site probabilistic model detailed in Reference (37). The response of such complex natural systems to water quality changes originating at the Tailings Basin can only be estimated. Therefore, monitoring of wetland hydrology and vegetation communities is the best way to document the extent and magnitude of wetland responses (potential indirect wetland impacts) to the Project.

5.2.2.5 Potential Indirect Impacts – Wildlife Utilization of Nearby Habitats from Project Noise

The following sections summarize the potential indirect impacts to wildlife utilization of nearby habitats from Project noise. As outlined in Attachment A, the following three steps were used in the potential indirect impact analysis: 1) potential sources and range of Project noise were identified; 2) potential wildlife species and habitat preferences within the area were identified; and 3) potential impacts to wildlife utilization of nearby habitats from Project noise were qualitatively assessed.



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5.2.2.5.1 Potential Sources and Range of Project Noise

Noise at the FTB will be generated primarily by the placement of FTB Containment System, construction of FTB dams, and by operation of various types of pumping equipment used to transport the tailings slurry and recovered water from the FTB Containment System. Noise levels heard by individual wildlife species cannot be exactly determined, because wildlife species are mobile. As an individual moves, the noise level from a given source changes with the distance between the source and the receptor (the individual animal).

5.2.2.5.2 General Habitat Types

The FTB and surrounding area is currently dominated by grasslands, extensive wetland complexes, and open water areas. The existing Tailings Basin is dominated by upland grassland communities across its flat upper surface and down the tailings dams that descend to the wetlands to the north and west. A natural upland promontory occurs along the northeastern edge of the FTB. This promontory is dominated by young aspen along the lower two-thirds of the slope, and by mixed hardwood and coniferous forest on the upper slopes.

5.2.2.5.3 Wildlife Species Present

Wildlife species within and adjacent to the FTB are similar to those described in Section 5.2.1.5 for the Mine Site. Most of the same common SGCN and RFSS species present at the Mine Site are also present at the FTB.

5.2.2.5.4 Potential Impacts to Wildlife Utilization of Nearby Habitats

Noise-related potential indirect impacts to wildlife utilization of nearby habitats will be similar to those for the Mine Site, described in Section 5.2.1.5, with one notable exception - the FTB is at least 5.5 miles from the nearest potential blasting site. At this distance, the sound of the blast will be under 61 dBA, based on a sound pressure level of 115 dBA at 50 feet from the blast (Reference (28). As a result, the physiological and behavioral changes potentially induced by blast noise will be greatly diminished at the FTB as compared to the Mine Site. In addition, the level of activity, including use of heavy equipment and number of support vehicles in operation, is expected to be lower at the FTB than at the Mine Site. As a result, overall noise generation should be lower at the FTB, resulting in fewer impacts to wildlife.

5.2.3 Transportation Corridors

Wetlands abutting the railroad corridor from the Mine Site to the Plant Site, within Area One and Area Two, are identified by wetland ID, wetland type using the Eggers and Reed (Reference (13)) wetland community types, and acreage in Large Table 17. There are approximately 543 acres of wetlands which include alder thicket or shrub-carr (75% of total acres), coniferous swamp (15% of total acres), shallow marsh (7% of total acres), deep marsh (1% of total acres), shallow, open water (1% of total acres), and sedge/wet meadow (less than 1% of total acres). Wetlands abutting the Dunka Road and Utility Corridor are identified in Section 3.2.3 and shown in Large Figure 7.



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5.2.3.1 Potential Indirect Impacts – Wetland Fragmentation

For remaining wetlands not directly impacted as discussed in Section 5.1, an estimate of potential indirect wetland impacts from wetland fragmentation by Project features (Dunka Road and Utility Corridor and Railroad Connection Corridor) was determined based on an analysis of the various factors that may contribute to potential fragmentation.

An approximately 0.01 acre alder thicket (Wetland ID 1034A), which is located just outside of the Dunka Road and Utility Corridor, was identified as a wetland fragment. Wetland ID 1034A is connected to Wetland ID 1034, which is directly impacted by the Dunka Road and Utility Corridor.

5.2.3.2 Potential Indirect Impacts – Water Quality Changes

5.2.3.2.1 Mine to Plant Railroad

The potential release of dust from railcars transporting ore from the Mine Site to the Plant Site was addressed in the May 6, 2011 Air Impact Assessment Planning Summary Memo: "The Air IAP group concluded that there will be minimal air impacts from any dust generated from ore hauled in the railcars due to the coarse nature of the ore." Based on this conclusion, air modeling of potential release of dust from railcars was not performed because the potential wetland impacts will not be significant.

The Air IAP group concluded that any dust generated from ore hauled in railcars will be coarse in nature (i.e., relatively large particles). These larger particles will tend to deposit on the soil surface near the railcar and not be dispersed to any great extent. An estimate of the spillage of ore fines along the rail corridor is shown in Section 8.4.3 of Reference (38). It was assumed that all spillage of the coarse material will occur in a 2-meter wide strip on both sides of the centerline of the railway (total width = 4 meters) over the entire haul distance after loading (~ 8 miles; ~13,000 meters), resulting in approximately 0.11 Kg/square meter of ore fines deposited annually or 2.14 Kg/square meter deposited for the 20-year Project. This equates to 0.002 inch of depth of ore fines deposited annually or 0.05 inches deposited for the 20-year Project.

Using the geochemical modeling methods described in Section 8.4.3 of Reference (38) for the spilled ore, the quality of water contacting this material was estimated on a per-unit area basis which is also a per unit length of the rail corridor (see Attachment E for details). The contact water was assumed to mix with the background surface runoff, using the runoff water quality and quantity determined in Sections 5.3.2 and 6.1.3.3.2 of Reference (15) for the Mine Site water quality model. For each meter of railway (2 meter spillage strip on one side), the area required to have a less than 10% likelihood of the mixed contact and natural runoff exceeding water quality standards (as defined in Section 2.2 of Reference (15)) was estimated by successive runs of a probabilistic water quality model.



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For most chemical constituents, the contact water leaving the spillage strip is estimated to have a greater than 90% likelihood of complying with surface water standards at all times. Constituents that have the potential to exceed surface water standards at the edge of the 2-meter spillage strip include aluminum, cobalt, copper, and nickel. Aluminum concentrations are often above the surface water standard in the background runoff, and it is not possible to achieve a less than 10% likelihood of exceeding the standard in the mixed water (Section 4.4.4.1.1 of Reference (15)). For cobalt, copper, and nickel the estimated area (square meters per meter of railroad track on each side) necessary to provide sufficient dilution for 90% probability of compliance is shown in Table 5-11. ²

Table 5-11 Estimated Runoff Area Required for Dilution of Spillage Contact Water

Constituent	Surface Water Standard (μg/L)	Natural runoff area (m² per m of track)
Cobalt	5.0	2.5
Copper	9.3(1)	675
Nickel	52 ⁽¹⁾	30

⁽¹⁾ Standard is hardness-based, value shown for 100 mg/L hardness

The limiting area required to provide sufficient dilution water for all constituents is estimated at 675 square meters per meter of track (one-sided). Approximately 543 acres of wetlands along the railroad corridor that may have potential indirect impacts are identified in Large Table 17. Watersheds were delineated for each wetland that abutted the railroad corridor as well as wetlands with contributing watersheds abutting the railroad corridor.

Wetlands that have contributing watersheds that include no segments of the railway (e.g., many of the wetlands uphill to the north of the rail corridor) were identified as having no potential indirect impacts from rail spillage. Wetlands immediately abutting the railway and whose watersheds include the rail centerline were identified as potentially being impacted, although the impacts may not extend to the full area of the wetland. Wetlands that have contributing watersheds which include natural areas that are larger than 675 square meters per meter of track (one-sided) in the contributing watershed were identified as having no potential indirect impacts.

5.2.3.2.2 Dunka Road

Loaded mine haul trucks will not travel on the Dunka Road. Empty mine haul trucks will only travel on the Dunka Road when they are in need of maintenance at the Area 1 Shop. It is

² Based on the PolyMet rail car modification evaluation (Reference (50)), ore spillage may be reduced by up to 97%, which would proportionally reduce the dilution needed to meet surface water standards.



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estimated that each truck will travel to Area 1 Shop twice per year. The total one-way trips per year are estimated at 44. Given the low traffic volumes (< 1 trip per week on average) and the consideration that the ore trucks will be empty, it was determined in Attachment A that a quantitative assessment of impacts from ore particle discharge from haul truck travelling down the Dunka Road is not warranted. Therefore, no potential indirect wetland impacts were identified for wetlands abutting the Dunka Road.

5.2.3.2.3 Product Shipping

Products produced in the hydrometallurgical plant (Gold and Platinum Group Metals concentrate, mixed hydroxide precipitate) will be loaded into super sacks (i.e., large industrial sacks used to transport solid material) and then loaded onto trucks or railcars. There is little or no potential for spillage with this method of shipping and Attachment A concluded that with respect to flotation concentrate, as stated in the Project Description (Reference (12)), "Each filtered concentrate will be conveyed to separate stockpiles within an enclosed 10,000 ton storage facility for loading into covered rail cars. The storage facility will store about 7 to 10 days of production capacity when flotation concentrate will be directed to Concentrate Dewatering/Storage. The storage facility will have a concrete floor and provisions to wash wheeled equipment leaving the facility to prevent concentrates from being tracked out of the facility." Best Management Practices adopted at other mining facilities, such as enclosed storage and loading, covered cars, top-loaded gondola-type cars, and vehicle wash facilities, are proposed for use at the Project. PolyMet will be paid on tons received by customers so it has a vested interest in not losing any concentrate. The covered rail cars will be inspected for holes and any holes repaired before concentrate loading. Attachment A determined that because the common carrier route (i.e., the rail line used to transport products) is not known (ultimate customer not known and could change), there is no way to assess impacts along the common carrier route. Therefore, no potential indirect wetland impacts were identified for wetlands along a common carrier route.

5.2.3.3 Potential Indirect Impacts – Wildlife Utilization of Nearby Habitats from Project Noise

The following sections summarize the potential indirect impacts to wildlife utilization of nearby habitats from Project noise. As outlined in Attachment A, the following three steps were used in the potential indirect impact analysis: 1) potential sources and range of Project noise were identified; 2) potential wildlife species and habitat preferences within the area were identified; and 3) potential impacts to wildlife utilization of nearby habitats from Project noise were qualitatively assessed.

5.2.3.3.1 Potential Sources and Range of Noise

Noise along the transportation corridors will be generated by trucks along Dunka Road and trains. Noise from trucks passing along Dunka Road is estimated to range from 67 dBA for light trucks to 90 dBA for larger dump trucks (Table 3.7-1 of Reference (39)). The decibel level of a passing freight train at approximately 50 feet is 80 dBA. A locomotive's horn decibel level is 96 dBA at 100 feet ahead of the locomotive (Table 3.7-1 of Reference (39)).



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5.2.3.3.2 General Habitat Types

Wildlife habitat along the transportation corridors is varied, and includes wetlands, forested uplands, and maintained grasslands adjacent to existing roads and railroads.

5.2.3.3.3 Wildlife Species Present

Wildlife species present in the transportation corridors are similar to those described in Section 5.2.1.5 for the Mine Site. Most of the same common SGCN and RFSS species present at the Mine Site are also present along the transportation corridors.

5.2.3.3.4 Potential Impacts to Wildlife Utilization of Habitats

Noise-related impacts to wildlife utilization of habitats nearby the transportation corridors will be similar to those for the Mine Site, described in Section 5.2.1.5.

Blasting noise along the transportation corridors will be somewhat reduced relative to the Mine Site. For portions of transportation corridors within one mile of the Mine Site, the noise generated from a blast will range from 71-75 dBA. Tree cover and atmospheric absorption will decrease these levels further.

Species currently utilizing the grassland rights-of-way along Dunka Road and the railroad will likely continue to use these areas. Currently there is low to moderate traffic along Dunka Road. During the Project, increased traffic along the transportation routes may cause some wildlife species to abandon the adjacent habitats. However, these are already moderately disturbed habitats, and are therefore most likely used by habitat generalists rather than SGCN and other more sensitive species. As a result, increases in traffic along Dunka Road and the railroad are not likely to result in significant abandonment of adjacent habitats.

5.2.4 Second Creek

A total of 30 wetlands covering 298.91 acres were identified within the Second Creek area of analysis (Table 3-8). The wetlands include alder thicket or shrub-carr (44%), shallow marsh (35%), hardwood swamp (7%), deep marsh (7%), coniferous swamp (6%), wet meadow (less than 1%), and shallow, open water (less than 1%). Wetlands within the Second Creek area are identified in Section 3.2.8 and shown in Large Figure 8.

The potential indirect wetland impacts were assessed based on changes to hydrology due to groundwater flow or seepage, drawdown or surface water quantity, or changes in surface water quality or metals deposition. There are no potential indirect wetland impacts due to wetland fragmentation, changes in watershed area, or dust deposition.

5.2.4.1 Potential Indirect Impacts – Change in Hydrology

5.2.4.1.1 Potential Indirect Impacts – Change in Hydrology due to Groundwater Flow or Seepage

Seepage from the south side of the FTB is generally restricted by bedrock outcrops and does



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not contribute to the groundwater flow south of the FTB. All seepage from the south side of the FTB is surface water, forming the headwaters of Second Creek (Sections 4.3.2.2.1 and 5.1.1.2 of Reference (37)). There are no potential indirect impacts to wetlands as a result of changes in groundwater flow in the area of analysis.

The current seepage capture system located at the southern toe of Tailing Basin Cell 1E, which was installed as part of the Cliffs Erie Consent Decree, has reduced seepage leaving the existing Tailings Basin. No further reductions in flow to Second Creek are anticipated as part of the Project, rather, the Project will augmented stream flow in Second Creek with treated water from the WWTP in order to return flows to conditions that existed before the current seepage capture system was constructed as part of the Cliffs Erie Consent Decree. There will be no construction in this area as a result of stream augmentation.

5.2.4.1.2 Potential Indirect Impacts – Change in Hydrology due to Drawdown or Surcharge

Wetlands abutting Second Creek are identified by wetland ID, wetland type using Reference (13) wetland community types, and acreage in Table 5-12 and Large Figure 8. There are 8 wetlands covering approximately 179 acres which include alder thicket or shrubcarr (66%), shallow marsh (26%), and deep marsh (8%).

Table 5-12 Wetlands Abutting Second Creek

Wetland ID	Dominant Eggers and Reed Wetland Community	Total Wetland Area (acres)
595 ⁽¹⁾	Deep marsh	1.05
595A	Deep marsh	3.06
1161	Deep marsh	9.41
1162	Shallow marsh	40.84
1174	Alder thicket or Shrub-carr	118.75
1176	Shallow marsh	4.92
P5-1	Deep marsh	0.77
P5-1A	Deep marsh	0.03
Total acres	of wetland	178.83

⁽¹⁾ Wetland 595 includes 3 separate areas.

Flow augmentation at the south toe of the Tailings Basin is designed such that the average annual discharge to that location is within +/- 20% of the pre-Consent Decree condition (Section 5.2.2.8.1 of Reference (37)). Plus or minus 20% is within the range of annual variability in precipitation, as well as streamflow, in the Partridge and Embarrass watersheds (Section 5.2.2.8.1 of Reference (37)). Therefore, anticipated changes to downstream hydrology, including adjacent wetlands, is expected to be within the range of that typically



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observed due to natural variability. Therefore, no potential indirect wetland impacts are identified for the wetlands abutting Second Creek.

5.2.4.2 Potential Indirect Impacts – Water Quality Changes

5.2.4.2.1 Potential Indirect Impacts – Change in Surface Water Quality

The Project will impact water quality in Second Creek by altering the chemistry of surface water discharges to the headwaters of Second Creek (Sections 5.2.2.8.1 and Section 6.6 of Reference (37)). The collection of seepage by the South Seepage Management System and augmentation with WWTP effluent water will generally improve downstream water quality relative to current conditions. Even if water quality is improved, there is potential for indirect impacts to wetlands due to changes in water quality.

Potential indirect wetland impacts due to changes in water quality will be limited to wetlands abutting Second Creek. Potential indirect impacts due to changes in surface water quality are expected to diminish as the distance from the Tailings Basin increases. Upstream of County Road 666, there are approximately 179 acres of wetlands abutting Second Creek (Table 5-13) that have the potential to be indirectly impacted by the change in water quality due to stream flow augmentation of Second Creek.

Table 5-13 Wetlands Abutting Second Creek

Wetland ID	Dominant Eggers and Reed Wetland Community	Total Wetland Area (acres)
595 ⁽¹⁾	Deep marsh	1.05
595A	Deep marsh	3.06
1161	Deep marsh	9.41
1162	Shallow marsh	40.84
1174	Alder thicket or Shrub-carr	118.75
1176	Shallow marsh	4.92
P5-1	Deep marsh	0.77
P5-1A	Deep marsh	0.03
Total acres of wetland		178.83

⁽¹⁾ Wetland 595 includes 3 separate areas.

5.2.4.2.2 Potential Indirect Impacts – Metals Deposition

The deposition modeling results (Section 5.2.1.4.1) indicate there are 7 wetlands in the Second Creek area covering approximately 44 acres that are potentially indirectly impacted (modeled metal deposition greater than 100% of background); of these, 1.05 acres are located within the FTB ambient air boundary (Large Figure 16). The wetlands are identified by



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wetland ID, wetland type using Eggers and Reed (Reference (13)), and acreage in Table 5-14.

Table 5-14 Wetlands Potentially Indirectly Impacted by Metal Deposition

Wetland ID	Dominant Eggers and Reed Wetland Community	Revised Total Wetland Area (acres) ⁽¹⁾	Reference (40) Total Wetland Area (acres)
595 ⁽²⁾	Deep marsh	1.05	1.05
595A	Deep marsh	3.06	3.06
1161 ⁽³⁾	Deep marsh	9.41	6.34
1166 ⁽³⁾	Shallow marsh	28.04	15.03
1167 ⁽³⁾	Shallow marsh	2.88	2.40
Total acres of wetland		44.44	

⁽¹⁾ Acreage for wetland IDs 595 and 595A did not change.

5.2.5 Summary of Potential Indirect Wetland Impacts

The analysis in Section 5.2 identified six factors that may result in potential indirect wetland impacts: wetland fragmentation, change in wetland hydrology from changes in watershed area, changes in wetland hydrology from groundwater drawdown, water quality changes related to deposition of dust, water quality changes related to ore spillage along the transportation corridor, and changes in water quality related to leakage from stockpiles/mine features and seepage from mine pits. A wetland may be potentially indirectly impacted by none of these factors or up to a maximum of six, with different combinations of factors possible. A rating was developed for the wetlands based on the number of factors that may potentially affect it – from No Impact (0 factors) to 6 (all six factors potentially indirectly impacting the wetland). Using this approach, no wetlands were rated as a 6 in this analysis.

Using the method identified in Attachment A to identify potential indirect wetland impacts from drawdown (Section 5.2.1.2.2), approximately 54% of wetlands received a rating of 1, with one factor potentially indirectly impacting the wetland; 42% of wetlands received a rating of 2, with two factors potentially indirectly impacting the wetland; 3% of wetlands received a rating of 3, with three factors potentially indirectly impacting the wetland; less than 0.2% of wetlands received a rating of 4, with four factors potentially indirectly impacting the wetland; and less than 0.1% of wetlands received a rating of 5, with five factors potentially indirectly impacting the wetland. Table 5-15 shows the wetland acreage for each rating for Attachment A method Ratings 1, 2, 3, 4, and 5. Large Figure 23 through Large Figure 25 show the ratings for wetlands in the Project analysis areas.

⁽²⁾ Wetland 595 includes 3 separate areas.

⁽³⁾ Previously identified in Reference (40) using the NWI.



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Table 5-15 Rating for Wetlands Potentially Indirectly Impacted in the Project Area

	Attachment A Method		Alternate Method	
Rating	Wetlands (acres)	Wetlands (% of total acres)	Wetlands (acres)	Wetlands (% of total acres)
1	4,305.94	54.4%	3,466.12	52.8%
2	3,126.77	42.1%	2,888.37	44.0%
3	245.31	3.3%	205.97	3.1%
4	15.89	0.2%	8.11	0.1%
5	0.25	<0.1%	0.25	<0.1%
Total acres of wetland	7,694.16		6,568.82	

Using the alternative method to identify potential indirect wetland impacts from drawdown (Section 5.2.1.2.2), approximately 53% of wetlands received a rating of 1, with one factor potentially indirectly impacting the wetland; 44% of wetlands received a rating of 2, with two factors potentially indirectly impacting the wetland; 3% of wetlands received a rating of 3, with three factors potentially indirectly impacting the wetland; less than 1% of wetlands received a rating of 4, with four factors potentially indirectly impacting the wetland; and less than 0.1% of wetlands received a rating of 5, with five factors potentially indirectly impacting the wetland. Table 5-15 shows the wetland acreage for alternate method Ratings 1, 2, 3, 4, and 5. Large Figure 26 through Large Figure 28 show the ratings for wetlands in the Project Area.

5.3 Cumulative Wetland Impacts

An analysis was conducted to determine the cumulative effects of direct impacts from all past, present, and reasonably foreseeable future projects to the wetlands, lakes, and deepwater resources located in the Partridge River and Embarrass River watersheds. The number and extent of wetland, lake, and deepwater resources were estimated for three time periods, including pre-settlement, existing, and the foreseeable future. Attachment A summarizes the methodology used for the cumulative wetland impact analysis.

5.3.1 Pre-settlement Wetland and Water Resources

The pre-settlement condition time period represents wetland, lake, and deepwater resources as they existed prior to mining and urban development in the late 1800s to early 1900s. An estimate of pre-settlement wetland, lake, and deepwater acreages within the Partridge River and Embarrass River watersheds was developed using the U.S. Fish and Wildlife Service



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(USFWS) National Wetland Inventory (NWI) maps and the original survey maps developed using data from the original Government Land Surveys.

In order to develop a relationship between NWI mapping and pre-settlement mapping of wetland, lake, and deepwater resources, townships in each watershed with minimal disturbance were used to calculate ratios of NWI to original survey wetland, lake, and deepwater resources. These ratios were used as adjustment factors to conform the original survey data to the standards and scales of the NWI data for estimating the pre-settlement wetland, lake, and deepwater resources within the disturbed areas of each watershed. The methodology used to identify disturbed areas in each watershed is summarized in Attachment A.

5.3.1.1 Partridge River Watershed

Township 58, Range 12 is one of the least disturbed townships in the Partridge River Watershed (0.2% disturbance in the entire township and 0.4% disturbance for the portion contained within the watershed: Large Figure 29). Using the disturbance at the township level (0.2%), the ratio of NWI to original survey wetlands, lakes, and deepwater resources was calculated to be 1.21 for the least disturbed township in the Partridge River Watershed. This ratio indicates there were approximately 21% more wetlands, lakes, and deepwater resources identified on the NWI maps than the original survey maps in the Partridge River Watershed.

Disturbance within the townships located in the Partridge River Watershed range between 0.4% and 52.4%, with approximately 15% of the entire Partridge River Watershed containing significant human disturbance since settlement of the area (Large Figure 29). The disturbance types (and percent of the disturbance area) include: mining features including stockpiles, pits, roads, and other infrastructure (82% of the disturbance area); primarily municipal/residential development (e.g., Cities of Aurora and Hoyt Lakes) with some barren land and cultivated crops (13% of the disturbance area); and roads and railroads (5% of the disturbance area). Approximately 85% of the Partridge River Watershed was judged to be relatively undisturbed, so NWI mapping was used in these areas to represent pre-settlement conditions for wetland, lake, and deepwater resources.

Based on the original survey maps, approximately 2,991 acres of wetland were mapped within the disturbed areas in the Partridge River Watershed. This wetland acreage was adjusted to 3,620 acres using the 1.21 adjustment factor. After accounting for the disturbed areas, a total of 33,601 acres of wetlands were identified in the 101,812 acre Partridge River Watershed, comprising 33% of the watershed (Large Table 18, Large Figure 29).

Based on the original survey maps, 24 acres of lake were mapped within the disturbed areas in the Partridge River Watershed. This lake acreage was adjusted to 29 acres using the 1.21 adjustment factor. After accounting for the disturbed areas, a total of 2,688 acres of lake were identified in the 101,812 acre watershed comprising 2.6% of the watershed (Large Table 19, Large Figure 29).



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No deepwater habitat (i.e., mine pits; Large Table 20, Large Figure 29) was identified in the watershed for the pre-settlement conditions.

5.3.1.2 Embarrass River Watershed

Township 61, Range 14 is one of the least disturbed townships in the Embarrass River Watershed (0.6% disturbance in the entire township and 0.7% disturbance for the portion contained within the watershed: Large Figure 29). Using the disturbance at the township level (0.6%), the ratio of NWI to original survey wetlands, lakes, and deepwater resources was calculated to be 0.85 for the least disturbed township in the Embarrass River Watershed. Based on this analysis, the ratio of NWI to original survey wetlands, lakes, and deepwater resources was calculated to be approximately 15% fewer wetlands, lakes, and deepwater resources identified on the NWI maps than the original survey maps in the Embarrass River Watershed.

Disturbance within the portions of townships located in the Embarrass River Watershed range between 0.7% and 63.3%, with approximately 12% of the entire Embarrass River Watershed containing significant human disturbance since settlement of the area (Large Figure 29). The disturbance types (and percent of the disturbance area) include: mining features including stockpiles, pits, roads, and other infrastructure (61% of the disturbance area); primarily municipal/residential development (e.g., Cities of Babbitt, Biwabik, Gilbert, and McKinley) with some barren land and cultivated crops (27% of the disturbance area); and roads and railroads (12% of the disturbance area). Approximately 88% of the Embarrass River watershed was judged to be relatively undisturbed, so NWI mapping was used in these areas to represent pre-settlement conditions for wetland, lake, and deepwater resources.

Based on the original survey maps, approximately 2,388 acres of wetland were mapped within the disturbed areas of the Embarrass River Watershed. This wetland acreage was adjusted to 2,030 acres using the 0.85 adjustment factor. After accounting for the disturbed areas, a total of 34,650 acres of wetlands were identified in the 116,797 acre Embarrass River Watershed, comprising approximately 30% of the watershed (Large Table 18, Large Figure 29).

Based on the original survey maps, 224 acres of lake were mapped within the disturbed areas in the Embarrass River Watershed. This lake acreage was adjusted to 190 acres using the 0.85 adjustment factor. After accounting for the disturbed areas, a total of 3,121 acres of lakes were identified in the 116,797 acre watershed comprising less than 3% of the watershed (Large Table 19, Large Figure 29).

No deepwater habitat (i.e., mine pits; Large Table 20, Large Figure 29) was identified in the watershed for the pre-settlement conditions.



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5.3.2 Existing Wetland and Water Resources

The existing conditions time period represents wetlands, lakes, and deepwater resources as they exist today, prior to the development of the Project (Large Figure 30). Existing wetlands, lakes, and deepwater resources were estimated using the following sources of data: wetland delineations completed in the area (described in Section 3.0), NWI maps, USGS National Hydrograph Dataset to estimate lake or lacustrine water bodies, and MDNR Mesabi Mining Features (2009) in combination with 2010 LiDAR data and aerial photographs from 2003, 2008, 2009, and 2010 to estimate deepwater or mine pit water bodies.

5.3.2.1 Partridge River Watershed

A total of 31,318 acres of existing wetlands were identified in the 101,812 acre watershed, comprising 31% of the land area (Large Table 18, Large Figure 30). There has been a decrease of approximately 2,283 acres of wetland; this represents a 7% decrease in wetland area compared to pre-settlement conditions (Large Table 21).

A total of 3,194 acres of lakes were identified in the 101,812 acre watershed, comprising 3% of the land area (Large Table 19, Large Figure 30). There has been an increase of approximately 506 acres of lakes; this represents a 19% increase in lake area compared to pre-settlement conditions (Large Table 22).

A total of 3,146 acres of deepwater resources (i.e., mine pits) were identified in the 101,812 acre watershed, comprising 3% of the land area (Large Table 20, Large Figure 30). There has been an increase of 3,146 acres of deepwater resources in the watershed compared to no deepwater resources present under pre-settlement conditions (Large Table 23).

The change in wetland, lake, and deepwater acreage has resulted primarily from mining projects, development of municipalities, and construction of transportation infrastructure such as roads and railroads.

5.3.2.2 Embarrass River Watershed

A total of 34,249 acres of existing wetlands were identified in the 116,797 acre watershed, comprising 29% of the land area (Large Table 18, Large Figure 30). There has been a decrease of approximately 402 acres of wetland; this represents a 1% decrease in wetland area compared to pre-settlement conditions (Large Table 21).

A total of 2,904 acres of lakes were identified in the 116,797 acre watershed, comprising 3% of the land area (Large Table 19, Large Figure 30). There was a decrease of approximately 217 acres of lakes in the watershed; this represents a 7% decrease in lake area compared to pre-settlement conditions (Large Table 22).

A total of 977 acres of deepwater resources (i.e., mine pits) were identified in the 116,797 acre watershed, comprising 1% of the land area (Large Table 20, Large Figure 30). There has



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been an increase of 977 acres of deepwater resources in the watershed compared to no deepwater resources present under pre-settlement conditions (Large Table 23).

The change in wetland, lake, and deepwater acreage has resulted primarily from mining projects, development of municipalities, and construction of transportation infrastructure such as roads and railroads.

5.3.3 Projected Future Wetland and Water Resources

The future conditions time period represents wetlands, lakes, and deepwater resources expected to be present following the conclusion and long-term closure of the Project. It is assumed that the future conditions represents the time period after the conclusion of the future projects when the mine pits will have flooded with water.

Relevant agencies were contacted to identify foreseeable future actions within the Partridge River and Embarrass River watersheds. Agency officials were asked to identify actual or potential development projects that may occur during the life of the Project. The Project Description (Reference (12) describes a 20-year mine life followed by reclamation and long-term closure. Public officials from city, county, state, and federal agencies were contacted as shown in Attachment F. Based on Reference (41), foreseeable future actions did not include projects that have only been proposed because it is too speculative to include in this analysis.

Future projects were identified in the Partridge and Embarrass River watersheds that may impact wetland, lake, and deepwater resources. The locations of these projects are shown on Large Figure 31 and their potential effects on future conditions for wetland and deepwater habitat resources are summarized on Large Table 24. The following projects are included in assessment of cumulative wetland impacts:

- The Project, located in the Embarrass and Partridge River watersheds, has identified the potential for 914 acres of direct wetland impact over the next 20 years. Approximately 321 acres of deepwater habitat is planned at the Mine Site at the conclusion of the Project.
- The proposed Mesabi Nugget Phase II project, located in the Partridge River watershed, has identified the potential for approximately 267 acres of direct wetland impact (Reference (42)) over the life of the project (Large Table 24, Large Figure 31). Approximately 1,601 acres of deepwater habitat is planned at the conclusion of the project (Reference (43), resulting in an increase of 49 acres from existing 1,552 acres of deepwater habitat (Large Table 24).
- The ArcelorMittal East Reserve project, located in the Embarrass River watershed, has identified the potential for approximately 116 acres of direct wetland impact (Reference (44)) over the life of the project. Through 2014, there have been 67.14 acres of direct wetland impact (Reference (45)). Approximately 275 acres of



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deepwater habitat is planned at the conclusion of the project (Reference (46)), resulting in an increase of 275 acres from the existing 0 acres of deepwater habitat.

- The ArcelorMittal Pushback project, located in the Embarrass River watershed, has identified the potential for approximately 23 acres of direct wetland impact (Reference (47)) over the life of the project. Approximately 107 acres of deepwater habitat may develop at the conclusion of the project (Reference (47)), resulting in an increase of 107 acres from the existing 0 acres of deepwater habitat.
- The Mining Resources Austin Powder (Biwabik) project, located in the Embarrass River watershed, has identified the potential for approximately 4 acres of direct wetland impact (Reference (48)) over the life of the project. No deepwater habitat is planned at the conclusion of the project.
- The Mining Resources McKinley project, located in the Embarrass River watershed, has identified the potential for approximately 50 acres of direct wetland impact (Reference (48), Reference (49)) over the life of the project. No deepwater habitat is planned at the conclusion of the project.
- The Laskin Energy Park is located in the Partridge River watershed and south of the Minnesota Power Laskin Energy Center. It is located adjacent to Colby and Whitewater Lakes, near the City of Hoyt Lakes. If every lot in the 220-acre industrial park was fully developed, the potential direct wetland impacts could range from zero to seven acres. The amount of wetland mitigation that may be conducted in the Partridge River watershed is unknown at this time.
- St. Louis County Public Works will be conducting 8 bridge replacements in the Partridge and Embarrass River watersheds over the next 10 years. Bridge replacements generally directly impact 10,000 square feet of wetlands or less, so the maximum direct wetland impact from the bridge projects will be 1.8 acres. Information was not provided regarding potential indirect wetland impacts for this project.

To estimate the future projected wetland, lake, and deepwater resources impacts from the Project, the Mesabi Nugget Phase II project, the Laskin Energy Park project, and the St. Louis County bridge replacement, the maximum impact acreages were used to calculate total acreages in Large Table 24. For the projected future conditions, the acreage of wetland, lake, and deepwater resources was estimated by subtracting the future projected wetland impacts and adding the future projected development of wetland, lake, and deepwater resources to the existing resource totals (Large Table 24).



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5.3.3.1 Partridge River Watershed

In addition to the Project, development of other projects (and associated impacts to and mitigation of wetland, lake and deepwater resources in the Partridge River Watershed) will occur under the foreseeable future conditions. Large Table 21 through Large Table 23 summarize future conditions for wetland, lake, and deepwater resources.

Approximately 30,276 acres of wetlands are projected to be present in the watershed in the foreseeable future comprising 30% of the land area (Large Table 18, Large Figure 31). The change in wetlands, as a proportion of all wetlands within the study area, will be a 10% reduction from pre-settlement conditions and a 3% reduction compared to existing conditions (Large Table 21).

Approximately 3,194 acres of lakes are projected to be present in the watershed in the foreseeable future, comprising 3% of the land area (Large Table 19, Large Figure 31). The change in lakes, as a proportion of the total study area, will be a 19% increase from presettlement conditions and there will be no changes compared to existing conditions (Large Table 22).

Approximately 3,516 acres of deepwater resources are projected to be present in the watershed in the foreseeable future, comprising 4% of the land area (Large Table 20, Large Figure 31). The change in deepwater, as a proportion of the total study area, will be a 100% increase from pre-settlement conditions and a 12% increase compared to existing conditions (Large Table 23).

5.3.3.2 Embarrass River Watershed

In addition to the Project, development of other projects (and associated impacts to and mitigation of wetland, lake, and deepwater resources in the Embarrass River Watershed) will occur under the foreseeable future conditions. Large Table 21 through Large Table 23 summarize future conditions for wetland, lake, and deepwater resources.

Approximately 33,947 acres of wetlands are projected to be present in the watershed in the foreseeable future comprising 29% of the land area (Large Table 18, Large Figure 31). The change in wetlands, as a proportion of all wetlands within the study area, will be a 2% reduction from pre-settlement conditions and a 1% reduction compared to existing conditions (Large Table 21).

Approximately 2,904 acres of lakes are projected to be present in the watershed in the foreseeable future, comprising 3% of the land area (Large Table 19, Large Figure 31). The change in lakes, as a proportion of the total study area, will be a 7% increase from presettlement conditions and there will be no changes compared to existing conditions (Large Table 22).



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Approximately 1,359 acres of deepwater resources are projected to be present in the watershed in the foreseeable future, comprising 1% of the land area (Large Table 20, Large Figure 31). The change in deepwater, as a proportion of the total study area, will be a 100% increase from pre-settlement conditions and a 39% increase compared to the existing conditions (Large Table 23).

5.3.4 Qualitative Analysis of Cumulative Wetland Impacts for the St. Louis River below the Ordinary High Water Mark from Its Confluence with the Embarrass River to Lake Superior

The XP-SWMM model developed for the Partridge River identified that the changes in average annual flow (and therefore stage) of the Partridge River will be within the naturally occurring annual variation for the Partridge River (Section 5.2.1.3). Therefore, no potential indirect wetland impacts are identified for the wetlands abutting the Partridge River.

The St. Louis River is located downstream of the Partridge River. Thus, impacts to flows (and by extension water surface elevations) generated by the Project are anticipated to be less than those estimated for the Partridge River and within the natural variation of flow within the St. Louis River. Therefore, no potential indirect wetland impacts are identified for the wetlands within the St. Louis River below the ordinary high water mark from its confluence with the Embarrass River to Lake Superior.

5.3.5 Quantitative Analysis of Cumulative Wetland Impacts

The quantitative analysis of cumulative wetland impacts for the Partridge and Embarrass River watersheds is discussed in Section 5.3.3.

5.3.6 Climate Change

The qualitative assessment of the potential impacts of climate change on wetlands was included in the Climate Change Evaluation Report developed by the Air IAP. No additional assessment was conducted for this data package.



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Revision History

Date	Version	Description
10/14/2011	1	Initial release
12/16/2011	2	Revisions based on comments received for Version 1 and additional information regarding Mine Site features.
1/20/2012	3	Revisions based on reviewing the status of wetlands within the currently permitted (Cliffs Erie LLC) waste facility boundary.
2/16/2012	4	Revisions based on comments received for Version 3
12/12/2012	5	Revisions based on additional information regarding Project features and wetland information.
12/28/2012	6	Revisions based on analysis of potential indirect wetland impacts.
3/1/2013	7	Revisions based on analysis of potential indirect wetland impacts.
11/17/2014	8	Revisions based on Project changes.
1/6/2015	9	Revisions based on agency comments provided for v8.
2/10/2015	10	Revisions based on agency comments provided for v9.
4/8/2015	11	Revisions based on agency comments provided for v10.



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Project Area	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed ⁽¹⁾ Wetland Community	Wetland Quality	Type of Direct Impact ⁽²⁾
Mine Site	1	3	0.42	0.00	0.42	Shallow marsh	Moderate	
Mine Site	3	3	0.35	0.00	0.35	Shallow marsh	Moderate	
Mine Site	5	2	0.61	0.61	0.00	Wet meadow	High	F
Mine Site	6	3	0.62	0.00	0.62	Shallow marsh	Moderate	
Mine Site	7	2	0.07	0.00	0.07	Wet meadow	Moderate	
Mine Site	8	2	6.80	6.80	0.00	Sedge meadow	Moderate	F,E
Mine Site	9	3	1.80	0.07	1.73	Shallow marsh	High	F
Mine Site	10	2	1.17	0.00	1.17	Sedge meadow	High	
Mine Site	11	8	8.88	0.00	8.88	Coniferous bog	High	
Mine Site	12	6	0.13	0.00	0.13	Alder thicket	High	
Mine Site	13	4	5.03	0.09	4.94	Deep marsh	High	F
Mine Site	14	2	0.33	0.33	0.00	Wet meadow	High	F
Mine Site	16	3	0.31	0.00	0.31	Shallow marsh	High	
Mine Site	18	3	18.90	18.90	0.00	Shallow marsh	High	Е
Mine Site	19	3	1.68	0.05	1.63	Shallow marsh	High	Е
Mine Site	20	2	17.06	16.96	0.10	Sedge meadow	High	E
Mine Site	22	3	1.43	0.00	1.43	Shallow marsh	High	
Mine Site	22A	7	0.89	0.00	0.89	Coniferous swamp	High	
Mine Site	24	6	0.80	0.39	0.41	Alder thicket	High	Е
Mine Site	25	8	1.95	0.00	1.95	Coniferous bog	High	
Mine Site	27	8	1.07	1.07	0.00	Coniferous swamp	Moderate	Е
Mine Site	29	3	12.02	0.00	12.02	Shallow marsh	High	
Mine Site	32	8	73.36	70.99	2.37	Coniferous bog	High	F,E
Mine Site	33A	6	18.46	5.77	12.69	Alder thicket	High	Е
Mine Site	33B	7	4.56	0.00	4.56	Coniferous swamp	High	
Mine Site	37	6	2.39	2.39	0.00	Shrub-carr	High	F
Mine Site	43	6	8.29	7.26	1.03	Alder thicket	High	F
Mine Site	44	6	3.27	1.99	1.28	Alder thicket	High	Е
Mine Site	45	6	37.55	28.83	8.72	Alder thicket	High	F,E
Mine Site	47	8	0.54	0.54	0.00	Open bog	High	F
Mine Site	48	8	89.16	27.80	61.36	Coniferous bog	High	F,E
Mine Site	48A	7	2.65	2.21	0.44	Coniferous swamp	High	F

Project Area	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed ⁽¹⁾ Wetland Community	Wetland Quality	Type of Direct Impact ⁽²⁾
Mine Site	51	6	7.47	7.45	0.02	Alder thicket	High	F
Mine Site	52	6	3.88	3.88	0.00	Alder thicket	High	F,E
Mine Site	53	6	18.59	0.00	18.59	Alder thicket	High	
Mine Site	53A	7	2.35	0.00	2.35	Coniferous swamp	High	
Mine Site	53B	7	0.43	0.00	0.43	Coniferous swamp	High	
Mine Site	53C	7	2.88	0.00	2.88	Coniferous swamp	High	
Mine Site	54	7	4.11	0.00	4.11	Coniferous swamp	High	
Mine Site	54C	6	0.74	0.00	0.74	Alder thicket	High	
Mine Site	55	6	3.91	3.85	0.06	Alder thicket	High	F,E
Mine Site	56 8		2.79	2.79	0.00	Open bog	High	Е
Mine Site	57	7	78.06	50.49	27.57	Coniferous swamp	High	F,E
Mine Site	58	6	34.58	0.00	34.58	Alder thicket	High	
Mine Site	60	6	6.71	6.71	0.00	Alder thicket	High	F
Mine Site	61	7	0.45	0.00	0.45	Coniferous swamp	High	
Mine Site	62	8	12.13	0.00	12.13	Coniferous bog	High	
Mine Site	64	7	0.31	0.00	0.31	Hardwood swamp	High	
Mine Site	68	7	23.81	10.89	12.92	Coniferous swamp	High	F,E
Mine Site	72	7	1.39	0.00	1.39	Coniferous swamp	High	
Mine Site	74	7	6.12	6.12	0.00	Hardwood swamp	High	E
Mine Site	76	8	3.92	2.21	1.71	Coniferous bog	High	E
Mine Site	77	8	13.01	0.92	12.09	Coniferous bog	High	F,E
Mine Site	78	8	1.75	1.75	0.00	Coniferous bog	High	F
Mine Site	79	8	2.39	0.00	2.39	Coniferous bog	High	
Mine Site	80	8	0.29	0.22	0.07	Coniferous bog	High	F
Mine Site	81	7	1.68	1.44	0.24	Coniferous swamp	High	F,E
Mine Site	82	8	62.40	60.77	1.63	Coniferous bog	High	F,E
Mine Site	83	8	3.99	0.00	3.99	Open bog	High	
Mine Site	84	8	1.33	0.00	1.33	Coniferous bog	High	
Mine Site	85	8	1.41	1.41	0.00	Coniferous bog	High	Е
Mine Site	86	8	2.47	2.46	0.01	Coniferous bog	High	F
Mine Site	88	8	5.58	5.02	0.56	Coniferous bog	High	F
Mine Site	90	8	176.08	34.22	141.86	Coniferous bog	High	F,E
Mine Site	90A	8	7.91	1.20	6.71	Open bog	High	F

Project Area	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed ⁽¹⁾ Wetland Community	Wetland Quality	Type of Direct Impact ⁽²⁾
Mine Site	95	8	2.54	2.54	0.00	Coniferous swamp	High	E
Mine Site	96	8	17.30	13.14	4.16	Coniferous bog	High	F,E
Mine Site	97	8	4.46	2.57	1.89	Coniferous bog	High	F,E
Mine Site	98	8	15.50	15.07	0.43	Coniferous bog	High	F,E
Mine Site	99	8	1.40	0.49	0.91	Coniferous bog	High	F,E
Mine Site	100	8	176.19	102.96	73.23	Coniferous bog	High	F,E
Mine Site	100A	6	1.66	1.66	0.00	Alder thicket	High	F
Mine Site	101	8	14.21	11.73	2.48	Coniferous bog	High	F,E
Mine Site	103	8	118.84	109.97	8.87	Coniferous bog	High	F,E
Mine Site	104	8	3.57	3.47	0.10	Coniferous bog	High	F
Mine Site	105	8	15.48	0.00	15.48	Coniferous bog	High	
Mine Site	107	8	40.92	31.63	9.29	Coniferous bog	High	F,E
Mine Site	107A	7	1.74	1.69	0.05	Coniferous swamp	High	F,E
Mine Site	107B	3	4.51	2.89	1.62	Shallow marsh	High	F,E
Mine Site	107C	6	27.60	27.60	0.00	Alder thicket	High	E
Mine Site	114	8	0.73	0.73	0.00	Coniferous bog	High	F
Mine Site	120	3	0.58	0.12	0.46	Shallow marsh	Moderate	E
Mine Site	200	7	6.36	6.36	0.00	Hardwood swamp	High	F
Mine Site	201	2	13.49	13.49	0.00	Wet meadow	High	F
Mine Site	202	8	3.11	3.11	0.00	Open bog	High	F
Mine Site	552	8	8.72	8.72	0.00	Coniferous bog	High	F
Mine Site	567	3	1.40	1.40	0.00	Shallow marsh	High	F
MINE SITE SUBTOTAL	87		1297.78	758.19	539.59		80/87 High 7/87 Moderate	
Railroad Connection Corridor	1038	7	0.07	0.07	0.00	Coniferous swamp	High	F
Railroad Connection Corridor	R-3	6	0.10	0.10	0.00	Shrub-carr	High	F
Railroad Connection Corridor	R-4	6	0.20	0.20	0.00	Alder thicket	High	F
Railroad Connection Corridor	R-5	3	0.07	0.07	0.00	Shallow marsh	High	F
RAILROAD CONNECTION CORRIDOR SUBTOTAL			0.44	0.44	0.00		4/4 High	
Dunka Road and Utility Corridor	22B	3	0.34	0.34	0.00	Shallow marsh	High	F
Dunka Road and Utility Corridor	22C	6	0.38	0.38	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	54A	7	0.60	0.60	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	54B	6	0.13	0.13	0.00	Alder thicket	High	F

Project Area	Wetland ID Dominant Circular 39 Community		Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed ⁽¹⁾ Wetland Community	Wetland Quality	Type of Direct Impact ⁽²⁾
Dunka Road and Utility Corridor	54D	7	0.09	0.09	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	390	6	0.41	0.41	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	392	6	0.14	0.14	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	394	7	0.64	0.64	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	395	7	0.01	0.01	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	396	6	0.65	0.65	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	400	8	0.14	0.14	0.00	Coniferous bog	High	F
Dunka Road and Utility Corridor	553	7	0.09	0.09	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	554	7	0.11	0.11	0.00	Coniferous swamp	High	F
Dunka Road and Utility Corridor	569	6	0.68	0.68	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	716	6	0.02	0.02	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	814	8	0.75	0.75	0.00	Coniferous bog	High	F
Dunka Road and Utility Corridor	Road and Utility Corridor 862		0.78	0.78	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	1034	6	0.02	0.02	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	1035	6	0.16	0.16	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	1124	6	0.44	0.44	0.00	Alder thicket	High	F
Dunka Road and Utility Corridor	R-7	3	0.18	0.18	0.00	Shallow marsh	High	F
DUNKA ROAD AND UTILITY CORRIDOR SUBTOTAL	21		6.76	6.76	0.00		21/21 High	
FTB	251	6	1.43	1.43	0.00	Alder thicket	Moderate	С
FTB	272	4	1.11	1.10	0.01	Deep marsh	Low	С
FTB	278	6	1.04	0.23	0.81	Alder thicket	Low	С
FTB	279	6	4.84	3.33	1.51	Alder thicket	Low	С
FTB	282	3	14.25	7.42	6.83	Shallow marsh	Moderate	С
FTB	284	6	2.92	2.51	0.41	Alder thicket	Low	С
FTB	290	7	0.48	0.22	0.26	Coniferous swamp	Moderate	F,E
FTB	292	4	1.71	1.29	0.42	Deep marsh	Low	С
FTB	307	3	0.78	0.77	0.01	Shallow marsh	Low	С
FTB	308	4	7.17	7.17 1.95 5.22		Deep marsh	Low	С
FTB	309	2	0.02	0.02	0.00	Wet meadow	Low	С
FTB	312	6	1.98	1.33	0.65	Shrub-carr	Low	С
FTB	314	3	24.87	5.70	19.17	Shallow marsh	Low	С
FTB	573	3	0.12	0.00	0.12	Shallow marsh	Low	
FTB	582	4	27.49	8.11	19.38	Deep marsh	Low	С

Project Area	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed ⁽¹⁾ Wetland Community	Wetland Quality	Type of Direct Impact ⁽²⁾
FTB	585	6	1.58	0.00	1.58	Alder thicket	Low	
FTB	586	4	1.89	1.53	0.36	Deep marsh	Low	С
FTB	587	3	0.97	0.17	0.80	Shallow marsh	Low	С
FTB	590	3	5.43	5.38	0.05	Shallow marsh	Low	С
FTB	591	4	2.71	0.70	2.01	Deep marsh	Low	С
FTB	593	4	9.80	8.47	1.33	Deep marsh	Low	С
FTB	594	4	0.06	0.00	0.06	Deep marsh	Low	
FTB	595	4	2.14	1.09	1.05	Deep marsh	Low	F
FTB	811	7	0.20	0.20	0.00	Coniferous swamp	Low	С
FTB	968	7	13.76	10.27	3.49	Coniferous swamp	Low	С
FTB	1027	6	0.20	0.00	0.20	Alder thicket	Moderate	
FTB	1125	2	0.07	0.07	0.00	Sedge meadow	Low	F
FTB	1126	7	0.69	0.69	0.00	Hardwood swamp	Low	F
FTB	1134	3	14.45	8.71	5.74	Shallow marsh	Low	С
FTB	1135	4	0.51	0.00	0.51	Deep marsh	Low	
FTB	1139	3	20.25	2.54	17.71	Shallow marsh	Low	С
FTB	1155	3	0.55	0.41	0.14	Shallow marsh	Low	С
FTB	1156	3	15.07	11.08	3.99	Shallow marsh	Low	С
FTB	1159	3	0.05	0.00	0.05	Shallow marsh	Low	
FTB	1160	5	0.85	0.00	0.85	Deep water	Low	
FTB	1176	7	0.34	0.00	0.34	Hardwood swamp	Moderate	
FTB	P10	6	0.34	0.00	0.34	Alder thicket	Low	
FTB	T1	4	1.93	0.11	1.82	Deep marsh	Low	F
FTB	T2	4	0.90	0.90	0.00	Deep marsh	Low	F
FTB	Т3	2	0.09	0.09	0.00	Wet meadow	Low	F
FTB	T4	2	1.02	1.02	0.00	Wet meadow	Low	F
FTB	T5	2	0.24	0.24	0.00	Wet meadow	Low	F
FTB	Т6	6	0.07	0.07	0.00	Shrub-carr	Low	F
FTB	Т7	3	0.92	0.92	0.00	Shallow marsh	Low	F
FTB	Т8	2	0.03	0.01	0.02	Wet meadow	Low	F
FTB	T10	4	1.48	1.48	0.00	Deep marsh	Low	F
FTB	T11	4	0.95	0.95	0.00	Deep marsh	Low	F
FTB	T12	3	0.39	0.39	0.00	Shallow marsh	Low	F

Project Area	Wetland ID	Dominant Circular 39 Community	Total Wetland Area within the Project Area (acres)	Direct Wetland Impacts (acres)	Remaining Wetland Area (acres)	Dominant Eggers and Reed ⁽¹⁾ Wetland Community	Wetland Quality	Type of Direct Impact ⁽²⁾
FTB	T13	4	1.05	0.97	0.08	Deep marsh	Low	F
FTB	T13A	4	0.16	0.16	0.00	Deep marsh	Low	F
FTB	T14	4	45.20	45.20	0.00	Deep marsh	Low	Е
FTB	T15	3	1.70	1.70	0.00	Shallow marsh	Low	F
FTB SUBTOTAL	52		238.25	140.93	97.32		5/52 Moderate 47/52 Low	
HRF	1155	3	35.45	6.89	28.56	Shallow marsh	Low	F
HRF	1159	3	0.62	0.62	0.00	Shallow marsh	Low	F
HRF SUBTOTAL	2		36.07	7.51	28.56		2/2 Low	
PROJECT TOTAL	166		1,579.24	913.83	665.41		105/166 High 12/166 Moderate 49/166 Low	

⁽¹⁾ Reference (13)
(2) The types of direct wetland impact disturbance factors include excavation €, fill (F), and containment system (C).

Large Table 2 Summary of Direct Wetland Impacts

	Circular 39 Wetland Classification	1	2	2	3	4	5	6	6	7	7	8	8		
Project Area	Eggers and Reed Wetland Community ⁽¹⁾	Seasonally Flooded	Fresh (Wet) Meadow	Sedge Meadow	Shallow Marsh	Deep Marsh	Shallow, Open Water	Shrub- Carr	Alder Thicket	Hardwood Swamp	Coniferous Swamp	Open Bog	Coniferous Bog	Deepwater	Wetland Total
Mine Site	Direct Impact (acres)	0.00	14.43	23.76	23.43	0.09	0.00	2.39	95.39	12.48	70.33	7.64	508.26	0.00	758.20
Wille Site	# of directly impacted wetlands	0	3	2	6	1	0	1	11	2	7	4	22	0	59
Railroad Connection	Direct Impact (acres)	0.00	0.00	0.00	0.07	0.00	0.00	0.10	0.20	0.00	0.07	0.00	0.00	0.00	0.44
Corridor	# of directly impacted wetlands	0	0	0	1	0	0	1	1	0	1	0	0	0	4
Dunka Road and	Direct Impact (acres)	0.00	0.00	0.00	0.52	0.00	0.00	0.00	3.81	0.00	1.54	0.00	0.89	0.00	6.76
Utility Corridor	# of directly impacted wetlands	0	0	0	2	0	0	0	11	0	6	0	2	0	21
FTB	Direct Impact (acres)	0.00	1.38	0.07	45.19	74.01	0.00	1.40	7.50	0.69	10.69	0.00	0.00	0.00	140.93
FIB	# of directly impacted wetlands	0	5	1	12	15	0	2	4	1	3	0	0	0	43
ПРЕ	Direct Impact (acres)	0.00	0.00	0.00	7.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.51
HRF	# of directly impacted wetlands	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Total	(acres)	0.00	15.81	23.83	76.72	74.10	0.00	3.89	106.90	13.17	82.63	7.64	509.15	0.00	913.84

⁽¹⁾ Reference (13)

Large Table 3 Wetlands within 500-feet increments – Mine Site

		Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 - 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
1	Shallow marsh	0	0	0	0	0	0	0	0.10	0.33	0	0	0	0	0	0	0	0	0	0	0
3	Shallow marsh	0	0	0	0	0	0	0	0	0	0.35	0	0	0	0	0	0	0	0	0	0
4	Wet meadow	0	0	0	0	0	0	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Shallow marsh	0	0	0	0	0	0	0	0.62	0	0	0	0	0	0	0	0	0	0	0	0
7	Wet meadow	0	0	0	0	0	0	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Shallow marsh	0	1.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Sedge meadow	0	0	0	0	0.12	1.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Coniferous bog	0	0	0	0	0	0	0	0.44	4.98	3.46	0	0	0	0	0	0	0	0	0	0
12	Alder thicket	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0
13	Deep marsh	0.01	4.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Shallow marsh	0	0	0.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Shallow marsh	0	0	0	0	0	0	0	0.12	1.00	0	0	0	0	0	0	0	0	0	0	0
19	Shallow marsh	0	0	0	0	0	1.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Sedge meadow	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Shallow marsh	0	0	1.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22A	Coniferous swamp	0	0	0.39	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22D	Shallow marsh	0	0	0.62	1.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22E	Alder thicket or Shrub-carr	0	0	0	2.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Alder thicket	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Coniferous bog	1.62	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Shallow marsh	0	0	0	0	0	0	0	0	0.02	11.75	0.24	0	0	0	0	0	0	0	0	0
32	Coniferous bog	2.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33A	Alder thicket	11.77	0.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33B	Coniferous swamp	1.96	2.47	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	Alder thicket	0	0.70	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
44	Alder thicket	1.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	Alder thicket	8.17	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	Shrub-carr	0	0	0	0	0.52	3.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	Coniferous bog	1.54	14.29	37.40	7.77	0.30	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48A	Coniferous swamp		0	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	Alder thicket	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	Alder thicket	0	0	0	1.48	0.44	0	4.51	10.24	1.91	0	0	0	0	0	0	0	0	0	0	0
53A	Coniferous swamp	0	0	0	0	0	0	0	1.36	0.99	0	0	0	0	0	0	0	0	0	0	0
53B	Coniferous swamp	0	0	0	0	0	0	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0
53C	Coniferous swamp	0	0	0	2.67	0.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53D	Alder thicket	0	3.67	30.49	44.04	31.61	14.74	19.96	27.72	42.97	48.42	73.99	129.85	107.42	52.72	39.85	33.10	38.85	35.91	31.97	16.02
53E	Coniferous swamp	0	0	0	0	0	0	0.05	1.83	0.04	0	0	0	0	0	0	0	0	0	0	0
54	Coniferous swamp	0	0	0	0	0	1.86	2.23	0.01	0	0	0	0	0	0	0	0	0	0	0	0
54C	Alder thicket	0	0	0	0	0	0.06	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0
54E	Coniferous swamp	0	0	0	0	0	0	1.43	1.17	0	0	0	0	0	0	0	0	0	0	0	0
54F	Alder thicket	0	0	0	0	0	0	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0
54G	Coniferous swamp	0	0	0	0	0	0.77	0.77	0	0	0	0	0	0	0	0	0	0	0	0	0
55	Alder thicket	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0
57	Coniferous swamp	0	0	0	2.66	5.98	11.25	5.70	1.95	0	0	0	0	0	0	0	0	0	0	0	0
58	Alder thicket	0	0	0	0	0	3.36	9.33	18.26	2.98	0.64	0	0	0	0	0	0	0	0	0	0
61	Coniferous swamp	0	0	0	0.35	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	Coniferous bog	0	0.17	2.58	7.52	1.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

								Wetlands	(acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	Mine Pit	S					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 - 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
64	Hardwood swamp	0	0	0	0.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	Coniferous swamp	0.83	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	Coniferous bog	1.71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	Coniferous bog	2.20	8.79	1.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	Coniferous bog	0	2.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	Coniferous bog	0	0	0.05	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	Coniferous swamp	0	0	0	0	0	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82	Coniferous bog	1.63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	Open bog	0	0	0	0	0	0	0	0	0	2.45	1.54	0	0	0	0	0	0	0	0	0
84	Coniferous bog	0	0	0	0	0	0.82	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0
84A	Coniferous bog	0	0	0	0	0	1.04	3.33	3.04	0.80	0	0	0	0	0	0	0	0	0	0	0
86	Coniferous bog	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
88	Coniferous bog	0	0	0	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	Coniferous bog	17.53	28.70	19.37	14.09	15.60	13.04	13.05	15.21	5.19	0.00	0	0	0	0	0	0	0	0	0	0
90A	Open bog	0	0	3.97	2.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96	Coniferous bog	4.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97	Coniferous bog	1.89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	Coniferous bog	0	0	0	0	0	0	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0
99	Coniferous bog	0.91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	Coniferous bog	29.61	37.10	6.43	0.04	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

								Wetlands	(acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	Mine Pit	S					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 - 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 – 7,500 Feet	7,500 - 8,000 Feet	8,000 – 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
101	Coniferous bog	2.26	0.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
103	Coniferous bog	8.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104	Coniferous bog	0	0	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	Coniferous bog	0	0	0	0	0	0	0	0	0	5.78	8.38	1.31	0	0	0	0	0	0	0	0
105A	Coniferous bog	0	0	0	0	0	0	0	0	0	0.04	0.09	0	0	0	0	0	0	0	0	0
106	Coniferous swamp	0	0	0	0	0	1.60	10.47	4.55	8.97	28.37	26.58	3.00	0	0	0	0	0	0	0	0
106B	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0.16	16.44	4.72	0	0	0	0	0
106C	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	5.70	10.75	3.48	0	0	0	0	0
106D	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.79	16.01	1.00	0	0	0
107	Coniferous bog	7.94	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107A	Coniferous swamp	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107B	Shallow marsh	1.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	Shallow marsh	0	0	0	0	0	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
315	Alder thicket or Shrub-carr	0	0	6.31	10.90	34.96	60.64	57.68	46.65	44.89	25.08	16.34	6.77	12.04	0.42	0	0	0	0	0	0
394A	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.48	6.95	21.58	37.21
396A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.80	1.88	0	0	0
397	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0.54	11.99	23.56	29.74	39.05	37.66	34.16	34.53
404	Coniferous swamp	0	0	0	0	0	0	0	1.09	8.72	2.97	0	0	0	0	0	0	0	0	0	0
406	Coniferous bog	0	0	0	0	2.26	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
407	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	2.27	6.93	5.38	0	0	0	0

								Wetlands	s (acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	e Mine Pit	S					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
409	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.16	11.30	11.10	15.53	19.45
410	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	1.96	0	0	0	0	0
457	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.90	16.40	31.66
458	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33
459	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.29	7.47	5.00	5.87	8.89	4.50
460	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	1.82	4.82	0.09	0	0	0	0	0
461	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.85	2.80
465	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.53	5.58	11.36	3.29	0
466	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	6.35	6.25	6.88	4.28	1.10	0	0
467	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	2.20	10.27	7.10	8.72	1.29	0	0
468	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.46	6.45	8.81	3.95	0	0
470	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.20
473	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.64	3.52	0.50
474	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.15	10.08	8.18	0.02	0	0
477	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.69
478	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.21	1.79	0
479	Coniferous bog	0	0	0	0	0	0	0	0	0.94	13.70	9.82	9.28	2.74	0.40	0	0	0	0	0	0
480	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	4.44	2.84	1.59	0	0	0	0	0	0	0	0
487	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	4.14	7.32

								Wetlands	s (acres) v	vithin 500	-Feet Incr	ements F	rom the E	Edge of the	e Mine Pit	s					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 - 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
489	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	9.04	47.95	45.51	34.46	33.56	7.82	0.39	0
491	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.42	1.05
492	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	7.30	0.11
493	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.62	12.10	12.29	10.88	10.69	0
494	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.59
510	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02
512	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.54	12.01	3.79	0	0
513	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.52	5.86	2.99	0
514	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.96	5.09	0.26	0
515	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.30
516	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.40
519	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.09
530	Coniferous bog	0	0	0	0	0	0	0	0	0	0.31	14.88	11.79	29.83	34.75	28.28	24.43	27.89	17.32	4.79	9.41
531	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	6.34	17.16	7.18	5.22	10.40	11.52	10.15	2.48
532	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.79	5.10	8.32	1.03	0
533	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.76	5.44	1.60	0
534	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.86	10.19	7.15
535	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
538	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.29

								Wetlands	(acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	Mine Pit	S					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 – 7,500 Feet	7,500 - 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
539	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.01	8.34
540	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.45
546	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	5.93	20.25	24.83	39.97	47.95	30.85	19.89	33.37
547	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.58	9.57	1.18	0	0	0
548	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.25	10.11	1.21
553A	Coniferous swamp	0	0	0	0	0	0	0.73	1.73	0	0	0	0	0	0	0	0	0	0	0	0
554A	Coniferous swamp	0	0	0	0	0	0	0	0.83	1.22	0	0	0	0	0	0	0	0	0	0	0
555	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	2.45	3.28	9.06	20.65	25.15	25.81	16.25	11.96	11.14	4.04	1.44	0.40
556	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	1.84	0	0	0	0	0	0	0	0	0
557	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	2.72	0.20	0	0	0	0	0	0	0	0	0	0
558	Coniferous bog	0	0	0	0	0	0	0	0		4.65	7.57	3.85	0	0	0	0	0	0	0	0
559	Coniferous bog	0	0	0	0	0	0	0.09	2.61	7.89	10.74	8.29	4.49	0.01	0	0	0	0	0	0	0
561	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.87	11.82	3.84
562	Coniferous bog	0	0	0	0	0	3.60	1.67	0	0	0	0	0	0	0	0	0	0	0	0	0
564	Coniferous bog	0	0	0	0	0	0	0.44	3.14	0	0	0	0	0	0	0	0	0	0	0	0
565	Alder thicket or Shrub-carr	0	0	0	0	0.06	1.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
566	Alder thicket or Shrub-carr	0	0	0	0	0	0	2.54	3.00	0.32	0	0	0	0	0	0	0	0	0	0	0
568	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.32	0.10	0	0	0	0
569A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	1.17	3.89	3.25	0	0	0	0	0
570	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.69	10.02	5.27	8.71	12.38	4.88

								Wetlands	(acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	Mine Pit	s					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 - 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 - 7,500 Feet	7,500 - 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
571	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29	2.85
678	Alder thicket	0	0	0	0	0	0	0	0	0	0.15	14.50	15.18	18.90	9.66	0	0	0	0	0	0
679	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0	0	0	0	0
68	Coniferous swamp	7.97	4.94	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
681	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0.88	1.21	0	0	0	0	0	0	0
682	Open bog	0	0	0	0	0	0	0	0	0	0	0	2.14	0.02	0	0	0	0	0	0	0
688	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	1.28	0.74	0	0	0	0	0	0
689	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	4.20	0.42	0	0	0	0	0	0
691	Alder thicket	0	0	0	0	0	0	0	0	0	0	0.35	3.62	2.27	0	0	0	0	0	0	0
693	Coniferous bog	0	0	0	0	0	0	0	0	0	0	3.46	8.87	0	0	0	0	0	0	0	0
695	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	3.30	0	0	0	0	0	0	0	0
697	Coniferous bog	0	0	0	0	0	0	0	0	2.52	2.02	0	0	0	0	0	0	0	0	0	0
699	Coniferous bog	0	0	0	0	0	0	0	0.76	1.44	0	0	0	0	0	0	0	0	0	0	0
700	Open bog	0	0	0	0	0	0	0	0	0	0	0.63	0	0	0	0	0	0	0	0	0
701	Coniferous swamp	0	0	0	0.37	12.42	28.46	32.50	56.82	22.12	0.24	0	0	0	0	0	0	0	0	0	0
708	Shallow marsh	0	0	0	0	0	0	0	0	1.31	2.61	0	0	0	0	0	0	0	0	0	0
709	Shallow marsh	0	0	0	0	0	0	0	0	0	1.70	6.43	0	0	0	0	0	0	0	0	0
713	Coniferous bog	0	0	0	0	0	0	0	0	1.13	6.33	0.44	0	0	0	0	0	0	0	0	0
714	Coniferous bog	0	0	0	0	0	19.80	44.26	45.74	28.37	18.99	19.10	13.19	5.08	0.12	0	0	0	0	0	0
716A	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08
725	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.62	5.21	2.17
726	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0.92	5.18	0.72	0	0	0	0	0

								Wetlands	(acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	e Mine Pit	s					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 - 3,000 Feet	3,000 - 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 - 6,500 Feet	6,500 - 7,000 Feet	7,000 - 7,500 Feet	7,500 - 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
727	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0	0
728	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0
729	Sedge meadow	0	0	0	0	0	0	0	0	0	0	0	0	0.57	0.20	0	0	0	0	0	0
730	Open bog	0	0	0	0	0	0	0	0	0	0	0.27	0	0	0	0	0	0	0	0	0
731	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0	0
732	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0	0	0	0	0	0
733	Open bog	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0
734	Open bog	0	0	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0	0	0	0
735	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0.91	0	0	0	0	0	0
736	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0.16	0.42	0	0	0	0	0	0	0
737	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0.17	0.25	0	0	0	0	0	0	0
738	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0.59	0	0	0	0	0	0	0
739	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0	0	0
740	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0	0
741	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0.20	0.38	0	0	0	0	0	0	0
742	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0.01	2.56	0.91	0	0	0	0	0	0	0
743	Alder thicket	0	0	0	0	0	0	0	0	0	0.44	0.20	0	0	0	0	0	0	0	0	0
744	Alder thicket	0	0	0	0	0	0	0	0	0	0.96	0	0	0	0	0	0	0	0	0	0
745	Coniferous swamp	0	0	0	0	0	0	5.66	6.23	1.43	0	0	0	0	0	0	0	0	0	0	0
746	Alder thicket	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0	0	0	0	0
747	Alder thicket	0	0	0	0	0	0	0	0.23	0.70	0	0	0	0	0	0	0	0	0	0	0
748	Alder thicket	0	0	0	0	0	0	0	0	0.47	0	0	0	0	0	0	0	0	0	0	0
749	Alder thicket	0	0	0	0	0	0	0	0	0.69	8.52	0.23		0	0	0	0	0	0	0	0
752	Alder thicket	0	0	0	0	0	0	0.16	3.43	0	0	0	0	0	0	0	0	0	0	0	0
753	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.27	0.25	0	0
754	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.18	0.80	0	0	0	0
755	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29	0.36	0	0	0	0	0

								Wetlands	s (acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	e Mine Pit	s					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 - 1,500 Feet	1,500 – 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 - 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 - 7,500 Feet	7,500 – 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
756	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.54	0	0	0	0	0
757	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0.30	0	0	0	0	0	0	0
759	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	5.79	4.29	0	0	0
760	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0.57	0	0	0	0	0	0	0
764	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.65	3.28	4.12	3.41	13.77	24.20
765	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.15	0
766	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.88	0	0
768	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.29
773	Coniferous bog	0	0	0	4.96	3.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
774	Coniferous bog	0	0	0	0	0	5.29	2.93	0	0	0	0	0	0	0	0	0	0	0	0	0
775	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	2.28	0
776	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.61	2.89	0.39	0	0
777	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0
778	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0.02	0.46	0	0	0	0	0	0	0	0
779	Alder thicket	0	0	0	0	0	0	0	0	0	0	0.96	0.07	0	0	0.55	0	0	0	0	0
780	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0.45	1.00	0	0	0	0	0	0	0	0
781	Coniferous bog	0	0	0	0	0	0	0	0	0.62	0.00	0	0	0	0	0	0	0	0	0	0
782	Coniferous bog	0	0	0	0	0	0	0	0		0.99	1.11	0	0	0	0	0	0	0	0	0
783	Coniferous bog	0	0	0	0	0	0	0	0	0.83	1.09	0	0	0	0	0	0	0	0	0	0
784	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	1.41	0.24	0	0	0	0	0	0	0
785	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	1.33	0	0	0	0	0	0	0
790	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.59	2.81	2.09
791	Lake	0	0	0	0	0	0	0	0	0	0	0	0	1.01	16.84	11.83	0.91	0	0	0	0

								Wetlands	s (acres) v	vithin 500	-Feet Incr	ements F	rom the E	dge of the	e Mine Pit	s					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 - 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
792	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	1.36	5.59	0.15	0	0	0	0
802	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	3.55	6.23	8.90	9.00	5.19	2.69	4.51
805	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
807	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	3.61
808	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	1.69	8.31	6.90	3.41	0	0	0	0	0
856	Coniferous swamp	0	0	0.00	6.90	2.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
864	Coniferous swamp	0	0	0	0	0	0.02	9.54	25.19	30.52	28.01	13.68	5.38	0.14	0	0	0	0	0	0	0
885	Open bog	0	0	0	0	0	0	0	12.96	37.36	37.85	23.34	9.32	10.84	5.11	2.46	0	0	0	0	0
887	Coniferous bog	0	0	0	0	0	0.65	20.75	43.72	33.07	27.97	44.84	54.45	47.30	44.90	50.38	51.06	43.00	29.33	20.15	14.11
888	Coniferous bog	0	1.18	36.50	50.85	55.24	25.94	14.79	8.37	0	0	0	0	0	0	0	0	0	0	0	0
889	Shallow marsh	0	0	0	0	12.22	17.96	6.48	0.31	0	0	0	0	0	0	0	0	0	0	0	0
890	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	3.34	11.24	19.69	3.00	0	0	0	0	0	0	0	0
891	Coniferous swamp	0	0	0	0	0	0	0	0	0.58	6.36	7.82	0.02	0	0	0	0	0	0	0	0
899	Open bog	0	0	0	0	0.68	10.96	16.35	2.15	0	0	0	0	0	0	0	0	0	0	0	0
900	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.23	7.97	1.37	0	0	0
901	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0.02	0.46	0	0	0	0	0	0	0
903	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.89	3.64	4.17	0
904	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	2.33	0	0	0	0	0	0
906	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.87	3.38	0	0
924	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.58	0.03	0
925	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.93	2.46	0
930	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0.05	2.18	0	0	0	0	0	0

Wetland ID Red Co 931 C 949 C 972 H 973 Al or	Eggers and eed Wetland community(1) Coniferous bog Coniferous bog Hardwood swamp Alder thicket or Shrub-carr Coniferous bog hallow marsh hallow marsh	0 - 500 Feet	500 - 1,000 Feet 0 0 0 0	1,000 - 1,500 Feet 0 0 0 0	1,500 - 2,000 Feet 0 0	2,000 - 2,500 Feet 0 0	2,500 - 3,000 Feet 0 0	3,000 - 3,500 Feet 0 0	3,500 - 4,000 Feet 0	4,000 - 4,500 Feet 0	4,500 - 5,000 Feet 0	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 - 6,500 Feet	6,500 - 7,000 Feet	7,000 - 7,500 Feet	7,500 - 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 - 9,500 Feet 0	9,500 – 10,000 Feet
931 949 C 972 H 973 Al or	bog Coniferous bog Hardwood swamp Alder thicket or Shrub-carr Coniferous bog hallow marsh	0 0 0 0	0 0	0 0	0	0	0	0	0												
972 H 973 Al or	bog Hardwood swamp Alder thicket or Shrub-carr Coniferous bog hallow marsh	0 0 0	0	0	0	0				0.30	1.50	0	_						0	0	
972 973 Al or	swamp Alder thicket or Shrub-carr Coniferous bog hallow marsh hallow marsh	0 0	0	0			0	0.90	0				0	0	0	0	0	0	U		0
9/3 or	Coniferous bog hallow marsh	0			0	0			U	0	0	0	0	0	0	0	0	0	0	0	0
984 C	bog hallow marsh hallow marsh	0	0	0			0	0	0	0	0	0	0	0	0	2.47	4.59	3.93	0	0	0
	hallow marsh			,	0	14.64	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
997 Sha	+		0	0	0	0	0	0	0	0	0	1.15	0.36	0	0	0	0	0	0	0	0
999 Sha		0	0	0	0	0	0	0	0	0	0	0.01	0.70	0	0	0	0	0	0	0	0
1004 Sha	hallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0.94	0	0	0	0	0	0	0
	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.91	0.50	0
1131 C	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0.36	4.19	0	0	0	0	0	0	0
1132 Sha	hallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.16	0	0	0	0	0
1136 De	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.12	11.88	24.49	3.01	0
1 113/ 1	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.76	4.35	6.73	0.25	0	0
1138 De	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.59	0.64		0	0	0
11144	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.08	9.41	14.78	19.60	7.49	0.44
1145	Coniferous swamp	0	0	0	0	0	0	0	0	0	2.80	16.78	23.58	28.22	8.51	0.66	0	0	0	0	0
1146	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.39	2.77	0	0	0	0
1149 C	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.80	0	0	0	0	0
1153	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.39	9.39	4.14	0	0	0
1154	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	4.06	11.06	1.99	0	0	0	0	0
Total acres of	of wetland	118.36	114.99	147.94	162.94	195.14	231.13	291.33	351.58	306.52	326.40	357.56	345.18	355.05	381.79	343.77	405.60	422.32	348.93	318.66	298.94

⁽¹⁾ Reference (13)

Large Table 4 Summary of Wetlands within 500-feet Increments – Mine Site Area

							Wetland	s (acres)	within 500)-Feet Inc	rements F	rom the E	Edge of th	e Mine Pi	ts					
Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 - 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 - 6,000 Feet	6,000 - 6,500 Feet	6,500 - 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 - 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
Alder thicket	21.62	5.85	30.82	45.52	32.05	18.16	35.08	59.88	50.11	59.13	90.36	149.08	130.72	62.67	40.76	33.10	41.12	38.04	33.12	16.10
Alder thicket or Shrub-carr	0	0	6.31	13.35	35.02	62.49	60.22	49.65	53.72	44.24	49.77	32.01	38.36	33.82	44.36	50.24	50.64	34.92	46.90	54.54
Coniferous bog	84.21	94.51	103.53	85.82	93.07	70.80	102.23	123.03	88.08	97.57	118.94	116.91	122.29	203.43	187.58	221.64	216.50	144.79	120.87	101.11
Coniferous swamp	10.81	7.96	0.96	13.45	21.46	44.20	69.51	102.76	74.59	68.75	64.88	34.13	47.67	57.03	49.68	75.88	78.83	80.02	75.97	86.37
Deep marsh	0.01	4.93	0	0	0	0	0	0	0	0	0	0	0	0	1.91	1.86	12.64	29.93	5.62	8.34
Hardwood swamp	0	0	0	0.31	0	0	0.90	0	0	0	0	0	0.57	0	0.18	0.80	0	0.78	2.28	4.29
Lake	0	0	0	0	0	0	0	0	0	0	0	0	1.01	16.84	11.83	0.91	0	0	0	0
Open bog	0	0	3.97	2.74	0.68	10.96	16.35	15.11	37.36	40.30	25.78	11.97	12.31	7.80	6.12	17.89	16.58	12.81	13.15	0
Sedge meadow	0.10	0	0	0	0.12	1.05	0	0	0	0	0	0	0.57	0.20	0	0	0	0	0	0
Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.70
Shallow marsh	1.61	1.74	2.35	1.75	12.22	20.04	6.48	1.15	2.66	16.41	7.83	1.06	0.94	0	0.16	0	1.89	4.23	6.98	3.29
Shallow, open water	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0	0
Shrub-carr	0	0	0	0	0.52	3.43	0	0	0	0	0	0.02	0.46	0	1.19	3.28	4.12	3.41	13.77	24.20
Wet meadow	0	0	0	0	0	0	0.56	0.00	0	0	0	0	0	0	0	0	0	0	0	0
Total acres of wetland	118.36	114.99	147.94	162.94	195.14	231.13	291.33	351.58	306.52	326.40	357.56	345.18	355.05	381.79	343.77	405.60	422.32	348.93	318.66	298.94

⁽¹⁾ Reference (13)

Large Table 5
Wetland and Watershed Acreages During Existing Operations Conditions, and Reclamation Conditions – Mine Site

					Pre-Mining (E	xisting) Condition	ns				Operations	s Conditions (1)					Reclamati	ion Conditions		
Wetland ID ⁽²⁾	Eggers and Reed Wetland Type	Change in Equivalent Yield ⁽³⁾ (%)	Watershed Total Area (acres)	Upland Area (acres)	Wetland Area (acres)	Wetland Area (%)	Tributary Acres per Wetland Acre	Contributing Net Precipitation (ac-ft/yr)	Watershed Total Area (acres)	Upland Area (acres)	Wetland Area (acres)	Wetland Area (%)	Tributary Acres per Wetland Acre	Contributing Net Precipitation (ac-ft/yr)	Watershed Total Area (acres)	Upland Area (acres)	Wetland Area (acres)	Wetland Area (%)	Tributary Acres per Wetland Acre	Contributing Net Precipitation (ac-ft/yr)
1	shallow marsh	0%	2.63	2.21	0.42	16.0%	6.26	6.14	2.63	2.21	0.42	16.0%	6.26	6.14	2.64	2.21	0.42	16.1%	6.22	5.86
3	shallow marsh wet meadow	0% R	1.95 5.99	1.60 5.38	0.35 0.61	17.9% 10.2%	5.57 9.82	5.46 9.63	1.95	1.60	0.35	17.9%	5.57	5.46	1.95	1.60	0.35	18.1%	5.51	5.19
6	shallow marsh	50%	3.22	2.60	0.62	19.3%	5.19	5.09	1.61	0.99	0.62	38.5%	2.60	2.55	3.22	2.60	0.62	19.2%	5.21	4.91
7	wet meadow	0%	0.72	0.65	0.07	9.7%	10.29	10.09	0.72	0.65	0.07	9.7%	10.29	10.09	0.72	0.65	0.07	9.2%	10.88	10.25
8	sedge meadow	R	33.23	26.43	6.80	20.5%	4.89	4.79	2.94	2.94	0.00	07.00/	0.00	0.04	33.24	26.43	6.80	20.5%	4.89	4.60
9	shallow marsh sedge meadow	18% 0%	8.04 9.64	6.24 8.47	1.80 1.17	22.4% 12.1%	4.47 8.24	4.38 8.08	6.36 9.64	4.63 8.47	1.73 1.17	27.2% 12.1%	3.68 8.24	3.61 8.08	8.04 9.63	6.31 8.47	1.73 1.17	21.5% 12.1%	4.65 8.25	4.38 7.77
11	coniferous bog	NA	23.99	15.11	8.88	37.0%	2.70	2.65	23.99	15.11	8.88	37.0%	2.70	2.65	23.99	15.11	8.88	37.0%	2.70	2.54
12	alder thicket	0%	0.13	0.00	0.13	100.0%	1.00	0.98	0.13	0.00	0.13	100.0%	1.00	0.98	0.13	0.00	0.13	100.0%	1.00	0.94
13	deep marsh wet meadow	11% R	11.60 4.44	6.57 4.11	5.03 0.33	43.4% 7.4%	2.31 13.45	2.26 13.20	10.13	5.19	4.94	48.8%	2.05	2.01	11.60 4.25	6.66 3.92	4.94 0.33	42.6% 7.8%	2.35 12.86	2.21 12.11
16	shallow marsh	86%	15.07	14.76	0.33	2.1%	48.61	47.68	2.08	1.77	0.31	14.9%	6.71	6.58	15.06	14.76	0.33	2.0%	48.88	46.03
18	shallow marsh	R	38.67	19.77	18.90	48.9%	2.05	2.01				, .	,			5		=.,,	10100	
19	shallow marsh	-2%	8.46	6.78	1.68	19.9%	5.04	4.94	8.38	6.75	1.63	19.5%	5.14	5.04	8.46	6.83	1.63	19.2%	5.20	4.90
20	sedge meadow shallow marsh	30% 0%	24.44 3.47	7.38 2.04	17.06 1.43	69.8% 41.2%	1.43 2.43	1.41 2.38	0.10 3.47	2.04	0.10 1.43	100.0% 41.2%	1.00 2.43	0.98 2.38	0.10 3.47	2.04	0.10 1.43	100.0% 41.1%	1.00 2.43	0.94 2.29
22A	coniferous swamp	0%	12.49	11.60	0.89	7.1%	14.03	13.76	12.49	11.60	0.89	7.1%	14.03	13.76	12.49	11.60	0.89	7.1%	14.06	13.24
22E	coniferous swamp	0%	8.06	5.61	2.45	30.4%	3.29	3.23	8.06	5.61	2.45	30.4%	3.29	3.23	8.06	5.61	2.45	30.4%	3.29	3.10
24 25	alder thicket	57%	12.68	11.88	0.80	6.3%	15.85	15.55	2.78	2.37	0.41	14.7%	6.78	6.65	2.79	2.37	0.41	14.8%	6.73	6.34
27	coniferous bog coniferous swamp	NA R	5.59 13.33	3.64 12.26	1.95 1.07	34.9% 8.0%	2.87 12.46	2.81 12.22	5.59	3.64	1.95	34.9%	2.87	2.81	5.59	3.64	1.95	34.8%	2.87	2.70
29	shallow marsh	7%	22.17	10.15	12.02	54.2%	1.84	1.81	20.64	8.62	12.02	58.2%	1.72	1.68	22.16	10.15	12.02	54.2%	1.84	1.74
32	coniferous bog	-159%	131.46	58.10	73.36	55.8%	1.79	1.76	10.98	8.61	2.37	21.6%	4.63	4.54	45.79	0.90	44.89	98.0%	1.02	0.96
33A 33B	alder thicket	30% 0%	43.79 9.16	25.33 4.60	18.46 4.56	42.2% 49.8%	2.37	2.33 1.97	21.11 9.16	8.42 4.60	12.69 4.56	60.1% 49.8%	1.66 2.01	1.63 1.97	21.12 9.16	8.42 4.60	12.69 4.56	60.1% 49.8%	1.66 2.01	1.57 1.89
37	coniferous swamp shrub-carr	R	11.22	8.83	2.39	21.3%	4.69	4.60	9.10	4.00	4.56	49.0%	2.01	1.97	9.16	4.60	4.56	49.0%	2.01	1.09
43	alder thicket	56%	25.17	16.88	8.29	32.9%	3.04	2.98	1.39	0.36	1.03	74.1%	1.35	1.32	25.17	16.88	8.29	32.9%	3.04	2.86
44	alder thicket	-65%	20.79	17.52	3.27	15.7%	6.36	6.24	13.42	12.14	1.28	9.5%	10.48	10.28	13.42	12.14	1.28	9.5%	10.52	9.91
45 47	alder thicket open bog	-63% R	70.31 28.60	32.76 28.06	37.55 0.54	53.4% 1.9%	1.87 52.96	1.84 51.95	26.67	17.95	8.72	32.7%	3.06	3.00	29.15	20.43	8.72	29.9%	3.34	3.15
48	coniferous bog	20%	199.33	110.17	89.16	44.7%	2.24	2.19	109.87	48.51	61.36	55.8%	1.79	1.76	188.28	120.80	67.47	35.8%	2.79	2.63
48A	coniferous swamp	60%	6.68	4.03	2.65	39.7%	2.52	2.47	0.44	0.00	0.44	100.0%	1.00	0.98	4.87	4.43	0.44	9.0%	11.06	10.42
51 52	alder thicket	-3635% R	18.60	11.13	7.47	40.2%	2.49	2.44	1.86	1.84	0.02	1.1%	93.00	91.22	18.29	14.93	3.36	18.4%	5.44	5.12
52 53	alder thicket alder thicket	0%	23.44 53.71	19.56 35.12	3.88 18.59	16.6% 34.6%	6.04 2.89	5.93 2.83	1.88 53.71	1.88 35.12	0.00 18.59	34.6%	2.89	2.83	23.44 53.70	20.80 35.12	2.64 18.59	11.3% 34.6%	8.89 2.89	8.37 2.72
53A	coniferous swamp	0%	3.77	1.42	2.35	62.3%	1.60	1.57	3.77	1.42	2.35	62.3%	1.60	1.57	3.77	1.42	2.35	62.3%	1.60	1.51
53B	coniferous swamp	20%	6.14	5.71	0.43	7.0%	14.28	14.01	4.92	4.49	0.43	8.7%	11.44	11.22	6.14	5.71	0.43	7.0%	14.29	13.45
53C 53D	coniferous swamp	36% 0%	24.02 1320.57	21.14 651.40	2.88 669.17	12.0% 50.7%	8.34 1.97	8.18 1.94	15.41 1319.65	12.53 650.48	2.88 669.17	18.7% 50.7%	5.35 1.97	5.25 1.93	24.15 1321.47	21.27 652.30	2.88 669.17	11.9% 50.6%	8.38 1.97	7.89 1.86
54	coniferous swamp	0%	36.06	31.95	4.11	11.4%	8.77	8.61	36.06	31.95	4.11	11.4%	8.77	8.61	36.06	31.95	4.11	11.4%	8.78	8.27
54C	alder thicket	0%	0.74	0.00	0.74	100.0%	1.00	0.98	0.74	0.00	0.74	100.0%	1.00	0.98	0.74	0.00	0.74	100.0%	1.00	0.94
54E 54F	alder thicket	-7%	5.82	3.22	2.60	44.7%	2.24	2.20	6.21	3.61	2.60	41.9%	2.39	2.34	6.21	3.61	2.60	41.9%	2.39	2.25
54F 54G	alder thicket alder thicket	0% 33%	0.43 6.48	0.00 4.94	0.43 1.54	100.0% 23.8%	1.00 4.21	0.98 4.13	0.43 4.36	0.00 2.82	0.43 1.54	100.0% 35.3%	1.00 2.83	0.98 2.78	0.43 6.47	0.00 4.94	0.43 1.54	100.0% 23.8%	1.00 4.21	0.94 3.96
55	alder thicket	-364%	17.70	13.79	3.91	22.1%	4.53	4.44	1.26	1.20	0.06	4.8%	21.00	20.60	17.70	13.79	3.91	22.1%	4.52	4.26
56	open bog	R	13.21	10.42	2.79	21.1%	4.73	4.64	2.48	2.48										
57 58	coniferous swamp	-12% 0%	137.06	59.00	78.06	57.0%	1.76	1.72	54.12	26.55	27.57	50.9%	1.96	1.93 3.04	54.12	26.55	27.56	50.9%	1.96	1.85
60	alder thicket alder thicket	0% R	107.19 28.48	72.61 21.77	34.58 6.71	32.3% 23.6%	3.10 4.24	3.04 4.16	107.19	72.61	34.58	32.3%	3.10	3.04	107.20 0.00	72.61	34.58	32.3%	3.10	2.92
61	coniferous swamp	0%	2.70	2.25	0.45	16.7%	6.00	5.89	2.70	2.25	0.45	16.7%	6.00	5.89	2.70	2.25	0.45	16.7%	5.98	5.63
62	coniferous bog	NA 0%	24.35	12.22	12.13	49.8%	2.01	1.97	24.35	12.22	12.13	49.8%	2.01	1.97	24.35	12.22	12.13	49.8%	2.01	1.89
64 68	hardwood swamp coniferous swamp	0% 23%	4.80 59.24	4.49 35.43	0.31 23.81	6.5% 40.2%	15.48 2.49	15.19 2.44	4.80 24.73	4.49 11.81	0.31 12.92	6.5% 52.2%	15.48 1.91	15.19 1.88	4.79 39.78	4.49 26.51	0.31 13.27	6.4% 33.4%	15.68 3.00	14.77 2.82
72	coniferous swamp	0%	5.67	4.28	1.39	24.5%	4.08	4.00	5.67	4.28	1.39	24.5%	4.08	4.00	5.66	4.28	1.39	24.5%	4.09	3.85
74	hardwood swamp	R	10.64	4.52	6.12	57.5%	1.74	1.71												
76 77	coniferous bog	NA NA	13.10	9.18	3.92	29.9%	3.34 1.94	3.28 1.91	6.49 15.20	4.78	1.71 12.09	26.3% 79.5%	3.80	3.72 1.23	6.49	4.78	1.71	26.3% 75.7%	3.80	3.58 1.24
78	coniferous bog	NA R	25.28 5.73	12.27 3.98	13.01 1.75	51.5% 30.5%	1.94 3.27	1.91 3.21	15.∠0	3.11	12.09	79.5%	1.26	1.23	17.18	4.18	13.01	75.7%	1.32	1.24
79	coniferous bog	NA	10.62	8.23	2.39	22.5%	4.44	4.36	10.62	8.23	2.39	22.5%	4.44	4.36	10.62	8.23	2.39	22.5%	4.45	4.19
80	coniferous bog	-17%	5.68	5.39	0.29	5.1%	19.59	19.21	1.61	1.54	0.07	4.3%	23.00	22.56	1.61	1.54	0.07	4.4%	22.93	21.59
81 82	coniferous swamp coniferous bog	-41% 32%	51.06 113.19	49.38 50.79	1.68 62.40	3.3% 55.1%	30.39 1.81	29.81 1.78	10.32 2.00	10.08 0.37	0.24 1.63	2.3% 81.5%	43.00 1.23	42.18 1.20	51.57 1.99	50.59 0.36	0.98 1.63	1.9% 81.8%	52.65 1.22	49.58 1.15
83	open bog	NA	18.64	14.65	3.99	21.4%	4.67	4.58	18.64	14.65	3.99	21.4%	4.67	4.58	18.64	14.65	3.99	21.4%	4.67	4.40
84	coniferous bog	NA	5.67	4.34	1.33	23.5%	4.26	4.18	5.67	4.34	1.33	23.5%	4.26	4.18	5.67	4.34	1.33	23.4%	4.28	4.03
84A	coniferous bog	NA D	11.50	3.28	8.22	71.5%	1.40	1.37	11.50	3.28	8.22	71.5%	1.40	1.37	11.50	3.28	8.22	71.4%	1.40	1.32
85 86	coniferous bog	R NA	5.07 8.25	3.66 5.78	1.41 2.47	27.8% 29.9%	3.60 3.34	3.53 3.28	1.16	1.15	0.01	0.9%	116.00	113.78	1.16	1.15	0.01	0.8%	121.57	114.47
88	coniferous bog	NA NA	9.86	4.28	5.58	56.6%	1.77	1.73	3.09	2.53	0.56	18.1%	5.52	5.41	1.56	1.00	0.56	35.8%	2.79	2.63
90	coniferous bog	NA	328.07	151.99	176.08	53.7%	1.86	1.83	234.60	92.74	141.86	60.5%	1.65	1.62	305.32	129.70	175.62	57.5%	1.74	1.64
90A	open bog	NA R	8.25 17.43	0.34 14.89	7.91 2.54	95.9% 14.6%	1.04 6.86	1.02 6.73	7.05	0.34	6.71	95.2%	1.05	1.03	8.25	0.34	7.91	95.8%	1.04	0.98
95 96	coniferous swamp coniferous bog	NA	39.02	21.72	17.30	14.6% 44.3%	2.26	2.21	10.63	6.47	4.16	39.1%	2.56	2.51	10.82	6.66	4.16	38.4%	2.60	2.45
			30.02													0.00		33/0		

Large Table 5
Wetland and Watershed Acreages During Existing Operations Conditions, and Reclamation Conditions – Mine Site

					Pre-Mining (Existing) Conditions					Operations	s Conditions (1)				Reclamation Conditions					
Wetland ID	Eggers and Reed Wetland Type	Change in Equivalent Yield ⁽³⁾ (%)	Watershed Total Area (acres)	Upland Area (acres)	Wetland Area (acres)	Wetland Area (%)	Tributary Acres per Wetland Acre	Contributing Net Precipitation (ac-ft/yr)	Watershed Total Area (acres)	Upland Area (acres)	Wetland Area (acres)	Wetland Area (%)	Tributary Acres per Wetland Acre	Contributing Net Precipitation (ac-ft/yr)	Watershed Total Area (acres)	Upland Area (acres)	Wetland Area (acres)	Wetland Area (%)	Tributary Acres per Wetland Acre	Contributing Net Precipitation (ac-ft/yr)
97	coniferous bog	NA	11.03	6.57	4.46	40.4%	2.47	2.43	3.61	1.72	1.89	52.4%	1.91	1.87	3.60	1.71	1.89	52.4%	1.91	1.80
98	coniferous bog	NA	49.43	33.93	15.50	31.4%	3.19	3.13	2.36	1.93	0.43	18.2%	5.49	5.38	49.42	33.93	15.50	31.4%	3.19	3.00
99	coniferous bog	NA	5.38	3.98	1.40	26.0%	3.84	3.77	1.47	0.56	0.91	61.9%	1.62	1.58	3.83	2.56	1.27	33.2%	3.01	2.83
100	coniferous bog	NA	295.25	119.06	176.19	59.7%	1.68	1.64	93.20	19.97	73.23	78.6%	1.27	1.25	101.43	25.32	76.11	75.0%	1.33	1.25
100A	alder thicket	R	1.66		1.66	100.0%	1.00	0.98												
101	coniferous bog	NA	34.92	20.71	14.21	40.7%	2.46	2.41	4.01	1.53	2.48	61.8%	1.62	1.59	10.14	3.58	6.56	64.7%	1.54	1.45
103	coniferous bog	11%	157.93	39.09	118.84	75.2%	1.33	1.30	10.52	1.65	8.87	84.3%	1.19	1.16	10.52	1.65	8.87	84.3%	1.19	1.12
104	coniferous bog	NA	8.30	4.73	3.57	43.0%	2.32	2.28	0.87	0.77	0.10	11.5%	8.70	8.53	0.87	0.77	0.10	11.3%	8.88	8.36
105	coniferous bog	NA	59.43	43.95	15.48	26.0%	3.84	3.77	59.43	43.95	15.48	26.0%	3.84	3.77	59.44	43.95	15.48	26.0%	3.84	3.62
105A	coniferous bog	NA 00/	0.62	0.50	0.12	19.4%	5.17	5.07	0.62 168.57	0.50	0.12	19.4%	5.17	5.07	0.63	0.50 84.99	0.12	19.7%	5.08 2.02	4.78 1.90
106 107	coniferous bog	0% NA	168.57 90.50	84.99 49.58	83.58 40.92	49.6% 45.2%	2.02 2.21	1.98 2.17	42.80	84.99 33.51	83.58	49.6% 21.7%	2.02 4.61	1.98 4.52	168.58 40.97	29.93	83.58 11.04	49.6% 26.9%	3.71	1.90 3.49
107 107A	coniferous bog			49.58 2.66	1.74	45.2% 39.5%	2.21	2.17	42.80 1.54		9.29 0.05	3.2%	30.80	30.21	1.92	1.68		12.6%	7.96	7.49
	coniferous swamp	-1118%	4.40		4.51				1.54 4.44	1.49 2.82		3.2%	2.74		_		0.24			
107B 107C	shallow marsh alder thicket	-67% R	7.41 28.29	2.90 0.69	27.60	60.9% 97.6%	1.64 1.03	1.61 1.01	4.44	2.82	1.62	36.5%	2.74	2.69	3.03	1.41	1.62	53.3%	1.88	1.77
114	coniferous bog	R	8.00	7.27	0.73	97.6%	10.96	10.75												
120	shallow marsh	-23%	8.93	8.35	0.73	6.5%	15.40	15.10	8.73	8.27	0.46	5.3%	18.98	18.61	8.93	8.47	0.46	5.1%	19.57	18.43
200	hardwood swamp	-23% R	13.51	7.15	6.36	47.1%	2.12	2.08	0.73	0.21	0.46	3.3%	10.90	10.01	0.93	0.47	0.46	5.176	19.57	10.43
200	wet meadow	R	24.54	11.05	13.49	55.0%	1.82	1.78												
202	open bog	R	6.52	3.41	3.11	47.7%	2.10	2.06												
315	alder thicket/shrub-car	0%	533.68	210.84	322.84	60.5%	1.65	1.62	533.68	210.84	322.84	60.5%	1.65	1.62	533.68	210.84	322.84	60.5%	1.65	1.56
552	coniferous bog	R	24.35	15.63	8.72	35.8%	2.79	2.74	000.00	210.04	022.04	00.070	1.00	1.02	333.00	210.04	022.04	00.070	1.00	1.00
566	alder thicket/shrub-car	11%	32.49	26.62	5.87	18.1%	5.53	5.43	29.05	23.18	5.87	20.2%	4.95	4.85	32.49	26.62	5.87	18.1%	5.53	5.21
567	shallow marsh	R	3.72	2.32	1.40	37.6%	2.66	2.61	20.00	20110	0.0.	20.270			02.10	20.02	0.07	.0,0	0.00	0.2.
678	alder thicket	0%	148.21	89.79	58.42	39.4%	2.54	2.49	148.21	89.79	58.42	39.4%	2.54	2.49	148.22	89.79	58.42	39.4%	2.54	2.39
679	coniferous bog	NA	0.50		0.50	100.0%	1.00	0.98	0.50	0.00	0.50	100.0%	1.00	0.98	0.50	0.00	0.50	100.0%	1.00	0.94
682	open bog	NA	4.85	2.69	2.16	44.5%	2.25	2.20	4.85	2.69	2.16	44.5%	2.25	2.20	4.85	2.69	2.16	44.6%	2.24	2.11
691	alder thicket	0%	32.11	25.88	6.23	19.4%	5.15	5.06	32.11	25.88	6.23	19.4%	5.15	5.06	32.12	25.88	6.23	19.4%	5.15	4.85
693	coniferous bog	NA	26.40	14.07	12.33	46.7%	2.14	2.10	26.40	14.07	12.33	46.7%	2.14	2.10	26.40	14.07	12.33	46.7%	2.14	2.02
699	coniferous bog	NA	2.21		2.21	100.0%	1.00	0.98	2.21	0.00	2.21	100.0%	1.00	0.98	2.21	0.00	2.21	100.0%	1.00	0.94
745	coniferous bog	NA	24.65	11.32	13.33	54.1%	1.85	1.81	24.65	11.32	13.33	54.1%	1.85	1.81	24.65	11.32	13.33	54.1%	1.85	1.74
782	coniferous bog	NA	6.54	4.44	2.10	32.1%	3.11	3.05	6.54	4.44	2.10	32.1%	3.11	3.05	6.54	4.44	2.10	32.1%	3.11	2.93
783	coniferous bog	NA	4.85	2.94	1.91	39.4%	2.54	2.49	4.85	2.94	1.91	39.4%	2.54	2.49	4.86	2.94	1.91	39.4%	2.54	2.39
887	coniferous bog	4%	701.48	146.12	555.36	79.2%	1.26	1.24	670.31	114.95	555.36	82.9%	1.21	1.18	670.31	114.95	555.36	82.9%	1.21	1.14
888	coniferous bog	NA	260.25	67.29	192.96	74.1%	1.35	1.32	260.25	67.29	192.96	74.1%	1.35	1.32	260.25	67.29	192.96	74.1%	1.35	1.27
889	shallow marsh	11%	75.69	8.55	67.14	88.7%	1.13	1.11	67.35	0.21	67.14	99.7%	1.00	0.98	67.35	0.21	67.14	99.7%	1.00	0.94
972	hardwood swamp	0%	0.90		0.90	100.0%	1.00	0.98	0.90	0.00	0.90	100.0%	1.00	0.98	0.90	0.00	0.90	100.0%	1.00	0.94
984	coniferous bog	NA	16.04	0.98	15.06	93.9%	1.07	1.04	15.32	0.26	15.06	98.3%	1.02	1.00	15.32	0.26	15.06	98.3%	1.02	0.96

⁽¹⁾ Wetland areas include fragments identified in Section 5.2.1.1

⁽²⁾ Wetlands in bold are identified as ombrotrophic.

⁽³⁾ Change in the equivalent yield from existing conditions to operational conditions is identified as increasing (+), decreasing (-), no change (0), watershed is removed (R), or not applicable (NA) for ombrotrophic coniferous and open bogs.

Large Table 6 Summary of Wetlands Crossing Analog Impact Zones Resulting from Changes in Hydrology – Mine Site

	v	Vetland Area (Analogue Ir	acres) within oncrement (feet		
Likelihood of wetland hydrology impact based on wetland type for each analogue distance	0-1,000 feet	1,000-2,000 feet	2,000-3,500 feet	3,500-10,000 feet	Eggers and Reed Wetland Community ⁽¹⁾
0 - 1,000 feet	-	•			
High Likelihood	866.85				coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket
Moderate Likelihood	8.30				deep marsh, shallow marsh, and shallow, open water
Low Likelihood	452.81				Minerotrophic and ombrotrophic coniferous bog
No Impact	0				open bog
1,000 - 2,000 feet					
Moderate Likelihood		522.40			coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket
Low Likelihood		4.11			deep marsh, shallow marsh, and shallow, open water
No Impact		92.05			minerotrophic and ombrotrophic coniferous bog and open bog
2,000 - 3,500 feet					
Low Likelihood			293.12		coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket
No Impact			868.89		deep marsh, shallow marsh, and shallow, open water, minerotrophic and ombrotrophic coniferous bog and open bog
3,500 - 10,000 feet	•				
No Impact				2,718.30	all wetland types
Total acres of wetland	1,327.96	618.56	1,162.01	2,718.30	

⁽¹⁾ Reference (13)

Large Table 7 Summary of Wetlands within Analog Impact Zones Resulting from Changes in Hydrology – Mine Site

	V	Vetland Area (a Analogue Ir	acres) within oncrement (feet		
Likelihood of wetland hydrology impact based on wetland type for each analogue distance	0-1,000 feet	1,000-2,000 feet	2,000-3,500 feet	3,500-10,000 feet	Eggers and Reed Wetland Community ⁽¹⁾
0 – 1,000 feet		•			
High Likelihood	46.37				coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket
Moderate Likelihood	8.3				deep marsh, shallow marsh, and shallow, open water
Low Likelihood	178.80				minerotrophic and ombrotrophic coniferous bog
No Impact	0				open bog
1,000 – 2,000 feet					
Moderate Likelihood		110.77			coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket
Low Likelihood		4.11			deep marsh, shallow marsh, and shallow, open water
No Impact		196.14			minerotrophic and ombrotrophic coniferous bog and open bog
2,000 – 3,500 feet		•			
Low Likelihood			384.99		coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket
No Impact			332.99		deep marsh, shallow marsh, and shallow, open water, minerotrophic and ombrotrophic coniferous bog and open bog
3,500 – 10,000 feet	•	•			
No Impact				4,564.38	all wetland types
Total acres of wetland	233.47	311.02	717.98	4,564.38	

⁽¹⁾ Reference (13)

Large Table 8 **Summary of Potential Wetland Community Changes Due to Drawdown**

Impact Sensitivity Category ⁽¹⁾	None			Moderate	Severe		
Community Type	Water Level Drawdown (feet)	Potential Impact	Water Level Drawdown (feet)	Potential Impact	Water Level Drawdown (feet)	Potential Impact	
Ombrotrophic Coniferous and Open bog	<0.75	None	0.75-2	Minor vegetation changes; Increased tree growth	>2	Possible conversion of wetland type	
Minerotrophic Coniferous and Open bog	<0.5	None	0.5-2	Change in vegetation; Increased tree growth	>2	Possible conversion of wetland type	
Shallow marsh ⁽²⁾	<1	None	1-3	Conversion of type	>3	Conversion of wetland type	
Deep marsh ⁽²⁾	<2	None	2-4	Conversion of type	>4	Conversion of wetland type	
Shallow, open water ⁽²⁾	<2	None	2-4	Conversion of type	>4	Conversion of wetland type	
Conifer swamp	<1	None	1-2	Minor changes in vegetation; Increased tree growth	>2	Change in vegetation	
Hardwood swamp	<2	None	2-4	Change in vegetation; Increased tree growth	>4	Conversion of wetland type; possible conversion to upland	
Alder thicket	<1	None	1-4	Change in vegetation; Increased shrub growth	>4	Conversion of wetland type; increased shrub growth	
Shrub-carr	<0.5	None	0.5-3	Change in vegetation; Increased shrub growth	>3	Conversion of wetland type	
Wet/Sedge meadow	<0.5	None	0.5-3	Change in vegetation; Conversion of type	>3	Conversion to upland	

 ⁽¹⁾ Interpreted from information provided in the hydrologic wetland sensitivity method as described in the Wetland Work Plan (Attachment A).
 (2) Shallow marsh, deep marsh, and shallow open water communities were not evaluated in the hydrologic wetland sensitivity method as described in the Wetland Work Plan (Attachment A), but are estimated in this table based on best professional judgment.

Large Table 9 Summary of Wetlands within the Mine Site Groundwater Flow Paths

		Wetlands within the Mine Site Groundwater Flow Paths (acres)							
Eggers and Reed Wetland Community ⁽¹⁾	Hydrology	West Pit	Overburden Storage and Laydown Area (OSLA)	Wastewater Treatment Facility (WWTF)	Ore Surge Pile (OSP)	Category 2/3 Stockpile			
Alder thicket	Groundwater	90.53	40.87	18.79	27.59	103.06			
Alder thicket or Shrub-carr	Groundwater	0	2.87	0	0	0			
Minerotrophic coniferous bog	Precipitation/ Groundwater	0.04	0	0	0	6.27			
Ombrotrophic coniferous bog	Precipitation	16.48	0	0	0	148.18			
Coniferous swamp	Groundwater	0	2.88	20.06	10.16	0.04			
Deep marsh	Groundwater	4.94	0	0	0	0			
Open bog	Precipitation	0	0	0	0	8.87			
Sedge meadow	Groundwater	0	0	0	0	1.17			
Shallow marsh	Groundwater	3.35	0.11	0	0	5.48			
Shrub-carr	Groundwater	0	3.95	0	0	0			
Wet meadow	Groundwater	0	0	0	0	0.07			
Total acres of wet	land	115.34	50.68	38.85	37.75	273.14			

⁽¹⁾ Reference (13)

Large Table 10 Summary of Coniferous and Open Bogs in Area One

Wetland ID	Eggers and Reed Community ⁽¹⁾	Status
11	Coniferous bog	Ombrotrophic
25	Coniferous bog	Ombrotrophic
32	Coniferous bog	Minerotrophic
48	Coniferous bog	Minerotrophic
62	Coniferous bog	Ombrotrophic
76	Coniferous bog	Ombrotrophic
77	Coniferous bog	Ombrotrophic
79	Coniferous bog	Ombrotrophic
80	Coniferous bog	Ombrotrophic
82	Coniferous bog	Minerotrophic
83	Open bog	Ombrotrophic
84	Coniferous bog	Ombrotrophic
84A	Coniferous bog	Ombrotrophic
86	Coniferous bog	Ombrotrophic
88	Coniferous bog	Ombrotrophic
90	Coniferous bog	Ombrotrophic
90A	Open bog	Ombrotrophic
96	Coniferous bog	Ombrotrophic
97	Coniferous bog	Ombrotrophic
98	Coniferous bog	Ombrotrophic
99	Coniferous bog	Ombrotrophic
100	Coniferous bog	Ombrotrophic
101	Coniferous bog	Ombrotrophic
103	Coniferous bog	Ombrotrophic
104	Coniferous bog	Ombrotrophic
105	Coniferous bog	Ombrotrophic
105A	Coniferous bog	Ombrotrophic
106B	Coniferous bog	Ombrotrophic
106C	Coniferous bog	Ombrotrophic
106D	Coniferous bog	Ombrotrophic
107	Coniferous bog	Ombrotrophic
400A	Coniferous bog	Ombrotrophic
406	Coniferous bog	Ombrotrophic

Wetland ID	Eggers and Reed Community ⁽¹⁾	Status
409	Coniferous bog	Ombrotrophic
415	Coniferous bog	Ombrotrophic
418	Coniferous bog	Ombrotrophic
419	Coniferous bog	Ombrotrophic
422	Coniferous bog	Ombrotrophic
423	Coniferous bog	Ombrotrophic
425	Coniferous bog	Ombrotrophic
435	Coniferous bog	Ombrotrophic
437	Coniferous bog	Ombrotrophic
438	Coniferous bog	Ombrotrophic
439	Coniferous bog	Ombrotrophic
441	Coniferous bog	Ombrotrophic
442	Coniferous bog	Ombrotrophic
451	Coniferous bog	Ombrotrophic
456	Coniferous bog	Ombrotrophic
459	Coniferous bog	Ombrotrophic
460	Coniferous bog	Ombrotrophic
465	Coniferous bog	Ombrotrophic
467	Coniferous bog	Ombrotrophic
469	Coniferous bog	Ombrotrophic
473	Coniferous bog	Ombrotrophic
474	Coniferous bog	Ombrotrophic
477	Coniferous bog	Ombrotrophic
478	Coniferous bog	Ombrotrophic
479	Coniferous bog	Ombrotrophic
489	Coniferous bog	Ombrotrophic
490	Coniferous bog	Ombrotrophic
492	Coniferous bog	Ombrotrophic
493	Open bog	Ombrotrophic
494	Coniferous bog	Ombrotrophic
496	Coniferous bog	Ombrotrophic
498	Coniferous bog	Ombrotrophic
499	Coniferous bog	Ombrotrophic
502	Coniferous bog	Ombrotrophic

Wetland ID	Eggers and Reed Community ⁽¹⁾	Status
503	Coniferous bog	Ombrotrophic
507	Coniferous bog	Ombrotrophic
508	Coniferous bog	Ombrotrophic
510	Coniferous bog	Ombrotrophic
513	Coniferous bog	Ombrotrophic
514	Coniferous bog	Ombrotrophic
519	Coniferous bog	Ombrotrophic
520	Coniferous bog	Ombrotrophic
526	Coniferous bog	Ombrotrophic
528	Coniferous bog	Ombrotrophic
530	Coniferous bog	Ombrotrophic
531	Coniferous bog	Ombrotrophic
535	Coniferous bog	Ombrotrophic
538	Coniferous bog	Ombrotrophic
540	Coniferous bog	Ombrotrophic
541	Coniferous bog	Ombrotrophic
546	Coniferous bog	Ombrotrophic
547	Coniferous bog	Ombrotrophic
548	Coniferous bog	Ombrotrophic
550	Open bog	Ombrotrophic
558	Coniferous bog	Ombrotrophic
559	Coniferous bog	Ombrotrophic
560	Coniferous bog	Ombrotrophic
561	Coniferous bog	Ombrotrophic
562	Coniferous bog	Ombrotrophic
564	Coniferous bog	Ombrotrophic
679	Coniferous bog	Ombrotrophic
681	Coniferous bog	Ombrotrophic
682	Open bog	Ombrotrophic
693	Coniferous bog	Ombrotrophic
695	Coniferous bog	Ombrotrophic
697	Coniferous bog	Ombrotrophic
699	Coniferous bog	Ombrotrophic
700	Open bog	Ombrotrophic

Wetland ID	Eggers and Reed Community ⁽¹⁾	Status
713	Coniferous bog	Ombrotrophic
714	Coniferous bog	Ombrotrophic
727	Open bog	Ombrotrophic
728	Open bog	Ombrotrophic
730	Open bog	Ombrotrophic
732	Open bog	Ombrotrophic
733	Open bog	Ombrotrophic
734	Open bog	Ombrotrophic
735	Coniferous bog	Ombrotrophic
737	Coniferous bog	Ombrotrophic
738	Open bog	Ombrotrophic
739	Open bog	Ombrotrophic
740	Open bog	Ombrotrophic
742	Coniferous bog	Ombrotrophic
757	Open bog	Ombrotrophic
759	Open bog	Ombrotrophic
773	Coniferous bog	Ombrotrophic
774	Coniferous bog	Ombrotrophic
776	Coniferous bog	Ombrotrophic
777	Open bog	Ombrotrophic
780	Coniferous bog	Ombrotrophic
781	Coniferous bog	Ombrotrophic
782	Coniferous bog	Ombrotrophic
783	Coniferous bog	Ombrotrophic
784	Coniferous bog	Ombrotrophic
795	Coniferous bog	Ombrotrophic
799	Coniferous bog	Ombrotrophic
814A	Coniferous bog	Ombrotrophic
885	Open bog	Ombrotrophic
887	Coniferous bog	Minerotrophic
888	Coniferous bog	Ombrotrophic
899	Open bog	Ombrotrophic
900	Coniferous bog	Minerotrophic
925	Open bog	Ombrotrophic

Wetland ID	Eggers and Reed Community ⁽¹⁾	Status
930	Open bog	Ombrotrophic
931	Coniferous bog	Ombrotrophic
949	Coniferous bog	Ombrotrophic
984	Coniferous bog	Ombrotrophic
1044	Coniferous bog	Ombrotrophic
1131	Coniferous bog	Ombrotrophic
1149	Coniferous bog	Ombrotrophic

⁽¹⁾ Reference (13)

Large Table 11 Wetlands within the Mine Site Groundwater Flow Paths

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Wetland Size (acres)				
East Pit – Category 2/3 Stockpile							
1	Shallow marsh	Groundwater	0.42				
3	Shallow marsh	Groundwater	0.35				
6	Shallow marsh	Groundwater	0.62				
7	Wet meadow	Groundwater	0.07				
10	Sedge meadow	Groundwater	1.17				
11	Coniferous bog	Precipitation	8.88				
12	Alder thicket	Groundwater	0.13				
24	Alder thicket	Groundwater	0.41				
29	Shallow marsh	Groundwater	4.09				
33A	Alder thicket	Groundwater	6.31				
43	Alder thicket	Groundwater	1.03				
48	Coniferous bog	Groundwater	6.27				
53D	Alder thicket	Groundwater	29.79				
55	Alder thicket	Groundwater	0.06				
58	Alder thicket	Groundwater	34.57				
77	Coniferous bog	Precipitation	12.08				
90	Coniferous bog	Precipitation	108.62				
90A	Open bog	Precipitation	6.71				
98	Coniferous bog	Precipitation	0.42				
105	Coniferous bog	Precipitation	15.47				
105A	Coniferous bog	Precipitation	0.12				
106	Coniferous swamp	Groundwater	0.04				
678	Alder thicket	Groundwater	30.76				
679	Coniferous bog	Precipitation	0.50				
681	Coniferous bog	Precipitation	2.09				
682	Open bog	Precipitation	2.16				
	Waste Water Treatn	nent Facility (WWTF)					
53	Alder thicket	Groundwater	0.38				
53D	Alder thicket	Groundwater	18.41				
106	Coniferous swamp	Groundwater	20.06				

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Wetland Size (acres)						
	Ore Surge Pile (OSP)								
53	Alder thicket	Groundwater	0.52						
53D	Alder thicket	Groundwater	27.07						
106	Coniferous swamp	Groundwater	10.16						
	Overburden Storage an	d Laydown Area (OSLA)							
4	Wet meadow	Groundwater	0.00						
9	Shallow marsh	Groundwater	0.11						
46	Shrub-carr	Groundwater	3.95						
52	Alder thicket	Groundwater	0.00						
53	Alder thicket	Groundwater	1.92						
53C	Coniferous swamp	Groundwater	2.88						
53D	Alder thicket	Groundwater	38.95						
557	Alder thicket or Shrub-carr	Groundwater	2.87						
	Wes	t Pit							
9	Shallow marsh	Groundwater	1.43						
13	Deep marsh	Groundwater	4.94						
16	Shallow marsh	Groundwater	0.31						
32	Coniferous bog	Groundwater	0.04						
53D	Alder thicket	Groundwater	90.53						
79	Coniferous bog	Precipitation	0.07						
107	Coniferous bog	Precipitation	9.29						
107B	Shallow marsh	Groundwater	1.61						
558	Coniferous bog	Precipitation	3.08						
559	Coniferous bog	Precipitation	1.24						
562	Coniferous bog	Precipitation	2.80						
(1) Reference	Total acres of wetland	<u></u>	515.76						

⁽¹⁾ Reference (13)

Large Table 12 Summary of Wildlife Species and Associated Habitat Types

										We	tland	Habi	itats	h.					Uplan	d Ha	bitats	S	,		
Taxa ⁽¹⁾	Scientific Name	Common Name	State ETSC	Federal ESA or BGEPA (eagle)	SGCN	USFS RFSS	Number of habitats	Forest- Lowland Coniferous	Forest- Lowland Deciduous	Lake- Deep	Lake- Shallow	River- Headwater to large	River- Very Large	Shrub- Lowland	Wetland- Non-forest	Cropland	Developed	Forest- Upland Coniferous	Forest- Upland Deciduous	Forest- Upland Deciduous	Grassland	Prairie	Shoreline-dunes-cliff/talus	Shrub/woodland- Upland	Wetland and Upland Habitats
BI	Gavia immer	Common Loon	NL	NL	х		1			Х															W
BI	Limnodromus griseus	Short-billed Dowitcher	NL	NL	х		1								х										W
BI	Melospiza georgiana	Swamp Sparrow	NL	NL	х		3	х						Х	х										W
BI	Rallus limicola	Virginia Rail	NL	NL	х		3				Х			х	х										W
FI	lchthyomyzon fossor	Northern Brook Lamprey	SPC	NL	х	х	1					х													W
IN	Erebia mancinus	Taiga Alpine	SPC	NL	х	х	1	х																	W
IN	Erebia discoidalis	Red-diked alpine	NL	NL			2	Х						Х											W
IN	Lycaena epixanthe michiganensis	Bog Copper	NL	NL	х		2	х						х											W
IN	Oeneis jutta ascerta	Jutta Arctic	NL	NL			2	х						Х											W
IN	Somatochlora brevicincta	Quebec emerald	NL	NL		х	1								х										W
MO	Lasmigona compressa	Creek Heelsplitter	SPC	NL	х	х	1					х													W
MO	Ligumia recta	Black Sandshell	SPC	NL	х	х	2					х	Х												W
RE	Chelydra serpentina	Common Snapping Turtle	SPC	NL	х		5			х	Х	х	х		х										W
RE	Glyptemys insculpta	Wood turtle	Т	NL		х	5	х	Х			х		х	х										W
BI	Aegolius funereus	Boreal Owl	NL	NL	х	х	4	х						х				х	х						В
BI	Ammodramus leconteii	Le Conte's Sparrow	NL	NL	х		4							Х	х						Х	Х			В
BI	Anas rubripes	American Black Duck	NL	NL	х		9	х	Х		Х				х			х	х	Х	х			Х	В
BI	Botaurus lentiginosus	American Bittern	NL	NL	х		5	х						х	х						х	Х			В
BI	Calidris alpina	Dunlin	NL	NL	х		2								х								Х		В
BI	Calidris pusilla	Semipalmated Sandpiper	NL	NL	х		2								х								Х		В
BI	Catharus fuscescens	Veery	NL	NL	х		5	х	Х									Х	Х	Х					В
BI	Circus cyaneus	Northern Harrier	NL	NL	х		6	Х						Х	х						Х	Х		Х	В
BI	Cistothorus platensis	Sedge Wren	NL	NL	х		5	х						Х	х						Х	Х			В
BI	Coccyzus erythropthalmus	Black-billed Cuckoo	NL	NL	х		6		Х					Х				Х	Х	Х				Х	В
BI	Contopus cooperi	Olive-sided Flycatcher	NL	NL	х	Х	4	х						Х				Х						Х	В

										We	tland	Habi	itats	ı				ļ	Uplar	nd Ha	bitats	S			
Taxa ⁽¹⁾	Scientific Name	Common Name	State ETSC	Federal ESA or BGEPA (eagle)	SGCN	USFS RFSS	Number of habitats	Forest- Lowland Coniferous	Forest- Lowland Deciduous	Lake- Deep	Lake- Shallow	River- Headwater to large	River- Very Large	Shrub- Lowland	Wetland- Non-forest	Cropland	Developed	Forest- Upland Coniferous	Forest- Upland Deciduous	Forest- Upland Deciduous	Grassland	Prairie	Shoreline-dunes-cliff/talus	Shrub/woodland- Upland	Wetland and Upland Habitats
BI	Contopus virens	Eastern Wood-pewee	NL	NL	х		5		Х									Х	Х	Х		Х			В
BI	Setophaga castanea	Bay-breasted Warbler	NL	NL	х	х	2	Х										Х							В
BI	Calidris alpina	Dunlin	NL	NL	х		2								Х								х		В
BI	Dolichonyx oryzivorus	Bobolink	NL	NL	х		6							х	Х	х					Х	х		Х	В
BI	Empidonax minimus	Least Flycatcher	NL	NL	х		4		Х									Х	Х	Х					В
BI	Falcipennis canadensis	Spruce Grouse	NL	NL	х		4	Х						х				х						х	В
BI	Falco peregrinus	Peregrine Falcon	THR	NL	х		10	Х			Х		х	Х	Х		Х				Х	х	Х	Х	В
BI	Haliaeetus leucocephalus	Bald Eagle	SPC	THR	х	х	7		Х	Х		Х						Х	Х	Х				Х	В
BI	Melanerpes erythrocephalus	Red-headed Woodpecker	NL	NL	х		8		Х							х	х		х	х	Х	х		х	В
BI	Oporornis agilis	Connecticut Warbler	NL	NL	х	х	2	Х										Х							В
BI	Pheucticus Iudovicianus	Rose-breasted Grosbeak	NL	NL	х		5		Х									х	х	х		х			В
ВІ	Picoides arcticus	Black-backed Woodpecker	NL	NL	х		3	х										х						х	В
BI	Pluvialis dominica	American Golden-plover	NL	NL	х		2								х								х		В
BI	Podiceps grisegena	Red-necked Grebe	NL	NL	х		2				Х				Х										В
BI	Poecile hudsonica	Boreal Chickadee	NL	NL	х		2	Х										х							В
BI	Scolopax minor	American Woodcock	NL	NL	х		4							х					х		Х			Х	В
BI	Seiurus aurocapilla	Ovenbird	NL	NL	х		4		Х									Х	Х	Х					В
BI	Setophaga castanea	Bay-breasted Warbler	NL	NL	х	х	2	х										Х							В
BI	Sphyrapicus varius	Yellow-bellied Sapsucker	NL	NL	х		4		Х									Х	Х	Х					В
BI	Stelgidopteryx serripennis	Northern Rough-winged Swallow	NL	NL	х		3					х									х		х		В
BI	Strix nebulosa	Great grey owl	NL	NL		Х		Х										Х							В
BI	Tringa melanoleuca	Greater Yellowlegs	NL	NL	х		2								Х								Х		В
BI	Troglodytes	Winter Wren	NL	NL	х		3	Х	Х									Х							В
BI	Tympanuchus phasianellus	Sharp-tailed Grouse	NL	NL	х		6							х	х	х					х	х		х	В
BI	Vermivora chrysoptera	Golden-winged Warbler	NL	NL	х		3	х						х					х						В
BI	Wilsonia canadensis	Canada Warbler	NL	NL	х		4	х										Х	Х	Х					В

										We	etland	d Habi	itats					ı	Uplar	ıd Ha	bitats	6			
Taxa ⁽¹⁾	Scientific Name	Common Name	State ETSC	Federal ESA or BGEPA (eagle)	SGCN	USFS RFSS	Number of habitats	Forest- Lowland Coniferous	Forest- Lowland Deciduous	Lake- Deep	Lake- Shallow	River- Headwater to large	River- Very Large	Shrub- Lowland	Wetland- Non-forest	Cropland	Developed	Forest- Upland Coniferous	Forest- Upland Deciduous	Forest- Upland Deciduous	Grassland	Prairie	Shoreline-dunes-cliff/talus	Shrub/woodland- Upland	Wetland and Upland Habitats
BI	Zonotrichia albicollis	White-throated Sparrow	NL	NL	х		7	х	Х					Х				Х	Х	Х				х	В
MA	Canis lupus	Gray Wolf	SPC	THR	Х	х	11	х						х	х	Х		х	Х	Х	Х	Х	Х	х	В
MA	Lynx canadensis	Canada lynx	NL	THR	х		7	х	Х					Х				х	Х	Х				х	В
MA	Microtus chrotorrhinus	Rock Vole	NL	NL	х		6		Х					Х				х	Х				Х	х	В
MA	Sorex fumeus	Smoky Shrew	SPC	NL	х		3	х										х					Х		В
MA	Spermophilus franklinii	Franklin's Ground Squirrel	NL	NL	х		5							х	Х						Х	х		х	В
AM	Plethodon cinereus	Eastern Red-backed Salamander	NL	NL	х		3											х	х	х					C
BI	Accipiter gentilis	Northern Goshawk	NL	NL	Х	х	3											Х	Х	Х					U
BI	Caprimulgus vociferus	Whip-poor-will	NL	NL	х		2											х		Х					U
BI	Chordeiles minor	Common Nighthawk	NL	NL	х		2										х						х		U
ВІ	Dendroica caerulescens	Black-throated Blue Warbler	NL	NL	х		3											х	х	х					U
BI	Hylocichla mustelina	Wood Thrush	NL	NL	х		3											х	Х	Х					U
BI	Picoides dorsalis	Three-toed woodpecker	NL	NL		х	1											х							U
BI	Sturnella magna	Eastern Meadowlark	NL	NL	х		2														Х	Х			U
BI	Toxostoma rufum	Brown Thrasher	NL	NL	х		2										Х							х	U
BI	Tryngites subruficollis	Buff-breasted Sandpiper	NL	NL	Х		4									х	Х				Х	Х			U
IN	Plebejus idas nabokovi	Nabokov's Blue	SPC	NL	х	Х	2											х						х	U
IN	Oeneis macounii	Macoun's Arctic	NL	NL	х		1											Х							U
IN	Phyciodes batesii	Tawny Crescent	NL	NL	х		2											Х						х	U
IN	Pyrgus centaureae freija	Grizzled Skipper	SPC	NL	х	Х	1																	Х	U
MA	Taxidea taxus	American Badger	NL	NL	х		7									х	х	х		Х	х	х		х	U

⁽¹⁾ Taxa include amphibians (AM), birds (BI), fish (FI), insects (IN), mammals (MA), mollusks (MO), reptiles (RE), and spiders (SP).

Large Table 13 Wetlands within 500-feet increments – Flotation Tailings Basin Area

							Wetlar	nds (acres	s) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 - 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 – 7,500 Feet	7,500 - 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
1000	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1001	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1002	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1003	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1006	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1008	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1009	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1010	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1011	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1012	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1013	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.78	7.80
1014	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1015	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1016	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1017	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1018	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1019	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1020	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1021	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1022	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.73	5.83
1023	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.35

							Wetlar	nds (acres	s) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
1024	Coniferous swamp	0	0	0	1.41	5.42	3.92	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0
1025	Hardwood swamp	0	0	1.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1026	Shallow open water	0	0	0	0	0	3.76	6.06	2.93	0.00	0	0	0	0	0	0	0	0	0	0	0
1027	Alder thicket	0	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1027A	Alder thicket or Shrub-carr	0	0.28	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1056	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.04	0	0	0	0	0
1057	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.83	2.04	0	0	0
1058	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.66	1.19	0
1059	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.72	3.74
1060	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.49
1065	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1066	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1067	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1069	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1070	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1071	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1072	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1073	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1074	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1076	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	nds (acres	s) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
1077	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
1078	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.44	7.54	17.86
1079	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1080	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.55
1081	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	2.15	7.55	17.16	14.94	10.31	11.98	13.90	16.61	11.15
1082	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29	4.78	4.57	13.17	12.91	6.75	0.92
1083	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	4.96	9.32	0.16	0	0	0	0	0	0
1084	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.37
1085	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.09	1.23	0	0	0
1086	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.64	1.30	0
1091	Shallow marsh	0	0.05	1.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1092	Alder thicket or Shrub-carr	0	0	0	0	4.62	6.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1093	Shallow marsh	0.64	4.29	1.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1094	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1095	Coniferous swamp	0	0	0	0	0	0	0	1.11	3.53	0.14	0	0	0	0	0	0	0	0	0	0
1096	Shallow open water	0	0	0	0	0	0	0	2.55	10.55	12.16	13.08	12.22	11.48	8.33	2.66	0	0	0	0	0
1105	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1106	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1107	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1108	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	nds (acres) within 5	00-Feet Ir	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 - 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
1109	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1110	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1111	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1112	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1113	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1114	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1115	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1116	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	5.76	0.19	0	0
1117	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.38	7.64	2.29	2.71	0	0
1125	Sedge meadow	0	0.07		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1126	Hardwood swamp	0	0.45	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	Coniferous swamp	0	0	0	0	0	0	0	0	6.53	8.95	9.19	6.86	0.75	0	0	0	0	0	0	0
1133	Coniferous swamp	0	10.36	12.10	13.66	24.26	10.00	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0
1134	Shallow marsh	2.65	3.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1134A	Shallow marsh	0	1.82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1135	Deep marsh	0	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1135A	Deep marsh	0	2.06	4.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139	Shallow marsh	2.39	12.42	2.87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139A	Shallow marsh	0	4.39	0.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139B	Shallow marsh	0	1.05	8.64	9.48	15.32	9.87	0.23	0	0	0	0	0	0	0	0	0	0	0	0	0
1140	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1141	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1142	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1143	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 - 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
1147	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1148	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1150	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1151	Coniferous swamp	0	0	0	0	2.23	25.56	32.98	26.57	9.69	3.85	1.26	3.60	10.35	1.18	0	0	0	0	0	0
1156	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1157	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.59	0.34	0	0	0	0
1158	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.13	0	0	0	0
252	Coniferous swamp	0	0	0	0	0	0	0	0	0.15	7.65	9.99	8.64	10.43	5.51	3.34	0	0	0	0	0
253	Deep marsh	0	0	0	0	0	0	0	0	1.15	4.12	0.62	0	0	0	0	0	0	0	0	0
254	Shallow marsh	0	0	0	0	0	0	0	1.41	7.93	11.19	10.52	5.65	0	0	0	0	0	0	0	0
255	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	2.88	2.54	0.60	0	0	0
256	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	1.68	7.89	8.80	5.03	0.02	0	0	0	0	0	0	0
257	Coniferous bog	0	0	0	0	0	0	0	0.79	15.47	20.86	13.04	10.94	8.40	11.78	3.27	0.18		0	0	0
259	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0.30	0.05	0	0	0	0	0	0	0	0	0
260	Shallow marsh	0	1.09	18.63	30.93	32.42	34.56	25.79	4.17	1.57	0.37	0	0	0	0	0	0	0	0	0	0
261	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0.84	0	0	0	0	0	0	0	0	0	0	0
262	Shallow marsh	0	0	0	0	0	0	0	1.85	0.02	0	0	0	0	0	0	0	0	0	0	0
263	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0.74	0	0	0	0	0	0	0	0	0	0	0	0
264	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.14	5.79	1.92	0	0	0
265	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	1.15	1.89	1.45	0.30	0	0	0	0	0	0	0	0	0
267	Alder thicket or Shrub-carr	0	0	0	0	0	1.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0
268	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0		0.24	2.77	1.75	1.18	1.27	5.99	2.22	0	0	0	0
270	Shallow marsh	0	1.34	5.65	17.76	13.22	6.24	3.64	5.28	2.35	2.46	4.85	5.01	4.85	5.12	4.47	3.56	0	0	0	0
271	Coniferous swamp	0	0	0	0	1.23	3.69	7.70	5.11	0.35	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	nds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
272	Deep marsh	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
275	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.38	5.22	12.77	7.23	3.97	0
276	Coniferous swamp	0	0.86	4.42	3.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
277	Alder thicket or Shrub-carr	0	0	0	0	0	0	2.39	7.93	3.87	0.26	0	0	0	0	0	0	0	0	0	0
278	Alder thicket	0.75	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
278A	Alder thicket or Shrub-carr	0	1.84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279	Alder thicket	1.39	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279A	Alder thicket or Shrub-carr	0	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279B	Alder thicket or Shrub-carr	0	1.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	Sedge meadow	0	0	0	0	3.36	5.28	8.08	0.40	0	0	0	0	0	0	0	0	0	0	0	0
281	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0.24	1.22	0	0	0	0	0	0	0	0	0	0
282	Shallow marsh	6.69	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282A	Shallow marsh	0	5.99	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282B	Shallow marsh	0.20	10.14	2.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
283	Deep marsh	0	0	0	0	0	0	0	0	0.04	6.46	2.39	0	0	0	0	0	0	0	0	0
284	Alder thicket	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
284A	Alder thicket or Shrub-carr	0.03	2.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
285	Coniferous swamp	0	0	0	2.51	11.37	15.49	20.26	23.81	21.64	13.77	34.18	43.36	49.32	44.66	35.27	20.51	16.01	12.44	0.10	0
286	Shallow open water	0	0	0	0	0	0		5.13	2.31	0	0	0	0	0	0	0	0	0	0	0
287	Alder thicket or Shrub-carr	0	0	0	0	0	0	1.66	4.27	0	0	0	0	0	0	0	0	0	0	0	0
288	Deep marsh	0	0	0.46	1.94	2.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
289	Alder thicket or Shrub-carr	0	0	0	1.54	1.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
290	Coniferous swamp	0.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailing	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
292	Deep marsh	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
292A	Deep marsh	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
293	Deep marsh	0	0	0	0	1.47	4.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
307	Shallow marsh	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
308	Deep marsh	3.53	1.69	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0
308A	Deep marsh	0	5.72	20.29	25.10	24.08	0.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
312	Shrub-carr	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314	Shallow marsh	10.94	8.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314A	Shallow marsh	0	8.46	4.80	6.07	1.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.66	4.95	9.09	2.02	0	0
476	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.77	0.05	0	0
529	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.30	0	0
549	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
572	Deep marsh	3.28	4.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
573	Shallow marsh	0	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
573A	Shallow marsh	0	5.44	8.19	0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
574	Deep marsh	0	0	5.77	6.29	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
575	Alder thicket or Shrub-carr	0	0	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
576	Sedge meadow or Wet meadow	0	0	0	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
577	Alder thicket or Shrub-carr	0	0	0	0.05	3.93	8.43	1.05	0	0	0	0	0	0	0	0	0	0	0	0	0
578	Deep marsh	0	0	0	0	0	0	0	0.38	7.99	7.93	1.18	0	0	0	0	0	0	0	0	0
579	Deep marsh	0	0	0	0	0	0	0	0	0	0.91	1.23	0	0	0	0	0	0	0	0	0
580	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0.28	1.44	0	0	0	0	0	0	0	0
581	Coniferous swamp	0	0	0	0	0	1.59	8.53	9.32	1.17	0	0	0	0	0	0	0	0	0	0	0
582	Deep marsh	6.69	12.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
582A	Deep marsh	0	16.88	3.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	nds (acres	s) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 - 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 - 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
584	Alder thicket or Shrub-carr	0	0.03	7.00	13.64	10.10	10.80	10.92	0.49	0	0	0	0	0	0	0	0	0	0	0	0
585	Alder thicket	0	0.86	0.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
585A	Alder thicket or Shrub-carr	0	0.04	2.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
586	Deep marsh	0.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
587	Shallow marsh	0.51	0.29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
588	Alder thicket or Shrub-carr	0	0	0	0	0	0	0.07	8.36	8.63	1.14	0	0	0	0	0	0	0	0	0	0
589	Deep marsh	0	0	0	0	2.81	13.77	14.84	8.60	0	0	0	0	0	0	0	0	0	0	0	0
590	Shallow marsh	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
591	Deep marsh	1.70	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
591A	Deep marsh	0.18	2.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
592	Alder thicket or Shrub-carr	0	0	0	0	0	0	1.64	0.14	0	0	0	0	0	0	0	0	0	0	0	0
593	Deep marsh	1.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
593A	Deep marsh	1.04	8.27	9.52	5.98	0.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
594	Deep marsh	0.03	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
594A	Deep marsh	0	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
596	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0.24	0	0	0	0	0	0	0	0	0	0	0	0
597	Hardwood swamp	0	0	0	0	0	0	0	1.76	2.45	0.23	0	0	0	0	0	0	0	0	0	0
598	Alder thicket or Shrub-carr	0	0	0	0	0.55	3.99	1.77	0	0	0	0	0	0	0	0	0	0	0	0	0
599	Alder thicket or Shrub-carr	0	0	0	0	0	2.79		0	0	0	0	0	0	0	0	0	0	0	0	0
600	Shallow marsh	0	0	0	0	0	3.50	4.97	0.31	0	0	0	0	0	0	0	0	0	0	0	0
601	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0.21	1.13	0	0	0	0	0	0	0	0
602	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0.59	0.01	0	0	0	0	0	0	0	0	0
603	Shallow marsh	0	0	0	0	0	0	0	0	0.07	0.03	0	0	0	0	0	0	0	0	0	0
604	Shallow marsh	0	0	0	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0
605	Shallow marsh	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	nds (acres	s) within 5	00-Feet Ir	ncrements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 - 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 - 7,500 Feet	7,500 – 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
606	Shallow marsh	0	0	0	0	0	0	0	0	0.12	0.07	0	0	0	0	0	0	0	0	0	0
607	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0.09	0	0	0	0	0	0	0	0	0	0	0
608	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0.44	0	0	0	0	0	0	0
609	Coniferous swamp	0	0	0	0	0	0	0	0.86	1.99	6.79	8.77	12.32	7.07	0.98	0	0	0	0	0	0
610	Shallow marsh	0	0	0	0	0	0	0	0.16	0	0	0	0	0	0	0	0	0	0	0	0
611	Coniferous bog	0	0	0	0	0	0	0	0	0.58	0	0	0	0	0	0	0	0	0	0	0
612	Coniferous bog	0	0	0	0	0	0	0.21	1.98	0	0	0	0	0	0	0	0	0	0	0	0
613	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	1.45	0.14	0	0	0	0	0	0	0	0	0
614	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	1.23	0	0	0	0	0	0	0
615	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0.44	0	0	0	0	0	0	0	0
616	Deep marsh	0	0	0	0	0	0	0	0	0	0	5.45	0.53	0	0	0	0	0	0	0	0
617	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	1.48	0.60	0	0	0	0	0	0	0
618	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0.08	1.38	0	0	0	0	0	0
619	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0.17	0.71	0	0	0	0	0	0	0
620	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0.28	0	0	0	0	0	0	0
621	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0.52	0	0	0	0	0	0	0
622	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0.29	0.08	0	0	0	0	0	0
623	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0.88	0	0	0	0	0	0
624	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.05	1.79	0	0	0	0
625	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.18	2.52	0
626	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.22
627	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.42	6.80	23.55	26.28	26.35	25.01
628	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	nds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailing	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 - 2,500 Feet	2,500 - 3,000 Feet	3,000 - 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 - 7,000 Feet	7,000 - 7,500 Feet	7,500 – 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
629	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.19	6.17	0.30
630	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.15	2.77	3.08	1.92	0.13
631	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.21	5.92
632	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
633	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
634	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.51
635	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
636	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.24	0.01	0
637	Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.87	14.79	18.98	17.15	18.68	25.45
638	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.07	7.31	0	0	0
639	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.04	0	0	0	0	0
640	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.58	6.19
641	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
642	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
643	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0.99	0.61	0	0	0	0	0	0
644	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
645	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
646	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
647	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
648	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
649	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
650	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
651	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
652	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.30	21.91	35.19
653	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
654	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
655	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
656	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.89	1.05
657	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0.01	2.34	3.42	3.64	9.70	18.01	8.76	15.09
659	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
660	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0.82	2.08	0	0	0	0	0
662	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
663	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
664	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
665	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
667	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
669	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.38	4.19	7.26	6.56	0	0
670	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	2.37
672	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.78	4.27	0	0	0
673	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.40	22.11
674	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
675	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
676	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
677	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
786	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
787	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
788	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.80	4.67	11.51
810	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.62	10.37	0.74	0	0
816	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
817	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
818	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
819	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
820	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
821	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
822	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
823	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
824	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
825	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
826	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
827	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
828	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
829	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
830	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
831	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
832	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
833	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
834	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
835	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
836	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
837	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
838	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
839	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
840	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
841	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	nds (acres	s) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
842	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
843	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
844	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
845	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
846	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
847	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
848	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
849	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
850	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
851	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
852	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
854	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
866	Hardwood swamp	0	0	0	0	0	0	0	0	1.95	9.04	9.05	5.87	4.50	0.61	0	0	0	0	0	0
867	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	6.92	19.74	22.04	11.64	9.18	4.66	5.26	0	0	0	0	0	0
868	Hardwood swamp	0	0	0	0	1.90	7.01	0.95	0	0	0	0	0	0	0	0	0	0	0	0	0
869	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
870	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	4.49	19.86	20.61	21.30	0.45	0	0	0
871	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
872	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
873	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
874	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
875	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
876	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
877	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	nds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
878	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
908	Shallow marsh	0	0	0	0	0	1.59	3.75	2.64	0.73	0	0	0	0	0	0	0	0	0	0	0
915	Alder thicket	0	0	0	0	0	0	0	0	0	0	5.18	0.29	0	0	0	0	0	0	0	0
917	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0.01	5.23	6.38	5.83	2.42	0	0	0	0	0
918	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	3.19	3.62	2.36	0.28	0	0	0	0	0	0
921	Alder thicket or Shrub-carr	0	0	0	0	0	0	0.13	0.25	0	0	0	0	0	0	0	0	0	0	0	0
923	Wet meadow	0	0	0	0	0	0	0.17	0.52	0	0	0	0	0	0	0	0	0	0	0	0
942	Deep marsh	0	0	0	0	0	1.40	1.56	0	0	0	0	0	0	0	0	0	0	0	0	0
943	Deep marsh	0	0	0	0.87	5.51	7.42	0.23	0	0	0	0	0	0	0	0	0	0	0	0	0
944	Hardwood swamp	0	0	0	0	1.43	0.99	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0
945	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0.32	2.00	0	0	0	0	0	0	0	0	0	0	0
946	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.44	0.51	0	0
947	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	2.09	5.57	6.15	5.75	0.81	0	0	0	0	0	0
950	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
951	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.88	18.88	33.02	32.26	26.22
952	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
953	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
954	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
955	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	2.44	7.40	6.81	2.70	12.59	6.91	0.37	0	0
956	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	2.70	3.83	7.27	3.51	0	0
957	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	1.41	1.81	3.65	0	0	0	0
958	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	1.38	2.19	0	0	0	0

							Wetlar	nds (acres	s) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
963	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.35	7.40
964	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		2.70
965	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.44	5.78	0.01
966	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.19	4.22	1.90	1.84	0	0
968	Coniferous swamp	3.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
974	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.23
975	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0.44	5.79	6.68	8.71	4.70	0	0
976	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.20	7.69	9.11
977	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
978	Hardwood swamp	0	0	0	0	1.33	1.42	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0
979	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	2.15	3.37	0.22	0	0	0	0
980	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	1.25	1.57	0	0	0	0	0	0	0	0	0	0
981	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0.38	0	0	0	0	0	0
982	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
983	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.85	0.84	0	0	0	0
985	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
986	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
987	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
988	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
989	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ids (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 – 1,500 Feet	1,500 – 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 – 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 – 5,500 Feet	5,500 – 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 – 8,000 Feet	8,000 – 8,500 Feet	8,500 – 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
990	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.40	8.25	6.17
991	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.30	20.05	21.40
992	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
993	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
994	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
995	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
996	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.73	2.37	0	0	0
T1	Deep marsh	1.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T13	Deep marsh	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T13A	Deep marsh	2.96	4.17	2.97	1.46	1.05	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Т8	Wet meadow	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0
Total a	cres of wetland	55.05	147.62	133.17	142.59	174.34	195.34	159.99	138.45	140.81	157.22	162.95	160.46	161.41	146.60	149.87	173.90	214.77	209.31	219.15	285.35

⁽¹⁾ Reference (13)

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	the Flotati	on Tailinç	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
1000	Coniferous swamp	0	0	0.43	7.90	4.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1001	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.16	21.99
1002	Coniferous swamp	0	0	0	0	1.03	3.26	1.52	0	0	0	0	0	0	0	0	0	0	0	0	0
1003	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1006	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1008	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1009	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06
1010	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1011	Alder thicket or Shrub-carr	0	0	0	0.49	1.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1012	Coniferous swamp	0	2.08	0.71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1013	Coniferous bog	1.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1014	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0.18	0	0	0	0	0	0	0	0	0	0	0	0
1015	Coniferous bog	0	1.21	12.56	17.14	18.08	21.96	14.91	10.89	2.56	0	0	0	0	0	0	0	0	0	0	0
1016	Sedge meadow or Wet meadow	0	0	0.21	0.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1017	Alder thicket or Shrub-carr	0	0	0	1.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1018	Coniferous bog	0	0	0	0.11	5.00	3.86	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0
1019	Coniferous bog	0	0	0		2.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1020	Sedge meadow or Wet meadow	0	0	0.25	1.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1021	Coniferous bog	0	0	0	0	0	0	0	2.75	2.35	0	0	0	0	0	0	0	0	0	0	0
1022	Deep marsh	4.98	6.58	1.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1023	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1024	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	he Flotati	on Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	- 11,000 Feet	– 11,500 Feet	12,000 Feet	- 12,500 Feet	- 13,000 Feet	- 13,500 Feet	- 14,000 Feet	- 14,500 Feet	– 15,000 Feet	– 15,500 Feet	- 16,000 Feet	- 16,500 Feet	– 17,000 Feet	17,500 Feet	18,000 Feet	- 18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
1025	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1026	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1027	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1027A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1056	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1057	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1058	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1059	Shallow open water	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1060	Shallow open water	3.52	4.61	4.62	3.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1065	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	2.31	8.45	23.25	67.41	57.03	3.96	0	0	0
1066	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0.92	2.29	17.46	28.73	24.55	19.79	13.46	1.14	0	0	0	0	0
1067	Alder thicket or Shrub-carr	0	0	0	0	0.73	15.22	13.06	17.41	9.51	1.14	0	0	0	0	0	0	0	0	0	0
1069	Shallow marsh	0	0	0	0	0	0	3.22	4.82	10.33	1.55	0	0	0	0	0	0	0	0	0	0
1070	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	2.44	1.36	0	0	0	0	0	0	0	0
1071	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0.03	2.00	11.77	4.36	3.42	2.85	4.71	0.03	0	0	0	0	0
1072	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	2.77	4.18	1.67	0	0	0
1073	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.44	3.34	0	0
1074	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1076	Coniferous swamp	0	2.73	7.74	21.47	17.17	1.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1077	Alder thicket or Shrub-carr	4.39	15.47	24.09	7.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	he Flotati	on Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	– 11,500 Feet	12,000 Feet	– 12,500 Feet	13,000 Feet	- 13,500 Feet	- 14,000 Feet	- 14,500 Feet	15,000 Feet	– 15,500 Feet	- 16,000 Feet	- 16,500 Feet	- 17,000 Feet	17,500 Feet	18,000 Feet	- 18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
1078	Shallow marsh	3.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1079	Coniferous swamp	0	0.37	2.10	0.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1080	Coniferous swamp	4.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1081	Alder thicket or Shrub-carr	11.32	5.26	3.44	8.13	8.29	2.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1082	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1083	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1084	Deep marsh	8.80	3.69	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1085	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1086	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1091	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1092	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1093	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1094	Sedge meadow or Wet meadow	0	1.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1095	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1096	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1105	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	5.33	0	0	0	0
1106	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.34	15.97	14.87	4.43	0	0
1107	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0.43	0.41	0	0	0	0	0	0	0
1108	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0		0.80	1.71	0	0	0	0	0	0
1109	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0.62	0.14	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	the Flotati	on Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
1110	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0.28	0	0	0	0	0	0	0	0
1111	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0.00	0.63	0	0	0	0	0	0	0
1112	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	1.92	0.35	0	0	0	0	0
1113	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1114	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.59
1115	Shallow marsh	0	0	0	0	0	0.43	0.66	0	0	0	0	0	0	0	0	0	0	0	0	0
1116	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1117	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1125	Sedge meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1126	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	Coniferous swamp	0	0	0.01	4.91	4.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1133	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1134	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1134A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1135	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1135A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139B	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1140	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0.01	2.60	6.19	13.39	15.05	19.32	21.57	0.86
1141	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0.21	7.60	1.60	0	0	0	0	0	0	0
1142	Alder thicket or Shrub-carr	0	0	0	0	2.39	9.09	8.30	0.57	0	0	0	0	0	0	0	0	0	0	0	0
1143	Coniferous swamp	0	0	0	0	0.63	3.69	3.33	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailin	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	- 10,500 Feet	- 11,000 Feet	– 11,500 Feet	- 12,000 Feet	– 12,500 Feet	- 13,000 Feet	– 13,500 Feet	– 14,000 Feet	– 14,500 Feet	- 15,000 Feet	– 15,500 Feet	- 16,000 Feet	- 16,500 Feet	- 17,000 Feet	– 17,500 Feet	- 18,000 Feet	- 18,500 Feet	- 19,000 Feet	– 19,500 Feet	20,000 Feet
1147	Alder thicket or Shrub-carr	0	0	0	0	3.69	9.56	0.21	0	0	0	0	0	0	0	0	0	0	0	0	0
1148	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1150	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.69
1151	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1156	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1157	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1158	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
252	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
253	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
254	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
255	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
256	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
257	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
259	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
260	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
261	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
262	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
263	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
264	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
265	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
267	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
268	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	the Flotati	on Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	– 11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	– 14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
271	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
272	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
275	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
276	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
277	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
278	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
278A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279B	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	Sedge meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
281	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282B	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
283	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
284	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
284A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
285	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
286	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
287	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
288	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
289	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
290	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
292	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
292A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
293	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
307	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
308	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
308A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
312	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
476	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
529	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
549	Alder thicket or Shrub-carr	0	0	0.28	1.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
572	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
573	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
573A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
574	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
575	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
576	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
577	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
578	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
579	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
580	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	_ 11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	_ 15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
581	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
582	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
582A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
584	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
585	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
585A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
586	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
587	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
588	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
589	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
590	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
591	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
591A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
592	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
593	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
593A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
594	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
594A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
596	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
597	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
598	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
599	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
600	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
601	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	the Flotati	on Tailinç	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
602	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
603	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
604	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
605	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
606	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
607	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
608	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
609	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
610	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
611	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
612	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
613	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
614	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
615	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
616	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
617	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
618	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
619	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
620	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
621	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
622	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
623	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
624	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
625	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	the Flotati	on Tailin	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	- 10,500 Feet	– 11,000 Feet	– 11,500 Feet	12,000 Feet	– 12,500 Feet	- 13,000 Feet	- 13,500 Feet	– 14,000 Feet	– 14,500 Feet	– 15,000 Feet	- 15,500 Feet	– 16,000 Feet	- 16,500 Feet	– 17,000 Feet	– 17,500 Feet	- 18,000 Feet	- 18,500 Feet	- 19,000 Feet	– 19,500 Feet	20,000 Feet
626	Coniferous swamp	6.13	8.81	9.97	16.88	32.70	31.67	32.28	36.12	36.53	22.97	15.52	6.69	1.31	0	0	0	0	0	0	0
627	Alder thicket or Shrub-carr	13.82	11.86	11.05	11.52	12.17	9.85	4.02	0.30	0	0	0	0	0	0	0	0	0	0	0	0
628	Deep marsh	4.45	5.54	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
629	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
630	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
631	Coniferous swamp	1.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
632	Alder thicket or Shrub-carr	0.99	2.39	6.43	1.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
633	Alder thicket or Shrub-carr	0.73	0.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
634	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
635	Alder thicket or Shrub-carr	1.54	0.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
636	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
637	Lake	25.17	10.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
638	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
639	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
640	Coniferous bog	9.27	5.50	4.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
641	Coniferous swamp	0	0	0	0	2.77	6.00	3.25	2.22	1.50	0.40	0	0	0	0	0	0	0	0	0	0
642	Shallow open water	0	0	0	0	0.02	4.67	3.65	0	0	0	0	0	0	0	0	0	0	0	0	0
643	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
644	Coniferous swamp	0	0	0	0	0	0	0	6.51	7.82	0	0	0	0	0	0	0	0	0	0	0
645	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0.78	0.26	0	0	0	0	0	0	0
646	Alder thicket or Shrub-carr	0	0	0	0	0	0.45	1.30	1.43	1.48	1.49	1.43	1.39	1.40	0.67	2.28	3.29	0.14	1.31	5.02	0.34
647	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	3.37	3.17	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	he Flotati	on Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
648	Alder thicket	0	0	0	0	0	0.26	2.98	2.14	3.95	1.96	14.82	18.53	1.32	0	0	0	0	0	0	0
649	Sedge meadow or Wet meadow	0	0	0	0	1.28	7.39	1.95	0	0	0	0	0	0	0	0	0	0	0	0	0
650	Sedge meadow or Wet meadow	0	0	0	5.37	2.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
651	Alder thicket	0	0	0	0	0	0	0	0	1.03	1.06	0	0	0	0	0	0	0	0	0	0
652	Coniferous swamp	28.35	12.35	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
653	Coniferous bog	0	0	0	0	0.12	5.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
654	Shrub-carr	0	0	0	0	0	0	0	1.41	6.59	1.85	1.97	3.03	0.32	0	0	0	0	0	0	0
655	Alder thicket or Shrub-carr	3.55	1.95	0.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
656	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
657	Alder thicket or Shrub-carr	12.43	17.82	8.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
659	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.20	1.88	2.99	0	0	0
660	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
662	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	6.66	7.61	6.64	5.45	0	0	0	0	0
663	Coniferous swamp	0	0	0	0	0	0	1.88	4.34	6.86	0.04	0	0	0	0	0	0	0	0	0	0
664	Coniferous swamp	0	0	0	0	4.74	8.52	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0
665	Shallow open water	0	0	0	0	5.69	9.83	3.75	1.44	0	0	0	0	0	0	0	0	0	0	0	0
667	Coniferous swamp	0	0	0	0	4.42	6.06	6.75	0.11	0	0	0	0	0	0	0	0	0	0	0	0
669	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
670	Coniferous swamp	4.18	6.69	11.60	5.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
672	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	on Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	- 10,500 Feet	- 11,000 Feet	– 11,500 Feet	- 12,000 Feet	– 12,500 Feet	- 13,000 Feet	– 13,500 Feet	– 14,000 Feet	– 14,500 Feet	- 15,000 Feet	– 15,500 Feet	– 16,000 Feet	- 16,500 Feet	– 17,000 Feet	– 17,500 Feet	- 18,000 Feet	- 18,500 Feet	- 19,000 Feet	– 19,500 Feet	20,000 Feet
673	Coniferous swamp	33.66	30.42	20.90	10.76	3.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
674	Open bog	0	0	0	0	0	0	0	0	0	1.13	1.22	0	0	0	0	0	0	0	0	0
675	Open bog	0	0	0	0	0	0	0	3.39	6.12	0.16	0	0	0	0	0	0	0	0	0	0
676	Deep marsh	0	0	0	0	0	0	0	0	0	5.77	3.71	0	0	0	0	0	0	0	0	0
677	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	9.27	24.90	23.93	12.82	30.73	30.94	24.51	8.55	0
786	Open bog	0	0	0		0.20	5.05	11.72	14.91	12.41	22.95	28.97	35.42	38.55	35.06	29.30	16.59	10.32	5.39	0	0
787	Alder thicket or Shrub-carr	0	0	0	2.64	5.79	3.02	2.93	1.85	0	0	0	0	0	0	0	0	0	0	0	0
788	Hardwood swamp	19.91	28.49	24.01	4.99	3.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
810	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
816	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	1.29	11.32	2.85	0	0	0	0	0	0
817	Deep marsh	0	0	0	0	0	0	0	0	0	2.62	6.89	0.52	0	0	0	0	0	0	0	0
818	Deep marsh	0	0	0	0	0	0	0	0	0	0	0.00	7.10	0.02	0	0	0	0	0	0	0
819	Deep marsh	0	0	0	0	0	0	0	0	0	0	0.12	0.85	0	0	0	0	0	0	0	0
820	Deep marsh	0	0	0	0	0	0	1.35	11.73	11.71	2.12		0	0	0	0	0	0	0	0	0
821	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.57	4.80	2.81	0	0	0
822	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	4.39	0	0	0	0	0
823	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0.27	5.39	0.55	0	0	0	0
824	Shallow marsh	0	0	0	0	0	4.40	1.34	0	0	0	0	0	0	0	0	0	0	0	0	0
825	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	1.70	0	0
826	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.02	4.91	0	0
827	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	2.42	0.09	0	0
828	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.39	3.06	0.80	0	0
829	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.99	3.82	0	0	0
830	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.13	1.75	0	0	0	0
831	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	5.63	8.03	0	0	0	0	0
832	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	2.92	6.45	0	0	0	0	0	0
833	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	2.59	12.54	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	he Flotati	on Tailinç	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
834	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	2.30	5.95	0	0	0	0	0	0	0
835	Wet meadow	0	0	0	0	0	0	0	0	0.10	5.19	6.12	1.25	0	0	0	0	0	0	0	0
836	Shrub-carr	0	0	0	0	0	0	0	0	3.11	6.46	1.93	0	0	0	0	0	0	0	0	0
837	Shrub-carr	0	0	0	0	0	0	0	3.48	8.80	1.21	0	0	0	0	0	0	0	0	0	0
838	Shrub-carr	0	0	0	0	0	0.57	10.59	7.82	0	0	0	0	0	0	0	0	0	0	0	0
839	Shrub-carr	0	0	0	0	0	0	0	1.44	10.63	0.99	0	0	0	0	0	0	0	0	0	0
840	Shrub-carr	0	0	0	0	10.93	19.41	0.95	0	0	0	0	0	0	0	0	0	0	0	0	0
841	Shrub-carr	0	0	0	0	0	0	0	0	0	0.52	8.72	0	0	0	0	0	0	0	0	0
842	Shrub-carr	0	0	0	0	0	0	0	0	0	0	2.60	5.70	0	0	0	0	0	0	0	0
843	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	6.14	6.42	0	0	0	0	0	0	0
844	Shrub-carr	0	0	0	0	0	0	0.27	9.54	14.75	3.96	0	0	0	0	0	0	0	0	0	0
845	Coniferous swamp	0	0	0	0	0	1.11	7.43	4.10	0	0	0	0	0	0	0	0	0	0	0	0
846	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	1.47	6.15	0.01	0	0	0	0	0	0
847	Shallow marsh	0	0	0	0	0	4.32	12.89	0.65	0	0	0	0	0	0	0	0	0	0	0	0
848	Shrub-carr	0	0	0	0	0	0	0	0	0.90	13.73	1.39	0	0	0	0	0	0	0	0	0
849	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	5.68	5.19	0	0	0	0	0	0	0
850	Shrub-carr	0	0	0	0	0	0	0	0	0.08	5.49	14.84	9.32	0	0	0	0	0	0	0	0
851	Shrub-carr	0	0	0	0	0	0	4.76	11.87	3.10	0	0	0	0	0	0	0	0	0	0	0
852	Shrub-carr	0	0	0	0	0	0	3.68	0	0	0	0	0	0	0	0	0	0	0	0	0
854	Coniferous swamp	0	0	0	4.77	9.22	0.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
866	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
867	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
868	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
869	Alder thicket or Shrub-carr	0	8.71	7.13	0.66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
870	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
871	Alder thicket or Shrub-carr	0	0	0	4.48	13.40	14.67	7.74	0.82	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	he Flotati	on Tailin	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	14,500 Feet	15,000 Feet	15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
872	Coniferous swamp	0	0	0	0	0	2.80	7.05	8.28	9.27	9.12	5.76	0	0	0	0	0	0	0	0	0
873	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	1.04	4.96	4.00	0	0	0	0	0	0	0
874	Coniferous swamp	0	0	0	0	0	1.80	3.53	0.48	0	0	0	0	0	0	0	0	0	0	0	0
875	Alder thicket or Shrub-carr	0	0	0	0.12	9.26	17.59	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0
876	Alder thicket	0	0	11.28	18.38	9.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
877	Alder thicket or Shrub-carr	2.04	7.62	2.98	0.00		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
878	Alder thicket or Shrub-carr	0	9.36	14.46	8.09	3.63	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
908	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
915	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
917	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
918	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
921	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
923	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
942	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
943	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
944	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
945	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
946	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
947	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
950	Alder thicket or Shrub-carr	0	0	0	0	0	0	3.10	0.03	0	0	0	0	0	0	0	0	0	0	0	0
951	Coniferous bog	19.26	13.61	10.97	8.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
952	Alder thicket or Shrub-carr	0	0	0	0	4.94	23.47	42.90	27.02	9.36	0.79	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	he Flotati	on Tailing	gs Basin					
		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	16,000	16,500	17,000	17,500	18,000	18,500	19,000	19,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,500 Feet	11,000 Feet	– 11,500 Feet	12,000 Feet	12,500 Feet	13,000 Feet	13,500 Feet	14,000 Feet	- 14,500 Feet	15,000 Feet	- 15,500 Feet	16,000 Feet	16,500 Feet	17,000 Feet	17,500 Feet	18,000 Feet	18,500 Feet	19,000 Feet	19,500 Feet	20,000 Feet
953	Alder thicket or Shrub-carr	0	0	0	4.73	24.50	17.23	18.39	23.70	33.71	84.51	117.24	113.24	62.20	32.44	30.16	35.05	16.92	0	0	0
954	Coniferous swamp	0	0	0	14.52	17.18	17.76	28.98	32.92	44.34	19.73	0.09	0	0	0	0	0	0	0	0	0
955	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
956	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
957	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
958	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
963	Alder thicket or Shrub-carr	4.63	13.45	13.39	11.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
964	Coniferous swamp	12.02	9.76	13.44	4.94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
965	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
966	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
968	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
974	Coniferous bog	20.70	15.80	18.13	9.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
975	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
976	Coniferous swamp	4.41	7.17	22.41	27.66	12.23	1.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
977	Coniferous swamp	0	0	0	0	0	0	0.61	12.15	11.04	2.47	2.54	16.46	8.41	0	0	0	0	0	0	0
978	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
979	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
980	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
981	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
982	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0.73	10.83	16.56	39.66	21.81	9.15	4.48	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	10,000 - 10,500 Feet	10,500 - 11,000 Feet	11,000 - 11,500 Feet	11,500 - 12,000 Feet	12,000 - 12,500 Feet	12,500 - 13,000 Feet	13,000 - 13,500 Feet	13,500 - 14,000 Feet	14,000 - 14,500 Feet	14,500 - 15,000 Feet	15,000 - 15,500 Feet	15,500 - 16,000 Feet	16,000 - 16,500 Feet	16,500 - 17,000 Feet	17,000 - 17,500 Feet	17,500 - 18,000 Feet	18,000 - 18,500 Feet	18,500 - 19,000 Feet	19,000 - 19,500 Feet	19,500 - 20,000 Feet
983	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
985	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0.25	6.97	6.22	7.73	13.03	19.24	1.81	0	0	0	0	0	0
986	Alder thicket or Shrub-carr	0	0.69	11.37	10.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
987	Shallow open water	0	0	0	0	1.47	0.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
988	Alder thicket or Shrub-carr	0	0	0	3.27	14.24	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
989	Coniferous swamp	0	0	0	0.00	9.96	5.41	3.33	15.36	30.62	29.93	24.04	11.59	0	0	0	0	0	0	0	0
990	Alder thicket or Shrub-carr	3.49	5.40	8.39	7.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
991	Coniferous swamp	8.27	2.65	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
992	Alder thicket or Shrub-carr	0	0	0	7.77	7.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
993	Alder thicket or Shrub-carr	0.14	3.04	3.83	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
994	Coniferous bog	0	0	0	5.81	12.99	7.24	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0
995	Coniferous swamp	0.01	3.69	8.54	6.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
996	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T1	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T13	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T13A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Т8	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total a	cres of wetland	283.28	287.31	302.15	292.22	310.86	312.02	281.38	285.38	311.82	286.76	304.43	326.61	248.66	186.85	198.60	233.91	135.33	74.95	44.78	27.53

⁽¹⁾ Reference (13)

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
1000	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1001	Coniferous bog	11.90	11.97	19.50	6.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1002	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1003	Alder thicket or Shrub-carr	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1006	Alder thicket or Shrub-carr	4.99	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1008	Alder thicket or Shrub-carr	0	0	0	0.08	1.41	2.91	3.54	1.85	2.53	1.60	2.82	3.07	5.34	3.73	0	0	0	0	0	0
1009	Alder thicket or Shrub-carr	3.67	1.96	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1010	Coniferous bog	0	0	0	2.56	12.32	13.93	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0
1011	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1012	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1013	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1014	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1015	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1016	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1017	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1018	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1019	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1020	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1021	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1022	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1023	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1024	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	– 21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	- 30,000 Feet
1025	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1026	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1027	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1027A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1056	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1057	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1058	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1059	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1060	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1065	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1066	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1067	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1069	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1070	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1071	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1072	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1073	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1074	Coniferous bog	0	0	0	0	0	7.69	21.21	22.67	19.66	14.63	15.24	21.34	11.21	9.79	2.79	0	0	0	0	0
1076	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1077	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailing	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	- 30,000 Feet
1078	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1079	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1080	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1081	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1082	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1083	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1084	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1085	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1086	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1091	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1092	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1093	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1094	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1095	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1096	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1105	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1106	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1107	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1108	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1109	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailing	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
1110	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1111	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1112	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1113	Coniferous bog	0	0	0	0	0	0	0	0	0	0.44	1.99	8.13	18.67	7.24	12.35	12.94	10.54	5.31	3.27	0.95
1114	Hardwood swamp	2.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1115	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1116	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1117	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1125	Sedge meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1126	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1129	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1130	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1133	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1134	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1134A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1135	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1135A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1139B	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1140	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1141	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1142	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1143	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	– 21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	– 24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	- 30,000 Feet
1147	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1148	Open bog	0	0	0	0	0	0	0.18	9.89	19.57	24.98	19.66	0.24	0	0	0	0	0	0	0	0
1150	Shallow marsh	2.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1151	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1156	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1157	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1158	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
252	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
253	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
254	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
255	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
256	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
257	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
259	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
260	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
261	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
262	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
263	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
264	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
265	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
267	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
268	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailing	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	– 21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
271	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
272	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
275	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
276	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
277	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
278	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
278A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279B	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	Sedge meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
281	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282B	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
283	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
284	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
284A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
285	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
286	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
287	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
288	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	nds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
289	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
290	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
292	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
292A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
293	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
307	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
308	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
308A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
312	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
476	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
529	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
549	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
572	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
573	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
573A	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
574	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
575	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
576	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
577	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
578	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
579	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
580	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
581	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
582	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
582A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
584	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
585	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
585A	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
586	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
587	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
588	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
589	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
590	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
591	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
591A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
592	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
593	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
593A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
594	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
594A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
596	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
597	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
598	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
599	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
600	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
601	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
602	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
603	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
604	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
605	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
606	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
607	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
608	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
609	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
610	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
611	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
612	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
613	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
614	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
615	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
616	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
617	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
618	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
619	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
620	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
621	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
622	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
623	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
624	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
625	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
626	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
627	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
628	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
629	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
630	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
631	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
632	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
633	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
634	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
635	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
636	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
637	Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
638	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
639	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
640	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
641	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
642	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
643	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
644	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
645	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
646	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
647	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailing	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
648	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
649	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
650	Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
651	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
652	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
653	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
654	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
655	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
656	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
657	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
659	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
660	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
662	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
663	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
664	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
665	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
667	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
669	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
670	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
672	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotati	ion Tailing	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
673	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
674	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
675	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
676	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
677	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
786	Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
787	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
788	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
810	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
816	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
817	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
818	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
819	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
820	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
821	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
822	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
823	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
824	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
825	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
826	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
827	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
828	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
829	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
830	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
831	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
832	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
833	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	the Flotati	on Tailing	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
834	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
835	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
836	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
837	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
838	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
839	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
840	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
841	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
842	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
843	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
844	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
845	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
846	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
847	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
848	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
849	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
850	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
851	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
852	Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
854	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
866	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
867	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
868	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
869	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
870	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
871	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Flotat	ion Tailin	gs Basin					
		20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
872	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
873	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
874	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
875	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
876	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
877	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
878	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
908	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
915	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
917	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
918	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
921	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
923	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
942	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
943	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
944	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
945	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
946	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
947	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
950	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
951	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
952	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of t	the Flotati	ion Tailing	gs Basin					
	_	20,000	20,500	21,000	21,500	22,000	22,500	23,000	23,500	24,000	24,500	25,000	25,500	26,000	26,500	27,000	27,500	28,000	28,500	29,000	29,500
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,500 Feet	21,000 Feet	– 21,500 Feet	22,000 Feet	22,500 Feet	23,000 Feet	23,500 Feet	24,000 Feet	24,500 Feet	25,000 Feet	25,500 Feet	26,000 Feet	26,500 Feet	27,000 Feet	27,500 Feet	28,000 Feet	28,500 Feet	29,000 Feet	29,500 Feet	30,000 Feet
953	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
954	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
955	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
956	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
957	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
958	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
963	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
964	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
965	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
966	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
968	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
974	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
975	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
976	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
977	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
978	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
979	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
980	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
981	Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
982	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							Wetlar	nds (acres	s) within 5	00-Feet Ir	ncrements	From the	Edge of	the Flotati	ion Tailin	gs Basin					
Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	20,000 - 20,500 Feet	20,500 - 21,000 Feet	21,000 - 21,500 Feet	21,500 - 22,000 Feet	22,000 - 22,500 Feet	22,500 - 23,000 Feet	23,000 - 23,500 Feet	23,500 - 24,000 Feet	24,000 - 24,500 Feet	24,500 - 25,000 Feet	25,000 - 25,500 Feet	25,500 - 26,000 Feet	26,000 - 26,500 Feet	26,500 - 27,000 Feet	27,000 - 27,500 Feet	27,500 - 28,000 Feet	28,000 - 28,500 Feet	28,500 - 29,000 Feet	29,000 - 29,500 Feet	29,500 - 30,000 Feet
983	Hardwood swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
985	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
986	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
987	Shallow open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
988	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
989	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
990	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
991	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
992	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
993	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
994	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
995	Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
996	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T1	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T13	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T13A	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T8	Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total a	cres of wetland	26.18	14.49	19.51	9.47	13.73	24.53	24.99	34.41	41.76	41.65	39.71	32.78	35.22	20.76	15.14	12.94	10.54	5.31	3.27	0.95

⁽¹⁾ Reference (13)

Large Table 14 Summary of Wetlands within 500-Feet Increments – Flotation Tailings Basin Area

						Wetlan	ds (acres) within 5	00-Feet In	crements	From the	Edge of	the Floata	tion Tailir	ngs Basin					
Eggers and Reed Wetland Community ⁽¹⁾	0 - 500 Feet	500 - 1,000 Feet	1,000 - 1,500 Feet	1,500 - 2,000 Feet	2,000 – 2,500 Feet	2,500 – 3,000 Feet	3,000 – 3,500 Feet	3,500 - 4,000 Feet	4,000 – 4,500 Feet	4,500 – 5,000 Feet	5,000 - 5,500 Feet	5,500 - 6,000 Feet	6,000 – 6,500 Feet	6,500 – 7,000 Feet	7,000 – 7,500 Feet	7,500 - 8,000 Feet	8,000 - 8,500 Feet	8,500 - 9,000 Feet	9,000 – 9,500 Feet	9,500 – 10,000 Feet
Alder thicket	2.55	1.25	0.72	0	0	0	0	0	0	0	5.18	0.29	0.08	1.76	0	0	0	0	0	0
Alder thicket or Shrub-carr	0.03	6.60	10.73	15.23	20.59	33.58	19.63	30.81	40.23	40.24	29.77	29.44	29.08	37.38	41.50	46.33	73.99	69.93	68.68	69.03
Coniferous bog	0	0	0	0	0	0	0.21	2.77	16.05	20.86	13.05	16.17	19.27	37.47	26.30	24.51	22.10	38.34	36.55	45.57
Coniferous swamp	3.76	11.22	16.52	20.98	44.51	60.25	69.63	66.78	45.05	41.15	66.58	83.36	89.60	54.91	56.17	56.15	65.94	67.72	79.39	104.50
Deep marsh	23.96	59.69	47.71	41.64	38.68	27.29	16.63	8.98	9.18	19.42	10.87	0.53	0	0	1.97	9.17	8.05	2.90	1.73	7.20
Hardwood swamp	0	0.45	1.79	0	4.66	9.42	1.20	1.76	4.40	9.27	9.05	5.87	4.50	1.43	2.93	0.84	0	0.80	4.67	11.51
Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.87	14.79	18.98	17.15	18.68	25.45
Open bog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sedge meadow	0	0.07	0	0	3.36	5.28	8.08	0.40	0	0	0	0	0	0	0	0	0	0	0	0
Sedge meadow or Wet meadow	0	0	0	0.35	0	0	0	0	0	0	0	0	0	0	0	3.09	1.23	0	0	0
Shallow marsh	24.07	68.34	55.70	64.39	62.54	55.76	38.38	15.82	13.04	14.12	15.37	12.58	6.96	5.23	14.77	12.36	15.17	7.00	7.54	17.86
Shallow, open water	0	0	0	0	0	3.76	6.06	10.61	12.86	12.16	13.08	12.22	11.92	8.33	2.66	2.83	2.04	1.66	1.91	4.23
Shrub-carr	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wet meadow	0.03	0	0	0	0	0	0.17	0.52	0	0	0	0	0	0.09	2.70	3.83	7.27	3.81	0	0
Total acres of wetland	55.05	147.62	133.17	142.59	174.34	195.34	159.99	138.45	140.81	157.22	162.95	160.46	161.41	146.60	149.87	173.90	214.77	209.31	219.15	285.35

						Wetlar	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Floata	tion Tailir	ngs Basin					
Eggers and Reed Wetland Community ⁽¹⁾	10,000 - 10,500 Feet	10,500 - 11,000 Feet	11,000 - 11,500 Feet	11,500 - 12,000 Feet	12,000 - 12,500 Feet	12,500 - 13,000 Feet	13,000 - 13,500 Feet	13,500 - 14,000 Feet	14,000 - 14,500 Feet	14,500 - 15,000 Feet	15,000 - 15,500 Feet	15,500 - 16,000 Feet	16,000 - 16,500 Feet	16,500 - 17,000 Feet	17,000 - 17,500 Feet	17,500 - 18,000 Feet	18,000 - 18,500 Feet	18,500 - 19,000 Feet	19,000 - 19,500 Feet	19,500 - 20,000 Feet
Community	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661	1 661
Alder thicket	0	0	11.28	18.38	9.46	0.26	2.98	2.14	4.98	3.02	14.82	18.53	1.32	0	0	0	0	0	0	0
Alder thicket or Shrub-carr	59.07	103.58	115.75	92.44	111.84	125.28	101.99	74.51	65.32	123.38	162.14	178.28	137.86	89.56	65.76	112.91	71.92	38.31	18.05	0.40
Coniferous bog	50.41	36.12	46.10	41.07	38.89	38.17	15.67	13.64	4.91	0	0	0	0.01	2.60	6.19	13.39	15.05	19.32	26.73	22.85
Coniferous swamp	103.52	86.72	98.16	125.25	124.90	91.92	99.96	122.59	147.98	84.66	48.99	48.67	29.78	31.81	74.75	74.88	21.82	4.43	0	0
Deep marsh	18.23	15.81	1.77	0	0	0	1.35	11.73	11.71	10.51	10.72	9.76	11.34	2.85	0	0	0	0	0	0
Hardwood swamp	19.91	28.49	24.01	4.99	3.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.59
Lake	25.17	10.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open bog	0	0	0	0	0.20	5.05	11.72	18.30	18.53	24.24	30.19	35.42	38.55	35.06	29.30	16.59	10.32	5.39	0	0
Sedge meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sedge meadow or Wet meadow	0	1.06	0.46	6.90	3.77	7.39	1.95	0	0	0	0	0.28	0	0	0.09	5.33	0	0	0	0
Shallow marsh	3.37	0	0	0	0	9.15	18.11	5.47	10.33	1.55	0	0.78	2.85	12.88	14.48	7.10	2.81	0	0	1.69
Shallow, open water	3.60	4.61	4.62	3.19	7.18	14.82	7.40	1.44	0	0	0	0	0	0	0	0	0	0	0	0
Shrub-carr	0	0	0	0	10.93	19.98	20.25	35.56	47.96	34.21	31.45	31.34	18.08	0.01	0	0	0	0	0	0
Wet meadow	0	0	0	0	0	0	0	0	0.10	5.19	6.12	3.55	8.87	12.08	8.03	3.71	13.41	7.50	0	0
Total acres of wetland	283.28	287.31	302.15	292.22	310.86	312.02	281.38	285.38	311.82	286.76	304.43	326.61	248.66	186.85	198.60	233.91	135.33	74.95	44.78	27.53

						Wetlan	ıds (acres) within 5	00-Feet In	crements	From the	Edge of	the Floata	tion Tailir	ngs Basin	ı				
Eggers and Reed Wetland Community ⁽¹⁾	20,000 - 20,500 Feet	20,500 - 21,000 Feet	21,000 - 21,500 Feet	21,500 - 22,000 Feet	22,000 - 22,500 Feet	22,500 - 23,000 Feet	23,000 - 23,500 Feet	23,500 - 24,000 Feet	24,000 - 24,500 Feet	24,500 - 25,000 Feet	25,000 - 25,500 Feet	25,500 - 26,000 Feet	26,000 - 26,500 Feet	26,500 - 27,000 Feet	27,000 - 27,500 Feet	27,500 - 28,000 Feet	28,000 - 28,500 Feet	28,500 - 29,000 Feet	29,000 - 29,500 Feet	29,500 - 30,000 Feet
Alder thicket	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alder thicket or Shrub-carr	9.16	2.52	0.01	0.08	1.41	2.91	3.54	1.85	2.53	1.60	2.82	3.07	5.34	3.73	0	0	0	0	0	0
Coniferous bog	11.90	11.97	19.50	9.39	12.32	21.62	21.27	22.67	19.66	15.07	17.23	29.47	29.88	17.03	15.14	12.94	10.54	5.31	3.27	0.95
Coniferous swamp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardwood swamp	2.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open bog	0	0	0	0	0	0	0.18	9.89	19.57	24.98	19.66	0.24	0	0	0	0	0	0	0	0
Sedge meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sedge meadow or Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shallow marsh	2.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shallow, open water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wet meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total acres of wetland	26.18	14.49	19.51	9.47	13.73	24.53	24.99	34.41	41.76	41.65	39.71	32.78	35.22	20.76	15.14	12.94	10.54	5.31	3.27	0.95

⁽¹⁾ Reference (13)

Large Table 15 Summary of Wetlands within the FTB Groundwater Flow Paths

		Wetlands within	the FTB Groundwater F	low Paths (acres)
Eggers and Reed Wetland Community ⁽¹⁾	Hydrology	Unnamed Creek	Trimble Creek	Mud Lake Creek
Alder thicket	Groundwater	53.36	8.90	0
Alder thicket or Shrub-carr	Groundwater	433.41	227.34	144.85
Ombrotrophic coniferous bog	Precipitation	37.56	196.63	58.14
Coniferous swamp	Groundwater	375.48	308.35	630.61
Deep marsh	Groundwater	130.89	97.59	125.83
Hardwood swamp	Groundwater	126.05	0	40.91
Open bog	Precipitation	157.48	0	0
Sedge meadow	Groundwater	17.13	0	0
Sedge or Wet meadow	Groundwater	17.88	0	0.35
Shallow marsh	Groundwater	196.48	225.79	124.14
Shallow, open water	Groundwater	8.34	0	7.44
Shrub-carr	Groundwater	234.72	0.65	0
Wet meadow	Groundwater	64.24	17.70	0
Total acres of wetlar	nd	1853.02	1082.95	1132.27

⁽¹⁾ Reference (13)

Large Table 16 Wetlands within the FTB Groundwater Flow Paths

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Area (acres)
	Unnamed (Creek	
264	Coniferous swamp	Groundwater	10.86
265	Alder thicket or Shrub-carr	Groundwater	0.42
268	Alder thicket or Shrub-carr	Groundwater	15.44
270	Shallow marsh	Groundwater	85.84
271	Coniferous swamp	Groundwater	18.08
275	Coniferous swamp	Groundwater	30.59
276	Coniferous swamp	Groundwater	8.68
277	Alder thicket or Shrub-carr	Groundwater	14.46
278	Alder thicket	Groundwater	0.81
278A	Alder thicket or Shrub-carr	Groundwater	1.84
279	Alder thicket	Groundwater	1.50
279A	Alder thicket or Shrub-carr	Groundwater	0.33
279B	Alder thicket or Shrub-carr	Groundwater	1.13
280	Sedge meadow	Groundwater	17.13
281	Alder thicket or Shrub-carr	Groundwater	1.46
282	Shallow marsh	Groundwater	6.83
282A	Shallow marsh	Groundwater	6.63
282B	Shallow marsh	Groundwater	12.41
283	Deep marsh	Groundwater	8.89
284	Alder thicket	Groundwater	0.41
284A	Alder thicket or Shrub-carr	Groundwater	2.99
287	Alder thicket or Shrub-carr	Groundwater	5.93
293	Deep marsh	Groundwater	5.74
591	Deep marsh	Groundwater	0.36
591A	Deep marsh	Groundwater	0.15
593	Deep marsh	Groundwater	1.18
593A	Deep marsh	Groundwater	25.73
594	Deep marsh	Groundwater	0.06
594A	Deep marsh	Groundwater	0.75
596	Alder thicket or Shrub-carr	Groundwater	0.24
597	Hardwood swamp	Groundwater	4.45
598	Alder thicket or Shrub-carr	Groundwater	6.31

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Area (acres)
599	Alder thicket or Shrub-carr	Groundwater	2.79
600	Shallow marsh	Groundwater	8.79
601	Alder thicket or Shrub-carr	Groundwater	1.34
602	Alder thicket or Shrub-carr	Groundwater	0.60
624	Alder thicket or Shrub-carr	Groundwater	4.84
625	Coniferous swamp	Groundwater	3.70
626	Coniferous swamp	Groundwater	200.75
627	Alder thicket or Shrub-carr	Groundwater	187.10
628	Deep marsh	Groundwater	10.53
629	Alder thicket or Shrub-carr	Groundwater	10.66
630	Coniferous bog	Precipitation	8.05
631	Coniferous swamp	Groundwater	10.05
632	Alder thicket or Shrub-carr	Groundwater	11.13
633	Alder thicket or Shrub-carr	Groundwater	1.07
634	Alder thicket or Shrub-carr	Groundwater	0.51
635	Alder thicket or Shrub-carr	Groundwater	1.76
636	Coniferous bog	Precipitation	2.26
641	Coniferous swamp	Groundwater	16.16
642	Shallow, open water	Groundwater	8.34
644	Coniferous swamp	Groundwater	11.73
645	Shallow marsh	Groundwater	1.04
646	Alder thicket or Shrub-carr	Groundwater	16.76
647	Alder thicket or Shrub-carr	Groundwater	6.55
648	Alder thicket	Groundwater	11.51
649	Sedge meadow or Wet meadow	Groundwater	10.01
650	Sedge meadow or Wet meadow	Groundwater	7.87
656	Alder thicket or Shrub-carr	Groundwater	1.94
786	Open bog	Precipitation	157.48
787	Alder thicket or Shrub-carr	Groundwater	16.23
788	Hardwood swamp	Groundwater	98.13
816	Deep marsh	Groundwater	15.46
817	Deep marsh	Groundwater	10.03
818	Deep marsh	Groundwater	7.13
819	Deep marsh	Groundwater	0.97
820	Deep marsh	Groundwater	26.92

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Area (acres)
821	Shallow marsh	Groundwater	9.19
822	Shallow marsh	Groundwater	4.46
823	Shallow marsh	Groundwater	6.22
824	Shallow marsh	Groundwater	5.74
825	Wet meadow	Groundwater	0.07
826	Wet meadow	Groundwater	8.93
827	Wet meadow	Groundwater	2.84
828	Wet meadow	Groundwater	4.25
829	Wet meadow	Groundwater	3.50
830	Shallow marsh	Groundwater	4.88
831	Wet meadow	Groundwater	13.66
832	Wet meadow	Groundwater	9.38
833	Shallow marsh	Groundwater	15.14
834	Wet meadow	Groundwater	8.26
835	Wet meadow	Groundwater	12.66
836	Shrub-carr	Groundwater	11.50
837	Shrub-carr	Groundwater	13.50
838	Shrub-carr	Groundwater	19.00
839	Shrub-carr	Groundwater	13.07
840	Shrub-carr	Groundwater	31.30
841	Shrub-carr	Groundwater	9.24
842	Shrub-carr	Groundwater	8.30
843	Shrub-carr	Groundwater	12.56
844	Shrub-carr	Groundwater	28.54
845	Coniferous swamp	Groundwater	12.64
846	Shrub-carr	Groundwater	7.63
847	Shallow marsh	Groundwater	17.87
848	Shrub-carr	Groundwater	16.03
849	Shrub-carr	Groundwater	10.88
850	Shrub-carr	Groundwater	29.75
851	Shrub-carr	Groundwater	19.74
852	Shrub-carr	Groundwater	3.68
876	Alder thicket	Groundwater	39.13
877	Alder thicket or Shrub-carr	Groundwater	12.65
878	Alder thicket or Shrub-carr	Groundwater	35.55

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Area (acres)
917	Coniferous bog	Precipitation	19.88
918	Coniferous swamp	Groundwater	9.44
921	Alder thicket or Shrub-carr	Groundwater	0.38
923	Wet meadow	Groundwater	0.69
942	Deep marsh	Groundwater	2.96
943	Deep marsh	Groundwater	14.03
944	Hardwood swamp	Groundwater	2.61
945	Alder thicket or Shrub-carr	Groundwater	2.32
950	Alder thicket or Shrub-carr	Groundwater	3.13
978	Hardwood swamp	Groundwater	2.80
980	Alder thicket or Shrub-carr	Groundwater	2.82
996	Alder thicket or Shrub-carr	Groundwater	4.10
1025	Hardwood swamp	Groundwater	1.55
1070	Alder thicket or Shrub-carr	Groundwater	3.80
1071	Alder thicket or Shrub-carr	Groundwater	29.18
1072	Alder thicket or Shrub-carr	Groundwater	8.62
1073	Alder thicket or Shrub-carr	Groundwater	3.57
1129	Coniferous swamp	Groundwater	9.79
1147	Alder thicket or Shrub-carr	Groundwater	13.46
1156	Shallow marsh	Groundwater	4.08
NA	Hardwood swamp	Groundwater	16.51
NA	Coniferous swamp	Groundwater	30.02
NA	Shallow marsh	Groundwater	7.36
NA	Coniferous swamp	Groundwater	2.99
NA	Coniferous bog	Precipitation	6.23
NA	Coniferous bog	Precipitation	1.14
	Trimble Cr	eek	
252	Coniferous swamp	Groundwater	45.74
253	Deep marsh	Groundwater	5.89
254	Shallow marsh	Groundwater	36.71
256	Alder thicket or Shrub-carr	Groundwater	21.23
259	Alder thicket or Shrub-carr	Groundwater	0.34
260	Shallow marsh	Groundwater	114.62
261	Alder thicket or Shrub-carr	Groundwater	0.84
262	Shallow marsh	Groundwater	1.86

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Area (acres)
267	Alder thicket or Shrub-carr	Groundwater	1.09
312	Shrub-carr	Groundwater	0.65
476	Alder thicket or Shrub-carr	Groundwater	0.82
529	Wet meadow	Groundwater	0.30
549	Alder thicket or Shrub-carr	Groundwater	1.89
578	Deep marsh	Groundwater	0.69
579	Deep marsh	Groundwater	2.14
580	Alder thicket or Shrub-carr	Groundwater	1.72
581	Coniferous swamp	Groundwater	20.62
582	Deep marsh	Groundwater	18.39
582A	Deep marsh	Groundwater	19.84
584	Alder thicket or Shrub-carr	Groundwater	53.00
585	Alder thicket	Groundwater	1.58
585A	Alder thicket or Shrub-carr	Groundwater	2.78
586	Deep marsh	Groundwater	0.36
587	Shallow marsh	Groundwater	0.81
588	Alder thicket or Shrub-carr	Groundwater	18.22
589	Deep marsh	Groundwater	40.05
590	Shallow marsh	Groundwater	0.05
591	Deep marsh	Groundwater	1.65
591A	Deep marsh	Groundwater	2.60
609	Coniferous swamp	Groundwater	0.33
610	Shallow marsh	Groundwater	0.09
611	Coniferous bog	Precipitation	0.23
612	Coniferous bog	Precipitation	2.19
613	Alder thicket or Shrub-carr	Groundwater	1.59
614	Shallow marsh	Groundwater	1.23
615	Shallow marsh	Groundwater	0.44
616	Deep marsh	Groundwater	5.98
617	Shallow marsh	Groundwater	2.08
618	Alder thicket	Groundwater	1.46
619	Alder thicket or Shrub-carr	Groundwater	0.88
620	Shallow marsh	Groundwater	0.28
621	Alder thicket or Shrub-carr	Groundwater	0.52
622	Alder thicket or Shrub-carr	Groundwater	0.37

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Area (acres)		
623	Alder thicket or Shrub-carr	Groundwater	0.89		
643	Alder thicket or Shrub-carr	Groundwater	1.59		
670	Coniferous swamp	Groundwater	29.76		
672	Coniferous swamp	Groundwater	9.05		
673	Coniferous swamp	Groundwater	110.07		
810	Alder thicket or Shrub-carr	Groundwater	11.40		
869	Alder thicket or Shrub-carr	Groundwater	16.50		
870	Coniferous bog	Precipitation	8.60		
915	Alder thicket	Groundwater	5.48		
946	Alder thicket or Shrub-carr	Groundwater	0.12		
947	Alder thicket or Shrub-carr	Groundwater	0.76		
951	Coniferous bog	Precipitation	116.45		
954	Coniferous swamp	Groundwater	39.29		
956	Wet meadow	Groundwater	17.40		
957	Coniferous swamp	Groundwater	6.88		
958	Alder thicket or Shrub-carr	Groundwater	3.58		
974	Coniferous bog	Precipitation	69.16		
975	Coniferous swamp	Groundwater	26.33		
979	Alder thicket or Shrub-carr	Groundwater	5.75		
981	Alder thicket	Groundwater	0.38		
990	Alder thicket or Shrub-carr	Groundwater	42.22		
991	Coniferous swamp	Groundwater	55.70		
995	Coniferous swamp	Groundwater	3.82		
1139	Shallow marsh	Groundwater	17.70		
1139A	Shallow marsh	Groundwater	5.31		
1139B	Shallow marsh	Groundwater	44.61		
	Mud Lake (Creek			
260	Shallow marsh	Groundwater	34.98		
285	Coniferous swamp	Groundwater	243.19		
286	Shallow, open water	Groundwater	7.44		
288	Deep marsh	Groundwater	4.51		
290	Coniferous swamp	Groundwater	0.25		
292	Deep marsh	Groundwater	0.41		
292A	Deep marsh	Groundwater	0.07		
308	Deep marsh	Groundwater 5.2			

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Dominant Source of Hydrology	Area (acres)
308A	Deep marsh	Groundwater	75.57
314	Shallow marsh	Groundwater	19.17
314A	Shallow marsh	Groundwater	20.92
572	Deep marsh	Groundwater	7.34
573	Shallow marsh	Groundwater	0.12
573A	Shallow marsh	Groundwater	11.33
574	Deep marsh	Groundwater	6.59
575	Alder thicket or Shrub-carr	Groundwater	0.49
576	Sedge meadow or Wet meadow	Groundwater	0.35
577	Alder thicket or Shrub-carr	Groundwater	2.26
578	Deep marsh	Groundwater	16.81
582	Deep marsh	Groundwater	0.99
582A	Deep marsh	Groundwater	0.90
652	Coniferous swamp	Groundwater	109.44
669	Shallow marsh	Groundwater	21.39
810	Alder thicket or Shrub-carr	Groundwater	0.35
866	Hardwood swamp	Groundwater	31.04
867	Alder thicket or Shrub-carr	Groundwater	64.89
868	Hardwood swamp	Groundwater	9.87
870	Coniferous bog	Precipitation	58.14
908	Shallow marsh	Groundwater	8.70
947	Alder thicket or Shrub-carr	Groundwater	19.62
963	Alder thicket or Shrub-carr	Groundwater	26.88
964	Coniferous swamp	Groundwater	42.88
965	Coniferous swamp	Groundwater	11.22
966	Alder thicket or Shrub-carr	Groundwater	8.15
968	Coniferous swamp	Groundwater	3.49
986	Alder thicket or Shrub-carr	Groundwater	22.21
1130	Coniferous swamp	Groundwater	32.29
1133	Coniferous swamp	Groundwater	70.54
1134	Shallow marsh	Groundwater	5.71
1134A	Shallow marsh	Groundwater	1.82
1135	Deep marsh	Groundwater	0.51
1135A	Deep marsh	Groundwater	6.91
1151	Coniferous swamp	Groundwater	117.31

Large Table 17 Summary of Wetlands Abutting the Railroad Corridor - Mine Site to Plant Site

Wetland ID	Eggers and Reed Wetland Community ⁽¹⁾	Wetland Size (acres)
9	Shallow marsh	1.80
13	Deep marsh	5.03
16	Shallow marsh	0.31
53	Alder thicket	18.59
53B	Coniferous swamp	0.43
53C	Coniferous swamp	2.88
53D	Alder thicket	241.16
81	Coniferous swamp	1.68
390A	Alder thicket or Shrub-carr	13.54
391	Coniferous swamp	22.32
556	Alder thicket or Shrub-carr	1.84
565	Alder thicket or Shrub-carr	1.92
568	Deep marsh	0.42
570	Alder thicket or Shrub-carr	31.69
571	Coniferous swamp	44.05
583	Alder thicket or Shrub-carr	0.13
595	Deep marsh	1.06
716A	Alder thicket	1.04
903	Shallow marsh	9.71
1037	Shallow, open water	6.59
1038A	Coniferous swamp	1.68
1041	Alder thicket or Shrub-carr	81.52
1042	Sedge meadow or Wet meadow	0.69
1119	Coniferous swamp	7.93
1137	Alder thicket or Shrub-carr	8.92
1160	Shallow, open water	0.85
R-1	Alder thicket or Shrub-carr	1.05
R-2	Alder thicket or Shrub-carr	1.65
R-3A	Alder thicket or Shrub-carr	0.53
R-4A	Alder thicket	3.31
R-5A	Shallow marsh	16.30
R-7A	Shallow marsh	12.05
	Total acres of wetland	542.67

Large Table 18 Total Wetland Area (Acres) for Pre-Settlement, Existing, and Future Conditions

		Pre-Settlement Conditions		Existing Conditions		Foreseeable Future Conditions with the Project		Foreseeable Future Conditions with the No Action Alternative	
Watershed	Total Land Area (acres)	Area (acres)	% of Watershed	Area (acres)	% of Watershed	Area (acres)	% of Watershed	Area (acres)	% of Watershed
Partridge River	101,812	33,601	33.0%	31,318	30.8%	30,276	29.7%	31,044	30.5%
Embarrass River	116,797	34,650	29.7%	34,249	29.3%	33,947	29.1%	34,122	29.2%

Large Table 19 Total Lake Area (Acres) for Pre-Settlement, Existing, and Future Conditions

		Pre-Settlement Conditions		Existing Conditions		Foreseeable Future Conditions with the Project		Foreseeable Future Conditions with the No Action Alternative	
Watershed	Total Land Area (acres)	Area (acres)	% of Watershed	Area (acres)	% of Watershed	Area (acres)	% of Watershed	Area (acres)	% of Watershed
Partridge River	101,812	2,688	2.6%	3,194	3.1%	3,194	3.1%	3,194	3.1%
Embarrass River	116,797	3,121	2.7%	2,904	2.5%	2,904	2.5%	2,904	2.5%

Large Table 20 Total Deepwater Habitat Area (Acres) for Pre-Settlement, Existing, and Future Conditions

		Pre-Settlement Conditions		Existing Conditions		Foreseeable Future Conditions with the Project		Foreseeable Future Conditions with the No Action Alternative	
Watershed	Total Land Area (acres)	Area (acres)	% of Watershed	Area (acres)	% of Watershed	Area (acres)	% of Watershed	Area (acres)	% of Watershed
Partridge River	101,812	0	0.0%	3,146	3.1%	3,516	3.5%	3,195	3.1%
Embarrass River	116,797	0	0.0%	977	0.8%	1,359	1.2%	1359	1.2%

Large Table 21 Summary of Future Known Changes in Wetland Resources for the Study Area⁽¹⁾

Watershed	Total Land Area (acres)	Pre- Settlement Conditions (acres)	Existing Conditions (acres)	% Change from Pre-Settlement to Existing Conditions	Foreseeable Future Conditions with the Project (acres)	% Change from Pre- Settlement to Future Conditions with the Project	% Change from Existing to Future Conditions with the Project	Foreseeable Future Conditions with the No Action Alternative (acres)	% Change from Pre- Settlement to Future Conditions with the No Action Alternative	% Change from Existing to Future Conditions with the No Action Alternative
Partridge River	101,812	33,601	31,318	-6.8%	30,276	-9.9%	-3.3%	31,044	-7.6%	-0.9%
Embarrass River	116,797	34,650	34,249	-1.2%	33,947	-2.0%	-0.9%	34,122	-1.5%	-0.4%

⁽¹⁾ The (-) represents a loss of wetland acres and the (+) represents a gain of wetland acres.

Large Table 22 Summary of Future Known Changes in Lake Resources for the Study Area⁽¹⁾

Watershed	Total Land Area (acres)	Pre- Settlement Conditions (acres)	Existing Conditions (acres)	% Change from Pre-Settlement to Existing Conditions	Foreseeable Future Conditions with the Project (acres)	% Change from Pre-Settlement to Future Conditions with the Project	% Change from Existing to Future Conditions with the Project	Foreseeable Future Conditions with the No Action Alternative (acres)		% Change from Existing to Future Conditions with the No Action Alternative
Partridge River	101,812	2,688	3,194	18.8%	3,194	18.8%	0%	3,194	18.8%	0%
Embarrass River	116,797	3,121	2,904	-7.0%	2,904	-7.0%	0%	2,904	-7.0%	0%

⁽¹⁾ The (-) represents a loss of lake acres and the (+) represents a gain of lake acres.

Large Table 23 Summary of Future Known Changes in Deepwater Habitat Resources for the Study Area

Watershed	Total Land Area (acres)	Pre- Settlement Conditions (acres)	Existing Conditions (acres)	% Change from Pre-Settlement to Existing Conditions	Foreseeable Future Conditions with the Project (acres)	% Change from Pre-Settlement to Future Conditions with the Project	% Change from Existing to Future Conditions with the Project	Foreseeable Future Conditions with the No Action Alternative (acres)	% Change from Pre- Settlement to Future Conditions with the No Action Alternative	% Change from Existing to Future Conditions with the No Action Alternative
Partridge River	101,812	0	3,146	100%	3,516	100%	11.8%	3,195	100%	1.6%
Embarrass River	116,797	0	977	100%	1,359	100%	39%	1,359	100%	39%

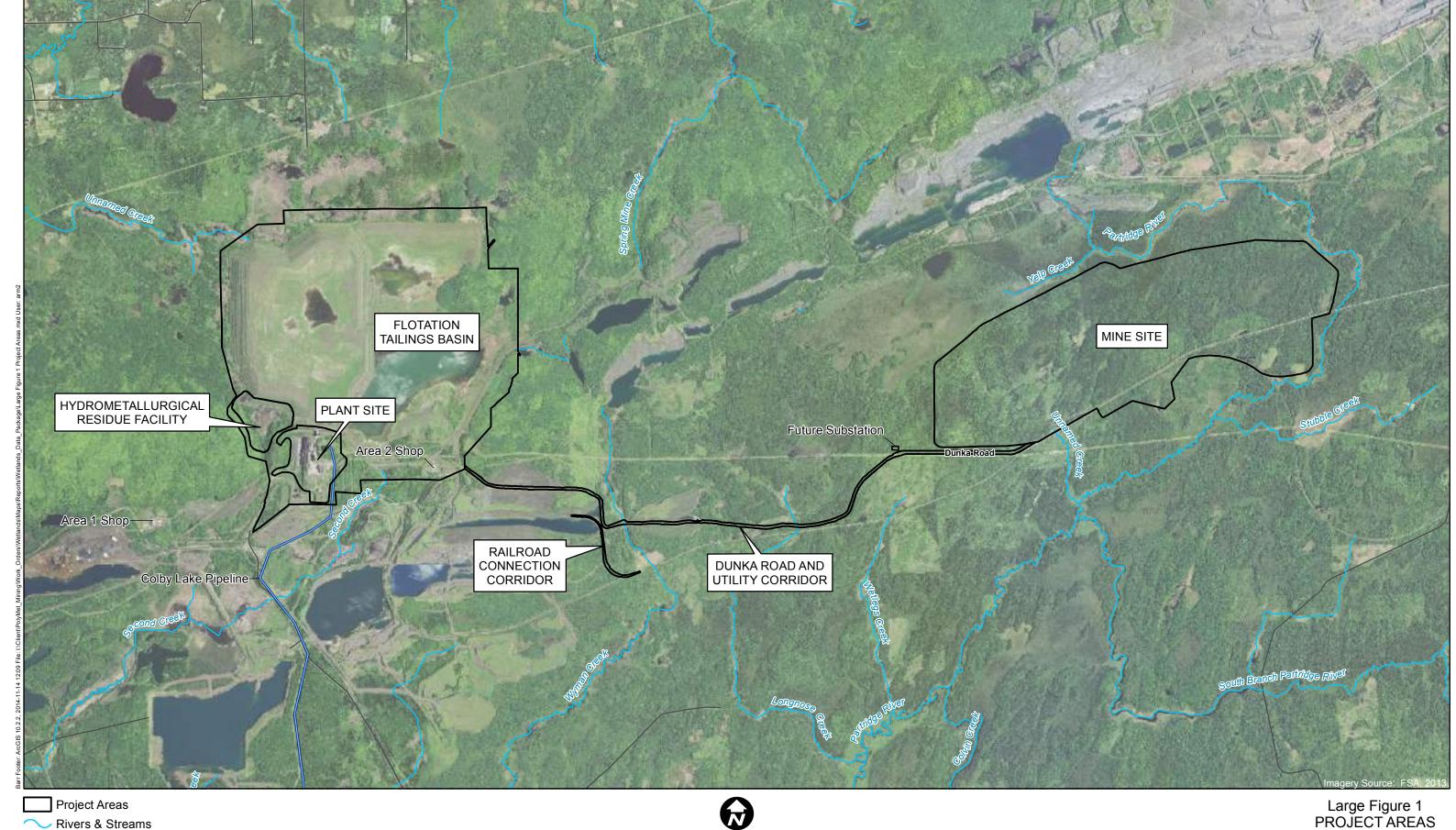
⁽¹⁾ The (-) represents a loss of deepwater acres and the (+) represents a gain of deepwater acres.

Large Table 24 Comparison of Future Conditions for Wetland and Deepwater Habitat Resources⁽¹⁾

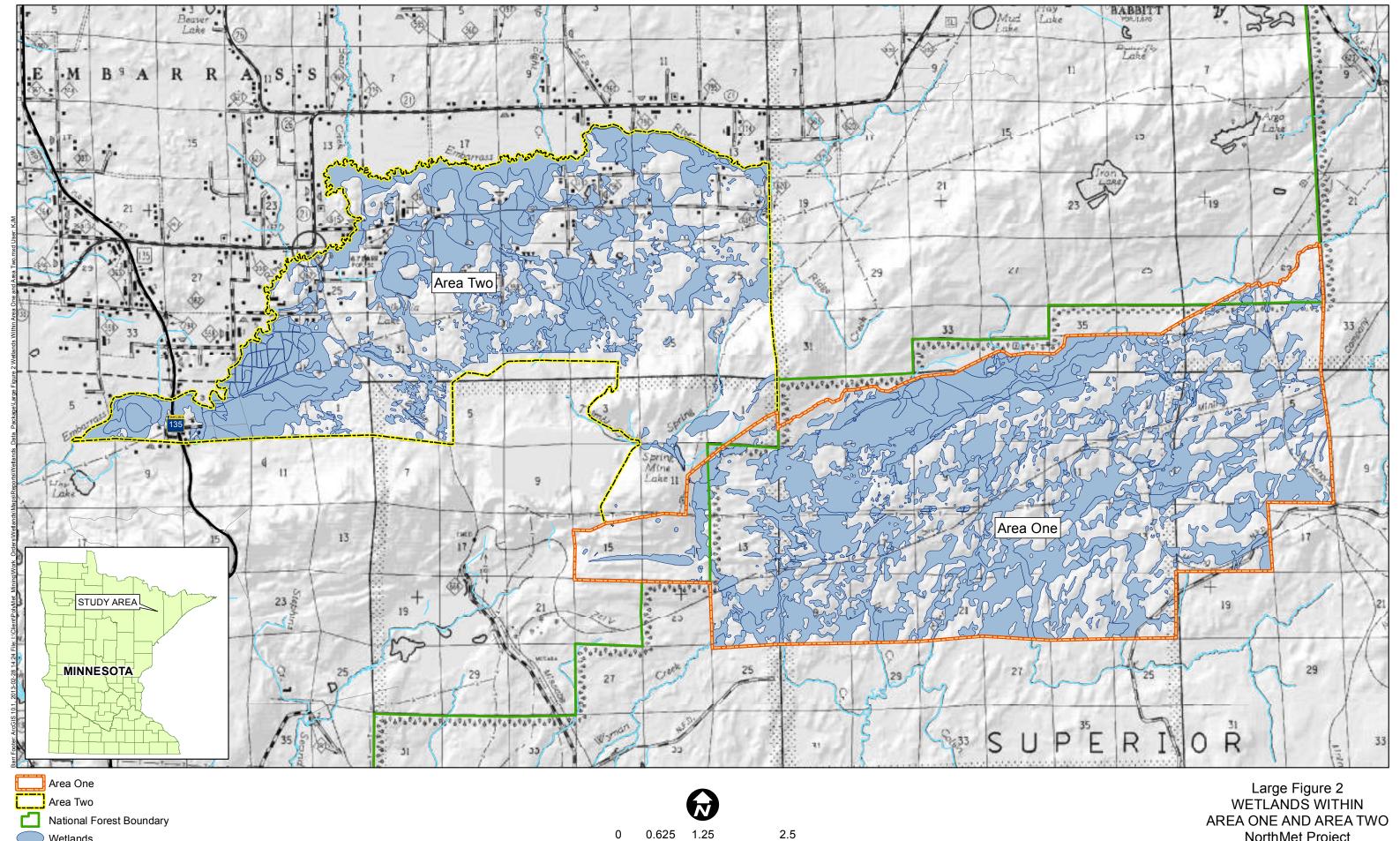
Project Name	Watershed	Wetland Impact (acres)	Proposed Wetland Mitigation (acres)	Net Change in Wetlands (acres)	Existing Deepwater Habitat (acres)	Future Deepwater Habitat (acres)	Net Change in Deepwater (acres)
PolyMet Mining Company	Partridge River	-767.6	0	-767.6	0	321.0	321.0
Mesabi Nugget Phase II	Partridge River	-266.8	0	-266.8	1,552.0	1,601.0	49.0
Laskin Energy Park - worst case scenario	Partridge River	-6.8	0	-6.8	0	0	0
St. Louis County Public Works Bridge Replacement	Partridge River	-0.9	0	-0.9	0	0	0
Total - Partridge River Watershed with Project	-1042.1	0	-1,042.1	1,552.0	1,922.0	370.0	
Total - Partridge River Watershed without Project	-275.4	0	-274.5	1,552.0	1,601.0	49.0	
PolyMet Mining Company	Embarrass River	-146.2	0	-146.2	0	0	0
PolyMet Mining Company ⁽²⁾	Embarrass River	-28.6	0	-28.6	0	0	0
St. Louis County Public Works Bridge Replacement	Embarrass River	-0.9	0	-0.9	0	0	0
ArcelorMittal East Reserve	Embarrass River	-49.1	0	-49.1	0	275	275
ArcelorMittal Pushback	Embarrass River	-23.5	0	-23.5	0	107	107
Mining Resources - Powder Basin (Biwabik)	Embarrass River	-3.4	0	-3.4	0	0	0
Mining Resources - McKinley	Embarrass River	-50.1	0	-50.1	0	0	0
Total - Embarrass River Watershed with Project	Total - Embarrass River Watershed with Project			-301.8	0	382	382
Total - Embarrass River Watershed without Proje	-127.0	0	-127.0	0	382	382	

 ⁽¹⁾ The (-) represents a loss of water resources acres and the (+) represents a gain of water resources acres.
 (2) These wetlands as exempt because the wetlands are located within the Cliffs Erie LLC (formerly LTVSMC) Permit To Mine Ultimate Tailings Basin Limit boundary and are not regulated by state and federal wetland regulations (Section 5.1).

Large Figures



0 2,250 4,500 9,000 Feet Large Figure 1
PROJECT AREAS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

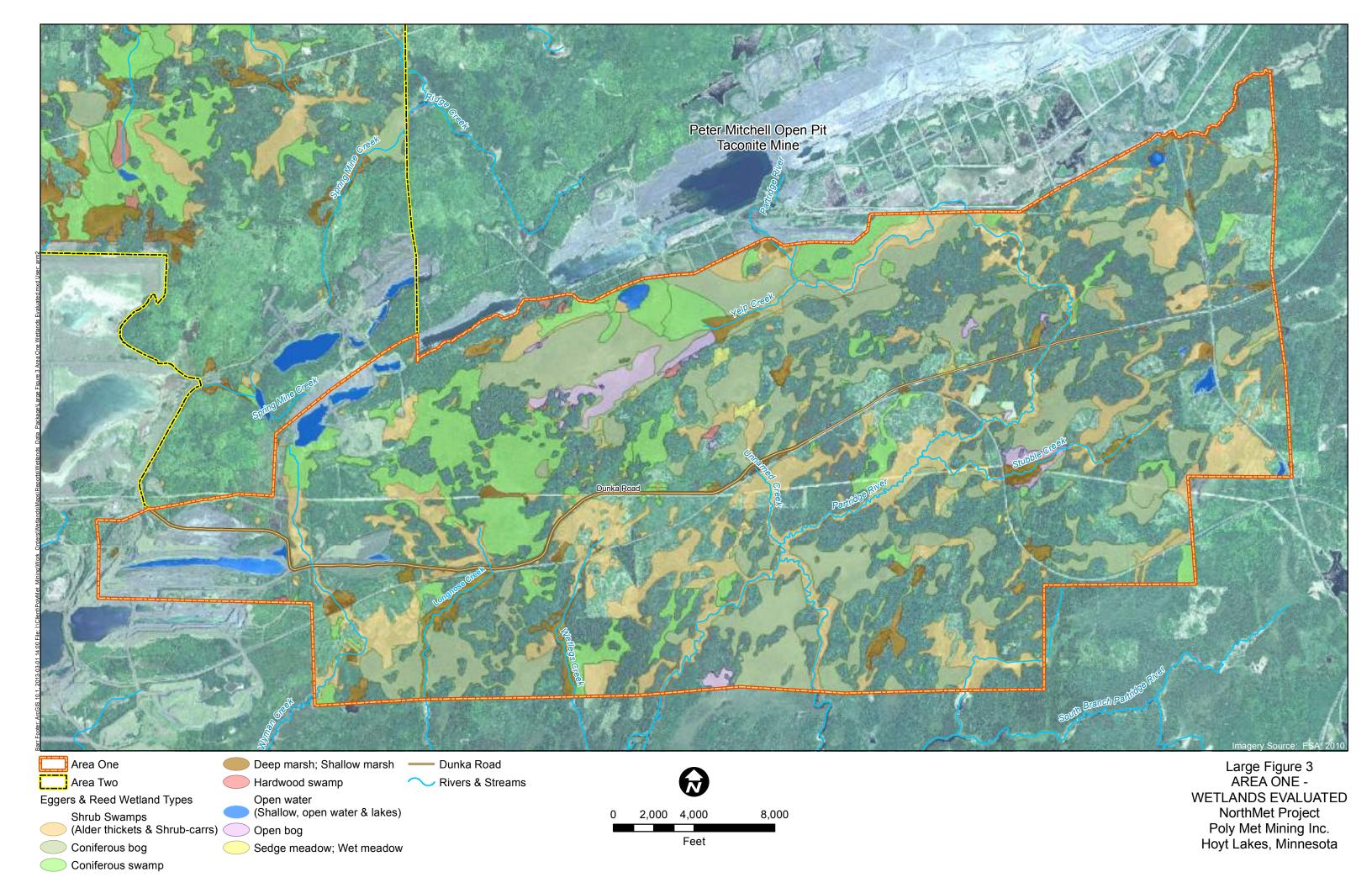


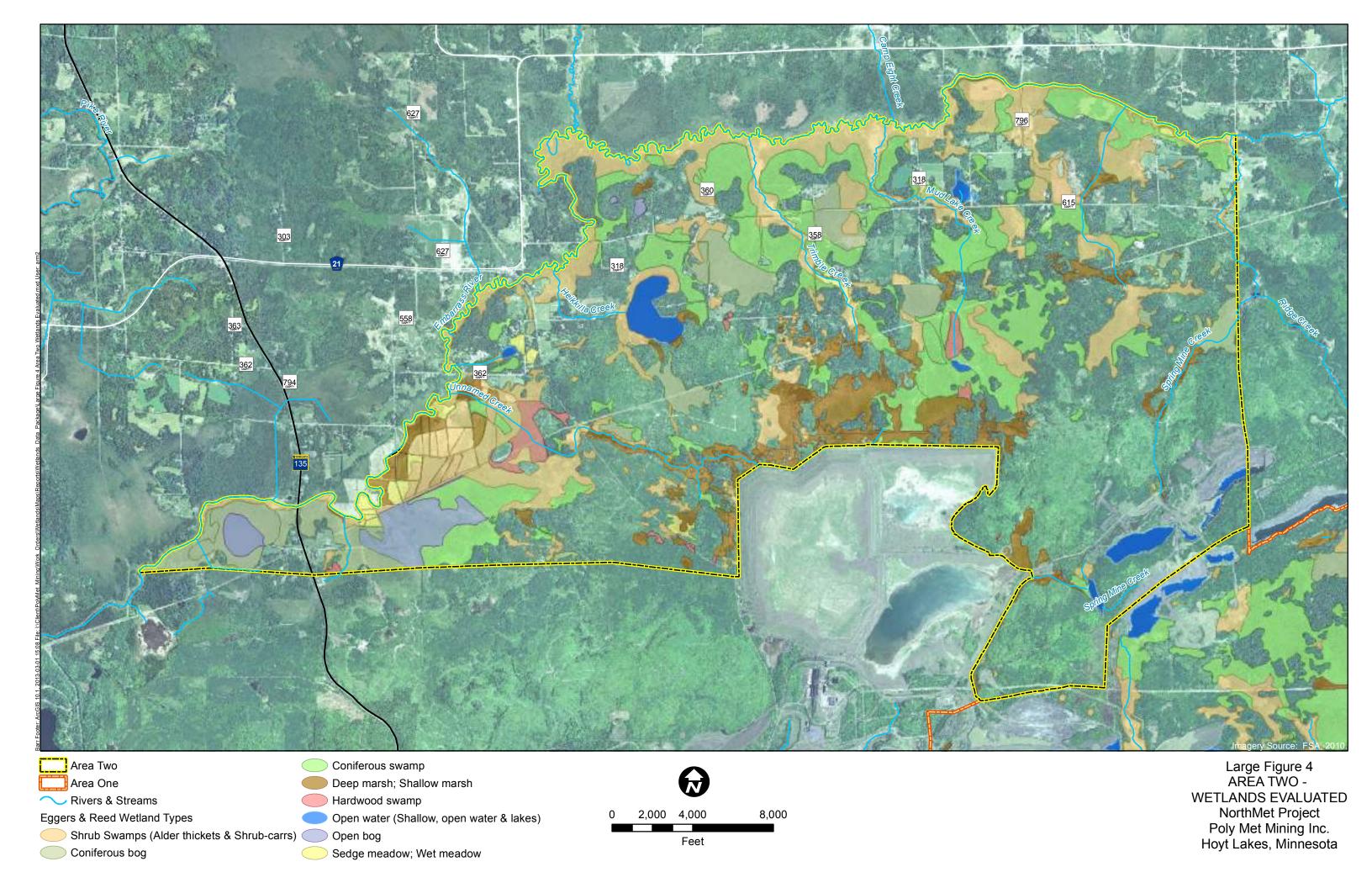
Miles

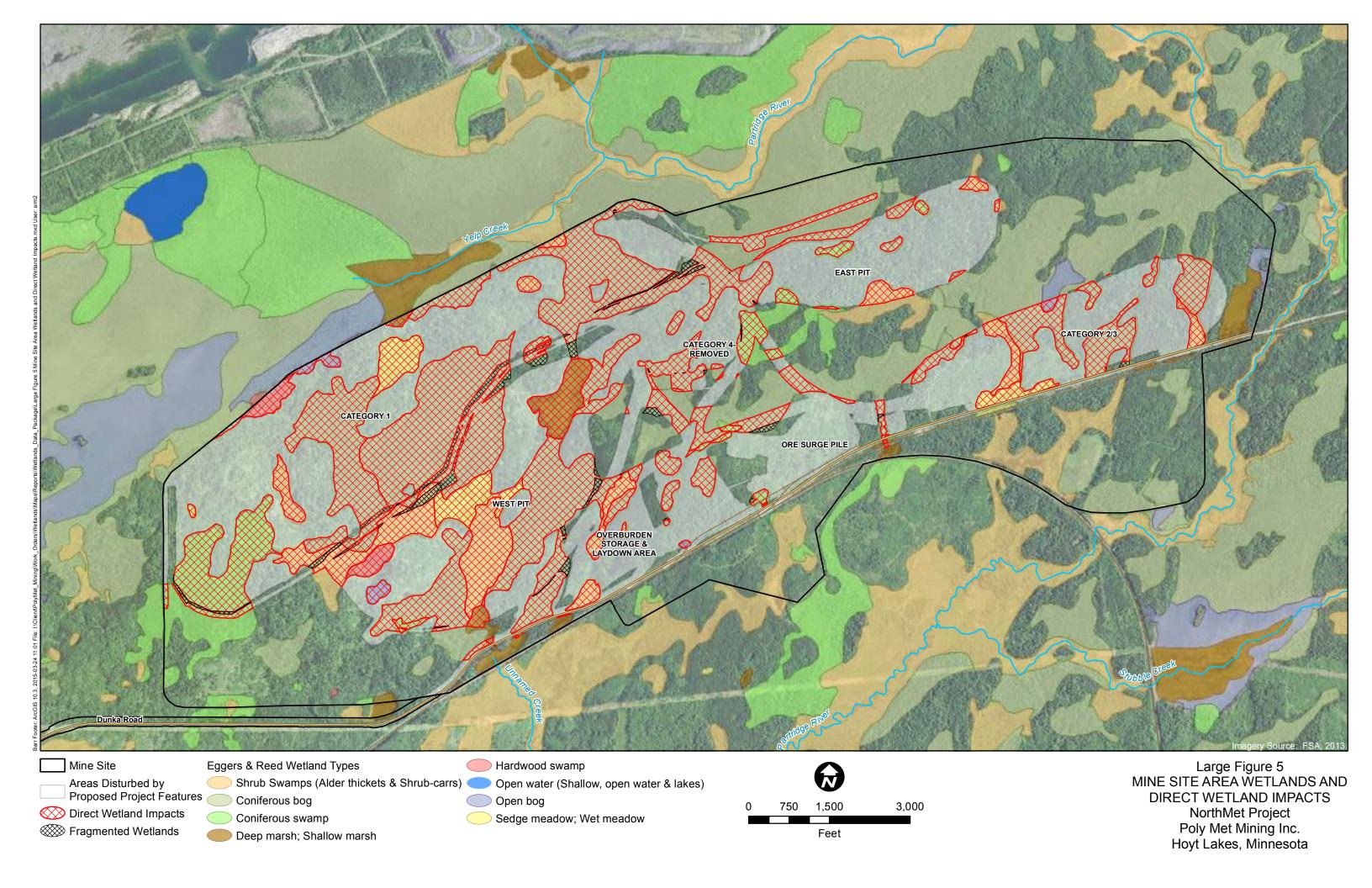
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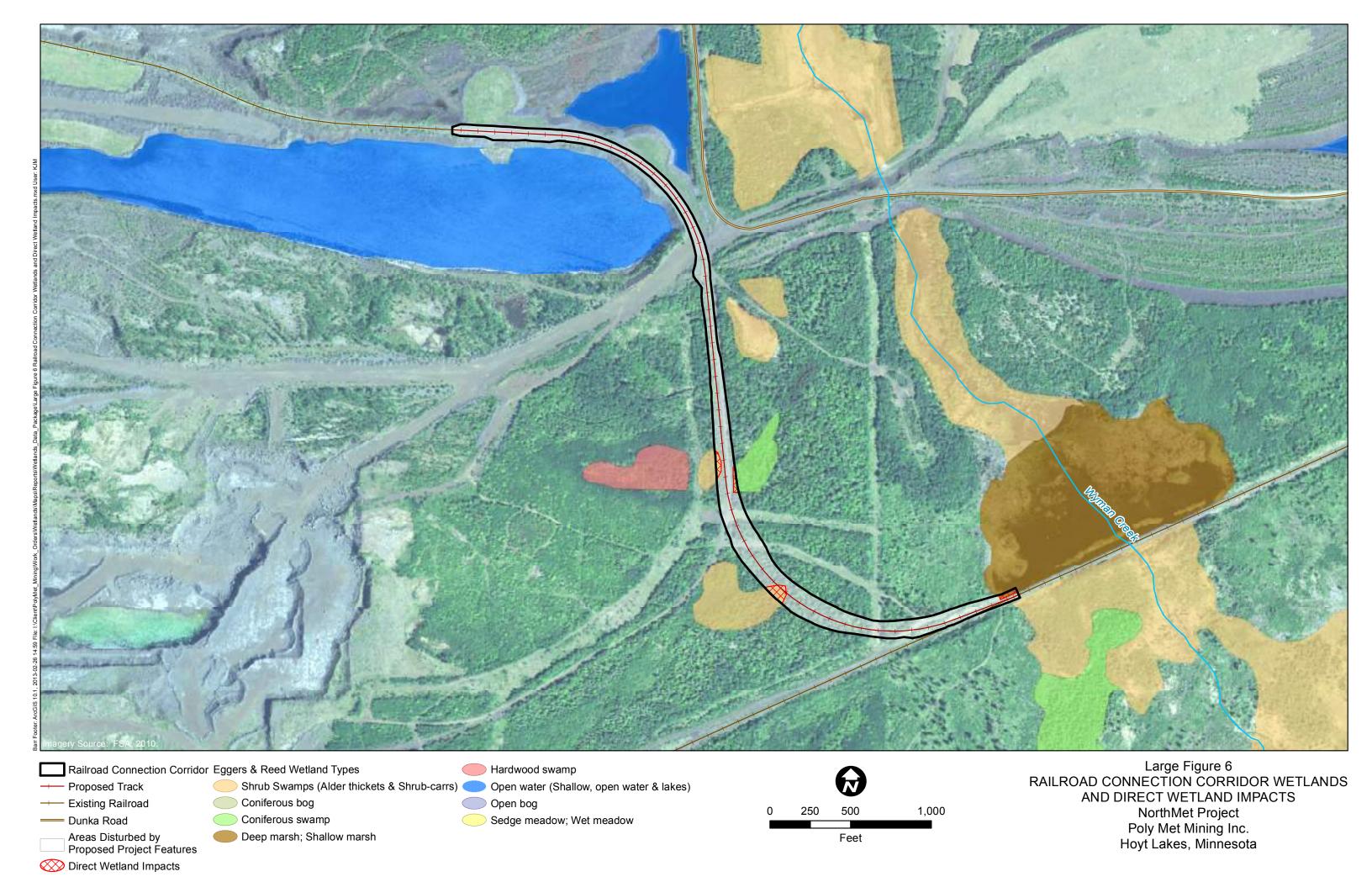
Streams

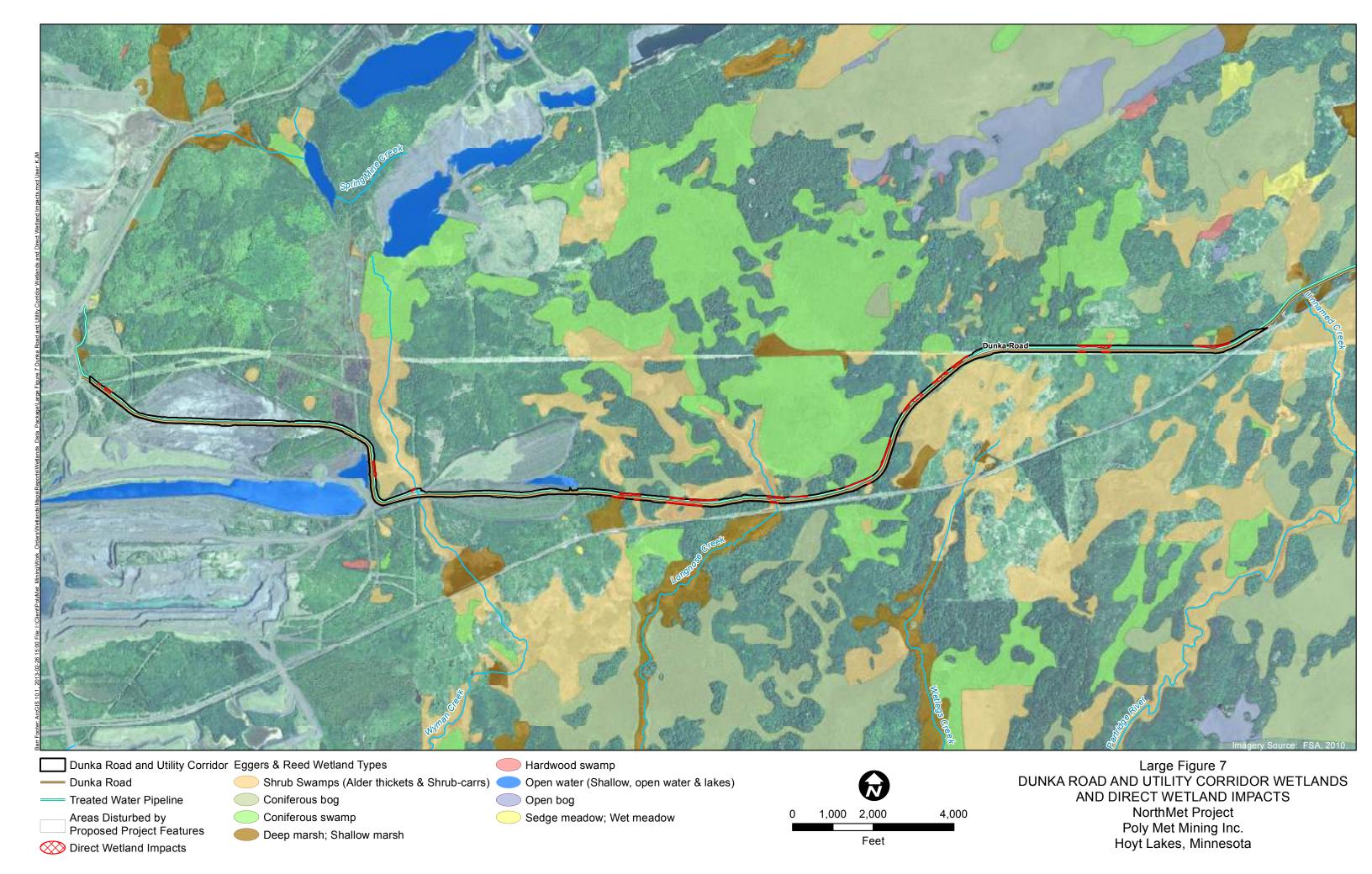
NorthMet Project Poly Met Mining Inc. Hoyt Lakes, Minnesota

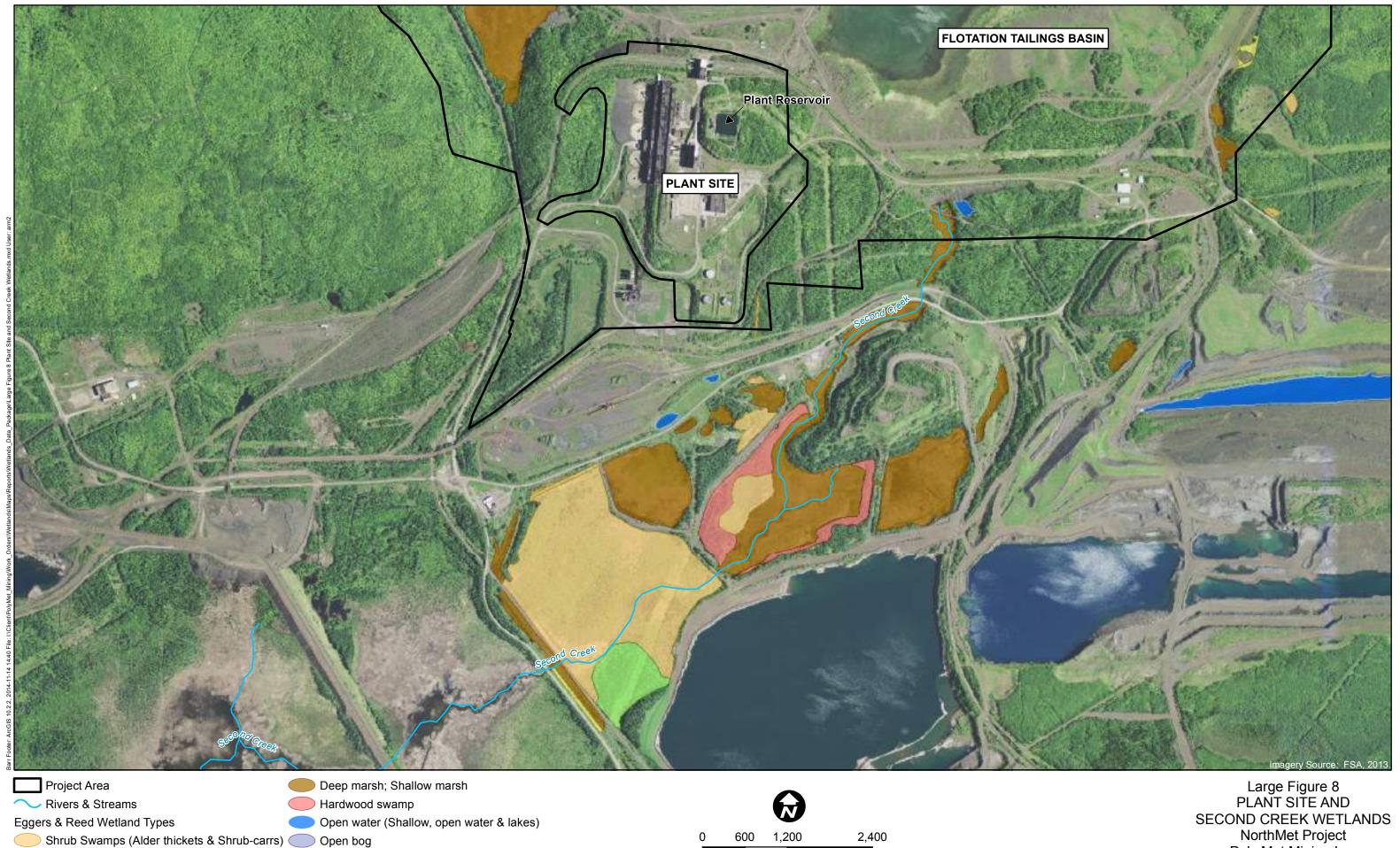










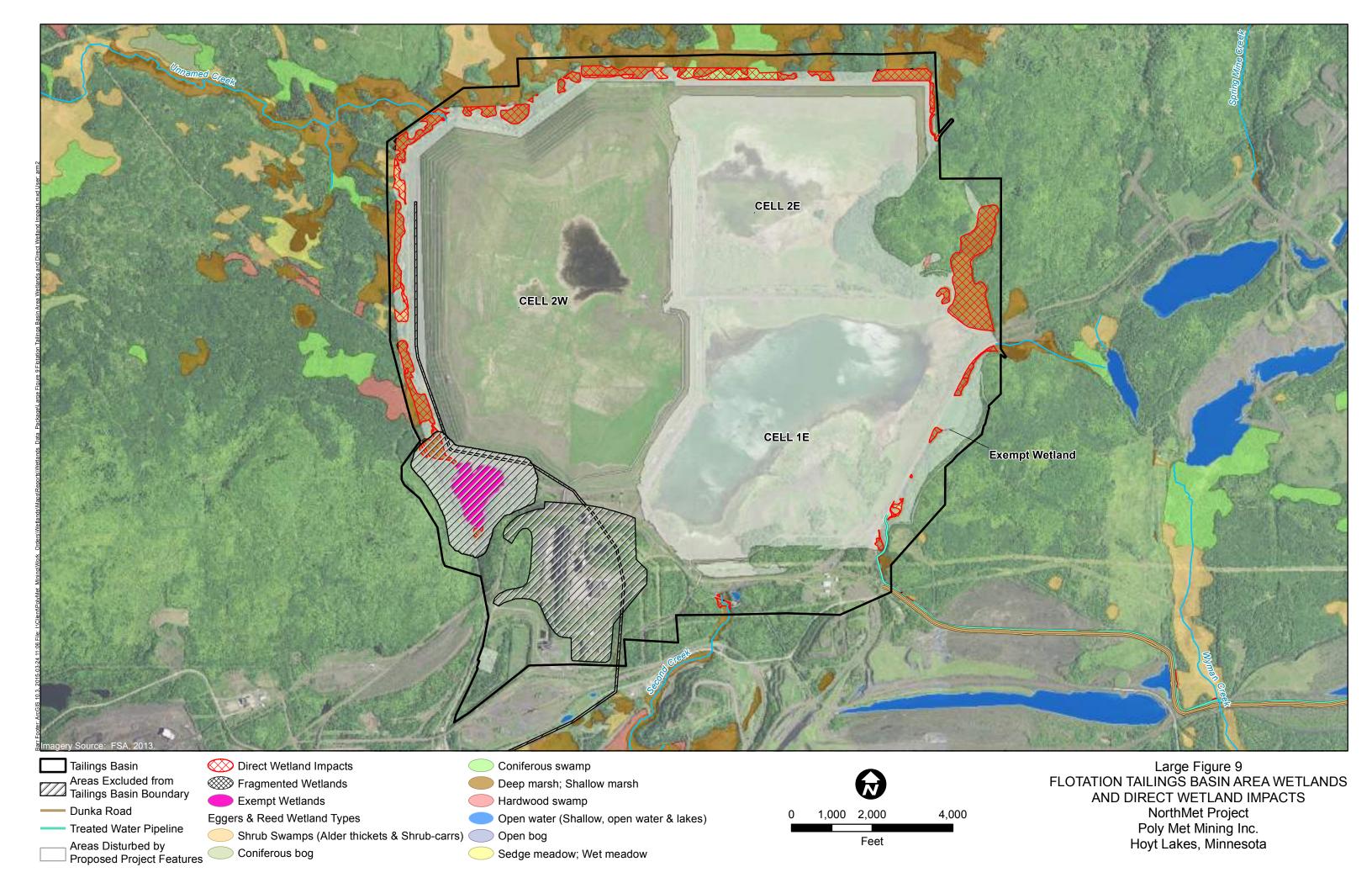


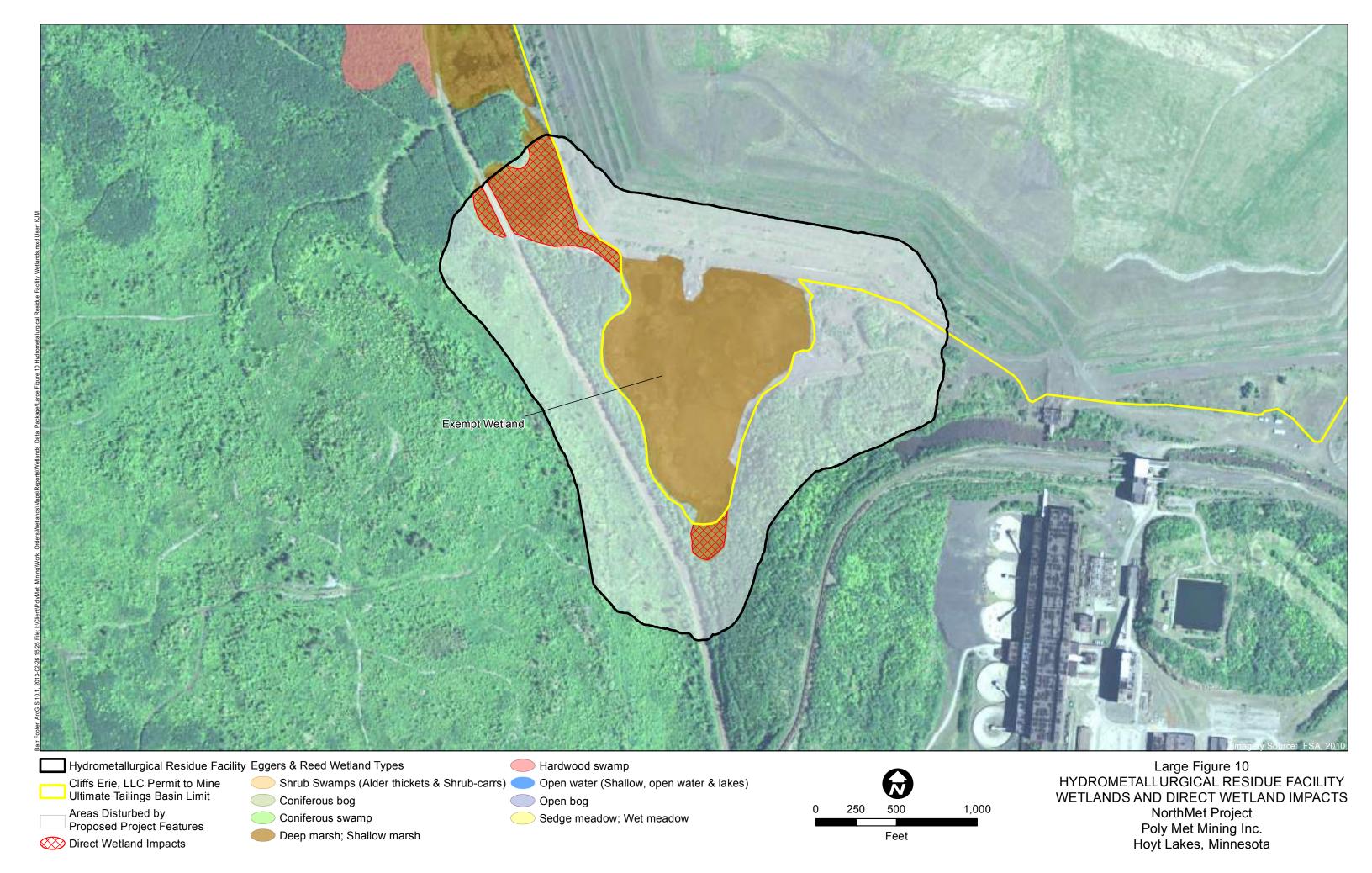
Coniferous bog

Coniferous swamp

Sedge meadow; Wet meadow

Poly Met Mining Inc. Feet Hoyt Lakes, Minnesota







1,500

Feet

3,000

PIPELINE WETLANDS

NorthMet Project

Poly Met Mining, Inc. Hoyt Lakes, Minnesota

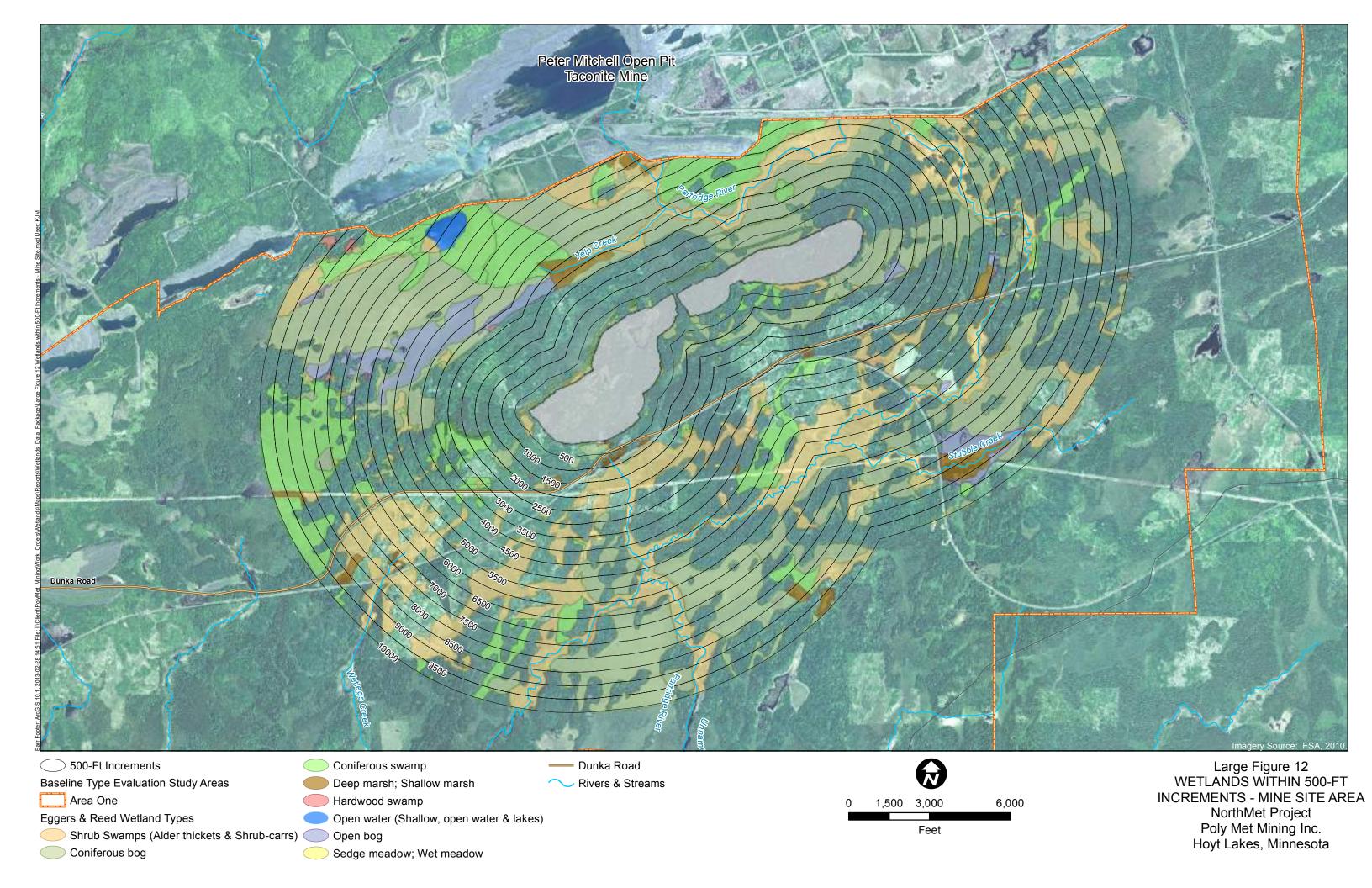
Coniferous swamp

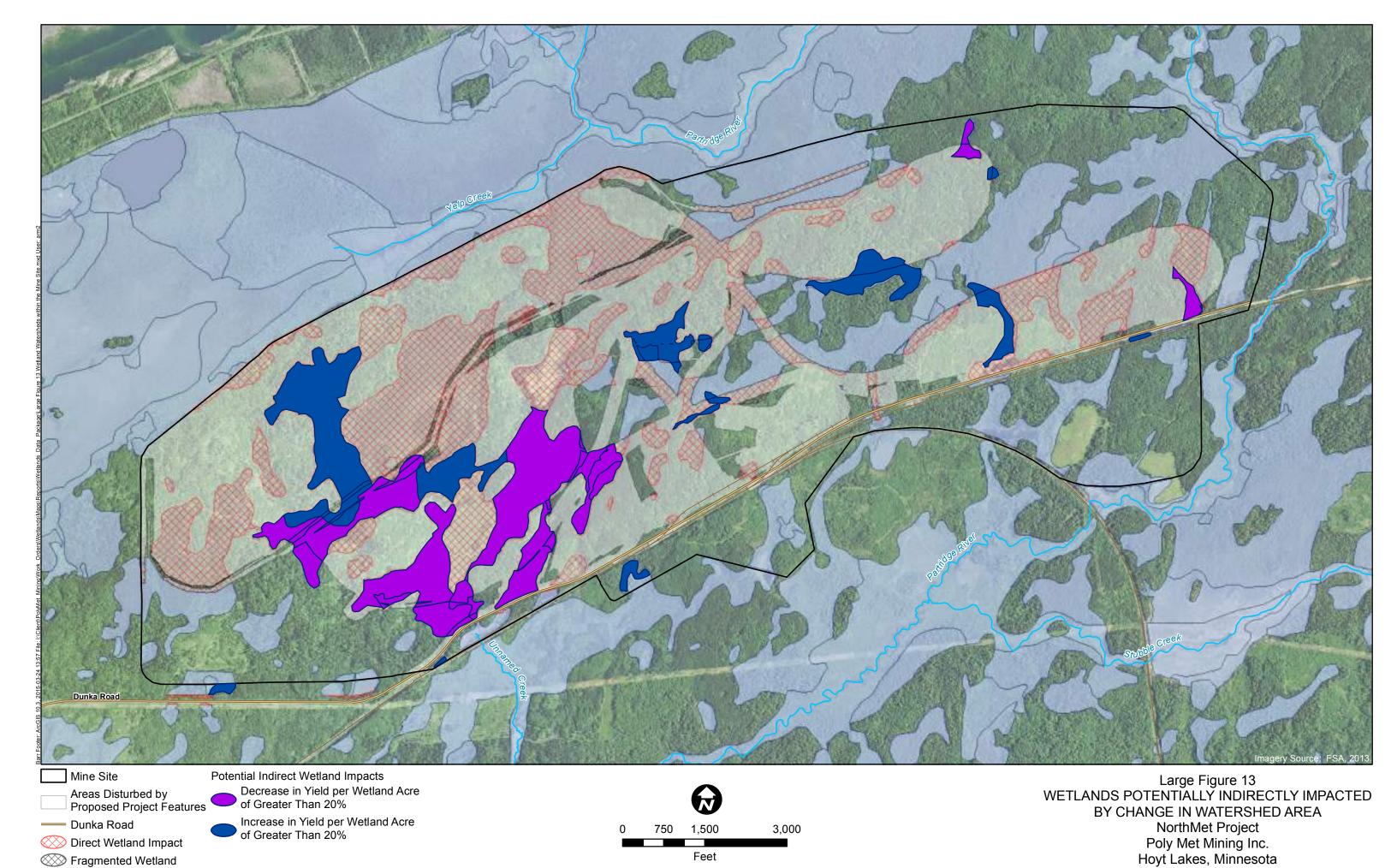
Deep marsh; Shallow marsh

Hardwood swamp

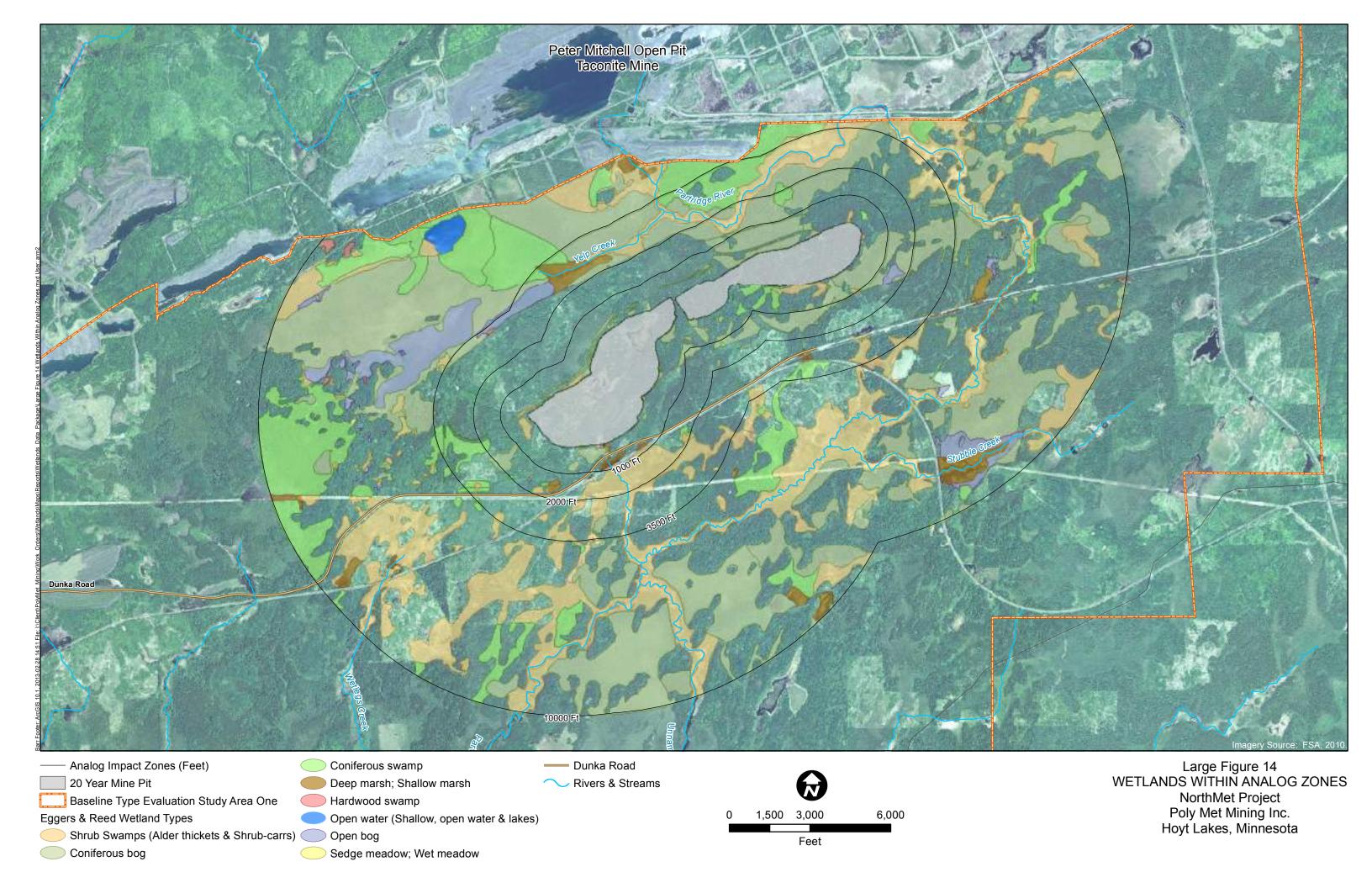
Open water (Shallow, open water & lakes)

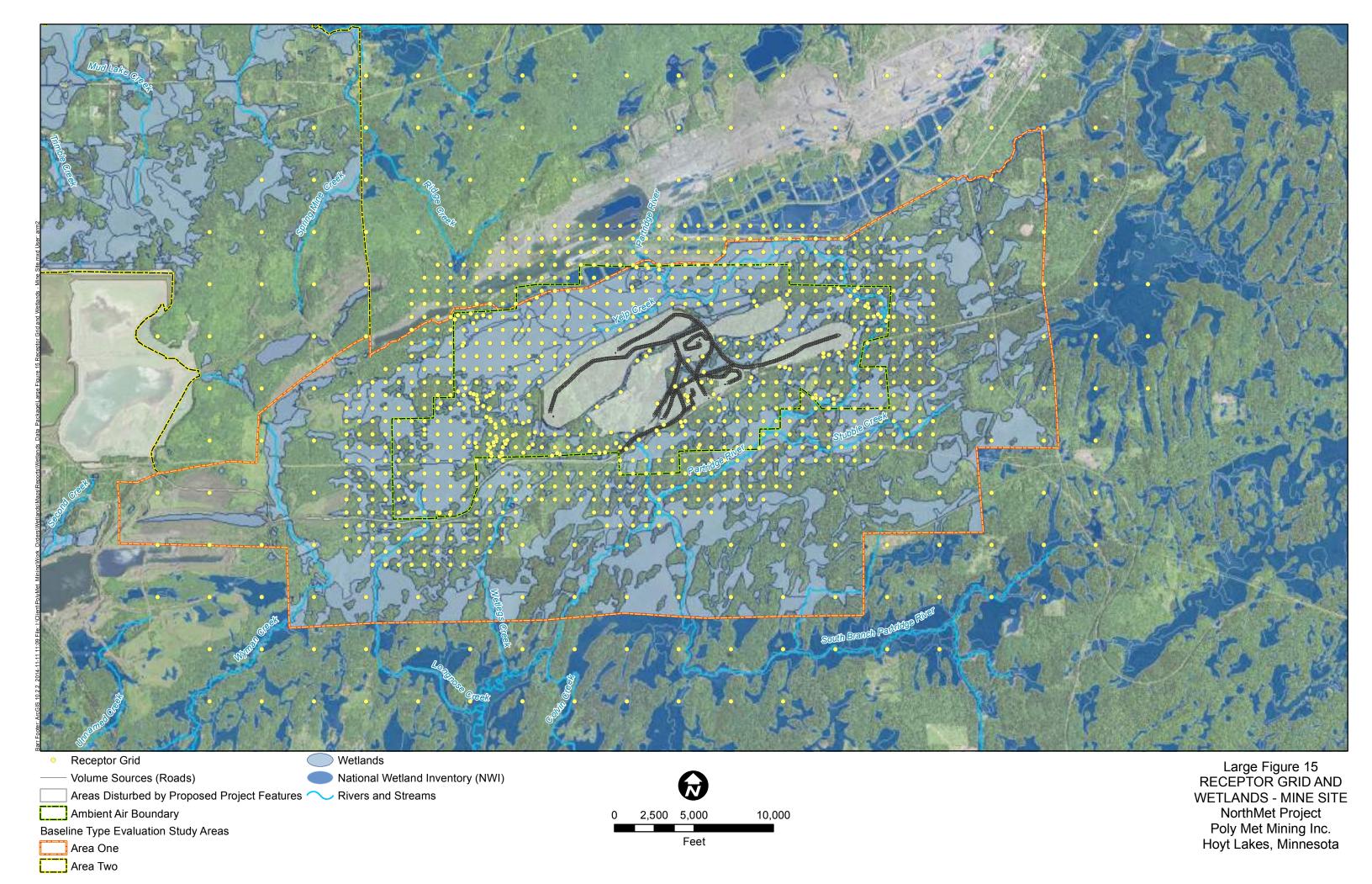
Open bog Sedge meadow; Wet meadow

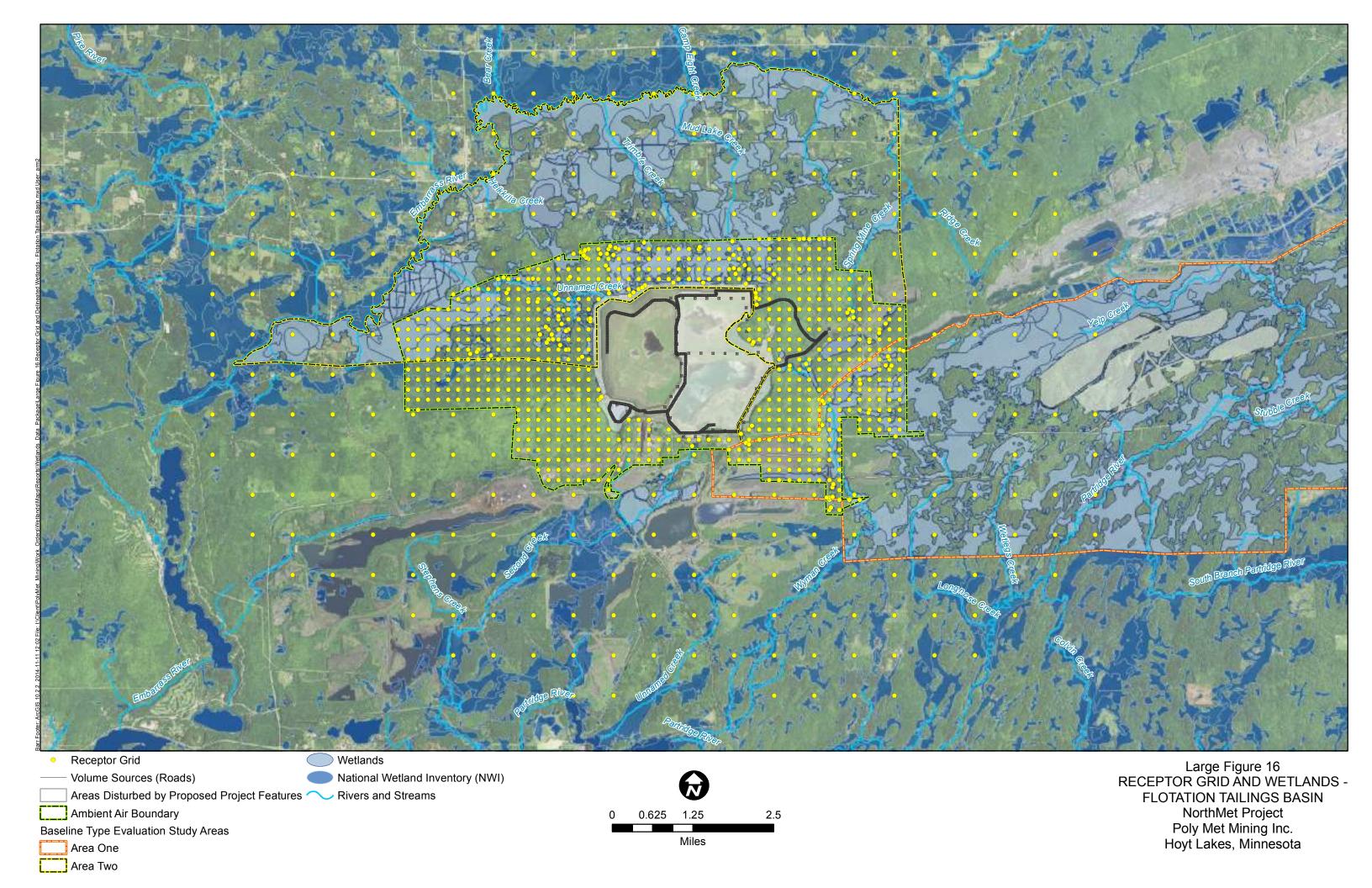


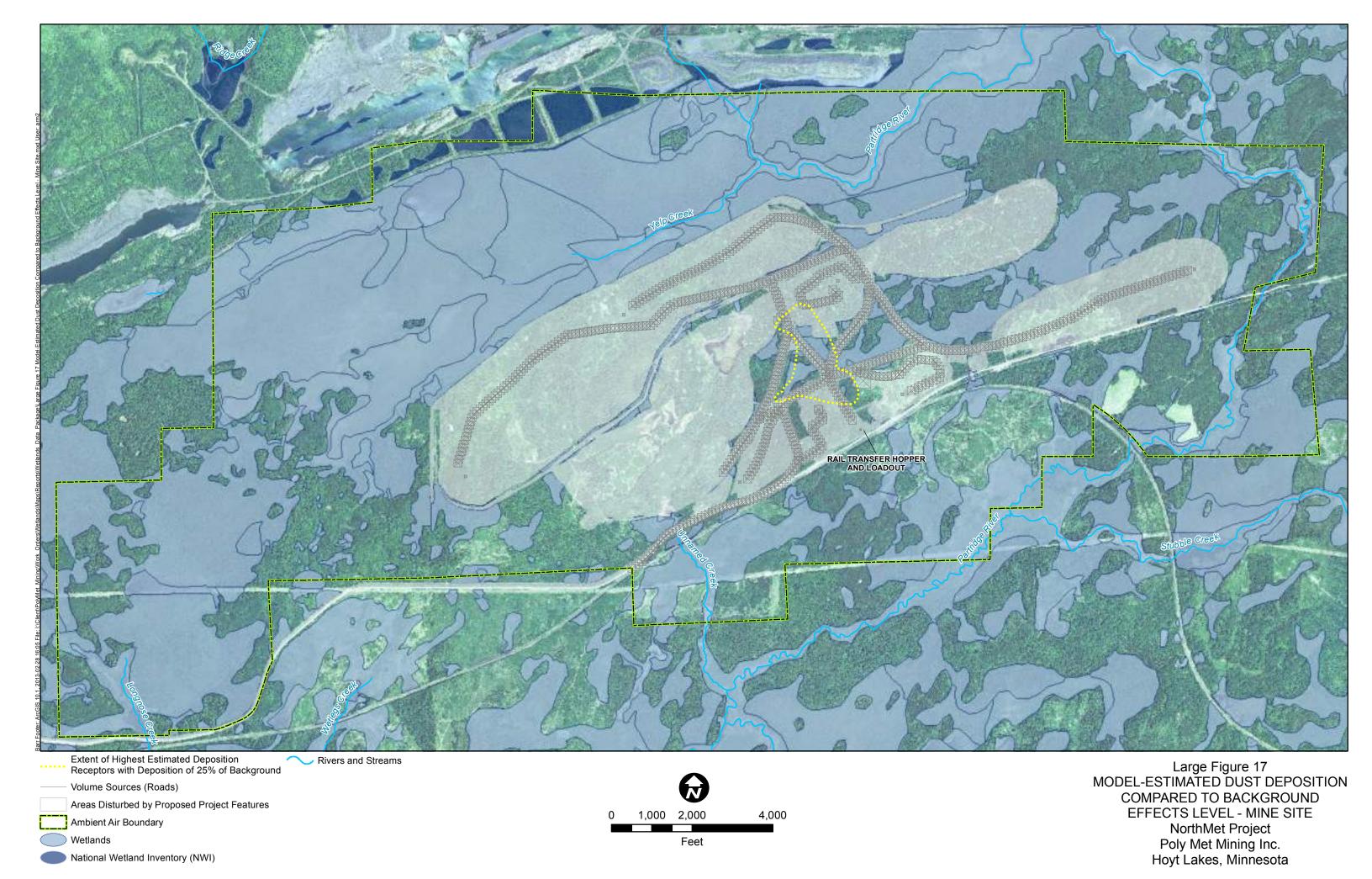


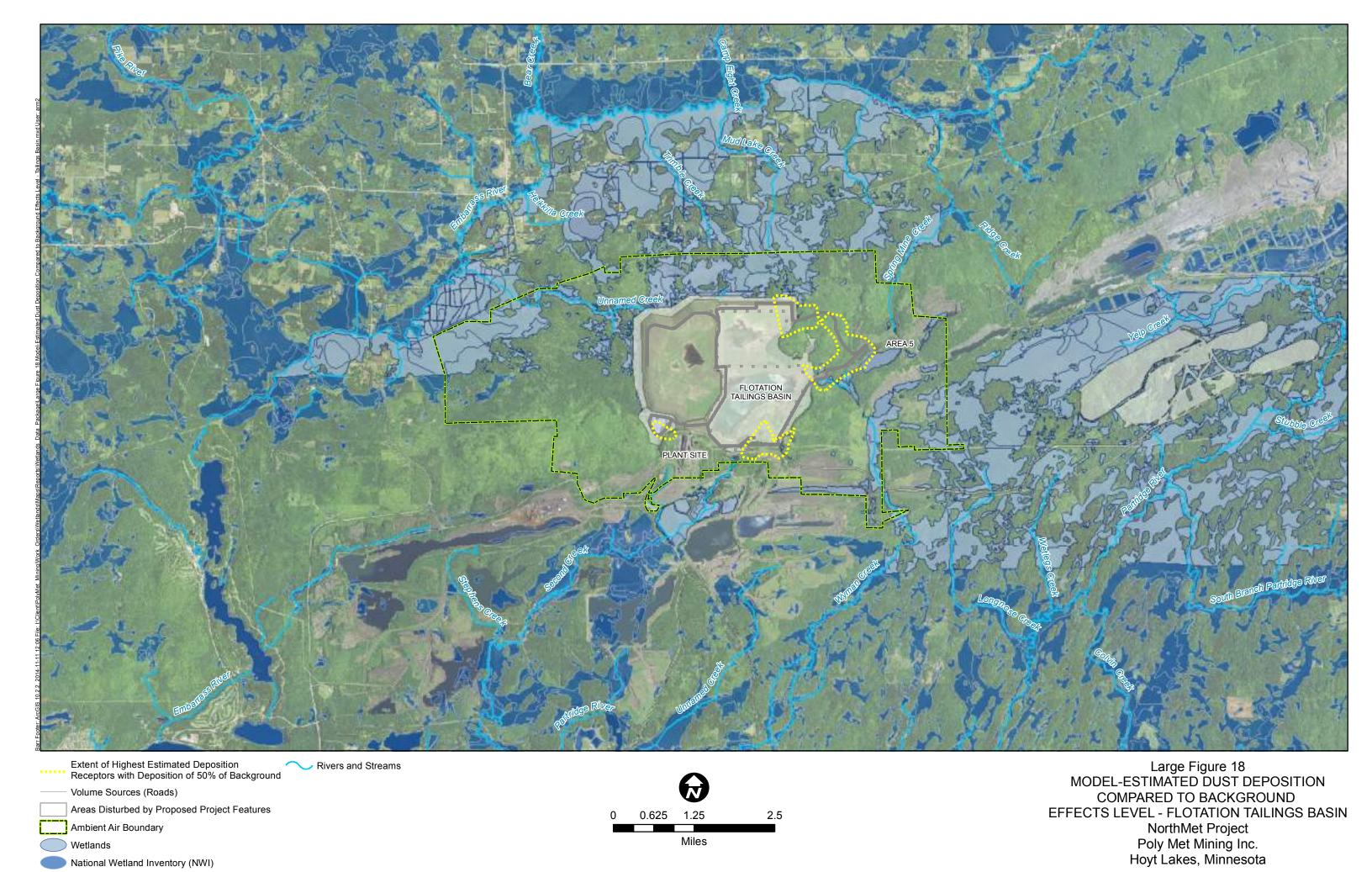
Wetland

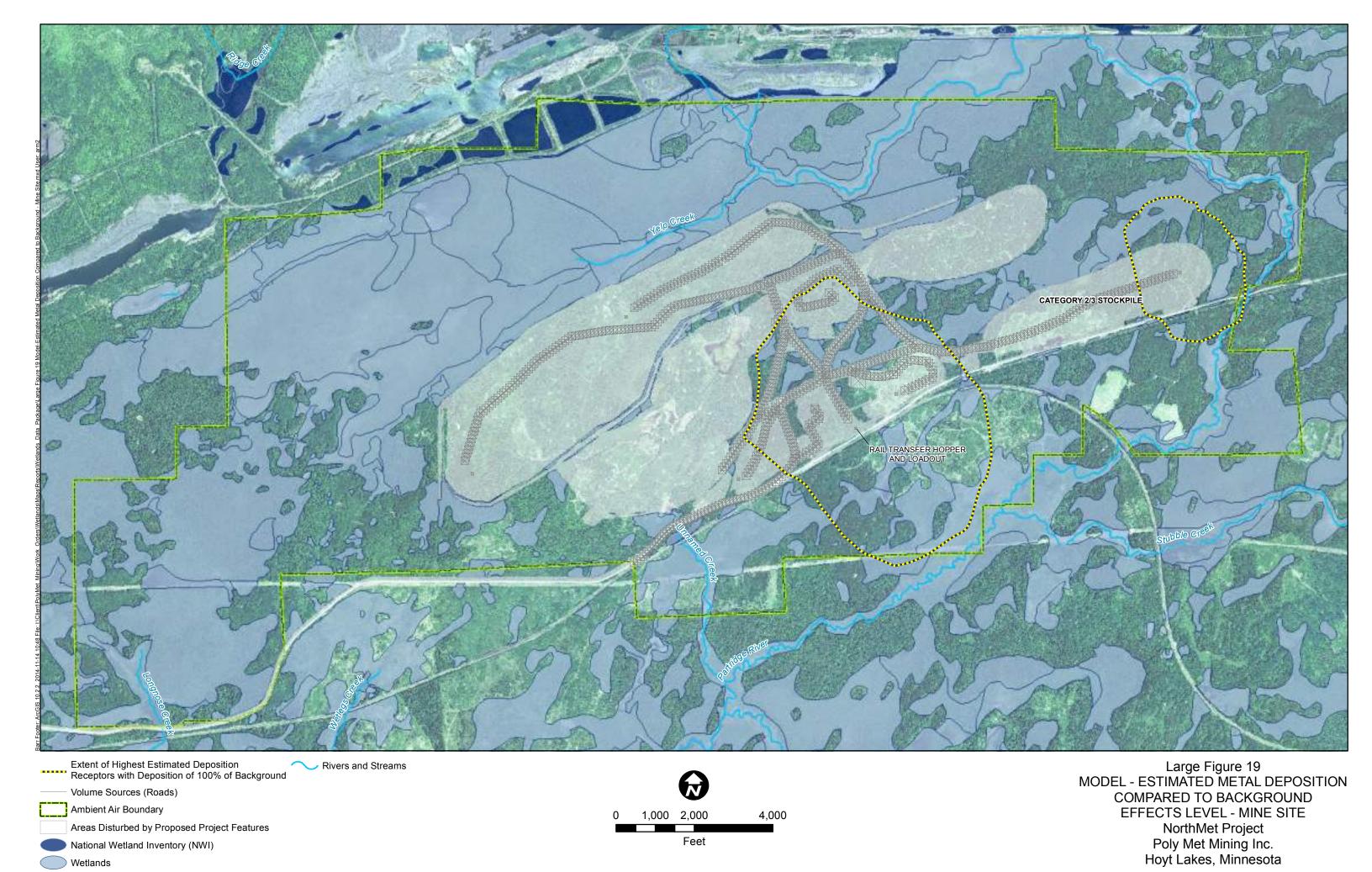


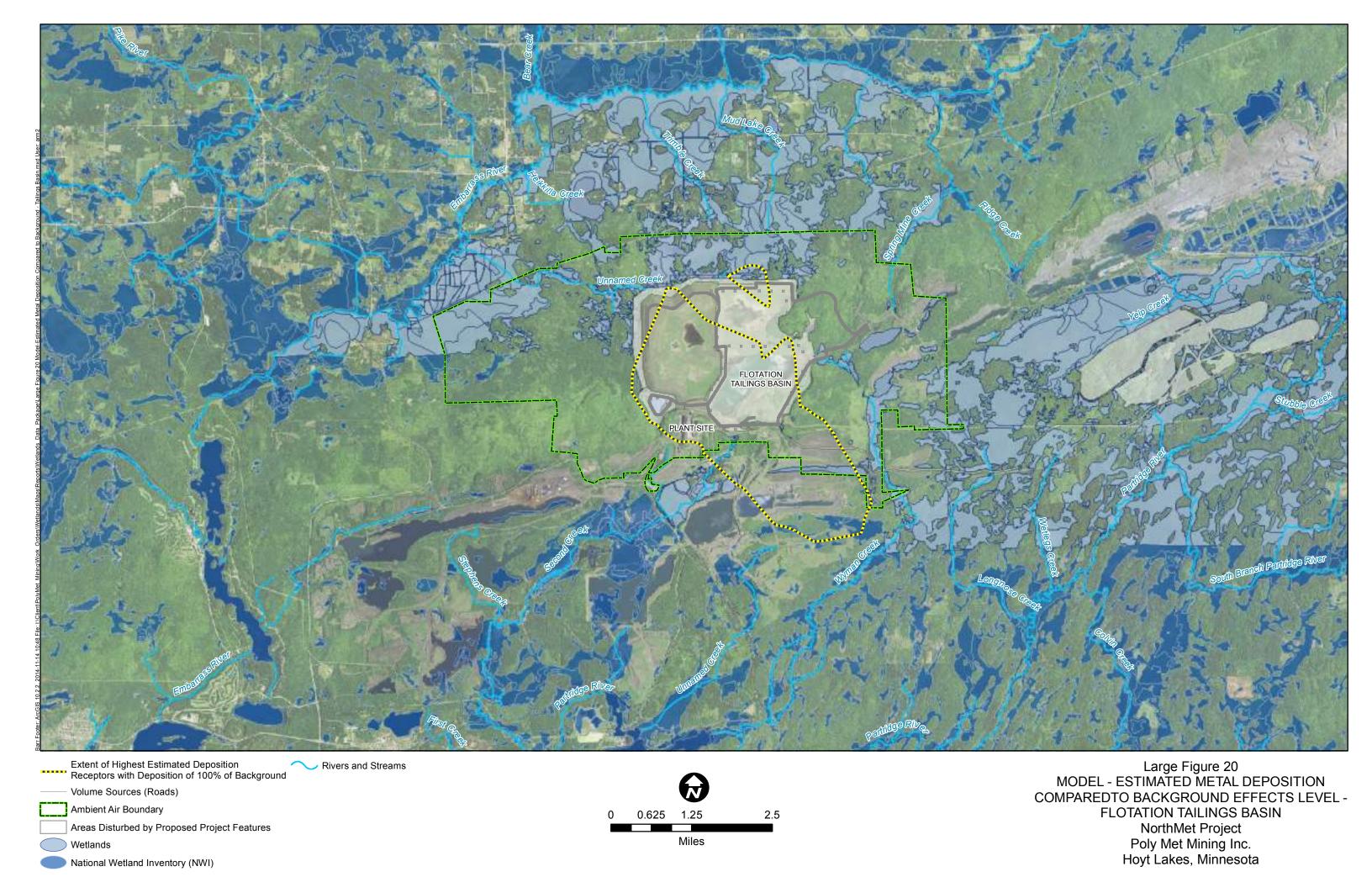


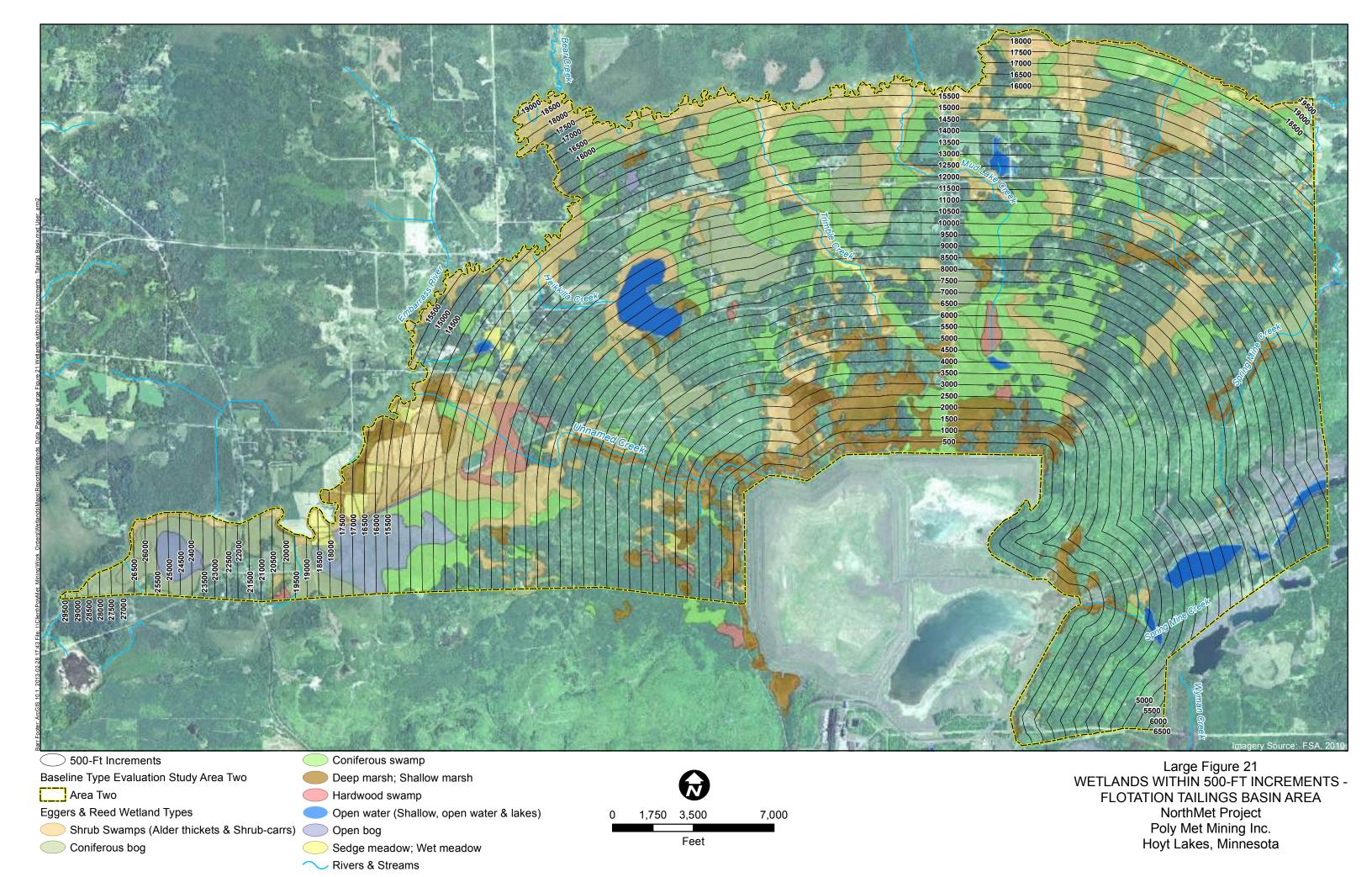


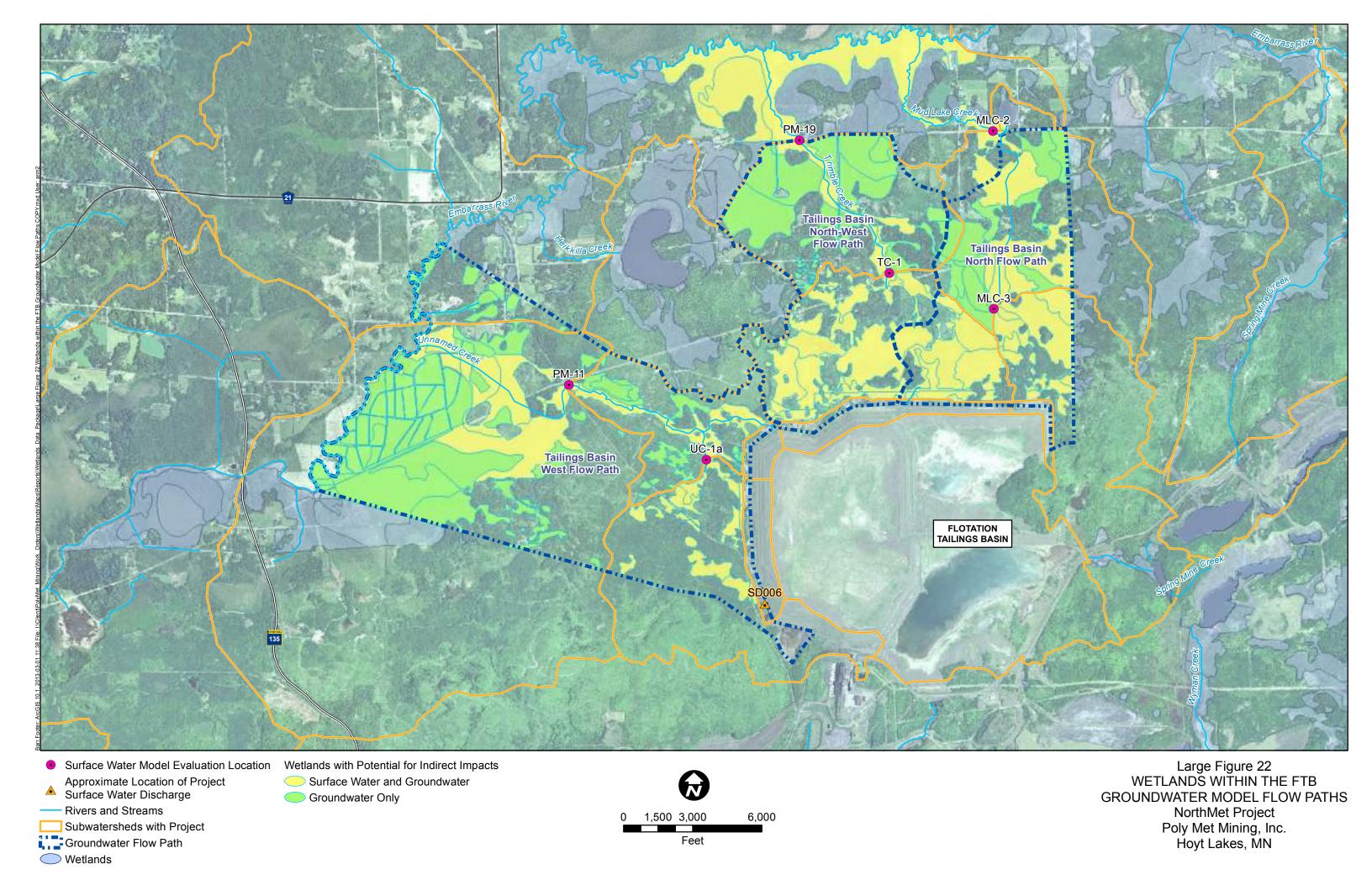


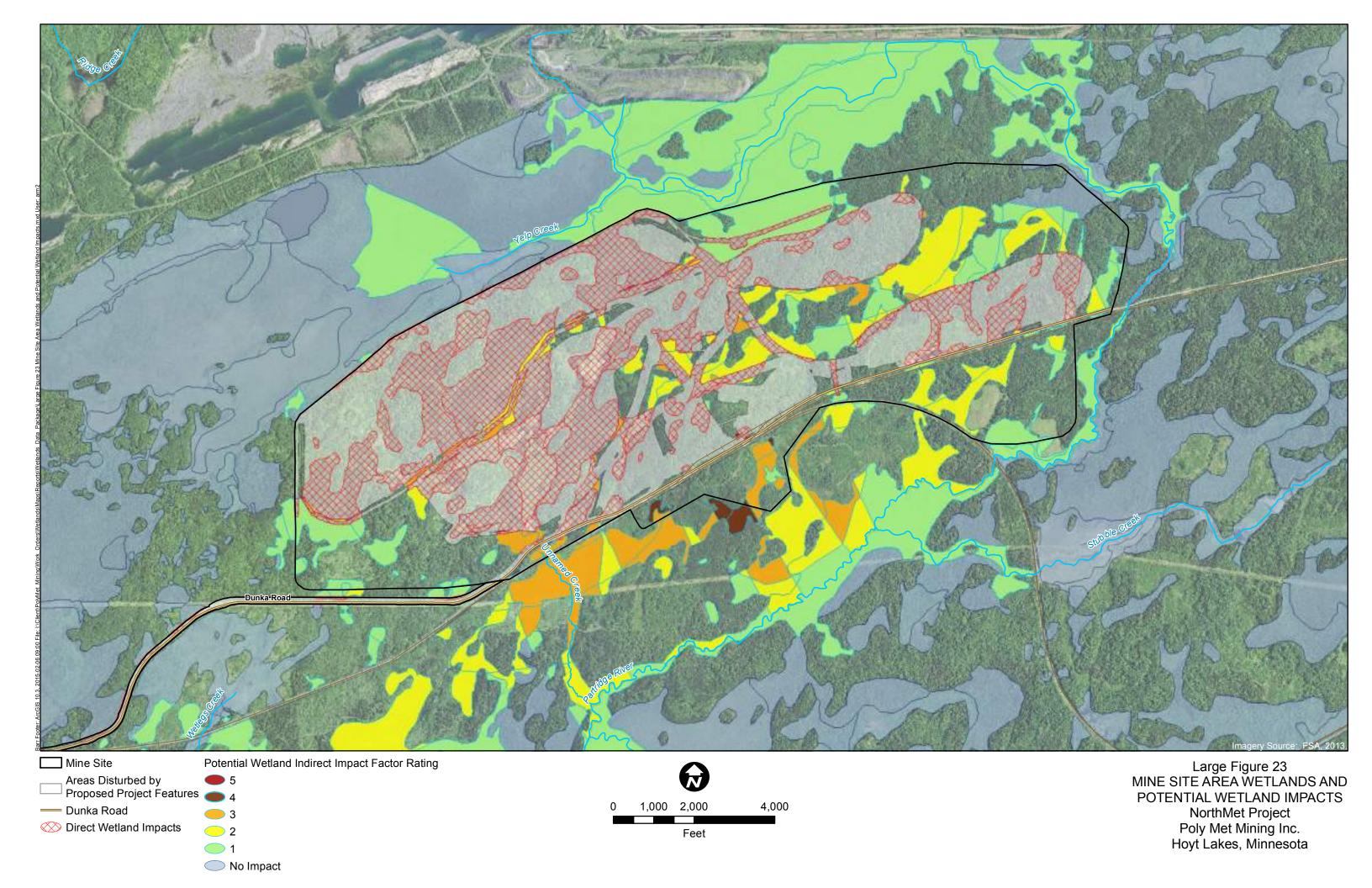


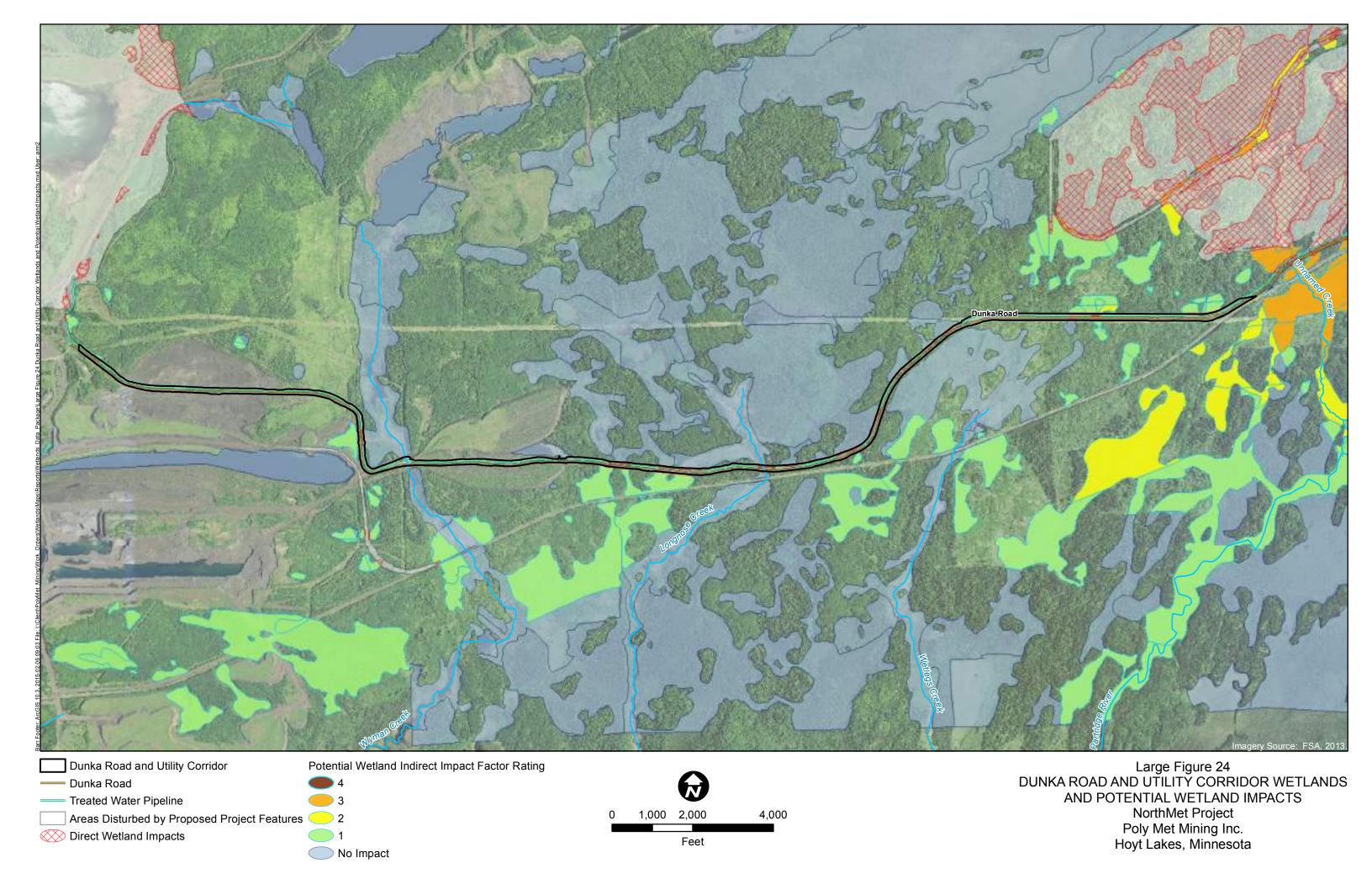


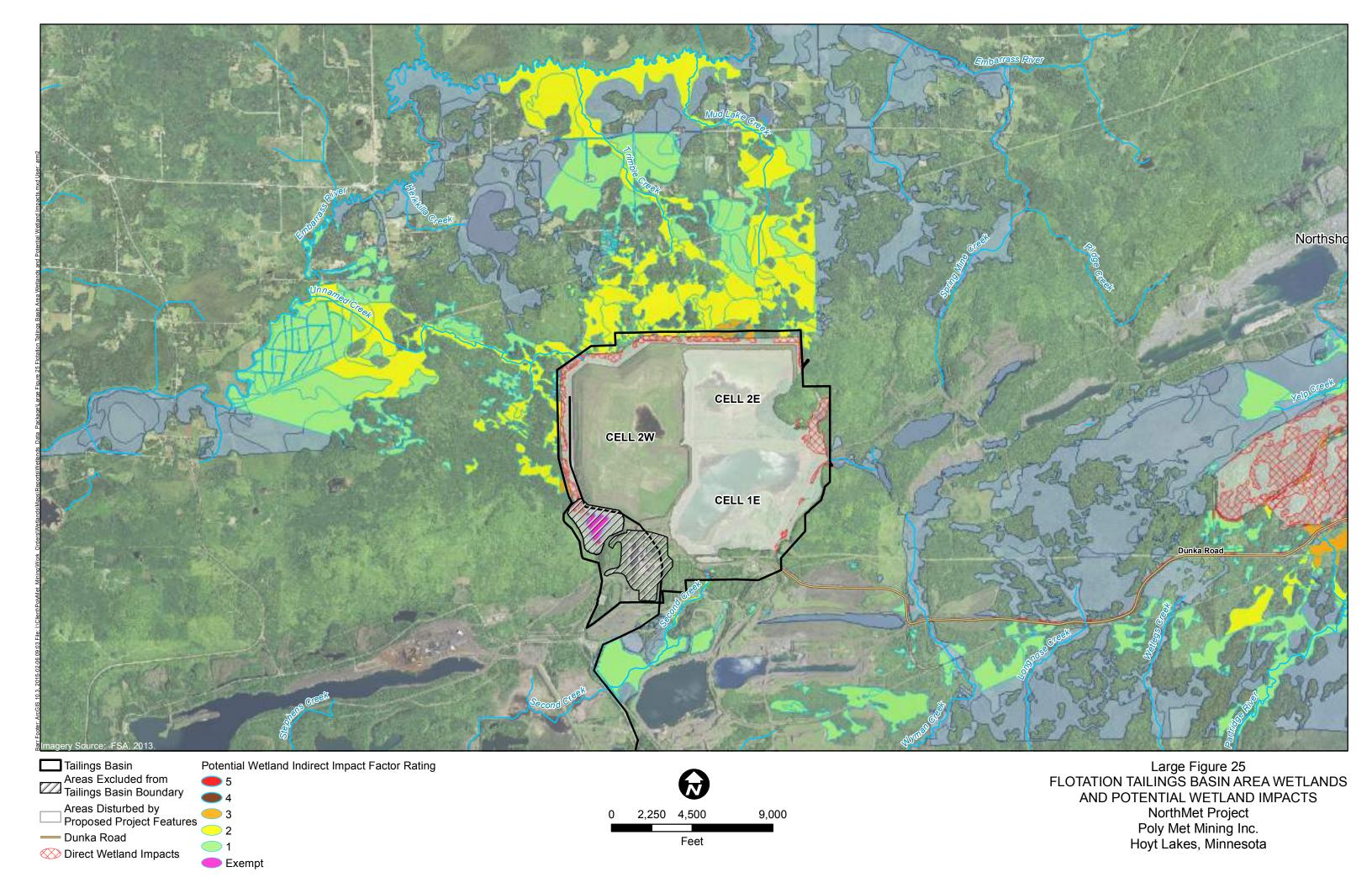


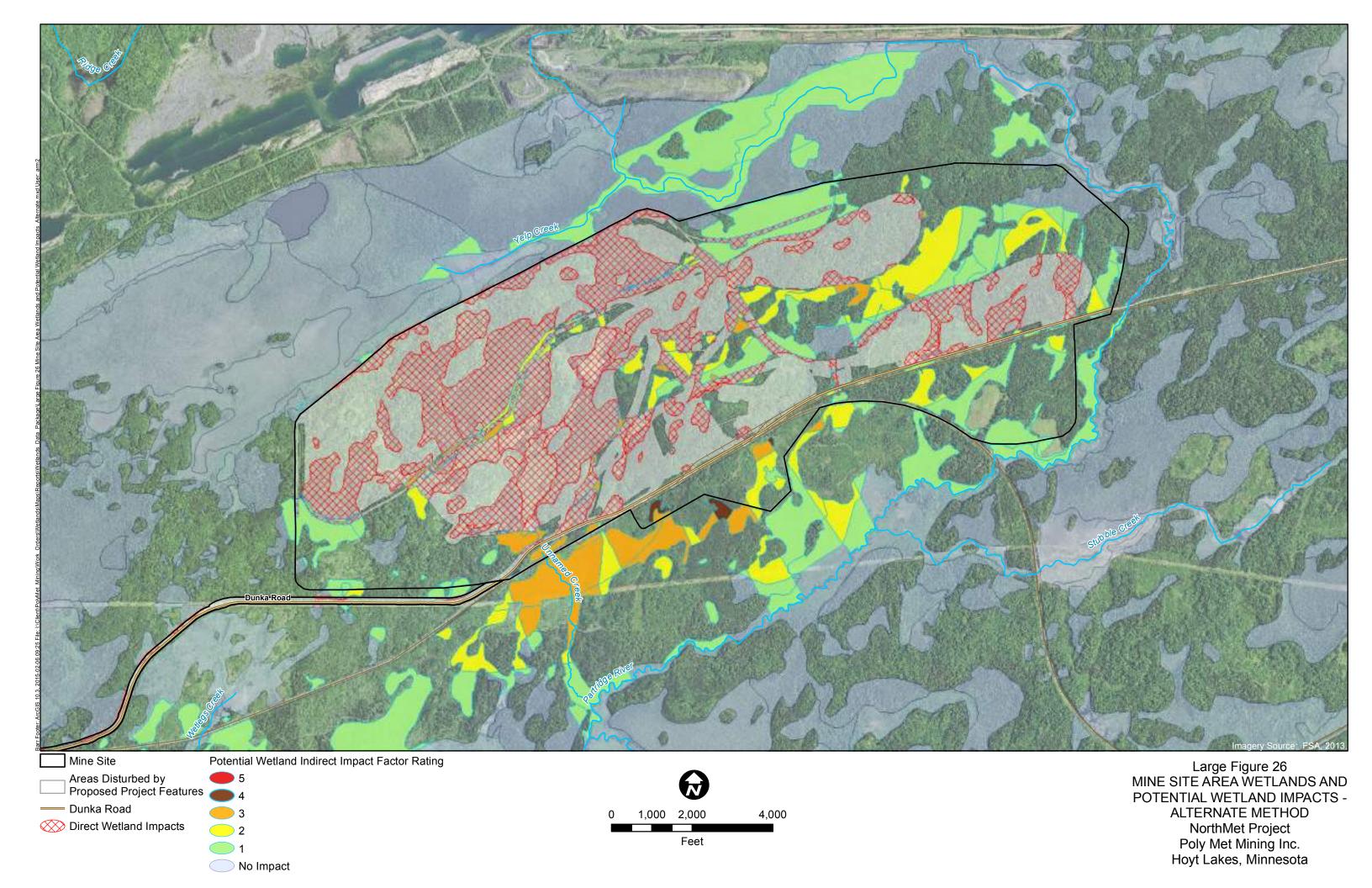


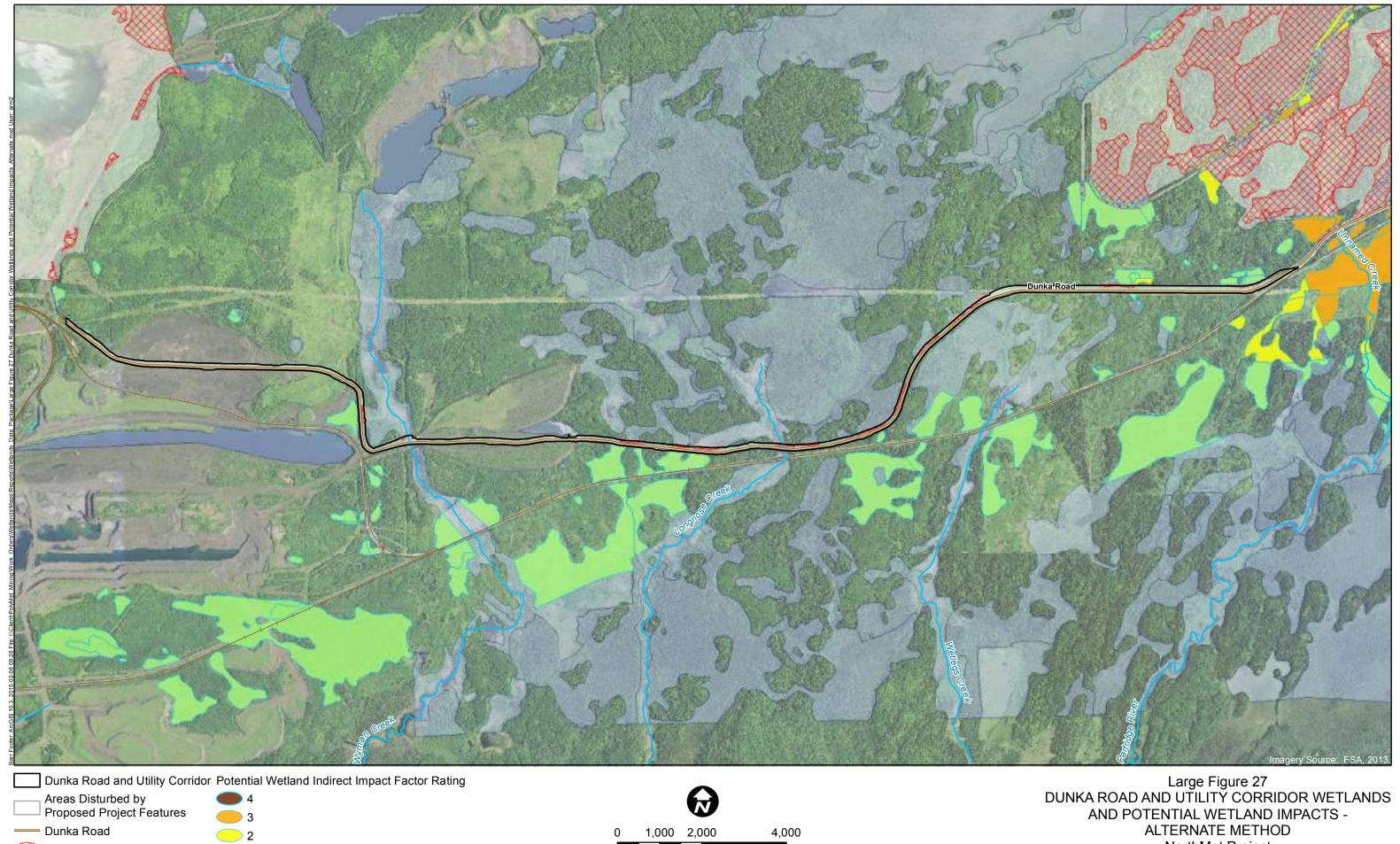




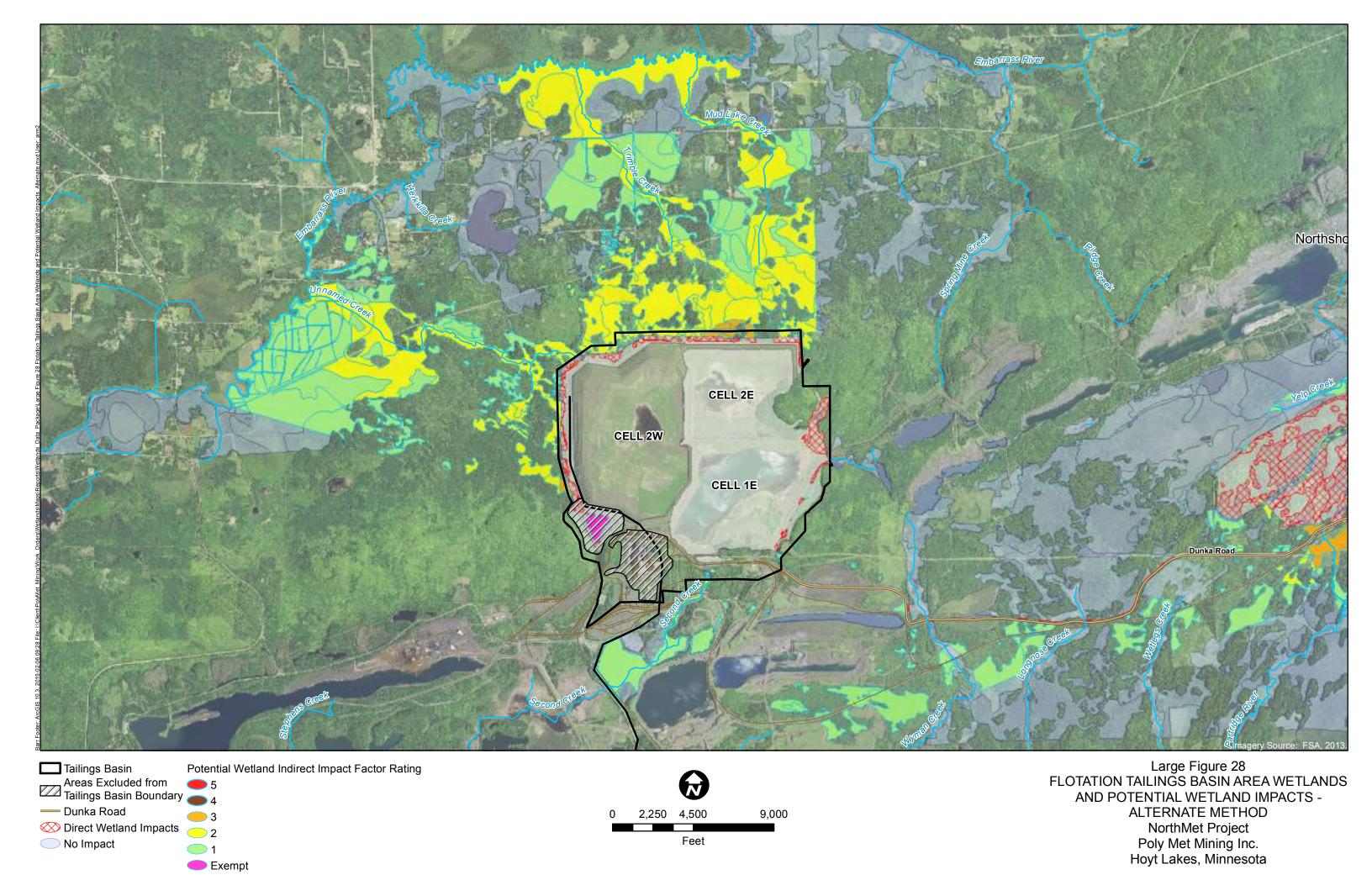


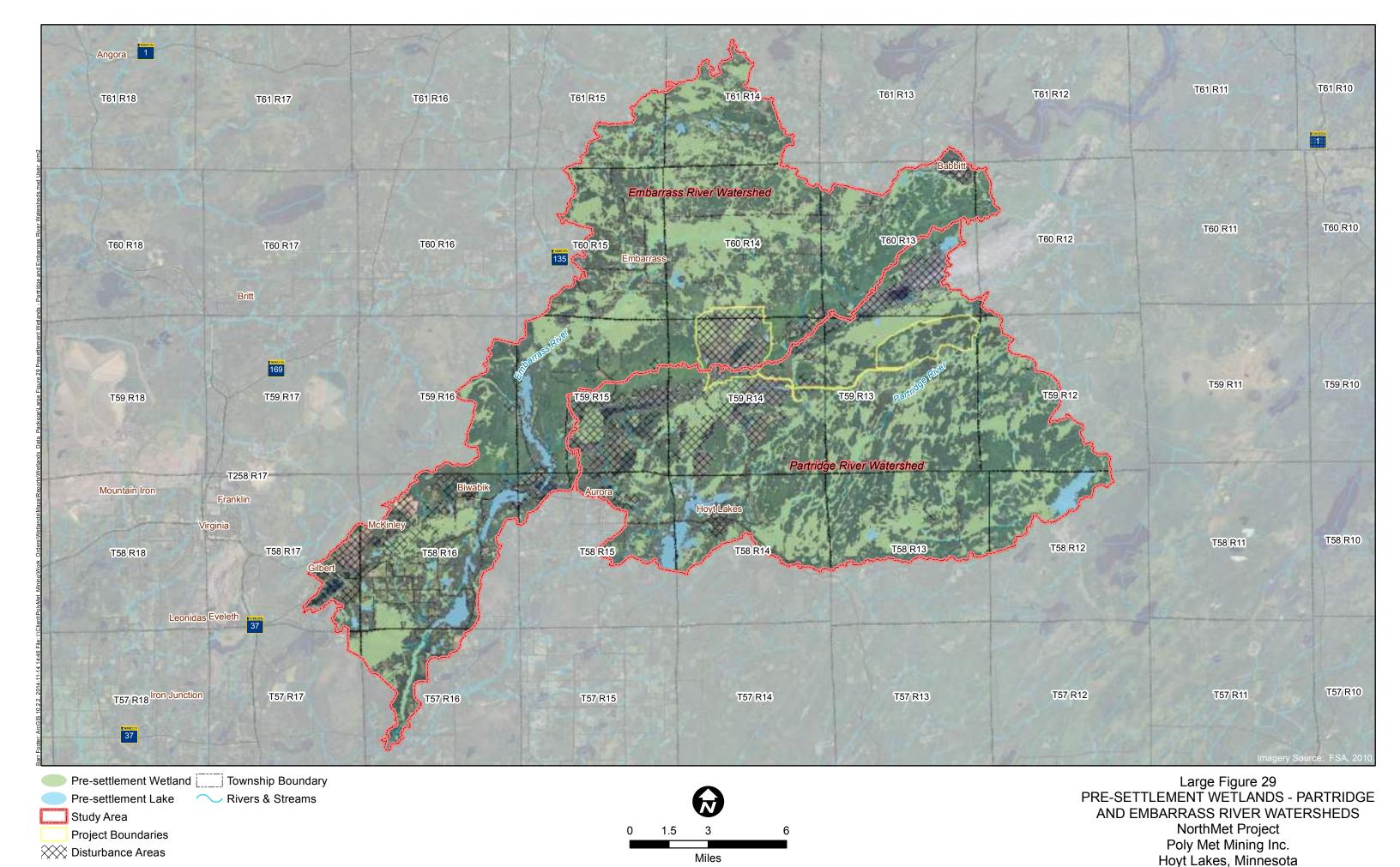


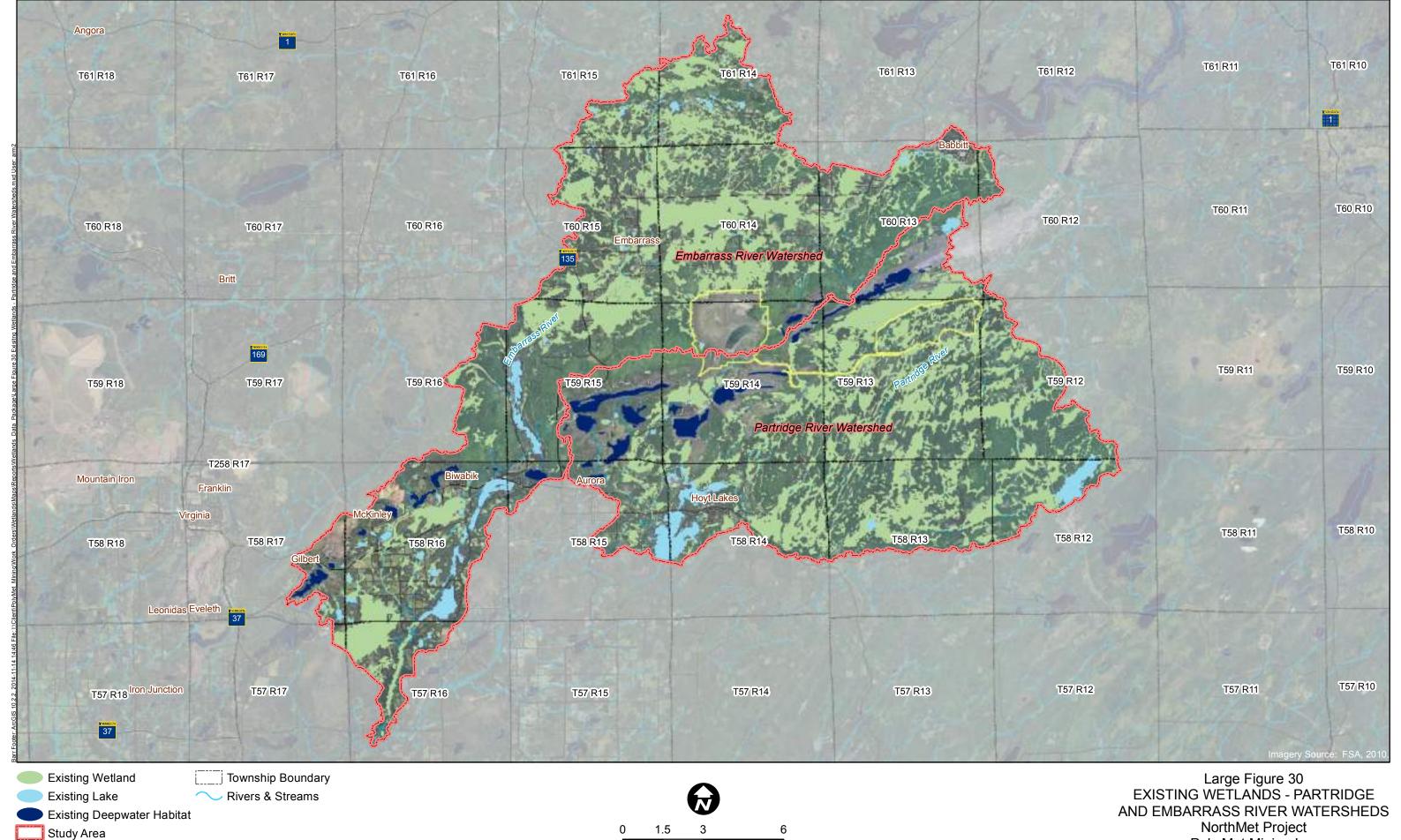




AND POTENTIAL WETLAND IMPACTS ALTERNATE METHOD
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota Direct Wetland Impacts Feet No Impact



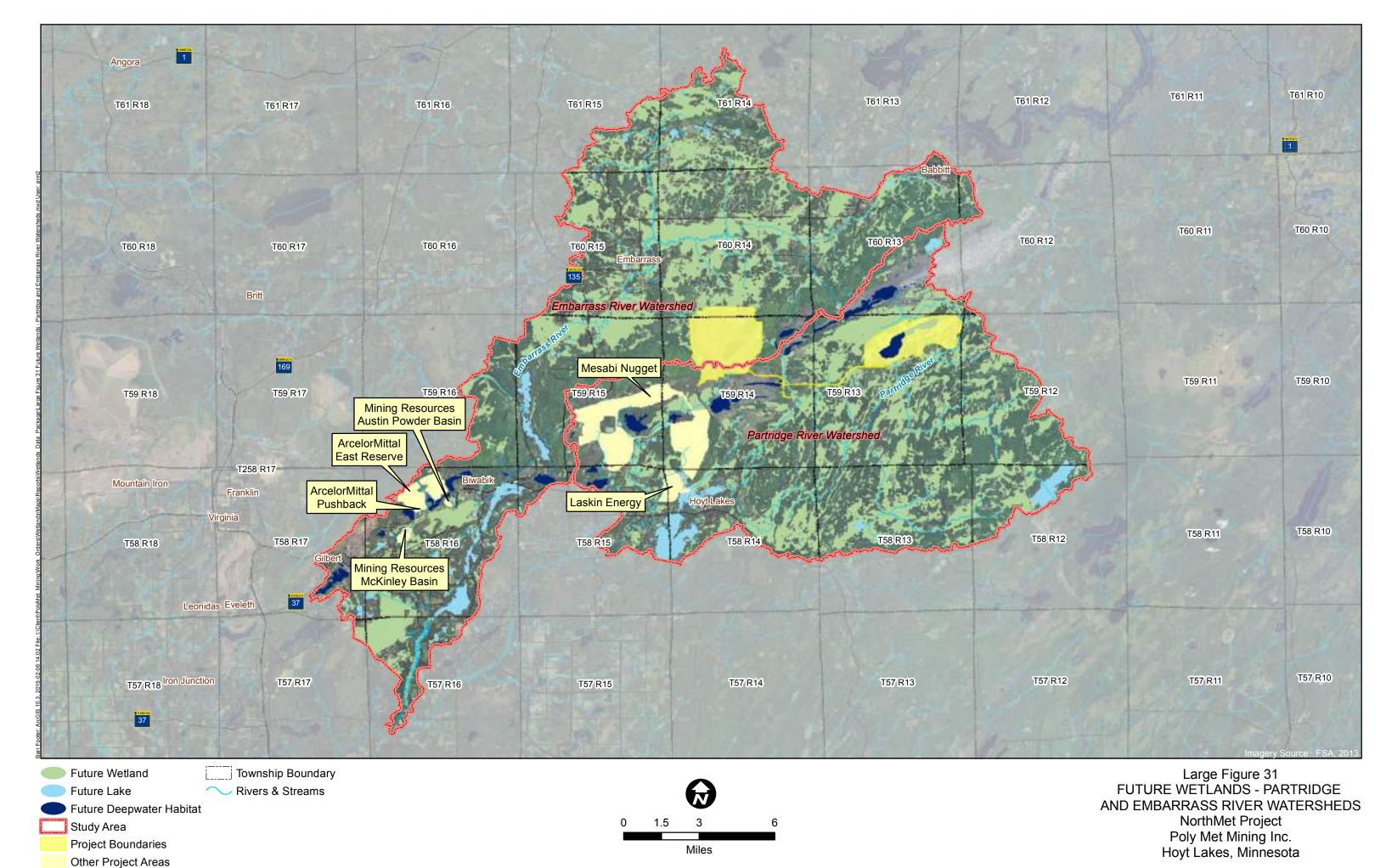




Miles

Project Boundaries

NorthMet Project Poly Met Mining Inc. Hoyt Lakes, Minnesota



Attachments

Attachment A

NorthMet Wetland Analysis Work Plan v3



NorthMet Project Wetland Analysis Work Plan

Version 3

October 13, 2011

NorthMet Project

Wetland Analysis Work Plan

Version 3

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1. Project

This document is the Work Plan for wetland analysis for the NorthMet Project (Project) as specified in Wetland Resources IAP Final Summary Memo and Co-lead Agency Final Work Plan Preparation Guidance of July 1, 2011 (Guidance Document) and the Wetland IAP Work Plan Compiled Comments dated August 30, 2011.

The project that will be modeled is the project described in the Co-lead Agency Draft Alternative Summary as amended in September, 2011. The Project Footprint that will be used for this analysis has been defined and detailed in the NorthMet Project Project Description (Reference 1).

2. Background

Wetland impacts for the Project were previously evaluated for the DEIS and included direct, potential indirect, and cumulative impacts. Using the wetland types and acreages identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), direct, potential indirect, and cumulative impacts will be evaluated as described in the following sections. The results of the wetland analysis in this Work Plan will be presented in the Wetland Data Package.

3. Direct Wetland Impacts

Direct wetland impacts will result from filling and excavation. The analysis performed for the SDEIS will duplicate the analysis performed for the DEIS (Section 4.2 of Reference 2) using the current Project Footprint described in Reference 1.

Wetlands within the Project Footprint will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for each wetland were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

The analysis output for the direct wetland impact will include:

- 1. A summary table will provide information for each wetland within the Project Footprint and include:
 - a. The wetland type, wetland acreage, and direct impact will be calculated using GIS.
 - b. The type of direct impact (fill, excavation, etc.) will be identified.
 - c. The quality of each wetland will be identified.
- 2. For each Eggers and Reed (1997) wetland type, a summary table will provide the total acreage and total acres of direct impact for the following Project Areas Mine Site, railroad corridor, Dunka Road and utility corridor, Plant Site, Flotation Tailings Basin, Hydrometallurgical Residue Facility, and the Colby Lake water pipeline corridor.
 - a. Figures for each of the Project Areas will be created that show the areas with direct wetland impacts.
- 3. The total direct wetland impact acreage for the Project Footprint will be provided.

4. Potential Indirect Wetland Impacts

The analysis of potential indirect wetland impacts will be completed using the Guidance Document. The purpose of this analysis is to provide an estimate of potential indirect wetland impacts.

Potential indirect wetland impacts will be assessed based on: changes in wetland watershed areas (during operation and post-closure); groundwater drawdown resulting from open pit mine dewatering; groundwater mounding/drawdown resulting from operation of the Flotation Tailings Basin including groundwater seepage interception wells; changes in stream flow near the Mine Site and Flotation Tailings

Basin and associated impacts to wetlands abutting the streams (during operation and post-closure); wetland fragmentation from Project elements such as open pits, stockpiles, haul roads, etc.; and changes in wetland water quality. If/when the Project is permitted, an indirect wetland impact monitoring plan will be implemented as part of the Section 404 permit conditions.

The analysis will be completed for the Mine Site, the Flotation Tailings Basin, and the transportation corridors (railroad and Dunka Road).

4.1 Mine Site

4.1.1 Wetland Identification

Wetlands within the Mine Site will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for Area One (which includes the Mine Site) were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

Wetland acreage by wetland type will be calculated using GIS within 500-foot radius increments beginning at the mine pits and continuing out to a total radius of 10,000 feet (for a total of 20 increments). The area of evaluation will only include wetlands within Area One where wetland type information has been developed and it will not include wetlands identified as directly impacted in Section 3.0. In addition, wetlands in the Peter Mitchell open pit taconite mine and areas north of this mine will be excluded from evaluation as described in the Guidance Document.

- 1. A detailed table will be provided for each increment identifying the wetland type and acreage for each wetland.
- 2. A summary table will be provided for each increment identifying the total acreage and total acres of direct impact for each Eggers and Reed (1997) wetland type.
- 3. For each wetland that will be directly impacted, the acreage for the portion of the remaining wetland will be calculated and included in a table.
- 4. A figure will be provided showing the increments and identifying the Eggers and Reed (1997) wetland types within each increment.

4.1.2 Potential Indirect Wetland Impacts Resulting from a Change in Watershed Area

For each wetland that will not be directly impacted by fill or excavation, but will have Project elements impacting its watershed, an estimate of the change in watershed area (acreage and percent gain or loss) will be calculated.

The change (acreage and percent gain or loss) in watershed areas and the wetland area found within each watershed will be identified for the following conditions: pre-Project, during operation when the maximum amount of watershed has been removed, and at closure.

An estimate of potential indirect wetland impacts (wetland acres by wetland type and type of indirect impact) will be calculated for non-directly impacted wetlands that will have changed watershed areas (during operation and post-closure) for each watershed that was identified as changed in the previous paragraph, using the following steps:

- 1. Determine the tributary acres per wetland acre for the pre-Project, during operation, and after closure conditions.
- 2. Determine the equivalent watershed yield (ac-ft/yr) for the pre-Project, during operation, and after closure conditions. The existing watershed yield will be calculated based on available gage data from Section 4.4.1 of Reference 3. This rate would be applied to each watershed to

- convert the tributary ratio in Step 1 to an equivalent yield (or equivalent average contributing net precipitation), expressed as acre-feet/year (ac-ft/yr) per acre of wetland.
- 3. The range in the equivalent yield (inches/year) estimated over the life of the Project will be evaluated relative to pre-Project yield to calculate a maximum percent change in yield. The estimated relative change in yield will be evaluated on a case-by-case basis, taking into account factors such as wetland type, to determine the potential for indirect impacts (e.g., groundwater fed wetlands may be less susceptible to changes in surface watershed).

4.1.3 Potential Indirect Wetland Impacts Resulting from Wetland Fragmentation

For remaining wetlands not directly impacted or indirectly impacted by watershed area changes, an estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) from wetland fragmentation by Project features (open pits, stockpiles, haul roads, etc) will be determined, using the following steps:.

1. For each portion of a remaining wetland, excluding indirect impacts from watershed changes, the potential area of indirect impacts will be determined based on an analysis of the various factors that may contribute to potential fragmentation. Based on this analysis, the identifying factor(s) contributing to potential fragmentation (change in size of wetland, surrounded by Project features, change in function and values of wetland e.g. wildlife habitat, etc.) will be identified. [Note: noise and dust do not cause fragmentation impacts according to the U.S. Army Corps of Engineers, May 16, 2011 conference call.]

4.1.4 Potential Indirect Wetland Impacts Resulting from Changes in Hydrology

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of indirect impact) due to groundwater drawdown from open pit mine dewatering, based on the Co-lead Agency guidance for estimating potential indirect wetland impacts from groundwater drawdown near open pit mines as provided on July 1, 2011 will be determined, using the following steps.

- 1. Use the information provided by the Groundwater IAP Group and other available and relevant hydrogeologic data to justify whether to use or modify the provided analogue information which is based upon comparisons of the existing regional and site specific geologic data (such as bedrock faults, bedrock joint systems, bedrock topography, glacial till hydraulic conductivities, etc.), site specific engineering controls such as the Category 1 Waste Rock Stockpile seepage containment system, and the geologic settings of the analogue information sites and the Mine Site.
- 2. Use the guidelines provided by the Corps Memorandum (CEMVP-OP-R) Distinguishing Between Bogs That Are Entirely Precipitation Driven Versus Those with Some Degree of Mineral Inputs from Groundwater and/or Surface Water Runoff to identify minerotrophic and ombrotrophic coniferous and open bogs.

The potential indirect wetland impact from glacial aquifer drawdown will be based on the analogue impact zone with the greater potential drawdown (zone closer to the open pit mine) for wetlands that lie on both sides of the analogue distance boundary. The analogue distances are described below in steps 1, 2, 3 and 4.

- 1. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within 0 feet to 1,000 feet from the pit edge. The table will also identify the type of indirect wetland impact for each indirectly impacted wetland. Identify the likelihood of wetland hydrology impact based on wetland type.
 - a. High Likelihood includes coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket

- b. Moderate Likelihood deep marsh, shallow marsh, and shallow open water
- c. Low Likelihood minerotrophic coniferous bog and open bog
- d. No Impact anticipated as identified in Guidance Document ombrotrophic coniferous bog and open bog
- 2. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within >1,000 feet to 2,000 feet from the pit edge. The table will also identify the type of indirect wetland impact for each indirectly impacted wetland. Identify the likelihood of wetland hydrology impact based on wetland type.
 - a. Moderate Likelihood coniferous swamps, hardwood swamps, sedge/wet meadow, shrub-carr, and alder thicket
 - b. Low Likelihood deep marsh; shallow marsh, and shallow open water
 - c. No Impact anticipated as identified in Guidance Document minerotrophic and ombrotrophic coniferous bog and open bog
- 3. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within >2,000 feet to 3,500 feet from the pit edge. The table will also identify the type of indirect wetland impact for each indirectly impacted wetland. Identify the likelihood of wetland hydrology impact based on wetland type.
 - a. Low Likelihood coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, alder thicket
 - b. No Impact anticipated as identified in Guidance Document deep marsh, shallow marsh, shallow open water, coniferous bog, open bog
- 4. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within >3,500 feet to 10,000 feet from the pit edge (within the wetland evaluation area). The table will also identify the type of indirect wetland impact for each indirectly impacted wetland.
 - a. No Impact anticipated as identified in Guidance Document all wetland types

A general discussion will be provided regarding the potential indirect wetland hydrology drawdown impacts to each wetland type based on the wetland sensitivity class tables for falling groundwater tables found in the Crandon mine project document titled *Wetland Impact Assessment Technical Memorandum – Appendix B* (Peterson Environmental Consulting, Inc. 2002).

1. A qualitative discussion of the types of potential indirect wetland impacts that might occur will be provided based on hypothetical hydrologic drawdown levels. Potential indirect wetland impacts might include: conversion to other wetland community types, a change in vegetation without a change in community type, conversion to uplands, or other impacts, which will be categorized using the Eggers and Reed (1997) wetland classification system.

4.1.5 Potential Indirect Wetland Impacts for Wetlands Abutting the Partridge River

Estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for wetlands abutting the Partridge River as a result of changes in river flow resulting from the Project (during operation and post-closure), using the following steps.

1. Identify in GIS the wetlands abutting the Partridge River within Area One. A table will identify the wetland ID, type and acreage for each wetland (only within the area previously characterized for wetlands).

- 2. Provide the change in flow and water levels in the Partridge River using the model developed in Section 5.6 of Reference 3.
- 3. Identify whether the changes in flow (and therefore stage) resulting from the Project are within the observed natural variation for the Partridge River (Section 4.4.1 of Reference 3).
- 4. If the changes in flow and water levels are not within the observed natural variation for the Partridge River, identify the potential indirect impacts for the wetlands abutting the Partridge River.

4.1.6 Potential Indirect Wetland Impacts Resulting from Water Quality Changes

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for remaining wetlands not directly impacted or indirectly impacted by previously evaluated causes in Sections 4.1.2 through 4.1.5 that would be impacted by water quality changes (such as from sulfidebearing dust deposition, ore spillage, seepage from stockpiles, etc.) will be completed using the following steps:

1. Fugitive Dust Emissions

- a. The air emissions from all surface fugitive dust sources at the Mine Site will be modeled using an EPA approved air dispersion model with a deposition algorithm (AERMOD version 11103). This is the same model that has been proposed to be used for assessing air impacts in Class II areas in the draft NorthMet Air Modeling Work Plan (version 1, May 9, 2011) which was developed in response to the Air Impacts Assessment Planning Summary Memo dated May 6, 2011. Comments have been received on this draft Work Plan, with no objections to the proposed model, so this model is expected to be specified in the final Work Plan. Emission rates and particle size distributions will be based on total particulate matter. Receptors will be placed on all delineated wetlands within the Project ambient air boundaries that have not been identified as directly impacted. The receptor grid will also initially extend 5 kilometers beyond the ambient air boundaries with a grid spacing of 500 meters. The receptor grid may be adjusted based on preliminary modeling results. Other modeling details would generally follow those specified in the Class II modeling protocols for the Mine Site as defined by the Air IAP and/or generally excepted modeling practice.
- b. The modeled dust sources at the Mine Site will include ore and waste rock truck loading and unloading outside of the pits, railcar loading, dust generation from traffic on unpaved roads on the surface (i.e. not in the pits), and overburden and other construction rock screening and/or crushing as defined by the Air IAP.
- c. Rock handling and roads within the pits will not be included in the analysis because:
 a) "pit-trapping" would greatly reduce the potential for dust to impact areas outside of the pits and b) Barr's past experience which indicates that the AERMOD "open pit" algorithm is incompatible with the AERMOD deposition algorithm.
- d. The output of the model will be deposition rate (grams per square meter) on an annual basis. The model results will be compared to background values such that contours where the modeled deposition is small relative to the background value can be developed. This can be considered a conservative assessment of how far away potential impacts to wetlands from dust may occur from fugitive dust sources. This should be considered a screening level analysis such that it would identify an upper bound for the potential range of distances at which impacts might occur, but the results will not identify actual impacts. This range of distances could be used to

estimate the extent of potential indirect impacts to guide development of monitoring plans to document actual indirect impacts. Based on the results of the screening analysis, PolyMet may propose a more refined approach to assess the distance at which potential impacts may occur.

2. Metals and Sulfide Dust Emissions

- a. The potential for sulfur deposition was evaluated for the DEIS Mine Plan in Screening Analysis of the Potential for Fugitive Dust Emissions Associated with Sulfide Rock Handling at the NorthMet Project Mine Site to Increase Sulfur Deposition to Nearby Wetlands (Barr, January 28, 2010). This analysis included dust emissions from the handling of Category 2, 3, and 4 waste rock and ore. Lean ore handling emissions were also modeled, but lean ore has been eliminated as a rock classification in the updated Mine Plan.
- b. The handling activities associated with Category 2, 3 and 4 waste rock and ore located outside of the pits will be included in the metals and sulfur analysis for the Mine Site. This includes truck loading and unloading with waste rock and ore and railcar loading with ore. Note: the potential for wind erosion from the stockpiles has been evaluated, and it has been determined that wind erosion would not occur through the use of EPA approved wind erosion calculations procedures in Section 13.2.5 of Reference 4. The calculations are described in the Mine Site Emission Inventory Spreadsheet (Version 2 Submitted August 1, 2011). This spreadsheet references the detailed calculations based on five years of meteorological data provided to MPCA via FTP site on May 9, 2011.
- c. Modeling will be conducted for the included sources in the same manner as described for dust modeling. The dust modeling and metals and sulfide modeling may be conducted in separate model runs or in the same run utilizing the model's source grouping capabilities.
- d. For air dispersion/deposition modeling, the total particulate emission rates (grams per second) will be speciated and converted to metals and sulfur emission rates based on data on the chemical composition of each material generating dust. Metals for evaluation, associated with rock and soils, would be: arsenic, cadmium, chromium, lead, manganese, nickel and selenium.
- e. Mercury will not be evaluated at the Mine Site for dust deposition because the concentration of mercury in the rock to be mined is very low (Sections 5.0 and 5.8 of Reference 3) and not considered to be environmentally significant in this medium.
- f. The model-estimated sulfur and metals deposition rates (grams per square meter) will be compared to background values to determine distance contours beyond which the deposition rate is insignificant compared to background. As with the dust analysis, this would be a screening level evaluation that could be used to identify a range of distances from a source beyond which impacts would be unlikely to occur. This range of distances could be used to estimate the extent of potential indirect wetland impacts to guide development of monitoring plans to document actual indirect impacts. PolyMet may choose to propose a more refined approach depending on the results of the screening level analysis. A more refined approach could take into account such factors as the potential for metals and/or sulfur to be liberated from the rock particles depending on the rock chemistry, environmental chemistry and general conditions in the ecosystem where the deposition is predicted to occur.
- 3. Ore spillage see the Section 4.3.2.

- 4. Leakage from stockpile will be evaluated using the following steps:
 - Quantify the amount of stockpile leakage water that discharges to surface water and wetlands, down gradient of the stockpiles based on the results of the water quality modeling.
 - b. Identify the wetlands (type, acreage) within the surficial aquifer groundwater flowpaths from mine features using boundaries used in the water quality modeling (as shown in the Groundwater IAP Summary document).
 - c. Categorize the wetlands within the flowpaths in Step ii into groundwater-fed and precipitation-fed wetlands using guidance from the Corps "Bog Memo" and evaluate the potential for indirect impacts based on potential water quality changes from the mine features.

4.1.7 Potential Indirect Wetland Impacts to Wildlife Utilization of Nearby Habitats From Project Noise

Provide a general discussion regarding the potential indirect wetland impact to wildlife utilization of nearby habitats from project noise using the following steps:

- 1. Identify the potential sources of project noise and the range of emitted noise levels.
- 2. Identify wildlife species that are found within the area, as well as their preferred habitats using wildlife surveys previously conducted for the NorthMet Project (Section 4.4 of Reference 2).
- 3. Qualitatively discuss the potential impacts and possible short- and long-term reactions of wildlife species to the potential project noise levels.

4.2 Flotation Tailings Basin

4.2.1 Wetland Identification

Wetlands around the Flotation Tailings Basin will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for Area Two (which includes the Flotation Tailings Basin) were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

Wetland acreage by wetland type will be calculated using GIS within 500-foot radius increments beginning at the Flotation Tailings Basin and continuing out to the Embarrass River. The area of evaluation will only include wetlands within Area Two where wetland type information has been developed and it will not include wetlands identified as directly impacted in Section 3.0.

- 1. A detailed table will be provided for each increment identifying the wetland type and acreage for each wetland.
- 2. A summary table will be provided for each increment identifying the total acreage and total acres of direct impact for each Eggers and Reed (1997) wetland type.
- 3. For each wetland that will be directly impacted, the acreage for the portion of the remaining wetland will be calculated and included in a table.
- 4. A figure will be provided showing the increments and identifying the Eggers and Reed (1997) wetland types within each increment.

4.2.2 Potential Indirect Wetland Impacts Resulting from Changes in Hydrology

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) from hydrologic changes (groundwater upwelling and resulting surface water flow in wetlands and/or groundwater drawdown near the groundwater seepage interception wells) resulting from groundwater seepage and/or interception well pumping will be determined.

- Quantify the amount of Flotation Tailings Basin groundwater seepage water that discharges
 to surface water features, including wetlands, down gradient of the Flotation Tailings Basin.
 A MODFLOW model developed for the Flotation Tailings Basin will be used in conjunction
 with a GoldSim probabilistic model to estimate the quantity of seepage that discharges to
 surface water features.
- 2. Identify all the wetlands (type, acreage) within the surficial aquifer groundwater flowpaths downgradient of the Flotation Tailings Basin using boundaries used in the water quality modeling (as shown in the Groundwater IAP Summary document).
- 3. Using the wetlands identified in step 2, categorize the wetlands into groundwater-fed and precipitation-fed wetlands using guidance in the Corps Memorandum (CEMVP-OP-R) Distinguishing Between Bogs That Are Entirely Precipitation Driven Versus Those with Some Degree of Mineral Inputs from Groundwater and/or Surface Water Runoff and evaluate the potential for indirect impacts resulting from groundwater seepage and/or interception well pumping.

Provide a general discussion regarding the potential indirect wetland hydrology impacts to each wetland type based on the wetland sensitivity class tables for rising groundwater tables found in the Crandon mine project document titled *Wetland Impact Assessment Technical Memorandum – Appendix B* (Peterson Environmental Consulting, Inc. 2002).

1. A qualitative discussion of the types of potential indirect wetland impacts that might occur will be provided based on hypothetical hydrologic drawdown or surchage levels. Potential indirect wetland impacts might include: conversion to other wetland community types, a change in vegetation without a change in community type, conversion to uplands, or other impacts, which will be categorized using the Eggers and Reed (1997) wetland classification system.

4.2.3 Potential Indirect Wetland Impacts for Wetlands Abutting Trimble Creek and the Two Unnamed Creeks

An estimate of potential indirect wetland impacts (wetland acres by wetland type) in wetlands abutting the three streams north and west of the Flotation Tailings Basin (Trimble Creek and the two unnamed creeks as shown in Figure 3 of the Water Resources IAP – Surface Water Summary Memo) as a result of changes in stream flow resulting from operation of the Flotation Tailings Basin will be determined using the following steps:

- 1. Identify in GIS the wetlands abutting the west Unnamed Creek (Mud Lake Creek), Trimble Creek, and the east Unnamed Creek within Area Two. A table will identify the wetland ID, type and acreage for each wetland (only within the area previously characterized for wetlands).
- 2. Provide the change in flow in the three streams using the GoldSim probabilistic model developed in Reference 6 and the method described in Section 4.4 of Reference 2. Estimate a corresponding change in stage based on available rating curves or simple hydraulic equations (e.g. Manning's equation).

- 3. Identify whether the changes in flow (and by extension, stage) are within the estimated natural variation for the three streams based on observed data or unit-area relationships extrapolated from gage data (Section 4.4.1 of Reference 5 and Page 3 of Reference 6).
- 4. If the changes in flow and water levels are not within the observed natural variation for the three streams, identify the potential indirect impacts for the wetlands abutting the three streams.

4.2.4 Potential Indirect Wetland Impacts Resulting from Water Quality Changes

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for wetlands that would be impacted by water quality changes (such as from sulfide-bearing dust deposition from the Flotation Tailings Basin, Flotation Tailings Basin groundwater seepage, etc.) will be completed using the following steps:

1. Fugitive Dust Emissions

- a. The air emissions from all surface fugitive dust sources at the Flotation Tailings Basin site will be modeled using an EPA approved air dispersion model with a deposition algorithm (AERMOD version 11103). This is the same model that has been proposed to be used for assessing air impacts in Class II areas in the draft NorthMet Air Modeling Work Plan (version 1, May 9, 2011) which was developed in response to the Air Impacts Assessment Planning Summary Memo dated May 6, 2011. Comments have been received on this draft Work Plan, with no objections to the proposed model, so this model is expected to be specified in the final Work Plan. Emission rates and particle size distributions will be based on total particulate matter. Receptors will be placed on all delineated wetlands within the Project ambient air boundaries that have not been identified as directly impacted. The receptor grid will also initially extend 5 kilometers beyond the ambient air boundaries with a grid spacing of 500 meters. The receptor grid may be adjusted based on preliminary modeling results. Other modeling details would generally follow those specified in the Class II modeling protocols for the Plant Site as defined by the Air IAP and/or generally excepted modeling practice.
- b. The modeled dust sources at the Flotation Tailings Basin will include LTV Steel Mining Company (LTVSMC) tailings loading and unloading, unpaved road traffic, and wind erosion from dams constructed of LTVSMC tailings and beaches composed of NorthMet tailings.
- c. The output of the model will be deposition rate (grams per square meter) on an annual basis. The model results will be compared to background values such that contours where the modeled deposition is small relative to the background value can be developed. This can be considered a conservative assessment of how far away potential impacts to wetlands from dust may occur from fugitive dust sources. This should be considered a screening level analysis such that it would identify an upper bound for the potential range of distances at which impacts might occur, but the results will not identify actual impacts. This range of distances could be used to estimate the extent of potential indirect impacts to guide development of monitoring plans to document actual indirect impacts. Based on the results of the screening analysis, if model-estimated particle deposition is equal to current background deposition (i.e., 100 percent of current background; i.e., a potential doubling of deposition), PolyMet may propose a more refined approach to assess the distance at which potential impacts may occur.

2. Metals and Sulfide Dust Emission

- a. At the Flotation Tailings Basin wind erosion from the embankment and beaches as well as truck traffic on roads composed of LTVSMC tailings will be included in the analysis.
- b. Modeling will be conducted for the included sources in the same manner as described for dust modeling. The dust modeling and metals and sulfide modeling may be conducted in separate model runs or in the same run utilizing the model's source grouping capabilities.
- c. For air dispersion/deposition modeling, the total particulate emission rates (grams per second) will be speciated and converted to metals and sulfur emission rates based on data on the chemical composition of each material generating dust. Proposed metals for evaluation, associated with rock and soils, will include: arsenic, cadmium, chromium, lead, manganese, nickel, and selenium.
- d. Because the NorthMet ore is low in mercury, the tailings, which includes roughly 98 percent of the ore, will also be low in mercury, and in fact pilot study data shows that the mercury preferentially goes to the flotation concentrate. The mercury in the tailings is also expected to be strongly bound within the mineral matrix. This is also true of the LTVSMC tailings that will be used to construct the Flotation Tailings Basin dams and that may be present on some road surfaces. Therefore, any mercury present in dust from the Flotation Tailings Basin would not be biologically available and we are not proposing to consider mercury in the deposition analysis at the Flotation Tailings Basin. When metal ores are concentrated and heated, such as in taconite mining or in smelting processes, then mercury becomes a metal of interest for air emissions and deposition. For the Project, potential mercury air emissions from ore processing (i.e., potential emissions from the autoclave) are being evaluated for potential local deposition impacts.
- e. The model-estimated sulfur and metals deposition rates (grams per square meter) will be compared to background values to determine distance contours beyond which the deposition rate is insignificant compared to background. As with the dust analysis, this will be a screening level evaluation that could be used to identify a range of distances from a source beyond which impacts would be unlikely to occur. This range of distances could be used to estimate the extent of potential indirect wetland impacts to guide development of monitoring plans to document actual indirect impacts. If model-estimated sulfur or individual metal deposition is equal to current background deposition (i.e., 100% of current background; i.e., a potential doubling of deposition), PolyMet may propose a more refined approach depending on the results of the screening level analysis. A more refined approach could take into account such factors as the potential for metals and/or sulfur to be liberated from the rock particles depending on the rock chemistry, environmental chemistry and general conditions in the ecosystem where the deposition is predicted to occur.

3. Flotation Tailings Basin Groundwater Seepage

- a. Identify the chemistry from the Flotation Tailings Basin groundwater seepage based on the results of the water quality modeling (Reference 6).
- b. Identify the wetlands (type, acreage) within the down gradient zone using boundaries used in the water quality modeling (as shown in the Groundwater IAP Summary document).
- c. Categorize the wetlands within the flowpaths in Step ii into groundwater-fed and precipitation-fed wetlands using guidance from the Corps Memorandum (CEMVP-

OP-R) Distinguishing Between Bogs That Are Entirely Precipitation Driven Versus Those with Some Degree of Mineral Inputs from Groundwater and/or Surface Water Runoff and evaluate the potential for indirect impacts based on potential water quality changes from the Flotation Tailings Basin.

4.2.5 Potential Indirect Wetland Impacts to Wildlife Utilization of Nearby Habitats From Project Noise

Provide a general discussion regarding the potential indirect wetland impact to wildlife utilization of nearby habitats from project noise using the following steps:

- 1. Identify the potential sources of project noise and the range of emitted noise levels.
- 2. Identify wildlife species that are found within the area, as well as their preferred habitats using wildlife surveys previously conducted for the NorthMet Project (Section 4.4 of Reference 2).
- 3. Qualitatively discuss the potential impacts and possible short- and long-term reactions of wildlife species to the potential project noise levels.

4.3 Transportation Corridors

4.3.1 Wetland Identification

Wetlands around the Flotation Tailings Basin will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for Area Two (which includes the Flotation Tailings Basin) were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

The wetlands abutting the Dunka Road and the railroad corridor within Area One and Area Two will be identified using GIS. The wetland ID, type and acreage for each wetland (only within the area previously characterized for wetlands) will be identified in a table.

4.3.2 Potential Indirect Wetland Impacts Resulting from Water Quality Changes

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for wetlands that will be impacted by water quality changes (such as from sulfide-bearing dust deposition, ore spillage, etc.) will be completed using the following steps:

Mine to Plant Rail

The potential release of dust from railcars transporting ore from the Mine Site to the Plant Site was addressed in the May 6, 2011 Air Impact Assessment Planning Summary Memo, "The air IAP group concluded that there would be minimal air impacts from any dust generated from ore hauled in the railcars due to the coarse nature of the ore." Based on this conclusion, air modeling of potential release of dust from railcars will not be performed because the potential wetland impacts will not be significant.

The air IAP group concluded that any dust generated from ore hauled in railcars would be coarse in nature (i.e., relatively large particles). These larger particles would tend to deposit near the railcar and not be dispersed to any great extent. An estimate of the spillage of ore fines along the rail corridor is shown in Section 8.5.3 of Reference 7. Assuming that all spillage of the coarse material would occur in a 2 meter wide strip on both sides of the centerline of the railway (total width = 4 meters) over the entire haul distance after loading (~ 8 miles; ~13,000 meters), results in approximately 0.11 Kg/square meter of ore fines annually or 2.14 Kg/square meter for the 20 year Project. This equates to 0.002 inch of depth annually or 0.05 inches for the 20 year Project.

Using the geochemical modeling methods described in Reference 7 for the Ore Surge Pile, the quality of water infiltrating through this material will be estimated on a per-unit area basis which will also be on a per unit length of the rail corridor. If the water quality is found to have a greater than 10 percent likelihood of exceeding water quality standards as defined in Table 1-3 of Reference 8, the unit area required to provide sufficient precipitation to dilute the water to meet standards will be calculated and converted to a distance to be added to the 2 meters from the centerline of the rail corridor that will be a potential dust impact corridor. Any wetlands identified in the above paragraph of this section that are within the potential dust impact corridor will be considered to be potentially indirectly impacted.

Dunka Road

Loaded mine haul trucks will not travel on the Dunka Road. Empty mine haul trucks will only travel on the Dunka Road when they are in need of maintenance at the Area 1 Shop. It is estimated that each truck will travel to Area 1 twice per year. The total one-way trips per year are estimated at 44. Given the low traffic volumes (< 1 trip per week on average) a quantitative assessment of impacts from ore particle discharge from haul trucks travelling down the Dunka Road is not warranted.

Product Shipping

Products produced in the hydrometallurgical plant (AU/PGM concentrate, mixed hydroxide precipitate) will be loaded into super sacks (i.e. large industrial sacks used to transport solid material) and then loaded onto trucks or railcars. There is little or no potential for spillage with this method of shipping. With respect to flotation concentrate, as stated in the project description (Reference 1) "Each filtered concentrate would be conveyed to separate stockpiles within an enclosed 10,000 ton storage facility for loading into covered rail cars. The storage facility would store about 7 to 10 days of production capacity when flotation concentrate would be directed to Concentrate Dewatering/Storage. The storage facility would have a concrete floor and provisions to wash wheeled equipment leaving the facility to prevent concentrates from being tracked out of the facility." The flotation concentrate is similar material to that which caused issues at the Red Dog Mine in Alaska (zinc concentrate transported in truck trailers), which has been cited as an example of potential consequences of product transport at mining operations. Some issues at Red Dog were driven by road dust and port activities which do not apply to the Project. Best Management Practices adopted at Red Dog - enclosed storage and loading, covered cars, and vehicle wash facilities - are proposed for use at the NorthMet project. Because the common carrier route (i.e. the rail line used to transport products) is not known (ultimate customer not known and could change), there is no way to assess impacts along the common carrier route. PolyMet will be paid on tons received by customers so it has a vested interest in not losing any concentrate. The covered rail cars will be inspected for holes and any holes repaired before concentrate loading.

4.3.3 Potential Indirect Wetland Impacts Resulting from Wetland Fragmentation

For remaining wetlands not directly impacted or identified in 4.3.2, an estimate of potential indirect wetlands (wetland acres by wetland type, and type of indirect impact) from wetland fragmentation by Project features will be completed using the following steps:

1. For each portion of a remaining wetland, excluding indirect impacts identified in 4.2.3, the potential area of indirect impacts would be determined based on an analysis of the various factors that may contribute to potential fragmentation. Based on the analysis, the identifying factor(s) contributing to potential fragmentation (change in size of wetland, surrounded by Project features, change in function and values of wetland e.g. wildlife habitat, etc.) would be identified. [Note: noise and dust do not cause fragmentation impacts according to the U.S. Army Corps of Engineers, May 16, 2011 conference call.]

4.3.4 Potential Indirect Wetland Impacts to Wildlife Utilization of Nearby Habitats From Project Noise

Provide a general discussion regarding the potential indirect wetland impact to wildlife utilization of nearby habitats from project noise using the following steps:

- 1. Identify the potential sources of project noise and the range of emitted noise levels.
- 2. Identify wildlife species that are found within the area, as well as their preferred habitats using wildlife surveys previously conducted for the NorthMet Project (Section 4.4 of Reference 2).
- 3. Qualitatively discuss the potential impacts and possible short- and long-term reactions of wildlife species to the potential project noise levels.

5. Cumulative Wetland Impacts

Analysis of cumulative wetland impacts will be done using accepted tools and protocols. The analysis performed for the DEIS is described and summarized in Section 4.3 of Reference 1. The analysis performed for the SDEIS will generally duplicate that effort using the revised direct and potential indirect wetland impact acreage, along with updated watershed information. The assessment will be conducted for both the Partridge River watershed and the Embarrass River watershed. The following steps will provide acreage for wetland and water resources for the pre-settlement, existing and foreseeable future conditions. Tables and figures will be developed to present the information.

5.1 Presettlement Wetland and Water Resources

The pre-settlement conditions time period represents wetlands, lakes, and deepwater resources as they existed prior to mining and urban development in the late 1800s to early 1900s. An estimate of presettlement wetland, lakes, and deepwater acreage within the Partridge River and Embarrass River watersheds will be developed in GIS using the following steps:

- The acreage of wetland and water resources estimated for the pre-settlement period will be developed using the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) and the original survey maps developed using data from the original Government Land Surveys along with other historical surveys and sources, generally from the late 1800s.
- 2. The NWI mapping efforts were generated from interpretations of black-and-white aerial photographs completed in the late 1970s to early 1980s. The NWI is a more accurate depiction of historic wetland resources where human disturbance has been limited. Therefore, the NWI will be used as a base wetland map and available delineation data will be substituted to improve the accuracy of the wetland mapping.
- 3. The original survey maps will be obtained from the MDNR GIS Data Deli maps at http://deli.dnr.state.mn.us/. The original survey maps identify water resources as marshes, bottoms, swamps, lakes, ponds, and rivers, as documented in early land surveys. The original survey maps are a more accurate depiction of historic wetland resources where human disturbance is present. The water resources within the areas of human disturbance in each watershed will be digitized and presented on a figure.
- 4. The wetland and water resources mapped on the original survey maps will be digitized for one township, with minimal disturbance (roads, railroads, mining areas, etc.) located within and adjacent to the Partridge River watershed and for one township located within the Embarrass River watershed. It is assumed that if there is a minimal amount of disturbance in a township, the NWI mapping would be representative of pre-settlement wetland and water resources conditions. Therefore the data from each township will be used to develop a relationship between the NWI and original survey data.

- 5. The total wetland and water resources acreage for the two data sets will be compiled and the ratio of NWI to original survey map wetland and water resources will be calculated for each township. This ratio will indicate the percent of wetland and water resources identified on the NWI maps compared the original survey maps. This ratio will be used as an adjustment factor to conform the original survey data to the standards and scales of the NWI data for estimating the pre-settlement wetland resources within the disturbed areas of the watershed. The selected townships and data used to determine the adjustment factor will be presented in a table.
- 6. For the human disturbance areas, the NWI wetlands and water resources located within the human disturbance polygon boundaries will be removed using a GIS clipping tool. The NWI within these disturbance areas do not accurately reflect pre-settlement conditions because the NWI either included wetlands that have since been eliminated because of disturbance activities or did not include wetlands that had already been eliminated when the NWI was completed (e.g., reservoir development permanently flooded the wetlands). Because the NWI does not accurately map these types of areas, it does not accurately represent pre-settlement conditions; therefore the NWI wetlands in the disturbed areas will be replaced with wetlands mapped on the original survey maps. The total area of wetland and water resources within those polygons will be corrected using the adjustment factor. The total acreage of pre-settlement wetlands and water resources will be estimated for the two watersheds.

5.2 Existing Wetland and Water Resources

The existing conditions time period represents wetland, lake, and deepwater resources as they exist today, prior to the development of the Project. An estimate of existing wetland, lake, and deepwater acreage within the Partridge River and Embarrass River watersheds will be developed in GIS using the following steps:

- 1. Existing wetland, lake, and deepwater resources will be estimated using: wetland delineations completed in the area (as available); lake or lacustrine water body acreages will be estimated using the USGS National Hydrograph Dataset and the NWI datasets; deepwater or mine pit water body acreages will be estimated using a combination of the MDNR Mesabi Mining Features (2008) and interpretation of 2003, 2008, 2009, and 2010 FSA aerial photographs; and NWI mapping.
- 2. A "composite" wetland and water resources layer will be developed by deleting all of the NWI polygons from areas in which more detailed mapping had been completed and replacing them with the delineated wetland, lake, and deepwater resources.

5.3 Projected Future Wetland and Water Resources

An estimate of future wetland acreage within the Partridge River and Embarrass River watersheds will be completed considering reasonably foreseeable future project wetland impacts, both direct and potential indirect. Reasonably foreseeable future projects are defined as those that have been permitted and those that have had permit applications submitted and/or are undergoing environmental review by regulatory agencies.

The future conditions time period represents wetland, lake, and deepwater resources expected to be present following conclusion and reclamation of the Project. It is assumed that the future conditions follows some time after conclusion of the future projects such that the mine pit will have filled with water.

Relevant public officials from city, county, state and federal agencies will be contacted to identify reasonably foreseeable future actions within the study area. Agency officials will be asked to identify reasonably foreseeable future projects that may occur during the life of the Project. Contacts will include

the City of Babbitt, St. Louis County, MDNR, Minnesota Board of Water and Soil Resources, the U.S. Forest Service, and the Iron Range Resources and Rehabilitation Board (IRRRB).

Future projects will be identified in the Partridge River watershed and the Embarrass River watershed that may impact wetland, lake, and deepwater resources. For the projected future conditions, the acreage of wetland, lake, and deepwater resources will be estimated by subtracting the future projected wetland impacts and adding the future projected development of wetland, lake, and deepwater resources to the existing resource totals. This information will be provided as a table.

5.4 Qualitative Analysis of Cumulative Wetland Impacts for the St. Louis River below the Ordinary High Water Mark From Its Confluence with the Embarrass River to Lake Superior

A qualitative analysis of cumulative wetland impacts for the St. Louis River below the ordinary high water mark from its confluence with the Embarrass River to Lake Superior will be developed based on a qualitative estimate of flow changes in the river.

A qualitative estimate of flow changes in the St. Louis River will be developed from the results of the Partridge River hydrologic modeling described in Section 7.1.1 of Reference 3. The estimated flow changes in the St. Louis River will be evaluated relative to gage data to determine if the changes are expected to be within the natural variation of flow within the St. Louis River will be developed using the following steps:

- 1. If the evaluation of the estimated flow changes in the St. Louis River is within the natural variation of average annual flow in within the St. Louis River observed at USGS gage 04016500 (St. Louis River near Aurora), no further analysis will be conducted. This location is the most upstream location of the St. Louis River affected by the NorthMet Project, and will therefore show the greatest impact.
- 2. If the evaluation of the estimated flow changes in the St. Louis River is not within the natural variation of flow in within the St. Louis River, the following analysis will be conducted.
 - a. An estimate of existing wetland acreage and wetland types below the ordinary high water mark of the St. Louis River from its confluence with the Embarrass River to Lake Superior will be made using the National Wetland Inventory.
 - b. An estimate of future wetland acreage and wetland types below the ordinary high water mark of the St. Louis River will be made from its confluence with the Embarrass River to Lake Superior.

5.5 Quantitative Analysis of Cumulative Wetland Impacts

5.5.1 Partridge River and Embarrass River Watersheds

A quantitative analysis of cumulative impacts for the Partridge River and Embarrass River watersheds will be developed using the following steps:

- 1. The acreage of wetland, lake, and deepwater resources for the pre-settlement, existing and reasonably foreseeable future conditions will be provided as a table. The foreseeable future conditions will include evaluation of a No Action Alternative and the Proposed Action.
 - a. The acreage of wetland, lake, and deepwater resources will be compared and discussed for the pre-settlement, existing and reasonably foreseeable future conditions.
 - b. The project's effect on the wetland, lake, and deepwater resources will be discussed and compared for the study area. This includes a discussion of changes in acreage,

water quality, unique habitat, adjacency to stream resources, and cumulative effects of projects within each watershed.

5.5.2 The St. Louis River below the Ordinary High Water Mark From Its Confluence with the Embarrass River to Lake Superior

A quantitative analysis of cumulative impacts for wetlands located below the ordinary high water mark of the of the St. Louis River from its confluence with the Embarrass River to Lake Superior will be developed using the following steps:

- 1. If the evaluation of the estimated flow changes in the St. Louis River is within the natural variation of flow in within the St. Louis River, no further analysis will be conducted.
- 2. If the evaluation of the estimated flow changes in the St. Louis River is not within the natural variation of flow in within the St. Louis River, determine the change in wetland acreage from existing to future conditions based on a qualitative estimate of flow changes in the St. Louis River.

5.6 Climate Change

A qualitative analysis of estimated climate change impacts (to be coordinated with the climate change evaluation being conducted for the air impacts chapter of the SDEIS) on cumulative wetland impacts in the Partridge River Watershed, the Embarrass River Watershed, and below the ordinary high water mark of the St. Louis River from its confluence with the Embarrass River to Lake Superior.

The qualitative assessment of the potential impacts of climate change on wetlands will be included in the Climate Change Evaluation Report developed by the Air IAP. No additional assessment will be conducted.

6. References

Reference 1 NorthMet Project Project Description, Version 3, September 13, 2011

Reference 2 NorthMet Project Draft Environmental Impact Statement. U.S. Army Corps of Engineers and Minnesota Department of Natural Resources. October 2009.

Reference 3 NorthMet Project Water Modeling Data Package – Volume 1 (Mine Site) Version 5

Reference 4 Compilation of Air Pollutant Emission Factors, AP-42 5th edit. Volume I Stationary Point and Area Sources, Section 13.2.5. Updated November 2006. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina.

Reference 5 NorthMet Project Water Modeling Data Package - Volume 2 (Plant Site) Version 2

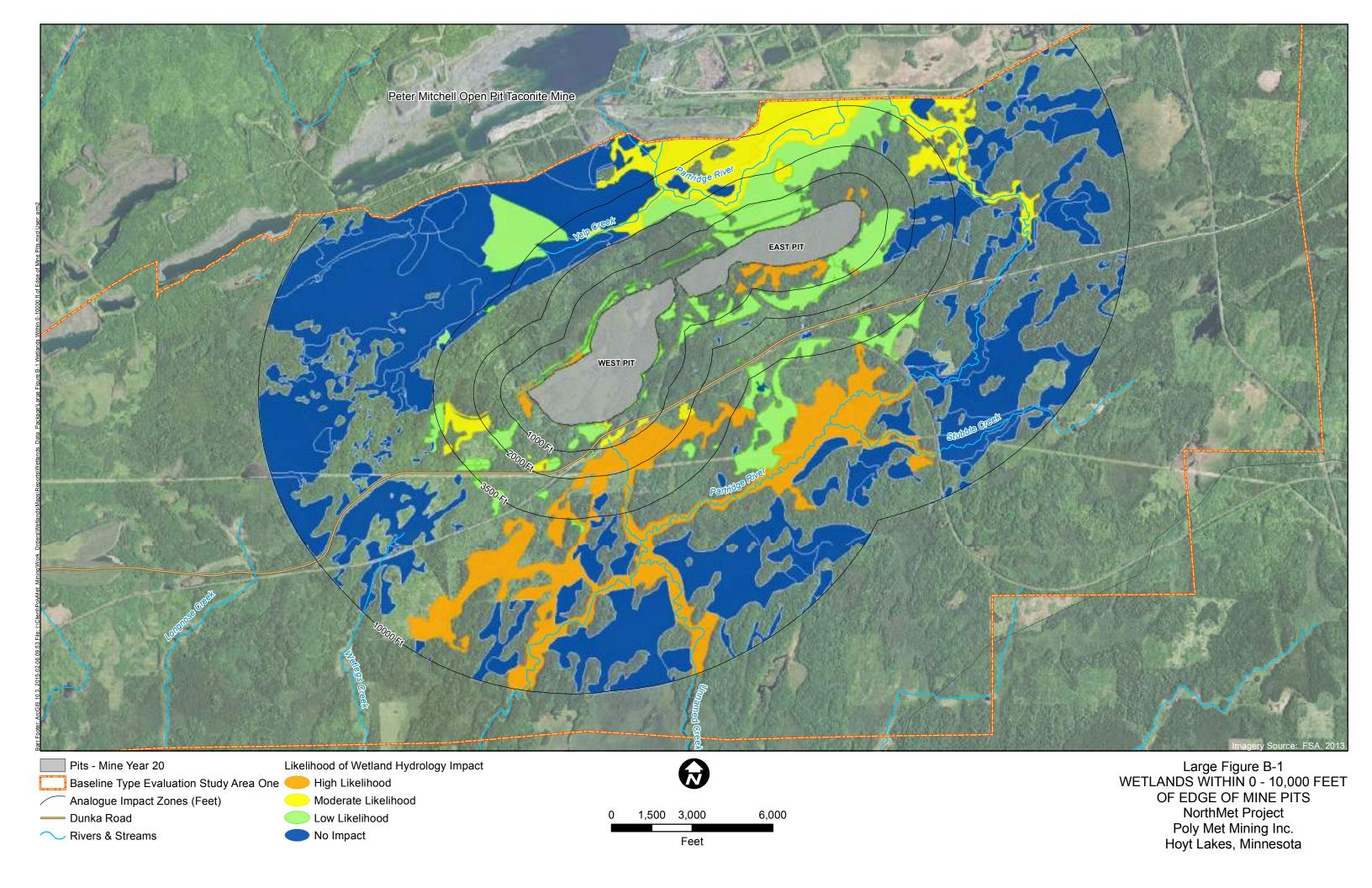
Reference 6 Surface Water IAP Group Summary Document, Date: May 20, 2011.

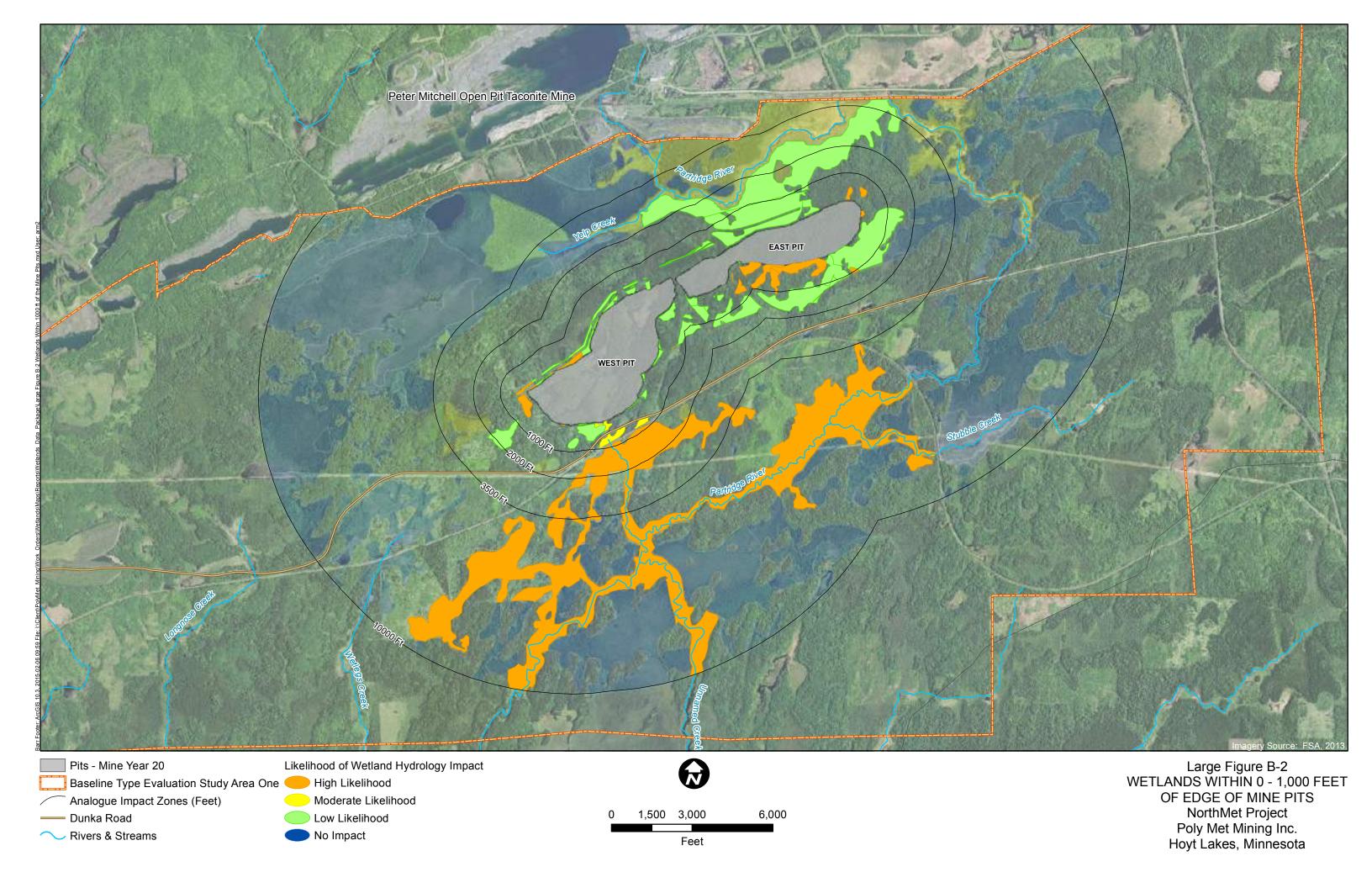
Reference 7 NorthMet Project Waste Characterization Data Package Version 5

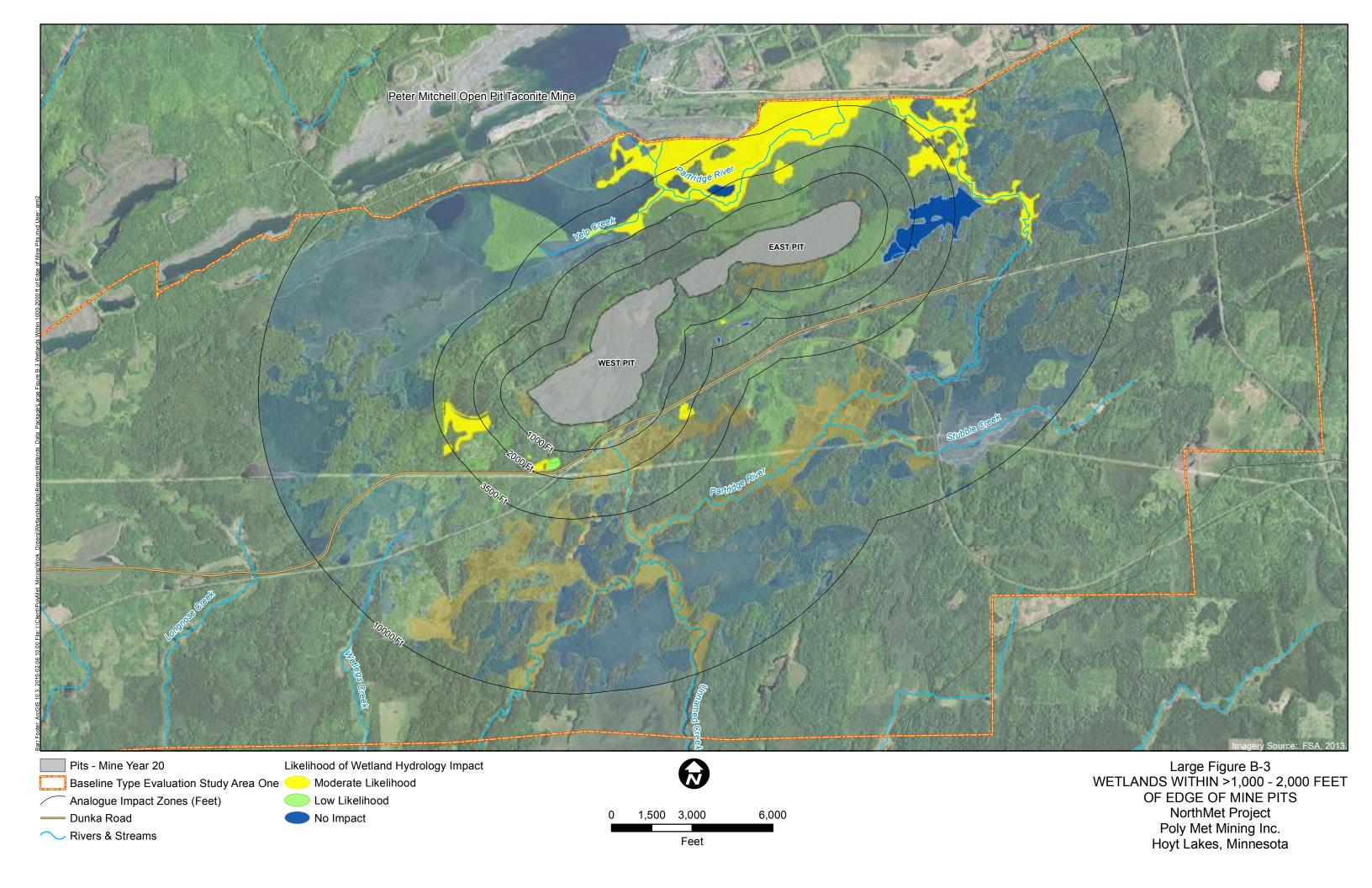
Reference 8 NorthMet Mine Site Water Modeling Work Plan Version 2

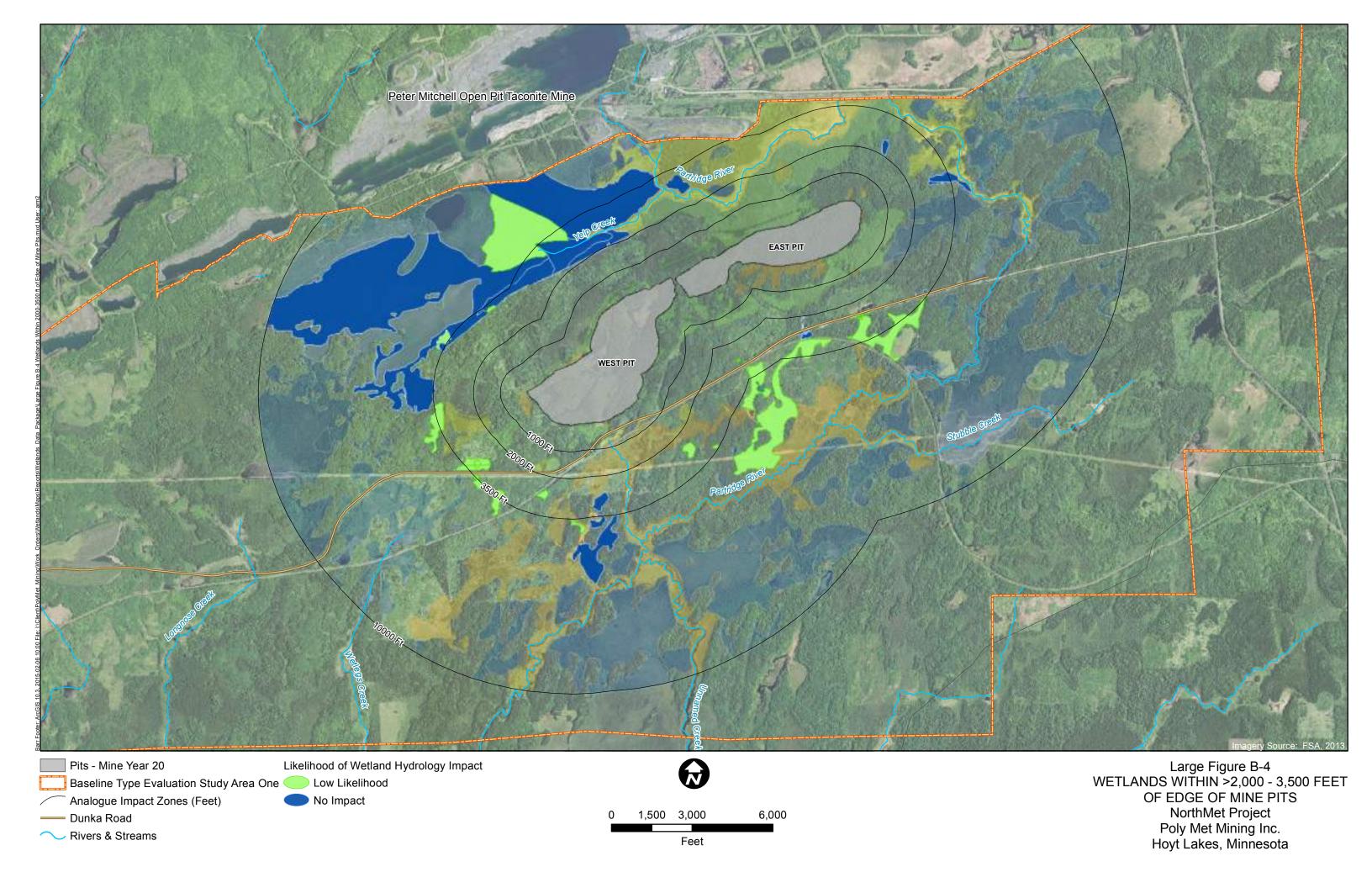
Attachment B

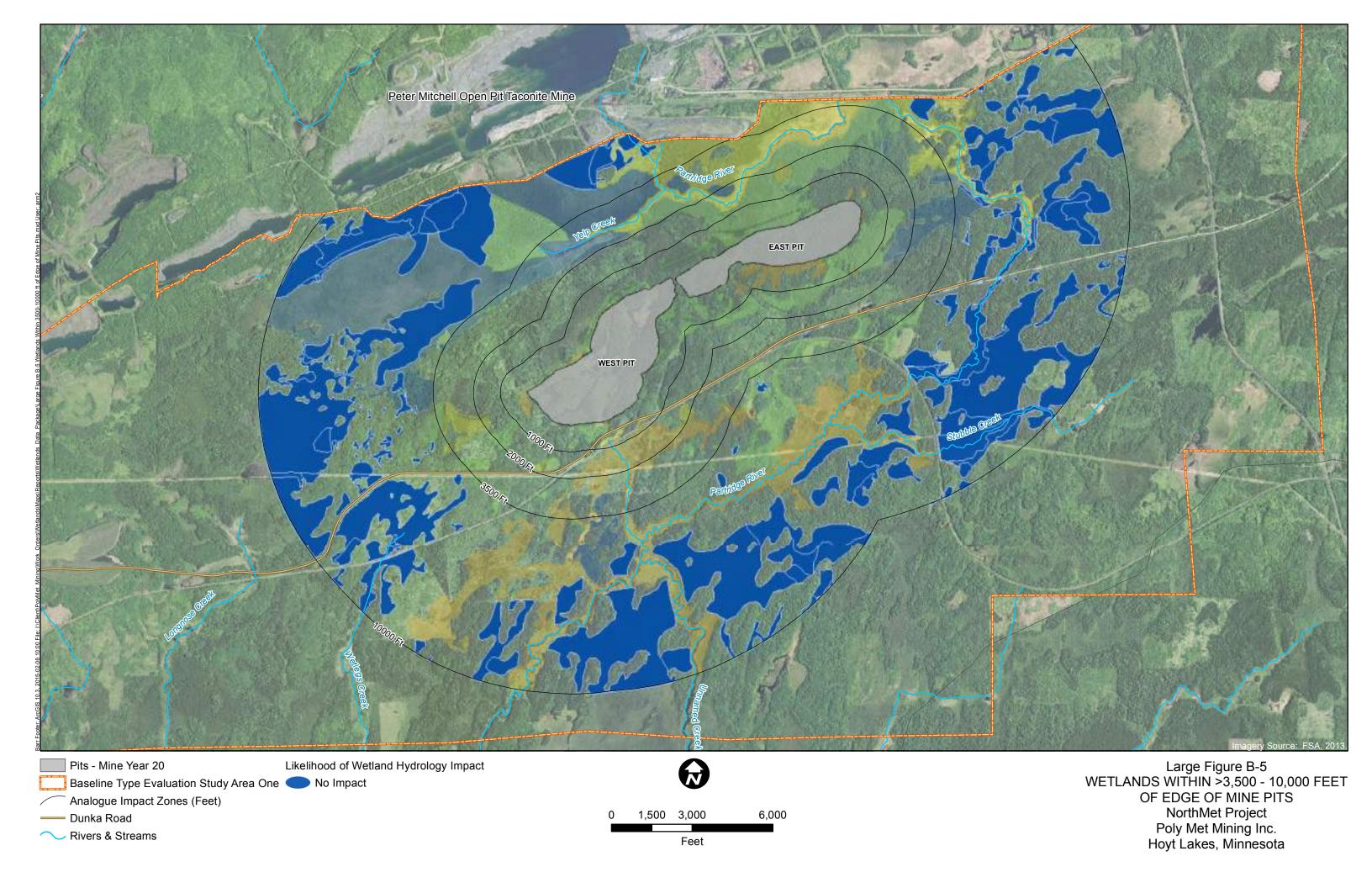
Wetlands within Analog Zones – Mine Site

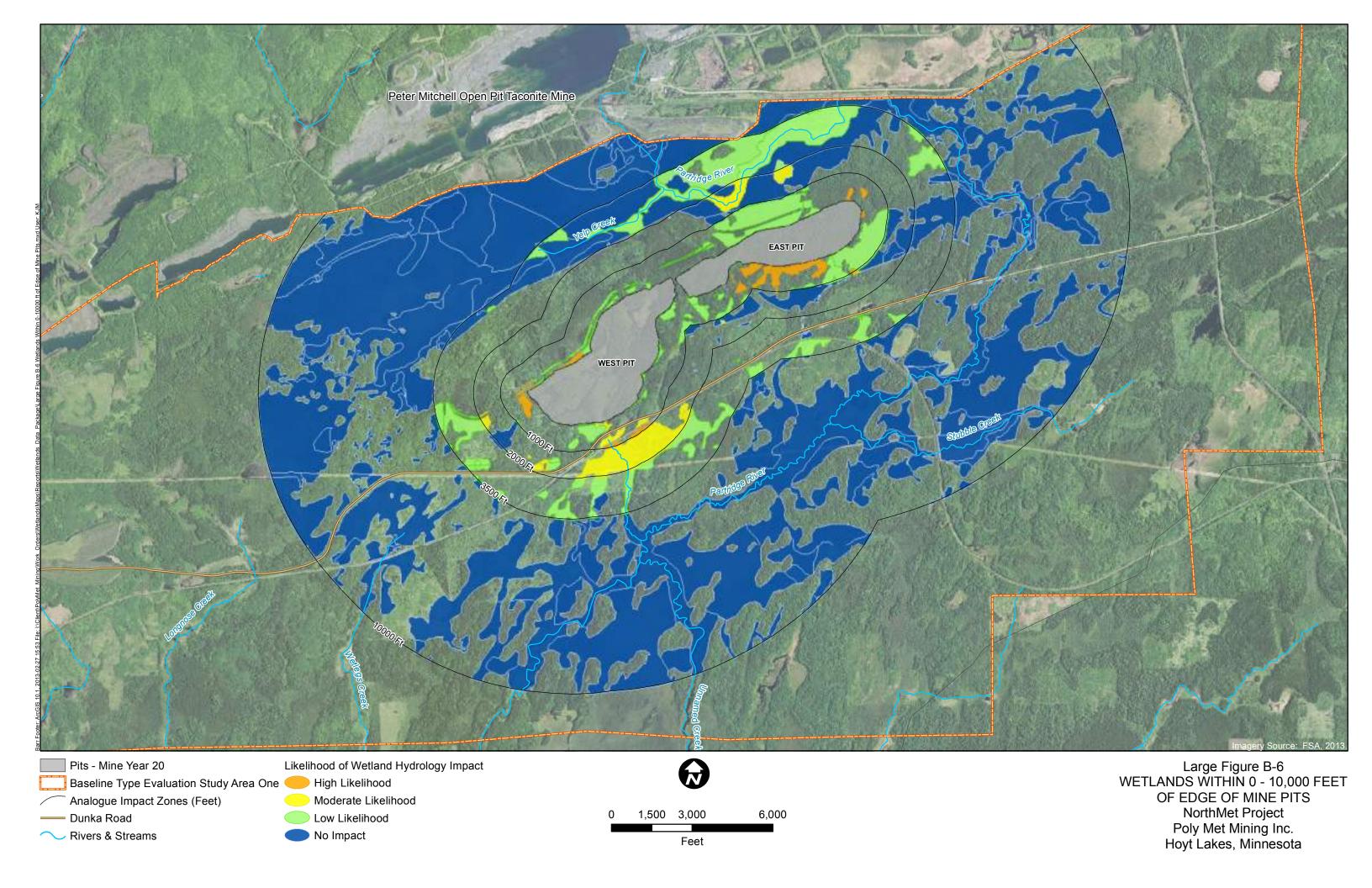


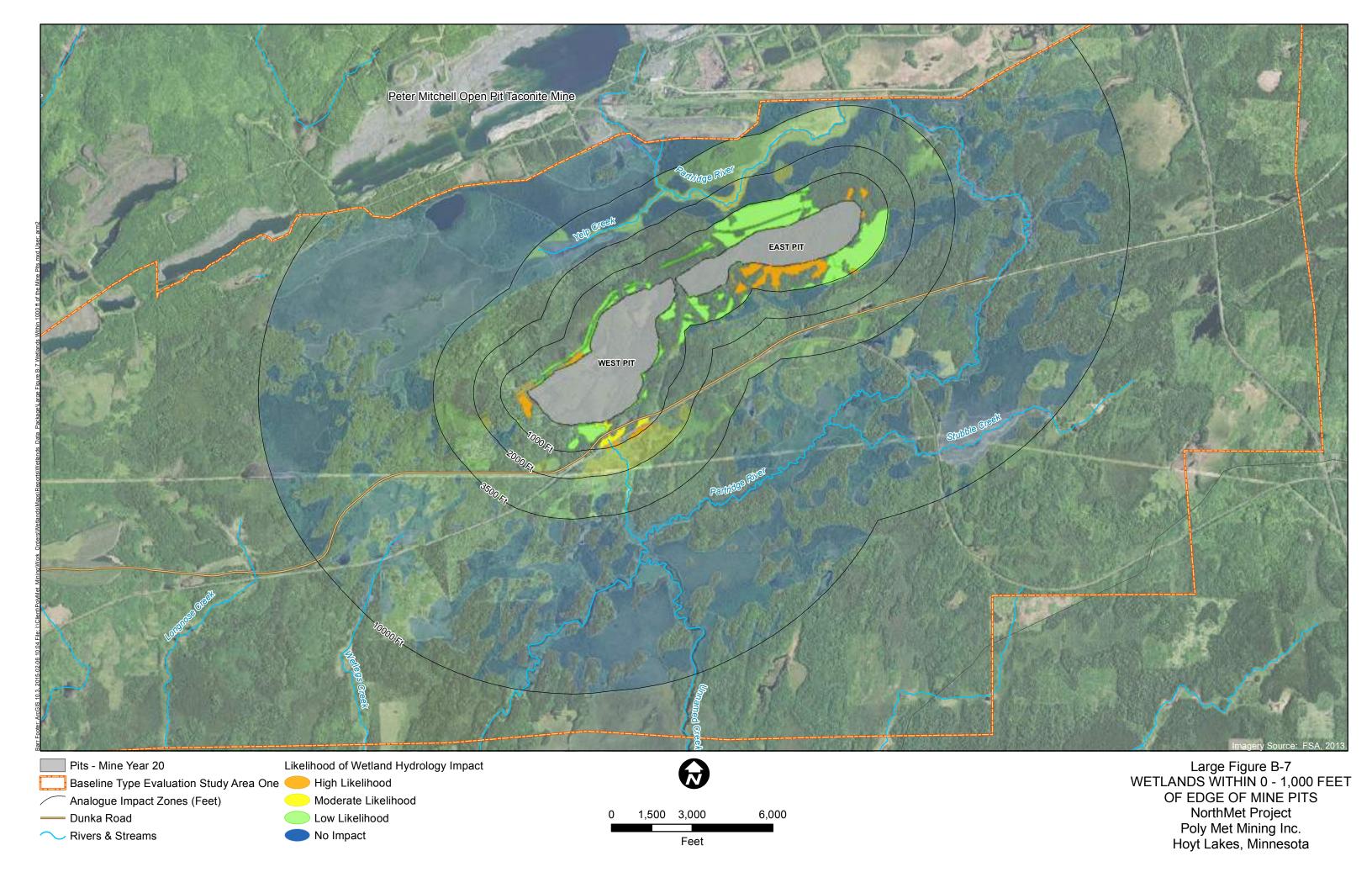


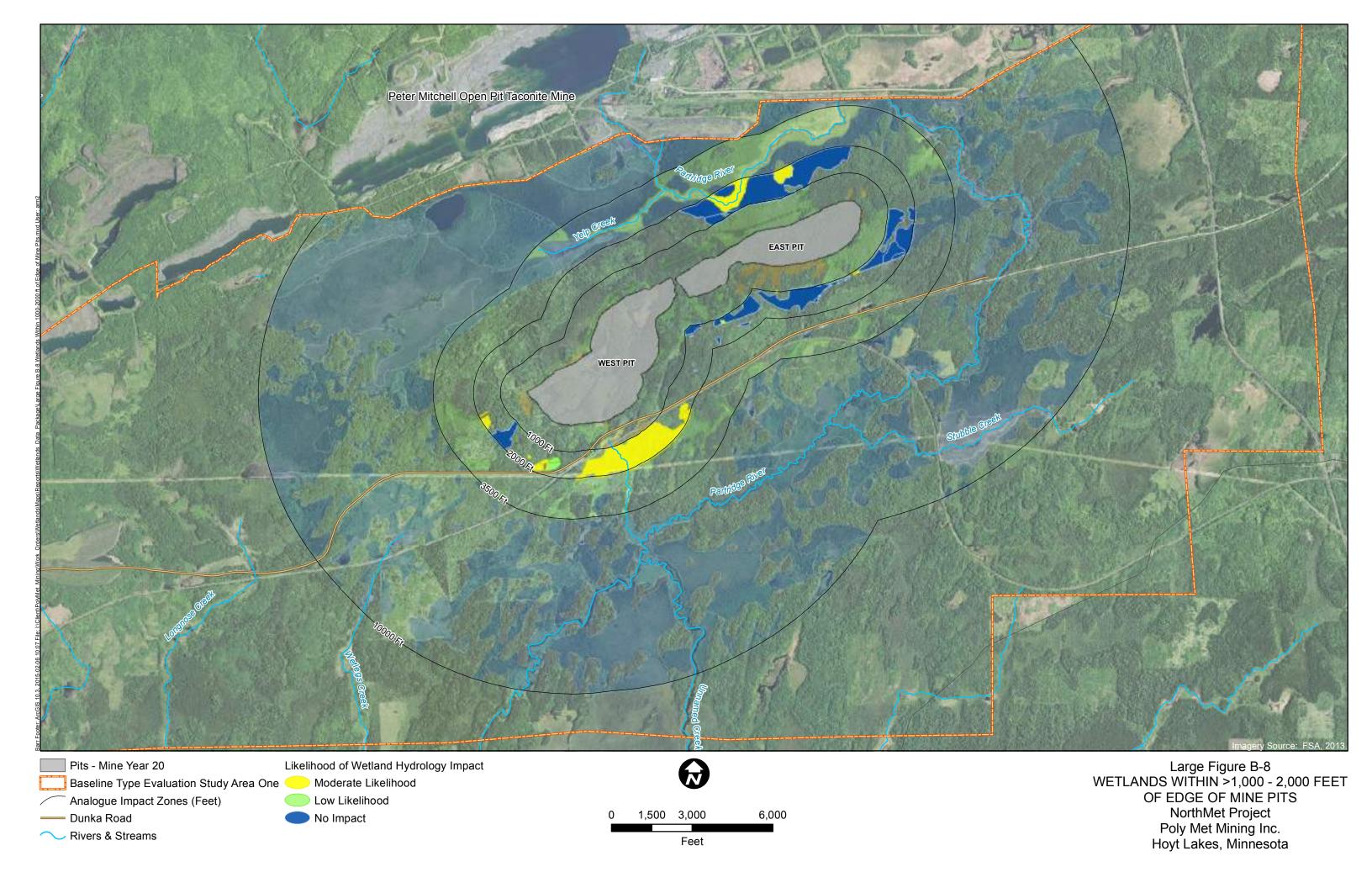


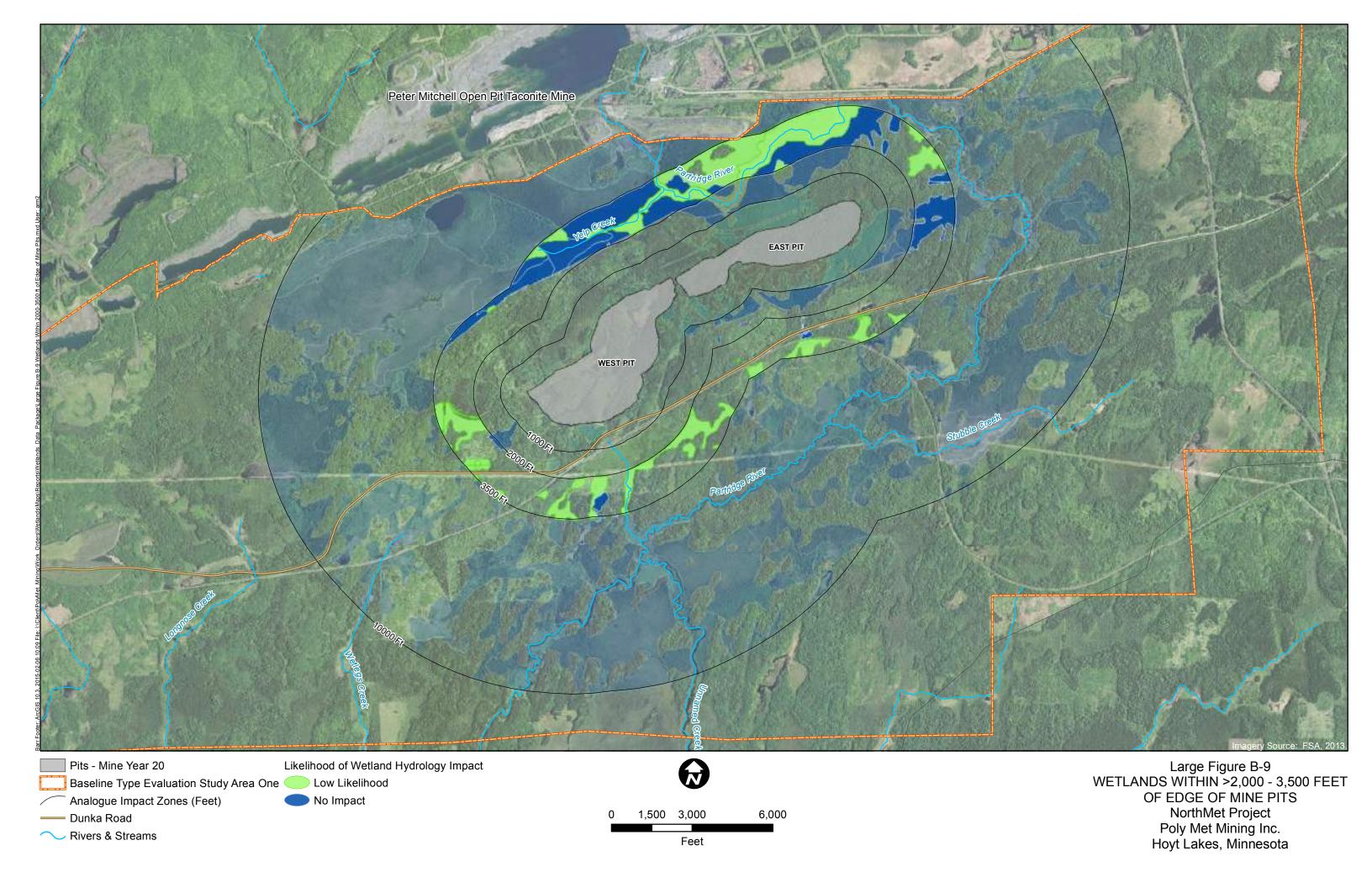


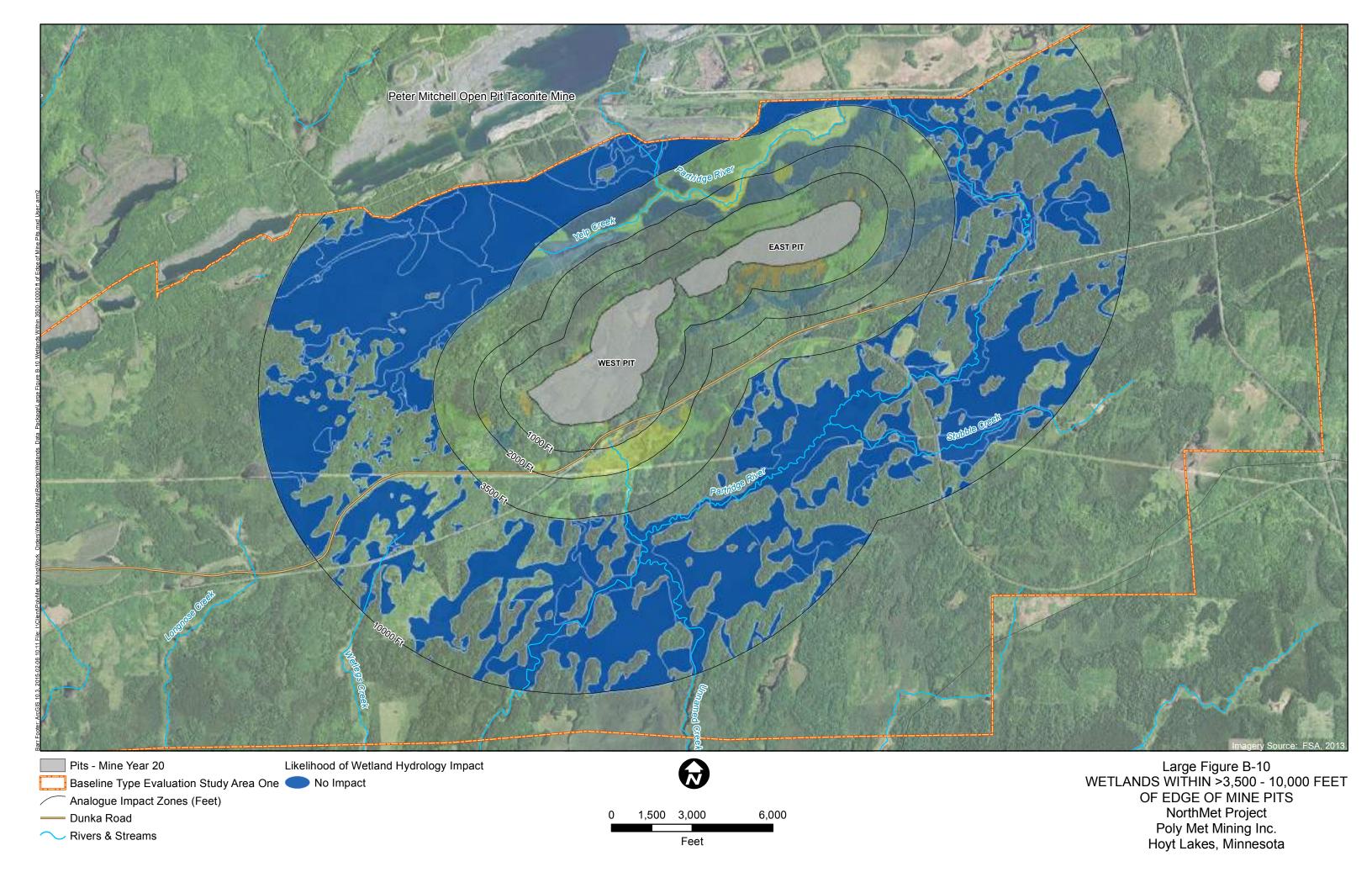












Attachment C

Chemistry of NorthMet Ore, NorthMet Tailings, and LTVSMC Tailings

Table C1-1 Ore and Waste Rock Chemistry Data Used Speciate Dust Depostion

Ore ¹					Cate	gory 1 Waste	Rock			
	Center	East	Wes	t Max		Center	East	West	Max	
Constituent	95% UCL	95%	95%		99th Percentile	95% UCL	95% UCL	95% UCL	95% UCL	99th Percentil e
AS_PPM	18.8	7.84	9.51	18.83	28.1	6.18	5.82	8.48	8.48	13.2
CD_PPM	0.838	0.923	0.814	1 0.92	2.50	0.513	0.609	0.576	0.61	1.30
CR_PPM	119	124	208	208.46	559	160	178	182	181.85	286
Cu_D	0.286	0.363	0.312	0.36	0.594	0.032	0.0394	0.046	0.0460	0.082
MN_PPM	970	956	911	970.41	1279	846	989	1004	1004.10	1363
Ni_D	0.106	0.097	6 0.082	0.11	0.153	0.032	0.0305	0.0343	0.0343	0.056
PB_PPM	9.11	10.6	7.81	10.58	16.8	3.74	5.65	5.33	5.65	12.1
SE_PPM				5.5					8.4	
Sulfur_PPM				9,588. 6					n/a	
V_PPM	106	126	96.5	126.29	259	63.8	117	98.2	117.00	168
ZN_PPM	100	104	92.3	104.12	138	80.4	110	86.4	110.17	116
Category 2/3 Waste Rock					Cate	gory 4 Waste I	Rock ²			
	Center	East	West	Max						
Constituent	95% UCL	95% UCL	95% UCL	95% UCL	99th Percentile	95% UCL	99th Percentile	Max		
AS_PPM	7.15	7.10	9.32	9.32	20.8	33.8	86.7			
CD_PPM	0.555	0.708	0.721	0.72	1.60	1.80	3.40			
CR_PPM	130	225	219	224.69	474	159	325			
Cu_D	0.068	0.072	0.100	0.10	0.130	0.0369	0.1290			
MN_PPM	713	1026	964	1025.74	1300	529	1758			
Ni_D	0.033	0.035	0.0362	0.04	0.051	0.0191	0.0470			
PB_PPM	3.25	6.77	6.81	6.81	13.7	12.4	25.1			
SE_PPM				8.38				8.38		
Sulfur_PPM				3,476.5				34,540.0		
V_PPM	49.9	119	124	123.94	280	143	256			
ZN_PPM	73.2	110	83.7	110.08	147	273	555			

PPM = part per million concentration

General Notes:

Values listed are the 95% upper confidence limit (UCL) for the mean for the maximum year in the 20-year projected life of the mine.

Columns labeled "Max Avg." contain the value used in the previous emission inventory submittals for comparison.

95% UCL Values are in PPM except for Cu and Ni which are expressed as percents. Maximum averages are all expresses as PPM (divide by 10,000 to convert PPM to %).

Footnotes:

¹Ore data used in the previous emission inventory submittals was not separated into East and Central pit values.

²Because of the relatively small volume of Category 4 Waste Rock, the statistical analysis was conducted for all data independent of year and pit.

References:

Geerts, S.D., 1994, Petrography and geochemistry of a platinum group element-bearing mineralized horizon in the Dunka Road prospect (Keweenawan) Duluth Complex northeastern Minnesota: Unpublished M.S. Thesis. University of Minnesota Duluth. 155 p., 8 plates.

Severson, M.J., 1988. Geology and structure of a portion of the Partridge River intrusion: A progress report: Natural Resources Research Institute, University of Minnesota Duluth, Technical Report, NRRI/GMIN-TR-88-08. Duluth, Minnesota. 78 p., 5 plates.

Severson, M.J., and Hauck, S.A. 1990. Geology, geochemistry, and stratigraphy of a portion of the Partridge River intrusion: Natural Resources Research Institute, University of Minnesota Duluth, Technical Report, NRRI/GMIN-TR-89-11. 235 p. 4 plates, 1 diskette.

Table C1-2 Tailings Chemistry Data Used to Speciate Dust Deposition

Metal	Conc. (ppm)	Source	Comments
NorthMet Ta	ilings		
Arsenic	0.08	2000 Pilot Study [2] 2005/2006 Pilot Study [1]	Emission factors calculated from trace metal analysis completed on tailings produced during the pilot study. The results from the -38um fraction was used because this would approximate TSP except when the -10um fraction appeared to produce higher quality data (e.g. lower detection limits). Data for the analysis of the entire tailings size range was also evaluated, but these values were lower, with the exception of boron, and the smaller particle sizes would represent those most likely to become airborne. The data for the entire tailings size range was used for boron, because the size specific data were below the detection limit. With the exception of vanadium, analysis for all of these elements was also performed during the 2005 pilot study. However, the results from 2000 were higher for all elements. 2000 data was used for all elements to be conservative.
			during 2005 and 2006 pilot studies. Average value for all parcels calculated. Values below the detection limit assumed to be at the detection limit.
Chromium Copper	310 547	2000 Pilot Study [2]	Emission factors calculated from trace metal analysis completed on tailings produced during the pilot study. The results from the -38um fraction was used because this would approximate TSP except
Lead	383		when the -10um fraction appeared to produce higher quality data (e.g. lower detection limits). Data for the analysis of the entire tailings size range
Manganese	1400		was also evaluated, but these values were lower, with the exception of boron, and the smaller particle sizes would represent those most likely to become airborne. The data for the entire tailings size range was used for boron, because the size specific data were below the detection limit. With the exception of vanadium, analysis for all of these elements was also performed during the 2005 pilot study. However, the results from 2000 were higher for all elements. 2000 data was used for all elements to be conservative.
Nickel	510	2000 Pilot Study [2]	Emission factors calculated from trace metal analysis completed on tailings produced during the pilot study. The results from the -38um fraction was used because this would approximate TSP except when the -10um fraction appeared to produce higher quality data (e.g. lower detection limits). Data for the analysis of the entire tailings size range was also evaluated, but these values were lower, with the exception of boron, and the smaller particle sizes would represent those most likely to become airborne. The data for the entire tailings size range was used for boron, because the size specific data were below the detection limit. With the exception of vanadium, analysis for all of these elements was also performed during the 2005 pilot study. However, the results from 2000 were higher for all elements. 2000 data was used for all elements to be conservative.
Selenium	1.2	2005/2006 Pilot Study [1]	Emission factor calculated from data obtained during 2005 and 2006 pilot studies. Average value for all parcels calculated. Values below the detection limit assumed to be at the detection limit.
Sulfur	1,210	Water Modeling Data Package; as of Sept. 04, 2012	1,210 mg S / kg tailings is ~ 0.12% sulfur content.
Zinc	548	2000 Pilot Study [2]	Emission factors calculated from trace metal analysis completed on tailings produced during the pilot study. The results from the -38um fraction was used because this would approximate TSP except when the -10um fraction appeared to produce higher quality data (e.g. lower detection limits). Data for the analysis of the entire tailings size range was also evaluated, but these values were lower, with the exception of boron, and the smaller particle sizes would represent those most likely to become airborne. The data for the entire tailings size range was used for boron, because the size specific data were below the detection limit. With the exception of vanadium, analysis for all of these elements was also performed during the 2005 pilot study. However, the results from 2000 were higher for all elements. 2000 data was used for all elements to be

Metal	Conc. (ppm)	Source	Comments
			conservative.
Vanadium	210	2000 Pilot Study [2]	Emission factors calculated from trace metal analysis completed on tailings produced during the pilot study. The results from the -38um fraction was used because this would approximate TSP except when the -10um fraction appeared to produce higher quality data (e.g. lower detection limits). Data for the analysis of the entire tailings size range was also evaluated, but these values were lower, with the exception of boron, and the smaller particle sizes would represent those most likely to become airborne. The data for the entire tailings size range was used for boron, because the size specific data were below the detection limit. With the exception of vanadium, analysis for all of these elements was also performed during the 2005 pilot study. However, the results from 2000 were higher for all elements. 2000 data was used for all elements to be conservative.
LTVSMC Tai			
Arsenic	24.6	Waste water modeling report [3]	
Cadmium	0.25	Waste water modeling report [3]	Result reports as < 0.5
Chromium	66.8	Waste water modeling report [3]	
Copper	12.6	Waste water modeling report [3]	
Lead	5.6	Waste water modeling report [3]	
Manganese	4880	Waste water modeling report [3]	
Nickel	4	Waste water modeling report [3]	
Selenium	1.2	NorthMet Data	Data not available for LTVSMC tailings.
Sulfur	1,210	Water Modeling Data Package; as of Sept. 04, 2012	1,210 mg S / kg tailings is ~ 0.12% sulfur content. Sulfur content of NorthMet tailings assumed to the sulfur content of the LTVSMC tailings.
Zinc	15.8	Waste water modeling report [3]	
Vanadium	10.4	LTVSMC tailings data (Aqua Regia tests) 06. Environmental Sampling and Analysis Flotation Process Liquids and Solid	Data submitted to the MDNR in June 2011 via email from P.Hinck (Barr) to M.Olson (MDNR).

^[1] Barr Engineering Co. May 2006. Environmental Sampling and Analysis Flotation Process Liquids and Solids Sampling Results Pilot Test – NorthMet Deposit PolyMet Mining, Inc. Table 9 and Barr Engineering Co. July 2006. Draft - Environmental Sampling and Analysis Flotation Process Optimization Test. Table 5.

^[2] SGS Lakefield Research Limited. Flotation Pilot Plant Products Environmental Investigation and Air Testing from NorthMet Samples. June 30, 2004. LR10054-003 Progress Report No. 6, Tables B-6 and B-1.

^[3] Barr Engineering Co. July 20, 2007. Waste Water Modeling – Tailings; NorthMet Project. Table 5-1 and supporting data set.'

Attachment D

Adjustment of Background Metal Deposition

ATTACHMENT D

Adjustment of Background Metal Deposition

The authors estimated that precipitation was under-estimated by 45% to 70%. An initial review of data (comparison of dry deposition and wet deposition as a percent of total deposition) indicates wet deposition is less than 50% of total deposition for the metals, except selenium (Table C2-1). Wet deposition in rural areas should account for 50% or more of the total deposition. For the Eagle Harbor data, the deposition estimates are considered to be skewed toward dry deposition (except for selenium)

Table D2-1 Comparing Wet Deposition and Dry Deposition to Total Deposition for the Eagle Harbor, Michigan Monitoring Site (Data as reported from Sweet et al. (1998).

Metal	Dry Deposition	Wet Deposition	Total (wet+dry)	Dry Deposition as a % of Total	Wet Deposition as a % of Total	Comments
	μg/m2/yr	μg/m2/yr	μg/m2/yr			
Vanadium	260	78	338	77%	23%	Wet dep % is low
Chromium	130	78	208	63%	38%	Wet dep % is low
Manganese	1,900	2,300	4,200	45%	55%	
Nickel	570	230	800	71%	29%	Wet dep % is low
Copper	2,400	700	3,100	77%	23%	Wet dep % is low
Zinc	5,300	3,500	8,800	60%	40%	Wet dep % is low
Arsenic	91	78	169	54%	46%	Wet dep % is low
Selenium	52	520	572	9%	91%	
Cadmium	380	78	458	83%	17%	Wet dep % is low
Lead (Pb)	920	550	1,470	63%	37%	Wet dep % is low

μg/m2/yr = micrograms per square meter per year

Because Sweet et al. (1998) indicated that precipitation was under-collected by 45% to 70%, the wet deposition component of t heir data was adjusted. The mid-range of the under-collection (60%) was used to adjust estimated wet deposition. A factor of 1.6 was applied to the wet deposition reported by Sweet et al. (1998). The adjusted wet deposition was added to the estimated dry deposition reported by Sweet et al. (1998) to derive an "adjusted total deposition" (Table C2-2). The adjusted total deposition from Table C2-2 was used for comparison to the respective modeled metal deposition rates for the Mine Site and Flotation Tailings Basin.

However, no adjustment to the selenium wet deposition was made because wet deposition was already accounting for 91% of the total deposition.

Even with the adjustment in wet deposition by a factor of 1.6, the adjusted wet deposition for most metals is less than 50% of total deposition.

Table D2-2 Summary Table of Adjustments in Background Metal Deposition Due to the Under-Collection of Precipitation at the Eagle Harbor, Michigan Monitoring Site (reported data from Sweet et al. 1998.)

Metal	Reported Dry Deposition [1]	Reported Wet Deposition [1]	Adjusted Wet Deposition [2]	Adjusted Total (Dry + Adjusted Wet) [3]	Dry Deposition as a % of Adjusted Total	Adjusted Wet Deposition as a % of Adjusted Total
	μg/m2/yr	μg/m2/yr	μg/m2/yr	μg/m2/yr		
Vanadium	260	78	125	385	68%	32%
Chromium	130	78	125	255	51%	49%
Manganese	1,900	2,300	3,680	5,580	34%	66%
Nickel	570	230	368	938	61%	39%
Copper	2,400	700	1,120	3,520	68%	32%
Zinc	5,300	3,500	5,600	10,900	49%	51%
Arsenic	91	78	125	216	42%	58%
Selenium	52	520	520 [4]	572 [4]	91% [4]	9% [4]
Cadmium	380	78	125	505	75%	25%
Lead (Pb)	920	550	880	1,800	51%	49%

μg/m2/yr = micrograms per square meter per year

- [1] Deposition as reported by Sweet et al. (1998).
- [2] Adjusted Wet Deposition = Reported Deposition x 1.6
- [3] Adjusted Total Deposition = Reported Dry Deposition + Adjusted Wet Deposition
- [4] Selenium wet deposition and total deposition were not adjusted for under-collection of precipitation.

Adjustment in total deposition compared to the deposition reported by Sweet et al. (1998) is summarized in Table C2-3. Overall, the adjustment in wet deposition by a factor of 1.6 (60% increase) results in relatively small increases in total deposition. Because dry deposition is the major component of the total deposition, the adjustment in the wet deposition for undercollection of precipitation does not change the total deposition appreciably and for most of the metals wet deposition is still the smaller component of the total deposition (Table C2-2).

Table D2-3. Change in estimated total deposition from the values originally reported by Sweet et al (1998)

	Initial Data: Fro	om Sweet et al. ((1998)			
						% Change in Total Deposition
Metal	Reported Dry Deposition	Reported Wet Deposition	Reported Total Deposition (wet + dry)	Adjusted Wet Deposition	Adjusted Total Deposition (adjusted wet + dry)	(Adjusted Total - Reported Total)/Reported Total
	μg/m2/yr	μg/m2/yr	μg/m2/yr	μg/m2/yr	μg/m2/yr	%
Vanadium	260	78	338	125	385	14%
Chromium	130	78	208	125	255	23%
Manganese	1,900	2,300	4,200	3,680	5,580	33%
Nickel	570	230	800	368	938	17%
Copper	2,400	700	3,100	1,120	3,520	14%
Zinc	5,300	3,500	8,800	5,600	10,900	24%
Arsenic	91	78	169	125	216	28%
Selenium	52	520	572			
Cadmium	380	78	458	125	505	10%
Lead (Pb)	920	550	1,470	880	1,800	22%



Memorandum

To: Project File From: Peter Hinck

Subject: NorthMet Mine Site to Plant Site rail impacts modeling

Date: December 21, 2012

Project: 23690862.00

This memorandum documents the water quality modeling assumptions and methods used to estimate the potential indirect impacts to wetlands along the Mine Site to Plant Site rail corridor. The basis for this analysis is described in the Wetland Analysis Work Plan (Reference [1], Section 4.3.2).

Conceptual model

As discussed in Reference [1], the goal of this analysis is to estimate the quality of water contacting spilled ore material along the rail corridor. If the resulting water quality (at Point 1 in Figure 1 below) is found to have a greater than 10 percent likelihood of exceeding surface water quality standards, this analysis seeks to determine the unit area needed (dimension *X* in Figure 1) to provide sufficient precipitation to dilute the water to meet water quality standards (at Point 2 in Figure 1).

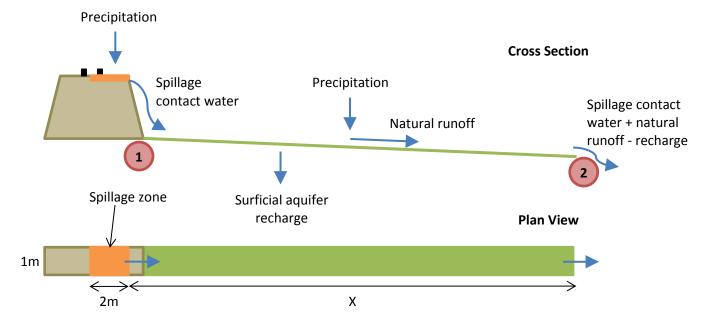


Figure 1 Rail spillage conceptual model schematic

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This modeling was performed using a probabilistic simulation in the GoldSim software, similar to the water quality modeling for the Mine Site. The model was run at a monthly timestep for 100 years, with 500 realizations performed using the GoldSim Monte Carlo simulation package.

Model input parameters

The list below includes all of the input parameters used in this modeling and their references. Any adjustments from the referenced methods or values are documented here.

Geochemical Parameters

- Width of spillage zone: 2 meters on both sides of the centerline of the railway (total width = 4 meters) (Reference [1], Section 4.3.2)
- Mass of spilled ore: 2.14 kg/m² at the end of 20 years, assumed to accumulate linearly from zero mass at time zero (Reference [1], Section 4.3.2)
- Humidity cell release rates: As defined for "ore composites" (Reference [2], Section 8.1)
- Water contact factor: 1.0, assumed complete rinsing (Reference [2], Section 8.4.3)
- Particle size factor: 1.0, assumed particle size distribution identical to humidity cells (Reference [2], Section 8.4.3)
- Temperature factor: uncertainty in annual field temperature and activation energy (Reference [2], Section 8.2.4)
- Acidification: uncertainty in acidification factor and time to acidification, time to acidification assumed to be scaled by the temperature factor (Reference [2], Sections 8.2.5 and 9.4)
- Concentration caps: uncertainty in nonacidic and acidic concentration caps for Duluth Complex Category 2/3/4 waste rock and ore (Reference [2], Sections 8.3.1.6 and 8.3.3)
- Depletion: mass of constituents per unit ore (Reference [2], Sections 8.4.1)

Hydrology Parameters

- Annual and monthly precipitation: uncertainty in annual precipitation (Reference [3], Section 5.2)
- Contact water from spilled ore: uniform range from 40% to 60% of annual precipitation (Reference [3], Section 6.1.3.4.2)
- Runoff from natural areas: uncertainty in summer and winter runoff as a percent of precipitation (Reference [3], Section 6.1.3.3.2)
- Annual surficial aquifer recharge: uniform range from 0.36 to 1.8 inches per year (Reference [3], Section 5.4.1.2)

Water Quality Parameters

- Background runoff water quality: uncertainty in mean runoff concentrations, calibrated to the Partridge River watershed (Reference [3], Section 5.3.2)
- Surface water quality standards: standards applicable to the Partridge River, 100 mg/L hardness assumed for hardness-based standards (Reference [3], Section 2.2)

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Additional modeling assumptions and methods

Constituent release from the spilled ore was modeled using release rates derived from ore composite humidity cells as well as from total metal content to total sulfur ratios from tests on core samples of ore rock (Reference [2], Section 8.1). Sulfate release was modeled using the linear regression to sulfur content developed from humidity cells at a range of sulfur contents (Reference [2], Section 8.1.1). The sulfur content used in this calculation was the currently-modeled sulfur content, with the result that sulfate release rates decrease as the remaining sulfur content decreases in the model. For metals with release rates based on metal to sulfur ratios, this method results in a corresponding decrease in metal release rates.

The water balance for the both the spillage zone and the natural runoff zone was modeled with consideration of the effects of snowmelt. Precipitation during the months of November through March is assumed to be stored on the landscape as snow. The accumulated snow is released as a one-month flow during the month of April. This method reduces the potential for unrealistically high concentrations due to low flows in the winter months, when in reality any water will be frozen in ice and snow.

The defined runoff or contact water from the spillage zone is assumed to be completely mixed with the runoff from natural areas. The only loss of water (and dissolved constituent mass) from this system prior to evaluation of standards compliance is due to recharge into the surficial aquifer. The recharge lost from the system is assumed to flow at the same rate both beneath the ore spillage zone (contact water concentration) and within the natural areas (mixed contact and natural runoff water concentration).

The modeled concentrations of all constituents were compared to surface water quality standards at each timestep during the 100-year simulation at both the edge of the spillage zone (Point 1 in Figure 1) and at the downstream edge of the mixing zone (Point 2 in Figure 1). For every timestep the fraction of the 500 realizations with recorded exceedances of the water quality standards was computed and compared to the stated goal of a less than 10% likelihood of exceeding a standard. For example, if at model time 20.5 years the concentration of copper was above the water quality standard in 75 of the 500 realizations, the simulation would have a 15% (75/500) likelihood of an exceedance and would fail the 10% goal. The model was run multiple times with varying lengths of the dilution zone (dimension *X* in Figure 1) until the 10% goal was met for all constituents in all timesteps.

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Results

For the majority of the modeled constituents, concentrations are expected to be well below the applicable surface water quality standards at the edge of the spillage zone. No additional dilution from unimpacted surface runoff is necessary, and there is little or no potential for indirect impacts to adjacent wetlands.

Four constituents have modeled concentrations at the edge of the spillage zone that have a greater than 10% likelihood of exceeding surface water quality standards: aluminum, cobalt, copper and nickel. The modeled water quality in the spillage contact water is shown for each of these constituents in Figure 2 through Figure 5; sulfate concentrations are also included for reference in Figure 6.

Background surface runoff has an approximately 20% likelihood of exceeding the water quality standard for aluminum, so no amount of dilution is possible to meet the goal of less than 10% likelihood of exceeding the standard. Therefore aluminum was not carried forward for additional analysis.

For cobalt, the likelihood of exceeding the surface water quality standard at the edge of the seepage zone is a maximum of approximately 90%. Using successive runs of the water quality model it was estimated that 2.5 meters (perpendicular to the rail line) of additional natural background runoff is necessary to reduce the likelihood of exceeding the standard to below 10%. Figure 7 shows the modeled cobalt concentrations at the downstream edge of a 2.5-meter buffer. Figure 8 shows the likelihood of exceedance for cobalt through time for both the edge of the seepage zone (purple line) and at the edge of a 2.5-meter buffer (green line).

For nickel, exceedances of the surface water quality standard at the edge of the seepage zone occurred in all model realizations for a period of about 30 years. Compared to cobalt, a longer buffer of an unimpacted runoff zone is necessary in order to dilute nickel concentrations to below the standard; the required distance is estimated as 30 meters (perpendicular to the rail line) for nickel. Figure 9 shows the modeled nickel concentrations at the downstream edge of a 30-meter buffer. Figure 10 shows the likelihood of exceedance for nickel through time for both the edge of the seepage zone (purple line) and at the edge of a 30-meter buffer (green line).

For copper, the modeled water quality at the edge of the seepage zone is consistently above the surface water quality standard until copper depletion begins to occur after about 40 years. Copper requires the longest buffer of an unimpacted runoff zone in order to have a less than 10% likelihood of exceeding the

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standard; the required distance is estimated as 675 meters (perpendicular to the rail line). Figure 11 shows the modeled copper concentrations at the downstream edge of a 675-meter buffer. Figure 12 shows the likelihood of exceedance for copper through time for both the edge of the seepage zone (purple line) and at the edge of a 30-meter buffer (green line).

Recommendations

Based on this analysis, it is recommended that wetlands with watersheds that contain less than 675 m² of unimpacted areas per meter of rail (one-sided) within the watershed be identified as potentially indirectly impacted due to water quality changes. Wetlands that are physically near the rail corridor but are not hydraulically connected to the rail line (i.e. no rail spillage areas are within the wetland's watershed) should not be considered to be indirectly impacted due to rail spillage effects.

References

- [1] NorthMet Project Wetland Analysis Work Plan. Version 3, October 2011.
- [2] NorthMet Project Waste Characterization Data Package. Version 9, July 2012.
- [3] NorthMet Project Water Modeling Data Package Volume 1 (Mine Site). Version 10, July 2012.

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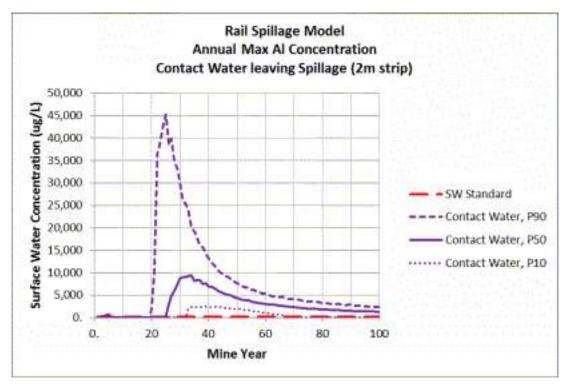


Figure 2 Aluminum concentrations at the edge of the spillage zone

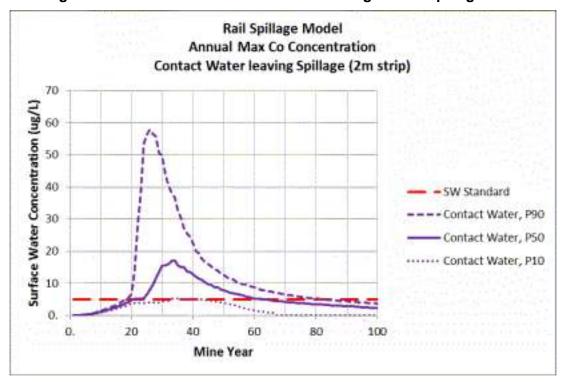


Figure 3 Cobalt concentrations at the edge of the spillage zone

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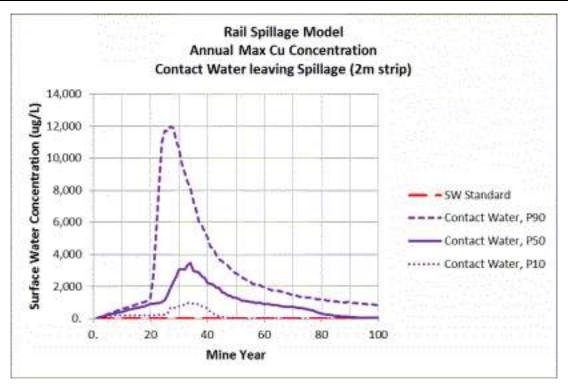


Figure 4 Copper concentrations at the edge of the spillage zone

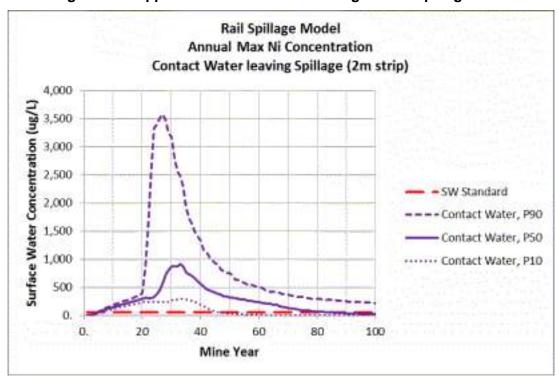


Figure 5 Nickel concentrations at the edge of the spillage zone

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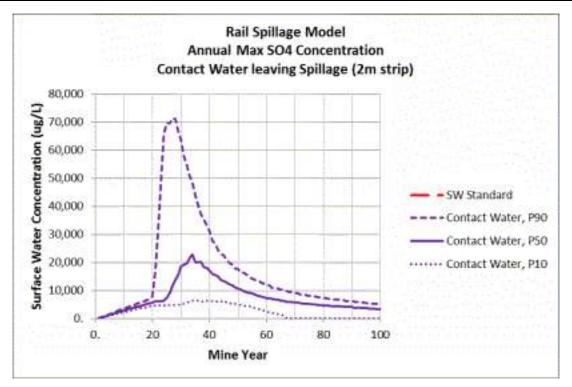


Figure 6 Sulfate concentrations at the edge of the spillage zone

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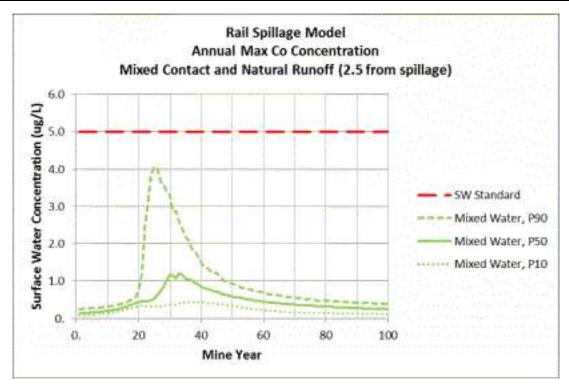


Figure 7 Cobalt concentrations at the edge of a 2.5-m buffer

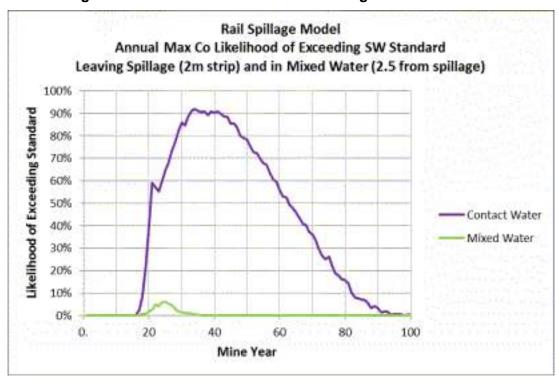


Figure 8 Cobalt likelihood of exceedance

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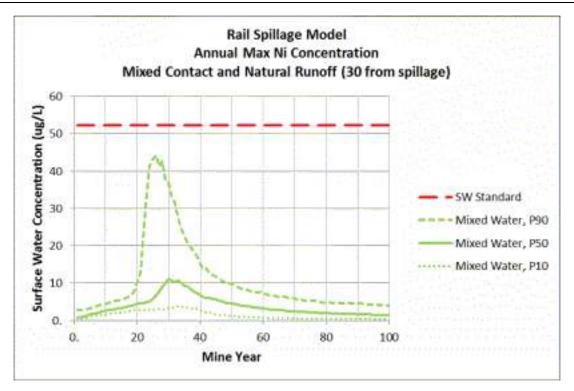


Figure 9 Nickel concentrations at the edge of a 30-m buffer

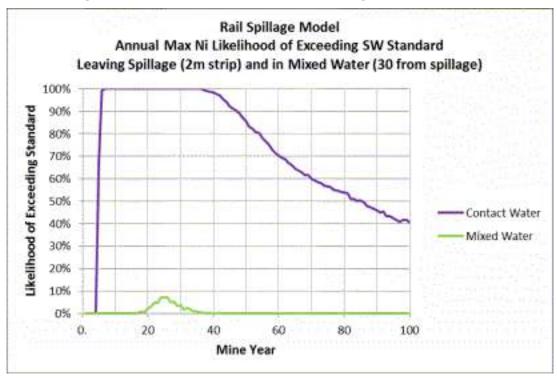


Figure 10 Nickel likelihood of exceedance

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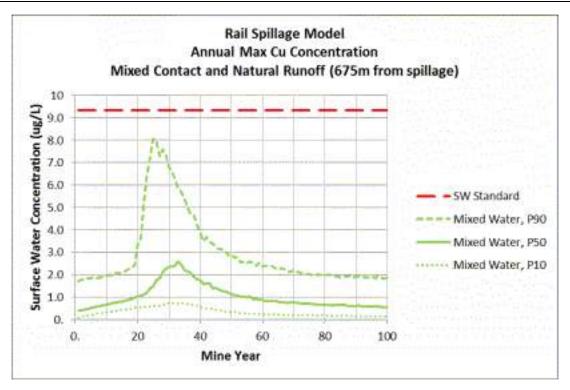


Figure 11 Copper concentrations at the edge of a 675-m buffer

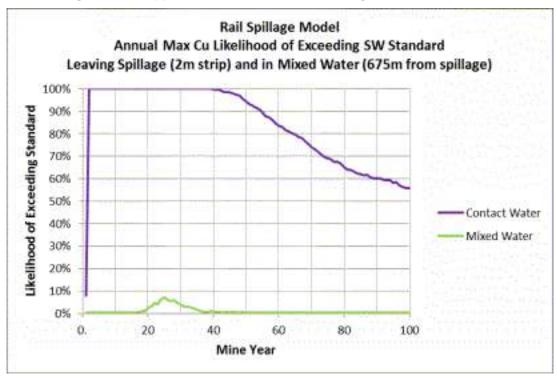


Figure 12 Copper likelihood of exceedance

Attachment F

 $For esee able\ Future\ Actions\ within\ the\ Partridge\ River\ and\ Embarrass\ River\ Watersheds$

1. U.S. Forest Service

- a. Superior National Forest: Marty Rye
 - i. The Eastern States BLM office has received 33 federal hardrock mineral prospecting permit applications and 21 operating plan proposals for mineral explorations in Superior National Forest. An EIS for the prospecting permits is currently under draft revision to determine where and under what circumstances the lands may be explored. The scope of the DEIS covers 1.7 million acres of land in Superior National Forest. Wetland impacts are unknown at this time but may occur if mineral prospecting permits are accepted.

2. Minnesota DNR

- a. Lands and Minerals: Anne Jagunich
 - i. The Mesabi Nugget project at the old LTV site will impact wetlands and the Partridge River. No other projects were identified.
- b. Forestry: Mike Magnuson
 - i. Future wetland impacts are not known at this time.
- c. Waters: Amy Loiselle
 - i. She referred to St. Louis County planning, MN BWSR, MN DNR staff, USFS staff, the Duluth EPA, MPCA, and Iron Range Resources for information on specific projects in the future.

3. Minnesota DOT

- a. Website
 - i. The website lists upcoming projects on Highways 135 and 37, which cross the Partridge River watershed. However, project locations are outside the watershed boundaries. No wetland impacts are expected.
- b. Duluth office: Howard Mackey
 - i. Highway projects are planned no more than 3 years in advance, but long range road plans do not show any highway projects in the watersheds for the next 20 years. Routine culvert replacements will be conducted on highways 135 and 37, but any wetland impacts will be temporary.
- 4. Minnesota Board of Soil and Water Resources
 - a. Joan Weyandt
 - i. She referred to St. Louis County Landuse and Planning and had no information on projects impacting wetlands.
- 5. St. Louis County
 - a. Landuse Planning and Zoning, Duluth office: Mark Lindhorst

- The Embarrass River watershed has little development, and no major projects are planned which will affect wetlands. The only foreseeable development in the watersheds includes homeowners adding decks, garages, or driveways to their properties. No wetland impacts are known at this time.
- b. Land Department, Pike Lake office: Mark Pannkuk
 - i. The Land department only manages tax forfeit lands, most of which is forestland. Foreseeable wetland impacts from the Land department may include logging bridges "under the silviculture exemption" over the next 5 years. He referred to Planning and Zoning department for specific permitting information and other projects in the county.
- c. Public Works Department, Duluth office: Inga Foster

 - ii. Projects in the study watersheds in the 10 year plan include: 8 bridge replacements and 1 complete road re-build (also mentioned by the City of Biwabik contact as a 3.5 mile road replacement project). Bridge replacements should impact no greater than 10,000 sq. feet per bridge for a maximum wetland impact of 80,000 sq. ft. (1.8 acres). Wetland impacts associated with the road replacement are unknown at this time.
- 6. North St. Louis County Soil and Water Conservation District
 - a. Virginia Office: Paul Ojanen
 - i. He referred to Inga Foster for county public works roads projects. Cliffs-Eerie is expanding a road near Babbitt for a mining project that will result in wetland impacts. There may also be an unknown number of smaller-scale projects which may impact wetlands. He also referred to St. Louis County Land Department for forestry impacts and the MNDOT in Duluth for highway impacts.

7. City of Babbitt

- a. Public Works: Rich Posie
 - i. The City of Babbitt is planning road building and storm sewer maintenance in the western portion of the municipality. Wetland impacts are unknown at this time.
- 8. City of Biwabik
 - a. City Administrator: Jeff Jacobsen
 - i. Two projects may impact wetlands in the Partridge River watershed. First, County Highway 4, just north of Biwabik, is being extended, and the project will create 3.5 miles of new roadway; this is the same

project described by St. Louis County Public Works.

- 9. City of Embarrass
 - a. Town Clerk: Diane Nelmark
 - i. Future wetland impacts are not known at this time.
- 10. City of Gilbert
 - a. Public Works: Ken Kuitunen
 - i. Future wetland impacts are not known at this time.
- 11. City of Aurora
 - a. Public Works
 - i. Future wetland impacts are not known at this time.
- 12. City of Mckinley
 - a. Public Works
 - i. Future wetland impacts are not known at this time.
- 13. City of Hoyt Lakes
 - a. Public Works
 - i. Future wetland impacts are not known at this time.
- 14. Iron Range Resources and Rehabilitation Board (IRRRB)
 - a. Mining and Mine land Reclamation: Dan Jordan
 - i. A number of mining projects may impacts wetlands within the Partridge and Embarrass River watersheds. Pending approval, Mesabi Nugget, Twin Metals, Arcelor Mittal, Northshore Mining Company, Encampment Resources, and Teck Resources plan to pursue underground copper-nickel mining operations. All projects are currently in the exploratory and/or permitting phase.
 - ii. Cardero Resource Corp. is currently in an "advanced" exploratory phase of an iron-titanium (Ilmenite) mining project just south of Hoyt Lakes at the Longnose property. The plant for this mining operation will likely be located within or adjacent to Hoyt Lakes. See the project summary dated April 12, 2011 at:

http://www.cardero.com/s/minnesota_ferro.asp?ReportID=459547

Attachment B

NorthMet Project Wetland Analysis Work Plan v3



NorthMet Project Wetland Analysis Work Plan

Version 3

October 13, 2011

NorthMet Project

Wetland Analysis Work Plan

Version 3

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1. Project

This document is the Work Plan for wetland analysis for the NorthMet Project (Project) as specified in Wetland Resources IAP Final Summary Memo and Co-lead Agency Final Work Plan Preparation Guidance of July 1, 2011 (Guidance Document) and the Wetland IAP Work Plan Compiled Comments dated August 30, 2011.

The project that will be modeled is the project described in the Co-lead Agency Draft Alternative Summary as amended in September, 2011. The Project Footprint that will be used for this analysis has been defined and detailed in the NorthMet Project Project Description (Reference 1).

2. Background

Wetland impacts for the Project were previously evaluated for the DEIS and included direct, potential indirect, and cumulative impacts. Using the wetland types and acreages identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), direct, potential indirect, and cumulative impacts will be evaluated as described in the following sections. The results of the wetland analysis in this Work Plan will be presented in the Wetland Data Package.

3. Direct Wetland Impacts

Direct wetland impacts will result from filling and excavation. The analysis performed for the SDEIS will duplicate the analysis performed for the DEIS (Section 4.2 of Reference 2) using the current Project Footprint described in Reference 1.

Wetlands within the Project Footprint will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for each wetland were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

The analysis output for the direct wetland impact will include:

- 1. A summary table will provide information for each wetland within the Project Footprint and include:
 - a. The wetland type, wetland acreage, and direct impact will be calculated using GIS.
 - b. The type of direct impact (fill, excavation, etc.) will be identified.
 - c. The quality of each wetland will be identified.
- 2. For each Eggers and Reed (1997) wetland type, a summary table will provide the total acreage and total acres of direct impact for the following Project Areas Mine Site, railroad corridor, Dunka Road and utility corridor, Plant Site, Flotation Tailings Basin, Hydrometallurgical Residue Facility, and the Colby Lake water pipeline corridor.
 - a. Figures for each of the Project Areas will be created that show the areas with direct wetland impacts.
- 3. The total direct wetland impact acreage for the Project Footprint will be provided.

4. Potential Indirect Wetland Impacts

The analysis of potential indirect wetland impacts will be completed using the Guidance Document. The purpose of this analysis is to provide an estimate of potential indirect wetland impacts.

Potential indirect wetland impacts will be assessed based on: changes in wetland watershed areas (during operation and post-closure); groundwater drawdown resulting from open pit mine dewatering; groundwater mounding/drawdown resulting from operation of the Flotation Tailings Basin including groundwater seepage interception wells; changes in stream flow near the Mine Site and Flotation Tailings

Basin and associated impacts to wetlands abutting the streams (during operation and post-closure); wetland fragmentation from Project elements such as open pits, stockpiles, haul roads, etc.; and changes in wetland water quality. If/when the Project is permitted, an indirect wetland impact monitoring plan will be implemented as part of the Section 404 permit conditions.

The analysis will be completed for the Mine Site, the Flotation Tailings Basin, and the transportation corridors (railroad and Dunka Road).

4.1 Mine Site

4.1.1 Wetland Identification

Wetlands within the Mine Site will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for Area One (which includes the Mine Site) were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

Wetland acreage by wetland type will be calculated using GIS within 500-foot radius increments beginning at the mine pits and continuing out to a total radius of 10,000 feet (for a total of 20 increments). The area of evaluation will only include wetlands within Area One where wetland type information has been developed and it will not include wetlands identified as directly impacted in Section 3.0. In addition, wetlands in the Peter Mitchell open pit taconite mine and areas north of this mine will be excluded from evaluation as described in the Guidance Document.

- 1. A detailed table will be provided for each increment identifying the wetland type and acreage for each wetland.
- 2. A summary table will be provided for each increment identifying the total acreage and total acres of direct impact for each Eggers and Reed (1997) wetland type.
- 3. For each wetland that will be directly impacted, the acreage for the portion of the remaining wetland will be calculated and included in a table.
- 4. A figure will be provided showing the increments and identifying the Eggers and Reed (1997) wetland types within each increment.

4.1.2 Potential Indirect Wetland Impacts Resulting from a Change in Watershed Area

For each wetland that will not be directly impacted by fill or excavation, but will have Project elements impacting its watershed, an estimate of the change in watershed area (acreage and percent gain or loss) will be calculated.

The change (acreage and percent gain or loss) in watershed areas and the wetland area found within each watershed will be identified for the following conditions: pre-Project, during operation when the maximum amount of watershed has been removed, and at closure.

An estimate of potential indirect wetland impacts (wetland acres by wetland type and type of indirect impact) will be calculated for non-directly impacted wetlands that will have changed watershed areas (during operation and post-closure) for each watershed that was identified as changed in the previous paragraph, using the following steps:

- 1. Determine the tributary acres per wetland acre for the pre-Project, during operation, and after closure conditions.
- 2. Determine the equivalent watershed yield (ac-ft/yr) for the pre-Project, during operation, and after closure conditions. The existing watershed yield will be calculated based on available gage data from Section 4.4.1 of Reference 3. This rate would be applied to each watershed to

- convert the tributary ratio in Step 1 to an equivalent yield (or equivalent average contributing net precipitation), expressed as acre-feet/year (ac-ft/yr) per acre of wetland.
- 3. The range in the equivalent yield (inches/year) estimated over the life of the Project will be evaluated relative to pre-Project yield to calculate a maximum percent change in yield. The estimated relative change in yield will be evaluated on a case-by-case basis, taking into account factors such as wetland type, to determine the potential for indirect impacts (e.g., groundwater fed wetlands may be less susceptible to changes in surface watershed).

4.1.3 Potential Indirect Wetland Impacts Resulting from Wetland Fragmentation

For remaining wetlands not directly impacted or indirectly impacted by watershed area changes, an estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) from wetland fragmentation by Project features (open pits, stockpiles, haul roads, etc) will be determined, using the following steps:.

1. For each portion of a remaining wetland, excluding indirect impacts from watershed changes, the potential area of indirect impacts will be determined based on an analysis of the various factors that may contribute to potential fragmentation. Based on this analysis, the identifying factor(s) contributing to potential fragmentation (change in size of wetland, surrounded by Project features, change in function and values of wetland e.g. wildlife habitat, etc.) will be identified. [Note: noise and dust do not cause fragmentation impacts according to the U.S. Army Corps of Engineers, May 16, 2011 conference call.]

4.1.4 Potential Indirect Wetland Impacts Resulting from Changes in Hydrology

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of indirect impact) due to groundwater drawdown from open pit mine dewatering, based on the Co-lead Agency guidance for estimating potential indirect wetland impacts from groundwater drawdown near open pit mines as provided on July 1, 2011 will be determined, using the following steps.

- 1. Use the information provided by the Groundwater IAP Group and other available and relevant hydrogeologic data to justify whether to use or modify the provided analogue information which is based upon comparisons of the existing regional and site specific geologic data (such as bedrock faults, bedrock joint systems, bedrock topography, glacial till hydraulic conductivities, etc.), site specific engineering controls such as the Category 1 Waste Rock Stockpile seepage containment system, and the geologic settings of the analogue information sites and the Mine Site.
- 2. Use the guidelines provided by the Corps Memorandum (CEMVP-OP-R) Distinguishing Between Bogs That Are Entirely Precipitation Driven Versus Those with Some Degree of Mineral Inputs from Groundwater and/or Surface Water Runoff to identify minerotrophic and ombrotrophic coniferous and open bogs.

The potential indirect wetland impact from glacial aquifer drawdown will be based on the analogue impact zone with the greater potential drawdown (zone closer to the open pit mine) for wetlands that lie on both sides of the analogue distance boundary. The analogue distances are described below in steps 1, 2, 3 and 4.

- 1. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within 0 feet to 1,000 feet from the pit edge. The table will also identify the type of indirect wetland impact for each indirectly impacted wetland. Identify the likelihood of wetland hydrology impact based on wetland type.
 - a. High Likelihood includes coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, and alder thicket

- b. Moderate Likelihood deep marsh, shallow marsh, and shallow open water
- c. Low Likelihood minerotrophic coniferous bog and open bog
- d. No Impact anticipated as identified in Guidance Document ombrotrophic coniferous bog and open bog
- 2. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within >1,000 feet to 2,000 feet from the pit edge. The table will also identify the type of indirect wetland impact for each indirectly impacted wetland. Identify the likelihood of wetland hydrology impact based on wetland type.
 - a. Moderate Likelihood coniferous swamps, hardwood swamps, sedge/wet meadow, shrub-carr, and alder thicket
 - b. Low Likelihood deep marsh; shallow marsh, and shallow open water
 - c. No Impact anticipated as identified in Guidance Document minerotrophic and ombrotrophic coniferous bog and open bog
- 3. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within >2,000 feet to 3,500 feet from the pit edge. The table will also identify the type of indirect wetland impact for each indirectly impacted wetland. Identify the likelihood of wetland hydrology impact based on wetland type.
 - a. Low Likelihood coniferous swamp, hardwood swamp, sedge/wet meadow, shrub-carr, alder thicket
 - b. No Impact anticipated as identified in Guidance Document deep marsh, shallow marsh, shallow open water, coniferous bog, open bog
- 4. For all wetlands, provide a table and figure identifying type and acreage of wetlands located within >3,500 feet to 10,000 feet from the pit edge (within the wetland evaluation area). The table will also identify the type of indirect wetland impact for each indirectly impacted wetland.
 - a. No Impact anticipated as identified in Guidance Document all wetland types

A general discussion will be provided regarding the potential indirect wetland hydrology drawdown impacts to each wetland type based on the wetland sensitivity class tables for falling groundwater tables found in the Crandon mine project document titled *Wetland Impact Assessment Technical Memorandum – Appendix B* (Peterson Environmental Consulting, Inc. 2002).

1. A qualitative discussion of the types of potential indirect wetland impacts that might occur will be provided based on hypothetical hydrologic drawdown levels. Potential indirect wetland impacts might include: conversion to other wetland community types, a change in vegetation without a change in community type, conversion to uplands, or other impacts, which will be categorized using the Eggers and Reed (1997) wetland classification system.

4.1.5 Potential Indirect Wetland Impacts for Wetlands Abutting the Partridge River

Estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for wetlands abutting the Partridge River as a result of changes in river flow resulting from the Project (during operation and post-closure), using the following steps.

1. Identify in GIS the wetlands abutting the Partridge River within Area One. A table will identify the wetland ID, type and acreage for each wetland (only within the area previously characterized for wetlands).

- 2. Provide the change in flow and water levels in the Partridge River using the model developed in Section 5.6 of Reference 3.
- 3. Identify whether the changes in flow (and therefore stage) resulting from the Project are within the observed natural variation for the Partridge River (Section 4.4.1 of Reference 3).
- 4. If the changes in flow and water levels are not within the observed natural variation for the Partridge River, identify the potential indirect impacts for the wetlands abutting the Partridge River.

4.1.6 Potential Indirect Wetland Impacts Resulting from Water Quality Changes

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for remaining wetlands not directly impacted or indirectly impacted by previously evaluated causes in Sections 4.1.2 through 4.1.5 that would be impacted by water quality changes (such as from sulfidebearing dust deposition, ore spillage, seepage from stockpiles, etc.) will be completed using the following steps:

1. Fugitive Dust Emissions

- a. The air emissions from all surface fugitive dust sources at the Mine Site will be modeled using an EPA approved air dispersion model with a deposition algorithm (AERMOD version 11103). This is the same model that has been proposed to be used for assessing air impacts in Class II areas in the draft NorthMet Air Modeling Work Plan (version 1, May 9, 2011) which was developed in response to the Air Impacts Assessment Planning Summary Memo dated May 6, 2011. Comments have been received on this draft Work Plan, with no objections to the proposed model, so this model is expected to be specified in the final Work Plan. Emission rates and particle size distributions will be based on total particulate matter. Receptors will be placed on all delineated wetlands within the Project ambient air boundaries that have not been identified as directly impacted. The receptor grid will also initially extend 5 kilometers beyond the ambient air boundaries with a grid spacing of 500 meters. The receptor grid may be adjusted based on preliminary modeling results. Other modeling details would generally follow those specified in the Class II modeling protocols for the Mine Site as defined by the Air IAP and/or generally excepted modeling practice.
- b. The modeled dust sources at the Mine Site will include ore and waste rock truck loading and unloading outside of the pits, railcar loading, dust generation from traffic on unpaved roads on the surface (i.e. not in the pits), and overburden and other construction rock screening and/or crushing as defined by the Air IAP.
- c. Rock handling and roads within the pits will not be included in the analysis because: a) "pit-trapping" would greatly reduce the potential for dust to impact areas outside of the pits and b) Barr's past experience which indicates that the AERMOD "open pit" algorithm is incompatible with the AERMOD deposition algorithm.
- d. The output of the model will be deposition rate (grams per square meter) on an annual basis. The model results will be compared to background values such that contours where the modeled deposition is small relative to the background value can be developed. This can be considered a conservative assessment of how far away potential impacts to wetlands from dust may occur from fugitive dust sources. This should be considered a screening level analysis such that it would identify an upper bound for the potential range of distances at which impacts might occur, but the results will not identify actual impacts. This range of distances could be used to

estimate the extent of potential indirect impacts to guide development of monitoring plans to document actual indirect impacts. Based on the results of the screening analysis, PolyMet may propose a more refined approach to assess the distance at which potential impacts may occur.

2. Metals and Sulfide Dust Emissions

- a. The potential for sulfur deposition was evaluated for the DEIS Mine Plan in Screening Analysis of the Potential for Fugitive Dust Emissions Associated with Sulfide Rock Handling at the NorthMet Project Mine Site to Increase Sulfur Deposition to Nearby Wetlands (Barr, January 28, 2010). This analysis included dust emissions from the handling of Category 2, 3, and 4 waste rock and ore. Lean ore handling emissions were also modeled, but lean ore has been eliminated as a rock classification in the updated Mine Plan.
- b. The handling activities associated with Category 2, 3 and 4 waste rock and ore located outside of the pits will be included in the metals and sulfur analysis for the Mine Site. This includes truck loading and unloading with waste rock and ore and railcar loading with ore. Note: the potential for wind erosion from the stockpiles has been evaluated, and it has been determined that wind erosion would not occur through the use of EPA approved wind erosion calculations procedures in Section 13.2.5 of Reference 4. The calculations are described in the Mine Site Emission Inventory Spreadsheet (Version 2 Submitted August 1, 2011). This spreadsheet references the detailed calculations based on five years of meteorological data provided to MPCA via FTP site on May 9, 2011.
- c. Modeling will be conducted for the included sources in the same manner as described for dust modeling. The dust modeling and metals and sulfide modeling may be conducted in separate model runs or in the same run utilizing the model's source grouping capabilities.
- d. For air dispersion/deposition modeling, the total particulate emission rates (grams per second) will be speciated and converted to metals and sulfur emission rates based on data on the chemical composition of each material generating dust. Metals for evaluation, associated with rock and soils, would be: arsenic, cadmium, chromium, lead, manganese, nickel and selenium.
- e. Mercury will not be evaluated at the Mine Site for dust deposition because the concentration of mercury in the rock to be mined is very low (Sections 5.0 and 5.8 of Reference 3) and not considered to be environmentally significant in this medium.
- f. The model-estimated sulfur and metals deposition rates (grams per square meter) will be compared to background values to determine distance contours beyond which the deposition rate is insignificant compared to background. As with the dust analysis, this would be a screening level evaluation that could be used to identify a range of distances from a source beyond which impacts would be unlikely to occur. This range of distances could be used to estimate the extent of potential indirect wetland impacts to guide development of monitoring plans to document actual indirect impacts. PolyMet may choose to propose a more refined approach depending on the results of the screening level analysis. A more refined approach could take into account such factors as the potential for metals and/or sulfur to be liberated from the rock particles depending on the rock chemistry, environmental chemistry and general conditions in the ecosystem where the deposition is predicted to occur.
- 3. Ore spillage see the Section 4.3.2.

- 4. Leakage from stockpile will be evaluated using the following steps:
 - a. Quantify the amount of stockpile leakage water that discharges to surface water and wetlands, down gradient of the stockpiles based on the results of the water quality modeling.
 - b. Identify the wetlands (type, acreage) within the surficial aquifer groundwater flowpaths from mine features using boundaries used in the water quality modeling (as shown in the Groundwater IAP Summary document).
 - c. Categorize the wetlands within the flowpaths in Step ii into groundwater-fed and precipitation-fed wetlands using guidance from the Corps "Bog Memo" and evaluate the potential for indirect impacts based on potential water quality changes from the mine features.

4.1.7 Potential Indirect Wetland Impacts to Wildlife Utilization of Nearby Habitats From Project Noise

Provide a general discussion regarding the potential indirect wetland impact to wildlife utilization of nearby habitats from project noise using the following steps:

- 1. Identify the potential sources of project noise and the range of emitted noise levels.
- 2. Identify wildlife species that are found within the area, as well as their preferred habitats using wildlife surveys previously conducted for the NorthMet Project (Section 4.4 of Reference 2).
- 3. Qualitatively discuss the potential impacts and possible short- and long-term reactions of wildlife species to the potential project noise levels.

4.2 Flotation Tailings Basin

4.2.1 Wetland Identification

Wetlands around the Flotation Tailings Basin will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for Area Two (which includes the Flotation Tailings Basin) were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

Wetland acreage by wetland type will be calculated using GIS within 500-foot radius increments beginning at the Flotation Tailings Basin and continuing out to the Embarrass River. The area of evaluation will only include wetlands within Area Two where wetland type information has been developed and it will not include wetlands identified as directly impacted in Section 3.0.

- 1. A detailed table will be provided for each increment identifying the wetland type and acreage for each wetland.
- 2. A summary table will be provided for each increment identifying the total acreage and total acres of direct impact for each Eggers and Reed (1997) wetland type.
- 3. For each wetland that will be directly impacted, the acreage for the portion of the remaining wetland will be calculated and included in a table.
- 4. A figure will be provided showing the increments and identifying the Eggers and Reed (1997) wetland types within each increment.

4.2.2 Potential Indirect Wetland Impacts Resulting from Changes in Hydrology

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) from hydrologic changes (groundwater upwelling and resulting surface water flow in wetlands and/or groundwater drawdown near the groundwater seepage interception wells) resulting from groundwater seepage and/or interception well pumping will be determined.

- Quantify the amount of Flotation Tailings Basin groundwater seepage water that discharges
 to surface water features, including wetlands, down gradient of the Flotation Tailings Basin.
 A MODFLOW model developed for the Flotation Tailings Basin will be used in conjunction
 with a GoldSim probabilistic model to estimate the quantity of seepage that discharges to
 surface water features.
- 2. Identify all the wetlands (type, acreage) within the surficial aquifer groundwater flowpaths downgradient of the Flotation Tailings Basin using boundaries used in the water quality modeling (as shown in the Groundwater IAP Summary document).
- 3. Using the wetlands identified in step 2, categorize the wetlands into groundwater-fed and precipitation-fed wetlands using guidance in the Corps Memorandum (CEMVP-OP-R) Distinguishing Between Bogs That Are Entirely Precipitation Driven Versus Those with Some Degree of Mineral Inputs from Groundwater and/or Surface Water Runoff and evaluate the potential for indirect impacts resulting from groundwater seepage and/or interception well pumping.

Provide a general discussion regarding the potential indirect wetland hydrology impacts to each wetland type based on the wetland sensitivity class tables for rising groundwater tables found in the Crandon mine project document titled *Wetland Impact Assessment Technical Memorandum – Appendix B* (Peterson Environmental Consulting, Inc. 2002).

1. A qualitative discussion of the types of potential indirect wetland impacts that might occur will be provided based on hypothetical hydrologic drawdown or surchage levels. Potential indirect wetland impacts might include: conversion to other wetland community types, a change in vegetation without a change in community type, conversion to uplands, or other impacts, which will be categorized using the Eggers and Reed (1997) wetland classification system.

4.2.3 Potential Indirect Wetland Impacts for Wetlands Abutting Trimble Creek and the Two Unnamed Creeks

An estimate of potential indirect wetland impacts (wetland acres by wetland type) in wetlands abutting the three streams north and west of the Flotation Tailings Basin (Trimble Creek and the two unnamed creeks as shown in Figure 3 of the Water Resources IAP – Surface Water Summary Memo) as a result of changes in stream flow resulting from operation of the Flotation Tailings Basin will be determined using the following steps:

- 1. Identify in GIS the wetlands abutting the west Unnamed Creek (Mud Lake Creek), Trimble Creek, and the east Unnamed Creek within Area Two. A table will identify the wetland ID, type and acreage for each wetland (only within the area previously characterized for wetlands).
- 2. Provide the change in flow in the three streams using the GoldSim probabilistic model developed in Reference 6 and the method described in Section 4.4 of Reference 2. Estimate a corresponding change in stage based on available rating curves or simple hydraulic equations (e.g. Manning's equation).

- 3. Identify whether the changes in flow (and by extension, stage) are within the estimated natural variation for the three streams based on observed data or unit-area relationships extrapolated from gage data (Section 4.4.1 of Reference 5 and Page 3 of Reference 6).
- 4. If the changes in flow and water levels are not within the observed natural variation for the three streams, identify the potential indirect impacts for the wetlands abutting the three streams.

4.2.4 Potential Indirect Wetland Impacts Resulting from Water Quality Changes

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for wetlands that would be impacted by water quality changes (such as from sulfide-bearing dust deposition from the Flotation Tailings Basin, Flotation Tailings Basin groundwater seepage, etc.) will be completed using the following steps:

1. Fugitive Dust Emissions

- a. The air emissions from all surface fugitive dust sources at the Flotation Tailings Basin site will be modeled using an EPA approved air dispersion model with a deposition algorithm (AERMOD version 11103). This is the same model that has been proposed to be used for assessing air impacts in Class II areas in the draft NorthMet Air Modeling Work Plan (version 1, May 9, 2011) which was developed in response to the Air Impacts Assessment Planning Summary Memo dated May 6, 2011. Comments have been received on this draft Work Plan, with no objections to the proposed model, so this model is expected to be specified in the final Work Plan. Emission rates and particle size distributions will be based on total particulate matter. Receptors will be placed on all delineated wetlands within the Project ambient air boundaries that have not been identified as directly impacted. The receptor grid will also initially extend 5 kilometers beyond the ambient air boundaries with a grid spacing of 500 meters. The receptor grid may be adjusted based on preliminary modeling results. Other modeling details would generally follow those specified in the Class II modeling protocols for the Plant Site as defined by the Air IAP and/or generally excepted modeling practice.
- b. The modeled dust sources at the Flotation Tailings Basin will include LTV Steel Mining Company (LTVSMC) tailings loading and unloading, unpaved road traffic, and wind erosion from dams constructed of LTVSMC tailings and beaches composed of NorthMet tailings.
- c. The output of the model will be deposition rate (grams per square meter) on an annual basis. The model results will be compared to background values such that contours where the modeled deposition is small relative to the background value can be developed. This can be considered a conservative assessment of how far away potential impacts to wetlands from dust may occur from fugitive dust sources. This should be considered a screening level analysis such that it would identify an upper bound for the potential range of distances at which impacts might occur, but the results will not identify actual impacts. This range of distances could be used to estimate the extent of potential indirect impacts to guide development of monitoring plans to document actual indirect impacts. Based on the results of the screening analysis, if model-estimated particle deposition is equal to current background deposition (i.e., 100 percent of current background; i.e., a potential doubling of deposition), PolyMet may propose a more refined approach to assess the distance at which potential impacts may occur.

2. Metals and Sulfide Dust Emission

- a. At the Flotation Tailings Basin wind erosion from the embankment and beaches as well as truck traffic on roads composed of LTVSMC tailings will be included in the analysis.
- b. Modeling will be conducted for the included sources in the same manner as described for dust modeling. The dust modeling and metals and sulfide modeling may be conducted in separate model runs or in the same run utilizing the model's source grouping capabilities.
- c. For air dispersion/deposition modeling, the total particulate emission rates (grams per second) will be speciated and converted to metals and sulfur emission rates based on data on the chemical composition of each material generating dust. Proposed metals for evaluation, associated with rock and soils, will include: arsenic, cadmium, chromium, lead, manganese, nickel, and selenium.
- d. Because the NorthMet ore is low in mercury, the tailings, which includes roughly 98 percent of the ore, will also be low in mercury, and in fact pilot study data shows that the mercury preferentially goes to the flotation concentrate. The mercury in the tailings is also expected to be strongly bound within the mineral matrix. This is also true of the LTVSMC tailings that will be used to construct the Flotation Tailings Basin dams and that may be present on some road surfaces. Therefore, any mercury present in dust from the Flotation Tailings Basin would not be biologically available and we are not proposing to consider mercury in the deposition analysis at the Flotation Tailings Basin. When metal ores are concentrated and heated, such as in taconite mining or in smelting processes, then mercury becomes a metal of interest for air emissions and deposition. For the Project, potential mercury air emissions from ore processing (i.e., potential emissions from the autoclave) are being evaluated for potential local deposition impacts.
- e. The model-estimated sulfur and metals deposition rates (grams per square meter) will be compared to background values to determine distance contours beyond which the deposition rate is insignificant compared to background. As with the dust analysis, this will be a screening level evaluation that could be used to identify a range of distances from a source beyond which impacts would be unlikely to occur. This range of distances could be used to estimate the extent of potential indirect wetland impacts to guide development of monitoring plans to document actual indirect impacts. If model-estimated sulfur or individual metal deposition is equal to current background deposition (i.e., 100% of current background; i.e., a potential doubling of deposition), PolyMet may propose a more refined approach depending on the results of the screening level analysis. A more refined approach could take into account such factors as the potential for metals and/or sulfur to be liberated from the rock particles depending on the rock chemistry, environmental chemistry and general conditions in the ecosystem where the deposition is predicted to occur.

3. Flotation Tailings Basin Groundwater Seepage

- a. Identify the chemistry from the Flotation Tailings Basin groundwater seepage based on the results of the water quality modeling (Reference 6).
- b. Identify the wetlands (type, acreage) within the down gradient zone using boundaries used in the water quality modeling (as shown in the Groundwater IAP Summary document).
- c. Categorize the wetlands within the flowpaths in Step ii into groundwater-fed and precipitation-fed wetlands using guidance from the Corps Memorandum (CEMVP-

OP-R) Distinguishing Between Bogs That Are Entirely Precipitation Driven Versus Those with Some Degree of Mineral Inputs from Groundwater and/or Surface Water Runoff and evaluate the potential for indirect impacts based on potential water quality changes from the Flotation Tailings Basin.

4.2.5 Potential Indirect Wetland Impacts to Wildlife Utilization of Nearby Habitats From Project Noise

Provide a general discussion regarding the potential indirect wetland impact to wildlife utilization of nearby habitats from project noise using the following steps:

- 1. Identify the potential sources of project noise and the range of emitted noise levels.
- 2. Identify wildlife species that are found within the area, as well as their preferred habitats using wildlife surveys previously conducted for the NorthMet Project (Section 4.4 of Reference 2).
- 3. Qualitatively discuss the potential impacts and possible short- and long-term reactions of wildlife species to the potential project noise levels.

4.3 Transportation Corridors

4.3.1 Wetland Identification

Wetlands around the Flotation Tailings Basin will be identified using the Eggers and Reed (1997) community classification system. The wetland types and acreages for Area Two (which includes the Flotation Tailings Basin) were identified in the report entitled: *NorthMet Project Baseline Wetland Typing Evaluation* (Barr 2011), which was discussed with the Wetland IAP Workgroup and approved by the Co-lead Agencies on March 30, 2011.

The wetlands abutting the Dunka Road and the railroad corridor within Area One and Area Two will be identified using GIS. The wetland ID, type and acreage for each wetland (only within the area previously characterized for wetlands) will be identified in a table.

4.3.2 Potential Indirect Wetland Impacts Resulting from Water Quality Changes

An estimate of potential indirect wetland impacts (wetland acres by wetland type, and type of impact) for wetlands that will be impacted by water quality changes (such as from sulfide-bearing dust deposition, ore spillage, etc.) will be completed using the following steps:

Mine to Plant Rail

The potential release of dust from railcars transporting ore from the Mine Site to the Plant Site was addressed in the May 6, 2011 Air Impact Assessment Planning Summary Memo, "The air IAP group concluded that there would be minimal air impacts from any dust generated from ore hauled in the railcars due to the coarse nature of the ore." Based on this conclusion, air modeling of potential release of dust from railcars will not be performed because the potential wetland impacts will not be significant.

The air IAP group concluded that any dust generated from ore hauled in railcars would be coarse in nature (i.e., relatively large particles). These larger particles would tend to deposit near the railcar and not be dispersed to any great extent. An estimate of the spillage of ore fines along the rail corridor is shown in Section 8.5.3 of Reference 7. Assuming that all spillage of the coarse material would occur in a 2 meter wide strip on both sides of the centerline of the railway (total width = 4 meters) over the entire haul distance after loading (~ 8 miles; ~13,000 meters), results in approximately 0.11 Kg/square meter of ore fines annually or 2.14 Kg/square meter for the 20 year Project. This equates to 0.002 inch of depth annually or 0.05 inches for the 20 year Project.

Using the geochemical modeling methods described in Reference 7 for the Ore Surge Pile, the quality of water infiltrating through this material will be estimated on a per-unit area basis which will also be on a per unit length of the rail corridor. If the water quality is found to have a greater than 10 percent likelihood of exceeding water quality standards as defined in Table 1-3 of Reference 8, the unit area required to provide sufficient precipitation to dilute the water to meet standards will be calculated and converted to a distance to be added to the 2 meters from the centerline of the rail corridor that will be a potential dust impact corridor. Any wetlands identified in the above paragraph of this section that are within the potential dust impact corridor will be considered to be potentially indirectly impacted.

Dunka Road

Loaded mine haul trucks will not travel on the Dunka Road. Empty mine haul trucks will only travel on the Dunka Road when they are in need of maintenance at the Area 1 Shop. It is estimated that each truck will travel to Area 1 twice per year. The total one-way trips per year are estimated at 44. Given the low traffic volumes (< 1 trip per week on average) a quantitative assessment of impacts from ore particle discharge from haul trucks travelling down the Dunka Road is not warranted.

Product Shipping

Products produced in the hydrometallurgical plant (AU/PGM concentrate, mixed hydroxide precipitate) will be loaded into super sacks (i.e. large industrial sacks used to transport solid material) and then loaded onto trucks or railcars. There is little or no potential for spillage with this method of shipping. With respect to flotation concentrate, as stated in the project description (Reference 1) "Each filtered concentrate would be conveyed to separate stockpiles within an enclosed 10,000 ton storage facility for loading into covered rail cars. The storage facility would store about 7 to 10 days of production capacity when flotation concentrate would be directed to Concentrate Dewatering/Storage. The storage facility would have a concrete floor and provisions to wash wheeled equipment leaving the facility to prevent concentrates from being tracked out of the facility." The flotation concentrate is similar material to that which caused issues at the Red Dog Mine in Alaska (zinc concentrate transported in truck trailers), which has been cited as an example of potential consequences of product transport at mining operations. Some issues at Red Dog were driven by road dust and port activities which do not apply to the Project. Best Management Practices adopted at Red Dog - enclosed storage and loading, covered cars, and vehicle wash facilities - are proposed for use at the NorthMet project. Because the common carrier route (i.e. the rail line used to transport products) is not known (ultimate customer not known and could change), there is no way to assess impacts along the common carrier route. PolyMet will be paid on tons received by customers so it has a vested interest in not losing any concentrate. The covered rail cars will be inspected for holes and any holes repaired before concentrate loading.

4.3.3 Potential Indirect Wetland Impacts Resulting from Wetland Fragmentation

For remaining wetlands not directly impacted or identified in 4.3.2, an estimate of potential indirect wetlands (wetland acres by wetland type, and type of indirect impact) from wetland fragmentation by Project features will be completed using the following steps:

1. For each portion of a remaining wetland, excluding indirect impacts identified in 4.2.3, the potential area of indirect impacts would be determined based on an analysis of the various factors that may contribute to potential fragmentation. Based on the analysis, the identifying factor(s) contributing to potential fragmentation (change in size of wetland, surrounded by Project features, change in function and values of wetland e.g. wildlife habitat, etc.) would be identified. [Note: noise and dust do not cause fragmentation impacts according to the U.S. Army Corps of Engineers, May 16, 2011 conference call.]

4.3.4 Potential Indirect Wetland Impacts to Wildlife Utilization of Nearby Habitats From Project Noise

Provide a general discussion regarding the potential indirect wetland impact to wildlife utilization of nearby habitats from project noise using the following steps:

- 1. Identify the potential sources of project noise and the range of emitted noise levels.
- 2. Identify wildlife species that are found within the area, as well as their preferred habitats using wildlife surveys previously conducted for the NorthMet Project (Section 4.4 of Reference 2).
- 3. Qualitatively discuss the potential impacts and possible short- and long-term reactions of wildlife species to the potential project noise levels.

5. Cumulative Wetland Impacts

Analysis of cumulative wetland impacts will be done using accepted tools and protocols. The analysis performed for the DEIS is described and summarized in Section 4.3 of Reference 1. The analysis performed for the SDEIS will generally duplicate that effort using the revised direct and potential indirect wetland impact acreage, along with updated watershed information. The assessment will be conducted for both the Partridge River watershed and the Embarrass River watershed. The following steps will provide acreage for wetland and water resources for the pre-settlement, existing and foreseeable future conditions. Tables and figures will be developed to present the information.

5.1 Presettlement Wetland and Water Resources

The pre-settlement conditions time period represents wetlands, lakes, and deepwater resources as they existed prior to mining and urban development in the late 1800s to early 1900s. An estimate of presettlement wetland, lakes, and deepwater acreage within the Partridge River and Embarrass River watersheds will be developed in GIS using the following steps:

- The acreage of wetland and water resources estimated for the pre-settlement period will be developed using the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) and the original survey maps developed using data from the original Government Land Surveys along with other historical surveys and sources, generally from the late 1800s.
- 2. The NWI mapping efforts were generated from interpretations of black-and-white aerial photographs completed in the late 1970s to early 1980s. The NWI is a more accurate depiction of historic wetland resources where human disturbance has been limited. Therefore, the NWI will be used as a base wetland map and available delineation data will be substituted to improve the accuracy of the wetland mapping.
- 3. The original survey maps will be obtained from the MDNR GIS Data Deli maps at http://deli.dnr.state.mn.us/. The original survey maps identify water resources as marshes, bottoms, swamps, lakes, ponds, and rivers, as documented in early land surveys. The original survey maps are a more accurate depiction of historic wetland resources where human disturbance is present. The water resources within the areas of human disturbance in each watershed will be digitized and presented on a figure.
- 4. The wetland and water resources mapped on the original survey maps will be digitized for one township, with minimal disturbance (roads, railroads, mining areas, etc.) located within and adjacent to the Partridge River watershed and for one township located within the Embarrass River watershed. It is assumed that if there is a minimal amount of disturbance in a township, the NWI mapping would be representative of pre-settlement wetland and water resources conditions. Therefore the data from each township will be used to develop a relationship between the NWI and original survey data.

- 5. The total wetland and water resources acreage for the two data sets will be compiled and the ratio of NWI to original survey map wetland and water resources will be calculated for each township. This ratio will indicate the percent of wetland and water resources identified on the NWI maps compared the original survey maps. This ratio will be used as an adjustment factor to conform the original survey data to the standards and scales of the NWI data for estimating the pre-settlement wetland resources within the disturbed areas of the watershed. The selected townships and data used to determine the adjustment factor will be presented in a table.
- 6. For the human disturbance areas, the NWI wetlands and water resources located within the human disturbance polygon boundaries will be removed using a GIS clipping tool. The NWI within these disturbance areas do not accurately reflect pre-settlement conditions because the NWI either included wetlands that have since been eliminated because of disturbance activities or did not include wetlands that had already been eliminated when the NWI was completed (e.g., reservoir development permanently flooded the wetlands). Because the NWI does not accurately map these types of areas, it does not accurately represent pre-settlement conditions; therefore the NWI wetlands in the disturbed areas will be replaced with wetlands mapped on the original survey maps. The total area of wetland and water resources within those polygons will be corrected using the adjustment factor. The total acreage of pre-settlement wetlands and water resources will be estimated for the two watersheds.

5.2 Existing Wetland and Water Resources

The existing conditions time period represents wetland, lake, and deepwater resources as they exist today, prior to the development of the Project. An estimate of existing wetland, lake, and deepwater acreage within the Partridge River and Embarrass River watersheds will be developed in GIS using the following steps:

- 1. Existing wetland, lake, and deepwater resources will be estimated using: wetland delineations completed in the area (as available); lake or lacustrine water body acreages will be estimated using the USGS National Hydrograph Dataset and the NWI datasets; deepwater or mine pit water body acreages will be estimated using a combination of the MDNR Mesabi Mining Features (2008) and interpretation of 2003, 2008, 2009, and 2010 FSA aerial photographs; and NWI mapping.
- 2. A "composite" wetland and water resources layer will be developed by deleting all of the NWI polygons from areas in which more detailed mapping had been completed and replacing them with the delineated wetland, lake, and deepwater resources.

5.3 Projected Future Wetland and Water Resources

An estimate of future wetland acreage within the Partridge River and Embarrass River watersheds will be completed considering reasonably foreseeable future project wetland impacts, both direct and potential indirect. Reasonably foreseeable future projects are defined as those that have been permitted and those that have had permit applications submitted and/or are undergoing environmental review by regulatory agencies.

The future conditions time period represents wetland, lake, and deepwater resources expected to be present following conclusion and reclamation of the Project. It is assumed that the future conditions follows some time after conclusion of the future projects such that the mine pit will have filled with water.

Relevant public officials from city, county, state and federal agencies will be contacted to identify reasonably foreseeable future actions within the study area. Agency officials will be asked to identify reasonably foreseeable future projects that may occur during the life of the Project. Contacts will include

the City of Babbitt, St. Louis County, MDNR, Minnesota Board of Water and Soil Resources, the U.S. Forest Service, and the Iron Range Resources and Rehabilitation Board (IRRRB).

Future projects will be identified in the Partridge River watershed and the Embarrass River watershed that may impact wetland, lake, and deepwater resources. For the projected future conditions, the acreage of wetland, lake, and deepwater resources will be estimated by subtracting the future projected wetland impacts and adding the future projected development of wetland, lake, and deepwater resources to the existing resource totals. This information will be provided as a table.

5.4 Qualitative Analysis of Cumulative Wetland Impacts for the St. Louis River below the Ordinary High Water Mark From Its Confluence with the Embarrass River to Lake Superior

A qualitative analysis of cumulative wetland impacts for the St. Louis River below the ordinary high water mark from its confluence with the Embarrass River to Lake Superior will be developed based on a qualitative estimate of flow changes in the river.

A qualitative estimate of flow changes in the St. Louis River will be developed from the results of the Partridge River hydrologic modeling described in Section 7.1.1 of Reference 3. The estimated flow changes in the St. Louis River will be evaluated relative to gage data to determine if the changes are expected to be within the natural variation of flow within the St. Louis River will be developed using the following steps:

- 1. If the evaluation of the estimated flow changes in the St. Louis River is within the natural variation of average annual flow in within the St. Louis River observed at USGS gage 04016500 (St. Louis River near Aurora), no further analysis will be conducted. This location is the most upstream location of the St. Louis River affected by the NorthMet Project, and will therefore show the greatest impact.
- 2. If the evaluation of the estimated flow changes in the St. Louis River is not within the natural variation of flow in within the St. Louis River, the following analysis will be conducted.
 - a. An estimate of existing wetland acreage and wetland types below the ordinary high water mark of the St. Louis River from its confluence with the Embarrass River to Lake Superior will be made using the National Wetland Inventory.
 - b. An estimate of future wetland acreage and wetland types below the ordinary high water mark of the St. Louis River will be made from its confluence with the Embarrass River to Lake Superior.

5.5 Quantitative Analysis of Cumulative Wetland Impacts

5.5.1 Partridge River and Embarrass River Watersheds

A quantitative analysis of cumulative impacts for the Partridge River and Embarrass River watersheds will be developed using the following steps:

- 1. The acreage of wetland, lake, and deepwater resources for the pre-settlement, existing and reasonably foreseeable future conditions will be provided as a table. The foreseeable future conditions will include evaluation of a No Action Alternative and the Proposed Action.
 - a. The acreage of wetland, lake, and deepwater resources will be compared and discussed for the pre-settlement, existing and reasonably foreseeable future conditions.
 - b. The project's effect on the wetland, lake, and deepwater resources will be discussed and compared for the study area. This includes a discussion of changes in acreage,

water quality, unique habitat, adjacency to stream resources, and cumulative effects of projects within each watershed.

5.5.2 The St. Louis River below the Ordinary High Water Mark From Its Confluence with the Embarrass River to Lake Superior

A quantitative analysis of cumulative impacts for wetlands located below the ordinary high water mark of the of the St. Louis River from its confluence with the Embarrass River to Lake Superior will be developed using the following steps:

- 1. If the evaluation of the estimated flow changes in the St. Louis River is within the natural variation of flow in within the St. Louis River, no further analysis will be conducted.
- 2. If the evaluation of the estimated flow changes in the St. Louis River is not within the natural variation of flow in within the St. Louis River, determine the change in wetland acreage from existing to future conditions based on a qualitative estimate of flow changes in the St. Louis River.

5.6 Climate Change

A qualitative analysis of estimated climate change impacts (to be coordinated with the climate change evaluation being conducted for the air impacts chapter of the SDEIS) on cumulative wetland impacts in the Partridge River Watershed, the Embarrass River Watershed, and below the ordinary high water mark of the St. Louis River from its confluence with the Embarrass River to Lake Superior.

The qualitative assessment of the potential impacts of climate change on wetlands will be included in the Climate Change Evaluation Report developed by the Air IAP. No additional assessment will be conducted.

6. References

Reference 1 NorthMet Project Project Description, Version 3, September 13, 2011

Reference 2 NorthMet Project Draft Environmental Impact Statement. U.S. Army Corps of Engineers and Minnesota Department of Natural Resources. October 2009.

Reference 3 NorthMet Project Water Modeling Data Package – Volume 1 (Mine Site) Version 5

Reference 4 Compilation of Air Pollutant Emission Factors, AP-42 5th edit. Volume I Stationary Point and Area Sources, Section 13.2.5. Updated November 2006. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina.

Reference 5 NorthMet Project Water Modeling Data Package - Volume 2 (Plant Site) Version 2

Reference 6 Surface Water IAP Group Summary Document, Date: May 20, 2011.

Reference 7 NorthMet Project Waste Characterization Data Package Version 5

Reference 8 NorthMet Mine Site Water Modeling Work Plan Version 2

Attachment C

Zim Wetland Mitigation Site Wetland Mitigation Plan



Zim Wetland Mitigation Site

Wetland Mitigation Plan

Poly Met Mining, Inc.



August 2016

Zim Wetland Mitigation Site Wetland Mitigation Plan

August 2016

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Appendix B Project Wetland Mitigation Crediting

Appendix C USACE 2013 Memo: Application of the Federal Mitigation Rule and St. Paul District Policy

Guidance on Compensatory Mitigation - Compensation Ratios for Loss of

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Appendix D Wetland Data Forms
Appendix E Site Photographs

Appendix F Wetland Mitigation Plan Drawings

1.0 Introduction

On behalf of PolyMet Mining, Inc. (PolyMet), Barr Engineering Co. has prepared this wetland restoration plan to provide compensatory wetland mitigation to replace unavoidable wetland impacts associated with PolyMet's NorthMet Project (Project). The Project is located in the St. Louis River #3 major watershed and a total of 939 acres of wetland impacts are proposed. The Zim Wetland Mitigation Site (Site) is located in two separate units (the 439-acre North Unit and the 93-acre South Unit) which will be developed concurrently and are hereby collectively referred to as the Site. The compensatory mitigation activities described in this report include those planned within the Site, which is located southwest of Eveleth (Large Figure 1).

The Site was a sod farm that encompasses approximately 532 acres of land, on which 504 acres of wetland restoration and 10 acres of upland buffer preservation is proposed (Large Figure 2 and Large Figure 3). The Site is located in St. Louis County in the St. Louis River major watershed (#3) within the Lake Superior basin (Bank Service Area #1). PolyMet owns the property with the intent to conduct wetland restoration activities.

This report includes discussions of the Site, construction activities, hydrology restoration activities, wetland mitigation crediting, vegetation establishment and management activities, wetland restoration goals, performance standards, schedules, and monitoring plans. A preliminary wetland restoration plan (Reference (1)) was submitted to the U.S. Army Corps of Engineers (USACE) and Minnesota Department of Natural Resources (MDNR) Division of Lands and Minerals in November 2011. The plan was reviewed by the USACE, MDNR, and Minnesota Pollution Control Agency (MPCA); comments were provided, and the plan was resubmitted for review. A revised permit application was submitted to the USACE and MDNR in August 2013 to start the permitting process (Reference (3)). A revised wetland mitigation plan was submitted to the USACE and MDNR in May 2014. The agencies determined that hydrologic monitoring should be conducted to justify the proposed crediting in the plan and the plans should be revised to comply with standards that have changed since the initial submittal. Hydrology monitoring was conducted in 2012 through 2015, and continues in 2016. Updates to the revised wetland permit application were submitted to the USACE and MDNR in November 2015.

This mitigation plan was developed to comply with Section 404 of the Clean Water Act as administered by the USACE, the current Wetland Conservation Act (WCA) rules (Minnesota Rules, chapter 8420) as administered by the Minnesota Department of Natural Resources – Division of Lands and Minerals, and Minnesota Rules, part 7050.0186 (wetland mitigation) as administered by the MPCA.

A declaration of restricted covenants, similar to the example provided in Appendix A, will be prepared and recorded to cover the wetland restoration and associated upland buffer areas within one year after starting the restoration activities at the site.

2.0 Project Wetland Mitigation

The overall compensatory wetland mitigation plan is designed to produce the number of mitigation credits, as required by the USACE and MDNR. The number of mitigation credits that are required is based on the types, sizes, and locations of wetlands that will be subject to direct and fragmentation impacts from the Project, and on the types, sizes, and locations of the wetlands that will be restored to replace them (Large Table 1 in Appendix B).

The formulas for calculating the number of required mitigation credits are complex, using ratios established by the USACE (base ratios) and the WCA (mitigation ratios). The USACE and the WCA use slightly different ratios, but generally, the ratios they use to determine the number of mitigation credits vary depending on whether the mitigation wetland will be in-kind (same wetland type as impacted wetland), in-place (same watershed as impacted wetland), and/or in-advance (one to ten years ahead of the wetland impact).

Current guidance from the USACE regarding conditions that constitute in-advance compensatory mitigation was provided in a memo dated May 29, 2013 ("Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation – Compensation Ratios for Loss of Wetlands/Aquatic Resources") (see Appendix C). In accordance with USACE guidance, all non-forested, non-bog, and low or medium quality wetlands have a base ratio of 1.5:1. All forested, bog, and high quality wetlands will have a base ratio of 2:1 (Large Table 2 in Appendix B). The USACE provides incentives to reduce the base ratios by 0.25 (e.g., from 1.5:1 to 1.25:1) for each of the following provisions that apply with a minimum ratio of 1:1:

- if the mitigation wetland is in-kind (same wetland type as impacted wetland)
- in-place (same major watershed as impacted wetland)
- in-advance (one to ten years ahead of the wetland impact (see Appendix C)

Under the Minnesota WCA, the mitigation ratio is 1:1 if the majority of wetlands are replaced with the same wetland type or same historic type and in the same watershed. For wetlands that are replaced outside of the watershed or a different wetland type, the ratio will increase to 1.5:1 (Large Table 3 in Appendix B). Should additional wetland mitigation credits be established beyond the needs for direct impacts, the excess credits will be utilized to compensate for potential indirect wetland impacts.

The number of mitigation credits needed to compensate for the impacted wetlands will be set during permitting by the agencies approving the wetland mitigation plan, and expressed in terms of mitigation credits that replace each type of lost wetland. Details on calculations of the wetland mitigation credits for the Project are presented in Reference (3), and summarized on Large Table 1 in Appendix B. The mitigation credit calculations, based on the USACE base ratios and the WCA mitigation ratios, are summarized in Large Table 2 and Large Table 3 of Appendix B, respectively.

3.0 Site Wetland Mitigation Crediting

The proposed wetland mitigation credit areas are shown for the North Unit and South Unit on Large Figure 4 and Large Figure 5, respectively. The credits were calculated based on:

- hydrology monitoring (Reference (4))
- lateral drainage effect from ditches
- soil survey information (Large Figure 6 and Large Figure 7)
- target plant communities (Large Figure 2 and Large Figure 3) developed based on existing elevations, proposed elevations, and planned hydrologic restoration
- existing wetland boundaries (Large Figure 8 through Large Figure 11)
- other site conditions

These credits are summarized for the North Unit and the South Unit in Table 1 and Table 2, respectively, based on actions eligible for credit in the USACE's policy (Reference (5)) for wetland mitigation in Minnesota and in the WCA rules. Proposed actions eligible for credit include the following with references to the applicable USACE's policy (2009), Section 404 of the Clean Water Act (CWA) and applicable subpart of Minnesota Rules, part 8420.0526:

- Upland buffer credit [Section 404 (upland buffers) and Minnesota Rules, part 8420.0526, subp. 2] is applied to areas that are not expected to develop as wetland after restoration is complete, but are located adjacent to wetland restoration areas and will provide integrated protection of wetlands and valuable wildlife habitat. These areas will be restored to native, non-invasive vegetation. Upland buffer credits are credited at 25% of the area maintained as upland buffer (4:1 ratio of upland acres to credit). Credit from upland buffers will not exceed 25% of the total credit from the Site. A total of 9.81 acres of upland buffer are planned for the proposed wetland restoration work resulting in 2.45 credits (Table 1 and Table 2). Credits generated from upland buffer areas will be proportionally distributed between the proposed wetland types.
- Credit for restoration of completely drained wetlands [Section 404 (restoration via reestablishment) and Minnesota Rules, part 8420.0526, subp. 3] is applied to the majority of the wetland restoration areas on the Site. The estimated area of wetland that is expected to develop is discussed in Section 4.0. Areas that are presently non-wetland and develop as wetland after restoration are proposed as 100% credit for the area restored (1:1; wetland to credit). An estimated 450.63 acres of drained wetland are planned to be restored with the Site for 477.27 credits (Table 1 and Table 2).
- Restoration of partially drained wetland [Section 404 (restoration via rehabilitation) and
 Minnesota Rules, part 8420.0526, subp. 4] applies to the existing wetlands and ditched wetlands
 (Large Figure 8 through Large Figure 11). These existing wetland areas are partially drained by the
 ditches adjacent to portions of the wetlands, the diversion of upstream watershed around the Site,
 and the extensive draintile network present throughout the Site. The wetland areas described

in Section 6.0 were determined using the hydrologic monitoring data and drainage setback tables (Reference (6)). Restoration will restore natural hydrology to these wetlands by removing the drainage system and eliminating the upstream watershed diversion. This would qualify as credit for restoration via rehabilitation under the USACE's policy (Reference (5)) and is proposed for 50% credit of the area restored (2:1; wetland to credit). The partially drained wetland area encompasses 53.57 acres for 26.64 credits (Table 1 and Table 2).

Table 1 Wetland Mitigation Credit Summary on the North Unit of the Site

Credit Type	Area (acres) ⁽¹⁾	Percent Credit	Credits
Drained wetlands	384.54	100%	384.54
Partially-drained wetlands	29.63	50%	14.81
Upland buffers	6.32	25%	1.58
Ditches (excavated wetlands functioning as ditches)	8.46	50%	4.23
Exclusion Areas	9.98	0%	0
Credit Subtotal ⁽¹⁾	438.93		405.16
Upland buffers over wetlands functioning as ditches	0.03	(100%)	(0.03)
Total for Site ⁽¹⁾	438.96		405.14

⁽¹⁾ Totals may not sum due to rounding.

Table 2 Wetland Mitigation Credit Summary on the South Unit of the Site

Credit Type	Area (acres) ⁽¹⁾	Percent Credit	Credits
Drained wetlands	66.09	100%	66.09
Partially-drained wetlands	13.59	50%	6.80
Upland buffers	3.46	25%	0.86
Ditches (excavated wetlands functioning as ditches)	1.59	50%	0.79
Exclusion Areas	8.13	0%	0
Total for Site ⁽¹⁾	92.87		74.55

⁽¹⁾ Totals may not sum due to rounding.

All of the ditch wetlands within the Site, encompassing 10.05 acres, will be filled to eliminate drainage effects (Large Figure 12 and Large Figure 13). Most of those areas will remain wetland and are proposed to receive 50% credit for restoring natural hydrology. Those ditch areas that will be located within the upland buffer, will be directly impacted, and are proposed to be mitigated at the Site.

Exclusion areas on the Site include an approximately 1.5 acre homestead in the northern part of the North Unit; the CSAH 7, Dibble Road and Sax Road rights-of-way (ROW); remaining county ditch ROW; and an

access road through a portion of the North Unit (Large Figure 4, Large Figure 5, Large Figure 12, and Large Figure 13). No credits are proposed for these exclusion areas.

In order to adequately track the timing of wetland mitigation construction and wetland impacts, a structured accounting system may be needed to determine the required mitigation ratios for the Project impacts. This information could be provided in the MDNR Permit to Mine annual report. The annual report could include a tabulation of wetland mitigation construction completed by May 1 of each year (prior to the growing season) and wetland impacts that occurred during the calendar year. This information would be submitted using the schedule for the Permit to Mine annual report, typically within one month after the end of each year.

4.0 Wetland Mitigation Goals

To the degree feasible, the primary goal of the wetland restoration on the Site is to restore high quality wetland communities (Reference (7)) of the same types as those impacted by the project. While it is not practicable to replace all impacted wetland types with an equivalent area of in-kind wetland due to site limitations, technical feasibility, and other considerations; the goal of the mitigation plan is to replace the wetland types in-kind to the degree practicable to replace lost wetland functions and values. A summary of the acreage of each targeted wetland restoration community and the projected credits are provided in Table 3 and Table 4. A total of approximately 503.90 acres of wetland restoration is proposed (Large Figure 2 and Large Figure 3). Coniferous bog and open bog are the targeted wetland communities for the Site.

The plan for the restoration will include an adaptive management plan to account for the natural development and to recognize changing conditions and unpredictable factors contributing to the dynamics of the Site. Restoration methods will be designed to restore a coniferous bog community (Reference (7)); however, developing a bog community is highly dependent on soil and groundwater parameters that are at times difficult to control. Therefore, a coniferous swamp community will be the contingent community if the soil and groundwater conditions preclude adequate bog regeneration.

Historically, portions of this landscape were open, emergent wetland communities. Trees may not become established in some portions of the Site with excess soil moisture, or will not be planted where easements prevent planting. Where trees do not or cannot successfully establish, the target community will be an open bog. As with the coniferous bog, developing an open bog community is highly dependent on soil and groundwater parameters that are at times difficult to control. Therefore, a sedge meadow community will be the contingent community if the soil and groundwater conditions preclude adequate bog regeneration. Credit allocation may be modified in the future for areas where trees do not develop.

Table 3 Wetland Mitigation Target Community Summary on the North Unit of the Site

Mitigation Summary	Coniferous Bog/Swamp	Total
Proposed wetland type (acres)	422.63 ac	422.63 ac
Proposed upland buffer (acres) ⁽¹⁾	6.35 ac	6.35 ac
Proposed wetland credits	403.58	403.58
Percent of total proposed wetland credits for each community	100%	100%
Anticipated upland buffer credits – Total all uplands	1.58	1.58
Upland buffer credits converted proportionately to wetland communities	1.58	1.58
Credit Subtotal ¹	405.16	405.16
Ditches filled to create upland buffer	(0.03)	(0.03)
Total Proposed Credits by Community Type ⁽²⁾	405.13	405.13

⁽¹⁾ Filled areas in upland buffer not proposed for crediting.

Table 4 Wetland Mitigation Target Community Summary on the South Unit of the Site

Mitigation Summary	Open Bog	Coniferous Bog/Swamp	Total
Proposed wetland type (acres)	10.37 ac	70.90 ac	81.27 ac
Proposed upland buffer (acres) ⁽¹⁾	3.46	5 ac	3.46 ac
Proposed wetland credits	8.96	64.73	73.69
Percent of total proposed wetland credits for each community ⁽²⁾	12%	88%	100%
Anticipated upland buffer credits – Total all uplands	0.87		0.87
Upland buffer credits converted proportionately to wetland communities	0.11	0.76	0.87
Credit Subtotal ⁽³⁾	9.06	65.49	74.55
Ditches filled to create upland buffer	0	0	0
Total Proposed Credits by Community Type ⁽³⁾	9.06	65.49	74.55

⁽¹⁾ Filled areas in upland buffer not proposed for crediting.

⁽²⁾ Totals may not sum due to rounding.

⁽²⁾ The upland buffer acres are distributed among the proposed wetland types.

⁽³⁾ Totals may not sum due to rounding.

Detailed descriptions of the targeted wetland communities within the wetland restoration areas are provided in the following sections.

4.1.1 Coniferous Bog

A total of 493.53 acres of coniferous bog wetland is planned on the Site (Table 3 and Table 4; Large Figure 2 and Large Figure 3). Coniferous bogs occur where an accumulation of peat becomes isolated from mineral-rich groundwater such that the majority of the water and all mineral inputs come from precipitation. The peat continues to accumulate upward in the bog from the growth and deposition of *Sphagnum* moss and other vegetation. Black spruce and several other bog species are sensitive to extended periods of high water, but are able to survive within the bog because the upper levels of peat remain aerated, especially in the middle of summer as the water table drops below the peat surface. The groundwater in the bog tends to be very acidic (pH < 5.5) as the low dissolved mineral concentrations provide little buffering capacity to the organic acid production (Reference (8)).

Sphagnum moss establishment will be the limiting component for the restoration of a bog community. A dense mat of sphagnum is an important component responsible for maintaining the appropriate soil pH, hydrologic, and peat conditions for the coniferous bog community. Coniferous bogs are dominated by black spruce and tamarack trees, though the trees are often stunted and slow-growing and canopy cover is often less than 50%. Coniferous bogs are often interspersed with areas of open bog; these open bog areas may be too wet for trees, may have a *Sphagnum* moss mat too thin to support trees, or lack of tree seed sources. The ground layer of coniferous bog is dominated by *Sphagnum* mosses, sedges (*Carex* spp.), and various low ericaceous shrubs such as leather leaf (*Chamaedaphne calyculata*) and small cranberry (*Vaccinium oxycoccos*). Restoration of these and other bog dominants is difficult, as the species are difficult to propagate and many are not widely available commercially.

In order to restore *Sphagnum*, the moss must be harvested from a donor site by shredding and then collecting the upper 4 to 6 inches of *Sphagnum* and surface applying the materials to the restoration site. The accumulation of *Sphagnum* can be slow when applied to a heavily disturbed agricultural site, especially a site in which the soil has been regularly stripped for sod farming; further increasing the variability in restoration response across sites.

4.1.1.1 Coniferous Swamp (contingency wetland community type)

Although coniferous bog restoration techniques will be implemented throughout the Site, the successful development of the bog community is controlled by multiple environmental factors and is not guaranteed to be successful in every location. Therefore, the coniferous swamp community will be the contingency community for wetland community restoration. Coniferous swamps have a poorly developed *Sphagnum* mat and a greater predominance of minerotrophic species than a bog community. Furthermore, many species present in a coniferous swamp are more widely available commercially.

Coniferous swamp communities occur in peat soils with no direct contact to mineral soil, though mineral-rich groundwater contributes some nutrients to the plants and buffers the acidity of the peat. Typically, in large peatland systems, this community type would occur adjacent to a mineral-rich discharge or between

bog communities and uplands. It generally occurs in areas where the high water table is more stable than that in a bog, leading to longer periods of surface soil saturation.

It is unlikely that mineral-rich groundwater is near the soil surface in the Site because it occurs within such a large complex of deep peat soil. However, there are two reasons a coniferous swamp may be more appropriate for the Site than a coniferous bog community. First, farming practices have physically and chemically altered the soil and hydrology and some of the peat topsoil has been stripped as part of the sod farming. These activities have contributed to lowering the elevation relative to the regional groundwater table. Second, residual mineral fertilizer is likely to favor species that would not otherwise thrive in the mineral-deficient peat soils of bogs. In this geomorphic setting, there is a good likelihood that a bog community will develop, but that process is difficult to control because it depends on the groundwater inputs and soil chemistry; bog community development is naturally slow and may only occur after many years under natural conditions, due to the low biological productivity of these systems.

4.1.2 Open Bog

A total of 10.37 acres of open bog wetland is planned on the Site, within the pipeline and transmission line easement corridors at the South Unit where tree and tall shrub cover are not compatible with the easement provisions (Table 3 and Table 4; Large Figure 2 and Large Figure 3). It is expected that the majority of the Site will have saturated soil throughout most of the growing season, with seasonal drawdowns, especially during drought periods, similar to the hydrology in the reference wetland. Such hydrology will support black spruce and tamaracks, which tolerate considerable soil moisture, but require some periods of aerobic soil conditions. However, where the soil surface is saturated for the entire growing season, these tree species may not establish or growth will be slow. It is unclear which areas may not support trees, so the open bog community is presented as a contingency target community in the event that some areas are better suited for emergent wetland community types. *Sphagnum* would be a dominant ground cover in an open bog, though this may take many years to develop even with *Sphagnum* moss introduction.

4.1.2.1 Sedge/Wet Meadow (contingency wetland community type)

Although open bog restoration techniques will be implemented on portions of the Site, the successful development of the bog community is controlled by multiple environmental factors and is not guaranteed to be successful in every location. Therefore, the sedge/wet meadow community will be the contingency community for wetland restoration development.

Wet meadows typically form in the transition zone from upland to aquatic systems, often intergrading into sedge meadows; the hydrology between wet/sedge meadows is slightly different and the vegetation often differs primarily by the predominance of sedges over grasses. The wet meadow community is targeted for a dominance of native grasses and perennial forbs, although sedges, rushes, ferns, and some shrubs may also be present. Sedge meadows typically form with a slightly wetter landscape position than wet meadows, with saturation near the surface typical and shallow inundation of 2-3 inches common, particularly early in the growing season. The sedge meadow community is targeted for a dominance of primarily native sedges, however, grasses such as Canada blue joint and manna grass may be present

along with scattered perennial forbs and some shrubs. The muck and mineral soils are typically saturated close to the surface for short to long duration during the growing season with shallow inundation occasionally occurring for long periods of time.

5.0 Wetland Mitigation Performance Standards

Performance standards have been developed for the Site to guide the restoration activities and to measure success. The performance standards are appropriate for either a coniferous bog or swamp community because the conditions for each are generally similar. The performance criteria include measures to evaluate whether or not the site hydrology and vegetation meet the plan goals. If the performance standards are not met during the 20-year monitoring period for the forested communities, a proposal will be submitted describing the corrective actions proposed and an implementation schedule or monitoring may continue for a longer duration.

5.1 General Performance Standards

Several general performance standards apply to all wetland restoration areas:

- More than 75% areal coverage of the vegetation in each wetland community shall be facultative (FAC) or wetter (FACW, OBL) as listed in the current version of the National Wetland Plant List (NWPL, current version) for the Northcentral and Northeast region.
- Invasive, non-native plant species shall not comprise more than 15% cumulative areal coverage within any community by the end of the monitoring period. Invasive species include those provided in Table 5 and those species listed by the MDNR (Reference (9)).
- Native, non-invasive species shall comprise at least 75-80% areal coverage by the end of the required monitoring period.

Table 5 Potentially Problematic Invasive Species

Common Name	Scientific Name
Bird's Foot trefoil	Lotus corniculatus
Blue cattail	Typha x glauca
Buckthorns	Rhamnus spp
Canada thistle	Cirsium arvense
Common reed	Phragmites australis
Common tansy	Tanacetum vulgare
Flowering rush	Botomus umbellatus
Foxtail	Setaria spp.
Narrowleaf cattail	Typha angustifolia
Perennial sow thistle	Sonchus arvensis
Purple loosestrife	Lythrum salicaria
Reed canary grass	Phalaris arundinacea
Smooth brome grass	Bromus inermis
Sweet clover	Melilotus alba
Yellow iris	Iris pseudacorus

Also includes other invasive, ok, species based on Reference (10).

5.2 Hydrology

Due to the nature of the Site, it is expected that the extent and duration of soil saturation and high water table will quickly increase as the Site hydrology stabilizes following removal of the drainage system. Therefore, it is expected that the duration of the high water table at the Site will gradually become more similar to the reference wetlands as these conditions develop. The hydrology success criteria are designed to reflect the incremental changes in hydrology. All restored wetland areas should meet the minimum hydrology standard of saturation to the surface at 75% of the reference wetland conditions during each year of monitoring in which precipitation conditions are within or wetter than the normal range.

A similar reference wetland has the same wetland community type or a comparable hydrologic regime to the restored target community type. A reference wetland has been identified within a coniferous bog community.

5.2.1 Coniferous Bog or Swamp

The hydrology in the coniferous bog or coniferous swamp community typically consists of to the water table within 6 inches of the surface during most of the growing season, except in drought years (driest 10% of the most recent 30-year period of precipitation record). Inundation shall not occur (unless there are site-specific conditions). An exception can be made for sites with hummocky microtopography:

hollows between hummocks can have standing water depths of up to 6 inches for extended duration. To account for climatic variations, the duration water table within 6 inches of the surface shall be at least 75% of that documented within the reference wetland.

5.2.2 Open Bog or Sedge/Wet Meadow

The open bog or sedge/wet meadow communities are likely to consist of the water table within 6 inches of the surface up to inundation by up to 3 inches of water throughout much of the growing season, under normal to wetter than normal conditions (70% of years based on the most recent 30-year record of precipitation). If hummocky microtopography develops, inundation of up to 6 inches may occur within hollows between hummocks for extended duration. To account for climatic variations, the duration water table within 6 inches of the surface shall be at least 75% of that documented within the reference wetland.

5.3 Vegetation

Vegetation development within the wetlands restored to coniferous bogs and coniferous swamps will start with an emphasis on development of sphagnum moss restoration, which is described below in Section 7.2.1. The sphagnum moss restoration methods planned for the Site have been largely planned based on methods presented in the Peatland Restoration Guide (Reference (11)) and based on information from peatland restoration projects by the Natural Resources Research Institute (NRRI), located near Zim.

Approximately, one to three years following bog harvest material installation, tree seeding and tree and shrub seedlings will be planted on the Site. The trees will be installed into the peat soil, through the newly establishing sphagnum and herbaceous community.

The following sections summarize the community type success criteria that will be used to determine success of the wetland mitigation Site.

5.4 Coniferous Bog or Swamp

5.4.1 Growing Season 1

- Herbaceous vegetation shall cumulatively comprise at least 50% areal cover.
- At least 30% areal cover shall be comprised of at least 4 species of native, non-invasive herbaceous plants.
- No more than 50% areal cover of invasive, non-native herbaceous species will be present.

5.4.2 Growing Season 2

- Herbaceous vegetation shall cumulatively comprise at least 60% areal cover.
- At least 40% areal cover shall be comprised of at least 5 species of native, non-invasive herbaceous plants.
- No more than 35% areal cover of invasive, non-native herbaceous species will be present.

 At least 240 living tree seedlings per acre will be present, including tamarack and black spruce, but other species may be present consistent with the species present in the natural forested reference wetlands. No more than 5% areal cover of invasive, non-native tree species will be present.

5.4.3 Growing Season 3

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least 6 species of native, non-invasive herbaceous plants shall be present or the community will have a vegetative diversity/integrity rating of high quality using the current version of MnRAM.
- No more than 20% areal cover of invasive, non-native herbaceous species will be present.

5.4.4 Growing Seasons 4-20

- Herbaceous vegetation shall cumulatively comprise at least 80% areal cover.
- At least 8 species of native, non-invasive herbaceous plants shall be present or the community will have a vegetative diversity/integrity rating of high quality using the current version of MnRAM.
- No more than 15% areal cover of invasive, non-native herbaceous species will be present.
- At least 210 trees per acre will be present by the end of the fifth growing season and at least 110 trees per acre after the tenth and subsequent growing seasons, or the number of trees will be at least 80% of a reference wetland of similar community type. At least 75 of those living trees per acre will be at least 4 feet in height by the end of the tenth growing season. The tree species will be dominated by tamarack and black spruce, but other species may be present. No more than 5% areal cover of invasive, non-native tree species will be present.

5.5 Open Bog (or Sedge/Wet Meadow)

In the event that trees do not become well-established in certain portions of the Site and supplemental plantings are not expected to be successful, the target community will be modified to an open bog or sedge/wet meadow and the new target area will be described and enumerated in the annual monitoring reports.

5.5.1 Growing Season 1

- Herbaceous vegetation shall cumulatively comprise at least 50% areal cover.
- At least 30% areal cover shall be comprised of at least 3 species of native, non-invasive plants.
- No more than 50% areal cover of invasive, non-native species will be present.

5.5.2 Growing Season 2

• Herbaceous vegetation shall cumulatively comprise at least 60% areal cover.

- At least 40% areal cover shall be comprised of at least 4 species of native, non-invasive plants.
- No more than 35% areal cover shall be comprised of invasive, non-native species.

5.5.3 Growing Season 3

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover of native, noninvasive species.
- At least 60% areal cover shall be comprised of at least 6 species of native, non-invasive plants.
- No more than 25% areal cover shall be comprised of invasive, non-native species.

5.5.4 Growing Season 4-5

- Herbaceous vegetation shall cumulatively comprise at least 80% areal cover.
- At least 10 species of native, non-invasive plants shall be present.
- No more than 15% areal cover shall be comprised of invasive, non-native species.
- Shrub and tree vegetation shall cumulatively comprise less than 30% areal cover with the exception of ericaceous shrubs, which may comprise up to 100% areal cover.

5.6 Upland Buffer

5.6.1 Growing Season 1

- Vegetation will cumulatively comprise at least 50% areal cover, which shall include at least six species of native, non-invasive plant species.
- The herbaceous layer or herbaceous communities shall contain four or more species of native, non-invasive plants.
- No more than 50% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.6.2 Growing Season 2

- Vegetation will comprise at least 60% areal cover, which shall include at least seven species of native, non-invasive plant species.
- The herbaceous layer or herbaceous communities shall contain five or more species of native, non- invasive plants.
- No more than 35% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.6.3 Growing Season 3

 Vegetation will comprise at least 70% areal cover, which shall include at least eight species of native, noninvasive plants.

- The herbaceous layer or herbaceous communities shall contain six or more species of native/non-invasive plants.
- No more than 25% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.6.4 Growing Season 4-5

- Vegetation will comprise at least 90% areal cover, which shall include at least ten species of native, non-invasive plants.
- The herbaceous layer or herbaceous communities shall contain fifteen or more species of native, non-invasive plants.
- No more than 15% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

6.0 Wetland Mitigation Site Description

The Zim wetland mitigation plan includes the restoration of 504 acres of wetland and the preservation of 10 acres of upland buffer on the Site (Large Figure 2 and Large Figure 3; Table 1 and Table 2). The Site is located in central St. Louis County, between the towns of Zim and Sax. The proposed wetland restoration area is located within Sections 2, 3, 10, 11, 26, 27, and 34; Township 55 North; Range 18 West. Currently the Site is owned by PolyMet, but the entirety will be transferred to another party following the completion of wetland restoration, management, and monitoring requirements and will be controlled by PolyMet for the sole purpose of wetland mitigation during the required monitoring period.

Available data were reviewed to determine information on site history and pre-settlement conditions. The Original Public Lands Survey Plat Map from 1867 (Reference (12)) and a map created from the original plat maps (Reference (13)) each show that the majority of the area was a coniferous bog or swamp, with some areas of open bog. These data are reliable indicators of regional vegetation types, though are not accurate predictors of site-specific design parameters. The National Wetland Inventory map for the Site is provided on Large Figure 14 and Large Figure 15.

Based on a review of historic aerial photos, it is evident that ditches have been present at the Site since before 1939. Only some portions of the North Unit along County Highway 7 had been cleared and cultivated for agriculture as of 1939. In each photo reviewed since 1939, it is evident that additional areas were added to the cultivation on the North Unit. By 1981, the majority of the agricultural portions of the South Unit were developed and under intensive management for crop or sod production; likewise for the North Unit in the 1989 photo. According to the former landowner, much of the Site was in operation as a sod farm for 40-50 years; however, some portions were developed within the last 10 years.

6.1 Geology and Soils

The Site lies with the boundaries of the Glacial Lake Upham Plain and the Aurora Till Plain. This is a unique area topographically and climatically. The till plain is a relatively flat plain, ecologically similar to the adjacent lacustrine plain with level to gently rolling topography. Glacial lacustrine (lake deposited) sediments occupy much of the area. Glacial drift within the lake beds ranges from 100 to 300 feet thick, with some of the thickest sediments at the northern edge of the Glacial Lake Upham basin, where it meets the Mesabi Range. Soils include extensive areas of histosols (peats) over both fine-textured (silt and clayrich) and sandy lacustrine deposits (Reference (8)).

According to soil mapping by the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS), the entire Site is mapped as the Greenwood soil series (Reference (14)). The Greenwood soil (Dysic, frigid Typic Haplohemist) is a very poorly drained hydric soil formed in organic deposits more than 51 inches thick. The official soil series description for this soil is provided in Appendix A. The organic deposits in the area accumulated over lacustrine sediment, mostly silt, deposited by Glacial Lake Upham (Reference (8)). However, at the Site, the underlying lacustrine deposits were observed to be gleyed clay. The Greenwood soil series is described as having a pH ranging from 3.5 to 4.5 and the typical vegetation is composed of bog species including: black spruce (*Picea mariana*), tamarack

(*Larix laricina*), bog rosemary (*Andromeda polifolia*), bog laurel (*Kalmia polifolia*), leatherleaf (*Chamaedaphne calyculata*), blueberries (*Vaccinium spp.*), and sphagnum (*Sphagnum spp.*)

6.2 Topography

A topographic survey of the Site was completed in November 2010 and the one-foot contours based on the survey data are provided in Large Figure 2 and Large Figure 3. Ditches are the most prominent topographic features on the Site, ranging from 2 to 9 feet in elevation lower than the surrounding field surface. The USGS quadrangle maps show ground elevations just northeast of the North Unit at 1,330 feet Mean Sea Level (ft MSL) sloping downward, to the south and west, to about 1,315 ft MSL within the South Unit (Large Figure 6 and Large Figure 7). The 2010 topographic survey indicates that ground surface elevations within the North Unit have subtle variations ranging from 1,326 ft MSL along the north edge to 1321 ft MSL in the southwest corner of the Site. The county ditch along the western edge of the North Unit decreases from 1,319 ft MSL at the northern end to about 1,313 ft MSL at the southern end (Large Figure 6). The field surface elevation within the South Unit varies from 1,314 ft MSL in the northeast corner to 1,308 ft MSL in the southwest corner. The lowest elevation within the South Unit is the bottom of the ditch in the southwest corner at 1,300 ft MSL, which is eight feet lower than the adjacent field (Large Figure 7).

6.3 Climate

The average annual precipitation for Zim, Minnesota, based on the current 30-year normal period 1981-2010 is 28.26 inches (Reference (15)). The average annual temperature in this area is about 37.7 degrees Fahrenheit.

6.4 Hydrology

The Site lies near the middle of a large peatland complex that encompasses approximately 100 square miles, which is roughly bound by the St. Louis River to the west and north, the Whiteface River to the south, and Highway 53 to the east (Large Figure 16). The hydrology in the peatland system located upstream of the Site was historically altered by ditching, with ditches approximately every mile (on the section lines). However, recently, much of the upstream peatland complex has been hydrologically restored. The contributing watershed upstream of the North Unit is approximately 5,959 ac in size and the watershed upstream of the South Unit is about 3,125 ac in size. Hydrology on the Site is likely to be primarily driven by shallow groundwater flow from the large peatland complex along with support from direct precipitation. Groundwater within the peatland can be expected to contain very low mineral and nutrient content. As a result of the combination of extremely low concentration of dissolved mineral ions and high organic acid production, the soil water is expected to be acidic, which supports conditions appropriate for the low pH-adapted bog plant community. Soil and/or water pH analyses will be completed prior to restoration to provide additional soil water information. In particular, if the soil porewater is acidic (pH 4.2 or lower at the peat surface) the Site is expected to support bog community plants.

According to information from the previous landowner, drain tiles are present throughout the Site within each field. The former landowner and operator of the former sod production activities reported that the drain tiles are spaced 50 to 100 feet apart at depths of 4 to 5 feet and effectively drain the area for sod production. In some years, irrigation was necessary to maintain soil moisture for growing sod grasses. An estimated location of these drain tiles was created using a review of aerial photographs (2008-2010). In many of these photos, distinct parallel signatures are evident within the fields that appear to be caused by subsurface drainage. The presence of drain tiles discharging to surface ditches has been observed throughout the site.

The primary water discharge within the Site and the general area is to the south and west through a system of drainage ditches which receive water from the subsurface drain tiles. The majority of the ditches oriented east to west are public ditches and the majority of the ditches oriented north to south are private ditches that only affect the drainage on the Site and primarily transmit water into public, county ditch lateral leading to a main county ditch along County Highway 7 (along the west edge of both units of the Site). The ditch along the eastern edge of the North Unit, flowing along the section line, is also a public ditch. Within the North Unit, the ditches along the north and south lines of Section 11 (along Dibbell Road and Ellsmere Road) are both public ditches. All public ditches within the property except the ditches along Dibbell Road and Sax Road will be abandoned through the ditch abandonment process. A petition for partial abandonment of County Ditch 1 will be submitted to the St. Louis County Board of Commissioners acting as the drainage authority for St. Louis County Ditch 1. No work will be completed to impede drainage within any county ditch until approval is received from the drainage authority. Ditches that facilitate drainage for the properties adjacent to the Site would not be impacted by restoration activities as discussed later in this report.

The ditches are generally between 2 and 6 feet deep relative to the adjacent fields and are mostly well-maintained and clear of obstructions. The county ditch along Highway 7 is the deepest and widest ditch on or near the Site and at the southern end of the South Unit it is up to 7 feet lower in elevation than the adjacent field. Within the private ditches, there are several control structures that maintain water levels within about 18 inches of the soil surface for sod production.

6.5 Hydrology Monitoring

Annually from 2012 through 2016, hydrology was monitored to collect baseline data to determine if wetland hydrology is present on the Site and to provide justification for the proposed credit plan. Hydrology monitoring well locations are shown on Large Figure 17 and Large Figure 18. The four years of monitoring data indicate that the majority of the Site no longer has wetland hydrology (Large Figure 19 and Large Figure 23).

6.5.1 Sod Fields

6.5.1.1 2012

The first two and a half months of the 2012 growing season was an exceptionally wet period, it is not indicative of long-term, sustained normal conditions. Therefore, hydrology data from 2012 was not considered for the evaluation of whether hydrologic criteria were met at the site with the exception of the

seven wells that did not meet wetland hydrology criteria (Wells N1, N2, N4, N9, N10, S1, and S2). This decision was approved by the USACE and MDNR during a meeting on May 5, 2016.

6.5.1.2 2013

The 2013 monitoring data showed that none of the nine sod fields monitored had wetland hydrology present (including the six new locations) when considering data from the entire growing season, including the periods with wetter than normal antecedent precipitation (Table 6). Three sod field monitoring locations (N5, N13, and S4; Large Figure 19, Large Figure 21, and Large Figure 23) had water levels above the wetland threshold for 12, 12, and 13 consecutive days respectively, so those locations were monitored again in 2014 to document the lack of wetland hydrology.

6.5.1.3 2014

The 2014 monitoring data showed that six of the nine sod fields monitored (N3, N5, N12, N13, N14, and N16) had wetland hydrology present when considering data from the entire growing season, including the first 53 days of the growing season with wetter than normal antecedent precipitation (Table 6). Wells N7, N15, and S4 did not meet the minimum criteria for wetland hydrology when considering data from the entire growing season in 2014.

6.5.1.4 2015

The 2015 monitoring data showed that one of the nine sod fields monitored (Well N15) had a hydroperiod of 14 days or more when considering data from the entire growing season, including the periods with wetter than normal antecedent precipitation (Table 6). Wells N3, N5, N7, N12, N13, N14, N16, and S4 were sod field monitoring locations that did not meet the minimum criteria for wetland hydrology when considering data from the entire growing season in 2015.

6.5.1.5 2016

The 2016 monitoring data (through mid-June) showed that none of the nine sod fields monitored had a hydroperiod of 14 days or more when considering the 31-day monitoring period at the beginning of the growing season (Table 6). Wells N3, N5, N7, N12, N13, N14, N15, N16, and S4 were sod field monitoring locations that did not meet the minimum criteria for wetland hydrology when considering data from the entire growing season in 2016.

6.5.1.6 **Summary**

Table 6 summarizes the hydrology criteria for the sod field locations for 2013-2015 and 2016 (through mid-June). None of the sod field monitoring locations had water levels above the wetland threshold for 14 or more consecutive days, in at least 50% of years, when considering the data from the entire 2013-2015 growing seasons and the partial growing season in 2016. In addition, the sod field monitoring locations had hydroperiods that ranged from 0 to 26% of the reference wetland. Therefore, based on 2013-2016 monitoring data, all of the sod fields on the Site are drained and no longer have wetland hydrology.

6.5.2 Forested and Natural Areas

6.5.2.1 2012

Since 2012 was an exceptionally wet period, it is not indicative of long-term, sustained normal conditions. Therefore, this year was not considered for the evaluation of whether hydrologic criteria were met at the site. This decision was approved by the USACE and MDNR during a meeting on May 5, 2016.

6.5.2.2 2013

The 2013 monitoring data for Wells N6, N8, N11, and S2 showed that these forested locations met the minimum criteria for wetland hydrology when considering data from the entire growing season (Table 6). However, the hydroperiods were only 22 to 59% of the reference wetland and drained faster than the reference wetland (Table 6). Therefore, these forested areas are partially drained by the adjacent drainage system.

6.5.2.3 2014

The 2014 monitoring data for Wells N6, N8, N11, and S2 showed that all forested and natural areas, except N8, did not met the minimum criteria for wetland hydrology when considering data from the entire growing season (Table 6). The hydroperiods for these wells ranged from 11 to 50% of the reference wetland and drained faster than the reference wetland. Therefore, these forested areas are at least partially drained by the adjacent drainage system (Table 6).

6.5.2.4 2015

The 2015 forested and natural areas monitoring data showed that Wells N6, N11, and S2 did not meet the minimum criteria for wetland hydrology when considering data from the entire growing season (Table 6; Large Figure 22 and Large Figure 23). Wells N8 and S5 met the minimum criteria; however, the hydroperiods that were 25% and 51% of the reference wetland, respectively, indicating these areas are at least partially drained by the adjacent drainage system (Table 6).

6.5.2.5 2016

The 2016 monitoring data for Wells N6, N8, N11, S2, S5, and S6 showed that only Wells N8 and S5 met the minimum criteria for wetland hydrology when considering data from the entire growing season (Table 6; Large Figure 22 and Large Figure 23).

6.5.2.6 **Summary**

Table 6 summarizes the hydrology criteria for the forested and natural areas for 2013-2016. The monitoring data shows that Wells N6, N8, N11, S2, and S5 had water levels above the wetland threshold for 14 or more consecutive days, in at least 50% of years when considering data from the entire 2013-2016 growing seasons; the remaining wells (N17, N18, N19, and S6) did not meet this criteria. All monitoring locations had hydroperiods ranging from 2 to 59% of the reference wetland. Therefore, based on 2013-2016 monitoring data, all forested and natural area monitoring locations are at least partially drained by the adjacent drainage system.

Table 6 Summary of Wetland Hydrology Monitoring Criteria

	D			Dui	ring the Entire Growing Season						2012-2016	2013-2016		
	Current Land Use	2012	2012			2014		2015		2016		" C	# . f	
Well ID		Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Reference	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Reference	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Reference	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Reference		# of years the Monitoring Location Meets Wetland Hydrology Criteria: 14 or more consecutive days of flooding, ponding, and/or a water table 12 inches or less below the soil surface (years/# monitoring years)	Drainage Status
N1	Field	10	8%									0/1		drained
N2	Field	8	6%									0/1		drained
N3	Field	12	9%	2	2%	31	23%	7	5%	0	0%	1/5	1/4	drained
N4	Field	4	3%									0/1		drained
N5	Field	43	32%	12	9%	32	24%	10	8%	0	0%	2/5	1/4	partially drained
N6	Forest	57	43%	50	38%	47	35%	3	2%	3	10%	3/5	2/4	partially drained
N7	Field	20	15%	3	2%	6	5%	1	1%	3	10%	1/5	0/4	drained
N8	Forest	96	72%	78	59%	66	50%	33	25%	31	100%	5/5	4/4	partially drained
N9	Field	9	7%									0/1		drained
N10	Field	6	5%									0/1		drained
N11	Forest			57	43%	52	39%	8	6%	13	42%		2/4	partially drained
N12	Field			4	3%	14	11%	5	4%	0	0%		1/4	drained
N13	Field			12	9%	32	24%	7	5%	0	0%		1/4	drained
N14	Field			0	0%	31	23%	10	8%	0	0%		1/4	drained
N15	Field			1	1%	6	5%	15	11%	0	0%		1/4	drained
N16	Field			0	0%	35	26%	2	2%	0	0%		1/4	drained
N17	Shrub-carr									4	13%		0/1	drained
N18	Forest									0	0%		0/1	drained
N19	Forest									0	0%		0/1	drained
S1	Field	2	2%									0/1		drained
S2	Forest	20	15%	29	22%	14	11%	5	4%	0	0%	3/5	2/4	partially drained
S 3	Field	9	7%									0/1		drained
S4	Field			13	10%	12	9%	5	4%	0	0%		0/4	drained
S5	Open Bog							68	51%	31	100%		2/2	partially drained
S6	Forest									0	0%		0/1	drained
Ref1	Conifer Bog	133		133		133		133		31				wetland

Bolded numbers meet the criteria for water level within 12 inches of the soil surface for 14 consecutive days during the entire growing season.

6.6 Wetland Delineation

Wetlands on the Site were delineated on May 10, 2012, November 13, 2015, and April 13, 2016. Delineated wetlands include both excavated wetlands functioning as ditches and naturally-occurring partially drained wetlands and are summarized in Large Figure 8, Table 7, and Table 8. The wetland delineation incorporated hydrology monitoring data collected from the 2012, 2013, 2014, and 2015 growing seasons, as well as well installation log data.

Barr conducted on-site wetland delineations according to the Routine On-Site Determination Method specified in the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual* (Reference (16)) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0* (Reference (17)). Soil borings were placed in and around the ditches, wetlands, and potential wetlands, and uplands; borings were taken to a depth of at least 15 inches below the ground surface, or until bedrock or large rocks were encountered. Representative soil samples from each boring were examined for the presence of hydric soil indicators. Soil textures were determined by feel. Soil colors were determined using a Munsell® soil color chart and were noted on Wetland Determination Data Forms (Appendix D). Hydrologic conditions were evaluated at each soil boring and this information was recorded on the Wetland Determination Data Forms in Appendix D. Vegetation was documented for each wetland and associated upland. The wetland indicator status for each species was noted using the current National Wetland Plant List (Reference (18)) for the Northcentral and Northeast region.

Wetland boundaries were located in the field using a Trimble GeoXH 6000 Global Positioning System (GPS) Unit, capable of recording positions with sub-foot horizontal accuracy. Wetland boundaries were later digitized in ArcView© Geographic Information System software. Delineated wetlands were classified using the Eggers and Reed Plant Community Classification System (Reference (7)), the U.S. Fish and Wildlife Service (USFWS) Circular 39 System (Reference (19)), and the USFWS Cowardin System (Reference (20)).

The 11 wetlands delineated across the Site are summarized in the sections below and in Table 7 and Table 8. Wetland data forms provided in Appendix D. Photographs for each wetland are provided in Appendix E.

6.6.1 North Unit Wetlands

A total of 39.04 acres of wetland, including excavated wetlands functioning as ditches and naturally-occurring partially drained wetlands, were delineated within the North Unit (Table 7). Two excavated wetlands functioning as ditches (9.41 acres) were delineated across the North Unit and are classified as shallow, open water wetlands (Large Figure 8 and Large Figure 10). Four naturally-occurring partially drained wetlands (29.63 acres) were also delineated, both of which are classified as coniferous swamp communities (Large Figure 8 and Large Figure 10).

Table 7 North Unit Wetland Summary

Wetland Name	Wetland Type	Common Vegetation	Typical Hydrology	Soil	Acres	
NW1	Shallow, open water	No vegetation	Water depths ranging from 2 to 6 inches	Peat	0.76	
NW2	Shallow, open water	No vegetation	Water depths ranging from 4 inches to 3.0 feet	Peat	8.64	
NW3	Coniferous Swamp	Tamarack, balsam fir, and raspberry	Saturated within 6 inches of the ground surface	Peat	10.13	
NW4	Coniferous swamp	Tamarack, raspberry, and lady fern	Saturated 13 inches below ground surface	Peat	8.37	
NW 5	Coniferous Tamarack, black spruce, Labrador swamp tea		Inundated with 1 inch	Peat	0.30	
NW 6	Coniferous swamp	Tamarack, black spruce, raspberry	Saturated 9 inches below the ground surface	Peat	10.82	
Total (acres) ⁽¹⁾						

⁽¹⁾ Totals may not sum due to rounding.

Wetland NW1

Wetland NW1 is an approximately 0.76 acre shallow, open water excavated wetland functioning as a ditch network, representing approximately 2.0% of the delineated wetland area within the North Unit. Wetland NW1 is located in the northwest part of the North Unit (Large Figure 8 and Large Figure 10). Wetland NW1 was field delineated on November 13, 2015 and at that time no vegetation was present. Soil, which consists of peat, was inundated with up to 6 inches of water. Additional hydrology and soil characteristics associated with this wetland are provided in Table 7 and Appendix D.

Wetland NW2

Wetland NW2 is an approximately 8.64 acre shallow, open water excavated wetland functioning as a ditch network, representing approximately 22.1% of the delineated wetland area within the North Unit (Large Figure 8 and Large Figure 10). Wetland NW2 was field delineated on November 13, 2015 and 2015 and at that time no vegetation was present. Soil, which consists of peat, was inundated with up to 3 feet of water. Additional hydrology and soil characteristics associated with this wetland are provided in Table 7 and Appendix D.

Wetland NW3

Wetland NW3 is an approximately 10.13 acre coniferous swamp, representing approximately 26.0% of the delineated wetland area within the North Unit. Wetland NW3 is a naturally-occurring partially drained wetland located in the central part of the North Unit (Large Figure 8 and Large Figure 10). Wetland NW3 was field delineated on November 13, 2015 and vegetation was dominated by tamarack (*Larix laricina*;

FACW), balsam fir (*Abies balsamea*; FAC), and raspberry (*Rubus idaeus*; FAC). Soil was saturated within 6 inches of the ground surface, and consists of peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 7 and Appendix D.

Wetland NW4

Wetland NW4 is an approximately 8.37 acre coniferous swamp/shrub-carr community, representing approximately 21.4% of the delineated wetland area within the North Unit. Wetland NW4 is a naturally-occurring partially drained wetland located in the south central part of the North Unit (Large Figure 8 and Large Figure 10). Wetland NW4 was field delineated on November 13, 2015 and vegetation was dominated by tamarack (*Larix laricina*; FACW), raspberry (*Rubus idaeus*; FAC), and lady fern (*Athyrium filix-femina*; FAC). Soil was saturated at the ground surface, with shallow surface water present in some areas, and consists of muck and peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 7 and Appendix D.

Wetland NW5

Wetland NW5 is an approximately 0.30 acre coniferous swamp community, representing approximately 0.8% of the delineated wetland area within the North Unit. Wetland NW5 is a naturally-occurring partially drained wetland located in the northeastern part of the North Unit (Large Figure 8 and Large Figure 10). Wetland NW5 was field delineated on April 13, 2016 and vegetation was dominated by tamarack (*Larix laricina*; FACW), black spruce (*Picea mariana*; FACW), and Labrador tea (*Ledum groenlandicum*; OBL). Soil was saturated at the ground surface, with shallow surface water was present (1 inch) in some areas, consists of peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 7 and Appendix D.

Wetland NW6

Wetland NW6 is an approximately 10.82 acre coniferous swamp community, representing approximately 27.7% of the delineated wetland area within the North Unit. Wetland NW6 is a naturally-occurring partially drained wetland located in the southern part of the North Unit (Large Figure 8 and Large Figure 10). Wetland NW6 was field delineated on May 10, 2012 and vegetation was dominated by tamarack (*Larix laricina*; FACW), black spruce (*Picea mariana*; FACW), and raspberry (*Rubus idaeus*; FAC). Soil was saturated 9 inches below the ground surface, and consists of peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 7 and Appendix D.

6.6.2 South Unit Wetlands

A total of 15.87 acres of wetland, including excavated wetlands functioning as ditches and naturally-occurring partially drained wetlands, were delineated within the South Unit (Table 8). Three ditches (2.3 acres) were delineated across the South Unit and are classified as shallow, open water wetlands (Large Figure 9 and Large Figure 11). Two non-ditch wetlands (15.59 acres), a coniferous swamp and an open bog community, were also delineated (Large Figure 9 and Large Figure 11).

Table 8 South Unit Wetland Summary

Wetland Name	Wetland Type	Common Vegetation	Typical Hydrology	Soil	Acres	
SW1	Shallow, open water	Reed canary grass	Water depths ranging from 0 to 6 inches	Peat	0.51	
SW2	Shallow, open water	No vegetation	Water depths ranging from 0.3 to 7 feet	Peat	1.47	
SW3	Shallow marsh	Reed canary grass	Water depth 6 inches	Peat	0.30	
SW4	Open bog	Labrador tea, bog birch, tamarack, and Canada bluejoint grass	Saturated between 4 inches below ground surface and at ground surface	Peat	10.51	
SW5	Coniferous Balsam fir, tamarack, and raspberry		Saturated 17 inches below the ground surface	Peat	3.08	
Total (acres) ⁽¹⁾						

⁽¹⁾ Totals may not sum due to rounding.

Wetland SW1

Wetland SW1 is an approximately 0.51 acre shallow, open water excavated wetlands functioning as a ditch network, representing approximately 3.2% of the delineated wetland area within the South Unit. Wetland SW1 is located in the northern part of the South Unit (Large Figure 9 and Large Figure 11). Wetland SW1 was field delineated on November 13, 2015 and vegetation was dominated by reed canary grass (*Phalaris arundinacea; FACW*). Soil was inundated with 6 inches, and consists of peat and sandy clay. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 8 and Appendix D.

Wetland SW2

Wetland SW2 is an approximately 1.47 acre shallow, open water community that includes excavated wetlands functioning as a ditch network, representing, approximately 9.3% of the delineated wetland area within the South Unit (Large Figure 9 and Large Figure 11). Wetland SW2 was field delineated on November 13, 2015 and at that time no vegetation was present. Soil, which consists of peat, was inundated with up to 7 feet of water. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 8 and Appendix D.

Wetland SW3

Wetland SW3 is an approximately 0.30 acre shallow marsh, representing approximately 1.9% of the delineated wetland area within the South Unit. Wetland SW3 is a naturally-occurring partially drained wetland located in the southwest part of the South Unit (Large Figure 9 and Large Figure 11). Wetland SW3 was field delineated on November 13, 2015 and vegetation was dominated by reed canary grass (*Phalaris arundinacea; FACW*). Soil was saturated at the ground surface, with shallow surface water present

in some areas, and consists of peat and mucky peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 8 and Appendix D.

Wetland SW4

Wetland SW4 is an approximately 10.51 acre open bog community, representing approximately 66.3% of the delineated wetland area within the South Unit. Wetland SW4 is a naturally-occurring partially drained wetland located in the southern part of the South Unit (Large Figure 9 and Large Figure 11). Wetland SW4 was field delineated on November 13, 2015 and vegetation was dominated by Labrador tea (*Ledum groenlandicum*; OBL), bog birch (*Betula pumila*; OBL) and Canada bluejoint grass (*Calamagrostis canadensis*; OBL). Soil was saturated within 4 inches of the ground surface, and consists of muck and peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 8 and Appendix D.

Wetland SW5

Wetland SW5 is an approximately 3.08 acre coniferous swamp community, representing approximately 19.4% of the delineated wetland area within the South Unit. Wetland SW5 is a naturally-occurring partially drained wetland located in the northeastern part of the South Unit (Large Figure 9 and Large Figure 11). Wetland SW6 was field delineated on May 10, 2012 and vegetation was dominated by balsam fir (*Abies balsamea*; FAC), tamarack (*Larix laricina*; FACW), and raspberry (*Rubus idaeus*; FAC). Soil was saturated within 17 inches of the ground surface, and consists of peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 8 and Appendix D.

6.7 Cultural Resources

10,000 Lakes Archaeology, Inc. (10,000 Lakes Archaeology) conducted Phase Ia background research for the Site in May and June 2015 (Reference (21)). This Phase Ia cultural resources investigation included a literature review and background research at the State Historic Preservation Office (SHPO), the Minnesota Historical Society (MHS), and Office of the State Archaeologist (OSA). Archaeologists examined the archaeological and historic site files, topographic maps, and historic maps to locate recorded archaeological and historic sites within the Site, as well as a 1-mile buffer surrounding the Site.

Archaeological sites are more likely to be located near water, on prominent topographic features, and near recorded archaeological sites; however these are not the only locations where archaeological sites might be found. Information obtained from the topographic maps, Minnesota State Archaeological Site Files, historic maps (General Land Office Historic plat maps and Trygg maps), and previously recorded sites can be used to identify, areas with a moderate to high potential for unrecorded archaeological sites.

The Phase Ia background research conducted by 10,000 Lakes Archaeology concluded that no archaeological or historic sites are recorded within one mile of the Site. The Site has a low potential for the presence of archaeological sites because it is located in a low area which was historically wetland, with little topographic relief or significant landscape features (Reference (21)).

6.8 Site Constraints

A portion of the North Unit is crossed by an underground natural gas pipeline within a strip of land owned by Northern Natural Gas (NNG). The South Unit is crossed by two utility easements: the NNG pipeline and a Minnesota Power overhead transmission line. Typically, within these types of easements, tree and shrub growth is not allowed. Letters are being sent to NNG and the Office of Pipeline Safety notifying them of the project in accordance with M.R. 8420.0330, Subp. 2B(12). PolyMet has contacted Minnesota Power and is pursuing written acknowledgement that the proposed wetland restoration project will not interfere with the operation and maintenance of the transmission lines within their easement.

The North Unit has one residence located within the Site and three additional properties with residences located downstream of, but adjacent to the Site. Discharge from the Site following restoration will be controlled through several armored spillways that will direct flow into remaining public ditches. No sheetflow will discharge from the Site onto adjacent properties because any surface water flow will either be obstructed by road berms or will be intercepted by lateral ditches oriented north to south, which discharge into the public ditches. The restoration of wetlands at the Site will increase the water storage capacity upstream of the adjacent properties resulting in reduced flow rates from the Site. In addition, the adjacent residences are elevated above the surrounding land and ditches and the drainage from each of these properties will not be affected by the PolyMet project.

Approximately 26,000 feet (~4.9miles) of St. Louis County Ditch No. 1 drainage system will be petitioned for abandonment. These ditch segments only benefit the property on which wetland mitigation is proposed. Discussions regarding abandonment have been initiated with the ditch authority in St. Louis County.

St. Louis County shows the presence of Ellsmere Road along the south boundary of the North Unit. The St. Louis County attorney has suggested that the County will issue a quit claim deed to remove Ellsmere Road from legal status.

7.0 Wetland Restoration Plan

According to the former landowner, much of the Site has been in operation as a sod farm for 40-50 years, though some portions were developed within the last 10 years. The Site hydrology is controlled by a series of ditches throughout the Site, typically surrounded by a system of dikes with outlet structures through the perimeter dikes. Water levels in the ditches are typically maintained approximately 1.5 feet below the field elevations to ensure an aerated rooting zone without soil saturation. The goal for each step in the restoration process is to continually progress toward the final goal of establishing desired wetland communities with the appropriate hydrology and dominated by characteristic native vegetation within each community. The restoration construction plans are provided in Appendix F.

The vegetation and hydrology will be restored to the Site over a one-year construction phase followed by up to 20 years of vegetation management. Coniferous bog (or swamp) and open bog communities will be established using peatland restoration methods (Reference (11)). The whole site will be treated with similar methods because soil and hydrology are expected to be similar throughout. The interior ditches will be filled, berms will be leveled, and drain tiles will be disabled to restore wetland hydrology. Native, harvested bog materials will be spread throughout the Site to facilitate the re-introduction of *Sphagnum* mosses and other bog species that cannot be easily re-introduced by seed. Natural re-generation of the herbaceous ground cover, in combination with the addition of bog harvest materials, will be supported by intensive weed management. Tree and shrub seedlings will be installed by hand throughout the Site and tree seeding will be conducted. The Site will be carefully monitored and managed; supplemental plantings and seeding may be used to encourage development until performance standards are met.

7.1 Zim Wetland Restoration Construction Plan

The overall objective of the plan is to restore the wetland hydrology within the Site by removing the internal drainage system and constructing outlets to establish specific hydrologic conditions that will meet the goals and performance standards described in Sections 4.0 and 5.0. All of the internal private ditches on the Site and all of the public ditches except the segments of County Ditch #1 along Diffel Road and Sax Road will be filled with soil excavated from elsewhere on the Site. Filling these ditches will eliminate the drainage effects and plug the ends of the drain tiles that discharge into the ditches. As a result, groundwater elevations are expected to rise within the fields and precipitation will no longer drain through subsurface tiles and discharge through the ditches. The majority of the water that will saturate the peat will come from precipitation that falls directly on the Site. Some groundwater will also contribute to wetland hydrology as it flows into the Site from the large peatland complex to the north and east.

Ditches will be filled with soil banks adjacent to the ditches and from shallow field scraping where insufficient soil volume is available within the berms. Material scraped from the adjacent fields will not be deeper than 3 inches below the presumed natural grade. Some ditches have shallow mounds from the ditch spoils; these will be pushed back into the ditches and compacted to recreate the level peatland grade. Because natural hydrology is being restored within the filled ditches and the elimination of the ditches recreates the natural landscape and hydrology, the ditches will receive partial credit (50%).

Mineral and peat soils will be placed in appropriate layers within the backfilled ditches. Clay and other mineral soil will be placed in the bottom of the ditch to plug the drain tiles, ensuring that the artificial drainage will be eliminated. The majority of the mineral soils will come from the spoil mounds adjacent to the ditches. Peat soils will be placed in the upper portions of the filled ditches. The peat will also effectively restrict flow and help create a natural grade to the land. Much of the peat will be pushed in from the edge of each ditch or from shallow scraping of adjacent areas.

Some ditches adjacent to the Site on the downstream (west) side will not be filled because they are not controlled by PolyMet. The lateral effect of the remaining open ditches adjacent to the Site has been calculated to help determine wetland credits. Lateral effects were determined using hydrologic monitoring data and drainage setback tables (Reference (6)).

For wooded areas affected by the existing drainage system on the Site, hydrologic restoration will be the primary action for mitigation credit. These areas are already forested with coniferous bog or swamp species, but the adjacent drainage system has eliminated wetland hydrology or reduced the period of saturation. For the areas not surrounded by ditches, the lateral effects were calculated to determine how much the area is affected by the existing drainage. Ditch filling will restore these forested wetland areas. Because some portions of these wooded areas are still wetland but partially-drained, mitigation credits are projected based on restoration of partially-drained wetlands (50%).

7.2 Vegetation Restoration Establishment

An adaptive management program is proposed to guide the development of the restored wetlands to the targeted conditions. The vegetative restoration community types proposed at the Site are shown on Large Figure 2 and Large Figure 3 and are summarized in Table 3 and Table 4. The vegetative restoration of the herbaceous layer in each wetland community will be implemented to promote the establishment of characteristic native species that are present in donor seed bank or that may be transported to the area from adjacent wetlands. The process for restoration of the wetlands is designed to meet the goals described in Section 4.0 and the performance objectives described in Section 5.0 in the most effective manner.

The goal of the vegetation restoration is to provide a setting and conditions in which the restoration areas will be restored to naturally self-sustaining and functioning wetlands to the extent feasible. The proposed wetland communities have been planned in areas that appear to match the natural hydrologic characteristics of each community type. However, during the restoration process, it is expected that the boundaries of the wetland communities may change to some degree and the plan will allow for adaptation to the conditions. It is recognized that this process cannot be accomplished within a year or two, but will take time, and therefore, short-term interim goals are also included in the performance standards.

Where feasible, reference wetlands will be identified in the vicinity of the Site for each of the restoration community types, such that they represent an approximation of the wetland communities anticipated after restoration.

7.2.1 Bog Restoration Methods

The *Sphagnum* moss restoration methods planned for the Site have been largely developed based on methods presented in the Peatland Restoration Guide (Reference (11)) and based on information from peatland restoration projects by the Natural Resources Research Institute (NRRI), located near Zim. The study by Johnson, et al. (Reference (22)) to evaluate the effects of planting time, mulch application, and planting of companion *Carex* species on the establishment of sphagnum mosses was evaluated and considered in the development of this plan.

Suitable donor site(s) for bog harvest materials will be selected based on a review of sites on the proposed NorthMet mine (Mine Site) and from other sites near the mitigation Site. A suitable site would have a large area of *Sphagnum* mat, at least 12 inches thick and with relatively few trees and shrubs. The donor site would also need to be accessible by machinery for harvest and loading the materials for transport. The ideal bog donor site(s) would occur at the proposed Mine Site in bogs that are proposed to be impacted by the mining activity. However, that would require transport of the bog materials from a considerable distance and may require many truckloads of materials. Therefore, sites closer to the mitigation Site will also be reviewed. If sufficient suitable sites are not found on the proposed Mine Site or transportation is considered to be impractical, a donor site closer to the mitigation Site may be used. For donor sites not located on the Mine Site, PolyMet would confer with the USACE and the MDNR before harvest of materials.

The donor site(s) will be characterized in the summer or fall prior to bog material harvest to identify existing cover of plants and mosses. Based on current research, the appropriate amount of *Sphagnum* plant material needed for application at the restoration site is the equivalent of what can be collected from an area approximately 1/10 the size of the restoration area. Therefore, approximately 42 acres will be needed to collect sufficient plant material.

Bog restoration would be completed as follows:

- Mitigation site surface preparation
 - Existing vegetation will be removed by mechanical removal or herbicide treatment in the summer and fall prior to spreading bog harvest material in the spring.
 - o Soil will be plowed and raked to form a smooth soil surface.
 - See 4 ounce per acre tamarack and 2 ounce per acre black spruce seed.
- Bog harvest material collection
 - Plant material will be collected in late fall, winter, or early spring before the frost has melted. Sphagnum fragments and additional materials collected in late fall or winter will be stored over winter for use the following spring.
 - The top 4 to 6 inches of the bog surface will be shredded with a Rotovator or other equipment appropriate to shred surface vegetation. Shredded bog vegetation will be

windrowed using a dozer or back-scraper and will be loaded in trucks using a front-end loader.

• The plant material will be transported to the restoration site and stockpiled close to the restoration area to minimize multiple hauls.

Bog material spreading

- The plant fragments will be spread over the site with a standard box manure spreader, ideally in early spring over frozen ground.
- The restoration site soil surface will be covered with a uniform 1 to 5 cm thick, fluffy layer of plant fragments.

Straw spreading

- Clean, fresh, straw mulch will be applied over plant fragments as soon as possible after plant spreading (ideally the same day) to improve growing conditions for plant fragments by creating a wetter and cooler air layer at the peat surface.
- Attempts will be made to utilize equipment that allows straw to be spread without traveling on top of plant fragments, such as a sideways straw bale blower with a mulch pass made after plant spreading from adjacent areas not yet completed.
- o Straw application rate: 2,500 pounds per acre.

• Fertilizer application

- Slow-release phosphate rock fertilizer (P2O5) will be applied to approximately one-half of the restoration areas with a conic spreader at 17.5 available phosphate pounds/acre to provide adequate nutrients for a rapid establishment of a Sphagnum mat. Because current research is not conclusive regarding the benefits of fertilizer, it will only be applied to one-half of the Site to determine the effectiveness of this treatment and the potential for deleterious effects of promoting invasive vegetation establishment. If additional information becomes available prior to restoration this treatment may be eliminated or added to the entire Site.
- Equipment that allows fertilizer to be spread without traveling on top of plant fragments and straw mulch will be used, such as with a conic spreader pulled behind an all-terrain vehicle, after mulch application has been completed.

7.2.2 Tree and Shrub Installation

One to three years following *Sphagnum* installation, tree and shrub seedlings will be planted on the Site. The trees will be installed into the peat soil, through the newly establishing *Sphagnum* and herbaceous community. After three years of monitoring the tree plantings, supplemental plantings may be completed in certain areas, especially if maintenance activities or invasive species are problematic. Black spruce and

tamarack will be the primary trees targeted for the planting, but other species may be considered based on their prevalence in area bogs.

7.2.3 Natural Regeneration and Bog Establishment

The general restoration strategy for the majority of the native herbaceous community is to promote natural regeneration during the first one to two years after hydrologic restoration. To the extent practicable, the majority of the weed control will be completed by hand, ATV, or aerial application to minimize the impact on the developing *Sphagnum* and the young trees. The proposed vegetation establishment and maintenance activities anticipated to meet the goals of the plan are listed for the conditions described, as appropriate for the restoration schedule:

- **Presence of invasive species.** Apply appropriate herbicides within wetland restoration areas containing reed canary grass or other invasive, non-native species. Depending on the density of each species in a given area, selective or broad-spectrum herbicides may be used. A list of invasive, non-native species is provided in Table 5. Mowing may also be used to prevent seed set, especially for annuals.
- Vegetation characterization. Characterize vegetation establishing in each wetland restoration
 area several times during each growing season to determine needed management and
 establishment procedures. Vegetation characterization will include documenting all problem
 species present, the approximate areal coverage of each species and approximate locations to
 quide management activities.
- **Spot treatment.** Spot spray up to three times annually to control reed canary grass and other perennial invasive, non-native species for 10 years or longer following initial restoration. Extensive treatments may not be needed after a sustainable wetland dominated by characteristic native vegetation is established such that the performance standards are achieved.

7.2.4 Supplemental Planting and Seeding

Careful monitoring of vegetation development on the Site will be completed annually to determine where problems are occurring and, to the degree possible determine the cause of those problems. Beginning in the third growing season after planting, supplemental trees and shrubs may be installed if performance standards are not met. Seed additions may also be used, beginning in the third growing season, if areas are present where suitable native vegetation has not developed. As such, native seed mixes would be used similar to those recommended by the Minnesota Board of Water and Soil Resources (BWSR) and applied after appropriate measures have been taken to control the invasive species.

7.2.5 Upland Area Establishment

Existing vegetation in the upland areas will be managed to promote development of native plant communities. The primary maintenance activity will be control of invasive, non-native species and seeding to develop diverse, native communities. Protecting the Site from further disturbances and allowing natural colonization and successional processes will maintain ecosystem biodiversity and structure.

Establishment and management activities will include:

- Monitoring Site to identify invasive species and management needs prior to seeding. Particular attention will be paid to edges of the upland sites.
- Removing or treating with appropriate herbicides all invasive, non-native plant species.
- Seeding of upland buffers with the upland buffer seed mix in Table 9 at a rate of 8.5 pounds/acre native species when areas exceeding one acre in size lack the species diversity and density needed to meet the performance standards.

Table 9 Upland Buffer Seed Mix

Scientific Name	Common Name	Rate	% of Mix				
Native Grasses							
Elymus trachycaulus	Slender wheat grass	0.11 lbs/acre	1.3%				
Bromus ciliata	Fringed brome	2.00 lbs/acre	23.5%				
Calamagrostis candensis	Bluejoint	0.13 lbs/acre	1.5%				
Danthonia spicata	Poverty oats	0.50 lbs/acre	5.9%				
Elymus canadensis	Canada wild-rye	1.25 lbs/acre	14.7%				
Elymus virginicus	Virginia wild-rye	1.00 lbs/acre	11.8%				
Panicum virgatum	Switchgrass	1.00 lbs/acre	11.8%				
Poa palustris	Fowl bluegrass	0.90 lbs/acre	10.6%				
Sorghastrum nutans	Indian grass	0.48 lbs/acre	5.6%				
	Native Forbs						
Achillea millefolium	Yarrow	0.48 oz/acre	0.4%				
Chamaecrista fasiculata	Partridge Pea	0.32 oz/acre	0.2%				
Asclepia syriaca	Common Milkweed	0.12 oz/acre	0.1%				
Doellingeria umbellata	Flat-topped aster	0.64 oz/acre	0.5%				
Heliopsis helianthiodes	Common ox-eye	2.08 oz/acre	1.5%				
Eurybia macrophylla	Large-leaved aster	0.32 oz/acre	0.2%				
Oligoneuron rigidum	Stiff goldenrod	2.24 oz/acre	1.6%				
Monarda fistulosa	Wild Bergamot	2.56 oz/acre	1.9%				
Rudbeckia hirta	Black-eyed susan	4.16 oz/acre	3.1%				
Solidago nemoralis	Gray goldenrod	0.96 oz/acre	0.7%				
Solidago ptarmicoides	Upland white aster	0.64 oz/acre	0.5%				
Symphyotrichum ericoides	Heath aster	0.48 oz/acre	0.4%				
Symphyotrichum laeve	Smooth aster	0.96 oz/acre	0.7%				
Verbena stricta	Hoary Vervain	2.08 oz/acre	1.5%				

8.0 Wetland Management Schedule

The following schedule presents a preliminary plan of the expected activities for restoring wetlands at the Site. However, with an adaptive management perspective, it should be recognized that the timing of specific establishment and management activities are likely to change as the restoration progresses. The overall target for restoration activities is to complete the restoration work within the first four years of the Project. The Year 1 restoration work will begin within the first year after permit issuance. The remaining restoration activities will generally follow the conceptual schedule provided below.

The mitigation wetlands restored on the Site will require regular vegetation management to become established. This is critical in the first 5 to 8 years and should be recognized as integral to the wetland restoration process. Management will include eliminating invasive species, creating conditions for the native plants to flourish, and seeding/planting to supplement natural regeneration. Weed removal and monitoring is important during the early stages of the restoration. All management activities described below apply to the management of the entire Site, including areas receiving credit for restoration of drained and partially-drained wetlands, and upland buffers.

After final certification from the permitting agencies that construction was completed as planned, a declaration of restricted covenants will be recorded and documentation will be provided to the USACE, the WCA administrator, and other appropriate regulatory agencies.

8.1 Site Preparation

8.1.1 Fall and Winter

- Lower existing water control structures to reduce water levels in the ditches prior to being filled with soil.
- Eliminate all vegetation down to bare soil using herbicide applications, mowing, and cultivation where needed.
- Harvest sphagnum from the donor site and/or Mine Site and store at the Site through the winter.
- Fill ditches and break subsurface drain tiles to restore site hydrology.
- Prepare as-built report documenting construction in comparison to the approved plans.

8.2 Year 1

8.2.1 Early Spring

- Spread donor sphagnum material, mulch, and fertilizer onto the site prior to melting frost.
- Monitor water levels in restored wetlands.
- Prepare as-built report documenting construction and establishment.

8.2.2 Spring/Summer

- Monitor water levels in restored wetlands.
- Characterize vegetation in restoration areas in approximately May and July followed by development of specific management objectives for the remainder of the year based on the findings.
- Mow wetlands in spring if annual weeds are present but no trees or shrubs are present.
- Assess the presence of potentially problematic weeds and implement appropriate management methods including spot treatments with selective herbicides.
- Complete construction repairs, as needed.

8.2.3 Fall—End of First Full Growing Season

- Prepare monitoring report, including documentation of wetland establishment activities completed during the previous year conducted in comparison to the plan and recommended actions for the following year.
- Apply herbicides to control invasive, non-native species.
- Prepare as-built survey and report following construction completion and request certification of construction.
- Complete construction repairs, as needed.

8.3 Year 2

8.3.1 Spring/Summer

- Monitor water levels in restored wetlands.
- If hydrologic conditions have stabilized and are appropriate, plant trees and shrubs, otherwise wait until spring of Year 3.
- Characterize vegetation in restoration areas in approximately May and July followed by development of specific management objectives for the remainder of the year based on the findings.
- Apply herbicides to control invasive, non-native species within wetland restoration areas.

8.3.2 Fall—End of Second Full Growing Season

- Prepare monitoring report, including documentation of wetland establishment activities completed during the previous year conducted in comparison to the plan and recommended actions for the following year.
- Apply herbicides to control invasive, non-native species.

Report on water levels in restored wetlands from the full growing season.

8.4 Year 3

8.4.1 Spring/Summer

- Monitor water levels in restored wetlands.
- Characterize vegetation in restoration areas approximately three times followed by development of specific management objectives for the remainder of the year based on the findings.
- Apply herbicides to control invasive, non-native species within wetland restoration areas.

8.4.2 Fall—End of Third Full Growing Season

- Apply herbicides to control invasive, non-native species.
- Prepare monitoring report, including documentation of wetland establishment activities completed during the previous year conducted in comparison to the plan and recommended actions for the following year.
- Report on water levels in restored wetlands from the full growing season. Determine if the
 hydrology performance standard has been met or if the groundwater has sufficiently stabilized
 such that no further groundwater monitoring is necessary.
- If large areas of invasive species are still present, those areas will be controlled and seeding and/or other remedial activities implemented.
- If trees and shrubs are not meeting performance criteria, re-planting efforts will be planned for next spring. If high groundwater is problematic in certain areas, the target communities in those areas should be altered to open bog.

8.5 Years 4-5

All of the management activities described for Year 3 will be continued in Years 4 and 5 along with the monitoring activities. If tree development in coniferous bog communities does not meet performance standards, additional seedlings will be planted or tree seeding will be conducted as described in Sections 7.2.4 and 7.2.5. The monitoring report completed after the fifth growing season will assess whether or not restored wetland communities (with the exception of forested communities) have met performance standards. If performance standards have been met, then the initial five year monitoring requirement would be complete.

8.6 Years 6 through 20

The establishment of forested and bog wetland communities can take longer than five years, therefore active management will be completed for twenty years in forested and bog communities. Many of the management activities described for Years 4-5 will be continued in Years 6-20 along with the monitoring activities. Management activities will focus on spot treatment and removal of invasive, non-native

vegetation species and the development of diverse, native bog species to conform to the performance standards. Monitoring of vegetation will be conducted at least twice per growing season to guide management decisions. Spot spraying, mowing, or other control methods will be conducted as needed to meet the performance standards. Should contiguous areas of the site larger than five acres in size contain fewer than two dominant, native species for more than one full growing season, those areas will be seeded with a suitable wetland seed mix, which will be submitted to the USACE and MDNR for review and approval prior to installation.

9.0 Wetland Mitigation Monitoring

The Site will be monitored for 20 years beginning in the first full growing season after completing hydrologic restoration. The purpose of the monitoring is to document the progress and condition of the restored wetland communities. Monitoring reports will be prepared for Years 1, 2, 3, 5, 8, 12, and 20 following construction. Monitoring results will be included in the reports to assess whether or not the restored wetlands are in conformance with performance standards and determine whether continued monitoring is required. Monitoring visits will include review of the areas receiving credit for restoration of partially-drained wetlands and in the preservation areas to identify potential problems with invasive species or other forms of degradation. The monitoring report completed after the final growing season of the monitoring period will assess whether or not the restored wetlands are in conformance with performance standards.

Hydrologic parameters will be evaluated in the mitigation areas most intensively during the first five years and then at a level deemed appropriate to the hydrologic characteristics of each area thereafter. Any significant modifications to the monitoring frequency proposed herein will be described in a revised monitoring plan to be submitted for review and approval prior to implementation. In addition to monitoring the restored wetlands, one reference wetland of each wetland restoration community type with relatively natural hydrologic conditions (if available) will be monitored within the general area of the Site. A monitoring plan will be submitted for review and approval prior to implementing the monitoring program; that plan will also include locations of proposed reference wetlands. Continuous recording wells will be utilized to the extent feasible.

9.1 Hydrologic Monitoring Years 1-5

Hydrologic monitoring in these generally saturated wetland communities will be conducted using shallow wells placed throughout the Site. Water levels will be recorded several times per day throughout the growing season.

9.2 Hydrologic Monitoring Years 6-20

If the monitoring conducted during Years 1-5 indicate a stable and consistent hydrologic regime similar to the reference wetland, water levels will be recorded several times per day throughout the growing season during Years 6-8 for the forest communities, but data will only be collected one time at the end of the growing season.

In wetlands where water level fluctuations differ substantially from the reference wetland, water levels will be recorded several times per day throughout the growing season in Years 6-8 for forest communities. Water level data will be collected approximately two times during the growing season to assist in determining the need for any corrective actions. If hydrology in the forested communities differs substantially from the performance standards through Year 8, monitoring will continue until sufficiently stabilized to meet performance standards utilizing recording wells with water levels recorded several times per day during the growing season and downloaded approximately twice.

9.3 Vegetation Monitoring

A detailed vegetation survey will be conducted once per year (typically August) in each wetland mitigation community, as well as in the reference wetland community, to evaluate the success of the restoration during the appropriate monitoring period for each community type. A time meander search will randomly sample 20% of each wetland restoration community. Documentation photographs will also be taken during monitoring from fixed reference points around each restored wetland area.

9.4 Monitoring Report

The monitoring reports will describe the status of the wetland mitigation, summarize the results of the vegetative and hydrologic monitoring, and discuss management activities and corrective actions conducted during the previous year, and activities planned for the following year. Each report will be submitted to USACE and MDNR by January 31 of the year following monitoring. The annual report will include the following information at a minimum:

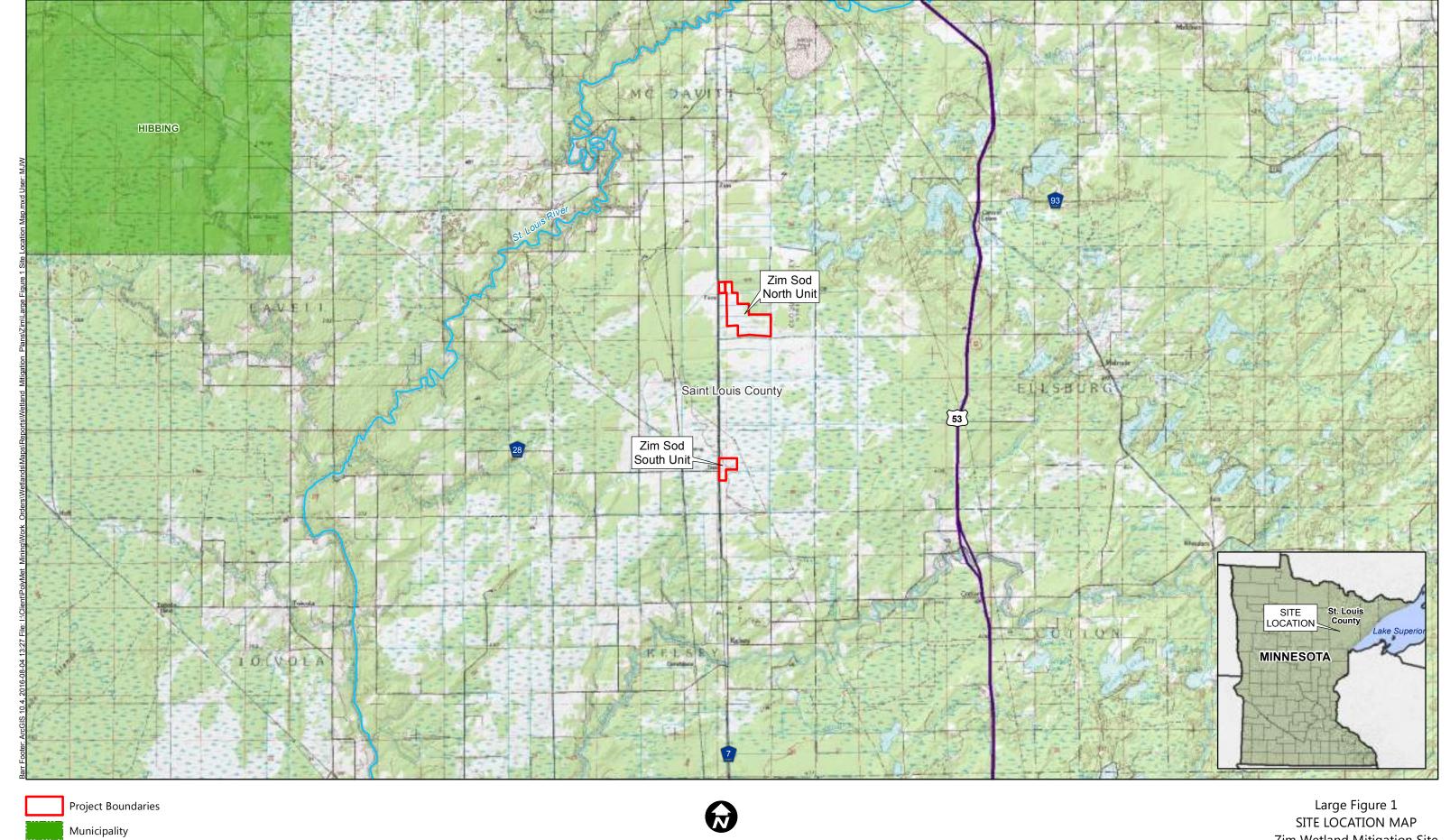
- A brief description of the wetland mitigation area, including location, size, vegetative and hydrologic monitoring data, current wetland types, and desired wetland types.
- Preparation of an as-built survey within the first year after construction is complete along with a comparison of the as-built survey to the approved plans.
- A summary of water level measurements taken to date and a determination whether the hydrology in the wetlands meets the design elevations and wetland hydrology criteria as defined in the performance standards.
- Vegetation survey information, including species and percent areal coverage within each restored wetland community and a determination of whether the vegetation meets the performance criteria, specifically reporting:
 - Percent coverage of native species, hydrophytic species, and invasive, non-native species by plant community type (absolute and relative percent cover);
 - Percent of species facultative or wetter (FAC, FACW, and OBL);
 - o Percent cover by growth form/layer (herbaceous, shrub, and tree layer); and
 - o Summary data by community type such as species richness.
- A map of the various plant communities present within the restoration areas will be prepared as distinctly different communities develop.
- Color photographs of the Site taken in August of each year at designated photo-reference points.
- A summary of management activities and/or corrective actions conducted in the wetlands during the previous year and activities planned for the following year.

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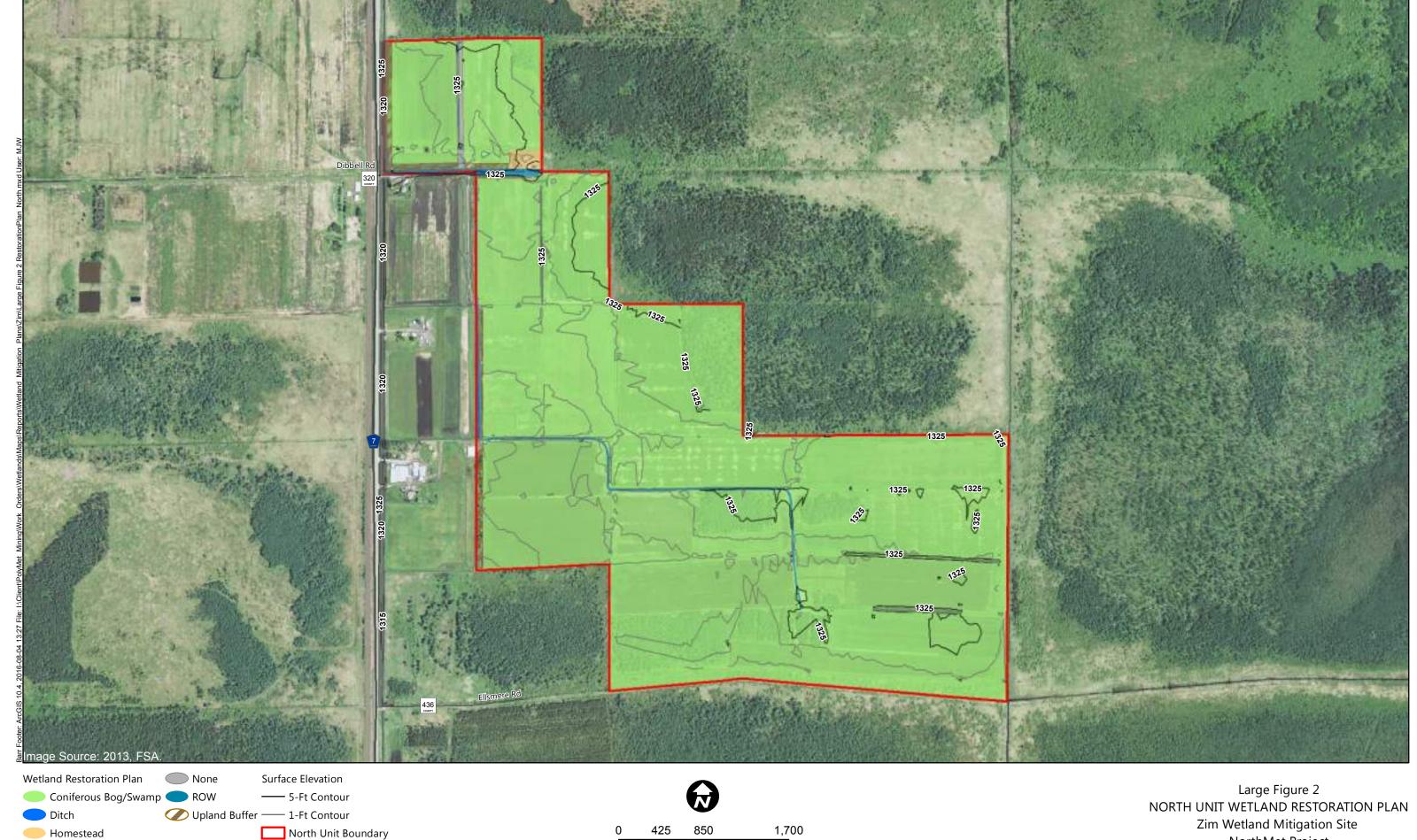
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Large Figures



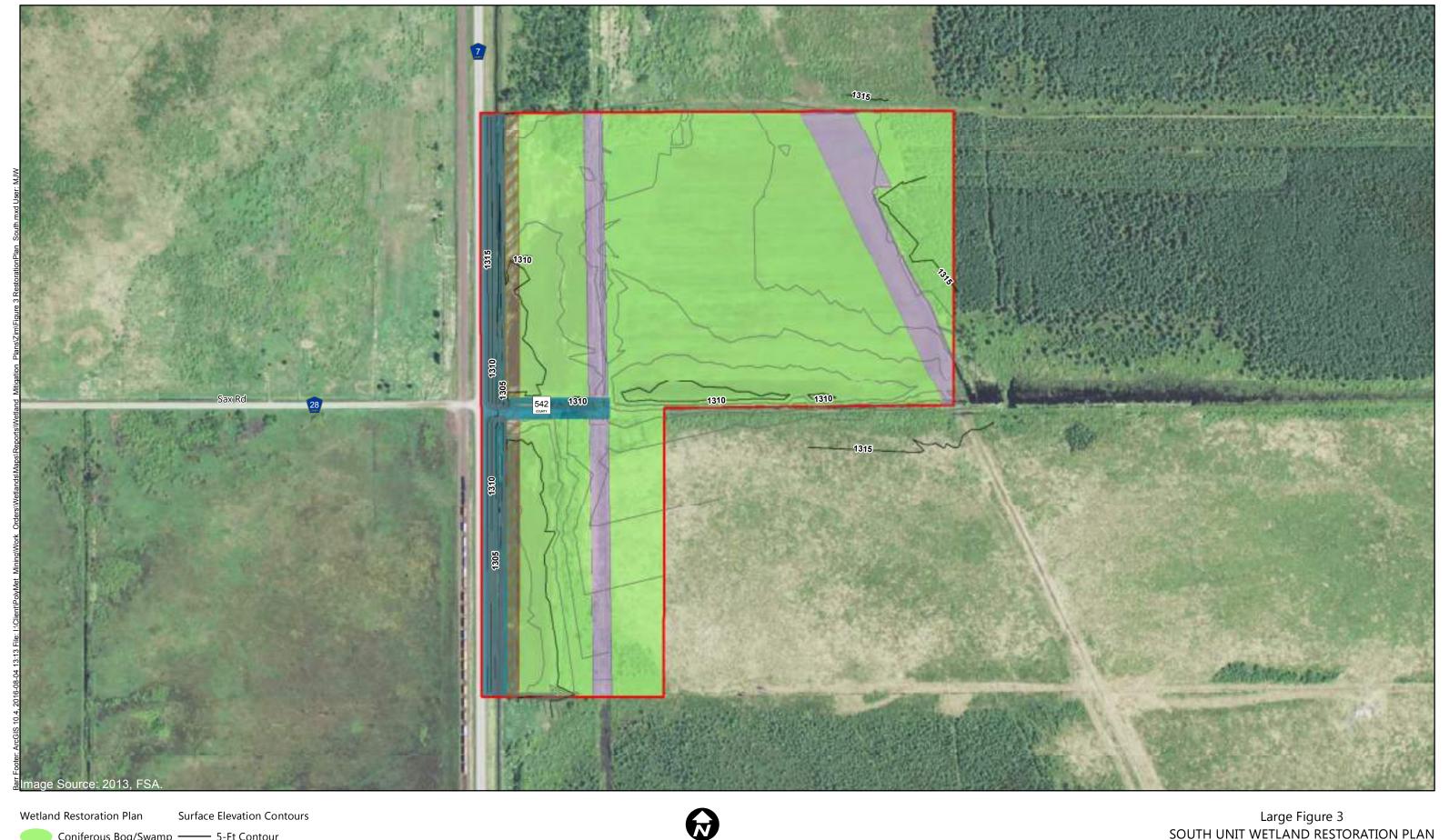
Miles

SITE LOCATION MAP
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



Feet

Zim Wetland Mitigation Site NorthMet Project Poly Met Mining, Inc Hoyt Lakes, Minnesota

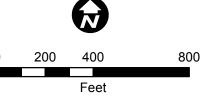


Coniferous Bog/Swamp —— 5-Ft Contour

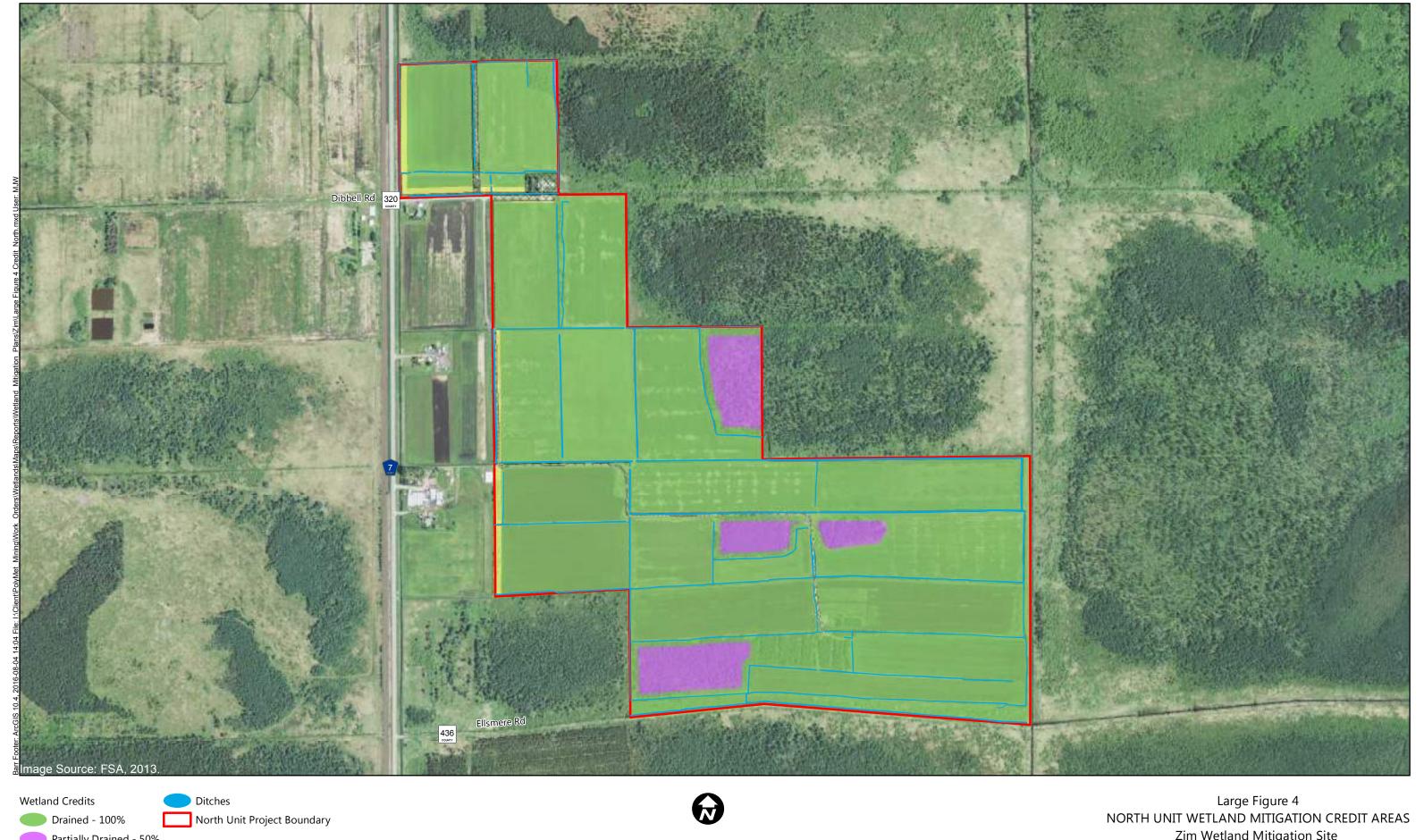
Open Bog —— 1-Ft Contour

ROW —— South Unit Boundary

Upland Buffer



Large Figure 3
SOUTH UNIT WETLAND RESTORATION PLAN
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



Drained - 100% North Unit Project Boundary

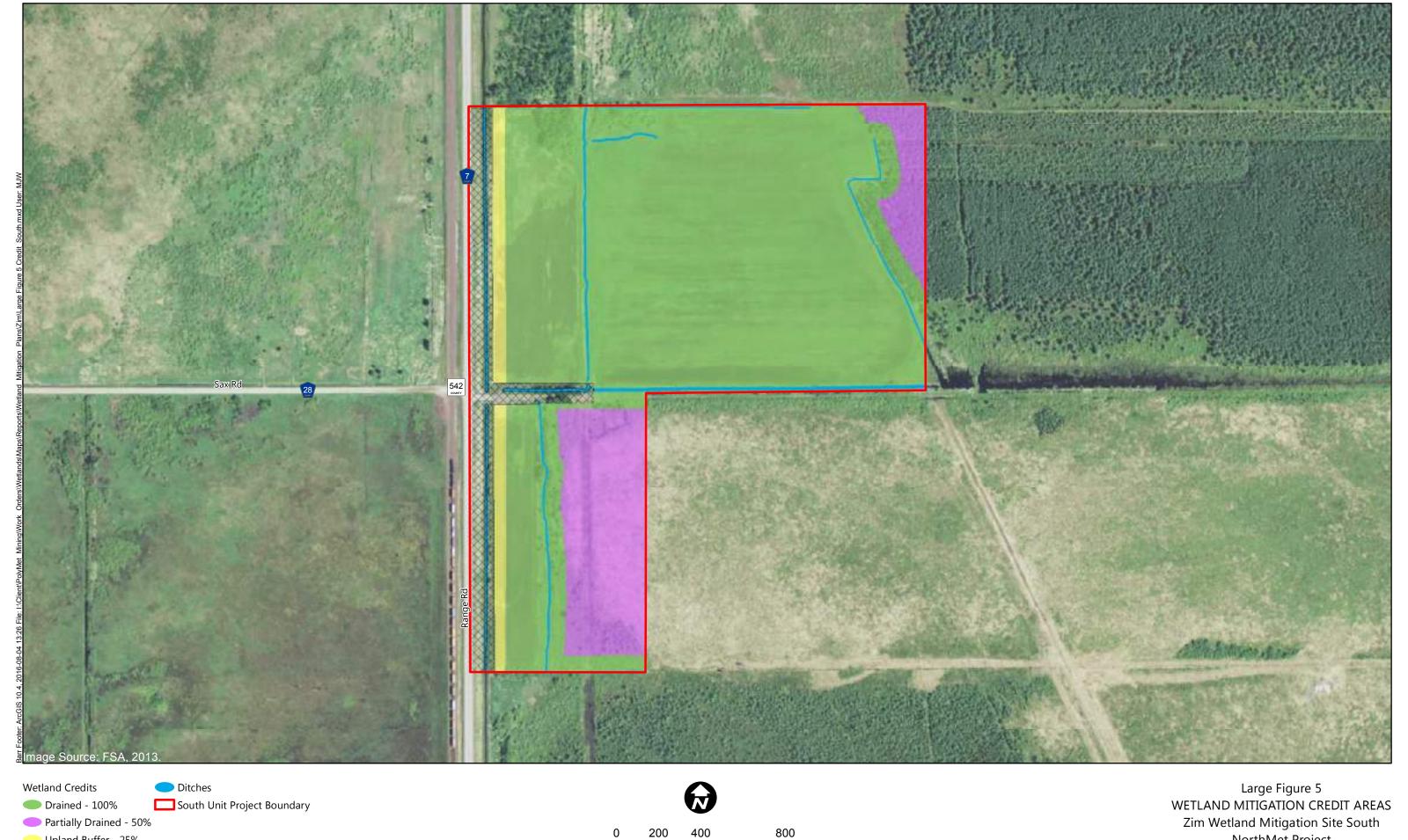
Partially Drained - 50%

Upland Buffer - 25%

Impact - 0%

No Credit - 0%

Large Figure 4
NORTH UNIT WETLAND MITIGATION CREDIT AREA
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



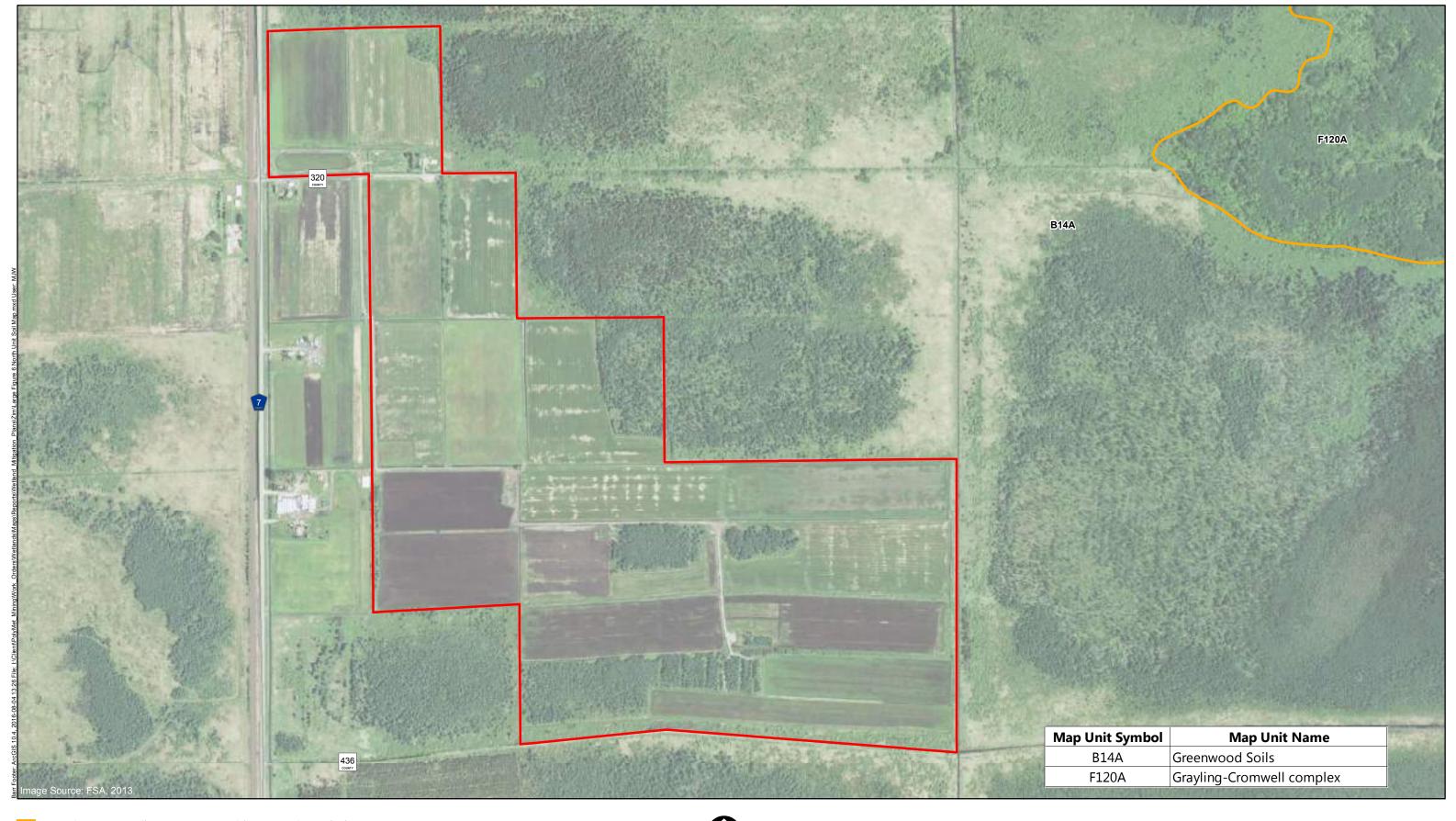
Feet

Upland Buffer - 25%

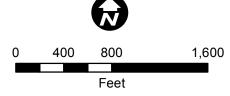
Impact - 0%

No Credit - 0%

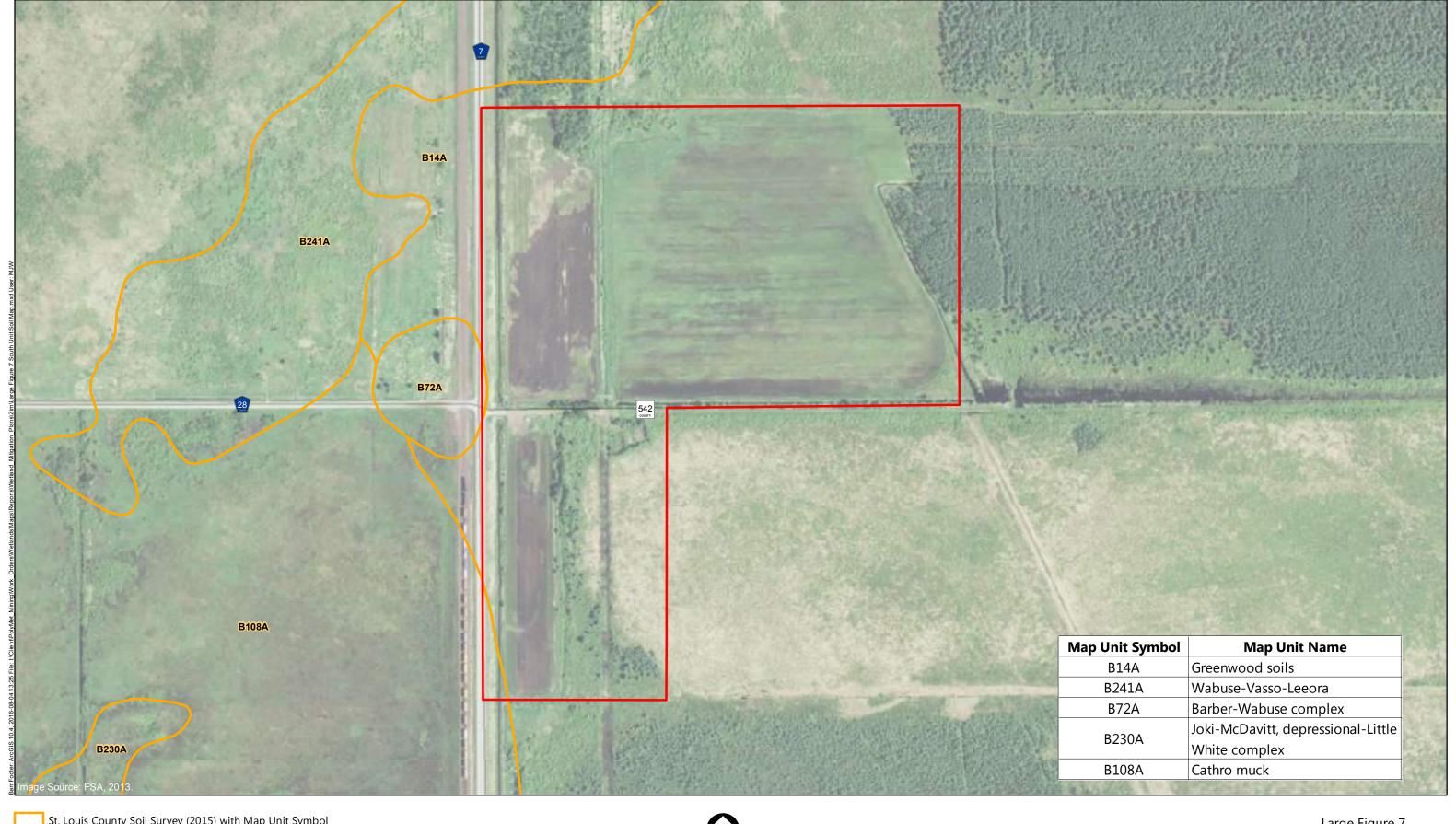
Zim Wetland Mitigation Site South NorthMet Project Poly Met Mining, Inc Hoyt Lakes, Minnesota

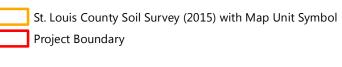


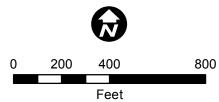
St. Louis County Soil Survey (2015) with Map Unit Symbol Project Boundary



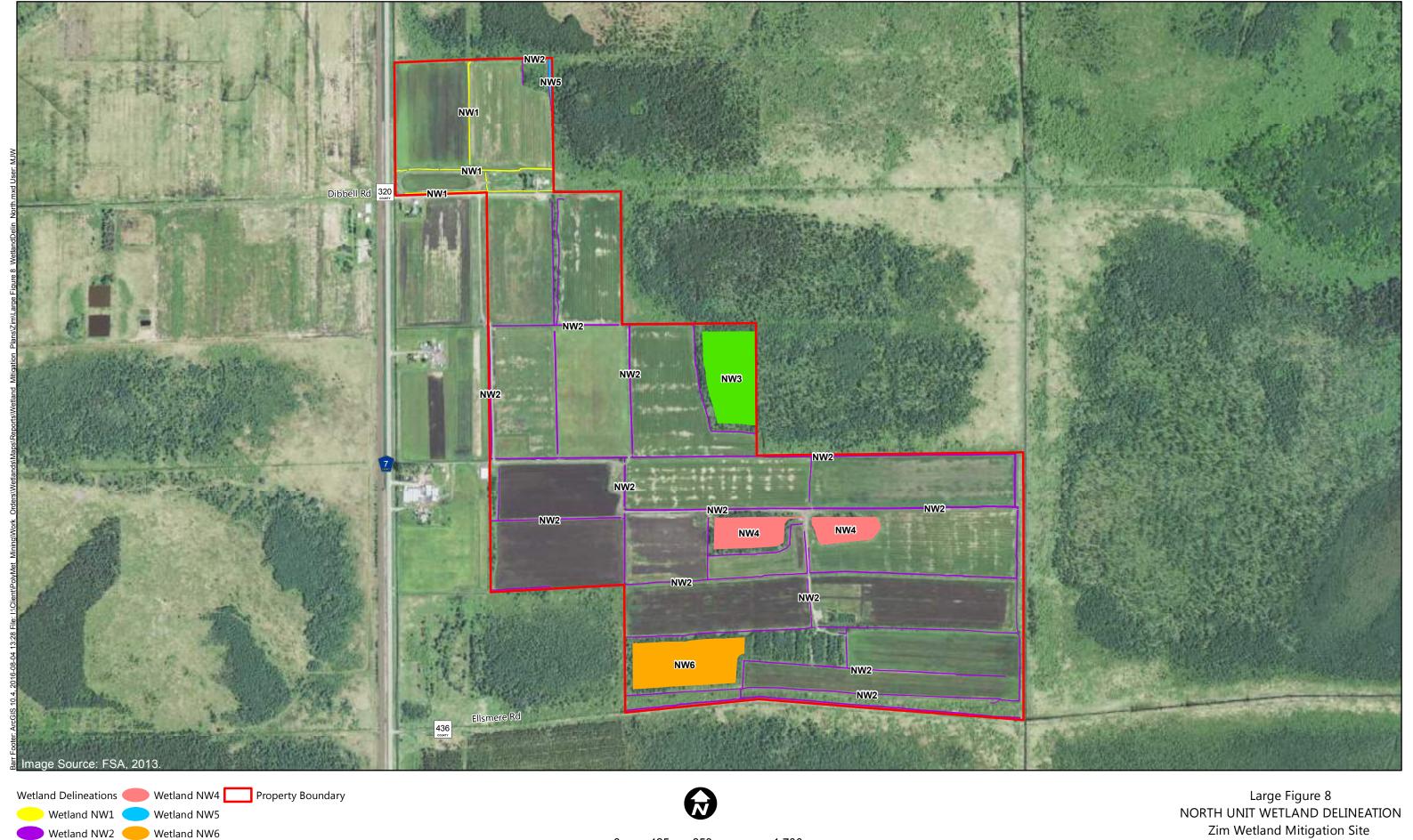
Large Figure 6
NORTH UNIT SOIL MAP
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN







Large Figure 7
SOUTH UNIT SOIL MAP
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



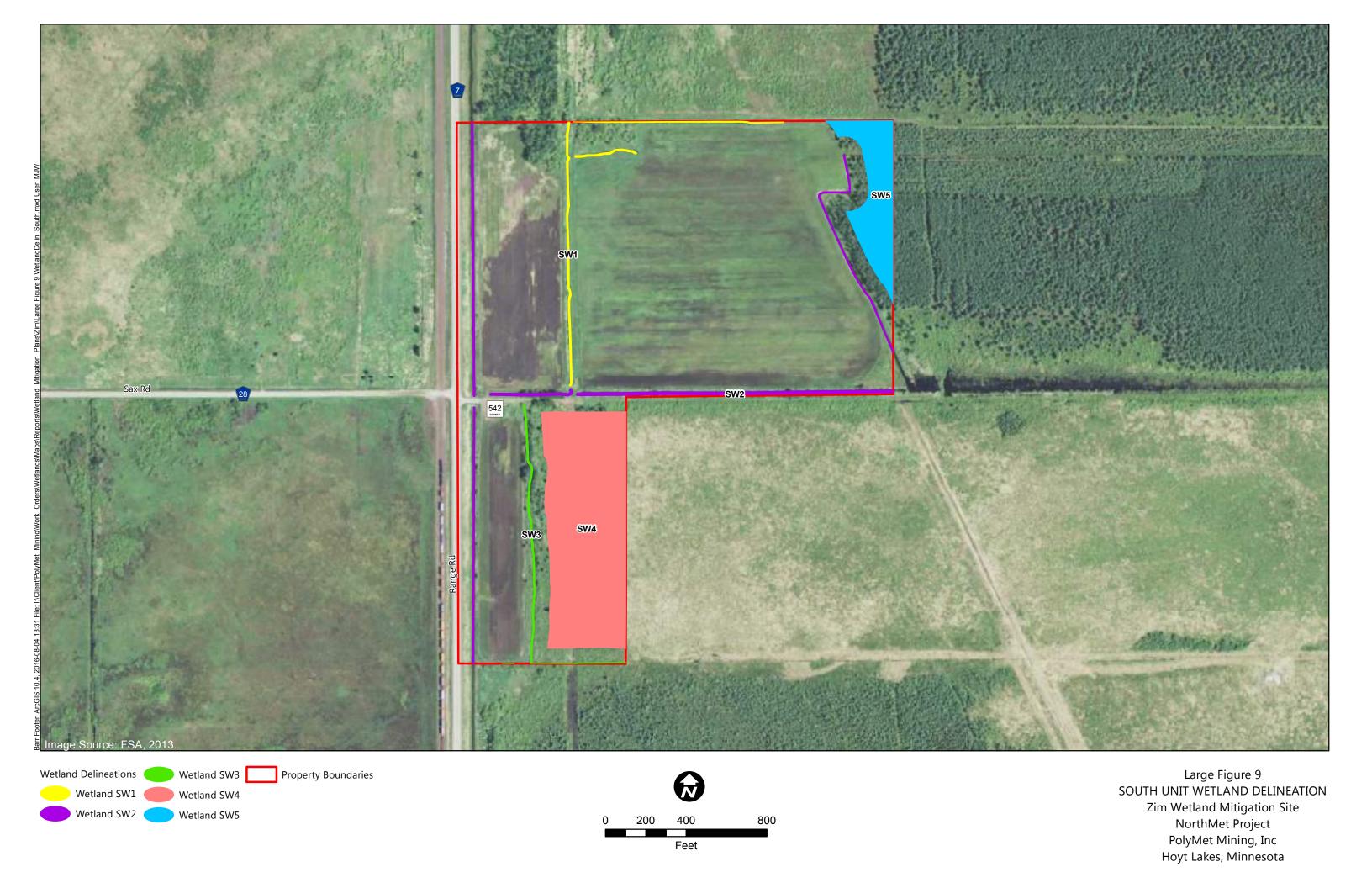
425 850

Feet

Wetland NW3

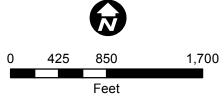
1,700

Zim Wetland Mitigation Site NorthMet Project Poly Met Mining, Inc Hoyt Lakes, Minnesota





Property Boundary
Wetland Delineation
Coniferous swamp
Shallow, open water



Large Figure 10

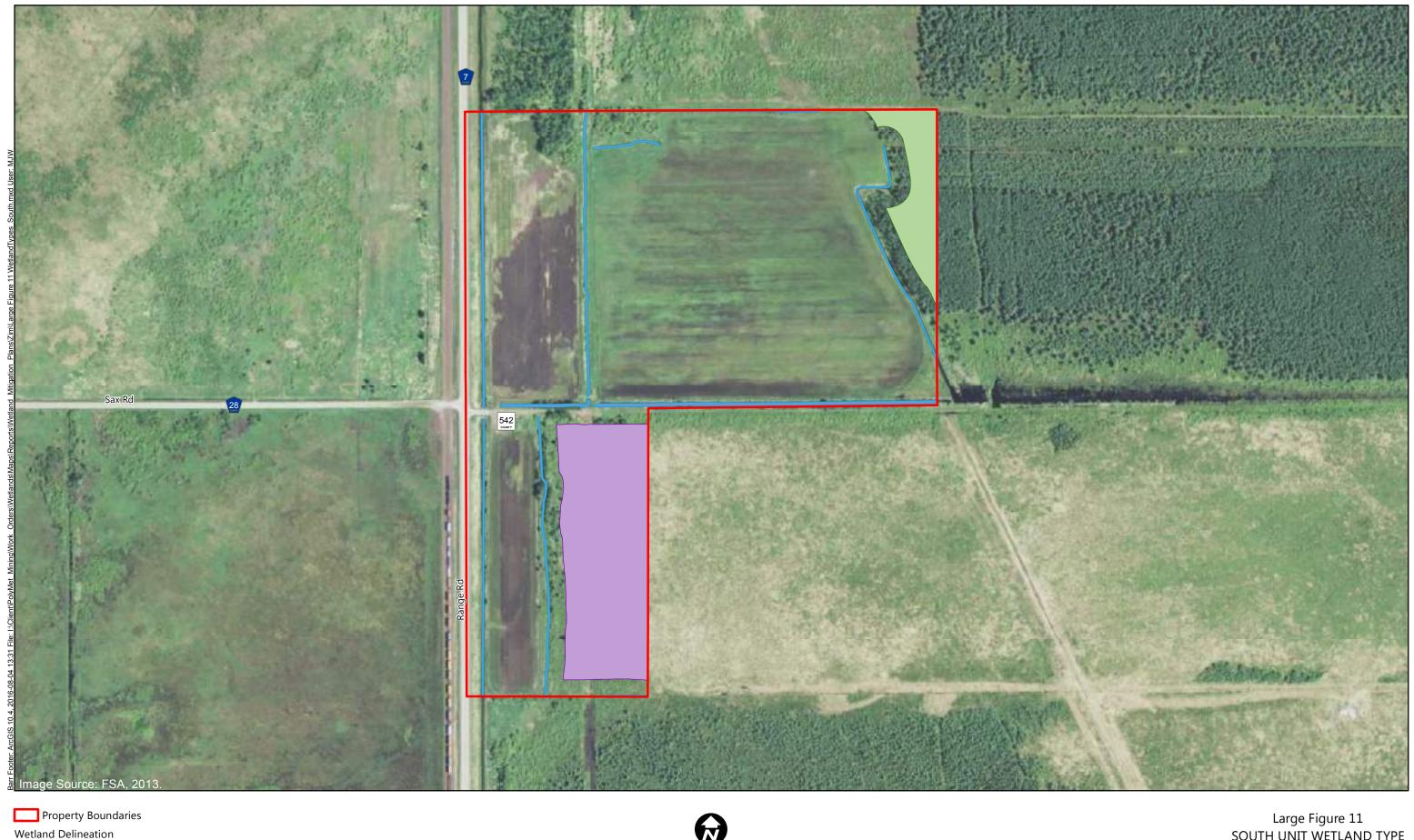
NORTH UNIT WETLAND TYPE

Zim Wetland Mitigation Site

NorthMet Project

Poly Met Mining, Inc

Hoyt Lakes, Minnesota



Coniferous swamp

Shallow, open water

Shrub swamp (Alder thickets & Shrub-carrs)

Open bog

200 400 800 Feet Large Figure 11
SOUTH UNIT WETLAND TYPE
Zim Wetland Mitigation Site
NorthMet Project
PolyMet Mining, Inc
Hoyt Lakes, Minnesota



400 800

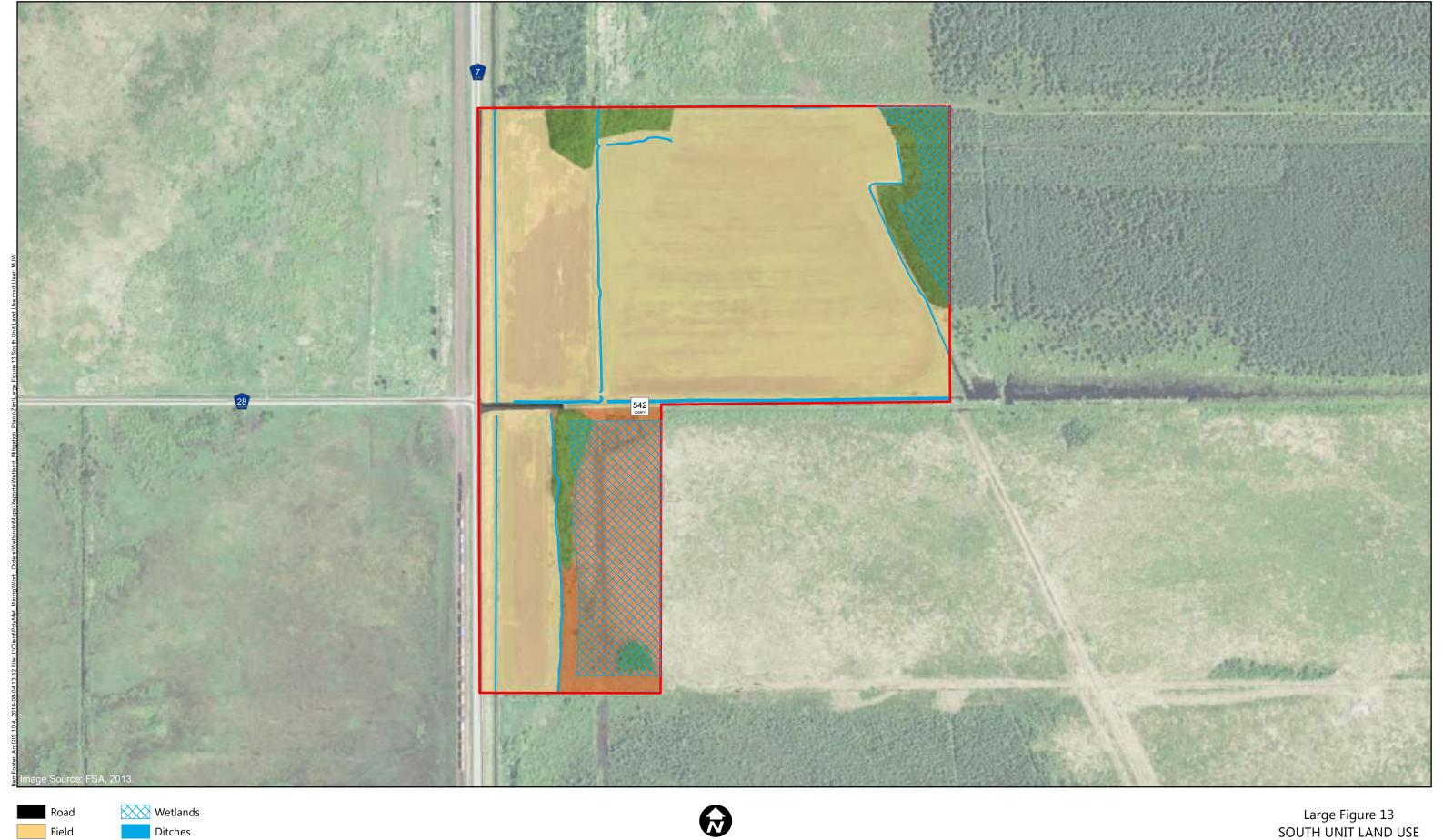
Feet

Homestead

Natural Area

1,600

Large Figure 12
NORTH UNIT LAND USE
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



200 400

Feet

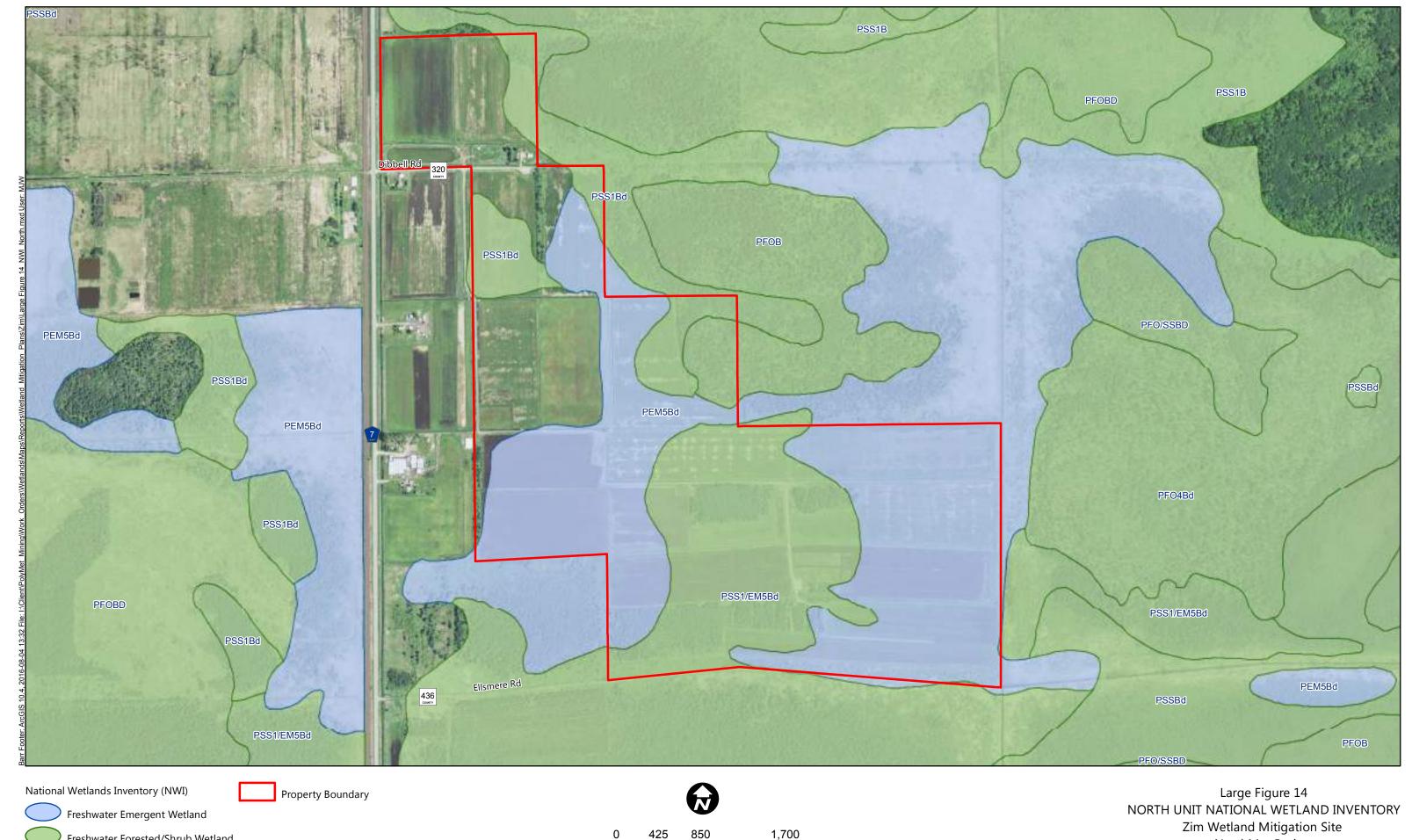
800

Forest

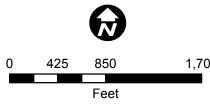
Natural Area

Project Boundary

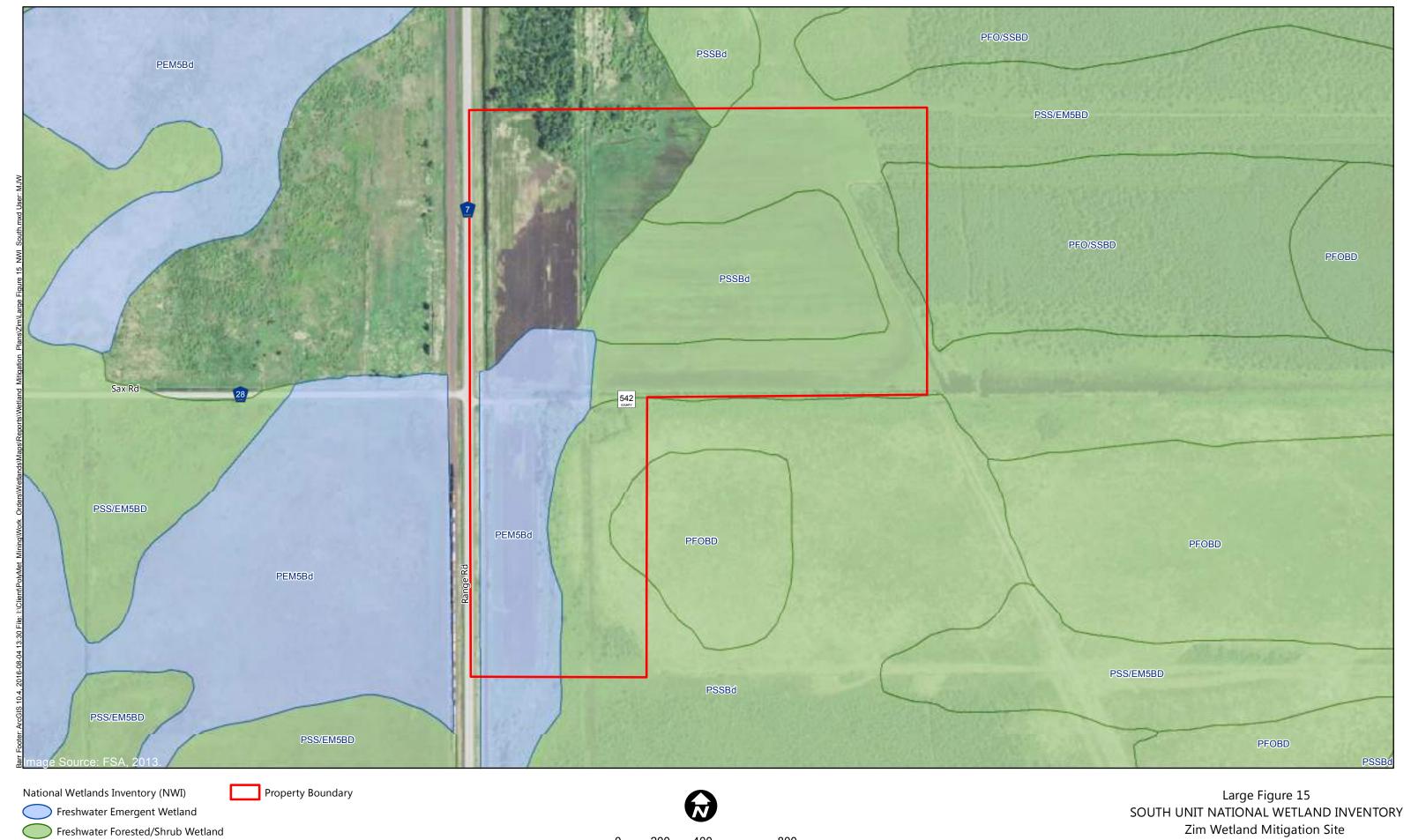
Large Figure 13
SOUTH UNIT LAND USE
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Freshwater Forested/Shrub Wetland Freshwater Pond Riverine



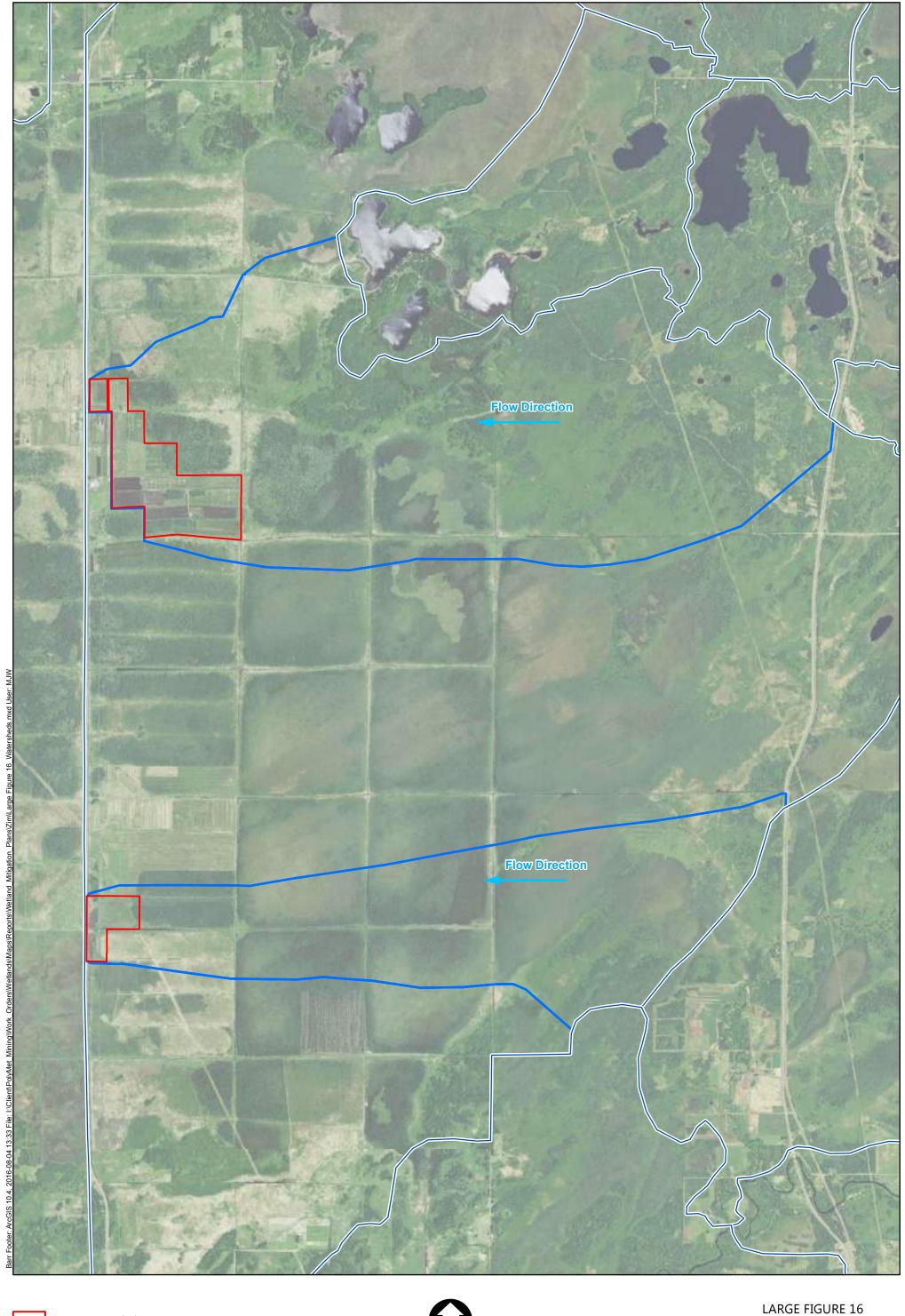
NorthMet Project Poly Met Mining, Inc Hoyt Lakes, Minnesota



Freshwater Pond

Riverine

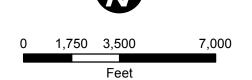
400 800 NorthMet Project Poly Met Mining, Inc Feet Hoyt Lakes, Minnesota



Property Boundaries

Level 8 Watersheds

Contributing Watersheds to North Unit and South Unit



CONTRIBUTING WATERSHEDS
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota

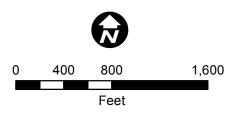


Active Well — 5-Foot

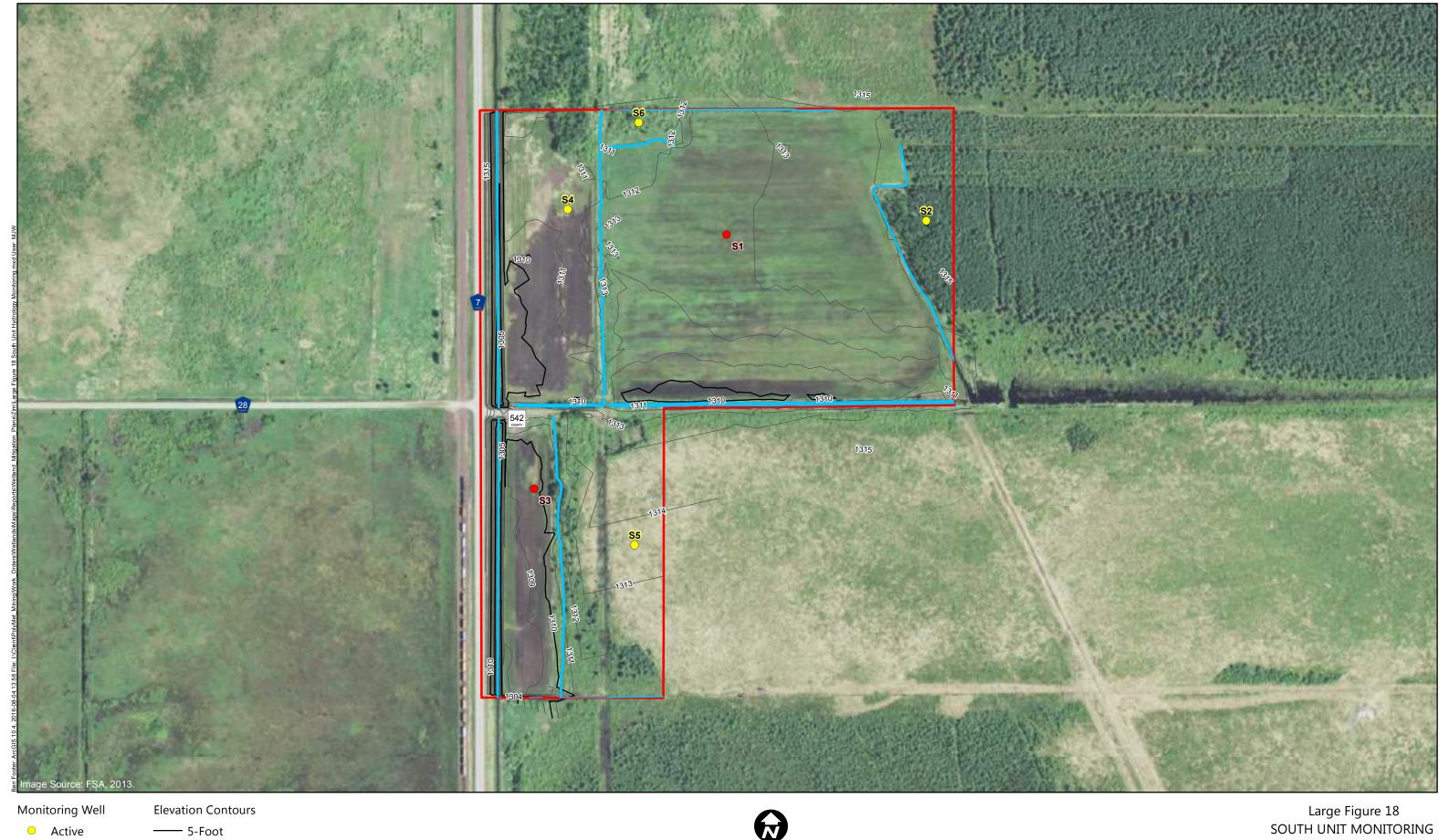
Removed Well — 1-Foot

Ditches

Project Boundary



Large Figure 17
NORTH UNIT MONITORING
WELL LOCATIONS
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



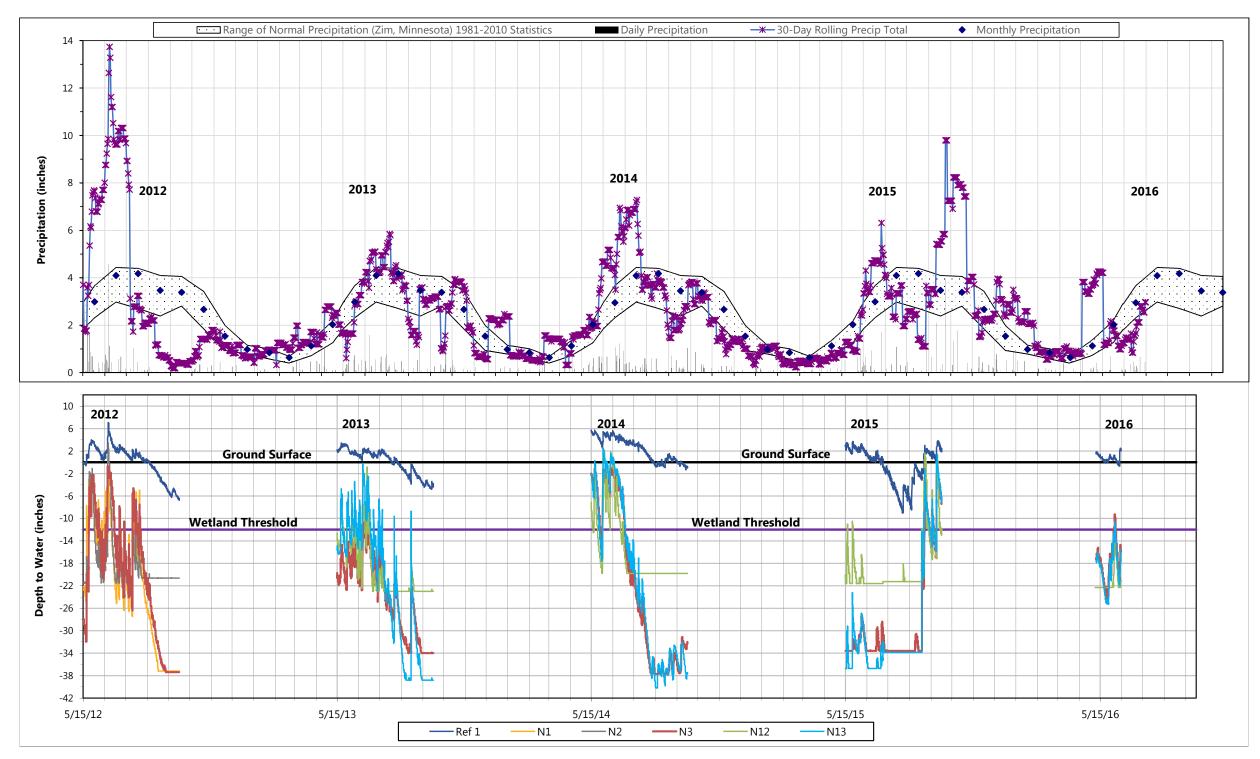
Removed Well

Project Boundary

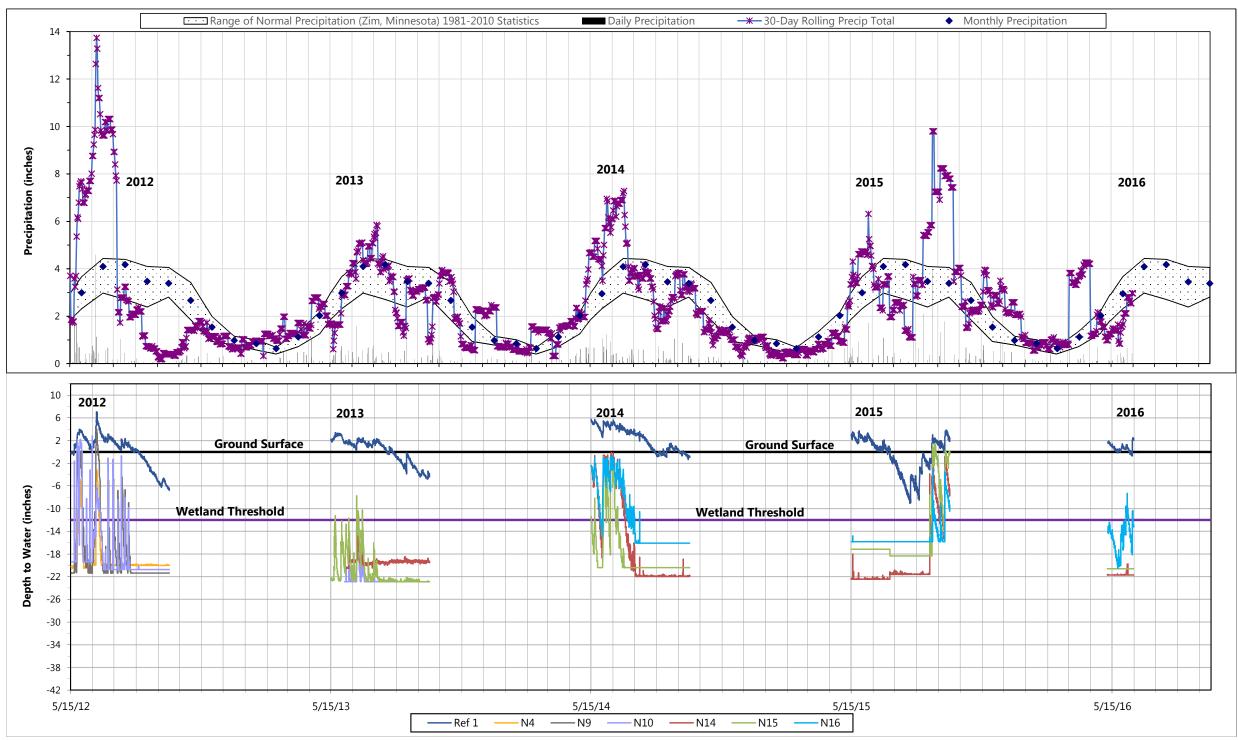
Ditches

____ 1-Foot

0 200 400 800 Feet Large Figure 18
SOUTH UNIT MONITORING
WELL LOCATIONS
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



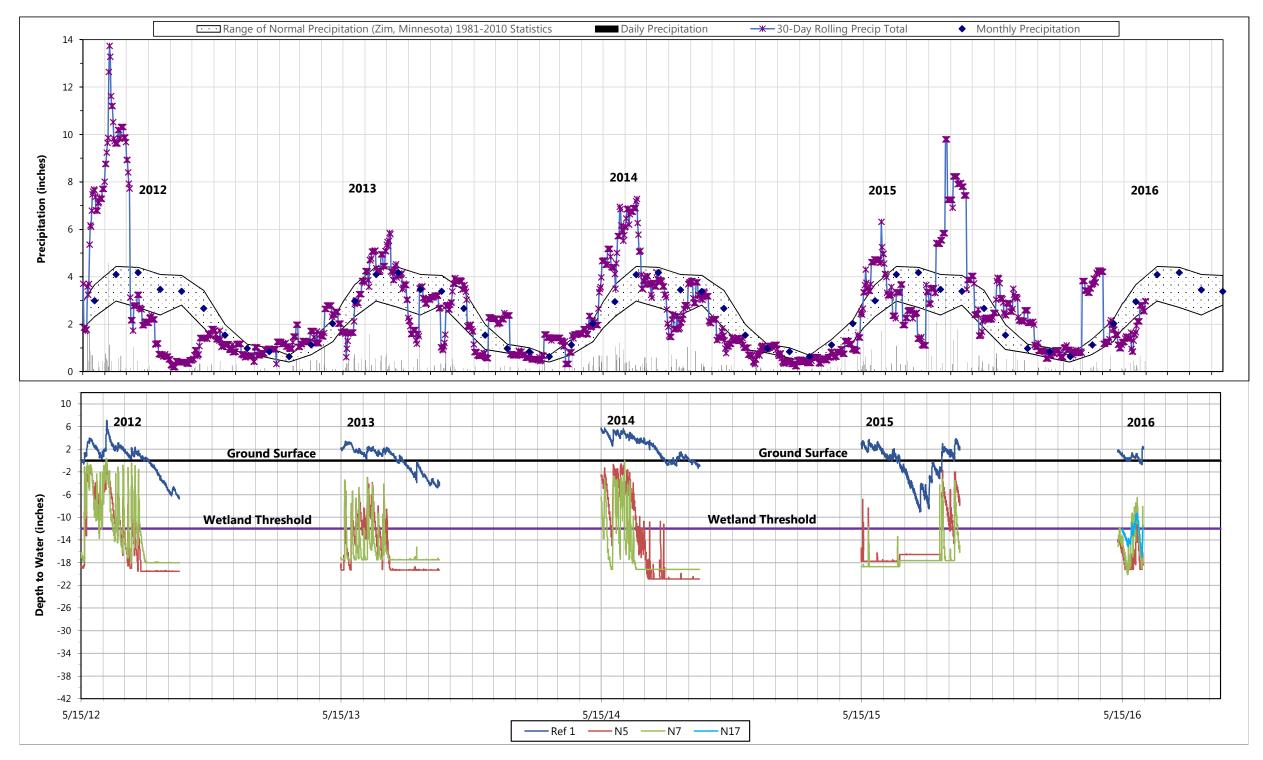
Large Figure 19
2012-2016 Hydrology Monitoring Data
North Unit Sod Fields: Wells N1, N2, N3, N12, and N13
Zim Sod Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



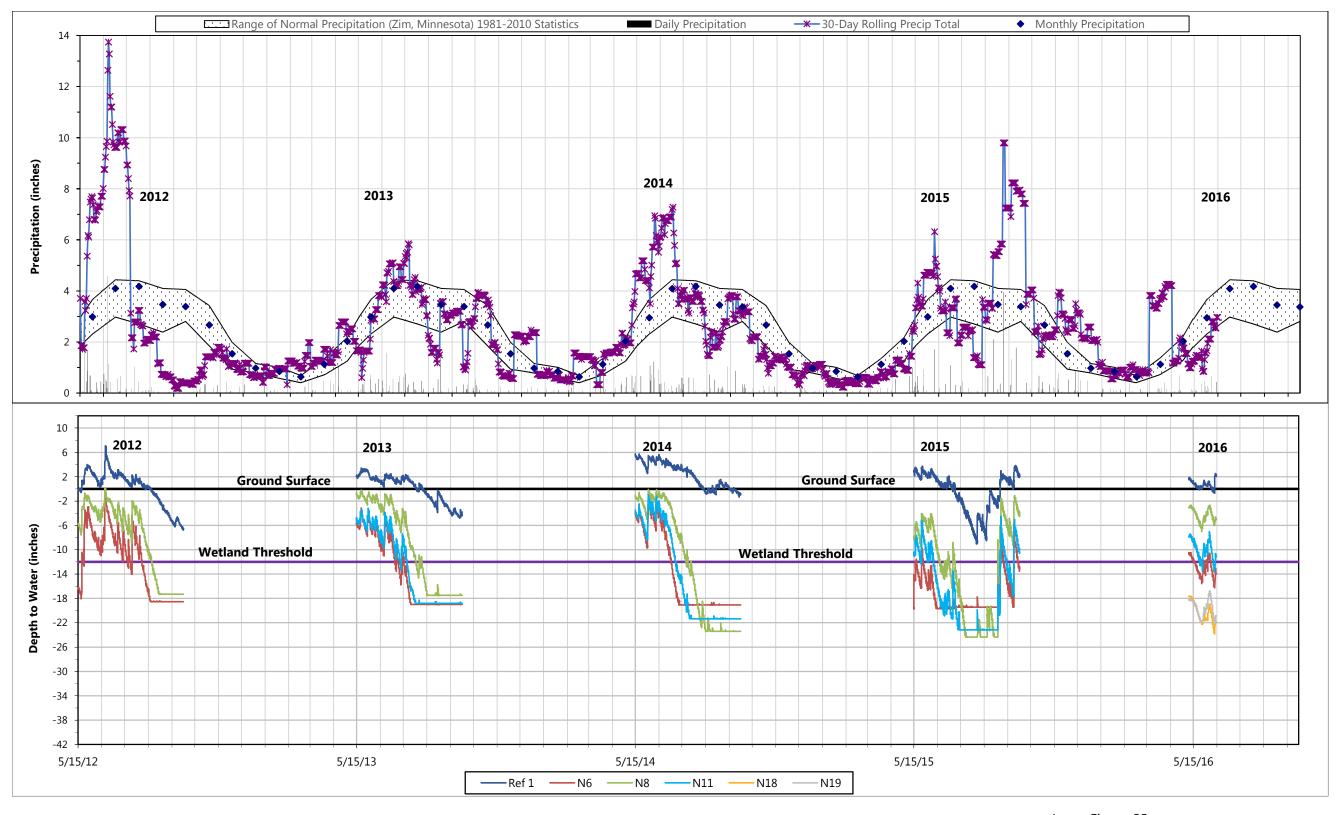
Wells 4 and 9 collected data in 2012 only, well 10 only in 2012-2013.

NOTE: In 2016, precipitation and logger data is shown through June 14

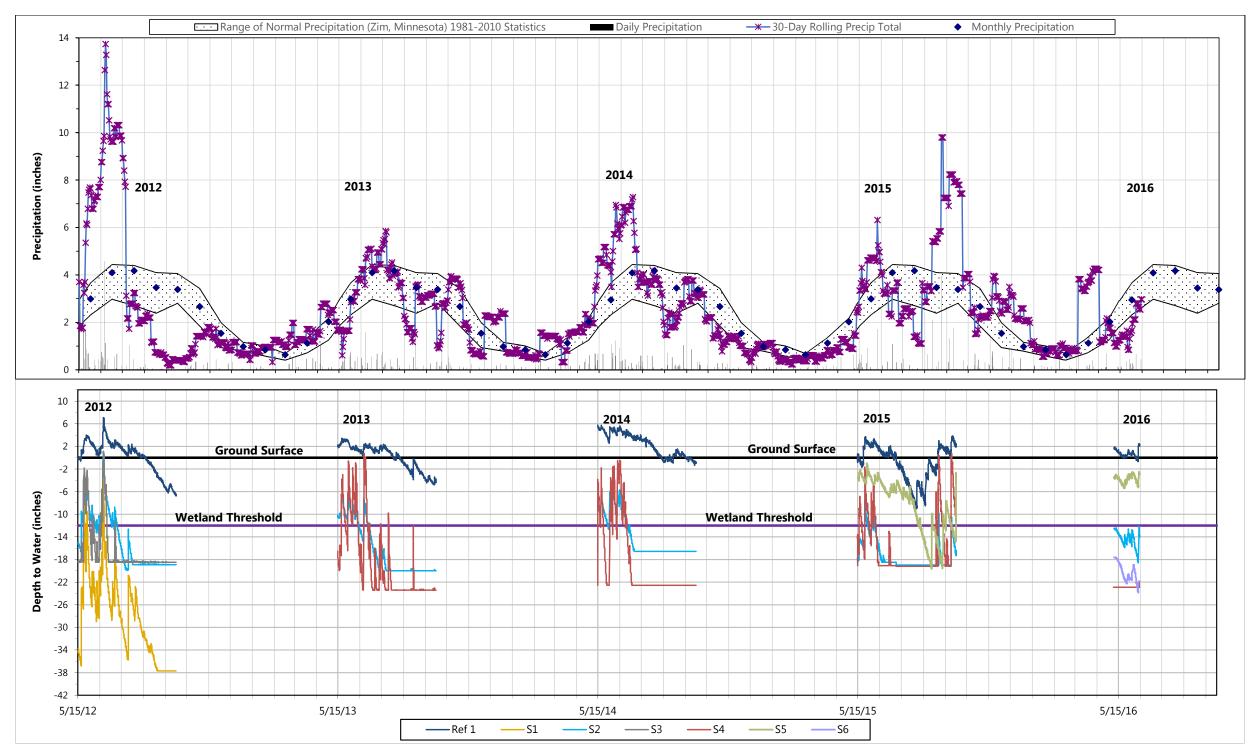
Large Figure 20
2012-2016 Hydrology Monitoring Data
North Unit Sod Fields: Wells N4, N9, N10, N14, N15, and N16
Zim Sod Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 21
2012-2016 Hydrology Monitoring Data
North Unit Sod Fields: Wells N5, N7, and N17
Zim Sod Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 22
2012-2016 Hydrology Monitoring Data
North Unit Forested Areas: Wells N6, N8, N11, N18, and N19
Zim Sod Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 23
2012-2016 Hydrology Monitoring Data
South Unit: Wells S1 (Sod Field), S2 (Forest), S3 (Sod Field),
S4 (Sod Field), S5 (Natural Area), and S6 (Forest)
Zim Sod Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN

Appendices

Appendix A

Declaration of Restricted Covenants Example

-(Above Space is Reserved for Recording Information)—

PERPETUAL CONSERVATION EASEMENT FOR WETLAND BANK

Grantor:

Location: within Section 5, Township 39 North, Range 22 West, County of Pine

This Perpetual Conservation Easement for Wetland Replacement ("Easement") is made on (date) by the undersigned, hereinafter referred to collectively as the "Grantor":

RECITALS

- A. This Easement is made pursuant to and in furtherance of the Wetland Conservation Act of 1991, as amended, Minn. Stat. §103G.222, *et. seq.* ("WCA") and the rules implementing WCA, Minn. R. ch. 8420 ("WCA Rules").
- B. This Easement pertains to all or part of the real property in Pine County, Minnesota, which is legally described on *Exhibit A* attached hereto and made a part hereof ("Real Property").
 - C. The Real Property is the subject of a wetland bank plan pursuant to Minn. R.8420.0740.
- D. The Grantors include all of the following (1) all the fee owners of the Real Property and (2) the applicants under the bank plan if different from the fee owners. The term "Grantor" includes all of the Grantors if there is more than one. The Grantors are jointly and severally responsible for complying with the terms of this instrument. This Easement and the duties and restrictions contained in it shall also run with the land.
- E. WCA is administered by the State of Minnesota through its Board of Water and Soil Resources ("State").

Page 1 of 6

- F. The local government unit ("LGU") charged under WCA with approval of the subject wetland replacement plan ("replacement plan") is the Minnesota Department of Natural Resources Division of Lands and Minerals. The subject wetland mitigation plan includes all fully executed forms provided by the State, all supporting maps, engineering plans, drawings, monitoring plan, vegetation establishment plan and management plan and facilities maintenance plan. A complete copy of the replacement plan is on file at the LGU. The address of the LGU is 1525 Third Avenue East, Hibbing, MN 55746. The State is responsible for the acceptance of this Easement.
- G. The replacement plan requires the restoration or creation of a wetland on the portion of the Real Property designated in Exhibit B attached hereto and made a part hereof ("Replacement Area"). The replacement plan may also require the establishment of upland buffer within the Replacement Area. This Easement pertains to both wetlands and specified uplands within the Replacement Area.
- H. The Replacement Area is subject to the WCA, WCA Rules and all other provisions of law that apply to wetlands, except that the exemptions in Minn. Stat. §103G.2241 and Minn. R. 8420.0122 do not apply to the Replacement Area, pursuant to Minn. Stat. §103G.222, subd. 1(h) and Minn. R. 8420.0115.
- I. All references in this Easement to Minnesota Statutes and to Minnesota Rules are to the statutes and rules currently in effect and as amended or renumbered in the future.
- J. The purposes of this Easement are to maintain and improve the ecological values of the Replacement Area through the means identified in the replacement plan and to preserve the Replacement Area in a natural condition in perpetuity.

IN ADDITION, THE GRANTORS, FOR THEMSELVES, THEIR HEIRS, SUCCESSORSAND ASSIGNS COVENANT THAT THEY:

- 1. Shall establish and maintain wetlands and upland buffers within the Replacement Area as specified in the replacement plan approved by the LGU and on file at the offices of the LGU. The wetland and any specified upland buffer area shall be the size and type specified in the replacement plan. Grantor shall not make any use of the Replacement Area that would adversely affect any of the functions or values of the area. Those functions and values are identified in Minn. R. 8420.0540, subp. 10, or specified in the approved replacement plan.
- 2. Shall pay the costs of establishment, maintenance, repairs and reconstruction of the wetlands and specified upland buffers within the Replacement Area, which the LGU or the State may deem necessary to comply with the specifications for the Replacement Area in the approved replacement plan. The Grantor's obligations under this paragraph include the payment of any lawful taxes or assessments on the Real Property.
- 3. Shall establish and maintain visible monuments such as signs, numbered fence posts or survey posts at prominent locations along the boundary of the Replacement Area in accordance with the approved replacement plan. If numbered fence posts are used, Grantor's Replacement Plan must contain a survey or scaled drawing of the property that corresponds to the fence post numbering. Posts

must be at least 4 feet high and notably visible on the landscape. If signs are used, such signs must be have a surface area of at least one quarter (1/4) square feet, mounted on a fence post at least 4 feet above ground, and minimally contain the words "Boundary of Wetland Replacement Area - Subject to Perpetual Conservation Easement Restrictions – Contact MN Board of Water and Soil Resources or Local Soil and Water Conservation District for Further Information." Said monuments must be made of non-degradable material and shall be at least four feet in height.

- 4. Grants to the LGU, the State, and the agents and employees of the LGU and the State, reasonable access to the Replacement Area for inspection, monitoring and enforcement purposes. The LGU, the State, and the agents and employees of the State are hereby granted a perpetual ingress and egress easement ("Access Easement") for access to and from the Replacement Area. The Access Easement shall be over and across the area ("Access Area") that is specified on Exhibit A attached hereto and made a part hereof or, if not specified on Exhibit A, the most reasonably direct and convenient route between the Replacement Area and a public road. If all or any part of the Access Area is owned by a person or entity other than Grantor, then the owner has joined in this Easement for purposes of granting the Access Easement by signing below. The signed written consent and subordination of all other holders of interests in the Access Area has been or will be obtained by Grantor and recorded in the same manner as specified in paragraph 5 below. This Easement grants no access to or entry to the Real Property, the Replacement Area, or the Access Area to the general public.
- 5. Represents that Grantor is (a) the fee owner of the Real Property and (b) the applicant under the replacement plan, if different from the fee owner. Grantor represents that all other parties who may have an interest in the Real Property (e.g., mortgagees, contract for deed vendees, holders of easements, etc.) have consented and subordinated their interests to this Easement by signing below. If it is determined at any time that there is any other party who may have an interest in the Real Property that is prior to this Easement, then Grantor shall immediately obtain and record a consent and subordination agreement signed by such other party. Acceptance of this Easement does not release Grantor from the obligation to obtain and record a consent and subordination agreement signed by any party who may have an interest in the Real Property that is prior to this Easement, even if such interest was of record at the time of acceptance.
- 6. Will record this easement at Grantor's expense in the real property records of the county where the Real Property is located. Said recording shall take place within 30 days of the State's acceptance of this Easement. The Grantor shall provide the original copy of the recorded easement to the State prior to making any credits from this replacement area available for use.
- 7. Acknowledge that this Easement shall be unlimited in duration, without being rerecorded. This Easement shall be deemed to be a perpetual conservation easement pursuant to Minn. Stat. ch. 84C.
- 8. Acknowledge that, unless expressly authorized in writing by the LGU in the approved replacement plan, Grantor:
 - (a) Shall not produce agricultural crops on the Replacement Area, except that this provision does not restrict the harvest of the seeds of native vegetation if only the seed-head is

- removed in the process of harvest and does not involve the use of vehicular, motorized equipment;
- (b) Shall not cut hay, mow vegetation or cut timber on the Replacement Area except as allowed or prescribed in the Replacement Plan;
- (c) Shall not make any vegetative alterations on the Replacement Area that do not enhance or would degrade the ecological functions and values of the Replacement Area.

 Vegetative alterations shall be limited to those listed in the approved replacement plan;
- (d) Shall not graze livestock on the Replacement Area;
- (e) Shall not place any materials, substances or other objects, nor erect or construct any type of structure, temporary or permanent, on the Replacement Area.
- (f) Shall not allow vehicular traffic on the Replacement Area except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (g) Shall not alter the topography of the Replacement Area by any means including plowing, dredging, filling, mining or drilling except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (h) Shall not modify the hydrology of the Replacement Area in any way or by any means including pumping, draining, ditching, diking, impounding or diverting surface or ground water into or out of the Replacement Area except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (i) Shall regularly inspect and maintain structures specified in the Replacement Plan in good working condition to sustain the goals in the approved Replacement Plan.
- 9. Acknowledge that the Grantor is responsible, at Grantor's cost, for weed control by complying with noxious weed control laws and emergency control of pests necessary to protect the public health on the Replacement Area.
- 10. Acknowledge that this Easement may be modified only by the joint written approval of the LGU and the State. If the Replacement Area has been used to mitigate wetland losses under the Federal Water Pollution Control Act, the U.S. Army Corps of Engineers (or successor agency) must also agree to the modification in writing.
- 11. Acknowledge that this Easement may be enforced, at law or in equity, by the LGU or the State. The LGU and the State shall be entitled to recover an award of reasonable attorney's fees from Grantor in any action to enforce this Easement. The right to enforce the terms of this Easement is not waived or forfeited by any forbearance or failure to act on the part of the State or LGU. If the subject Replacement Area is to be used partially or wholly to fulfill permit requirements under the Federal Water Pollution Control Act or a federal farm program, then the provisions of this Easement

that run to the State or the LGU may also be enforced by the United States of America in a court of competent jurisdiction.

12. Acknowledge that this Easement is not valid until the Easement has been accepted by the State, the Grantor has recorded this Easement and the State has received evidence of such recording.

SIGNATURE OF GRANTOR

SIGNATURE OF FEE OWNER(S):	
STATE OF MINNESOTA)) ss. COUNTY OF)	
This instrument was acknowledged before manual (name(s) with marital status).	ne this day of , by
Notarial Stamp or Seal	Notary Public
SIGNATURE OF BANK APPLICANT (S), IF DIFFERENT FROM FEE OWNER:	
STATE OF MINNESOTA)) ss. COUNTY OF) This instrument was acknowledged before re-	ne this day of by
This instrument was acknowledged before n (name(s) with marital status).	ne this day of , by
Notarial Stamp or Seal	Notary Public

ACCEPTANCE

The State accepts the foregoing Easement.

MINNESOTA BOARD OF WATER AND SOIL RESOURCES:

Ву:	<u> </u>				
Its:	_				
STATE OF MINNESOTA)) ss. COUNTY OF)					
This instrument was acknowledged before me person) as (title) of the Board of Water and Soi		day of	,	by	(name of
Notarial Stamp or Seal	Notary P	'ublic			
This instrument was drafted by the Board of Water and S One West Water Street, St. Paul, MN 55107	Soil Resou	rces			
If there are additional holders of interest the subject : Consent and Subordination agreement [BWSR Form		-			ach their

EXHIBIT A Legal Description of Real Property

EXHIBIT B Map or Survey of Bank Area

Appendix B

Project Wetland Mitigation Crediting

Large Table 5

Mitigation Credit Summary⁽¹⁾
Poly Met Mining, Inc.

	Within Project Watershed				tside Project	Total Wetland		Total Wetland				
Community / Credit Type	Zim Sod Wetland Mitigation (acres)	Credit Percent	Total Wetland Mitigation Credits	Aitkin Wetland Mitigation (acres)	Aitkin Wetland Mitigation Credits	Hinckley Wetland Mitigation (acres)	Hinckley Wetland Mitigation Credits	Credit Percent	Total Wetland Mitigation Credits	Mitigation ⁽¹⁾	Credit Percent	Mitigation Credits ⁽¹⁾
Off-Site Restoration of draine	d wetland (2)											
Type 2 Fresh (Wet) Meadow	0		0	0	0	0	0		0	0	100%	0.0
Type 2 Sedge Meadow	0		0	0	0	56.17	56.17		56.17	56.17		56.17
Type 3 Shallow Marsh	0		0	21.22	21.22	0	0		21.22	21.22		21.22
Type 4 Deep Marsh	0		0	0	0	0	0		0	0		0
Type 5 Shallow, Open Water	0		0	0	0	0	0		0	0		0
Type 6 Shrub-Carr	0	100%	0	0	0	98.43	98.43	100%	98.43	98.43		98.43
Type 6 Alder Thicket	0		0	0	0	98.44	98.44		98.44	98.44		98.44
Type 7 Hardwood Swamp	0		0	147.95	147.95	7.40	7.40	•	155.35	155.35		155.35
Type 7 Coniferous Swamp	0		0	544.94	544.94	0	0		544.94	544.94		544.94
Type 8 Open Bog	7.54		7.54	0	0	0	0		0	7.54		7.54
Type 8 Coniferous Bog	443.09		443.09	0	0	0	0		0	443.09		443.09
Off-Site Restoration of partial	Off-Site Restoration of partially-drained wetland ⁽³⁾											
Type 2 Sedge Meadow	0		0	0	0	13.16	6.58	50%	6.58	13.16	50%	6.58
Type 3 Shallow Marsh	0		0	0.30	0.15	0	0		0	0.30		0
Type 7 Coniferous Swamp	0		0	25.15	12.58	0	0		12.58	25.15		12.58
Type 8 Open Bog	2.83	50%	1.42	0	0	0	0		0	2.83		1.42
Type 6 Shrub-Carr	0		0	0	0	62.46	31.23		31.23	62.46		31.23
Type 7 Hardwood Swamp	0		0	73.49	36.75	0.17	0		36.83	73.66		36.83
Type 8 Coniferous Bog	50.45		25.23	0	0	0	0		0	50.45		25.23
Off-Site Site Wetland Creation	1 (4)											
Type 2 Sedge Meadow	0		0	0	0	7.14	5.36		5.36	7.14		5.355
Type 6 Shrub-Carr	0	75%	0	0	0	2.52	1.89	75%	1.89	2.52	75%	1.89
Type 6 Alder Thicket	0		0	0	0	2.52	1.89		1.89	2.52		1.89
Off-Site Site Wetland Restora	tion that will	not receiv	e credit ⁽⁵⁾							<u>-</u>		
Type 3 Shallow Marsh	0		0	14.02	0	0	0		0	14.02		0
Type 7 Hardwood Swamp	0		0	0.02	0	0	0		0	0.02		0
Type 7 Coniferous Swamp	0		0	0.86	0	0	0		0	0.86		0
Off-Site Upland Buffer (6)	9.78	25%	2.45	64.26	16.07	57.31	14.33	25%	30.39	131.35	25%	32.84
Impact ⁽⁷⁾	0.03		-0.03	0.51	-0.51	0.32	-0.32		0.86	0.86		-0.86
No Credit ⁽⁸⁾	18.12			127.60		10.68				156.40		
Upland Buffer Total	9.78		2.45	64.26	16.07	57.31	14.33		30.39	131.35		32.84
Wetland Total	503.91		477.24	827.95	763.07	348.41	307.15		1,070.22	1,680.27		1,547.46
Total	531.84		479.69	1,020.32	779.14	416.72	321.48		1,100.61	1,968.88		1,580.30
(1) Totals may not add exactly due to re				,					.,	.,		.,

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ Credits for restoration of completely drained wetlands are worth 100% of the acreage restored based on USACE St. Paul District Policy (Restoration via re-establishment) and the Minnesota WCA Chap. 8420.0526 Subp. 3

⁽³⁾ Credits for restoration of partially-drained wetlands are worth 50% of the acreage restored based on USACE St. Paul District Policy (Restoration via rehabilitation) and the Minnesota WCA Chap. 8420.0526 Subp. 4

⁽⁴⁾ Credits for wetland creation are worth 75% of the acreage created based on USACE St. Paul District Policy (Wetland Creation) and the Minnesota WCA Chap. 8420.0526 Subp. 7 (per Minnesota Statute 103G.2251 modified August 1, 2011.)

⁽⁵⁾ Wetlands will be restored within areas (e.g., Diversion Channel easement) that will not receive credit.

⁽⁶⁾ Credits for upland buffers are worth 25% of the acreage of native, noninvasive vegetation established or maintained adjacent to the wetland based on USACE St. Paul District Policy (Preservation) and the Minnesota WCA Chap. 8420.0526 Subp. 1

⁽⁷⁾ Negative credits for ditches (wetlands) that are filled within upland buffer which is removed from the credit total.

⁽⁸⁾ Areas within a Site without construction including homesteads, building areas, easements, etc.

Large Table 6

Wetland Mitigation Utilizing USACE Credits⁽¹⁾
Poly Met Mining, Inc.

	Mit	tigation Cı	redits Avail	able	NorthMet Project Prop	Total Credits	No More Than 2 Apply			Total Applied	Applied		
Wetland or Credit Type	Zim	Aitkin	Hinckley	Total	Non-forested, Non- bog, and Low or Medium Quality (Base Ratio 1.5:1) ⁽³⁾	Bogs, Forested, and High Quality (Base Ratio 2:1) ⁽⁴⁾	Total Impact Acres	Required for Mitigation at Base Ratio	Incentive for in- kind -0.25:1	Incentive for credits in- place -0.25:1	Incentive for credits in- advance ⁽⁵⁾ -0.25:1	Mitigation Credits ^{(6), (7)}	Mitigation Ratio ⁽⁸⁾
Type 2 Fresh (Wet) Meadow	0	0	0	0	1.38	14.43	15.81	30.93				30.93	1.96
Type 2 Sedge Meadow	0	0	68.11	68.11	6.87	17.05	23.92	44.41	(5.98)			38.43	1.61
Type 3 Shallow Marsh	0	20.86	0	20.86	53.13	23.90	77.03	127.50	(5.22)		(5.22)	117.07	1.52
Type 4 Deep Marsh	0	0	0	0	74.20	0.09	74.29	111.48				111.48	1.50
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0				0	
Type 6 Shrub-Carr	0	0	131.23	131.23	1.40	2.49	3.89	7.08	(0.97)			6.11	1.57
Type 6 Alder Thicket	0	0	100.33	100.33	7.50	103.09	110.59	217.43				217.43	1.97
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	0.69	12.47	13.16	25.98	(3.29)			22.69	1.72
Type 7 Coniferous Swamp	0	557.52	0	557.52	0	84.43	84.43	168.86	(21.11)			147.75	1.75
Type 8 Open Bog	8.96	0	0	8.96	0	7.64	7.64	15.28				15.28	2.00
Type 8 Coniferous Bog	468.29	0	0	468.29	0	529.98	529.98	1,059.96	(117.07)	(117.07)		825.82	1.56
Wetland Impact													
Wetland Total	477.24	763.07	307.15	1,547.46	145.17	795.57	940.74	1,808.90				1,532.97	1.63
Upland Buffer	2.45	16.07	14.33	32.84								9	
Total	479.69	779.14	321.48	1,580.30		940.74		(153.64) (117.07) (5.22)		(5.22)	1,532.97		
Total	47 3.03	113.14	321.40	1,560.30		J4V.14		1,808.90 (275.92) 1,532.9				1,032.37	
-	otal Surplus Wetland Mitigation Credits for Project (Total Credit minus Total Applied Mitigation Credit)								1.63				

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Base ratio 1.5:1 per USACE St. Paul District Policy for wetlands that are not considered High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁴⁾ Base ratio 2:1 per USACE May 29, 2013 Draft Memorandum for wetlands that are High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁵⁾ Based on USACE May 29, 2013 Draft Memorandum guidance for in-advance qualification assuming all mitigation will be constructed one full growing season before wetland impacts occur.

⁽⁶⁾ Total Applied Mitigation Credits = Total Credits Required for Mitigation at Base Ratio minus Incentive Credits.

⁽⁷⁾ Credits applied may include surplus credits from different wetland types.

⁽⁸⁾ The ratio of applied credits to project impacts (not including the surplus credits).

⁽⁹⁾ Includes 0.5 credit of upland buffer, applied from totals listed above.

Large Table 7

Wetland Mitigation Utilizing WCA Credits⁽¹⁾ Poly Met Mining, Inc.

	Mitigation Credits			NorthMet Project Proposed Direct	Credits Applied for	Additional Mitigation	Total Mitigation	Total		
Wetland or Credit Type	Zim Sod	Aitkin	Hinckley	Total	Wetland Impacts (acres) ^(1,2)	1:1 Replacement	Required ⁽³⁾ +0.5:1	Credits Applied	Mitigation Ratio	
Type 2 Fresh (Wet) Meadow	0	0	0	0	15.81	15.81	7.91	23.72	1.5:1	
Type 2 Sedge Meadow	0	0	68.11	68.11	23.92	23.92	11.96	35.88	1.5:1	
Type 3 Shallow Marsh	0	20.86	0	20.86	77.03	77.03	38.52	115.55	1.5:1	
Type 4 Deep Marsh	0	0	0	0	74.29	74.29	37.15	111.44	1.5:1	
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0	1.5:1	
Type 6 Shrub-Carr	0	0	131.23	131.23	3.89	3.89	1.95	5.84	1.5:1	
Type 6 Alder Thicket	0	0	100.33	100.33	110.59	110.59	55.30	165.89	1.5:1	
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	13.16	13.16	6.58	19.74	1.5:1	
Type 7 Coniferous Swamp	0	557.52	0	557.52	84.43	84.43	42.22	126.65	1.5:1	
Type 8 Open Bog	8.96	0	0	8.96	7.64	7.64	3.82	11.46	1.5:1	
Type 8 Coniferous Bog	468.29	0	0	468.29	529.98	529.98	30.85	560.83	1:1 ⁽⁴⁾	
Wetland Total	477.24	763.07	307.15	1,547.46	940.74	940.74	236.23	1,176.97		
Upland Buffer	2.45	16.07	14.33	32.84						
Total	479.69	779.14	321.48	1,580.30	940.74	940.74	236.23	1,176.97		
(Total cred	-		Credits for Project mitigation required)		403.33		1.25:1 ⁽⁵⁾			
		Total W	etland Mitig	gation Cred	its Used for Project		1,176.97			

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Additional required for mitigation out of the watershed at Aitkin and Hinckley sites.

⁽⁴⁾ Assumes 1:1 replacement for 473.3 acres compensated in-kind and in the watershed and 1.5:1 for the remaining 56.7 acres replaced out of the watershed.

⁽⁵⁾ The ratio of applied credits to project impacts (not including the total surplus credits).

Appendix C

USACE 2013 Memo: Application of the Federal Mitigation Rule and St.
Paul District Policy Guidance on Compensatory Mitigation Compensation Ratios for Loss of Wetlands/Aquatic Resources



DRAFT MEMORANDUM

Date: 29 May 2013

Subject: Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation - Compensation Ratios for Loss of Wetlands/Aquatic Resources

I. Introduction

The St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota (2009) [District Policy] applies three factors to determine compensation ratios: in-place vs. out-of-place, in-kind vs. out-of-kind, and in-advance vs. not in-advance. The temporal loss issue is addressed by the in-advance vs. not-in-advance factor. The Federal Mitigation Rule states that compensation ratios of greater than 1:1 can be applied to account for factors including temporal loss and the difficulty of restoring or establishing certain wetlands/aquatic resources (332.3 (f)). This statement was incorporated into the St. Paul District Policy (page 23).

II. In-Advance Incentive per St. Paul District Policy

Compensatory mitigation must account for the temporal losses of wetland/aquatic resource functions associated with authorized impacts. Temporal losses can be minimized if compensation sites are established in advance of authorized impacts, which is typically the case for mitigation banking. In rare cases, permittee-responsible compensation could also establish compensation sites in advance of authorized impacts.

A reduction in the compensation ratio of 0.25 can be applied if a permittee-responsible compensation site establishes wetland hydrology and initial vegetation in advance of authorized impacts. At a minimum, the site must have wetland hydrology and hydrophytic vegetation established at least one full growing season (May-October) prior to the authorized discharge of dredged/fill materials (pages 14, 24). Further, the compensation site must meet the success criteria/performance standards applicable at that development stage of the site (page 14).

The intent of the <u>minimum</u> requirement that the compensation site must have wetland hydrology and hydrophytic vegetation established <u>at least</u> one growing season in advance is to confirm: (1) that the site is providing wetland functions in advance of authorized impacts; and (2) a reasonable assurance that the compensation site is on the correct trajectory for success. Success is defined by the performance standards developed for each compensation site. Great variability exists for establishing various wetlands/aquatic resources and the performance standards reflect this. The minimum of a single growing season can be sufficient for emergent, aquatic vegetation to colonize a shallow marsh restoration site and provide habitat, water quality functions, etc. At the opposite end of the spectrum are compensation sites involving restoration of forested wetlands, which may require 8 to 10 growing seasons to determine if hydrology and woody seedlings/shrubs/saplings indicate that the site is on the correct trajectory for success. It is true

that woody seedlings/shrubs/saplings would not provide the same habitat and other functions as a mature forested wetland, but the intent of the "in-advance" incentive per the St. Paul District Policy would be met.

Use of the 0.25 incentive for "in-advance" by permittee-responsible compensation has been so rare that St. Paul District has not developed a break-out of minimum requirements and timeframes by wetland type. Given the current review of large-scale mining projects and associated permittee-responsible compensation, there is now a need to do so. The timeframes listed by Table 1 represent the best case scenario (e.g., no substantial setbacks or corrective actions needed to establish target hydrology and initial vegetation). These timeframes are based on field observations of compensatory mitigation sites in Minnesota and Wisconsin during the past 35 years.

TABLE 1

Minimum Number of Growing Seasons Needed to Determine if a Compensation Site has Met the Requirements for the In-Advance Incentive

Seasonally Flooded Basin: 1 Growing Season
Shallow Marsh: 1 Growing Season
Sedge Meadow: 3 Growing Seasons
Open Bog: 3 to 5 Growing Seasons
Alder Thicket/Shrub-Carr: 5 Growing Seasons
Coniferous Bog: 8 to 10 Growing Seasons
Hardwood and Coniferous Swamps: 8 to 10 Growing Seasons

III. Compensation Ratios for Difficult-to-Replace, Rare and/or Exceptional Wetlands per the Federal Mitigation Rule and St. Paul District Policy

The Federal Mitigation Rule states that "difficult to replace" wetlands/aquatic resources includes bogs and forested wetlands (323.3(e)(3) and Preamble, page 19633). The majority of wetlands that would be impacted by the proposed NorthMet project are "difficult-to-replace" – coniferous bog, open bog, coniferous swamp and hardwood swamp.

St. Paul District Policy also states that compensation ratios can be raised on a case-by-case basis if the impacted wetland/aquatic resource provides rare or exceptional functions including plant communities that rate "exceptional" using MnRAM, or have a high rating using a Floristic Quality Assessment (FQA) (page 24). Most of the wetlands that would be impacted by the NorthMet project are of pre-European settlement condition and rate at the highest FQA levels for those plant communities in Minnesota. MnRAM vegetative diversity/integrity ratings would be "exceptional" for these pre-European settlement condition wetlands.

Therefore, the District Engineer may determine that a higher compensation ratio is required to offset losses of wetlands that are difficult to replace and/or provide an exceptional level of functions. For simplicity, these wetlands will be referred to as "high quality wetlands" in the following discussions.

District Policy states a base compensation ratio of 1.5:1, and a minimum of 1:1, with a provision for a case-by-case determination of higher ratios to account for factors including difficult to replace, rare and/or exceptional wetlands/aquatic resources. For low to moderate quality wetlands, the 1.5:1 base ratio would apply in accordance with District guidance. For impacts to high quality wetlands, the Corps may require additional compensation in accordance with District Policy. A value of 0.25 was assigned by the District Policy to each of the factors applied for determining compensation ratios. Given this precedent, it would be consistent to assign a value of +0.25 for difficult to replace wetlands, and +0.25 for wetlands

that have exceptional functional levels, to the base ratio of 1.5:1. Therefore, the base compensation ratio in these cases would start at 2:1. Compensation that is in-kind, in-place and/or in-advance could reduce this ratio in 0.25 increments.

IV. Analysis for NorthMet PSDEIS

To qualify for the 0.25 in-advance incentive, the proposed compensation by PolyMet for the NorthMet project would need to be established and meeting performance standards for hydrology and initial vegetation as shown by Table 1. Temporal loss of functions associated with forested wetland types would still be significant in any scenario (i.e., it will take 30 to 50 years for a non-forested compensation site to replace the functions of a forested wetland). But, as stated previously, the intent of the Policy's "in-advance" incentive would be met. This is no different than what is applied to mitigation banking sites. Credits consisting of forested wetlands can be fully released in as little as 10 years provided that performance standards are met.

Compensation proposed at the Zim Site would be expected to meet both in-kind (-0.25) and in-place (-0.25) incentives thereby reducing the compensation ratio for high-quality wetland impacts from 2:1 to 1.5:1. If in-advance, the ratio would be further reduced to 1.25:1. For low to moderate-quality wetlands, the recommended base ratio of 1.5:1, as proposed in the PSDEIS, would be required and could be reduced to 1.25:1 if in-kind and 1:1 if also in-advance.

Compensation proposed at the Hinckley and Aitkin Sites would be expected to meet in-kind resulting in a compensation ratio for high-quality wetland impacts of 1.75:1, and if in-advance, the ratio would be reduced to 1.5:1. For low to moderate-quality wetlands, the recommended base ratio of 1.5:1, as proposed in the PSDEIS, would be required and could be reduced to 1.25:1 if in-kind and 1:1 if also in-advance.

District guidance on compensatory mitigation emphasizes a functional approach to offset proposed project impacts be considered. While bogs and forested wetlands are characterized as difficult to replace, the proposed compensation sites for the NorthMet project are likely to achieve in-kind compensation to offset functional losses. The proposed mitigation sites were selected based on availability and the high likelihood of meeting performance criteria.

V. USEPA Comments on Compensation Ratios

USEPA recommended a compensation ratio of 2:1 or 3:1 to offset adverse impacts given the degree of temporal losses of wetland functions and scope of the losses (approximately 917 acres of direct impacts).

Temporal losses of wetland functions are addressed by the in-advance factor described above.

District Policy does not address the scale issue raised by USEPA. It is acknowledged that the proposed NorthMet project is a large scale impact that demands a comprehensive approach to offset those impacts.

No suitable quantitative wetland functional assessment method for northeast Minnesota exists to calculate the acres/wetland type/timeframe necessary for compensatory mitigation to offset proposed impacts. Lacking such a method, we employ an acreage surrogate as discussed above. A base ratio of 2:1, for high-quality wetlands as described in IV above, would be consistent with USEPA's recommendation of at least a 2:1compensation ratio. However, District Policy would allow for the compensation ratio to be reduced if it is in-kind, in-place and/or in-advance. Allowing for these incentives to reduce the base compensation ratio is integral to our policy. While USEPA has identified the scale of impacts and temporal loss of

functions as factors in their recommendation of a 2:1 or 3:1 compensation ratio, there is no scientific data to say what ratio is most accurate or appropriate.

If, however, large scale wetland losses in the Great Lakes Basin are not compensated for within that basin, a final ratio of 2:1 to 3:1 as recommended by USEPA could be warranted.

VI. Statement for NorthMet PSDEIS

St. Paul District has not made a final determination of the compensation ratios that would be required. Base compensation ratios would be either 2:1 or 1.5:1 depending on the location, quality of the wetland, wetland type, and timeframe of the compensation. A decision on whether proposed compensation would qualify for the 0.25 incentive for in-advance requires additional information including: (1) development of performance standards that would specify the hydrology and initial vegetation to be established; and (2) number of growing seasons that wetland compensation sites would be established in advance of authorized impacts.

In conclusion, the compensatory mitigation ratios proposed in the PSDEIS for the NorthMet project were based on recommended guidance. They assumed successful outcomes for the proposed compensatory mitigation sites. However, to address concerns expressed by USEPA, the base compensation ratios could be increased to 2:1 for impacts to high-quality, difficult to replace, bog and forested wetlands. For impacts to low and moderate quality wetlands, a base ratio of 1.5:1, as proposed in the PSDEIS, would be applied. Incentives to reduce the recommended base ratios would be considered at the time of permitting. District guidance on recommended compensation ratios takes these incentives into account. The final decision on compensatory mitigation ratios will be determined at the time of the permit decision based on current District guidance.

Appendix D Wetland Data Forms

WETLAND DETERM	INATION DATA FORI	M - Northcentral and Northeast Region
Project/Site: Zim Site	Applicant/Owner: PolyMet Mining	City/County: St. Louis State: MN Sampling Date: 11/13/15
Investigator(s): KMS2,LMT2	Section: 2+	Township: 55 Range: 18W Sampling Point: 101-E-Up
Land Form: Terrace	Local Relief: None	Slope %: 0 Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%
Subregion (LRR): <u>K</u>	Latitude: 5235290	Longitude: 530258
Cowardin Classification: Upland	Circular 39 Classification: Upland	Mapped NWI Classification:
Are climatic/hydrologic conditions on the site typical for		nin in remarks) Eggers & Reed (primary): Upland
, , , , , , , , , , , , , , , , , , ,	 · · ·	Are "normal Yes Eggers & Reed (secondary):
Are vegetation <u>No</u> Soil <u>No</u> Hydrol	logy <u>No</u> significantly disturbed?	circumstances" Eggers & Reed (tertiary):
Are vegetation No Soil No Hydrol	logy <u>No</u> naturally problematic?	present? Eggers & Reed (quaternary):
SUMMARY OF FINDINGS - Attach si	ite map showing sampling p	point locations, transects, important features, etc.
Hydrophytic vegetation present? No		djacent to excavated ditch.
Hydric soil present? Yes	(explain any answers Point ID: 358 if needed):	
Indicators of wetland hydrology present? No		1)
<u> </u>	If yes, optional Wetland Site ID: (NW	<u> </u>
VEGETATION		
	Absolute Dominant	Indicator 50/20 Thresholds: 20% 50%
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>) % Cover Species?	Status 0 0
1.	0	Sapling/Shrub Stratum 0 0
2.	0	Herb Stratum 5 12.5
3.	0	Woody Vine Stratum 0 0
4.	0	<u>Dominance Test Worksheet:</u>
	Total Cover: 0	Number of Dominant Species That Are ORL FACW or FAC: 0 (A)
Sapling/Shrub Stratum (Plot Size: 15 ft)	That Are OBE, I AON OF I AO.
1.	0	Total Number of Dominant Species Across All Strata: 1 (B)
2.	0	Percent of Dominant Species
3.	0	That Are OBL, FACW or FAC: 0.00% (A/B)
4.	0	Prevalence Index Worksheet:
5.	Total Cover: 0	Total % Cover of: Multiply by:
(Dist 9; 5 #	Total Cover: 0	
<u>Herb Stratum</u> (Plot Size: <u>5 ft</u>		OBE Species
1. Poa pratensis	25 Yes	PACU PACIFIC P
2. 3.	0	PAC Species
4.		FACO Species
5.	0	UPL Species 0 X 5 0
6.	0	Column Totals: 25 (A) 100 (B)
7.	0	Prevalence Index = B/A = 4.00
8.	0	Hydrophytic Vegetation Indicators:
	Total Cover: 25	No Rapid Test for Hydrophytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft)	No Dominance Test is >50%
1.	0	No Prevalence Index ≤ 3.0 [1] No Morphological Adaptations [1] (provide supporting data
2.	0	in vegetation remarks or on a separate sheet)
	Total Cover: 0	No Problematic Hydrophytic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cove	[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.
Vegetation Remarks: (include photo numbers here of	or on a separate sheet)	Hydrophytic vegetation present? <u>No</u>
Former sod field.		

SOIL Sampling Point: 101-E-Up

	led to document the indicator or confirm the abscence	of indicators).		
' 	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
1 0 - 22 10YR 3/2			Oe	
2. 22 - 42 7.5YR 3/2			Oi	
3. <u>42 - 46</u> <u>Gley 1, 4/10Y</u>			Ifs	
4				
5				
[1] Type: C=Concentration, D=Depletion, RM=R0	educed Matrix, CS=Covered or Coated Sand Grains	2] Location: F	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, ι	ınless otherwise noted)	Ind	cators for Problematic Hydric Soi	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149	<i>PB)</i>	5 cm Mucky Peat or Peat (S3) (LR.	R K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
☐ Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	<i>ILRA 149B)</i>
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	<i>145, 149B)</i>
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or problemati	c	Very Shallow Dark Surface (TF12)	nama antra)
Restrictive Layer (if present): Type:	Depth (inches):	<i></i>	Hydric soil present?	Yes
			• •	
Soil Remarks:				
HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; cl	neck all that apply)	Seconda	y Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)	Drain.	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	Moss	Trim Lines (B16)	
☐ Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)	Dry-S	eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayf	sh Burrows (C8)	
Drift Deposits (B3)	_	Satur	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	Stunt	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled Soils (C6)	Geon	orphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)	Shallo	w Aquitard (D3)	
☐ Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	Micro	topographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	gy present? <u>No</u>
Surface water present?	Surface Water Depth (inches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
Recorded Data: Aerial Photo M	onitoring Well Stream Gauge Previous Ins	pections		
Hydrology Remarks:				

	W	ETLA	AND	DETE	RM	INATIO	N	DATA	FORI	/I - Norti	hcentral an	d Northe	ast Re	egion		
Projed	ct/Site:	Zim Site				Applicant/0	Owner	: PolyMet	Mining	City/County: <u>St</u>	t. Louis Stat	e: <u>MN</u> San	npling Date:	<u>11/13/15</u>		
Inves	tigator(s):	KMS2,LM	T2			Section:	2-	<u>+</u>		Township: 55	Rar	nge: <u>18W</u> Sai	mpling Point:	101-E-Wet		
	Form:	Terrace				Local Relie		<u>one</u>		Slope %: <u>0</u>	Soil Map Unit Na	ame: B14A Gree	enwood Soils	s, Upham Bas	sin, 0-1%	
Subre	egion (LRR).	<u>K</u>				Latitude:	<u>52</u>	235300		Longitude: 530	<u>)269</u> <i>Dat</i>	um: NAD 83				
Cowa	ardin Classif	ication:	PUBH	<u>4x</u>		Circular 39	Class	sification:	Type 5	-		Classification:				
			ditions o	n the site typ	ical for i	this time of yea	r?	Yes	(If no, explain	n in remarks)	Eggers & Re	ed (primary):	Shallow, Or	pen Water		
Are v	egetation	No	Soil	<u>No</u>	Hydrold	ogy <u>No</u>	signii	ficantly dist	urhad?	Are "normal circumstances"	==	ed (secondary):				
Are v	egetation	No	Soil	No	Hydrolo	ogy No	natura	ally problen		present?	Eggers & Re Faaers & Re	ed (tertiary): ed (quaternary):				
	Ü				,	<u> </u>				oint locati	ons, transects		features	s, etc.		
Hydri Indica	ophytic vege c soil preser tors of wetla	nt? and hydrol	ogy pres		Yes Yes	General Rema (explain any ar if needed):	nswers	S		acent to former	sod field. No vegetation	n observed in ditch	ı			
	sampled are		wetlan	ď?	<u>Yes</u>	If yes, optiona	i Wet	land Site II	D : <u>NW1</u>							_
VEG	ETATIO	JN														
								<u>Absolute</u>	<u>Dominant</u>	<u>Indicator</u>	50/20 Threshold	<u>s:</u>		<u>20%</u>	<u>50%</u>	
	Tree Stratu	<u>m</u>		(Plot Size:	<u>30 ft</u>) 2	% Cover	Species?	<u>Status</u>	Tree Stratum	44			0	-
1.								0			Sapling/Shrub S Herb Stratum	tratum		0	0	-
2.							_	0			Woody Vine Stra	ntum		0	0	-
3.							4	0			Dominance Test	Worksheet:				-
4.						Total Cover		<u>0</u>			Number of Domi					
	Sapling/Shi	ub Stratu	m	(Plot Size:	15 ft	Total Gover		<u>u</u>			That Are OBL, F.			(A)		
1.	Supinity on	uo on utu	<u></u>	(1.101.01201	<u>10 11</u>		ÓГ	0			Total Number of			(B)		
2.								0			Species Across					
3.								0			Percent of Domi That Are OBL, F.			(A/B)		
4.								0			Dravalance Index	· Markahaati				_
5.						T-(-10		0			Prevalence Index			Meddinlehe		
				(DI=4.0:===	F 0	Total Cover:		<u>0</u>			Total % (over or:	X 1	Multiply by	0	_
	<u>Herb Stratu</u>	<u>m</u>		(Plot Size:	<u>5 II</u>)		1 1		OBL Species	0	X 2	-	0	
1. 2.								0			FACW Species	0	X 3	-	0	
3.								0			FAC Species	0	X 4		0	
4.								0			FACU Species	0	X 5	-	0	
5.								0			UPL Species	0	(A)		0 (B))
6.								0			Column Totals:	revalence Index =		#Nu		'
7.								0			Hydrophytic Vege			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		_
8.						Total Cover:		0			JII 	Test for Hydropi	_	ation		
ا	Noody Vine	Stratum		(Plot Size:	<u>30 ft</u>	Total Cover.)	<u>0</u>			No Domi	nance Test is >50	%			
1.								0				lence Index ≤ 3.0 hological Adapta	• •	rovido sunno	rtina date	
2.								0				jetation remarks			nuny uata	•
						Total Cover:		<u>0</u>			No Probl	ematic Hydrophy	tic Vegetation	on [1] (Expla	in)	
% Ba	re Ground i	n Herb St	ratum:		_		% :	Sphagnum	Moss Cove	r:	[1] Indicators of hyd disturbed or proble		nydrology mu	ist be present,	unless	
Vege	tation Rema	arks: (incl	ude ph	oto number:	s here c	or on a separat	te she	eet)			Hydrophytic vege	tation present?	<u>No</u>			_
No ve	egetation in	ditch.														
Ī																

SOIL Sampling Point: 101-E-Wet

(inches) Color (moist)	%	Color (moist) % Type [1	Loc [2]	Texture	Remarks
				Peat	
<u> </u>			_		
-				_	
-					
-				_	
] Type: C=Concentration, D=Depletion, RM=	Reduced M	latrix, CS=Covered or Coated Sand Grains	[2] Location	: PL=Pore Lining, M=Matrix.	
ydric Soil Indicators: (applicable to all LRRs,	, unless oth	herwise noted)	ı	ndicators for Problematic Hydric	Soils [3]:
Histosol (A1)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, M	LRA 149B)
] Histic Epipedon (A2)		Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LR.	R K, L, R)
Black Histic (A3)		Polyvalue Below Surface (S8) (LRR R, MLRA	149B)	5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
] Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)		Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8)	(LRR K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR k	•
Thick Dark Surface (A12)		Depleted Matrix (F3)		Iron-Manganese Masses (F12)	
Sandy Mucky Mineral (S1)	_	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19	
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 14	4A, 145, 149B)
		5 / 5 / (50)			
Sandy Redox (S5)		Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlar			atic.	Red Parent Material (F21) Very Shallow Dark Surface (TF	"-"-" (")
Sandy Redox (S5)			atic.	_	"-"-" (")
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlan	nd hydrolog	y must be present, unless disturbed or problem Depth (inches):	atic.	Very Shallow Dark Surface (TF	12) remarks)
Sandy Redox (S5) If Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil both	nd hydrolog	y must be present, unless disturbed or problem Depth (inches):	atic.	Very Shallow Dark Surface (TF	12) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlanestrictive Layer (if present): Type:	nd hydrolog	y must be present, unless disturbed or problem Depth (inches):	atic.	Very Shallow Dark Surface (TF	-12) remarks)
Sandy Redox (S5) If Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil both	nd hydrolog	y must be present, unless disturbed or problem Depth (inches):	atic.	Very Shallow Dark Surface (TF	12) remarks)
Sandy Redox (S5) If Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil booty YDROLOGY	oring in adjac	y must be present, unless disturbed or problem Depth (inches): cent field.		Very Shallow Dark Surface (TF	Yes
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Oil Remarks: Soil assumed, based on soil book YDROLOGY Vetland Hydrology Indicators:	oring in adjac	must be present, unless disturbed or problem Depth (inches): cent field. hat apply) Water-Stained Leaves (B9)	Secon	Very Shallow Dark Surface (TF Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6)	remarks) Yes
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil book YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required;	oring in adjac	y must be present, unless disturbed or problem Depth (inches): cent field.	Secon Su Dra	Very Shallow Dark Surface (TF Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10)	Yes required)
Sandy Redox (S5) Red Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil book yDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1)	oring in adjac	must be present, unless disturbed or problem Depth (inches): cent field. hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secon Su Dra	Wery Shallow Dark Surface (TF Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) ass Trim Lines (B16)	Yes required)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil boo YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2)	oring in adjac	must be present, unless disturbed or problem Depth (inches): Cent field. hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Secon Su Dra Dra Dra Dra	dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) ass Trim Lines (B16) y-Season Water Table (C2)	Yes required)
Sandy Redox (S5) Restrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil book YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3)	oring in adjac	must be present, unless disturbed or problem Depth (inches): cent field. hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secon Su Dra Mc Drg Drg 3) Cra	Wery Shallow Dark Surface (TF Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) oss Trim Lines (B16) y-Season Water Table (C2) ayfish Burrows (C8)	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil book YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	oring in adjac	w must be present, unless disturbed or problem Depth (inches): cent field. hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C	Secon Su Dra Dra Dra Dra Sa Sa Sa	dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) as Trim Lines (B16) y-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (C	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil boo YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	oring in adjac	must be present, unless disturbed or problem Depth (inches): Cent field. Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4)	Secon Su Dra Mc Dr Sa St St	Wery Shallow Dark Surface (TF Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) oss Trim Lines (B16) y-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (Cunted or Stressed Plants (D1)	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) By Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil book YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Py Surface Water (A1) Py High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	oring in adjac	must be present, unless disturbed or problem Depth (inches): Cent field. Mat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secon Su Dr. Dr. Dr. Sa Ste Gee	dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) as Trim Lines (B16) by-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (Cunted or Stressed Plants (D1) comorphic Position (D2)	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil both YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	oring in adjac	must be present, unless disturbed or problem Depth (inches): Cent field. Cent field. Mat apply) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Secon Su Dra Dra Dra Sa Sta Sh	Wery Shallow Dark Surface (TF Hydric soil present? Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) ass Trim Lines (B16) y-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (Canted or Stressed Plants (D1) comorphic Position (D2) allow Aquitard (D3)	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) If Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Oil Remarks: Soil assumed, based on soil booty VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; If Surface Water (A1) If High Water Table (A2) If Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	oring in adjac	must be present, unless disturbed or problem Depth (inches): Cent field. Mat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secon Su Dra Dra Dra Sa Sta Sh	dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) as Trim Lines (B16) by-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (Cunted or Stressed Plants (D1) comorphic Position (D2)	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil both YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) ield Observations:	check all the	must be present, unless disturbed or problem Depth (inches): cent field. hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secon Su Dra Dra Sa Stu Gee Mo	Wery Shallow Dark Surface (TF Hydric soil present? Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) ass Trim Lines (B16) y-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (Canted or Stressed Plants (D1) comorphic Position (D2) allow Aquitard (D3)	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil boo YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) ield Observations: urface water present?	check all the	must be present, unless disturbed or problem Depth (inches): Cent field. Depth (inches): Cent field. Depth (inches): Cent field. Depth (inches): Cent field. Depth (inches): Depth (inches): Cent field. Cent field. Depth (inches): Cent field. Cent f	Secon Su Dra Sa Sta Sta Sh Mid	Hydric soil present? Hydric soil present? Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) ainage Patterns (B16) ay-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (Canted or Stressed Plants (D1) and Promorphic Position (D2) allow Aquitard (D3) crotopographic Relief (D4)	remarks) Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlant estrictive Layer (if present): Type: oil Remarks: Soil assumed, based on soil both YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) ield Observations:	check all the	must be present, unless disturbed or problem Depth (inches): cent field. hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secon Su Dra Dra Sa Stu Gee Mo	Hydric soil present? Hydric soil present? dary Indicators (minimum of two rface Soil Cracks (B6) ainage Patterns (B10) as Trim Lines (B16) y-Season Water Table (C2) ayfish Burrows (C8) turation Visible on Aerial Imagery (Canted or Stressed Plants (D1) comorphic Position (D2) allow Aquitard (D3) crotopographic Relief (D4) Indicators of wetland hydro	remarks) Yes required) FAC-Neutral Test (D5)

WETLAND DETERMINATION	DATA FOR	M - North	central and Northe	ast Region
Project/Site: Zim Site Applicant/Own	per: PolyMet Mining	City/County: St.	Louis State: MN San	npling Date: 11/13/15
Investigator(s): KMS2,LMT2 Section:	<u>2+</u>	Township: 55	Range: 18W San	mpling Point: 101-S-Up
Land Form: Terrace Local Relief:	None	Slope %: <u>0</u>	Soil Map Unit Name: B14A Gree	enwood Soils, Upham Basin, 0-1%
Subregion (LRR): <u>K</u> Latitude:	<u>5235290</u>	Longitude: 5302	<u>Datum: NAD 83</u>	
Cowardin Classification: Upland Circular 39 Cl.	assification: Upland		Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, expla	ain in remarks)	Eggers & Reed (primary):	<u>Upland</u>
Are vegetation No Soil No Hydrology No sig	nificantly disturbed?	Are "normal	Yes Eggers & Reed (secondary):	
	-	circumstances" present?	Eggers & Reed (tertiary):	
	urally problematic?		Eggers & Reed (quaternary):	• •
SUMMARY OF FINDINGS - Attach site map sho	wing sampling p	point locatio	ons, transects, important	teatures, etc.
Hydrophytic vegetation present? No General Remarks Hydric soil present? Yes (explain any answ if needed): Indicators of wetland hydrology present? No If yes, optional W Is the sampled area within a wetland? No If yes, optional W	Point ID: 358	idjacent to excavate	ed ditch.	
VEGETATION				
	Absolute Dominan	t Indicator	50/20 Thresholds:	<u>20%</u> <u>50%</u>
Tree Stratum (Plot Size: 30 ft)	% Cover Species?		Tree Stratum	0 0
	0		Sapling/Shrub Stratum	0 0
1. 2.	0		Herb Stratum	5 12.5
3.	0		Woody Vine Stratum	0 0
4.	0		Dominance Test Worksheet:	
Total Cover:	<u>0</u>		Number of Dominant Species	0 (A)
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)			That Are OBL, FACW or FAC:	<u> </u>
1.	0		Total Number of Dominant Species Across All Strata:	1 <i>(B)</i>
2.	0		Percent of Dominant Species	
3.	0		That Are OBL, FACW or FAC:	0.00% (A/B)
4.	0		Dravalance Index Markshoots	
5.	0		Prevalence Index Worksheet:	Marieta la laca
Total Cover:	<u>0</u>		Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft)			OBL Species	X 2 0
1. Poa pratensis	25 Yes	FACU	PACW Species	X3 0
2. 3.	0		FAC Species	
4.	0		FACU Species25	
5.	0		UPL Species0	X 5 <u>0</u>
6.	0		Column Totals: 25	(A) <u>100</u> (B)
7.	0		Prevalence Index =	
8.	0		Hydrophytic Vegetation Indicators	=
Total Cover:	<u>25</u>		No Rapid Test for Hydropl	•
Woody Vine Stratum (Plot Size: 30 ft)			No Dominance Test is >50 No Prevalence Index ≤ 3.0	
1.	0			ions [1] (provide supporting data
2.	0		in vegetation remarks	
Total Cover:	<u>0</u>		No Problematic Hydrophy	tic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	er:	[1] Indicators of hydric soil & wetland h disturbed or problematic.	nydrology must be present, unless
Vegetation Remarks: (include photo numbers here or on a separate s	heet)		Hydrophytic vegetation present?	<u>No</u>
Previously in sod production.				

SOIL Sampling Point: 101-S-Up

Profile Description: (Describe to the depth needs	ed to document the indicator or confirm the abscen Redox Features	ce of indicators		
<u> </u>	% Color (moist) % Type [1] Loc [2]	Texture	Remarks
1. 0 - 22			Oe	
2. 22 - 42			Oi	
3. 42 - 48 Gley1,4/10Y			lfs	
4			· -	
5			-	
[1] Type: C=Concentration, D=Depletion, RM=Re	duced Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)	In	dicators for Problematic Hydric So	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	4 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA	149B)	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L))
Thick Dark Surface (A12)	Depleted Matrix (F3)		☐ Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or problei	matic.	Very Shallow Dark Surface (TF12)	"-"-")
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; ch	eck all that apply)	Second	ary Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (B9)		ace Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)	Drai	nage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	_	s Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor (C1)		Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (rfish Burrows (C8)	
☐ Drift Deposits (B3)	Descense of Dadward Iron (C4)		ration Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)		nted or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled Soils (C6)		morphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)		llow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	Micr	otopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	gy present? <u>No</u>
Surface water present?	Surface Water Depth (inches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
Recorded Data: Aerial Photo Mo	onitoring Well Stream Gauge Previous	Inspections		
Hydrology Remarks:				

WETLAND DETERMINAT	ION DATA FOR	M - Northcentral a	nd Northeast R	egion
Project/Site: Zim Site Appli	cant/Owner: PolyMet Mining	City/County: St. Louis S	State: MN Sampling Date.	<u>11/13/15</u>
Investigator(s): KMS2,LMT2 Sect.	ion: <u>2+</u>	Township: 55	Range: 18W Sampling Point	nt: 101-S-Wet
	l Relief: None	Slope %: 0 Soil Map Unit	Name: B14A Greenwood Soil	ls, Upham Basin, 0-1%
Subregion (LRR): <u>K</u> Latitu	<i>ide:</i> <u>5235280</u>	Longitude: <u>530257</u> L	Datum: NAD 83	
Cowardin Classification: PUBH4x Circu	lar 39 Classification: Type 5	Mapped N	WI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of	of year? Yes (If no, expl	ain in remarks) Eggers & .	Reed (primary): Shallow, C	Open Water
Are vegetation No Soil No Hydrology No		Are "normal Yes Eggers &	Reed (secondary):	-
Are vegetation No Soil No Hydrology No		nrocont2	Reed (tertiary): Reed (quaternary):	
SUMMARY OF FINDINGS - Attach site maj	3,		· ·	es. etc.
Hydrophytic vegetation present? No General in Hydric soil present? Yes (explain in the specific present)	Remarks Excavated ditch a	djacent to former sod field. No vegeta		<u> </u>
Indicators of wetland hydrology present? Yes if needed):			
Is the sampled area within a wetland? Yes If yes, op	tional Wetland Site ID: NW	<u>1</u>		
VEGETATION				
	Absolute Dominan	t Indicator 50/20 Thresho	olds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: 30 ft	% Cover Species?			0 0
1.	0	Sapling/Shrul) Stratum	0 0
2.	0	Herb Stratum		0 0
3.	0	Woody Vine S	tratum	0 0
4.	0	Dominance To	est Worksheet:	
Total (Sapling/Shrub Stratum (Plot Size: 15 ft	Cover: 0		minant Species , FACW or FAC:	(A)
1.	0	Total Number		(B)
2.	0	Species Acros		
3.	0		minant Species , FACW or FAC:	(A/B)
4.	0			<u> </u>
5.	0		dex Worksheet:	
Total C	<u>0</u>	-	% Cover of:	Multiply by:
<u>Herb Stratum</u> (Plot Size: <u>5 ft</u>)	OBL Species	0 X 1	0
1.	0	FACW Specie		0
2.	0	FAC Species	<u> </u>	0
3.	0	FACU Species	s <u> </u>	0
4. <u></u>	0	UPL Species	<u> </u>	0
6.	0	Column Total	s: <u> </u>	0 (B)
7.	0		Prevalence Index = B/A =	#Num!
8.	0	Hydrophytic V	egetation Indicators:	
Total C	cover: 0	 '	oid Test for Hydrophytic Veget minance Test is >50%	tation
Woody Vine Stratum (Plot Size: 30 ft	<i>,</i>		evalence Index ≤ 3.0 [1]	
1.	0		rphological Adaptations [1] (p	
2. Total C	0 Cover: 0	· L	regetation remarks or on a sep	,
rotar C	<u>U</u>		bblematic Hydrophytic Vegetat	
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	rer: [1] Indicators of disturbed or productions	hydric soil & wetland hydrology m blematic.	ust be present, unless
Vegetation Remarks: (include photo numbers here or on a se	parate sheet)	Hydrophytic ve	egetation present? <u>No</u>	
No vegetation in ditch.		"		

SOIL Sampling Point: 101-S-Wet

(inches) Color (moist)	%	Color (moist) % Type [1]	Loc [2]	Texture	Remarks
<u> </u>				Peat	_
<u> </u>					
-			-		_
-					
· · · · · · · · · · · · · · · · · · ·				-	_
] Type: C=Concentration, D=Depletion, RM=F	Reduced M	flatrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
ydric Soil Indicators: (applicable to all LRRs,	unless otl	herwise noted)	Inc	dicators for Problematic Hydric S	oils [3]:
Histosol (A1)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLF	RA 149B)
] Histic Epipedon (A2)		Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)		Polyvalue Below Surface (S8) (LRR R, MLRA 14	9B)	5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)		Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (Li	RR K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L	
Thick Dark Surface (A12)		Depleted Matrix (F3)		Iron-Manganese Masses (F12) (L	•
Sandy Mucky Mineral (S1)	_	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19)	•
	11.	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Gleyed Matrix (S4)		D / D / (Es)	_	D 10 1111 11/501	
Sandy Gleyed Matrix (S4) Sandy Redox (S5)		Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlan			ic.	Very Shallow Dark Surface (TF12	e) remarks)
Sandy Redox (S5)			ic.	_	namanta)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlandestrictive Layer (if present): Type:	d hydrolog	y must be present, unless disturbed or problema		Very Shallow Dark Surface (TF12 Hydric soil present?	e) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlandestrictive Layer (if present): Type:	d hydrolog	y must be present, unless disturbed or problema Depth (inches):		Very Shallow Dark Surface (TF12 Hydric soil present?	e) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlandestrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet deal	d hydrolog	y must be present, unless disturbed or problema Depth (inches):		Very Shallow Dark Surface (TF12 Hydric soil present?	e) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet deep	d hydrolog	y must be present, unless disturbed or problema. Depth (inches): djacent field. Peat assumed, based on soil boring	in adjacent fie	Very Shallow Dark Surface (TF12 Hydric soil present?	Yes
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet decorpy YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of	d hydrolog	y must be present, unless disturbed or problema. Depth (inches): djacent field. Peat assumed, based on soil boring	in adjacent fie	Very Shallow Dark Surface (TF12 Hydric soil present? eld.	Yes
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Oil Remarks: Ditch approximately 2.5 feet decomposition of the provided Hydrology Indicators:	d hydrolog	Depth (inches): djacent field. Peat assumed, based on soil boring that apply)	in adjacent flee Seconda Surfa	Very Shallow Dark Surface (TF12 Hydric soil present? eld. ary Indicators (minimum of two re	yes quired)
Sandy Redox (S5) By Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet deed YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of Surface Water (A1)	d hydrolog	must be present, unless disturbed or problemand Depth (inches): dijacent field. Peat assumed, based on soil boring that apply) Water-Stained Leaves (B9)	Seconda Drain	Hydric soil present? Hydric soil present? eld. ary Indicators (minimum of two reface Soil Cracks (B6)	yes quired)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet dee YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2)	d hydrolog	Depth (inches): Depth (inches): djacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)	Seconda Surfa Drain Mos.	Hydric soil present? Hydric soil present? Peld. ary Indicators (minimum of two reface Soil Cracks (B6)) mage Patterns (B10)	yes quired)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet deed YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) Saturation (A3)	d hydrolog	must be present, unless disturbed or problemate Depth (inches): djacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Seconda Surfa Drain Mos. Dry-	Hydric soil present? Hydric soil present? Peld. Perpendicators (minimum of two researce Soil Cracks (B6)) Inage Patterns (B10) Se Trim Lines (B16)	yes quired)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet dee YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of the surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	d hydrolog	must be present, unless disturbed or problemate Depth (inches): djacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Seconda Surfa Drain Dry- Cray Satu	Hydric soil present? Hydric soil present? Peld. Peld. Person Indicators (minimum of two researce Soil Cracks (B6) Personage Patterns (B10) Person Water Table (C2) Person Water Table (C2) Person Visible on Aerial Imagery (C9)	yes quired) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Soil Remarks: Ditch approximately 2.5 feet decomposited the second process of the	d hydrolog	Depth (inches): Depth (inches): djacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Seconda Surfa Drain Mos. Dry- Cray Satu	Hydric soil present? Hydric soil present? eld. ary Indicators (minimum of two reference Soil Cracks (B6) ange Patterns (B10) as Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) viration Visible on Aerial Imagery (C9) sted or Stressed Plants (D1)	yes quired) FAC-Neutral Test (D5)
Sandy Redox (S5) By Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type:	d hydrolog	must be present, unless disturbed or problemand Depth (inches): Depth (inches): djacent field. Peat assumed, based on soil boring that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Seconda Surfa Drain Mos. Dry- Cray Satu Stun Geor	Hydric soil present? Hydric soil present? Peld. Peld. Person Indicators (minimum of two researce Soil Cracks (B6) Personage Patterns (B10) Person Water Table (C2) Person Water Table (C2) Person Visible on Aerial Imagery (C9) Person Visible on Aerial Imagery (C9) Person Visible on Stressed Plants (D1) Person Morrow (D2)	yes quired) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type:	d hydrolog	probleman Depth (inches): Depth (inches): dijacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Seconda Seconda Drain Dry- Cray Satun Geon Shall	Hydric soil present? Hydric soil present? Peld. Peld. Person Indicators (minimum of two researce Soil Cracks (B6) anage Patterns (B10) as Trim Lines (B16) Season Water Table (C2) Mish Burrows (C8) Person Visible on Aerial Imagery (C9) Peted or Stressed Plants (D1) Person Managery (D2) Person Indicators (D2) Person Indicators (D3)	yes quired) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Ditch approximately 2.5 feet decomposite (Section 1) Petland Hydrology Indicators: Indicators (minimum of one required; of the section 1) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	d hydrolog	must be present, unless disturbed or problemand Depth (inches): Depth (inches): djacent field. Peat assumed, based on soil boring that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Seconda Seconda Drain Dry- Cray Satun Geon Shall	Hydric soil present? Hydric soil present? Peld. Peld. Person Indicators (minimum of two researce Soil Cracks (B6) Personage Patterns (B10) Person Water Table (C2) Person Water Table (C2) Person Visible on Aerial Imagery (C9) Person Visible on Aerial Imagery (C9) Person Visible on Stressed Plants (D1) Person Morrow (D2)	yes quired) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet decorporate of the second of the seco	d hydrolog	must be present, unless disturbed or problemate Depth (inches): djacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Seconda Seconda Drain Dry- Cray Satun Geon Shall	Hydric soil present? Hydric soil present? Peld. Peld. Person Indicators (minimum of two researce Soil Cracks (B6) anage Patterns (B10) as Trim Lines (B16) Season Water Table (C2) Mish Burrows (C8) Person Visible on Aerial Imagery (C9) Peted or Stressed Plants (D1) Person Managery (D2) Person Indicators (D2) Person Indicators (D3)	yes quired) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet deed YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of source Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) ield Observations: urface water present?	ceper than a	Depth (inches): Depth (inches): dijacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Seconda Seconda Drain Dry- Cray Satun Geon Shall	Hydric soil present? Hydric soil present? Peld. Peld. Person Indicators (minimum of two researce Soil Cracks (B6) Personage Patterns (B10) Person Water Table (C2) Person Water Table (C2) Person Visible on Aerial Imagery (C9) Peted or Stressed Plants (D1) Person Managery (D2) Pelow Aquitard (D3) Pelopographic Relief (D4)	yes quired) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Ditch approximately 2.5 feet decorporate of the second of the seco	eper than a	must be present, unless disturbed or problemate Depth (inches): djacent field. Peat assumed, based on soil boring hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Seconda Seconda Drain Dry- Cray Satun Geon Shall	Hydric soil present? Hydric soil present? Peld. Peld. Person Indicators (minimum of two researce Soil Cracks (B6) Person Patterns (B10) Person Water Table (C2) Person Water Table (C2) Person Visible on Aerial Imagery (C9) Person Visible On Aerial Imagery (yes quired) FAC-Neutral Test (D5)

WETLAND DETERMINATION	N DATA FORM -	Northcentral and Northe	ast Region
Project/Site: Zim Site Applicant/O	wner: PolyMet Mining City/C	County: St. Louis State: MN Sam	ppling Date: 04/13/16
Investigator(s): KMS2 Section:	<u>2+</u> Town	nship: <u>55</u> Range: <u>18W</u> San	npling Point: 102 East Wetland
Land Form: Terrace Local Relie	f: None Slope	e %: 0 Soil Map Unit Name: B14A Gree	nwood Soils, Upham Basin, 0-1%
Subregion (LRR): K Latitude:	<u>5235574</u> Longi	itude: 530517 Datum: NAD 83	
Cowardin Classification: PFO24 Circular 39	Classification: Type 7	Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year	? <u>Yes</u> (If no, explain in re	emarks) Eggers & Reed (primary):	Coniferous Swamp
Are vegetation No Soil No Hydrology No	cianiticantly dicturbed?	normal Yes Eggers & Reed (secondary): mstances" Eggers & Reed (tertiany):	
	naturally problematic?	Lyyers a Need (tertiary).	
	· ·		Santuman ata
SUMMARY OF FINDINGS - Attach site map sh			reatures, etc.
Hydrophytic vegetation present? Yes General Remar Hydric soil present? Yes (explain any an	l l	I N02.	
Hydric soil present? Yes (explain any an. Indicators of wetland hydrology present? Yes Yes	SWC13		
	Wetland Site ID: NW5		
VEGETATION			
		dicator 50/20 Thresholds:	<u>20%</u> <u>50%</u>
Tree Stratum (Plot Size: 30 ft		dicator <u>50/20 Triresholds.</u> atus Tree Stratum	11 27.5
· · · · · · · · · · · · · · · · ·	,	Sanling/Shruh Stratum	$\frac{11}{6}$ $\frac{27.5}{15}$
Picea mariana Leriy leriana	30 Yes Yes Yes	FACW Herb Stratum	5 12.5
Larix laricina .	0 165	Woody Vine Stratum	0 0
4.	0	Dominance Test Worksheet:	
Total Cover:	<u>55</u>	Number of Dominant Species	E (A)
Sapling/Shrub Stratum (Plot Size: 15 ft)	That Are OBL, FACW or FAC:	5 <i>(A)</i>
1. Picea mariana	15 Yes	FACW Total Number of Dominant Species Across All Strata:	5 <i>(B)</i>
2. Larix laricina	15 Yes	FACW Percent of Dominant Species	
3.	0	That Are OBL, FACW or FAC:	100.00% (A/B)
4.	0	Prevalence Index Worksheet:	
5. Total Cover:	30	Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft	<u>30</u>	OBL Species 25	X 1 25
Ledum groenlandicum	25 Yes	OBL FACW Species 85	X 2 170
2.	0 100	FAC Species 0	X 3 0
3.	0	FACU Species 0	X 4 0
4.	0	UPL Species 0	X 5 0
5.	0	Column Totals: 110	(A) 195 (B)
6	0 0	Prevalence Index =	B/A = 1.77
8.	0	Hydrophytic Vegetation Indicators:	
Total Cover:	<u>25</u>	Yes Rapid Test for Hydroph	ytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft))	Yes Dominance Test is >50	%
1.	0	Yes Prevalence Index ≤ 3.0	• •
2.	0	No Morphological Adaptate in vegetation remarks of	ions [1] (provide supporting data or on a separate sheet)
Total Cover:	<u>0</u>	No Problematic Hydrophyt	ic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cover:	[1] Indicators of hydric soil & wetland h	ydrology must be present, unless
Vegetation Remarks: (include photo numbers here or on a separate	e sheet)	Hydrophytic vegetation present?	<u>Yes</u>
		Ш	

SOIL Sampling Point: 102 East Wetland

Profile Description: (Describe to the depth needs	ed to document the indicator or confirm the Redox Feature		ators).	
·	% Color (moist) %	Type [1] Loc	[2] Texture	Remarks
1. 0 - 34 10YR 2/1	<u> </u>	,	Oi	
2				-
3			<u></u>	
4				
5				-
[1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand	Grains [2] Loca	ntion: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)		Indicators for Problematic Hydric S	oils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLF	RA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149)	В)	Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R,	MLRA 149B)	5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA	l <i>149B)</i>	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (Li	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L	2)
☐ Thick Dark Surface (A12)	Depleted Matrix (F3)		☐ Iron-Manganese Masses (F12) (L	.RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or	problematic.	Very Shallow Dark Surface (TF12	e) remarks)
Restrictive Layer (if present): Type:	Depth (inches)	:	Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; ch	eck all that apply)	Se	econdary Indicators (minimum of two re	quired)
	Water-Stained Leaves (B9)		Surface Soil Cracks (B6)	FAC-Neutral Test (D5)
✓ Surface Water (A1) ☐ High Water Table (A2)	Aquatic Fauna (B13)		Drainage Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)		Moss Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odor (C1)		Dry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living I	Roots (C3)	Crayfish Burrows (C8)	
Drift Deposits (B3)			Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)		Stunted or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled So	ils (C6)	Geomorphic Position (D2)	
	Thin Muck Surface (C7)		Shallow Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)		Microtopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrological	pgy present? Yes
Surface water present?	✓ Surface Water Depth (inches):	1	Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
, , , , , , , , , , , , , , , , , , , ,		evious Inspection	ns	

WETLAND DETERMIN	IATION DATA FORM	I - Northcentral and Northeast Region
Project/Site: Zim Site	Applicant/Owner: PolyMet Mining (City/County: St. Louis State: MN Sampling Date: 11/13/15
Investigator(s): KMS2,LMT2	Section: 2+	Township: 55 Range: 18W Sampling Point: 102-S-Up
Land Form: Terrace		Slope %: 0 Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%
Subregion (LRR): <u>K</u>	Latitude: <u>5235287</u>	Longitude: 530311 Datum: NAD 83
Cowardin Classification: Upland	Circular 39 Classification: Upland	Mapped NWI Classification:
Are climatic/hydrologic conditions on the site typical for this		
3,		Are "normal Yes Eggers & Reed (secondary):
Are vegetation No Soil No Hydrology		circumstances" Eggers & Reed (tertiary):
Are vegetation No Soil No Hydrology	No naturally problematic?	present? Eggers & Reed (quaternary):
SUMMARY OF FINDINGS - Attach site	map showing sampling po	oint locations, transects, important features, etc.
Hydric soil present? Yes (exp. if net and indicators of wetland hydrology present? No	plain any answers eeded): Point ID: 390	acent to excavated ditch.
<u> </u>	es, optional Wetland Site ID: (NW1	1
VEGETATION		
	Absolute Dominant	<u>Indicator</u> <u>50/20 Thresholds:</u> <u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>) <u>% Cover</u> <u>Species?</u>	Status 0 0
1.	0	Sapling/Shrub Stratum 0 0
2.	0	Herb Stratum
3.	0	
4.	0	Dominance Test Worksheet:
T	otal Cover: 0	Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)	
1.	0	Total Number of Dominant Species Across All Strata: 1 (B)
2.	0	Percent of Dominant Species
3.	0	That Are OBL, FACW or FAC: 0.00% (A/B)
4.	0	Prevalence Index Worksheet:
5. T	otal Cover: 0	Total % Cover of: Multiply by:
	otal cover. <u>u</u>	OBL Species 0 X 1 0
Herb Stratum (Plot Size: 5 ft)	OBE Species
1. Poa pratensis	25 Yes	1AC0 1ACN OPCOICS
2. 3.	0	OF VA
4.	0	PACO Species
5.	0	UPL Species 0
6.	0	Column Totals: 25 (A) 100 (B)
7.	0	Prevalence Index = B/A = 4.00
8.	0	Hydrophytic Vegetation Indicators:
To	otal Cover: 25	No Rapid Test for Hydrophytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft)	No Dominance Test is >50%
1.	0	No Prevalence Index ≤ 3.0 [1] No Morphological Adaptations [1] (provide supporting data
2.	0	in vegetation remarks or on a separate sheet)
To	otal Cover: 0	No Problematic Hydrophytic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cover	[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.
Vegetation Remarks: (include photo numbers here or or	n a separate sheet)	Hydrophytic vegetation present? <u>No</u>
Former sod field.		

SOIL Sampling Point: 102-S-Up

Profile Description: (Describe to the depth need	ded to document the indicator or co	nfirm the abscence of	indicators).		
Depth Matrix		ox Features			
(inches) Color (moist)	% Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
1. 0 - 20 10YR 3/2				Oe Oe	
2. <u>20 - 47</u> 7.5YR 3/2 47 - 48 Gley1 5/10Y				Oi	
J				<u>ls</u>	
4					
5					
[1] Type: C=Concentration, D=Depletion, RM=R	Peduced Matrix, CS=Covered or Coat	ted Sand Grains [2]	Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)		Indi	cators for Problematic Hydric Soi	ls [3]:
✓ Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLRA	149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, M	MLRA 149B)		Coast Prairie Redox (A16) (LRR K,	L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (St	8) (LRR R, MLRA 149B,)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRF	R R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (I	LRR K, L)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) (LR	P.R. K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (N	<i>ILRA 149B)</i>
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must he present, upless di	sturbed or problematic		Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:		(inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks:					
HYDROLOGY					
Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required; c	heck all that apply)		Secondar	y Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves ([B9)	Surfac	e Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)	Aquatic Fauna (B13)		Draina	ge Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Moss	Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor ((C1)	Dry-Se	eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres			sh Burrows (C8)	
	,	3 ()		tion Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iro	on (C4)		d or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in	n Tilled Soils (C6)		orphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)			w Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7)	Other (explain in remark	rs)		opographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)		, 	IVIICION	эродгартік кенет (D4)	
Field Observations:	Comfort Mater Double (in	-6		Indicators of wetland hydrolog	y present? <u>No</u>
Surface water present?	Surface Water Depth (inc			Describe Recorded Data:	
Water table present?	Water Table Depth (inche	•			
Saturation present? (includes capillary fringe)	Saturation Depth (inches	<u> </u>			
	Ionitoring Well Stream Gauge	Previous Inspe	ections		
Hydrology Remarks:					

	WET	LANL	DETE	RMI	NATION	DATA	FORI	/I - North	ncentral and	Northe	ast Re	egion	
Project/.	'Site: Zim	<u>Site</u>			Applicant/Own	ner: PolyMet	Mining	City/County: <u>St.</u>	Louis State:	MN Sam	pling Date:	<u>11/13/15</u>	
Investig	nator(s): KMS:	2,LMT2			Section:	<u>2+</u>		Township: 55	Range	. <u>18W</u> Sam	npling Point:	102-S-Wet	
Land Fo		rrace			Local Relief:	None		Slope %: <u>0</u>	Soil Map Unit Name	e: B14A Green	nwood Soils	, Upham Bas	in, 0-1%
Subreg	ion (LRR): <u>K</u>				Latitude:	<u>5235279</u>		Longitude: 5303	310 Datum.	NAD 83			
Coward	din Classification	n: <u>PUB</u> l	<u>-14x</u>		Circular 39 Cl	assification:	Type 5		Mapped NWI Cla	assification:			
Are clin	natic/hydrologic	conditions	on the site typ	ical for th	nis time of year?	<u>Yes</u>	(If no, explain	n in remarks)	Eggers & Reed	(primary):	Shallow, Op	oen Water	
Are veg	netation No	Soil	<u>No</u>	Hydrolog	gy <u>No</u> sig	nificantly dist	urhad?	Are "normal circumstances"	Yes Eggers & Reed	=			
Are veg	netation No	Soil	<u>No</u>	Hydrolog	gy <u>No</u> nat	urally problen		present?	Eggers & Reed Eggers & Reed				
SUMM	IARY OF I	FINDING	GS - Atta	ch sit	e map sho	wing san	npling po	oint locatio	ons, transects, ii	mportant i	features	s, etc.	
Hydric s Indicato	hytic vegetation soil present? ors of wetland h	ydrology pre		Yes (6) Yes	General Remarks explain any answ f needed):	rers	-	acent to former s	sod field. No vegetation ob	oserved in ditch.			
	ampled area wi	thin a wetlai	nd?	Yes II	yes, optional W	etland Site I	D : <u>NW1</u>						
VEGE	TATION												
						Absolute	Dominant	Indicator	50/20 Thresholds:			<u>20%</u>	<u>50%</u>
<u>Tr</u>	ee Stratum		(Plot Size:	<u>30 ft</u>)	% Cover	Species?	<u>Status</u>	Tree Stratum	.			
1.						0			Sapling/Shrub Strat Herb Stratum	tum		0 0	0
2.						0			Woody Vine Stratur	n		0	0
3.						0			Dominance Test We	orksheet:			
4.					Total Cover:	<u>0</u>			Number of Dominar				
Sa	pling/Shrub S	tratum	(Plot Size:	15 ft)	-			That Are OBL, FAC			(A)	
1.			(0			Total Number of Do			(B)	
2.						0			Species Across All Percent of Dominar				
3.						0			That Are OBL, FAC			(A/B)	
4.						0			Prevalence Index W	'arkshoot:		<u> </u>	
5.					Total Cover:	0			Total % Cov			Multiply by	
u.	uh Ctuatum		(Plot Size:	F. #	Total Cover:	<u>0</u>			OBL Species	0	X 1	минріу Бу	0
	erb Stratum		(F101 3126.	<u>311</u>)		1 1		FACW Species	0	X 2		0
1. 2.						0			FAC Species	0	X 3		0
3.						0			FACU Species	0	X 4		0
4.						0			UPL Species	0	X 5		0
5.						0			Column Totals:	0	(A)		0 (B)
6.						0			 	alence Index =		#Nu	
7. 8.						0			Hydrophytic Vegetat	tion Indicators:			
0.					Total Cover:	<u>0</u>			No Rapid Te	st for Hydroph	ytic Vegeta	tion	
<u>W</u>	oody Vine Stra	<u>tum</u>	(Plot Size:	<u>30 ft</u>)	<u>u</u>			No Dominar	ice Test is >509	%		
1.						0				ce Index ≤ 3.0 ogical Adaptati	• •	ovido oveno	rtina doto
2.						0				ntion remarks o			rting data
					Total Cover:	<u>0</u>		·	No Problem	atic Hydrophyt	ic Vegetatio	on [1] (Expla	in)
% Bare	Ground in He	rb Stratum.	; <u> </u>	_	9	% Sphagnum	n Moss Cover	r:	[1] Indicators of hydric disturbed or problemat		ydrology mu	st be present,	unless
Vegeta	tion Remarks:	(include pl	hoto number	s here or	on a separate s	heet)			Hydrophytic vegetati	ion present?	<u>No</u>		
No vege	etation in ditch.												

SOIL Sampling Point: 102-S-Wet

Profile Description: (D	•	needed to doo	cument the indicator or c			f indicators).		
Depth	Matrix			dox Featu			- .	
(inches)	Color (moist)		Color (moist)	<u></u> %	Type [1]	Loc [2]	Texture	Remarks
							Peat	
					·			
6								
[1] Type: C=Concentra	ation, D=Depletion, RI	M=Reduced M	latrix, CS=Covered or Co	ated Sand	d Grains [2	Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators:	: (applicable to all LRI	Rs, unless oth	nerwise noted)			Ind	licators for Problematic Hydric Soi	ls [3]:
✓ Histosol (A1)			Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	?)		Dark Surface (S7) (LRR R	, MLRA 14	19B)		Coast Prairie Redox (A16) (LRR K	, L, R)
Black Histic (A3)			Polyvalue Below Surface ((S8) (LRR	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
Hydrogen Sulfide (A	1 <i>4)</i>		Thin Dark Surface (S9) (Li	RR R, MLF	RA 149B)] Dark Surface (S7) (LRR K, L)	
Stratified Layers (A.	5)		Loamy Mucky Mineral (F1)	(LRR K, L	1)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dai	rk Surface (A11)		Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface	(A12)		Depleted Matrix (F3)] Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Miner	ral (S1)		Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matri	ix (S4)		Depleted Dark Surface (F)	7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)			Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydroph	hytic vegetation and wei	tland hvdrolog	y must be present, unless	disturbed (or problematic.		Very Shallow Dark Surface (TF12)	
Restrictive Layer (if pr		3 03	·	th (inche			Hydric soil present?	<u>Yes</u>
Soil Remarks: Soil a	assumed based on soil b	ooring in adjac	ent field.					
HYDROLOGY								
Wetland Hydrology Ind								
Primary Indicators (mi	inimum of one require	d; check all th -					ry Indicators (minimum of two req	
Surface Water (A1)			Water-Stained Leaves	s (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
✓ High Water Table (A	4 <i>2)</i>	[Aquatic Fauna (B13)			Drain	age Patterns (B10)	
Saturation (A3)		[Marl Deposits (B15)			Moss	Trim Lines (B16)	
Water Marks (B1)		[Hydrogen Sulfide Odo	r (C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits	(B2)		Oxidized Rhizosphere	s on Living	Roots (C3)	Crayi	fish Burrows (C8)	
Drift Deposits (B3)		-				Satur	ration Visible on Aerial Imagery (C9)	
Algal Mat or Crust (I	(B4)	Ĺ	Presence of Reduced			Stuni	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)		Ĺ	Recent Iron Reduction		Soils (C6)	Georg	norphic Position (D2)	
☐ Inundation Visible o	n Aerial Imagery (B7)	Ĺ	Thin Muck Surface (C.			Shall	ow Aquitard (D3)	
	Concave Surface (B8)		Other (explain in rema	rks)		Micro	topographic Relief (D4)	
Field Observations:							Indicators of wetland hydrolog	y present? Yes
Surface water present	?	✓	Surface Water Depth (i	nches):	4		Describe Recorded Data:	
Water table present?		✓	Water Table Depth (inc	hes):	0			
Saturation present? (ii	ncludes capillary fring	re)	Saturation Depth (inch	es):	0			
Recorded Data:	Aerial Photo	Monitoring	Well Stream Gau	ge 🔲	Previous Insp	ections		
Hydrology Remarks:								

	W	ETLA	AND	DETE	RM	INATI	ON	DATA	FORI	И - N	orth	centi	ral and	d Nort	hea	st Re	gion		
Projec	ct/Site:	Zim Site	!			Applica	nt/Owr	ner: PolyMe	t Mining	City/Cour	nty: St. L	_ouis	State.	MN_	Samp	ling Date:	<u>11/13/15</u>		
Inves	tigator(s):	KMS2,LM	<u>T2</u>			Section) <i>:</i>	<u>2+</u>		Townshi	p: <u>55</u>		Rang	<u>re: 18W</u>	Samp	oling Point:	<u>109-S-Up</u>		
Land	Form:	Terrace	<u>!</u>			Local R	Pelief:	<u>None</u>		Slope %.	: <u>0</u>	Soil N	Map Unit Nar	ne: <u>B14A</u>	Green	wood Soils,	Upham Ba	sin, 0-	1%
Subr	egion (LRR)): <u>K</u>				Latitude	9:	<u>5234416</u>		Longitua	le: 53073	<u>37</u>	Datu	<i>m:</i> NAD 83	}				
Cowa	- ardin Classi	fication:	Upland	d		Circulai	- 39 Cla	assification:	Upland	, and the second		Ma	apped NWI (Classification	7:				
			ditions o	n the site typ	oical for i	this time of t	rear?	<u>Yes</u>	(If no, expla	in in rema	arks)	E	 ggers & Ree	d (primary):	U	lpland			
	regetation	<u>No</u>	Soil	<u>No</u>	Hydrold	_		nificantly dist		Are "norr	mal	Yes Eg	ggers & Ree ggers & Ree	d (secondar					
Are v	regetation	No	Soil	No	Hydrolo	ogy <u>No</u>	nat	urally problen	matic?	present?	?	-	ggers & Reel		rv):				
		_				<u> </u>			npling p	oint le	postio					anturos	oto		
SUIVI	WART	OF FIN	DING	3 - Alla	CII SI	te map	3110	willy sai	nping p	OIIIL IC	Jealioi	115, u a	nsecis,	πιροιτα	11111 16	atures,	elc.		
Hydri Indica	ophytic vege ic soil prese ators of wett sampled an	nt? land hydrol	logy pres		Yes No	General Re (explain any if needed): If yes, option	/ answ		er sod field ac ID: 773 D: (NW:		excavate	ed ditch.							
VFG	ETATI	ON																	
0												50/20	Thresholds:	,			20%	5	0%
	Tree Stratu			(Plot Size:	20 #		1	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	Indica Statu			tratum				0		0 <i>78</i> 0
	Tree Stratt	<u> </u>		(Piot Size.	<u>30 ft</u>		,						g/Shrub Str	atum			0	-	0
1.								0				1	Stratum	u.u			5		2.5
2.								0				Wood	y Vine Strat	um			0		0
3.								0				Domir	nance Test I	Vorksheet:					
4.						Total Co	vor:	<u>0</u>					er of Domin						
	Canlina/Ch	with Caratio		(Diet Cine)	1 F #	Total Co	ver.	<u>u</u>					Are OBL, FA				0 <i>(A)</i>		
	Sapling/Sh	rub Stratu	<u>III</u>	(Plot Size:	<u>15 ft</u>)					Total	Number of L	Oominant	_		4 (D)		
1. 2.								0				Specie	es Across A	II Strata:	_		1 (B)		
3.								0					nt of Domin			0.00	% (A/E	3)	
4.								0				T TTAL F	re OBL, FA	CW OF FAC	· <u>-</u>			,	
5.								0				Preval	ence Index	Worksheet:					
						Total Co	/er:	0					Total % Co	over of:			Multiply b	y:	
	Herb Stratu	ım		(Plot Size:	<u>5 ft</u>)					OBL S	pecies		0	X 1		0	
1.	Poa prater	nsis					,	25	Yes	F.A	ACU	FACW	/ Species		0	X 2		0	
2.								0					Species		0	X 3		0	
3.								0					Species		25	X 4		100	
4.								0					pecies		0	X 5		0	
5.								0					n Totals:		25	(A)		100	(B)
6.								0				Coluii		valence Inc				4.00	()
7.								0				Hydror	hytic Veget						
8.						Total Car	or:	0				-				tic Vanatat	ion		
	147	. 04 - 4		(Dla40)	20.5	Total Co	rer:	<u>25</u>				No No		Test for Hyd ance Test is		_	IOII		
	Woody Vin	e Stratum		(Plot Size:	<u>30 11</u>)					No		ence Index :					
1.								0				No	Morpho	ological Ad	aptatio	- ns [1] (pro			data
2.						Total Co	or:	0				Ma	•	tation rema		•	,		
0/ 5		in Unit O	lund			I OTAL CO		<u>0</u>	. Mo O:				ators of hydr			•		,	s
	re Ground							. •	1 Moss Cove	er: 			ed or problem						
Vege	tation Rem	arks: (incl	lude ph	oto number	s here c	or on a sepa	arate s	heet)				Hydro _l	phytic vegeta	ation presen	t?	<u>No</u>			

Former sod field.

SOIL Sampling Point: 109-S-Up

Profile Description: (Describe to the depth need Depth Matrix	led to document the indicator or confirm the abscend Redox Features	e of indicators).		
<u> </u>	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
1. 0 - 14 10YR 3/2			Oe	
2. 14 - 48 7.5YR 3/2			Oi	
3				
4		<u> </u>		
6				
[1] Type: C=Concentration, D=Depletion, RM=Rd	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	ınless otherwise noted)	Inc	icators for Problematic Hydric So	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	4 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA	(49B)	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or problem	atic.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY				
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl	anck all that apply)	Seconds	ry Indicators (minimum of two req	wired)
			,	
Surface Water (A1)	Water-Stained Leaves (B9)		ce Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)	Aquatic Fauna (B13)		age Patterns (B10)	
Saturation (A3)	☐ Marl Deposits (B15)☐ Hydrogen Sulfide Odor (C1)	_	Trim Lines (B16) Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on Living Roots (C.		ish Burrows (C8)	
Sediment Deposits (B2)	Oxidized Kriizosprieres on Living Roots (C.		ation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		ed or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)		norphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)		ow Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)		topographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)				
Field Observations: Surface water present?	Surface Water Depth (inches):		Indicators of wetland hydrolog	gy present? <u>No</u>
		<u> </u>	Describe Recorded Data:	
Water table present? Saturation present? (includes capillary fringe)	Water Table Depth (inches): Saturation Depth (inches):			
	onitoring Well Stream Gauge Previous I	nspections		
Hydrology Remarks:				

WETLAND DETE	RMINATION DATA FOR	M - Northcentral and	Northeast Region
Project/Site: Zim Site	Applicant/Owner: PolyMet Mining	City/County: St. Louis State:	MN Sampling Date: 11/13/15
Investigator(s): KMS2,LMT2	Section: 2+	Township: 55 Range:	18W Sampling Point: 109-S-Wet
Land Form: Terrace	Local Relief: None	Slope %: 0 Soil Map Unit Name	
Subregion (LRR): K	Latitude: 5234423	, -	NAD 83
Cowardin Classification: PUBH4x	Circular 39 Classification: Type 5	Mapped NWI Cla	
Are climatic/hydrologic conditions on the site typ		lain in remarks) Eggers & Reed (
		Are "normal Yes Eggers & Reed (•
Are vegetation No Soil No	Hydrology <u>No</u> significantly disturbed?	circumstances" Eggers & Reed (-
Are vegetation No Soil No	Hydrology <u>No</u> naturally problematic?	' Eggers & Reed (
SUMMARY OF FINDINGS - Atta	ch site map showing sampling	point locations, transects, in	nportant features, etc.
Hydrophytic vegetation present?	(ayalain any anawara	adjacent to former sod field. No vegetation ob	served in ditch.
Hydric soil present?	Yes (explain any answers if needed):		
Indicators of wetland hydrology present? Is the sampled area within a wetland?	Yes If yes, optional Wetland Site ID: NW	12	
<u> </u>		<u></u>	
/EGETATION			
	<u>Absolute</u> <u>Dominan</u>		<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size:	30 ft) % Cover Species?	- Tree Stratum	0 0
1.	0	Sapling/Shrub Strat	
2.	0	Herb Stratum Woody Vine Stratun	$\frac{0}{0}$ $\frac{0}{0}$
3.	0		
4.	0	Dominance Test Wo	
	Total Cover: 0	Number of Dominan That Are OBL, FACV	t Species V or FAC: (A)
<u>Sapling/Shrub Stratum</u> (Plot Size:	<u>15 ft</u>)	Total Number of Do	
1.	0	Species Across All	
2.	0	Percent of Dominan	
3. <u></u>	0	That Are OBL, FAC	V or FAC:
5.		Prevalence Index Wo	orksheet:
	Total Cover: 0	Total % Cove	er of: Multiply by:
Herb Stratum (Plot Size:	5 ft	OBL Species	0 X 1 0
1.		FACW Species	0 X 20
2.	0	FAC Species	0 X3 0
3.	0	FACU Species	0 X 4 0
4.	0	UPL Species	0 X5 0
5.	0	Column Totals:	0 (A) 0 (B)
6.	0	-	elence Index = B/A = #Num!
7.	0	Hydrophytic Vegetati	
8.	Total Cover:	J []	st for Hydrophytic Vegetation
Woody Vine Stratum (Plot Size:	<u>u</u>		ce Test is >50%
,		#Type! Prevalence	ce Index ≤ 3.0 [1]
1. 2.	0		gical Adaptations [1] (provide supporting data
2.	Total Cover: 0		tion remarks or on a separate sheet) tic Hydrophytic Vegetation [1] (Explain)
	<u></u>		soil & wetland hydrology must be present, unless
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	ver: disturbed or problemati	
Vegetation Remarks: (include photo number	s here or on a separate sheet)	Hydrophytic vegetation	on present? <u>No</u>
No vegetation in ditch.			
9			

SOIL Sampling Point: 109-S-Wet

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
-		Peat	
<u> </u>			
-			_
<u> </u>			
			- -
Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
dric Soil Indicators: (applicable to all LRRs, u	inless otherwise noted)	Indicators for Problematic Hydric So	oils [3]:
Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLF	RA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149B)	5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (Li	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L	<u>L)</u>
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (L	LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A	1, <i>145, 149B)</i>
	Daday Danracciona (E0)	Pad Parant Material (F21)	Other (explain in each
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	Otner (explain in soli
-	hydrology must be present, unless disturbed or problematic.	Very Shallow Dark Surface (TF12	
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type:	hydrology must be present, unless disturbed or problematic. Depth (inches):	<u> </u>	Other (explain in soil remarks) Yes
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring TDROLOGY	hydrology must be present, unless disturbed or problematic. Depth (inches):	Very Shallow Dark Surface (TF12	2) remarks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Indicators of hydrophytic vegetation and wetland wetland estrictive Layer (if present): Type: Indicators: Type: Indicators:	hydrology must be present, unless disturbed or problematic. Depth (inches): Ing in adjacent field.	Very Shallow Dark Surface (TF12 Hydric soil present?	<u>Yes</u>
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Indicators of hydrophytic vegetation and wetland wetland estrictive Layer (if present): Type: Indicators: Type: Indicators:	Depth (inches): ng in adjacent field.	Very Shallow Dark Surface (TF12 Hydric soil present? Secondary Indicators (minimum of two re	Yes equired)
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on soil boring the property of	Depth (inches): ng in adjacent field. Deck all that apply) Water-Stained Leaves (B9)	Very Shallow Dark Surface (TF12 Hydric soil present? Hydric soil present? Secondary Indicators (minimum of two re Surface Soil Cracks (B6)	Yes
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring IDROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2)	Depth (inches):	Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10)	remarks) Yes equired)
Indicators of hydrophytic vegetation and wetland instrictive Layer (if present): Type: Indicators: Type: Indicators:	ng in adjacent field. Depth (inches): g in adjacent field. Depth (inches): Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16)	remarks) Yes equired)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil assumed, based on soil boring TOROLOGY Estland Hydrology Indicators: Imary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	Depth (inches): Depth (inches): In g in adjacent field. Depth (inches): Depth (inches): Depth (inches): Adjacent field.	Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2)	remarks) Yes equired)
Indicators of hydrophytic vegetation and wetland instrictive Layer (if present): Type: In Remarks: Soil assumed, based on soil boring TDROLOGY Setland Hydrology Indicators: Imary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	ng in adjacent field. Depth (inches): g in adjacent field. Depth (inches): Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8)	remarks) Yes rquired) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland instrictive Layer (if present): Type: Ill Remarks: Soil assumed, based on soil boring TDROLOGY Setland Hydrology Indicators: Imary Indicators (minimum of one required; check the surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	Depth (inches): Depth (inches): Ing in adjacent field. Depth (inches): Ing in adjacent field. Depth (inches): Ing in adjacent field.	Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9)	remarks) Yes rquired) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland istrictive Layer (if present): Type: Ill Remarks: Soil assumed, based on soil boring TDROLOGY Indicators: Indicators (minimum of one required; check the control of the control o	Depth (inches): Depth (inches): Ing in adjacent field. Depth (inches): Ing in adjacent field. Depth (inches): Ing in adjacent field.	Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	remarks) Yes required) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil assumed, based on soil boring DROLOGY etland Hydrology Indicators: Imary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Very Shallow Dark Surface (TF12 Hydric soil present? Hydric soil present? Secondary Indicators (minimum of two reconstruction Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	remarks) Yes required) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (soil assumed	Depth (inches): Depth (inches): Ing in adjacent field.	Wery Shallow Dark Surface (TF12) Hydric soil present? Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	remarks) Yes rquired) FAC-Neutral Test (L
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (soil assumed	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Very Shallow Dark Surface (TF12 Hydric soil present? Hydric soil present? Secondary Indicators (minimum of two reconstruction Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	remarks) Yes rquired) FAC-Neutral Test (L
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Jil Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: Jil Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: Jil Remarks: Soil assumed, based on soil boring the striction of	ng in adjacent field. Depth (inches): Ing in adjacent field. Depth (inches)	Wery Shallow Dark Surface (TF12) Hydric soil present? Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	remarks) Yes rquired) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on soil boring the strictive Layer (if present): If Remarks: Soil assumed, based on soil boring the strictive Layer (if present): If Remarks: Soil assumed, based on soil boring the striction of the	Depth (inches): Depth (inches): Ing in adjacent field. Depth (inches): Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Hydric soil present? Hydric soil present? Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	remarks) Yes rquired) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: il Remarks: Soil assumed, based on soil boring the strictive Layer (if present): Type: Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	ng in adjacent field. Depth (inches): Ing in adjacent field. Depth (inches)	Hydric soil present? Hydric soil present? Secondary Indicators (minimum of two re Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrological	remarks) Yes rquired) FAC-Neutral Test (D

WE	ETLAND	DETE	RMIN	IATIO	N DATA	FORI	W - North	central and	l Northe	ast Reg	gion	
Project/Site:	Zim Site			Applicant/Ov	wner: PolyMet	t Mining	City/County: St.	Louis State:	MN Sam	ppling Date: 0	<u>5/10/12</u>	
ŭ 17 <u>-</u>	KMS2/TPT			Section:	<u>26+</u>		Township: 55	Rang		npling Point: 1		
Land Form:	<u>Terrace</u>			Local Relief.			<i>Slope %:</i> <u>0</u>	Soil Map Unit Nan	ne: B14A Gree	nwood Soils, U	pham Basir	<u>n, 0-1%</u>
Subregion (LRR):	<u>K</u>			Latitude:	<u>5234620</u>		Longitude: 5310	<u>119</u> Datui	<i>n:</i> NAD 83			
Cowardin Classific	cation: PFO2	,4/SS1B		Circular 39 (Classification:	Type 7		Mapped NWI (Classification:			
Are climatic/hydrol	logic conditions c	on the site typi	ical for this	time of year?	Yes Yes	(If no, expla	in in remarks)	Eggers & Reed	d (primary):	Coniferous Sw	<u>amp</u>	
Are vegetation	No Soil	<u>No</u>	Hydrology	No s	significantly dist	turbed?	Are "normal circumstances"	Yes Eggers & Reed Eggers & Reed	-			
Are vegetation	No Soil	<u>No</u>	Hydrology	No na	aturally problen	natic?	present?	Eggers & Reed	d (quaternary):			
SUMMARY O	F FINDING	S - Atta	ch site	map sho	owing san	npling p	oint locatio	ns, transects,	important i	features,	etc.	
Hydrophytic vegeta Hydric soil present Indicators of wetlar Is the sampled area	t? nd hydrology pre. ea within a wetlan	esent?	Yes (exp	neral Remark plain any ans eeded): res, optional			<u>1</u>		•			
VEGETATIO)N											
					Absolute	Dominant	Indicator	50/20 Thresholds:			<u>20%</u>	<u>50%</u>
Tree Stratum	<u>n</u>	(Plot Size:	<u>30 ft</u>		% Cover	Species?	Status	Tree Stratum			14	35
Larix laricina	2				40	Yes	FACW	Sapling/Shrub Str	atum	_	12	30
Abies balsar					30	Yes	FAC	Herb Stratum		_	11	27.5
3.	ilica .				0	103	TAG	Woody Vine Strate	um	_	0	0
4.					0			Dominance Test V	Vorksheet:			
Sapling/Shru	uh Stratum	(Plot Size:		Total Cover:	70			Number of Domin That Are OBL, FA			7 (A)	
		(PIOL SIZE.	<u>15 ft</u>)	Vaa	FACIAL	Total Number of D	ominant		- 7 (D)	
 Larix laricina Abies balsar 					20	Yes	FACW FAC	Species Across A	II Strata:		7 (B)	
 Abies balsar Cornus alba 					20	Yes	FACW	Percent of Domina		100.00%	% (A/B)	
4.					0	103	TACW	That Are OBL, FA	CW or FAC:		_	
5.					0			Prevalence Index	Norksheet:			
0.			7	otal Cover:	60			Total % Co	ver of:	M	lultiply by:	
Herb Stratun	n	(Plot Size:	5 ft		<u></u>			OBL Species	10	X 1		10
Rubus idaeu					25	Yes	FAC	FACW Species	100	X 2	2	00
Impatiens ca					20	Yes	FACW		75	X 3	2	25
3. Betula pumil	<u> </u>				10	No	OBL	FAC Species	0	X 4		0
4.					0		OBE	FACU Species	0	X 5		0
5.					0			UPL Species		-		
6.					0			Column Totals:	185	(A)		35 (B)
7.					0			Pre	valence Index =	B/A =	2.	35
8.					0			Hydrophytic Veget	ation Indicators:		·	· · · ·
			T	otal Cover:	<u>55</u>			No Rapid 1	est for Hydroph	ytic Vegetatio	n	
Woody Vine	Stratum_	(Plot Size:	<u>30 ft</u>		<u> </u>			II	nce Test is >50			
1.					0				nce Index ≤ 3.0			
2.					0				logical Adaptati tation remarks o			ting data
			7	otal Cover:	<u>0</u>			11	natic Hydrophyt	•		n)

% Sphagnum Moss Cover:

30

% Bare Ground in Herb Stratum:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Problematic Hydrophytic Vegetation [1] (Explain)

Yes

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present?

SOIL Sampling Point: 111-W-Wet

	ded to document the indicator or confirm the abscence	of indicators).		
Depth Matrix (inches) Color (moist)	% Color (moist) Redox Features 7 Type [1]	Loc [2]	Texture	Remarks
0 - 4 10YR 2/1	100		Oi	
4 - 10 10YR 2/1		-	Oa	
3. 10 - 30 10YR 2/1	100		Oi	
4				
5				
6				
[1] Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location: I	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)	Ind	icators for Problematic Hydric Soi	• •
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 14	9B)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR.	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	<i>NLRA 149B)</i>
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless disturbed or problema	tic.	Very Shallow Dark Surface (TF12)	no ma o ntro l
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks:		<u>, </u>		
HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; c.	heck all that apply)	Seconda	ry Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)	Drain	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	Moss	Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayf	ish Burrows (C8)	
Drift Deposits (B3)		Satur	ation Visible on Aerial Imagery (C9)	
☐ Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	Stunt	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled Soils (C6)	Geon	norphic Position (D2)	
	Thin Muck Surface (C7)	Shallo	ow Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	Micro	topographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	gy present? Yes
Surface water present?	Surface Water Depth (inches):	_	Describe Recorded Data:	
Water table present?	Water Table Depth (inches):		Four years of monitoring data. Th	ree out of four years met wetland
Saturation present? (includes capillary fringe)	Saturation Depth (inches):	=	hydrology.	
Recorded Data: Aerial Photo V	Ionitoring Well Stream Gauge Previous In:	spections	•	
Hydrology Remarks:				

WETLAND DETERMINATION	N DATA FOR	RM - Northcentral and Northeast Region
Project/Site: Zim Site Applicant/	Owner: PolyMet Mining	City/County: St. Louis State: MN Sampling Date: 11/13/15
Investigator(s): KMS2,LMT2 Section:	<u>2+</u>	Township: 55 Range: 18W Sampling Point: 113-N-Up
Land Form: Terrace Local Rel	ief: None	Slope %: 0 Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%
Subregion (LRR): K Latitude:	<u>5234398</u>	Longitude: 530776 Datum: NAD 83
	9 Classification: Upland	Mapped NWI Classification:
Are climatic/hydrologic conditions on the site typical for this time of year	ar? <u>Yes</u> (If no, expl	olain in remarks) Eggers & Reed (primary): <u>Upl</u> and
	·	Are "normal Yes Eggers & Reed (secondary):
Are vegetation No Soil No Hydrology No	significantly disturbed?	circumstances" Eggers & Reed (tertiary): present?
Are vegetation No Soil No Hydrology No	naturally problematic?	Eggers & Reed (quaternary):
SUMMARY OF FINDINGS - Attach site map s	howing sampling _l	point locations, transects, important features, etc.
	nswers Point ID: 823	adjacent to excavated ditch. W2)
VEGETATION		
	Absolute Dominan	nt Indicator 50/20 Thresholds: 20% 50%
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>) % Cover Species?	? Status 0 0
1.	0	Sapling/Shrub Stratum 0 0
2.	0	Herb Stratum 5 12.5
3.	0	Woody Vine Stratum 0 0
4.	0	Dominance Test Worksheet:
Total Cove Sapling/Shrub Stratum (Plot Size: 15 ft	r: <u>0</u>	Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)
1.	0	Total Number of Dominant Species Across All Strate: 1 (B)
2.	0	- Oposics Asioss Ali Status
3.	0	Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)
4.	0	
5.	0	Prevalence Index Worksheet:
Total Cover	<u>0</u>	Total % Cover of: Multiply by:
<u>Herb Stratum</u> (Plot Size: <u>5 ft</u>)	OBL Species 0 X 1 0
Poa pratensis	25 Yes	FACU FACU Species 0 X 2 0
2.	0	FAC Species0 X 30
3.	0	FACU Species 25 X 4 100
4. 5.	0	UPL Species0 X 50
6.	0	Column Totals: (A) (B)
7.	0	Prevalence Index = B/A = 4.00
8.	0	Hydrophytic Vegetation Indicators:
Total Cover	: <u>25</u>	No Rapid Test for Hydrophytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft)	No Dominance Test is >50%
1.	0	No Prevalence Index ≤ 3.0 [1] No Morphological Adaptations [1] (provide supporting data
2.	0	in vegetation remarks or on a separate sheet)
Total Cover	: <u>0</u>	No Problematic Hydrophytic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.
Vegetation Remarks: (include photo numbers here or on a separa	te sheet)	Hydrophytic vegetation present? <u>No</u>

Former sod field.

SOIL Sampling Point: 113-N-Up

	eded to document the indicator or confirm the a		ors).	
Depth Matrix (inches) Color (moist)	Redox Features Color (moist) % 1	s Гуре [1] Loc [2	Texture	Remarks
0 - 37 10YR 3/2	50			
2 7.5YR 3/2	50		Oi	
3. 37 - 41 10YR 3/1			SiC	-
4				-
5			<u> </u>	<u>.</u>
[1] Type: C=Concentration, D=Depletion, RM=	Reduced Matrix, CS=Covered or Coated Sand G	rains [2] Location	on: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)		Indicators for Problematic Hydric So	oils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLF	RA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B,	3)	Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, I	MLRA 149B)	5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA	149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (Li	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L	2)
☐ Thick Dark Surface (A12)	Depleted Matrix (F3)		☐ Iron-Manganese Masses (F12) (L	LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlar	nd hydrology must be present, unless disturbed or p	oroblematic.	Very Shallow Dark Surface (TF12	" - " - " ' - " ' - " ' - " ' ' ' ' ' ' ' ' '
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	Yes
Soil Remarks:				
HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required;			ondary Indicators (minimum of two re	<u> </u>
Surface Water (A1)	Water-Stained Leaves (B9)		Surface Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		Drainage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Moss Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor (C1)		Dry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Re		Crayfish Burrows (C8)	
☐ Drift Deposits (B3)	Descense of Dadward Iran (CA)		Saturation Visible on Aerial Imagery (C9,)
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	In (C()	Stunted or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled Soil.		Geomorphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)		Shallow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	/	Microtopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrological	ogy present? <u>No</u>
Surface water present?	Surface Water Depth (inches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
Recorded Data: Aerial Photo	Monitoring Well Stream Gauge Pre	evious Inspections		
Hydrology Remarks:				

	W	ETLA	AND	DETE	RM	INATIO	N L	DATA	FORI	/I - Norti	hcentral a	and I	Northe	ast Re	egion		
Proje	ect/Site:	Zim Site				Applicant/C)wner.	<u>PolyMet</u>	Mining	City/County: <u>St</u>	t. Louis	State:	MN Sam	pling Date:	<u>11/13/15</u>		
Inve	stigator(s):	KMS2,LM	T2			Section:	2+	<u>+</u>		Township: 55		Range:	<u>18W</u> Sam	pling Point.	113-N-Wet		
	d Form:	Terrace				Local Relie		<u>one</u>		Slope %: <u>0</u>	Soil Map Un	nit Name:	B14A Green	nwood Soils	s, Upham Bas	in, 0-1%	
Sub	region (LRR):	<u>K</u>				Latitude:	<u>52</u>	<u>234250</u>		Longitude: 531	284	Datum:	NAD 83				
Cov	vardin Classifi	cation:	PUBH-	<u>4x</u>		Circular 39	Class	sification:	Type 5	-	Mapped I	NWI Clas	sification:				
			ditions o	n the site typ	ical for i	this time of year	?	Yes	(If no, explain	n in remarks)	Eggers &	& Reed (p.	rimary):	Shallow, Or	pen Water		
Are	vegetation	<u>No</u>	Soil	<u>No</u>	Hydrold	ogy <u>No</u>	signit	ficantly dist	urhad?	Are "normal circumstances"			econdary):				
Are	vegetation	No	Soil	No	Hydrolo	ogy No	- natura	ally problem		present?		& Reed (te & Reed (g	ertiary): uaternary):				
	Ü			<u> </u>	,					oint locati	ons, transec	-	-	eatures	s, etc.		
Hydi India	rophytic veget ric soil presen eators of wetla	t? nd hydrol	ogy pres		Yes Yes	General Remai (explain any an if needed):	swers	S		acent to former	sod field. No veget	ation obs	erved in ditch.				
	e sampled are		wetland	d? 	<u>Yes</u>	If yes, optiona	l Wet	land Site II	D : <u>NW2</u>								_
VEC	BETATIO	N															_
								Absolute	Dominant	Indicator	50/20 Thresh	holds:			<u>20%</u>	<u>50%</u>	
	Tree Stratur	<u>n</u>		(Plot Size:	<u>30 ft</u>) 2	% Cover	Species?	<u>Status</u>	Tree Stratum	=			0	0	_
1.								0			Sapling/Shru Herb Stratum		m		0	0	
2.							_ _	0			Woody Vine				0	0	_
3.							4	0			Dominance 1	Test Wor	kshoot:				=
4.						Total Cover	L	0 			Number of D						
	Sapling/Shr	uh Stratu	m	(Plot Size:	15 ft	rotar cover.)	<u>v</u>			That Are OB				(A)		
1.	<u>Capinig/Ciri</u>	uo otrutu	<u></u>	(1 101 0120.	<u>10 II</u>		, 	0			Total Number				(B)		
2.							- -	0			Species Acre			-			
3.							٦F	0			Percent of D That Are OB				(A/B)		
4.								0			Don of the second		1.1				
5.								0			Prevalence II				M 10.1 1		
				(DL 4.0)	= 0	Total Cover:		<u>0</u>			<u> </u>	% Cover	of: 0	X 1	Multiply by	0	
	Herb Stratui	<u>n</u>		(Plot Size:	<u>5 ft</u>)		1 1		OBL Species		0	X 2		0	
1.							_	0			FACW Speci		0	X 3		0	
2.3.							- -	0			FAC Species		0	X 4		0	
4.							- -	0			FACU Specie		0	X 5		0	
5.							Ħ	0			UPL Species		0	(A)		_	В)
6.								0			Column Tota		ence Index =		#Nu		-,
7.							 -	0			Hydrophytic				#NG		
8.						Total Cover:		0					t for Hydroph		ation		
	Woody Vine	Stratum		(Plot Size:	<u>30 ft</u>	rotal cover.)	<u>0</u>			No D	ominanc	e Test is >509	%	111011		
1.								0					e Index ≤ 3.0 jical Adaptati	• •	rovide suppo	rting da	ta
2.								0			inin	vegetati	on remarks o	r on a sepa	arate sheet)		••
						Total Cover:		<u>0</u>			<u> </u>		ic Hydrophyt	•		•	
% B	are Ground i	n Herb St	ratum:		_		% \$	Sphagnum	Moss Cove	r:	[1] Indicators o			ydrology mu	ist be present,	unless	
Veg	etation Rema	rks: (incl	lude ph	oto number:	s here o	or on a separat	e she	et)			Hydrophytic ı	vegetation	present?	<u>No</u>			_
No۱	egetation in c	litch.															

SOIL Sampling Point: 113-N-Wet

(inches)	Color (moist)	%	Color (moist) % T	ype [1]	Loc [2]	Texture	Remarks
						Peat	
·							_
·							
1] Type: C=Concent	ration, D=Depletion, R	M=Reduced M	latrix, CS=Covered or Coated Sand Gr	rains [2] L	ocation: I	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators	: (applicable to all LR	Rs, unless otl	herwise noted)		Ind	licators for Problematic Hydric S	Soils [3]:
Histosol (A1)			Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, ML)	RA 149B)
Histic Epipedon (A.	2)		Dark Surface (S7) (LRR R, MLRA 149B))		Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)			Polyvalue Below Surface (S8) (LRR R, M	MLRA 149B)		5 cm Mucky Peat or Peat (S3) (L	LRR K, L, R)
Hydrogen Sulfide ((A4)		Thin Dark Surface (S9) (LRR R, MLRA 1	149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A	1 <i>5)</i>		Loamy Mucky Mineral (F1) (LRR K, L)			Polyvalue Below Surface (S8) (L	.RR K, L)
Depleted Below Da	ark Surface (A11)		Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K,	L)
Thick Dark Surface	e (A12)		Depleted Matrix (F3)] Iron-Manganese Masses (F12) ((LRR K, L, R)
Sandy Mucky Mine	eral (S1)		Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Mat	rix (S4)		Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144)	4, <i>145, 149B)</i>
						Pod Parant Material (E21)	
Sandy Redox (S5)			Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
_ , , ,			Redox Depressions (F8) y must be present, unless disturbed or pi	oroblematic.		Keu Parent Material (F21) Very Shallow Dark Surface (TF1	mamanlin)
[3] Indicators of hydrop	hytic vegetation and we	tland hydrolog	y must be present, unless disturbed or property (inches):	oroblematic.	_		mamanlin)
[3] Indicators of hydrop	hytic vegetation and we	tland hydrolog	y must be present, unless disturbed or property (inches):	oroblematic.	_	Very Shallow Dark Surface (TF1	2) remarks)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil	resent): Type:assumed, based on soil	tland hydrolog	y must be present, unless disturbed or property (inches):	oroblematic.		Very Shallow Dark Surface (TF1	2) remarks)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In	resent): Type:assumed, based on soil	tland hydrolog	y must be present, unless disturbed or property (inches): cent field.	oroblematic.	Seconda	Very Shallow Dark Surface (TF1	Yes
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In	andicators: hyptic vegetation and we resent): Type: assumed, based on soil	tland hydrolog	y must be present, unless disturbed or property (inches): cent field.	oroblematic.		Very Shallow Dark Surface (TF1 Hydric soil present?	Yes
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In	anytic vegetation and we resent): Type:assumed, based on soil adicators:inimum of one require	tland hydrolog	y must be present, unless disturbed or property (inches): cent field.	oroblematic.	Surfa	Very Shallow Dark Surface (TF1 Hydric soil present? ry Indicators (minimum of two re	Yes equired)
[3] Indicators of hydroper Restrictive Layer (if possible Remarks: Soil Soil Remarks: Soil Sydnorm Wetland Hydrology In Primary Indicators (m. Surface Water (A1)	anytic vegetation and we resent): Type:assumed, based on soil adicators:inimum of one require	tland hydrolog	py must be present, unless disturbed or property (inches): cent field. hat apply) Water-Stained Leaves (B9)	oroblematic.	Surfa Drain	Very Shallow Dark Surface (TF1 Hydric soil present? ry Indicators (minimum of two rece Soil Cracks (B6)	Yes equired)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m Surface Water (A1, High Water Table (anytic vegetation and we resent): Type:assumed, based on soil adicators:inimum of one require	tland hydrolog	py must be present, unless disturbed or purple to the present field. Depth (inches): cent field. hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)	oroblematic.	Surfa Drain Moss	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10)	Yes equired)
[3] Indicators of hydroper Restrictive Layer (if possible Remarks: Soil Soil Remarks: Soil Soil Remarks: Soil WYDROLOGY Wetland Hydrology Interpretation (in Sourface Water (A1) High Water Table (In Saturation (A3))	assumed, based on soil adicators: aninimum of one require (A2)	tland hydrolog	must be present, unless disturbed or property (inches): Cent field. Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)		Surfa Drain Moss Dry-S	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B16) Trim Lines (B16)	Yes equired)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m Surface Water (A1, High Water Table (Saturation (A3)	anytic vegetation and we resent): Type: assumed, based on soil adicators: ainimum of one require (A2)	tland hydrolog	must be present, unless disturbed or property (inches): Cent field. Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Ro		Surfa Drain Moss Dry-S Crayl	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2)	Yes Yes Pequired) FAC-Neutral Test (D5)
[3] Indicators of hydroper Restrictive Layer (if per Soil Remarks: Soil Soil Remarks: Soil Soil Remarks: Soil Rema	assumed, based on soil assumed one require (A2)	tland hydrolog	presence of Reduced Iron (C4) Depth (inches): Depth (in	pots (C3)	Surfa Drain Moss Dry-S Crayl Satur	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) iish Burrows (C8)	Yes Yes Pequired) FAC-Neutral Test (D5)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m Surface Water (A1, High Water Table (Saturation (A3) Water Marks (B1) Sediment Deposits (B3)	assumed, based on soil assumed one require (A2)	tland hydrolog	mat apply) Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Ro Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils	pots (C3)	Surfa Drain Moss Dry-S Crayn Satur Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) aution Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) morphic Position (D2)	Yes Yes Pequired) FAC-Neutral Test (D5)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m Surface Water (A1, High Water Table (Saturation (A3) Water Marks (B1) Sediment Deposits (B3) Algal Mat or Crust Iron Deposits (B5)	assumed, based on soil assumed one require (A2)	tland hydrolog	property must be present, unless disturbed or property (inches): Depth (inches): Cent field. Depth (inches): Cent field. Depth (inches):	pots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) Sish Burrows (C8) Sation Visible on Aerial Imagery (C9) sed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	Yes Yes Pequired) FAC-Neutral Test (D5)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m ✓ Surface Water (A1) ✓ High Water Table (✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B3) Drift Deposits (B3) Algal Mat or Crust Iron Deposits (B5) Inundation Visible	assumed, based on soil assumed, based on soil adicators: ainimum of one require (A2) (B4)	etland hydrolog	mat apply) Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Ro Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils	pots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) aution Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) morphic Position (D2)	Yes Yes Pequired) FAC-Neutral Test (D5)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m ✓ Surface Water (A1) ✓ High Water Table (✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B3) Drift Deposits (B3) Algal Mat or Crust Iron Deposits (B5) Inundation Visible	assumed, based on soil assumed, based on soil adicators: ainimum of one require (A2) (B4) On Aerial Imagery (B7)	etland hydrolog	property must be present, unless disturbed or property (inches): Depth (inches): Cent field. Depth (inches): Cent field. Depth (inches):	pots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) Sish Burrows (C8) Sation Visible on Aerial Imagery (C9) sed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	Yes Yes Paquired) FAC-Neutral Test (D5)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m Surface Water (A1, High Water Table (Saturation (A3) Water Marks (B1) Sediment Deposits (B3) Algal Mat or Crust Iron Deposits (B5) Inundation Visible (Sparsely Vegetate Field Observations: Surface water presen	assumed, based on soil assumed, based on soil adicators: ainimum of one require (A2) (B4) (B4) On Aerial Imagery (B7) d Concave Surface (B8)	etland hydrolog	property must be present, unless disturbed or property (inches): Depth (inches): Cent field. Depth (inches): Cent field. Depth (inches):	pots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) Gish Burrows (C8) Faition Visible on Aerial Imagery (C9) and or Stressed Plants (D1) morphic Position (D2) ow Aquitard (D3) stopographic Relief (D4)	Yes Yes Paquired) FAC-Neutral Test (D5)
[3] Indicators of hydrop Restrictive Layer (if p Soil Remarks: Soil YDROLOGY Wetland Hydrology In Primary Indicators (m Surface Water (A1, High Water Table (Saturation (A3) Water Marks (B1) Sediment Deposits (B3) Algal Mat or Crust Iron Deposits (B5) Inundation Visible Sparsely Vegetates Field Observations: Surface water present Water table present?	assumed, based on soil assumed, based on soil adicators: ainimum of one require (A2) (B4) (B4) On Aerial Imagery (B7) d Concave Surface (B8)	etland hydrolog	mat apply) Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Ro Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils Thin Muck Surface (C7) Other (explain in remarks)	oots (C3) s (C6)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) stopographic Relief (D4) Indicators of wetland hydrol	Yes Yes Paquired) FAC-Neutral Test (D5)

WEILAND DETE	ERMINATION DATA	FURIVI - North	entrai and Nortnea	ast Region
Project/Site: Zim Site	Applicant/Owner: PolyMet N	<u>lining</u> City/County: <u>St. Lo</u>	ouis State: MN Samp	pling Date: <u>11/13/15</u>
Investigator(s): KMS2,LMT2 Land Form: Terrace	Section: 2+ Local Relief: None	Township: 55 Slope %: 0	Soil Map Unit Name: B14A Green	pling Point: 113-S-Up nwood Soils, Upham Basin, 0-1%
Subregion (LRR): <u>K</u>	<i>Latitude:</i> <u>5234263</u>	Longitude: 531288		
Cowardin Classification: Upland Are climatic/hydrologic conditions on the site typ	-	<u>Upland</u> If no, explain in remarks)	Mapped NWI Classification: Eggers & Reed (primary): U	Upland
	<u> </u>	Are "normal	Yes Eggers & Reed (secondary):	<u>орини</u>
Are vegetation No Soil No	Hydrology <u>No</u> significantly distur	bed? circumstances"	Eggers & Reed (tertiary):	
	Hydrology No naturally problema	tic? '	Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Atta	ch site map showing sam	pling point location	ıs, transects, important f	eatures, etc.
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No General Remarks Yes (explain any answers if needed): Point ID:	sod field adjacent to excavated .889	l ditch.	
Is the sampled area within a wetland?	No If yes, optional Wetland Site ID:	(NW2)		
/EGETATION				
<u>Tree Stratum</u> (Plot Size:	0/ 0	Dominant Indicator Species? Status	50/20 Thresholds: Tree Stratum	20% 50% 0 0
1.	0		Sapling/Shrub Stratum	0 0
2.	0		Herb Stratum Woody Vine Stratum	$\frac{5}{0}$ $\frac{12.5}{0}$
3.	0		-	
4.	0		<u>Dominance Test Worksheet:</u>	
Condition (Charle Oferstern (Diet Cines	Total Cover: 0		Number of Dominant Species That Are OBL, FACW or FAC:	0 (A)
Sapling/Shrub Stratum (Plot Size:			Total Number of Dominant	4 (D)
1. 2.	0		Species Across All Strata:	1 <i>(B)</i>
3.	0		Percent of Dominant Species That Are OBL, FACW or FAC:	0.00% (A/B)
4.	0		Prevalence Index Worksheet:	
5.			Total % Cover of:	Multiply by:
Herb Stratum (Plot Size:	-		OBL Species 0	X 1 0
Poa pratensis		Yes FACU	FACW Species 0	X 2 0
2.	0	17.00	FAC Species 0	X 3 0
3.	0		FACU Species 25	X 4 100
4.	0		UPL Species 0	X 5 0
5.	0		Column Totals: 25	(A) 100 (B)
6	0		Prevalence Index = I	B/A = 4.00
8.	0		Hydrophytic Vegetation Indicators:	
	Total Cover: 25		No Rapid Test for Hydrophy	ytic Vegetation
Woody Vine Stratum (Plot Size:			No Dominance Test is >50%	
1.	0		No Prevalence Index ≤ 3.0 [· -
2.	0		No Morphological Adaptation in vegetation remarks of	ons [1] (provide supporting data r on a separate sheet)
	Total Cover: 0		No Problematic Hydrophytic	ic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum N	Noss Cover:	[1] Indicators of hydric soil & wetland hy disturbed or problematic.	drology must be present, unless
Vegetation Remarks: (include photo numbers	s here or on a separate sheet)		Hydrophytic vegetation present?	<u>No</u>
Former sod field.				

SOIL Sampling Point: 113-S-Up

Profile Description: (Describe to the depth ne	eeded to document the indicator or confirm the abscence Redox Features	of indicators).		
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
0 - 48 10YR 3/2	50		Oe	
2 7.5YR 3/2	50	- <u> </u>	Oi	
3				
4				
5				
o	Reduced Matrix, CS=Covered or Coated Sand Grains	[2] Location: P	=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs	s, unless otherwise noted)	India	ators for Problematic Hydric Soi	ls [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K,	L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 14	9B)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (LR	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetla	and hydrology must be present, unless disturbed or problemat	tic.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
YDROLOGY Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required;	check all that apply)	Secondary	Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surfac	e Soil Cracks (B6)	FAC-Neutral Test (DS
☐ High Water Table (A2)	Aquatic Fauna (B13)	Draina	ge Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	Moss	Frim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)	Dry-Se	ason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayfis	h Burrows (C8)	
Drift Deposits (B3)		Satura	tion Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	Stunte	d or Stressed Plants (D1)	
Iron Deposits (B5)	Recent Iron Reduction in Tilled Soils (C6)	Geom	rphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)	Shallo	v Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	Microto	ppographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	y present? <u>No</u>
Surface water present?	Surface Water Depth (inches):	-	Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):	-		
Recorded Data: Aerial Photo	Monitoring Well Stream Gauge Previous Ins	spections		
Hydrology Remarks:				

WETLAND DETERMINATION	N DATA FOR	M - Northc	entral and Nortl	heast Reg	gion	
Project/Site: Zim Site Applicant/Ou	wner: PolyMet Mining	City/County: St. Lou	uis State: MN	Sampling Date: 1	1/13/15	
Investigator(s): KMS2,LMT2 Section:	<u>2+</u>	Township: 55	Range: 18W	Sampling Point: 1	113-S-Wet	
Land Form: Terrace Local Relief	None None	Slope %: <u>0</u>	Soil Map Unit Name: B14A C	Greenwood Soils, L	Jpham Basi	n, 0-1%
Subregion (LRR): K Latitude:	<u>5234252</u>	Longitude: 531284	Datum: NAD 83			
Cowardin Classification: PUBH4x Circular 39	Classification: Type 5		Mapped NWI Classification:			
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, expl	ain in remarks)	Eggers & Reed (primary):	Shallow, Oper	n Water	
Are vegetation No Soil No Hydrology No s	significantly disturbed?	Are "normal Ye circumstances"	es Eggers & Reed (secondary,) <i>:</i>		
Are vegetation No Soil No Hydrology No n.	aturally problematic?	present?	Eggers & Reed (tertiary): Eggers & Reed (quaternary,	·)·		
SUMMARY OF FINDINGS - Attach site map sho		ooint locations			etc.	
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland? No General Remark (explain any ans if needed): Yes If yes, optional			field. No vegetation observed in d	litch.		
VEGETATION						
	Absolute Dominan	t Indicator	50/20 Thresholds:		20%	50%
<u>Tree Stratum</u> (Plot Size: 30 ft) % Cover Species?		Tree Stratum		0	0
1.	0		Sapling/Shrub Stratum	=	0	0
2.	0		Herb Stratum Woody Vine Stratum	_	0	0
3.	0					
4	0		<u>Dominance Test Worksheet:</u>			
Total Cover: Sapling/Shrub Stratum (Plot Size: 15 ft	<u>0</u>)		Number of Dominant Species That Are OBL, FACW or FAC:		(A)	
1.	0		Total Number of Dominant Species Across All Strata:		(B)	
2.	0		Percent of Dominant Species		_ ` ´	
3.	0		That Are OBL, FACW or FAC:		(A/B)	
4.	0 0		Prevalence Index Worksheet:			
5. Total Cover:	0		Total % Cover of:	N	fultiply by:	
Herb Stratum (Plot Size: 5 ft	<u>~</u>)	'	OBL Species	0 X 1		0
1.	0		FACW Species	0 X2		0
2.	0		FAC Species	0 X3		0
3.	0		FACU Species	0 X 4		0
4.	0		UPL Species	0 X 5		0
5. 6.	0		Column Totals:	0 (A)		0 (B)
7.	0		Prevalence Inde	ex = B/A =	#Nu	m!
8.	0		Hydrophytic Vegetation Indicat			
Total Cover: <u>Woody Vine Stratum</u> (Plot Size: <u>30 ft</u>	<u>0</u>)		No Rapid Test for Hydromology No Dominance Test is	>50%	on	
1.	0		#Type! Prevalence Index ≤ Morphological Ada		iida sunnai	rtina data
2.	0		in vegetation remar			ung uata
Total Cover:	<u>0</u>		No Problematic Hydrop			•
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov		[1] Indicators of hydric soil & wetla disturbed or problematic.	nd hydrology must	be present, u	ınless
Vegetation Remarks: (include photo numbers here or on a separate	sheet)	-	Hydrophytic vegetation present?	? <u>No</u>		
No vegetation in ditch.						

SOIL Sampling Point: 113-S-Wet

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
<u> </u>		Peat	
<u> </u>			
-			
Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
dric Soil Indicators: (applicable to all LRRs, u	unless otherwise noted)	Indicators for Problematic Hydric Soils [
Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA 14	19B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L,	R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149B)	5 cm Mucky Peat or Peat (S3) (LRR K,	, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LRR K,	<i>L)</i>
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (LRR k	K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLR.	PA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145	, 149B)
Condu Daday (CE)	Redox Depressions (F8)	Red Parent Material (F21)	Other (explain in soi
Sandy Redox (S5)			
-	hydrology must be present, unless disturbed or problematic.	Very Shallow Dark Surface (TF12)	remarks)
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type:	hydrology must be present, unless disturbed or problematic. Depth (inches):	☐ Very Shallow Dark Surface (TF12)	_ , ,
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent	hydrology must be present, unless disturbed or problematic. Depth (inches):	☐ Very Shallow Dark Surface (TF12)	remarks)
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on adjacent of the present of	t field SB.	Very Shallow Dark Surface (TF12) Hydric soil present? Y	remarks) (es
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on adjacent of DROLOGY Setland Hydrology Indicators:	Depth (inches): Tield SB.	Very Shallow Dark Surface (TF12) Hydric soil present? Y Secondary Indicators (minimum of two require	remarks) (es
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on adjacent DROLOGY Itland Hydrology Indicators: mary Indicators (minimum of one required; chemical striction)	t field SB. Depth (inches): t field SB. Meck all that apply) Water-Stained Leaves (B9)	Secondary Indicators (minimum of two require Surface Soil Cracks (B6)	remarks) (ies
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent present pres	Depth (inches): Depth (inches): It field SB. Deck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10)	remarks) (les
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Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent	Depth (inches): Depth (inches): It field SB. Depth (inches): Mater-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2)	remarks) (es
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on adjacent adjacent and the strictive Layer (if present): If Remarks: Soil assumed, based on adjacent adjacent adjacent and the striction adjacent adjacent and the striction and the stri	t field SB. Depth (inches): Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secondary Indicators (minimum of two requires Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8)	remarks) (les
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): TDROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required; check process of the striction of th	Thydrology must be present, unless disturbed or problematic. Depth (inches): It field SB. Depth (inches): Depth (Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9)	remarks) (es
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on adjacent adjacent and the strictive Layer (if present): If Remarks: Soil assumed, based on adjacent adjacent and the strictive Layer (by Land Hydrology Indicators: Imary Indicators (minimum of one required; characteristic Layer (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Thydrology must be present, unless disturbed or problematic. Depth (inches): It field SB. Depth (inches): It field SB. Depth (inches): It field SB. Depth (inches): Dept	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	remarks) (es
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Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: If Remarks: Soil assumed, based on adjacent processes and processes are processes and processes and processes and processes and processes and processes and processes are processes and processes and processes are processes and processes and processes are processes an	Depth (inches): Depth (inches): It field SB. Depth (inches): It field SB. Depth (inches): It field SB. Depth (inches): Depth (inches): It field SB. Depth (inches): D	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	remarks) (les
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: Il Remarks: Soil assumed, based on adjac	Thydrology must be present, unless disturbed or problematic. Depth (inches): It field SB. Depth (inches): Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	remarks) (es
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent process (if present): Type: il Remarks: Soil assumed, based on adjacent process (if present): Type: il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent present process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent process (if present): Type: Il Remarks: Soil assumed, based on adjacent present	Theck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	es remarks)
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): If Remarks: Soil assumed, based on adjacent adjacent and the strictive Layer (if present): If Remarks: Soil assumed, based on adjacent adjacent adjacent and the strictive Layer (Based on adjacent and the strictive Layer (Based on adjacent adjacen	The problematic. Depth (inches): It field SB. Depth (inches): Depth (inches): It field SB. Depth (inches): Dep	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	es remarks)
Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent processing the strictive Layer (if present): Type: It and Hydrology Indicators: mary Indicators (minimum of one required; check processing the strictive Layer (if present): Type: Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Theck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secondary Indicators (minimum of two require Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	remarks) es od) FAC-Neutral Test (L

	W	EILA	ND	DETE	:KIV	IINATIO	N	DATA	FORI	VI - North	ncentral al	nd Northe	ast Re	gion		
Projed	ct/Site:	Zim Site				Applicant/0	Owner	: PolyMet	t Mining	City/County: St.	. Louis St	tate: <u>MN</u> Sai	mpling Date:	05/10/12		
Inves	tigator(s):	KMS2/TPT	[Section:	2	<u>6+</u>		Township: 55	R	ange: <u>18W</u> Sai	mpling Point:	117-N-Wet		
Land	Form:	Terrace				Local Reli	ef: N	<u>one</u>		Slope %: <u>0</u>	Soil Map Unit	Name: B14A Gree	enwood Soils,	Upham Bas	sin, 0-19	<u>%</u>
Subre	egion (LRR)	<u>): K</u>				Latitude:	<u>5</u> :	<u> 234199</u>		Longitude: 531	<u>141</u> D	atum: NAD 83				
Cowa	ardin Classi	ification:	PF02/	<u>'SS1</u>		Circular 39	Clas	sification:	Type 7,6		Mapped NV	WI Classification:				
Are c	limatic/hydr	rologic cona	litions o	n the site typ	ical for	this time of yea	r?	<u>Yes</u>	(If no, explain	in in remarks)	Eggers & F	Reed (primary):	Coniferous S	<u>wamp</u>		
Are v	egetation	<u>No</u>	Soil	<u>No</u>	Hydro	logy <u>No</u>	signi	ficantly dist	turbod2	Are "normal circumstances"		Reed (secondary):	Shrub-Carr			
Are v	egetation	No	Soil	No	Hydro	<i>logy</i> No	natura	ally problen		present?		Reed (tertiary): Reed (quaternary):				
	· ·				,					oint locatio	ons, transect	.,	features,	etc.		
Hydri	c soil prese			-	Yes Yes	General Rema (explain any ai if needed):		Well 6				<u> </u>				
		land hydrold rea within a			<u>Yes</u> Yes	If yes, optiona	al Wet	land Site I	D : NW4							
	ETATI					• • •				•						
VLO	LIAII										50/20 Three ho	ldo.		200/	50	0/
	Tree Stratu			(Plot Size:	20 f			<u>Absolute</u> <u>% Cover</u>	Dominant Species?	<u>Indicator</u> Status	50/20 Thresho	ius:		<u>20%</u>	<u>50'</u>	
				(F101 312e.	<u>30 II</u>		, -				Sapling/Shrub	Stratum		0	0	
1.	Larix larici	na					 -	20	Yes	FACW	Herb Stratum			6	15	5
2. 3.							 -	0			Woody Vine St	tratum		0	0	
4.								0			Dominance Te	st Worksheet:				
L						Total Cover	:	<u>20</u>				minant Species FACW or FAC:		3 (A)		
3	Sapling/Sh	rub Stratui	<u>m</u>	(Plot Size:	<u>15 ft</u>)				Total Number		-	_ ` ′		
1.								0			Species Acros			3 <i>(B)</i>		
2.							<u> </u>	0				minant Species	100.00	— % (A/B)	1	
3. 4.								0			That Are OBL,	FACW or FAC:	100.00	70 (A/D)	,	
5.								0			Prevalence Ind	ex Worksheet:				
						Total Cover	'	<u>0</u>			Total %	Cover of:		Multiply by	r:	
	Herb Strati	<u>um</u>		(Plot Size:	<u>5 ft</u>)				OBL Species	0	X 1		0	
1.	Rubus ida	eus					ήſ	20	Yes	FAC	FACW Species	20	X 2		40	
2.	Athyrium f	ilix-femina						10	Yes	FAC	FAC Species	30	X 3		90	
3.								0			FACU Species	0	X 4		0	
4.							<u> </u>	0			UPL Species	0	X 5		0	
5. 6.								0			Column Totals	.:50	(A)		130	(B)
7.							\dashv	0			_	Prevalence Index =	= B/A =	2	2.60	
8.								0			Hydrophytic Ve	getation Indicators	<u>;</u>			
		_			22.5	Total Cover	:	<u>30</u>				id Test for Hydrop ninance Test is >50		ion		
	Woody Vin	e Stratum		(Plot Size:	<u>30 ft</u>		<i>)</i>					valence Index ≤ 3.0				
1.								0				phological Adapta			orting o	lata
2.						Total Cover		0			¹	egetation remarks blematic Hydrophy	•	,	in)	
% Ra	ro Ground	in Herb St	ratum:			Total Cover		_	n Moss Cove	<i>er:</i> 10	[1] Indicators of h	ydric soil & wetland l	•		•	
					_			. •	033 0076	. 10	disturbed or prob					
Vege	tation Rem	arks: (incl	uae ph	oto number:	s nere	or on a separa	te she	eet)			Hydrophytic ve	getation present?	<u>Yes</u>			

SOIL Sampling Point: 117-N-Wet

Profile Description: (Describe to the depth need Depth Matrix	ded to document the indicator or confire Redox F		findicators).		
(inches) Color (moist)		% Type [1]	Loc [2]	Texture	Remarks
0 - 21 10YR 2/1	100			Oi	
2					
3					
4					
5					-
[1] Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coated	Sand Grains [2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, t	unless otherwise noted)		Inc	icators for Problematic Hydric Soi	ls [3]:
✓ Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLR	PA 149B)		Coast Prairie Redox (A16) (LRR K	, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (L	LRR R, MLRA 149L	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R,	MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRF	R K, L)		Polyvalue Below Surface (S8) (LR.	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (N	<i>ILRA 149B)</i>
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless distur	bed or problematic		Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (in	iches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY					
Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required; co				ry Indicators (minimum of two req	- <u>_</u>
Surface Water (A1)	Water-Stained Leaves (B9)		_	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)	Aquatic Fauna (B13)		_	age Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)		_	Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odor (C1)			Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on L	Living Roots (C3)		ish Burrows (C8)	
Drift Deposits (B3)	Presence of Reduced Iron ((CA)		ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Til			ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)	ieu Suiis (Cu)		norphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)		_	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	отнет (ехріант інтетіаліз)		Micro	topographic Relief (D4)	
Field Observations:				Indicators of wetland hydrolog	y present? Yes
Surface water present?	Surface Water Depth (inches	· —		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			Four years of monitoring data sho drained.	w that this wetland is partially
Saturation present? (includes capillary fringe)	Saturation Depth (inches):	13		a. airiou.	
Recorded Data: Aerial Photo 🗸 M	Ionitoring Well Stream Gauge	Previous Insp	ections		
Hydrology Remarks:					

WETLAND DETERMINATI	ON DATA FOR	M - Northcentral and Northeast Region
Project/Site: Zim Site Applica	nt/Owner: PolyMet Mining	City/County: St. Louis State: MN Sampling Date: 11/13/15
Investigator(s): KMS2,LMT2 Section	: <u>2+</u>	Township: 55 Range: 18W Sampling Point: 120-W-Up
Land Form: Terrace Local F	Pelief: None	Slope %: 0 Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%
Subregion (LRR): <u>K</u> Latitud	e: <u>5234113</u>	Longitude: <u>531309</u>
Cowardin Classification: Upland Circula	39 Classification: Upland	Mapped NWI Classification:
Are climatic/hydrologic conditions on the site typical for this time of	year? <u>Yes</u> (If no, expl	lain in remarks) Eggers & Reed (primary): Upland
Are vegetation No Soil No Hydrology No	significantly disturbed?	Are "normal Yes Eggers & Reed (secondary):
		circumstances" Eggers & Reed (tertiary): present?
Are vegetation No Soil No Hydrology No	naturally problematic?	Eggers & Reed (quaternary):
SUMMARY OF FINDINGS - Attach site map	showing sampling _l	point locations, transects, important features, etc.
, <u> </u>		adjacent to excavated ditch. N2)
VEGETATION		
	Absolute Dominan	nt Indicator 50/20 Thresholds: 20% 50%
<u>Tree Stratum</u> (Plot Size: 30 ft) % Cover Species?	Tree drawn
1.	0	Sapling/Shrub Stratum 0 0
2.	0	Herb Stratum
3.	0	
4.	0	Dominance Test Worksheet:
Total Co <u>Sapling/Shrub Stratum</u> (Plot Size: 15 ft	/er: <u>0</u>	Number of Dominant Species That Are OBL, FACW or FAC: (A)
1.	0	Total Number of Dominant Species Across All Strata: 1 (B)
2.	0	Oposios Asioss Air saudi.
3.	0	Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)
4.	0	
5.	0	Prevalence Index Worksheet:
Total Co	<u>0</u>	Total % Cover of: Multiply by: ORL Species 0 X 1 0
<u>Herb Stratum</u> (Plot Size: <u>5 ft</u>)	ODE opecies
1. Poa pratensis	25 Yes	FACU FACW Species0 X 20
2.	0	FAC Species0 X30
3. 4.	0	FACU Species 25
5.	0	UPL Species0 X 50
6.	0	Column Totals: (A) (B)
7.	0	Prevalence Index = B/A = 4.00
8.	0	Hydrophytic Vegetation Indicators:
Total Co	<i>yer:</i> <u>25</u>	No Rapid Test for Hydrophytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft		No Prevalence Index ≤ 3.0 [1]
1.	0	No Morphological Adaptations [1] (provide supporting data
2.	0	in vegetation remarks or on a separate sheet)
Total Co	<u>0</u>	No Problematic Hydrophytic Vegetation [1] (Explain) [1] Indicators of hydric soil & wetland hydrology must be present, unless
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	Ver: disturbed or problematic.
Vegetation Remarks: (include photo numbers here or on a sepa	rate sheet)	Hydrophytic vegetation present? <u>No</u>

Former sod field.

SOIL Sampling Point: 120-W-Up

Depth Matrix	eded to document the indicator or confirm the abscence of Redox Features	rinaicators).	
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
1 0 - 40 10YR 3/2	50	Oe	
2 7.5YR 3/2	50	Oi	
3. 40 - 44 10YR 3/1		Ic	
4			
5			
6 [1] Type: C=Concentration, D=Depletion, RM=	Reduced Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs	, unless otherwise noted)	Indicators for Problematic Hydric So	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K	, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149E	_	•
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LR	RKI)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)	•
Thick Dark Surface (A12)	Depleted Matrix (F3)	Iron-Manganese Masses (F12) (LF	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (I	•
		<u> </u>	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A,	143, 149В)
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetla	nd hydrology must be present, unless disturbed or problematic.	Very Shallow Dark Surface (TF12)	Temans
Restrictive Layer (if present): Type:	Depth (inches):	Hydric soil present?	<u>Yes</u>
IYDROLOGY Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required;		Secondary Indicators (minimum of two req	
Surface Water (A1)	Water-Stained Leaves (B9)	Surface Soil Cracks (B6)	FAC-Neutral Test (D5
High Water Table (A2)	Aquatic Fauna (B13)	☐ Drainage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	Moss Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Dry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayfish Burrows (C8)	
Sediment Deposits (B2) Drift Deposits (B3)	Oxidized Rhizospheres on Living Roots (C3)	☐ Crayfish Burrows (C8)☐ Saturation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	<u> </u>	
Drift Deposits (B3) Algal Mat or Crust (B4)		Saturation Visible on Aerial Imagery (C9)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Presence of Reduced Iron (C4)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	
Drift Deposits (B3) Algal Mat or Crust (B4)	Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	yy present? <u>No</u>
 □ Drift Deposits (B3) □ Algal Mat or Crust (B4) □ Iron Deposits (B5) □ Inundation Visible on Aerial Imagery (B7) □ Sparsely Vegetated Concave Surface (B8) 	Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microlopographic Relief (D4)	yy present? <u>No</u>
□ Drift Deposits (B3) □ Algal Mat or Crust (B4) □ Iron Deposits (B5) □ Inundation Visible on Aerial Imagery (B7) □ Sparsely Vegetated Concave Surface (B8) Field Observations:	Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microlopographic Relief (D4) Indicators of wetland hydrolog	gy present? <u>No</u>
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microlopographic Relief (D4) Indicators of wetland hydrolog	gy present? <u>No</u>
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrolog Describe Recorded Data:	gy present? <u>No</u>
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches): Saturation Depth (inches):	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrolog Describe Recorded Data:	gy present? <u>No</u>

	WETLA	ND DETE	RMINAT	ION	DATA	FORI	/I - North	ncentral and	Northe	ast Re	gion	
Project/Site.	Zim Site		Appli	cant/Owner	r: PolyMet	Mining	City/County: <u>St.</u>	Louis State:	MN Sam	pling Date:	<u>11/13/15</u>	
Investigator	<i>'s):</i> KMS2,LMT2	2	Sect	ion: <u>2</u>	<u>+</u>		Township: 55	Range	. <u>18W</u> Sam	pling Point:	120-W-Wet	
Land Form:	Terrace	=	Loca	l Relief: N	lone		Slope %: <u>0</u>	Soil Map Unit Name	B14A Green	nwood Soils,	Upham Bas	in, 0-1%
Subregion (LRR): <u>K</u>		Latit	<i>ıde:</i> <u>5</u>	23410 9		Longitude: 5312	296 Datum.	NAD 83			
Cowardin C	lassification:	PUBH4x	Circu	lar 39 Clas	ssification:	Type 5		Mapped NWI Cla	assification:			
Are climatic	hydrologic condit	ions on the site typ	nical for this time o	of year?	<u>Yes</u>	(If no, explain	n in remarks)	Eggers & Reed	(primary):	Shallow, Op-	en Water	
Are vegetat	on <u>No</u>	Soil No	Hydrology <u>No</u>	signi	ificantly dist	urhad?	Are "normal circumstances"	Yes Eggers & Reed	=			
Are vegetat	on <u>No</u>	Soil No	Hydrology No	natur	ally problen		present?	Eggers & Reed Eggers & Reed				
SUMMA	RY OF FIND	INGS - Atta	ch site ma _l	show	ing san	npling p	oint locatio	ons, transects, ii	mportant i	eatures	, etc.	
Hydric soil µ Indicators of	wetland hydrolog	gy present?	Yes if needed	any answer):	rs		acent to former s	sod field. No vegetation ob	served in ditch.			
· ·	ed area within a v	vetland?	Yes If yes, or	tional We	tland Site I	D: <u>NW2</u>						
VEGETA	IION											
					Absolute	Dominant	<u>Indicator</u>	50/20 Thresholds:			<u>20%</u>	<u>50%</u>
Tree S	<u>tratum</u>	(Plot Size:	<u>30 ft</u>)	% Cover	Species?	<u>Status</u>	Tree Stratum			0	
1.					0			Sapling/Shrub Strat Herb Stratum	tum		0	0
2.					0			Woody Vine Stratur	n		0	0
3. 4.					0			Dominance Test We	orksheet:			
4.			Total (Cover:	<u>0</u>			Number of Dominar				
Saplin	g/Shrub Stratum	(Plot Size:)	-			That Are OBL, FAC			(A)	
1.		(0			Total Number of Do			(B)	
2.					0			Species Across All Percent of Dominar				
3.					0			That Are OBL, FAC			(A/B)	
4.					0			Prevalence Index W	'arkshoot:		<u> </u>	
5.			Total C		0			Total % Cov			Multiply by:	
Hamb (4ma 4	(Plot Size:		over:	<u>0</u>			OBL Species	0	X 1	тинарту бу.	0
Herb S	<u>tratuiii</u>	(F10t 312e.	<u>511</u>)	0	1 1		FACW Species	0	X 2		0
1. 2.					0			FAC Species	0	X 3		0
3.					0			FACU Species	0	X 4		0
4.					0			UPL Species	0	X 5		0
5.					0			Column Totals:	0	(A)		0 (B)
6.					0			 	alence Index =		#Nu	
7. 8.					0			Hydrophytic Vegetat	ion Indicators:			
0.			Total C	over:	<u>0</u>			No Rapid Te	st for Hydroph	ytic Vegetal	tion	
Wood	Vine Stratum	(Plot Size:	<u>30 ft</u>)	<u>u</u>			No Dominar	ce Test is >509	%		
1.					0				ce Index ≤ 3.0 ogical Adaptati	• •	ovido oveno	rtina doto
2.					0				ogical Adaptati ition remarks o			rting data
			Total C	over:	<u>0</u>			No Problem	atic Hydrophyt	ic Vegetatio	n [1] (Expla	in)
% Bare Gro	und in Herb Stra	ntum:	_	%	Sphagnum	Moss Cove	r:	[1] Indicators of hydric disturbed or problemat		ydrology mus	st be present,	unless
Vegetation	Remarks: (inclu	de photo number	s here or on a se	parate sh	eet)			Hydrophytic vegetati	on present?	<u>No</u>		
No vegetati	on in ditch.											

SOIL Sampling Point: 120-W-Wet

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
			Peat	-
·		- <u> </u>		_
·		·	-	
·			•	-
1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
lydric Soil Indicators: (applicable to all LRRs, ι	unless otherwise noted)	Inc	dicators for Problematic Hydric S	oils [3]:
Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, ML)	RA 149B)
] Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 14	<i>9B)</i>	5 cm Mucky Peat or Peat (S3) (L	.RR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (L	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K,	L)
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) ((LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A	4 <i>, 145, 149B)</i>
			-	
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
_ , , , ,	Redox Depressions (F8) I hydrology must be present, unless disturbed or problema	ic.	」Red Parent Material (F21) Very Shallow Dark Surface (TF1.	mamanlin)
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless disturbed or problema Depth (inches):	ic.	_	mamanlin)
3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent	d hydrology must be present, unless disturbed or problema Depth (inches):	ic.	Very Shallow Dark Surface (TF1.	2) remarks)
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless disturbed or problema Depth (inches):	ic.	Very Shallow Dark Surface (TF1.	2) remarks)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: [Soil Remarks: Soil assumed, based on adjacent Sydnorm of the company of the co	thydrology must be present, unless disturbed or problema Depth (inches): t field SB.		Very Shallow Dark Surface (TF1.	Yes
Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent YDROLOGY Vetland Hydrology Indicators: Primary Indicators (minimum of one required; cl	thydrology must be present, unless disturbed or problema Depth (inches): t field SB.	Seconda	Very Shallow Dark Surface (TF1. Hydric soil present?	Yes
All Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent Particles of the All Soil Assumed Primary Indicators (minimum of one required; classifications) Surface Water (A1)	thydrology must be present, unless disturbed or problema Depth (inches): It field SB. The problema of the present of the present of the problema of the present of the p	Seconda Surfa	Very Shallow Dark Surface (TF1. Hydric soil present? ary Indicators (minimum of two re	2) remarks) Yes equired)
3) Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl	t field SB. Depth (inches): t field SB. Mater-Stained Leaves (B9)	Seconda Surfa Drain	Very Shallow Dark Surface (TF1. Hydric soil present? ary Indicators (minimum of two reace Soil Cracks (B6)	2) remarks) Yes equired)
3) Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl	thydrology must be present, unless disturbed or problema Depth (inches): It field SB. The problema of the present of the problema of the pr	Seconda Surfa Drain Moss	Wery Shallow Dark Surface (TF1. Hydric soil present? ary Indicators (minimum of two reace Soil Cracks (B6) mage Patterns (B10)	2) remarks) Yes equired)
All Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent Public Primary Indicators (minimum of one required; cl. Surface Water (A1) High Water Table (A2) Saturation (A3)	thydrology must be present, unless disturbed or problema Depth (inches): It field SB. The depth (inches): Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Seconda Surfa Drain Moss	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reace Soil Cracks (B6) mage Patterns (B10) s Trim Lines (B16)	2) remarks) Yes equired)
All Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent Primary Indicators (minimum of one required; check Primary Indicators (thydrology must be present, unless disturbed or problema Depth (inches): It field SB. Theck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3,	Seconda Surfa Drain Moss Dry- Cray	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reace Soil Cracks (B6) Anage Patterns (B10) S Trim Lines (B16) Season Water Table (C2)	yes Pequired) FAC-Neutral Test (D5)
All Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent Part of the Soil Remarks: YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	t field SB. Depth (inches): Depth (inches): Tield SB. Depth (inches): Depth (inches): It field SB. Depth (inches):	Seconda Surfa Drain Moss Dry- Cray Satu	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reference Soil Cracks (B6) Anage Patterns (B10) So Trim Lines (B16) Season Water Table (C2) Ifish Burrows (C8)	yes Pequired) FAC-Neutral Test (D5)
3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; check the soil of the so	thydrology must be present, unless disturbed or problema Depth (inches): It field SB. Theck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3, Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Seconda Surfa Drain Moss Cray Satu	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reace Soil Cracks (B6) Anage Patterns (B10) Season Water Table (C2) Iffish Burrows (C8) Irration Visible on Aerial Imagery (C8)	yes Pequired) FAC-Neutral Test (D5)
Soil Remarks: Soil assumed, based on adjacent	t field SB. Depth (inches): Depth (inches): Depth (inches): It field SB. Heck all that apply)	Seconda Surfa Drain Moss Cray Satu Sturn Geor	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reference Soil Cracks (B6) mage Patterns (B10) Source Trim Lines (B16) Season Water Table (C2) Iffish Burrows (C8) Irration Visible on Aerial Imagery (C9) Intel or Stressed Plants (D1)	yes Pequired) FAC-Neutral Test (D5)
Algal Mat or Crust (B4) Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: T	thydrology must be present, unless disturbed or problema Depth (inches): It field SB. Theck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3, Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Seconda Surfa Drain Moss Cray Satu Stun Geoo	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reace Soil Cracks (B6) Anage Patterns (B10) Season Water Table (C2) Affish Burrows (C8) Arration Visible on Aerial Imagery (C3) Arted or Stressed Plants (D1) Morphic Position (D2)	yes Pequired) FAC-Neutral Test (D5)
3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl. Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	t field SB. Depth (inches): Depth (inches): The continuous of the continuous field service of the contin	Seconda Surfa Drain Moss Cray Satu Stun Geoo	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reference Soil Cracks (B6) Anage Patterns (B10) So Trim Lines (B16) Season Water Table (C2) Affish Burrows (C8) Aration Visible on Aerial Imagery (C9) Atted or Stressed Plants (D1) Morphic Position (D2) How Aquitard (D3)	yes Pequired) FAC-Neutral Test (D5)
3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl. 2. Surface Water (A1) I High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	t field SB. Depth (inches): Depth (inches): Depth (inches): It field SB. Heck all that apply)	Seconda Surfa Drain Moss Cray Satu Stun Geoo	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reference Soil Cracks (B6) Anage Patterns (B10) So Trim Lines (B16) Season Water Table (C2) Affish Burrows (C8) Aration Visible on Aerial Imagery (C9) Atted or Stressed Plants (D1) Morphic Position (D2) Allow Aquitard (D3) Apotopographic Relief (D4)	yes Pequired) FAC-Neutral Test (D5)
3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Soil assumed, based on adjacent YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl. Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	t field SB. Depth (inches): The period of the present, unless disturbed or problemation of the period	Seconda Surfa Drain Moss: Cray Satu Stun Geon Shal	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two reace Soil Cracks (B6) Anage Patterns (B10) As Trim Lines (B16) Season Water Table (C2) Affish Burrows (C8) Arration Visible on Aerial Imagery (C3) Attended or Stressed Plants (D1) Amorphic Position (D2) Allow Aquitard (D3) Apotopographic Relief (D4) Indicators of wetland hydrole	yes Pequired) FAC-Neutral Test (D5)

WETLAND DETE	RMINATION D	ATA FORI	/I - Northce	ntral and Northea	st Region
Project/Site: Zim Site	Applicant/Owner:	PolyMet Mining	City/County: St. Louis	State: MN Samp	ling Date: 11/13/15
Investigator(s): KMS2,LMT2 Land Form: Terrace Subregion (LRR): K	Section: 2+ Local Relief: Non Latitude: 523:	_	Township: 55 Slope %: 0 Longitude: 531294	3.	oling Point: 121-S-Up wood Soils, Upham Basin, 0-1%
Cowardin Classification: Upland Are climatic/hydrologic conditions on the site type Assessment from New Coll.	-	Yes (If no, explain	in in remarks) Are "normal <u>Yes</u>		<u>Ipland</u>
Are vegetation No Soil No Are vegetation No Soil No SUMMARY OF FINDINGS - Atta	Hydrology No naturally	problematic?	circumstances" present? oint locations,	Eggers & Reed (tertiary): Eggers & Reed (quaternary): transects, important fe	eatures, etc.
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland?	No General Remarks Yes (explain any answers if needed): No If yes, optional Wetlan	Point ID: 1227	jacent to excavated dito	ch.	
VEGETATION Tree Stratum (Plot Size:	21	solute Dominant Cover Species?	Status Ti	0/20 Thresholds: ree Stratum	20% 50% 0 0
1. 2. 3.		0 0	— н	apling/Shrub Stratum erb Stratum /oody Vine Stratum	$\begin{array}{c c} 0 & 0 \\ \hline 5 & 12.5 \\ 0 & 0 \end{array}$
4. Sapling/Shrub Stratum (Plot Size:	Total Cover:	<u>0</u>	N N	ominance Test Worksheet: umber of Dominant Species hat Are OBL, FACW or FAC:	0 (A)
1. 2. 3.		0 0	S	otal Number of Dominant pecies Across All Strata: ercent of Dominant Species hat Are OBL, FACW or FAC:	0.00% (A/B)
4. 5.	Total Cover:	0 0		revalence Index Worksheet: Total % Cover of:	Multiply by:
Herb Stratum (Plot Size:	<u>5 ft</u>)			BL Species 0 ACW Species 0	X 1 0 X 2 0
 Poa pratensis 3. 4. 5. 		0 0 0	F. F. U	AC Species 0 ACU Species 25 PL Species 0	X 3 0 X 4 100 X 5 0
6. 7. 8.	Total Cover:	0 0 0		olumn Totals: 25 Prevalence Index = B drophytic Vegetation Indicators: No Rapid Test for Hydrophy	
Woody Vine Stratum (Plot Size: 1. 2.		<u>25</u> 0 0		No Dominance Test is >50% No Prevalence Index ≤ 3.0 [1	ns [1] (provide supporting data
% Bare Ground in Herb Stratum:	-	0 hagnum Moss Cove	r: dis	No Problematic Hydrophytic Indicators of hydric soil & wetland hydric turbed or problematic.	: Vegetation [1] (Explain)
Vegetation Remarks: (include photo number	s here or on a separate sheet))	Ⅱ H	lydrophytic vegetation present?	No

Former sod field.

SOIL Sampling Point: 121-S-Up

Profile Description: (Describe to the depth need Depth Matrix	led to document the indicator or confirm the absce Redox Features	nce of indicators).	
<u> </u>	% Color (moist) % Type	[1] Loc [2]	Texture	Remarks
1. 0 - 10 10YR 3/2			Oe	
2. 10 - 48 7.5YR 3/2			Oi	
3				
4				
6				
[1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)	Ir	dicators for Problematic Hydric So	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR)	4 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLR.	4 <i>149B)</i>	5 cm Mucky Peat or Peat (S3) (LR	P.R. K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 1498	3)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L))
Thick Dark Surface (A12)	Depleted Matrix (F3)		☐ Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or proble	ematic.	Very Shallow Dark Surface (TF12,	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY Westered Hydrology Indicators:				
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch	nack all that anniv)	Second	lary Indicators (minimum of two req	uuirad)
			· · · · · · · · · · · · · · · · · · ·	<u> </u>
Surface Water (A1)	Water-Stained Leaves (B9)☐ Aquatic Fauna (B13)	_	face Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)			inage Patterns (B10)	
Saturation (A3)	☐ Marl Deposits (B15)☐ Hydrogen Sulfide Odor (C1)	_	ss Trim Lines (B16) -Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on Living Roots		yfish Burrows (C8)	
Sediment Deposits (B2)	Oxidized Kriizospheres on Living Roots		uration Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		nted or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (Cd	a =	omorphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)		llow Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)		rotopographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)		IVIIC		
Field Observations: Surface water present?	Surface Water Depth (inches):		Indicators of wetland hydrolog	gy present? <u>No</u>
			Describe Recorded Data:	
Water table present? Saturation present? (includes capillary fringe)	Water Table Depth (inches): Saturation Depth (inches):			
, , , , , , , , , , , , , , , , , , , ,				
	onitoring Well Stream Gauge Previou	s Inspections		
Hydrology Remarks:				

	WE	ILANL	DETE	RMI	NATION	DATA	FORI	/I - North	icentral and	Northe	ast Re	egion	
Project/S	Site: <u>Zi</u>	m Site			Applicant/Own	er: PolyMet	Mining	City/County: St.	Louis State:	MN Sam	pling Date:	<u>11/13/15</u>	
Investiga	ator(s): KM:	S2,LMT2			Section:	<u>2+</u>		Township: 55	Range.	. <u>18W</u> Sam	pling Point:	121-S-Wet	
Land Fo		<u>errace</u>				None		Slope %: <u>0</u>	Soil Map Unit Name	B14A Green	nwood Soils	, Upham Bas	in, 0-1%
Subregi	ion (LRR): <u>K</u>				Latitude:	<u>5233891</u>		Longitude: 5313	3 <u>14</u> <i>Datum.</i>	NAD 83			
Coward	lin Classificati	ion: PUBI	<u> 14x</u>		Circular 39 Cla	assification:	Type 5	-	Mapped NWI Cla	assification:			
			on the site typ	ical for th	nis time of year?	<u>Yes</u>	(If no, explain	n in remarks)	Eggers & Reed	(primary):	Shallow, Op	oen Water	
Are vege	etation <u>No</u>	Soil	<u>No</u>	Hydrolog	gy <u>No</u> sig	nificantly dist	urhad?	Are "normal circumstances"	Yes Eggers & Reed				
Are vege	<i>etation</i> No	Soil	No	Hydrolog	gy No <i>nat</i> i	urally problen		present?	Eggers & Reed (Eggers & Reed (-			
		=	· <u></u>	, ,	<u> </u>			oint locatio	ons, transects, ii		eatures	s, etc.	
Hydric s Indicator	nytic vegetationsistic vegetations of present?	hydrology pre		Yes (6) Yes	General Remarks explain any answ f needed):	ers	-	acent to former s	sod field. No vegetation ob	served in ditch.			
	mpled area v		nd?	Yes If	yes, optional W	etland Site II	D: <u>NW2</u>						
VEGE	TATION	1											
						Absolute	Dominant	<u>Indicator</u>	50/20 Thresholds:			<u>20%</u>	<u>50%</u>
Tre	ee Stratum		(Plot Size:	<u>30 ft</u>)	% Cover	Species?	<u>Status</u>	Tree Stratum			0	0
1.						0			Sapling/Shrub Strat	tum		0 0	0
2.						0			Woody Vine Stratur	n		0	0
3.						0			Dominance Test We				
4.					Total Cover:	<u>0</u>			Number of Dominar				
Sai	pling/Shrub	Stratum	(Plot Size:	15 ft)	<u>u</u>			That Are OBL, FAC			(A)	
1.	omig/omas	otratam	(1.101.01201	<u>10 11</u>	,	0			Total Number of Do			(B)	
2.						0			Species Across All				
3.						0			Percent of Dominar That Are OBL, FAC			(A/B)	
4.						0			Dravalance Index W	la ulca baadi			
5.					T. (110:	0			Prevalence Index W			Maritimira bar	_
			(DI-4 0:	F 4	Total Cover:	<u>0</u>			Total % Cov	<u>er or:</u>	X 1	Multiply by	0
	rb Stratum		(Plot Size:	<u>5 II</u>)		1 1		OBL Species _	0	X 2		0
1. 2.						0			FACW Species _	0	X 3		0
3.						0			FAC Species _	0	X 4		0
4.						0			FACU Species _	0	X 5		0
5.						0			UPL Species _	0	(A)		0 (B)
6.						0			Column Totals:	alence Index =		#Nu	
7.						0			Hydrophytic Vegetat			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
8.					Total Cover:	0				st for Hydroph		tion	
<u> W</u> o	oody Vine St	<u>ratum</u>	(Plot Size:	<u>30 ft</u>)	<u>0</u>			No Domina n	ce Test is >50%	%		
1.						0				ce Index ≤ 3.0		ovido oveno	rtina doto
2.						0				ogical Adaptati ition remarks o			rung data
					Total Cover:	<u>0</u>			No Problem	atic Hydrophyti	ic Vegetatio	on [1] (Expla	in)
% Bare	Ground in H	erb Stratum	: <u> </u>	_	9	% Sphagnum	Moss Cove	r:	[1] Indicators of hydric disturbed or problemat		ydrology mu	st be present,	unless
Vegetat	ion Remarks	s: (include pl	hoto number	s here or	on a separate s	heet)			Hydrophytic vegetati	on present?	<u>No</u>		
No vege	etation in ditch	۱.							11				

SOIL Sampling Point: 121-S-Wet

(inches) Color (moist)	%	Color (moist) % Type [1]	Loc [2]	Texture	Remarks
<u> </u>				Peat	
<u> </u>					
-			_		
-					
-	· -				
Type: C=Concentration, D=Depletion, RM	=Reduced N	flatrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
dric Soil Indicators: (applicable to all LRR	s, unless ot	herwise noted)	In	dicators for Problematic Hydric	Soils [3]:
Histosol (A1)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, ML	RA 149B)
Histic Epipedon (A2)		Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRF	? K, L, R)
Black Histic (A3)		Polyvalue Below Surface (S8) (LRR R, MLRA 1	19B)	5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)		Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LRR K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K,	•
Thick Dark Surface (A12)		Depleted Matrix (F3)		Iron-Manganese Masses (F12)	•
Sandy Mucky Mineral (S1)	_	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19)	
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144	A, 145, 149B)
Sandy Redox (S5)		Redox Depressions (F8)	L	Red Parent Material (F21)	Other (explain in soil
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetl		Redox Depressions (F8) y must be present, unless disturbed or problema	tic.	Rea Parent Material (F21) Very Shallow Dark Surface (TF	"-"-" " ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '
Sandy Redox (S5)			tic.	_	"-"-" " ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '
Sandy Redox (S5) Indicators of hydrophylic vegetation and well	and hydrolog	y must be present, unless disturbed or problema	tic.	Very Shallow Dark Surface (TF	12) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and well strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacents.	and hydrolog	y must be present, unless disturbed or problema	tic.	Very Shallow Dark Surface (TF	12) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type:	and hydrolog	y must be present, unless disturbed or problema	tic.	Very Shallow Dark Surface (TF	12) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and well strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacents.	and hydrolog	y must be present, unless disturbed or problema	tic.	Very Shallow Dark Surface (TF	12) remarks)
Sandy Redox (S5) Indicators of hydrophytic vegetation and well strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjacent to the control of the	cent field SB.	y must be present, unless disturbed or problema Depth (inches):		Very Shallow Dark Surface (TF	Yes
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetle strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace to the strictive Layer (If present): Type: il Remarks: Soil assumed, based on adjace to the strictive Layer (If present): Type: il Remarks: Soil assumed, based on adjace to the strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indicators of hydrophytic vegetation and wetle strictive Layer (If present): Type: Indica	cent field SB.	y must be present, unless disturbed or problema Depth (inches):	Second	Very Shallow Dark Surface (TF Hydric soil present?	Yes
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace TDROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required	cent field SB.	y must be present, unless disturbed or problema Depth (inches): hat apply)	Second Sun	Very Shallow Dark Surface (TF Hydric soil present? lary Indicators (minimum of two n	Yes required)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetle strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace of the strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace of the strictive Layer (Indicators): Indicators: imary Indicators (minimum of one required surface Water (A1)	cent field SB.	ny must be present, unless disturbed or problema Depth (inches): hat apply) Water-Stained Leaves (B9)	Second Sun Drai	Hydric soil present? Hydric soil present? dary Indicators (minimum of two inface Soil Cracks (B6)	Yes required)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace IDROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required Surface Water (A1) High Water Table (A2)	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Second Sun Dra Mos	Very Shallow Dark Surface (TF Hydric soil present? lary Indicators (minimum of two reface Soil Cracks (B6) inage Patterns (B10)	Yes required)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetle strictive Layer (if present): Type:	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Second Sun Dran Mos Dry Cra	Hydric soil present? Hydric soil present? Hary Indicators (minimum of two nature) face Soil Cracks (B6) inage Patterns (B10) ss Trim Lines (B16) -Season Water Table (C2) yfish Burrows (C8)	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace IDROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	cent field SB.	must be present, unless disturbed or probleme Depth (inches): Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Second Sun Dra Mos Dry Cra Sate	Hydric soil present? Hydric soil present? Hary Indicators (minimum of two reface Soil Cracks (B6) inage Patterns (B10) inage Patterns (B16) Season Water Table (C2) yrish Burrows (C8) uration Visible on Aerial Imagery (C	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and well strictive Layer (if present): Type:	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Second Sun Dran Mos Dry Cra Satu	Hydric soil present? Hydric soil present? Hary Indicators (minimum of two reface Soil Cracks (B6) inage Patterns (B10) inage Patterns (B16) -Season Water Table (C2) yfish Burrows (C8) uration Visible on Aerial Imagery (Canted or Stressed Plants (D1)	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and well strictive Layer (if present): Type: iil Remarks: Soil assumed, based on adjaction and Hydrology Indicators: imary Indicators (minimum of one required Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Second Sun Dra Mos Dry Cra Sate Stu	Hydric soil present? Hydric soil present? Hary Indicators (minimum of two reface Soil Cracks (B6) inage Patterns (B10) inage Patterns (B16) Ses Trim Lines (B16) Season Water Table (C2) yrish Burrows (C8) urration Visible on Aerial Imagery (Canted or Stressed Plants (D1) inmorphic Position (D2)	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and well strictive Layer (if present): Type:	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Second Sun Drai Mos Dry Cra Satu Stur	Hydric soil present? Hydric soil present? Hydric soil present? Hary Indicators (minimum of two nates of the present of the presen	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type:	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Second Sun Drai Mos Dry Cra Satu Stur	Hydric soil present? Hydric soil present? Hary Indicators (minimum of two reface Soil Cracks (B6) inage Patterns (B10) inage Patterns (B16) Ses Trim Lines (B16) Season Water Table (C2) yrish Burrows (C8) urration Visible on Aerial Imagery (Canted or Stressed Plants (D1) inmorphic Position (D2)	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and weth strictive Layer (if present): Type:	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Second Sun Drai Mos Dry Cra Satu Stur	Hydric soil present? Hydric soil present? Hydric soil present? Hary Indicators (minimum of two nates of the present of the presen	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and well strictive Layer (if present): Type:	cent field SB.	must be present, unless disturbed or problems Depth (inches): Depth (inc	Second Sun Dra. Dry Cra Sate Stu	Hydric soil present? Hydric soil present? Hydric soil present? Hary Indicators (minimum of two nates of the present of the presen	Yes required) FAC-Neutral Test (D5)
Sandy Redox (S5) Indicators of hydrophytic vegetation and weth strictive Layer (if present): Type: il Remarks: Soil assumed, based on adjace IDROLOGY Interpolation (Based on adjace) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	cent field SB.	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Second Sun Dra. Dry Cra Satu Stur Sha	Hydric soil present? Hydric soil present? Hary Indicators (minimum of two reface Soil Cracks (B6) inage Patterns (B10) SS Trim Lines (B16) Season Water Table (C2) Syfish Burrows (C8) Suration Visible on Aerial Imagery (Conted or Stressed Plants (D1) Somorphic Position (D2) Sollow Aquitard (D3) Totopographic Relief (D4) Indicators of wetland hydro	Yes required) FAC-Neutral Test (D5)

SUMMARY (OF FINE	DING	S - Atta	ch site	map sho	owing sa	mpling p	oint loc	ation	s, trans	ects, in	nporta	ant features	, etc.
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> na	aturally proble	matic?	present?		Egge	rs & Reed (quaternar	ry):	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> s	ignificantly dis	sturbed?	Are "norma circumstant	-		rs & Reed (: rs & Reed (i	-	y):	
Are climatic/hydro	ologic condi	tions or	n the site typ	ical for this	time of year?	<u>Yes</u>	(If no, expla	ain in remark.		55	rs & Reed (37	<u>Upland</u>	
Cowardin Classifi	ication:	<u>Upland</u>			Circular 39 (Classification:	<u>Upland</u>			Марр	ed NWI Cla	ssificatioi	n:	
Subregion (LRR).	: <u>K</u>				Latitude:	<u>5233808</u>		Longitude:	531060	<u>)</u>	Datum:	NAD 83		
Land Form:	<u>Terrace</u>				Local Relief:	<u>None</u>		Slope %:	<u>0</u>	Soil Map	Unit Name.	<u>B14A</u>	Greenwood Soils,	Upham Basin, 0-1%
Investigator(s):	KMS2/TPT				Section:	<u>26+</u>		Township:	<u>55</u>		Range:	<u>18W</u>	Sampling Point:	<u>123-E-Wet</u>
Project/Site:	Zim Site				Applicant/Ov	vner: PolyMe	et Mining	City/County	: St. Lo	<u>ouis</u>	State:	MN	Sampling Date:	05/10/12

Hydrophytic vegetation present?	Yes	General Remarks	Well N11. Hydrology monitoring = drained
Hydric soil present?	Yes	(explain any answers	
Indicators of wetland hydrology present?	No	if needed):	
Is the sampled area within a wetland?	<u>Yes</u>	If yes, optional Wetlar	nd Site ID: drained

<u>Tree</u>	<u>Stratum</u>	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum		20% 2	<u>50%</u> 5
Lari	ix laricina			0		FACW	Sapling/Shrub Stratum	-	4	10
Pice	ea mariana			10	Yes	FACW	Herb Stratum Woody Vine Stratum	-	17 0	42.5 0
				0			Woody vine Stratum			0
				0			Dominance Test Worksheet:			
Sanl	ing/Shrub Stratum	(Plot Size:	Total Cover:	<u>10</u>			Number of Dominant Species That Are OBL, FACW or FAC:		5 (A)	
	x laricina	(F10t 312e.	<u>1511</u>)	20	Yes	FACW	Total Number of Dominant		5 <i>(B)</i>	
Lan	A Idilcilla			0	163	TACW	Species Across All Strata:		<u> </u>	
				0			Percent of Dominant Species That Are OBL, FACW or FAC:	100.00	% (A/B)	
				0			THAT ARE OBL, FACW OF FAC.			
				0			Prevalence Index Worksheet:			
			Total Cover:	20			Total % Cover of:		Multiply by:	
Herb	Stratum .	(Plot Size:	<u>5 ft</u>	_			OBL Species1	0 X 1	1	0
Rub	ous idaeus			25	Yes	FAC	FACW Species7	0 X 2	14	0
Lari	x laricina			20	Yes	FACW	FAC Species3	5 X3	10)5
Pice	ea mariana			20	Yes	FACW	III	0 X 4		0
Mat	teuccia struthiopteris			10	No	FAC	II '	0 X 5		0
Beti	ula pumila			10	No	OBL	.	_	25	
				0			Column Totals: 11 Prevalence Index	- ` ′	2.2	_
				0					2.2	.2
				0			Hydrophytic Vegetation Indicate			
			Total Cover:	<u>85</u>			No Rapid Test for Hydro		on	
Woo	dy Vine Stratum	(Plot Size:	<u>30 ft</u>				Yes Dominance Test is > Yes Prevalence Index ≤ 3			
				0			No Morphological Adap		vide supporti	ina da
				0			in vegetation remark			g
			Total Cover:	<u>0</u>			No Problematic Hydrop	nytic Vegetation	[1] (Explain))
Bare G	round in Herb Stratun	n:	_	% Sphagnun	n Moss Cover	50	[1] Indicators of hydric soil & wetlan disturbed or problematic.	d hydrology must	be present, ur	nless
aetatio	n Remarks: (include p	ohoto numbers	s here or on a senarate	sheet)			Hydrophytic vegetation present?	Yes		

SOIL Sampling Point: 123-E-Wet

Profile Description: (Describe to the depth need Depth Matrix		irm the abscence Features	of indicators)		
(inches) Color (moist)	% Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
1. 0 - 24 10YR 2/1	100			Oe	
2					
3					
4					
5			-		
[1] Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coate	d Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, t	unless otherwise noted)		In	dicators for Problematic Hydric Sol	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLRA	4 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, ML	.RA 149B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8)	(LRR R, MLRA 14	<i>9B)</i>	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRR I	R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LF	RR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	l hydrology must be present, unless distu	urbed or problemat	ic.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY					
Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required; co	heck all that apply)		Second	ary Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (B9	9)	Surf	ace Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		Drai	nage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Mos	s Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor (C	1)	Dry-	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on	Living Roots (C3)		fish Burrows (C8)	
☐ Drift Deposits (B3)	Dracence of Dadwood Ivan	(04)		ration Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron			ted or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in	rillea Solis (Co)		morphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7) Other (explain in remarks)			llow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	'	Micr	otopographic Relief (D4)	
Field Observations:				Indicators of wetland hydrolog	gy present? <u>No</u>
Surface water present?	Surface Water Depth (inch	· —	=	Describe Recorded Data:	
Water table present?	Water Table Depth (inches			Three years of monitoring data - t	his wetland is drained.
Saturation present? (includes capillary fringe)	Saturation Depth (inches):	9.8			
Recorded Data: Aerial Photo 📝 M	Ionitoring Well Stream Gauge	Previous Ins	spections	_	·
Hydrology Remarks:					

WETLAND DETERN	IINATION DATA	4 FORM - North	hcentral and Northeas	t Region
Project/Site: Zim Site	Applicant/Owner: PolyMe	et Mining City/County: St	. Louis State: MN Sampling	1 Date: 11/13/15
Investigator(s): KMS2,LMT2 Land Form: Terrace Subregion (LRR): K	Section: 2± Local Relief: None Latitude: 5233708	Township: <u>55</u> Slope %: <u>0</u> Longitude: <u>531</u>	Soil Map Unit Name: B14A Greenwoo	g Point: 126-S-Up nd Soils, Upham Basin, 0-1%
Cowardin Classification: Upland Are climatic/hydrologic conditions on the site typical for Are vegetation No Soil No Hydro Are vegetation No Soil No Hydro	ology <u>No</u> significantly dis	nrasant?	Mapped NWI Classification: Eggers & Reed (primary): Upla Yes Eggers & Reed (secondary): Eggers & Reed (tertiary): Eggers & Reed (quaternary):	<u>nd</u>
Hydrophytic vegetation present? Hydrosoil present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland? VEGETATION	General Remarks Form	ner sod field adjacent to excava t ID: 1234	<u> </u>	tures, etc.
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>	·	<u>Dominant</u> <u>Indicator</u> <u>Species?</u> <u>Status</u>	50/20 Thresholds: Tree Stratum Sapling/Shrub Stratum	20% 50% 0 0
1. 2.	0		Herb Stratum Woody Vine Stratum	5 12.5 0 0
3. 4.	0 0 Total Cover: 0		<u>Dominance Test Worksheet:</u> Number of Dominant Species	
Sapling/Shrub Stratum (Plot Size: 15 ft			That Are OBL, FACW or FAC: Total Number of Dominant Species Across All Strata:	0 (A) 1 (B)
2. 3.	0		Percent of Dominant Species That Are OBL, FACW or FAC:	0.00% (A/B)
5.	0 0 0 Total Cover: 0		Prevalence Index Worksheet: Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft)		OBL Species 0 X	
 Poa pratensis 3. 4. 5. 6. 	25 0 0 0 0 0	Yes FACU	FACW Species	3 0 4 100 5 0 N) 100 (B)
7. 8.	0 0 Total Cover: 25		Hydrophytic Vegetation Indicators: No Rapid Test for Hydrophytic	
Woody Vine Stratum (Plot Size: 30 ft 1.) 0 0 0 Total Cover: 0		No Dominance Test is >50% No Prevalence Index ≤ 3.0 [1] No Morphological Adaptations in vegetation remarks or on No Problematic Hydrophytic Ve	• /
% Bare Ground in Herb Stratum:	% Sphagnu	m Moss Cover:	[1] Indicators of hydric soil & wetland hydrol disturbed or problematic.	ogy must be present, unless
Vegetation Remarks: (include photo numbers here	or on a separate sheet)		Hydrophytic vegetation present?	<u>No</u>

Former sod field.

SOIL Sampling Point: 126-S-Up

Profile Description: (Describe to the depth need Depth Matrix	led to document the indicator or confirm the abscenc Redox Features	e of indicators).		
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
1. 0 - 18 10YR 3/2			Oe	
2. 18 - 48 7.5YR 3.2			Oi	
3				
4				-
6				
[1] Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	unless otherwise noted)	Inc	icators for Problematic Hydric So.	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, MLR)	4 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 1	49B)	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L))
Thick Dark Surface (A12)	Depleted Matrix (F3)] Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	l hydrology must be present, unless disturbed or problem	atic.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY Westered Hydrology Indicators:				
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; cl	hock all that anniv)	Seconda	ry Indicators (minimum of two req	wired)
	Water-Stained Leaves (B9)		ce Soil Cracks (B6)	FAC-Neutral Test (D5)
Surface Water (A1)	Aquatic Fauna (B13)		age Patterns (B10)	TAC-Neulial Test (D3)
High Water Table (A2)	Marl Deposits (B15)		Trim Lines (B16)	
Saturation (A3)	Hydrogen Sulfide Odor (C1)	_	Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on Living Roots (C.		ish Burrows (C8)	
Sediment Deposits (B2)	Oxidized Kilizospiletes on Living Roots (e.		ration Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		ed or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)		norphic Position (D2)	
Iron Deposits (B5)	Thin Muck Surface (C7)		ow Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)		topographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)				
Field Observations: Surface water present?	Surface Water Depth (inches):		Indicators of wetland hydrolog	gy present? <u>No</u>
Water table present?	Water Table Depth (inches):	_	Describe Recorded Data:	
Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
		nspections		
Hydrology Remarks:	Stream Gauge Frevious	iapecuolia		
, 3,				

V	EILANL	DEIE	:KIVIII	NATION	I DA	IAF	URIV	ı - Norti	ncentrai a	na nort	neast R	egion	
Project/Site:	Zim Site			Applicant/Ow	ner: Pol	yMet Minir	ng C	City/County: St.	. Louis S	State: MN	Sampling Date	: 11/13/15	
Investigator(s):	KMS2,LMT2			Section:	<u>2+</u>			Township: 55	ļ	Range: 18W	Sampling Poin	t: 126-S-Wet	
Land Form:	Terrace			Local Relief:				Slope %: <u>0</u>	Soil Map Unit		Greenwood Soi	ls, Upham Bas	sin, 0-1%
Subregion (LRR				Latitude:	5233700)		Longitude: <u>531</u>	301 <i>L</i>	Datum: NAD 83		•	
Cowardin Classi	51151	14x		Circular 39 C	Classification	оп: <u>Тур</u>		<u> </u>		WI Classification	=		
	rologic conditions		nical for the					n in remarks)		Reed (primary):		Open Water	
,		,		-				Are "normal		Reed (secondar	· · · · · · · · · · · · · · · · · · ·	pon mater	
Are vegetation	<u>No</u> Soil	<u> </u>	Hydrolog		ignificantly			circumstances" present?	00	Reed (tertiary):			
Are vegetation	No Soil		Hydrolog		turally pro		, ,	'		Reed (quaternai	-		
SUMMARY	OF FINDING	3S - Atta	ch site	e map sho	wing s	sampli	ing po	oint location	ons, transec	ts, importa	ant feature	s, etc.	
Hydrophytic veg	etation present?			eneral Remark:		xcavated o	ditch adja	acent to former s	sod field. No vegeta	tion observed in	ditch.		
Hydric soil prese		10	if.	explain any ansi needed):	wers								
	tland hydrology pre erea within a wetlai		Yes If	yes, optional l	Notland S	ito ID:	NW2						l
•		iu:	<u>163</u> II	yes, optionar i	vetiana o	itte ib.	INVVZ						
/EGETATI	ON												
					Absolu	<u>ite Doi</u>	minant_	Indicator	50/20 Thresho	olds:		<u>20%</u>	<u>50%</u>
Tree Strate	<u>um</u>	(Plot Size:	<u>30 ft</u>)	% Cov	er Spe	ecies?	<u>Status</u>	Tree Stratum			0	0
1.						0			Sapling/Shrul	Stratum		0	0
2.						0			Herb Stratum Woody Vine S	Stratum		0	0
3.					4	0							
4.						0			_ -	est Worksheet:			
			45.0	Total Cover:		<u>0</u>			Number of Do That Are OBL	minant Specie , FACW or FAC	s):	(A)	
	nrub Stratum	(Plot Size:	<u>15 ft</u>						Total Number	of Dominant		(2)	
1. 2.					4	0			Species Acro	ss All Strata:		(B)	
3.					41	0				minant Species , FACW or FAC		(A/B))
4.					┩┡───	0			That Are OBL	, I ACW OI I AC			
5.						0			Prevalence Inc	dex Worksheet	<u>:</u>		
				Total Cover:		0	.		Total 9	% Cover of:		Multiply by	
Herb Strate	<u>um</u>	(Plot Size:	<u>5 ft</u>)					OBL Species		0 X 1		0
1.						0			FACW Specie	s	0 X 2		0
2.						0			FAC Species		0 X 3		0
3.					4	0			FACU Species	s	0 X 4		0
4.						0			UPL Species		0 X 5		0
5.6.					41	0			Column Total	s:	0 (A)		0 (B)
7.					41	0				Prevalence Inc	dex = B/A =	#Nu	ım!
8.					1	0			Hydrophytic V	egetation Indic	ators:		
				Total Cover:		<u>0</u>			No Ra	pid Test for Hyd	drophytic Vege	tation	
Woody Vin	ne Stratum	(Plot Size:	<u>30 ft</u>)						minance Test is			
1.						0			<u> </u>	evalence Index		rovido oveno	rtina data
2.						0					aptations [1] (¡ arks or on a se¡		rung data
		_		Total Cover:		0			No Pro	blematic Hydro	ophytic Vegetat	tion [1] (Expla	in)
% Bare Ground	in Herb Stratum:	: <u> </u>	_		% Sphag	num Mos	s Cover	:	[1] Indicators of disturbed or pro		land hydrology m	ust be present,	unless
Vegetation Ren	narks: (include pl	noto number	s here or	on a separate	sheet)				Hydrophytic ve	egetation presen	nt? <u>No</u>		
No vegetation in	ditch								Ш				
. 10 rogolation III	. anom												

SOIL Sampling Point: 126-S-Wet

(inches) Color (moist)	%	Color (moist) % Type	[1] Loc [[2] Texture	Remarks
				Peat	
<u> </u>					
-					
- -					
<u> </u>					
Type: C=Concentration, D=Depletion, RM=R	Reduced M	atrix, CS=Covered or Coated Sand Grains	[2] Locat	ion: PL=Pore Lining, M=Matrix	c.
ric Soil Indicators: (applicable to all LRRs,	unless oth	nerwise noted)		Indicators for Problematic H	lydric Soils [3]:
Histosol (A1)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR k	(, L, MLRA 149B)
Histic Epipedon (A2)		Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A1	6) (LRR K, L, R)
Black Histic (A3)		Polyvalue Below Surface (S8) (LRR R, MLR)	1 <i>149B)</i>	✓ 5 cm Mucky Peat or Pea	t (S3) (LRR K, L, R)
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR	K, L)
Stratified Layers (A5)		Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface	(S8) (LRR K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)
Thick Dark Surface (A12)		Depleted Matrix (F3)		☐ Iron-Manganese Masses	(F12) (LRR K, L, R)
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)		Piedmont Floodplain Soil	ls (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7)		Mesic Spodic (TA6) (ML)	RA 144A, 145, 149B)
				Red Parent Material (F2)	1)
Sandy Redox (S5)		Redox Depressions (F8)		Keu Fareni watenai (i 2 i	Unit (explain in se
Sandy Redox (S5) ndicators of hydrophytic vegetation and wetland		•	matic.	Very Shallow Dark Surfa	Office (explain in se
	d hydrology	•	matic.		ce (TF12) remarks)
ndicators of hydrophytic vegetation and wetland trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacen DROLOGY	d hydrology	v must be present, unless disturbed or proble	matic.	Very Shallow Dark Surfa	ce (TF12) remarks)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer DROLOGY Iland Hydrology Indicators:	nt field SB.	w must be present, unless disturbed or problem. Depth (inches):		Very Shallow Dark Surfa Hydric soil prese	ce (TF12) remarks) ent? Yes
ndicators of hydrophytic vegetation and wetland trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacen DROLOGY	nt field SB.	what apply)	Sec	Very Shallow Dark Surfa Hydric soil prese	ce (TF12) remarks) ent? Yes of two required)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer DROLOGY Iland Hydrology Indicators:	nt field SB.	must be present, unless disturbed or proble Depth (inches): mat apply) Water-Stained Leaves (B9)	Sec	Hydric soil preso	ce (TF12) remarks) ent? Yes
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacen DROLOGY Iland Hydrology Indicators: nary Indicators (minimum of one required; c	nt field SB.	nat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)	Sec	Hydric soil prese	ce (TF12) remarks) ent? Yes of two required)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer DROLOGY Iland Hydrology Indicators: nary Indicators (minimum of one required; c	nt field SB.	must be present, unless disturbed or proble Depth (inches): mat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Sec	Hydric soil preso	ce (TF12) remarks) ent? Yes of two required)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacent process of the state of the stat	nt field SB.	nat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)		Hydric soil presented by the soil presented	ce (TF12) remarks) ent? Yes of two required)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer DROLOGY Iland Hydrology Indicators: mary Indicators (minimum of one required; c Surface Water (A1) High Water Table (A2) Saturation (A3)	nt field SB.	must be present, unless disturbed or proble Depth (inches): mat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)		Hydric soil presonant pres	ce (TF12) remarks) ent? Yes of two required) FAC-Neutral Test (
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer DROLOGY Identify Indicators: Inary Indicators (minimum of one required; continued) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	nt field SB.	must be present, unless disturbed or proble Depth (inches): Mattapply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C1)		Hydric soil presonant pres	of two required) FAC-Neutral Test (spery (C9)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer DROLOGY Iland Hydrology Indicators: nary Indicators (minimum of one required; c Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	nt field SB.	nat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (Presence of Reduced Iron (C4)		Hydric soil prese Frondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1)	of two required) FAC-Neutral Test (spery (C9)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer DROLOGY Identify Indicators: Inary Indicators (minimum of one required; continued) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	nt field SB.	must be present, unless disturbed or problet Depth (inches): Depth (inch		Hydric soil presonant present presonant presentation present	of two required) FAC-Neutral Test (spery (C9)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacent strictive Layer (if present): Type: Remarks: Soil assumed, based on adjacent strictive s	nt field SB.	Depth (inches): Depth		Hydric soil present Hydric soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	of two required) FAC-Neutral Test (spery (C9)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacent processing the present of the pres	nt field SB.	must be present, unless disturbed or problet Depth (inches): Depth (inch		Hydric soil presonant present presonant presentation present	of two required) FAC-Neutral Test (spery (C9)
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacent processing the second processing	theck all the	must be present, unless disturbed or problet Depth (inches): Depth (inch		Hydric soil present Hydric soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	ce (TF12) remarks) ent? Yes of two required) FAC-Neutral Test (1) gery (C9)
rictive Layer (if present): Type: Remarks: Soil assumed, based on adjacer PROLOGY Idand Hydrology Indicators: mary Indicators (minimum of one required; c Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) d Observations: face water present?	theck all the	Depth (inches):	C3)	Hydric soil preservations of the preservation	ent? Yes If two required) FAC-Neutral Test (start of the property (C9)) In the property of two required (start of the property (C9))
trictive Layer (if present): Type: Remarks: Soil assumed, based on adjacent processing the second processing	theck all the	must be present, unless disturbed or problet Depth (inches): Depth (inch		Hydric soil preservation (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland	ent? Yes If two required) FAC-Neutral Test (start of the property (C9)) In the property of two required (start of the property (C9))

Project/Site:	Zim Site				Applicant/0	Owner:	PolyMe	t Mining	City/County	: <u>St.</u>	. Louis	State:	MN	Sampling Date:	04/13/16
Investigator(s): Land Form:	KMS2 Terrace				Section: Local Reli	<u>2+</u> ef: <u>No</u>	<u>ne</u>		Township: Slope %:	<u>55</u> <u>0</u>	S	Range Soil Map Unit Nam		Sampling Point: A Greenwood Soils	127 Wet , Upham Basin, 0-1%
Subregion (LRR):	<u>K</u>				Latitude:	<u>523</u>	3367 <u>5</u>		Longitude:	5309	<u>918</u>	Datun	. NAD	<u>83</u>	
Cowardin Classific	cation:	PSS1F	<u>d</u>		Circular 39	Classi	ification:	Type 6				Mapped NWI C	lassificat	ion:	
Are climatic/hydro.	logic condit	tions or	ı the site typ.	ical for this i	time of yea	r?	Yes	(If no, expla	ain in remark.	s)		Eggers & Reea	(primary): Shrub-Carr	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	signific	cantly dis	turbed?	Are "norma circumstant		<u>Yes</u>	Eggers & Reea Eggers & Reea	•	37	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	natural	ly problei	matic?	present?			Eggers & Reea	(quatern	nary):	
SUMMARY ()F FINE	ING	S - Atta	ch site	man sh	owi	กต รลเ	mplina r	oint loc	atic	ons	transects i	mnor	tant features	etc

Hydrophytic vegetation present?	Yes	General Remarks	Natural area between the southernmost two ditches, western area.
Hydric soil present?	Yes	(explain any answers	
Indicators of wetland hydrology present?	Yes	if needed):	
Is the sampled area within a wetland?	<u>Yes</u>	If yes, optional Wetlar	nd Site ID: NW6

Tree Stratum	(Plot Size: 3	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		0 	50% 0
			0			Sapling/Shrub Stratum Herb Stratum	_	12 13	30 32.5
			0			Woody Vine Stratum	_	0	32.5
			0			II			
			0			<u>Dominance Test Worksheet:</u>			
Sapling/Shrub Strate	um (Plot Size: 1	Total Cover:	<u>0</u>			Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)	
Alnus incana	<u> </u>	<u> </u>	25	Yes	FACW	Total Number of Dominant	4	(B)	
Salix discolor			30	Yes	FACW	Species Across All Strata:	-	- (=)	
Cornus alba			5	No	FACW	Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)	
			0			matale obe, raow or rao.		•	
			0			Prevalence Index Worksheet:			
		Total Cover:	<u>60</u>			Total % Cover of:	Mo	ıltiply by:	
Herb Stratum	(Plot Size: 5	<u>5 ft</u>				OBL Species 60	X 1	60)
Calamagrostis cana	densis		40	Yes	OBL	FACW Species60	X 2	120)
Carex lacustris			20	Yes	OBL	FAC Species5	X 3	15	5
Rubus idaeus			5	No	FAC	FACU Species 0	X 4	(0
			0			UPL Species 0	X 5	(0
			0			405	(A)	195	
			0			Column Totals: 125	· ` ′ —		- `
			0					1.56)
			0			Hydrophytic Vegetation Indicators	_		
		Total Cover:	<u>65</u>			Yes Rapid Test for Hydrop		1	
Woody Vine Stratum	<u>ı</u> (Plot Size: <u>3</u>	<u>?O ft</u>)				Yes Dominance Test is >50 Yes Prevalence Index ≤ 3.0			
			0			No Morphological Adapta		da sunnartii	na da
			0			in vegetation remarks			ig uu
		Total Cover:	<u>0</u>			No Problematic Hydrophy	tic Vegetation [1] (Explain)	
Bare Ground in Herb S	tratum:	;	% Sphagnum	n Moss Cover	: <u> </u>	[1] Indicators of hydric soil & wetland disturbed or problematic.	hydrology must b	e present, uni	less
getation Remarks: (inc	luda abata aumbara b		b 0			Hydrophytic vegetation present?	Yes		

SOIL Sampling Point: 127 Wet

Oi Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Trype: C-Concentration, D-Depletion Matrix, CS-Covered or Coated Sand Grains Trype: Depletion Matrix (SS) Indicators for Problematic Hydric Soils [3]: Indicators (A10) Indicators (A10) Indicators for Problematic Hydric Soils [3]: Trype: Depletion Matrix (F2) Depletion Matrix (F2	(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture Remarks
Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Location: PL-Pore Lining, M-Matrix. Tripe: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Location: PL-Pore Lining, M-Matrix. Tripe: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Location: PL-Pore Lining, M-Matrix. Indicators (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils (3): Historia State (30) LRR R. M. RA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498 2 cm Muck (A10) LRR K. L.		,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,	
Type: C*Concentration, D*Depletion, RM*Reduced Matrix, CS**Covered or Coated Sand Grains (2) Location: PL*Pore Lining, M*Matrix. Trick Soil Indicators: (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils (3): History (A1) Dark Surface (SD) (LRR R. M. R.A. 1498) Dark Surface (SD) (LRR R. L. M. R.A. 1498) Hydrogen Sullies (A3) Polyvabue Belan Surface (SD) (LRR R. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (A1) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Surface (SD) Surface (SD) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface			
Type: O-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Locations: PL-Pore Lining, M-Matrix. Tripe: O-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Locations: PL-Pore Lining, M-Matrix. Tripe: O-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Locations: PL-Pore Lining, M-Matrix. Tripe: O-Concentration, D-Depletion, RM-Reduced Matrix (5)	<u> </u>		
drik Soil Indicators: (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils [3]: Historia (A1)	<u> </u>		
drike Soil Indicators: (applicable to all LRRs, unless otherwise noted) Helsios (A1)	-		
Rissical (A1) Shipped Matrix (S6) 2 cm Muck (A10) (R.R.K. L. R.M. RA 1498) Rissic (A2) Dark Surface (S7) (R.R.R. M.R.R.A 1498) Cass Praise Redox (A110) (R.R.K. L. R.) Black Histic (A3) Polyvalue Bolow Surface (S8) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S8) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S8) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S9) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. L. R.	Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.
Bisck Histic (A3)	dric Soil Indicators: (applicable to all LRRs, ι	unless otherwise noted)	Indicators for Problematic Hydric Soils [3]:
Black Flistic (A3) Polyvalue Bolow Surface (S8) (LRR R, MLRA 1498) 5 cm Mucky Peat or Peat (S3) (LRR K, L, R) Hydrogen Sulfide (A4) Thin Dark Surface (S9) (LRR K, MLRA 1498) Dark Surface (S7) (LRR K, L) Polyvalue Bolow Surface (S1) (LRR K, L) Polyvalue Bolow Surface (S9) (LRR K, L) Polyvalue Bolow Surface (A11) Loany Mucky Minneral (F1) (LRR K, L) Polyvalue Bolow Surface (S9) (LRR K, L) Thick Dark Surface (A12) Depleted Matin (F2) Thin Dark Surface (S9) (LRR K, L) Sandy Mucky Minneral (S1) Redox Dark Surface (F6) Pleedmont Floodplain Solis (F19) (MLRA 1498) Sandy Redox (S5) Redox Dark Surface (F6) Pleedmont Floodplain Solis (F19) (MLRA 1498) Sandy Redox (S5) Redox Dark Surface (F6) Pleedmont Floodplain Solis (F19) (MLRA 1498) Sandy Redox (S5) Redox Dark Surface (F7) Mess: Spotia; (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox Dark Surface (F7) Pleedmont Floodplain Solis (F19) (MLRA 1449) Sandy Redox (S5) Redox Dark Surface (F7) Pleedmont Floodplain Solis (F19) (MLRA 1449) Sandy Redox (S5) Redox (S5) Redox Dark Surface (F7) Mess: Spotia; (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox (S5) Redox Dark Surface (F8) Pleedmont Floodplain Solis (F19) (MLRA 1444, 145, 1498) Sandy Redox (S5) Redox (S5) Redox Dark Surface (F7) Pleedmont Floodplain Solis (F19) (MLRA 1444, 145, 1498) Sandy Redox (S5) Redox (S5) Redox Dark Surface (S6) Pleedmont Floodplain Solis (F19) (MLRA 1444, 145, 1498) Sandy Redox (S5) Redox (S5) Redox Dark Surface (S6) Pleedmont Floodplain Solis (F19) (MLRA 1444, 145, 1498) Sandy Redox (S5) Redox (S5) Redox (S6) Pleedmont Material (F12) Pleedmont Material (F12) Surface Water (F19) Redox (S6) Pleedmont Material (F19) Surface Water (F19) Redox (S6) Pleedmont Floodplain Solis (F19) (MLRA 1444, 145, 1498) Sandy Redox (S5) Redox (S6) Pleedmont Floodplain Solis (F19) Surface Water (F19) Redox (S6) Pleedmont Floodplain Solis (F19) Surface Water (F19) Redox (S6)	Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA 149B)
Hydrogen Sulfide (A4)	Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L, R)
Statified Layers (A5)	Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149B)	5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
Depleted Below Dark Surface (A11)	Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)
Trick Dark Surface (A12) Depleted Matrix (F3) Iron-Manganese Masses (F12) (LRR K, L. R) Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Pledmont Floodplain Soils (F19) (MLRA 144B) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic. Setrictive Layer (if present): Type: Depth (inches): Hydric soil present? Yes Settled Hydric Soil present? Yes Secondary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1) Water Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (D High Water Table (A2) Aquatic Fauna (B13) Drainage Patterns (B10) Saturation (A3) Mart Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Hydrogen Sulfide Odor (C1) Dry-Season Water Table (C2) Saturation Deposits (B3) Presence of Reduced Iron (C4) Submed or Stressed Plants (D1) Saturation Visible on Aerial Imagery (C7) Spassely Vegetated Concave Surface (B8) Microlopographic Relief (D4) Set Observations: Indicators of wetland hydrology present? Yes Secretal kno Reduction in Tilled Soils (C4) Geomorphic Position (D2) Spassely Vegetated Concave Surface (B8) Microlopographic Relief (D4) Set Table Present? Surface Water Depth (inches): 1 Set table present? Water Table Depth (inches): 1 Secretal knothers (S5) Moss Trim Lines (S6) Microlopographic Relief (D4)	Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LRR K, L)
Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Pledmont Floodplain Soils (F19) (MLRA 1448) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Surface Water (A1) Presence of Reduced Iron (C4) Saturation (F3) Surface Water (A8) Presence of Reduced Iron (C4) Stallow Dark Surface (B8) Indicators (B3) Presence (B8) Indicators (B6) Recent Iron Reduction in Tilled Soils (C6) Incidation Visible on Aerial Imagery (B7) Thin Muck Surface (C7) Incidation Visible on Aerial Imagery (B7) Surface Water Table (Data (Inches)) Indicators (incidudes capillary fringe) Surface Water Open (inches): Indicators (minimum of two required) Incidators (minimum of two required) Incidators (minimum of two required) Incidators (Material Imagery (B7) Presence of Reduced Iron (C4) Stallow Aquillard (D3) Incidators (Material Imagery (B7) Thin Muck Surface (C7) Shallow Aquillard (D3) Incidators (Material Imagery (B7) Surface Water Depth (inches): Incidators (Material Imagery (B7) Secondary Indicators (minimum of two required) Incidators (Material Imagery (B7) Thin Muck Surface (C7) Shallow Aquillard (D3) Incidators (Material Imagery (B7) Thin Muck Surface (C7) Shallow Aquillard (D3) Incidators of wetland hydrology present? Surface Water Depth (inches): Indicators of wetland hydrology present? Yes Describe Recorded Data:	Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)
Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present? Yes	Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (LRR K, L, R)
Sandy Redox (\$5) Redox Depressions (F8) Redox Depressions (F8) Redox Peressions (F8) Redox Depressions (F8) R	Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA 149B)
Il Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) remarks	Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
Indicators of hydrophylic vegetation and wetland hydrology must be present, unless disturbed or problematic. Phydric soil present? Yes	Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21) Other (explain i
PDROLOGY setland Hydrology Indicators: imary Indicators (minimum of one required; check all that apply) Surface Water (A1)	Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or problematic.	☐ Very Shallow Dark Surface (TF12) remarks)
POROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1) High Water Table (A2) Aquatic Fauna (B13) Mart Deposits (B15) Aquatic Fauna (B13) Mart Deposits (B15) Moss Trim Lines (B16) Dry-Season Water Table (C2) Craylish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Pattern Table (C1) Other (explain in remarks) Mater Table Spath (inches): Indicators (minimum of two required) Secondary Indicators (minimum of two required) Secondary Indicators (minimum of two required) Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Prace Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Moss Trim Lines (B16) Dry-Season Water Table (C2) Craylish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Standardor Visible on Aerial Imagery (C9) Shallow Aquitard (D3) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Indicators of wetland hydrology present? Vest Describe Recorded Data: Indicators of wetland hydrology present? Vest Describe Recorded Data:	estrictive Layer (if present): Type:	Depth (inches):	Hydric soil present? Yes
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High Water Table (A2)			
Saturation (A3)	etland Hydrology Indicators:	neck all that apply)	Secondary Indicators (minimum of two required)
Water Marks (B1)	etland Hydrology Indicators: imary Indicators (minimum of one required; cl		
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Presence (B8) Oxidized Rhizospheres on Living Roots (C3) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrology present? Indicators of wetland hydrology present? Indicators of wetland hydrology present? Saturation Depth (inches): Inturation present? (includes capillary fringe) Saturation Depth (inches): Saturation Depth (inches): Saturation Depth (inches): Saturation Depth (inches): Saturation Visible on Aerial Imagery (C9) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrology present? Describe Recorded Data:	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1)	☐ Water-Stained Leaves (B9)	Surface Soil Cracks (B6) FAC-Neutral Te
Drift Deposits (B3)	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2)	☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)	Surface Soil Cracks (B6) FAC-Neutral Te
Algal Mat or Crust (B4) Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Iron Deposits (B5) Recent Iron Reduction in Tilled Soils (C6) Geomorphic Position (D2) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Sparsely Vegetated Concave Surface (B8) Vegetated Concave Surface (B8) Indicators of wetland hydrology present? Yes urface water present? Water Table Depth (inches): 1 Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Describe Recorded Data: Describe Reco	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl] Surface Water (A1)] High Water Table (A2)] Saturation (A3)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Surface Soil Cracks (B6) FAC-Neutral Te Drainage Patterns (B10) Moss Trim Lines (B16)
Algal Mat or Crust (B4)	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Surface Soil Cracks (B6) FAC-Neutral Te Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2)
Inundation Visible on Aerial Imagery (B7) Indicators of wetland hydrology present? Indicators of wetland hydrology	etland Hydrology Indicators: imary Indicators (minimum of one required; ch] Surface Water (A1)] High Water Table (A2)] Saturation (A3)] Water Marks (B1)] Sediment Deposits (B2)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Surface Soil Cracks (B6) FAC-Neutral Te Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8)
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Other (explain in remarks) Indicators of wetland hydrology present? Indicators of wetland hydrology present? Surface Water Depth (inches): Indicators of wetland hydrology present? Describe Recorded Data: Indicators of wetland hydrology present? Indicators of wetland hydrology present? Describe Recorded Data:	etland Hydrology Indicators: imary Indicators (minimum of one required; cl] Surface Water (A1)] High Water Table (A2)] Saturation (A3)] Water Marks (B1)] Sediment Deposits (B2)] Drift Deposits (B3)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Surface Soil Cracks (B6) FAC-Neutral Tell Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)
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urface water present? ✓ Surface Water Depth (inches): 1 Describe Recorded Data: water table present? water Table Depth (inches): 0	etland Hydrology Indicators: imary Indicators (minimum of one required; cl] Surface Water (A1)] High Water Table (A2)] Saturation (A3)] Water Marks (B1)] Sediment Deposits (B2)] Drift Deposits (B3)] Algal Mat or Crust (B4) I ron Deposits (B5)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Surface Soil Cracks (B6) FAC-Neutral Tell Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) ✓ Geomorphic Position (D2) Shallow Aquitard (D3)
ater table present? Water Table Depth (inches): turation present? (includes capillary fringe) Saturation Depth (inches): 0	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Surface Soil Cracks (B6) FAC-Neutral Tell Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) ✓ Geomorphic Position (D2) Shallow Aquitard (D3)
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	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present?	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surface Soil Cracks (B6)
	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present?	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Surface Soil Cracks (B6)

***	LAND	DETERMIN	AIION DAIA		ncential and	Mortificast Neg	ווטון
Project/Site:	Zim Site		Applicant/Owner: PolyMe	t Mining City/County: S	t. Louis State:	MN Sampling Date: 04	<u>4/13/16</u>
Investigator(s): <u>k</u> Land Form: Subregion (LRR):	<u>XMS2</u> <u>Terrace</u> <u>K</u>		Section: 2+ Local Relief: None Latitude: 5233669	Township: <u>55</u> Slope %: <u>0</u> Longitude: <u>53</u> :	Range: Soil Map Unit Name 1478 Datum:		<u></u>
Are vegetation	ogic conditions o	on the site typical for this No Hydrology	No significantly dis	nresent?	Lyyers a Reeu ((primary): Shrub-Carr (secondary): (tertiary):	
<u> </u>	<u>No</u> Soil OF FINDING	No Hydrology SS - Attach site	No naturally probler	Halic?	Eggers & Reed (ions, transects, in	(quaternary): mportant features, (etc.
Hydrophytic vegeta Hydric soil present	?	Yes (exp	neral Remarks Naturaliain any answers neded):	al area between the southern	most two ditches, eastern a	area.	

NW7

VECETATION

Indicators of wetland hydrology present?

Is the sampled area within a wetland?

Yes

Yes If yes, optional Wetland Site ID:

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum			20% 0	_	50% 0
			0			Sapling/Shrub Stratum			12		30
			0			Herb Stratum			13		32.5
			0			Woody Vine Stratum			0		0
			0			Dominance Test Workshe	et:				
		Total Cover:	<u>0</u>			Number of Dominant Spec That Are OBL, FACW or FA			4 (A)		
Sapling/Shrub Stratun	<u>1</u> (Plot Size:	<u>15 ft</u>)				Total Number of Dominan	t				
Salix discolor			30	Yes	FACW	Species Across All Strata			4 (B)		
Alnus incana			25	Yes	FACW	Percent of Dominant Spec	ies				
Cornus alba			5	No	FACW	That Are OBL, FACW or F.	AC:	100.00	% (A/	В)	
			0			Prevalence Index Workshe	et.				
		Total Cover:	0 <u>60</u>			Total % Cover of:	. <u></u>		Multiply b	ov:	
Herb Stratum	(Plot Size:		<u>00</u>			OBL Species	60	X 1		60	
Calamagrostis canade		<u> </u>	40	Yes	OBL	FACW Species	60	X 2		120	
Carex lacustris	11313		20	Yes	OBL	FAC Species	5	X 3		15	
Rubus idaeus			5	No	FAC	† 	0	X 4		0	
Trabas ladous			0		1710	FACU Species	0	X 5		0	
			0			UPL Species					
			0			Column Totals:	125	(A)		195	(1
			0			Prevalence	Index =	B/A =		1.56	
			0			Hydrophytic Vegetation Inc	licators:				
		Total Cover:	<u>65</u>			Yes Rapid Test for I	Hydroph	ytic Vegetat	ion		
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>	_			Yes Dominance Tes					
			0			Yes Prevalence Inde					
			0			No Morphological in vegetation re	Adaptati	ons [1] (pro	vide sup	porting	j da
		Total Cover:	<u>0</u>			No Problematic Hy				•	
Bare Ground in Herb Str	atum:	_	% Sphagnun	n Moss Cover	<u> </u>	[1] Indicators of hydric soil & v					ss
getation Remarks: (inclu	de photo numbers	s here or on a separate s	sheet)			Hydrophytic vegetation pres	sent?	Yes			
,	-	· .				11 2 13 0 1					

SOIL Sampling Point: 128 Wet

O - 30 7.5YR 3/2 Oi Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2] Location: PL=Pore Lining, M=Matrix. Indicators: (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils [3]: Histosol (A1) Stripped Matrix (S6) 2 cm Muck (A10) (LRR K, L, MLRA 149B) 3 coast Prairie Redox (A16) (LRR K, L, R) Black Histic (A3) Polyvalue Below Surface (S9) (LRR R, MLRA 149B) 5 cm Mucky Peat or Peat (S3) (LRR K, L, R) Hydrogen Sulfide (A4) Thin Dark Surface (S9) (LRR R, MLRA 149B) Dark Surface (S7) (LRR K, L) Stratified Layers (A5) Depleted Below Dark Surface (A11) Damy Mucky Mineral (F1) (LRR K, L) Polyvalue Below Surface (S9) (LRR K, L) Thick Dark Surface (A12) Depleted Matrix (F3) Nron-Manganese Masses (F12) (LRR K, L, R) Sandy Mucky Mineral (S1) Redox Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144B) Sandy Redox (S5) Redox Depressions (F8) Redox Depressions (F8) Redox Dark Surface (F7) Depth (inches): Hydric soil present? Yes Salicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. **MOROLOGY**	(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Location: PL-Pore Lining, M-Matrix. Tripe: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Location: PL-Pore Lining, M-Matrix. Tripe: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Location: PL-Pore Lining, M-Matrix. Indicators (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils (3): Historia State (30) LRR R. M. RA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498) 2 cm Muck (A10) LRR K. L. MLRA 1498 2 cm Muck (A10) LRR K. L.				
Type: C*Concentration, D*Depletion, RM*Reduced Matrix, CS**Covered or Coated Sand Grains (2) Location: PL*Pore Lining, M*Matrix. Trick Soil Indicators: (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils (3): History (A1) Dark Surface (SD) (LRR R. M. R.A. 1498) Dark Surface (SD) (LRR R. L. M. R.A. 1498) Hydrogen Sullies (A3) Polyvabue Belan Surface (SD) (LRR R. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (A1) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Surface (SD) Surface (SD) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface (SD) (LRR R. L. M. R.A. 1498) Depleted Below Dark Surface				
Type: O-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Locations: PL-Pore Lining, M-Matrix. Tripe: O-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Locations: PL-Pore Lining, M-Matrix. Tripe: O-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains (2) Locations: PL-Pore Lining, M-Matrix. Tripe: O-Concentration, D-Depletion, RM-Reduced Matrix (5)	<u> </u>			
drik Soil Indicators: (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils [3]: Historia (A1)	<u> </u>			
drike Soil Indicators: (applicable to all LRRs, unless otherwise noted) Helsios (A1)	-			
Rissical (A1) Shipped Matrix (S6) 2 cm Muck (A10) (R.R.K. L. R.M. RA 1498) Rissic (A2) Dark Surface (S7) (R.R.R. M.R.R.A 1498) Cass Praise Redox (A110) (R.R.K. L. R.) Black Histic (A3) Polyvalue Bolow Surface (S8) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S8) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S8) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S9) (R.R.R. M.R.R.A 1498) Dark Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L.) Polyvalue Bolow Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. K. L. R.) Polyvalue Bolow Surface (S7) (R.R.R. L. R.	Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
Bisck Histic (A3)	dric Soil Indicators: (applicable to all LRRs, ι	unless otherwise noted)	Indicators for Problematic Hydric Soils [3]:	
Black Flistic (A3) Polyvalue Bolow Surface (S8) (LRR R, MLRA 1498) 5 cm Mucky Peat or Peat (S3) (LRR K, L, R) Hydrogen Sulfide (A4) Thin Dark Surface (S9) (LRR R, MLRA 1498) Dark Surface (S7) (LRR K, L) Polybeled Bolow Dark Surface (A11) Loany Mucky Mineral (F1) (LRR K, L) Polybeled Bolow Surface (S9) (LRR K, L) Thick Dark Surface (A12) Depleted Matrix (F2) Itin Dark Surface (S9) (LRR K, L) Thick Dark Surface (A12) Depleted Matrix (F2) Itin Dark Surface (S9) (LRR K, L) Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Pledmont Floodplain Soils (F19) (MLRA 1498) Sandy Redox (S5) Redox Dark Surface (F6) Pledmont Floodplain Soils (F19) (MLRA 1498) Sandy Redox (S5) Redox Dark Surface (F7) Mess: Spodic (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox Dark Surface (F7) Mess: Spodic (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox Dark Surface (F7) Mess: Spodic (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox Dark Surface (F7)	Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA 149B))
Hydrogen Sulfide (A4)	Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L, R)	
Statified Layers (A5)	Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149B)) 5 cm Mucky Peat or Peat (S3) (LRR K, L,	R)
Depleted Below Dark Surface (A11)	Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Trick Dark Surface (A12)	Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LRR K, L)	
Sandy Mucky Mineral (S1)	Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)	
Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Indicators of hydrophylic vegetation and welland hydrology must be present? Yes	Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (LRR K, L	., R)
Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Indicators of hydrophylic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Very Shallow Present? Very Shallow Again in soil remarks Very Shallow Again in Soil remarks Very Shallow Present? Very Shallow Present In Shallow Again in Soil remarks Very Shallow Present Very Shallow Present? Very Shallow Present? Very Shallow Dark Surface (TF12) Very Shallow Present? Very Shallow Present Present? Very Shallow Present Present?	Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA	149B)
Il Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) remarks	Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145, 1	49B)
Indicators of hydrophylic vegetation and wetland hydrology must be present, unless disturbed or problematic. Phydric soil present? Yes	Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	Other (explain in soil
PDROLOGY setland Hydrology Indicators: imary Indicators (minimum of one required; check all that apply) Surface Water (A1)	Indicators of hydrophytic vegetation and wetland	I hydrology must be present, unless disturbed or problematic.	Very Shallow Dark Surface (TF12)	remarks)
POROLOGY **etland Hydrology Indicators:** **imary Indicators (minimum of one required; check all that apply)** Secondary Indicators (minimum of two required)** Surface Water (A1)	estrictive Layer (if present): Type:	Depth (inches):	Hydric soil present? Yes	
Secondary Indicators (minimum of one required; check all that apply) Surface Water (A1) Water-Stained Leaves (B9) Aquatic Fauna (B13) Drainage Patterns (B10) Sutface Soil Cracks (B6) FAC-Neutral Test (D. Drainage Patterns (B10) Moss Trim Lines (B16) Water Marks (B1) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Presence of Reduced Iron (C4) In Deposits (B3) Recent Iron Reduction in Tilled Soils (C6) In Undation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Presence Surface Water Depth (inches): Indicators of wetland hydrology present? Water Table Depth (inches): Saturation Depth (inches): Saturation present? (includes capillary fringe) Surface Water Depth (inches): Surface Water Table Depth (inches): Saturation Depth (inches): One of the Valence Soil Cracks (B6) Surface Soil Cracks (B6) Surface Soil Cracks (B6) FAC-Neutral Test (D. Surface Soil Cracks (B6)) FAC-Neutral Test (D. Surface (B10)) Moss Trim Lines (B16) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Describe Recorded Data: Indicators of wetland hydrology present? Yes Describe Recorded Data:				
Surface Water (A1) Water-Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (Dispersion of the Control of the	'DROLOGY			
High Water Table (A2)				
Saturation (A3)	PROLOGY Setland Hydrology Indicators: Setland Hydrology Indicators: Setland Hydrology Indicators:	heck all that apply)	Secondary Indicators (minimum of two required)	
Water Marks (B1)	etland Hydrology Indicators: imary Indicators (minimum of one required; cl			FAC-Neutral Test (D.
Sediment Deposits (B2)	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1)	Water-Stained Leaves (B9)	Surface Soil Cracks (B6)	FAC-Neutral Test (D£
Drift Deposits (B3)	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2)	☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)	Surface Soil Cracks (B6) Drainage Patterns (B10)	FAC-Neutral Test (D.
Algal Mat or Crust (B4)	Tetland Hydrology Indicators: rimary Indicators (minimum of one required; cl] Surface Water (A1)] High Water Table (A2)] Saturation (A3)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16)	FAC-Neutral Test (D:
Algal Mat or Crust (B4)	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl] Surface Water (A1)] High Water Table (A2)] Saturation (A3) Water Marks (B1)	 Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13) ☐ Marl Deposits (B15) ☐ Hydrogen Sulfide Odor (C1) 	Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2)	FAC-Neutral Test (D.
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Indicators of wetland hydrology present? Indicators of wetland hydrology	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl] Surface Water (A1)] High Water Table (A2)] Saturation (A3)] Water Marks (B1)] Sediment Deposits (B2)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9)	FAC-Neutral Test (D.
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Other (explain in remarks) Indicators of wetland hydrology present? Indicators of wetland hydrology present? Surface Water Depth (inches): Indicators of wetland hydrology present? Describe Recorded Data: Indicators of wetland hydrology present? Indicators of wetland hydrology	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	FAC-Neutral Test (D:
Sparsely Vegetated Concave Surface (B8) Indicators of wetland hydrology present? Yes	Tetland Hydrology Indicators: rimary Indicators (minimum of one required; classification (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Surface Soil Cracks (B6) □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) ✓ Geomorphic Position (D2)	FAC-Neutral Test (Ds
urface water present? ✓ Surface Water Depth (inches): 1 Describe Recorded Data: water table present? water Table Depth (inches): 0	etland Hydrology Indicators: imary Indicators (minimum of one required; cl] Surface Water (A1)] High Water Table (A2)] Saturation (A3)] Water Marks (B1)] Sediment Deposits (B2)] Drift Deposits (B3)] Algal Mat or Crust (B4) I fron Deposits (B5)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Surface Soil Cracks (B6) □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) ☑ Geomorphic Position (D2) □ Shallow Aquitard (D3)	FAC-Neutral Test (D:
ater table present? Water Table Depth (inches): turation present? (includes capillary fringe) Saturation Depth (inches): 0	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Surface Soil Cracks (B6) □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) ☑ Geomorphic Position (D2) □ Shallow Aquitard (D3)	FAC-Neutral Test (D.
aturation present? (includes capillary fringe) Saturation Depth (inches): 0	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surface Soil Cracks (B6) □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) ☑ Geomorphic Position (D2) □ Shallow Aquitard (D3) □ Microtopographic Relief (D4)	
	etland Hydrology Indicators: rimary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present?	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surface Soil Cracks (B6) □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) ☑ Geomorphic Position (D2) □ Shallow Aquitard (D3) □ Microtopographic Relief (D4)	·
	etland Hydrology Indicators: imary Indicators (minimum of one required; cl Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present? ater table present?	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Surface Soil Cracks (B6) □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) ☑ Geomorphic Position (D2) □ Shallow Aquitard (D3) □ Microtopographic Relief (D4)	,

WETLAND DETERMINATION	N DATA FOR	M - North	central and N	ortheast Reg	gion
Project/Site: Zim Site Applicant/O	wner: PolyMet Mining	City/County: St. I	Louis State: MN	N Sampling Date: 1	<u>1/13/15</u>
Investigator(s): KMS2,LMT2 Section:	26+	Township: 55	Range: 18	<u>SW</u> Sampling Point: 2	<u>201-E-Up</u>
Land Form: Terrace Local Relie.	f: None	Slope %: <u>0</u>	Soil Map Unit Name:	B14A Greenwood Soils, L	Jpham Basin, 0-1%
Subregion (LRR): K Latitude:	5228745	Longitude: 5302	04 Datum: NA	AD 83	
	Classification: Upland	Longhade. 5502	Mapped NWI Classifi		
Covariant Glassineation.		ain in romarks)			
Are climatic/hydrologic conditions on the site typical for this time of year		ain in remarks) Are "normal	Eggers & Reed (prim		
Are vegetation No Soil No Hydrology No	significantly disturbed?	circumstances"	Eggers & Reed (tertil		
Are vegetation No Soil No Hydrology No m	aturally problematic?	present?	Eggers & Reed (qua	**	
SUMMARY OF FINDINGS - Attach site map sh	owing sampling p	ooint locatio	ns, transects, imp	ortant features,	etc.
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland? No General Reman. (explain any ans if needed): No If yes, optional					
VEGETATION	,				
	Absolute Deminer	t Indicator	50/20 Thresholds:		20% 50%
Tree Stratum (Plot Size: 30 ft	Absolute Dominant		Tree Stratum		0 0
\	,		Sapling/Shrub Stratum	-	0 0
1.	0		Herb Stratum	=	5 12.5
2.	0		Woody Vine Stratum	-	0 0
3.	0		Dominance Test Works	hoot:	
4.	0				
Total Cover: Sapling/Shrub Stratum (Plot Size: 15 ft	<u>0</u>)		Number of Dominant Sp That Are OBL, FACW or		0 (A)
1.	0		Total Number of Domine Species Across All Stra		1 <i>(B)</i>
2.	0		Percent of Dominant Sp	-	_
3.	0		That Are OBL, FACW or		% (A/B)
4.	0		Duration de la Marta		<u>-</u>
5.	0		Prevalence Index Works		
Total Cover:	<u>0</u>		Total % Cover of		Multiply by:
<u>Herb Stratum</u> (Plot Size: <u>5 ft</u>)		OBL Species		0
1. Poa pratensis	25 Yes	FACU	FACW Species	0 X 2	0
2.	0		FAC Species	0 X3	0
3.	0		FACU Species	25 X 4	100
4.	0		UPL Species	0 X 5	0
5.	0		Column Totals:	25 (A)	100 (B)
6.	0			ce Index = B/A =	4.00
7.	0		Hydrophytic Vegetation	Indicators:	
8	0			or Hydrophytic Vegetation	
Total Cover:	<u>25</u>		No Rapid Test fo	, , ,	ЭП
Woody Vine Stratum (Plot Size: 30 ft	<u> </u>			ndex ≤ 3.0 [1]	
1.	0			al Adaptations [1] (prov	ride supporting data
2.	0		in vegetation	remarks or on a separa	ate sheet)
Total Cover:	<u>0</u>		<u> </u>	Hydrophytic Vegetation	
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	er:	[1] Indicators of hydric soil disturbed or problematic.	& wetland hydrology must	be present, unless

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No

Hydrophytic vegetation present?

SOIL Sampling Point: 201-E-Up

Profile Description: (Describe to the depth need			f indicators).		
Depth Matrix		ox Features	1 101	T . ()	D d .
(inches) Color (moist)	% Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
1. 0 - 14 10YR 2/1				Peat SaC	
2. <u>14-20</u>				300	
4.					
5					
6					
[1] Type: C=Concentration, D=Depletion, RM=R	Reduced Matrix, CS=Covered or Coat	ted Sand Grains [2] Location: F	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)		Indi	cators for Problematic Hydric Soil	ls [3]:
Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLRA	149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, I	MLRA 149B)		Coast Prairie Redox (A16) (LRR K,	L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (St	8) (LRR R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRF	R R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L)	
☐ Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) (LR	P.R. K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (N	ILRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless di	sturbed or problematic.		Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:		(inches):		Hydric soil present?	No
Coll Domonton - Field and double and for a day	. A. a. P. a. a				
Soil Remarks: Field previously used for sod pro	oduction.				
HYDROLOGY					
Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required; c	heck all that apply)		Secondar	y Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves ((B9)	Surfac	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		Draina	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Moss	Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor ((C1)	Dry-S	eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	on Living Roots (C3)	Crayfi	sh Burrows (C8)	
Drift Deposits (B3)			Satura	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron	on (C4)	Stunte	ed or Stressed Plants (D1)	
Iron Deposits (B5)	Recent Iron Reduction in	n Tilled Soils (C6)	_	orphic Position (D2)	
	Thin Muck Surface (C7)			w Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8)	Other (explain in remark	rs)		topographic Relief (D4)	
_ , , , , , , , , , , , , , , , , , , ,					
Field Observations: Surface water present?	Surface Water Depth (inc	ches):		Indicators of wetland hydrolog Describe Recorded Data:	y present? <u>No</u>
Water table present?	Water Table Depth (inche			Describe Recorded Data:	
Saturation present? (includes capillary fringe)	Saturation Depth (inches	•			
		<u> </u>	actions		
Hydrology Remarks:	Monitoring Well Stream Gauge	rievious insp	ecuons		
Tryulology Nellialks.					

WETLAND DET	ERMINATION	DATA FORI	И - North	central and Northeast	Region
Project/Site: Zim Site	Applicant/Owne	er: PolyMet Mining	City/County: St. L	ouis State: MN Sampling	Date: <u>11/13/15</u>
Investigator(s): KMS2,LMT2	Section: 2	<u>26+</u>	Township: 55	Range: <u>18W</u> Sampling	Point: 201-E-Wet
Land Form: Terrace	Local Relief: N	<u>None</u>	Slope %: <u>0</u>	Soil Map Unit Name: B14A Greenwood	d Soils, Upham Basin, 0-1%
Subregion (LRR): <u>K</u>	Latitude: 5	<u>5228761</u>	Longitude: 53022	<u>2</u>	
Cowardin Classification: PUBHx	Circular 39 Clas	ssification: Type 5		Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site ty,	pical for this time of year?	Yes (If no, explai	in in remarks)	Eggers & Reed (primary): Shallo	ow, Open Water
Are vegetation No Soil No	Hydrology <u>No</u> sign	ificantly disturbed?	Are "normal circumstances"	Yes Eggers & Reed (secondary):	
Are vegetation No Soil No	Hydrology <u>No</u> natur	rally problematic?	present?	Eggers & Reed (tertiary): Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Atta	, ₆ , <u>—</u>	3,	oint location		uros oto
	•			<u> </u>	ures, etc.
Hydrophytic vegetation present?	Yes General Remarks Ves (explain any answer	Excavated ditch, or Point ID: 121	iented N/S, drains s	south.	
Hydric soil present? Indicators of wetland hydrology present?	Yes (explain any answer Yes if needed):				
Is the sampled area within a wetland?	Yes If yes, optional We	etland Site ID: SW1			
VEGETATION					
		About to Builting	La Parter	50/20 Thresholds:	20% 50%
<u>Tree Stratum</u> (Plot Size:		<u>Absolute</u> <u>Dominant</u> <u>% Cover</u> <u>Species?</u>	<u>Indicator</u> <u>Status</u>	Tree Stratum	0 0
	<u> </u>			Sapling/Shrub Stratum	$\frac{0}{0}$
1.		0 0		Herb Stratum	12 30
2. <u></u>		0		Woody Vine Stratum	0 0
4.		0		Dominance Test Worksheet:	
	Total Cover:	<u>0</u>		Number of Dominant Species	4 (4)
<u>Sapling/Shrub Stratum</u> (Plot Size:	: <u>15 ft</u>)			That Are OBL, FACW or FAC:	1 (A)
1.		0		Total Number of Dominant Species Across All Strata:	1 <i>(B)</i>
2.		0		Percent of Dominant Species	
3.		0		That Are OBL, FACW or FAC:	100.00% (A/B)
4.		0		Prevalence Index Worksheet:	
5.	Total Cover:	0		Total % Cover of:	Multiply by:
Herb Stratum (Plot Size:		<u>0</u>		OBL Species 0 X 1	
,)	60 Yes	FACW	FACW Species 60 X 2	120
 Phalaris arundinacea Phalaris arundinacea 		60 Yes	FACW	FAC Species 0 X 3	
3.		0		FACU Species0 X 4	4 0
4.		0		UPL Species 0 X 5	
5.		0		OPL Species	
6.		0		Column Totals:60 (A) Prevalence Index = B/A =	
7.		0		Hydrophytic Vegetation Indicators:	2.00
8.	Total Cover:	0		No Rapid Test for Hydrophytic V	/agatation
Was de Vina Stantona (Blot Sizon		<u>60</u>		Yes Dominance Test is >50%	regetation
Woody Vine Stratum (Plot Size:	<u> </u>			Yes Prevalence Index ≤ 3.0 [1]	
1. 2.		0		No Morphological Adaptations [
۷.	Total Cover:	<u>0</u>		in vegetation remarks or on a No Problematic Hydrophytic Veg	• /
% Bare Ground in Herb Stratum:		Sphagnum Moss Cove	er:	[1] Indicators of hydric soil & wetland hydrolo disturbed or problematic.	
Vegetation Remarks: (include photo number		. •		·	<u>Yes</u>
rogetation Nemarks. (include prioto number	is note of on a separate sit			Tryaropriyac vegetation present:	103

SOIL Sampling Point: 201-E-Wet

(inches) Color (moist)	%	Redox Feature Color (moist) %	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 2 10YR 2/1			-		Peat	<u> </u>
2. 2 - 14					SaC	
3						
4						
5						
[1] Type: C=Concentration, D=Depletion, RM=Re	educed N	latrix, CS=Covered or Coated Sand	Grains [2]	Location: I	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless ot	herwise noted)		Ind	icators for Problematic Hydric S	Soils [3]:
Histosol (A1)		Stripped Matrix (S6)		✓	2 cm Muck (A10) (LRR K, L, ML	RA 149B)
Histic Epipedon (A2)		Dark Surface (S7) (LRR R, MLRA 149)	PB)		Coast Prairie Redox (A16) (LRF	? K, L, R)
Black Histic (A3)		Polyvalue Below Surface (S8) (LRR R,	, MLRA 149B,)	5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
☐ Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LRR R, MLRA	4 <i>149B)</i>		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)		Loamy Mucky Mineral (F1) (LRR K, L)			Polyvalue Below Surface (S8) (LRR K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K,	L)
Thick Dark Surface (A12)		Depleted Matrix (F3)			Iron-Manganese Masses (F12)	(LRR K, L, R)
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19)) (MLRA 149B)
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144	A, 145, 149B)
Sandy Redox (S5)		Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrolog	y must be present, unless disturbed or	problematic.		Very Shallow Dark Surface (TF)	12) remarks)
Restrictive Layer (if present): Type:		Depth (inches)):	_	Hydric soil present?	<u>Yes</u>
Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soils estimated.		Depth (inches)):		Hydric soil present?	<u>Yes</u>
Soil Remarks: Excavated ditch, soils estimated.		Depth (inches)):		Hydric soil present?	<u>Yes</u>
Soil Remarks: Excavated ditch, soils estimated.		Depth (inches)):		Hydric soil present?	<u>Yes</u>
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY	eck all ti			Seconda	Hydric soil present?	
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch	eck all t					
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1)	eck all t	hat apply)		Surfa	ry Indicators (minimum of two r	equired)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2)	eck all t	hat apply) Water-Stained Leaves (B9)		Surfa	ry Indicators (minimum of two r	equired)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2)	e ck all t i	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)		Surfa Drain Moss	ry Indicators (minimum of two r ce Soil Cracks (B6) age Patterns (B10)	equired)
Soil Remarks: Excavated ditch, soils estimated. IYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3)	e ck all t i	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)		Surfa Drain Moss Dry-S	ry Indicators (minimum of two r ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16)	equired)
Soil Remarks: Excavated ditch, soils estimated. IYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	eck all ti	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I		Surfa Drain Moss Dry-S Crayl	ry Indicators (minimum of two r ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2)	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. IYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	e ck all t i	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I	Roots (C3)	Surfa Drain Moss Dry-S Crayl	ry Indicators (minimum of two r ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) ceason Water Table (C2) ish Burrows (C8)	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	eck all ti	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I	Roots (C3)	Surfa Drain Moss Dry-S Crayl Satur	ry Indicators (minimum of two r ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; chellow) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	e ck all t i	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled So Thin Muck Surface (C7)	Roots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Ceed or Stressed Plants (D1)	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	eeck all ti	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I	Roots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Ced or Stressed Plants (D1)	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch. Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	eck all ti	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled So Thin Muck Surface (C7)	Roots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Celed or Stressed Plants (D1) storphic Position (D2)	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	eck all ti	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled So Thin Muck Surface (C7)	Roots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two rece Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Ceed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4)	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; chell of the state of the] 	hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled So Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Roots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two ree Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Ceed or Stressed Plants (D1) storphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydro	equired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soils estimated. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; chellow) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	[hat apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living I Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled So Thin Muck Surface (C7) Other (explain in remarks)	Roots (C3) bils (C6)	Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ry Indicators (minimum of two ree Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Ceed or Stressed Plants (D1) storphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydro	equired) FAC-Neutral Test (D5)

WETLAND DETERMINATION	DATA FOR	M - North	central and Northe	east Region
Project/Site: Zim Site Applicant/Own	er: PolyMet Mining	City/County: St. I	<u>Louis</u> State: <u>MN</u> Sai	mpling Date: <u>11/13/15</u>
Investigator(s): KMS2,LMT2 Section:	<u>26+</u>	Township: 55	Range: 18W Sa	mpling Point: 201-S-Up
	None	Slope %: <u>0</u>	Soil Map Unit Name: B14A Gre	enwood Soils, Upham Basin, 0-1%
Subregion (LRR): <u>K</u> Latitude:	<u>5228745</u>	Longitude: 53020	<u>04</u>	
Cowardin Classification: Upland Circular 39 Cla	assification: <u>Upland</u>		Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, expla	ain in remarks)	Eggers & Reed (primary):	<u>Upland</u>
Are vegetation No Soil No Hydrology No sig	nificantly disturbed?	Are "normal	Yes Eggers & Reed (secondary):	
	urally problematic?	circumstances" present?	Eggers & Reed (tertiary): Eggers & Reed (quaternary):	
	3,			
SUMMARY OF FINDINGS - Attach site map show	wing sampiing p	ooint locatio	ns, transects, important	teatures, etc.
Hydrophytic vegetation present? No General Remarks Hydric soil present? Yes (explain any answer if needed): Indicators of wetland hydrology present? No If yes, optional W		72)		
VEGETATION				
	Absolute Dominan	t Indicator	50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>)	% Cover Species?		Tree Stratum	0 0
1.	0		Sapling/Shrub Stratum	0 0
2.	0		Herb Stratum Woody Vine Stratum	$\frac{8}{0}$ $\frac{20}{0}$
3.	0			
4.	0		Dominance Test Worksheet:	
Total Cover:	<u>0</u>		Number of Dominant Species That Are OBL, FACW or FAC:	1 <i>(A)</i>
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)			Total Number of Dominant	
1.	0		Species Across All Strata:	2 (B)
2. 3.	0		Percent of Dominant Species	50.00% (A/B)
4.	0		That Are OBL, FACW or FAC:	
5.	0		Prevalence Index Worksheet:	
Total Cover:	<u>0</u>		Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft)			OBL Species0	X 1 0
Phalaris arundinacea	20 Yes	FACW	FACW Species20	X 2 40
2. Poa pratensis	20 Yes	FACU	FAC Species0	X 3 0
3.	0		FACU Species20	X 4 80
4. <u></u>	0		UPL Species0	X 5 0
6.	0		Column Totals:40	(A) 120 (B)
7.	0		Prevalence Index :	= B/A = 3.00
8.	0		Hydrophytic Vegetation Indicators	<u>s:</u>
Total Cover:	<u>40</u>		No Rapid Test for Hydrop	•
Woody Vine Stratum (Plot Size: 30 ft)			No Dominance Test is >50 Yes Prevalence Index ≤ 3.0	
1.	0			tions [1] (provide supporting data
2.	0		in vegetation remarks	or on a separate sheet)
Total Cover:	<u>0</u>			rtic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	6 Sphagnum Moss Cov	er:	[1] Indicators of hydric soil & wetland disturbed or problematic.	hydrology must be present, unless
Vegetation Remarks: (include photo numbers here or on a separate s	heet)		Hydrophytic vegetation present?	<u>No</u>
Field adjacent to excavated ditch. Field previously cultivated for sod productions and production of the production of t	ction.			

SOIL Sampling Point: 201-S-Up

Profile Description: (Describe to the depth need	ed to document the indicator or confirm the abscenc	e of indicators)		
' ————————————————————————————————————	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
0 - 14 10YR 2/1			Peat	
2. 14 - 20			SaC	
3		_		
4				
5			·	
[1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)	Inc	licators for Problematic Hydric Sol	ils [3]:
Histosol (A1)	Stripped Matrix (S6)	•	2 cm Muck (A10) (LRR K, L, MLRA	4 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 1	49B)	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)] Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	<i>145, 149B)</i>
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or problema	atic.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY				
Wetland Hydrology Indicators:	sock all that annivi	Cocond	Indicators (minimum of two year	ina all
Primary Indicators (minimum of one required; ch			ry Indicators (minimum of two req	
Surface Water (A1)	Water-Stained Leaves (B9)		nce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		nage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Strim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)		Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C.		fish Burrows (C8)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		ration Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)		ted or Stressed Plants (D1)	
Iron Deposits (B5)	Thin Muck Surface (C7)		norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)	<u> </u>	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)		IVIICI	ntopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	gy present? <u>No</u>
Surface water present?	Surface Water Depth (inches):	_	Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):	_		
		nspections		
Hydrology Remarks: Sod field adjacent to exca	vated ditch.			

WEILAND DEIERWIN	IATION DATA	FURINI - NOT	tncentral and Nort	neast Reg	ion
Project/Site: Zim Site	Applicant/Owner: PolyMet	Mining City/County:	St. Louis State: MN	Sampling Date: 11	<u>/13/15</u>
Investigator(s): KMS2,LMT2	Section: 26+	Township: 55	5 <i>Range:</i> <u>18W</u>	Sampling Point: 20)1-S-Wet
Land Form: Terrace	Local Relief: None	<i>Slope %:</i> 0		Greenwood Soils, Up	oham Basin, 0-1%
Subregion (LRR): K	Latitude: <u>5228738</u>	Longitude: 5			
Cowardin Classification: PUBH4x	Circular 39 Classification:	<u>Type 5</u>	Mapped NWI Classification	•	
Are climatic/hydrologic conditions on the site typical for this		(If no, explain in remarks)	Eggers & Reed (primary):	Shallow, Open	Water
, , , , , , , , , , , , , , , , , , ,	_	Are "normal	Yes Eggers & Reed (secondar)	·	<u>vutor</u>
Are vegetation No Soil No Hydrology	No significantly distu	Circumstances			
Are vegetation No Soil No Hydrology	No naturally problem	atic? present?	Eggers & Reed (quaternar	y):	
SUMMARY OF FINDINGS - Attach site	map showing san	npling point loca	tions, transects, importa	nt features, e	etc.
	neral Remarks No veg	etation observed in ditch.			
Trydic son present.	plain any answers eeded):				
Indicators of wetland hydrology present? Yes	es, optional Wetland Site IE	• cm5			
<u> </u>	es, optional Wetland Site it	D: <u>SW2</u>			
VEGETATION					
	Absolute	Dominant Indicator	50/20 Thresholds:		<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>) <u>% Cover</u>	Species? Status	Tree Stratum	_	0 0
1.	0		Sapling/Shrub Stratum	_	0 0
2.	0		Herb Stratum	_	0 0
3.	0		Woody Vine Stratum		
4.	0		Dominance Test Worksheet:		
1	otal Cover: 0		Number of Dominant Species That Are OBL, FACW or FAC		(A)
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)		Total Number of Dominant		-
1.	0		Species Across All Strata:		(B)
2.	0		Percent of Dominant Species		- (A/D)
3.	0		That Are OBL, FACW or FAC	:	(A/B) -
4. <u> </u>	0		Prevalence Index Worksheet:		
	otal Cover: 0		Total % Cover of:	Mı	ultiply by:
Herb Stratum (Plot Size: <u>5 ft</u>	<u>-</u>		OBL Species	0 X 1	0
1.	, 0		FACW Species	0 X 2	0
2.	0		FAC Species	0 X3	0
3.	0		FACU Species	0 X 4	0
4.	0		UPL Species	0 X 5	0
5.	0		Column Totals:	0 (A)	0 (B)
6.	0		Prevalence Inc	 dex = B/A =	#Num!
7. 8.	0		Hydrophytic Vegetation Indica	ators:	
	2440		No Rapid Test for Hyd	 drophytic Vegetation	n
Woody Vine Stratum (Plot Size: <u>30 ft</u>	otal Cover: 0		No Dominance Test is		
1.	, 0		#Type! Prevalence Index :	≤ 3.0 [1]	
2.	0			aptations [1] (provid arks or on a separate	
	otal Cover: 0		—	ophytic Vegetation [•
% Bare Ground in Herb Stratum:	- % Sphagnum	Moss Cover	[1] Indicators of hydric soil & wetle		• • •
	, •		disturbed or problematic.	10 11	
Vegetation Remarks: (include photo numbers here or o	n a separate sheet)		Hydrophytic vegetation present	t? <u>No</u>	
Open water, no vegetation.					

SOIL Sampling Point: 201-S-Wet

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
0 - 2 10YR 2/1			Peat	
2 - 14 5YR 4/1			SaC	
<u>-</u>				
- -			-	
-				
Type: C=Concentration, D=Depletion, RM=R	Reduced Matrix, CS=Covered or Coated Sand Grains	2] Location:	PL=Pore Lining, M=Matrix.	
vdric Soil Indicators: (applicable to all LRRs, i	unless otherwise noted)	Inc	dicators for Problematic Hydric	Soils [3]:
Histosol (A1)	Stripped Matrix (S6)	✓	2 cm Muck (A10) (LRR K, L, M	LRA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LR	R K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149	OB)	5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) ((LRR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K	(, L)
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12)	(LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19	P) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144	4A, 145, 149B)
			Red Parent Material (F21)	Other (explain in soil
Sandy Redox (S5)	Redox Depressions (F8)			Otrici (capialii ili 3011
	Redox Depressions (F8) d hydrology must be present, unless disturbed or problemati	c	Very Shallow Dark Surface (TF	
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present):	d hydrology must be present, unless disturbed or problemati Depth (inches):	c	_	
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated.	d hydrology must be present, unless disturbed or problemati Depth (inches):	c	Very Shallow Dark Surface (TF	12) remarks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated.	d hydrology must be present, unless disturbed or problemati Depth (inches):	c.	Very Shallow Dark Surface (TF	12) remarks)
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TOROLOGY Tetland Hydrology Indicators:	d hydrology must be present, unless disturbed or problemate Depth (inches):		Very Shallow Dark Surface (TF Hydric soil present?	Yes
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; continuation)	heck all that apply)	Seconda	Very Shallow Dark Surface (TF Hydric soil present? ary Indicators (minimum of two	Yes required)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TDROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c) Surface Water (A1)	heck all that apply) Water-Stained Leaves (B9)	Seconda Surfa	Very Shallow Dark Surface (TF Hydric soil present? Ary Indicators (minimum of two ace Soil Cracks (B6)	Yes required)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c) Surface Water (A1) High Water Table (A2)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)	Seconda Surfa Drain	Wery Shallow Dark Surface (TF Hydric soil present? Ary Indicators (minimum of two ace Soil Cracks (B6) mage Patterns (B10)	Yes required)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c) Surface Water (A1) High Water Table (A2) Saturation (A3)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Seconda Surfa Drain Moss	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two acce Soil Cracks (B6) mage Patterns (B10) is Trim Lines (B16)	Yes required)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. DROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Seconda Surfa Drain Moss Dry-	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two ace Soil Cracks (B6) mage Patterns (B10) s Trim Lines (B16) Season Water Table (C2)	Yes required)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TDROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Seconda Surfa Drain Moss Dry- Cray	Wery Shallow Dark Surface (TF Hydric soil present? Ary Indicators (minimum of two ace Soil Cracks (B6) mage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) fish Burrows (C8)	required) FAC-Neutral Test (D.
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Seconda Surfa Drain Moss Dry- Cray Satu	Hydric soil present? Hydric soil present? Ary Indicators (minimum of two ace Soil Cracks (B6) age Patterns (B10) s Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (C	required) FAC-Neutral Test (D.
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Seconda Surfa Drain Moss Dry- Cray Satun	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two ace Soil Cracks (B6) age Patterns (B10) as Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (Cated or Stressed Plants (D1)	required) FAC-Neutral Test (Ds
A Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Excavated ditch, soils estimated. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; c. Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Seconda Surfa Drain Moss Dry- Cray Satu Sturn Geor	Ary Indicators (minimum of two ace Soil Cracks (B6) nage Patterns (B10) season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2)	required) FAC-Neutral Test (D.
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. CDROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Seconda Surfa Drain Moss Dry- Cray Satun Geool Shali	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two accessed of Cracks (B6)) Anage Patterns (B10) So Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (Cated or Stressed Plants (D1)) morphic Position (D2) low Aquitard (D3)	required) FAC-Neutral Test (D.
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. DROLOGY Total Remarks: Excavated ditch, soils estimated. DROLOGY Total Remarks: Excavated ditch, soils estimated. Total Remarks: Excavated ditch, soils estim	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Seconda Surfa Drain Moss Dry- Cray Satun Geool Shali	Ary Indicators (minimum of two ace Soil Cracks (B6) nage Patterns (B10) season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2)	required) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: pil Remarks: Excavated ditch, soils estimated. TOROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations:	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Seconda Surfa Drain Moss Dry- Cray Satun Geool Shali	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two accessed of Cracks (B6)) Anage Patterns (B10) So Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (Cated or Stressed Plants (D1)) morphic Position (D2) low Aquitard (D3)	remarks) Yes required) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. DROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; c. Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present?	heck all that apply) Water-Stained Leaves (B9)	Seconda Surfa Drair Moss Dry- Cray Satun Geool Shali	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two accessed of Cracks (B6) anage Patterns (B10) as Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (Cated or Stressed Plants (D1) amorphic Position (D2) low Aquitard (D3) ptopographic Relief (D4)	required) FAC-Neutral Test (D
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Excavated ditch, soils estimated. CDROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Seconda Surfa Drair Moss Dry- Cray Satun Geool Shali	Hydric soil present? Hydric soil present? Hydric soil present? Ary Indicators (minimum of two ace Soil Cracks (B6) age Patterns (B10) as Trim Lines (B16) Season Water Table (C2) affish Burrows (C8) aration Visible on Aerial Imagery (Cated or Stressed Plants (D1) amorphic Position (D2) allow Aquitard (D3) appropriate to the property of the prope	required) FAC-Neutral Test (D

WETLAND DETERMINATION	DATA FOR	M - Northcentral and Northeast Region	า
Project/Site: Zim Site Applicant/Own	er: PolyMet Mining	City/County: St. Louis State: MN Sampling Date: 11/13/1	<u>5</u>
Investigator(s): KMS2,LMT2 Section:	<u>26+</u>	Township: 55 Range: 18W Sampling Point: 202-S-I	<u>Jp</u>
Land Form: Terrace Local Relief:	<u>None</u>	Slope %: 0 Soil Map Unit Name: B14A Greenwood Soils, Upham	Basin, 0-1%
Subregion (LRR): <u>K</u> Latitude:	<u>5228748</u>	Longitude: 530251 Datum: NAD 83	
Cowardin Classification: Upland Circular 39 Cla	assification: Upland	Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, expla	in in remarks) Eggers & Reed (primary): Upland	
Are vegetation No Soil No Hydrology No sig	nificantly disturbed?	Are "normal Yes Eggers & Reed (secondary):	
	urally problematic?	circumstances" Eggers & Reed (tertiary): present? Eggers & Reed (quaternary):	
		oint locations, transects, important features, etc.	
Hydrophytic vegetation present? No General Remarks		djacent to excavated ditch.	
Hydric soil present? Yes (explain any answe		,	
Indicators of wetland hydrology present? Yes if needed):			
Is the sampled area within a wetland? No If yes, optional W	etland Site ID: (SW	<u>?)</u>	
VEGETATION			
	Absolute Dominant	Indicator 50/20 Thresholds: 20%	<u>50%</u>
<u>Tree Stratum</u> (Plot Size: 30 ft)	% Cover Species?	Status Tree Stratum 0	0
1.	0	Sapling/Shrub Stratum 0	0
2.	0	Herb Stratum 5	12.5
3.	0	Woody Vine Stratum 0	0
4.	0	Dominance Test Worksheet:	
Total Cover:	<u>0</u>	Number of Dominant Species That Are ORL FACW or FAC: 0 (A	Δ)
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)		mat Are OBE, I AON OF I AO.	7
1.	0	Total Number of Dominant Species Across All Strata: 1 (i	3)
2.	0	Percent of Dominant Species	
3.	0	That Are OBL, FACW or FAC: 0.00%	4/B)
4.	0	Prevalence Index Worksheet:	
5. Total Cover:	0	Total % Cover of: Multiply	, hv.
Herb Stratum (Plot Size: 5 ft	<u>u</u>	OBL Species 0 X 1	0
	25 Yes	0 X2	0
 Poa pratensis Poa pratensis 	25 Yes 0	FACU FACW Species	0
3.	0	TAC Species	100
4.	0	1 Acc species	0
5.	0	UPL Species	100 (B)
6.	0	Column Totals:	4.00
7.	0	Hydrophytic Vegetation Indicators:	4.00
8. Tatal Causes	0	No Rapid Test for Hydrophytic Vegetation	
Total Cover:	<u>25</u>	No Dominance Test is >50%	
Woody Vine Stratum (Plot Size: 30 ft)		No Prevalence Index ≤ 3.0 [1]	
1.	0	No Morphological Adaptations [1] (provide su	
2. Total Cover:	0	in vegetation remarks or on a separate she	•
rotar Cover:	<u>0</u>	No Problematic Hydrophytic Vegetation [1] (Ex	• •
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	er: disturbed or problematic.	ent, umess
Vegetation Remarks: (include photo numbers here or on a separate s	heet)	Hydrophytic vegetation present? <u>No</u>	
Former sod field. Numerous grasses and weeds.			

SOIL Sampling Point: 202-S-Up

(inches) Color (moist)	% Color (moist) % Type [] Loc [2]	Texture	Remarks
0 - 20 10YR 2/1			Peat	
20 - 24			SaC	
<u> </u>		<u> </u>	<u> </u>	
		<u> </u>	-	
Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
lric Soil Indicators: (applicable to all LRRs, ι	unless otherwise noted)	Inc	dicators for Problematic Hydric	Soils [3]:
Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, M	LRA 149B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LR	R K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA	149B)	5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8)	(LRR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR k	(, L)
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12)	(LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19	P) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 14	4A, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in so
Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless disturbed or problet	natic.	Very Shallow Dark Surface (TF	12) remarks)
trictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Remarks:				
Remarks:				
Remarks:	heck all that apply)	Seconda	ary Indicators (minimum of two	required)
PROLOGY Iland Hydrology Indicators: mary Indicators (minimum of one required; co	heck all that apply)		ary Indicators (minimum of two ace Soil Cracks (B6)	
PROLOGY Surface Water (A1)		Surf	· · · · · · · · · · · · · · · · · · ·	
PROLOGY Sland Hydrology Indicators: mary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2)	Water-Stained Leaves (B9)	Surfa	ace Soil Cracks (B6)	
PROLOGY Surface Water (A1)	☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)	Surfa	nage Patterns (B10)	
PROLOGY Stand Hydrology Indicators: nary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2) Saturation (A3)	 Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Surfa	ace Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16)	
PROLOGY Sland Hydrology Indicators: mary Indicators (minimum of one required; c.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C	Surf. Drai. Mos. Dry. 3) Cray	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2)	FAC-Neutral Test (L
PROLOGY Itand Hydrology Indicators: Inary Indicators (minimum of one required; c) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C1) Presence of Reduced Iron (C4)	Surfa Drain Moss Dry- 3) Satu	ace Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) dish Burrows (C8)	FAC-Neutral Test (L
PROLOGY Iland Hydrology Indicators: mary Indicators (minimum of one required; construction (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C1) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Surf. Drai. Mos. Dry. Satur. Sturn.	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rfish Burrows (C8) rration Visible on Aerial Imagery (C	FAC-Neutral Test (L
PROLOGY Cland Hydrology Indicators: mary Indicators (minimum of one required; construction of the sequence) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C1) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Surfa Drain Moss Dry- 3) Cray Satu Geo.	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) dish Burrows (C8) rration Visible on Aerial Imagery (Cated or Stressed Plants (D1)	FAC-Neutral Test (i
PROLOGY Itland Hydrology Indicators: mary Indicators (minimum of one required; c. Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C1) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Surf. Drai. Mos. Dry. Satu Sturn Geo. Shai	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) offish Burrows (C8) oration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2)	FAC-Neutral Test (i
PROLOGY Idand Hydrology Indicators: Inary Indicators (minimum of one required; contract water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) d Observations:	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surf. Drai. Mos. Dry- Satu Stur. Geo. Shai	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rfish Burrows (C8) rration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2)	FAC-Neutral Test (i
PROLOGY Iland Hydrology Indicators: mary Indicators (minimum of one required; case) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) d Observations: face water present?	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (€ Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches):	Surf. Drain Mos. Dry- Satur. Sturr. Geo. Shari	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rish Burrows (C8) rration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (L
PROLOGY Idand Hydrology Indicators: Inary Indicators (minimum of one required; contract water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) d Observations:	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surf. Drai. Mos. Dry- Satu Stur. Geo. Shai	ace Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) offish Burrows (C8) reation Visible on Aerial Imagery (Cotted or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (L

WEILAND DEIERMIN	NATION DATA	FURIN - Nor	tncentral and Nor	tneast Reg	gion
Project/Site: Zim Site	Applicant/Owner: PolyMet	Mining City/County:	St. Louis State: MN	Sampling Date: 1	<u>.1/13/15</u>
Investigator(s): KMS2,LMT2	Section: 26+	Township: 55	5 <i>Range:</i> 18W	Sampling Point: 2	202-S-Wet
Land Form: Terrace	Local Relief: None	<i>Slope %:</i> 0	-	AA Greenwood Soils, U	Jpham Basin, 0-1%
Subregion (LRR): K	Latitude: 5228739	Longitude: 5	30251 Datum: NAD 8	83	
Cowardin Classification: PABH6x	Circular 39 Classification:	Type 4, 5	Mapped NWI Classificati		
Are climatic/hydrologic conditions on the site typical for this		(If no, explain in remarks)	Eggers & Reed (primary		
3,		Are "normal	Yes Eggers & Reed (second		n Water
Are vegetation No Soil No Hydrology	y <u>No</u> significantly distr	CITCUITISTATICES		-	
Are vegetation No Soil No Hydrology	y <u>No</u> naturally problem	natic? present?	Eggers & Reed (quatern	nary):	
SUMMARY OF FINDINGS - Attach site	map showing san	npling point loca	tions, transects, impor	tant features,	etc.
<i></i>		ated ditch adjacent to forme	er sod field. No vegetation observed	in ditch.	
Try and som prosont:	xplain any answers needed):				
Indicators of wetland hydrology present? Yes		O O O			
	yes, optional Wetland Site II	D: <u>SW2</u>			
VEGETATION					
	Absolute	Dominant Indicator	50/20 Thresholds:		<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>)	Species? Status	Tree Stratum		0 0
1.	0		Sapling/Shrub Stratum	=	0 0
2.	0		Herb Stratum	=	0 0
3.	0		Woody Vine Stratum		0 0
4.	0		<u>Dominance Test Workshee</u>		
	Total Cover: 0		Number of Dominant Speci That Are OBL, FACW or FA	ies No:	(A)
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)		i i		_
1.	0		Total Number of Dominant Species Across All Strata:		(B)
2.	0		Percent of Dominant Speci		
3.	0		That Are OBL, FACW or FA	IC:	(A/B)
4.	0		Prevalence Index Workshee	 et:	
5.	Total Cover: 0		Total % Cover of:		Multiply by:
Herb Stratum (Plot Size: <u>5 ft</u>	, <u>u</u>		OBL Species	0 X 1	0
,)		FACW Species	0 X 2	0
1. 2.	0		FAC Species	0 X3	0
3.	0		FACU Species	0 X 4	0
4.	0			0 X 5	0
5.	0		UPL Species	0 (A)	0 (B)
6.	0		Column Totals:		#Num!
7.	0		Hydrophytic Vegetation Indi		#HUIII:
8.	0				
	Total Cover: 0		No Rapid Test for H	lydrophytic Vegetatio t is >50%)II
Woody Vine Stratum (Plot Size: 30 ft	,		#Type! Prevalence Inde		
1.	0			Adaptations [1] (prov	
2.	0 Total Cover: 0		—II	marks or on a separa drophytic Vegetation	•
	<u>u</u>		[1] Indicators of hydric soil & w		,
% Bare Ground in Herb Stratum:	% Sphagnum	Moss Cover:	disturbed or problematic.	caana nyarology must i	no present, uniess
Vegetation Remarks: (include photo numbers here or o	on a separate sheet)		Hydrophytic vegetation prese	ent? <u>No</u>	
No vegetation, water too deep.					

SOIL Sampling Point: 202-S-Wet

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture R	emarks
0 - 20 10YR 2/1		Peat	
<u>-</u>			
- 			
-			
Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
rdric Soil Indicators: (applicable to all LRRs, u	unless otherwise noted)	Indicators for Problematic Hydric Soils [3]:	
Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA 149B)	
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L, R)	
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149B,	5 cm Mucky Peat or Peat (S3) (LRR K, L, R)	
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LRR K, L)	
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (LRR K, L, R)	
] Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA 149B)	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145, 149B)	
1	Redox Depressions (F8)	Dad Darant Material (E21)	(ovaloin in coil
Sandy Redox (S5)	Redux Depressions (1 0)		(explain in soil
	hydrology must be present, unless disturbed or problematic.	☐ Very Shallow Dark Surface (TF12) Other remark	*
·	·	Other	*
I Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep.	hydrology must be present, unless disturbed or problematic.	☐ Very Shallow Dark Surface (TF12) remar.	*
estrictive Layer (if present): Type:	hydrology must be present, unless disturbed or problematic.	☐ Very Shallow Dark Surface (TF12) remar.	*
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Soil estimated - water too deep.	Depth (inches):	☐ Very Shallow Dark Surface (TF12) remar.	*
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; chemical extension)	Depth (inches):	Very Shallow Dark Surface (TF12) remark Hydric soil present? Yes Secondary Indicators (minimum of two required)	ks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. DROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; ch	Depth (inches): Depth (inches):	Very Shallow Dark Surface (TF12) remark Hydric soil present? Yes Secondary Indicators (minimum of two required)	ks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. ODROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2)	Depth (inches): Depth (inches): Depth (inches): Depth (inches): Depth (inches):	Very Shallow Dark Surface (TF12) remark Hydric soil present? Yes	ks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. ODROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2)	Depth (inches): Depth (inches): Water-Stained Leaves (B9) Aquatic Fauna (B13)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10)	ks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. VDROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3)	Depth (inches): Depth (inches): Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8)	ks)
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Soil estimated - water too deep. VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9)	ks)
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. VDROLOGY Vetland Hydrology Indicators: Trimary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	Depth (inches): Depth	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	*
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: pil Remarks: Soil estimated - water too deep. VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	ks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. VDROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Depth (inches): Depth	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	ks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. DROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	ks)
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: Soil estimated - water too deep. follows: Soil estima	Depth (inches): Depth	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	ks)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. ODROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present?	Depth (inches): Depth	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	veutral Test (D:
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: Soil estimated - water too deep. ODROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch.) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Depth (inches): Depth	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	ks) ['] Neutral Test (D£

WETLAND DET	ERMINATION DA	TA FORM - Norti	ncentral and Norti	heast Region
Project/Site: Zim Site	Applicant/Owner: Pol	lyMet Mining City/County: St	Louis State: MN	Sampling Date: 05/10/12
Investigator(s): KMS2/TPT Land Form: Terrace Subregion (LRR): K Cowardin Classification: Upland Are climatic/hydrologic conditions on the site to the second secon	Hydrology <u>No</u> significantly Hydrology <u>No</u> naturally pro	ion: Upland S (If no, explain in remarks) Are "normal y disturbed? circumstances" present?	Soil Map Unit Name: B14A (670 Datum: NAD 83 Mapped NWI Classification Eggers & Reed (primary): Yes Eggers & Reed (secondary Eggers & Reed (quaternary): Eggers & Reed (quaternary)	<u>Upland</u>): '):
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland?	Yes General Remarks Yes (explain any answers No Yes If yes, optional Wetland S		Well S2. Hydrology monitoring = drain	ned
VEGETATION				
<u>Tree Stratum</u> (Plot Size	Absolu e: <u>30 ft</u>) <mark>% Cov</mark>		50/20 Thresholds: Tree Stratum	20% 50% 12 30
Abies balsamea	3	30 Yes FAC	Sapling/Shrub Stratum Herb Stratum	<u>6</u> 15 18 45
2. Larix laricina	3	Yes FACW	Woody Vine Stratum	$\frac{10}{0} \frac{43}{0}$
3.		0	Dominance Test Worksheet:	
4.		<u>0</u>	Number of Dominant Species	4 (A)

	Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum			20% 12		<u>50%</u> 30
	Abies balsamea				30	Yes	FAC	Sapling/Shrub Stratu	m		6		15
	Larix laricina				30	Yes	FACW	Herb Stratum			18		45
	Lanx lancina				0	103	TACW	Woody Vine Stratum			0		0
					0			Dominance Test Wor	ksheet:				
				Total Cover:	<u>60</u>			Number of Dominant					
	Sapling/Shrub Stratum	(Plot Size:	1E #	rotar oover.	<u>50</u>			That Are OBL, FACW			4	(A)	
		(PIOL SIZE.	<u>13 II</u>	,				Total Number of Don	ninant				
	Abies balsamea				25	Yes	FAC	Species Across All S	trata:		4	(B)	
	Ledum groenlandicum				5	No	OBL	Percent of Dominant	Species	400.0	•••	(4 /D)	
					0			That Are OBL, FACW	or FAC:	100.0	J%	(A/B)	
					0			Prevalence Index Wo	rkehoot:				
					0]	,				
				Total Cover:	<u>30</u>			Total % Cover	5	X 1	Multip	у ву: 5	_
	Herb Stratum	(Plot Size:	<u>5 ft</u>)				OBL Species					-
	Rubus idaeus				75	Yes	FAC	FACW Species	35	X 2		70	-
	Athyrium filix-femina				10	No	FAC	FAC Species	140	X 3		420	/
	Mentha arvensis				5	No	FACW	FACU Species	0	X 4		0	ſ
					0			UPL Species	0	X 5		0)
					0			III '	180	(A)		495	;
					0			Column Totals:	ence Index =	` '		2.75	-
					0							2.75	
					0			Hydrophytic Vegetation	n Indicators.				
				Total Cover:	<u>90</u>			II '	t for Hydroph		tion		
	Woody Vine Stratum	(Plot Size:	30 ft)					e Test is >50				
					0				e Index ≤ 3.0				
					0				gical Adaptat on remarks o				g d
				Total Cover:	0			- ~	ic Hydrophyl			•	
В	are Ground in Herb Stratu	m:				n Moss Cover	:	[1] Indicators of hydric so	oil & wetland h	•			ess
	arara a manada a a a a a		_		. •								
	etation Remarks: (include	pnoto numbers	s nere o	r on a separate s	neet)			Hydrophytic vegetation	ı present?	<u>Yes</u>			

SOIL Sampling Point: 203-N-Wet

		document the indicator or co			indicators).		
Depth	Matrix		x Featu		1 101	Toutons	Damada
	Color (moist) %	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. <u>0 - 36</u> 10YR 2						Oi Oe	
Z						<u> </u>	
3							
5							
6							
[1] Type: C=Concentratio	n, D=Depletion, RM=Reduce	d Matrix, CS=Covered or Coa	ted Sand	d Grains [2	Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (a	pplicable to all LRRs, unless	otherwise noted)			Ind	licators for Problematic Hydric Soi	ls [3]:
✓ Histosol (A1)		Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, MLRA	l <i>149B)</i>
Histic Epipedon (A2)		Dark Surface (S7) (LRR R, I	MLRA 14	19B)		Coast Prairie Redox (A16) (LRR K,	L, R)
Black Histic (A3)		Polyvalue Below Surface (Se	8) (LRR 1	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LRF	R R, MLR	RA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)] Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark S	urface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A1	2)	Depleted Matrix (F3)] Iron-Manganese Masses (F12) (LR	P.R. K, L, R)
Sandy Mucky Mineral (.	S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S	54)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)		Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic	vegetation and wetland hydro	logy must be present, unless di	sturbed (or problematic		Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if prese			(inches	-		Hydric soil present?	Yes
Soil Remarks:							
Son Remarks.							
HYDROLOGY							
Wetland Hydrology Indica	itors:						
Primary Indicators (minim	um of one required; check a	ll that apply)			Seconda	ry Indicators (minimum of two req	uired)
Surface Water (A1)		Water-Stained Leaves (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)		Aquatic Fauna (B13)			Drain	age Patterns (B10)	
✓ Saturation (A3)		Marl Deposits (B15)			Moss	Trim Lines (B16)	
Water Marks (B1)		Hydrogen Sulfide Odor	(C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits (B2))	Oxidized Rhizospheres	on Living	Roots (C3)	Cray	fish Burrows (C8)	
Drift Deposits (B3)					Satur	ration Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)		Presence of Reduced In	on (C4)		Stuni	ed or Stressed Plants (D1)	
Iron Deposits (B5)		Recent Iron Reduction in	n Tilled S	Soils (C6)		norphic Position (D2)	
		Thin Muck Surface (C7)				ow Aquitard (D3)	
Inundation Visible on A		Other (explain in remark	(s)			ntopographic Relief (D4)	
Sparsely Vegetated Co.	TICAVE SUITACE (DO)						
Field Observations: Surface water present?	Г	Surface Water Depth (inc	choe).			Indicators of wetland hydrolog	y present? <u>No</u>
Water table present?	L	Water Table Depth (inch				Describe Recorded Data: Four years of monitoring data. On	o out of four years mot wotland
Saturation present? (inclu	udes canillary fringe)		•	17		hydrology criteria. Drained	e out of four years met wettand
Recorded Data:	Aerial Photo Monitor	ing Well Stream Gauge	;	Previous Insp	ections		
Hydrology Remarks:							

Project/Site Proj
Land Farm Intrace Local Relief Mare Slage 1
Ace vegetation No Soil No Hydrology No Inductory No If yes, optional Wetland Site ID: Sapiling/Shrub Stratum (Plot Size: 30 ft 1
SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.
Point Provided P
Tree Stratum
Sapling/Shrub Stratum
Herb Stratum
Moody Vine Stratum
A
Number of Dominant Species That Are OBL, FACW or FAC:
1. 0
2.
That Are OBL, FACW or FAC: 0.00% (A/B)
Description
Herb Stratum (Plot Size: 5ft)) Yes FACU FACW Species 0 X 1 0 1. Poa pratensis 25 Yes FACU FACW Species 0 X 2 0 0 X 3 0 2. 0 0 0 0 0 FACW Species 0 X 3 0 3. 0 0 0 0 0 FACU Species 25 X 4 100 4. 0 0 0 0 0 0 UPL Species 0 X 5 0
nerb Stratum (Flot Size. Sh.) Yes FACU FACW Species 0 X 2 0 2. 0 0 FAC Species 0 X 3 0 3. 0 0 FACU Species 25 X 4 100 4. 0 0 UPL Species 0 X 5 0
2. FACU Species D X 3 D 3. D D D D 4. D D D D TACU Species D X 3 D FACU Species D X 3 D FACU Species D X 5 D TACU Species D X 5 TACU Species D X 5 D TACU Species D X 5 TACU Species D X 5 D TACU Species D X 5 D TACU S
3. 0
4. 0 UPL Species 0 X 5 0
5. Column Totals: 25 (A) 100 (B)
6. 0 Prevalence Index = B/A = 4.00
8. By the second of the second
Total Cover: 25 No Rapid Test for Hydrophytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft) No Prevalence Index ≤ 3.0 [1]
1. No Morphological Adaptations [1] (provide supporting data
2
Total Cover: 0 No Problematic Hydrophytic Vegetation [1] (Explain) **Bare Ground in Herb Stratum:
Vegetation Remarks: (include photo numbers here or on a separate sheet) Hydrophytic vegetation present? No

Excavated ditch spoils adjacent to ditch.

SOIL Sampling Point: 204-E-Up

Profile Description: (Describe to the depth need			indicators).		
Depth Matrix		ox Features	1	T . ()	D d .
(inches) Color (moist)	% Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
1. <u>0 - 20</u> 10YR 2/1				Peat	
2					
4					
5					
6					
[1] Type: C=Concentration, D=Depletion, RM=R	Reduced Matrix, CS=Covered or Coat	ted Sand Grains [2]	Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)		Indi	cators for Problematic Hydric Soil	ls [3]:
✓ Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLRA	149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, I	MLRA 149B)		Coast Prairie Redox (A16) (LRR K,	L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (Sa	8) (LRR R, MLRA 149B,)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRF	R R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) ((LRR K, L)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) (LR	PR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless di	isturbed or problematic.		Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth	(inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: Peat depth estimated from preview HYDROLOGY	ous soil borings.				
Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required; of	heck all that apply)		Secondar	y Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves ((B9)	Surfac	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		Draina	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Moss	Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor	(C1)	Dry-S	eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	on Living Roots (C3)	Crayfi	sh Burrows (C8)	
Drift Deposits (B3)			Satura	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced In		Stunte	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in		Geom	orphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	☐ Thin Muck Surface (C7)		Shallo	w Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remark	(S)	Micro	topographic Relief (D4)	
Field Observations:				Indicators of wetland hydrolog	y present? <u>No</u>
Surface water present?	Surface Water Depth (inc	ches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inch	es):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches	s):			
Recorded Data: Aerial Photo	Ionitoring Well Stream Gauge	Previous Inspe	ections		
Hydrology Remarks:					

WEILAND DETERMIN	IATION DATA	FURIN - NORTH	icentral and Nortne	ast Region
Project/Site: Zim Site	Applicant/Owner: PolyMet I	Mining City/County: St.	Louis State: MN San	npling Date: 11/13/15
Investigator(s): KMS2,LMT2	Section: 26+	Township: 55	Range: 18W Sar	mpling Point: 204-E-Wet
Land Form: Terrace	Local Relief: None	<i>Slope %:</i> 0	•	nwood Soils, Upham Basin, 0-1%
Subregion (LRR): K	Latitude: 5228714	Longitude: 530	•	· · · · · · · · · · · · · · · · · · ·
Cowardin Classification: PUBH4x		<u>Type 5</u>	Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this		(If no, explain in remarks)	Eggers & Reed (primary):	Shallow Marsh
	-	Are "normal	Yes Eggers & Reed (secondary):	Strailow iviai str
Are vegetation No Soil No Hydrology	No significantly distu	ribed? circumstances" present?	Eggers & Reed (tertiary):	
Are vegetation No Soil No Hydrology	No naturally problema	atic?	Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Attach site	map showing sam	pling point location	ons, transects, important	features, etc.
	neral Remarks Excava	ted ditch adjacent to former s	sod field.	
Trydro son present.	plain any answers eeded):			
indicators of wetland hydrology present? <u>Yes</u>		0.140		
	es, optional Wetland Site ID	: <u>SW3</u>		
VEGETATION				
	Absolute	Dominant Indicator	50/20 Thresholds:	<u>20%</u> <u>50%</u>
Tree Stratum (Plot Size: 30 ft) % Cover	Species? Status	Tree Stratum	0 0
-	,		Sapling/Shrub Stratum	0 0
1. 2.	0 0		Herb Stratum	5 12.5
3.	0		Woody Vine Stratum	0 0
4.	0		<u>Dominance Test Worksheet:</u>	
1	Total Cover: 0		Number of Dominant Species	1 <i>(A</i>)
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)		That Are OBL, FACW or FAC:	
1.	0		Total Number of Dominant Species Across All Strata:	1 <i>(B)</i>
2.	0		Percent of Dominant Species	
3.	0		That Are OBL, FACW or FAC:	100.00% (A/B)
4.	0		Prevalence Index Worksheet:	
5.	0] ———	NA TO LET
	Total Cover: 0		Total % Cover of:	Multiply by:
<u>Herb Stratum</u> (Plot Size: <u>5 ft</u>)		OBL Species	X 2 50
Phalaris arundinacea	25	Yes FACW	PACW Species	
2.	0		FAC Species0	X 3 0
3.	0		FACU Species0	X 4 <u>0</u>
4.5.	0		UPL Species0	X 5 <u>0</u>
6.			Column Totals: 25	(A) <u>50</u> (B)
7.	0		Prevalence Index =	B/A = 2.00
8.	0		Hydrophytic Vegetation Indicators	<u>:</u>
1	otal Cover: 25		No Rapid Test for Hydropl	nytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft)		Yes Dominance Test is >50	
1.	0		Yes Prevalence Index ≤ 3.0	• •
2.	0		No Morphological Adaptation remarks	ions [1] (provide supporting data or on a separate sheet)
7	otal Cover: 0		No Problematic Hydrophy	tic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum	Moss Cover:	[1] Indicators of hydric soil & wetland h disturbed or problematic.	ydrology must be present, unless
Vegetation Remarks: (include photo numbers here or o	n a separate sheet)		Hydrophytic vegetation present?	<u>Yes</u>
Excvated/disturbed ditch.			11	

SOIL Sampling Point: 204-E-Wet

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
0 - 10 10YR 2/1			Peat	
-				
·			-	
1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains	2] Location: F	PL=Pore Lining, M=Matrix.	
lydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)	Ind	icators for Problematic Hydric So	ils [3]:
Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR)	4 <i>149B)</i>
] Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 14)	(B)	5 cm Mucky Peat or Peat (S3) (LR	P.R. K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L))
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
			Deal Demont Metable (F24)	
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
	Redox Depressions (F8) hydrology must be present, unless disturbed or problemati	<u> </u>	Red Parent Material (F21) Very Shallow Dark Surface (TF12)	
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type:		<u> </u>		
3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated.	hydrology must be present, unless disturbed or problemati	2.	Very Shallow Dark Surface (TF12)	remarks) remarks)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type:	hydrology must be present, unless disturbed or problemati	<u></u>	Very Shallow Dark Surface (TF12)	remarks) remarks)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated.	hydrology must be present, unless disturbed or problemate Depth (inches):		Very Shallow Dark Surface (TF12)	Yes
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch	hydrology must be present, unless disturbed or problemate Depth (inches):	Seconda	Very Shallow Dark Surface (TF12, Hydric soil present?	Yes
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. YDROLOGY Wetland Hydrology Indicators:	hydrology must be present, unless disturbed or problemate Depth (inches): eck all that apply)	Secondal Surface	Very Shallow Dark Surface (TF12, Hydric soil present? ry Indicators (minimum of two rec	remarks) Yes uuired)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch	Depth (inches): Depth (inches): Water-Stained Leaves (B9)	Seconda: Surfac Draine	Hydric soil present? Hydric soil present? ry Indicators (minimum of two recovers)	remarks) Yes uuired)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. EYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2)	hydrology must be present, unless disturbed or problemate Depth (inches): eck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)	Secondal Surfac Draina Moss	Very Shallow Dark Surface (TF12, Hydric soil present? ry Indicators (minimum of two recovers) ce Soil Cracks (B6) age Patterns (B10)	remarks) Yes uuired)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2) Saturation (A3)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secondal Surfau Drain Moss Dry-S	ry Indicators (minimum of two recover Soil Cracks (B6) age Patterns (B16) Trim Lines (B16)	remarks) Yes uuired)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. EYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Secondal Surfac Drain Moss Dry-S Crayfi	ry Indicators (minimum of two recovers) age Patterns (B10) Trim Lines (B16) Season Water Table (C2)	remarks) Yes Juired) FAC-Neutral Test (D5)
33 Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type:	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Secondal Surfact Draina Moss Dry-S Crayfi Satura	ry Indicators (minimum of two red ce Soil Cracks (B6) age Patterns (B16) Season Water Table (C2) ish Burrows (C8)	remarks) Yes Juired) FAC-Neutral Test (D5)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. EXPOROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secondar Surfact Draina Moss Dry-S Crayfa	ry Indicators (minimum of two recovers) Try Indicators (minimum of two recovers) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9)	remarks) Yes Juired) FAC-Neutral Test (D5)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. EYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Secondal Surface Draina Moss Dry-S Crayfi Satura Stunta	ry Indicators (minimum of two recovers) Try Indicators (minimum of two recovers) Trim Cines (B16) Trim Lines (B16) Season Water Table (C2) Tish Burrows (C8) ation Visible on Aerial Imagery (C9) and or Stressed Plants (D1)	remarks) Yes Juired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soil estimated. Soil Remarks: Excavated ditch, soil estimated. YDROLOGY	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secondal Surface Draine Moss Dry-S Crayfi Satura Stunta Geom	ry Indicators (minimum of two recovers) Try Indicators (minimum of two recovers) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1)	remarks) Yes Juired) FAC-Neutral Test (D5)
Soil Remarks: Excavated ditch, soil estimated. Soil Remarks: Excavated ditch, soil estimated. YDROLOGY	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Secondal Surface Draine Moss Dry-S Crayfi Satura Stunta Geom	Hydric soil present? Hydric soil present? Hydric soil present? Ty Indicators (minimum of two recovers) See Soil Cracks (B6) See Patterns (B10) Trim Lines (B16) See son Water Table (C2) Sish Burrows (C8) Sation Visible on Aerial Imagery (C9) Seed or Stressed Plants (D1) Shorphic Position (D2) Sow Aquitard (D3)	yes yuired) FAC-Neutral Test (D5)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. EYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che and the state of the	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Secondal Surface Draine Moss Dry-S Crayfi Satura Stunta Geom	Hydric soil present? Hydric soil present? Hydric soil present? Ty Indicators (minimum of two recovers) See Soil Cracks (B6) See Patterns (B10) Trim Lines (B16) See son Water Table (C2) Sish Burrows (C8) Seation Visible on Aerial Imagery (C9) Seed or Stressed Plants (D1) Shorphic Position (D2) Sow Aquitard (D3) Stopographic Relief (D4)	yes yuired) FAC-Neutral Test (D5)
[3] Indicators of hydrophytic vegetation and wetland Restrictive Layer (if present): Type: Soil Remarks: Excavated ditch, soil estimated. EYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secondal Surface Draine Moss Dry-S Crayfi Satura Stunta Geom	ry Indicators (minimum of two recessed Plants (D1) and or Stressed Plants (D1) and or Stressed Plants (D1) and or Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrological presents (D1) Indicators of wetland hydrological presents (D4) Indicators of wetland hydrological presents (D4) Indicators of wetland hydrological presents (D4)	yes yuired) FAC-Neutral Test (D5)

WETLAND DET	ERMINATION DATA FOR	RM - Northcentral and Northea	st Region
Project/Site: Zim Site	Applicant/Owner: PolyMet Mining	City/County: St. Louis State: MN Sample	ing Date: 05/10/12
Investigator(s): KMS2/TPT Land Form: Terrace Subregion (LRR): K	Section: 26+ Local Relief: None Latitude: 5228543	· · · · · =	ling Point: 205-N-Wet rood Soils, Upham Basin, 0-1%
Cowardin Classification: PML1/SS2,4B Are climatic/hydrologic conditions on the site of the following series of the condition on the site of the following series of the follo	Hydrology No significantly disturbed? Hydrology No naturally problematic?	Mapped NWI Classification: lain in remarks) Are "normal Yes Eggers & Reed (secondary): circumstances" present? Eggers & Reed (tertiary): Eggers & Reed (quaternary): point locations, transects, important fe	pen Bog Patures, etc.
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland?	Yes General Remarks Yes (explain any answers if needed): Yes If yes, optional Wetland Site ID: SW	d in the south unit. Well S5	
VEGETATION <u>Tree Stratum</u> (Plot Size	Absolute Dominar e: 30 ft	? Status Tree Stratum	20% 50% 0 0
1. 2. 3.	0 0	Sapling/Shrub Stratum Herb Stratum Woody Vine Stratum	$ \begin{array}{c c} $
4.	Total Cover:	Dominance Test Worksheet: Number of Dominant Species	4 (A)

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	<u>Indicator</u> <u>Status</u>	Tree Stratum		•	0	0
				0			Sapling/Shrub Stratur	1		15	37.5
				0			Herb Stratum			8	20
				0			Woody Vine Stratum		<u> </u>	0	0
				0			Dominance Test Work	sheet:			
			Total Cover:	0			Number of Dominant S That Are OBL, FACW		4	(A)	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)	20	Van	ODI	Total Number of Domi			· (D)	
Ledum groenlandicum				30	Yes	OBL	Species Across All St	rata:	4	(B)	
Betula pumila	lata			25 10	No	OBL OBL	Percent of Dominant S		100.00%	(A/B)	
Chamaedaphne calycu	iala				No		That Are OBL, FACW	or FAC:	100.0070	(A/D)	
Salix discolor				10	140	FACW	Prevalence Index World	sheet:			
			Total Cover:	<u>75</u>			Total % Cover	of:	Ми	ıltiply by:	
Herb Stratum	(Plot Size:	<u>5 ft</u>)				OBL Species	95	X 1	95	;
Calamagrostis canade	nsis			30	Yes	OBL	FACW Species	10	X 2	20	1
Rubus idaeus				10	Yes	FAC	FAC Species	10	X 3	30	,
				0			FACU Species	0	X 4	0)
				0			111 · —	0	X 5	0	-)
				0			UPL Species	115	(A)	145	-
				0			Column Totals:		• •		-
				0				nce Index =	-	1.26	
				0			Hydrophytic Vegetation	n Indicators:			
			Total Cover:	<u>40</u>			 '		ytic Vegetation	1	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>)				Yes Dominance				
				0			Yes Prevalence				
				0					ions [1] (provi or on a separat		g d
			Total Cover:	<u>0</u>			II		ic Vegetation [•	
Bare Ground in Herb Stra	tum:	_	!	% Sphagnum	n Moss Cover	:	[1] Indicators of hydric so disturbed or problematic.		•	• • • •	ess
egetation Remarks: (inclu	d			h4)			Hydrophytic vegetation	procent?	Yes		_

SOIL Sampling Point: 205-N-Wet

Profile Description: (Describe to the depth need Depth Matrix	ed to document the indicator or confirm the abs	cence of indicato	rs).	
<u> </u>		pe [1] Loc [2]		Remarks
0 - 12 10YR 2/1	100		Oi	
2. 12 - 36 10YR 2/1	100		Oe	
3				
4				
5				
[1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grai	ins [2] Locatio	n: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)		Indicators for Problematic Hydric So	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR	A 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, ML	.RA 149B)	5 cm Mucky Peat or Peat (S3) (LF	RR K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRR R, MLRA 14	9B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L))
Thick Dark Surface (A12)	Depleted Matrix (F3)		☐ Iron-Manganese Masses (F12) (L	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or pro-	blematic.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; ch	eck all that apply)	Seco	ndary Indicators (minimum of two red	quired)
Surface Water (A1)	Water-Stained Leaves (B9)	\square S	urface Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)	\square D	rainage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	<i>N</i>	loss Trim Lines (B16)	
☐ Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)		Pry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Root	ts (C3) C	rayfish Burrows (C8)	
Drift Deposits (B3)			aturation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)		tunted or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled Soils (C6)	Seomorphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)	S	hallow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	<i>N</i> /	licrotopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolo	gy present? Yes
	Surface Water Depth (inches):		Describe Recorded Data:	
Surface water present?	Curios Vater Depar (mones):			
Surface water present? Water table present?	Water Table Depth (inches):		One year of monitoring data. Wa	
		4	One year of monitoring data. Wa hydrology, but not as long as the	
Water table present? Saturation present? (includes capillary fringe)	Water Table Depth (inches): ✓ Saturation Depth (inches):	ous Inspections		

WETLAND DETERMINATION	N DATA FORM -	Northcentral and Northe	ast Region
Project/Site: Zim Site Applicant/O	wner: PolyMet Mining City/C	County: St. Louis State: MN Sam	ppling Date: 04/13/16
Investigator(s): KMS2 Section:	<u>2+</u> Town	nship: <u>55</u> Range: <u>18W</u> San	npling Point: 102 East Wetland
Land Form: Terrace Local Relie	f: None Slope	e %: 0 Soil Map Unit Name: B14A Gree	nwood Soils, Upham Basin, 0-1%
Subregion (LRR): K Latitude:	<u>5235574</u> Longi	itude: 530517 Datum: NAD 83	
Cowardin Classification: PFO24 Circular 39	Classification: Type 7	Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year	? <u>Yes</u> (If no, explain in re	emarks) Eggers & Reed (primary):	Coniferous Swamp
Are vegetation No Soil No Hydrology No	cianiticantly dicturhod?	normal Yes Eggers & Reed (secondary): mstances" Eggers & Reed (tertiany):	
	naturally problematic?	Lyyers a Need (tertiary).	
	· ·		Santuman ata
SUMMARY OF FINDINGS - Attach site map sh			reatures, etc.
Hydrophytic vegetation present? Yes General Remar Hydric soil present? Yes (explain any an	l l	I N02.	
Hydric soil present? Yes (explain any an. Indicators of wetland hydrology present? Yes Yes	SWC13		
	Wetland Site ID: NW5		
VEGETATION			
		dicator 50/20 Thresholds:	<u>20%</u> <u>50%</u>
Tree Stratum (Plot Size: 30 ft		dicator <u>50/20 Triresholds.</u> atus Tree Stratum	11 27.5
· · · · · · · · · · · · · · · · ·	,	Sanling/Shruh Stratum	$\frac{11}{6}$ $\frac{27.5}{15}$
Picea mariana Leriy leriana	30 Yes Yes Yes	FACW Herb Stratum	5 12.5
Larix laricina .	0 165	Woody Vine Stratum	0 0
4.	0	Dominance Test Worksheet:	
Total Cover:	<u>55</u>	Number of Dominant Species	E (A)
Sapling/Shrub Stratum (Plot Size: 15 ft)	That Are OBL, FACW or FAC:	5 <i>(A)</i>
1. Picea mariana	15 Yes	FACW Total Number of Dominant Species Across All Strata:	5 <i>(B)</i>
2. Larix laricina	15 Yes	FACW Percent of Dominant Species	
3.	0	That Are OBL, FACW or FAC:	100.00% (A/B)
4.		Prevalence Index Worksheet:	
5. Total Cover:	30	Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft	<u>30</u>	OBL Species 25	X 1 25
Ledum groenlandicum	25 Yes	OBL FACW Species 85	X 2 170
2.	0 100	FAC Species 0	X 3 0
3.	0	FACU Species 0	X 4 0
4.	0	UPL Species 0	X 5 0
5.	0	Column Totals: 110	(A) 195 (B)
6	0 0	Prevalence Index =	B/A = 1.77
8.	0	Hydrophytic Vegetation Indicators:	
Total Cover:	<u>25</u>	Yes Rapid Test for Hydroph	ytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft))	Yes Dominance Test is >50	%
1.	0	Yes Prevalence Index ≤ 3.0	• •
2.	0	No Morphological Adaptate in vegetation remarks of	ions [1] (provide supporting data or on a separate sheet)
Total Cover:	<u>0</u>	No Problematic Hydrophyt	ic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cover:	[1] Indicators of hydric soil & wetland h	ydrology must be present, unless
Vegetation Remarks: (include photo numbers here or on a separate	e sheet)	Hydrophytic vegetation present?	<u>Yes</u>
		Ш	

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL Sampling Point: 102 East Wetland

Profile Description: (Describe to the depth needs	ed to document the indicator or confirm the Redox Feature		ators).	
·	% Color (moist) %	Type [1] Loc	[2] Texture	Remarks
1. 0 - 34 10YR 2/1	<u> </u>	,	Oi	
2				-
3			<u></u>	
4				
5				-
[1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand	Grains [2] Loca	ntion: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)		Indicators for Problematic Hydric S	oils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLF	RA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149)	В)	Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R,	MLRA 149B)	5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA	1 <i>149B)</i>	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (Li	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L	2)
☐ Thick Dark Surface (A12)	Depleted Matrix (F3)		☐ Iron-Manganese Masses (F12) (L	.RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or	problematic.	Very Shallow Dark Surface (TF12	e) remarks)
Restrictive Layer (if present): Type:	Depth (inches)	:	Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; ch	eck all that apply)	Se	econdary Indicators (minimum of two re	quired)
	Water-Stained Leaves (B9)		Surface Soil Cracks (B6)	FAC-Neutral Test (D5)
✓ Surface Water (A1) ☐ High Water Table (A2)	Aquatic Fauna (B13)		Drainage Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)		Moss Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odor (C1)		Dry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living I	Roots (C3)	Crayfish Burrows (C8)	
Drift Deposits (B3)			Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)		Stunted or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled So	ils (C6)	Geomorphic Position (D2)	
	Thin Muck Surface (C7)		Shallow Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)		Microtopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrological	pgy present? Yes
Surface water present?	✓ Surface Water Depth (inches):	1	Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
, , , , , , , , , , , , , , , , , , , ,		evious Inspection	ns	

	WE	ETLAN	D DETE	ERM	INATION	I DATA	FORM	1 - North	ncentral and	d Northe	ast Re	gion	
Proj	ect/Site:	Zim Site			Applicant/Ou	ner: PolyMet	Mining C	City/County: St.	Louis State	: <u>MN</u> San	npling Date: (05/10/12	
Inve	estigator(s): <u>K</u>	MS2, TPT			Section:	<u>26+</u>		Township: 55	Rang	ge: <u>18W</u> San	npling Point:	<u> </u>	
		Terrace			Local Relief:	None		Slope %: <u>0</u>	Soil Map Unit Nar	ne: B14A Gree	nwood Soils, L	Jpham Basii	n, 0-1%
Sub	region (LRR):	<u>——</u>			Latitude:	5233808		Longitude: <u>5</u>)60 <i>Datu</i>	<i>m:</i> NAD 83			
	vardin Classific	55	O2,4D		Circular 39 C		Type 7	<u></u> -	Mapped NWI (
				nical for	this time of year?		(If no, explain	n in romarke)	Eggers & Ree		Coniferous Sv	wamn	
		No <i>Sc</i>		Hydrol	_	Yes ignificantly dist	urbod?	Are "normal	Yes Eggers & Ree	4 37	Corillerous 3	<u>varrip</u>	
	_			,				circumstances" present?	Eggers & Ree				
	_	<u>No</u> So	_	Hydrol		nturally problen				d (quaternary):			
SUN	MARY O	F FINDIN	VGS - Atta	ich si	te map sho	owing sar	npling po	oint location	ons, transects,	important	features,	etc.	
Hya India Is th	rophytic vegeta tric soil present's cators of wetlan e sampled area	? nd hydrology p a within a wet	present?	Yes Yes Yes Yes	General Remark. (explain any ansi if needed): If yes, optional l	wers	iated with Wel	l N11					
VE(GETATIO	N											
						Absolute	Dominant	Indicator	50/20 Thresholds			<u>20%</u>	<u>50%</u>
	Tree Stratum	1	(Plot Size:	<u>30 ft</u>	j	% Cover	Species?	<u>Status</u>	Tree Stratum			10	25
1.	Larix laricina	1				30	Yes	FACW	Sapling/Shrub Str	ratum	_	6	15
2.	Picea mariar					20	Yes	FACW	Herb Stratum		=	17	42.5
3.						0			Woody Vine Strat	um	=	0	0
4.						0			Dominance Test l	Norksheet:			
					Total Cover:	<u>50</u>			Number of Domin			7 <i>(A</i>)	
	Sapling/Shru	b Stratum	(Plot Size:	<u>15 ft</u>	j)			That Are OBL, FA				
1.	Larix laricina	1				20	Yes	FACW	Total Number of L Species Across A			7 <i>(B)</i>	
2.	Picea marian	าล				10	Yes	FACW	Percent of Domin			_	
3.						0			That Are OBL, FA		100.00	% (A/B)	
4.						0			Bravalance Index	Markahaati			
5.						0			Prevalence Index				
					Total Cover:	<u>30</u>			Total % Co	10	X 1	lultiply by:	10
	Herb Stratum	1	(Plot Size:	<u>5 ft</u>	J	1			OBL Species		•		
1.	Rubus idaeu	IS				25	Yes	FAC	FACW Species	120	X 2		40
2.	Larix laricina					20	Yes Yes	FACW	FAC Species	35	X 3	1	05
3.	Picea marian					20	No	FACW	FACU Species	0	X 4		0
4.	Matteuccia s	<u> </u>				10	No	FAC OBL	UPL Species	0	X 5		0
5. 6.	Betula pumila	<u>а</u>				0	INO	UBL	Column Totals:	165	(A)	3	55 (B)
7.						0			Pre	evalence Index =	B/A =	2.	15
8.						0			Hydrophytic Veget	tation Indicators			
0.					Total Cover:	<u>85</u>			No Rapid	Test for Hydroph	ytic Vegetati	on	
	Woody Vine S	Stratum	(Plot Size:	30 ft	1	<u> </u>				ance Test is >50			
1.	vine		1	<u> </u>		0			Yes Prevale	ence Index ≤ 3.0	[1]		
1. 2.						0				ological Adaptat			ting data
۷.					Total Cover:	<u>0</u>			,	etation remarks o matic Hydrophy	•	,	n)
% P	are Ground in	Herh Stratu	m·		. 0.01 00701	v % Sphagnum	Moss Cover		[1] Indicators of hydr	ic soil & wetland h	•		•
				- .							.,,		
Veg	etation Remar	rks: (include	photo number	's here o	or on a separate	sheet)			Hydrophytic vegeta	ation present?	<u>Yes</u>		

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL Sampling Point: NW6

Profile Description: (Describe to the depth nee	ded to document the indicator or confirm the a		ators).	
(inches) Color (moist)		Гуре [1] Loc	[2] Texture	Remarks
1. 0 - 24 10YR 2/1	100		Oe	
2				
3				<u> </u>
4				
6				-
[1] Type: C=Concentration, D=Depletion, RM=F	Reduced Matrix, CS=Covered or Coated Sand G	rains [2] Loca	tion: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)		Indicators for Problematic Hydric Sc	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR	A 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B,	")	Coast Prairie Redox (A16) (LRR I	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, I	MLRA 149B)	5 cm Mucky Peat or Peat (S3) (LF	RR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA	149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LF	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)
Thick Dark Surface (A12)	Depleted Matrix (F3)		☐ Iron-Manganese Masses (F12) (L	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A)	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlan	d hydrology must be present, unless disturbed or p	oroblematic.	Very Shallow Dark Surface (TF12)) remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; of	check all that apply)	Se	condary Indicators (minimum of two re	quired)
Surface Water (A1)	Water-Stained Leaves (B9)		Surface Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		Drainage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Moss Trim Lines (B16)	
☐ Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)		Dry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Re	oots (C3)	Crayfish Burrows (C8)	
Drift Deposits (B3)	Dragging of Dadward ken (CA)		Saturation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	(C()	Stunted or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled Soil. Thin Muck Surface (C7)	3 (00)	Geomorphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)		Shallow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Ошег (ехріаш штетіатхз)		Microtopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolo	gy present? Yes
Surface water present?	Surface Water Depth (inches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):		Three years of monitoring data.	This wetland is partially drained.
Saturation present? (includes capillary fringe)	Saturation Depth (inches):	9.8		
	Monitoring Well Stream Gauge Pre	vious Inspection	s	
Hydrology Remarks:				

WETLAND DETERMINATION	DATA FOR	RM - North	central and Northeas	st Region
Project/Site: Zim Site Applicant/Own	ner: PolyMet Mining	City/County: St. I	Louis State: MN Samplir	ng Date: 05/10/12
Investigator(s): KMS2, TPT Section:	<u>26+</u>	Township: 55	Range: <u>18W</u> Samplii	ng Point: SW5
<u> </u>	None	Slope %: <u>0</u>	Soil Map Unit Name: B14A Greenwo	ood Soils, Upham Basin, 0-1%
Subregion (LRR): K Latitude:	5228993	Longitude: 5306	70 Datum: NAD 83	
Cowardin Classification: PFO2,4D Circular 39 Ci	lassification: Type 7		Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, ex	plain in remarks)	Eggers & Reed (primary): Con	niferous Swamp
	gnificantly disturbed?	Are "normal circumstances"	Yes Eggers & Reed (secondary): Eggers & Reed (tertiary):	.
Are vegetation No Soil No Hydrology No nat	urally problematic?	present?	Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Attach site map sho		noint locatio		aturas atc
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland? Yes General Remarks (explain any answ if needed): Yes If yes, optional W	Associated with			
VEGETATION				
	Absolute Domina	_	50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: 30 ft)	<u>% Cover</u> <u>Species</u>	s? <u>Status</u>	Tree Stratum	12 30
1. Abies balsamea	30 Yes	FAC	Sapling/Shrub Stratum Herb Stratum	$\frac{6}{18}$ $\frac{15}{45}$
2. Larix laricina	30 Yes	FACW	Woody Vine Stratum	$\frac{10}{0}$ $\frac{10}{0}$
3.	0		Dominance Test Worksheet:	
4. Total Cover:	0		Number of Dominant Species	
Sapling/Shrub Stratum (Plot Size: 15 ft)	<u>60</u>		That Are OBL, FACW or FAC:	4 (A)
Abies balsamea	25 Yes	FAC	Total Number of Dominant Species Across All Strata:	4 (B)
2. Ledum groenlandicum	5 No	OBL	Percent of Dominant Species	
3.	0		That Are OBL, FACW or FAC:	100.00% (A/B)
4.	0		Prevalence Index Worksheet:	
5.	0			Markinghama
Total Cover:	<u>30</u>		Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft)		1	OBL Species	<u> </u>
1. Rubus idaeus	75 Yes No	FAC	1 AON opecies	×3 420
Athyrium filix-femina Mentha arvensis	10 No No	FAC FACW	PAC Species	× 4 0
4.	0	TACW	PACO Species	
5.	0		UPL Species	
6.	0		- Column Totalor	(A) 495 (B)
7.	0		Prevalence Index = B/A	4 = 2.75
8.	0		Hydrophytic Vegetation Indicators:	
Total Cover:	<u>90</u>		No Rapid Test for Hydrophytic	c Vegetation
<u>Woody Vine Stratum</u> (Plot Size: 30 ft)			Yes Dominance Test is >50% Yes Prevalence Index ≤ 3.0 [1]	
1.	0			s [1] (provide supporting data
Z. Tatal Course	0		in vegetation remarks or o	•
Total Cover:	<u>0</u>		No Problematic Hydrophytic \	,
% Bare Ground in Herb Stratum:	% Sphagnum Moss Co	over:	[1] Indicators of hydric soil & wetland hydro disturbed or problematic.	ology must be present, unless
Vegetation Remarks: (include photo numbers here or on a separate s	sheet)		Hydrophytic vegetation present?	<u>Yes</u>

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL Sampling Point: SW5

Profile Description: (Describe to the depth need Depth Matrix	led to document the indicator or confirm the abscence of Redox Features	of indicators).		
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
1 0 - 36 10YR 2/1	100		Oi	
2. 36 - 40 10YR 2/1	100		Oe	
3				
4				
5				
[1] Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coated Sand Grains [2] Location: F	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, o	unless otherwise noted)	Ind	cators for Problematic Hydric Soi	ls [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	l <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K,	L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149	<i>PB)</i>	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	<i>ILRA 149B)</i>
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	I hydrology must be present, unless disturbed or problemati	c.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; ca	heck all that apply)	Seconda	y Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surfac	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)	Draina	age Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)	Moss	Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Dry-S	eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayfi	sh Burrows (C8)	
Drift Deposits (B3)		Satura	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	Stunte	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in Tilled Soils (C6)	Geom	orphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)	Shallo	w Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	Micro	opographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	y present? Yes
Surface water present?	Surface Water Depth (inches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):		Four years of monitoring data. On hydrology criteria. Partially draine	
Saturation present? (includes capillary fringe)	Saturation Depth (inches): 17		nyurology ontona. i artially urallie	a welland.
Recorded Data: Aerial Photo 🗸 M	onitoring Well Stream Gauge Previous Ins	pections	<u> </u>	
Hydrology Remarks:				

Appendix E Site Photographs

Zim Wetland Mitigation Site - Photographs Wetland NW1



South edge of field N01, east-west public ditch M04, view west, 11/4/2014



South edge of field N02, east-west public ditch M04, view east, 11/4/2014



Southwest corner of field N09, view northeast, 7/8/2015



Southwest corner of field N15, public ditch PL01, view east, 7/8/2015



North edge of fields N07 and N08, public ditch L07view east, 10/21/2015



South side of field N15, private ditch, view east, 10/21/2015



Drain tile along west edge of field N12, private ditch, view west, 5/9/2012



At monitoring Well N8, view south, 7/12/2013



At monitoring Well N8, view east, 10/25/2013



At monitoring Well N6, view east, 11/4/2014



At monitoring Well N6, view west, 10/21/2015



View east towards Wetland NW5, 4/13/16

Drained wetland



Drained Wetland at Well N11, view north, 11/4/2014



Drained Wetland at Well N11, view west, 11/4/2014



North-south ditch between field S01 and S02, view north, 7/26/2012



Wetland SW2, south edge of field S01, public ditch M07, view west, 10/21/2015



Wetland SW2, south edge of field S02, public ditch M07, view east, 10/21/2015



View south-southeast along edge of Wetland SW3, 4/13/2016



View south along edge of Wetland SW3, 7/26/2012



View southwest at Well S5, 10/21/2015



View west at Well S5, 7/8/2015

County Ditch



County Ditch parallel to County Road 7, view north, 7/8/2015



County Ditch parallel to County Road 7, view south, 7/8/2015



Well S2, view east, 7/12/13



Well S2, view east, 10/21/15

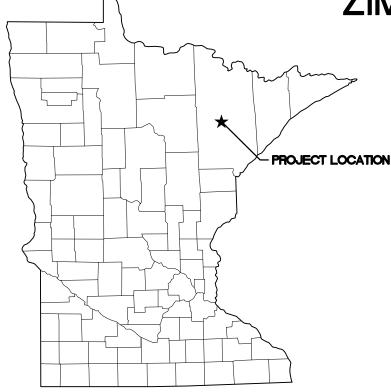
Appendix F

Wetland Mitigation Plan Drawings

POLYMET

ZIM SOD WETLAND MITIGATION PLANS

ZIM, MINNESOTA



STATE MAP

CALL 48 HOURS BEFORE DIGGING GOPHER STATE ONE CALL
TWIN CITIES AREA 651-454-0002
MN TOLL FREE 1-800-252-1166

INDEX

Sheet No.

TS-001 TITLE SHEET, PROJECT SITE, STATE MAP, VICINITY MAP, LEGEND AND INDEX OF SHEETS CS-001 EXISTING CONDITIONS AND CULVERT SCHEDULE NORTH UNIT - FIELDS NO1 - NO6 CS-002 EXISTING CONDITIONS AND CULVERT SCHEDULE NORTH UNIT - FIELDS NO7 - N16 CS-003 EXISTING CONDITIONS AND CULVERT SCHEDULE NORTH UNIT - FIELDS N14 - N18 CS-004 EXISTING CONDITIONS AND CULVERT SCHEDULE SOUTH UNIT - FIELDS S01 - S03

VER DATE

CS-005 NORTH UNIT PLAN - FIELDS NO1 TO NO6 CS-006 NORTH UNIT PLAN - FIELDS NO7 TO N16 CS-007 NORTH UNIT PLAN - FIELDS N14 TO N18 CS-008 SOUTH UNIT PLAN - FIELDS S01 TO S03

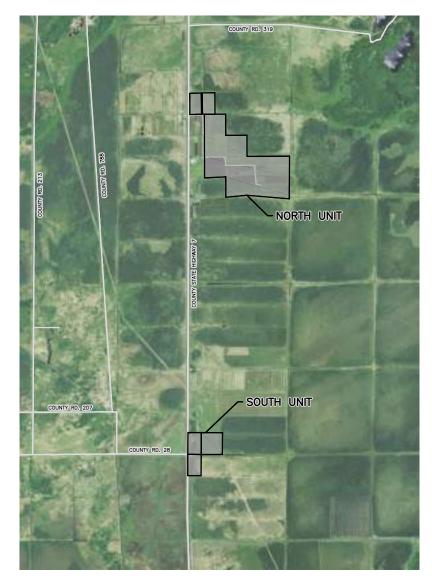
CS-009 NORTH UNIT - SECTIONS 1 TO 27 CS-010 . . . NORTH UNIT - SECTIONS 28 TO 62

CS-011 SOUTH UNIT - SECTIONS 63 TO 78 CS-012 . . . TYPICAL DETAILS

CS-013 STORMWATER POLLUTION PREVENTION PLAN - NORTH UNIT CS-014 STORMWATER POLLUTION PREVENTION PLAN - SOUTH UNIT

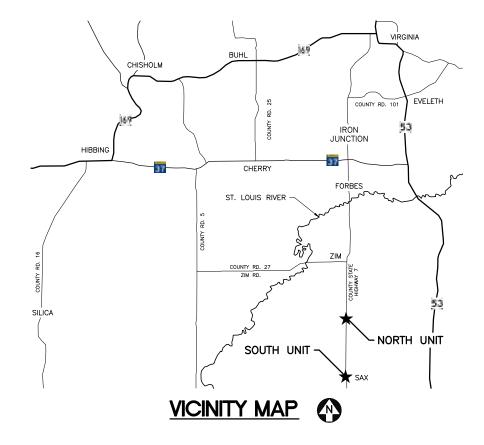
CS-015 . . . STORMWATER POLLUTION PREVENTION (SWPPP)

CS-016 EROSION CONTROL DETAILS



PROJECT SITE (A)

DESCRIPTION



LEGEND

MAJOR CONTOUR MINOR CONTOUR DRAIN TILES ROAD EDGE OVERHEAD POWER LINE UNDERGROUND PETRO LINE BORROW AREA RIGHT OF WAY (ROW) CULVERT DITCH POWER POLE 0 NATURAL GAS POST

ARANDONED DITCH

77777

BASIS OF DRAWING FILE: DATE OF SURVEY: 11-24-2010 ORIGIN/DATE OF BASE: 11-24-2010 COORDINATE SYSTEM: ST. LOUIS COUNTY CENTRAL HORIZONTAL DATUM: NAD83(1996) VERTICAL DATUM: NAVD88

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION TITLE SHEET, PROJECT SITE, STATE MAP, VICINITY MAP, LEGEND AND INDEX OF SHEETS

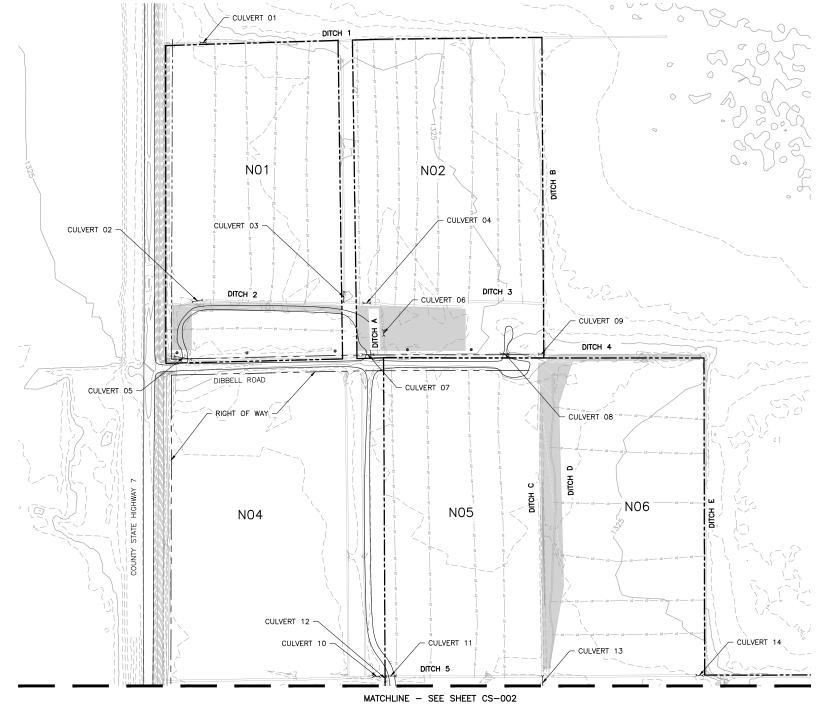
POLY MET MINING, INC. NORTHMET PROJECT

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. Ph: 1-800-632-2277

VERSION ISSUED DATE POLYMET DRAWN: HOYT LAKES, MINNESOTA CMB2 CHECKED: FOR CONSTRUCTION ARR PROJECT NO. BARR GNATURE _ NOT APPROVED FOR CONSTRUCTION AS SHOWN TS-001

ISSUE STATUS





CULVERT UNIT DITCH LENGTH ACTION 14.3 REMOVE 01 NORTH 35.9 REMOVE 38.9 REMOVE 03 NORTH 25.2 REMOVE 05 NORTH 64.8 NONE 06 NORTH 18.3 REMOVE 4 41.2 NONE 07 NORTH NORTH 09 NORTH 18.3 REMOVE 10 NORTH 24.6 NONE 11 NORTH 36.6 REMOVE 12 NORTH 10.4 REMOVE 14 NORTH 5 22.9 REMOVE 15 NORTH 40.6 REMOVE 16 NORTH G 36.7 REMOVE 17 NORTH 6 20.5 REMOVE 18 NORTH 6 40.9 REMOVE 19 NORTH H 22.6 REMOVE

22	NORTH	K	33.2	REMOVE
23	NORTH	7	27.4	REMOVE
24	NORTH	M	57.2	REMOVE
25	NORTH	8	25.3	REMOVE
26	NORTH	-	22.8	REMOVE
27	NORTH	P	19.5	REMOVE
28	NORTH	-	26.3	NONE
29	NORTH	9	21.7	REMOVE
30	NORTH	9	18.3	REMOVE
31	NORTH	K	33.8	REMOVE
32	NORTH	N	27.5	REMOVE
33	NORTH	10	25.4	REMOVE
34	NORTH	Q	25.2	REMOVE
35	NORTH	11	35.5	REMOVE
36	NORTH	13	18.4	REMOVE
37	SOUTH	15	21.3	REMOVE
38	SOUTH	16	26.7	REMOVE
39	SOUTH	15	17.8	REMOVE

CULVERT UNIT DITCH LENGTH ACTION 20 NORTH K 29.6 REMOVE

21 NORTH K 17.1 REMOVE

2 TABLE: EXISTING CULVERTS
SEE NOTE 4

- 1. EXISTING CONTOURS OF EXISTING GROUND DEVELOPED FROM MN-DNR 2012 LIDAR SURVEY, AND SURVEY DATED 11/24/2010.
- 2. INDEX CONTOURS SHOWN AT 10' INTERVALS, INTERMEDIATE CONTOURS SHOWN AT 2' INTERVALS
- 3. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
- 4. LENGTH OF CULVERTS LISTED ON TABLE 2 ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY LOCATION AND ACTUAL LENGTH.



VER NO	DATE	DESCRIPTION	ISSUE STATUS						
			ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN.			
			FOR PERMITTING			SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER	DRAWN: CMB2		
						UNDER THE LAWS OF THE STATE OF MINNESOTA.	CHECKED:		
]						
			FOR CONSTRUCTION		FOR CONSTRUCTION		l	PRINTED NAME	BARR PROJECT NO.:
						SIGNATURE	23/69-0029		
			NOT APPROVED FOR CONSTRUCTION			DATE LICENSE#	SCALE:		
]				AS SHOWN		

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION EXISTING CONDITIONS AND CULVERT SCHEDULE NORTH UNIT - FIELDS NO1 - NO6

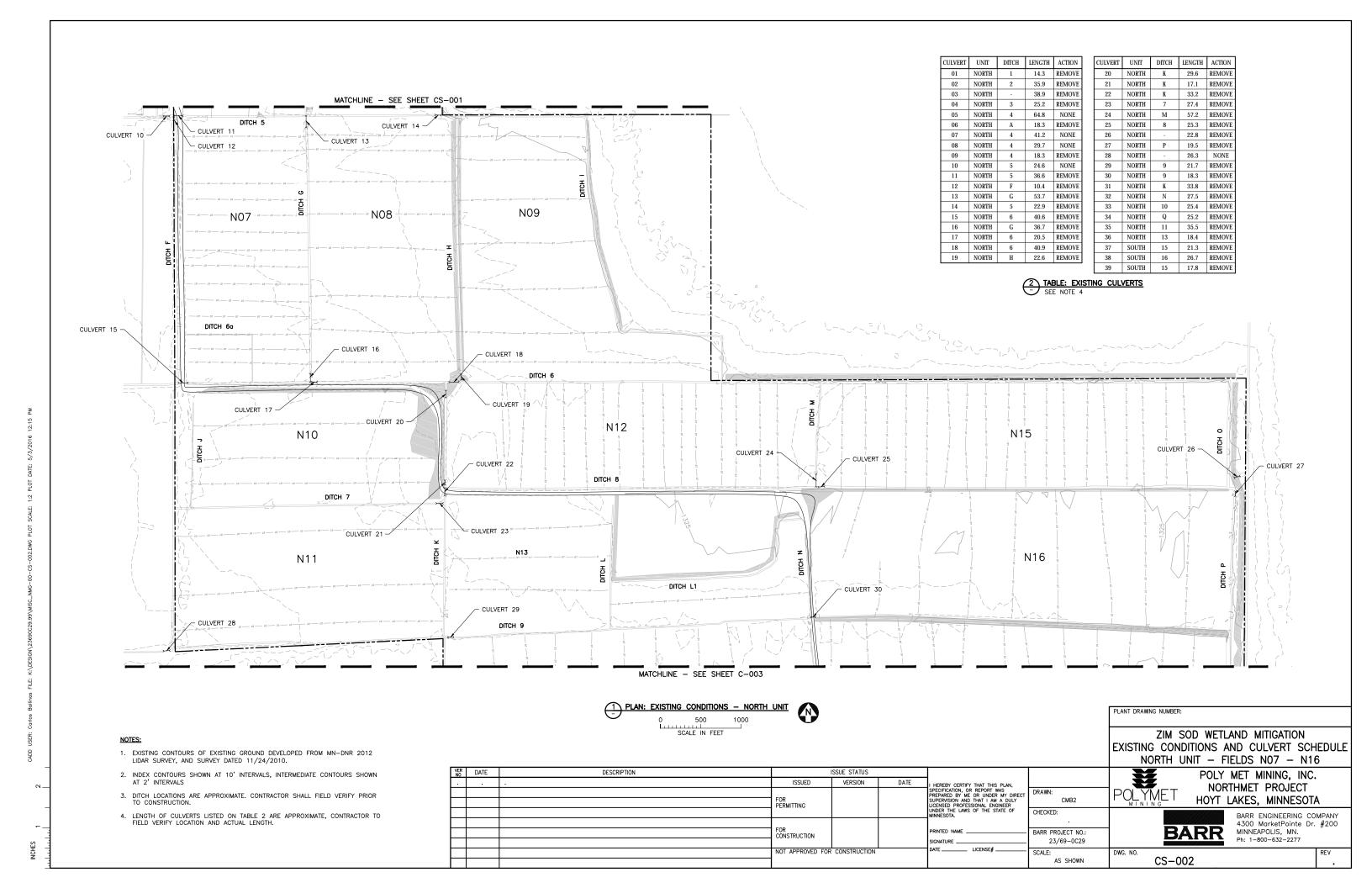


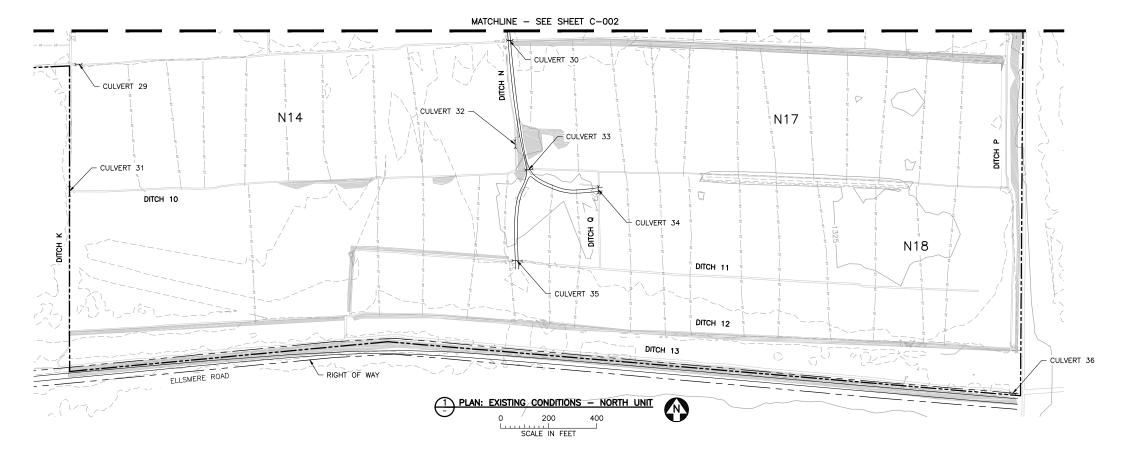
POLY MET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA



BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. Ph: 1-800-632-2277

CS-001





- EXISTING CONTOURS OF EXISTING GROUND DEVELOPED FROM MN-DNR 2012 LIDAR SURVEY, AND SURVEY DATED 11/24/2010.
- 2. INDEX CONTOURS SHOWN AT 10' INTERVALS, INTERMEDIATE CONTOURS SHOWN AT 2' INTERVALS
- 3. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
- 4. LENGTH OF CULVERTS LISTED ON TABLE 3 ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY LOCATION AND ACTUAL LENGTH.SEE SHEET CS-012 FOR CULVERT REMOVAL DETAIL.

CULVERT	UNIT	DITCH	LENGTH	ACTION		CULVERT	UNIT	DITCH	LENGTH	ACTION
01	NORTH	1	14.3	REMOVE		20	NORTH	K	29.6	REMOVE
02	NORTH	2	35.9	REMOVE		21	NORTH	K	17.1	REMOVE
03	NORTH	-	38.9	REMOVE		22	NORTH	K	33.2	REMOVE
04	NORTH	3	25.2	REMOVE		23	NORTH	7	27.4	REMOVE
05	NORTH	4	64.8	NONE		24	NORTH	M	57.2	REMOVE
06	NORTH	A	18.3	REMOVE		25	NORTH	8	25.3	REMOVE
07	NORTH	4	41.2	NONE		26	NORTH	-	22.8	REMOVE
08	NORTH	4	29.7	NONE		27	NORTH	P	19.5	REMOVE
09	NORTH	4	18.3	REMOVE		28	NORTH	-	26.3	NONE
10	NORTH	5	24.6	NONE		29	NORTH	9	21.7	REMOVE
11	NORTH	5	36.6	REMOVE		30	NORTH	9	18.3	REMOVE
12	NORTH	F	10.4	REMOVE		31	NORTH	K	33.8	REMOVE
13	NORTH	G	53.7	REMOVE		32	NORTH	N	27.5	REMOVE
14	NORTH	5	22.9	REMOVE		33	NORTH	10	25.4	REMOVE
15	NORTH	6	40.6	REMOVE		34	NORTH	Q	25.2	REMOVE
16	NORTH	G	36.7	REMOVE		35	NORTH	11	35.5	REMOVE
17	NORTH	6	20.5	REMOVE		36	NORTH	13	18.4	REMOVE
18	NORTH	6	40.9	REMOVE		37	SOUTH	15	21.3	REMOVE
19	NORTH	Н	22.6	REMOVE		38	SOUTH	16	26.7	REMOVE
					'	39	SOUTH	15	17.8	REMOVE

2 TABLE: EXISTING CULVERTS
SEE NOTE 4

ZIM SOD WETLAND MITIGATION EXISTING CONDITIONS AND CULVERT SCHEDULE NORTH UNIT - FIELDS N14 - N18

PLANT DRAWING NUMBER:

POLYMET

	VER NO	DATE	DESCRIPTION		ISSUE STATUS			
ſ				ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN,	
ŀ				FOR			SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY	DRAWN: CMB2
İ				PERMITTING			LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.	CHECKED:
ŀ				FOR			PRINTED NAME	BARR PROJECT NO.:
ł				CONSTRUCTION			SIGNATURE	23/69-0029
				NOT APPROVED FOR CONSTRUCTION			DATE LICENSE#	SCALE:
ſ								AS SHOWN

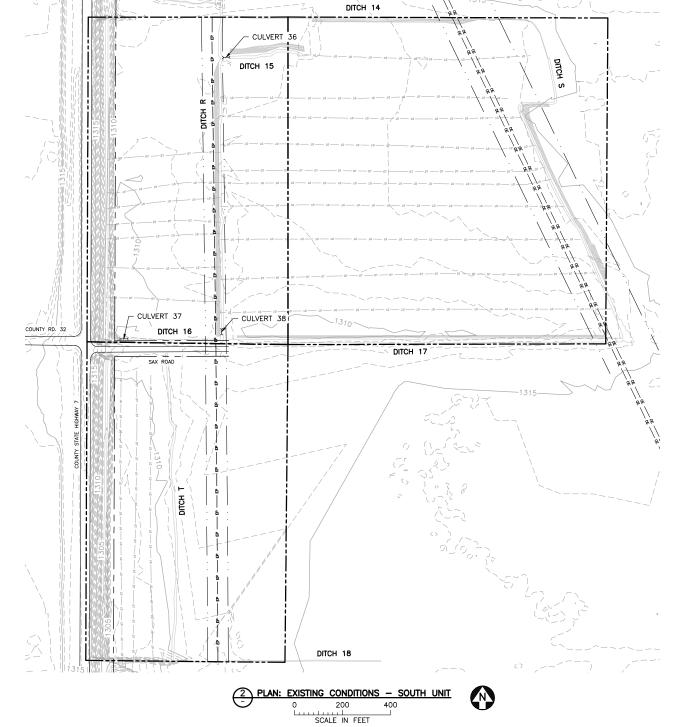
BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. **BARR** Ph: 1-800-632-2277

POLY MET MINING, INC. NORTHMET PROJECT

HOYT LAKES, MINNESOTA

CS-003

 EXISTING CONTOURS OF EXISTING GROUND DEVELOPED FROM MN-DNR 2012 LIDAR SURVEY, AND SURVEY DATED 11/24/2010. 2. INDEX CONTOURS SHOWN AT 10' INTERVALS, INTERMEDIATE CONTOURS SHOWN AT 2' INTERVALS 3. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION. 4. LENGTH OF CULVERTS LISTED ON TABLE 2 ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY LOCATION AND ACTUAL LENGTH.



CULVERT UNIT DITCH LENGTH ACTION CULVERT UNIT DITCH LENGTH ACTION 01 NORTH 1 14.3 REMOVE 03 NORTH 38.9 REMOVE NORTH 64.8 NONE NORTH 06 NORTH A 18.3 REMOVE 07 NORTH 4 41.2 NONE 08 NORTH 09 NORTH 10 NORTH 5 24.6 NONE NORTH 36.6 REMOVE 12 NORTH 13 NORTH 14 NORTH 5 22.9 REMOVE 15 NORTH G 36.7 REMOVE 16 NORTH 17 NORTH 6 20.5 REMOVE 18 NORTH 6 40.9 REMOVE H 22.6 REMOVE 19 NORTH

20	NORTH	K	29.6	REMOVE
21	NORTH	K	17.1	REMOVE
22	NORTH	K	33.2	REMOVE
23	NORTH	7	27.4	REMOVE
24	NORTH	M	57.2	REMOVE
25	NORTH	8	25.3	REMOVE
26	NORTH	-	22.8	REMOVE
27	NORTH	P	19.5	REMOVE
28	NORTH	-	26.3	NONE
29	NORTH	9	21.7	REMOVE
30	NORTH	9	18.3	REMOVE
31	NORTH	K	33.8	REMOVE
32	NORTH	N	27.5	REMOVE
33	NORTH	10	25.4	REMOVE
34	NORTH	Q	25.2	REMOVE
35	NORTH	11	35.5	REMOVE
36	NORTH	13	18.4	REMOVE
37	SOUTH	15	21.3	REMOVE
38	SOUTH	16	26.7	REMOVE
39	SOUTH	15	17.8	REMOVE

2 TABLE: EXISTING CULVERTS
SEE NOTE 4

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION EXISTING CONDITIONS AND CULVERT SCHEDULE SOUTH UNIT - FIELDS S01 - S03

VER NO	DATE	DESCRIPTION	i	SSUE STATUS			
			ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN.	
			FOR PERMITTING			SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER	DRAWN: CMB2
			PERMITTING			UNDER THE LAWS OF THE STATE OF MINNESOTA.	CHECKED:
							•
			FOR CONSTRUCTION			PRINTED NAME	BARR PROJECT NO.:
			Constitution			SIGNATURE	23/69-0C29
			NOT APPROVED FOR CONSTRUCTION			DATE LICENSE#	SCALE:
							AS SHOWN

POLY MET MINING, INC. POLYMET

CS-004

NORTHMET PROJECT HOYT LAKES, MINNESOTA

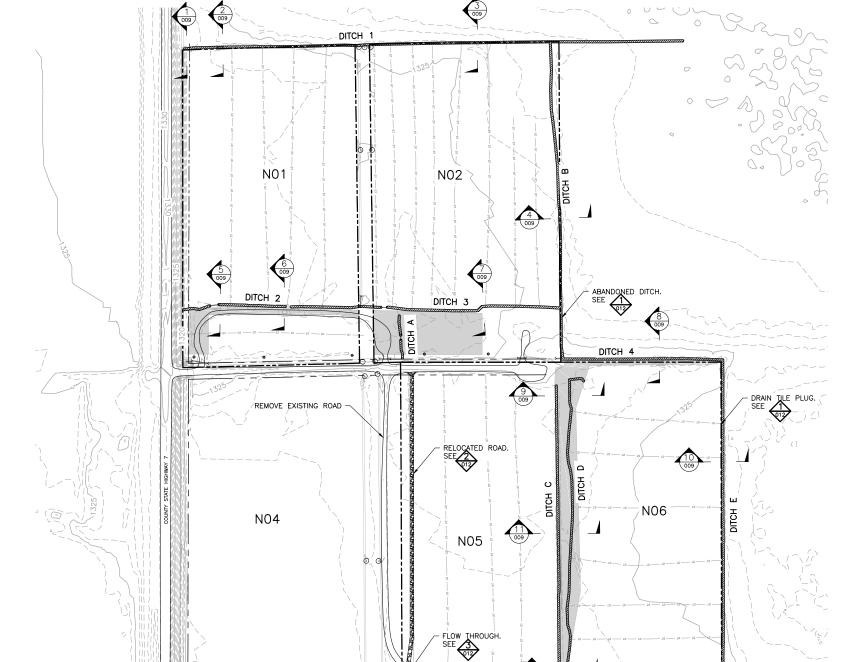
BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. **BARR** Ph: 1-800-632-2277

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.

 CONTRACTOR SHALL FILL THE EXISTING DITCHES WITH MATERIAL FROM THE PILES ADJACENT TO THE DITCHES. DESIGNATED FILL SOURCES ARE IDENTIFIED IN THE PLANS AND SHALL BE ONLY USED WHEN THE EXISTING PILES HAVE BEEN EXHAUSTED.

3. CONTRACTOR SHOULD PROMOTE POSITIVE DRAIN TO THE WEST OF THE SITE OR TO THE NEAREST OPEN DITCH. GRADING OUTSIDE THE DITCH ABANDONMENT AREA SHALL BE MINIMIZED AND ONLY WITH PREVIOUS AUTHORIZATION FROM THE OWNER OR ITS REPRESENTATIVE.

4. FOR EROSION CONTROL FEATURES SEE SHEETS CS-013 TO CS-016



1 PLAN: NORTH UNIT - FIELDS NO1 - NO6 0 200 400 SCALE IN FEET

MATCHLINE - SEE SHEET CS-006

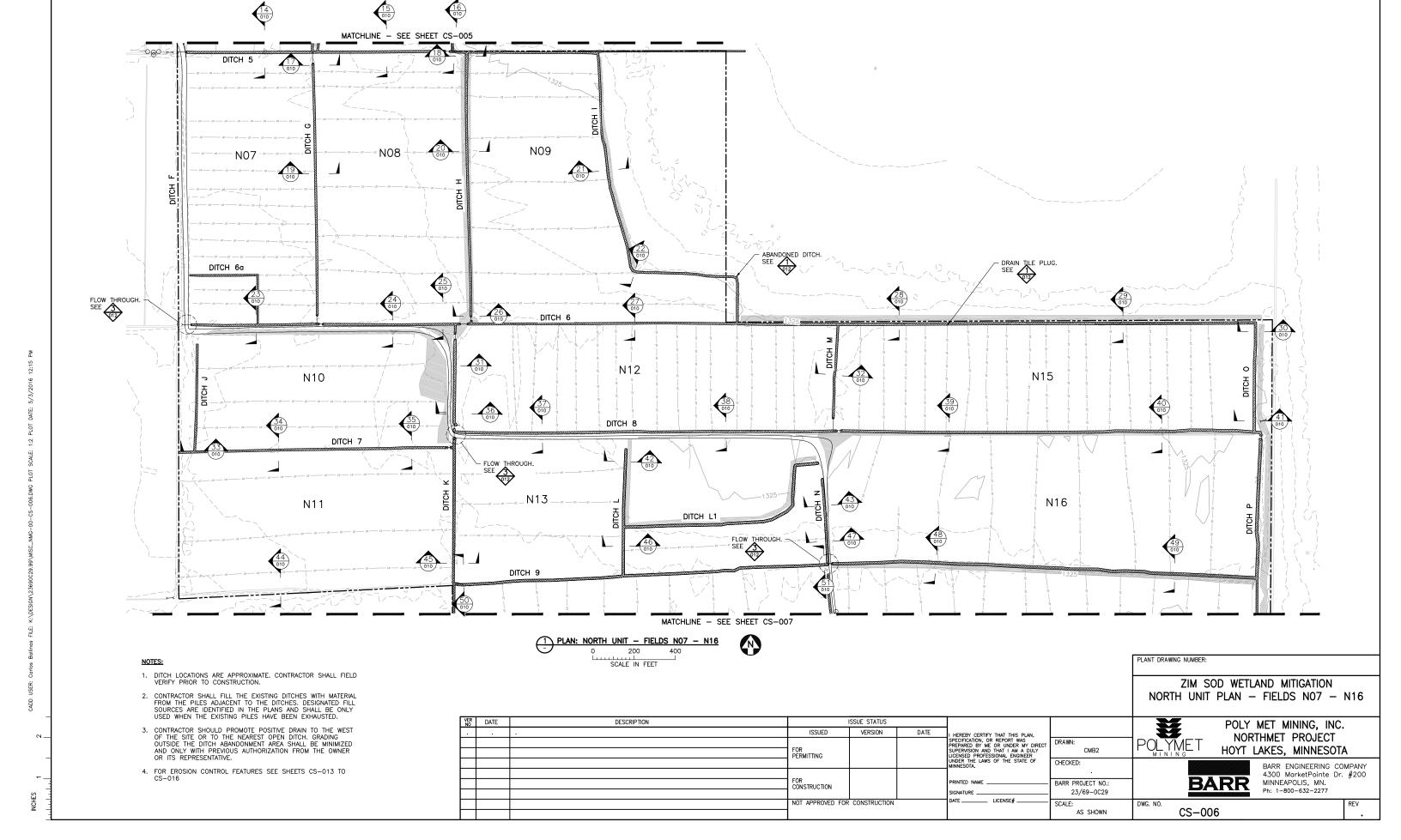
DITCH 5

N

ZIM SOD WETLAND MITIGATION NORTH UNIT PLAN — FIELDS NO1 — NO6

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			ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN.		3	NORTHMET PROJECT		•
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						SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA. PRINTED NAME	CMB2	I OLIVILI MINING	HOYT L	Γ LAKES, MINNESOTA	
							CHECKED:			BARR ENGINEERING CO	MPANY
			FOR CONSTRUCTION				•			4300 MarketPointe Dr.	
							BARR PROJECT NO.:	1 B .		MINNEAPOLIS, MN.	
						SIGNATURE	23/69-0C29			Ph: 1-800-632-2277	
			NOT APPROVED FOR CONSTRUCTION			DATE LICENSE#	SCALE:	DWG. NO.			REV
			1				AS SHOWN	l cs_c	105		



MATCHLINE - SEE SHEET CS-007

N14

DRAIN TILE PLUG.

DITCH 10

FLOW THROUGH.

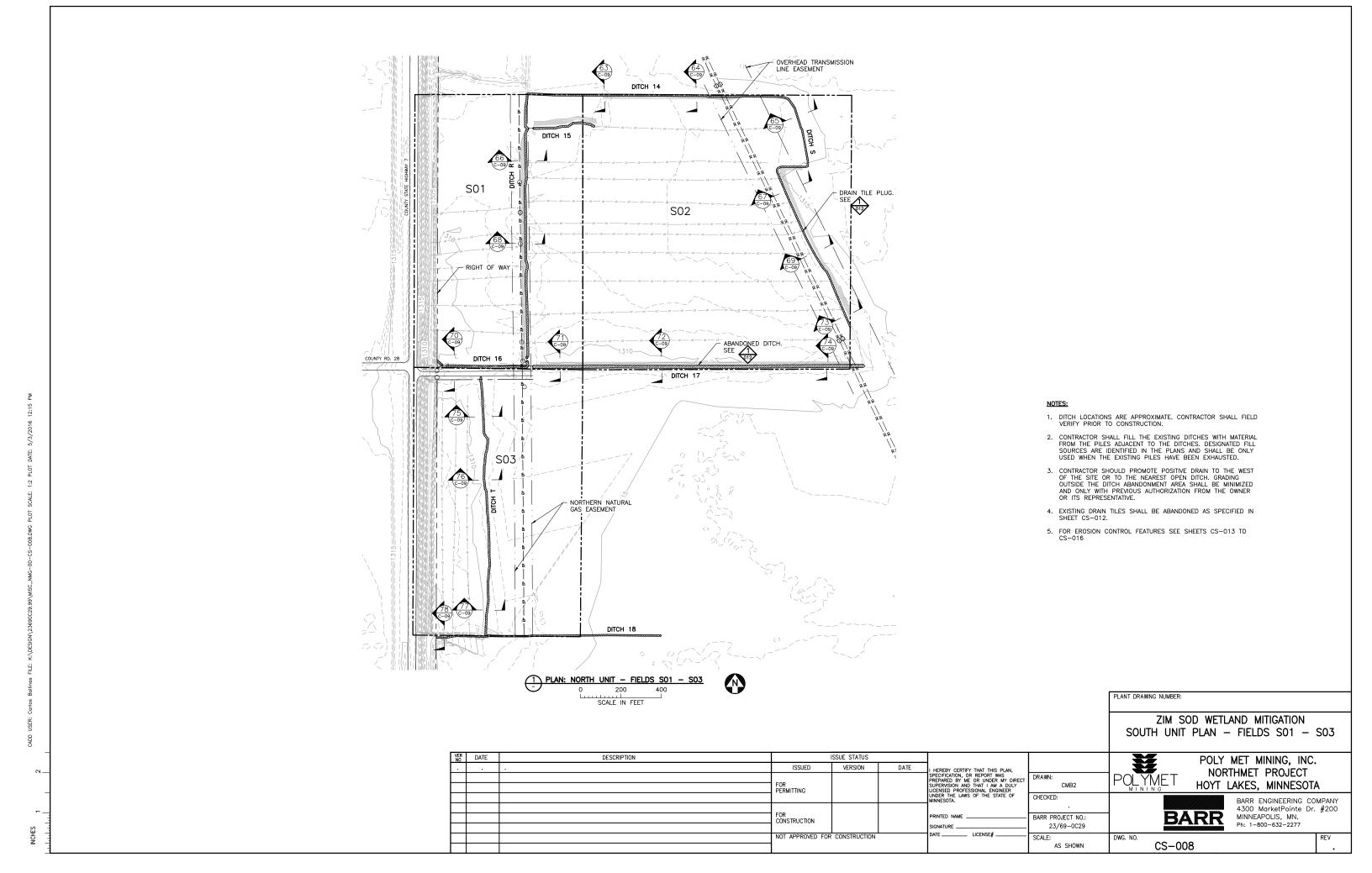
N17

DITCH 11

DITCH 12

DITCH

N18



DESCRIPTION

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ISSUE STATUS

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FOR PERMITTING

FOR CONSTRUCTION

NOT APPROVED FOR CONSTRUCTION

VERSION

DATE

HEREBY CERTIFY THAT THIS PLAN, IPECIFICATION, OR REPORT WAS REPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LOCKISCE PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF

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SIGNATURE ___

DRAWN:

CHECKED:

CMB2

BARR PROJECT NO .:

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POLY MET MINING, INC.

NORTHMET PROJECT

HOYT LAKES, MINNESOTA

MINNEAPOLIS, MN.

Ph: 1-800-632-2277

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200

POLYMET

BARR

CS-009

CADD USER: Carlos Ballinas FILE: K:\DESIGN\23690C29.99\MISC_NMG_00-CS-009.DWG PLOT SCALE: 1:2 PLOT DATE: 5/3/2016 12:15 F

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1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.

 CROSS SECTIONS SHOWN MAY BE DIFFERENT THAN THE ACTUAL CONDITIONS OF THE DITCHES AT THE TIME OF CONSTRUCTION. CONTRACTOR SHALL FIELD VERIFY AND INFORM THE ENGINEER IF DITCH CONDITIONS ARE SUBSTANTIALLY DIFFERENT.

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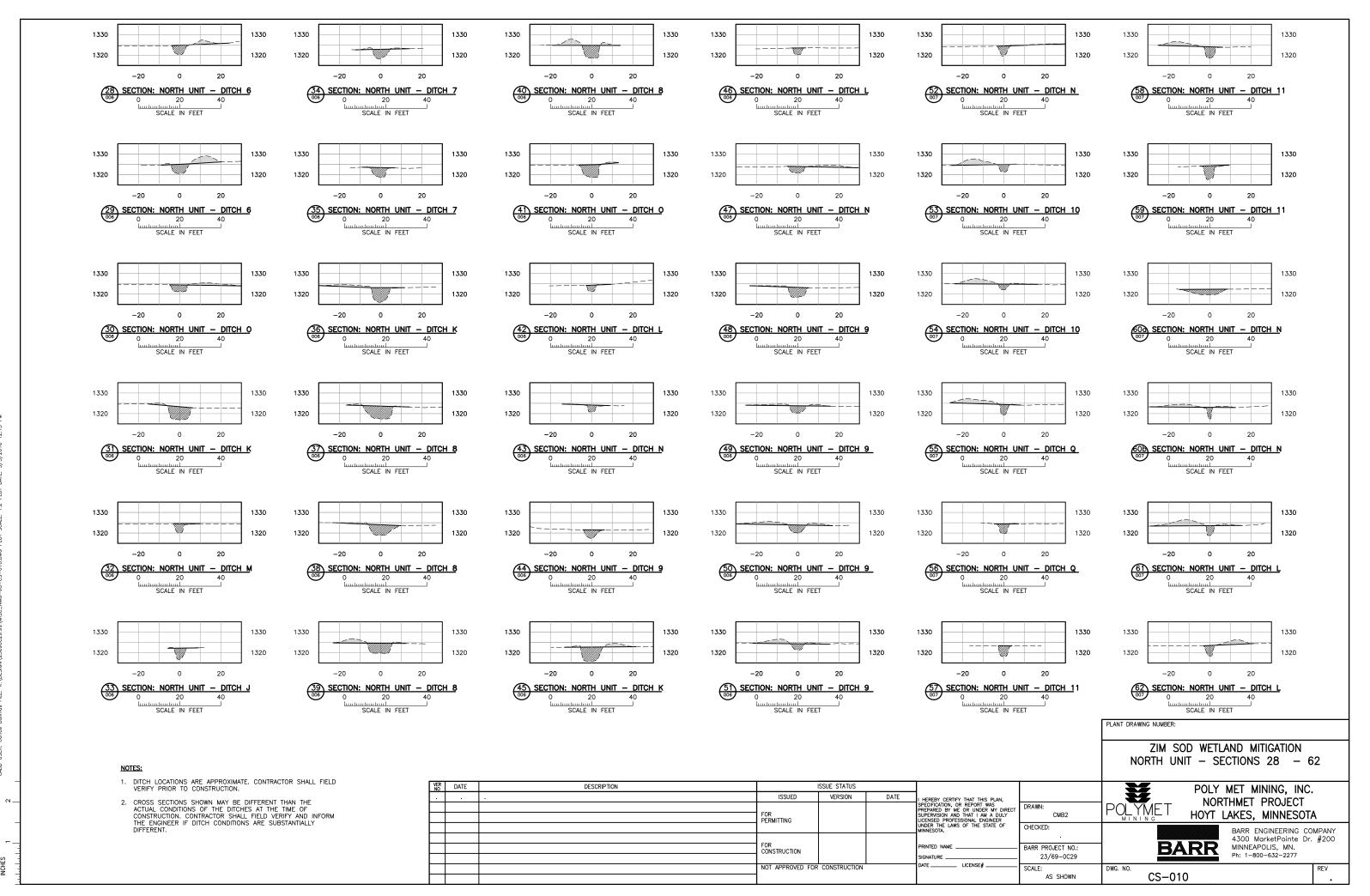
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- 1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
- CROSS SECTIONS SHOWN MAY BE DIFFERENT THAN THE ACTUAL CONDITIONS OF THE DITCHES AT THE TIME OF CONSTRUCTION. CONTRACTOR SHALL FIELD VERIFY AND INFORM THE ENGINEER IF DITCH CONDITIONS ARE SUBSTANTIALLY DIFFERENT.

VER DATE DESCRIPTION ISSUE STATUS I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA. VERSION DATE ISSUED DRAWN: FOR PERMITTING CHECKED: FOR CONSTRUCTION RINTED NAME BARR PROJECT NO.: 23/69-0029 SIGNATURE ____ NOT APPROVED FOR CONSTRUCTION SCALE:

PLANT DRAWING NUMBER:

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AS SHOWN

ZIM SOD WETLAND MITIGATION SOUTH UNIT - SECTIONS 63 - 78

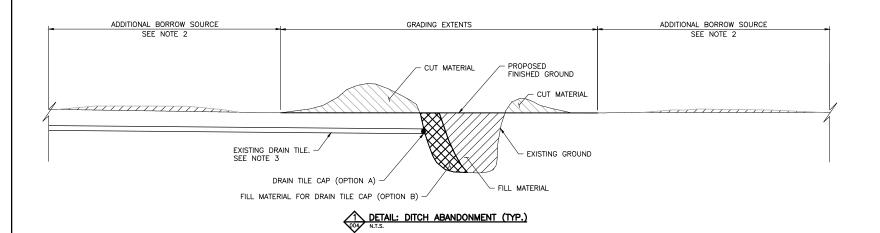
> POLY MET MINING, INC. NORTHMET PROJECT

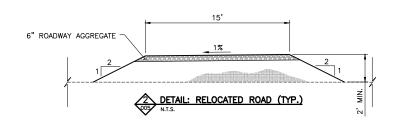
POLYMET HOYT LAKES, MINNESOTA

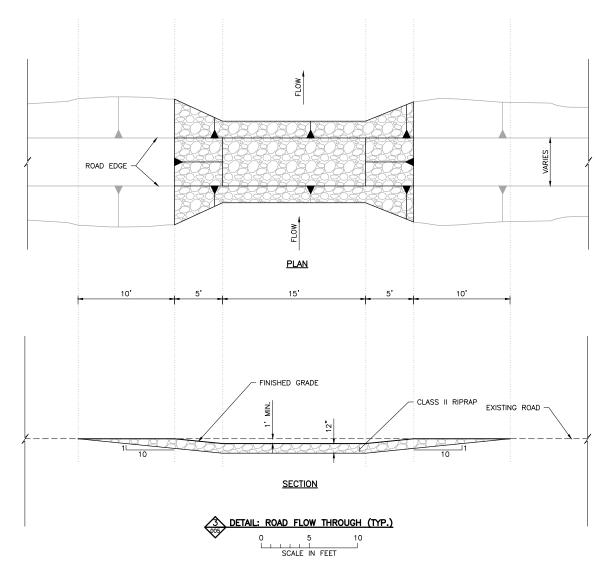
BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 BARR MINNEAPOLIS, MN. Ph: 1-800-632-2277

CS-011









NOTES:

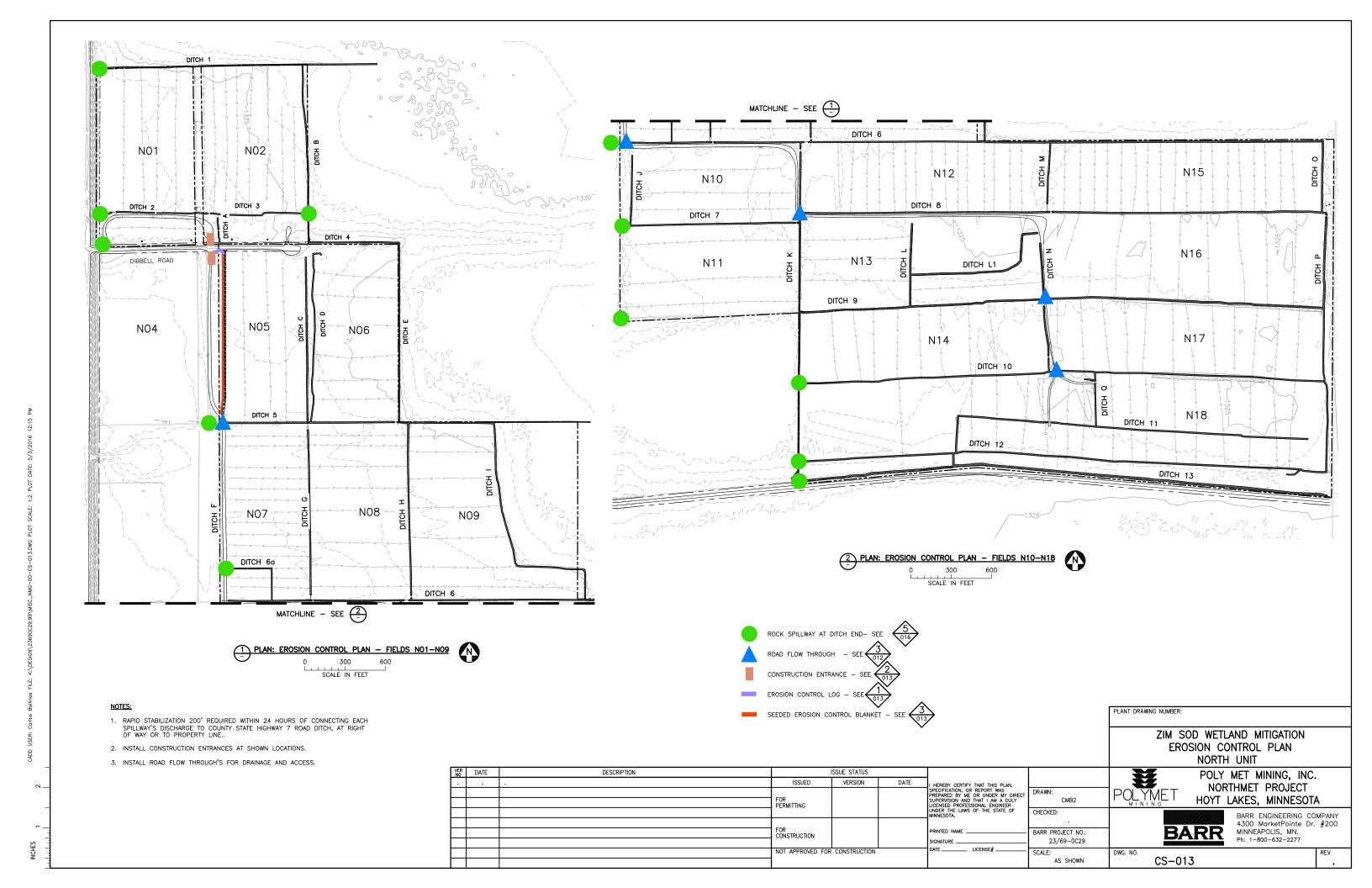
- ABANDONED DITCHES SHALL BE FILLED WITH ADJACENT MATERIAL AND BORROW SOURCES AREAS SHOWN IN PLANS.
- ADDITIONAL MATERIAL FOR DITCH ABANDONMENT SHALL BE OBTAINED BY SCRAPING 1-2" FROM ADJACENT FIELDS. CARE SHALL BE TAKEN TO PROVIDE POSITIVE DRAINAGE AND TO AVOID PONDING OF WATER.
- EXISTING DRAIN TILE SHALL BE ABANDONED BY:
 A. PLACEMENT OF PLASTIC CAP
 B. COMPACTED CLAY

ZIM	SOD	WETLAND:	S MIT	IGATION
NORT	H AND	SOUTH	UNIT	DETAILS

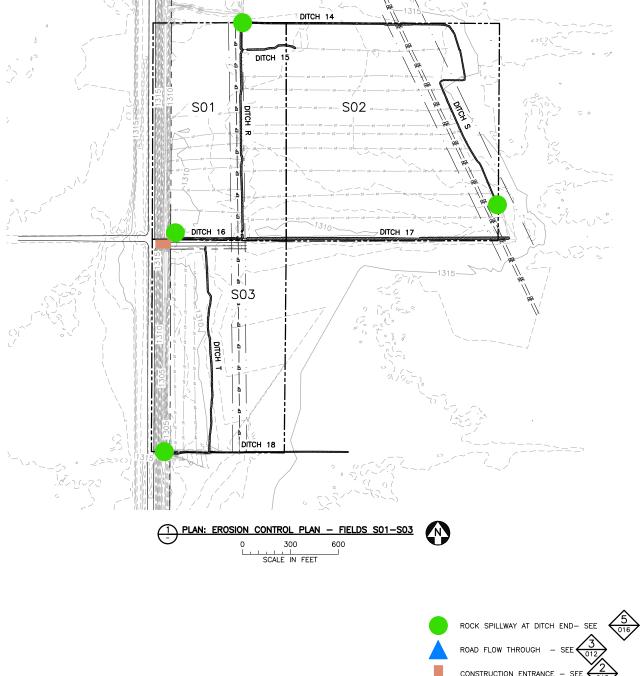
BARR ENGINEERING COMPANY 4700 WEST 77TH STREET MINNEAPOLIS, MN.

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L			FOR CONSTRUCTION	TION			CMB2		4700 WE	ST 77TH STRE	ΞET
L							BARR PROJECT NO.:	l BA		OLIS, MN.	
L							23/69-0C29		Ph: 1-800-	1-632-2277	
L				WINGS - NOT APPROVED FOR		DATE REG. NO	SCALE:	DWG. NO.			REV
Г			CONSTRUCTION.				AS SHOWN	CS-01	, 2		i







- RAPID STABILIZATION 200' REQUIRED WITHIN 24 HOURS OF CONNECTING EACH SPILLWAY'S DISCHARGE TO COUNTY STATE HIGHWAY 7 ROAD DITCH, AT RIGHT OF WAY OR TO PROPERTY LINE..
- 2. INSTALL CONSTRUCTION ENTRANCES AT SHOWN LOCATIONS.
- 3. INSTALL ROAD FLOW THROUGH'S FOR DRAINAGE AND ACCESS.

NOOK SHEEMAL AT BITCH END SEE 016
ROAD FLOW THROUGH - SEE
CONSTRUCTION ENTRANCE – SEE $\sqrt{\frac{2}{013}}$
EROSION CONTROL LOG - SEE
SEEDED EROSION CONTROL BLANKET - SEE 3

SIGNATURE ____

PLANT DRAWING NUMBER:

POLYMET MINING

23/69-0029

AS SHOWN

ZIM SOD WETLAND MITIGATION EROSION CONTROL PLAN SOUTH UNIT

VER DATE DESCRIPTION ISSUE STATUS ISSUED VERSION DATE DRAWN: FOR PERMITTING CMB2 CHECKED: FOR CONSTRUCTION BARR PROJECT NO.:

NOT APPROVED FOR CONSTRUCTION

BARR

CS-014

HOYT LAKES, MINNESOTA BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. Ph: 1-800-632-2277

POLY MET MINING, INC.

NORTHMET PROJECT

PROJECT DESCRIPTION:

The Storm Water Pollution Prevention Plan (SWPPP) is required for the General Permit Authorization to Discharge Stormwater Associated with Construction Activity (NPDES Permit) as required by the Minnesota Pollution Control Agency (MPCA) under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS).

The project is a wetlands mitigation project, restoring existing agricultural land into wetland. The project will consist of regrading the site to eliminate internal drainage. Existing drainage system culverts will be removed and internal ditches and swales will be filled. The site will be established with native vegation, shrubs, and trees. All disturbed sloped areas will be stabilized with mulch, erosion control blanket, or rip—rap.

The total project area with in the construction limits is approximately 569 acres, most of which will be disturbed during construction. There is approximately 1.7 acres of existing impervious surface that will be removed from the project site and the project will add 0.4 acres of new impervious surface resulting in a net decrease.

Special or Impaired Waters: This project discharges to county road ditches that discharge to the Whiteface River which is not an impaired water. There are no special or impaired waters within 1 mile that receives drainage from

This project stormwater discharge is not anticipated to impact any of the following: Outstanding resource value waters, trout waters, wetlands, calcareous fens, properties listed by the National Register of Historic Places or archaeological sites and is not subject to additional regulations due to any formal environmental reviews, endangered

Sheet C01, C02 Sheet C03-C06 Sheet Existing Conditions Plan: Site Plan Stormwater Pollution Prevention Plan (SWPPP) Sheet C10 Frosion Control Plan: Sheet C11 Frosion Control Sections and Details: Erosion and Sedimentation Control Quantities See Project Bid Form

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IMPLEMENTATION RESPONSIBILITIES:

- The OWNER and CONTRACTOR are Permittee(s) as identified by the NPDES Permit.

 CONTRACTOR shall be responsible for all on—site implementation of the SWPPP, including the activities of all of CONTRACTOR's subcontractors.
- CONTRACTOR shall provide a person(s) knowledgable and experienced in the application of erosion prevention and sediment control BMP's to oversee all installation and maintenance of BMP's and implementation of the
- CONTRACTOR shall provide person(s) meeting the <u>training requirements of the NPDES Permit</u> to conduct inspection and maintenance of all erosion prevention and sediment control BMP's in accordance with the requirements of the Permit. One of these individual(s) must be available for an on site inspection within 72 hours upon request by MPCA. CONTRACTOR shall provide training documentation for these individual(s) as required by the NPDES Permit. This training documentation shall be recorded in or with the SWPPP before the start of construction.
- Following Final Stabilization and the Termination of Coverage for the NPDES Permit, the OWNER is expected to furnish long term operation and maintenance (0 & M) of the permanent storm water management system.

STORMWATER TREATMENT DESIGNS

Restored Wetlands by eliminating existing drainage systems.

- following sequence describes, in general, the work on the site:

 CONTRACTOR shall submit a detailed construction staging, erosion control staging, and stormwater management plan for the entire project for the duration of construction.

 CONTRACTOR shall verify that all permits have been obtained and/or obtain the necessary permits.
- CONTRACTOR shall perform site inspections, record keeping and record retention in accordance with all permits. CONTRACTOR shall install all perimeter and down-gradient erosion control and sediment control best-management-practices (BMP's), construction entrances prior to site grading, excavation, stockpiling or
- disturbing existing vegetative cover.

 CONTRACTOR shall perform site grading, excavation, stockpiling work in accordance with the stormwater pollution prevention plan (SWPPP).
- CONTRACTOR shall install, inspect, monitor and maintain temporary and permanent erosion control BMPs as shown on plans & in conformance w/NPDES permit, continously during the Work.
- CONTRACTOR shall stabilize all exposed soil areas immediately to limit soil erosion but in no case stabilization must be completed within 14 days after construction activity in that portion of the site has temporarily or permanently ceased with a temporary cover crop as necessary.
- CONTRACTOR shall replace or repair erosion control and sediment control BMP's that are not functioning
- properly.

 CONTRACTOR shall perform site restoration activitities for permanent vegetative establishment associated with outflow spillways and shall seed exposed areas with MNDOT Mix 34-171 as identified on the plans.

 CONTRACTOR shall remove non-biodegradeable sediment control devices prior to submitting Notice Of
- 11. Submit notice of termination to MPCA within 30 days of final stabilization.

- CONSTRUCTION ACTIVITY FIELD REQUIREMENTS:

 A. All field requirements shall be performed in accordance with the requirements of the NPDES Permit and
- Stormwater Pollution Prevention Plan (SWPPP).
 The CONTRACTOR must implement the SWPPP and provide BMPs identified in the SWPPP in an appropriate and
- The CONTRACTOR shall respond to changing site conditions and implement/supplement erosion prevention and sediment control measures utilized to provide adequate protection of disturbed soils and adequate prevention of sediment transport off—site. At a minimum, the following storm water pollution prevention construction activity field requirements shall be furnished by the CONTRACTOR.

EROSION PREVENTION PRACTICES

- CONTRACTOR shall be responsible for the following erosion prevention practices:

 The CONTRACTOR shall attempt to phase all work to minimize erosion and maintain vegetative cover to the extent possible. The location of areas not to be disturbed must be delineated on the site before construction
- All exposed soils must be stabilized immediately and in no case completed no later than <u>14 days</u> after the All exposed soils must be stabilized immediately and in no case completed no later than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, including stockpiles with significant silt, clay or organic components.

 The normal wetted perimeter of any temporary or permanent drainage ditch that drains water from a construction site or diverts water around a site must be stabilized by CONTRACTOR within 200 feet from the property edge, or from the point of discharge to any surface water within 24 hours of connecting to a surface water. Temporary or permanent ditch swales being used as a sediment containment system do not
- need to be stabilized until they are no longer used as a sediment containment system, after which they must
- be stabilized within 24 hours.

 Temporary or permanent energy dissipation at drainage or pipe outlets must be provided within 24 hours of connecting to a surface water.

- SEDIMENT CONTROL PRACTICES
 CONTRACTOR shall be responsible for the following sediment control practices:
 1. CONTRACTOR must install all down gradient perimeter controls before any up gradient disturbance begins. CONTRACTOR shall maintain perimeter controls until final stabilization.
- CONTRACTOR shall provide grading and BMP installation to limit all slopes of 3H:1V or steeper to an unbroken length of 75
- feet or less.
 Timing and installation of sediment control devices can be adjusted by CONTRACTOR to accommodate short—term activities such as clearing and grubbing or vehicle passage. Any short—term activity must be completed as quickly as possible and the sediment control practices must be installed immediately after the activity is completed and in all cases prior to the
- If present, all storm sewer inlets and outlets shall be protected by CONTRACTOR with appropriate BMP's during the work. These practices shall remain in place until the potential sources for discharging sediment to inlets have been stabilized by CONTRACTOR.
- Temporary soil stockpiles must have silt fence, sediment control logs, or other effective sediment controls. Soil Stockpiles shall not be placed within surface waters or stormwater conveyances except to fill ditches and swales according to grading plans. CONTRACTOR shall install silt fence protection or sediment control logs around the limits of all temporary soil stockpile areas. All soil stockpiles that remain undisturbed for a period greater than 14 days shall be protected and
- stabilized by CONTRACTOR with cover of mulch, erosion control blanket, or plastic sheeting.

 CONTRACTOR shall implement measures to control vehicle tracking off site onto CSAH 7. Erosion control construction entrances to minimize the tracking of sediment shall be constructed of rock pads, slash mulch, mud mats, equivolent system must be installed at active project entrances and near active stockpiles by CONTRACTOR to minimize tracking from

- DEWATERING AND BASIN DRAINING
 CONTRACTOR shall be responsible for the following dewatering requirements:

 1. No dewatering activities are anticipated with this project.
- However, if dewatering is necessary, CONTRACTOR's dewatering activities that have sediment-laden discharge must discharge into a temporary or permanent sedimentation basin when possible, otherwise it must be discharged through some form of best management practice (BMP) by CONTRACTOR to prevent sediment from leaving the site. These BMPs may included the use of flocculents and/or polyacrilimides to satisfactorily remove sediment from the discharge. Prior to discharge, the CONTRACTOR shall perform a visual test to ensure adequate treatment is obtained in the basin or BMP and apply additional treatment as required to ensure adequate treatment. The discharge must be dispersed over an accepted energy dissipation measure and not adversely affect the receiving water or downstream landowners or wetlands.

INSPECTIONS AND MAINTENANCE

- CONTRACTOR shall be reponsible for performing the following inspections and maintenance:
- When inspections find erosion prevention and sediment control BMP's that are nonfunctional, all nonfunctional BMP's must be repaired, replaced or supplemented with functional BMP's within 24 hours after discovery or otherwise in accordance with the NPDES Permit requirements. The CONTRACTOR shall also place any additional erosion control measures deemed necessary by the ENGINEER or MPCA within 24 hours of notice.
- The CONTRACTOR must routinely inspect the site once every 7 days during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours.

 All inspections and maintenance conducted during construction must be recorded in writing by CONTRACTOR and retained with the SWPPP by CONTRACTOR. Maintenance must be completed by CONTRACTOR in conformance with NPDES permit.
 - CONTRACTOR's records must include: a. Date and time of inspections.
 - b. Name of person conducting inspection.
 - c. Finding of inspection including corrective action.
- c. Finding of inspection including corrective action.

 d. Details of corrective action (date. Time. Party competing maintenance).
 e. Date and amount of rainfall greater than 0.5 inches in 24 hours.
 f. Documentation of changes to SWPPP.
 In areas of project where final stabilization is complete inspections can be reduced to once a month until stabilized areas have achieved the minimum of 70% vegetation cover sufficient for the CONTRACTOR to submit the Notice of Termination (NOT). These areas shall be inspected by CONTRACTOR for monthly and may be suspended during frozen conditions in winter months provided that inspections resume within 24 hours of first spring runoff or prior to resuming construction following any winter stoppage, whichever is first.
- All erosion control measures must be installed and maintained by CONTRACTOR according to the details included in the

- 5. All erosion control measures must be installed and maintained by CONTRACTOR according to the details included in the construction documents and in accordance with the product manufacturer's recommendations.

 6. All silt must be removed from silt fence by CONTRACTOR when it reaches a height equal to one-half of the height of the silt fence. CONTRACTOR shall repair or replace silt fence that is nonfunctional within 24 hours of discovery.

 7. Temporary and permanent sedimentation basins must be derained and sediment removed by CONTRACTOR once the sediment collected reaches one half the storage volume within 72 hours of discovery, or as soon as field conditions allow.

 8. All sediment deposits within surface waters or stormwater conveyances must be removed and restabilized by CONTRACTOR within 7 days of discovery, including deltas and storm sewer sediment deposits. The CONTRACTOR shall be responsible for obtaining ALL permits required, if necessary, for such sediment removal.

 9. CONTRACTOR shall be responsible for keeping existing paved surfaces clean of sediment. Construction entrances shall be checked daily by CONTRACTOR. If the entrance becomes inundated with sediment, the entrance will be cleaned or replaced as appropriate by CONTRACTOR. Streets and paved roads leading to and from the construction entrance shall be checked daily by CONTRACTOR as soon as possible and within 24 hours of discovery. CONTRACTOR shall extend sweeping to the extremity of any sediment tracking onto poved surfaces. These areas will be swept clean of any tracked materials by CONTRACTOR as soon as possible and within 24 hours of discovery. CONTRACTOR shall extend sweeping to the extremity of any sediment tracking that occurs off site. All sweeping must be accomplished using a two step wetting and sweeping method. Dry sweeping which causes a dust cloud is prohibited.

 10. All infiltration/filtration areas must be inspected by CONTRACTOR to ensure that no sediment from ongoing construction is accumulating over the infiltration/filtratio
- accumulating over the infiltration/filtration area. Sediment accumulated over infiltration/filtration must be removed by CONTRACTOR.

- POLLUTION PREVENTION MEASURES

 CONTRACTOR shall be responsible for implementing the following pollution management measures on the site:

 1. Solid waste: collected sediment, asphalt, concrete millings, floating debris, paper, plastic, fabric, construction and demolition debris and other wastes must be disposed of properly and must comply with MPCA disposal requirements.

 2. Hazardous materials: oil, gasoline, point and any hazardous substances must be stored in appropriate containers. All tanks containing hazardous materials must be double walled or contain secondary containment to prevent spills, leaks or other disposace. Peatricted access to storage greas must be provided to prevent vandalism. Storage and disposal of hazardous discharges. Restricted access to storage areas must be provided to prevent vandalism. Storage and disposal of hazardous
- waste must comply with MPCA regulations.

 A defined area of the site must be designated for use as a wash area for trucks and other equipment. No engine degreasing allowed on site.
- Concrete washout containment is not expeced to be required on site.
- Portable toilets brought to the property shall be made secure to prevent spillage from vandalism or other accidental spillage

VER DATE

RECORD RETENTION

The CONTRACTOR shall keep appropriate records of inspections and maintenance of erosion prevention and sediment control measures, precipitation and all other records required by the NPDES permit during the duration of the Work.

The SWPPP, all changes to it, and inspections and maintenance records must be kept at the site during construction by the permittee who has operational control of the portion of the site. CONTRACTOR and OWNER must keep the SWPPP on file for three years after the submittal of the notice of termination. Including the records of all inspection and maintenance conducted during construction.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) ZIM WETLAND MITIGATION SITE, ST. LOUIS COUNTY

DESCRIPTION

VERSION HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS REFERRED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER INDER THE LAWS OF THE STATE OF MUNICEYS. ISSUED DATE NORTHMET PROJECT DRAWN: POLYMET HOYT LAKES, MINNESOTA FOR PERMITTING STD CHECKED: BARR GNATURE BARR PROJECT NO. MINNEAPOLIS. MN CONSTRUCTION PRINTED NAME ____ Ph: 1-800-632-2277 PERMIT DRAWINGS - NOT APPROVED FOR AS SHOWN CS-015

DRAWING STATUS

NOTICE OF TERMINATION

Permittee must ensure final stabilization of the site and submit the Notice of Termination within 30 days of final

Final stabilization can be achieved in the following way:

- 1. All soil disturbing activities are complete and a uniform perennial vegetative cover with a density of 70% over the entire pervious surface has been achieved, including stabilization of all ditches and swales
- 2. All permanent stormwater treatment systems meet the requirements of the NPDES Permit.
- 3. Removal of all temporary synthetic and structural BMPs. BMPs designed to decompose on site may be left in
- 4. Removal of sediments from storm water conveyances and permanent water quality basins.

The Permittee must amend the SWPPP as necessary to include additional requirements, Such as additional or modified BMPs, Designed to correct problems identified or address situations wheneve

- 1. There is a change in design, construction, operation or maintenance.
- 2. Weather or seasonal conditions that have significant effect on discharge. Inspection is required within 24 hours of a rainfall event greater than one-half inch.
- 3. Inspection or investigation by site operators, local, state or federal officials indicate the SWPPP is not effective. 4. The SWPPP is not achieving the general objectives of controlling pollutants or the SWPPP is not consistent with
- 5. The MPCA determines that discharge may cause or contribute to non-attainment of any applicable water quality standards or the SWPPP does not incorporate the requirements related to an approved total maximum daily load

SWPPP CERTIFICATION

This Stormwater Pollution Prevention Plan was prepared by individual(s) trained in accordance with the Permit's training requirements for preparation SWPPPs. Individual(s) preparing this SWPPP:

Tom Tri, Senior Designer

Date of Training/Certification: January, 2005

Water Resources Certification Program: University of Minnesota

Design of SWPPP - Mn/DOT, Arden Hills Barr Engineering Company May 7, 2014 Recertification

218-529-8226 Certificate Expiration: May 7, 2017

RESPONSIBLE PERSONS:

Below is a list of people responsible for this project who are knowledgeable and experienced in the application of erosion prevention and sediment control BMPs. They shall oversee the implementation of the SWPPP, inspection, and maintenance of erosion prevention, and sediment control BMPs before and during construction.

RESPONSIBLE PERSONS IS PENDING CONTRACTOR SELECTION:

OWNER'S REPRESENTATIVES: OWNER:

Polymet Mining Corporation 6500 County Road 666 Polymet Mining Corporation P.O. Box 475 Manager Env. Permitting & Compliance Hovt Lakes, MN 55750 6500 County Road 666 P.O. Box 475

CONTRACTOR:

Constuction Co. P.O. Box MN Main Phone: (218) Main Fax: (218)

P.O. Box .MN Office: (218)

Mobile: (218)

P.O. Box

On-Site Representative Construction Co.

Barr Engineering Company 4300 MarketPointe Drive, #200 Office: (952) 832-2764 Mobile: (612) 240-3297

Hoyt Lakes, MN 55750

218-471-2150

Mark Jacobson

Vice President

Daniel Tix Wetland Ecologist Barr Engineering Company 4300 MarketPointe Drive, #200 Minneapolis, MN, 55435 Office: (952) 832-2918 Mobile: (612) 540-7848

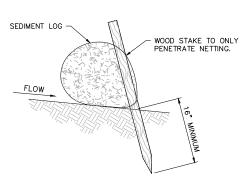
Barr Engineering Company 4300 MarketPointe Drive, #200 Minneapolis, MN 55435 Office: (952) 832-

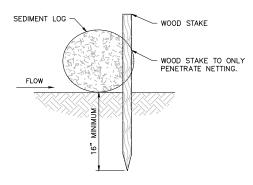
PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

POLY MET MINING INC.

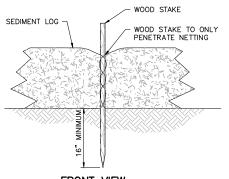
BARR ENGINEERING COMPANY 4300 MARKETPOINTE DRIVE

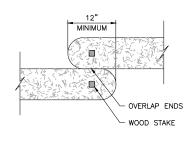




SIDE VIEW ON SLOPE

SIDE VIEW FLAT





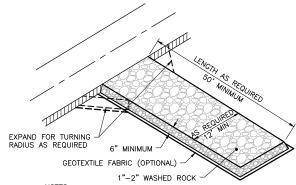
FRONT VIEW

TOP VIEW

- 1. SEDIMENT LOG SHOULD BE INSTALLED ALONG CONTOURS (CONSTANT ELEVATION).
- 2. NO GAPS SHALL BE PRESENT UNDER SEDIMENT LOG. PREPARE AREA AS NEEDED TO SMOOTH SURFACE OR REMOVE DEBRIS.
- 3. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN REACHING 1/2 OF LOG
- 4. SEDIMENT LOG SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND REPAIRED OR REPLACED AS REQUIRED.

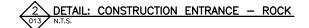


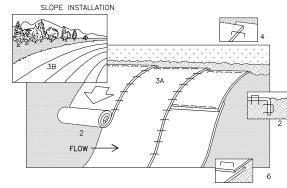
	34-171 Wetland	Rehabilitation Seed Mix				
Wetland Seed Mix at 5.3 pounds po	er acre,	lbs/ac	0/ - 5		Soods/ooft	
Native Grasses, Rushes and Sedge	s	IDS/ac	% of mix	•		
Virginia wild-rye	Elymus virginicus	3.00	56.60%	FACW	4.63	
Fowl bluegrass	Poa palustris	1.00	18.87%	FACW	47.80	
Grasses Subtotal	4.00	75.47%		52.43		
Dark green bulrush	Scirpus atrovirens	0.36	6.79%	OBL	60.00	
Fox sedge	Carex vulpinoidea	0.20	3.77%	OBL	7.50	
path rush	Juncus tenuis	0.16	3.02%	FAC	59.00	
Wool grass Scirpus cyperinus		0.08	1.51%	OBL	50.00	
Sedges and Rushes subtotal	·	0.80	15.09%		176.50	
Native Forbs						
Water Horehound	Lycopus americanus	0.33	6.23%	OBL	23.15	
nodding bur marigold	Bidens cenua	0.13	2.45%	OBL	1.00	
blue monkey flower	Mimulus ringens	0.04	0.75%	OBL	30.00	
Forbs subtotal		0.50	9.43%		54.15	
Total		5.30	100.00%		283.08	



NOTES:

- ENTRANCE SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND REPAIRED OR REPLACED AS REQUIRED TO PREVENT TRACKING OFFSITE.
- 2. ENTRANCE SHALL BE REMOVED IN CONJUNCTION WITH FINAL GRADING AND SITE STABILIZATION.





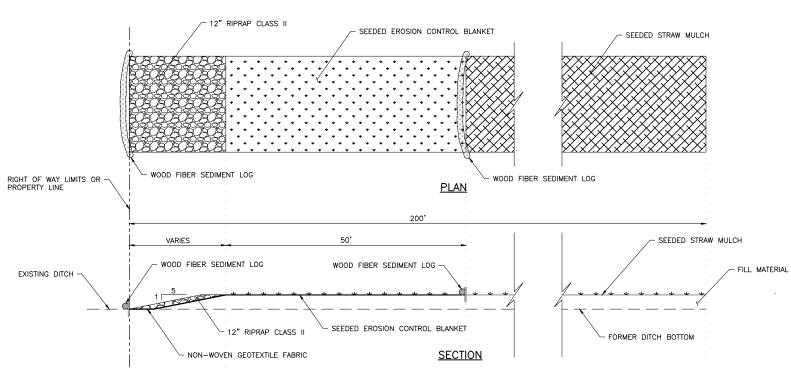
NOTES:

- REFER TO MANUFACTURER RECOMMENDATIONS FOR STAPLE PATTERNS FOR SLOPE INSTALLATIONS.
- 2. PREPARE SOIL BY LOOSENING TOP 1-2 INCHES AND APPLY SEED (AND FERTILIZER WHERE REQUIRED) PRIOR TO INSTALLING BLANKETS. GROUND SHOULD BE SMOOTH AND FREE OF
- 3. BEGIN (A) AT THE TOP OF THE SLOPE AND ROLL THE BLANKETS DOWN OR (B) AT ONE END OF THE SLOPE AND ROLL THE BLANKETS HORIZONTALLY ACROSS THE SLOPE.
- 4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 6" OVERLAP, WITH THE UPHILL BLANKET ON TOP.
- 5. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH APPROXIMATELY 6" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART.
- 6. BLANKET MATERIALS SHALL BE AS SPECIFIED OR AS APPROVED BY ENGINEER.



PLANT DRAWING NUMBER:

POLYMET



DETAIL: ROCK SPILLWAY AT DITCH END

ZIM SOD WETLAND MITIGATION **EROSION CONTROL DETAILS**

!	DATE	DESCRIPTION					
			ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN,	
			505			SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT	DRAWN:
			FOR PERMITTING			SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER	STD
						UNDER THE LAWS OF THE STATE OF MINNESOTA.	CHECKED:
]	CMB2
			FOR CONSTRUCTION			SIGNATURE	BARR PROJECT NO.:
			CONCINCONON		l	PRINTED NAME	23/69-0029
			PERMIT DRAWINGS -	NOT APPROVED		DATE REG. NO	SCALE:
			CONSTRUCTION.			·	AS SHOWN

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 **BARR** MINNEAPOLIS, MN. Ph: 1-800-632-2277

CS-016

POLY MET MINING INC. NORTHMET PROJECT

HOYT LAKES, MINNESOTA

Attachment D

Hinckley Wetland Mitigation Site Wetland Mitigation Plan



Hinckley Wetland Mitigation Site

Wetland Mitigation Plan

Poly Met Mining, Inc.



August 2016

Hinckley Wetland Mitigation Site Wetland Mitigation Plan

August2016

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1.0 Introduction

On behalf of Poly Met Mining, Inc. (PolyMet), Barr Engineering Co. has prepared this wetland restoration plan to provide compensatory wetland mitigation to replace unavoidable wetland impacts associated with PolyMet's NorthMet Project (Project). The Project is located in the St. Louis River #3 major watershed and a total of 939 acres of wetland impacts are proposed. The compensatory mitigation activities described in this report include those planned within one property (Site) located near Hinckley, Minnesota in Pine County (Large Figure 1).

The Site was an active sod production facility that encompasses approximately 417 acres of land, on which, 348 acres of wetland restoration and 58 acres of upland buffer preservation is proposed (Large Figure 2). The Site is located in the Snake River #36 major watershed within Bank Service Area #6. PolyMet has entered into an option agreement with the landowner formalizing the landowner's intent to allow the restoration activities.

This report includes discussions of the Site, construction activities, hydrology restoration activities, wetland mitigation crediting, vegetation establishment and management activities, wetland restoration goals, performance standards, schedules, and monitoring plans. A preliminary wetland restoration plan (Reference (1)) was submitted to the U.S. Army Corps of Engineers (USACE) and Minnesota Department of Natural Resources (MDNR) Division of Lands and Minerals in August 2007. The plan was reviewed by the USACE, MDNR, and Minnesota Pollution Control Agency (MPCA); comments were provided, and the plan was resubmitted for review. A final review was conducted by the same agencies and a final plan was submitted in January 2008 (Reference (2)). A revised permit application was submitted to the USACE and MDNR in August 2013 to start the permitting process (Reference (3)). A revised wetland mitigation plan was submitted to the USACE and MDNR in May 2014. The agencies determined that hydrologic monitoring should be conducted to justify the proposed crediting in the plan and the plans should be revised to comply with standards that have changed since the initial submittal. Hydrology monitoring was conducted in 2014 and 2015, and continues in 2016. Updates to the revised wetland permit application were submitted to the USACE and MDNR in November 2015.

This mitigation plan was developed to comply with Section 404 of the Clean Water Act as administered by the USACE, the current Wetland Conservation Act (WCA) rules (Minnesota Rules, chapter 8420) as administered by the Minnesota Department of Natural Resources – Division of Lands and Minerals, and Minnesota Rules, part 7050.0186 (wetland mitigation) as administered by the MPCA.

A declaration of restricted covenants, similar to the example provided in Appendix A will be prepared and recorded to cover the wetland restoration and associated upland buffer areas within one year after starting the restoration activities at the Site.

2.0 Project Wetland Mitigation

The overall compensatory wetland mitigation plan for the Project is designed to produce the number of mitigation credits, as required by the USACE and MDNR. The number of mitigation credits that are required is based on the types, sizes, and locations of wetlands that will be subject to direct and fragmentation impacts from the Project, and on the types, sizes, and locations of the wetlands that will be restored to replace them (Large Table 1, Appendix B).

The formulas for calculating the number of required mitigation credits are complex, using ratios established by the USACE (base ratios) and the WCA (mitigation ratios). The USACE and the WCA use slightly different ratios, but generally, the ratios they use to determine the number of mitigation credits vary depending on whether the mitigation wetland will be in-kind (same wetland type as impacted wetland), in-place (same watershed as impacted wetland), and/or in-advance.

Current guidance from the USACE regarding conditions that constitute in-advance compensatory mitigation was provided in a memo dated May 29, 2013 ("Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation – Compensation Ratios for Loss of Wetlands/Aquatic Resources") (see Appendix C). In accordance with USACE guidance, all non-forested, non-bog, and low or medium quality wetlands have a base ratio of 1.5:1. All forested, bog, and high quality wetlands will have a base ratio of 2:1 (Large Table 2, Appendix B). The USACE provides incentives to reduce the base ratios by 0.25 (e.g., from 1.5:1 to 1.25:1) for each of the following provisions that apply with a minimum ratio of 1:1:

- if the mitigation wetland is in-kind (same wetland type as impacted wetland)
- in-place (same major watershed as impacted wetland)
- in-advance (one to ten years ahead of the wetland impact; see Appendix C)

Under the Minnesota WCA, the mitigation ratio is 1:1 if the majority of wetlands are replaced with the same wetland type or same historic type and in the same watershed. For wetlands that are replaced outside of the watershed or a different wetland type, the ratio will increase to 1.5:1 (Large Table 3, Appendix B). Should additional wetland mitigation credits be established beyond the needs for direct impacts, the excess credits will be utilized to compensate for potential indirect wetland impacts.

The number of mitigation credits needed to compensate for the impacted wetlands will be set during permitting by the agencies approving the wetland mitigation plan, and expressed in terms of mitigation credits that replace each type of lost wetland. Details on calculations of the wetland mitigation credits for the Project are summarized on Large Table 1 in Appendix B. The mitigation credit calculations, based on the USACE base ratios and the WCA mitigation ratios, are summarized in Large Table 2 and Large Table 3 in Appendix B, respectively.

3.0 Site Wetland Mitigation Crediting

The proposed wetland mitigation credit areas for the Site are shown in Large Figure 3. The credits were calculated based on:

- hydrology monitoring (Reference (4))
- lateral drainage effect from ditches
- soil survey information (Large Figure 4)
- target plant communities (Large Figure 2) developed based on existing elevations, proposed elevations, and planned hydrologic restoration
- delineated wetland boundaries (Large Figure 5 and Large Figure 6)
- other site conditions

These credits are summarized in Table 1 based on actions eligible for credit in the USACE's policy (Reference (3)) for wetland mitigation in Minnesota and in the WCA rules. Proposed actions eligible for credit include the following with references to the applicable USACE's policy (2009), Section 404 of the Clean Water Act (CWA) and applicable subpart of Minnesota Rules, part 8420.0526:

- Upland buffer credit [Section 404 (upland buffers) and Minnesota Rules, part 8420.0526, subpart 2] is applied to areas that are not expected to develop as wetland after restoration is complete, but are located adjacent to wetland restoration areas and will provide integrated protection of wetlands and valuable wildlife habitat. These areas will be restored to native, non-invasive vegetation. Upland buffer credits are credited at 25% of the area maintained as upland buffer (4:1 ratio of upland acres to credit). Credit from upland buffers will not exceed 25% of the total credit from the Site. A total of 57.31 acres of upland buffer are planned for the proposed wetland restoration work resulting in 14.33 credits (Table 1). Credits generated from upland buffer areas will be proportionally distributed between the proposed wetland types.
- Credit for restoration of completely drained wetlands [Section 404 (restoration via reestablishment) and Minnesota Rules, part 8420.0526, subpart 3] is applied to the majority of the wetland restoration areas on the Site (Large Figure 3). The estimated area of wetland that is expected to develop is more fully discussed in Section 4.0. Areas that are presently non-wetland and develop as wetland after restoration are proposed as 100% credit for the area restored (1:1 ratio of wetland acres to credit). An estimated 260.44 acres of drained wetland are planned to be restored at the Site for 260.44 credits (Table 1).
- Restoration of partially drained wetland [Section 404 (restoration via rehabilitation) and Minnesota Rules, part 8420.0526, subp. 4] applies to the existing wetlands and ditched wetlands on the Site (Large Figure 3). The wetland areas described in Section 6.0 were determined using the hydrologic monitoring data and drainage setback tables (Reference (5)). These existing

wetland areas are partially drained by the ditches adjacent to portions of the wetlands and diversion of the upstream watershed around the Site, which has been documented through hydrologic monitoring. Restoration will restore natural hydrology to these wetlands by removing the drainage system and eliminating some of the effect from the upstream watershed diversion. This would qualify as credit for restoration via rehabilitation under the USACE's policy (Reference (3)) and is proposed for 50% credit of the area restored (2:1 ratio of wetland acres to credit). The partially drained wetland area encompasses 64.62 acres for 32.31 credits (Table 1).

Credit for wetland creation [Section 404 (wetland creation) and Minnesota Rules, part 8420.0526 subpart 7] is applied to four areas on the Site that are planned for obtaining sufficient soils to fill existing ditches (Large Figure 3). Because much of the soil material excavated to create the ditches on the site has been spread broadly across the site, there is insufficient, well-defined spoil banks available to completely fill the ditches. Therefore, four areas of the Site with slightly higher elevations and non-hydric soils will be excavated by 0 to 3 feet to obtain sufficient fill material. Six inches of topsoil will be stored and replaced at the surface following excavation. The wetland creation areas will be contiguous with and surrounded or nearly surrounded by restored wetlands or upland buffers, therefore, integrated into the larger, restored wetland complex. The hydrology monitoring conducted at the Site, the planned elimination of the extensive drainage system within the Site, and the elimination of a majority of the upstream watershed diversion around the site will ensure the development of sustainable wetland hydrology. The estimated area of wetland that is expected to develop is more fully discussed in Section 4.0. Areas that were historically nonwetland and develop as wetland after construction are proposed for 75% credit for the area restored (4:3 ratio of wetland acres to credit). An estimated 12.2 acres of created wetland are planned at the Site for 9.15 credits (Table 1).

Table 1 Wetland Mitigation Credit Summary

Credit Type	Area (acres)	Percent Credit	Credits
Drained wetlands	260.44	100%	260.44
Partially-drained wetlands	64.62	50%	32.31
Upland buffers	57.31	25%	14.33
Ditches (excavated wetlands functioning as ditches)	11.16	50%	5.58
Wetland creation	12.18	75%	9.14
Exclusion Areas	10.68	0%	0
Credit Subtotal ⁽¹⁾	416.40		321.79
Ditches filled to create upland buffer	0.32	(100%)	(0.32)
Total for the Site ⁽¹⁾	416.72		321.47

⁽¹⁾ Totals may not sum due to rounding.

All of the excavated wetlands functioning as private ditches within the Site, encompassing approximately 11.16 acres, will be filled to eliminate drainage effects (Large Figure 7). Most of those areas will remain wetland and are proposed to receive 50% credit for restoring natural hydrology. Those ditch areas that will be located within the upland buffer (Large Figure 3), will be directly impacted, and are proposed to be mitigated at the Site.

The area within the 33-foot wide right-of-way on either side of the Sod Road (Township Road 56) centerline, along the south side of the Site, is not proposed for credit. In addition, no credit is proposed within the 50-foot wide right-of-way on either side of the railroad centerline within the eastern part of the Site. Finally, no credit is proposed within the assumed 30-foot wide easement area on either side of the County Ditch 7 centerline through the Site (Large Figure 3). Other exclusion areas include a private ditch in the northwestern portion and an access road in the southeastern portion of the Site (Large Figure 7).

In order to adequately track the timing of wetland mitigation construction and wetland impacts, a structured accounting system may be needed to determine the required mitigation ratios for the Project impacts. This information could be provided in the MDNR Permit to Mine annual report. The annual report could include a tabulation of wetland mitigation construction completed by May 1 of each year (prior to the growing season) and wetland impacts that occurred during the calendar year. This information would be submitted using the schedule for the Permit to Mine annual report, typically within one month after the end of each year.

4.0 Wetland Mitigation Goals

To the degree feasible, the primary goal of the wetland mitigation plan for PolyMet is to restore high quality wetland communities (Reference (6)) of the same types as those impacted by the Project. While it is not practicable to replace all impacted wetland types with an equivalent area of in-kind wetland due to site limitations, technical feasibility, and other considerations; the goal of the mitigation plan is to replace the wetland types in-kind to the degree practicable in order to replace lost wetland functions and values. A summary of the acreage of each targeted wetland restoration community and the projected credits are provided in Table 2. A total of 348 acres of wetland restoration is proposed (Large Figure 2), including three wetland community types that are planned to replace impacts in-kind to the degree practicable, constrained by the restoration of wetland types that are ecologically suitable and sustainable for the landscape area.

Table 2 Wetland Mitigation Target Plant Community Summary

Mitigation Summary	Sedge/Wet Meadow	Shrub-Carr/ Alder Thicket	Hardwood Swamp	Total
Proposed wetland type (acres)	76.47 ac	264.37 ac	7.56 ac	348.41 ac
Proposed upland buffer (acres) ⁽¹⁾		57.63 ac		57.63 ac
Proposed wetland credits	68.11	231.88	7.48	307.47
Percent of total proposed wetland credits for each community ⁽²⁾	22%	75%	2%	100%
Anticipated upland buffer credits – Total all uplands		14.33		
Upland buffer credits converted proportionately to wetland communities	3.17	10.80	0.35	14.32
Credit Subtotal ^(2,3)	71.28	242.68	7.83	321.79
Ditches filled to create upland buffer	0 (0.32) 0			(0.32)
Total Proposed Credits by Community Type ⁽³⁾	71.28	242.36	7.83	321.47

⁽¹⁾ Filled areas in upland buffer not proposed for crediting.

Detailed descriptions of the target wetland communities within the wetland restoration area are provided in the following sections.

4.1 Sedge/Wet Meadow

A total of 76.47 acres of sedge/wet meadow wetland is planned in three areas of the Site (Table 2, Large Figure 2). Wet meadows typically form in the transition zone from upland to aquatic systems, often intergrading into sedge meadows and shrub-carr. The wet meadow community is targeted for a dominance of native grasses and perennial forbs, although sedges, rushes, ferns, and some shrubs may

⁽²⁾ The upland buffer acres are distributed among the proposed wetland types..

⁽³⁾ Totals may not sum due to rounding.

also be present. Sedge meadows typically form with a slightly wetter landscape position than wet meadows, with saturation near the surface typical and shallow inundation of 2-3 inches common, particularly early in the growing season. The sedge meadow community is targeted for a dominance of primarily native sedges, however, grasses such as Canada bluejoint and manna grass may be present along with scattered perennial forbs and some shrubs. The muck and mineral soils are typically saturated close to the surface for short to long duration during the growing season with shallow inundation occasionally occurring. These wetland communities are a major component of the adjacent wetland complex to the north, to which this Site was historically connected.

4.2 Shrub-Carr/Alder Thicket

A total of 264.37 acres of shrub-carr/alder thicket wetland is planned in one location at the Site (Table 2, Large Figure 2). Shrub-carr/alder thicket communities are typically saturated close to the surface for much of the growing season with occasional short-term inundation during floods and following snowmelt, particularly where a hummocky surface is present. The vegetation is expected to be composed of at least 50% areal coverage of shrubs, including primarily willow or speckled alder with meadowsweet and dogwood. The understory vegetation is expected to be composed of grasses such as Canada bluejoint and manna grass along with scattered, perennial forbs. The tree coverage is variable, typically with less than 25% coverage of trees taller than six feet. The shrub-carr/alder thicket restoration areas contain sapric to hemic organic soils. These wetland communities are also a major component of the adjacent wetland complex to the north, to which this Site was historically connected.

4.3 Hardwood Swamp

A total of 7.56 acres of hardwood swamp wetland is planned in one location (Table 2, Large Figure 2). Hardwood swamp communities are typically saturated at, or within, 12 inches of the surface throughout the growing season; inundation of up to six inches between hummocks can occur for extended periods of time. The hardwood swamp is an existing, partially drained wetland dominated by quaking aspen, alder, raspberry, Canada bluejoint, and sedges. The hardwood swamp area is primarily underlain by organic soils.

5.0 Wetland Mitigation Performance Standards

Performance standards have been developed for each wetland community type targeted in the wetland restoration plan to guide the restoration activities and to determine success. The performance criteria include measures to evaluate whether or not the site hydrology and vegetation meet the plan goals. Should the performance standards not be met during the established monitoring period (five years for sedge/wet meadow and existing hardwood swamp and eight years for the shrub communities), a proposal will be submitted to the USACE and the MDNR Division of Lands and Minerals describing the corrective actions proposed and an implementation schedule.

5.1 General Performance Standards

Several general performance standards apply to all wetland restoration areas:

- more than 75% areal coverage of the vegetation in each wetland community shall be facultative (FAC) or wetter (FACW, OBL) as listed in the current version of the National Wetland Plant List (NWPL, current version) for the Northcentral and Northeast region
- invasive, non-native plant species shall not comprise more than 15% cumulative areal coverage within any community by the end of the monitoring period. Invasive, non-native species include those provided in Table 3 and those species listed by the MDNR (Reference (7))
- native, non-invasive species shall comprise at least 75-80% areal coverage by the end of the required monitoring period

Table 3 Potentially Problematic Invasive Species

Common Name	Scientific Name			
Flowering rush	Botomus umbellatus			
Smooth brome grass	Bromus inermis			
Canada thistle	Cirsium arvense			
Glossy false buckthorn	Frangula alnus			
Yellow iris	Iris pseudacorus			
Non-native honeysuckles	Lonicera x bella; Lonicera tartarica, etc.			
Bird's Foot trefoil	Lotus corniculatus			
Purple loosestrife	Lythrum salicaria			
Sweet clover	Melilotus alba or M. officianalis			
Reed canary grass	Phalaris arundinacea			
Common reed	Phragmites australis			
Common buckthorns	Rhamnus cathartica			
Curly dock	Rumex crispus			
Foxtail	Setaria spp.			
Perennial sow thistle	Sonchus arvensis			
Common tansy	Tanacetum vulgare			
Narrowleaf cattail	Typha angustifolia			
Blue cattail	Typha x glauca			

5.2 Hydrology

Due to the nature of the Site, it is expected that the extent and duration of soil saturation and high water table will gradually increase as the Site develops more dense vegetation and hydrology stabilizes following removal of the drainage system. Therefore, it is expected that the duration of the high water table at the Site will gradually become more similar to the reference wetlands over time. The hydrology success criteria are designed to reflect the incremental changes in hydrology.

5.2.1 Sedge/Wet Meadow

The sedge/wet meadow communities typically consists of a water table within six inches of the surface to inundation by up to 3 inches of water for 60 cumulative days comprised of at least 15 day periods during the growing season, under normal to wetter than normal conditions (70% of years based on the most recent 30-year record of precipitation). If hummocky microtopography develops, inundation of up to 6 inches may occur within hollows between hummocks for extended duration. To account for climatic

variations, the duration of saturation shall be within 25% of that documented within the reference wetland.

5.2.2 Shrub-Carr/Alder Thicket

The hydrology in the shrub-carr/alder thicket community is typically consists of a water table within six inches of the surface throughout the growing season, under normal to wetter than normal conditions (70% of years based on the most recent 30-year record of precipitation), with some inundation up to 3 inches. An exception can be made for sites with hummocky microtopography: hollows between hummocks can have standing water depths of up to 6 inches for extended duration. Success will be determined by hydrologic conditions for at leaset 60 cumulative days comprised of 15 day periods or within 25% of the reference wetland.

5.2.3 Hardwood Swamp

The hydrology in the hardwood swamp community typically consists of a water table at or within 12 inches of the surface throughout the growing season, except in drought years, with some inundation up to 3 inches. Inundation should not occur (unless there are site-specific conditions). An exception can be made for sites with hummocky microtopography – hollows between hummocks can have standing water depths of up to 6 inches for extended duration. Success will be determined by hydrologic conditions documented within 35% of the hydrologic regime documented in the reference wetland.

A reference wetland has the same wetland community type or a comparable hydrologic regime to the restored target community type. One reference wetland location has been identified adjacent to the Site within a sedge meadow; this site also has shrub-carr components and will be used to document hydrologic success in the sedge/wet meadow and shrub-carr/alder thicket communities. A second reference wetland location has been established approximately three miles north of the Site, which includes hardwood swamp, shrub-carr, and sedge meadow components and will be used to document hydrologic success in the hardwood swamp community.

5.3 Vegetation

Vegetation development within the restored wetlands is planned to start with emphasis on developing the herbaceous layer in the first one to two years followed by the addition of shrubs in the shrub-carr communities.

No seeding is planned within the first year or two, because, prior experience indicates that a diverse, native herbaceous community is likely to develop from the seedbank and natural seed dispersal mechanisms. The Site is surrounded by intact wetland communities, which will also serve as a valuable seed source during restoration. This natural regeneration has been observed to result in similar diversity and cover compared to sites that have been seeded. If vegetation development is not adequate to meet the success criteria, seed may be installed after the first or second growing season. These community type success criteria will be used to determine success of the Site. Routine monitoring and control measures have been incorporated into the restoration plan. A restoration plan that utilizes an adaptive management approach will be critical for successful restoration of the Site.

Wetland restorations typically rely on seed additions to re-introduce native species and establish wetland plant communities, especially for wetland mitigation. The existing seed bank has often been viewed as having limited value for establishing wetland cover on mitigation sites, partly due to historical site disturbances. Three wetland restorations and one wetland creation were completed between 2008 and 2009 in north-central Minnesota to mitigate wetland losses. The four sites range in size from 11 acres to 608 acres. Two of the sites (320 and 608 acres) were restored solely using existing seed banks and the other two sites, an 11-acre wetland creation and a 235-acre restoration were seeded with native wetland species. Each of the sites was monitored annually to document the native species composition and density over the last five to six years. Following five to six years of development, the sites that were established using existing seed banks developed similar or greater plant species diversity compared to the seeded sites. In 2013, the wetlands that were developed using existing seed banks had 83 to 131 native hydrophytic species present compared to 55 to 88 native hydrophytic species present for the two seeded wetland sites. All of the sites had natural wetlands bordering at least a portion of the restored wetlands.

5.4 Sedge/Wet Meadow

5.4.1 Growing Season 1

- Herbaceous vegetation shall cumulatively comprise at least 50% areal cover.
- At least 30% areal cover shall be comprised of at least four species of native, non-invasive plants.
- No more than 50% areal cover of invasive, non-native species will be present.

5.4.2 Growing Season 2

- Herbaceous vegetation shall cumulatively comprise at least 60% areal cover of native noninvasive species.
- At least 40% areal cover shall be comprised of at least five species of native, non-invasive plants.
- No more than 35% areal cover shall be comprised of invasive, non-native species.

5.4.3 Growing Season 3

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover of native, noninvasive species.
- At least 60% areal cover shall be comprised of at least six species of native, non-invasive plants.
- No more than 25% areal cover shall be comprised of invasive, non-native species.

5.4.4 Growing Seasons 4-5

- Herbaceous vegetation shall cumulatively comprise at least 75-80% areal cover of native, noninvasive species.
- At least 10 species of native, non-invasive plants shall be present.

- To be considered sedge meadow, sedge species shall be dominant; most of which should be the
 genus Carex, but also may include spike-rushes, bulrushes, and nut-grasses. Grasses, forbs, and
 true rushes, and ferns may comprise the remaining herbaceous cover.
- No more than 15% areal cover shall be comprised of invasive, non-native species.
- Shrub and tree vegetation shall cumulatively comprise less than 30% areal cover.

5.5 Shrub-Carr/Alder Thicket

5.5.1 Growing Season 1

- Herbaceous vegetation shall cumulatively comprise at least 50% areal cover.
- At least 30% areal cover shall be comprised of at least four species of native, non-invasive plants.
- No more than 50% areal cover of invasive, non-native herbaceous species will be present.

5.5.2 Growing Season 2

- Herbaceous vegetation shall cumulatively comprise at least 60% areal cover.
- At least 40% areal cover shall be comprised of at least five species of native, non-invasive plants.
- No more than 35% areal cover of invasive, non-native herbaceous species will be present.
- At least 10% of the designated shrub-carr community will be present, including willow, dogwood, alder, or other native shrub species present in the reference wetlands. No more than 5% areal cover of invasive, non-native shrub species will be present.

5.5.3 Growing Season 3

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least six species of native, non-invasive plants shall be present or the community will have a vegetative diversity/integrity rating of high quality using the current version of MnRAM.
- No more than 25% areal cover of invasive, non-native herbaceous species will be present.
- At least 25% of the designated shrub-carr community will be present, including willow, dogwood, alder, and other native shrub species present in the reference wetlands. No more than 5% areal cover of invasive, non-native shrub species will be present.

5.5.4 Growing Seasons 4-8

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least 10 species of native, non-invasive plants shall be present.
- No more than 15% areal cover of invasive, non-native herbaceous species will be present.

- The total native shrub and tree sapling cover will exceed 50% of the shrub-carr/alder thicket community or greater than 200 stems per acre and may include willow, dogwood, alder, or other native shrub species present in the reference wetlands.
- No more than 5% areal cover of invasive, non-native shrub species will be present.

5.6 Hardwood Swamp

The hardwood swamp is an existing, partially drained wetland dominated by quaking aspen, alder, raspberry, Canada bluejoint, and sedges. The hardwood swamp community will meet the following vegetation success criteria for each growing season following construction.

5.6.1 Growing Seasons 1-4

- The existing density of hydrophytic trees will be maintained or will be comparable to the reference wetland with at least 50% areal cover.
- The coverage of herbaceous vegetation will be maintained or will be comparable to the reference wetland.
- No more than 15% areal cover of invasive, non-native herbaceous species will be present. No more than 5% areal cover of invasive, non-native tree or shrub species will be present.

5.6.2 Growing Seasons 4-20

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least eight species of native, non-invasive herbaceous plants shall be present or the community
 will have a vegetative diversity/integrity rating of high quality using the current version of
 MnRAM.
- No more than 15% areal cover of invasive, non-native herbaceous species will be present.
- At least 210 trees per acre and 108 shrubs per acre will be present by the end of the fifth and tenth growing seasons, respectively, or the number of trees will be at least 80% of a reference wetland of similar community type. At least 75 of those living trees per acre will be at least 4 feet in height by the end of the tenth growing season. The tree species may include quaking aspen and balsam poplar, but other species may be present consistent with the species present in the natural forested reference wetlands.
- No more than 5% areal cover of invasive, non-native tree species will be present.

5.7 Upland Buffer

5.7.1 Growing Season 1

• Vegetation will cumulatively comprise at least 50% areal cover, which shall include at least six species of native/non-invasive plant species.

- The herbaceous layer or herbaceous communities shall contain four or more species of native/non-invasive plants.
- No more than 50% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.7.2 Growing Season 2

- Vegetation will comprise at least 60% areal cover, which shall include at least seven species of native/non-invasive plant species.
- The herbaceous layer or herbaceous communities shall contain five or more species of native/non-invasive plants.
- No more than 35% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.7.3 Growing Season 3

- Vegetation will comprise at least 70% areal cover, which shall include at least eight species of native/non-invasive plants.
- The herbaceous layer or herbaceous communities shall contain six or more species of native/non-invasive plants.
- No more than 25% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.7.4 Growing Seasons 4-5

- Vegetation will comprise at least 90% areal cove.
- The herbaceous layer or herbaceous communities shall contain fifteen or more species of native/non-invasive plants.
- No more than 15% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

6.0 Wetland Mitigation Site Description

The Hinckley wetland mitigation plans include the restoration of 348 acres of wetland and the preservation of 58 acres of upland buffer on the Site (Large Figure 2). The Site is located in Section 5, Township 39 North, Range 22 West, Pine County, Minnesota. The Site is located in the Snake River #36 major watershed and Bank Service Area #6 (Large Figure 2). The National Wetland Inventory map for the wetland restoration area is provided in Large Figure 8.

6.1 Geology and Soils

Patterson and Knaeble (Reference (8)) mapped the surficial geology within the restoration area as primarily peat and organic-rich sediment deposited in marshes and shallow lakes during the Holocene and Late Pleistocene. An area of silty and sandy sediment deposited in shallow water is also mapped within the southeast corner of the Site over sandy deposits (Reference (8)). Knaeble, et al. (Reference (9)) show the presence of Glacial Lake Grantsburg encompassing the proposed Site during the period when the Grantsburg sublobe of the Des Moines lobe advanced into Pine County from the southwest. During that period, till and lake sediment were deposited over much of southern Pine County, including the proposed Site (Reference (9)).

County Well Index boring logs in the vicinity of the Site indicate deposits of primarily clay and clay mixed with gravel or rock from the surface down to depths of up to 80 feet with some layers of sand and sandy gravel intermixed. Bedrock (primarily sandstone) is typically present at depths ranging from 70 feet to 80 feet. The soils within the wetland restoration areas are mapped in the Soil Survey of Pine County, Minnesota (Reference (10)) as primarily peat soils throughout approximately the northern three-fourths of the Site with mineral soils mapped along the south and east sides of the property. The Natural Resources Conservation Service (NRCS) has conducted a more detailed mapping of the soils within the Site, and a preliminary mapping of the soils was obtained from the public record as part of another project, however, it is not in a format that can be readily published. The preliminary NRCS soil mapping indicates that the majority of the Site is Markey muck within the northern three-fourths of the Site and the south-central portion. The area located east of the railroad tracks is mapped as Cathro muck. Non-hydric mineral soils are mapped primarily within proposed upland buffer areas. The majority of the upstream watershed area is also mapped as peat soils. The water table appears to be near the surface throughout much of the general area, as indicated by the large wetland complexes underlain by peat soils.

6.2 Topography

The topographic relief is minimal throughout the Site. A topographic survey of the Site was completed and a one-foot contour map was created from the data (Large Figure 2). Detailed survey data indicates ground elevations on Site range from about 985 feet MSL to 1000 feet MSL with elevations in the ditches down to 979 feet MSL and on the dikes up to 1004 feet MSL. The gradient in the wetland restoration area ranges from flat to about 1%.

6.3 Climate and Hydrology

The average annual precipitation for the project area, based on the current 30-year normal period 1981-2010 is 29.77 inches (Reference (11)). A water budget completed by Lindholm et al. (Reference (12)) for the Snake River watershed calculated general runoff in the watershed to be 8.5 inches based on annual, average precipitation of 28.93 inches from the normal period 1939-1968. The average annual precipitation for the current normal period (1981-2010) from the nearest National Weather Service station (Mora) is 29.77 inches. The Site is located near the middle of the Snake River watershed, for which the water budget was calculated. While the average annual runoff value calculated by Lindholm et al. (Reference (12)) may not accurately reflect runoff conditions in all areas of the watershed, it provides a reasonable estimate for computing an order-of-magnitude water volume that might be expected to discharge from various portions of the watershed.

6.4 Hydrology

A total of approximately 6,580 acres of upstream watershed area drains to and through the Site, including 6,425 acres from the north and 155 acres from the south (Large Figure 9). The primary drainage feature affecting the Site is an unnamed tributary that carries discharge from the 6,425-acre northern upstream drainage area. The portion of this tributary that runs through the Site is designated as County Ditch 7 (Large Figure 2). Agricultural production on most of the site started prior to 1939, with the exception of the northeast corner (Large Figure 10). Based on review of the 1991 aerial photograph (Large Figure 11), it appears that the northeast corner of the Site had not been cultivated as of 1991. While not confirmed, it has been reported that much of that area was put into production in about 1997. County Ditch 7 flows through the Site, discharging to Pokegama Creek approximately 4.5 miles east of the Site (Large Figure 9).

Hydrology will be restored within the proposed wetland restoration areas by reestablishing the natural discharge flow pathways from the large wetland complexes located north of the farm, which are currently diverted around the Site except during high flows. As the farm was developed, starting in the early 1900s, a ditch system was constructed to intercept the upstream discharge and either route it around the farm or utilize it for irrigation/water supply. Those natural flow paths will be restored to the planned restoration areas.

6.5 Hydrology Monitoring

In 2014 and 2015, hydrology monitoring was initiated to collect baseline data to determine if wetland hydrology is present on the Site and to provide further justification for the proposed credit plan. Hydrology monitoring wells locations are shown on Large Figure 12. Results of the monitoring data are shown on Table 4 and Large Figure 13 through Large Figure 17.

6.5.1 2014

Precipitation during 2014 was exceptionally wet with nearly 14 inches more than the normal annual precipitation and nearly 9 inches more than normal during the growing season. Therefore, 2014 is not indicative of long-term, sustained normal conditions and not considered for the evaluation of whether

hydrologic criteria were met at the Site. This decision was approved by the USACE and MDNR during a meeting on May 5, 2016.

6.5.2 2015

The 2015 water year (October 1, 2014, through September 30, 2015) was characterized by 28.84 inches of precipitation, which is within the normal range. During the 2015 water year, the precipitation was above the normal range during three months (including two months during the growing season), within the normal range for four months, and below the normal range in five months (Table 4). The total growing season precipitation (May through September 2015) was 22.92 inches, which was above the normal range.

The 2015 monitoring data showed that 11 of the 16 monitoring locations had wetland hydrology present when considering data from the entire growing season (Table 4). All monitoring locations (except Wells 7, 9, 11, 13, and 16) met the minimum criteria in 2015 (Table 4). Reference Well 1 (sedge meadow) and Reference Well 2 (hardwood swamp) had water levels within 12 inches of the surface for 88 and 86 consecutive days, respectively.

The water table in the reference wetlands was above the wetland threshold for 59 to 60% of the 147-day monitoring period during the growing season (Table 4). Compared to the reference wetlands, the hydroperiod for the 16 monitoring locations on the Site ranged from 0 to 56% of the reference wetlands for the entire growing season, which includes several periods (64 total days) in which the antecedent precipitation was above the normal range. The 2015 data indicate that all monitored areas of the Site have been at least partially drained by the drainage system.

6.5.3 2016

During the first nine months of the 2016 water year (October 1, 2015, through September 30, 2016), the precipitation was above the normal range during four months, within the normal range for four months, and below the normal range in one month (Table 4). Monthly precipitation during May 2016 was 0.22 inches below the normal range. Monthly precipitation in June 2016 was 1.18 inches below the average precipitation, but within the normal range.

In 2016, the monitoring data collected from the beginning of the growing season on May 6 through June 15, shows that 2 of the 19 monitoring locations had wetland hydrology present when considering data from the entire growing season monitoring period (Table 4). Only Wells 1 and 15 met the minimum criteria in 2016 (Table 4). Both Reference Well 1 (sedge meadow) and Reference Well 2 (hardwood swamp) had water levels within 12 inches of the surface for 42 consecutive days.

The water table in the reference wetlands was above the wetland threshold for 100% of the first 42 days of the growing season (Table 4). Compared to the reference wetlands, the hydroperiod for the 19 monitoring locations on the Site ranged from 0 to 76% of the reference wetlands for the first 42 days of the growing season, which includes several periods (26 total days) in which the antecedent precipitation was above the normal range. Seventeen monitoring locations did not meet the minimum criteria in 2016 (Table 4). The 2016 data indicate that all monitored areas of the Site have been at least partially drained by the drainage system.

6.5.4 Summary

Considering the two years of valid monitoring data collected to date (2015 and 2016), wetland hydrology criteria was not met in eight locations (Wells 7, 9, 11, 13, 16, 17, 18, and 19) on the Site was met in one of two years in nine locations (Wells 2, 3, 4, 5, 6, 10, 12, and 14) and was met in both years in two locations (Wells 1 and 15) (Large Figure 13 through Large Figure 17).

Table 4 Summary of Wetland Hydrology Monitoring Criteria

		During the Entire Growing Season									2014-2016	2015-2016	
		20	14		20	15		201	6		# of years the Monitoring	# of years the Monitoring	
Well ID	Current Land Use	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Percent of Well Ref2	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Percent of Well Ref2	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Percent of Well Ref2	Location Meets Wetland Hydrology Criteria: 14 or more consecutive days of flooding, ponding, and/or a water table 12 inches or less below the soil surface (years/# monitoring years)	Location Meets Wetland Hydrology Criteria: 14 or more consecutive days of flooding, ponding, and/or a water table 12 inches or less below the soil surface (years/# monitoring years)	Drainage Status
1	Field	49	57%	60%	28	32%	33%	14	33%	33%	3/3	2/2	partially drained
2	Field	29	34%	36%	17	19%	20%	9	21%	21%	2/3	1/2	partially drained
3	Field	50	58%	62%	34	39%	40%	12	29%	29%	2/3	1/2	partially drained
4	Field	35	41%	43%	26	30%	30%	9	21%	21%	2/3	1/2	partially drained
5	Field	50	58%	62%	49	56%	57%	11	26%	26%	2/3	1/2	partially drained
6	Field	18	21%	22%	25	28%	29%	0	0%	0%	2/3	1/2	partially drained
7	Field	28	33%	35%	10	11%	12%	0	0%	0%	1/3	0/2	drained
8	Field	50	58%	62%	35	40%	41%	4	10%	10%	2/3	1/2	partially drained
9	Field	13	15%	16%	10	11%	12%	0	0%	0%	0/3	0/2	drained
10	Field	29	34%	36%	27	31%	31%	0	0%	0%	2/3	1/2	partially drained
11	Field	17	20%	21%	13	15%	15%	1	2%	2%	1/3	0/2	drained
12	Field	47	55%	58%	26	30%	30%	11	26%	26%	2/3	1/2	partially drained
13	Field	4	5%	5%	0	0%	0%	0	0%	0%	0/3	0/2	drained
14	Field	48	56%	59%	37	42%	43%	9	21%	21%	2/3	1/2	partially drained
15	Forest	55	64%	68%	38	43%	44%	32	76%	76%	3/3	2/2	partially drained
16	Forest				4	5%	5%	0	0%	0%		0/2	drained
17	Field							0	0%	0%	0/1	0/1	drained
18	Field							0	0%	0%	0/1	0/1	drained
19	Field							0	0%	0%	0/1	0/1	drained
Ref1	Sedge meadow	86			88			42		-	3/3	3/3	wetland
Ref2	Shrub-carr	81			86			42			3/3	3/3	wetland

Bolded numbers meet the criteria for water level within 12 inches of the soil surface for 14 consecutive days during the entire growing season.

6.6 Wetland Delineation

Wetlands on the Site were delineated in the field during July and August of 2014 and July and September of 2015. Fielddlineated wetlands include both excavated wetlands functioning as ditches and naturally-occurring partially drained wetlands, which are shown on Large Figure 5 and summarized in Table 5. The wetland delineation incorporated hydrology monitoring data collected from the 2014 and 2015 growing seasons. Additional wetlands were identified and mapped in 2016 based on hydrology monitoring data collected from 2014 through 2016. The wetlands identified in 2016 (wetlands 11 through 19) were mapped based on hydrology monitoring data, topography, and lateral effect of adjacent ditches.

Barr conducted on-site wetland delineations according to the Routine On-Site Determination Method specified in the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual* (Reference (13)) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0* (Reference (14)). Soil borings were placed in and around wetlands, potential wetlands, and uplands; borings were taken to a depth of at least 15 inches below the ground surface, or until bedrock or large rocks were encountered. Representative soil samples from each boring were examined for the presence of hydric soil indicators. Soil textures were determined by feel. Soil colors were determined using a Munsell® soil color chart and were noted on Wetland Determination Data Forms (Appendix D). Hydrologic conditions were evaluated at each soil boring; this information was recorded on the Wetland Determination Data Forms in Appendix D. Vegetation was documented for each wetland and associated upland. The wetland indicator status for each species was noted using the current National Wetland Plant List (Reference (15)) for the Northcentral and Northeast region.

Wetland boundaries were located in the field using a Trimble GeoXH 6000 Global Positioning System (GPS) Unit, capable of recording positions with sub-foot horizontal accuracy. Wetland boundaries were later digitized in ArcView© Geographic Information System software. Delineated wetlands were classified using the Eggers and Reed Plant Community Classification System (Reference (6)), the U.S. Fish and Wildlife Service (USFWS) Circular 39 System (Reference (16)), and the USFWS Cowardin System (Reference (17)).

A total of 77.49 acres of wetlands, including excavated wetlands functioning as ditches and naturally-occurring partially drained wetlands, were delineated within the Site (Table 5). Seven excavated wetlands functioning as ditches (13.49 acres) were delineated across the Site, most of which are classified as shallow marsh wetlands (Large Figure 6). Twelve naturally-occurring partially drained wetlands (64.0 acres) were also identified and include a shrub-carr wetland, a seasonally flooded basin, and 10 fresh (wet) meadows (Large Figure 6).

The 19 wetlands delineated across the Site are summarized in the sections below and in Table 5. Wetland data forms are provided in Appendix D. Photographs for each wetland are provided in Appendix E.

Table 5 Wetland Summary

Wetland Name	Wetland Type	Common Vegetation	Typical Hydrology	Soil	Acres
1	Shallow, open water/wet meadow (sample point taken in wet meadow, on the edge of shallow, open water)	Reed canary grass and red raspberry	Saturated within 8 inches of the ground surface	Muck	0.57
2	Shallow marsh/wet meadow (sample point taken in wet meadow, on the edge of shallow marsh)	Reed canary grass	Saturated at the ground surface	Mucky peat, mucky fine sandy loam, fine sandy loam	5.10
3	Shallow marsh/wet meadow (sample point taken in wet meadow, on the edge of shallow marsh)	Water plantain and reed canary grass	Saturated at the ground surface, often shallow standing water	Mucky peat	4.82
4	Shrub-carr/wet meadow	Pussy willow, alder, black willow, and reed canary grass	Saturated at the ground surface	Mucky silt, silt loam, clay loam	0.43
5	Shallow marsh/seasonally flooded basin	Reed canary grass, broad-leaf cattail, and duckweed	Saturated at the ground surface, inundated up to 4 inches	Fine sandy loam, loamy fine sand, very fine sandy loam	1.01
6	Shallow marsh/seasonally flooded basin/wet meadow (sample point taken in seasonally flooded basin, on the edge of shallow marsh)	Stinging nettle	Saturated within 9 inches of ground surface	Mucky fine sandy loam, fine sandy loam, very fine sandy loam	1.28
7	Shallow marsh	Broad-leaf cattail and lake sedge	Saturated at the ground surface	Very fine sandy loam	0.34
8	Seasonally flooded basin	Aspen, spotted touch-me-not and sensitive fern	Seasonally inundated, saturated within 14 inches of ground surface	Fine sandy loam, clay	1.46
9	Shallow marsh/seasonally flooded basin (sample point taken in seasonally flooded basin, on the edge of shallow marsh)	Reed canary grass, stinging nettle, and water parsnip	Saturated within 4 inches of the ground surface	Fine sandy loam	0.37
10	Fresh (wet) meadow	Reed canary grass and red raspberry	Not saturated; secondary indicators include geomorphic position and FAC-Neutral test	Peat, sandy clay, loamy fine sand	0.28
11	Fresh (wet) meadow	Lake sedge, fox sedge, fowl bluegrass, and meadow willow	Water table was present approximately 18 inches below the ground surface	Muck, mucky peat	5.43
12	Fresh (wet) meadow	fowl bluegrass, red clover, common dandelion, and meadow willow	Water table was present approximately 13 inches below the ground surface	Muck and mucky peat	9.04
13	Fresh (wet) meadow	Fox sedge and red clover	Water table was present approximately 14 inches below the ground surface	Muck and mucky peat	2.68
14	Fresh (wet) meadow	Lake sedge and fox sedge	Saturated at the surface; inundated up to 6 inches	Muck and mucky peat	16.52
15	Fresh (wet) meadow	Fowl bluegrass, red clover, common dandelion, and meadow willow	Water table was present approximately 17 inches below the ground surface	Muck and mucky peat	8.95
16	Fresh (wet) meadow	Common dandelion fowl bluegrass, parasol whitetop, and meadow willow	Water table was present approximately 23inches below the ground surface	Muck, mucky peat, and mucky peat with fine sand	8.00
17	Fresh (wet) meadow	Red clover, fowl bluegrass, and stinging nettle	Water table was present approximately 29inches below the ground surface	Muck, mucky peat, and silty clay loam	1.87
18	Fresh (wet) meadow	Red clover and common dandelion	Water table was present approximately 14 inches below the ground surface	Muck and mucky peat	6.05
19	Fresh (wet) meadow	Red clover, fox sedge, broom sedge, and fowl bluegrass	Water table was present approximately 17 inches below the ground surface	Muck and mucky peat	3.27
TOTAL (acres) ⁽¹⁾					77.49

⁽¹⁾ Totals may not sum due to rounding.

Wetland 1 is an approximately 0.57 acre shallow, open water wetland, representing approximately 0.7% of the delineated wetland area across the Site. Wetland 1 is an excavated wetland functioning as ditch located along the north and western parts of the Site (Large Figure 5 and Large Figure 6). The sample point for Wetland 1 is located in a wet meadow, at the edge of the shallow, open water portion of the wetland. The wetland was field delineated on July 20, 2015 and vegetation was dominated by reed canary grass (*Phalaris arundinacea*; FACW) and red raspberry (*Rubus idaeus*; FAC). Soil was saturated at a depth of 8 inches and consists of muck to at least 36 inches in depth. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 2

Wetland 2 is an approximately 5.10 acre shallow marsh/wet meadow, representing approximately 6.6% of the delineated wetland area across the Site. Wetland 2 consists of a network of excavated wetlands functioning as ditches located in the west and central parts of the Site (Large Figure 5 and Large Figure 6). The sample point for Wetland 2 is located in a wet meadow, at the edge of the shallow marsh portion of the wetland. The wetland was field delineated on July 31, 2014 and vegetation was dominated by reed canary grass. Soil was saturated at the ground surface and consists of muck over fine sandy loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 3

Wetland 3 is an approximately 4.82 acre shallow marsh/wet meadow, representing approximately 6.2% of the delineated wetland area across the Site. Wetland 3 consists of a network of excavated wetlands functioning as ditches located in the eastern part of the Site (Large Figure 5 and Large Figure 6). The sample point for Wetland 3 is located in a wet meadow, at the edge of the shallow marsh portion of the wetland. The wetland was field delineated on July 30, 2014 and vegetation was dominated by water plantain (*Alisma subcordatum*; OBL) and reed canary grass. Soil was saturated at the ground surface with occasional areas of shallow inundation and consists of mucky peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 4

Wetland 4 is an approximately 0.43 acre shrub-carr/wet meadow, representing approximately 0.6% of the delineated wetland area across the Site. Wetland 4 is a naturally-occurring partially drained wetland located in the northeastern part of the Site (Large Figure 5 and Large Figure 6). Wetland 4 was field delineated on July 20, 2015 and vegetation was dominated by pussy willow (*Salix discolor*), black willow (*Salix nigra*; OBL), and alder (*Alnus incana*; FACW) in the shrub layer and reed canary grass and woolgrass (*Scirpus cyperinus*; OBL) in the ground layer. Soil was saturated at the ground surface and consists of mucky silt over silt loam and clay loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D

Wetland 5 is an approximately 1.01 acre shallow marsh/seasonally flooded basin, representing approximately 1.3% of the delineated wetland area across the Site. Wetland 5 consists of a network of excavated wetlands functioning as ditches located in the southeastern part of the Site (Large Figure 5 and Large Figure 6). Wetland 5 was field delineated on July 30, 2014 and vegetation was dominated by reed canary grass, broad-leaf cattail (*Typha latifolia*; OBL), and duck weed (*Lemna minor*; OBL). Soil was saturated at the ground surface and in some areas, inundated with up to 4 inches. Soil consists of fine sandy loam over loamy fine sand and very fine sandy loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 6

Wetland 6 is an approximately 1.28 acre shallow marsh/seasonally flooded basin/wet meadow, representing approximately 1.7% of the delineated wetland area across the Site. Wetland 6 consists of a network of excavated wetlands functioning as ditches located in the southwestern part of the Site (Large Figure 5 and Large Figure 6). The sample point for Wetland 6 is located in a seasonally flooded basin, at the edge of the shallow marsh portion of the wetland. The wetland was field delineated on August 1, 2014 and vegetation was dominated by stinging nettle (*Urtica dioica*; FAC). Soil was saturated at a depth of 9 inches below the ground surface and consists of mucky fine sandy loam over fine sandy loam and very fine sandy loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 7

Wetland 7 is an approximately 0.34 acre shallow marsh, representing approximately 0.4% of the delineated wetland area across the Site. Wetland 7 consists of an excavated wetland functioning as a ditch located in the southwestern part of the Site (Large Figure 5 and Large Figure 6). Wetland 7 was field delineated on August 1, 2014 and vegetation was dominated by reed canary grass, broad-leaf cattail, and lake sedge (*Carex lacustris*; OBL). Soil was saturated at the ground surface and consists of very fine sandy loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 8

Wetland 8 is an approximately 1.46 acre seasonally flood basin, representing approximately 1.9% of the delineated wetland area across the Site. Wetland 8 is a naturally-occurring partially drained wetland located in the south-central part of the Site (Large Figure 5 and Large Figure 6). Wetland 8 was field delineated on July 31, 2014 and vegetation was dominated by quaking aspen (*Populus tremuloides*; FAC), spotted touch-me-not (*Impatiens capensis*; FACW), and sensitive fern (*Onoclea sensibilis*; FACW). Soil was saturated within 14 inches of the ground surface and consists of fine sandy loam over clay. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 9 is an approximately 0.37 acre shallow marsh/seasonally flooded basin, representing approximately 0.5% of the delineated wetland area across the Site. Wetland 9 consists of an excavated wetland functioning as ditch located in the south-central part of the Site (Large Figure 5 and Large Figure 6). The sample point for Wetland 9 is located in a seasonally flooded basin, at the edge of the shallow marsh portion of the wetland. The wetland was field delineated on July 31, 2014 and vegetation was dominated by reed canary grass, stinging nettle, and water parsnip (*Sium suave*; OBL). Soil was saturated at a depth of 4 inches below the ground surface and consists of fine sandy loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 10

Wetland 10 is an approximately 0.28 acre fresh (wet) meadow, representing approximately 0.4% of the delineated wetland area across the Site. Wetland 10 is a naturally-occurring partially drained wetland located in the southwestern part of the Site (Large Figure 5 and Large Figure 6). Wetland 10 was field delineated on September 28, 2015 and vegetation was dominated by reed canary grass and red raspberry. Soil was not saturated; however, secondary hydrology indicators were present, including geomorphic position and FAC-Neutral test. Soil consists of peat over sandy clay and loamy fine sand. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 11

Wetland 11 is an approximately 5.43 acre fresh (wet) meadow, representing approximately 7.0% of the delineated wetland area across the Site. Wetland 11 is a naturally-occurring partially drained wetland located in the northeastern part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 11 was collected on July 30, 2014 and vegetation was dominated by lake sedge (*Carex lacustris*; OBL), fox sedge (*Carex vulpinoidea*; OBL), fowl bluegrass (*Poa pal*ustris; FACW), and meadow willow (*Salix petiolaris*; FACW). Soil consists of muck and mucky peat. The water table was present approximately 17 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 12

Wetland 12 is an approximately 9.04 acre fresh (wet) meadow, representing approximately 11.7% of the delineated wetland area across the Site. Wetland 12 is a naturally-occurring partially drained wetland located in the northern part of the Site (Large Figure 5 and Large Figure 6). Wetland 12 was field identified on July 30, 2014 and vegetation was dominated by fowl bluegrass (*Poa palustris*; FACW), red clover (*Trifolium* pretense; FACU), common dandelion (*Taraxacum officinale*; FACU), and meadow willow (*Salix petiolaris*; FACW). Soil consists of muck and mucky peat. The water table was present approximately 17 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 13 is an approximately 2.7 acre fresh (wet) meadow, representing approximately 3.5% of the delineated wetland area across the Site. Wetland 13 is a naturally-occurring partially drained wetland located in the northern part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 13 was collected on July 30, 2014 and vegetation was dominated by fox sedge (*Carex vulpinoidea*; OBL) and red clover (*Trifolium* pretense; FACU). Soil consists of muck and mucky peat. The water table was present approximately 14 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 14

Wetland 14 is an approximately 16.5 acre fresh (wet) meadow, representing approximately 21.3% of the delineated wetland area across the Site. Wetland 14 is a naturally-occurring partially drained wetland located in the northeastern part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 14 was collected on July 30, 2014 and vegetation was dominated by lake sedge (*Carex lacustris*; OBL) and fox sedge (*Carex vulpinoidea*; OBL). Soil was saturated at the ground surface and in some areas, inundated with up to 6 inches. Soil consists of muck and mucky peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 15

Wetland 15 is an approximately 9.0 acre fresh (wet) meadow, representing approximately 11.6% of the delineated wetland area across the Site. Wetland 15 is a naturally-occurring partially drained wetland located in the west central part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 15 was collected on July 30, 2014 and vegetation was dominated by fowl bluegrass (*Poa pal*ustris; FACW), red clover (*Trifolium* pretense; FACU), common dandelion (*Taraxacum officinale*; FACU), and meadow willow (*Salix petiolaris*; FACW). Soil consists of muck and mucky peat. The water table was present approximately 17 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 16

Wetland 16 is an approximately 8.0 acre fresh (wet) meadow, representing approximately 10.3% of the delineated wetland area across the Site. Wetland 16 is a naturally-occurring partially drained wetland located in the east central part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 16 was collected on July 30, 2014 and vegetation was dominated by common dandelion (*Taraxacum officinale*; FACU), fowl bluegrass (*Poa pal*ustris; FACW), parasol whitetop (*Doellingeria umbellate*; FACW), and meadow willow (*Salix petiolaris*; FACW). Soil consists of muck, mucky peat, and mucky peat with fine sand. The water table was present approximately 23 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 17

Wetland 17 is an approximately 1.9 acre fresh (wet) meadow, representing approximately 2.4% of the delineated wetland area across the Site. Wetland 17 is a naturally-occurring partially drained wetland

located in the central part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 17 was collected on July 30, 2014 and vegetation was dominated by red clover (*Trifolium* pretense; FACU), fowl bluegrass (*Poa pal*ustris; FACW), and stinging nettle (*Urtica dioica*; FAC). Soil consists of muck, mucky peat, and silty clay loam. The water table was present approximately 29 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 18

Wetland 18 is an approximately 6.1 acre fresh (wet) meadow, representing approximately 7.8% of the delineated wetland area across the Site. Wetland 18 is a naturally-occurring partially drained wetland located in the eastern part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 18 was collected on July 30, 2014 and vegetation was dominated by red clover (*Trifolium* pretense; FACU) and common dandelion (*Taraxacum officinale*; FACU). Soil consists of muck and mucky peat. The water table was present approximately 14 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

Wetland 19

Wetland 19 is an approximately 3.3 acre fresh (wet) meadow, representing approximately 4.2% of the delineated wetland area across the Site. Wetland 19 is a naturally-occurring partially drained wetland located in the southeastern part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 19 was collected on July 30, 2014 and vegetation was dominated by red clover (*Trifolium* pretense; FACU), fox sedge (*Carex vulpinoidea*; OBL), broom sedge (*Carex scoparia*; FACW), and fowl bluegrass (*Poa pal*ustris; FACW). Soil consists of muck and mucky peat. The water table was present approximately 17 inches below the ground surface. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix D.

6.7 Cultural Resources

10,000 Lakes Archaeology, Inc. (10,000 Lakes Archaeology) conducted Phase Ia background research for the Site in May and June 2015 (Reference (18)). This Phase Ia cultural resources investigation included a literature review and background research at the State Historic Preservation Office (SHPO), the Minnesota Historical Society (MHS), and Office of the State Archaeologist (OSA). Archaeologists examined the archaeological and historic site files, topographic maps, and historic maps to locate recorded archaeological and historic sites within the Site, as well as a 1-mile buffer surrounding the Site.

Archaeological sites are more likely to be located near water, on prominent topographic features, and near recorded archaeological sites; however these are not the only locations where archaeological sites might be found. Information obtained from the topographic maps, Minnesota State Archaeological Site Files, historic maps (General Land Office Historic plat maps and Trygg maps), and previously recorded sites can be used to identify, areas with a moderate to high potential for unrecorded archaeological sites.

The Phase Ia background research conducted by 10,000 Lakes Archaeology concluded that no archaeological or historic sites are recorded within one mile of the Site. The Site has a low potential for

the presence of archaeological sites because it is located in a low area which was historically wetland, with little topographic relief or significant landscape features (Reference (18)).

6.8 Site Constraints

The Site is crossed by one railroad easement for the BNSF Railroad. There is also a legally-mandated maintenance area along either side of Pine County Ditch No. 7 which flows south and east through the Site. While no maintenance easement is recorded for County Ditch No. 7, and the legally-mandated minimum maintenance zone extends 16.5 feet from either side of the ditch; PolyMet will leave a 60-foot wide corridor centered on the ditch centerline to allow for future ditch maintenance. No wetland mitigation credit is proposed within that zone and the declaration of restricted covenants will not include that area. No activities or credit are proposed within either the railroad easement area or ditch maintenance zones.

Approximately 3,325 feet of County Ditch No. 7 will be petitioned for abandonment. This ditch segment only benefits the property on which wetland mitigation is proposed. Discussions regarding abandonment have been initiated with the ditch authority in Pine County.

The Site has buildings located on the southwest portion; however, they are not residences. These buildings will be removed from the site as part of the wetland restoration activities. There is one water well located in the southwest portion of the site that will be sealed by a licensed well contractor as part of the restoration activities. The well contractor will submit a copy of the well and boring sealing record to the Minnesota Department of Health, as required, upon completion of sealing the well.

7.0 Wetland Restoration Plan

The Site was previously managed as a sod production facility and for row crop agricultural production, both of which require considerable control over the hydrology of the Site. The Site hydrology is controlled by a series of ditches throughout the Site, typically surrounded by a system of dikes with outlet structures through the perimeter dikes. Water levels in the ditches are typically maintained approximately 2 to 5 feet below the field elevations to ensure an aerated rooting zone without soil saturation. The goal for each step in the restoration process is to continually progress toward the final goal of establishing wetland communities with the appropriate hydrology and dominated by characteristic native vegetation. The restoration construction plans are provide in Appendix F.

7.1 Hinckley Wetland Restoration Construction Plan

The overall objective of the plan is to restore the hydrologic connection between the upstream watersheds and the Site and disable the internal drainage system within the Site. The hydrology will be restored by filling ditches and utilizing broad, rock-lined overflow weirs to allow for protected overflow, eliminating culverts, where possible, and to establish specific hydrologic conditions that will meet the goals and performance standards described in Section 5.0.

The restoration process will start with activities to restore the hydrology. Prior to constructing the surface inlets and outlets, silt fence/erosion control barriers will be installed downstream of the restoration areas within the primary outlet ditches. Before restoration work begins within the Site, the water flow from the upstream watershed will be temporarily blocked to prevent flooding during construction. In general, the proposed outlet modifications will be constructed first, then moving downstream within the Site, culverts will be removed and internal ditches will be filled in accordance with the plans. The final step will be to reestablish the connections to upstream watersheds. The final connection to upstream watersheds will be sequenced by first removing the existing dikes and lastly, filling the exterior ditch.

The outflow weirs will be constructed by lowering sections of dike to the elevations within approximately a 20 foot bottom width with 20H:1V slopes connecting into the top of the established dike. Each overflow would then be covered with 1/2-inch to 6-inch riprap over geotextile fabric to a depth of 12 inches and extending up the sides of the overflow 1 to 2 feet in elevation. Larger, Class II riprap will also extend on the upstream and downstream slopes. Organic or mineral hydric soils removed from the dike during construction will be utilized to fill the interior field ditches where practical. After the water supply has been reestablished, efforts will be focused on establishment of the targeted wetland communities as described in Section 4.0.

7.2 Vegetation Restoration Establishment

An adaptive management program is proposed to guide the development of the restored wetlands to the targeted conditions. The vegetative restoration community types proposed are shown on Large Figure 2 and are summarized in Table 2. The herbaceous layer vegetative restoration of each wetland community will be implemented to promote the establishment of characteristic native species that are present in the seed bank or that may be transported to the area from adjacent wetlands. By reestablishing the

hydrologic connection to upstream wetlands as the first restoration activity at the Site, one of the primary seed transport mechanisms will be restored to assist in the development of wetland communities native to the area. The process for restoration of the wetlands is designed to meet the goals described in Section 4.0 and the performance standards described in Section 5.0 in the most effective manner.

The goal of the vegetation restoration is to provide a setting and conditions in which the restoration areas will be restored to naturally self-sustaining and functioning wetlands to the extent feasible. The proposed wetland communities have been planned in areas that appear to match the natural hydrologic characteristics of each community type. However, during the restoration process, it is expected that the boundaries of the wetland communities may change to some degree and the plan will allow for adaptation to the conditions.

Reference wetlands have been identified in the vicinity of the Site for each restoration community type that represent an approximation of the wetland communities anticipated after restoration. It is recognized that this process cannot be accomplished within a year or two, but will take time, and therefore, short-term interim goals are also included in the performance standards.

7.2.1 General Site Preparation

Prior to or concurrent with hydrologic restoration activities, existing, invasive, non-native vegetation will be removed from the Site through mechanical means or herbicide application. Treatment methods that may be used include mowing (for annual weeds), selective herbicide application (for broadleaf weeds or invasive, non-native grasses), or broad-spectrum herbicide application (for areas where limited desirable species are present).

7.2.2 Natural Regeneration - All Communities

The proposed vegetation establishment and maintenance activities anticipated to meet the goals of the plan are listed for the conditions described as appropriate to the restoration schedule:

- Presence of reed canary grass or other non-native grasses. Spray grass-selective herbicide at label rates in early spring (prior to growth of desirable native vegetation) and late fall within wetland restoration areas containing more than 20% areal coverage of reed canary grass or other invasive, non-native grasses and all dikes and ditch slopes adjacent to the wetland restoration areas. The purpose of this treatment is to kill reed canary grass and other actively growing non-native grasses while desirable native plants are dormant. Other restoration projects have had considerable success using this treatment recently.
- **Presence of broadleaf weeds.** Spray perimeter dikes and slopes adjacent to wetland restoration areas and wetland areas where warranted with a broadleaf herbicide (e.g., Transline™) at recommended rates targeting stinging nettle, Canada thistle, and other broadleaf non-native species.
- Revegetate berms and dikes. Seed ditch banks and dikes with an appropriate native grass seed mix.

- **Hydrologic restoration and monitoring.** Construct hydrologic restoration activities, as described in Section 7.1. Monitor water levels in restored wetlands to determine if target hydrology is present.
- Presence of annual weeds. Where annual weeds are present, mow seeded areas to 6-8 inch
 height with low ground-pressure mower to prevent any annual weeds present from producing
 viable seed.
- Vegetation characterization. Characterize vegetation establishing in each wetland restoration
 area several times during each growing season to determine needed management and
 establishment procedures. Vegetation characterization will include documenting all problem
 species present, the approximate areal coverage of each species and approximate locations to
 guide management activities.
- **General weed control**. Continue treatments 1, 2, 5, and 6 annually until reed canary grass, stinging nettle, Canada thistle and other invasive, non-native species are adequately controlled (see list in Table 3).
- **Site specific treatment.** Spot spray wetland restoration areas two times annually to control reed canary grass and other perennial invasive, non-native species for up to 8 years in shrub communities and 5 years in other communities following initial restoration. Extensive treatments may not be needed after a sustainable wetland dominated by characteristic native vegetation is established such that the performance standards described in Section 5.0 are achieved.
- **Weed control.** Conduct a spring burn in the sedge/wet meadow communities after the second or third growing season to kill weed seed and promote germination of native plants, assuming that there is sufficient fuel for burning and assuming that there are no concerns with fire management due to climate conditions or potential for peat fires.

7.2.3 Seeding/Planting – Sedge/Wet Meadow and Shrub-Carr/Alder Thicket Communities

Diverse, native, herbaceous wetland vegetation is expected to develop in the restoration wetlands from the existing seedbank and from the wetland vegetation that surrounds the Site (both through vegetative propagation and through seed transport) or by other seed dispersal methods. At the end of the first and second growing seasons, detailed assessments of the vegetation re-establishment will be conducted within the wetland areas. Based upon the results of the assessments per the performance standards in Section 5.0, areas that have not met the requirements may be seeded as follows:

- Sedge and wet meadow areas that do not have adequate wetland vegetation cover or appropriate species established after the first and second full growing season will be seeded in the fall with the seed mix shown in Table 6.
- Shrub-carr/alder thicket communities. Shrub-carr/alder thicket wetlands will be planted with locally collected dormant cuttings of willow species, which will be staked in the fall or spring, after

the first growing season at approximately 220 shrubs per acre. Locally-collected alder seed will be applied at alder thicket wetlands at after the end of the first full growing season. Alder seed will be collected from approximately one acre of alder thicket for every five acres of restored wetland to be seeded. Shrub cutting survival and development from seed will be closely monitored and corrective measures will be planned and implemented if shrub mortality surpasses 50%.

• Filled ditches and other graded areas within 20 feet of and discharging to County Ditch No. 7 will be seeded with the seed mix shown in Table 6 and covered with staked erosion control blanket on slopes of 3H:1V or steeper or crimped native grass mulch on flatter slopes.

Table 6 Wetland Seed Mix

Scientific Name	Common Name	Wetland Indicator	Rate	% of Mix ⁽¹⁾	
Native Grasses, Rushes, and Sedges					
Beckmannia szyigachne	American slough grass	OBL	1.00 lbs/acre	17.9%	
Bromus ciliata	Fringed brome	FACW	1.00 lbs/acre	17.9%	
Calamagrostis candensis	Bluejoint	OBL	0.30 lbs/acre	5.4%	
Carex hystericina	Porcupine sedge	OBL	0.25 lbs/acre	4.5%	
Carex lacustris	Lake sedge	OBL	0.15 lbs/acre	2.7%	
Carex retrorsa	Knotsheath sedge	OBL	0.10 lbs/acre	1.8%	
Carex utriculata	Northwest Territory sedge	OBL	0.10 lbs/acre	1.8%	
Carex vulpinoidea	Fox sedge	OBL	0.21 lbs/acre	3.8%	
Elymus virginicus	Virginia wild-rye	FACW	1.80 lbs/acre	32.1%	
Glyceria canadensis	Rattlesnake manna grass	OBL	0.18 lbs/acre	3.2%	
Juncus dudleyii	Dudley's rush	FACW	0.10 lbs/acre	1.8%	
Scirpus atrovirens	Dark green bulrush	OBL	0.05 lbs/acre	0.9%	
Scirpus cyperinus	Wool grass	OBL	0.15 lbs/acre	2.7%	
Spartina pectinate ⁽²⁾	Prairie cordgrass	FACW	0.30 lbs/acre	NA	
Native Forbs					
Asclepias incarnata	Marsh milkweed	OBL	0.50 oz/acre	0.6%	
Doellingeria umbellata	Flat-topped aster	FACW	0.10 oz/acre	0.1%	
Eupatorium perfoliatum	Boneset	FACW	0.50 oz/acre	0.6%	
Eutrochium maculatum	Joe-Pye weed	OBL	0.62 oz/acre	0.7%	
Helianthus giganteus	Giant sunflower	FACW	0.13 oz/acre	0.1%	
Symphyotrichum lanceolatum	Eastern-lined aster	FACW	0.10 oz/acre	0.1%	
Thalictrum dasycarpum	Tall meadow rue	FACW	0.20 oz/acre	0.2%	
Verbena hastata	Blue vervain	FACW	0.70 oz/acre	0.8%	
Zizia aurea	Golden Alexander's	FAC	0.50 oz/acre	0.6%	

⁽¹⁾ The % of mix is calculated without *Spartina pectinata*.

7.2.4 Hardwood Swamp

The existing hardwood swamp wetland will be managed to minimize the prevalence of invasive, nonnative species however, active seeding and planting are not expected to be needed. Should conditions develop that are not consistent with performance standards, a plan will be developed for management to achieve those standards.

⁽²⁾ Spartina pectinata will be added in selected locations.

7.2.5 Upland Area Management

Vegetation in the existing upland areas will be managed to promote natural succession of the existing plant communities. Each of the plant cover layers – ground, shrub, and tree layers – will be managed to promote the ecological integrity and function of native plant communities. The primary maintenance activity will be control of invasive, non-native species such as, but not limited to buckthorn, honeysuckle, and garlic mustard. Protecting the Site from further disturbances and allowing natural colonization and successional processes will maintain ecosystem biodiversity and structure.

Establishment and management activities will include:

- Monitoring Site to identify and anticipate problems with invasive species before they reach problem proportions. Particular attention will be paid to edges of the upland sites.
- Removing or treating with appropriate herbicides all invasive, non-native plant species when found; timing/season of treatment will be based upon best practices for control of the species.
- Seeding of upland buffers with the upland buffer seed mix in Table 7 at a rate of 8.5 pounds per acre native species when areas exceeding one acre in size lack the species diversity and density needed to meet the performance standards.

Table 7 Upland Buffer Seed Mix

Scientific Name	Common Name	Rate	% of Mix			
Native Grasses						
Elymus trachycaulus	Slender wheat grass	0.11 lbs/acre	1.3%			
Bromus ciliata	Fringed brome	2.00 lbs/acre	23.5%			
Calamagrostis candensis	Bluejoint	0.13 lbs/acre	1.5%			
Danthonia spicata	Poverty oats	0.50 lbs/acre	5.9%			
Elymus canadensis	Canada wild-rye	1.25 lbs/acre	14.7%			
Elymus virginicus	Virginia wild-rye	1.00 lbs/acre	11.8%			
Panicum virgatum	Switchgrass	1.00 lbs/acre	11.8%			
Poa palustris	Fowl bluegrass	0.90 lbs/acre	10.6%			
Sorghastrum nutans	Indian grass	0.48 lbs/acre	5.6%			
Native Forbs						
Achillea millefolium	Yarrow	0.48 oz/acre	0.4%			
Chamaecrista fasiculata	Partridge Pea	0.32 oz/acre	0.2%			
Asclepia syriaca	Common Milkweed	0.12 oz/acre	0.1%			
Doellingeria umbellata	Flat-topped aster	0.64 oz/acre	0.5%			
Heliopsis helianthiodes	Common ox-eye	2.08 oz/acre	1.5%			
Eurybia macrophylla	Large-leaved aster	0.32 oz/acre	0.2%			
Oligoneuron rigidum	Stiff goldenrod	2.24 oz/acre	1.6%			
Monarda fistulosa	Wild Bergamot	2.56 oz/acre	1.9%			
Rudbeckia hirta	Black-eyed susan	4.16 oz/acre	3.1%			
Solidago nemoralis	Gray goldenrod	0.96 oz/acre	0.7%			
Solidago ptarmicoides	Upland white aster	0.64 oz/acre	0.5%			
Symphyotrichum ericoides	Heath aster	0.48 oz/acre	0.4%			
Symphyotrichum laeve	Smooth aster	0.96 oz/acre	0.7%			
Verbena stricta	Hoary Vervain	2.08 oz/acre	1.5%			

8.0 Wetland Management Schedule

The following schedule presents a preliminary plan of the expected activities for restoring wetlands at the Site. However, with an adaptive management perspective, it should be recognized that the timing of specific establishment and management activities are likely to change as the restoration work progresses. The overall target for restoration activities at the Site is to complete the majority of the restoration work within the first four years of the Project. The Year 1 restoration work will begin within the first year after permit issuance. The remaining restoration activities will generally follow the conceptual schedule provided below.

The mitigation wetlands restored for the Project will require regular management to become established. This is critical in the first five to eight years and should be recognized as integral to the wetland mitigation process. Management will include both eliminating invasive, non-native species, creating ideal conditions for the native plants to flourish, and seeding/planting to supplement natural regeneration. Weeds can establish quickly as the wetlands develop particularly if the ground is bare at the time of restoration. Some weeds are very aggressive and will out-compete the desirable wetland seedlings. Therefore, weed removal and careful monitoring is important during the early stages of the restoration. As native plants grow and spread over the years, and as thatch builds, the Site will become less vulnerable to weed species. Removal of weeds does continue to be important during the first five to eight years to ensure that the native plant communities become established. Structures constructed to control hydrology within the restoration areas will be inspected annually during the established monitoring period and repairs will be made to maintain the goals of the plan.

After final certification of the restored wetlands by the appropriate regulatory agencies, the land owner of the Site will be required by the declaration of restricted covenants that will be recorded after completion of construction (examples provided in Appendix A), to regularly inspect and maintain those structures to sustain the goals of the approved plan.

8.1 Year 1

8.1.1 Fall/Winter

- Apply herbicide to areas where undesirable natural vegetation is present.
- Fill ditches as shown on the plans.
- Complete hydrologic restoration construction as described in Section 7.1 and as shown on the wetland restoration plans (Appendix F).
- Prepare as-built report documenting construction in comparison to the approved plans.
- Spray grass-selective and broad-leaf herbicides on dikes and dike slopes adjacent to restoration areas.
- Seed dike, dike slopes, and other upland buffer areas with the seed mix in Table 7.

 Spray restoration fields containing at least 20% areal coverage of invasive, non-native grass species with grass-selective herbicide.

8.1.2 Spring/Summer

- Monitor water levels in restored wetlands.
- Characterize vegetation in restoration areas three times (May-August) followed by development of specific management objectives for the remainder of the year based on the findings.
- Mow sedge/wet meadow, shrub-carr, and upland buffer areas in spring if annual weeds are present.
- Apply grass-selective and broad-leaf herbicide to upland buffers, dikes, and dike slopes where invasive, non-native or species are present.
- Spot spray wetland restoration areas to eliminate invasive, non-native species.

8.2 Year 2

8.2.1 Fall – End of First Full Growing Season

- Complete monitoring report, including documentation of wetland establishment activities completed during the previous year conducted in comparison to the plan and recommended actions for the following year.
- Monitor water levels in restored wetlands.
- Apply herbicides as necessary to control invasive, non-native species in all communities.
- Collect alder seed and install within planned alder thicket communities.

8.2.2 Spring/Summer

- Monitor water levels in restored wetlands.
- Spray grass-selective and broad-leaf herbicides (typically in early June) in upland areas adjacent
 to restoration areas where invasive, non-native grass and forb species are present before seed
 production is complete.
- Characterize vegetation in restoration areas approximately three times followed by development of specific management objectives for the remainder of the year based on the findings.
- Spot spray or wick-apply grass-selective and non-selective or other appropriate herbicide to eliminate invasive, non-native species within wetland restoration areas.
- Mow restored wetlands if annual weeds are present prior to seed production.
- Install shrub cuttings within planned shrub-carr communities.

8.3 Year 3

8.3.1 Fall – End of Second Full Growing Season

- Complete monitoring report, including documentation of wetland establishment activities
 completed during the previous year conducted in comparison to the plan and recommended
 actions for the following year. Make recommendations for permanent water level control
 adjustments that may be needed for restored wetlands to better promote vegetation
 development that meets performance standards.
- Monitor water levels in restored wetlands.
- Apply herbicides as necessary to control invasive, non-native species in all communities.
- If species diversity or vegetative cover development in herbaceous layer do not conform to performance standards, conduct seeding.

8.3.2 Spring/Summer

- If invasive, non-native species are present in the sedge meadow or wet meadow communities, conduct a spring burn.
- Monitor water levels in wetlands.
- Spray grass-selective and broad-leaf herbicides (typically in early June) in upland areas adjacent to restoration areas where invasive, non-native grass and forb species are present before seed production is complete, reseed if bare soils are present within areas greater than five acres in size.
- If shrub development does not appear to be on a trajectory to conform to performance standards, conduct additional shrub staking or seeding.
- Characterize vegetation in restoration areas in June and August followed by development of specific management objectives for the remainder of the year based on the findings.
- Spot spray or wick-apply with grass-selective, broad-leaved, or non-selective herbicide to eliminate invasive, non-native species within restored wetland areas.

8.4 Years 4-5

Many of the management activities described for Year 3 will be continued in Years 4 and 5 along with the monitoring activities. If shrub development does not meet performance standards, additional shrub seedlings or cuttings will be planted as described in Section 7.2.3. The monitoring report completed after the fifth growing season will assess whether or not restored wetland communities (with the exception of shrub communities) have met performance standards. If performance standards have been met, then the initial five year monitoring requirement would be complete.

8.5 Years 6-20

The establishment of shrub and forest communities can take longer, therefore the active management will be completed for eight years within shrub communities. Many of the management activities described for Years 4-5 will be continued in Years 6-8 along with the monitoring activities. Management activities will focus on spot treatment and removal of invasive, non-native vegetation species and the development of diverse native species to conform to the performance standards. Monitoring of vegetation will be conducted at least twice per growing season to guide management decisions. Spot spraying, mowing, or other control methods will be conducted as needed to meet the performance standards. Should contiguous areas of the site larger than five acres in size contain fewer than two dominant, native species for more than one full growing season, those areas will be seeded with the wetland seed mix (Table 6).

9.0 Wetland Mitigation Monitoring

The wetland restoration area will be monitored for at least five years (eight years for shrub communities) beginning in the first full growing season after completing hydrologic restoration. Monitoring will document the progress and condition of the wetland communities at the Site. For all wetland types, an annual monitoring report will be prepared for years 1 through 5 following construction. For shrub communities, monitoring results will also be included in reports prepared for year 8 following construction. The monitoring report completed after the final growing season of the monitoring period will assess whether or not the restored wetlands are in conformance with performance standards.

Hydrologic parameters will be evaluated in the mitigation area most intensively during the first five years and then at a level deemed appropriate to the hydrologic characteristics of each area thereafter. Any significant modifications to the monitoring frequency proposed herein will be described in a revised monitoring plan to be submitted for review and approval prior to implementation. In addition to monitoring the restored wetlands, one reference wetland of each wetland restoration community type with relatively natural hydrologic conditions (if available) will be monitored within the general area of the Site. A monitoring plan will be submitted for review and approval prior to implementing the monitoring program; that plan will also include locations of reference wetlands. Continuous recording wells will be utilized to the extent feasible.

9.1 Hydrologic Monitoring Years 1-5

Hydrologic monitoring in the restored wetland communities will be conducted using shallow wells placed within each restored wetland area; continuous recording wells will be utilized to the extent feasible. Water levels will be recorded several times per day throughout the growing season.

9.2 Hydrologic Monitoring Years 6-8

9.2.1 Shrub-Carr/Alder Thicket

If the monitoring conducted during Years 1-5 indicate a stable and consistent hydrologic regime similar to the reference wetlands, water levels will be recorded throughout the growing season during Years 6-8 for the shrub communities, but data will only be collected one time at the end of the growing season.

In wetlands where water level fluctuations differ substantially from the reference wetlands, water levels will be recorded throughout the growing season in Years 6-8 for the shrub and forest communities. Water level data will be collected approximately two times during the growing season to assist in determining the need for any corrective actions.

9.3 Vegetation Monitoring

A detailed vegetation survey will be conducted once per year (typically in August) in each wetland mitigation community, as well as in the reference wetland communities, to evaluate the success of the restoration during the appropriate monitoring period for each community type. A time meander search

will randomly sample 20% of each wetland restoration community. Documentation photographs will also be taken in August from fixed reference points around each restored wetland area.

9.4 Monitoring Report

The monitoring reports will describe the status of the wetland mitigation, summarize the results of the vegetative and hydrologic monitoring, and discuss management activities and corrective actions conducted during the previous year, and activities planned for the following year. Each report will be submitted to the USACE and MDNR by January 31 of the year following monitoring. The annual report will include the following information at a minimum:

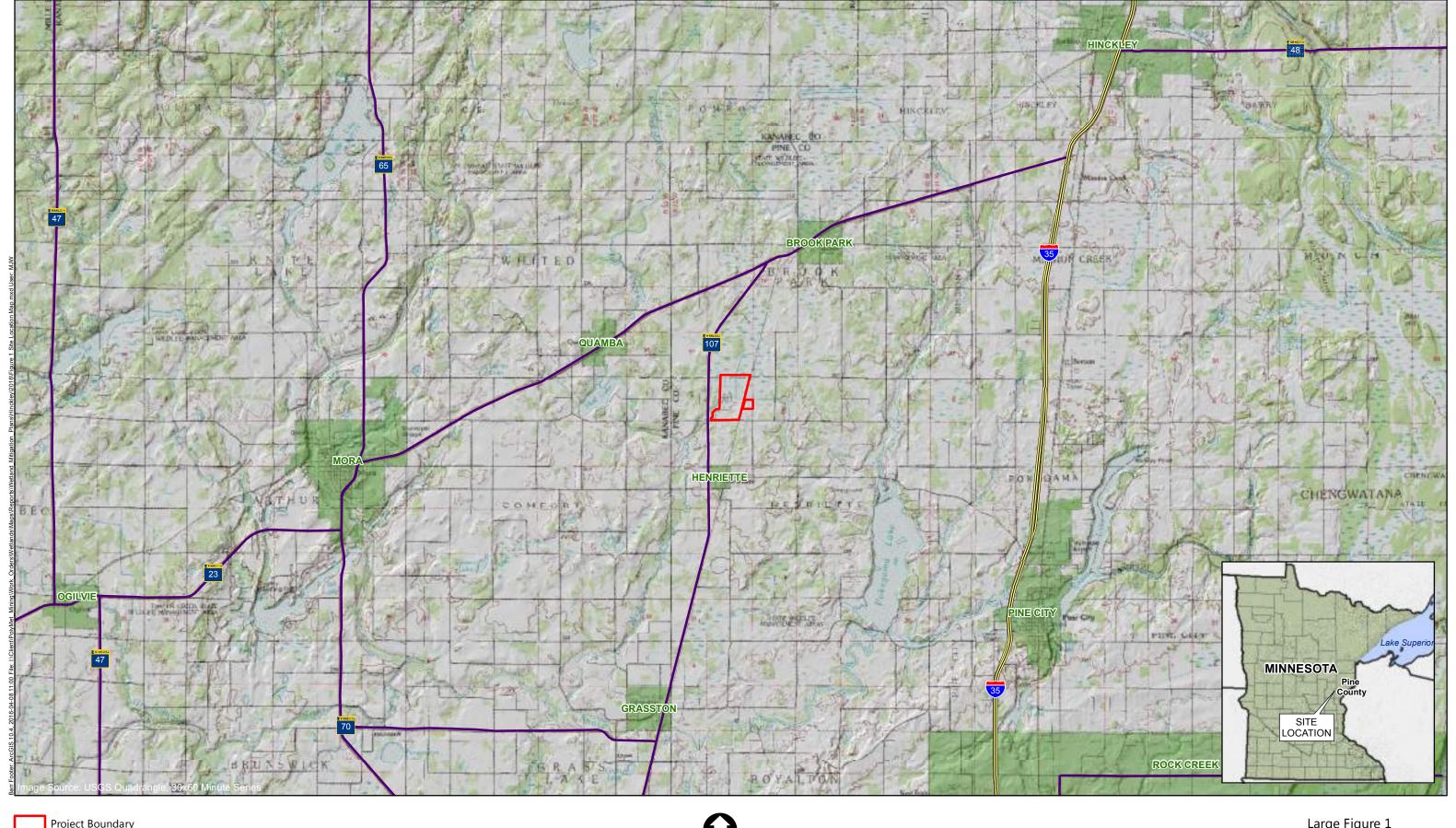
- A brief description of the wetland mitigation area, including location, size, vegetative and hydrologic monitoring data, current wetland types, and desired wetland types.
- Preparation of an as-built survey within the first year after construction is complete along with a comparison of the as-built survey to the approved plans.
- A summary of water level measurements taken to date and a determination whether the
 hydrology in the wetlands meets the design elevations and wetland hydrology criteria as defined
 in the performance standards.
- Vegetation survey information, including species and percent areal coverage within each restored wetland community and a determination of whether the vegetation meets the performance criteria, specifically reporting:
 - Percent coverage of native species, hydrophytic species, and non-native species by plant community type (absolute and relative percent cover);
 - Percent of species facultative or wetter (FAC, FACW, and OBL);
 - o Percent cover by growth form/layer (herbaceous, shrub, and tree layer); and
 - Summary data by community type such as species richness.
- A map of the various plant communities present within the restoration areas will be prepared as distinctly different communities develop.
- Color photographs of the Site taken in August of each year at designated photo-reference points.
- A summary of management activities and/or corrective actions conducted in the wetlands during the previous year and activities planned for the following year.

10.0 References

- 1. Barr Engineering Co. Wetland Mitigation Plan (RS-20T) (Draft-02). August 3, 2007.
- 2. —. Wetland Mitigation Plan (RS20T) (Draft-03). [RS-20T Draft-03]. January 2008.
- 3. **U.S. Army Corps of Engineers St. Paul District.** St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota. January 2009.
- 4. **Barr Engineering Co.** Hinckley Wetland Mitigation Site Hydrology Monitoring 2014-2016 (through mid-June). August 2016.
- 5. **Minnesota Board of Water & Soil Resources.** BWSR Guidance Concerning NRCS Developed Drainage Setback Tables (Version 2.0). October 2013.
- 6. **Eggers, Steve D. and Donald M. Reed.** Wetland Plants and Plant Communities of Minnesota and Wisconsin. s.l.: U.S. Army Corps of Engineers, St. Paul District, July 2015. Vol. Version 3.2.
- 7. **Minnesota Department of Natural Resources.** Invasive terrestrial plants. *Minnesota Department of Natural Resources*. [Online] 2002. http://www.dnr.state.mn.us/invasives/terrestrialplants/index.html.
- 8. **Patterson, C J and Knaeble, A R.** Geologic Atlas of Pine County Surficial Geology. St. Paul, Minnesota: University of Minnesota, Minnesota Geological Survey, 2001.
- 9. **Knaeble, A R, Patterson, C J and Meyer, G N.** Geologic Atlas of Pine County Quaternary Stratigraphy. St. Paul, Minnesota : University of Minnesota, Minnesota Geological Survey, 2001.
- 10. **Simmons, C S, et al.** Soil Survey of Pine County, Minnesota. s.l., Washington, D.C.: United States Department of Agriculture. U.S. Government Printing Office, 1941.
- 11. **Natural Resources Conservation Service.** WETS Climate Information Wetlands Retrieval for Minnesota. *U.S. Department of Agriculture NRCS.* [Online] 2007. http://www.wcc.nrcs.usda.gov/cgibin/getwetco.pl?state=mn.
- 12. **Lindholm, G F, et al.** Water Resources of the Snake River Watershed, East-Central Minnesota. s.l., Washington D.C.: U.S. Geological Survey, 1974.
- 13. **U.S. Army Corps of Engineers, Environmental Laboratory.** Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1987.
- 14. **Ed. J.S. Wakeley, R.W. Lichvar, C.B. Noble, and J.F. Berkowitz.** *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0).* U.S. Army Engineer Research and Development Center, U.S. Army Corps of Engineers. Vicksburgh, MS: s.n., 2012. ERDC/EL TR-12-1.

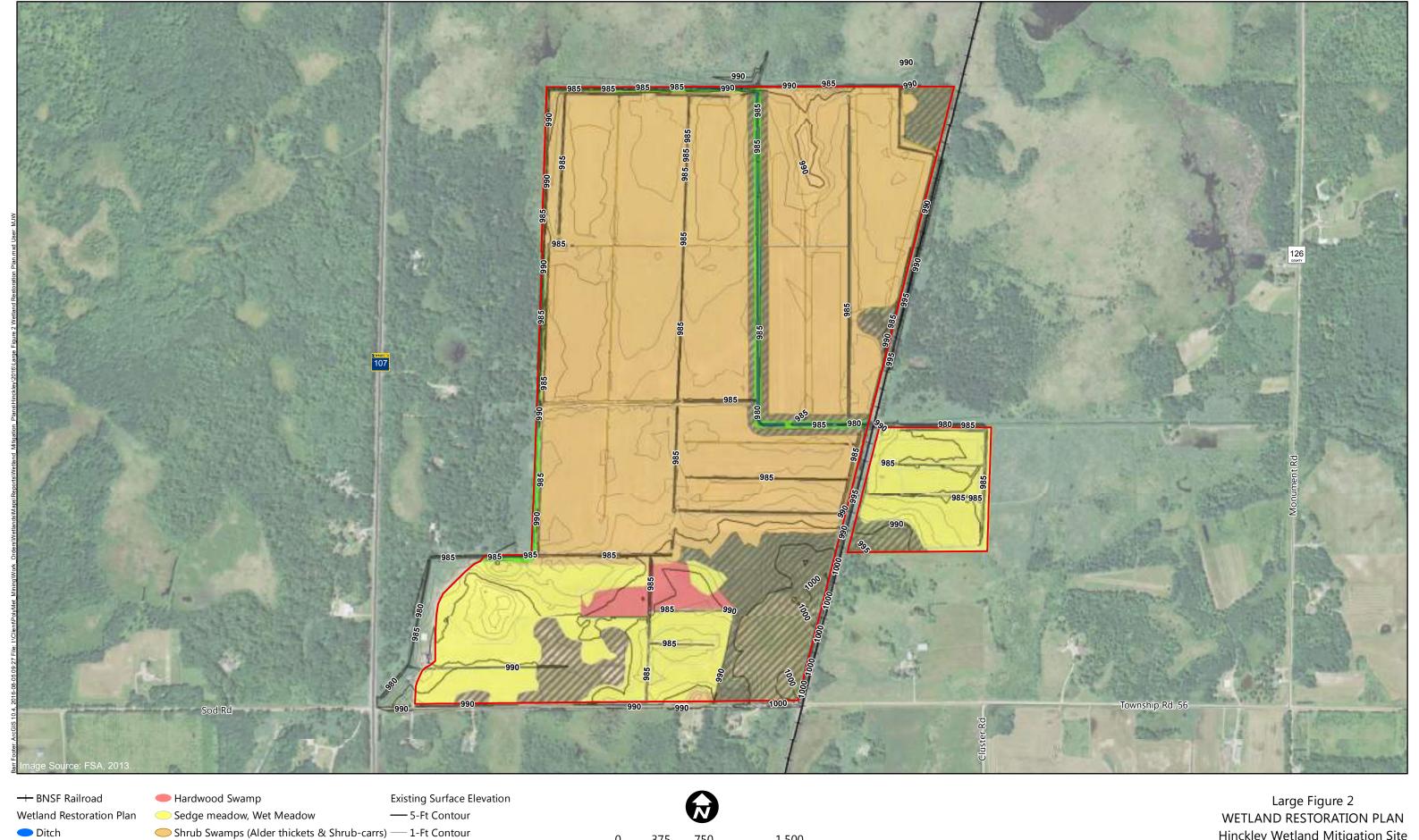
- 15. **Lichvar, R. W., et al.** Northcentral and Northeast 2014 Regional Wetland Plant List. s.l.: U.S. Army Corps of Engineers, April 2014.
- 16. **Shaw, S.P. and C.G. Fredine.** *Wetlands of the United States Their Extent and their Value to Waterfowl and Other Wildlife.* Washington, D.C.: U.S. Department of the Interior, 1956. p. 67. Circular 39.
- 17. **Cowardin, L.M., V. Carter, F.C. Golet, R.T. LaRoe.** *Classification of Wetlands and Deepwater Habitats of the United States.* s.l.: U.S. Fish and Wildlife Service, 1979. p. 103. FWS/OBS079/31.
- 18. **10,000 Lakes Archaeology, Inc.** Cultural Resource Investigations for Proposed Wetland Mitigation at Four Locations in Northern Minnesota. December 1, 2015.
- 19. Poly Met Mining Inc. NorthMet Project Wetland Permit Application (v2). August 19, 2013.

Large Figures





Large Figure 1
SITE LOCATION MAP
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



750

Feet

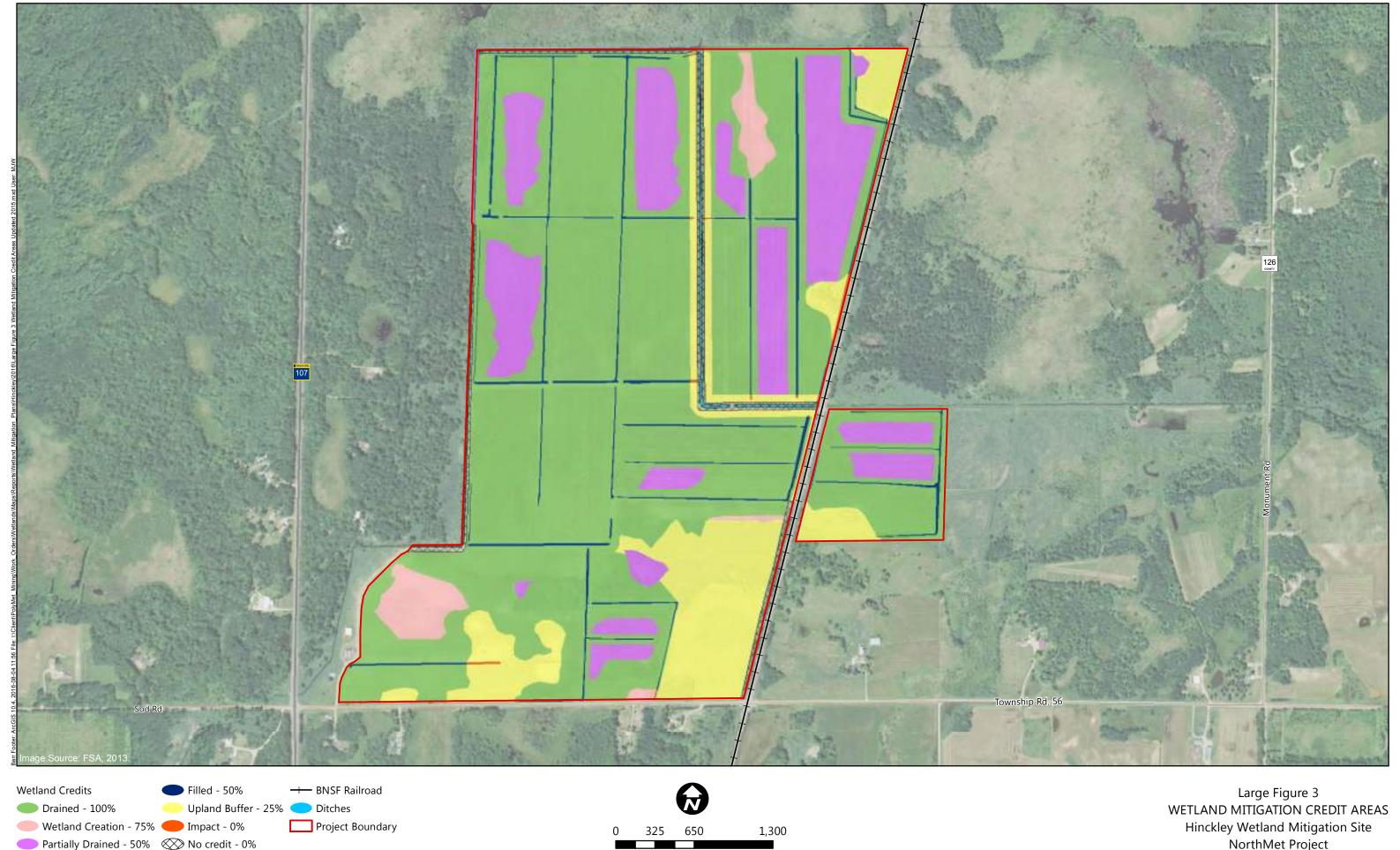
1,500

375

Project Boundary

Ditch Maintenance Zone Upland Buffer

Large Figure 2 WETLAND RESTORATION PLAN Hinckley Wetland Mitigation Site NorthMet Project Poly Met Mining Inc. Hoyt Lakes, MN



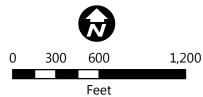
Feet

Partially Drained - 50% No credit - 0%

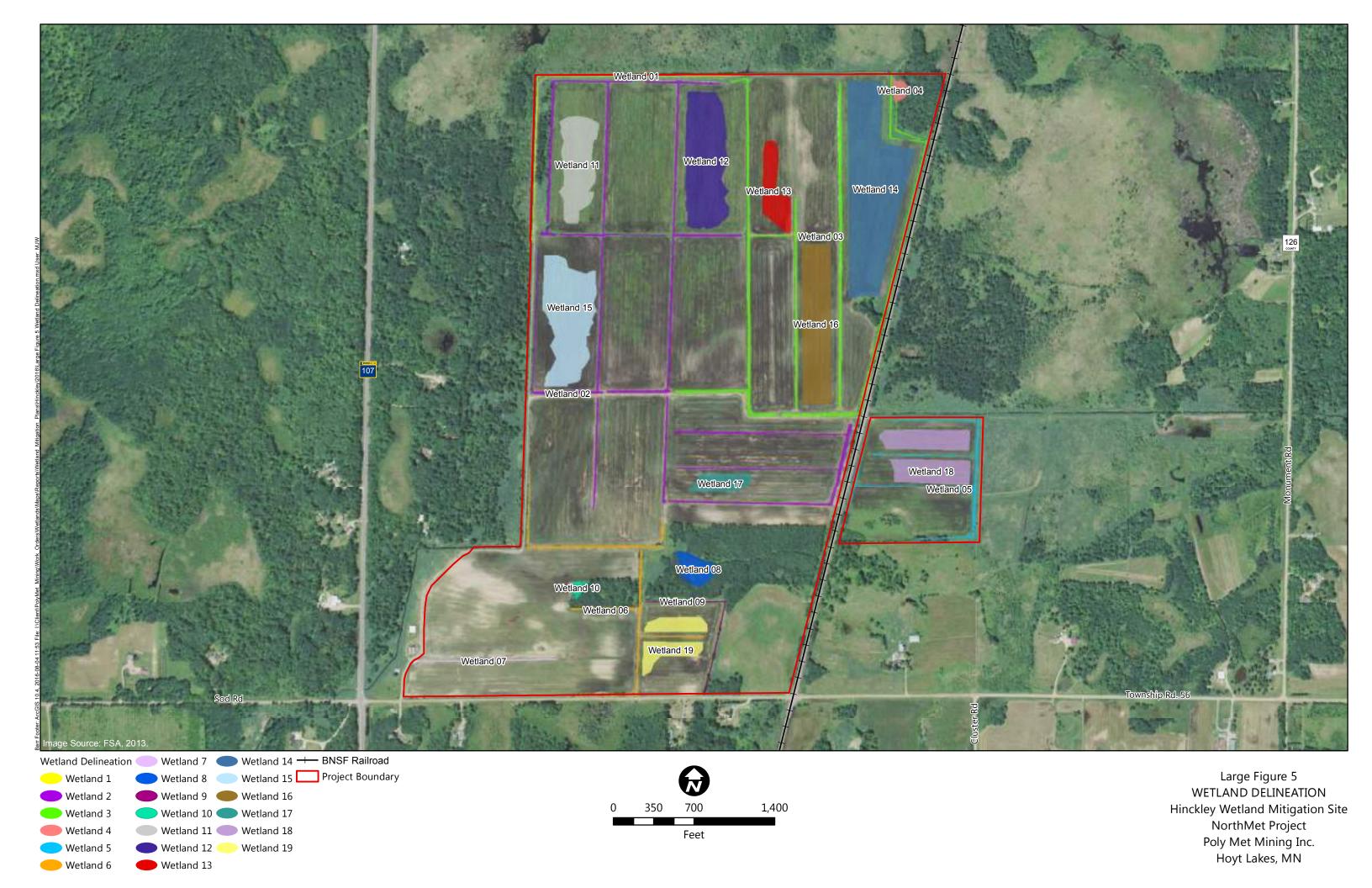
Hinckley Wetland Mitigation Site NorthMet Project Poly Met Mining Inc. Hoyt Lakes, MN

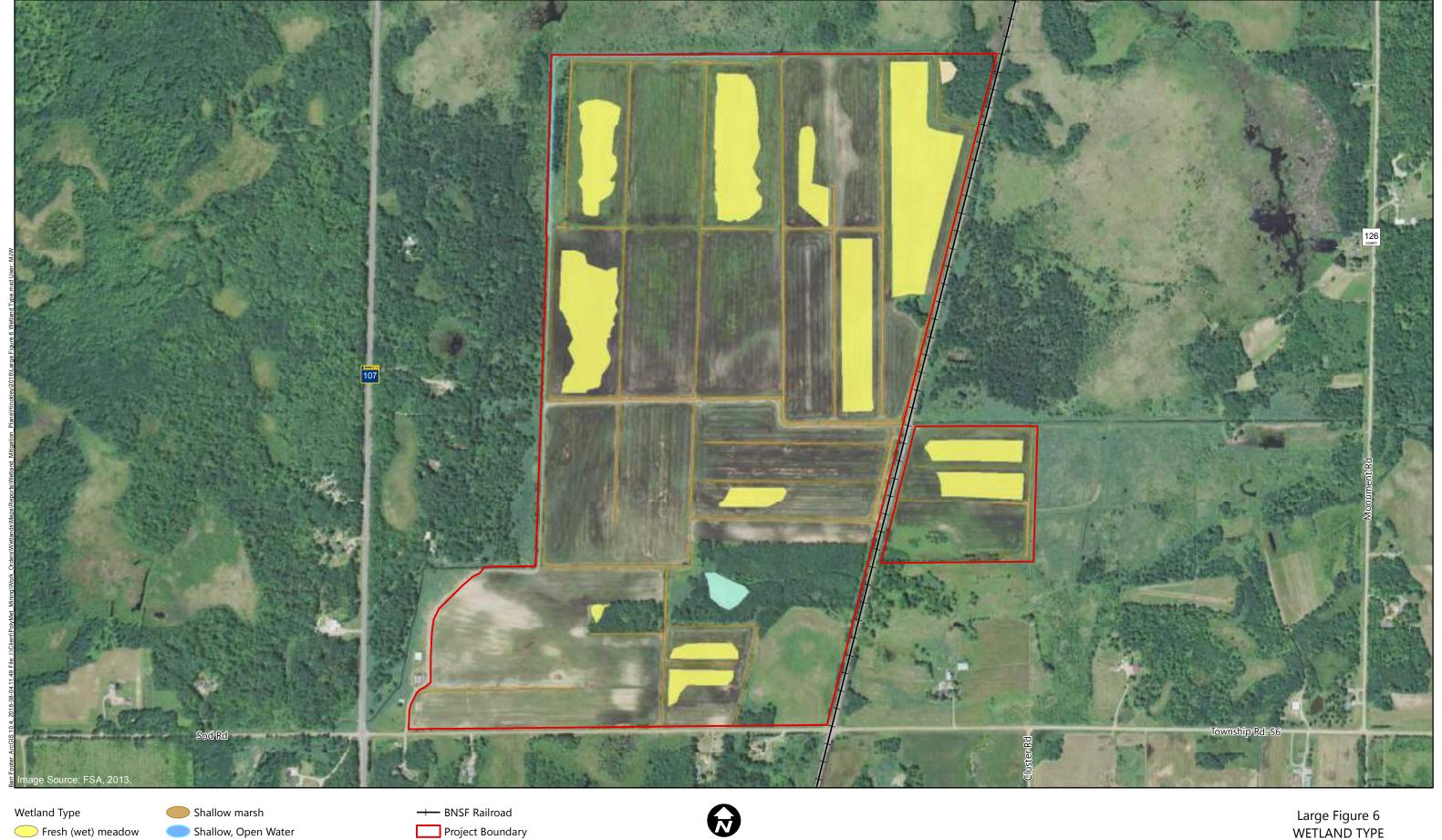


BNSF RailroadPine County Soil Survey (1941) with Map Unit SymbolProject Boundary



Large Figure 4
SOIL MAP
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN





350

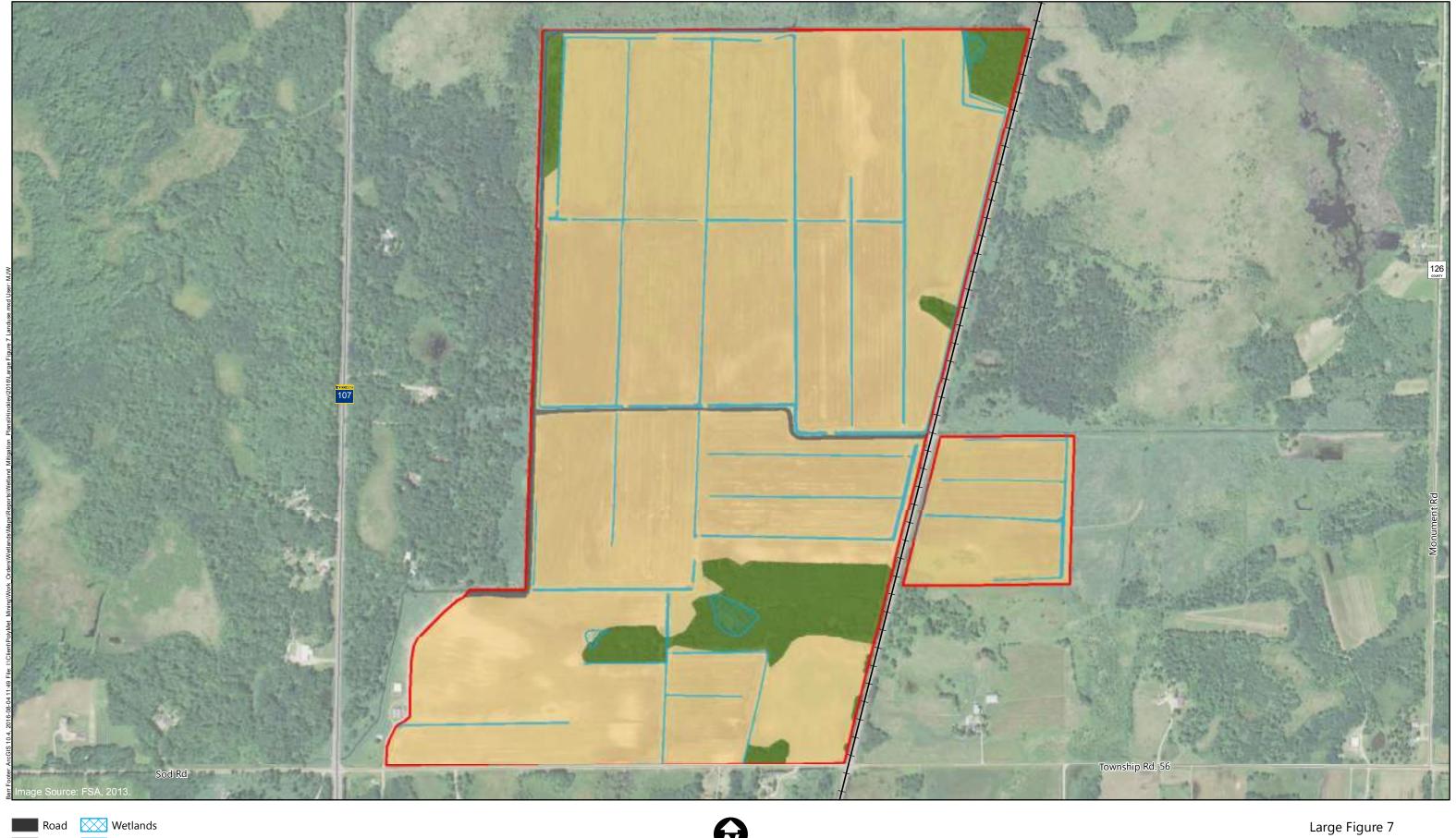
Seasonally flooded basin Shrub Swamps (Alder thickets & Shrub-carrs)

700

Feet

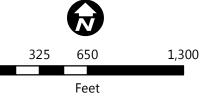
1,400

Large Figure 6
WETLAND TYPE
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Road Wetlands
Field Ditches
Forest Project Boundary

BNSF Railroad



Large Figure 7
LAND USE
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



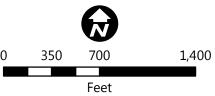
National Wetlands Inventory (NWI) Project Boundary

Freshwater Emergent Wetland + BNSF Railroad

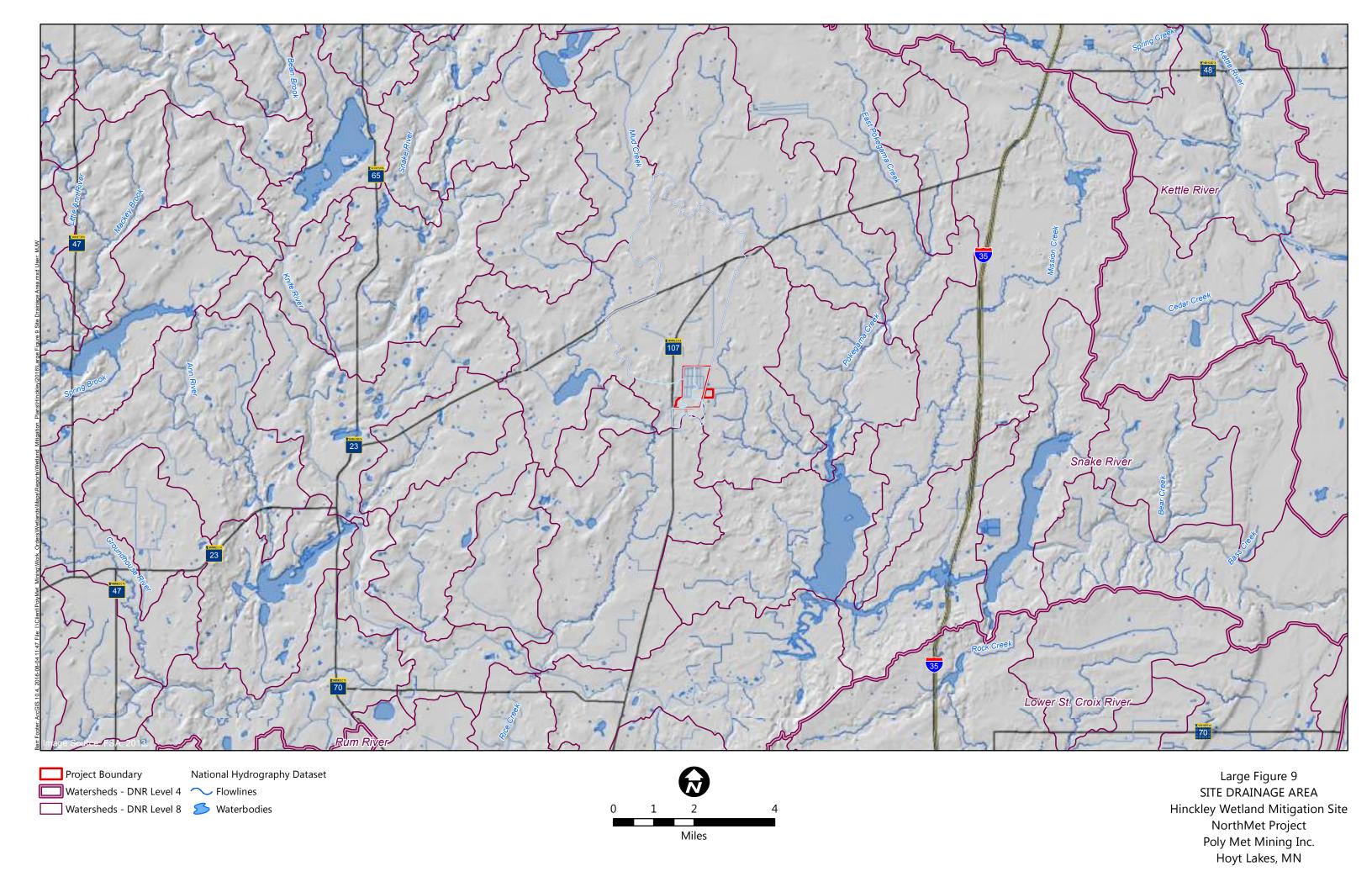
Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine



Large Figure 8
NATIONAL WETLAND INVENTORY
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



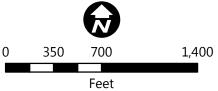


0 350 700 1,400 Feet

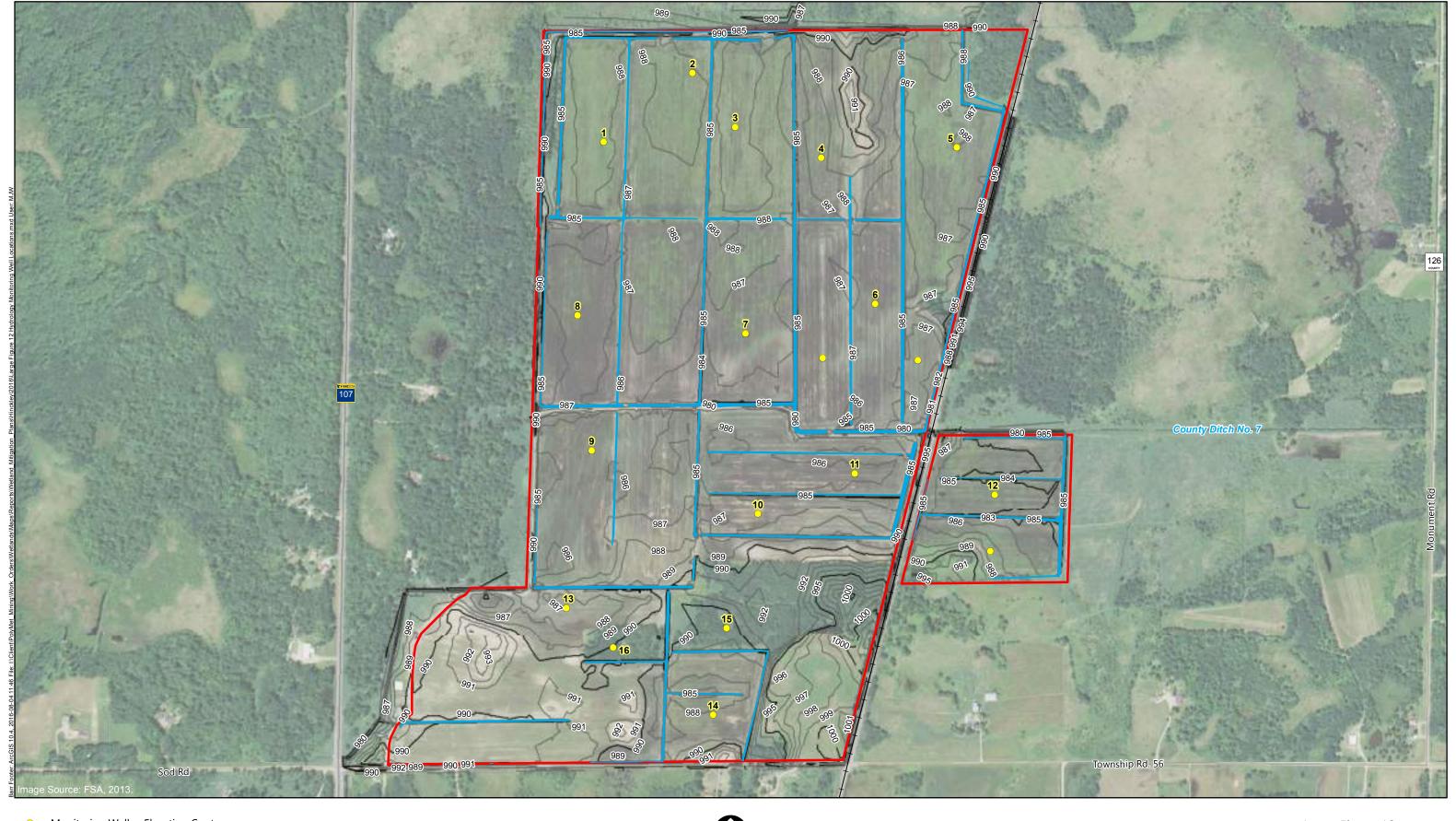
Large Figure 10 1939 AERIAL PHOTO Hinckley Wetland Mitigation Site NorthMet Project Poly Met Mining Inc. Hoyt Lakes, MN

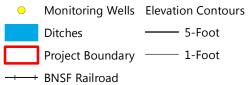


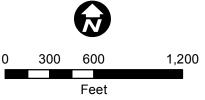
Project Boundary



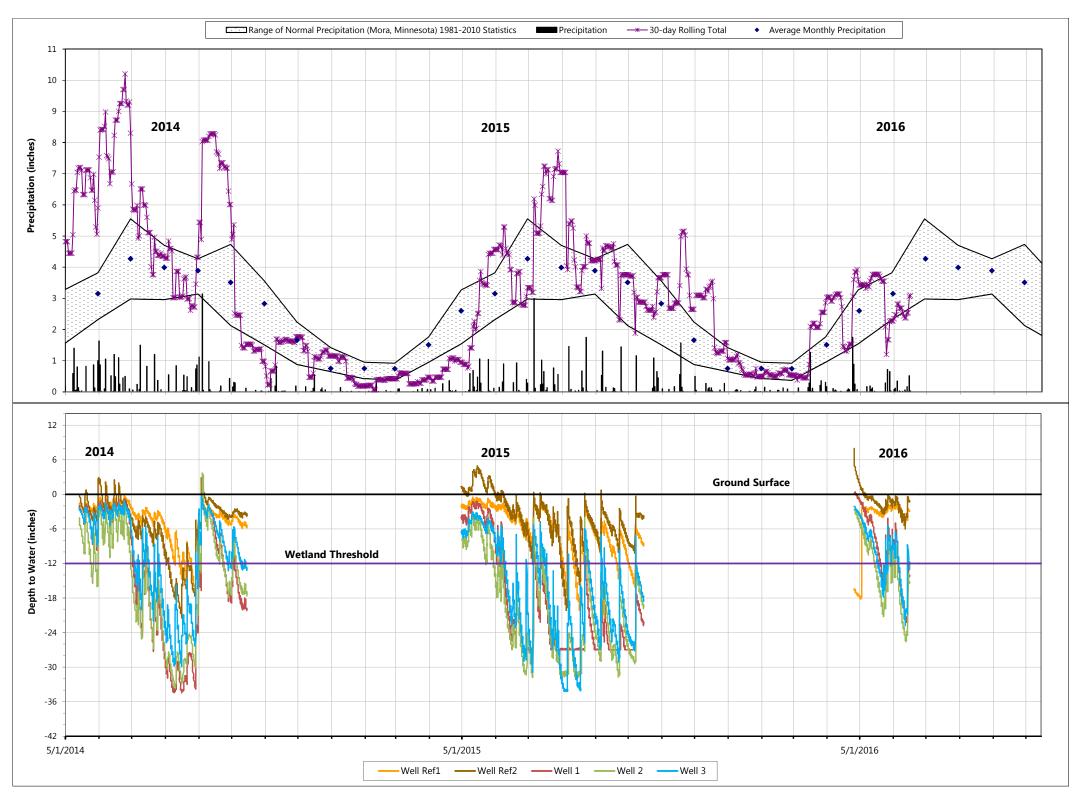
Large Figure 11 1991 AERIAL PHOTO Hinckley Wetland Mitigation Site NorthMet Project Poly Met Mining Inc. Hoyt Lakes, MN



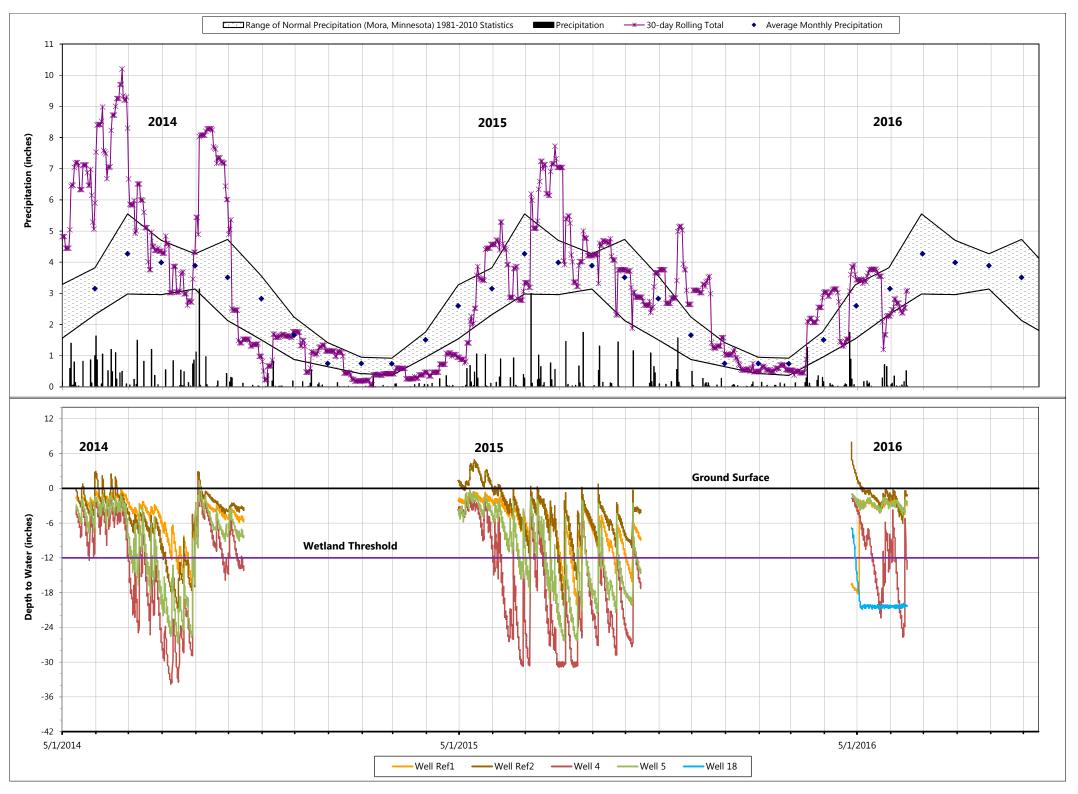




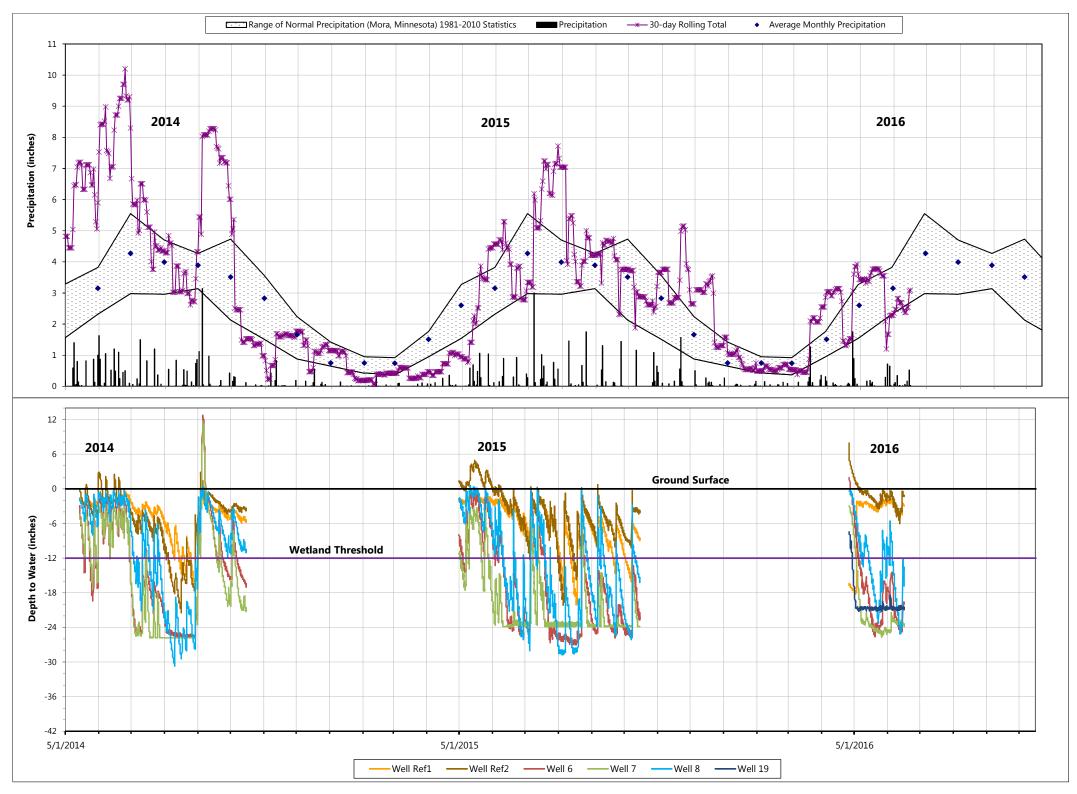
Large Figure 12
MONITORING WELL LOCATIONS
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



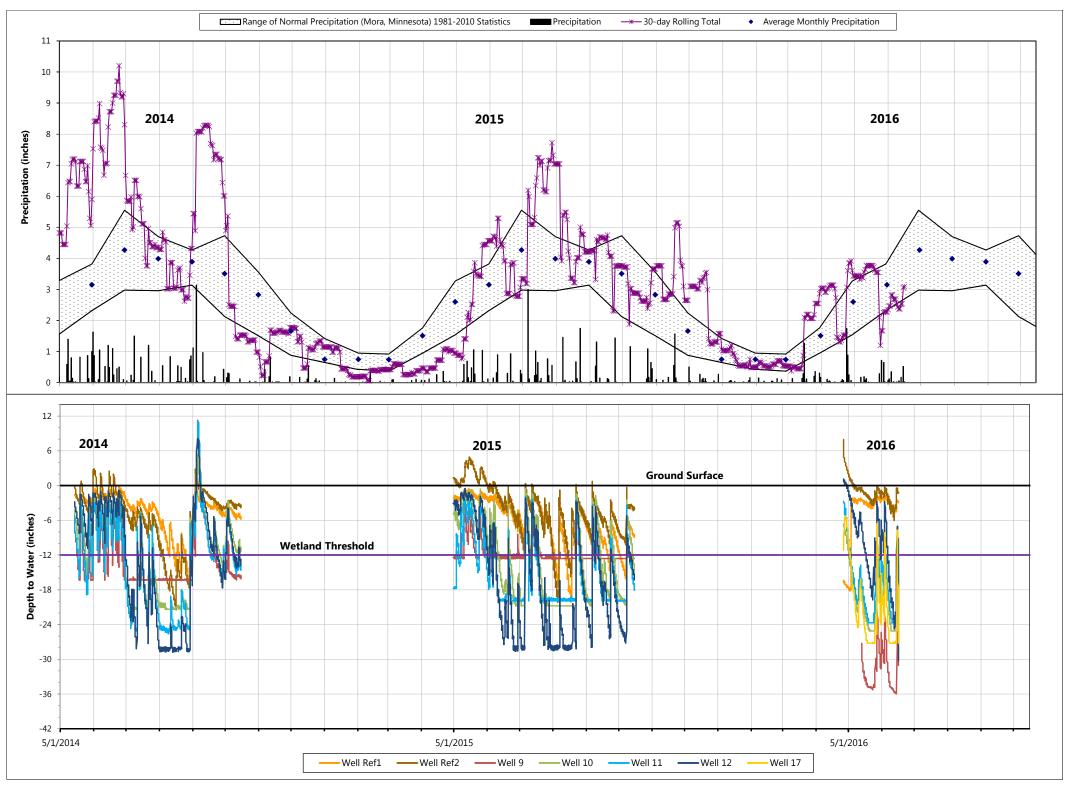
Large Figure 13
2014-2016 Hydrology Monitoring Data
Wells 1, 2, and 3
Hinckley Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



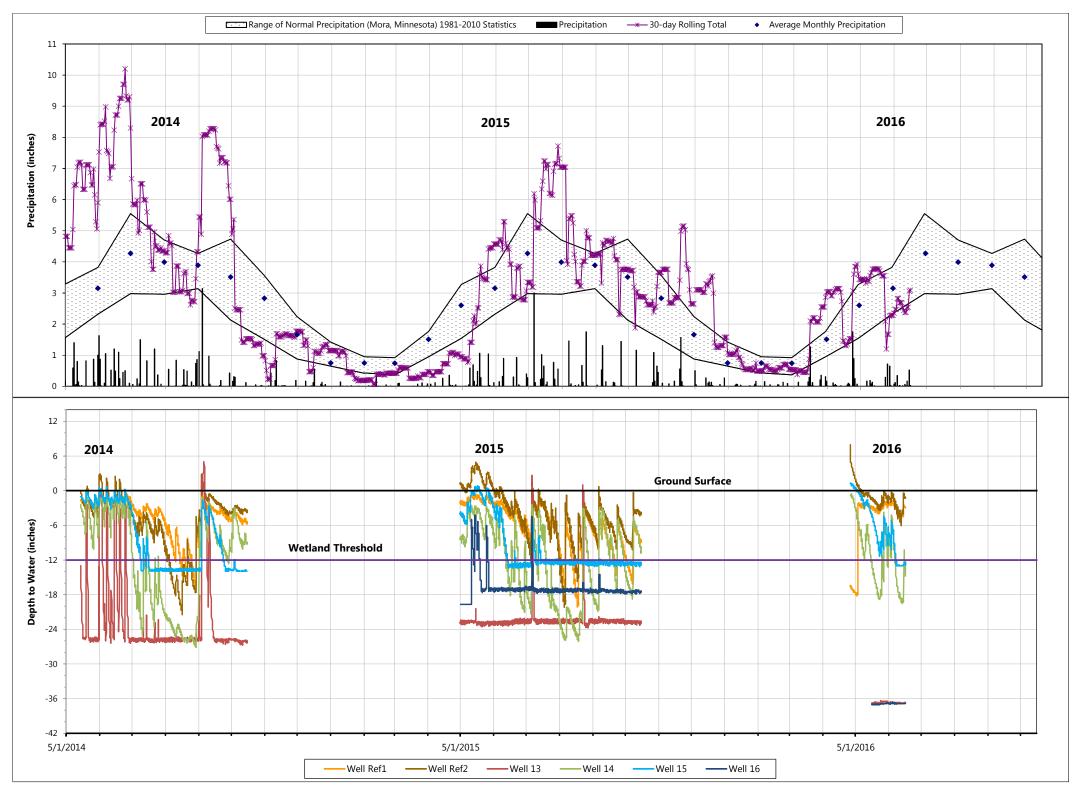
Large Figure 14
2014-2016 Hydrology Monitoring Data
Wells 4, 5, and 18
Hinckley Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 15
2014-2016 Hydrology Monitoring Data
Wells 6, 7, 8, and 19
Hinckley Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 16
2014-2016 Hydrology Monitoring Data
Wells 9, 10, 11, 12, and 17
Hinckley Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 17
2014-2016 Hydrology Monitoring Data
Wells 13, 14, 15, and 16
Hinckley Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN

Appendices

Appendix A

Declaration of Restricted Covenants Example

-(Above Space is Reserved for Recording Information)—

PERPETUAL CONSERVATION EASEMENT FOR WETLAND BANK

Grantor:

Location: within Section 5, Township 39 North, Range 22 West, County of Pine

This Perpetual Conservation Easement for Wetland Replacement ("Easement") is made on (date) by the undersigned, hereinafter referred to collectively as the "Grantor":

RECITALS

- A. This Easement is made pursuant to and in furtherance of the Wetland Conservation Act of 1991, as amended, Minn. Stat. §103G.222, *et. seq.* ("WCA") and the rules implementing WCA, Minn. R. ch. 8420 ("WCA Rules").
- B. This Easement pertains to all or part of the real property in Pine County, Minnesota, which is legally described on *Exhibit A* attached hereto and made a part hereof ("Real Property").
 - C. The Real Property is the subject of a wetland bank plan pursuant to Minn. R.8420.0740.
- D. The Grantors include all of the following (1) all the fee owners of the Real Property and (2) the applicants under the bank plan if different from the fee owners. The term "Grantor" includes all of the Grantors if there is more than one. The Grantors are jointly and severally responsible for complying with the terms of this instrument. This Easement and the duties and restrictions contained in it shall also run with the land.
- E. WCA is administered by the State of Minnesota through its Board of Water and Soil Resources ("State").

Page 1 of 6

- F. The local government unit ("LGU") charged under WCA with approval of the subject wetland replacement plan ("replacement plan") is the Minnesota Department of Natural Resources Division of Lands and Minerals. The subject wetland mitigation plan includes all fully executed forms provided by the State, all supporting maps, engineering plans, drawings, monitoring plan, vegetation establishment plan and management plan and facilities maintenance plan. A complete copy of the replacement plan is on file at the LGU. The address of the LGU is 1525 Third Avenue East, Hibbing, MN 55746. The State is responsible for the acceptance of this Easement.
- G. The replacement plan requires the restoration or creation of a wetland on the portion of the Real Property designated in Exhibit B attached hereto and made a part hereof ("Replacement Area"). The replacement plan may also require the establishment of upland buffer within the Replacement Area. This Easement pertains to both wetlands and specified uplands within the Replacement Area.
- H. The Replacement Area is subject to the WCA, WCA Rules and all other provisions of law that apply to wetlands, except that the exemptions in Minn. Stat. §103G.2241 and Minn. R. 8420.0122 do not apply to the Replacement Area, pursuant to Minn. Stat. §103G.222, subd. 1(h) and Minn. R. 8420.0115.
- I. All references in this Easement to Minnesota Statutes and to Minnesota Rules are to the statutes and rules currently in effect and as amended or renumbered in the future.
- J. The purposes of this Easement are to maintain and improve the ecological values of the Replacement Area through the means identified in the replacement plan and to preserve the Replacement Area in a natural condition in perpetuity.

IN ADDITION, THE GRANTORS, FOR THEMSELVES, THEIR HEIRS, SUCCESSORSAND ASSIGNS COVENANT THAT THEY:

- 1. Shall establish and maintain wetlands and upland buffers within the Replacement Area as specified in the replacement plan approved by the LGU and on file at the offices of the LGU. The wetland and any specified upland buffer area shall be the size and type specified in the replacement plan. Grantor shall not make any use of the Replacement Area that would adversely affect any of the functions or values of the area. Those functions and values are identified in Minn. R. 8420.0540, subp. 10, or specified in the approved replacement plan.
- 2. Shall pay the costs of establishment, maintenance, repairs and reconstruction of the wetlands and specified upland buffers within the Replacement Area, which the LGU or the State may deem necessary to comply with the specifications for the Replacement Area in the approved replacement plan. The Grantor's obligations under this paragraph include the payment of any lawful taxes or assessments on the Real Property.
- 3. Shall establish and maintain visible monuments such as signs, numbered fence posts or survey posts at prominent locations along the boundary of the Replacement Area in accordance with the approved replacement plan. If numbered fence posts are used, Grantor's Replacement Plan must contain a survey or scaled drawing of the property that corresponds to the fence post numbering. Posts

must be at least 4 feet high and notably visible on the landscape. If signs are used, such signs must be have a surface area of at least one quarter (1/4) square feet, mounted on a fence post at least 4 feet above ground, and minimally contain the words "Boundary of Wetland Replacement Area - Subject to Perpetual Conservation Easement Restrictions – Contact MN Board of Water and Soil Resources or Local Soil and Water Conservation District for Further Information." Said monuments must be made of non-degradable material and shall be at least four feet in height.

- 4. Grants to the LGU, the State, and the agents and employees of the LGU and the State, reasonable access to the Replacement Area for inspection, monitoring and enforcement purposes. The LGU, the State, and the agents and employees of the State are hereby granted a perpetual ingress and egress easement ("Access Easement") for access to and from the Replacement Area. The Access Easement shall be over and across the area ("Access Area") that is specified on Exhibit A attached hereto and made a part hereof or, if not specified on Exhibit A, the most reasonably direct and convenient route between the Replacement Area and a public road. If all or any part of the Access Area is owned by a person or entity other than Grantor, then the owner has joined in this Easement for purposes of granting the Access Easement by signing below. The signed written consent and subordination of all other holders of interests in the Access Area has been or will be obtained by Grantor and recorded in the same manner as specified in paragraph 5 below. This Easement grants no access to or entry to the Real Property, the Replacement Area, or the Access Area to the general public.
- 5. Represents that Grantor is (a) the fee owner of the Real Property and (b) the applicant under the replacement plan, if different from the fee owner. Grantor represents that all other parties who may have an interest in the Real Property (e.g., mortgagees, contract for deed vendees, holders of easements, etc.) have consented and subordinated their interests to this Easement by signing below. If it is determined at any time that there is any other party who may have an interest in the Real Property that is prior to this Easement, then Grantor shall immediately obtain and record a consent and subordination agreement signed by such other party. Acceptance of this Easement does not release Grantor from the obligation to obtain and record a consent and subordination agreement signed by any party who may have an interest in the Real Property that is prior to this Easement, even if such interest was of record at the time of acceptance.
- 6. Will record this easement at Grantor's expense in the real property records of the county where the Real Property is located. Said recording shall take place within 30 days of the State's acceptance of this Easement. The Grantor shall provide the original copy of the recorded easement to the State prior to making any credits from this replacement area available for use.
- 7. Acknowledge that this Easement shall be unlimited in duration, without being rerecorded. This Easement shall be deemed to be a perpetual conservation easement pursuant to Minn. Stat. ch. 84C.
- 8. Acknowledge that, unless expressly authorized in writing by the LGU in the approved replacement plan, Grantor:
 - (a) Shall not produce agricultural crops on the Replacement Area, except that this provision does not restrict the harvest of the seeds of native vegetation if only the seed-head is

- removed in the process of harvest and does not involve the use of vehicular, motorized equipment;
- (b) Shall not cut hay, mow vegetation or cut timber on the Replacement Area except as allowed or prescribed in the Replacement Plan;
- (c) Shall not make any vegetative alterations on the Replacement Area that do not enhance or would degrade the ecological functions and values of the Replacement Area.

 Vegetative alterations shall be limited to those listed in the approved replacement plan;
- (d) Shall not graze livestock on the Replacement Area;
- (e) Shall not place any materials, substances or other objects, nor erect or construct any type of structure, temporary or permanent, on the Replacement Area.
- (f) Shall not allow vehicular traffic on the Replacement Area except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (g) Shall not alter the topography of the Replacement Area by any means including plowing, dredging, filling, mining or drilling except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (h) Shall not modify the hydrology of the Replacement Area in any way or by any means including pumping, draining, ditching, diking, impounding or diverting surface or ground water into or out of the Replacement Area except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (i) Shall regularly inspect and maintain structures specified in the Replacement Plan in good working condition to sustain the goals in the approved Replacement Plan.
- 9. Acknowledge that the Grantor is responsible, at Grantor's cost, for weed control by complying with noxious weed control laws and emergency control of pests necessary to protect the public health on the Replacement Area.
- 10. Acknowledge that this Easement may be modified only by the joint written approval of the LGU and the State. If the Replacement Area has been used to mitigate wetland losses under the Federal Water Pollution Control Act, the U.S. Army Corps of Engineers (or successor agency) must also agree to the modification in writing.
- 11. Acknowledge that this Easement may be enforced, at law or in equity, by the LGU or the State. The LGU and the State shall be entitled to recover an award of reasonable attorney's fees from Grantor in any action to enforce this Easement. The right to enforce the terms of this Easement is not waived or forfeited by any forbearance or failure to act on the part of the State or LGU. If the subject Replacement Area is to be used partially or wholly to fulfill permit requirements under the Federal Water Pollution Control Act or a federal farm program, then the provisions of this Easement

that run to the State or the LGU may also be enforced by the United States of America in a court of competent jurisdiction.

12. Acknowledge that this Easement is not valid until the Easement has been accepted by the State, the Grantor has recorded this Easement and the State has received evidence of such recording.

SIGNATURE OF GRANTOR

SIGNATURE OF FEE OWNER(S):	
STATE OF MINNESOTA)) ss. COUNTY OF)	
This instrument was acknowledged before manual (name(s) with marital status).	ne this day of , by
Notarial Stamp or Seal	Notary Public
Notary Public IGNATURE OF BANK APPLICANT (S), F DIFFERENT FROM FEE OWNER:	
STATE OF MINNESOTA)) ss. COUNTY OF) This instrument was acknowledged before re-	ne this day of by
This instrument was acknowledged before n (name(s) with marital status).	ne this day of , by
Notarial Stamp or Seal	Notary Public

ACCEPTANCE

The State accepts the foregoing Easement.

MINNESOTA BOARD OF WATER AND SOIL RESOURCES:

Ву:	<u> </u>				
Its:	_				
STATE OF MINNESOTA)) ss. COUNTY OF)					
This instrument was acknowledged before me person) as (title) of the Board of Water and Soi		day of	,	by	(name of
Notarial Stamp or Seal	Notary P	'ublic			
This instrument was drafted by the Board of Water and S One West Water Street, St. Paul, MN 55107	Soil Resou	rces			
If there are additional holders of interest the subject : Consent and Subordination agreement [BWSR Form		-			ach their

EXHIBIT A Legal Description of Real Property

EXHIBIT B Map or Survey of Bank Area

Appendix B

Project Wetland Mitigation Crediting

Large Table 5

Mitigation Credit Summary⁽¹⁾
Poly Met Mining, Inc.

	Within I	Project Wa	tershed		Ou	tside Project	: Watershed ⁽¹)		Total Wetland		Total Wetland
Community / Credit Type	Zim Sod Wetland Mitigation (acres)	Credit Percent	Total Wetland Mitigation Credits	Aitkin Wetland Mitigation (acres)	Aitkin Wetland Mitigation Credits	Hinckley Wetland Mitigation (acres)	Hinckley Wetland Mitigation Credits	Credit Percent	Total Wetland Mitigation Credits	Mitigation ⁽¹⁾ (acres)	Credit Percent	Mitigation Credits ⁽¹⁾
Off-Site Restoration of draine	d wetland (2)											
Type 2 Fresh (Wet) Meadow	0		0	0	0	0	0		0	0		0.0
Type 2 Sedge Meadow	0		0	0	0	56.17	56.17		56.17	56.17		56.17
Type 3 Shallow Marsh	0		0	21.22	21.22	0	0		21.22	21.22		21.22
Type 4 Deep Marsh	0		0	0	0	0	0		0	0		0
Type 5 Shallow, Open Water	0		0	0	0	0	0		0	0		0
Type 6 Shrub-Carr	0	100%	0	0	0	98.43	98.43	100%	98.43	98.43	100%	98.43
Type 6 Alder Thicket	0		0	0	0	98.44	98.44		98.44	98.44		98.44
Type 7 Hardwood Swamp	0		0	147.95	147.95	7.40	7.40		155.35	155.35		155.35
Type 7 Coniferous Swamp	0		0	544.94	544.94	0	0		544.94	544.94		544.94
Type 8 Open Bog	7.54		7.54	0	0	0	0		0	7.54		7.54
Type 8 Coniferous Bog	443.09		443.09	0	0	0	0		0	443.09		443.09
Off-Site Restoration of partial	ly-drained w	etland ⁽³⁾			•				•			
Type 2 Sedge Meadow	0		0	0	0	13.16	6.58		6.58	13.16		6.58
Type 3 Shallow Marsh	0		0	0.30	0.15	0	0		0	0.30		0
Type 7 Coniferous Swamp	0		0	25.15	12.58	0	0	1	12.58	25.15	50%	12.58
Type 8 Open Bog	2.83	50%	1.42	0	0	0	0	50%	0	2.83		1.42
Type 6 Shrub-Carr	0		0	0	0	62.46	31.23		31.23	62.46		31.23
Type 7 Hardwood Swamp	0		0	73.49	36.75	0.17	0		36.83	73.66		36.83
Type 8 Coniferous Bog	50.45		25.23	0	0	0	0		0	50.45		25.23
Off-Site Site Wetland Creation	1 ⁽⁴⁾											
Type 2 Sedge Meadow	0		0	0	0	7.14	5.36		5.36	7.14		5.355
Type 6 Shrub-Carr	0	75%	0	0	0	2.52	1.89	75%	1.89	2.52	75%	1.89
Type 6 Alder Thicket	0		0	0	0	2.52	1.89		1.89	2.52		1.89
Off-Site Site Wetland Restora	tion that will	not receiv	e credit ⁽⁵⁾							<u>-</u>		
Type 3 Shallow Marsh	0		0	14.02	0	0	0		0	14.02		0
Type 7 Hardwood Swamp	0		0	0.02	0	0	0		0	0.02		0
Type 7 Coniferous Swamp	0		0	0.86	0	0	0		0	0.86		0
Off-Site Upland Buffer (6)	9.78	25%	2.45	64.26	16.07	57.31	14.33	25%	30.39	131.35	25%	32.84
Impact ⁽⁷⁾	0.03		-0.03	0.51	-0.51	0.32	-0.32		0.86	0.86		-0.86
No Credit ⁽⁸⁾	18.12			127.60		10.68				156.40		
Upland Buffer Total	9.78		2.45	64.26	16.07	57.31	14.33		30.39	131.35		32.84
Wetland Total	503.91		477.24	827.95	763.07	348.41	307.15		1,070.22	1,680.27		1,547.46
Total	531.84		479.69	1,020.32	779.14	416.72	321.48		1,100.61	1,968.88		1,580.30
(1) Totals may not add exactly due to re				,					.,	.,		.,

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ Credits for restoration of completely drained wetlands are worth 100% of the acreage restored based on USACE St. Paul District Policy (Restoration via re-establishment) and the Minnesota WCA Chap. 8420.0526 Subp. 3

⁽³⁾ Credits for restoration of partially-drained wetlands are worth 50% of the acreage restored based on USACE St. Paul District Policy (Restoration via rehabilitation) and the Minnesota WCA Chap. 8420.0526 Subp. 4

⁽⁴⁾ Credits for wetland creation are worth 75% of the acreage created based on USACE St. Paul District Policy (Wetland Creation) and the Minnesota WCA Chap. 8420.0526 Subp. 7 (per Minnesota Statute 103G.2251 modified August 1, 2011.)

⁽⁵⁾ Wetlands will be restored within areas (e.g., Diversion Channel easement) that will not receive credit.

⁽⁶⁾ Credits for upland buffers are worth 25% of the acreage of native, noninvasive vegetation established or maintained adjacent to the wetland based on USACE St. Paul District Policy (Preservation) and the Minnesota WCA Chap. 8420.0526 Subp. 1

⁽⁷⁾ Negative credits for ditches (wetlands) that are filled within upland buffer which is removed from the credit total.

⁽⁸⁾ Areas within a Site without construction including homesteads, building areas, easements, etc.

Large Table 6

Wetland Mitigation Utilizing USACE Credits⁽¹⁾
Poly Met Mining, Inc.

	Mit	tigation Cı	redits Avail	able	NorthMet Project Prop	oosed Direct Wetland I Acres ^(1,2)	mpacts in	Total Credits	No l	More Than 2 A		Total Applied	Applied
Wetland or Credit Type	Zim	Aitkin	Hinckley	Total	Non-forested, Non- bog, and Low or Medium Quality (Base Ratio 1.5:1) ⁽³⁾	Bogs, Forested, and High Quality (Base Ratio 2:1) ⁽⁴⁾	Total Impact Acres	Required for Mitigation at Base Ratio	Incentive for in- kind -0.25:1	Incentive for credits in- place -0.25:1	Incentive for credits in- advance ⁽⁵⁾ -0.25:1	Mitigation Credits ^{(6), (7)}	Mitigation Ratio ⁽⁸⁾
Type 2 Fresh (Wet) Meadow	0	0	0	0	1.38	14.43	15.81	30.93				30.93	1.96
Type 2 Sedge Meadow	0	0	68.11	68.11	6.87	17.05	23.92	44.41	(5.98)			38.43	1.61
Type 3 Shallow Marsh	0	20.86	0	20.86	53.13	23.90	77.03	127.50	(5.22)		(5.22)	117.07	1.52
Type 4 Deep Marsh	0	0	0	0	74.20	0.09	74.29	111.48				111.48	1.50
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0				0	
Type 6 Shrub-Carr	0	0	131.23	131.23	1.40	2.49	3.89	7.08	(0.97)			6.11	1.57
Type 6 Alder Thicket	0	0	100.33	100.33	7.50	103.09	110.59	217.43				217.43	1.97
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	0.69	12.47	13.16	25.98	(3.29)			22.69	1.72
Type 7 Coniferous Swamp	0	557.52	0	557.52	0	84.43	84.43	168.86	(21.11)			147.75	1.75
Type 8 Open Bog	8.96	0	0	8.96	0	7.64	7.64	15.28				15.28	2.00
Type 8 Coniferous Bog	468.29	0	0	468.29	0	529.98	529.98	1,059.96	(117.07)	(117.07)		825.82	1.56
Wetland Impact													
Wetland Total	477.24	763.07	307.15	1,547.46	145.17	795.57	940.74	1,808.90				1,532.97	1.63
Upland Buffer	2.45	16.07	14.33	32.84								9	
Total	479.69	779.14	321.48	1 500 20		940.74		1,808.90	(153.64)	(117.07)	(5.22)	1,532.97	
Total	479.09	119.14	321.40	1,580.30		34U.14 		1,000.90		(275.92)		1,532.97	
Total Surplus Wetland (Total Credit minus T	_		_					47.33					1.63

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Base ratio 1.5:1 per USACE St. Paul District Policy for wetlands that are not considered High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁴⁾ Base ratio 2:1 per USACE May 29, 2013 Draft Memorandum for wetlands that are High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁵⁾ Based on USACE May 29, 2013 Draft Memorandum guidance for in-advance qualification assuming all mitigation will be constructed one full growing season before wetland impacts occur.

⁽⁶⁾ Total Applied Mitigation Credits = Total Credits Required for Mitigation at Base Ratio minus Incentive Credits.

⁽⁷⁾ Credits applied may include surplus credits from different wetland types.

⁽⁸⁾ The ratio of applied credits to project impacts (not including the surplus credits).

⁽⁹⁾ Includes 0.5 credit of upland buffer, applied from totals listed above.

Large Table 7

Wetland Mitigation Utilizing WCA Credits⁽¹⁾ Poly Met Mining, Inc.

		Mitigat	ion Credits	3	NorthMet Project Proposed Direct	Credits Applied for	Additional Mitigation	Total Mitigation	Total
Wetland or Credit Type	Zim Sod	Aitkin	Hinckley	Total	Wetland Impacts (acres) ^(1,2)	1:1 Replacement	Required ⁽³⁾ +0.5:1	Credits Applied	Mitigation Ratio
Type 2 Fresh (Wet) Meadow	0	0	0	0	15.81	15.81	7.91	23.72	1.5:1
Type 2 Sedge Meadow	0	0	68.11	68.11	23.92	23.92	11.96	35.88	1.5:1
Type 3 Shallow Marsh	0	20.86	0	20.86	77.03	77.03	38.52	115.55	1.5:1
Type 4 Deep Marsh	0	0	0	0	74.29	74.29	37.15	111.44	1.5:1
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0	1.5:1
Type 6 Shrub-Carr	0	0	131.23	131.23	3.89	3.89	1.95	5.84	1.5:1
Type 6 Alder Thicket	0	0	100.33	100.33	110.59	110.59	55.30	165.89	1.5:1
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	13.16	13.16	6.58	19.74	1.5:1
Type 7 Coniferous Swamp	0	557.52	0	557.52	84.43	84.43	42.22	126.65	1.5:1
Type 8 Open Bog	8.96	0	0	8.96	7.64	7.64	3.82	11.46	1.5:1
Type 8 Coniferous Bog	468.29	0	0	468.29	529.98	529.98	30.85	560.83	1:1 ⁽⁴⁾
Wetland Total	477.24	763.07	307.15	1,547.46	940.74	940.74	236.23	1,176.97	
Upland Buffer	2.45	16.07	14.33	32.84					
Total	479.69	779.14	321.48	1,580.30	940.74	940.74	236.23	1,176.97	
(Total cred		-		_	Credits for Project mitigation required)		403.33		1.25:1 ⁽⁵⁾
		Total W	etland Mitig	gation Cred	its Used for Project		1,176.97		

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Additional required for mitigation out of the watershed at Aitkin and Hinckley sites.

⁽⁴⁾ Assumes 1:1 replacement for 473.3 acres compensated in-kind and in the watershed and 1.5:1 for the remaining 56.7 acres replaced out of the watershed.

⁽⁵⁾ The ratio of applied credits to project impacts (not including the total surplus credits).

Appendix C

USACE 2013 Memo: Application of the Federal Mitigation Rule and St.
Paul District Policy Guidance on Compensatory Mitigation Compensation Ratios for Loss of Wetlands/Aquatic Resources



DRAFT MEMORANDUM

Date: 29 May 2013

Subject: Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation - Compensation Ratios for Loss of Wetlands/Aquatic Resources

I. Introduction

The St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota (2009) [District Policy] applies three factors to determine compensation ratios: in-place vs. out-of-place, in-kind vs. out-of-kind, and in-advance vs. not in-advance. The temporal loss issue is addressed by the in-advance vs. not-in-advance factor. The Federal Mitigation Rule states that compensation ratios of greater than 1:1 can be applied to account for factors including temporal loss and the difficulty of restoring or establishing certain wetlands/aquatic resources (332.3 (f)). This statement was incorporated into the St. Paul District Policy (page 23).

II. In-Advance Incentive per St. Paul District Policy

Compensatory mitigation must account for the temporal losses of wetland/aquatic resource functions associated with authorized impacts. Temporal losses can be minimized if compensation sites are established in advance of authorized impacts, which is typically the case for mitigation banking. In rare cases, permittee-responsible compensation could also establish compensation sites in advance of authorized impacts.

A reduction in the compensation ratio of 0.25 can be applied if a permittee-responsible compensation site establishes wetland hydrology and initial vegetation in advance of authorized impacts. At a minimum, the site must have wetland hydrology and hydrophytic vegetation established at least one full growing season (May-October) prior to the authorized discharge of dredged/fill materials (pages 14, 24). Further, the compensation site must meet the success criteria/performance standards applicable at that development stage of the site (page 14).

The intent of the <u>minimum</u> requirement that the compensation site must have wetland hydrology and hydrophytic vegetation established <u>at least</u> one growing season in advance is to confirm: (1) that the site is providing wetland functions in advance of authorized impacts; and (2) a reasonable assurance that the compensation site is on the correct trajectory for success. Success is defined by the performance standards developed for each compensation site. Great variability exists for establishing various wetlands/aquatic resources and the performance standards reflect this. The minimum of a single growing season can be sufficient for emergent, aquatic vegetation to colonize a shallow marsh restoration site and provide habitat, water quality functions, etc. At the opposite end of the spectrum are compensation sites involving restoration of forested wetlands, which may require 8 to 10 growing seasons to determine if hydrology and woody seedlings/shrubs/saplings indicate that the site is on the correct trajectory for success. It is true

that woody seedlings/shrubs/saplings would not provide the same habitat and other functions as a mature forested wetland, but the intent of the "in-advance" incentive per the St. Paul District Policy would be met.

Use of the 0.25 incentive for "in-advance" by permittee-responsible compensation has been so rare that St. Paul District has not developed a break-out of minimum requirements and timeframes by wetland type. Given the current review of large-scale mining projects and associated permittee-responsible compensation, there is now a need to do so. The timeframes listed by Table 1 represent the best case scenario (e.g., no substantial setbacks or corrective actions needed to establish target hydrology and initial vegetation). These timeframes are based on field observations of compensatory mitigation sites in Minnesota and Wisconsin during the past 35 years.

TABLE 1

Minimum Number of Growing Seasons Needed to Determine if a Compensation Site has Met the Requirements for the In-Advance Incentive

Seasonally Flooded Basin: 1 Growing Season
Shallow Marsh: 1 Growing Season
Sedge Meadow: 3 Growing Seasons
Open Bog: 3 to 5 Growing Seasons
Alder Thicket/Shrub-Carr: 5 Growing Seasons
Coniferous Bog: 8 to 10 Growing Seasons
Hardwood and Coniferous Swamps: 8 to 10 Growing Seasons

III. Compensation Ratios for Difficult-to-Replace, Rare and/or Exceptional Wetlands per the Federal Mitigation Rule and St. Paul District Policy

The Federal Mitigation Rule states that "difficult to replace" wetlands/aquatic resources includes bogs and forested wetlands (323.3(e)(3) and Preamble, page 19633). The majority of wetlands that would be impacted by the proposed NorthMet project are "difficult-to-replace" – coniferous bog, open bog, coniferous swamp and hardwood swamp.

St. Paul District Policy also states that compensation ratios can be raised on a case-by-case basis if the impacted wetland/aquatic resource provides rare or exceptional functions including plant communities that rate "exceptional" using MnRAM, or have a high rating using a Floristic Quality Assessment (FQA) (page 24). Most of the wetlands that would be impacted by the NorthMet project are of pre-European settlement condition and rate at the highest FQA levels for those plant communities in Minnesota. MnRAM vegetative diversity/integrity ratings would be "exceptional" for these pre-European settlement condition wetlands.

Therefore, the District Engineer may determine that a higher compensation ratio is required to offset losses of wetlands that are difficult to replace and/or provide an exceptional level of functions. For simplicity, these wetlands will be referred to as "high quality wetlands" in the following discussions.

District Policy states a base compensation ratio of 1.5:1, and a minimum of 1:1, with a provision for a case-by-case determination of higher ratios to account for factors including difficult to replace, rare and/or exceptional wetlands/aquatic resources. For low to moderate quality wetlands, the 1.5:1 base ratio would apply in accordance with District guidance. For impacts to high quality wetlands, the Corps may require additional compensation in accordance with District Policy. A value of 0.25 was assigned by the District Policy to each of the factors applied for determining compensation ratios. Given this precedent, it would be consistent to assign a value of +0.25 for difficult to replace wetlands, and +0.25 for wetlands

that have exceptional functional levels, to the base ratio of 1.5:1. Therefore, the base compensation ratio in these cases would start at 2:1. Compensation that is in-kind, in-place and/or in-advance could reduce this ratio in 0.25 increments.

IV. Analysis for NorthMet PSDEIS

To qualify for the 0.25 in-advance incentive, the proposed compensation by PolyMet for the NorthMet project would need to be established and meeting performance standards for hydrology and initial vegetation as shown by Table 1. Temporal loss of functions associated with forested wetland types would still be significant in any scenario (i.e., it will take 30 to 50 years for a non-forested compensation site to replace the functions of a forested wetland). But, as stated previously, the intent of the Policy's "in-advance" incentive would be met. This is no different than what is applied to mitigation banking sites. Credits consisting of forested wetlands can be fully released in as little as 10 years provided that performance standards are met.

Compensation proposed at the Zim Site would be expected to meet both in-kind (-0.25) and in-place (-0.25) incentives thereby reducing the compensation ratio for high-quality wetland impacts from 2:1 to 1.5:1. If in-advance, the ratio would be further reduced to 1.25:1. For low to moderate-quality wetlands, the recommended base ratio of 1.5:1, as proposed in the PSDEIS, would be required and could be reduced to 1.25:1 if in-kind and 1:1 if also in-advance.

Compensation proposed at the Hinckley and Aitkin Sites would be expected to meet in-kind resulting in a compensation ratio for high-quality wetland impacts of 1.75:1, and if in-advance, the ratio would be reduced to 1.5:1. For low to moderate-quality wetlands, the recommended base ratio of 1.5:1, as proposed in the PSDEIS, would be required and could be reduced to 1.25:1 if in-kind and 1:1 if also in-advance.

District guidance on compensatory mitigation emphasizes a functional approach to offset proposed project impacts be considered. While bogs and forested wetlands are characterized as difficult to replace, the proposed compensation sites for the NorthMet project are likely to achieve in-kind compensation to offset functional losses. The proposed mitigation sites were selected based on availability and the high likelihood of meeting performance criteria.

V. USEPA Comments on Compensation Ratios

USEPA recommended a compensation ratio of 2:1 or 3:1 to offset adverse impacts given the degree of temporal losses of wetland functions and scope of the losses (approximately 917 acres of direct impacts).

Temporal losses of wetland functions are addressed by the in-advance factor described above.

District Policy does not address the scale issue raised by USEPA. It is acknowledged that the proposed NorthMet project is a large scale impact that demands a comprehensive approach to offset those impacts.

No suitable quantitative wetland functional assessment method for northeast Minnesota exists to calculate the acres/wetland type/timeframe necessary for compensatory mitigation to offset proposed impacts. Lacking such a method, we employ an acreage surrogate as discussed above. A base ratio of 2:1, for high-quality wetlands as described in IV above, would be consistent with USEPA's recommendation of at least a 2:1compensation ratio. However, District Policy would allow for the compensation ratio to be reduced if it is in-kind, in-place and/or in-advance. Allowing for these incentives to reduce the base compensation ratio is integral to our policy. While USEPA has identified the scale of impacts and temporal loss of

functions as factors in their recommendation of a 2:1 or 3:1 compensation ratio, there is no scientific data to say what ratio is most accurate or appropriate.

If, however, large scale wetland losses in the Great Lakes Basin are not compensated for within that basin, a final ratio of 2:1 to 3:1 as recommended by USEPA could be warranted.

VI. Statement for NorthMet PSDEIS

St. Paul District has not made a final determination of the compensation ratios that would be required. Base compensation ratios would be either 2:1 or 1.5:1 depending on the location, quality of the wetland, wetland type, and timeframe of the compensation. A decision on whether proposed compensation would qualify for the 0.25 incentive for in-advance requires additional information including: (1) development of performance standards that would specify the hydrology and initial vegetation to be established; and (2) number of growing seasons that wetland compensation sites would be established in advance of authorized impacts.

In conclusion, the compensatory mitigation ratios proposed in the PSDEIS for the NorthMet project were based on recommended guidance. They assumed successful outcomes for the proposed compensatory mitigation sites. However, to address concerns expressed by USEPA, the base compensation ratios could be increased to 2:1 for impacts to high-quality, difficult to replace, bog and forested wetlands. For impacts to low and moderate quality wetlands, a base ratio of 1.5:1, as proposed in the PSDEIS, would be applied. Incentives to reduce the recommended base ratios would be considered at the time of permitting. District guidance on recommended compensation ratios takes these incentives into account. The final decision on compensatory mitigation ratios will be determined at the time of the permit decision based on current District guidance.

Appendix D Wetland Data Forms

Project/Site:	Hinckley S	<u>Site</u>			Applicant/O	vner:	<u>PolyMet</u>	<u>t</u>	City/County.	Gras	ston, Pine	State:	MN	Sampling Date:	07/20/15
Investigator(s): k	kms2 Footslope	<u> </u>			Section: Local Relief	<u>5</u> Cor	ıvex		Township: Slope %:	<u>39N</u> <u>0</u>	Soil Ma _l	Range: o Unit Name		Sampling Point:	<u>1U</u>
Subregion (LRR):	<u>K</u>				Latitude:	<u>508</u>	3463		Longitude:	<u>49076</u>	<u>1</u>	Datum:	UTM, N	AD 83, meters	
Cowardin Classific	cation: <u>l</u>	Jpland			Circular 39	Classit	fication:	<u>Upland</u>			Мар	ped NWI Cla	ssification	7:	
Are climatic/hydrol	logic condit	ions or	the site typ	ical for this	time of year:		<u>Yes</u>	(If no, expla	ain in remarks	s)	Egge	ers & Reed (primary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	No s	ianific	antly dist	turhed?	Are "normal		Yes Egge	ers & Reed (secondary	y):	
The vegetation	110	3011	110	riyurology	110	ngriine	unity uist	arbea.	circumstano present?	ces"	Egge	ers & Reed (tertiary):		
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> n	aturall	y problen	natic?	ргезеп:		Egge	ers & Reed ('quaternar	ry):	
IIMMARY C)F FIND	ING	S - Atta	ch sita	man shi	awir	na san	nnlina r	noint loc	ation	e tran	sacts in	nnorta	nt fostures	etc

Hydrophytic vegetation present? Hydric soil present?	<u>No</u> <u>No</u>	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. West ditch
Indicators of wetland hydrology present?	<u>No</u>	ii necucuj.	
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetla	nd Site ID: (Wetland 1)

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	Indicator Status	50/20 Thresholds:	•		0	- 	50%
			0			Sapling/Shrub Str Herb Stratum	ratum		12 9		30 22.5
			0			Woody Vine Stratu	ıım		<u>9</u>		22.5 0
			0								
			0			Dominance Test V					
Sapling/Shrub Stratum	(Plot Size:	Total Cover:	<u>0</u>			Number of Domin That Are OBL, FA			2	(A)	
Rubus idaeus	(**************************************	,	60	Yes	FAC	Total Number of D			4	(B)	
Trabas radeas			0			Species Across A				(-)	
			0			Percent of Domina That Are OBL, FA		50.00	%	(A/B)	
			0								
			0			Prevalence Index	Worksheet:				
		Total Cover:	<u>60</u>		L	Total % Co			Multij	oly by:	
Herb Stratum	(Plot Size:	<u>5 ft</u>				OBL Species	0	X 1		0	_
Taraxacum officinale		·	5	No	FACU	FACW Species	15	X 2		30)
A solonio a surio a a			15	Yes	UPL	FAC Species	60	X 3		180)
Asclepias syriaca											_
Cirsium arvense			10	Yes	FACU	111	15	X 4		60)
. ,				Yes Yes	FACU FACW	FACU Species	15 15	X 4 X 5		60 75	-
Cirsium arvense			10			FACU Species UPL Species	15	X 5		75	<u> </u>
Cirsium arvense			10 15			FACU Species UPL Species Column Totals:	15 105	X 5 (A)		75 345	<u>-</u>
Cirsium arvense			10 15 0 0			FACU Species UPL Species Column Totals:	15 105 evalence Index =	X 5 (A) B/A =		75	<u>-</u>
Cirsium arvense			10 15 0 0 0 0			FACU Species UPL Species Column Totals: Pre Hydrophytic Veget	15 105 valence Index =	X 5 (A) B/A =		75 345	<u>-</u>
Cirsium arvense Phalaris arundinacea		Total Cover:	10 15 0 0			FACU Species UPL Species Column Totals: Pre Hydrophytic Veget	15 105 valence Index = ation Indicators: Test for Hydroph	X 5 (A) B/A =	ion	75 345	<u>-</u>
Cirsium arvense	(Plot Size:		10 15 0 0 0 0			FACU Species UPL Species Column Totals: Pre	15 105 valence Index = ation Indicators: Test for Hydroph ance Test is >50	X 5 (A) B/A = Experimental exp	ion	75 345	<u>-</u>
Cirsium arvense Phalaris arundinacea	(Plot Size:		10 15 0 0 0 0 0 45			FACU Species UPL Species Column Totals: Pre	15 105 valence Index = ation Indicators: Test for Hydroph ance Test is >500 ence Index ≤ 3.0	X 5 (A) B/A = : : : :: :: :: :: :: :: :: :: :: :: ::		75 345 3.29	-
Cirsium arvense Phalaris arundinacea	(Plot Size:	<u>30 ft</u>)	10 15 0 0 0 0 45			FACU Species UPL Species Column Totals: Pre Hydrophytic Veget No Rapid Totals No Domina No Prevale No Morpho in vege	15 105 valence Index = ation Indicators: Test for Hydroph ance Test is >500 ence Index ≤ 3.0 ological Adaptatitation remarks of	X 5 (A) B/A = : : : : : : : : : : : : : : : : : :	ovide s	345 3.29 supportinheet)	-
Cirsium arvense Phalaris arundinacea	(Plot Size:		10 15 0 0 0 0 0 45			FACU Species UPL Species Column Totals: Pre Hydrophytic Veget No Rapid Totals No Domina No Prevale No Morpho in vege	15 105 valence Index = ation Indicators: Test for Hydroph ance Test is >50 ence Index ≤ 3.0 blogical Adaptati	X 5 (A) B/A = : : : : : : : : : : : : : : : : : :	ovide s	345 3.29 supportinheet)	- - - -
Cirsium arvense Phalaris arundinacea		30 ft) Total Cover:	10 15 0 0 0 0 45		FACW	FACU Species UPL Species Column Totals: Pre Hydrophytic Veget No Rapid Totals No Domina No Prevale No Morpho in vege	15 105 105 valence Index = ation Indicators: Test for Hydroph ance Test is >509 ence Index ≤ 3.0 blogical Adaptati station remarks of matic Hydrophyt ic soil & wetland h	X 5 (A) B/A = inytic Vegetati [1] ions [1] (proper on a separatic Vegetation	ovide : rate s n [1] (345 3.29 supportinheet) (Explain)	ig d

SOIL Sampling Point: 1U

Profile Description: Depth	(Describe to the depth Matrix	needed to doc	ument the indicator or o	confirm the		f indicators	s).	
(inches)	Color (moist)	%	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
0 - 26	0YR 4/4	100					fine sandy loam	dry
2								
3								<u> </u>
4						-		
5								
[1] Type: C=Concent	tration, D=Depletion, R	RM=Reduced Ma	trix, CS=Covered or Co	oated Sand	Grains [2	2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators	s: (applicable to all LF	RRs, unless oth	erwise noted)			li	ndicators for Problematic Hydric S	oils [3]:
Histosol (A1)		<u> </u>	tripped Matrix (S6)			[2 cm Muck (A10) (LRR K, L, ML)	RA 149B)
Histic Epipedon (A	12)		Oark Surface (S7) (LRR F	R, MLRA 14	19B)		Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)		<i>F</i>	Polyvalue Below Surface	(S8) (LRR I	R, MLRA 1491	<i>B)</i> [5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
☐ Hydrogen Sulfide	(A4)	7	Thin Dark Surface (S9) (L	RR R, MLR	PA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A	(A5)	<i>L</i>	oamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (L	RR K, L)
Depleted Below De	ark Surface (A11)	<i>L</i>	oamy Gleyed Matrix (F2))			Thin Dark Surface (S9) (LRR K,	<u>L)</u>
Thick Dark Surface	e (A12)		epleted Matrix (F3)				Iron-Manganese Masses (F12) (LRR K, L, R)
Sandy Mucky Mine	eral (S1)		Pedox Dark Surface (F6)				Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Mad	trix (S4)		epleted Dark Surface (F	7)			Mesic Spodic (TA6) (MLRA 144A	l, <i>145, 149B)</i>
Sandy Redox (S5))		Pedox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrop	phytic vegetation and we	etland hydrology	must be present, unless	disturbed o	or problematic	: [Very Shallow Dark Surface (TF1.	<u>2)</u> remarks)
Restrictive Layer (if p	oresent): Type:		Dep	oth (inches	s):		Hydric soil present?	<u>No</u>
HYDROLOGY Wetland Hydrology I	ndicators:							
	ninimum of one require	ed; check all th	at apply)			Second	dary Indicators (minimum of two re	quired)
Surface Water (A1	1)		Water-Stained Leave.	s (B9)		Sui	face Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table			Aquatic Fauna (B13)			Dra	inage Patterns (B10)	_
Saturation (A3)	(/12/	Г	Marl Deposits (B15)				ss Trim Lines (B16)	
Water Marks (B1)				or (C1)		□ Dry	-Season Water Table (C2)	
Sediment Deposits		Г	Oxidized Rhizosphere	es on Living	Roots (C3)	Cra	yfish Burrows (C8)	
Drift Deposits (B3)		_	_			Sat	uration Visible on Aerial Imagery (C9)
Algal Mat or Crust			Presence of Reduced	I Iron (C4)		Stu	nted or Stressed Plants (D1)	
☐ Iron Deposits (B5)			Recent Iron Reduction	n in Tilled S	Soils (C6)	Ge	omorphic Position (D2)	
			Thin Muck Surface (C	<i>27)</i>		Sha	allow Aquitard (D3)	
	on Aerial Imagery (B7) ed Concave Surface (B8)))	Other (explain in rema	arks)		Mic	rotopographic Relief (D4)	
Field Observations:							Indicators of wetland hydrole	ogy present? <u>No</u>
Surface water presen	nt?		Surface Water Depth (inches):			Describe Recorded Data:	
Water table present?	•		Water Table Depth (inc	ches):				
Saturation present?	(includes capillary frin	ge)	Saturation Depth (inch	ies):				
Recorded Data:	Aerial Photo	Monitoring	Well Stream Gau	ige 🔲 l	Previous Insp	ections	1	
Hydrology Remarks:								

Project/Site:	Hinckley S	<u>Site</u>			Applicant/C	Owner:	PolyMet	<u>t</u>	City/County:	Grasstor	n, Pine	State:	MN	Sampling Date:	07/20/15
Investigator(s): k	kms2				Section:	<u>5</u>			Township:	<u>36N</u>		Range:	<u>22W</u>	Sampling Point:	<u>1W</u>
Land Form:	Stream c	<u>hannel</u>			Local Relie	ef: <u>Co</u>	oncave		Slope %:	<u>0</u>	Soil Map Ui	nit Name:	P-Peat		
Subregion (LRR):	<u>K</u>				Latitude:	<u>50</u>	<u> 183465</u>		Longitude:	<u>490756</u>		Datum:	UTM, NA	AD 83, meters	
Cowardin Classific	cation:	<u>PUBG</u>			Circular 39	Class	ification:	Type 5			Mapped	NWI Cla	ssification	: <u>PEMA</u>	
Are climatic/hydroi	logic condi	tions or	the site typ	ical for this	time of year	?	<u>Yes</u>	(If no, expla	in in remarks	5)	Eggers	& Reed (j	orimary):	Shallow, Op	en Water
-	<u>No</u>	Soil	No No	Hydrology	_	J	icantly dist		Are "normal circumstance present?		Eggers	& Reed (i		, <u></u>	Meadow
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	rialura	lly problen	nauc?	•		Eggers	& Reea (C	quaternary	<i>I):</i>	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes Yes Yes	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. Sample point is in a wet meadow on the edge of a shallow, open water wetland (ditch).
Is the sampled area within a wetland?	Yes	If yes, optional Wetla	nd Site ID: Wetland 1

Tree Stratum	(Plot Size: 30)	ft)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum			20% O	50 %
	· <u></u>		11 0		1	Sapling/Shrub Stra	atum	_	2	5
			0			Herb Stratum		_	19	47.
			0			Woody Vine Stratu	ım	_	0	0
			0			Dominance Test W	orksheet:			
		Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC	ent Species	3	(A)	
Sapling/Shrub Stratum	(Plot Size: 15)	<u>ft</u>)				Total Number of D			-	
Salix interior			10	Yes	FACW	Species Across Al		3	(B)	
			0			Percent of Domina			(4/5)	
			0			That Are OBL, FAC	CW or FAC:	100.00%	(A/B)	
			0			Prevalence Index V	Vorksheet:			
		Total Cover:	10			Total % Co		М	ultiply by:	
Herb Stratum	(Plot Size: <u>5 ft</u>	1				OBL Species	5	X 1		5
Phalaris arundinacea		,	60	Yes	FACW	FACW Species	70	X 2	14	0
Rubus idaeus			30	Yes	FAC	FAC Species	30	X 3	9	0
Glyceria grandis			5	No	OBL	FACU Species	0	X 4	(0
			0			UPL Species	0	X 5	(0
			0			III '	105	(A)	23	5
			0			Column Totals:	/alence Index =	` ′	2.2	_
			0			Hydrophytic Vegeta				•
		Total Cover:	0]	est for Hydroph			
Weed Weed of	(Diet Siene 20)		<u>95</u>				nce Test is >50%		,	
Woody Vine Stratum	(Plot Size: <u>30 i</u>	<u>""</u>)	1				nce Index ≤ 3.0			
			0			No Morpho	logical Adaptati	ons [1] (provi	de supporti	ing c
		Total Cover:	<u>0</u>			- II	ation remarks o	-		
Bare Ground in Herb Strati	um:			n Moss Cover:	;	No Problem [1] Indicators of hydric disturbed or problema	natic Hydrophyti c soil & wetland hy tic.			
getation Remarks: (include						Hydrophytic vegetal		Yes		
	•	•	•			11 7 7 7 3	*			

SOIL Sampling Point: 1W

Profile Description: (Describe to the depth Depth Matrix	needed to document the indicator or confirm the absc Redox Features	ence of indicators).		
(inches) Color (moist)	% Color (moist) % Type	e [1] Loc [2]	Texture	Remarks
1. 0 - 36 10YR 2/1	100		muck	
2				
3				
4				
5				
[1] Type: C=Concentration, D=Depletion, R	M=Reduced Matrix, CS=Covered or Coated Sand Grain	s [2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LF	Rs, unless otherwise noted)	Inc	licators for Problematic Hydric So.	ils [3]:
Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR)	4 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLR	RA 149B)	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149.	В)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	✓ Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
☐ Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and we	etland hydrology must be present, unless disturbed or prob	lematic.	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY				
Wetland Hydrology Indicators: Primary Indicators (minimum of one require	ed: check all that anniv)	Seconda	nry Indicators (minimum of two req	uired)
	Water-Stained Leaves (B9)		ace Soil Cracks (B6)	FAC-Neutral Test (D5)
Surface Water (A1)	Aquatic Fauna (B13)		nage Patterns (B10)	TAC-Neullal Test (D3)
High Water Table (A2)	Marl Deposits (B15)		aye Fallens (B16) 5 Trim Lines (B16)	
Saturation (A3)	Hydrogen Sulfide Odor (C1)		Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on Living Roots		fish Burrows (C8)	
Sediment Deposits (B2)	Oxidized Milzosphores on Evring Moois		ration Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		ted or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C	(Z)	morphic Position (D2)	
Iron Deposits (B5)	Thin Muck Surface (C7)	_	low Aquitard (D3)	
 ☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8, 	Other (explain in remarks)		otopographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	gy present? Yes
Surface water present?	Surface Water Depth (inches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fring	ge) Saturation Depth (inches):	8		
Recorded Data: Aerial Photo	Monitoring Well Stream Gauge Previous	us Inspections		
Hydrology Remarks:				

Project/Site:	Hinckley S	<u>Site</u>			Applicant/C	Owner:	<u>PolyMet</u>	<u>t</u>	City/County:	Grassto County	on, Pine	State:	<u>MN</u>	Sampling Date:	07/31/14
Investigator(s):	kms2, jtk				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	<u>2U</u>
Land Form:	Shoulder				Local Relie	ef: <u>Co</u>	<u>nvex</u>		Slope %:	<u>0</u>	Soil Map Ui	nit Name	: <u>P- Pea</u>	<u>at</u>	
Subregion (LRR):	<u>K</u>				Latitude:	<u>50</u>	83470 mN	<u>I</u>	Longitude:	490977 r	<u>nE</u>	Datum:	UTM, N	AD 83, meters	
Cowardin Classifi	ication:	Upland			Circular 39	O Class	sification:	<u>Upland</u>			Mapped	NWI Cla	ssification) <i>:</i>	
Are climatic/hydro	ologic condi	tions or	n the site typ	ical for this	time of yea	r?	<u>Yes</u>	(If no, expla	in in remarks	;)	Eggers a	& Reed ((primary):	<u>Upland</u>	
Are vegetation	Yes	Soil	Yes	Hydrology	No	sianifi	icantly dist	turbed?	Are "normal	_		•	secondary	y):	
3				, ,,		Ü	,		circumstanc present?	es	55	,	tertiary):		
Are vegetation	<u>No</u>	Soil	<u>Yes</u>	Hydrology	<u>No</u>	natura	lly problen	natic?	prosent:		Eggers a	& Reed ('quaternar _'	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes Yes No	General Remarks (explain any answers if needed):	Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. ID_Field: well2 wetland Ditch spoil at location
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlar	nd Site ID: (Wetland 2)

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	Indicator Status	50/20 Thresholds: Tree Stratum		_	0	0
			0			Sapling/Shrub Stratum Herb Stratum		-	21	0 52.5
			0			Woody Vine Stratum		_	2	5
			0			Dominance Test Workshe	et:			
		Total Cover:	<u>0</u>			Number of Dominant Spe That Are OBL, FACW or F			3 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)	0			Total Number of Dominan	t		- 3 <i>(B)</i>	
			0			Species Across All Strata				
			0			Percent of Dominant Spec That Are OBL, FACW or F		100.009	6 (A/B)	
			0			Prevalence Index Workshop	eet:			
		Total Cover:	0			Total % Cover of:	<u> </u>	Λ	lultiply by:	
Herb Stratum	(Plot Size:		<u>u</u>			OBL Species	10	X 1		10
Urtica dioica	(<u> </u>	60	Yes	FAC	FACW Species	35	X 2	-	70
Sium suave			10	No	OBL	FAC Species	70	Х3	2	10
Phalaris arundinacea			25	Yes	FACW	FACU Species	0	X 4		0
Asclepias speciosa			10	No	FAC	UPL Species	0	X 5		0
			0			Column Totals:	115	(A)	29	90
			0			Prevalence		•	2.	
			0			Hydrophytic Vegetation Inc	dicators:			
	(DI - (O' -	Total Cover:	<u>105</u>			Yes Rapid Test for Dominance Test	•	•	on	
Woody Vine Stratum	(Plot Size:	<u>30 II</u>	10	Ves	E A O1A'	Yes Prevalence Ind				
Echinocystis lobata			10	Yes	FACW	No Morphological				ting d
		Total Cover:	<u>10</u>			in vegetation re				1)
Bare Ground in Herb Stratu	m:			n Moss Cover	:	[1] Indicators of hydric soil & disturbed or problematic.		_		
getation Remarks: (include	district		L 0			Hydrophytic vegetation pres	10	Yes		

SOIL Sampling Point: 2U

Minches Color (moles No Color (moles No Nape No Nape No Nape No Nape Na	Profile Description: (Describe to the depth ne	eded to document the indicator or confirm the abscence of Redox Features	of indicators).		
17 Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains Z Location, PL-Pore Lining, M-Matrix,		% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
1	1. 0 - 37 10YR 2/1	100		mucky silt loam	no redox, dry
17 Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains	2				
Fig.	· — -				
Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)	4				
Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)	6				
Mislasod (A1)	[1] Type: C=Concentration, D=Depletion, RM=	Reduced Matrix, CS=Covered or Coated Sand Grains [2] Location: PL	=Pore Lining, M=Matrix.	
Histic Epipodon (A2)	Hydric Soil Indicators: (applicable to all LRRs	, unless otherwise noted)	Indic	ators for Problematic Hydric So	ils [3]:
Black Histic (A1)	Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR)	A <i>149B)</i>
Hydrogen Sulfide (A4)	Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
Stratified Layers (A5)	Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149	DB)	5 cm Mucky Peat or Peat (S3) (LR	P.R. K, L, R)
Depleted Below Dark Surface (A11)	Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Thick Dark Surface (A12) Depleted Matrix (F3) Pror-Manganese Masses (F12) (I.RR K. I. R)	Stratified Layers (A5)	✓ Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	PRK,L)
Sandy Mucky Milneral (S1)	Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L,)
Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spootic (TA6) (MLRA 144A, 145, 149B) Other (explain in soil remarks) Other (explain in remarks) Other (explain in remarks) Other (explain in soil remarks) Other (explain in remarks	Thick Dark Surface (A12)	Depleted Matrix (F3)		lron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Redox (S5)	Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (i	MLRA 149B)
Bill Indicators of hydrophylic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (1F12) remarks	Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Restrictive Layer (if present): Type: Depth (inches): Hydric soil present? Yes Soil Remarks: Soil disturbed, problematic. Likely ditch spoil. HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1) Water-Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (D5) High Water Table (A2) Aquatic Fauna (B13) Drainage Patterns (B10) Saturation (A3) Mart Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Phydrogen Sulfide Odor (C1) Dry-Season Water Table (C2) Sediment Deposits (B3) Saturation Visible on Aerial Imagery (C9) Algal Mat or Crust (B4) Recent fron Reduction in Tilled Soils (C6) Geomorphic Position (D2) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microlopographic Relief (D4) Field Observations: Surface water present? Water Table Depth (inches): Water table present? Water Table Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Saturation present? (includes capillary fringe) Stauration Depth (inches): Saturation present? (includes capillary fringe) Stauration Depth (inches): Saturation present? (includes capillary fringe) Stauration Depth (inches):	Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	✓ Other (explain in soil
Soil Remarks: Soil disturbed, problematic. Likely ditch spoil. Sypanse Soil Remarks: Soil disturbed, problematic. Likely ditch spoil.	[3] Indicators of hydrophytic vegetation and wetlan	nd hydrology must be present, unless disturbed or problematio	c.	Very Shallow Dark Surface (TF12,) remarks)
Soil Remarks: Soil disturbed, problematic. Likely ditch spoil. SYPROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1)	Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Primary Indicators (minimum of one required; check all that apply) Surface Water (A1) Water-Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (D5) High Water Table (A2) Aqualic Fauna (B13) Drainage Patterns (B10) Saturation (A3) Marl Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Hydrogen Sulfide Odor (C1) Dry-Season Water Table (C2) Sediment Deposits (B2) Oxidized Rhizospheres on Living Roots (C3) Cayfish Burrows (C8) Drift Deposits (B3) Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Iron Deposits (B5) Recent Iron Reduction in Tilled Soils (C6) Geomorphic Position (D2) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Surface water present? Surface Water Depth (inches): Indicators of wettand hydrology present? No Describe Recorded Data: Indicators (minimum of two required) Inundation (Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Surface Water Depth (inches): Indicators of wettand hydrology present? No Describe Recorded Data: Indicators (Mater Table Depth (inches): Saturation Depth (inches): Previous Inspections Previous Inspection Previou					
Aquatic Fauna (B13) Drainage Patterns (B10) Saturation (A3) Marl Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Hydrogen Sullide Odor (C1) Dry-Season Water Table (C2) Sediment Deposits (B2) Oxidized Rhizospheres on Living Roots (C3) Crayfish Burrows (C8) Drift Deposits (B3) Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Iron Deposits (B5) Recent Iron Reduction in Tilled Soils (C6) Geomorphic Position (D2) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Surface Water Depth (inches): Describe Recorded Data: Water table present? Water Table Depth (inches): Describe Recorded Data: Recorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections		check all that apply)	Secondary	Indicators (minimum of two red	quired)
High Water Table (A2)	Surface Water (A1)	Water-Stained Leaves (B9)	Surface	Soil Cracks (B6)	FAC-Neutral Test (D5)
Saturation (A3) Marl Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Hydrogen Sulfide Odor (C1) Dry-Season Water Table (C2) Sediment Deposits (B2) Oxidized Rhizospheres on Living Roots (C3) Crayfish Burrows (C8) Drift Deposits (B3) Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Iron Deposits (B5) Recent Iron Reduction in Tilled Soils (C6) Geomorphic Position (D2) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Surface water present? Surface Water Depth (inches): Water Table Depth (inches): Saturation Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Secorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections		Aquatic Fauna (B13)	Drainag	ne Patterns (B10)	_
Water Marks (B1)	_	Marl Deposits (B15)			
Sediment Deposits (B2)		☐ Hydrogen Sulfide Odor (C1)	Dry-Sea	ason Water Table (C2)	
Drift Deposits (B3) Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Recent Iron Reduction in Tilled Soils (C6) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Surface Water Table Depth (inches): Saturation present? (includes capillary fringe) Monitoring Well Stream Gauge Previous Inspections Stream Gauge Previous Inspections		Oxidized Rhizospheres on Living Roots (C3)	Crayfisi	n Burrows (C8)	
Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Surface Water Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Recorded Data: Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrology present? Describe Recorded Data: Previous Inspections		_	Saturati	ion Visible on Aerial Imagery (C9)	
Iron Deposits (B5)	<u> </u>	Presence of Reduced Iron (C4)	Stunted	or Stressed Plants (D1)	
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Other (explain in remarks)		Recent Iron Reduction in Tilled Soils (C6)	Geomo	rphic Position (D2)	
Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water Table Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Saturation Depth (inches): Recorded Data: Other (explain in remarks) Microtopographic Relief (D4) Describe Recorded Data: Surface Water Depth (inches): Describe Recorded Data: Recorded Data: Previous Inspections		Thin Muck Surface (C7)	Shallow	Aquitard (D3)	
Surface water present? Surface Water Depth (inches): Describe Recorded Data: Water table present? Water Table Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Recorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections	_	Other (explain in remarks)	Microto	pographic Relief (D4)	
Water table present? Water Table Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Recorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections				Indicators of wetland hydrolo	gy present? <u>No</u>
Saturation present? (includes capillary fringe) Saturation Depth (inches): Recorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections				Describe Recorded Data:	
Recorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections	Water table present?	Water Table Depth (inches):			
	Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
Hydrology Remarks:	Recorded Data: Aerial Photo	Monitoring Well Stream Gauge Previous Insp	pections		
	Hydrology Remarks:				

***	-					NUAIR	11011	101 - 110	HITCE	iti ai t	aria	i voi ti	neast me	<i>3</i> 1011
Project/Site:	<u>Hinckley</u>	<u>Site</u>			Applicant/0	Owner: PolyMe	<u> 2t</u>	City/County:	Grasston, County	Pine_	State:	MN	Sampling Date: () <u>7/31/14</u>
Investigator(s): k	ms2, jtk				Section:	<u>5</u>		Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point: 2	<u>2W</u>
Land Form:	Ditch				Local Reli	ef: Concave		Slope %:	<u>0</u> So	oil Map Un	nit Name:	P- Pea	<u>at</u>	
Subregion (LRR):	<u>K</u>				Latitude:	508346 7 m	<u>N</u>	Longitude:	490978 mE		Datum:	UTM, NA	AD 83, meters	
Cowardin Classific	cation:	PEMC/	<u>'A</u>		Circular 3	9 Classification:	Type 3/2			Mapped I	NWI Clas	ssification	<i>v</i> :	
Are climatic/hydrol	logic condi	itions or	n the site i	ypical for this	time of yea	r? <u>Yes</u>	(If no, expl	lain in remarks	5)	Eggers &	Reed (p	orimary):	Shallow Mars	<u>n</u>
Are vegetation	Yes	Soil	<u>Yes</u>	Hydrology	<u>No</u>	significantly dis	sturbed?	Are "normal circumstance		Eggers & Eggers &	•	secondary ertiary):	/): Fresh (Wet) N	<u>leadow</u>
Are vegetation	<u>No</u>	Soil	<u>Yes</u>	Hydrology	<u>No</u>	naturally proble	matic?	present?		Eggers &	Reed (d	quaternary	y):	
SUMMARY C	F FINL	DING	S - Att	ach site	map sl	howing sa	mpling	point loc	ations, t	transed	cts, in	nporta	nt features,	etc.
Hydrophytic veget	,	e nt ?			neral Rema plain any a				J	,		٠,	. Antecedent precip	

Hydric soil present?	Yes Yes Yes	General Remarks (explain any answers if needed):	Sample point is in a wet meadow on the edge of a shallow marsh (ditch). Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. ID_Field: well2wetland
3 05 7		If yes, optional Wetlar	nd Site ID: Wetland 2

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	Indicator Status	50/20 Thresholds: Tree Stratum	_	0	<u>50%</u> 0
			0			Sapling/Shrub Stratum Herb Stratum	_	0 18	0 45
			0			Woody Vine Stratum	_	2	5
			0			Dominance Test Worksheet:		<u> </u>	
		Total Cover:	<u>0</u>			Number of Dominant Species	,	. (4)	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>				That Are OBL, FACW or FAC:		2 <i>(A)</i>	
			0			Total Number of Dominant Species Across All Strata:	2	2 <i>(B)</i>	
			0			Percent of Dominant Species		_	
			0			That Are OBL, FACW or FAC:	100.00%	(A/B)	
			0			Prevalence Index Worksheet:			
		Total Cover:	0			Total % Cover of:	М	ultiply by:	
Herb Stratum	(Plot Size:		⊻			OBL Species 0	X 1		0
Urtica dioica			5	No	FAC	FACW Species 90	X 2	180)
Phalaris arundinacea			80	Yes	FACW	FAC Species 5	X 3	15	- 5
Ambrosia artemisiifolia			5	No	FACU	FACU Species 5	X 4	20	-)
			0			UPL Species 0	X 5	(0
			0			Column Totals:	(A)	215	5
			0			Prevalence Index =	•	2.15	_
			0			Hydrophytic Vegetation Indicators	<u> </u>		
		Total Cover:	90			No Rapid Test for Hydroph	ytic Vegetatio	n	
Woody Vine Stratum	(Plot Size:	30 ft)	<u>70</u>			Yes Dominance Test is >50	%		
Echinocystis lobata			10	Yes	FACW	Yes Prevalence Index ≤ 3.0			
			0			No Morphological Adaptation remarks of			ng da
		Total Cover:	<u>10</u>			No Problematic Hydrophy			
Bare Ground in Herb Stratu	ı m :		% Sphagnum	n Moss Cover	:	[1] Indicators of hydric soil & wetland h disturbed or problematic.	ydrology must k	e present, un	less
getation Remarks: (include	nhoto numbers	horo or on a sonarato s	choot)			Hydrophytic vegetation present?	Yes		

SOIL Sampling Point: 2W

Profile Description: (Describe to the depth nee	ded to document the indicator	or confirm the Redox Feature		findicators).		
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1 0 - 13 10YR 2/1	100 none				mucky peat	no redox, saturated
2 13 - 16 10YR 2/1	100 none				mucky fine sandy loam	no redox, saturated
3. 16 - 43 10YR 3/1	100 none				fine sandy loam	no redox, saturated
4						-
5						
6	Reduced Matrix CS=Covered or	Coated Sand	Grains 12	1 Location: I	PL=Pore Lining, M=Matrix.	-
Hydric Soil Indicators: (applicable to all LRRs,		Ocated Cana	Oramo (2	•	icators for Problematic Hydric So	nils [3]·
Histosol (A1)	Stripped Matrix (S6)					
✓ Histic Epipedon (A2)	Dark Surface (S7) (LR)	D D MI DA 140	n <i>D</i>)		Coast Prairie Redox (A16) (LRR	
				2)		•
✓ Black Histic (A3)	Polyvalue Below Surfa			<i>y</i>	5 cm Mucky Peat or Peat (S3) (L	KK K, L, K)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9,		•		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral	(F1) (LRR K, L)			Polyvalue Below Surface (S8) (Li	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix ((F2)			Thin Dark Surface (S9) (LRR K, L)
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L	.RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F	⁻ (6)			Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface	(F7)			Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox (S5)	Redox Depressions (Fo	8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlan	nd hydrology must he present unle	ess disturbed or	r problematic		Very Shallow Dark Surface (TF12	
Restrictive Layer (if present): Type:		Depth (inches)			Hydric soil present?	Yes
IYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required;	check all that apply)			Seconda	ry Indicators (minimum of two re	quired)
Surface Water (A1)	Water-Stained Lea	ives (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)	Aquatic Fauna (B1	(3)		Drain	age Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B1)	5)		_	Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide (Season Water Table (C2)	
	Oxidized Rhizosph		Roots (C3)		ish Burrows (C8)	
Sediment Deposits (B2)	Chialed Wilesoph	ores on Living i	110013 (00)		ation Visible on Aerial Imagery (C9))
Drift Deposits (B3)	Presence of Reduc	ced Iron (C4)				,
Algal Mat or Crust (B4)	Recent Iron Reduc		nils (C6)		ed or Stressed Plants (D1)	
Iron Deposits (B5)	Thin Muck Surface		JII.3 (00)		norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)					ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in re	emarks)		Micro	topographic Relief (D4)	
Field Observations:					Indicators of wetland hydrological	ogy present? Yes
Surface water present?	Surface Water Dept	th (inches):			Describe Recorded Data:	
Water table present?	Water Table Depth	(inches):				
Saturation present? (includes capillary fringe)	Saturation Depth (ii	nches):	0			
Recorded Data: Aerial Photo	Monitoring Well Stream C	Gauge P	revious Insp	ections	1	
Hydrology Remarks:						

Project/Site:	Hinckley S	<u>Site</u>			Applicant/C	Owner:	<u>PolyMet</u>		City/County:	Grasston County	, Pine	State:	MN	Sampling Date:	07/30/14
Investigator(s): k	kms2, jtk				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	<u>3U</u>
Land Form:	<u>Ditch</u>				Local Relie	ef: Cor	<u>ncave</u>		Slope %:	<u>0</u>	Soil Map Ui	nit Name:	P- Pea	<u>nt</u>	
Subregion (LRR):	<u>K</u>				Latitude:	508	33197 mN		Longitude:	<u>491754 ml</u>	=	Datum:	UTM, NA	AD 83, meters	
Cowardin Classific	cation:	Upland			Circular 39	Classii	fication:	<u>Upland</u>			Mapped	NWI Cla.	ssification):	
Are climatic/hydrol	logic condit	tions or	n the site typ	ical for this	time of year	?	<u>No</u>	(If no, expla	in in remarks)	Eggers a	& Reed (p	primary):	<u>Upland</u>	
Are vegetation	Yes	Soil	<u>Yes</u>	Hydrology	<u>No</u>	signific	cantly distu	urbed?	Are "normal circumstance		55	& Reed (s & Reed (t	secondary tertiary):	<i>():</i>	
Are vegetation	<u>No</u>	Soil	<u>Yes</u>	Hydrology	<u>No</u>	naturali	ly problem	natic?	present?		Eggers a	& Reed (d	quaternary	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No Yes No	General Remarks (explain any answers if needed):	Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. ID_Field: field 5,east side ditch
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlan	nd Site ID: (Wetland 3)

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		_	20% 0	<u>50%</u> 0
			0			Sapling/Shrub Stratum		_	3	7.5
			0			Herb Stratum		_	9	22.5
			0			Woody Vine Stratum			0	0
			0			Dominance Test Worksheet:				
0	(DI - (O' -	Total Cover:	0			Number of Dominant Specie That Are OBL, FACW or FAC		C	(A)	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)				Total Number of Dominant			-	
Corylus cornuta			15	Yes	FACU	Species Across All Strata:		3	(B)	
			0			Percent of Dominant Specie		2 222	(4/5)	
			0			That Are OBL, FACW or FAC	:	0.00%	(A/B)	
			0			Prevalence Index Worksheet	:			
		Total Cover:	1 <u>5</u>			Total % Cover of:	•	М	ultiply by:	
Herb Stratum	(Plot Size:		<u>10</u>			OBL Species	0	X 1		0
Solidago canadensis	(* ************************************	<u> </u>	20	Yes	FACU	FACW Species	0	X 2	(0
Cirsium arvense			10	Yes	FACU	FAC Species	5	X 3	1:	5
Rubus idaeus			5	No	FAC	∃	55	X 4	220	_
Lactuca canadensis			5	No	FACU	FACU Species	0	X 5		0
Ambrosia artemisiifolia			5	No	FACU	UPL Species		_		_
			0			Column Totals:	60	(A)	23	<u>5</u> (E
			0			Prevalence In	dex =	B/A =	3.92	2
			0			Hydrophytic Vegetation Indic	ators:			
		Total Cover:	45			No Rapid Test for Hy	droph	ytic Vegetatio	n	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>				No Dominance Test i	s >50%	6		
			0			No Prevalence Index		•		
			0			No Morphological Action rem				ng dat
		Total Cover:	<u>0</u>			No Problematic Hydr				
are Ground in Herb Stratu	m:		% Sphagnun	n Moss Cover	:	[1] Indicators of hydric soil & wet	land hy	drology must b	e present, un	less
etation Remarks: (include	photo numbers	s here or on a separate s	sheet)			Hydrophytic vegetation preser	nt?	<u>No</u>		
•	•	•				11 * ' ' " ' '				

SOIL Sampling Point: 3U

Profile Description: (Describe to the depth need Depth Matrix	ded to document the indicator or confirm the abscence o Redox Features	f indicators).	
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
1 0 - 9 10YR 3/2		mucky peat	very dry
9 - 27 10YR 2/2		mucky peat	dry
3. 27 - 36 10YR 2/2		muck	moist
4			
5			
6	Reduced Matrix, CS=Covered or Coated Sand Grains [2	Location: PL=Pore Lining, M=Matrix.	_
Hydric Soil Indicators: (applicable to all LRRs,		Indicators for Problematic Hydric So	oils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLR	RA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR)	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149)		
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	, _,,
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LI	DD K I)
Depleted Below Dark Surface (A11)		Thin Dark Surface (S9) (LRR K, L	
	Loamy Gleyed Matrix (F2)		
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (L	•
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19)	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	✓ Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless disturbed or problematic	Very Shallow Dark Surface (TF12	e) remarks)
Restrictive Layer (if present): Type:	Depth (inches):	Hydric soil present?	<u>Yes</u>
YDROLOGY Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required; c	heck all that apply)	Secondary Indicators (minimum of two re	quired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surface Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)	Aquatic Fauna (B13)	Drainage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	Moss Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)	Dry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayfish Burrows (C8)	
Drift Deposits (B3)	_	Saturation Visible on Aerial Imagery (C9))
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	Stunted or Stressed Plants (D1)	
	Recent Iron Reduction in Tilled Soils (C6)	Geomorphic Position (D2)	
Iron Deposits (B5)	Thin Muck Surface (C7)	Shallow Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)	Microtopographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)	, -	wheretopographic Kener (D4)	
Field Observations:		Indicators of wetland hydrolo	ogy present? No
Surface water present?	Surface Water Depth (inches):	Describe Recorded Data:	
Water table present?	Water Table Depth (inches):		
Saturation present? (includes capillary fringe)	Saturation Depth (inches):		
Recorded Data: Aerial Photo N	Monitoring Well Stream Gauge Previous Insp	ections	
	Monitoring Well Stream Gauge Previous Inspirithin 36 inches of soil surface.	ections	

	W	ETLA	ND	DETE	RMI	NATIO	ON E	ATA	FOR	M - N	lorth	ncent	ral a	and	Nort	hea	st Re	egion	
Proje	ct/Site:	Hinckley	Site			Applicant	t/Owner:	<u>PolyMe</u>	<u>t</u>	City/Cou	_	asston, Pin	ne S	State:	MN	Samp	oling Date:	07/30/14	
Inves	tigator(s):	kms2, jtk				Section:	<u>5</u>			Townsh	<i>ip:</i> 39N			Range:	22W	Samp	oling Point:	<u>3W</u>	
	Form:	Ditch				Local Re		ncave		Slope %	. <u>—</u> 6: 0	Soil i	Map Uni	it Name	: <u>P- Pe</u>	<u>at</u>			
Subr	egion (LRR)	: K				Latitude:	50	 83199 mN	ı	•	- de: <u>4917</u>	75 6 mE		Datum:	UTM, N	— IAD 83.	meters		
	ardin Classit	_	PEMC/	'A		Circular .	39 Class	ification:	Type 3/2	3					assificatio				
					nical for t	his time of ye		<u>Yes</u>	(If no, expla	ain in rom	arke)				(primary):		Shallow Ma	rch	
AICC	iii iia iic/rryur	nogic condi	ונוטווא טו	тите эне тур		-				Are "nor			00		secondai) (secondai		resh (Wet)		
Are v	regetation	<u>Yes</u>	Soil	<u>Yes</u>	Hydrolo	gy <u>No</u>	signifi	cantly dist	turbed?	circumst	tances"				tertiary):	<i>)</i> /- <u>-</u>			
Are v	regetation	<u>No</u>	Soil	<u>Yes</u>	Hydrolo	gy <u>No</u>	natura	lly probler	matic?	present	?	Ε	ggers &	Reed ((quaterna	ry):			
SUM	MARY	OF FINE	DING	S - Atta	ch sit	te map s	howi	ng sar	npling _l	ooint l	ocatio	ons, tra	ansec	ts, ir	nporta	ant fe	eatures	s, etc.	
Hydro	ophytic vege	tation pres	ent?		<u>Yes</u>	General Ren	narks	Samp	le point is in	a wet me	adow on	the edge of	of a shal	low ma	rsh (ditch). Anted	edent pred	cipitation amo	unts
Hydri	ic soil presei	nt?				(explain any l if needed):	answers		ove the nor Soil Survey.				m the 19	41 Soil	Survey o	f Pine o	ounty arch	ived on the N	RCS
	ators of wetla	-			<u>Yes</u>	,		ļ	•		, L Side (unch							
Is the	sampled ar	ea within a	wetland	1?	<u>Yes</u>	f yes, option	nal Wetla	and Site I	D: Wet	land 3									
VEG	ETATIO	ON																	
							4	bsolute	Dominan	t Indic	eator	50/20	Thresh	olds:				20%	50%
	Tree Stratu	m		(Plot Size:	30 ft		_	Cover	Species?			Tree	Stratum	,				0	0
							<u> </u>	0				Saplii	ng/Shru	b Strat	um			1	2.5
1. 2.								0				Herb	Stratum	1				7	17.5
3.								0				Wood	dy Vine	Stratun	n			0	0
4.								0				Domi	inance T	est Wo	orksheet:				
[Total Cove	er:	0				Numb	ber of Do	ominar	nt Specie	s			
	Sapling/Shi	rub Stratur	m	(Plot Size:	15 ft)	_							W or FAC			3 <i>(A)</i>	
1.	Salix nigra		_					5	Yes	(OBL		Numbe					3 <i>(B)</i>	
2.	Odiix Tiigita						\dashv	0	103		, , , , , , , , , , , , , , , , , , ,	1 11 '	ies Acro			-			
3.							<u> </u>	0							nt Specie: W or FAC		100.0	0% (A/B)	
4.								0						,		-			
5.								0				<u>Preva</u>	lence In	dex W	<u>orksheet</u>				
						Total Cove	er:	<u>5</u>	·			ÎII	Total	% Cov	er of:			Multiply by:	
,	Herb Stratu	<u>m</u>		(Plot Size:	<u>5 ft</u>)					OBL S	Species	_		30	X 1		30
1.	Phalaris ar	undinacea						10	Yes	F	ACW	FACV	V Specie	es _		10	X 2		20
2.	Sagittaria la	atifolia						5	No	(OBL	FACS	Species	_		0	X 3		0
3.	Alisma sub	cordatum						20	Yes	(OBL	FACU	J Specie	es _		0	X 4		0
4.								0					Species	_		0	X 5		0
5.								0					mn Tota			40	(A)		50 (B)
6.								0					1010		alence In				.25
7.							_	0				Hydroi	phytic V		ion Indic				
8.						Total Cove		0				Yes					tic Vegeta	tion	
	Moody V	. C4r-4		(Plot Size:	20 #	rotar COVE	۱.	<u>35</u>				Yes		•	ce Test i		•		
	Woody Vine	e stratum		(PIUL SIZE:	<u>30 II</u>							Yes			ce Index				

0

0

0

% Sphagnum Moss Cover:

Total Cover:

% Bare Ground in Herb Stratum:

Plot Photos: 12456-58

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Remark: Open water

Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)

Yes

Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

No

Hydrophytic vegetation present?

SOIL Sampling Point: 3W

Profile Description: (Describe to the depth need Depth Matrix	led to do	ocument the indicator or confirm the Redox Featu		muicators).		
· <u></u>	%	Color (moist) %	Type [1]	Loc [2]	Texture	Remarks
1 0 - 5 10YR 2/1	100	none			mucky peat	saturated
5 - 13 10YR 2/1	100	none			mucky peat	saturated
3 13 - 24 10YR 2/1	100	none			mucky peat	saturated
4. 24 - 36 10YR 2/1	100	none			mucky peat	saturated
5						
6		Matrix 00-0			N-D Lining M-M-M-	
[1] Type: C=Concentration, D=Depletion, RM=Re			Grains [2]		PL=Pore Lining, M=Matrix.	W. 101
Hydric Soil Indicators: (applicable to all LRRs, u	iniess o			ina	cators for Problematic Hydric So	
✓ Histosol (A1)		Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLR)	
Histic Epipedon (A2)		Dark Surface (S7) (LRR R, MLRA 14	9B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
Black Histic (A3)		Polyvalue Below Surface (S8) (LRR I	R, MLRA 149B)		5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LRR R, MLR	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)		Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L)	
✓ Thick Dark Surface (A12)		Depleted Matrix (F3)			Iron-Manganese Masses (F12) (Li	
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (I	•
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144A,	•
		•			•	
Sandy Redox (S5)		Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland	hydrolo	gy must be present, unless disturbed o	r problematic.		Very Shallow Dark Surface (TF12)	тетакзу
Restrictive Layer (if present): Type:		Depth (inches):		Hydric soil present?	<u>Yes</u>
IYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required; ch	neck all	that apply)		Secondar	y Indicators (minimum of two req	uired)
✓ Surface Water (A1)		Water-Stained Leaves (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)		Aquatic Fauna (B13)		Draina	age Patterns (B10)	
✓ Saturation (A3)		Marl Deposits (B15)		Moss	Trim Lines (B16)	
		Hydrogen Sulfide Odor (C1)		Drv-S	eason Water Table (C2)	
Water Marks (B1)		Oxidized Rhizospheres on Living	Roots (C3)		sh Burrows (C8)	
Sediment Deposits (B2)		Oxidized Willzospheres on Elving	110013 (03)		ation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)		Presence of Reduced Iron (C4)				
Algal Mat or Crust (B4)		Recent Iron Reduction in Tilled S	inile (CA)		ed or Stressed Plants (D1)	
Iron Deposits (B5)			ulis (Cu)	Geom	orphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)		Thin Muck Surface (C7)		Shallo	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)		Other (explain in remarks)		Micro	topographic Relief (D4)	
					Indicators of wetland hydrolog	gy present? Yes
Field Observations:					•	
Field Observations: Surface water present?	✓	Surface Water Depth (inches):			Describe Recorded Data:	
	✓	Surface Water Depth (inches): Water Table Depth (inches):	0		Describe Recorded Data:	
Surface water present?			0		Describe Recorded Data:	
Surface water present? Water table present? Saturation present? (includes capillary fringe)		Water Table Depth (inches): Saturation Depth (inches):		ctions	Describe Recorded Data:	
Surface water present? Water table present? Saturation present? (includes capillary fringe) Recorded Data: Aerial Photo M	☐ ✓ Ionitorin	Water Table Depth (inches): Saturation Depth (inches):	O Previous Inspe	ections	Describe Recorded Data:	

Project/Site:	Hinckley S	<u>Site</u>			Applicant/O	vner: [PolyMet		City/County:	_	rasston, Pi ounty	ine S	State:	MN	Sampling Date:	09/28/15
Investigator(s): <u>c</u> Land Form:	df, bkb Footslope	!			Section: Local Relief	<u>5</u> None	Latitude	2:	,	39N 0	_	il Map Uni	Range: t Name:		Sampling Point:	<u>4U</u>
Subregion (LRR):	<u>K</u>				<u>5081874 mľ</u>	<u> </u>			Longitude:	<u>491</u>	193 mE		Datum:	UTM, NA	AD 83, meters	
Cowardin Classific	cation: L	<u>Jpland</u>			Circular 39	Classific	ation:	<u>Upland</u>			ı	Mapped N	VWI Cla.	ssification	:	
Are climatic/hydrol	logic conditi	ions or	the site typic	cal for this i	time of year:	,	Yes ((If no, explai	in in remarks	s)		Eggers &	Reed (orimary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	No /	Hydrology	No s	significal	ntly distu	ırbed?	Are "normal circumstance			Eggers & Eggers &		-	<i>)</i>):	
Are vegetation	<u>No</u>	Soil	No /	Hydrology	<u>No</u> n	aturally	problema	atic?	present?			Eggers &	Reed (d	quaternary	y):	
NIMMADV C	C EIND	INIO	0 44	. la . :4.				!!	-:-41	4:	4		4- :			-4-

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No No No	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. NE wetland
Is the sampled area within a wetland?	No	If yes, optional Wetlan	nd Site ID: (Wetland 4)

	Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		<u>-</u>	<u>20%</u> 17		<u>0%</u> 2.5
	Quercus macrocarpa			60	Yes	FACU	Sapling/Shrub Stra	tum	=	5	12	_
	Acer saccharum			10	No	FACU	Herb Stratum		-	13	32	
	Populus tremuloides			15	No	FAC	Woody Vine Stratu	m	-	0	(0
				0			Dominance Test W	orksheet:				
			Total Cover:	<u>85</u>			Number of Dominal That Are OBL, FAC			1 (A)		
	Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>				Total Number of Do			_		
	Corylus americana			25	Yes	FACU	Species Across All			4 <i>(B)</i>		
				0			Percent of Dominar	nt Species		_		
				0			That Are OBL, FAC		25.00	% (A/B)		
				0								_
				0			Prevalence Index W	orksheet:				
			Total Cover:	<u>25</u>			Total % Cov			Multiply by	:	
	Herb Stratum	(Plot Size:	<u>5 ft</u>				OBL Species	0	X 1		0	
ſ	Amphicarpaea bracteata		,	40	Yes	FAC	FACW Species	0	X 2		0	
	Pteridium aquilinum			15	Yes	FACU	FAC Species	55	X 3		165	
ŀ	Fragaria vesca			5	No	UPL	111	110	X 4		140	
ļ	Asarum canadense			5	No	UPL	FACU Species _	10	X 5		50	
ļ				0			UPL Species					
Ī				0			Column Totals:	175	(A)	(355	
ļ				0			Prev	alence Index =	B/A =	3	.74	
ļ				0			Hydrophytic Vegeta	tion Indicators:				
L			Total Cover:	<u>65</u>			No Rapid Te	st for Hydroph	vtic Vegetati	on		
	Woody Vine Stratum	(Plot Size:		<u>03</u>			 '	nce Test is >509				
	Woody vine Stratum	(F10t 312e.	<u>30 ll</u>)				No Prevalen	ce Index ≤ 3.0	[1]			
ļ				0				ogical Adaptati			rting	d
				0			<u>-</u>	ation remarks o	•	,		
			Total Cover:	<u>0</u>			No Problem	atic Hydrophyti	ic Vegetation	[1] (Expla	in)	
Ва	re Ground in Herb Stratum	:	0	% Sphagnum	Moss Cover	: 0	[1] Indicators of hydric disturbed or problemate		drology must/	be present	unless	5
ge	tation Remarks: (include p	hoto number	s here or on a separate s	heet)			Hydrophytic vegetati	ion present?	<u>No</u>			
_												_

SOIL Sampling Point: 4U

Profile Description: (De	escribe to the depth needed to d	locument the indicator or co	onfirm the	abscence of	f indicators).		
Depth	Matrix		lox Featur		1 101	T . (Daniel C
(inches)	Color (moist) %	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. 4 12 10VI	R 3/2 100 R 6/3 100					Silt loam	dry
40 40 110)	YR 6/4 100					Fine sandy loam Fine sand	dry dry
3. <u>12 - 18</u> 1101		-				- Ino cana	<u>,</u>
5.		-					
6							
[1] Type: C=Concentral	tion, D=Depletion, RM=Reduced	Matrix, CS=Covered or Coa	ated Sand	Grains [2] Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators:	(applicable to all LRRs, unless	otherwise noted)			Indi	cators for Problematic Hydric So	ils [3]:
Histosol (A1)		Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR)	1 <i>149B)</i>
Histic Epipedon (A2)		Dark Surface (S7) (LRR R,	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR K	, L, R)
Black Histic (A3)		Polyvalue Below Surface (S	S8) (LRR F	P., MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
Hydrogen Sulfide (A4	4)	Thin Dark Surface (S9) (LR	RR R, MLR	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)] Loamy Mucky Mineral (F1)	(LRR K, L,)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark	K Surface (A11)] Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface ((A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Minera	ol (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (I	<i>NLRA 149B)</i>
Sandy Gleyed Matrix	(S4)	Depleted Dark Surface (F7))			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)		Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
-	tic vegetation and wetland hydrolo		dicturbed o	r problematic		Very Shallow Dark Surface (TF12)	
Restrictive Layer (if pre			h (inches			Hydric soil present?	
Restrictive Layer (II pre	sent): Type:	Бері	n (inches)·		rryunc son present:	<u>No</u>
Soil Remarks: Power	dy dry soil; could not auger deepe	r than 18" because soil would	l not stay ir	n auger.			
L HYDROLOGY							
Wetland Hydrology Indi	icatore:						
1 3	imum of one required; check al	that apply)			Secondar	y Indicators (minimum of two req	uired)
Surface Water (A1)		☐ Water-Stained Leaves	(B9)			re Soil Cracks (B6)	FAC-Neutral Test (D5)
	2)	Aquatic Fauna (B13)	,		_	ge Patterns (B10)	
High Water Table (A2)	2)	Marl Deposits (B15)			_	Trim Lines (B16)	
Saturation (A3)		Hydrogen Sulfide Odol	· (C1)			eason Water Table (C2)	
Water Marks (B1)	0.01	Oxidized Rhizospheres		Poots (C3)		sh Burrows (C8)	
Sediment Deposits (E	B2)	Oxidized Nilizospiicies	on Living	110013 (03)		ntion Visible on Aerial Imagery (C9)	
Drift Deposits (B3)					Jalura	mon visible on Achai inagery (C7)	
		Presence of Reduced I	Iron (C4)		Stunto		
Algal Mat or Crust (B	14)	Presence of Reduced I		oils (C6)		d or Stressed Plants (D1)	
	(4)	Recent Iron Reduction	in Tilled S	oils (C6)	Geom	od or Stressed Plants (D1) corphic Position (D2)	
☐ Algal Mat or Crust (B☐ Iron Deposits (B5)☐ Inundation Visible on	Aerial Imagery (B7)	Recent Iron Reduction Thin Muck Surface (C)	in Tilled Si	oils (C6)	Geom Shallo	od or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3)	
☐ Algal Mat or Crust (B☐ Iron Deposits (B5)☐ Inundation Visible on		Recent Iron Reduction	in Tilled Si	oils (C6)	Geom Shallo	od or Stressed Plants (D1) corphic Position (D2)	
Algal Mat or Crust (B Iron Deposits (B5) Inundation Visible on Sparsely Vegetated of Field Observations:	Aerial Imagery (B7) Concave Surface (B8)	Recent Iron Reduction Thin Muck Surface (C7 Other (explain in remain	in Tilled Si 7) rks)	oils (C6)	Geom Shallo	od or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3)	yy present? <u>No</u>
☐ Algal Mat or Crust (B☐ Iron Deposits (B5)☐ Inundation Visible on☐ Sparsely Vegetated (Field Observations: Surface water present?	Aerial Imagery (B7) Concave Surface (B8)	Recent Iron Reduction Thin Muck Surface (C)	in Tilled Si 7) rks)	oils (C6)	Geom Shallo	od or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4)	gy present? <u>No</u>
Algal Mat or Crust (B Iron Deposits (B5) Inundation Visible on Sparsely Vegetated of Field Observations: Surface water present? Water table present?	Aerial Imagery (B7) Concave Surface (B8)	Recent Iron Reduction Thin Muck Surface (C7 Other (explain in remain) Surface Water Depth (including Mater Table Depth (including Ma	in Tilled Si Tks) nches):	oils (C6)	Geom Shallo	or or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolog	ny present? <u>No</u>
☐ Algal Mat or Crust (B☐ Iron Deposits (B5)☐ Inundation Visible on☐ Sparsely Vegetated (SFIELD Observations: Surface water present?	Aerial Imagery (B7) Concave Surface (B8)	Recent Iron Reduction Thin Muck Surface (C7 Other (explain in remai	in Tilled Si Tks) nches):	oils (C6)	Geom Shallo	or or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolog	gy present? <u>No</u>
Algal Mat or Crust (B Iron Deposits (B5) Inundation Visible on Sparsely Vegetated of Field Observations: Surface water present? Water table present?	Aerial Imagery (B7) Concave Surface (B8)	Recent Iron Reduction Thin Muck Surface (C) Other (explain in remail Surface Water Depth (incless Water Table Depth (inchess	in Tilled Si	oils (C6)	Geom Shallo Microt	or or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolog	gy present? <u>No</u>
Algal Mat or Crust (B Iron Deposits (B5) Inundation Visible on Sparsely Vegetated (C) Field Observations: Surface water present? Water table present? (inc	Aerial Imagery (B7) Concave Surface (B8)	Recent Iron Reduction Thin Muck Surface (C) Other (explain in remail Surface Water Depth (incless Water Table Depth (inchess	in Tilled Si		Geom Shallo Microt	or or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolog	gy present? <u>No</u>

Project/Site:	Hinckley S	<u>Site</u>			Applican	nt/Owner:	PolyMe	<u>et</u>	City/County	: Gras	ston,	Pine Pine	State:	MN	Sampling Date.	: 07/20/15
Investigator(s): Land Form:	kms2 Terrace				Section.	_	ncave		Township: Slope %:	<u>39N</u> 0	So	oil Map Ui	Range: nit Name:	22W P-Pea	Sampling Poin	t: <u>4W</u>
Subregion (LRR):					Latitude	<u>508</u>	33458		Longitude:	<u>49171</u>	<u>5</u>	•	Datum:	UTM, N	AD 83, meters	
Cowardin Classifi	cation: E	PSS1B	<u> </u>		Circular	39 Classi	fication:	Type 3/1				Mapped	NWI Cla.	ssification	n:	
Are climatic/hydro	ologic conditi	ions or	n the site typ	ical for this	time of y	ear?	Yes	(If no, expi	lain in remarks	s)		Eggers a	& Reed (j	orimary):	Shallow M	<u>arsh</u>
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	signific	cantly dis	sturbed?	Are "normal circumstance		<u>Yes</u>	55	& Reed (s & Reed (i	secondary tertiary):	y): <u>Seasonall</u> y	y Flooded Basin
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	naturali	ly problei	matic?	present?			Eggers a	& Reed (d	quaternar	ry):	
SUMMARY C	OF FIND	ING	S - Atta	ch site	map s	showii	ng sai	mpling	point loc	atior	ıs, t	ranse	cts, in	nporta	nt feature	s, etc.

Hydrophytic vegetation present?	Yes	General Remarks	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. NE Wetland
Hydric soil present?	Yes	(explain any answers	
Indicators of wetland hydrology present?	Yes	if needed):	
Is the sampled area within a wetland?	<u>Yes</u>	If yes, optional Wetlan	nd Site ID: Wetland 4

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	Indicator Status	50/20 Thresholds: Tree Stratum		-	0	<u>50%</u> 0
			0			Sapling/Shrub Stratum		=	15	37.5
			0			Herb Stratum Woody Vine Stratum		=	14.4	36
			0			Woody vine Stratum		_	0	
			0			Dominance Test Workshee	<u>t:</u>			
Sapling/Shrub Stratum	(Plot Size:	Total Cover:	<u>0</u>			Number of Dominant Speci That Are OBL, FACW or FA			5 (A)	
Salix discolor	(1 101 0126.	1011 /	30	Yes	FACW	Total Number of Dominant			5 <i>(B)</i>	
Alnus incana			20	Yes	FACW	Species Across All Strata:			-	
Salix nigra			20	Yes	OBL	Percent of Dominant Specie That Are OBL, FACW or FA	es C.	100.00	% (A/B)	
Rubus idaeus			5	No	FAC	That Are OBL, FACW or FA	U:			
Trabas ladeas			0		1710	Prevalence Index Workshee	<u>t:</u>			
		Total Cover:	<u>75</u>			Total % Cover of:		/	fultiply by:	
Herb Stratum	(Plot Size:	<u>5 ft</u>	_			OBL Species	47	X 1	4	7
Scirpus cyperinus			20	Yes	OBL	FACW Species	90	X 2	18	0
Phalaris arundinacea			35	Yes	FACW	FAC Species	10	X 3	3	0
Eutrochium purpureum			5	No	FAC	FACU Species	0	X 4		0
Onoclea sensibilis			5	No	FACW	III '	0	X 5		0
Typha latifolia			2	No	OBL	UPL Species	147	(A)	25	_
Carex lacustris			5	No	OBL	Column Totals:		` ′		_ `
			0			Prevalence I		B/A =	1.7	5
			0			Hydrophytic Vegetation Indi	cators:			
		Total Cover:	<u>72</u>			No Rapid Test for H		•	on	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>				Yes Dominance Test				
			0			Yes Prevalence Index No Morphological A		•	ido ounnorti	ina dat
			0			in vegetation ren				ny uau
		Total Cover:	0			No Problematic Hyd)
Pare Ground in Herb Stratu	m:		% Sphagnun	n Moss Cover	:	[1] Indicators of hydric soil & we disturbed or problematic.	tland hy	drology must	be present, ur	ıless
etation Remarks: (include			0			Hydrophytic vegetation prese	10	Yes		

SOIL Sampling Point: 4W

(inches) Color (moist)	%	Color (moist)	dox Featur %	Type [1]	Loc [2]	Texture	Remarks
0 - 4 10YR 2/2		7.5 YR 4/6		C		mucky silt	saturated
4 - 8 10YR 3/2		10YR 3/4				mucky silt	with gravel, saturated
8 - 10 10YR 2/1	100					silt loam	saturated
10 - 15 10YR 3/1	40					clay loam	with sand, saturated
10 - 15 10YR 2/1	40	10YR 3/4	20			clay loam/sand pockets	with gravel, saturated
Type: C=Concentration, D=Depletion, RM=F	Reduced I	Matrix, CS=Covered or Co	ated Sand	Grains [2]	Location:	PL=Pore Lining, M=Matrix.	
rdric Soil Indicators: (applicable to all LRRs,	unless of	herwise noted)			Inc	licators for Problematic Hydric	Soils [3]:
Histosol (A1)		Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, N	<i>ILRA 149B)</i>
Histic Epipedon (A2)		Dark Surface (S7) (LRR R)	, MLRA 149	9B)		Coast Prairie Redox (A16) (LF	RR K, L, R)
Black Histic (A3)		Polyvalue Below Surface ((S8) (LRR F	R. MLRA 149E	·)	5 cm Mucky Peat or Peat (S3)	•
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LF			,	Dark Surface (S7) (LRR K, L)	(2,11,11,1,2,11)
Stratified Layers (A5)		Loamy Mucky Mineral (F1)		•		Polyvalue Below Surface (S8)	(IRRKI)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)	(LNN N, L)	,		Thin Dark Surface (S9) (LRR)	
Thick Dark Surface (A12)		Depleted Matrix (F3)				Trini Dark Surface (S9) (ERR) Iron-Manganese Masses (F12	
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)	-1			Piedmont Floodplain Soils (F1	,
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F)	9			Mesic Spodic (TA6) (MLRA 14	44A, 145, 149B)
Sandy Redox (S5)	✓	Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
Indicators of hydrophytic vegetation and wetlan	nd hydrolog	y must be present, unless	disturbed o	r problematic.		Very Shallow Dark Surface (T	F12) remarks)
estrictive Layer (if present): Type:		TO.				Hydric soil present?	Voo
		Бері	th (inches):		riyunc son present:	<u>Yes</u>
oil Remarks:			th (inches):		Tryunc sun present:	<u>res</u>
oil Remarks:			th (inches):		Tryunc sun present:	<u>res</u>
oil Remarks: YDROLOGY Vetland Hydrology Indicators:	check all t		th (inches):	Seconda	ry Indicators (minimum of two	
oil Remarks: /DROLOGY detland Hydrology Indicators: rimary Indicators (minimum of one required; of	check all t):			o required)
Oil Remarks: /DROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a continuation of the co	check all t	hat apply)):	Surfa	ry Indicators (minimum of two	o required)
TOROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2)	check all t	hat apply) Water-Stained Leaves):	Surfa	ry Indicators (minimum of two	o required)
oil Remarks: /DROLOGY /etland Hydrology Indicators: rimary Indicators (minimum of one required; of a continuation of the second of the seco	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15)	S (B9)):	Surfa Drair Moss	ry Indicators (minimum of two ice Soil Cracks (B6) iage Patterns (B10)	o required)
TOROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo	s (B9) or (C1)		Surfa Drain Moss Dry-s	ry Indicators (minimum of two ice Soil Cracks (B6) iage Patterns (B10) is Trim Lines (B16) Season Water Table (C2)	o required)
oil Remarks: //DROLOGY /etland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1)] High Water Table (A2)] Saturation (A3)] Water Marks (B1)] Sediment Deposits (B2)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15)	s (B9) or (C1)		Surfa Drain Moss Dry-S	ry Indicators (minimum of two ice Soil Cracks (B6) iage Patterns (B10) is Trim Lines (B16) Season Water Table (C2)	o required) [FAC-Neutral Test (DE
VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere.	s (B9) or (C1) s on Living		Surfa Drair Moss Dry-: Cray.	ry Indicators (minimum of two ice Soil Cracks (B6) iage Patterns (B10) is Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (o required) [FAC-Neutral Test (DE
Coil Remarks: POROLOGY Setland Hydrology Indicators: rimary Indicators (minimum of one required; of a continuous of a conti	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere.	s (B9) or (C1) s on Living Iron (C4)	Roots (C3)	Surfa Drair Moss Dry- Cray. Satun	ry Indicators (minimum of two ace Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (o required) [FAC-Neutral Test (DE
oil Remarks: YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction	s (B9) or (C1) s on Living Iron (C4) n in Tilled S	Roots (C3)	☐ Surfa ☐ Drain ☐ Moss ☐ Dry-s ☐ Cray ☐ Satur ☐ Sturn	ry Indicators (minimum of two ce Soil Cracks (B6) cage Patterns (B10) crim Lines (B16) Geason Water Table (C2) fish Burrows (C8) cation Visible on Aerial Imagery (ced or Stressed Plants (D1)	o required) [FAC-Neutral Test (D5
Coll Remarks: CPROLOGY Cetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	or (C1) s on Living Iron (C4) n in Tilled S	Roots (C3)	Surfa □ Drair □ Moss □ Dry-: □ Cray. □ Satun □ Stunn □ Shali	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (ded or Stressed Plants (D1) morphic Position (D2)	o required) FAC-Neutral Test (DS
cetland Hydrology Indicators: imary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction	or (C1) s on Living Iron (C4) n in Tilled S	Roots (C3)	Surfa □ Drair □ Moss □ Dry-: □ Cray. □ Satun □ Stunn □ Shali	ry Indicators (minimum of two ce Soil Cracks (B6) cage Patterns (B10) crim Lines (B16) Geason Water Table (C2) fish Burrows (C8) cation Visible on Aerial Imagery (ced or Stressed Plants (D1)	o required) FAC-Neutral Test (DS
fetland Hydrology Indicators: rimary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	or (C1) s on Living Iron (C4) n in Tilled S	Roots (C3)	Surfa □ Drair □ Moss □ Dry-: □ Cray. □ Satun □ Stunn □ Shali	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ration Visible on Aerial Imagery (ded or Stressed Plants (D1) morphic Position (D2)	o required) FAC-Neutral Test (D:
oil Remarks: YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	r (C1) s on Living Iron (C4) n in Tilled Si	Roots (C3)	Surfa □ Drair □ Moss □ Dry-: □ Cray. □ Satun □ Stunn □ Shali	ry Indicators (minimum of two ace Soil Cracks (B6) age Patterns (B10) at Trim Lines (B16) Season Water Table (C2) fish Burrows (C8) ation Visible on Aerial Imagery (ated or Stressed Plants (D1) morphic Position (D2) ow Aquitard (D3)	o required) FAC-Neutral Test (D:
celland Hydrology Indicators: rimary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	check all t	hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	or (C1) s on Living Iron (C4) n in Tilled Si 7) prks)	Roots (C3)	Surfa □ Drair □ Moss □ Dry-: □ Cray. □ Satun □ Stunn □ Shali	ry Indicators (minimum of two loce Soil Cracks (B6) lage Patterns (B10) lage Trim Lines (B16) lage Season Water Table (C2) lage Season Water Table (C2) lage on Visible on Aerial Imagery (lage or Stressed Plants (D1) lage of Stressed Plants (D1) lage of Aquitard (D3) lage of Stressed Plants (D4) Indicators of wetland hydrology	o required) FAC-Neutral Test (D:
Cetland Hydrology Indicators: rimary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present?		hat apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C. Other (explain in rema	or (C1) s on Living Iron (C4) n in Tilled Si T) urks) nches):	Roots (C3)	Surfa □ Drair □ Moss □ Dry-: □ Cray. □ Satun □ Stunn □ Shali	ry Indicators (minimum of two loce Soil Cracks (B6) lage Patterns (B10) lage Trim Lines (B16) lage Season Water Table (C2) lage Season Water Table (C2) lage on Visible on Aerial Imagery (lage or Stressed Plants (D1) lage of Stressed Plants (D1) lage of Aquitard (D3) lage of Stressed Plants (D4) Indicators of wetland hydrology	o required) FAC-Neutral Test (D:

WETLAND DETERMINATION DATA FOR	RM - Northo	entral and	Northeast Re	gion	
Project/Site: Hinckley Site Applicant/Owner: PolyMet	City/County: Grass		MN Sampling Date:	07/30/14	
Investigator(s): kms2, jtk Section: 5	Township: 39N	Range:	<u>22W</u> Sampling Point:	<u>5U</u>	
Land Form: Terrace Plain Local Relief: None Latitude:	<i>Slope %:</i> <u>0</u>	Soil Map Unit Name:	P - Peat		
Subregion (LRR): <u>K</u> 5082389 mN	Longitude: 491761	mE Datum:	UTM, NAD 83, meters		
Cowardin Classification: Upland Circular 39 Classification: Upland		Mapped NWI Clas	ssification:		
Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, exp. Are vegetation No Soil Yes Hydrology No significantly disturbed?	lain in remarks) Are "normal circumstances"	Eggers & Reed (p	secondary):		
Are vegetation No Soil No Hydrology No naturally problematic? SUMMARY OF FINDINGS - Attach site map showing sampling	present? point location	Eggers & Reed (c	quaternary):	, etc.	
	ived on the NRCS Wel		Soils data are from the 194	1 Soil Surve	ey of
	etland 5)				
VEGETATION	_				
Absolute Dominal	nt Indicator	50/20 Thresholds:		<u>20%</u>	<u>50%</u>
Tree Stratum (Plot Size: 30 ft) % Cover Species	? Status	Tree Stratum		0	0
1. 0		Sapling/Shrub Stratu	ım	0	0
2.		Herb Stratum		19	47.
3.		Woody Vine Stratum	1		0
4. 0		Dominance Test Wo	rksheet:		

	Tree Stratum	(Plot Size:	30 ft)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds:			20% 0		<u>50%</u> 0	
		(Field 2010) <u>66 h</u>			_			Sapling/Shrub Stra	ntum		0		0	
1.					0			Herb Stratum			19		47.5	
2.					0			Woody Vine Stratu	oody Vine Stratum				0	
3.					0			Dominance Test W	Worksheet					
4.					0									
	Sapling/Shrub Stratum	(Plot Size:	15 ft	Total Cover:	<u>0</u>			Number of Dominant Species That Are OBL, FACW or FAC:		0	(A)			
1.	Sapinigi Om ab Oti atam	(1.101.01201	<u>10 11</u>	,	0			Total Number of Dominant Species Across All Strata:			4	(B)		
2.					0			Percent of Dominant Species						
3.					0			That Are OBL, FACW or FAC:		0.00	.00% (A/B)			
4.					0						_			
5.					0			Prevalence Index V	Vorksheet:					
		Total Cover:		<u>0</u>			Total % Cover of:			Multiply by:				
	Herb Stratum	(Plot Size:	<u>5 ft</u>)				OBL Species	0	X 1		0	i	
1.	Asclepias syriaca			,	20	Yes	UPL	FACW Species	0	X 2		0	1	
2.	Ambrosia artemisiifolia				15	Yes	FACU	FAC Species	0	X 3		0		
3.	Taraxacum officinale				25	Yes	FACU	FACU Species	75	X 4		300		
4.	Oxalis corniculata				15	Yes	FACU	1	20	X 5		100	1	
5.	Lactuca canadensis				10	No	FACU	UPL Species	95	(A)		400	(B)	
6.	Cirsium arvense				10	No	FACU	Column Totals:		()			(D)	
7.					0			Prevalence Index = B/A =				4.21		
8.					0			Hydrophytic Vegetation Indicators:						
Total Cover:					95			No Rapid Test for Hydrophytic Vegetation						
Woody Vine Stratum (Plot Size: 30 ft)					_			No Dominance Test is >50%						
1.	1			0			No Prevalence Index ≤ 3.0 [1]							
2.					0									
Total Cover:			0			in vegetation remarks or on a separate sheet) No Problematic Hydrophytic Vegetation [1] (Explain)								
	Total Cover.								[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.					
% В	% Bare Ground in Herb Stratum:													
Veg	etation Remarks: (include	Hydrophytic vegetation present? <u>No</u>												
Dlot	Photos: 754-757							11						
1 101	. 1 110103. 73T-737													

SOIL Sampling Point: 5U

Depth Matrix	Re	edox Features	e of indicators).		
(inches) Color (moist)	% Color (moist)	% Type [1] Loc [2]	Texture	Remarks
1 0 - 9 10YR 2/1	100 none			mucky silt loam	no redox, dry
9 - 22 10YR 4/2	60 10yr 42/1	40	<u> </u>	fine sandy loam	dry
3. 22 - 36 10YR 4/2	100 none			loamy fine sand	no redox, dry
4					
5					_
6	Reduced Matrix, CS=Covered or C	oated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs			Inc	licators for Problematic Hydric So	oils [3]:
Histosol (A1)	Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, MLR	PA 149B)
✓ Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR F	R. MLRA 149B)		Coast Prairie Redox (A16) (LRR)	
Black Histic (A3)	Polyvalue Below Surface		149R)	5 cm Mucky Peat or Peat (S3) (Li	•
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (L			Dark Surface (S7) (LRR K, L)	W N, 2, N
Stratified Layers (A5)	✓ Loamy Mucky Mineral (F1	•		Polyvalue Below Surface (S8) (LI	OD ν Ι)
					•
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	1	L	Thin Dark Surface (S9) (LRR K, L	
Thick Dark Surface (A12)	Depleted Matrix (F3)			∫ Iron-Manganese Masses (F12) (L	•
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F	7)		Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlar	nd hydrology must be present, unless	disturbed or problem	atic.	Very Shallow Dark Surface (TF12	remarks)
Restrictive Layer (if present): Type:	Dej	oth (inches):		Hydric soil present?	<u>Yes</u>
YDROLOGY Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required;	check all that apply)		Seconda	ry Indicators (minimum of two re	quired)
Surface Water (A1)	Water-Stained Leave	s (B9)	Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		Drain	nage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Moss	Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Od	or (C1)			
Water Warks (DT)		7) (C1)	Dry	Season Water Table (C2)	
Sodiment Denosits (R2)	Oxidized Rhizosphere				
Sediment Deposits (B2)	Oxidized Rhizosphere		3)	fish Burrows (C8))
Drift Deposits (B3)	Oxidized Rhizosphere	es on Living Roots (C	3) Cray	fish Burrows (C8) ration Visible on Aerial Imagery (C9,	
Drift Deposits (B3) Algal Mat or Crust (B4)	Presence of Reduced	es on Living Roots (C	3) Cray Satu	fish Burrows (C8) ration Visible on Aerial Imagery (C9, ted or Stressed Plants (D1)	
Drift Deposits (B3)	Presence of Reduced Recent Iron Reduction	es on Living Roots (C d Iron (C4) n in Tilled Soils (C6)	3) Cray Satu Stun Geor	fish Burrows (C8) ration Visible on Aerial Imagery (C9, ted or Stressed Plants (D1) morphic Position (D2))
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	es on Living Roots (C I Iron (C4) n in Tilled Soils (C6)	3) Cray Satu Stun Geo Shal	fish Burrows (C8) ration Visible on Aerial Imagery (C9, ted or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Presence of Reduced Recent Iron Reduction	es on Living Roots (C I Iron (C4) n in Tilled Soils (C6)	3) Cray Satu Stun Geo Shal	fish Burrows (C8) ration Visible on Aerial Imagery (C9, ted or Stressed Plants (D1) morphic Position (D2))
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	es on Living Roots (C d Iron (C4) n in Tilled Soils (C6) C7) arks)	3) Cray Satu Stun Geo Shal	fish Burrows (C8) ration Visible on Aerial Imagery (C9, ted or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	es on Living Roots (C d Iron (C4) n in Tilled Soils (C6) C7) arks)	3) Cray Satu Stun Geo Shal	rish Burrows (C8) ration Visible on Aerial Imagery (C9, red or Stressed Plants (D1) norphic Position (D2) row Aquitard (D3) rotopographic Relief (D4)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	es on Living Roots (C d Iron (C4) n in Tilled Soils (C6) (C7) arks)	3) Cray Satu Stun Geo Shal	ration Visible on Aerial Imagery (C9, led or Stressed Plants (D1) morphic Position (D2) low Aquitard (D3) httppographic Relief (D4) Indicators of wetland hydrologian (D8)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in remo	es on Living Roots (C d Iron (C4) n in Tilled Soils (C6) C7) arks) (inches):	3) Cray Satu Stun Geo Shal	ration Visible on Aerial Imagery (C9, led or Stressed Plants (D1) morphic Position (D2) low Aquitard (D3) httppographic Relief (D4) Indicators of wetland hydrologian (D8)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in remo	es on Living Roots (C d Iron (C4) n in Tilled Soils (C6) C7) arks) (inches): ches):	3) Cray Satu Stun Geo Shal	ration Visible on Aerial Imagery (C9, led or Stressed Plants (D1) morphic Position (D2) low Aquitard (D3) httppographic Relief (D4) Indicators of wetland hydrologian (D8)	
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in remains) Surface Water Depth (included) Water Table Depth (included)	es on Living Roots (C d Iron (C4) n in Tilled Soils (C6) C7) arks) (inches): ches):	3) Cray Satur Stun Geor Shal	ration Visible on Aerial Imagery (C9, led or Stressed Plants (D1) morphic Position (D2) low Aquitard (D3) httppographic Relief (D4) Indicators of wetland hydrologian (D8)	

WETLAND DETERMINATION	I DATA FOR	M - Northcentral and Northeast Region
Project/Site: Hinckley Site Applicant/Ow	ner: PolyMet	City/County: Grasston, Pine State: MN Sampling Date: 07/30/14 County
Investigator(s): kms2, jtk Section:	<u>5</u>	Township: 39N Range: 22W Sampling Point: 5W
Land Form: Ditch Local Relief:	None Latitude:	Slope %: 0 Soil Map Unit Name: P-Peat
Subregion (LRR): <u>K</u> 5082393 mN		Longitude: 491762 mE Datum: UTM, NAD 83, meters
Cowardin Classification: PEMC/A Circular 39 C	Classification: Type 3/1	Mapped NWI Classification:
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, expl	lain in remarks) Eggers & Reed (primary): Shallow Marsh
Are vegetation No Soil Yes Hydrology No si	ignificantly disturbed?	Are "normal Yes Eggers & Reed (secondary): Seasonally Flooded Basin circumstances" Fagers & Reed (section):
Are vegetation No Soil No Hydrology No na	turally problematic?	croumstances Eggers & Reed (tertiary): present? Eggers & Reed (quaternary):
		point locations, transects, important features, etc.
Hydrophytic vegetation present? Yes General Remark:		pitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of
Hydric soil present? Yes (explain any ansi	wers Pine county archiv	ved on the NRCS Web Soil Survey.
Indicators of wetland hydrology present? Yes if needed):	Well 12 field-wet I	DICT
Is the sampled area within a wetland? Yes If yes, optional V	Wetland Site ID: Wei	tland 5
VEGETATION		
	Absolute Dominan	nt Indicator <u>50/20 Thresholds:</u> <u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>)	% Cover Species?	
1.	0	Sapling/Shrub Stratum 0 0
2.	0	Herb Stratum 14 35
3.	0	Woody Vine Stratum 0 0
4.	0	Dominance Test Worksheet:
Total Cover:	<u>0</u>	Number of Dominant Species That Are ORL FACW or FAC: 3 (A)
Sapling/Shrub Stratum (Plot Size: 15 ft)		That Are ODE, I AON OF AO.
1.	0	Total Number of Dominant Species Across All Strata: 3 (B)
2.	0	Percent of Dominant Species
3.	0	That Are OBL, FACW or FAC: 100.00% (A/B)
4.	0	Prevalence Index Worksheet:
5. T-14/0	0	
Total Cover:	<u>0</u>	Total % Cover of: Multiply by: OBL Species 50 X 1 50
Herb Stratum (Plot Size: 5ft	Van	OBL Species
Phalaris arundinacea Typha latifolia	20 Yes Yes	TACW TACW Openies
3. Lemna minor	25 Yes	ODI TAC Species
Asclepias incarnata	5 No	OBI PACO Species
5.	0	OFL Species
6.	0	Column Totals: 70 (A) 90 (B)
7.	0	Prevalence Index = B/A = 1.29
8.	0	Hydrophytic Vegetation Indicators:
Total Cover:	<u>70</u>	Yes Rapid Test for Hydrophytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft)		Yes Dominance Test is >50% Yes Prevalence Index ≤ 3.0 [1]
1.	0	No Morphological Adaptations [1] (provide supporting data
2.	0	in vegetation remarks or on a separate sheet)
Total Cover:	<u>0</u>	No Problematic Hydrophytic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.
Vegetation Remarks: (include photo numbers here or on a separate	sheet)	Hydrophytic vegetation present? Yes
Plot Photos: 2578-2580		

SOIL Sampling Point: <u>5W</u>

Depth Matrix	ded to document the indicator or co Red	onnimi the abscence lox Features	of indicators).		
(inches) Color (moist)	% Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
1 0 - 7 10YR 4/2	30 10YR 3/4	60		fine sandy loam	moist
2 0-7	10YR 3/2	20		-	
3. 7 - 18 10YR 3/2	60 10YR 3/4	40		loamy fine sand	saturated
4. 18 - 40 10YR 3/3	100 none	- <u></u>		very fine sandy loam	no redox, saturated
5					
6	educed Matrix CS=Covered or Coa	ated Sand Grains	[2] ocation: F	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,		Tiou Guina Grains	• •	icators for Problematic Hydric	Soils 131
Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, N	
		AN DA 140D)			
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R,			Coast Prairie Redox (A16) (LF	·
Black Histic (A3)	Polyvalue Below Surface (S		19B)	5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LR	PR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1)	(LRR K, L)		Polyvalue Below Surface (S8)	(LRR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR I	K, L)
Thick Dark Surface (A12)	✓ Depleted Matrix (F3)			Iron-Manganese Masses (F12) (LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F1	9) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7))		Mesic Spodic (TA6) (MLRA 14	
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	<u></u>
	_ ,				Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless a	listurbed or problema	tic.	Very Shallow Dark Surface (Ti	F12) Terriario
Restrictive Layer (if present): Type:	Depti	h (inches):		Hydric soil present?	<u>Yes</u>
IYDROLOGY Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required; c	heck all that apply)		Seconda	ry Indicators (minimum of two	• •
Surface Water (A1)	Water-Stained Leaves	(B9)	Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
✓ High Water Table (A2)	Aquatic Fauna (B13)		Drain.	age Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)		Moss	Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odor	(C1)	Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	on Livina Roots (C3)	Cravf	ish Burrows (C8)	
	,	<i>3</i> (<i>)</i>		ation Visible on Aerial Imagery ((C9)
Drift Deposits (B3)	Presence of Reduced I.	ron (C4)		ed or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction				
Iron Deposits (B5)				norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	☐ Thin Muck Surface (C7)		Shallo	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in reman	KS)	Micro	topographic Relief (D4)	
Field Observations:				Indicators of wetland hydr	rology present? Yes
	Surface Water Depth (in	nches):	_	Describe Recorded Data:	
Surface water present?		1			
Surface water present? Water table present?	✓ Water Table Depth (inch	nes): 1			
	✓ Water Table Depth (inch✓ Saturation Depth (inche	•			
Water table present? Saturation present? (includes capillary fringe)		es): 0	_		
Water table present? Saturation present? (includes capillary fringe)	Saturation Depth (inche	es): 0	_		

Project/Site:	Hinckley S	<u>Site</u>			Applicant/Ov	ner: PolyMet	Ĺ	City/County:	Grasston, County	Pine Sta	ate:	MN .	Sampling Date:	08/01/14
Investigator(s): <u>k</u> Land Form:	ms2, jtk Summit				Section: Local Relief:	<u>5</u> <u>Convex</u>			39N 0 S	Ra oil Map Unit N	ange: Name:		Sampling Point: at	<u>6U</u>
Subregion (LRR):	<u>K</u>				Latitude:	5082241 mN	<u>l</u>	Longitude:	490993 mE	Dá	atum:	UTM, NA	AD 83, meters	
Cowardin Classific	cation: L	Jpland			Circular 39 (Classification:	<u>Upland</u>			Mapped NVI	VI Clas	sification:		
Are climatic/hydroi	logic condit	ions or	the site typ	oical for this	time of year?	<u>Yes</u>	(If no, expla	in in remarks	5)	Eggers & R	eed (p	rimary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	No s	ignificantly dist	turbed?	Are "normal circumstance		Eggers & R Eggers & R		,):	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> na	nturally problem	natic?	present?		Eggers & R		,		

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No No No	General Remarks (explain any answers if needed):	Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. ID_Field: Field east of well 9 Next to ditch south of field
Is the sampled area within a wetland?	No	If yes, optional Wetlan	nd Site ID: (Wetland 6)

To Otal	(DI: (O')		Absolute % Cover	Dominant Species?	<u>Indicator</u> Status	50/20 Thresholds:			20%	<u>50%</u>
Tree Stratum	(Plot Size: <u>30 i</u>	<u> </u>	<u> 70 00707</u>	<u>opcorco.</u>	<u>Otatuo</u>	Tree Stratum Sapling/Shrub Stra	_	0 -	0	
			0			Herb Stratum	atum	_	14	35
			0			Woody Vine Stratu	ım	_	0 -	0
			0			Dominance Test V		_	<u> </u>	
		Total Course	0			J				
Sapling/Shrub Stratum	(Plot Size: 15)	Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC	CW or FAC:) (A)	
Sapiniy/Siliub Stratum	(Flot 3/2e. <u>15/</u>	<u>" </u>				Total Number of D	ominant		- (D)	
			0			Species Across Al	Il Strata:		B (B)	
			0			Percent of Domina		0.00%	(A/B)	
			0			That Are OBL, FAC	JW or FAC:		- (- "-)	
			0			Prevalence Index V	Vorksheet:			
		Total Cover:	<u>0</u>			Total % Co	ver of:	М	ultiply by:	
Herb Stratum	(Plot Size: 5 ft	<u>'</u>	_			OBL Species	0	X 1	0)
Asclepias syriaca			30	Yes	UPL	FACW Species	0	X 2	0)
Cirsium arvense			15	Yes	FACU	FAC Species	0	Х3	0)
Elymus repens			20	Yes	FACU	FACU Species	40	X 4	160)
Solidago canadensis			5	No	FACU	UPL Species	30	X 5	150)
			0			111	70	(A)	310	-)
			0			Column Totals:	valence Index =	` ′ -	4.43	-
			0						4.43	<u> </u>
			0			Hydrophytic Vegeta				
		Total Cover:	<u>70</u>				est for Hydroph		n	
Woody Vine Stratum	(Plot Size: <u>30</u>	<u>ft</u>)				<u> </u>	nce Test is >50 ? nce Index ≤ 3.0			
			0				logical Adaptati		de supportin	na c
			0			in vege	tation remarks o	r on a separa	te sheet)	. J 4
		Total Cover:	<u>0</u>			No Problem	natic Hydrophyt	ic Vegetation	[1] (Explain)	
Pare Ground in Herb Stratu	ım:	!	% Sphagnum	n Moss Cover:	0	[1] Indicators of hydridisturbed or problema	c soil & wetland hy atic.	drology must b	e present, unl	ess
. C.C D	photo numbers her	re or on a separate s	sheet)			Hydrophytic vegeta	tion present?	No		
etation Remarks: (include										

SOIL Sampling Point: 6U

Profile Description: (Describe to the depth ne	eded to document the indicator or co	nfirm the	abscence of	indicators).		
Depth Matrix		ox Featur				
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 7 10YR 3/2	none				loam	no redox, dry
2. 7 - 27 10YR 2/1 10YR 5/4	90 none 10YR 4/6	9			mucky sandy loam loamy fine sand	no redox, dry
77 24	2.5YR 5/2				luality lifte Saliu	moist
4 10VP 6//	40 10YR 6/1	40			loamy fine sand	moist
5. 34 - 42 101K 0/4 10YR 4/6	20				<u></u>	
[1] Type: C=Concentration, D=Depletion, RM=	Reduced Matrix, CS=Covered or Coa	ted Sand	Grains [2	Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs	, unless otherwise noted)			Inc	licators for Problematic Hydric Soi	ls [3]:
Histosol (A1)	Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, I	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR K	, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S	8) (LRR F	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRI	R R, MLR	PA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)				- │ <i>Iron-Manganese Masses (F12) (LF</i>	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	<i>ILRA 149B)</i>
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A,	•
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	
	_ ,	lation bank a			Very Shallow Dark Surface (TF12)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetlan	,					
Restrictive Layer (if present): Type:	Дери	(inches			Hydric soil present?	<u>No</u>
Soil Remarks:						
LIVEROLOGY						
HYDROLOGY						
Wetland Hydrology Indicators:	shoot all discount Y			0	a distribution (setator or etc.)	tn
Primary Indicators (minimum of one required;					ry Indicators (minimum of two req	
Surface Water (A1)	Water-Stained Leaves (<i>B9)</i>		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)			Drain	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)			Moss	Trim Lines (B16)	
☐ Water Marks (B1)	☐ Hydrogen Sulfide Odor	(C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	on Living	Roots (C3)	Cray	fish Burrows (C8)	
Drift Deposits (B3)				Satur	ration Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced In	on (C4)		Stuni	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in	n Tilled S	oils (C6)	Geor	norphic Position (D2)	
	Thin Muck Surface (C7)			Shall	ow Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8)	Other (explain in remark	(s)			topographic Relief (D4)	
Field Observations: Surface water present?	Surface Water Depth (in	chocl:			Indicators of wetland hydrolog	y present? <u>No</u>
·					Describe Recorded Data:	
Water table present?	Water Table Depth (inch	•				
Saturation present? (includes capillary fringe)	Saturation Depth (inches					
	Monitoring Well Stream Gauge) F	Previous Insp	ections		
Hydrology Remarks:						

Project/Site:	Hinckley S	<u>Site</u>			Applicant/O	wner:	<u>PolyMet</u>	City/County:	Grasston County	, Pine	State:	MN	Sampling Date:	<u>08/01/14</u>
Investigator(s): k	ms2, jtk				Section:	<u>5</u>		Township:	<u>39N</u>		Range:		Sampling Point:	<u>6W</u>
Land Form:	Toeslope	<u>!</u>			Local Relie	<i>f:</i> <u>Cor</u>	nvex	Slope %:	0 5	Soil Map Ui	nit Name:	<u>P - Pea</u>	<u>at</u>	
Subregion (LRR):	<u>K</u>				Latitude:	508	322 38 mN	Longitude:	490993 mE	_	Datum:	UTM, NA	AD 83, meters	
Cowardin Classific	cation:	PEMC/	<u>'A/B</u>		Circular 39	Classi	fication: Type 3/1/2			Mapped	NWI Clas	ssification	ÿ.	
Are climatic/hydrol	logic condit	tions or	n the site typ	oical for this i	time of year	?	Yes (If no, expla	nin in remarks	<i>;)</i>	Eggers	& Reed (µ	orimary):	Shallow Mar	<u>sh</u>
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	signific	cantly disturbed?	Are "normal circumstance		00	& Reed (s & Reed (t	secondary tertiary):	Seasonally Fresh (Wet)	Flooded Basin Meadow
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> r	naturali	ly problematic?	present?		Eggers	& Reed (d	quaternary	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present?	Yes Yes	General Remarks (explain any answers	Sample point is in a seasonally flooded basin on the edge of a shallow marsh (ditch). Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of
Indicators of wetland hydrology present?	Yes	if needed):	Pine county archived on the NRCS Web Soil Survey. Field east of well 9. ID. Field: Field east of well 9.
Is the sampled area within a wetland?	<u>Yes</u>	If yes, optional Wetlan	

Tree Stratum	(Plot Size: <u>30 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum			<u>20%</u> 0	<u>50%</u> 0
			0			Sapling/Shrub Stratum		_	0	0
			0			Herb Stratum		_	22	55
			0			Woody Vine Stratum		_	0	0
			0			Dominance Test Worksh	eet:			
		Total Cover:	<u>0</u>			Number of Dominant Sp That Are OBL, FACW or	ecies FAC:		1 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size: 15 ft)	0			Total Number of Domina Species Across All Strat	nt		– 1 <i>(B</i>)	
			0			1 '			- ' '	
			0			Percent of Dominant Sp That Are OBL, FACW or		100.00%	6 (A/B)	
			0						_	
			0			Prevalence Index Works	<u>ieet:</u>			
		Total Cover:	<u>0</u>			Total % Cover of			ultiply by:	
Herb Stratum	(Plot Size: 5 ft)				OBL Species	10	X 1	10)
Urtica dioica			70	Yes	FAC	FACW Species	20	X 2	40)
Lemna minor			10	No	OBL	FAC Species	80	X 3	240)
Rubus idaeus			10	No	FAC	FACU Species	0	X 4	()
Impatiens capensis			10	No	FACW	UPL Species	0	X 5	()
Polygonum lapathifolium			10	No	FACW	Column Totals:	110	(A)	290)
			0			Prevalence		•	2.64	-
			0			Hydrophytic Vegetation I	ndicators:			
		Total Cover:	110			Yes Rapid Test fo	Hvdroph	vtic Vegetatio	n	
Woody Vine Stratum	(Plot Size: 30 ft)	110			Yes Dominance T				
Woody Vine Guatum	(1.101.01201 <u>50.11</u>					Yes Prevalence In	dex ≤ 3.0	[1]		
			0			No Morphologica				ng d
		Total Cover:	0			in vegetation No Problematic F				
Bare Ground in Herb Stratun						[1] Indicators of hydric soil & disturbed or problematic.	-	-		less
getation Remarks: (include p	hoto numbers here	or on a separate s	heet)			Hydrophytic vegetation pr	esent?	<u>Yes</u>		
otos 2976-78						11				

SOIL Sampling Point: 6W

Profile Description: (De	escribe to the depth need Matrix	ded to d	ocument the indicator or co	onfirm the		f indicators).		
(inches)	Color (moist)	%	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1 0 - 6 10YF	R 2/1	100	none				mucky fine sandy loam	no redox, moist
2 6-9 10YF	R 6/1	85	10YR 5/6	15			fine sandy loam	moist
3. 9 - 14 10YF	R 4/6	80	10YR 4/1	20			fine sandy loam	saturated
4. 14 - 41 7.5Y	R 4/2	80	10YR 5/4	20			very fine sandy loam	saturated
5			· <u></u>				-	
6								
[1] Type: C=Concentrat	tion, D=Depletion, RM=R	Reduced	Matrix, CS=Covered or Coa	ated Sand	Grains [2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators:	(applicable to all LRRs,	unless c	therwise noted)			Ind	icators for Problematic Hydric So	oils [3]:
Histosol (A1)			Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR	PA 149B)
Histic Epipedon (A2)			Dark Surface (S7) (LRR R,	MLRA 149	9B)		Coast Prairie Redox (A16) (LRR)	K, L, R)
Black Histic (A3)			Polyvalue Below Surface (S	S8) (LRR F	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (Li	RR K, L, R)
Hydrogen Sulfide (A4	1)		Thin Dark Surface (S9) (LR	RR R, MLR.	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	-	✓	Loamy Mucky Mineral (F1)		•		Polyvalue Below Surface (S8) (LF	RR K. L)
Depleted Below Dark			Loamy Gleyed Matrix (F2)	(=::::, =)			Thin Dark Surface (S9) (LRR K, L	•
_ '								
Thick Dark Surface (•		Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L	•
Sandy Mucky Mineral	• •		Redox Dark Surface (F6)			L	Piedmont Floodplain Soils (F19)	•
Sandy Gleyed Matrix	(S4)		Depleted Dark Surface (F7,)			Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox (S5)			Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophy	tic vegetation and wetland	d hydrold	ngy must be present, unless o	disturbed o	r problematic.		Very Shallow Dark Surface (TF12	remarks)
Restrictive Layer (if pre-	sent): Type:		Dept	th (inches)):		Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indi	cators:							
Primary Indicators (min.		heck all	that apply)			Seconda	ry Indicators (minimum of two re	quired)
	, ,		Water-Stained Leaves	(B9)			ce Soil Cracks (B6)	FAC-Neutral Test (D5)
Surface Water (A1)			Aquatic Fauna (B13)	(27)		_	age Patterns (B10)	
High Water Table (A2	<u>()</u>		•			_		
Saturation (A3)			Marl Deposits (B15)	(04)		_	Trim Lines (B16)	
Water Marks (B1)			Hydrogen Sulfide Odor				Geason Water Table (C2)	
Sediment Deposits (E	32)		Oxidized Rhizospheres	s on Living	Roots (C3)	Crayi	ish Burrows (C8)	
Drift Deposits (B3)						Satur	ation Visible on Aerial Imagery (C9,	
Algal Mat or Crust (B-	4)		Presence of Reduced I	Iron (C4)		Stunt	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)			Recent Iron Reduction	in Tilled So	oils (C6)	Georg	norphic Position (D2)	
	4 (1)		Thin Muck Surface (C7	7)		Shall	ow Aquitard (D3)	
☐ Inundation Visible on Sparsely Vegetated (Aeriai imagery (B7) Concave Surface (B8)		Other (explain in remain	rks)		Micro	topographic Relief (D4)	
Field Observations:	. ,						Indicators of wetland hydrold	gy present? Yes
Surface water present?			Surface Water Depth (in	nches):			Describe Recorded Data:	
Water table present?			Water Table Depth (incl	hes):			Total Total Bullet	
Saturation present? (inc	cludes capillary fringe)	✓			9			
Recorded Data:		Monitorir			Previous Insp	ections	1	
L		Julion	y Usam Gaug	~ F	. cvious ilisp	COLIONS		
Hydrology Remarks:								

Project/Site:	Hinckley S	<u>Site</u>			Applicant/C	Owner:	<u>PolyMet</u>		City/County:	Grassto County	n, Pine	State:	MN	Sampling Date:	08/01/14
Investigator(s): k	kms2, jtk Summit				Section: Local Relie	<u>5</u> of None	e <i>Latitude</i>	o.	Township: Slope %:	<u>39N</u> 0	Soil Map U	Range: nit Name.		Sampling Point: er silt loam	<u>7U</u>
Subregion (LRR):					5081951 m		<u>u</u> Lamaac	<i>.</i> .	,	_		Datum:		AD 83, meters	
Cowardin Classific	cation:	<u>Upland</u>			Circular 39	Classifi Classifi	ication:	<u>Upland</u>			Mappea	NWI Cla	ssification		
Are climatic/hydrol	logic condit	tions or	n the site typ	ical for this	time of year	r?	<u>Yes</u>	(If no, expla	ain in remarks	5)	Eggers	& Reed (f	orimary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	significa	antly distu	urbed?	Are "normal circumstance		- 00	& Reed (: & Reed (i	secondary tertiary):	<i>ı):</i>	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	naturally	y problem	natic?	present?		Eggers	& Reed (quaternar	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No No No	General Remarks (explain any answers if needed):	Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. ID_Field: well13field
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlan	nd Site ID: (Wetland 7)

Tree Stratum	(Plot Size: <u>3</u>	<u>0ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		<u>20%</u> 0	<u>50%</u> 0
			0			Sapling/Shrub Stratum Herb Stratum Woody Vine Stratum		0 12 0	0 30 0
			0			Dominance Test Worksheet.			
Sapling/Shrub Stratum	(Plot Size: 1	Total Cover:	0			Number of Dominant Specie That Are OBL, FACW or FAC	s):	0 (A)	
<u>Suping Smus Statum</u>	(FIOC 0120. 1	<u> </u>	0			Total Number of Dominant Species Across All Strata:		1 (B)	
			0			Percent of Dominant Specie That Are OBL, FACW or FAC		.00% (A/B)	
			0			Prevalence Index Worksheet	<u>:</u>		
Herb Stratum	(Plot Size: <u>5</u>	Total Cover:	<u>0</u>			Total % Cover of: OBL Species	0 X 1	Multiply by:	0
Elymus repens	(1 101 0126. <u>3</u>	<u>"</u>	60	Yes	FACU	FACW Species	0 X 2		0
			0			FAC Species	0 X3		0
			0			FACU Species	60 X 4	24	_
			0			UPL Species	0 X 5 60 (A)	24	0 10 (E
			0			Prevalence In		4.0	_ `
		Total Cover:	0 60			Hydrophytic Vegetation Indic		etation	
Woody Vine Stratum	(Plot Size: 3	<u>)</u>	0			No Dominance Test in No Prevalence Index			
		Total Cover:	0			No Morphological Ac	arks or on a se	parate sheet)	
Bare Ground in Herb Stratu	m: 20		_	Moss Cover	: _ 0	No Problematic Hydr [1] Indicators of hydric soil & well disturbed or problematic.			•
		ere or on a separate s				Hydrophytic vegetation preser	nt? No		

SOIL Sampling Point: 7<u>U</u>

Profile Description: (Describe to the depth ne	eded to d	ocument the indicator or c	onfirm the	abscence of	f indicators).		
Depth Matrix			lox Featur			_ ,	
(inches) Color (moist)	%	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. <u>0 - 15</u> 10YR 3/4	100	none				fine sandy loam	no redox, dry
2. 15 - 22 10YR 4/4	100	none	- 			fine sandy loam	no redox, dry
3. 22 - 26 10YR 4/4 7.5YR 4/3	95 60	10YR 4/6 2.5YR 5/2	- <u>5</u> 25			fine sandy loam clay loam	dry dry
4		7.5YR 4/6	- - 25 15			ciay loairi	шу
5		7.0110 1/0					-
[1] Type: C=Concentration, D=Depletion, RM	=Reduced	Matrix, CS=Covered or Co.	ated Sand	Grains [2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRR	s, unless o	otherwise noted)			Inc	icators for Problematic Hydric Soi	ls [3]:
Histosol (A1)		Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)		Dark Surface (S7) (LRR R,	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR K	, L, R)
☐ Black Histic (A3)		Polyvalue Below Surface (.	S8) (LRR F	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LF	RR R, MLR	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)] Loamy Mucky Mineral (F1)	(LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)		Depleted Matrix (F3)				Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7	")			Mesic Spodic (TA6) (MLRA 144A,	
Sandy Redox (S5)		Redox Depressions (F8)	,			Red Parent Material (F21)	
						Very Shallow Dark Surface (TF12)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetla	ana nyarok	,					
Restrictive Layer (if present): Type:		<i>Dер</i> і	h (inches): 		Hydric soil present?	<u>No</u>
Soil Remarks:							
HADDOLOGA							
HYDROLOGY							
Wetland Hydrology Indicators:		(december)			0	and the state of the terror and the same	tn
Primary Indicators (minimum of one required	check all	_				ry Indicators (minimum of two req	
Surface Water (A1)		Water-Stained Leaves	(B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)		Aquatic Fauna (B13)			Drain	age Patterns (B10)	
Saturation (A3)		Marl Deposits (B15)			Moss	Trim Lines (B16)	
☐ Water Marks (B1)		Hydrogen Sulfide Odol	r (C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)		Oxidized Rhizospheres	s on Living	Roots (C3)	Crayi	ish Burrows (C8)	
Drift Deposits (B3)					Satur	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)		Presence of Reduced	Iron (C4)		Stunt	ed or Stressed Plants (D1)	
Iron Deposits (B5)		Recent Iron Reduction	in Tilled S	oils (C6)	Georg	norphic Position (D2)	
		Thin Muck Surface (C)	7)		Shall	ow Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)		Other (explain in rema	rks)			topographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)						topograpino Nonor (B 1)	
Field Observations:	_	Curfood Mater Danth /:	nahas):			Indicators of wetland hydrolog	y present? <u>No</u>
Surface water present?		Surface Water Depth (iii				Describe Recorded Data:	
Water table present?	<u> </u>	Water Table Depth (inc					
Saturation present? (includes capillary fringe		Saturation Depth (inche					
Recorded Data: Aerial Photo	Monitorii	ng Well Stream Gaug	ge 🗌 F	Previous Insp	ections		
Hydrology Remarks:							

Project/Site:	Hinckley S	<u>Site</u>			Applicant/C	Owner:	<u>PolyMet</u>	:	City/County:	Grasston, County	Pine_	State:	MN	Sampling Date:	08/01/14
Investigator(s):	ms2, jtk				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	<u>7W</u>
Land Form:	Toeslope	<u>!</u>			Local Relie	ef: <u>Co</u>	<u>ncave</u>		Slope %:	<u>0</u> 5	oil Map Ui	nit Name.	Fs-Fre	eer silt loam	
Subregion (LRR):	<u>K</u>				Latitude:	<u>50</u>	81939 mN		Longitude:	490790 mE		Datum:	UTM, N	AD 83, meters	
Cowardin Classific	cation:	<u>PEMC</u>			Circular 39	Class	ification:	Type 3			Mapped	NWI Cla	ssification) <i>:</i>	
Are climatic/hydro	logic condit	tions or	the site typ	ical for this	time of year	r?	<u>Yes</u>	(If no, expla	ain in remarks	<i>:)</i>	Eggers a	& Reed (orimary):	Shallow Mar	<u>'sh</u>
Are vegetation	<u>No</u>	Soil	Yes	Hydrology	No	sianifi	icantly dist	urbed?	Are "normal		00		secondary	y):	
J				, 0,					circumstance present?	es	55	& Reed (31		
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	natura	lly problen	natic?	F		Eggers (& Reed (guaternar	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes Yes Yes	General Remarks (explain any answers if needed):	Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. ID_Field: well13field Ditch in field
Is the sampled area within a wetland?	Yes	If yes, optional Wetlan	nd Site ID: Wetland 7

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		<u> </u>	2 <mark>0%</mark> 0	<u>50%</u> 0
			0			Sapling/Shrub Stratum		_	0	0
			0			Herb Stratum			7	17.5
			0			Woody Vine Stratum		-	0	0
			0			Dominance Test Worksheet	<u>:</u>			
		Total Cover:	<u>0</u>			Number of Dominant Specie That Are OBL, FACW or FA	es C:	2	(A)	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)	0			Total Number of Dominant	,	2	(D)	
			0			Species Across All Strata:		2	(B)	
			0			Percent of Dominant Specie That Are OBL, FACW or FA		100.00%	(A/B)	
			0			That Are OBL, FACW or FA	<i>.</i> .		(-)	
			0			Prevalence Index Workshee	<u>t:</u>			
		Total Cover:	0			Total % Cover of:		Mu	Itiply by:	
Herb Stratum	(Plot Size:	<u>5 ft</u>	_			OBL Species	35	X 1	3	5
Typha latifolia			20	Yes	OBL	FACW Species	0	X 2	(0
Carex lacustris			15	Yes	OBL	FAC Species	0	X 3	(0
			0			FACU Species	0	X 4	- 1	0
			0			UPL Species	0	X 5		0
			0			III - T	35	(A)	3	_
			0			Column Totals:		_	1.00	_
			0					D/A -	1.00	<u> </u>
			0			Hydrophytic Vegetation India				
		Total Cover:	<u>35</u>			Yes Rapid Test for Hy		_		
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>				Yes Dominance Test Yes Prevalence Index				
			0			No Morphological A		-	le supporti	ina da
			0			in vegetation ren	arks o	on a separate	sheet)	
		Total Cover:	<u>0</u>			No Problematic Hyd	rophyti	c Vegetation [1] (Explain)	
Bare Ground in Herb Stra	re Ground in Herb Stratum:				: <u> </u>	[1] Indicators of hydric soil & we disturbed or problematic.	tland hy	drology must be	present, un	less
getation Remarks: (includ	de photo numbers l	nere or on a separate s	heet)			Hydrophytic vegetation prese	nt?	<u>Yes</u>		

SOIL Sampling Point: <u>TW</u>

Depth Matrix	ded to document the indicator or Re	edox Featur	es			
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1 0 - 6 10YR 3/2	40 7.5YR 4/3	30			very fine sandy loam	saturated
2. 0 - 6	7.5YR 4/6	15				
3. 0-6	2.5YR 5/2	15				
4. <u>6 - 41</u> 7.5YR 4/3	80 7.5YR 4/6	15			very fine sandy loam	saturated
5. 6 - 41	7.5YR 5/2	5			<u> </u>	
6 [1] Type: C=Concentration, D=Depletion, RM=F	Reduced Matrix, CS=Covered or C	oated Sand	Grains [2	Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)			In	dicators for Problematic Hydric	Soils [3]:
Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, M	LRA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR F	R, MLRA 149	9B)		Coast Prairie Redox (A16) (LR	R K, L, R)
Black Histic (A3)	Polyvalue Below Surface	(S8) (LRR R	R, MLRA 1491	3)	5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (L	LRR R, MLR.	A 149B)	Г	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (Fi		•		Polyvalue Below Surface (S8)	(LRR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K	•
Thick Dark Surface (A12)	Depleted Matrix (F3)	,			Iron-Manganese Masses (F12)	•
Sandy Mucky Mineral (S1)	✓ Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F					
Sandy Redox (S5)	Redox Depressions (F8)	,			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlan		e disturbed o	r problematic		Very Shallow Dark Surface (TF	
Restrictive Layer (if present): Type:		oth (inches		<u> </u>	Hydric soil present?	<u>Yes</u>
Soil Remarks: Soil disturbed						
YDROLOGY						
YDROLOGY Wetland Hydrology Indicators:	check all that apply)			Second	ary Indicators (minimum of two	required)
YDROLOGY Wetland Hydrology Indicators:	check all that apply)	es (B9)			ary Indicators (minimum of two face Soil Cracks (B6)	
YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of the surface Water (A1)		• •		Surf	,	required) [FAC-Neutral Test (D5
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2)	☐ Water-Stained Leave	• •		Surf	ace Soil Cracks (B6)	
IYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of the surface Water (A1) High Water Table (A2) Saturation (A3)	☐ Water-Stained Leave ☐ Aquatic Fauna (B13)	, ,		Surf	nage Patterns (B10)	
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) ☐ High Water Table (A2) ✓ Saturation (A3) ☐ Water Marks (B1)	☐ Water-Stained Leave ☐ Aquatic Fauna (B13) ☐ Marl Deposits (B15)	or (C1)	Roots (C3)	Surt Drai Mos Dry-	ace Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16)	
IYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of the surface Water (A1) ☐ High Water Table (A2) ✓ Saturation (A3) ☐ Water Marks (B1) ☐ Sediment Deposits (B2)	 Water-Stained Leave □ Aquatic Fauna (B13) □ Marl Deposits (B15) □ Hydrogen Sulfide Odd 	or (C1)	Roots (C3)	Surl Drai Mos Dry Craj	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2)	FAC-Neutral Test (D.
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	 Water-Stained Leave □ Aquatic Fauna (B13) □ Marl Deposits (B15) □ Hydrogen Sulfide Odd 	or (C1) es on Living	Roots (C3)	Surl Drai Mos Dry Cray	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rfish Burrows (C8) rration Visible on Aerial Imagery (C	FAC-Neutral Test (D.
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od	lor (C1) es on Living d Iron (C4)		Surt Drai Mos Dry Cray Satu	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) dish Burrows (C8) rration Visible on Aerial Imagery (Cated or Stressed Plants (D1)	FAC-Neutral Test (D.
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) ✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizosphere	lor (C1) es on Living d Iron (C4) on in Tilled So		Surl Drai Mos Dry Cray Satu Stur	race Soil Cracks (B6) rage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rifish Burrows (C8) rration Visible on Aerial Imagery (Cate) rited or Stressed Plants (D1) morphic Position (D2)	FAC-Neutral Test (D.
YDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) ✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odl Oxidized Rhizosphere Presence of Reduced Recent Iron Reductio	lor (C1) es on Living d Iron (C4) on in Tilled Sc		Surf Drai Mos Dry Cray Satu Stur Geo	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rfish Burrows (C8) rration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2)	FAC-Neutral Test (D.
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) ✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizosphere Presence of Reduced Recent Iron Reductio Thin Muck Surface (C	lor (C1) es on Living d Iron (C4) on in Tilled Sc		Surf Drai Mos Dry Cray Satu Stur Geo	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rfish Burrows (C8) rration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (DS
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) ✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odl Oxidized Rhizosphere Presence of Reduced Recent Iron Reductio Thin Muck Surface (C	lor (C1) es on Living d Iron (C4) en in Tilled Sc C7) arks)		Surf Drai Mos Dry Cray Satu Stur Geo	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) offish Burrows (C8) oration Visible on Aerial Imagery (Cotted or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (Ds
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) ☐ High Water Table (A2) ✓ Saturation (A3) ☐ Water Marks (B1) ☐ Sediment Deposits (B2) ☐ Drift Deposits (B3) ☐ Algal Mat or Crust (B4) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizosphere Presence of Reduced Recent Iron Reductio Thin Muck Surface (C) Other (explain in rem.	lor (C1) es on Living d Iron (C4) on in Tilled Sc (C7) arks) (inches):		Surf Drai Mos Dry Cray Satu Stur Geo	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) rfish Burrows (C8) rration Visible on Aerial Imagery (Cated or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (D.
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) ✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odd Oxidized Rhizosphere Presence of Reduced Recent Iron Reductio Thin Muck Surface (C Other (explain in rem.	lor (C1) es on Living d Iron (C4) en in Tilled Sc (C7) earks) (inches): ches):	oils (C6)	Surf Drai Mos Dry Cray Satu Stur Geo	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) offish Burrows (C8) oration Visible on Aerial Imagery (Cotted or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (DS
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) ☐ High Water Table (A2) ✓ Saturation (A3) ☐ Water Marks (B1) ☐ Sediment Deposits (B2) ☐ Drift Deposits (B3) ☐ Algal Mat or Crust (B4) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizosphere Presence of Reduced Recent Iron Reductio Thin Muck Surface (C Other (explain in rem.	lor (C1) es on Living d Iron (C4) on in Tilled Sc (C7) arks) (inches): ches):	0 oils (C6)	Surf	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) offish Burrows (C8) oration Visible on Aerial Imagery (Cotted or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (DS
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of Surface Water (A1) ☐ High Water Table (A2) ✓ Saturation (A3) ☐ Water Marks (B1) ☐ Sediment Deposits (B2) ☐ Drift Deposits (B3) ☐ Algal Mat or Crust (B4) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Water-Stained Leave Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odd Oxidized Rhizosphere Presence of Reduced Recent Iron Reductio Thin Muck Surface (C Other (explain in rem.	lor (C1) es on Living d Iron (C4) on in Tilled Sc (C7) arks) (inches): ches):	oils (C6)	Surf	race Soil Cracks (B6) nage Patterns (B10) s Trim Lines (B16) Season Water Table (C2) offish Burrows (C8) oration Visible on Aerial Imagery (Cotted or Stressed Plants (D1) morphic Position (D2) flow Aquitard (D3) otopographic Relief (D4)	FAC-Neutral Test (D5

Project/Site:	Hinckley:	<u>Site</u>			Applicant/C	Owner:	<u>PolyMet</u>		City/County:	Grasstor County	, Pine	State:	MN	Sampling Date:	07/31/14
Investigator(s):	kms2, jtk				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	<u>8U</u>
Land Form:	Swale				Local Relie	ef: Cor	<u>ncave</u>		Slope %:	<u>0</u>	Soil Map Ui	nit Name.	: <u>P - Pe</u>	<u>at</u>	
Subregion (LRR):	<u>K</u>				Latitude:	508	82188 mN		Longitude:	491224 m	<u>N</u>	Datum:	UTM, N	AD 83, meters	
Cowardin Classifi	cation:	Upland			Circular 39	O Classi	ification:	<u>Upland</u>			Mapped	NWI Cla	ssification	v.	
Are climatic/hydro	logic condi	tions or	n the site typ	ical for this	time of yea	r?	<u>Yes</u>	(If no, expla	in in remarks	;)	Eggers a	& Reed ((primary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	signific	cantly dist	urbed?	Are "normal circumstance		55	& Reed (. & Reed (secondary (tertiary):	<i>ı):</i>	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	natural	lly problem	natic?	present?		Eggers a	& Reed ('quaternar	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No No Yes	General Remarks (explain any answers if needed):	Antecedent precipitation amounts are above the normal range. Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. ID_Field: well15wetland
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlan	nd Site ID: (Wetland 8)

Tree Stratum	(Plot Size: <u>30 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum			<u>20%</u> 16	<u>50%</u> 40
Populus tremuloides			60	Yes	FAC	Sapling/Shrub Stratum		_	6	15
Acer rubrum			20	Yes	FAC	Herb Stratum		_	12	30
Accirabiani			0	103	TAC	Woody Vine Stratum		_	0	0
			0			Dominance Test Works	neet:			
	To	otal Cover:	<u>80</u>			Number of Dominant Sp That Are OBL, FACW or	ecies	4	I (A)	
Sapling/Shrub Stratum	(Plot Size: <u>15 ft</u>)				Total Number of Domina			- ' '	
Populus tremuloides			30	Yes	FAC	Species Across All Stra		5	5 <i>(B)</i>	
			0			Percent of Dominant Sp	ecies		-	
			0			That Are OBL, FACW or	FAC:	80.00%	(A/B)	
			0			Prevalence Index Works	heet:			
	To	otal Cover:	30			Total % Cover of	:	М	ultiply by:	
Herb Stratum	(Plot Size: <u>5 ft</u>	1	_			OBL Species	0	X 1	()
Lactuca canadensis		,	5	No	FACU	FACW Species	25	X 2	50)
Impatiens capensis			25	Yes	FACW	FAC Species	110	X 3	330)
Pteridium aquilinum			20	Yes	FACU	FACU Species	35	X 4	140)
Corylus americana			10	No	FACU	UPL Species	0	X 5	(<u> </u>
			0			Column Totals:	170	(A)	520	_)
			0				e Index =	` ′	3.06	_
			0			Hydrophytic Vegetation	ndicators:			
	To	otal Cover:	60			No Rapid Test fo	r Hvdroph	ytic Vegetatio	n	
Woody Vine Stratum	(Plot Size: 30 ft)	<u>00</u>			Yes Dominance T				
Woody Vine Gadam	(1.10001201 <u>00 N</u>		0			No Prevalence In	dex ≤ 3.0	[1]		
			0					ons [1] (provi		ıg da
	To	otal Cover:	0			·		r on a separat ic Vegetation [,	
Bare Ground in Herb Stra	re Ground in Herb Stratum:			Moss Cover	:	[1] Indicators of hydric soil of disturbed or problematic.				ess
etation Remarks: (includ	le photo numbers here or or	ı a separate sl	heet)			Hydrophytic vegetation pr	resent?	<u>No</u>		
						Ш				

SOIL Sampling Point: 8U

Profile Description: (Describe to t	he depth needed to d	ocument the indicator or c	onfirm the	abscence of	indicators).		
· —	Matrix		dox Featur				
(inches) Color (mo		Color (moist)	_ %	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 10 10YR 2/2 0 - 10	90	10YR 4/3 10YR 4/6	$-\frac{8}{2}$			fine sandy loam	dry
10 21 10VD 4/4	90	10YR 4/6	9			sandy loam	faint redox, dry
3. 10 - 21 10 r 4/4 10 - 21		10YR 4/1				canay roam	- and roughly dry
5. 21 - 30 7.5YR 3/4	50	7.5YR 4/6	40			clay Loam	dry
6. 21 - 30		7.5YR 4/2	10				
[1] Type: C=Concentration, D=Dep	oletion, RM=Reduced	Matrix, CS=Covered or Co	ated Sand	Grains [2	Location: F	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable	e to all LRRs, unless o	otherwise noted)			Ind	icators for Problematic Hydric So	ils [3]:
Histosol (A1)		Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR.	4 <i>149B)</i>
Histic Epipedon (A2)		Dark Surface (S7) (LRR R	, MLRA 14	9B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
Black Histic (A3)		Polyvalue Below Surface ((S8) (LRR F	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LF	P.R. K, L, R)
☐ Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (Li	RR R, MLR	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)] Loamy Mucky Mineral (F1)) (LRR K, L)		Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A	11)] Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L,)
Thick Dark Surface (A12)		Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L.	RR K, L, R)
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F)	7)			Mesic Spodic (TA6) (MLRA 144A,	•
Sandy Redox (S5)		Redox Depressions (F8)	,			Red Parent Material (F21)	
			م ام ماس بامالم			Very Shallow Dark Surface (TF12)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation	_	· · · · · · · · · · · · · · · · · · ·					
Restrictive Layer (if present):	Type:		th (inches):		Hydric soil present?	<u>No</u>
Soil Remarks: Redox distinct at 2	21"						
HYDROLOGY							
Wetland Hydrology Indicators:							
Primary Indicators (minimum of or	ne required; check all	that apply)			Seconda	ry Indicators (minimum of two red	quired)
Surface Water (A1)		✓ Water-Stained Leaves	s (B9)		Surfac	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)		Aquatic Fauna (B13)			Draina	age Patterns (B10)	
Saturation (A3)		Marl Deposits (B15)			✓ Moss	Trim Lines (B16)	
✓ Water Marks (B1)		Hydrogen Sulfide Odd	or (C1)		✓ Dry-S	eason Water Table (C2)	
Sediment Deposits (B2)		Oxidized Rhizosphere	s on Living	Roots (C3)	Crayfi	ish Burrows (C8)	
Drift Deposits (B3)					Satura	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)		Presence of Reduced	Iron (C4)		Stunte	ed or Stressed Plants (D1)	
Iron Deposits (B5)		Recent Iron Reduction	n in Tilled S	oils (C6)	Geom	orphic Position (D2)	
	()	Thin Muck Surface (C	7)		Shallo	ow Aquitard (D3)	
✓ Inundation Visible on Aerial Imag✓ Sparsely Vegetated Concave Su	· -	Other (explain in rema	irks)			topographic Relief (D4)	
	nace (Bo)						
Field Observations: Surface water present?	_	Surface Water Depth (i	nches).			Indicators of wetland hydrolo	gy present? Yes
Water table present?		Water Table Depth (inc				Describe Recorded Data:	
Saturation present? (includes cap	illary fringe)	Saturation Depth (inch	•				
			<u> </u>				
Recorded Data:	Photo 🗌 Monitorii	ng Well 🦳 Stream Gau	ge 🥅 F	Previous Insp	ections		
Hydrology Remarks: Dry							

WE	ETLAN	D DETE	RMIN	NATION	I DATA	FOR	M - No	rthcer	ntral and	l Nort	heast Re	egion	
Project/Site:	<u>Hinckley Site</u>			Applicant/Ow	ner: PolyMet	<u>l</u>	City/County.	Grasston, County	Pine State.	MN	Sampling Date:	07/31/14	
Investigator(s): kr Land Form: Subregion (LRR): Cowardin Classifica Are climatic/hydrolo	ation: PEI	<u>-</u>	oical for this	Section: Local Relief: Latitude: Circular 39 C		Type 1	Longitude: ain in remarks	- 49122 2 mE	Mapped NWI (ne: P-Pei m: UTM, N Classification d (primary):	AD 83, meters n: <u>Seasonally</u>	: 8W Flooded Basin	<u>n</u>
<u>-</u>	No Sa No Sa F FINDIN	oil <u>No</u>	Hydrology Hydrology ch site	' <u>No</u> na	ignificantly dist turally problen pwing san	natic?	Are "normal circumstand present?	res"	Eggers & Ree Eggers & Ree Eggers & Ree Eransects,	d (tertiary): d (quaternar	ry):	s, etc.	
Hydrophytic vegeta Hydric soil present! Indicators of wetlan Is the sampled area	? nd hydrology µ	oresent?	Yes (ex Yes if r	eneral Remarks oplain any ansv needed): ves, optional V	vers Pine c ID_Fie	ounty archiveld: well15w	ed on the NF			ge. Soils dat	a are from the 19	v41 Soil Surve	y of
VEGETATIO	N												
Tree Stratum	1	(Plot Size:	30 ft)	Absolute % Cover	Dominan Species?		<u>-</u> -	/20 Thresholds: ee Stratum			<u>20%</u> 12	<u>50</u>

	Tree Stratum	(Plot Size:	<u>30 ft</u>)	% Cover	Species?	<u>Status</u>	
1.	Populus tremuloides				60	Yes	FAC	1
2.					0			Ш
3.					0			╟
4.					0			Ш
				Total Cover:	<u>60</u>			Ш
	Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)				
1.	Populus tremuloides				30	Yes	FAC	
2.	Quercus alba				5	No	FACU	
3.					0			
4.					0			╟
5.					0			
				Total Cover:	<u>35</u>			Ш
	Herb Stratum	(Plot Size:	<u>5 ft</u>)				
1.	Impatiens capensis				20	Yes	FACW	Ш
2.	Pteridium aquilinum				5	No	FACU	
3.	Onoclea sensibilis				10	Yes	FACW	
4.	Rubus idaeus				5	No	FAC	
5.					0			
6.					0			
7.					0			╟
_					_			ш

Total Cover:

Total Cover:

(Plot Size: 30 ft

25

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Woody Vine Stratum

% Bare Ground in Herb Stratum:

Plot Photos: 2674-78

2.

<u>40</u>

0

0

0

% Sphagnum Moss Cover:

50/20 Thresholds:			20	<u>)70</u>	<u> </u>	070
Tree Stratum			1	2	;	30
Sapling/Shrub Stratum				7	1	7.5
Herb Stratum			- 1	8		20
Woody Vine Stratum			(0		0
Dominance Test Worksh	neet:					
Number of Dominant Sp That Are OBL, FACW or			4	(A)		
Total Number of Domina Species Across All Strat			4	(B)		
Percent of Dominant Sp That Are OBL, FACW or		100.00	%	(A/B)		
Prevalence Index Works	heet:					
Total % Cover of	•		Mul	tiply by	:	
OBL Species	0	X 1			0	
FACW Species	30	X 2			60	
FAC Species	95	X 3		2	285	
FACU Species	10	X 4			40	
UPL Species	0	X 5			0	
Column Totals:	135	(A)		3	85	(B)
Prevalend	ce Index =	B/A =		2	.85	
Hydrophytic Vegetation I	ndicators:					
No Rapid Test fo	r Hydroph	ytic Vegetat	ion			
Yes Dominance T	est is >50%	6				
Yes Prevalence In	idex ≤ 3.0	[1]				
No Morphologica in vegetation					rting	data
No Problematic I	Hydrophyti	ic Vegetatio	n [1]	(Expla	in)	
[1] Indicators of hydric soil & disturbed or problematic.	& wetland hy	drology mus	t be	present,	unles	ss
•						

SOIL Sampling Point: 8W

(inches) Color (moist)	%	Color (moist)	% Type	[1] Loc [2]	Texture	Rema	arks
0 - 4 10YR 3/2	100	none	- 		fine sandy loam	no redox, dry	
4 - 18 10YR 4/4	60	10YR 4/2	20		fine sandy loam	moist	
4 - 18		7.5YR 4/6					
18 - 25 7.5YR 5/1	40	7.5YR 4/6	30		clay	moist	
18 - 25		7.5YR 4/3	30				
Type: C=Concentration, D=Depletion, R	M=Reduced	Matrix, CS=Covered or Co.	ated Sand Grains	[2] Location	n: PL=Pore Lining, M=Matrix.		
dric Soil Indicators: (applicable to all LR	Rs, unless o	therwise noted)			Indicators for Problematic Hyd	dric Soils [3]:	
Histosol (A1)		Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L	L, MLRA 149B)	
Histic Epipedon (A2)		Dark Surface (S7) (LRR R,	MLRA 149B)		Coast Prairie Redox (A16)	(LRR K, L, R)	
Black Histic (A3)		Polyvalue Below Surface (S	S8) (LRR R, MLRA	149B)	5 cm Mucky Peat or Peat (S3) (LRR K, L, R)	
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LF	RR R, MLRA 149B,)	Dark Surface (S7) (LRR K,	L)	
Stratified Layers (A5)		Loamy Mucky Mineral (F1)	(LRR K, L)		Polyvalue Below Surface (S	S8) (LRR K, L)	
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LR	RR K, L)	
Thick Dark Surface (A12)		Depleted Matrix (F3)			Iron-Manganese Masses (F	F12) (LRR K, L, R)	
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)			Piedmont Floodplain Soils		
		Depleted Dark Surface (F7)	·)		Mesic Spodic (TA6) (MLRA		
Sandy Gleved Matrix (S4)			/		mesic opedie (1710) (METO)	11111, 110, 1112)	
Sandy Gleyed Matrix (S4)		•			Pod Parent Material (E21)		
Sandy Redox (S5)		Redox Depressions (F8)	distribus de se montele	m otio	Red Parent Material (F21) Very Shallow Dark Surface	Other (exp	plain in soi
Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gil Remarks: Auger refusal at 25 inches by	coarse fragme	Redox Depressions (F8) gy must be present, unless of the present	h (inches):	25 -	Red Parent Material (F21) Very Shallow Dark Surface Hydric soil present toeslope in concave position an	(TF12) remarks) t? Yes	
Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gill Remarks: Auger refusal at 25 inches to TDROLOGY	coarse fragme	Redox Depressions (F8) gy must be present, unless of the present	h (inches):	25 -	Very Shallow Dark Surface Hydric soil present	(TF12) remarks) t? Yes	
Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gill Remarks: Auger refusal at 25 inches to TDROLOGY Setland Hydrology Indicators:	coarse fragme	Redox Depressions (F8) gy must be present, unless of ents Depte surface due to presence of of	h (inches):	25 - Site is located in	Very Shallow Dark Surface Hydric soil present	t? Yes Indies likely to collect water	
Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gil Remarks: Auger refusal at 25 inches to DROLOGY Intland Hydrology Indicators: Imary Indicators (minimum of one require	coarse fragme	Redox Depressions (F8) gy must be present, unless of ents Depte surface due to presence of of	th (inches):	25 - Site is located in	Wery Shallow Dark Surface Hydric soil present n toeslope in concave position an	t? Yes India is likely to collect water two required)	er.
Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gil Remarks: Auger refusal at 25 inches to DROLOGY Itland Hydrology Indicators: mary Indicators (minimum of one require Surface Water (A1)	coarse fragme	Redox Depressions (F8) gy must be present, unless of ents Depte surface due to presence of contact that apply) Water-Stained Leaves	th (inches):	25 - Site is located in Secon	Hydric soil present In toeslope in concave position and Indary Indicators (minimum of tourface Soil Cracks (B6)	t? Yes India is likely to collect water two required)	er.
Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gall Remarks: Auger refusal at 25 inches to DROLOGY Itland Hydrology Indicators: Imary Indicators (minimum of one required Surface Water (A1) High Water Table (A2)	coarse fragme	Redox Depressions (F8) gy must be present, unless of the presence of country surface due to presence of country that apply) Water-Stained Leaves Aquatic Fauna (B13)	th (inches):	25 - Site is located in Secon	Hydric soil present In toeslope in concave position and Indary Indicators (minimum of tourface Soil Cracks (B6) Irainage Patterns (B10)	t? Yes India is likely to collect water two required)	er.
Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Q il Remarks: Auger refusal at 25 inches to the strictive Layer (if present): Type: Q il Remarks: Auger refusal at 25 inches to the strictive Layer (if present): Type: Q il Remarks: Auger refusal at 25 inches to the strictive Layer (BT) it refusal at 25 inches to the strictive Layer (III) it refusal at 25	coarse fragme	Redox Depressions (F8) gy must be present, unless of ents Depte surface due to presence of contact apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15)	coarse fragments.	25 - Site is located in Secon Secon Do M	Hydric soil present In toeslope in concave position and Indary Indicators (minimum of tourface Soil Cracks (B6) Irainage Patterns (B10) Ioss Trim Lines (B16)	t? Yes India is likely to collect water two required)	er.
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Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger refusal at 25 inches to a strictive Layer (if present): Type: Gail Remarks: Auger	coarse fragme	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Mydrogen Sulfide Odol Oxidized Rhizospheres	coarse fragments. (B9) (C1) s on Living Roots (25	Hydric soil present In toeslope in concave position and Indary Indicators (minimum of tourface Soil Cracks (B6) Irainage Patterns (B10) Ioss Trim Lines (B16) Ingry-Season Water Table (C2) Irayfish Burrows (C8) Indicators (t? Yes Ind is likely to collect water two required) FAC-Neu	er.
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Sandy Redox (S5) Indicators of hydrophytic vegetation and we strictive Layer (if present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (if present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (if present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches to the strictive Layer (If present): Type: Gil Remarks: Auger refusal at 25 inches	elow ground	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odol Oxidized Rhizospheres Presence of Reduced a Recent Iron Reduction Thin Muck Surface (Ci	coarse fragments. (B9) (C1) s on Living Roots (In the Coal) fron (C4) in Tilled Soils (C6) fros (C6) fron (C4)	25 - Site is located in Secon	Hydric soil present In toeslope in concave position and interest process of the soil present in toeslope in concave position and indary Indicators (minimum of the surface Soil Cracks (B6) arainage Patterns (B10) loss Trim Lines (B16) aray-Season Water Table (C2) arayfish Burrows (C8) and attraction Visible on Aerial Imagent tunted or Stressed Plants (D1) eeomorphic Position (D2) thallow Aquitard (D3) dicrotopographic Relief (D4) Indicators of wetland hydric soil present in the soi	t? Yes India is likely to collect water two required) FAC-New ydrology present?	er. htral Test (L

WETLAND DETERMINATION DATA FOR	RM - Northcentral and Northeast	Region
Project/Site: Hinckley Site Applicant/Owner: PolyMet	City/County: Grasston, Pine State: MN Sampling Da	ate: <u>07/31/14</u>
Investigator(s): kms2, jtk Section: 5	Township: 39N Range: 22W Sampling Po	oint: <u>9U</u>
Land Form: Backslope Local Relief: None Latitude:	Slope %: <u>0</u> Soil Map Unit Name: <u>P- Peat</u>	
Subregion (LRR): <u>K</u> 5081874 mN	Longitude: 491193 mE Datum: UTM, NAD 83, meter	<u>s</u>
Cowardin Classification: Upland Circular 39 Classification: Upland	Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, exp. Are vegetation No Soil No Hydrology No significantly disturbed?	xplain in remarks)Eggers & Reed (primary):UplandAre "normalYesEggers & Reed (secondary):	
Are vegetation No Soil No Hydrology No naturally problematic?	circumstances" Eggers & Reed (tertiary): present? Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Attach site map showing sampling	point locations, transects, important featu	res, etc.
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? No General Remarks (explain any answers if needed): No logonaria Remarks (explain any answers if needed): No logonaria Remarks Pine county arch if needed): No logonaria Remarks Pine county arch if needed):	cipitation amounts are above the normal range. Soils data are from the chived on the NRCS Web Soil Survey. 4wetland	e 1941 Soil Survey of
Is the sampled area within a wetland? No If yes, optional Wetland Site ID: (W	Wetland 9)	
VEGETATION		
Absolute Domina	ant Indicator 50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: 30 ft) Cover Species	Status Tree Stratum	0 0
1. 0	Sapling/Shrub Stratum	0 0
2.	Herb Stratum	13 32.
3.	Woody Vine Stratum	0 0
4. 0	Dominance Test Worksheet:	

			Absolute	<u>Dominant</u>	Indicator	50/20 Thresholds:		<u>20%</u>	<u>50%</u>
Tree Stratum	(Plot Size:	<u>30 ft</u>	% Cover	Species?	<u>Status</u>	Tree Stratum		0	0
			0			Sapling/Shrub Stratum		0	0
			0			Herb Stratum		13	32.
			0			Woody Vine Stratum			0
			0			Dominance Test Worksheet:			
		Total Cover:	<u>0</u>			Number of Dominant Species That Are OBL, FACW or FAC:		0 (A)	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)				Total Number of Dominant			
			0			Species Across All Strata:		2 (B)	
			0			Percent of Dominant Species	0.00)% (A/B)	
			0			That Are OBL, FACW or FAC:		(A/D)	
			0			Prevalence Index Worksheet:			
		Total Cover:	<u>0</u>			Total % Cover of:		Multiply by:	
Herb Stratum	(Plot Size:	5 ft	_			OBL Species (0
Elymus repens	•		30	Yes	FACU	FACW Species) X 2		0
Taraxacum officinale			10	No	FACU	FAC Species) X3		0
Trifolium repens			25	Yes	FACU	FACU Species 65	- 5 X 4	26	60
-			0			UPL Species (-) X 5		0
			0				_	26	60
			0			Column Totals:6	- ` ′	4.0	
			0					4.0	,,,
			0			Hydrophytic Vegetation Indicator			
		Total Cover:	<u>65</u>			No Rapid Test for Hydro		rion	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>				No Dominance Test is >5 No Prevalence Index ≤ 3.			
			0			No Morphological Adapta		ovide suppor	tina o
			0			in vegetation remarks			
		Total Cover:	<u>0</u>			No Problematic Hydroph	ytic Vegetatio	n [1] (Explair	1)
Bare Ground in Herb Stratu	m: 10	<u>)</u>	% Sphagnum	n Moss Cover	:	[1] Indicators of hydric soil & wetland disturbed or problematic.	hydrology mus	t be present, u	nless
						Hydrophytic vegetation present?	No		

SOIL Sampling Point: 9U

Depth Matrix	eded to document the indicator or o	dox Features		ndicators).		
(inches) Color (moist)	% Color (moist)			Loc [2]	Texture	Remarks
0 - 10 10YR 2/1	100 none				fine sandy loam	no redox, dry
10 - 24 10YR 4/3	100 none				medium fine sand	no redox, moist
3. 24 - 32 10YR 4/3	60 10YR 4/2	40			fine sand	saturated
4						
5						
6. [1] Type: C=Concentration, D=Depletion, RM=.	Reduced Matrix. CS=Covered or C	 pated Sand G	rains [2] L	ocation: I	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,					icators for Problematic Hydric Soi	ls [3]:
Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLRA	
☐ Histic Epipedon (A2)	Dark Surface (S7) (LRR F	O MI DA 110R	')		Coast Prairie Redox (A16) (LRR K	
Black Histic (A3)						
	Polyvalue Below Surface		•		5 cm Mucky Peat or Peat (S3) (LR	K K, L, K)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (L		149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1)) (LRR K, L)			Polyvalue Below Surface (S8) (LR.	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2))			Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	NLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F	7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlar	nd hydrology must ha prasant uplass	disturbed or r	oroblematic		Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:		oth (inches):	noblematic.	<u> </u>	Hydric soil present?	<u>No</u>
IYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required;	check all that apply)			Seconda	ry Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leave.	s (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (DS
High Water Table (A2)	Aquatic Fauna (B13)			Drain	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)				Trim Lines (B16)	
	Hydrogen Sulfide Odd	or (C1)			Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizosphere		nots (C3)		ish Burrows (C8)	
Sediment Deposits (B2)	O Maize a Tanzo Sprior C	on Ening To	3013 (00)		ation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced	I Iron (C4)				
Algal Mat or Crust (B4)			c (C6)		ed or Stressed Plants (D1)	
	Recent Iron Reduction	n in Tilled S∩il•			norphic Position (D2)	
Iron Deposits (B5)	Recent Iron Reduction		3 (00)	_	•	
	Thin Muck Surface (C	27)	3 (00)	_	ow Aquitard (D3)	
Iron Deposits (B5)		27)	s (<i>co)</i>	Shallo	•	
Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Thin Muck Surface (C	27)	5 (00)	Shallo	ow Aquitard (D3)	ıy present? <u>No</u>
☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8)	Thin Muck Surface (C	erks)		Shallo	ow Aquitard (D3) topographic Relief (D4)	ry present? <u>No</u>
Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	☐ Thin Muck Surface (C☐ Other (explain in rema	inches):	5 (00)	Shallo	topographic Relief (D4) Indicators of wetland hydrolog	ry present? <u>No</u>
Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	☐ Thin Muck Surface (C☐ Other (explain in remo	inches):	24	Shallo	topographic Relief (D4) Indicators of wetland hydrolog	ry present? <u>No</u>
Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	☐ Thin Muck Surface (C☐ Other (explain in remainder) ☐ Surface Water Depth (incompared) ☐ Water Table Depth (incompared)	inches): ches):		Shallo	topographic Relief (D4) Indicators of wetland hydrolog	ıy present? <u>No</u>
Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	☐ Thin Muck Surface (C☐ Other (explain in rem. ☐ Surface Water Depth (☐ Water Table Depth (incl.) ☐ Saturation Depth (incl.)	inches): ches):	24	Shallo	topographic Relief (D4) Indicators of wetland hydrolog	ry present? <u>No</u>

	И	ETLA	AND	DETE	ERM	INATI	ON	DATA	FOR	M - N	orth	ncentra	al and	Nort	thea	ast Re	∍gio	on	
Proje	ect/Site:	Hinckley	<u>/ Site</u>			Applican	t/Owne	r: PolyMet	<u>t</u>	City/Cour		asston, Pine	State:	MN	Samp	oling Date:	<u>07/31</u>	<u>/14</u>	
Inve	estigator(s):	kms2, jtk				Section.	<u>5</u>	<u>i</u>		Township	p: 39N		Range	e: 22W	Sam	oling Point:	<u>9W</u>		
	d Form:	Toeslop	oe .			Local Re		Concave		Slope %:		Soil Ma	ap Unit Nam	e: P-Pe	<u>eat</u>				
Sub	region (LRR	e). K				Latitude	· 5	 08187 8 mN	I	Longitude	_	204 mF	Datun	n: UTM, N	1 V D 83	meters			
	_		DEMC	·/^						Longitud	. <u>+712</u>					, meters			
	vardin Class		PEMC	<u></u>				ssification:	<u>Type 3/1</u>			•	pped NWI C						
Are	climatic/hydi	rologic con	ditions o	n the site ty _l	pical for t	this time of y	ear?	<u>Yes</u>	(If no, expla			00	gers & Reed	" "	_	Shallow Ma			
Are	vegetation	<u>No</u>	Soil	<u>No</u>	Hydrold	ogy <u>No</u>		ificantly dist		Are "norn circumsta present?	ances"	Egg	gers & Reed gers & Reed	(tertiary):	-	<u>Seasonally</u>	<u>Floode</u>	<u>d Basin</u>	
Are	vegetation	<u>No</u>	Soil	<u>No</u>	Hydrolo	ogy <u>No</u>	natur	rally problen	natic?	prosont.		Egg	gers & Reed	l (quaterna	ry):				
SUN	<i>MARY</i>	OF FIN	DING	S - Atta	ch si	te map s	show	ing sar	npling p	point lo	catio	ons, tran	sects, i	<i>importa</i>	ant f	eatures	s, etc).	
Hyd India Is th	rophytic veg fric soil prese cators of wet e sampled a	ent? Hand hydrol erea within a	logy pre:		Yes Yes	General Rer (explain any if needed): If yes, optio	answei	Antece Pine c	edent precip county archiveld: well14w	oitation amoved on the	ounts ar	led basin on e above the i Web Soil Sur	normal rang	e. Soils da			41 Soil	Survey o	of
	<i></i>											50/00 T							500/
								Absolute	Dominan			50/20 11	<u>hresholds:</u>				<u>209</u>	<u>%</u>	<u>50%</u>
	Tree Strate	<u>um</u>		(Plot Size:	<u>30 ft</u>)	% Cover	Species?	<u>Status</u>	<u>s</u>	Tree St					0		0
1.								0				II ' "	/Shrub Stra	atum			0		0
2.								0				Herb St					12		30
3.								0				Woody	Vine Stratu	ım			0		0
4.								0				<u>Domina</u>	nce Test V	orksheet:	:				
					45.0	Total Cov	er:	0					r of Domina e OBL, FAC				2	(A)	
	Sapling/Sh	rub Stratu	<u>m</u>	(Plot Size:	<u>15 ft</u>					1		Total N	umber of D	ominant	•				
1.								0					Across Al				2	(B)	
2.								0				Percent	of Domina	nt Specie	s			(. ()	
3.								0				That Ar	e OBL, FAC	CW or FAC):	100.0	0%	(A/B)	
4. 5.								0				Prevale	nce Index V	Vorksheet	<u>:</u>				
	L					Total Cov	er:	<u>0</u>	L			·	Total % Co	ver of:			Multij	ply by:	
	Herb Strat	um		(Plot Size:	<u>5 ft</u>		1					OBL Sp	ecies		15	X 1		15	5
1.	Urtica dioi	ira						15	Yes	F/	AC	FACW	Species		25	X 2		50)
2.	Sium suav							10	No	t	BL	FAC Sp			15	X 3		45	5
3.		rundinacea	1					25	Yes	l	CW	111 '			5	X 4		20	-)
4.	Asclepias		•					5	No		BL	FACUS	•						_
5.	Cirsium ar							5	No		CU	UPL Sp	ecies		0	X 5		0	-
6.	Oli Sidili di	101130						0				Column	Totals:		60	(A)		130	<u>(B)</u>
7.								0				-	Pre	valence In	dex = L	B/A =		2.17	7
8.								0				Hydroph	ytic Vegeta	tion Indic	ators:				
0.						Total Cov	L er:					Yes	Rapid T	est for Hv	drophy	rtic Vegeta	tion		
	Moody Vi	no Ctrotur		(Plot Size:	2∩ #		1	<u>60</u>				Yes	_ ′	nce Test i		•			
	Woody Vir	ie Stratum		(FIUL 3120:	<u>30 II</u>			1		1		Yes	_	nce Index					
1.								0				No	_ Morpho	logical Ad	laptatio	ons [1] (pr			ng data
2.								0]		J II ——	_			on a sepa			
						Total Cov	er:	0				No	Problen	natic Hvdr	ophytic	c Vegetation	on [11 /	(Explain)	

% Sphagnum Moss Cover:

% Bare Ground in Herb Stratum:

Plot Photos: 2765-67

10

Vegetation Remarks: (include photo numbers here or on a separate sheet)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Yes

Hydrophytic vegetation present?

SOIL Sampling Point: 9W

Profile Description: (Describe to the depth new Depth Matrix		r confirm the Redox Featur		t indicators)	•	
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 4 10YR 2/1	100 none				fine sandy loam	no redox, saturated
2. <u>4 - 10</u> 10YR 3/2	90 10YR 5/2	10			fine sandy loam	saturated
3. <u>10 - 32</u> <u>10YR 4/1</u>	85 10YR 4/6	15		-	fine sandy loam	saturated
4				-		
5				-		
6 [1] Type: C=Concentration, D=Depletion, RM=	Reduced Matrix, CS=Covered or (Coated Sand	Grains [2	Location:	PL=Pore Lining, M=Matrix.	-
Hydric Soil Indicators: (applicable to all LRRs	, unless otherwise noted)			In	dicators for Problematic Hydric S	 oils [3]:
Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLF	RA 149B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR	R. MLRA 149	9B)		Coast Prairie Redox (A16) (LRR	
☐ Black Histic (A3)	Polyvalue Below Surface			3)	5 cm Mucky Peat or Peat (S3) (L	•
Hydrogen Sulfide (A4)	Thin Dark Surface (S9)			<i>"</i>	Dark Surface (S7) (LRR K, L)	, , , , , , , , , , , , , , , , , , ,
Stratified Layers (A5)	Loamy Mucky Mineral (F	•	•		Polyvalue Below Surface (S8) (L.	DD V I)
			'			•
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (Fa)	2)			Thin Dark Surface (S9) (LRR K, I	
Thick Dark Surface (A12)	✓ Depleted Matrix (F3)			L	☐ Iron-Manganese Masses (F12) (I	•
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6			L	Piedmont Floodplain Soils (F19)	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface ((F7)		L	Mesic Spodic (TA6) (MLRA 144A	I, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8,)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	nd hydrology must be present, unles	ss disturbed o	r problematic	:	Very Shallow Dark Surface (TF1.	2) remarks)
Restrictive Layer (if present): Type:	De	epth (inches):		Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required;	check all that apply)			Second	ary Indicators (minimum of two re	quired)
Surface Water (A1)	Water-Stained Leav	res (B9)		Surf	ace Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13	3)		Drail	nage Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15))		☐ Mos	s Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide O	dor (C1)		Dry-	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizosphe	eres on Living	Roots (C3)	Cray	fish Burrows (C8)	
Drift Deposits (B3)	,	· ·			ration Visible on Aerial Imagery (C9)
	Presence of Reduce	ed Iron (C4)			ted or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reducti	ion in Tilled S	oils (C6)		morphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface	(C7)			low Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7)	Other (explain in rei	marks)			otopographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)				IVIICI	отородгартіс кенет (Б4)	
Field Observations:	- 6 A W . 6 4	(in all co)			Indicators of wetland hydrole	ogy present? Yes
Surface water present?	Surface Water Depth				Describe Recorded Data:	
Water table present?	Water Table Depth (i					
Saturation present? (includes capillary fringe)	Saturation Depth (inc	ches):	4			
Recorded Data: Aerial Photo	Monitoring Well Stream Ga	auge 🗌 P	revious Insp	ections		
Hydrology Remarks:						

Project/Site:	Hinckley S	<u>Site</u>			Applicant/C	Owner:	<u>PolyMet</u>	<u>.</u>	City/County:	Grasston, County	<u>Pine</u>	State:	MN	Sampling Date:	07/20/15
Investigator(s): k	kms2				Section:	<u>5</u>			Township:	39N		Range:	<u>22W</u>	Sampling Point:	<u>10U</u>
Land Form:	Terrace F	<u>Plain</u>			Local Relie	ef: No	<u>ne</u>		Slope %:	<u>0</u> 5	Soil Map Ur	nit Name.	P- Pea	<u>nt</u>	
Subregion (LRR):	<u>K</u>				Latitude:	50	<u>82083</u>		Longitude:	<u>490850</u>		Datum:	UTM, N	AD 83, meters	
Cowardin Classific	cation:	Upland			Circular 39	Class	ification:	<u>Upland</u>			Mapped	NWI Cla	ssification	<i>:</i>	
Are climatic/hydrol	logic condit	ions or	n the site typ	ical for this	time of year	?	Yes	(If no, expla	nin in remarks	<i>:)</i>	Eggers a	& Reed (j	primary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	Yes	Hydrology	<u>No</u>	sianifi	cantly dist	urbed?	Are "normal		00	•	secondary	<i>)):</i>	
· ····································				,		9			circumstanc present?	es	Eggers a	& Reed (tertiary):		
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> /	naturai	lly problen	natic?	ргозен:		Eggers a	& Reed (quaternar	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	<u>No</u> <u>No</u> No	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. 1 of 5 - Forest transect near well 16
Is the sampled area within a wetland?	No	If yes, optional Wetla	nd Site ID: (Wetland 10)

<u>Tr</u>	ee Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum			<u>20%</u> 16	4	0 <u>%</u> 10
_	Populus tremuloides			80	Yes	FAC	Sapling/Shrub Stratum Herb Stratum		-	6.4		6
				0			Woody Vine Stratum		-	0.4		1
·				0			Dominance Test Workshe	et:				
			Total Cover:	80			Number of Dominant Spec	ies		5 (A)		
Sa	pling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)				That Are OBL, FACW or FA		-			
R	ubus idaeus			30	Yes	FAC	Total Number of Dominant Species Across All Strata:			7 <i>(B)</i>		
Р	opulus tremuloides			10	Yes	FAC	Percent of Dominant Spec			_		
S	ambucus racemosa			10	Yes	FACU	That Are OBL, FACW or FA		71.43	% (A/B))	
В	etula papyrifera			10	Yes	FACU						
А	cer negundo			10	Yes	FAC	Prevalence Index Workshe	et:				
			Total Cover:	<u>70</u>			Total % Cover of:			Multiply by		
He	erb Stratum	(Plot Size:	<u>5 ft</u>				OBL Species	0	X 1		0	
Р	halaris arundinacea		<u> </u>	20	Yes	FACW	FACW Species	20	X 2		40	
U	Irtica dioica			5	No	FAC	FAC Species	142	X 3		426	
R	hamnus cathartica			5	No	FAC	FACU Species	20	X 4		80	
L	actuca biennis			2	No	FAC	UPL Species	0	X 5		0	
				0			 	182	(A)		546	(E
				0			Column Totals: Prevalence		• •		.00	(-
				0							.00	_
				0			Hydrophytic Vegetation Inc		=			
			Total Cover:	<u>32</u>			No Rapid Test for I			on		
W	oody Vine Stratum	(Plot Size:	<u>30 ft</u>				Yes Dominance Tes					
٧	itis sp.			2	No		No Morphological			vida sunni	rtina	dat
				0			in vegetation re				, ung	ual
			Total Cover:	<u>2</u>			No Problematic Hy	drophy	tic Vegetation	[1] (Expla	in)	
Doro	Ground in Herb Stratur	n:		% Sphagnum	n Moss Cover	:	[1] Indicators of hydric soil & w disturbed or problematic.	etland h	ydrology must	be present	unles	S
Dare							11					

SOIL Sampling Point: 100

Depth	Matrix	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	cument the indicator or (Re	dox Featur	es	muicators).		
(inches)	Color (moist)	%	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1 0-3	7.5YR 2.5/2	50					sil	
2 0-3	7.5YR 3/4	50					sil	-
3. 3-8	7.5YR 3/4		5YR 3/4	10			fsl	layered/mixed/swirled
43 - 8	10YR 2/1	100					fsl	
53 - 8	2.5YR 5/3	100					fsl	
6								-
[1] Type: C=Conce	entration, D=Depletion, R	M=Reduced I	flatrix, CS=Covered or Co	pated Sand	Grains [2]	Location: F	L=Pore Lining, M=Matrix.	
Hydric Soil Indicat	tors: (applicable to all LF	Rs, unless ot	herwise noted)			Ind	cators for Problematic Hydric So	oils [3]:
Histosol (A1)			Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLF	PA 149B)
Histic Epipedon	1 (A2)		Dark Surface (S7) (LRR F	R, MLRA 149	PB)		Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3	3)		Polyvalue Below Surface	(S8) (LRR R	P, MLRA 149B,)	5 cm Mucky Peat or Peat (S3) (L.	RR K, L, R)
Hydrogen Sulfid	de (A4)		Thin Dark Surface (S9) (L	RR R, MLR	4 <i>149B)</i>		Dark Surface (S7) (LRR K, L)	
Stratified Layers	s (A5)		Loamy Mucky Mineral (F1) (LRR K, L))		Polyvalue Below Surface (S8) (Li	RR K, L)
Depleted Below	v Dark Surface (A11)		Loamy Gleyed Matrix (F2))			Thin Dark Surface (S9) (LRR K, L)
Thick Dark Surf.		_	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L	
Sandy Mucky M.		_	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19)	
Sandy Gleyed N	, ,		Depleted Dark Surface (F	<i>7</i>)			Mesic Spodic (TA6) (MLRA 144A	
Sandy Redox (S			Redox Depressions (F8)	• •			Red Parent Material (F21)	
_ ,			•				Very Shallow Dark Surface (TF12	Other (explain in soil remarks)
	drophytic vegetation and we						-	•
Restrictive Layer (if present): Type: (coarse fragmer	nts Dep	th (inches): 8-		Hydric soil present?	<u>No</u>
Soil Remarks:								
HYDROLOG								
Wetland Hydrology	y Indicators:							
Primary Indicators	(minimum of one require	ed; check all t	hat apply)			Seconda	y Indicators (minimum of two re	quired)
Surface Water ((A1)		Water-Stained Leave.	s (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Tab	ole (A2)		Aquatic Fauna (B13)			Draina	age Patterns (B10)	
Saturation (A3)			Marl Deposits (B15)			Moss	Trim Lines (B16)	
☐ Water Marks (B			Hydrogen Sulfide Odd	or (C1)		Dry-S	eason Water Table (C2)	
Sediment Depo			Ovidized Phizoenhers					
	3N3 (DZ)		Oxidized Rhizosphere	es on Living	Roots (C3)		sh Burrows (C8)	
Drift Danacite (R3)		Oxidized Rhizosphere	es on Living	Roots (C3)	Crayfi)
Drift Deposits (E			Presence of Reduced		Roots (C3)	Crayfi	ation Visible on Aerial Imagery (C9)
Algal Mat or Cru	ust (B4)			I Iron (C4)		Crayfi	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1))
	ust (B4)		Presence of Reduced Recent Iron Reduction	l Iron (C4) n in Tilled So		Crayfi Satura Stunte Geom	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1) orphic Position (D2)	
☐ Algal Mat or Cru☐ Iron Deposits (E☐ Inundation Visib	ust (B4) B5) ble on Aerial Imagery (B7)		Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	I Iron (C4) n in Tilled Sc (7)		Crayfi Satura Stunte Geom Shallo	ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3)	
☐ Algal Mat or Cru☐ Iron Deposits (E☐ Inundation Visib	ust (B4) 35))	Presence of Reduced Recent Iron Reduction	I Iron (C4) n in Tilled Sc (7)		Crayfi Satura Stunte Geom Shallo	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1) orphic Position (D2)	
Algal Mat or Cru Iron Deposits (E Inundation Visit Sparsely Vegeta Field Observations	ust (B4) B5) ble on Aerial Imagery (B7) ated Concave Surface (B8) s:)	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	I Iron (C4) In in Tilled Sc (7) (arks)		Crayfi Satura Stunte Geom Shallo	ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3)	
☐ Algal Mat or Cru ☐ Iron Deposits (E ☐ Inundation Visit. ☐ Sparsely Veget. Field Observations Surface water pres	ust (B4) B5) ble on Aerial Imagery (B7) ated Concave Surface (B8) s: sent?		Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in remains) Surface Water Depth (I Iron (C4) In in Tilled So It in Tilled So		Crayfi Satura Stunte Geom Shallo	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4)	
Algal Mat or Cru Iron Deposits (E Inundation Visit Sparsely Vegeta Field Observations	ust (B4) B5) ble on Aerial Imagery (B7) ated Concave Surface (B8) s: sent?		Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	I Iron (C4) In in Tilled So It in Tilled So		Crayfi Satura Stunte Geom Shallo	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolo	
Algal Mat or Cru Iron Deposits (E Inundation Visit Sparsely Vegeta Field Observations Surface water present	ust (B4) B5) ble on Aerial Imagery (B7) ated Concave Surface (B8) s: sent?		Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in remains) Surface Water Depth (I Iron (C4) In in Tilled So Tilled S		Crayfi Satura Stunte Geom Shallo	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolo	
Algal Mat or Cru Iron Deposits (E Inundation Visit Sparsely Vegeta Field Observations Surface water present	ust (B4) B5) ble on Aerial Imagery (B7) ated Concave Surface (B8) s: sent? nt?		Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in remains) Surface Water Depth (included) Saturation Depth (included)	inches):		Crayfi Saturi Stunte Geom Shalle	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolo	
☐ Algal Mat or Cru ☐ Iron Deposits (E ☐ Inundation Visit. ☐ Sparsely Vegets Field Observations Surface water pres Water table present Saturation present	ust (B4) B5) ble on Aerial Imagery (B7) aled Concave Surface (B8) s: sent? nt? t? (includes capillary frin	ge)	Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in remains) Surface Water Depth (included) Saturation Depth (included)	inches):	oils (C6)	Crayfi Saturi Stunte Geom Shalle	ation Visible on Aerial Imagery (C9, ed or Stressed Plants (D1) orphic Position (D2) w Aquitard (D3) opographic Relief (D4) Indicators of wetland hydrolo	

	W	ETL	AND	DETE	ERM	INATIO	ON	DATA	FORI	И - No	orth	icen	tral a	and	Nort	thea	ast Re	gion	
Proje	ect/Site:	Hinckle	y Site			Applican	t/Own	er: PolyMet		City/Count		asston, P unty	<u>Pine</u>	State:	MN	Sam	pling Date:	09/28/15	
Inve	estigator(s):	cdf, bkb				Section:		<u>5</u>		Township	: <u>39N</u>	-		Range.	22W	Sam	pling Point:	<u>10U-1</u>	
	d Form:	Terrac	e Plain			Local Re	elief:	None Latitud	le:	Slope %:	<u>0</u>	Soi	il Map Uı	nit Name	e: <u>P- Pe</u>	<u>at</u>			
Sub	region (LRR)): <u>K</u>				5082149	9 mN			Longitude	: <u>4908</u>	36 mE		Datum:	UTM, N	IAD 83	s, meters		
Cov	vardin Classii	fication:	Upland	i		Circular	—— 39 Cla	ssification:	Upland	Ü			Mapped		assification				
	climatic/hydro			=	nical for t				(If no, explai	in in remar	·ks)		• • •		(primary):		Upland		
										Are "norm			-		secondar).	_	<u>оршни</u>		
Are	vegetation	<u>No</u>	Soil	<u>No</u>	Hydrold	gy <u>No</u>	sigi	nificantly dist	urbed?	circumstai	nces"		Eggers a			<i>37</i>			
Are	vegetation	<u>No</u>	Soil	<u>No</u>	Hydrold	gy <u>No</u>	natu	ırally problen	natic?	present?			Eggers a	& Reed ((quaterna	ry):			
SUN	MARY (OF FIN	IDING	S - Atta	ch si	te map s	shov	ving san	a pnilan	oint lo	catio	ons. tr	ranse	cts. iı	nporta	ant f	eatures	. etc.	
												-		-	•			-	
-	rophytic vege Iric soil presei		esent?			General Ren (explain any			lata are from	the 1941 :	Soli Sul	vey or Pi	ine coun	ty archiv	ea on the	NRCS	s wed soil s	survey.	
_	cators of wetla		oloav pres	sent?		if needed):													
	e sampled ar	-				lf yes, optio	nal W	etland Site II	D: (Wet	land 10)									
VEC	GETATIO	ON																	
VL																			
								<u>Absolute</u>	<u>Dominant</u>			<u>50/2</u>	0 Thres	<u>holds:</u>				<u>20%</u>	<u>50%</u>
	Tree Stratu	<u>ım</u>		(Plot Size:	<u>30 ft</u>)	% Cover	Species?	<u>Status</u>			Stratur					0	0
1.								0				1	ling/Shr		um			0	0
2.								0					b Stratui					16	40
3.								0				WOO	ody Vine	Stratur	11			0	0
4.								0				<u>Don</u>	<u>ninance</u>	Test Wo	orksheet:				
						Total Cov	er:	<u>0</u>							nt Specie			1 (A)	
	Sapling/Shi	rub Strat	<u>um</u>	(Plot Size:	<u>15 ft</u>)								W or FAC):			
1.								0					al Numb cies Acr					2 <i>(B)</i>	
2.								0				1			otrata. It Specie:	_		_ ``	
3.								0							W or FAC		50.00	0% <i>(A/B)</i>	ı
4.								0											
5.								0				<u>Prev</u>	alence l	ndex W	<u>orksheet</u>	<u>:</u>			
						Total Cov	er:	<u>0</u>					Tota	l % Cov	er of:			Multiply by	
	Herb Stratu	<u>ım</u>		(Plot Size:	<u>5 ft</u>)					OBL	L Specie	s _		0	X 1		0
1.	Panicum vi	irgatum						60	Yes	FA	C	FAC	CW Spec	ies _		0	X 2		0
2.	Setaria fab	eri						20	Yes	FAG	CU	FAC	Specie	s _		60	X 3	1	180
3.								0				FAC	CU Speci	ies _		20	X 4		80
4.								0					. Specie:			0	X 5		0
5.								0					umn Tot			80	(A)		260 (B)
6.								0					unni 100	_	alence In				.25
7.								0				Hude	onhytic		ion Indic				
8.						Total O		0										tion	
				(DL 4.5)	00.0	Total Cov	er:	<u>80</u>				N			st тог ну ce Test i:		ytic Vegeta %	uon	
	Woody Vine	e Stratun	1	(Plot Size:	<u>30 ft</u>)								ce lndex				
1.								0									•	ovide suppo	orting data
2								0				II —					ronacona		-

Total Cover:

% Bare Ground in Herb Stratum:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

0

% Sphagnum Moss Cover:

Problematic Hydrophytic Vegetation [1] (Explain)

No

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present?

SOIL Sampling Point: 10U-1

	needed to document the indicator or confirm the abscence	of indicators).		
Depth Matrix (inches) Color (moist)	Redox Features % Color (moist) % Type [1]	Loc [2]	Texture	Remarks
1 0 - 9 10YR 2/1			peat	dry
9 - 24 10YR 5/4	70		loamy sand	dry
3 9 - 24 7.5YR 4/6	20	-	loamy sand	dry
9 - 24 10YR 5/6	10		loamy sand	dry
5				
6				
[1] Type: C=Concentration, D=Depletion, F	RM=Reduced Matrix, CS=Covered or Coated Sand Grains	[2] Location: F	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LI	RRs, unless otherwise noted)	Indi	icators for Problematic Hydric So	ils [3]:
Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR.	A <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 14	9B)	5 cm Mucky Peat or Peat (S3) (LF	P.R. K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L,)
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (L	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and w	etland hydrology must be present, unless disturbed or problemat	ic.	Very Shallow Dark Surface (TF12)	"-"-" -" (-)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>No</u>
Soil Remarks:		•		
HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one requir				
	ed; check all that apply)	Secondar	ry Indicators (minimum of two red	quired)
Surface Water (A1)	Water-Stained Leaves (B9)		ry Indicators (minimum of two red ce Soil Cracks (B6)	puired) FAC-Neutral Test (D5)
Surface Water (A1) High Water Table (A2)		Surfac	,	<u> </u>
` '	Water-Stained Leaves (B9)	Surfac	ce Soil Cracks (B6)	<u> </u>
High Water Table (A2) Saturation (A3)	☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)	Surface Draina Moss	ce Soil Cracks (B6) age Patterns (B10)	<u> </u>
High Water Table (A2) Saturation (A3) Water Marks (B1)		☐ Surface ☐ Draina ☐ Moss ☐ Dry-S	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16)	<u> </u>
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	 Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13) ☐ Marl Deposits (B15) ☐ Hydrogen Sulfide Odor (C1) 	Surface Draina Moss Dry-S Crayfi	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2)	<u> </u>
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	 Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13) ☐ Marl Deposits (B15) ☐ Hydrogen Sulfide Odor (C1) 	Surface Draina Moss Dry-S Crayfi Satura	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) leason Water Table (C2) ish Burrows (C8)	<u> </u>
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	 Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) 	Surface Draina Moss Dry-S Crayfi Satura	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9)	<u> </u>
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	 Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) 	Surface Draina Moss Dry-S Crayfi Satura Stunte	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) corphic Position (D2)	<u> </u>
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surface Draina Moss Dry-S Crayfi Satura Stunte Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1)	<u> </u>
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surface Draina Moss Dry-S Crayfi Satura Stunte Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) eorphic Position (D2) ew Aquitard (D3) topographic Relief (D4)	FAC-Neutral Test (D5)
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surface Draina Moss Dry-S Crayfi Satura Stunte Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) corphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	 Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches):	Surface Draina Moss Dry-S Crayfi Satura Stunte Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) eorphic Position (D2) ew Aquitard (D3) topographic Relief (D4)	FAC-Neutral Test (D5)
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Surface Draina Moss Dry-S Crayfi Satura Stunte Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) corphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary frince)	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Surface Draina Moss Dry-S Crayfi Satura Stunte Geom Shalla	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) corphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Surface Draina Moss Dry-S Crayfi Satura Stunte Geom Shalla	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) corphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)

W	ETLA	ND	DETE	RMIN	IATIO	N C	ATA	FOR	M - No	rthce	ntral	and	Nort	heast Re	egion	
Project/Site:	Hinckley S	<u>iite</u>			Applicant/C	Owner:	<u>PolyMe</u>	<u>et</u>	City/County.	Grasston County	, Pine	State:	MN	Sampling Date:	09/28/15	
Investigator(s):	cdf, bkb				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	10W-1	
Land Form:	<u>Toeslope</u>				Local Relie	of: Cor	<u>ncave</u>		Slope %:	0 3	Soil Map U	nit Name.	P- Pea	<u>t</u>		
Subregion (LRR)): <u>K</u>				Latitude:	508	32124 ml	<u>V</u>	Longitude:	490872 mE	 	Datum:	UTM, NA	AD 83, meters		
Cowardin Classii	fication: E	PEMB			Circular 39	Classi	ification:	Type 2			Марреа	NWI Cla	ssification.	:		
Are climatic/hydro	ologic conditi	ions or	n the site typ	ical for this	time of year	?	<u>Yes</u>	(If no, exp	lain in remarks Are "normai	•		& Reed (orimary): secondary	Fresh (Wet)) Meadow	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	No No	signific	cantly dis	turbed?	circumstand		00	& Reed (,).		
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	No No	natural	ly problei	matic?	present?		00	•	quaternary	<i>ı):</i>		
SUMMARY (OF FIND	ING	S - Atta	ch site	map sh	owii	ng sai	mpling	point loc	ations,	transe	cts, in	nporta	nt features	s, etc.	
Hydrophytic vege Hydric soil presei Indicators of wetla	nt?		ent?	Yes (ex	neral Remai plain any ar peeded):		Soils Fores		m the 1941 Sc	oil Survey of	Pine cour	ity archive	ed on the I	NRCS Web Soil	Survey.	
Is the sampled ar	rea within a w	vetlana	<i>!</i> ?		es, optiona	l Wetla	and Site	ID: (We	etland 10)							
/EGETATION	ON															
						A	bsolute	Dominar	nt Indicato	<u>r</u> 50	0/20 Thres	holds:			<u>20%</u>	5
Tree Stratu	<u>ım</u>		(Plot Size:	<u>30 ft</u>) %	Cover	Species:	? <u>Status</u>		ree Stratui	m			3	7
											anlina/Shi	uh Strati	um			

<u>Tr</u>	ree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		_	3	7.5
F	Populus tremuloides			15	Yes	FAC	Sapling/Shrub Strat Herb Stratum Woody Vine Stratur		-	6 13 0	32.5 0
				0			Dominance Test We				
c.	onling/Chruh Stratum	/Plot Sizo	Total Cover:	<u>15</u>			Number of Dominal That Are OBL, FAC			3 <i>(A)</i>	
	Rubus idaeus	(Plot Size:	<u>1311</u>)	30	Yes	FAC	Total Number of Do Species Across All			3 <i>(B)</i>	
				0			Percent of Dominar That Are OBL, FAC		100.009	% (A/B)	
				0			Prevalence Index W	orksheet:			
			Total Cover:	<u>30</u>			Total % Cov			Multiply by:	
He	erb Stratum	(Plot Size:	<u>5 ft</u>				OBL Species	0	X 1		0
P	Phalaris arundinacea			60	Yes	FACW	FACW Species _	60	X 2	1:	20
l	Jrtica dioica			5	No	FAC	FAC Species	50	X 3	1:	50
				0			FACU Species	0	X 4		0
				0			UPL Species	0	X 5		0
				0			Column Totals:	110	(A)	2	70
				0			_	alence Index =	` ′	2.	_
				0			Hydrophytic Vegetat				
			Total Cover:	0 <u>65</u>			JII 	st for Hydroph		on	
W	oody Vine Stratum	(Plot Size:	<u>30 ft</u>	_			Yes Dominan	ce Test is >50%	%		
				0			<u> </u>	ce Index ≤ 3.0			
-				0				ogical Adaptati Ition remarks o			ting o
L			Total Cover:	0			- ·	atic Hydrophyti	•	,	1)
Bare	Ground in Herb Stratun	n:	<u>_</u>	~ % Sphagnun	n Moss Cover	:	[1] Indicators of hydric disturbed or problemat	soil & wetland hy	•		
geta	tion Remarks: (include p	nhoto numbers	s here or on a separate s	heet)			Hydrophytic vegetati	on present?	<u>Yes</u>		

SOIL Sampling Point: 10W-1

Profile Description: (Describe to the depth nee	ded to document the indicator or co	nfirm the	abscence o	f indicators).		
Depth Matrix		ox Featur		1 [0]	Toutous	Damada
(inches) Color (moist)	% Color (moist)	<u></u>	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 12 10YR 2/1 2. 12 - 15 2.5Y 3/1	<u>100</u> 100				peat sandy clay	moist moist
2. 12 · 13 2.31 3/1 15 · 32 10YR 5/3	80 7.5YR 4/6	20			loamy fine sand	moist
15 - 32 10 10 10 10 10 10 10 10 10 10 10 10 10	20 5YR 4/6	20			loamy fine sand	moist
5. 15 - 32	5YR 7/6	2				
6						
[1] Type: C=Concentration, D=Depletion, RM=I	Reduced Matrix, CS=Covered or Coa	ted Sand	Grains [2] Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)			Indi	cators for Problematic Hydric S	oils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLF	RA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, I	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR	K, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S	8) (LRR F	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRI	R R, MLR	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K. L.	,)		Polyvalue Below Surface (S8) (Li	RR K. L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, I	•
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (I	•
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19)	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A	,
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	
	_ , , , , ,					Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetlan			•		Very Shallow Dark Surface (TF12	
Restrictive Layer (if present): Type:	Depth	(inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks:						
UVDBOLOOV						
HYDROLOGY						
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; of	chack all that annly)			Secondar	y Indicators (minimum of two re	auired)
	Water-Stained Leaves ((DO)		_	,	FAC-Neutral Test (D5)
Surface Water (A1)		D9)			re Soil Cracks (B6)	▼ FAC-Neullal Test (D3)
☐ High Water Table (A2)	Aquatic Fauna (B13)			_	nge Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	(04)			Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor				eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	on Living	Roots (C3)		sh Burrows (C8)	
Drift Deposits (B3)	Drassass of Dadward I	· (C4)			ation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4)	Presence of Reduced In		" (0.1)	Stunte	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction in		OIIS (C6)	✓ Geom	orphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)			Shallo	w Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remark	(S)		Microt	opographic Relief (D4)	
Field Observations:					Indicators of wetland hydrological	ogy present? Yes
Surface water present?	Surface Water Depth (in	ches):			Describe Recorded Data:	
Water table present?	Water Table Depth (inch	es):				
Saturation present? (includes capillary fringe)	Saturation Depth (inches	s):				
Recorded Data: Aerial Photo	Monitoring Well Stream Gauge	• <u> </u>	revious Insp	ections	•	
Hydrology Remarks:						
Tryurology Remarks.						

WETLAND DETE	RMINATION DATA FORI	M - Northcentral and Northeast R	egion
Project/Site: Hinckley Site	Applicant/Owner: PolyMet	City/County: Grasston, Pine State: MN Sampling Date County	09/28/15
Are vegetation No Soil No	Hydrology No significantly disturbed? Hydrology No naturally problematic?	Township: 39N Range: 22W Sampling Point Slope %: 0 Soil Map Unit Name: P- Peat Longitude: 490883 mE Datum: UTM, NAD 83, meters Mapped NWI Classification: Are "normal Yes Eggers & Reed (primary): Upland circumstances" present? Eggers & Reed (tertiary): Eggers & Reed (quaternary): Coint locations, transects, important feature	
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland?	No General Remarks Yes (explain any answers if needed): Soils data are from Forest	tland 10)	
VEGETATION			
	Absolute Dominant		<u>20%</u> <u>50</u>
<u>Tree Stratum</u> (Plot Size:	<u>30 ft</u>) <u>% Cover</u> <u>Species?</u>		12 3
Populus tremuloides	60 Yes	FAC Sapling/Shrub Stratum Herb Stratum	$\frac{12}{4.6}$ $\frac{3}{11}$
2	0	Helb Stratum	4.0

	Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		_	<u>20%</u> 12	<u>5(</u>
	Populus tremuloides			60	Yes	FAC	Sapling/Shrub Stratur Herb Stratum	m	-	12 4.6	3
2.				0			Woody Vine Stratum		_	0	
				0			Dominance Test World	kehoot:			
			Total Cover:	0			_ 				
	Sapling/Shrub Stratum	(Plot Size:		<u>60</u>			Number of Dominant That Are OBL, FACW			3 <i>(A)</i>	
	Rubus idaeus	(50	Yes	FAC	Total Number of Dom Species Across All St			3 <i>(B)</i>	
	Sambucus racemosa			10	No	FACU	Percent of Dominant			_ ``	
				0			That Are OBL, FACW		100.00%	% (A/E)
				0			Prevalence Index Wor	kshoot:			
			Total Cover:	<u>60</u>			Total % Cover		A.	fultiply by	v.
	Herb Stratum	(Plot Size:		<u>00</u>			OBL Species	0	X 1	unipiy b	0
	Phalaris arundinacea	(, , , , , , , , , , , , , , , , , , ,	<u> </u>	20	Yes	FACW	FACW Species	21	X 2		42
	Parthenocissus guinguefol	lia		20	No	FACU	FAC Species	110	X 3		330
	Dryopteris carthusiana			1	No	FACW	FACU Species	12	X 4		48
	3 1			0				0	X 5		0
				0			UPL Species	143	(A)		420
							Column Totals:	0	(* 4)		
				0			Prevale	ence Index =	B/A =		7.94
				0				ence Index =	-	,	2.94
			Total Covery	0			Hydrophytic Vegetatio	n Indicators:			2.94
	Woody Vine Stratum	(Plot Size:	Total Cover:	0			Hydrophytic Vegetatio No Rapid Test	n Indicators:	ytic Vegetation		2.94
	Woody Vine Stratum	(Plot Size:		0 0 23			No Rapid Test Yes Dominance Yes Prevalence	n Indicators: for Hydroph e Test is >509 e Index ≤ 3.0	ytic Vegetatio	on	
	Woody Vine Stratum	(Plot Size:		0			No Rapid Test Yes Dominance No Morpholog	n Indicators: for Hydroph Test is >509 Index ≤ 3.0	ytic Vegetatio % [1] fons [1] (prov	on ride supp	orting
	Woody Vine Stratum	(Plot Size:		0 0 23			No Rapid Test Yes Dominance Yes Prevalence No Morpholog in vegetatio	n Indicators: for Hydroph Test is >509 Index ≤ 3.0 ical Adaptation remarks o	ytic Vegetatio	on ride supp tte sheet)	orting
В	Woody Vine Stratum		30 ft) Total Cover:	0 0 23 0 0 0	n Moss Cover:		No Rapid Test Yes Dominance Yes Prevalence No Morpholog in vegetatio	n Indicators: for Hydroph Test is >50% Index ≤ 3.0 ical Adaptati on remarks o ic Hydrophyt il & wetland h wetland h wetland h	ytic Vegetation [1] [ons [1] (prover on a separatic vegetation	on ride supp ite sheet) [1] (Expl	orting ain)

SOIL Sampling Point: 10U-2

Profile Description: (Describe to the depth nee		onfirm the		f indicators).		
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
0 - 10 10YR 2/1	100				peat	dry
2 10 - 12 2.5YR 3/1	100			-	sandy clay loam	dry
3. 12 - 27 10YR 5/4	65 7.5YR 4/6	20			loamy sand	dry
4. 12 - 27	7.5YR 5/6	10				-
5	5YR 4/6	5				
6						
[1] Type: C=Concentration, D=Depletion, RM=I	Reduced Matrix, CS=Covered or Co	ated Sand	Grains [2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)			Inc	licators for Problematic Hydric S	oils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, ML	RA 149B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R,	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR	K, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR F	R, MLRA 1491	3)	5 cm Mucky Peat or Peat (S3) (L	RR K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LR	RR R, MLR.	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1)	(LRR K, L,)		Polyvalue Below Surface (S8) (L	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K,	L)
Thick Dark Surface (A12)	Depleted Matrix (F3)				 Iron-Manganese Masses (F12) (LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19)	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7))			Mesic Spodic (TA6) (MLRA 144)	
Sandy Redox (S5)	Redox Depressions (F8)	,			Red Parent Material (F21)	<u> </u>
					Very Shallow Dark Surface (TF1	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetlar						
Restrictive Layer (if present): Type:	Dept	h (inches): 		Hydric soil present?	<u>Yes</u>
Soil Remarks:						
HYDROLOGY						
Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required;	check all that apply)			Seconda	ry Indicators (minimum of two re	equired)
Surface Water (A1)	Water-Stained Leaves	(B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
		, ,			age Patterns (B10)	
High Water Table (A2)	Marl Deposits (B15)			_	Trim Lines (B16)	
Saturation (A3)	Hydrogen Sulfide Odol	r (C1)		_	Season Water Table (C2)	
Water Marks (B1)			Poots (C2)			
Sediment Deposits (B2)	Oxidized Rhizospheres	s UII LIVIIIY	K001S (C3)		fish Burrows (C8)	ni.
Drift Deposits (B3)	Presence of Reduced	Iron (CA)			ration Visible on Aerial Imagery (C)
Algal Mat or Crust (B4)			oile (C4)		ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction		ulis (Co)		norphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C)	-		Shall	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remain	rks)		Micro	topographic Relief (D4)	
Field Observations:					Indicators of wetland hydrol	ogy present? <u>No</u>
Surface water present?	Surface Water Depth (ii	nches):			Describe Recorded Data:	
Water table present?	Water Table Depth (inc.	hes):				
Saturation present? (includes capillary fringe)	Saturation Depth (inche	es):				
Recorded Data: Aerial Photo	Monitoring Well Stream Gaug	ge P	Previous Insp	ections		
Hudrology Pomorko						
Hydrology Remarks:						

V	VETLAND	DETERI	MINATIO	N DAT	A FORI	W - No	rthcer	ntral and	d Northe	ast Re	gion	
Project/Site:	Hinckley Site		Applicant/C	Owner: PolyN	<u>/let</u>	City/County:	Grasston, County	Pine State	e: <u>MN</u> Sar	mpling Date:	09/28/15	
Investigator(s):	cdf, bkb		Section:	<u>5</u>		Township:	<u>39N</u>	Ran	ge: <u>22W</u> Sai	mpling Point:	<u>10W-2</u>	
Land Form:	<u>Toeslope</u>		Local Relie	f: Concave		Slope %:	<u>0</u> S	oil Map Unit Na	me: P-Peat			
Subregion (LRI	R): <u>K</u>		Latitude:	<u>5082133 r</u>	<u>nN</u>	Longitude:	490858 mE	Datu	<i>m:</i> UTM, NAD 8	33, meters		
Cowardin Class	sification: PEME	<u> </u>	Circular 39	Classification	: <u>Type 2</u>			Mapped NWI	Classification:			
Are climatic/hyd	drologic conditions (on the site typical f	or this time of year	? Yes	(If no, expla	in in remarks)	Eggers & Ree	ed (primary):	Fresh (Wet)	<u>Meadow</u>	
Are vegetation	No Soil	<u>No</u> Hydi	rology <u>No</u>	significantly a	listurbed?	Are "normal circumstance	_	Eggers & Ree Eggers & Ree	ed (secondary): ed (tertiary):			
Are vegetation	No Soil	<u>No</u> Hydi	rology <u>No</u> 1	naturally probl	lematic?	present?		Eggers & Ree	ed (quaternary):			
SUMMARY	OF FINDING	S - Attach	site map sh	owing sa	ampling p	oint loc	ations, t	transects,	important	features,	, etc.	
Hydrophytic veg Hydric soil pres Indicators of we	getation present?	Yes Yes esent? Yes	General Remar (explain any an if needed):	rks Soil	s data are from				hived on the NRC			
VEGETAT	ION											
				Abaaliita	. Dominant	Indianta	50/	/20 Thresholds	:		20%	<u>50%</u>
Tree Stra	tum	(Plot Size: 30	ft	Absolute Note: 1 March 1997		Indicator Status	- -	ee Stratum	-		0	0
		(<u></u>	,				pling/Shrub St	ratum		0	0
1. 2.				0			—— He	rb Stratum			20.2	50.5
3.				0			Wo	oody Vine Stra	tum		0	0
4.				0			<u>Do</u>	minance Test	Worksheet:			
0 11 10		(5) (6) 45	Total Cover:	<u>0</u>				mber of Domir at Are OBL, FA			1 <i>(A)</i>	
	hrub Stratum	(Plot Size: 15	<u>ft</u>)			То	tal Number of	Dominant	1		
1. 2.				0			Sp	ecies Across A	All Strata:		1 (B)	
3.				0				rcent of Domir at Are OBL, FA		100.00)% <i>(A/B)</i>)
4.				0			///	at Are ODL, 17	icw or rac.			
5.				0			<u>Pre</u>	valence Index	Worksheet:			
			Total Cover:	0				Total % C	****		Multiply by	
Herb Stra	<u>tum</u>	(Plot Size: 5 ft)			OE	BL Species	0	X 1		0
1. Phalaris	arundinacea			100	Yes	FACW	√ FA	CW Species	100	X 2	2	200
2. Urtica dio	oica			1	No	FAC	FA	C Species	1	X 3	-	3
3.				0			FA	CU Species	0	X 4		0
4.				0			UF	L Species	0	X 5		0
5.				0				lumn Totals:	101	(A)	2	203 (B)
6. 7.				0					evalence Index =	= B/A =	2	.01
8							Hyd	Irophytic Vege	tation Indicators	<u>):</u>		

0

0

0

0

% Sphagnum Moss Cover:

<u>101</u>

No

Yes

Yes

No

disturbed or problematic.

Hydrophytic vegetation present?

Rapid Test for Hydrophytic Vegetation

Morphological Adaptations [1] (provide supporting data

Yes

in vegetation remarks or on a separate sheet)

Problematic Hydrophytic Vegetation [1] (Explain) [1] Indicators of hydric soil & wetland hydrology must be present, unless

Dominance Test is >50%

Prevalence Index ≤ 3.0 [1]

Total Cover:

Total Cover:

(Plot Size: 30 ft

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Woody Vine Stratum

% Bare Ground in Herb Stratum:

2.

SOIL Sampling Point: 10W-2

Content Cont	Profile Description: (Describe to the depth ne	eeded to docun		confirm the		f indicators)		
3	· · · · · · · · · · · · · · · · · · ·	%				Loc [2]	Texture	Remarks
11 - 32 109R 4D 30 7.5YR 46 30 Inamy fine sand model 11 Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains	1 0 - 11 10YR 2/1	100					peat	moist
17 Type: C-Concentration, D-Depletion, RIM-Reduced Matrix, CS-Covered or Coated Sand Grains 72 Location: PL-Pore Lining, M-Matrix.	2. 11 - 32 10YR 5/3	70 7.5	YR 5/6	20			loamy fine sand	moist
Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)	3. <u>11 - 32</u> <u>10YR 4/2</u>	30 7.5	YR 4/6	30			loamy fine sand	moist
Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)	4							
Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)	5							-
Mistissus (A1)	6	=Reduced Matr	ix, CS=Covered or Co	oated Sand	Grains [2] Location:	PL=Pore Lining, M=Matrix.	
Histic Epipedon (A2)						Inc	licators for Problematic Hydric Sc	ils [3]:
Black Histlic (A3)	✓ Histosol (A1)	Stri	pped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR	A 149B)
Black Histic (AU)	Histic Epipedon (A2)	□ Dai	rk Surface (S7) (LRR R	R. MLRA 149	9B)		Coast Prairie Redox (A16) (LRR I	(, L, R)
Hydrogen Sulfide (A4)						3) [-	•
Stratified Layers (A5)						<i>"</i>	-	((
Depleted Below Dark Surface (A11)					•		-	N N N
Trick Dark Surface (A12)					1		-	•
Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Piedmont Floodplain Soils (F19) (MLRA 144A, 145, 149B) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Sil Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) remarks Well Restrictive Layer (if present): Type: Depth (inches): Hydric soil present? Yes Soil Remarks: VYDROLOGY		_)			-	
Sandy Cleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Salt Remarks: Very Shallow Dark Surface (FT) Present? Yes Soil Remarks: Yes Nydric soil present? Yes Soil Remarks: Yes Nydric soil present? Surface Water (A1) Water Stained Leaves (B9) Surfaces (B6) Precious (minimum of two required) Surface Water (A1) Aquatic Fauna (B13) Drainage Patterns (B10) Surface Water (A1) Aquatic Fauna (B13) Drainage Patterns (B10) Saturation (A3) Mart Deposits (B15) Moss Tim Linus (B16) Water Marks (B1) Hydrogen Sulfide Odor (C1) Dry Season Water Table (C2) Seediment Deposits (B2) Oxidized Rhizospheres on Living Roots (C3) Craylish Burrows (C8) Drift Deposits (B3) Presence of Reduced Iron (C4) Stantalion Visible on Aerial Imagery (C9) Inundation Visible on Aerial Imagery (B7) Thin Muck Surface (C7) Shallow Aquilard (D3) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Indicators of wetland hydrology present? Yes Describe Recorded Data: Indicators of wetland hydrology present? Yes Describe Recorded Data: Indicators of wetland hydrology present? Yes Describe Recorded Data: Indicators of wetland hydrology present? Yes Describe Recorded Data: Indicators of wetland hydrology present? Yes Describe Recorded Data: Indicators of wetland hydrology present? Yes Describe Recorded Data: Indicators of wetland hydrology present? Yes Describe Recorded Data: Indicators of wetlan	Thick Dark Surface (A12)	<i>Dep</i>	oleted Matrix (F3)				Iron-Manganese Masses (F12) (L	RR K, L, R)
Sandy Redox (\$5\$)	Sandy Mucky Mineral (S1)	☐ Red	dox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (MLRA 149B)
Soil Remarks: Soil Remarks	Sandy Gleyed Matrix (S4)	☐ Dep	oleted Dark Surface (F.	7)			Mesic Spodic (TA6) (MLRA 144A)	145, 149B)
Sol Remarks: Sol	Sandy Redox (S5)	☐ Red	dox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
Restrictive Layer (if present): Type: Depth (inches): Hydric soil present? Yes Foil Remarks: PAPROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1)	31 Indicators of hydrophytic yegetation and wetla	and hvdroloav m	ust be present, unless	disturbed of	r problematic		Very Shallow Dark Surface (TF12	mama anlica)
Soil Remarks: Soil Remarks: Surface water present? Staturation people in the surface water previous Inspections Secondary Indicators (minimum of two required) Surface water post (Ca) Surface water present? Surface water post (B13) During Deposits (B13) During Deposits (B15) During Deposits (B15) During Deposits (B2) During Depos		· y · · · · · · · · · · · · ·					Hydric soil present?	Yes
Surface Water (A1)								
High Water Table (A2)	Primary Indicators (minimum of one required,	check all that	apply)			Seconda	ry Indicators (minimum of two re	quired)
Saturation (A3) Marl Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Hydrogen Sulfide Odor (C1) Dry-Season Water Table (C2) Sediment Deposits (B2) Oxidized Rhizospheres on Living Roots (C3) Crayfish Burrows (C8) Drift Deposits (B3) Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Iron Deposits (B5) Recent Iron Reduction in Tilled Soils (C6) Geomorphic Position (D2) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Surface water present? Surface Water Depth (inches): Describe Recorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections Saturation Previous Inspections Previous Inspections Previous Inspections Marl Deposits (B15) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Saturation Visible on Aerial Imagery (C9) Shallow Aquitard (D3) Microtopographic Relief (D4) Microtopographic Relief (D4) Seconded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections Marl Deposits (B15) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Saturation (C4) Stunted or Stressed Plants (D1) Shallow Aquitard (D3) Microtopographic Relief (D4) Microtopographic Relief (D4) Describe Recorded Data: Descri	Surface Water (A1)		Water-Stained Leaves	s (B9)		Surfa	ace Soil Cracks (B6)	✓ FAC-Neutral Test (DS
Saturation (A3)	High Water Table (A2)		Aquatic Fauna (B13)			Draii	nage Patterns (B10)	
Water Marks (B1)	_		Marl Deposits (B15)			Mos	s Trim Lines (B16)	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water Table Depth (inches): Saturation Depth (inches): Saturation Depth (includes capillary fringe) Stream Gauge Previous Inspections Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Staturation Visible on Aerial Imagery (C9) Staturation Visible on Aerial Imagery (C9) Staturation Depth (Inches): Surface Water Depth (inches): Saturation Depth (inches): Saturation Previous Inspections	_		Hydrogen Sulfide Odd	or (C1)		Dry-	Season Water Table (C2)	
Drift Deposits (B3)			Oxidized Rhizosphere	es on Living	Roots (C3)	Cray	fish Burrows (C8)	
Algal Mat or Crust (B4)	<u> </u>		,	3	. ,			
Recent Iron Reduction in Tilled Soils (C6) Geomorphic Position (D2) Iron Deposits (B5) Thin Muck Surface (C7) Shallow Aquitard (D3) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Indicators of wetland hydrology present? Yes Surface water present? Water Table Depth (inches): Describe Recorded Data: Water table present? (includes capillary fringe) Saturation Depth (inches): Secorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections Previous Inspections Previous			Presence of Reduced	I Iron (C4)				
Iron Deposits (B5)	<u> </u>				oils (C6)			
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Other (explain in remarks) Microtopographic Relief (D4) Field Observations: Surface water present? Water Table Poepth (inches): Water table present? Water Table Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Secorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections	Iron Deposits (B5) 				• 7			
Field Observations: Surface water present? Water Table Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Secorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections	Inundation Visible on Aerial Imagery (B7)			•			,	
Surface water present? Surface Water Depth (inches): Water table present? Water Table Depth (inches): Saturation present? (includes capillary fringe) Saturation Depth (inches): Secorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections	Sparsely Vegetated Concave Surface (B8)		Опет (ехріант інтенів	шкэу		Micro	otopographic Relief (D4)	
Water table present?	Field Observations:						Indicators of wetland hydrolo	gy present? Yes
Saturation present? (includes capillary fringe) Saturation Depth (inches):	Surface water present?	_ s	urface Water Depth (inches):			Describe Recorded Data:	
Recorded Data: Aerial Photo Monitoring Well Stream Gauge Previous Inspections	Water table present?		Vater Table Depth (inc	ches):				
	Saturation present? (includes capillary fringe) s	aturation Depth (inch	ies):				
Hydrology Remarks: Pit dug to 32 inches; returned to pit after 5 hours and water level was 17 inches below ground surface.	Recorded Data: Aerial Photo	Monitoring We	ell Stream Gau	ige P	revious Insp	ections		
	Hydrology Remarks: Pit dug to 32 inches; re	turned to pit after	er 5 hours and water le	vel was 17 i	nches below	ground surfa	ce.	

Project/Site:	Hinckley:	<u>Site</u>			Applicant/O	Owner	r: PolyMe	<u>t</u>	City/County.	Grasst County	on, Pine /	State:	<u>MN</u>	Sampling Date:	07/20/15
Investigator(s):	kms2				Section:	<u>5</u>			Township:	39N	-	Range:	<u>22W</u>	Sampling Point:	<u>11U</u>
Land Form:	Terrace I	<u>Plain</u>			Local Relie	e <i>f:</i> N	lone		Slope %:	<u>0</u>	Soil Map U	Init Name.	: <u>P- Pea</u>	<u>at</u>	
Subregion (LRR):	<u>K</u>				Latitude:	<u>5</u>	082092		Longitude:	<u>490893</u>		Datum:	UTM, N	AD 83, meters	
Cowardin Classifi	ication:	<u>Upland</u>			Circular 39	Clas	sification:	<u>Upland</u>			Маррес	i NWI Cla	ssification) <i>:</i>	
Are climatic/hydro	ologic condi	itions or	the site typ	ical for this	time of year	?	<u>Yes</u>	(If no, expla	ain in remarks	5)	Eggers	& Reed ((primary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	<u>Yes</u>	Hydrology	<u>No</u>	signi	ificantly dist	turbed?	Are "normal circumstand	_		& Reed (. & Reed (secondary (tertiary):	y):	
Are vegetation	No	Soil	No	Hydrology	No /	natur	ally probler	matic?	present?		Fagers	& Reed ('auaternar	v)·	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	<u>No</u> <u>No</u> No	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. 2 of 5 - Forest transect near well 16
Is the sampled area within a wetland?	No	If yes, optional Wetland	nd Site ID: (Wetland 10)

Tree Stratum	(Plot Size: <u>30 i</u>	<u>ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		_	<u>20%</u> 16	50% 40
Populus tremuloides			80	Yes	FAC	Sapling/Shrub Stra	atum	_	4	10
			0			Herb Stratum Woody Vine Stratu		-	16 2	40 5
			0			,				3
			0			<u>Dominance Test W</u>	<u>/orksheet:</u>			
Sapling/Shrub Stratum	(Plot Size: 15)	Total Cover:	<u>80</u>			Number of Domina That Are OBL, FAC	ant Species CW or FAC:		4 (A)	
	(Fiot 3ize. <u>131</u>	,	20	Vac	FACIL	Total Number of D	ominant			
Sambucus racemosa			20	Yes	FACU	Species Across Al	Il Strata:		6 <i>(B)</i>	
			0			Percent of Domina		66.67%	% (A/B)	
			0			That Are OBL, FAC	JW or FAC:			
			0			Prevalence Index V	Vorksheet:			
		Total Cover:	<u>20</u>			Total % Co	ver of:	N	lultiply by:	
Herb Stratum	(Plot Size: 5 ft)				OBL Species	0	X 1	()
Rubus idaeus			25	Yes	FAC	FACW Species	0	X 2	()
Lactuca biennis			20	Yes	FAC	FAC Species	145	X 3	435	5
Urtica dioica			20	Yes	FAC	FACU Species	45	X 4	180)
Rubus allegheniensis			15	No	FACU	UPL Species	0	X 5	()
			0			111	190	(A)	615	5
			0			Column Totals:	valence Index =	•	3.24	-
			0						3.2.	•
			0			Hydrophytic Vegeta				
		Total Cover:	<u>80</u>				est for Hydroph nce Test is >50%		on	
Woody Vine Stratum	(Plot Size: 30)	<u>ft</u>)					nce Index ≤ 3.0			
Celastrus scandens			10	Yes	FACU		logical Adaptati		ide supporti	ng d
			0			in veget	tation remarks o	r on a separa	te sheet)	-
		Total Cover:	<u>10</u>				natic Hydrophyt	•		
		¢.	% Sphagnum	Moss Cover	;	[1] Indicators of hydric disturbed or problema		drology must	be present, un	less
Bare Ground in Herb Strat	tum: 10	•	, ,			-				

SOIL Sampling Point: 11U

Prome Description. (Describe to the depth needs	ed to document the indicator or co	onfirm the abscence o	findicators).		
Depth Matrix		ox Features			
	% Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
1. 0 - 6 10YR 2/1	50			<u>Oe</u>	dry
2. 0 - 6 10YR 2/2 10YR 3/3	40			SI	dry
3. 6-8 104R 3/3 7.5YR 2.5/3	30			Sl	- ury
6 - 8 10YR 2/1	30		-	Oe	
6					
[1] Type: C=Concentration, D=Depletion, RM=Re	duced Matrix, CS=Covered or Coa	ated Sand Grains [2] Location: F	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, un	nless otherwise noted)		Ind	icators for Problematic Hydric So	ils [3]:
Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLR.	A 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R,	MLRA 149B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (\$	58) (LRR R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	RR K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LR	PR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1)	(LRR K, L)		Polyvalue Below Surface (S8) (LR	P.R.K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L,)
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) (Li	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (i	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7))		Mesic Spodic (TA6) (MLRA 144A,	
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	
				Very Shallow Dark Surface (TF12)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland		·			,
Restrictive Layer (if present): Type: coarse	fragments Dept.	h (inches): 8-		Hydric soil present?	<u>No</u>
Soil Remarks:					
HYDROLOGY					
HYDROLOGY Wetland Hydrology Indicators:					
	eck all that apply)		Seconda	ry Indicators (minimum of two rec	quired)
Wetland Hydrology Indicators:	eck all that apply)	<i>(B9)</i>		ry Indicators (minimum of two red ce Soil Cracks (B6)	quired) FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1)		(B9)	Surfac	,	
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2)	☐ Water-Stained Leaves	(B9)	Surfac	ce Soil Cracks (B6)	
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3)	☐ Water-Stained Leaves ☐ Aquatic Fauna (B13)	`	Surface Draine Moss	ce Soil Cracks (B6) age Patterns (B10)	
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	 Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15)	· (C1)	☐ Surface ☐ Draina ☐ Moss ☐ Dry-S	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16)	
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor	· (C1)	Surface Draina Moss Dry-S Crayfi	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) season Water Table (C2) ish Burrows (C8)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor	(C1) on Living Roots (C3)	Surface Drain. Moss Dry-S Crayfi Satura	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Eeason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres	c (C1) on Living Roots (C3) fron (C4)	Surface Drain. Moss Dry-S Crayfi Satura. Stunte	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) eason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced i	r (C1) r on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Drain. Moss Dry-S Crayfi Satura Stunte Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Eeason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced of Recent Iron Reduction Thin Muck Surface (C7	r (C1) r on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Surface Drain. Moss Dry-S Crayfi Satura Stunta Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced I Recent Iron Reduction	r (C1) r on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Surface Drain. Moss Dry-S Crayfi Satura Stunta Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Eeason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced of Recent Iron Reduction Thin Muck Surface (C7) Other (explain in remains)	r (C1) r on Living Roots (C3) ron (C4) in Tilled Soils (C6) r)	Surface Surface Drain. Moss Dry-S Crayfi Satura Stunta Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced I Recent Iron Reduction Thin Muck Surface (C7) Other (explain in remai	r (C1) r on Living Roots (C3) ron (C4) in Tilled Soils (C6) r) ks)	Surface Surface Drain. Moss Dry-S Crayfi Satura Stunta Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4)	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced I Recent Iron Reduction Thin Muck Surface (C7 Other (explain in remai	r (C1) r on Living Roots (C3) ron (C4) in Tilled Soils (C6) r) ks) nches):	Surface Surface Drain. Moss Dry-S Crayfi Satura Stunta Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) sed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrological	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced I Recent Iron Reduction Thin Muck Surface (C7) Other (explain in remai	r (C1) r on Living Roots (C3) ron (C4) in Tilled Soils (C6) r) ks) nches):	Surface Surface Drain. Moss Dry-S Crayfi Satura Stunta Geom	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) sed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrological	FAC-Neutral Test (D5)
Wetland Hydrology Indicators: Primary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? (includes capillary fringe)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced I Recent Iron Reduction Thin Muck Surface (C7 Other (explain in remai	r (C1) r on Living Roots (C3) rron (C4) in Tilled Soils (C6) r) ks) nches):	Surfai Draini Moss Dry-S Crayfi Saturi Stunti Geom Shallo Micro	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) sed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrological	FAC-Neutral Test (D5)

WETLAND DETERMINATION	I DATA FORI	- Northcentral and N	lortheast Region
Project/Site: Hinckley Site Applicant/Ow	ner: PolyMet	ty/County: <u>Grasston, Pine</u> State: <u>N</u> County	NN Sampling Date: 07/30/14
Investigator(s): kms2, jtk Section:	<u>5</u>	ownship: 39N Range: 2	22W Sampling Point: W11
Land Form: Local Relief:	<u>None</u>	lope %: 0 Soil Map Unit Name:	P - Peat
Subregion (LRR): <u>K</u> Latitude:	5083274 mN	ongitude: 490842 mE Datum: <u>L</u>	JTM, NAD 83, meters
Cowardin Classification: PEMC2 Circular 39 C	Classification: Type 2	Mapped NWI Class	ification:
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, expla	in remarks) Eggers & Reed (pri	imary): Fresh (Wet) Meadow
Are vegetation No Soil Yes Hydrology No s	ignificantly disturbed?	re "normal <u>Yes</u> Eggers & Reed (se	-
	nturally problematic?	resent? Eggers & Reed (ter resent? Eggers & Reed (qu	37
v <u> </u>	3.		-
SUMMARY OF FINDINGS - Attach site map sho			Jortani reatures, etc.
Hydrophytic vegetation present? Yes General Remark. Hydric soil present? Yes (explain any ans		1.	
Indicators of wetland hydrology present? Indicators of wetland hydrology present? No			
Is the sampled area within a wetland? No If yes, optional	Wetland Site ID: Wet	<u>d 11</u>	
VEGETATION			
	Absolute Deminent	Indicator 50/20 Thresholds:	<u>20%</u> <u>50%</u>
Tree Stratum (Plot Size: 30 ft	Absolute Dominant <u>% Cover Species?</u>	<u>Indicator</u> <u>Status</u> Tree Stratum	0 0
		Sapling/Shrub Stratun	
1.	0	Herb Stratum	19 47.5
2. 3.	0 0	Woody Vine Stratum	0 0
4.	0	Dominance Test Work	sheet:
Total Cover:	<u>0</u>	Number of Dominant S	
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>	ı	That Are OBL, FACW of	or FAC: 4 (A)
1.	0	Total Number of Domi	A (B)
2.	0	Percent of Dominant S	
3.	0	That Are OBL, FACW	
4.	0	Prevalence Index Work	zehoot:
5. Total Cover:	0	Total % Cover	
	<u>0</u>	OBL Species	40 X 1 40
· — ,	Vec		45 X 2 90
Salix petiolaris Poa palustris	20 Yes 20 Yes	FACW FACW Species	10 X 3 30
3. Urtica dioica	10 No	FAC	0 X4 0
Carex vulpinoidea	20 Yes	OBI PACO Species	0 X5 0
5. Salix bebbiana	5 No	FACW UPL Species	
6. Carex lacustris	20 Yes	OBL Column Totals:	95 (A) 160 (B)
7.	0		nce Index = B/A = 1.68
8.	0	Hydrophytic Vegetation	
Total Cover:	<u>95</u>		for Hydrophytic Vegetation Test is >50%
<u>Woody Vine Stratum</u> (Plot Size: <u>30 ft</u>			Index ≤ 3.0 [1]
1.	0		cal Adaptations [1] (provide supporting data
2.	0	<u> </u>	n remarks or on a separate sheet)
Total Cover:	<u>0</u>	<u> </u>	Hydrophytic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov	[1] Indicators of hydric soi disturbed or problematic.	il & wetland hydrology must be present, unless
Vegetation Remarks: (include photo numbers here or on a separate	sheet)	Hydrophytic vegetation	present? Yes
		**	

SOIL Sampling Point: W11

Profile Description: (Describe to the depth neede	ed to document the indicator or confirm the abscence of	f indicators).		
Depth Matrix	Redox Features	1 101	Toutous	Damada
	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
1. 0 - 3 10YR 2/1 10YR 2/2	100		Oa Oe	
2. 16 - 33 10YR 2/1	100		Oa	
4. 33 - 35 10YR 3/1	100		Oe	
5				
6. — — —				
[1] Type: C=Concentration, D=Depletion, RM=Re	duced Matrix, CS=Covered or Coated Sand Grains [2]	?] Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, ur	nless otherwise noted)	Indi	cators for Problematic Hydric Soil	's [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	149B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K,	L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 1498	B)	5 cm Mucky Peat or Peat (S3) (LRI	R K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LRF	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (LR	PR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (N	ILRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland i	hydrology must be present, unless disturbed or problematic.	. \square	Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY Wetland Hydrology Indicators: Primary Indicators (minimum of one required; che	ack all that anniv)	Secondar	y Indicators (minimum of two requ	uirad)
				FAC-Neutral Test (D5)
Surface Water (A1)	Water-Stained Leaves (B9)		e Soil Cracks (B6)	FAC-Neullal Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		ge Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1) ☐ Oxidized Rhizospheres on Living Roots (C3)		eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Kilizospheres on Living Kools (C3)		tion Visible on Aerial Imageny (CO)	
☐ Drift Deposits (B3)	Presence of Reduced Iron (C4)		tion Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)		d or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)		orphic Position (D2) w Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)			
Sparsely Vegetated Concave Surface (B8)		I IVIICIOI	opographic Relief (D4)	
Field Observations:	<u> </u>		Indicators of wetland hydrolog	y present? <u>No</u>
Surface water present?	Surface Water Depth (inches):		Indicators of wetland hydrolog Describe Recorded Data:	y present? <u>No</u>
Surface water present? Water table present?	Surface Water Depth (inches): Water Table Depth (inches): 17.8		, ,	y present? <u>No</u>
Surface water present? Water table present? Saturation present? (includes capillary fringe)	Surface Water Depth (inches): ✓ Water Table Depth (inches): Saturation Depth (inches):		, ,	y present? <u>No</u>
Surface water present? Water table present? Saturation present? (includes capillary fringe) Recorded Data: Aerial Photo Mo	Surface Water Depth (inches): Water Table Depth (inches): 17.8		, ,	y present? <u>No</u>
Surface water present? Water table present? Saturation present? (includes capillary fringe)	Surface Water Depth (inches): ✓ Water Table Depth (inches): Saturation Depth (inches):		, ,	y present? <u>No</u>

Project/Site:	Hinckley S	<u>Site</u>			Applicant/C	Owne	r: PolyMe	<u>t</u>	City/County:	Grasston, County	Pine	State:	MN	Sampling Date:	07/20/15
Investigator(s): k	ms2				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	<u>12U</u>
Land Form:	Terrace F	<u>lain</u>			Local Relie	ef: <u>N</u>	<u>lone</u>		Slope %:	<u>0</u> 5	Soil Map Ui	nit Name.	P- Pea	<u>nt</u>	
Subregion (LRR):	<u>K</u>				Latitude:	<u>5</u>	082104		Longitude:	490932		Datum:	UTM, N	AD 83, meters	
Cowardin Classific	cation:	<u>Jpland</u>			Circular 39	Clas	ssification:	<u>Upland</u>			Mapped	NWI Cla	ssification):	
Are climatic/hydrol	logic condit	ions or	the site typ	ical for this	time of year	r?	<u>Yes</u>	(If no, expla	ain in remarks	5)	Eggers	& Reed (j	orimary):	<u>Upland</u>	
Are vegetation	<u>No</u>	Soil	Yes	Hydrology	<u>No</u>	sian	ificantly disi	turbed?	Are "normal		00		secondary	<i>)):</i>	
rue regelation	<u></u>	00	<u> </u>	y u. o.ogy	110	o.g	mountry uno		circumstand present?	es	Eggers	& Reed (tertiary):		
Are vegetation	No	Soil	<u>No</u>	Hydrology	<u>No</u> /	natur	ally probler	natic?	ргезепт:		Eggers :	& Reed (quaternar	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No No No	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. 3 of 5 - Forest transect near well 16
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlan	nd Site ID: (Wetland 10)

Tree Stratum	(Plot Size: 3	<u>0 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum	-	2	50%
Populus tremuloides			10	Yes	FAC	Sapling/Shrub Stratum Herb Stratum	=	8 18	20 45
			0			Woody Vine Stratum	-	0 -	0
			0			Dominance Test Worksheet:	<u> </u>		
		T- (-1.0	0			∐			
Sapling/Shrub Stratu	m (Plot Size: 1	Total Cover:	<u>10</u>			Number of Dominant Species That Are OBL, FACW or FAC:		2 (A)	
Corylus cornuta	<u></u> (1.101-0.1201 <u></u>	<u>, , , , , , , , , , , , , , , , , , , </u>	25	Yes	FACU	Total Number of Dominant		6 <i>(B</i>)	
Populus tremuloides			10	Yes	FAC	Species Across All Strata:		<u> </u>	
Acer rubrum			5	No	FAC	Percent of Dominant Species That Are OBL, FACW or FAC:	33.339	% (A/B)	
			0			77107 052,77107 077707			
			0			Prevalence Index Worksheet:			
		Total Cover:	<u>40</u>			Total % Cover of:		fultiply by:	
Herb Stratum	(Plot Size: 5	<u>ft</u>				OBL Species 0	X 1	()
Pteridium aquilinum		<u>*</u>	30	Yes	FACU	FACW Species0	X 2	C)
Vaccinium angustifoli	um		25	Yes	FACU	FAC Species40	X 3	120)
Rubus allegheniensis			20	Yes	FACU	FACU Species 100	X 4	400)
Cornus racemosa			10	No	FAC	UPL Species 0	X 5	()
Acer rubrum			5	No	FAC	Column Totals: 140	(A)	520)
			0			Prevalence Index	` ′	3.71	_
			0			Hydrophytic Vegetation Indicators		0.7	
		T / 10	0			J	_		
	(1)	Total Cover:	<u>90</u>			No Rapid Test for Hydrop Dominance Test is >50	•	on	
Woody Vine Stratum	(Plot Size: 3	<u> </u>	1			No Prevalence Index ≤ 3.0			
			0			No Morphological Adapta	tions [1] (prov	ride supportir	ng c
		TatalOnic	0			in vegetation remarks	•	•	
Bare Ground in Herb St	ratum:	Total Cover:	<u>0</u> % Sphagnum	n Moss Cover:		No Problematic Hydrophy [1] Indicators of hydric soil & wetland	•	,	
				. 111033 00761.		disturbed or problematic.			
getation Remarks: (inc	ude photo numbers he	ere or on a separate s	sheet)			Hydrophytic vegetation present?	No		

SOIL Sampling Point: 12U

Profile Description: (Describe to the depth n Depth Matrix		rm the abscence of l	indicators).		
(inches) Color (moist)		% Type [1]	Loc [2]	Texture	Remarks
1 0 - 3 7.5YR 2.5/1	100			sil	w/light sand (whitish)
2 3 - 8 7.5YR 4/2	50			sl	layered
3. 3 - 8 7.5YR 2.5/1	50			sl	layered
4					
5					
6 [1] Type: C=Concentration, D=Depletion, RM		Sand Grains [2]	Location: F	PL=Pore Lining, M=Matrix.	_
Hydric Soil Indicators: (applicable to all LRR				icators for Problematic Hydric S	Coils [3]:
Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, ML	
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, ML)	RA 149R)		Coast Prairie Redox (A16) (LRR	
Black Histic (A3)	Polyvalue Below Surface (S8) (5 cm Mucky Peat or Peat (S3) (L	
	Thin Dark Surface (S9) (LRR R			Dark Surface (S7) (LRR K, L)	INN K, L, Ky
☐ Hydrogen Sulfide (A4)				, , ,	DD K I)
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRI	R K, L)		Polyvalue Below Surface (S8) (L	·
Depleted Below Dark Surface (A11) 	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K,	•
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) ((LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144)	4, <i>145, 149B)</i>
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetl	land hydrology must be present, unless distur	rbed or problematic.		Very Shallow Dark Surface (TF1	remarks)
	arse fragments			Hydric soil present?	<u>No</u>
IYDROLOGY Wetland Hydrology Indicators:					
Primary Indicators (minimum of one required	l; check all that apply)		Secondar	ry Indicators (minimum of two re	equired)
Surface Water (A1)	Water-Stained Leaves (B9))	Surfac	ce Soil Cracks (B6)	FAC-Neutral Test (D5
High Water Table (A2)	Aquatic Fauna (B13)		Draina	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		_	Trim Lines (B16)	
	Hydrogen Sulfide Odor (C1	·)		eason Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on			ish Burrows (C8)	
Sediment Deposits (B2)	Oxidized Niizospheres en	Erving Noois (66)		ation Visible on Aerial Imagery (Cs	2)
Drift Deposits (B3)	Presence of Reduced Iron	(C4)			7)
Algal Mat or Crust (B4)	Recent Iron Reduction in Ti			ed or Stressed Plants (D1)	
Iron Deposits (B5)	Thin Muck Surface (C7)		_	norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	_			ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)		Micro	topographic Relief (D4)	
Field Observations:				Indicators of wetland hydrol	ogy present? <u>No</u>
Surface water present?	Surface Water Depth (inche	es):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches)	:			
Saturation present? (includes capillary fringe	e) Saturation Depth (inches):				
Recorded Data: Aerial Photo	Monitoring Well Stream Gauge	Previous Inspe	ctions		
Hydrology Remarks:					

WETLAND DETERMINATION	N DATA	A FORN	/I - North	ncentral and Northea	nst Region
Project/Site: Hinckley Site Applicant/Ou	wner: PolyMe	<u>et</u> (City/County: Gra	asston, Pine State: <u>MN</u> Samp unty	oling Date: 07/30/14
Investigator(s): kms2, jtk Section:	<u>5</u>		Township: 39N	Range: 22W Samp	oling Point: W12
Land Form: Local Relief	None None		Slope %: <u>0</u>	Soil Map Unit Name: P - Peat	
Subregion (LRR): <u>K</u> Latitude:	5083259 ml	<u>N</u>	Longitude: 4911	182 mE Datum: <u>UTM, NAD 83,</u>	meters
Cowardin Classification: PEMC2 Circular 39	Classification:	Type 2		Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes Yes	(If no, explain	n in remarks)	Eggers & Reed (primary): <u>F</u>	resh (Wet) Meadow
Are vegetation No Soil Yes Hydrology No S	significantly dis	sturbod2	Are "normal circumstances"	Yes Eggers & Reed (secondary): Eggers & Reed (tertiary):	
Are vegetation No Soil No Hydrology No no	aturally problei	matic?	present?	Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Attach site map sho	owina sai	mplina n	oint locatio	ons transects important fe	eatures etc
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland? We General Remark (explain any ans if needed): No If yes, optional	Associates	ciated with We	II 3.	mo, a unocoo, important is	
	Absolute	Dominant	Indicator	50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: 30 ft	% Cover	Species?	<u>Status</u>	Tree Stratum	0 0
1.	0			Sapling/Shrub Stratum	0 0
2.	0			Herb Stratum	17 42.5
3.	0			Woody Vine Stratum	0 0
4.	0			<u>Dominance Test Worksheet:</u>	
Total Cover: Sapling/Shrub Stratum (Plot Size: 15 ft	<u>0</u>			Number of Dominant Species That Are OBL, FACW or FAC:	2 (A)
1.	0			Total Number of Dominant	4 <i>(</i> B)
2.	0			Species Across All Strata:	. (=/
3.	0			Percent of Dominant Species That Are OBL, FACW or FAC:	50.00% (A/B)
4.	0			 	
5.	0			Prevalence Index Worksheet:	
Total Cover:	<u>0</u>			Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft)	1 1		OBL Species	X 2 80
1. Trifolium pratense	25	Yes	FACU	TACW Species	X3 0
Taraxacum officinale Poa palustris	20	Yes	FACU FACW	FAC Species	
Salix petiolaris	20	Yes	FACW	FACU Species45	X 4 180
5.	0		171011	UPL Species0	X 5 <u>0</u>
6.	0			Column Totals:85	(A) <u>260</u> (B)
7.	0			Prevalence Index = E	3/A = 3.06
8.	0			Hydrophytic Vegetation Indicators:	
Total Cover:	<u>85</u>			No Rapid Test for Hydrophy	•
Woody Vine Stratum (Plot Size: 30 ft)			No Dominance Test is >50%	
1.	0			No Prevalence Index ≤ 3.0 [* No Morphological Adaptation	ns [1] (provide supporting data
2.	0			in vegetation remarks or	
Total Cover:	0			No Problematic Hydrophytic	Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	% Sphagnur	n Moss Cove	r:	[1] Indicators of hydric soil & wetland hyddisturbed or problematic.	drology must be present, unless
Vegetation Remarks: (include photo numbers here or on a separate	sheet)			Hydrophytic vegetation present?	<u>No</u>

Profile Description: (Describe to the depth need Depth Matrix	ded to document the indicator or confirm the abscence o Redox Features	of indicators).	
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture Remarks	:
1 0 - 6 10YR 2/1	100	Oa	
6 - 17 10YR 2/2	100		
3. 17 - 37 10YR 3/1	100	Oe	
4			
5			
6	educed Matrix, CS=Covered or Coated Sand Grains [
Hydric Soil Indicators: (applicable to all LRRs,		Indicators for Problematic Hydric Soils [3]:	
✓ Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA 149B)	
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L, R)	
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149)		
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
	<u> </u>		
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LRR K, L)	
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)	Iron-Manganese Masses (F12) (LRR K, L, R)	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA 149B)	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145, 149B)	
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21) Other (explain	n in soil
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless disturbed or problematic	c. Very Shallow Dark Surface (TF12) remarks)	
Restrictive Layer (if present): Type:	Depth (inches):	Hydric soil present? Yes	
YDROLOGY Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required; c	heck all that apply)	Secondary Indicators (minimum of two required)	
Surface Water (A1)	Water-Stained Leaves (B9)	Surface Soil Cracks (B6) FAC-Neutral 7	Test (D5
High Water Table (A2)	Aquatic Fauna (B13)	☐ Drainage Patterns (B10)	
_	Marl Deposits (B15)	Moss Trim Lines (B16)	
Saturation (A3)	Hydrogen Sulfide Odor (C1)	Dry-Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on Living Roots (C3)	Crayfish Burrows (C8)	
Sediment Deposits (B2)	Ostalzed Kilizosphores on Living Roots (C3)	Saturation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)	Stunted or Stressed Plants (D1)	
Iron Deposits (B5)		Geomorphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)	Shallow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	Microtopographic Relief (D4)	
Field Observations:		Indicators of wetland hydrology present?	<u>Vo</u>
Surface water present?	Surface Water Depth (inches):	Describe Recorded Data:	
Water table present?	Water Table Depth (inches): 13.4		
Saturation present? (includes capillary fringe)	Saturation Depth (inches):		
Recorded Data: Aerial Photo 🗸 N	fonitoring Well Stream Gauge Previous Insp	pections	
Hydrology Remarks:			
7			

Project/Site:	Hinckley	<u>Site</u>			Applicant/0	Ownei	r: PolyMet	<u>t</u>	City/County	Grasston County	Pine	State:	MN	Sampling Date:	07/20/15
Investigator(s):	kms2				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	<u>13U</u>
Land Form:	Terrace	Plain			Local Reli	ef: N	<u>lone</u>		Slope %:	<u>0</u> .5	Soil Map Ui	nit Name.	<u>P- Pea</u>	<u>at</u>	
Subregion (LRR).	: <u>K</u>				Latitude:	<u>5</u>	082113		Longitude:	<u>490965</u>		Datum:	UTM, N	AD 83, meters	
Cowardin Classifi	ication:	Upland	_		Circular 39	9 Clas	sification:	<u>Upland</u>			Mapped	NWI Cla	ssification) <i>:</i>	
Are climatic/hydro	ologic condi	itions o	n the site typ	oical for this	time of yea	r?	<u>Yes</u>	(If no, expla	ain in remark:	s)	Eggers a	& Reed (primary):	<u>Upland</u>	
Are vegetation	No	Soil	Yes	Hydrology	No	siani	ificantly dist	turbed?	Are "normal circumstant		00		secondary	y):	
J) 3)		,	,		present?	.es	00	& Reed (, ,		
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u>	natur	ally problen	natic?	p. ccom.		Eggers a	& Reed ('quaternar _.	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	No No No	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. 4 of 5 - Forest transect near well 16
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetla	nd Site ID: (Wetland 10)

VEGETATION

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		_	20% 12	<u>50%</u> 30
Populus tremuloides			60	Yes	FAC	Sapling/Shrub Strat	tum	=	18	45
			0			Herb Stratum Woody Vine Stratur		-	12	30
			0			- Woody Vine Stratum	11			U
			0			Dominance Test Wo	orksheet:			
Sapling/Shrub Stratum	(Plot Size:	Total Cover:	<u>60</u>			Number of Dominar That Are OBL, FAC		;	3 <i>(A)</i>	
Diervilla lonicera	(F10t 312e.	<u>151t</u>)	60	Yes	UPL	Total Number of Do			5 <i>(B</i>)	
Cornus racemosa			20	Yes	FAC	Species Across All	Strata:		5 <i>(B)</i>	
Rosa acicularis			5	No	FACU	Percent of Dominar That Are OBL, FAC		60.00%	6 (A/B)	
Ribes hirtellum			5	No	FACW	That Are OBL, FACI	W OF FAC:			
Tribos filitoliam			0		171011	Prevalence Index W	orksheet:			
		Total Cover:	90			Total % Cov	er of:	M	ultiply by:	
Herb Stratum	(Plot Size:	<u>5 ft</u>				OBL Species	0	X 1	(0
Vaccinium angustifoliur	n	,	40	Yes	FACU	FACW Species	20	X 2	40	0
Spiraea alba			15	Yes	FACW	FAC Species	80	X 3	240	0
Solidago canadensis			5	No	FACU	FACU Species	50	X 4	200	0
			0				60	X 5	300	0
			0			UPL Species _	210	(A)	78	_
			0			Column Totals: _	alence Index =	_		_
			0						3.7	ı
			0			Hydrophytic Vegetat				
		Total Cover:	<u>60</u>				st for Hydroph		n	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>					ce Test is >50% ce Index ≤ 3.0	•		
			0				ce index ≤ 3.0 ogical Adaptati		ida sunnarti	na d
			0				ition remarks o			g uc
		Total Cover:	<u>0</u>			No Problema	atic Hydrophyti	ic Vegetation	[1] (Explain)	
are Ground in Herb Stra	itum:	_	% Sphagnun	Moss Cover	: <u> </u>	[1] Indicators of hydric disturbed or problemat		/drology must l	oe present, un	less
etation Remarks: (inclu	do nhoto numboro	hara ar an a concrete	choot)			Hydrophytic vegetation	on procent?	No		

Profile Description: (Describe to the depth no	eeded to do		onfirm the		f indicators).		
(inches) Color (moist)	%	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 3 10YR 2/2	100					Sl	w/some white sand, 10%
2. 3 - 15 10YR 4/4	98	10YR 4/6	2	С	М	ls	faint conc.
3 -					-		
4 -						-	
5 -							
1] Type: C=Concentration, D=Depletion, RM	=Reduced I	Matrix, CS=Covered or Co	ated Sand	Grains [2] Location:	PL=Pore Lining, M=Matrix.	
lydric Soil Indicators: (applicable to all LRR	s, unless o	therwise noted)			Inc	licators for Problematic Hydric	Soils [3]:
Histosol (A1)		Stripped Matrix (S6)] 2 cm Muck (A10) (LRR K, L, M	LRA 149B)
Histic Epipedon (A2)		Dark Surface (S7) (LRR R	, MLRA 14	9B)		Coast Prairie Redox (A16) (LR	R K, L, R)
Black Histic (A3)		Polyvalue Below Surface ('S8) (LRR F	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (Li	RR R, MLR	PA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)		Loamy Mucky Mineral (F1)) (LRR K, L,)		Polyvalue Below Surface (S8) ((LRR K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K	(, L)
Thick Dark Surface (A12)		Depleted Matrix (F3)] Iron-Manganese Masses (F12)	(LRR K, L, R)
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19	P) (MLRA 149B)
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F)	7)			Mesic Spodic (TA6) (MLRA 144	4A, 145, 149B)
Sandy Redox (S5)		Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
3] Indicators of hydrophytic vegetation and wetla	and hydrolog	av must be present, unless	disturbed a	or problematic		Very Shallow Dark Surface (TF	
	arse fragme		th (inches			Hydric soil present?	<u>No</u>
YDROLOGY Vetland Hydrology Indicators:							
rimary Indicators (minimum of one required	; check all	that apply)			Seconda	ry Indicators (minimum of two	required)
Surface Water (A1)		Water-Stained Leaves	s (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
] High Water Table (A2)		Aquatic Fauna (B13)			Drair	age Patterns (B10)	
Saturation (A3)		Marl Deposits (B15)			Moss	Trim Lines (B16)	
Water Marks (B1)		Hydrogen Sulfide Odd	or (C1)		Dry	Season Water Table (C2)	
Sediment Deposits (B2)		Oxidized Rhizosphere	s on Living	Roots (C3)	Cray	fish Burrows (C8)	
Drift Deposits (B3)					Satu	ration Visible on Aerial Imagery (C	<i>C9)</i>
Algal Mat or Crust (B4)		Presence of Reduced	Iron (C4)		Stun	ed or Stressed Plants (D1)	
Iron Deposits (B5)		Recent Iron Reduction	in Tilled S	ioils (C6)	Geor	norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)		Thin Muck Surface (C	7)		Shall	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)		Other (explain in rema	nrks)		Micro	topographic Relief (D4)	
ield Observations:						Indicators of wetland hydro	ology present? <u>No</u>
Surface water present?		Surface Water Depth (i	,			Describe Recorded Data:	
Water table present?	, _	Water Table Depth (inc					
Saturation present? (includes capillary fringe)	Saturation Depth (inch	es):	<u> </u>			
ecorded Data: Aerial Photo	Monitorin	g Well Stream Gau	ge 🗌 F	Previous Insp	ections		
lydrology Remarks:							

WETLAND DETE	RMINATION	DATA FORI	W - North	central and Northea	ast Region
Project/Site: Hinckley Site	Applicant/Owne	er: PolyMet	City/County: Gra	<u>nsston, Pine</u> State: <u>MN</u> Samp unty	pling Date: 07/30/14
Investigator(s): kms2, jtk	Section: 5	<u>5</u>	Township: 39N	Range: 22W Sam	pling Point: W13
Land Form:	Local Relief:	None_	Slope %: <u>0</u>	Soil Map Unit Name: P - Peat	
Subregion (LRR): <u>K</u>	Latitude:	5083232 mN	Longitude: 49138	87 mE Datum: UTM, NAD 83	s, meters
Cowardin Classification: PEMC2	Circular 39 Clas	ssification: Type 2		Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typic	cal for this time of year?	Yes (If no, expla	ain in remarks)	Eggers & Reed (primary):	Fresh (Wet) Meadow
Are vegetation No Soil Yes	Hydrology <u>No</u> sign	nificantly disturbed?	Are "normal circumstances"	Yes Eggers & Reed (secondary): Eggers & Reed (tertiary):	
Are vegetation No Soil No	Hydrology <u>No</u> natui	rally problematic?	present?	Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Attac	-	ving sampling p	oint locatio		eatures, etc.
Hydric soil present?	Yes General Remarks Yes (explain any answe	Associated with W	ell 4.		
	No If yes, optional We	etland Site ID: Wet	land 13		
·	<u>110</u> y 00, 0p 110	<u> </u>	<u>ana 10</u>		
VEGETATION					
		Absolute Dominant		50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size:	<u>30 ft</u>	% Cover Species?	<u>Status</u>	Tree Stratum	0 0
1.		0		Sapling/Shrub Stratum Herb Stratum	<u>0</u> 0 16 40
2.		0		Woody Vine Stratum	$\frac{10}{0} \frac{40}{0}$
3.		0			
4.		0		Dominance Test Worksheet:	
	Total Cover:	<u>0</u>		Number of Dominant Species That Are OBL, FACW or FAC:	1 (A)
<u>Sapling/Shrub Stratum</u> (Plot Size:	<u>15 ft</u>			Total Number of Dominant	
1.		0		Species Across All Strata:	2 <i>(B</i>)
2. 3.		0 0		Percent of Dominant Species	50.00% (A/B)
4.		0		That Are OBL, FACW or FAC:	
5.		0		Prevalence Index Worksheet:	
	Total Cover:	<u>0</u>		Total % Cover of:	Multiply by:
Herb Stratum (Plot Size:	<u>5 ft</u>			OBL Species 25	X 1 25
Trifolium pratense		25 Yes	FACU	FACW Species30	X 2 60
2. Carex vulpinoidea		25 Yes	OBL	FAC Species 0	X 3 0
3. Poa palustris		10 No	FACW	FACU Species 25	X 4 100
4. Doellingeria umbellata		10 No	FACW	UPL Species0	X 5 0
5. Solidago gigantea		10 No	FACW	Column Totals: 80	(A) 185 (B)
6.		0		Prevalence Index = 1	
7.		0		Hydrophytic Vegetation Indicators:	
8.	Total Cover:	0		No Rapid Test for Hydrophy	utic Vegetation
West Viscous (Plot Sizes		<u>80</u>		No Dominance Test is >50%	•
Woody Vine Stratum (Plot Size:	3011			Yes Prevalence Index ≤ 3.0 [
1.		0			ons [1] (provide supporting data
2.	Total Cover:	0		in vegetation remarks of	•
	rotar Cover:	<u>0</u>			ic Vegetation [1] (Explain)
% Bare Ground in Herb Stratum:	_ %	Sphagnum Moss Cov	er:	[1] Indicators of hydric soil & wetland hy disturbed or problematic.	varology must be present, unless
Vegetation Remarks: (include photo numbers	here or on a separate sh	neet)		Hydrophytic vegetation present?	<u>Yes</u>

SOIL Sampling Point: <u>W13</u>

Profile Description: (Describe to the depth need Depth Matrix	ed to document the indicator or confin Redox F		findicators).		
' ————————————————————————————————————		% Type [1]	Loc [2]	Texture	Remarks
0 - 6 10YR 2/1	100			Oa	 -
2. 6 - 19 10YR 2/2	100			Oe	
3. <u>19 - 36</u> <u>10YR 2/1</u>	100			Oa	
4					
5					
[1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated	Sand Grains [2	Location: F	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)		Ind	icators for Problematic Hydric Soi	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)			2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLR	RA 149B)		Coast Prairie Redox (A16) (LRR K	, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (L	LRR R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRR R,	MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRF	R K, L)		Polyvalue Below Surface (S8) (LR.	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless distur	bed or problematic.		Very Shallow Dark Surface (TF12)	
Restrictive Layer (if present): Type:	Depth (in			Hydric soil present?	<u>Yes</u>
Soil Remarks: HYDROLOGY					
Wetland Hydrology Indicators:	and all that and a		On a small state of the state o	and a disasterna (minimum afterna man	order all
Primary Indicators (minimum of one required; ch				ry Indicators (minimum of two req	
Surface Water (A1)	Water-Stained Leaves (B9)			ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		_	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)		_	Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor (C1)			eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on L	Living Roots (C3)		ish Burrows (C8)	
Drift Deposits (B3)	Presence of Reduced Iron ((CA)		ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Til			ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)	100 30113 (00)		norphic Position (D2)	
☐ Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)			ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Outer (explain in remains)		IVIICTO	topographic Relief (D4)	
Field Observations:		,		Indicators of wetland hydrolog	gy present? <u>No</u>
Surface water present?	Surface Water Depth (inches	· —		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):	14.2			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):				
	onitoring Well Stream Gauge	Previous Insp	ections		
Hydrology Remarks:					

Project/Site:	Hinckley S	<u>Site</u>			Applicant/0	Owner	r: PolyMet	İ	City/County:	Grassto County	n, Pine	State:	MN	Sampling Date:	07/20/15
Investigator(s):	kms2				Section:	<u>5</u>			Township:	<u>39N</u>		Range:	<u>22W</u>	Sampling Point:	<u>14U</u>
Land Form:	Terrace F	<u>Plain</u>			Local Reli	ef: N	<u>lone</u>		Slope %:	<u>0</u>	Soil Map U	nit Name	: <u>P- Pea</u>	<u>at</u>	
Subregion (LRR):	<u>K</u>				Latitude:	<u>5</u>	082122		Longitude:	<u>490998</u>		Datum:	UTM, N	AD 83, meters	
Cowardin Classifi	cation:	Upland			Circular 39	9 Clas	sification:	<u>Upland</u>			Mapped	NWI Cla	ssification) <i>:</i>	
Are climatic/hydro	logic condi	tions or	n the site typ	ical for this	time of yea	r?	<u>Yes</u>	(If no, expla	in in remarks	5)	Eggers	& Reed ((primary):	<u>Upland</u>	
Are vegetation	No	Soil	<u>Yes</u>	Hydrology	No	signi	ificantly dist	urbed?	Are "normal circumstance		_ 00	•	secondary	y):	
Are vegetation	No	Soil	No	Hydrology		natur	ally problen	natic?	present?	ເວລ	00	& Reed (& Reed (tertiary): (quaternar ₎	y):	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	<u>No</u> <u>No</u> No	General Remarks (explain any answers if needed):	Soils data are from the 1941 Soil Survey of Pine county archived on the NRCS Web Soil Survey. 5 of 5 - Forest transect near well 16
Is the sampled area within a wetland?	No	If yes, optional Wetlan	nd Site ID: (Wetland 10)

VEGETATION

<u>Tree Stratum</u>	(Plot Size: <u>30</u>	<u>ft</u>)	Absolute % Cover	<u>Dominant</u> <u>Species?</u>	Indicator Status	50/20 Thresholds: Tree Stratum		-	<u>20%</u> 4		50% 10
Populus tremuloides			20	Yes	FAC	Sapling/Shrub Strat	tum	-	17		42.5
			0			Herb Stratum Woody Vine Stratum	n	=	7		17.5 0
			0			Woody Vine Stratum		-	0		U
			0			<u>Dominance Test Wo</u>	orksheet:				
Sapling/Shrub Stratum	(Plot Size: 15	Total Cover:	<u>20</u>			Number of Dominar That Are OBL, FAC		<u>, </u>	1	(A)	
Vaccinium angustifolium	<u> </u>	<u>, , , , , , , , , , , , , , , , , , , </u>	40	Yes	FACU	Total Number of Do			4	(B)	
Ribes cynosbati			20	Yes	FACU	Species Across All			_	(0)	
Corylus cornuta			15	No	FACU	Percent of Dominan That Are OBL, FACI		25.00	%	(A/B)	
Cornus racemosa			10	No	FAC				_		
			0			Prevalence Index W	orksheet:				
		Total Cover:	<u>85</u>			Total % Cove	er of:		Multip	ly by:	
Herb Stratum	(Plot Size: 5 f	<u>t</u>)				OBL Species	0	X 1		0	
Solidago canadensis		·	30	Yes	FACU	FACW Species	5	X 2		10	
Solidago gigantea			5	No	FACW	FAC Species _	30	X 3		90	
			0			111	105	X 4		420	
						II FACU Species	105	A 4			
			0			FACU Species _	0	X 5		0	
			0			UPL Species _					•
			0 0			UPL Species _ Column Totals: _	0 140	X 5 (A)		520	•
			0 0			UPL Species _ Column Totals: _ Preva	0 140 alence Index =	X 5 (A) B/A =			•
		T.(10)	0 0 0			UPL Species Column Totals: Preve	0 140 alence Index =	X 5 (A) B/A =		520	•
		Total Cover:	0 0			UPL Species Column Totals: Prevention Hydrophytic Vegetat No Rapid Te	0 140 alence Index = tion Indicators: st for Hydroph	X 5 (A) B/A =	ion	520	•
Woody Vine Stratum	(Plot Size: <u>30</u>		0 0 0 0 35			UPL Species Column Totals: Preva Hydrophytic Vegetat No Rapid Te No Dominan	0 140 alence Index =	X 5 (A) B/A = ytic Vegetati	ion	520	•
Woody Vine Stratum	(Plot Size: 30		0 0 0 0 0 35			UPL Species Column Totals: Preva Hydrophytic Vegetat No Rapid Te No Dominan No Prevalence No Morpholo	0 140 alence Index = ion Indicators: st for Hydroph ice Test is >509 ce Index ≤ 3.0 pgical Adaptati	X 5 (A) B/A = ytic Vegetati % [1] ons [1] (pro	vide s	520 3.71 upportin	•
Woody Vine Stratum	(Plot Size: 30	<u>ft</u>)	0 0 0 0 0 35			UPL Species Column Totals: Preva Hydrophytic Vegetat No Rapid Te No Dominan No Prevalen No Morpholo in vegeta	0 140 alence Index = ion Indicators: st for Hydroph ice Test is >50% ce Index ≤ 3.0 pgical Adaptati ition remarks o	X 5 (A) B/A = ytic Vegetati % [1] ons [1] (prov	vide s ate sh	520 3.71 upportin	•
Woody Vine Stratum	(Plot Size: 30		0 0 0 0 0 35			UPL Species Column Totals: Preva Hydrophytic Vegetat No Rapid Te No Dominan No Prevalent No Morpholo in vegetat No Problema	0 140 alence Index = tion Indicators: st for Hydroph nce Test is >50% ce Index ≤ 3.0 pogical Adaptati tion remarks o atic Hydrophyti	X 5 (A) B/A = ytic Vegetati % [1] ons [1] (prover on a separatic Vegetation	vide s ate sh 1 [1] (E	520 3.71 upportin eet) Explain)	g d
Woody Vine Stratum		Total Cover:	0 0 0 0 35	n Moss Cover		UPL Species Column Totals: Preva Hydrophytic Vegetat No Rapid Te No Dominan No Prevalen No Morpholo in vegeta	0 140 alence Index = tion Indicators: st for Hydroph nce Test is >50% ce Index ≤ 3.0 pogical Adaptati tion remarks o atic Hydrophyti soil & wetland hy	X 5 (A) B/A = ytic Vegetati % [1] ons [1] (prover on a separatic Vegetation	vide s ate sh 1 [1] (E	520 3.71 upportin eet) Explain)	g d

Profile Description: (Describe to the depth no Depth Matrix	eeded to document the i	ndicator or confirm the Redox Featur		f indicators).		
(inches) Color (moist)	% Color (moist) %	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 3 7.5YR 2.5/1	100				sil	w/white sand
2. 3 - 12 10YR 4/2	60 7.5YR 4/4	40			ls	
3. <u>12 - 20</u> <u>10YR 4/2</u>	40 7.5YR 4/4	30			lfs	w/gravels
4 -	7.5YR 4/6					_
5	7.5YR 3/4	5				_
6	=Reduced Matrix, CS=C	overed or Coated Sand	Grains [2		PL=Pore Lining, M=Matrix.	_
Hydric Soil Indicators: (applicable to all LRR				Inc	licators for Problematic Hydric S	coils [3]:
Histosol (A1)	Stripped Mati				2 cm Muck (A10) (LRR K, L, ML)	
Histic Epipedon (A2)		(S7) (LRR R, MLRA 149	OR)		Coast Prairie Redox (A16) (LRR	
				D)		•
Black Histic (A3)		low Surface (S8) (LRR R		5) _	5 cm Mucky Peat or Peat (S3) (L	.KK N, L, K)
Hydrogen Sulfide (A4) 		rface (S9) (LRR R, MLR.	•		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky	Mineral (F1) (LRR K, L))		Polyvalue Below Surface (S8) (L	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleye	d Matrix (F2)			Thin Dark Surface (S9) (LRR K,	L)
Thick Dark Surface (A12)	Depleted Mai	rix (F3)] Iron-Manganese Masses (F12) ((LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark S	Surface (F6)			Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dar	k Surface (F7)			Mesic Spodic (TA6) (MLRA 144)	4, <i>145, 149B)</i>
Sandy Redox (S5)	Redox Depre				Red Parent Material (F21)	
_					Very Shallow Dark Surface (TF1	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetla Restrictive Layer (if present): Type:	and hydrology must be pre	sent, unless disturbed of Depth (inches		;	Hydric soil present?	<u>No</u>
Soil Remarks:						
YDROLOGY						
Netland Hydrology Indicators:	s abook all that apply)			Sacanda	muladiantara (minimum of two r	aguirad)
Primary Indicators (minimum of one required					ry Indicators (minimum of two re	• •
Surface Water (A1)		ained Leaves (B9)		_	ce Soil Cracks (B6)	FAC-Neutral Test (D
☐ High Water Table (A2)	Aquatic F	auna (B13)		Drain	age Patterns (B10)	
Saturation (A3)	Marl Dep	osits (B15)		Moss	Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogei	Sulfide Odor (C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized	Rhizospheres on Living	Roots (C3)	Cray	ish Burrows (C8)	
Drift Deposits (B3)					ration Visible on Aerial Imagery (C	9)
<u> </u>	Presence	of Reduced Iron (C4)			ed or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent II	on Reduction in Tilled Se	oils (C6)		norphic Position (D2)	
Iron Deposits (B5)	_	k Surface (C7)		_	,	
Inundation Visible on Aerial Imagery (B7)	<u> </u>	plain in remarks)			ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Olinei (ex	piaiii iii remarks)		Micro	topographic Relief (D4)	
Field Observations:					Indicators of wetland hydrol	ogy present? <u>No</u>
Surface water present?	Surface W	ater Depth (inches):			Describe Recorded Data:	
Water table present?	Water Tab	e Depth (inches):				
Saturation present? (includes capillary fringe) Saturation	Depth (inches):				
Recorded Data: Aerial Photo	Monitoring Well	Stream Gauge P	revious Ins	ections		
Hydrology Remarks:	- Ц	- Ш	•			

WETLAND DE	TERMINATION	DATA FORI	И - North	central and Northe	east Region
Project/Site: Hinckley Site	Applicant/Own	ner: PolyMet	City/County: Gras Cour		mpling Date: 07/30/14
Investigator(s): kms2, jtk	Section:	<u>5</u>	Township: 39N	Range: <u>22W</u> Sai	mpling Point: W14
Land Form:	Local Relief:	None	Slope %: <u>0</u>	Soil Map Unit Name: P - Peat	
Subregion (LRR): <u>K</u>	Latitude:	5083240 mN	Longitude: 49166	<u>Datum: UTM, NAD 8</u>	33, meters
Cowardin Classification: PEMC2	Circular 39 Cl	assification: Type 2		Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site	e typical for this time of year?	Yes (If no, explai	in in remarks)	Eggers & Reed (primary):	Fresh (Wet) Meadow
Are vegetation No Soil Yes	-	unificantly disturbed?		Yes Eggers & Reed (secondary):	
Are vegetation No Soil No	Hydrology No nati	urally problematic?	present?	Eggers & Reed (tertiary): Eggers & Reed (quaternary):	
<i>y</i> — —	, s, <u> </u>	3,			
SUMMARY OF FINDINGS - A	ttach site map sho	wing sampling p	oint location	ıs, transects, ımportant	teatures, etc.
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland?	Yes General Remarks Yes (explain any answ if needed): No If yes, optional W				
<u> </u>	No If yes, optional W	venario site ib. <u>vvena</u>	and 14		
VEGETATION					
		Absolute Dominant	Indicator	50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Si	ize: <u>30 ft</u>)	% Cover Species?	<u>Status</u>	Tree Stratum	0 0
1.		0		Sapling/Shrub Stratum	0 0
2.		0		Herb Stratum	15 37.5
3.		0		Woody Vine Stratum	00
4.		0		Dominance Test Worksheet:	
	Total Cover:	<u>0</u>		Number of Dominant Species	3 (A)
Sapling/Shrub Stratum (Plot Si	ize: <u>15 ft</u>)			That Are OBL, FACW or FAC:	
1.		0		Total Number of Dominant Species Across All Strata:	3 <i>(B)</i>
2.		0		Percent of Dominant Species	
3.		0		That Are OBL, FACW or FAC:	100.00% (A/B)
4.		0		5 1 11 11 11 1	
5.		0		Prevalence Index Worksheet:	
	Total Cover:	<u>0</u>		Total % Cover of:	Multiply by:
<u>Herb Stratum</u> (Plot Si	ize: <u>5 ft</u>)			OBL Species 50	X 1 50
Carex lacustris		30 Yes	OBL	FACW Species15	X 2 30
Carex vulpinoidea		20 Yes	OBL	FAC Species5	X 3 15
3. Urtica dioica		5 No Yes	FAC	FACU Species5	X 4 20
4. Salix petiolaris		15	FACW	UPL Species0	X 5 0
5. Trifolium repens		5 No	FACU	Column Totals:75	(A) 115 (B)
6. 7.		0		Prevalence Index =	= B/A = 1.53
8.		0		Hydrophytic Vegetation Indicators	<u>X</u>
	Total Cover:	<u>75</u>		No Rapid Test for Hydrop	hytic Vegetation
Woody Vine Stratum (Plot Si	ize: 30 ft)	<u>15</u>		Yes Dominance Test is >50	0%
1.	, <u></u>	0		Yes Prevalence Index ≤ 3.0	[1]
2.		0			tions [1] (provide supporting data or on a separate sheet)
-	Total Cover:	<u>0</u>		1	or on a separate sneet) tic Vegetation [1] (Explain)
9/ Boro Cround in Harb Stratum		_		[1] Indicators of hydric soil & wetland	
% Bare Ground in Herb Stratum:		% Sphagnum Moss Cove	·	disturbed or problematic.	
Vegetation Remarks: (include photo num	bers here or on a separate s	heet)		Hydrophytic vegetation present?	<u>Yes</u>

	Redox Features		
	% Color (moist) % Type [1]	Loc [2] Texture Remarks	•
0 - 5 10YR 2/1	100	<u>Oa</u>	
5 - 19 10YR 2/2 10YR 3/1	100	<u>Oe</u> Oa	
24 - 34 10YR 2/1	100		
-			
<u>-</u>			
7 Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains	2] Location: PL=Pore Lining, M=Matrix.	
rdric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)	Indicators for Problematic Hydric Soils [3]:	
Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA 149B)	
] Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L, R)	
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149	7B) 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)	
] Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LRR K, L)	
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (LRR K, L, R)	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA 149B)	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145, 149B)	
Sandy Redox (S5)	Redox Depressions (F8)	Pod Parant Material (E21)	
	•	- Van Challey Dark Cyrfees (TE12) remarks)	in soil
	hydrology must be present, unless disturbed or problemation	C. Very Shahow Bark Surface (17-12)	
estrictive Layer (if present): Type:	Depth (inches):	Hydric soil present? Yes	
oil Romarks:	• • • • • • • • • • • • • • • • • • • •	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
/DROLOGY			
/DROLOGY /etland Hydrology Indicators:			
POROLOGY Setland Hydrology Indicators: Simary Indicators (minimum of one required; ch	neck all that apply)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral	Test (D9
POROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch	neck all that apply) Water-Stained Leaves (B9)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral	Test (D9
POROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral Companies Patterns (B10)	Test (DS
POROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16)	Test (DS
TOROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral in the prainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2)	Test (DS
/DROLOGY /etland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	neck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8)	Test (DS
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	meck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral in the properties of the properties	Test (D9
/DROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; chase) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	meck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	Test (D5
YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral in the property of the pr	Test (D9
POROLOGY Setland Hydrology Indicators: rimary Indicators (minimum of one required; chase) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	meck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	Test (DS
retland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral in the property of the pr	Test (DS
fetland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	meck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	Test (D.
TOROLOGY Tetland Hydrology Indicators: Trimary Indicators (minimum of one required; chase) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	meck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	
fetland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	meck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	
retland Hydrology Indicators: rimary Indicators (minimum of one required; ch Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) eld Observations: urface water present?	meck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Secondary Indicators (minimum of two required) Surface Soil Cracks (B6) FAC-Neutral (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	

Part Part	WETLAND DETERMINATION	N DATA	FORM	1 - North	central and Northea	ast Region				
Local Foot Supple Suppl	Project/Site: Hinckley Site Applicant/On	wner: PolyMet				oling Date: 07/30/14				
Substitution Consideration Investigator(s): kms2, jtk Section:	<u>5</u>		Township: 39N	Range: 22W Samp	pling Point: W15					
Control Classification E_MC Control Service F_MC Control S	Land Form: Local Relies	. None		Slope %: <u>0</u>	Soil Map Unit Name: P - Peat					
Are expectation No Soil Yes Hydrology No Significantly disturbed? Are regretation No Soil Yes Hydrology No Significantly disturbed? Are regretation No Soil No Hydrology No Significantly disturbed? Are regretation No Soil No Hydrology No Significantly disturbed? Are regretation No Soil No Hydrology No Significantly disturbed? Are regretation No No No No No No No	Subregion (LRR): <u>K</u> Latitude:	5082906 mN	<u>.</u>	Longitude: 4908	33 mE Datum: UTM, NAD 83	, meters				
Accordance Acc	Cowardin Classification: PEMC2 Circular 39	Classification:	Type 2		Mapped NWI Classification:					
Are vegetation by Soil Vos I lydrology to Springerally disturbed and every present? SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc. Hydrologic registation present? Vege Canada Remarks Associated with Well 8. Associated with Well 8.		? Yes	(If no. explain	n in remarks)	Eggers & Reed (primary): F	Fresh (Wet) Meadow				
Accordation No Soil No No No No No No No N			urhad?	Are "normal	Yes Eggers & Reed (secondary):	<u> </u>				
### Cround in Horb Stratum Post Stratum Chot Size: 15 ft 10 10 10 10 10 10 10 1	Are vegetation No. Soil No. Hydrology No. r.	aturally problem								
Production Pro				- ! 4 ! 4! -		4				
Vest Content SUMMARY OF FINDINGS - Attach site map sh	owing san	npiing po	oint locatio	ns, transects, important to	eatures, etc.					
	Hydric soil present? Yes (explain any ans if needed): Indicators of wetland hydrology present? No If yes, optional	swers								
Tree Stratum	VEGETATION									
1					50/20 Thresholds:	<u>20%</u> <u>50%</u>	<u>ó</u>			
Note	<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>) <u>% Cover</u>	Species?	<u>Status</u>						
	1.	0			II					
1	2.	0								
Total Cover: Q Number of Dominant Species A (B)	3.	0			woody vine Stratum		_			
That Are OBL, FACW or FAC: 2 (A) That Are OBL, FACW or FAC: 2 (A)	4.	0			<u>Dominance Test Worksheet:</u>					
Total Cover: Sociadago gigantea Total Cover: Sociadago gig		<u>0</u>				2 (A)				
2.		,				A (P)				
3.		4			Species Across All Strata:					
Total Cover: O						50.00% (A/B)				
Prevalence Index Worksheet: Total Cover: O					That Are OBL, FACW of FAC.					
Total Cover: 0					Prevalence Index Worksheet:					
Poa palustris					Total % Cover of:	Multiply by:				
Poa palustris	Herb Stratum (Plot Size: 5 ft	1			OBL Species 0	X 1 0				
20	<u> </u>	20	Yes	FACW	50	X 2 100				
3. Salix petiolaris 4. Trifolium pratense 5. Doellingeria umbellata 6. Solidago gigantea 7. Total Cover: Woody Vine Stratum 7. Total Cover: Total Cover: Total Cover: O Sphagnum Moss Cover: Sphagnum Moss Cover: FACU FACU FACU FACU FACU FACU FACU FAC	· ·					X 3 0				
Trifolium pratense Doellingeria umbellata Solidago gigantea Total Cover: Woody Vine Stratum (Plot Size: 30 ft) Total Cover: 0 No Rapid Test for Hydrophytic Vegetation No Rapid Test for Hydrophytic Vegetation No Dominance Test is >50% Yes FACU FACW FACU FAC			Yes		40	X 4 160				
5. Doellingeria umbellata 6. Solidago gigantea 7. O	4. Trifolium pratense	20	Yes	FACU	PACO Species					
Solidago gigantea No Prevalence Index = B/A = 2.89 Hydrophytic Vegetation Indicators: No Rapid Test for Hydrophytic Vegetation No Dominance Test is >50% Yes Prevalence Index ≤ 3.0 [1] No Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet) No Problematic Hydrophytic Vegetation [1] (Explain) Share Ground in Herb Stratum: No Problematic Hydrophytic Vegetation [1] (Explain) [1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.	5. Doellingeria umbellata	5	No	FACW	UPL Species		D)			
Hydrophytic Vegetation Indicators: No Rapid Test for Hydrophytic Vegetation	6. Solidago gigantea	5	No	FACW	Column Totals.		D)			
No Rapid Test for Hydrophytic Vegetation No Dominance Test is >50% Yes Prevalence Index ≤ 3.0 [1] No Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet) No Problematic Hydrophytic Vegetation [1] (Explain)	7.	0				B/A = 2.89				
Woody Vine Stratum (Plot Size: 30 ft) No Dominance Test is >50% Yes Prevalence Index ≤ 3.0 [1] No Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet) No Problematic Hydrophytic Vegetation [1] (Explain)	8.	0			Hydrophytic Vegetation Indicators:					
Yes Prevalence Index ≤ 3.0 [1]	Total Cover:	<u>90</u>			 ' ' ' ' '	•				
1. O Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet) No Problematic Hydrophytic Vegetation [1] (Explain) **Bare Ground in Herb Stratum: % Sphagnum Moss Cover: [1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.	Woody Vine Stratum (Plot Size: 30 ft)			<u> </u>					
In vegetation remarks or on a separate sheet) No Problematic Hydrophytic Vegetation [1] (Explain) No Bare Ground in Herb Stratum: % Sphagnum Moss Cover: in vegetation remarks or on a separate sheet) No Problematic Hydrophytic Vegetation [1] (Explain) [1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.	1.	0				•	ata.			
Total Cover: 0 No Problematic Hydrophytic Vegetation [1] (Explain) % Bare Ground in Herb Stratum: % Sphagnum Moss Cover: [1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.	2.	0					ıld			
% Bare Ground in Herb Stratum: % Sphagnum Moss Cover: disturbed or problematic.	Total Cover:	<u>0</u>			No Problematic Hydrophytic Vegetation [1] (Explain)					
Vegetation Remarks: (include photo numbers here or on a separate sheet) Hydrophytic vegetation present? Yes	% Bare Ground in Herb Stratum:	% Sphagnum	Moss Cover	r:		drology must be present, unless				
	Vegetation Remarks: (include photo numbers here or on a separate	sheet)			Hydrophytic vegetation present?	<u>Yes</u>	_			

Depth Matrix	ded to document the indicator or confirm the abscence of Redox Features	rindicators).	
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
1 0 - 4 10YR 2/1	100	 Oa	-
2 4 - 13 10YR 2/2	100	Oe	
3. 13 - 24 10YR 3/1	100	Oe	
4. 24 - 39 10YR 2/1	100	Oa	
5			
6		The second secon	
	,	Location: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	_	Indicators for Problematic Hydric S	
✓ Histosol (A1)	☐ Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, ML)	RA 149B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 1498	B) 5 cm Mucky Peat or Peat (S3) (L	.RR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (L	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K,	L)
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19)	·
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144)	
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	
	_ , , , , ,		Other (explain in soil remarks)
	d hydrology must be present, unless disturbed or problematic.	Very Shallow Dark Surface (TF1	2) remano,
Restrictive Layer (if present): Type:	Depth (inches):	Hydric soil present?	<u>Yes</u>
IYDROLOGY Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required; o	heck all that apply)	Secondary Indicators (minimum of two re	equired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surface Soil Cracks (B6)	
☐ High Water Table (A2)		Currace Con Cracks (Do)	FAC-Neutral Test (D5)
	Aquatic Fauna (B13)	☐ Drainage Patterns (B10)	FAC-Neutral Test (D5)
_	☐ Aquatic Fauna (B13) ☐ Marl Deposits (B15)		FAC-Neutral Test (D5)
Saturation (A3)		☐ Drainage Patterns (B10)	FAC-Neutral Test (D5)
Saturation (A3) Water Marks (B1)	Marl Deposits (B15)☐ Hydrogen Sulfide Odor (C1)	☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2)	FAC-Neutral Test (D5)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	Marl Deposits (B15)	☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8)	
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	 Marl Deposits (B15) ☐ Hydrogen Sulfide Odor (C1) ☐ Oxidized Rhizospheres on Living Roots (C3) 	 □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) 	
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	 □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) 	
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	 Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) 	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	 □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) 	
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	 Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) 	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	 □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) □ Geomorphic Position (D2) □ Shallow Aquitard (D3) 	9)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	9)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	9)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches):	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	9)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches): 16.8	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C3) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrol Describe Recorded Data:	9)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? (includes capillary fringe)	Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches): 16.8 Saturation Depth (inches):	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C3) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrol Describe Recorded Data:	9)

WEILAND DEIER	WINATION DAT	A FURIN -	Nortncentral	and Nortnea	ast Region	1
Project/Site: Hinckley Site	Applicant/Owner: Polyl	Met City/	County: Grasston, Pine County	State: MN Samp	pling Date: 07/30/14	<u>ļ</u>
Investigator(s): kms2, jtk	Section: 5	Tow	nship: 39N	Range: 22W Sam	pling Point: W16	
Land Form:	Local Relief: None	Slop	ne %: 0 Soil Map	Unit Name: P - Peat		
Subregion (LRR): <u>K</u>	Latitude: 5082853	mN Long	gitude: 491493 mE	Datum: UTM, NAD 83	3. meters	
Cowardin Classification: PEMC2	Circular 39 Classification		, <u>——</u>	ed NWI Classification:	<u>,</u>	
Are climatic/hydrologic conditions on the site typical		(If no, explain in i			Fresh (Wet) Meadow	
		Are		s & Reed (secondary):	Testi (Wet) Meadow	
Are vegetation No Soil Yes Hy	drology <u>No</u> significantly of	disturbed? circu	ımstances" Egger:	s & Reed (tertiary):		
Are vegetation No Soil No Hyd	drology <u>No</u> naturally prob	pres	sent? Eggers	s & Reed (quaternary):		
SUMMARY OF FINDINGS - Attach	site map showing s	ampling poin	t locations, trans	ects, important f	eatures, etc.	
Hydrophytic vegetation present? Yes		sociated with Well 6.				
Hydric soil present? Yes	s (explain any answers if needed):					
Indicators of wetland hydrology present?	2					
Is the sampled area within a wetland? No	If yes, optional Wetland Si	te ID: Wetland 1	<u>6</u>			
VEGETATION						
	Absolut	te Dominant Ir	ndicator 50/20 Thre	esholds:	20%	<u>50%</u>
Tree Stratum (Plot Size: 30	9/ Cava		tatus Tree Strate	um	0	0
` _			Sapling/SI	hrub Stratum	0	0
1. 2.	0		Herb Strat	um	12	30
3.	0		Woody Vii	ne Stratum	0	0
4.	0		Dominanc	e Test Worksheet:		
	Total Cover: 0	- L L	Number of	f Dominant Species		
Sapling/Shrub Stratum (Plot Size: 15	_	•	That Are C	DBL, FACW or FAC:	3 (A	1)
1.	, ,			ber of Dominant	4 (B	2)
2.	0			cross All Strata:		7
3.	0	+		f Dominant Species DBL, FACW or FAC:	75.00% (A	\/B)
4.	0	+ -	mat Are C	DE, I ACW OF I AC.		
5.	0		<u>Prevalence</u>	e Index Worksheet:		
	Total Cover: 0	! !	To	tal % Cover of:	Multiply	by:
<u>Herb Stratum</u> (Plot Size: <u>5</u>	<u>ft</u>		OBL Spec	ies 0	X 1	0
Poa palustris	10	Yes	FACW Spe	ecies30	X 2	60
Taraxacum officinale	30		FACU FAC Spec	0	X 3	0
Doellingeria umbellata	10	Yes	FACU Spe		X 4	120
4. Salix petiolaris	10	Yes	FACW UPL Spec		X 5	0
5.	0		ll '	60	(A)	180 (B)
6.	0	4	Column To	Prevalence Index = 1		3.00
7.	0		Hydrophyti	ic Vegetation Indicators:	•	3.00
8.	0					
	Total Cover: 60		No Yes	Rapid Test for Hydrophy Dominance Test is >50%	, ,	
Woody Vine Stratum (Plot Size: 30		,		Prevalence Index ≤ 3.0		
1.	0		No	Morphological Adaptation	 ons [1] (provide sup	pporting data
2.	0]		in vegetation remarks of	r on a separate shee	et)
	Total Cover: 0	!	No No	Problematic Hydrophyti		•
% Bare Ground in Herb Stratum: 40	% Sphagn	num Moss Cover:		s of hydric soil & wetland hy problematic.	drology must be prese	ent, unless
Vegetation Remarks: (include photo numbers he	ere or on a separate sheet)		Hydrophyti	ic vegetation present?	<u>Yes</u>	<u> </u>
Remnant corn stalks present						

Profile Description: (Describe to the depth need Depth Matrix	ed to document the indicator or confirm the abscend	e of indicators).		
<u> </u>	% Color (moist) % Type [1]] Loc [2]	Texture	Remarks
0 - 7 10YR 2/1	100		Oa	
2. 7 - 30 10YR 2/2	100		Oe	
3. <u>30 - 33</u> <u>10YR 3/1</u>	100		Oe w/ fine sand	
4				
5				
[1] Type: C=Concentration, D=Depletion, RM=Rd	educed Matrix, CS=Covered or Coated Sand Grains	[2] Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	inless otherwise noted)	Indi	cators for Problematic Hydric Soi	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	1 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA	149B)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR.	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (LF	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (M	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or problem	atic.	Very Shallow Dark Surface (TF12)	
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; cl	neck all that apply)	Secondar	y Indicators (minimum of two reg	uired)
	Water-Stained Leaves (B9)		ce Soil Cracks (B6)	FAC-Neutral Test (D5)
Surface Water (A1)	Aquatic Fauna (B13)		age Patterns (B10)	
High Water Table (A2)	Marl Deposits (B15)		Trim Lines (B16)	
Saturation (A3)	☐ Hydrogen Sulfide Odor (C1)		eason Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on Living Roots (C		sh Burrows (C8)	
Sediment Deposits (B2)			ation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		ed or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)		orphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)		w Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks)	_	opographic Relief (D4)	
Field Observations:			Indicators of wetland hydrolog	gy present? <u>No</u>
Surface water present?	Surface Water Depth (inches):	_	Describe Recorded Data:	
Water table present?	✓ Water Table Depth (inches): 22	.9		
Saturation present? (includes capillary fringe)	Saturation Depth (inches):			
Recorded Data: Aerial Photo 🗸 M	onitoring Well Stream Gauge Previous	nspections	•	
Hydrology Remarks:				

WEILAND DEIERMIN	ATION DATA	FURINI - Nort	incentral and North	east Region
Project/Site: Hinckley Site	Applicant/Owner: PolyMet	City/County: (<u>Grasston, Pine</u> <i>State:</i> <u>MN</u> <i>Sa</i> County	ampling Date: 07/30/14
Investigator(s): kms2, jtk	Section: 5	Township: 39		ampling Point: W17
in congator (o)	Local Relief: None	Slope %: 0	Soil Map Unit Name: P - Peat	, s <u>—</u>
		, <u> </u>	•	00 1
• · / -	Latitude: 5082399 mN	Longitude: 49		83, meters
Cowardin Classification: PEMC2	Circular 39 Classification:	Type 2	Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical for this to	ime of year? Yes	(If no, explain in remarks)	Eggers & Reed (primary):	Fresh (Wet) Meadow
Are vegetation No Soil Yes Hydrology	No significantly distu	urbed? Are "normal circumstances	" Yes Eggers & Reed (secondary): Eggers & Reed (tertiary):	
Are vegetation No Soil No Hydrology	No naturally problem	present?	Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Attach site i	map showing sam	npling point locat	tions, transects, important	t features, etc.
Hydrophytic vegetation present? Yes Gen	eral Remarks Associa	ated with Well 10.	-	
	lain any answers	ated with Well 10.		
Indicators of wetland hydrology present? No	eded):			
	s, optional Wetland Site ID	Wetland 17		
VEGETATION				
VEGETATION				
	<u>Absolute</u>	Dominant Indicator	50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>) <u>% Cover</u>	Species? Status	Tree Stratum	00
1.	0		Sapling/Shrub Stratum	0 0
2.	0		Herb Stratum	17 42.5
3.	0		Woody Vine Stratum	00
4.	0		Dominance Test Worksheet:	
To	otal Cover: 0		Number of Dominant Species	2 (4)
Sapling/Shrub Stratum (Plot Size: 15 ft)		That Are OBL, FACW or FAC:	2 (A)
1.	, 0		Total Number of Dominant	3 <i>(B)</i>
2.	0		Species Across All Strata:	
3.	0		Percent of Dominant Species That Are OBL, FACW or FAC:	66.67% (A/B)
4.	0		That Are OBE, I ACW OF FAC.	
5.	0		Prevalence Index Worksheet:	
	tal Cover: 0		Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: <u>5 ft</u>	1		OBL Species	X 1 0
1. Poa palustris	20	Yes FACW	FACW Species 40	X 2 80
Urtica dioica	20	Yes FAC	FAC Species 20	O X 3 60
Trifolium pratense	25	Yes FACU		
4. Salix petiolaris	10	No FACW	PACO Species	
5. Solidago gigantea	10	No FACW	OPL Species	
6.	0		Column Totals:85	- ` ′ ` ′ ′
7.	0		Prevalence Index	= B/A = 2.82
8.	0		Hydrophytic Vegetation Indicator	<u>'S:</u>
To	tal Cover: 85		No Rapid Test for Hydro	phytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft)		Yes Dominance Test is >5	50%
1.	0		Yes Prevalence Index ≤ 3.	• •
2.	0		No Morphological Adapta	ations [1] (provide supporting data sor on a separate sheet)
	tal Cover: 0			ytic Vegetation [1] (Explain)
	_		[1] Indicators of hydric soil & wetland	
% Bare Ground in Herb Stratum:	% Sphagnum	Moss Cover:	disturbed or problematic.	, eregjer no procent, umose
Vegetation Remarks: (include photo numbers here or on	a separate sheet)		Hydrophytic vegetation present?	<u>Yes</u>
Remnant corn stalks present.			•	

Profile Description: (Describe to the depth need Depth Matrix		firm the		f indicators).		
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1 0 - 11 10YR 2/1	100				Oa -	
11 - 17 10YR 2/2	100				Oe	
3. 17 - 22 10YR 3/1	100				Oe	
4. 22 - 25 10YR 4/1	80 7.5YR 3/4	20	С	М	silty clay loam	
5						
6	laduand Matrix, CS=Covered or Cont	ad Cand	Croino [T Locations I	PL=Pore Lining, M=Matrix.	
[1] Type: C=Concentration, D=Depletion, RM=R		eu Sanu	Grains [2			I ₂ (21.
Hydric Soil Indicators: (applicable to all LRRs, (_			Ina	icators for Problematic Hydric Soil	
✓ Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLRA	
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, N	1LRA 14	9B)		Coast Prairie Redox (A16) (LRR K,	L, R)
Black Histic (A3)	Polyvalue Below Surface (\$8	?) (LRR F	R, MLRA 1491	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRR	R, MLR	'A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (L	RR K, L,)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (LR	?R K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	// RA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A,	•
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless dis	turbed o	r problematic		Very Shallow Dark Surface (TF12)	Terriarks)
Restrictive Layer (if present): Type:	Depth	(inches):		Hydric soil present?	<u>Yes</u>
IYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required; c	heck all that apply)			Seconda	ry Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (E	39)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
High Water Table (A2)	Aquatic Fauna (B13)			Drain	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)			Moss	Trim Lines (B16)	
	☐ Hydrogen Sulfide Odor (C1)			Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres of		Roots (C3)		ish Burrows (C8)	
Sediment Deposits (B2)	Oxidized Wilzospheres e	iii Liviiig	110013 (03)		ation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iro	on (C.4)				
Algal Mat or Crust (B4)	Recent Iron Reduction in		ioile (C6)		ed or Stressed Plants (D1)	
Iron Deposits (B5)		Tilleu 3	ulis (Cu)	Geon	norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7)			Shalle	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remarks	5)		Micro	topographic Relief (D4)	
Field Observations:					Indicators of wetland hydrolog	y present? <u>No</u>
Surface water present?	Surface Water Depth (inc	hes):			Describe Recorded Data:	
Water table present?	✓ Water Table Depth (inche)	s):	28.8			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):				
Recorded Data: Aerial Photo 📝 M	Ionitoring Well Stream Gauge	<i>F</i>	Previous Insp	ections	1	
Hydrology Remarks:						

	И	ETL	AND	DETE	RIV	IINA	HON	DATA	<i>FORI</i>	/I - No	rthcer	itral a	and	Nort	hea	ast Re	egic	on		
Proje	ect/Site:	<u>Hinckle</u>	ey Site			Аррі	licant/Own	er: PolyMe	<u>:t</u>	City/County:	Grasston, County	Pine .	State:	MN	Sam	oling Date:	07/30	<u>/14</u>		
Inve	estigator(s):	kms2, jtk				Sec	tion:	<u>5</u>		Township:	39N		Range:	22W	Sam	pling Point:	<u>W18</u>			
	d Form:	' <u></u>				Loca	al Relief:	<u>None</u>		Slope %:	<u>0</u> So	oil Map Un	nit Name	e: <u>P - Pe</u>	<u>at</u>					
Sub	region (LRR	?): <u>K</u>				Lati	tude:	5082496 mN	<u>\</u>	Longitude:	491769 mE		Datum:	UTM, N	AD 83	, meters				
Cov	vardin Class	ification:	PEMC	:2		Circ	ular 39 Cla	assification:	Type 2			Mapped I	NWI Cla	assification	1:					
			nditions o	n the site typ	ical for	this time	of year?	<u>Yes</u>	(If no, explain	n in remarks	s)	Eggers &	Reed ((primary):	ı	Fresh (Wet)	Mead	OW		
	-	-					-	nificantly dis	turbod?	Are "normal	<u>Yes</u>			'secondary	-					
AIE	vegetation	<u>No</u>	Soil	<u>Yes</u>	Hydro	logy <u>No</u>	_			circumstand present?	ces"	Eggers &								
Are	vegetation	<u>No</u>	Soil	<u>No</u>	Hydro	logy <u>No</u>	<u>natu</u>	ırally probler	matic?	present.		Eggers &	Reed ((quaternar	y):					
SUN	<i>MARY</i>	OF FIN	IDING	SS - Atta	ch s	ite ma	p show	ving saı	mpling p	oint loc	ations, t	transec	cts, ir	nporta	int f	eatures	, etc).		
_	rophytic veg ric soil prese		esent?		<u>No</u> Yes		Remarks any answe		ciated with We	ll 12.										
	cators of wet				<u>No</u>															
Is th	e sampled a	rea within	a wetlan	d?	<u>No</u>	If yes, o	ptional W	etland Site I	ID: <u>Wetla</u>	and 18										
VE	GETATI	ON																		
								Absolute	Dominant	Indicato	r <u>50/</u>	/20 Thresh	nolds:				209	<u>%</u>	<u>50%</u>	Ś
	Tree Strat	<u>um</u>		(Plot Size:	<u>30 ft</u>)	% Cover	Species?	<u>Status</u>	Tre	ee Stratum	1				0		0	
1.								0				pling/Shru		tum			0		0	
2.								0				rb Stratun					16		40	
3.								0			Wo	oody Vine	Stratun	n			0		0	_
4.								0			<u>Do</u>	minance 1	Test Wo	orksheet:						
						Total	Cover:	<u>0</u>				mber of D					0	(A)		
	Sapling/SI	rub Strat	<u>um</u>	(Plot Size:	<u>15 ft</u>)					at Are OB			:		_	(2.9)		
1.								0				tal Numbe ecies Acro					2	(B)		
2.								0				rcent of D			;		_			
3.								0				at Are OB				0.0	0%	(A/B)		
4.								0			Pre	evalence In	ndex W	orksheet:						
5.						Total	Cover:	0			—∥ '''		% Cove		•		Multi	ply by:		
	U. A. O.			(Diet Cire)	га	Total	Cover:	<u>0</u>			<u> </u>			er or.	20	X 1	wuiuj		20	_
	Herb Strat			(Plot Size:	<u>3 II</u>)		1 1			BL Species			0	X 2			0	
1.		m officinale	9					25	Yes	FACI		CW Speci			10	X 3			30	
2.3.	Trifolium p							25 10	No	FACU		C Species							_	
3. 4.	Cyperus of Rumex cr							10	No	FAC	FA	CU Specie	es _		50	X 4		20	00	
5.	Carex vul	<u>'</u>						10	No	OBL	——II UP	L Species	-		0	X 5			0	
6.	'							0			Co	lumn Tota	_		80	(A)				B)
7.								0						alence Inc				3.	13	
8.								0			<u>Hyd</u>	Irophytic \	Vegetat	ion Indica	ators:					
						Total	Cover:	<u>80</u>								ytic Vegeta	tion			
	Woody Vir	e Stratun	<u>1</u>	(Plot Size:	<u>30 ft</u>)							ce Test is						
1.								0						ce Index :	-	[1] ons [1] (pr	ovida	eunnor	tina d	afa
2.								0								r on a sepa			ung u	ita
						Total	Cover:	<u>0</u>			<u> </u>	No Pr	roblema	atic Hydro	phyti	c Vegetatio	on [1] (Explair	1)	
% B	are Ground	in Herb S	Stratum:		_		9	% Sphagnun	n Moss Cove	r:		ndicators of urbed or pro			and hy	drology mus	st be pi	resent, u	ınless	
Veg	etation Ren	narks: (ind	clude ph	oto number:	s here	or on a s	eparate si	heet)			Ну	rdrophytic v	vegetation	on present	t?	<u>No</u>				

Profile Description: (Describe to the depth need Depth Matrix	ded to document the indicator or confirm the abscence o Redox Features	f indicators).
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture Remarks
1 0 - 9 10YR 2/1	100	Oa
2. 9 - 19 10YR 2/2	100	Oe —
3. 19 - 30 N2/0	100	<u>Oa</u>
4		
5		
6	Reduced Matrix, CS=Covered or Coated Sand Grains [2	Location: PL=Pore Lining, M=Matrix.
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)	Indicators for Problematic Hydric Soils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLRA 149B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149L	B) 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LRR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)
Thick Dark Surface (A12)	Depleted Matrix (F3)	Iron-Manganese Masses (F12) (LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)		
	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21) Other (explain in so
[3] Indicators of hydrophytic vegetation and wetland	d hydrology must be present, unless disturbed or problematic	☐ Very Shallow Dark Surface (TF12) Ternains)
Restrictive Layer (if present): Type:	Depth (inches):	Hydric soil present? Yes
IYDROLOGY Wetland Hydrology Indicators:		
Primary Indicators (minimum of one required; c	heck all that apply)	Secondary Indicators (minimum of two required)
Surface Water (A1)	Water-Stained Leaves (B9)	☐ Surface Soil Cracks (B6) ☐ FAC-Neutral Test (I
☐ High Water Table (A2)	Aquatic Fauna (B13)	☐ Drainage Patterns (B10)
Saturation (A3)	Marl Deposits (B15)	Moss Trim Lines (B16)
Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)	Dry-Season Water Table (C2)
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayfish Burrows (C8)
Drift Deposits (B3)		Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	Stunted or Stressed Plants (D1)
<u> </u>	Recent Iron Reduction in Tilled Soils (C6)	Geomorphic Position (D2)
Iron Deposits (B5)	Thin Muck Surface (C7)	Shallow Aguitard (D3)
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)	Microtopographic Relief (D4)
Sparsely Vegetated Concave Surface (B8)		Wild Oldpographic Nelici (54)
Field Observations:		Indicators of wetland hydrology present? No
Surface water present?	Surface Water Depth (inches):	Describe Recorded Data:
Water table present?	✓ Water Table Depth (inches): 14.2	
But the Contract of the Contra	Saturation Depth (inches):	
Saturation present? (includes capillary fringe)		
	flonitoring Well Stream Gauge Previous Insp	ections
Saturation present? (includes capillary fringe) Recorded Data: Aerial Photo M Hydrology Remarks:		ections

	N	ETL	AND	DETE	:RM	INATIO)N L	DATA	FORI	/I - Noi	rthce	ntral	and	North	east R	egi	on	
Proje	ect/Site:	<u>Hinckle</u>	ey Site			Applicant/	Owner	: PolyMet	<u>t</u> (City/County:	Grasston County	n, Pine	State:	MN S	ampling Date	: 07/30	<u>3/14</u>	
Inve.	stigator(s):	kms2, jtk				Section:	<u>5</u>			Township:	<u>39N</u>		Range	· <u>22W</u> S	ampling Poin	<i>t:</i> <u>W19</u>	!	
Land	d Form:	-				Local Reli	ef: N	<u>one</u>		Slope %:	<u>0</u> .	Soil Map L	Unit Name	e: P - Peat				
Sub	region (LRR)): <u>K</u>				Latitude:	<u>5(</u>	081 948 mN	[.	Longitude:	4911 31 ml	<u>E</u>	Datum	: UTM, NAC	83, meters			
Сои	ardin Class	ification·	PEMC	2		Circular 3	9 Class	sification:	Type 2	_		Марре	d NWI Cla	assification:				
				_	oical for	this time of yea	ar?	Yes	(If no, explain	n in remarks.)			(primary):	Fresh (We	t) Meac	work	
	-					-				Are "normal	<u>Yes</u>			(secondary):		ty mode	<u></u>	
Are	vegetation	<u>No</u>	Soil	<u>Yes</u>	Hydrol	ogy <u>No</u>	signii	ficantly dist	(circumstance	es"		s & Reed	=				
Are	vegetation	<u>No</u>	Soil	<u>No</u>	Hydrol	ogy <u>No</u>	natura	ally problen	natic?	present?		Eggers	s & Reed	(quaternary):				
SUN	IMARY	OF FIN	NDING	S - Atta	ch si	ite map sl	how	ing san	npling p	oint loca	ations,	transe	ects, ii	mportan	t feature	s, et	c.	
Hydi	rophytic veg	etation pre	esent?		<u>Yes</u>	General Rema			iated with We	II 14.								
-	ric soil prese				<u>Yes</u>	(explain any alif needed):	nswers	5										
	ators of wet	-			<u>No</u>	•	- / IA/-4	land Cita I	D. Matla									ļ
	e sampled a		a wellan	<i>u?</i>	<u>No</u>	If yes, optiona	ai vvet	iano Site il	velia <u>vvelia</u>	ınd 19								
VE	ETATI	ON																
								Absolute	Dominant	Indicator	<u> 5</u>	0/20 Thre	sholds:			<u>20</u>	<u>%</u>	<u>50%</u>
	Tree Strate	<u>um</u>		(Plot Size:	30 ft			% Cover	Species?	Status	_	ree Stratu	ım			0)	0
1.								0			s	apling/Sh	rub Stra	tum		0)	0
2.							-	0				lerb Strati				18	8	45
3.											и	Voody Vin	ne Stratui	n		0)	0
4.								0			<u> </u>	ominance	e Test W	orksheet:				
						Total Cover		0			N	lumber of	Domina	nt Species		_	(4)	
	Sapling/Sh	rub Strat	um	(Plot Size:	15 ft)				T	hat Are O	BL, FAC	W or FAC:		3	(A)	
1.				•			Ó	0				otal Num				4	(B)	
2.							-	0				pecies A					(=)	
3.								0						nt Species W or FAC:	75.	00%	(A/B)	
4.								0					,					
5.								0			<u>P</u>	revalence	Index W	orksheet:				
						Total Cover	:	0			_ _	Tot	tal % Cov	er of:	_	Multi	iply by:	
	Herb Strat	<u>um</u>		(Plot Size:	<u>5 ft</u>)				o	BL Speci	ies _	2	<u>0</u> X 1		2	20
1.	Trifolium p	ratense					Ė	25	Yes	FACU	F	ACW Spe	cies _	4	5 X 2	_	9	0
2.	Carex vul	oinoidea						20	Yes	OBL	F	AC Speci	ies _		0 X3			0
3.	Carex sco	paria						20	Yes	FACW	F	ACU Spe	cies _	2	5 X 4		10	0
4.	Poa palus	tris						20	Yes	FACW	/ u	IPL Speci	es		0 X 5			0
5.	Solidago (gigantea						5	No	FACW	/	Column To	_	9	0 (A)	•	21	0 (B)
6.							4	0			_∥ ັ	oranni re	_	alence Index	= B/A =		2.3	
7.							 -	0				/drophytic	c Vegetai	tion Indicato	rs:			
8.						Total Cover	_	0			_ "				<u>no.</u> phytic Vege	tation		
	Manda Vi		_	(Plot Size:	20 f	Total Cover		<u>90</u>			-			ice Test is >		ation		
	Woody Vir	e Stratun	<u>1</u>	(FIUL SIZE.	<u>30 II</u>			_			-	Yes	Prevalen	ce Index ≤ 3	3.0 [1]			
1.							4	0							tations [1] (p			ing data
2.						Total Cover		0			¯		•		s or on a sep		•	,
						rotal Cover	•	<u>U</u>			 				hytic Vegetat			
% B	are Ground	in Herb S	Stratum:		_		% :	Sphagnum	Moss Cove	r:		Indicators sturbed or			d hydrology m	ust be p	resent, ui	nless
Veg	etation Ren	narks: (ind	clude ph	oto number:	s here (or on a separa	te she	eet)			Н	Hydrophytia	c vegetati	on present?	<u>Yes</u>			
Rem	nant corn s	talks prese	ent.															

Profile Description: (Describe to the depth need Depth Matrix		onfirm the		indicators).		
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1 0 - 7 10YR 2/1	100				Oa	
2. 7 - 24 10YR 2/2	100				Oe	
3. <u>24 - 38</u> <u>10YR 2/1</u>	50 10YR 2/2	50			Oa/Oe	
4						
5						
6 [1] Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Co	ated Sand	Grains [2	Location: I	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, (unless otherwise noted)			Ind	icators for Problematic Hydric So.	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR)	4 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R,	, MLRA 149	9B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (3)	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LF			, <u> </u>	Dark Surface (S7) (LRR K, L)	, ,
Stratified Layers (A5)	Loamy Mucky Mineral (F1)		•		Polyvalue Below Surface (S8) (LR	R K. I)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	(=::::, =)			Thin Dark Surface (S9) (LRR K, L)	•
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (LI	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (I	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	7)			Mesic Spodic (TA6) (MLRA 144A,	•
		/				
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland	1 hydrology must be present, unless o	disturbed of	r problematic		Very Shallow Dark Surface (TF12)	romanoj
Restrictive Layer (if present): Type:	Dері	th (inches)):		Hydric soil present?	<u>Yes</u>
YDROLOGY Wetland Hydrology Indicators:				0		
Primary Indicators (minimum of one required; c					ry Indicators (minimum of two req	
Surface Water (A1)	Water-Stained Leaves	(B9)			ce Soil Cracks (B6)	FAC-Neutral Test (D5
High Water Table (A2)	Aquatic Fauna (B13)			Drain	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)			Moss	Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odol	r (C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	s on Living	Roots (C3)	Crayf	ish Burrows (C8)	
Drift Deposits (B3)				Satur	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced			Stunt	ed or Stressed Plants (D1)	
Iron Deposits (B5)	Recent Iron Reduction	in Tilled So	oils (C6)	Geon	norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C)	7)		Shalle	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remai	rks)		Micro	topographic Relief (D4)	
Field Observations:		, .			Indicators of wetland hydrolog	gy present? <u>No</u>
Surface water present?	Surface Water Depth (ii	,			Describe Recorded Data:	
Water table present?	✓ Water Table Depth (inc.)		17.2			
Saturation present? (includes capillary fringe)	Saturation Depth (inche	es):				
Recorded Data: Aerial Photo 📝 M	nonitoring Well Stream Gaug	ge P	revious Insp	ections		
Hydrology Remarks:						

Appendix E Site Photographs

Hinckley Wetland Mitigation Site Photographs West Side of Site



View to southwest corner of site and buildings, 7/3/14, #12426



Forest beyond west edge of the site, 8/1/14, #12876

 $P:\Most{\colorer} P:\Most{\colorer} Post{\colorer}

West Side of Site



Western road, view to the south, 11/4/15, #14



Western ditch at southwest corner of site, view NE, 11/4/15, #165

West Side of Site



Western ditch outlet, west side of highway view west, 11/4/15, #166



Northwest corner of site, view NW, 11/4/15, #21



Ditch along north edge of site, view east, 11/4/15, #30



Ditch along north edge of site, view east, beaver dam, 11/4/15, #31



Ditch along north edge of site upstream of beaver dam, view east, 11/4/15, #35



View north from north ditch to Public Ditch, 11/4/15, #37



Public Ditch from north ditch, view south, 11/4/15, #38



NE corner of site, forested area near RR tracks, 7/30/14, #12377



NE corner of site, forested area, 7/30/14, #12375



NE corner of site at ditch corner, view north, 11/4/15, #43



NE corner of site, east ditch, view south, 11/4/15, #47



East ditch along RR tracks, view north, 7/3/14, #12489



Small forest along eastern edge next to RR tracks, 7/30/14, #12459



Box culvert under RR tracks, west side, 11/4/15, #114



Box culvert at RR tracks, view east, 7/3/14, #12506



Box culvert at RR tracks, view west, 7/3/14, #12507



Easternmost edge of site, view south, 5/13/14, #10261



View north from central field, 7/30/14, #12482

Central Part of Site



View south to south-central forest, 11/4/15, #149



Medium-sized central ditch, view west, 7/3/14, #12477

Central Part of Site



Large-sized central ditch, view west, 7/31/14, #12805



Central forest ATV trail, view west, 7/31/14, #12666

South-Central Part of Site



Central forest near Well 15, view north, 11/4/15, #160



South edge of site, view north to central forest, 7/31/14, #12754

Appendix F

Wetland Mitigation Plan Drawings

DRAWING No.

TS-201

CS-201

CS-203

CS-205

CS-206

CS-207 CS-208

CS-209

CS-210

CS-211

CS-212

CS-214

CS-215

GOPHER STATE ONE CALL, CALL BEFORE YOU DIG: 1-800-252-1166 (MN TOLL FREE) 651-454-0002 (TWIN CITIES AREA)

CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD-LOCATING ALL SITE UTILITIES, PRIVATE AND PUBLIC, PRIOR TO STARTING THE WORK. ALL UTILITIES DAMAGED BY THE CONTRACTOR SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE UTILITY OWNER.

STATE MAP

INDEX

TITLE SHEET, INDEX SHEET, AND SITE LOCATION MAP

NW & NE QUARTER SECTION CROSS SECTIONS

NW & NE QUARTER SECTION CROSS SECTIONS

NW & NE QUARTER SECTION CROSS SECTIONS

SW & SE QUARTER SECTION CROSS SECTIONS

SW & SE QUARTER SECTION CROSS SECTIONS

SW & SE QUARTER SECTION CROSS SECTIONS

EROSION CONTROL AND SITE RESTORATION PLAN

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

BORROW SOURCE PROFILES

EROSION CONTROL DETAILS

DETAILS

EXISTING CONDITIONS AND EXISTING CONDITIONS INDEX MAP

EXISTING CONDITIONS - NW & NE SECTION 5 QUARTER SECTIONS

EXISTING CONDITIONS - SW & SE SECTION 5 QUARTER SECTIONS

SITE WETLAND MITIGATION PLAN AND MITIGATION PLAN INDEX MAP SITE WETLAND MITIGATION PLAN - NW & NE SECTION 5 QUARTER SECTIONS

SITE WETLAND MITIGATION PLAN - SW & SE SECTION 5 QUARTER SECTIONS

PROJECT LOCATION

REVISION

0

0

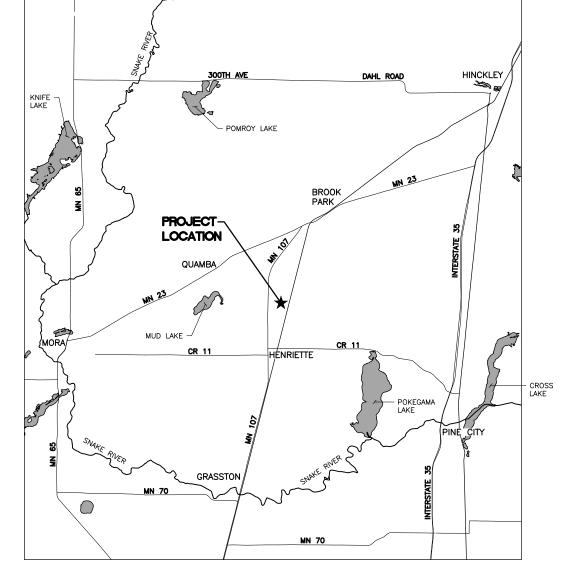
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POLYMET

HINCKLEY WETLAND MITIGATION PLAN

HINCKLEY, MINNESOTA





VICINITY MAP 10,000 SCALE IN FEET

PROJECT SITE (A)

SCALE IN FEET

HINCKLEY WETLAND MITIGATION PLAN TITLE SHEET, INDEX SHEET, AND SITE LOCATION MAP

DATE DESCRIPTION ISSUE STATUS ISSUED VERSION DATE SECRETIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS SECRETIFY. PRINTED WAS SECRETIFY THAT THIS PLAN, SPECIFICATION THAT									
FOR PERMITTING FOR PERMITTING FOR PERMITTING FOR PERMITTING FOR PERMITTING FOR PERMITTING FOR PERMITTING FOR PRINTED NAME BARR PROJECT NO: CONSTRUCTION FOR PRINTED NAME BARR PROJECT NO: 23/69-0862.00	/ER NO	DATE	DESCRIPTION	ı	SSUE STATUS		1		
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FOR CONSTRUCTION FOR CONSTRUCTION PRINTED NAME BARR PROJECT NO.: 23/69-0862.00									
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				NOT APPROVED FOR	CONSTRUCTION		DATE LICENSE#	SCALE:	

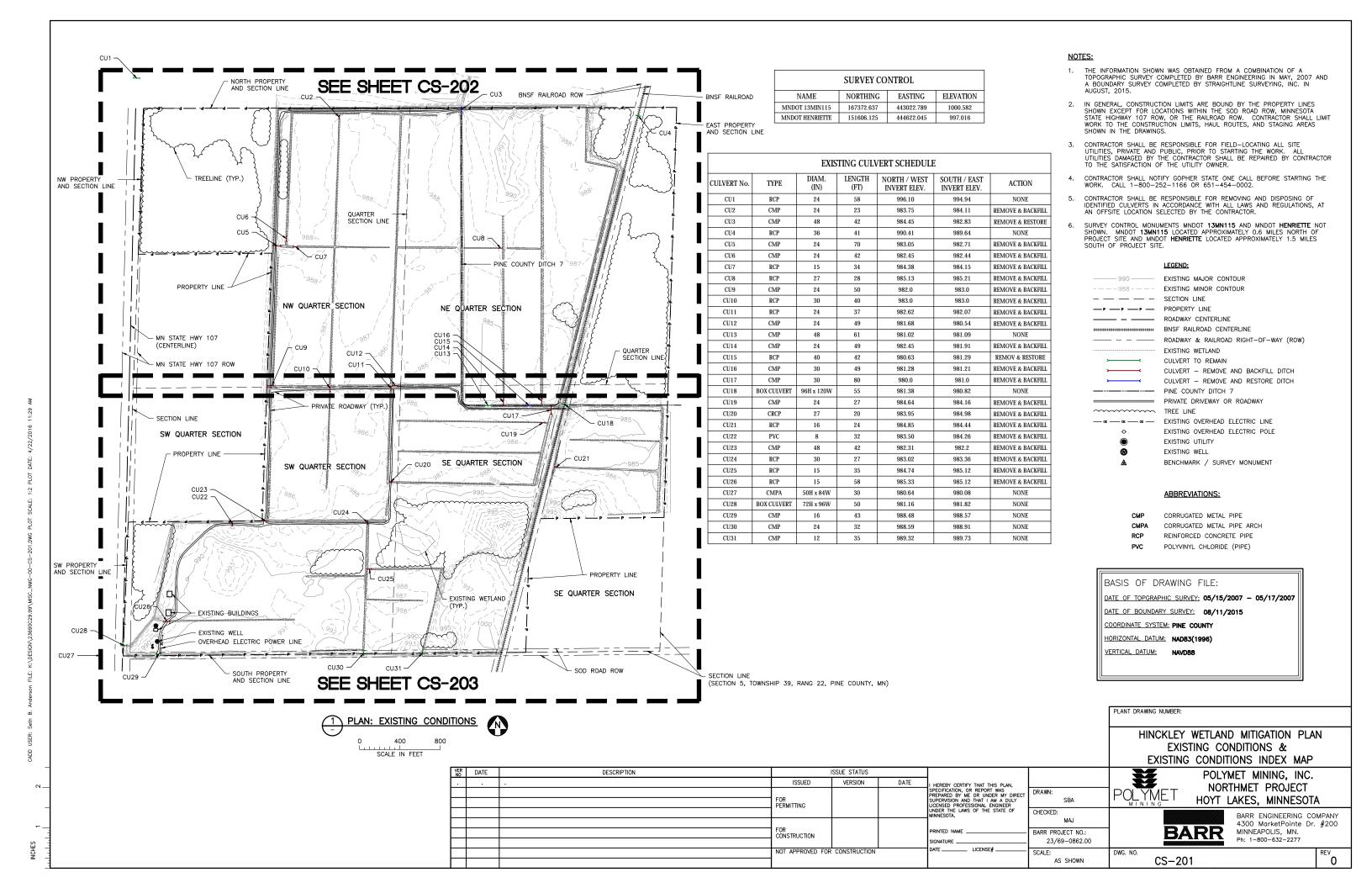
POLYMET

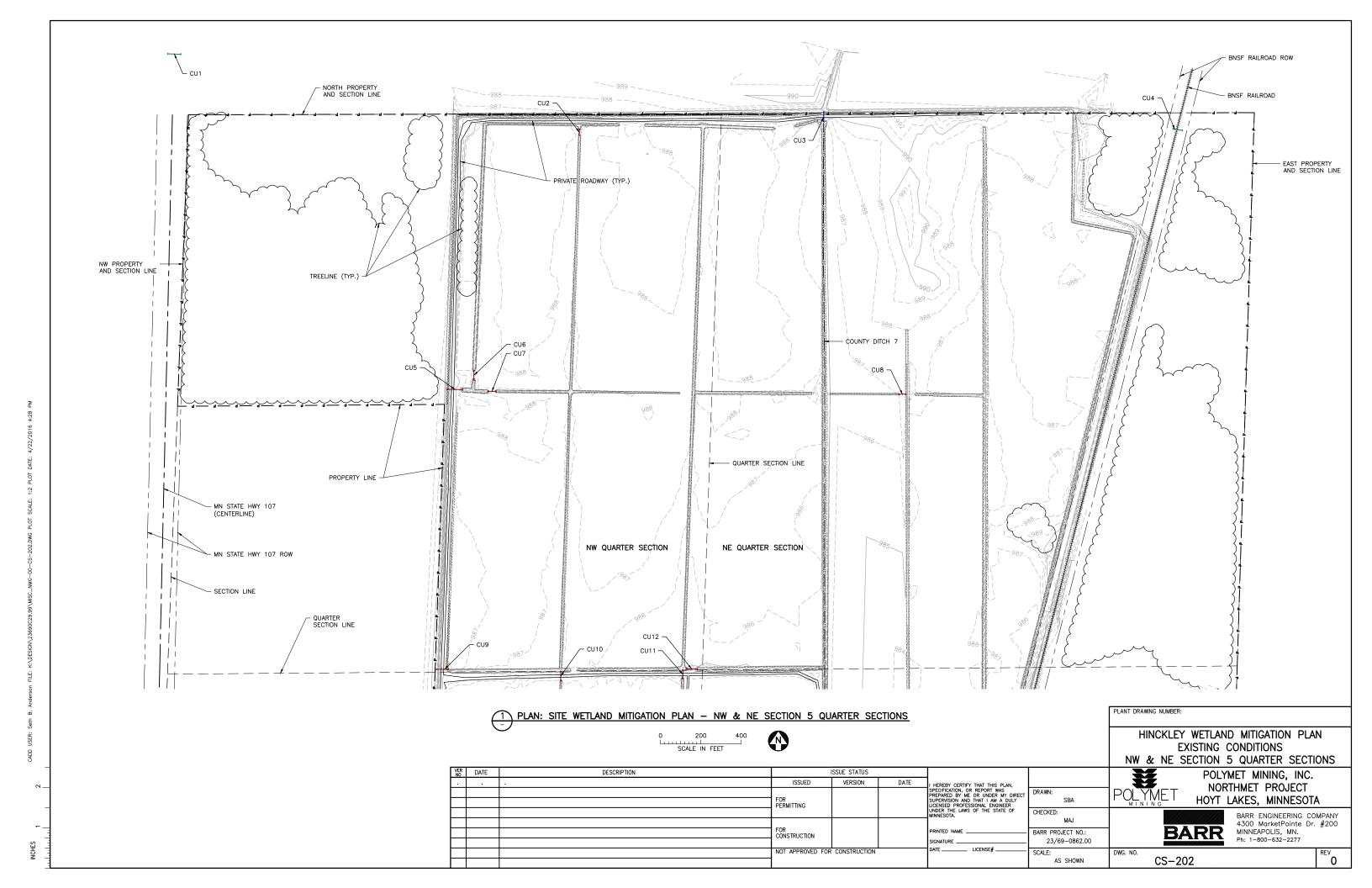
TS-201

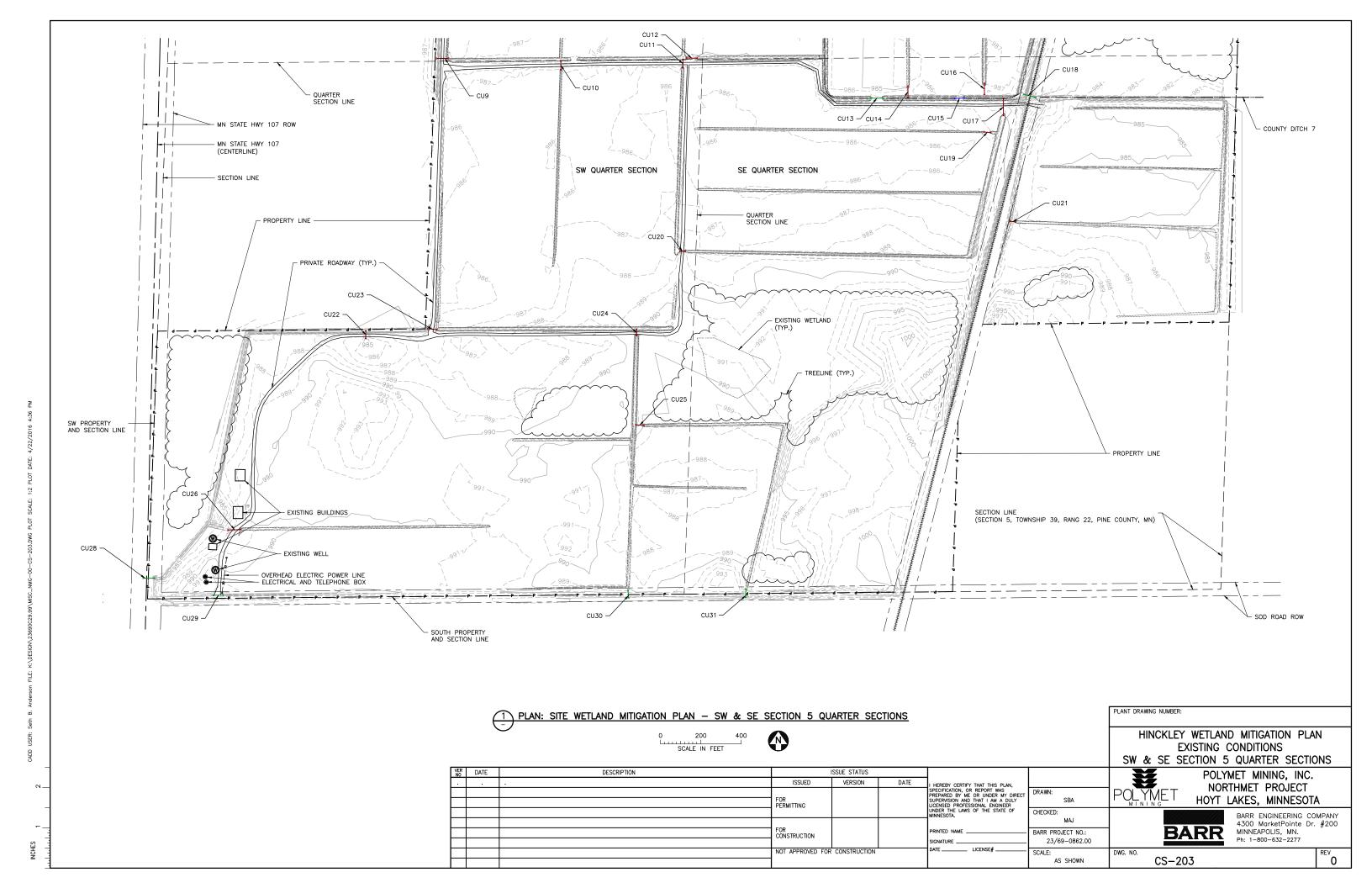
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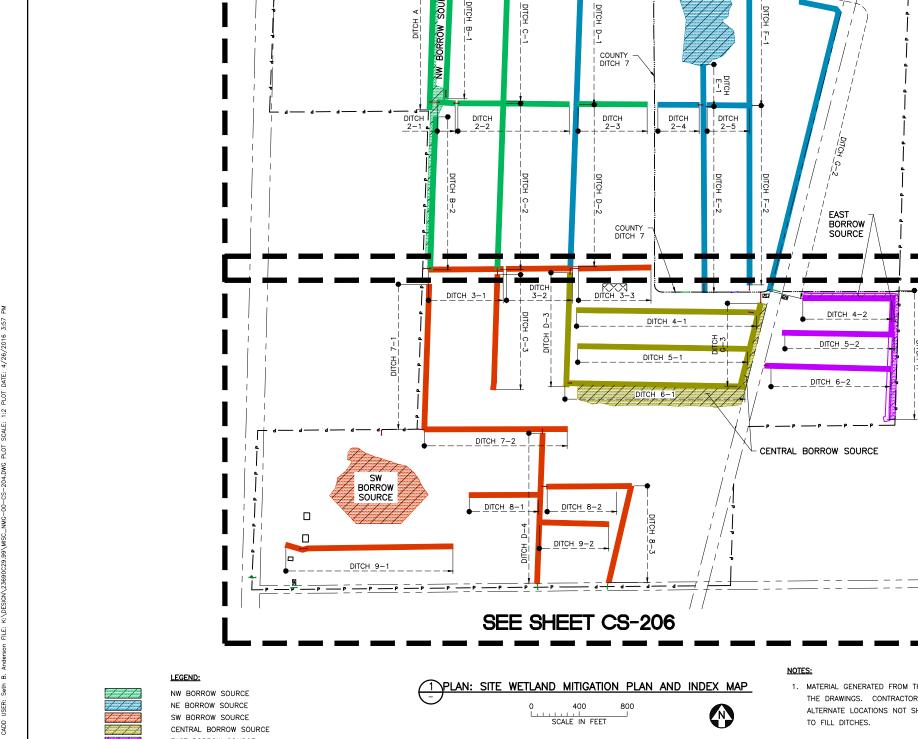
POLYMET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 BARR MINNEAPOLIS, MN.









VER DATE

SEE SHEET CS-205

DITCH_G-1_

NE BORROW SOURCE

DESCRIPTION

DITCH ALIGNMENT	DITCH SEGMENT	DITI STATIO		DITCH LENGTH (FT)	AVG X-SECTION AREA (SF)	ESTIMATED FILL VOL (CY)	ESTIMATED FILL VO SUBTOTAL (CY)
A	1	00+00	14+50	1,450	70	3,800	3,800
	1	00+00	13+00	1,300	75	3,700	
В	2	15+00	27+50	1,250	4	200	3,900
	1	00+00	13+00	1,300	40	2,000	
c	2	13+00	27+00	1,400	30	1,600	4,400
	3	27+50	37+00	950	20	800	
	1	00+00	13+50	1,350	50	2,500	
_	2	13+50	27+00	1,350	50	2,500	10.500
D	3	27+50	37+00	950	60	2,200	10,500
	4	41+50	54+00	1,250	70	3,300	
-	1	00+00	03+50	350	20	300	1.000
E	2	03+50	19+00	1,550	15	900	1,200
_	1	00+00	13+50	1,350	30	1,500	
F	2	13+50	28+25	1,475	55	3,100	4,600
	2	12+00	45+00	3,300	60	7,400	0.000
G	3	46+50	54+00	750	90	2,500	9,900
Н	1	00+00	11+00	1,100	35	1,500	1,500
	1	00+00	07+00	700	40	1,100	2,600
1	2	08+00	14+50	650	45	1,100	
	3	15+50	17+00	150	55	400	
	1	00+00	01+50	150	40	300	
	2	02+00	11+00	900	35	1,200	
2	3	11+75	17+50	575	50	1,100	3,100
	4	18+50	21+75	325	15	200	
	5	22+50	26+00	350	20	300	
	1	00+00	06+00	600	45	1,000	
3	2	06+50	12+00	550	45	1,000	3,500
	3	12+50	18+50	600	65	1,500	
	1	00+00	15+00	1,500	15	900	1 400
4	2	19+00	26+50	750	15	500	1,400
-	1	00+00	14+00	1,400	30	1,600	6.000
5	2	17+50	26+00	850	20	700	2,300
0	1	00+00	14+50	1,450	45	2,500	0.700
6	2	17+50	27+75	1,025	30	1,200	3,700
7	1	00+00	12+00	1,200	10	500	4.100
7	2	12+00	24+00	1,200	80	3,600	4,100
	1	00+00	06+00	600	25	600	
8	2	07+00	14+00	700	30	800	1,800
	3	14+00	22+50	850	10	400	
0	1	00+00	14+00	1,400	30	1,600	9 100
9	2	21+50	27+00	550	20	500	2,100
	TOTAL	 [.		41,450	-	64	400

DITCH FILL BORROW SOURCES				
SOURCE NAME	BOTTOM OF CUT (ELEV)	AVAILABLE VOLUME (CY)	TARGET DITCHES	
NW BORROW SOURCE	987.0 - 988.5	18,000	A B C-1 C-2 1-1 1-2 1-3 2-1 2-2 2-3	
NE BORROW SOURCE	988.0	25,000	G-2 F-1 F-1 E-1 E-2 D-1 D-2 2-4 2-5	
SW BORROW SOURCE	990.0	17,000	C-3 D-4 3-1 3-2 3-3 7-1 7-2 8-1 8-2 8-3 9-1 9-2	
CENTRAL	986.0 - 989.0	10,000	D-3 G-3 4-1 5-1 6-1	
EAST	984.0 - 985.0	7,000	Н 4-2 5-2 6-2	

EAST BORROW SOURCE

DITCH SEGMENT BACKFILLED WITH MATERIAL FROM NW BORROW SOURCE DITCH SEGMENT BACKFILLED WITH MATERIAL FROM NE BORROW SOURCE DITCH SEGMENT BACKFILLED WITH MATERIAL FROM SW BORROW SOURCE DITCH SEGMENT BACKFILLED WITH MATERIAL FROM CENTRAL BORROW SOURCE DITCH SEGMENT BACKFILLED WITH MATERIAL FROM EAST BORROW SOURCE CONTRACTOR STAGING AREA

1. MATERIAL GENERATED FROM THE PROPOSED BORROW SOURCES SHALL BE USED AS DITCH FILL MATERIAL AS SHOWN IN THE DRAWINGS. CONTRACTOR SHALL EXHAUST ALL BORROW SOURCE MATERIAL PRIOR TO GENERATING MATERIAL FROM ALTERNATE LOCATIONS NOT SHOWN. CONTRACTOR SHALL COORDINATE WITH ENGINEER IF ADDITIONAL MATERIAL IS NEEDED

DATE

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

RINTED NAME

IGNATURE ___

DRAWN:

CHECKED:

SBA

23/69-0862.00

AS SHOWN

BARR PROJECT NO.:

ISSUE STATUS

ISSUED

FOR PERMITTING

FOR CONSTRUCTION

NOT APPROVED FOR CONSTRUCTION

VERSION

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN SITE WETLAND MITIGATION PLAN AND MITIGATION PLAN INDEX MAP

POLYMET

POLYMET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. Ph: 1-800-632-2277

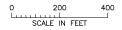
CS-204





NOTES:

- 1. CONTRACTOR SHALL EXCAVATE EACH PASS MADE WITHIN THE BORROW SOURCE DOWN TO THE DESIGN ELEVATION PRIOR TO OPENING UP A NEW SECTION OF THE BORROW SOURCE IN ORDER TO MINIMIZE THE DISTURBANCE AREA. ONCE THE REQUIRED VOLUME OF DITCH FILL MATERIAL HAS BEEN GENERATED. CONTRACTOR SHALL TERMINATE BORROW SOURCE EXCAVATION ACTIVITIES AND RESTORE THE DISTURBED AREA THROUGH PLACEMENT OF TOPSOIL AND OTHER REQUIREMENTS SHOWN IN THE DRAWINGS AND STATED IN THE STORMWATER POLLUTION PREVENTION BLAN (SWOPD). AND SPECIFICATIONS PLAN (SWPPP) AND SPECIFICATIONS.
- 2. TOPSOIL STRIPPING WITHIN THE BORROW SOURCE SHALL ONLY OCCUR WHEN ALL MATERIAL WITHIN THE DISTURBED PORTION OF THE BORROW PIT HAS BEEN EXHAUSTED. STRIP AND STOCKPILE TOPSOIL IN THE LOCATIONS SHOWN IN THE DRAWING AND IN ACCORDANCE WITH THE EROSION AND SEDIMENT CONTROL PLAN AND THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP).





HINCKLEY WETLAND MITIGATION PLAN SITE WETLAND MITIGATION PLAN NW & NE SECTION 5 QUARTER SECTIONS

VER DATE DESCRIPTION ISSUE STATUS VERSION DATE ISSUED POLYMET DRAWN: SBA FOR PERMITTING CHECKED: FOR CONSTRUCTION BARR PROJECT NO.: 23/69-0862.00 GNATURE _

NOT APPROVED FOR CONSTRUCTION

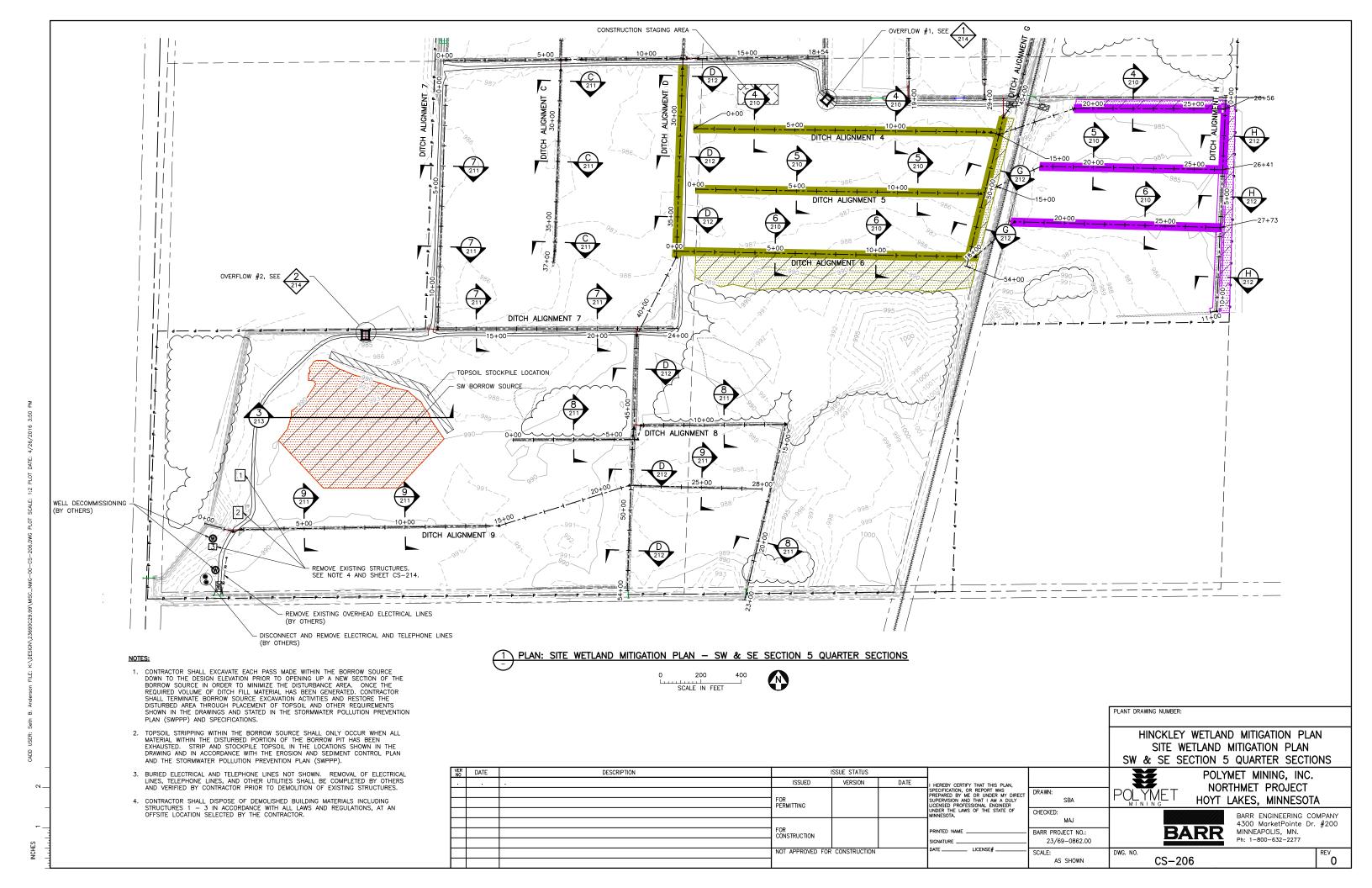
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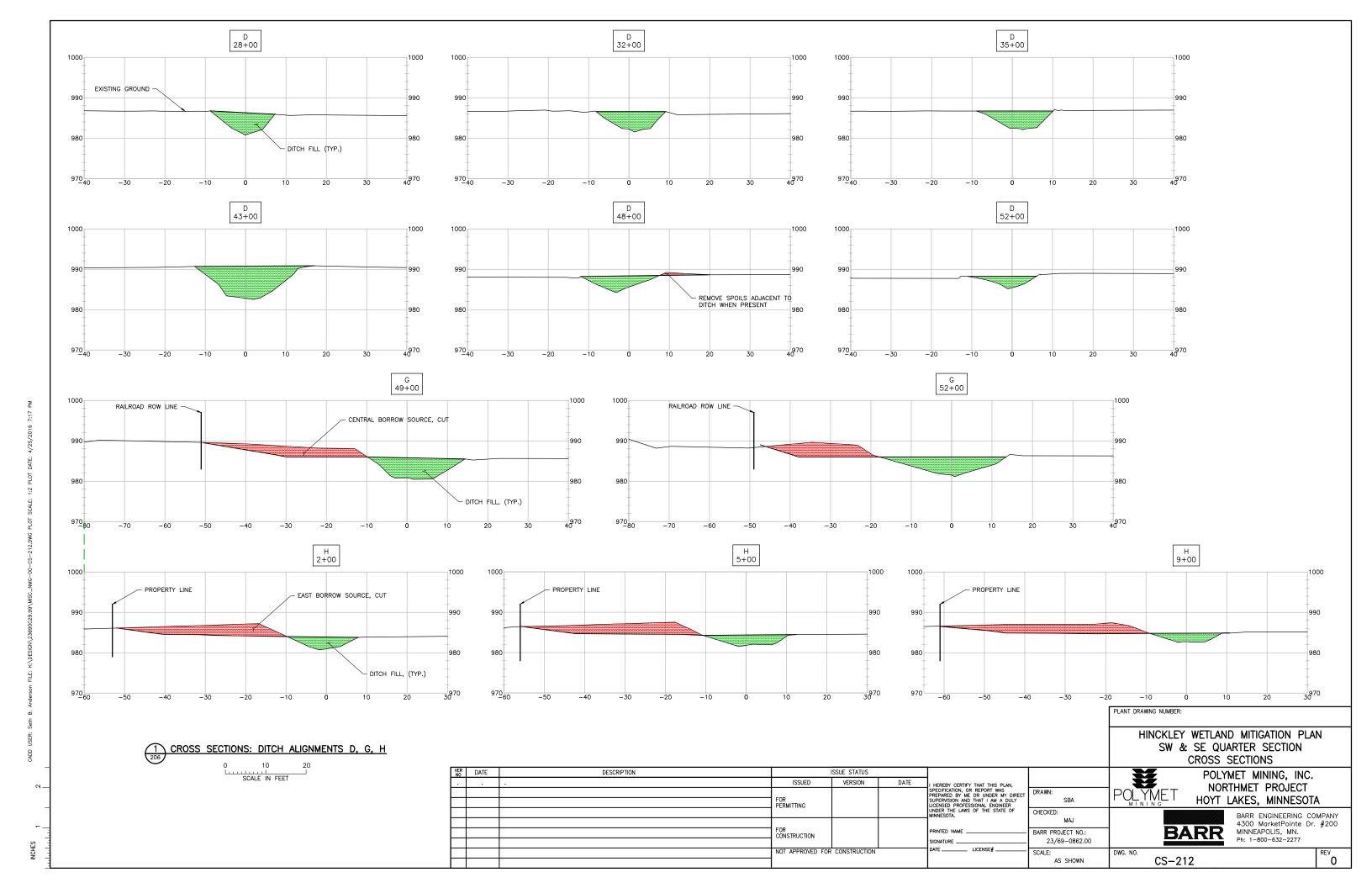
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POLYMET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA

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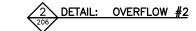
BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 **BARR** MINNEAPOLIS, MN. Ph: 1-800-632-2277







DETAIL: OVERFLOW #1





1 EXISTING STRUCTURE 1 WITH CONCRETE FLOOR
206 APPROXIMATE DIMENSIONS: 50' x 60'



2 EXISTING STRUCTURE 2 WITH DIRT FLOOR
APPROXIMATE DIMENSIONS: 50' x 60'



3 EXISTING STRUCTURE 3 (HOUSE)
APPROXIMATE DIMENSIONS: 40' x 30'

VER NO DATE DESCRIPTION	DESCRIPTION ISSUE STATUS				
	ISSUED V	VERSION DATE	I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS		
	FOR PERMITTING		SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER	DRAWN: SBA	
			UNDER THE LAWS OF THE STATE OF MINNESOTA. PRINTED NAME	JNDER THE LAWS OF THE STATE OF CLIEC	CHECKED: MAJ
	FOR CONSTRUCTION			BARR PROJECT NO.: 23/69-0862.00	
	NOT APPROVED FOR CON	NSTRUCTION	DATE LICENSE#	SCALE: AS SHOWN	

PLANT DRAWING NUMBER:

POLYMET MINING

HINCKLEY WETLAND MITIGATION PLAN DETAILS

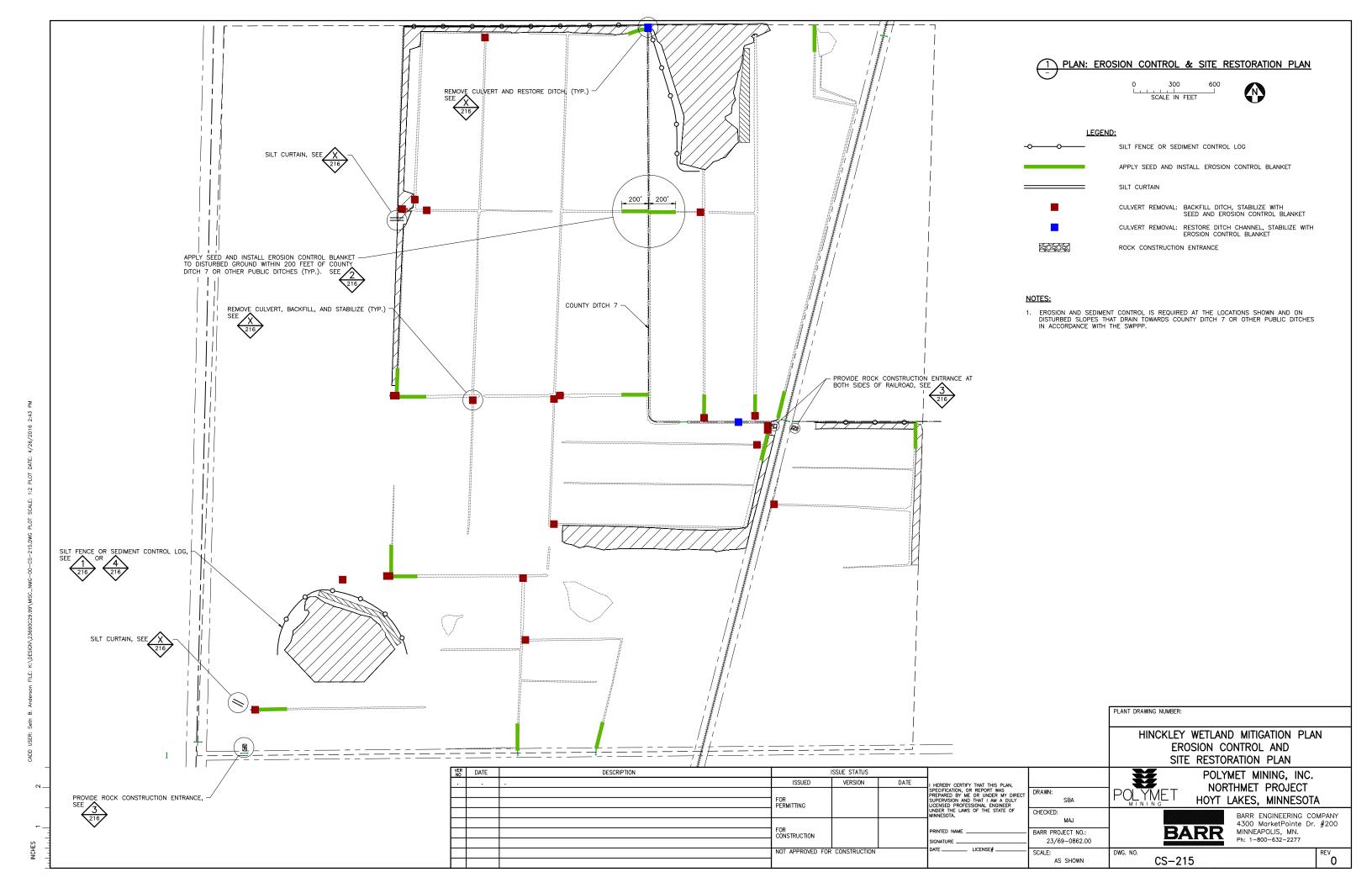
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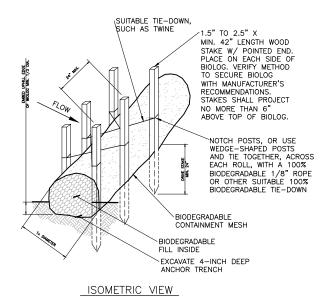
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POLYMET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA

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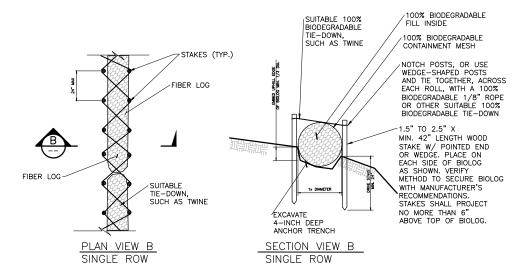


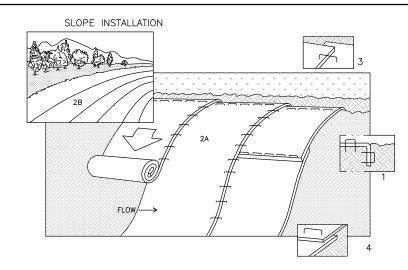


NOTES:

- CORE MATERIAL SHALL BE BIODEGRADABLE OR RECYCLABLE, SUCH AS COCONUT FIBERS OR OTHER ENGINEER-APPROVED MATERIAL. CORE MATERIAL SHALL BE COMPRESSED AND STUFFED INTO A NETTING.
- 2. CONTAINMENT MESH (NETTING) SHALL BE 100% BIODEGRADABLE MATERIAL SUCH AS BURLAP, TWINE, ETC.
- 3. BIOLOG SHALL BE PLACED AS INDICATED ON THE PLANS AND WITHIN 24 HOURS OF VEGETATATION REMOVAL.
- 4. SECURE BIOLOG IN A METHOD ADEQUATE TO PREVENT DISPLACEMENT AS A RESULT OF NORMAL RAIN EVENTS, SUCH THAT FLOW IS NOT ALLOWED UNDER THE BIOLOG. ALL MATERIALS USED TO SECURE BIOLOG SHALL BE
- 5. BIOLOG SHALL BE NO LESS THAN 9" IN DIAMETER.

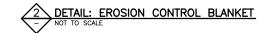


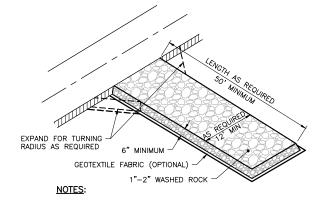




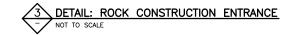
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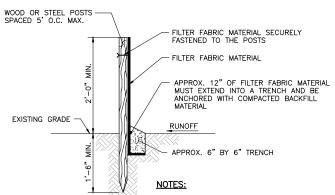
- 1. REFER TO GENERAL STAPLE PATTERN GUIDE FOR CORRECT STAPLE PATTERN RECOMMENDATIONS FOR SLOPE INSTALLATIONS.
- 1. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
- 2. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE.
- 3. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 6" OVERLAP, WITH THE UPHILL BLANKET ON TOP.
- 4. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH APPROXIMATELY 6" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART.
- 5. SLOPE SURFACE SHOULD BE SMOOTH AND FREE OF ROCKS, LUMPS OF DIRT, GRASS, AND STICKS. BLANKET SHALL BE PLACED FLAT ON SOIL SURFACE TO ENSURE PROPER SOIL CONTACT.





- ENTRANCE SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND REPAIRED OR REPLACED AS REQUIRED TO PREVENT TRACKING OFFSITE.
- ENTRANCE SHALL BE REMOVED IN CONJUNCTION WITH FINAL GRADING AND SITE STABILIZATION.





SBA

AS SHOWN

- INSTALL SILT FENCE AT TOE OF SLOPE PRIOR TO EXCAVATION AND GRADING.
- MACHINE SLICED SILT FENCE MEETING MnDOT SPECIFICATION 3886.1 ACCEPTABLE.

PLANT DRAWING NUMBER:

POLYMET



HINCKLEY WETLAND MITIGATION PLAN **EROSION CONTROL DETAILS**

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CS-216

BARR

Ph: 1-800-632-2277 O PEV

MINNEAPOLIS, MN.

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200

POLYMET MINING, INC.

NORTHMET PROJECT

HOYT LAKES, MINNESOTA

PROJECT INFORMATION:

The project is located in the southwest portion of Pine County in Pokegama Township, approximately one (1.0) mile north of the city of Henriette, Minnesota. Proposed construction will take place within Section 5, of Township 39 North, and Range 22 West in Pine County, Minnesota. The site lies east of State Trunk Highway (STH) 107 and north of Sod Road, Town Road #56. (Latitude: 45.8977, Longitude: -93.1145)

PROJECT DESCRIPTION:

The Storm Water Pollution Prevention Plan (SWPPP) is required for the <u>General Permit Authorization to Discharge</u> Stormwater Associated with Construction Activity (NPDES Permit) as required by the Minnesota Pollution Control Agency (MPCA) under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS).

The project is a wetlands mitigation project, restoring existing agricultural land into wetland. The project will consist of regrading the site to eliminate internal drainage. Existing drainage system culverts will be removed and internal ditches and swales will be filled. The site will be established with native vegetation, shrubs, and trees. All disturbed sloped areas will be stabilized with mulch, erosion control blanket, or rip-rap.

The total project area with in the construction limits is approximately 511 acres, some of which will be disturbed during construction. The project will not add any additional impervious surface.

REGULAIORY CONTEXT:

Special or Impaired Waters: This project discharges to county ditches that eventually discharge to the Pokegama Creek several miles to the east and Mud Creek to the west. Mud Creek is an impaired water located approximately one half (1/2) mile southwest of the project. The Creek is impaired for fecal coliform bacteria but not for construction related impairments. Although the restoration project is expected to disturb approximately 76 acres, the project is designed to slow runoff and infiltrate stormwater across the site.

No other special or impaired waters such as trout waters, wetlands, calcareous fens, will be affected by the Project. The Project will not affect properties listed by the National Register of Historic Places or archaeological sites and is not subject to additional regulations due to any formal environmental reviews, endangered or threatened

FIGURES:

Site Location and Vicinity Map: Sheet Existing Conditions Plan: Site Plan Sheet TS-201 Sheet CS-201, CS-202, CS-203 Sheet CS-204, CS-205, CS-206 Sheet CS-217 Sheet CS-215 Stormwater Pollution Prevention Plan (SWPPP) Erosion Control Plan: Erosion Control Flan.
Erosion Control Sections and Details: Sheet CS-216 Erosion and Sedimentation Control Quantities

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IMPLEMENTATION RESPONSIBILITIES:

- The OWNER and CONTRACTOR are Permittee(s) as identified by the NPDES Permi CONTRACTOR shall be responsible for all on-site implementation of the SWPPP including the activities of all of
- CONTRACTOR shall provide a person(s) knowledgable and experienced in the application of erosion prevention and sediment control BMP's to oversee all installation and maintenance of BMP's and implementation of the
- CONTRACTOR shall provide person(s) meeting the training requirements of the NPDES Permit to conduct inspection and maintenance of all erosion prevention and sediment control BMP's in accordance with the requirements of the Permit. One of these individual(s) must be available for an on site inspection within 72 hours upon request by MPCA. CONTRACTOR shall provide training documentation for these individual(s) as required by the NPDES Permit. This training documentation shall be recorded in or with the SWPPP before
- the start of construction.

 Following Final Stabilization and the Termination of Coverage for the NPDES Permit, the OWNER is expected to furnish long term operation and maintenance (0 & M) of the permanent storm water management system

STORMWATER TREATMENT DESIGNS

stored Wetlands by eliminating existing drainage systems

SEQUENCE OF CONSTRUCTION

wing sequence describes, in general, the work on the site

- CONTRACTOR shall submit a detailed construction staging, erosion control staging, and stormwater management plan for the entire project for the duration of construction.

 CONTRACTOR shall verify that all permits have been obtained and/or obtain the necessary permits
- CONTRACTOR shall perform site inspections, record keeping and record retention in accordance with all permits. CONTRACTOR shall install all perimeter and down-gradient erosion control and sediment control best-management-practices (BMP's), construction entrances prior to site grading, excavation, stockpiling or
- disturbing existing vegetative cover.

 CONTRACTOR shall perform site grading, excavation, stockpiling work in accordance with the stormwater pollution prevention plan (SWPPP).
- CONTRACTOR shall install, inspect, monitor and maintain temporary and permanent erosion control BMPs as shown on plans & in conformance w/NPDES permit, continously during the Work.

 CONTRACTOR shall stabilize all exposed soil areas immediately to limit soil erosion but in no case stabilization must be completed within 7 <u>days</u> after construction activity in that portion of the site has temporarily or permanently ceased with a temporary cover crop as necessary.
- CONTRACTOR shall replace or repair erosion control and sediment control BMP's that are not functioning
- CONTRACTOR shall perform site restoration activities for permanent vegetative establishment by others and shall seed expose areas with a temporary cover crop.
- CONTRACTOR shall remove non-biodegradeable sediment control devices prior to submitting Notice Of
- Submit notice of termination to MPCA within 30 days of final stabilization.

CONSTRUCTION ACTIVITY FIELD REQUIREMENTS:

- All field requirements shall be performed in accordance with the requirements of the NPDES Permit and Stormwater Pollution Prevention Plan (SWPPP).

 The CONTRACTOR must implement the SWPPP and provide BMPs identified in the SWPPP in an appropriate and
- The CONTRACTOR shall respond to changing site conditions and implement/supplement erosion prevention and sediment control measures utilized to provide adequate protection of disturbed soils and adequate prevention of sediment transport off—site. At a minimum, the following storm water pollution prevention construction activity field requirements shall be furnished by the CONTRACTOR.

 The CONTRACTOR shall keep and maintain an active rain guage on site to collect and contain daily

- EROSION PREVENTION PRACTICES:

 B. CONTRACTOR shall be responsible for the following erosion prevention practices:

 1. The CONTRACTOR shall attempt to phase all work to minimize erosion and maintain vegetative cover to the extent possible. The location of areas not to be disturbed must be delineated on the site before construction
- All exposed soils must be stabilized immediately and in no case completed no later than 7 days after the construction activity in that portion of the site has temporarily or permanently ceased, including stockpiles with
- construction activity in that portion of the site has temporarily or permanently ceased, including stockpiles with significant silt, clay or organic components.

 The normal wetted perimeter of any temporary or permanent drainage ditch constructed for the project that drains water from a construction site or diverts water around a site must be stabilized by CONTRACTOR within 200 feet from the property edge, or from the point of discharge to any surface water within 24 hours of connecting to a surface water. Temporary or permanent ditch swales being used as a sediment containment system do not need to be stabilized until they are no longer used as a sediment containment system, after which they must be stabilized within 24 hours.

 Temporary or permanent exerny dissinction at drainage or pipe outlets must be provided within 24 hours of
- Temporary or permanent energy dissipation at drainage or pipe outlets must be provided within 24 hours of

- C. SEDIMENT CONTROL PRACTICES

 CONTRACTOR shall be responsible for the following sediment control practices:

 1. CONTRACTOR must install all down gradient perimeter controls before any up gradient disturbance begins. CONTRACTOR shall maintain perimeter controls until final stabilization.
 - CONTRACTOR shall provide grading and BMP installation to limit all slopes of 3H:1V or steeper to an unbroken length of 75 Timing and installation of sediment control devices can be adjusted by CONTRACTOR to accommodate short-term activities
 - such as clearing and grubbing or vehicle passage. Any short-term activity must be completed as quickly as possible and the sediment control practices must be installed immediately after the activity is completed and in all cases prior to the
 - ... process, an storm sewer mets and outlets shall be protected by CONTRACTOR with appropriate BMP's during the work. These practices shall remain in place until the potential sources for discharging sediment to inlets have been stabilized by CONTRACTOR. If present, all storm sewer inlets and outlets shall be protected by CONTRACTOR with appropriate BMP's during the work
 - Temporary soil stockpiles must have silt fence, sediment control logs, or other effective sediment controls. Soil Stockpiles shall not be placed within surface waters or stormwater conveyances except to fill ditches and swales according to grading plans. CONTRACTOR shall install silt fence protection or sediment control logs around the limits of all temporary soil stockpile areas. All soil stockpiles that remain undisturbed for a period greater than 7 days shall be protected and
 - stabilized by CONTRACTOR with cover of mulch, erosion control blanket, or plastic sheeting.

 CONTRACTOR shall implement measures to control vehicle tracking off site onto STH 109 and other roads. Erosion control construction entrances to minimize the tracking of sediment shall be constructed of rock pads, slash mulch, mul mats, equivalent system must be installed at active project entrance by CONTRACTOR to minimize tracking from site.

CONTRACTOR shall be responsible for the following dewatering requirements:

1. No dewatering activities are anticipated with this project.

- However, if dewatering is necessary, CONTRACTOR's dewatering activities that have sediment-laden discharge must discharge into a temporary or permanent sedimentation basin when possible, otherwise it must be discharged through some form of into a temporary or permanent seaimentation basin when possible, otherwise it must be discharged through some form of best management practice (BMP) by CONTRACTOR to prevent sediment from leaving the site. These BMPs may include the use of flocculents and/or polyacrilimides to satisfactorily remove sediment from the discharge. Flocclents if used, must not directly discharge to surface waters. Prior to discharge, the CONTRACTOR shall perform a visual test to ensure adequate treatment is obtained in the bosin or BMP and apply additional treatment as required to ensure adequate treatment. The discharge must be dispersed over an accepted energy dissipation measure and not adversely affect the receiving water or downstream landowners or wetlands.

- INSPECTIONS AND MAINTENANCE
 CONTRACTOR shall be reponsible for performing the following inspections and maintenance:

 1. When inspections find erosion prevention and sediment control BMP's that are affected in accordance with the repaired, replaced or supplemented with functional BMP's within 24 hours after discovery or otherwise in accordance with the NPDES Permit requirements. The CONTRACTOR shall also place any additional erosion control measures deemed necessary by the ENGINEER or MPCA within 24 hours of notice.
- The CONTRACTOR must routinely inspect the site once every 7 days during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours.

 All inspections and maintenance conducted during construction must be recorded in writing by CONTRACTOR and retained with the SWPPP by CONTRACTOR. Maintenance must be completed by CONTRACTOR in conformance with NPDES permit. CONTRACTOR's records must include: a. Date and time of inspections.

 - b. Name of person conducting inspection
- b. Name of person conducting inspection.
 c. Finding of inspection including corrective action.
 d. Details of corrective action (date. Time. Party completing maintenance).
 e. Date and amount of rainfall greater than 0.5 inches in 24 hours onsite.
 f. Documentation of changes to SWPPP.
 In areas of project where final stabilization is complete inspections can be reduced to once a month until stabilized areas have achieved the minimum of 70% vegetation cover sufficient for the CONTRACTOR to submit the Notice of Termination (NOT). These areas shall be inspected by CONTRACTOR for monthly and may be suspended during frozen conditions in winter months provided that inspections resume within 24 hours of first spring runoff or prior to resuming construction following any winter stoppage, whichever is first.
- All erosion control measures must be installed and maintained by CONTRACTOR according to the details included in the
- All silt must be removed from silt fence by CONTRACTOR according to the details included in the construction documents and in accordance with the product manufacturer's recommendations.

 All silt must be removed from silt fence by CONTRACTOR when it reaches a height equal to one—half of the height of the silt fence. CONTRACTOR shall repair or replace silt fence that is nonfunctional within 24 hours of discovery. Temporary and permanent sedimentation basins must be drained and sediment removed by CONTRACTOR once the sediment collected reaches one half the storage volume within 72 hours of discovery, or as soon as field conditions allow.

- collected reaches one half the storage volume within 72 hours of discovery, or as soon as field conditions allow. All sediment deposits within surface waters or stormwater conveyances must be removed and restabilized by CONTRACTOR within 7 days of discovery, including deltas and storm sewer sediment deposits. The CONTRACTOR shall be responsible for obtaining ALL permits required, if necessary, for such sediment removal.

 CONTRACTOR shall be responsible for keeping existing paved surfaces clean of sediment. Construction entrances shall be checked daily by CONTRACTOR. If the entrance becomes inundated with sediment, the entrance will be cleaned or replaced as appropriate by CONTRACTOR. Streets and paved roads leading to and from the construction entrance shall be checked daily by CONTRACTOR for evidence of off-site sediment tracking onto paved surfaces. These areas will be swept clean of any tracked materials by CONTRACTOR as soon as possible and within 24 hours of discovery. CONTRACTOR shall extend sweeping to the extremity of any sediment tracking that occurs off site. All sweeping must be accomplished using a two step wetting and sweeping method. Dry sweeping which causes a dust cloud is prohibited.

 All infiltration/filtration areas must be inspected by CONTRACTOR to ensure that no sediment from ongoing construction is accumulating over the infiltration/filtration area. Sediment accumulated over infiltration/filtration must be removed by CONTRACTOR.

VER DATE

- POLLUTION PREVENTION MEASURES
 CONTRACTOR shall be responsible for implementing the following pollution management measures on the site:

 1. Solid waste: collected sediment, removed drain tile, culverts, asphalt, concrete, floating debris, paper, plastic, fabric, construction and building demolition debris and other wastes must be disposed of properly and must comply with MPCA
- disposal requirements.

 Hazardous materials: oil, gasoline, paint and any hazardous substances must be stored in appropriate containers. All tanks containing hazardous materials must be double walled or contain secondary containment to prevent spills, leaks or other discharges. Restricted access to storage areas must be provided to prevent vandalism. Storage and disposal of hazardous waste must comply with MPCA regulations. Contractor must have an emergency spill kit onsite available to remedy any spills

DESCRIPTION

- In the event of a spill, Contractor must immediately notify Owner.

 A defined area of the site must be designated for use as a wash area for trucks and other equipment. No engine degreasing allowed on site. Concrete washout containment is not expeced to be required on site.
- Portable toilets brought to the property shall be made secure (anchored) to prevent spillage from vandalism or other accidental spillage of internal liquids.

- The CONTRACTOR shall keep appropriate records of inspections and maintenance of erosion prevention and sediment control measures, precipitation and all other records required by the NPDES permit during the

— The SWPPP, all changes to it, and inspections and maintenance records must be kept at the site during construction by the permittee who has operational control of the portion of the site. CONTRACTOR and OWNER must keep the SWPPP on file for three years after the submittal of the notice of termination. Including the records of all inspection and maintenance conducted during construction.

NOTICE OF TERMINATION

- Permittee must ensure final stabilization of the site and submit the Notice of Termination within 30 days of

- Final stabilization can be achieved in the following way:
 All soil disturbing activities are complete and a uniform perennial vegetative cover with a density of 70% over the entire pervious surface has been achieved, including stabilization of all ditches and

 - All permanent stormwater treatment systems meet the requirements of the NPDES Permit.

 Removal of all temporary synthetic and structural BMPs. BMPs designed to decompose on site may be left in place if indicated by the plan.
 - Removal of sediments from storm water conveyances and permanent water quality basins.

or modified BMPs, Designed to correct problems identified or address situations whenever:

1. There is a change in design, construction, operation or maintenance.

- Weather or seasonal conditions that have significant effect on discharge. Inspection is required within 24 hours of a rainfall event greater than one—half inch.
 Inspection or investigation by site operators, local, state or federal officials indicate the SWPPP is

- The SWPPA is not achieving the general objectives of controlling pollutants or the SWPPP is not consistent with the terms and conditions of this permit.

 The MPCA determines that discharge may cause or contribute to non-attainment of any applicable water quality standards or the SWPPP does not incorporate the requirements related to an approved total maximum daily load (TMDL).

SWPPP CERTIFICATION

This Stormwater Pollution Prevention Plan was prepared by individual(s) trained in accordance with the Permit's training requirements for preparation SWPPPs. Individual(s) preparing this SWPPP: TRAINING / CERTIFICATION

PREPARED BY: Tom Tri, Senior Env. Scientist Water Resources

Date of Training/Certification: January, 2005 Certification Program: University of Minnesota

Design of SWPPP - Mn/DOT, Arden Hills Barr Engineering Company Recertification: May 7, 2014 May 7, 2017 218-529-8226

Certification Expiration:

RESPONSIBLE PERSONS:

— Below is a list of people responsible for this project who are knowledgeable and experienced in the application of erosion prevention and sediment control BMPs. They shall oversee the implementation of the SWPPP, inspection, and maintenance of erosion prevention, and sediment control BMPs before and during

Responsible persons:

RESPONSIBLE PERSONS IS PENDING CONTRACTOR SELECTION

OWNER:	OWNER'S REPRESENTATIVES
Polymet Mining Corporation	Kevin Pylka Polymet Mining Corporation
6500 County Road 666 P.O. Box 475 Hoyt Lakes, MN 55750 218–471–2150	Manager Env. Permitting & Compliance 6500 County Road 666 P.O. Box 475 Hoyt Lakes, MN 55750 218-471-2150
	Mark Jacobson

Vice President CONTRACTOR: Barr Engineering Company 4700 West 77th Street Construction Co. Minneapolis, MN 55435 Office: (952) 832-2764 Main Phone: (218) Main Fax: (218) migcobson@barr.com

Daniel Tix Wetland Ecologist Barr Engineering Company 4700 West 77th Street Construction Co. Office: (218) Minneapolis, MN 55435 Office: (952) 832-2918 Mobile: (218) Mobile: (612) 540-7848 dtix@barr.com

On-Site Representative

P.O. Box

ISSUE STATUS

ISSUED

FOR PERMITTING

CONSTRUCTION

NOT APPROVED FOR CONSTRUCTION

VERSION

DATE

RINTED NAME

IGNATURE ___

Construction Co. Office: (218) Phone: (218)

Barr Engineering Company 4700 West 77th Street Minneapolis, MN 55435 Office: (952) 832-

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN

CS-217

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS REPEARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY ICENSED PROFESSIONAL ENGINEER INDER THE LAWS OF THE STATE OF DRAWN: POLYMET TPT CHECKED:

BARR PROJECT NO.

23/69-0862.00

AS SHOWN

POLYMET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 BARR MINNEAPOLIS. MN. Ph: 1-800-632-2277

Attachment E

Aitkin Wetland Mitigation Site Wetland Mitigation Plan



Aitkin Wetland Mitigation Site

Wetland Mitigation Plan

Poly Met Mining, Inc.



August 2016

Aitkin Wetland Mitigation Site Wetland Mitigation Plan

August 2016

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1.0 Introduction

On behalf of Poly Met Mining, Inc. (PolyMet), Barr Engineering Co. has prepared this wetland restoration plan to provide compensatory wetland mitigation to replace unavoidable wetland impacts associated with PolyMet's NorthMet Project (Project). The Project is located in the St. Louis River #3 major watershed and a total of 939 acres of wetland impacts are proposed. The compensatory mitigation activities described in this report include those planned within one property (Site) located near Aitkin, Minnesota in Aitkin County (Large Figure 1).

Review of the 1940 aerial photograph indicates that much of the Site was under agricultural production at that time and some of the drainage ditches had already been constructed. The 1991 aerial photograph shows the Site during the years of wild rice production, which apparently extended from as early as the late 1950s, until about 1998 when the Site was converted for sod production. The Site is currently an active farm producing primarily row crops and has been drained by a series of ditches and culverts (Reference (1)). The Site encompasses approximately 1,020 acres of land, on which, 828 acres of wetland restoration and 65 acres of upland buffer preservation is proposed (Large Figure 2). The Site is located in the Mississippi River-Brainerd #10 major watershed within Bank Service Area #5. PolyMet has entered into an option agreement formalizing the intent to conduct wetland restoration activities.

This report includes discussions of the Site, construction activities, hydrology restoration activities, wetland mitigation crediting, vegetation establishment and management activities, wetland restoration goals, performance standards, schedules, and monitoring plans. A preliminary wetland restoration plan (Reference (2)) was submitted to the U.S. Army Corps of Engineers (USACE) and Minnesota Department of Natural Resources (MDNR) Division of Lands and Minerals in August 2007. The plan was reviewed by the USACE, MDNR, and Minnesota Pollution Control Agency (MPCA); comments were provided, and the plan was resubmitted for review. A final review was conducted by the same agencies and a final plan was submitted in January 2008 (Reference (3)). A revised permit application was submitted to the USACE and MDNR in August 2013 to start the permitting process (Reference (1)). A revised wetland mitigation plan was submitted to the USACE and MDNR in May 2014. The agencies determined that hydrologic monitoring should be conducted to justify the proposed crediting in the plan and the plans should be revised to comply with standards that have changed since the initial submittal. Hydrology monitoring was conducted in 2012 through 2015 and continues in 2016. Updates to the revised wetland permit application were submitted to the USACE and MDNR in November 2015.

This mitigation plan was developed to comply with Section 404 of the Clean Water Act as administered by the USACE, the current Wetland Conservation Act (WCA) rules (Minnesota Rules Chapter 8420) as administered by the Minnesota Department of Natural Resources – Division of Lands and Minerals, and Minnesota Rules, part 7050.0186 (wetland mitigation) as administered by the MPCA.

A declaration of restricted covenants, similar to the example provided in Appendix A will be prepared and recorded to cover the wetland restoration and associated upland buffer areas within one year after starting the restoration activities at the Site.

2.0 Project Wetland Mitigation

The overall compensatory wetland mitigation plan is designed to produce the number of mitigation credits required by the USACE and MDNR. The number of mitigation credits that are required is based on the types, sizes, and locations of wetlands that will be subject to direct and fragmentation impacts from the Project, and on the types, sizes, and locations of the wetlands that will be restored to replace them (Large Table 1, Appendix B).

The formulas for calculating the number of required mitigation credits are complex, using ratios established by the USACE (base ratios) and the WCA (mitigation ratios). The USACE and the WCA use slightly different ratios, but generally, the ratios they use to determine the number of mitigation credits vary depending on whether the mitigation wetland will be in-kind (same wetland type as impacted wetland), in-place (same watershed as impacted wetland), and/or in-advance (one to ten years ahead of the wetland impact).

Current guidance from the USACE regarding conditions that constitute in-advance compensatory mitigation was provided in a memo dated May 29, 2013 ("Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation – Compensation Ratios for Loss of Wetlands/Aquatic Resources") (see Appendix C). In accordance with USACE guidance, all non-forested, non-bog, and low or medium quality wetlands have a base ratio of 1.5:1. All forested, bog, and high quality wetlands will have a base ratio of 2:1 (Large Table 2, Appendix B). The USACE provides incentives to reduce the base ratios by 0.25 (e.g., from 1.5:1 to 1.25:1) for each of the following provisions that apply with a minimum ratio of 1:1:

- if the mitigation wetland is in-kind (same wetland type as impacted wetland)
- in-place (same major watershed as impacted wetland)
- in-advance (one to ten years ahead of the wetland impact; see Appendix C)

Under the Minnesota WCA, the mitigation ratio is 1:1 if the majority of wetlands are replaced with the same wetland type or same historic type and in the same watershed. For wetlands that are replaced outside of the watershed or a different wetland type, the ratio will increase to 1.5:1 (Large Table 3, Appendix B). Should additional wetland mitigation credits be established beyond the needs for direct impacts, the excess credits will be utilized to compensate for potential indirect wetland impacts.

The number of mitigation credits needed to compensate for the impacted wetlands will be set during permitting by the agencies approving the wetland mitigation plan, and expressed in terms of mitigation credits that replace each type of lost wetland. Details on calculations of the wetland mitigation credits for the Project, are presented in Reference (1), and summarized on Large Table 1 in Appendix B. The mitigation credit calculations, based on the USACE base ratios and the WCA mitigation ratios, are summarized in Large Table 2 and Large Table 3 in Appendix B, respectively.

3.0 Site Wetland Mitigation Crediting

The proposed wetland mitigation credit areas for the Site are shown in Large Figure 3. The credits were calculated based on:

- hydrology monitoring (Reference (4))
- lateral drainage effect from ditches
- soil survey information (Large Figure 4)
- target plant communities (Large Figure 2) developed based on existing elevations, proposed elevations, and planned hydrologic restoration
- delineated wetland boundaries (Large Figure 5 and Large Figure 6)
- other site conditions

These credits are summarized in Table 1 based on actions eligible for credit in the USACE's policy (Reference (5)) for wetland mitigation in Minnesota and in the WCA rules. Proposed actions eligible for credit include the following with references to the applicable USACE's policy (2009), Section 404 of the Clean Water Act (CWA) and applicable subpart of Minnesota Rules, part 8420.0526):

- Upland buffer credit [Section 404 (upland buffers) and Minnesota Rules, part 8420.0526, subp. 2] is applied to areas that are not expected to develop as wetland after restoration is complete, but are located adjacent to wetland restoration areas and will provide integrated protection of wetlands and valuable wildlife habitat. These areas will be restored to native, non-invasive vegetation. Upland buffer credits are credited at 25% of the area maintained as upland buffer (4:1 ratio of upland acres to credit). Credit from upland buffers will not exceed 25% of the total credit from the Site. A total of 64.25 acres of upland buffer are planned for the proposed wetland restoration work resulting in 16.06 credits (Table 1). Credits generated from upland buffer areas will be proportionally distributed between the proposed wetland types.
- Credit for restoration of completely drained wetlands [Section 404 (restoration via reestablishment) and Minnesota Rules, part 8420.0526, subpart 3] is applied to the majority of the wetland restoration areas on the Site. The estimated area of wetland that is expected to develop is more fully discussed in Section 4.0. Areas that are presently non-wetland and develop as wetland after restoration are proposed as 100% credit for the area restored (1:1; wetland to credit). An estimated 714.11 acres of drained wetland are planned to be restored at the Site for 714.11 credits (Table 1).

• Restoration of partially drained wetland [Section 404 (restoration via rehabilitation) and Minnesota Rules, part 8420.0526, subp. 4] applies to the existing wetlands and ditched wetlands on the Site (Large Figure 3). The wetland areas described in Section 6.0 were determined using the hydrologic monitoring data and drainage setback tables (Reference (6)). These existing wetland areas are partially drained by the ditches adjacent to portions of the wetlands, which have been documented through hydrologic monitoring. Restoration will restore natural hydrology to these wetlands by removing the drainage system. This would qualify as credit for restoration via rehabilitation under the USACE's policy (Reference (5)) and is proposed for 50% credit of the area restored (2:1; wetland to credit). The partially drained wetland area encompasses 78.81 acres for 39.41 credits (Table 1).

Table 1 Wetland Mitigation Credit Summary

Credit Type	Area (acres)	Percent Credit	Credits
Drained Wetlands	714.11	100%	714.11
Partially-drained wetlands	78.81	50%	39.41
Upland buffers	64.25	25%	16.06
Ditches (excavated wetlands functioning as ditches)	20.13	50%	10.06
Exclusion Areas	142.49	0%	0
Credit Subtotal ⁽¹⁾	1,019.79		779.64
Ditches filled to create upland buffer	0.51	(100%)	(0.51)
Total for the Site ⁽¹⁾	1,020.30		779.13

⁽¹⁾ Totals may not sum due to rounding.

All of the excavated wetlands functioning as private ditches within the Site, encompassing approximately 20.13 acres, will be filled to eliminate drainage effects (Large Figure 7). Most of those areas will remain wetland and are proposed to receive 50% credit for restoring natural hydrology. Those ditch areas that will be located within the upland buffer, will be directly impacted, and are proposed to be mitigated at the Site.

The area within the Diversion Channel easement along the north edge of the property is not proposed for credits because this area may be modified by the local ditch authority in the future to manage regional drainage. No credits are proposed for areas within the County Highway 1 right-of-way and the County Ditch 11 and County Ditch 27 maintenance zones. Wetlands that are restored in these areas (14.90 acres) will not be eligible for credit. Other credit exclusion areas on the Site include an approximately 4.5 acre homestead and non-field areas (Large Figure 7).

In order to adequately track the timing of wetland mitigation construction and wetland impacts, a structured accounting system may be needed to determine the required mitigation ratios for the Project impacts. This information could be provided in the MDNR Permit to Mine annual report. The annual report could include a tabulation of wetland mitigation construction completed by May 1 of each year (prior to the growing season) and wetland impacts that occurred during the calendar year. This

information would be submitted using the schedule for the Permit to Mine annual report, typically within one month after the end of each year.

4.0 Wetland Mitigation Goals

To the degree feasible, the primary goal of the wetland mitigation plan for PolyMet is to restore high quality wetland communities (Reference (7)) of the same types as those impacted by the Project. While it is not practicable to replace all impacted wetland types with an equivalent area of in-kind wetland due to site limitations, technical feasibility, and other considerations; the goal of the mitigation plan is to replace the wetland types in-kind to the degree practicable to replace lost wetland functions and values. A summary of the acreage of each targeted wetland restoration community is provided in Table 2. A total of 828 acres of wetland restoration is proposed (Large Figure 2), including three wetland community types that are planned to replace impacts in-kind to the degree practicable, constrained by the restoration of wetland types that are ecologically suitable and sustainable for the landscape area.

Table 2 Wetland Mitigation Target Community Summary

Mitigation Summary	Shallow Marsh	Hardwood Swamp	Coniferous Swamp	Total
Proposed wetland type (acres) ⁽¹⁾	35.53 ac	221.46 ac	570.95 ac	827.94 ac
Proposed upland buffer (acres) ⁽¹⁾		64.77 ac		64.77 ac
Proposed wetland credits	21.37	184.70	557.51	763.58
Percent of total proposed wetland credits for each community ⁽²⁾	3%	24%	73%	100%
Anticipated upland buffer credits – Total all uplands	16.07			16.07
Upland buffer credits converted proportionately to wetland communities	0.45	3.89	11.73	16.07
Credit Subtotal ⁽³⁾	21.82	188.58	569.24	779.64
Ditches filled to create upland buffer	(0.51)	0	0	(0.51)
Total Proposed Credits by Community Type ⁽³⁾	21.31	188.58	569.24	779.13

⁽¹⁾ Wetlands that are restored within exclusion areas, and will not receive credit, will include shallow marsh (14.02 acres, hardwood swamp (0.02 acres), and coniferous swamp (0.86 acres).

Detailed descriptions of the target wetland communities within the wetland restoration area are provided in the following sections.

4.1 Shallow Marsh

A total of 35.53 acres of shallow marsh wetland is planned in two areas of the Site (Table 2, Large Figure 2). Shallow marsh communities typically form within a slightly wetter landscape position. Inundation of up to 18 inches of water may occur in a shallow marsh during the growing season, but will not exceed 30 consecutive days. The shallow marsh plant community is targeted for a dominance of

⁽²⁾ Filled areas in upland buffer not proposed for crediting.

⁽³⁾ The upland buffer acres are distributed among the proposed wetland types.

⁽⁴⁾ Totals may not sum due to rounding.

herbaceous emergent vegetation such as cattails, bulrushes, arrowheads, and lake sedges. The muck soils are typically saturated close to the surface for most of the growing season with shallow inundation common for long periods of time.

4.2 Hardwood Swamp

A total of 221.46 acres of hardwood swamp wetland is planned on the western part of the Site (Table 2, Large Figure 2). Hardwood swamp communities are typically saturated close to the surface with up to six inches of inundation for much of the growing season; with occasional short-term inundation up to 14 inches during floods and following snowmelt. Hardwood swamps are typically dominated by black ash, but other tree species such as quaking aspen, balsam poplar, and yellow birch may develop. Shrub layer cover is expected to be variable with black ash common, along with mountain maple and swamp red currant likely. Herbaceous plants may include various grasses, sedges, ferns, and forbs suited to the microtopography present at the Site. The hardwood swamp communities are planned in the transition zones between the organic soil wetlands and mineral soil uplands. In mature hardwood swamps (older than 75 years), the tree canopy ranges from interrupted to continuous in coverage (50 to 100% cover). The majority of the hardwood swamp restoration area at the Site is underlain by mineral soils.

4.3 Coniferous Swamp

A total of 570.95 acres of coniferous swamp wetland is planned on the eastern part of the Site (Table 2, Large Figure 2). Coniferous swamp communities are typically saturated close to the surface with temporary inundation of up to 12 inches during the growing season. Tamarack-dominated coniferous swamp is the targeted community in this plan. While tamarack is targeted as the dominant tree species, black spruce and balsam fir may also be present. Shrub layer cover is expected to be considerable, and may be composed of species such as speckled alder, winterberry, Labrador tea, blueberries, and various tree species. The ground layer is expected to be variable, and may include mosses, grasses, sedges, ferns, and forbs suited to the microtopography present at the Site. In coniferous swamps, the tall shrub layer coverage is variable and the tree canopy is patchy to interrupted (50 to 75% cover). The planned coniferous swamp restoration areas are predominantly underlain by muck soils.

5.0 Wetland Mitigation Performance Standards

Performance standards have been developed for each wetland community type targeted in this plan to guide the restoration activities and to determine success. The performance criteria include measures to evaluate whether or not the site hydrology and vegetation meet the plan goals. Should the performance standards not be met during the established monitoring period (five years for shallow marsh, eight years for the shrub communities, and twenty years for the forested communities), a proposal will be submitted to the USACE and the MDNR Division of Lands and Minerals describing the corrective actions proposed and an implementation schedule.

5.1 General Performance Standards

Several general performance standards apply to all wetland restoration areas:

- more than 75% areal coverage of the vegetation in each wetland community shall be facultative (FAC) or wetter (FACW, OBL) as listed in the current version of the National Wetland Plant List (NWPL, current version) for the Northcentral and Northeast region.
- invasive, non-native plant species shall not comprise more than 15% cumulative areal coverage within any community by the end of the monitoring period. Invasive species include those identified in Table 3 and those species listed by the MDNR (Reference (8)).
- native, non-invasive species shall comprise at least 80% areal coverage by the end of the required monitoring period.

Table 3 Potentially Problematic Invasive Species

Common Name	Scientific Name
Flowering rush	Botomus umbellatus
Smooth brome grass	Bromus inermis
Canada thistle	Cirsium arvense
Glossy false buckthorn	Frangula alnus
Yellow iris	Iris pseudacorus
Non-native honeysuckles	Lonicera x bella; Lonicera tartarica, etc.
Bird's Foot trefoil	Lotus corniculatus
Purple loosestrife	Lythrum salicaria
Sweet clover	Melilotus alba or M. officianalis
Reed canary grass	Phalaris arundinacea
Common reed	Phragmites australis
Common buckthorns	Rhamnus cathartica
Foxtail	Setaria spp.
Perennial sow thistle	Sonchus arvensis
Common tansy	Tanacetum vulgare
Narrowleaf cattail	Typha angustifolia
Blue cattail	Typha x glauca

5.2 Hydrology

Due to the nature of the Site, it is expected that the extent and duration of soil saturation and high water table will gradually increase as the Site develops more dense vegetation and hydrology stabilizes following removal of the drainage system. Therefore, it is expected that the duration of the high water table at the Site will gradually become more similar to the reference wetlands as these conditions develop. The hydrology success criteria are designed to reflect the incremental changes in hydrology.

5.2.1 Shallow Marsh

The shallow marsh communities will develop in the wettest portions of the Site subject to inundation and extended periods of soil saturation. The hydrology in the shallow marsh community shall consist of a water table at the surface to inundation by up to 6 inches of water for a minimum of 56 consecutive days or four periods of 14 consecutive days during the growing season, under normal to wetter than normal conditions (70% of years based on the most recent 30-year record of precipitation). During the growing season, inundation by up to 18 inches of water may occur, but will not exceed 30 consecutive days (e.g., water depth drops from 18 inches to 6 inches within the 30 days).

5.2.2 Hardwood Swamp

The hydrology in the hardwood swamp community typically consists of a water table at or within 12 inches of the surface throughout the growing season, except in drought years, , with some inundation up to 3 inches. Inundation should not occur (unless there are site-specific conditions). An exception can be made for sites with hummocky microtopography – hollows between hummocks can have standing water depths of up to 6 inches for extended duration. Success will be determined by hydrologic conditions documented within 35% of the hydrologic regime documented in the reference wetland.

5.2.3 Conifer Swamp

The hydrology in the conifer swamp community typically consists of a water table at or within 12 inches of the surface throughout most of the growing season, except in drought years. Inundation shall not occur (unless there are site-specific conditions). An exception can be made for sites with hummocky microtopography – hollows between hummocks can have standing water depths of up to 6 inches for extended duration. To account for climatic variations, the duration of saturation shall be within 25% of that documented within the reference wetland.

A reference wetland has the same wetland community type or a comparable hydrologic regime to the restored target community type. Reference wetlands were identified with shrub-carr and conifer swamp communities and will be used to document hydrologic success in the conifer swamp community. A similar reference wetland could not be found for the planned shallow marsh or hardwood swamp communities.

5.3 Vegetation

Vegetation development within the restored wetlands is planned to start with emphasis on developing the herbaceous layer in the first one to two years followed by the addition of trees in the hardwood swamp and conifer swamp communities.

No seeding is planned within the first year or two, because prior experience indicates that a diverse, native herbaceous community is likely to develop from the seedbank and natural seed dispersal mechanisms. The Site has some adjacent intact wetland communities, which will serve as a valuable seed source during restoration. This natural regeneration has been observed to result in similar diversity and cover compared to sites that have been seeded. If vegetation development is not adequate to meet the success criteria, seed may be installed aft.er the first or second growing season. These community type success criteria will be used to determine success of the Site. A restoration plan that utilizes an adaptive management approach will be critical for successful restoration of the Site.

Wetland restorations typically rely on seed additions to re-introduce native species and establish wetland plant communities, especially for wetland mitigation. The existing seed bank has often been considered as having limited value for establishing wetland cover on mitigation sites, partly due to historical site disturbances. Three wetland restorations and one wetland creation were completed between 2008 and 2009 in north-central Minnesota to mitigate wetland losses. The four sites range in size from 11 acres to 608 acres. Two of the sites (320 and 608 acres) were restored solely using existing seed banks and the other two sites, an 11-acre wetland creation and a 235-acre restoration were seeded with native wetland

species. Each of the sites was monitored annually to document the native species composition and density over the last five years. Following five to six years of development, the sites that were established using existing seed banks developed similar or greater plant species diversity compared to the seeded sites. In 2013, the wetlands that were developed using existing seed banks had 83 to 131 native hydrophytic species present compared to 55 to 88 native hydrophytic species present for the two seeded wetland sites. All of the sites had natural wetlands bordering at least a portion of the restored wetlands.

5.4 Shallow Marsh

This area will meet the following vegetation success criteria described below for each growing season following construction:

5.4.1 Growing Season 1

- Herbaceous vegetation shall cumulatively comprise at least 50% areal cover.
- At least 30% areal cover shall be comprised of at least three species of native, non-invasive plants.
- No more than 30% areal cover shall be comprised of invasive, non-native species.

5.4.2 Growing Season 2

- Herbaceous vegetation shall cumulatively comprise at least 60% areal cover.
- At least 40% areal cover shall be comprised of at least four species of native, non-invasive plants.
- No more than 25% areal cover shall be comprised of invasive, non-native species.

5.4.3 Growing Season 3

- Herbaceous vegetation shall cumulatively comprise at least 60% areal cover.
- At least 50% areal cover shall be comprised of at least four species of native, non-invasive plants.
- No more than 15% areal cover shall be comprised of invasive, non-native species.

5.4.4 Growing Seasons 4-5

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least 10 species of native, non-invasive plants shall be present and at least three species shall be dominants as determined by an approved vegetation dominance test or will have a vegetative diversity/integrity rating of high quality using the Minnesota Routine Assessment Method (MnRAM) for Evaluating Wetland Functions.
- No more than 15% areal cover shall be comprised of invasive, non-native species.

5.5 Hardwood Swamp

The hardwood swamp community will meet the following vegetation success criteria for each growing season following construction.

5.5.1 Growing Season 1

- Herbaceous vegetation shall cumulatively comprise at least 50% areal cover.
- At least 30% areal cover shall be comprised of at least four species of native, non-invasive herbaceous plants.
- No more than 50% areal cover of invasive, non-native herbaceous species will be present.

5.5.2 Growing Season 2

- Herbaceous vegetation shall cumulatively comprise at least 60% areal cover.
- At least 40% areal cover shall be comprised of at least five species of native, non-invasive herbaceous plants.
- No more than 35% areal cover of invasive, non-native herbaceous species will be present.
- At least 240 living tree seedlings per acre will be present, including quaking aspen and balsam poplar, but other species may be present consistent with the species present in the natural forested reference wetlands. No more than 5% areal cover of invasive, non-native tree species will be present.

5.5.3 Growing Season 3

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least six species of native, non-invasive herbaceous plants shall be present or the community
 will have a vegetative diversity/integrity rating of high quality using the current version of
 MnRAM.
- No more than 25% areal cover of invasive, non-native herbaceous species will be present.
- No more than 5% areal cover of invasive, non-native tree species will be present.

5.5.4 Growing Seasons 4-20

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least eight species of native, non-invasive herbaceous plants shall be present or the community will have a vegetative diversity/integrity rating of high quality using the current version of MnRAM.
- No more than 15% areal cover of invasive, non-native herbaceous species will be present.

• At least 210 trees per acre and 108 trees per acre will be present by the end of the fifth growing season and at least 10 trees per acre after the tenth and subsequent growing seasons, or the number of trees will be at least 80% of a reference wetland of similar community type. At least 75 of those living trees per acre will be at least 4 feet in height by the end of the tenth growing season. The tree species will include quaking aspen and balsam poplar, but other species may be present consistent with the species present in the natural forested reference wetlands. No more than 5% areal cover of invasive, non-native tree species will be present.

5.6 Coniferous Swamp

5.6.1 Growing Season 1

- Herbaceous vegetation shall cumulatively comprise at least 50% areal cover.
- At least 30% areal cover shall be comprised of at least four species of native, non-invasive herbaceous plants.
- No more than 50% areal cover of invasive, non-native herbaceous species will be present.

5.6.2 Growing Season 2

- Herbaceous vegetation shall cumulatively comprise at least 60% areal cover.
- At least 40% areal cover shall be comprised of at least five species of native, non-invasive herbaceous plants.
- No more than 30% areal cover of invasive, non-native herbaceous species will be present.
- At least 240 living tree seedlings per acre will be present, including tamarack and black spruce, but other species may be present consistent with the species present in the natural forested reference wetlands. No more than 5% areal cover of invasive, non-native tree species will be present.

5.6.3 Growing Season 3

- Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.
- At least six species of native, non-invasive herbaceous plants shall be present or the community
 will have a vegetative diversity/integrity rating of high quality using the current version MnRAM.
- No more than 20% areal cover of invasive, non-native herbaceous species will be present.
- No more than 5% areal cover of invasive, non-native tree species will be present.

5.6.4 Growing Seasons 4-20

• Herbaceous vegetation shall cumulatively comprise at least 70% areal cover.

- At least eight species of native, non-invasive herbaceous plants shall be present or the community
 will have a vegetative diversity/integrity rating of high quality using the current version of
 MnRAM.
- No more than 15% areal cover of invasive, non-native herbaceous species will be present.
- At least 210 trees per acre will be present by the end of the fifth growing season and at least 108 trees per acre after the tenth and subsequent growing seasons, or the number of trees will be at least 80% of a reference wetland of similar community type. At least 75 of those living trees per acre will be at least 4 feet in height by the end of the tenth growing season. The tree species will include quaking aspen and balsam poplar, but other species may be present consistent with the species present in the natural forested reference wetlands. No more than 5% areal cover of invasive, non-native tree species will be present.

5.7 Upland Buffer

The upland buffer areas will meet the success criteria described below for each growing season following construction.

5.7.1 Growing Season 1

- Vegetation will cumulatively comprise at least 50% areal cover, which shall include at least six species of native, non-invasive plant species.
- The herbaceous layer or herbaceous communities shall contain four or more species of native, non-invasive plants.
- No more than 50% areal cover shall contain invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.7.2 Growing Season 2

- Vegetation will comprise at least 60% areal cover, which shall include least seven species of native, non-invasive plant species.
- The herbaceous layer or herbaceous communities shall contain five or more species of native, non-invasive plants.
- No more than 35% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.7.3 Growing Season 3

- Vegetation will comprise at least 70% areal cover, which shall include at least eight species of native, non-invasive plants.
- The herbaceous layer or herbaceous communities shall contain six or more species of native, noninvasive plants.

• No more than 25% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

5.7.4 Growing Seasons 4-5

- Vegetation will comprise at least 90% areal cover, which shall include at least ten species of native, non-invasive plants.
- The herbaceous layer or herbaceous communities shall contain fifteen or more species of native, non-invasive plants.
- No more than 15% areal cover shall be comprised of invasive, non-native vegetation and no more than 5% areal cover of invasive, non-native shrub and tree species shall be present.

6.0 Wetland Mitigation Site Description

The Aitkin wetland mitigation plan includes the restoration of 828 acres of wetland and the preservation of 65 acres of upland buffer on a row-crop farm (Large Figure 2). The Site is located in Section 6, Township 47 North, Range 26 West; and Section 1, Township 47 North, Range 27 West, Aitkin County, Minnesota. The Site is located in the upper portion of the Mississippi River-Brainerd #10 major watershed and Bank Service Area #5 (Large Figure 2). The National Wetland Inventory map for the wetland restoration area is provided in Large Figure 8.

6.1 Geology and Soils

Oakes and Bidwell (Reference (9)) mapped the surficial geology within the restoration area as glacial lake peat deposits, silts, sands and clays with flat topography. The Site is located in an area of extensive peat deposits in the glacial Lake Upham area. County Well Index boring logs in the vicinity of the Site indicate layered deposits of primarily clay and sand to a depth of 150 feet or more below the surficial soils. The soils within the wetland restoration areas are mapped in the Soil Survey of Aitkin County, Minnesota (Reference (10)) as primarily muck soils, including the Cathro (Map Unit 1983), Sago (Map Unit 532), and Sax (Map Unit 1154) soil series (Large Figure 4). Mineral hydric soils including: Baudette silt loam (Map Unit 1982), Spooner silt loam (Map Unit 147), Sandwick loamy sand (Map Unit 625), and Waukenabo fine sandy loam (Map Unit 759) are mapped within portions of the Site (Large Figure 4).

All soils mapped within the wetland restoration areas are hydric. The majority of the entire land area located upstream of the Site is also mapped as hydric soils, and includes predominantly muck and peat soils in the large wetland complexes and mineral hydric soils in the mesic forested areas. The water table appears to be near the surface throughout much of the general area, as indicated by the large wetland complexes underlain by muck and peat soils.

Soil profiles and water table information were collected during fieldwork conducted on April 25, 2007 and June 5-6, 2007. A topographic survey was completed for the Site and a one-foot contour map was created from the data. The survey data along with soil information was used to create stratigraphic fence diagrams that show the complexity of the soils in the area. The water table information collected during the field survey was also plotted on the diagrams (Figures B2-B9, Appendix D). A discussion of the Site, based on the fieldwork, is presented in the following sections.

6.1.1 East Area Soils

Soil borings were completed on the east side of the Site and showed that deep organic soils were present across the majority of Fields 17, 18, 21, 22, and 23 (Figure B1, Appendix D). Soils that have an organic layer that is 16 or more inches thick (within the upper 32 inches of soil) are classified as Histosols. These soils are typically found in the areas likely to have been the wettest historically. These soils are in areas that are poorly to very poorly drained with long periods of saturation in their undisturbed state. The depth of peat and/or muck at the Site ranged from 16 inches to more than 48 inches in depth, typically underlain by either sand or fine textured materials (e.g., clay, silt, silt loam, etc.). These profiles are described at sites 1-4, 7, 8, 18-21, and 24 (Figure B1, Appendix D).

Soils with an organic layer that is more than eight inches but less than 16 inches in depth have a histic epipedon. These soils are typically formed under somewhat poorly drained conditions with frequent periods of high water tables. The depth of peat and/or muck at these sites ranges from 6 to 15 inches in depth, and is typically underlain by either fine sand, silt, clay, and/or clay loam soils. These profiles are described at sites 5, 6, 16, and 17 (Figure B1, Appendix D).

The remainder of the sites have mineral soil profiles that typically contain up to seven different textural horizons within 36 to 42 inches below the soil surface. The textures throughout the profiles include fine sand, loam, silt, clay, clay loam, loamy fine sand, fine sandy loam, fine sandy clay loam, and fine sandy clay. The presence of multiple strata within 3 to 4 feet of soil indicates these soils were created in near-shore conditions with little wave action so that finer textured materials settle out over time. These profiles are generally formed under poorly drained conditions with periods of short inundation. All the profiles were classified as hydric except at sites 10, 11, and 12, which are located in the northeast area (Large Figure 2) at elevations above 1202 feet Mean Sea Level (ft MSL) (Appendix D).

6.1.2 West Area Soils

Soil borings were completed on the west side of the site in Fields 2, 6, 8, 9, 10, and 11 (Figures B-1 to B-9, Appendix D). These borings show that organic soils are present to a depth of at least 15 inches below the soil surface. In addition, soil samples were collected throughout the west area of the Site for a seedbank germination project. A walk-over of the west area during the collection of soil samples indicated that organic soils were present throughout the ditch system and the sod fields.

The soil survey indicates that nearly the entire west area is mapped as Cathro muck, which typically has peat and/or muck to a depth of 16 to 51 inches below the soil surface. There are two areas of mapped mineral soil, Spooner silty loam, in the northwest and southwest portions of the west area. This series is typically a poorly drained soil that formed from glaciolacustrine parent material and it is classified as hydric. These soils typically formed under poorly to very poorly drained conditions with long periods of saturation.

6.2 Topography

The topographic relief is fairly minimal throughout the Site. The United States Geological Survey (USGS) quadrangle topography indicates an elevation of 1205 ft MSL in the west-central portion of the Site to an elevation of 1204 ft MSL in the east-central portion of the Site. The USGS topography does not show any contours through most of the fields. Detailed survey data indicates ground elevations in the wetland restoration areas ranging from 1196 ft MSL to 1201 ft MSL with elevations on the dikes up to 1213 ft MSL. The gradient in the wetland restoration area ranges from flat to about 0.7% in the northwest corner and 0.3% in the northeast corner of the Site. The gradient in the wetland complex located north of the restoration area appears to be about 1.5 feet per mile or 0.03%.

6.3 Climate

The average annual precipitation for Aitkin, based on the current 30-year normal period 1981-2010 is 28.61 inches (Reference (11)). A water budget completed by Oakes and Bidwell (Reference (9)) for the

Mississippi River headwaters watershed calculated general runoff in the watershed to be 5.34 inches based on annual, average precipitation of 25.33 inches. The Site is located in the downstream portion of the Mississippi River headwaters watershed, for which the water budget was calculated. While the average annual runoff value calculated by Oakes and Bidwell (Reference (9)) may not accurately reflect runoff conditions in all areas of the watershed, it provides a reasonable estimate for computing an order-of-magnitude water volume that might be expected to discharge from various portions of the watershed and is expected to be higher than estimated due to the increased annual precipitation.

6.4 Hydrology

The Mississippi River Diversion Channel (Diversion Channel), constructed in the 1950s to prevent flood damages to the city of Aitkin, is located on the north side of the Site (Large Figure 9). The flood channel diverts a portion of the Mississippi River flows downstream to a lower portion of the river during high flows. A flood study was published for the Aitkin County area in 1981 (Reference (12)) in which specific flood elevations were determined for the Site. The 10-year flood elevation for the Site is approximately 1200.5 ft MSL and the 100-year flood elevation for the Site is approximately 1203 ft MSL. The flood channel also intercepts the Little Willow River and carries its discharge to the Mississippi River. It appears that the Diversion Channel may also intercept some surface and subsurface drainage from the north that may have historically made its way to the Site. However, based on a review of historic topography maps and aerial photographs, it appears that the historic drainage area contributing to the Site may have been limited. There is an artesian well located near the central part of the Site that will flow freely when not restricted. However, the specifications of that well are unknown. It does indicate that there is a general upward groundwater head gradient at some depth at the Site. The Mississippi River abuts the east side of the Site. The existing, immediately contributing watershed area to the Site is currently confined to the Site itself and there is no upstream drainage that enters the Site except for occasional flooding from the Mississippi River (Large Figure 9).

The primary drainage features affecting the farm are surface ditches spaced approximately every 700 feet with the fields contoured to drain to the ditches. There are four outlets from the west part of the Site; two in the northwest part (one north through the Diversion Channel dike and one through the west dike), one in the southeast corner, and another near the center of the east side. These outlets range in elevation from 1193.6 ft MSL in the northwest to 1195 ft MSL in the east and southeast, generally 5 to 7 feet below the field elevations. County Ditch 27 lies along the west of the Site. The west half of the Site is bordered by dikes on the north and west sides. The north dike ranges in elevation from about 1205 ft MSL to 1210 ft MSL. The west dike ranges in elevation from about 1200 ft MSL to about 1204 ft MSL. County Highway 1 acts as a dike along the east and south sides of the west part of the Site ranging in elevation from about 1205 ft MSL to more than 1207 ft MSL.

There are three outlets from the east half of the Site; one discharging to County Ditch 1, which flows into the Diversion Channel at the northwest corner of the east half of the Site and one along the east side discharging to the Mississippi River. The culvert through the Diversion Channel dike in the northwest corner carries discharge from approximately the northern quarter mile of County Highway 1 ditch and overflows from the northeastern part of the Site. The Site outlets range in elevation from 1194.4 ft MSL in

the northwest corner to 1196.2 ft MSL and 119.7 ft MSL in the east, generally 3 to 7 feet below the field elevations. One of the east outlet has an adjustable control structure that can be modified to control water levels. The east half of the Site is bordered by a dike on the north side ranging in elevation from about 1205 ft MSL to 1213 ft MSL. County Highway 1 acts as a dike on the west side, ranging in elevation from about 1205 ft MSL to more than 1207 ft MSL. The south side of the east half of the Site is bordered by a dike that ranges in elevation from about 1201 ft MSL to 1205 ft MSL. The east side of the east half of the Site is bordered by 391st Lane which ranges in elevation from about 1202 ft MSL in the south to 1205 ft MSL in the north.

Review of the 1940 aerial photograph indicates that much of the Site was under agricultural production at that time and some of the drainage ditches had already been constructed (Large Figure 10). The 1991 aerial photograph (Large Figure 11) shows the Site during the years of wild rice production, which apparently extended from as early as the late 1950s until about 1998 when the Site was converted for sod production. Hydrology will be restored within the majority of the proposed wetland restoration areas by eliminating the drainage system through filling the drainage ditches, and eliminating lowered outlets to historic outlet elevations to the degree feasible.

6.5 Hydrology Monitoring

In 2012-2016, hydrology has been monitored to collect baseline data to determine if wetland hydrology is present on the Site, and to provide further justification for the proposed credit plan. Hydrology monitoring wells locations are shown on Large Figure 12. The monitoring data is shown in Table 4; Large Figure 13 through Large Figure 17).

6.5.1 2012

Since 2012 was an exceptionally wet period including one period with 14 inches of precipitation more than the average for the first 3 months of the growing season, it is not indicative of long-term, sustained normal conditions. Therefore, this year was not considered for the evaluation of whether hydrologic criteria were met at the site. This decision was approved by the USACE and MDNR during a meeting on May 5, 2016.

6.5.2 2013

During 2013, a total of 34 of the first 67 days of the growing season were characterized by antecedent precipitation wetter than the normal range. The 2013 monitoring data showed that, when considering data from the entire growing season, including the periods with wetter than normal antecedent precipitation; only Well 10 had sustained water levels above the wetland threshold for more than 14 consecutive days. Water levels in all other monitoring locations were sustained above the wetland threshold for 8 days or less throughout the entire growing season. The reference wetland had water levels within the wetland threshold for 142 consecutive days during the entire growing season. One monitoring location (Well 10) met the minimum criteria for wetland hydrology in 2013 (Table 4).

6.5.3 2014

During 2014, a total of 62 of the first 70 days of the growing season were characterized by antecedent precipitation wetter than the normal range. The monitoring locations at the Site in 2014 had sustained water levels above the wetland threshold for seven to 43 consecutive days during the entire growing season when including the wetter than normal periods (Table 4). In 2014, both of the reference wetlands met the minimum hydrology criteria with water levels within the wetland threshold for 147 consecutive days at Ref1 and 91 consecutive days at Ref2 (Table 4). Ten monitoring locations (Wells 4, 5, 7, 9, 10, 11, 12, 13, 14, and 15) met the minimum criteria for wetland hydrology in 2014.

6.5.4 2015

In 2015, the first 38 of 43 days of the growing season were characterized by antecedent precipitation wetter than the normal range. The monitoring locations at the Site in 2015 had sustained water levels above the wetland threshold for 0 to 29 consecutive days during the entire growing season when including wetter than normal periods (Table 4). During 2015, both reference wetlands met the minimum hydrology criteria with water levels within the wetland threshold for 154 consecutive days at Ref1 and 62 consecutive days at Ref2 (Table 4). Three monitoring locations (Wells 5, 12, and14) met the minimum criteria for wetland hydrology in 2015.

6.5.5 2016

In 2016, 14 of the first 62 days of the growing season were characterized by antecedent precipitation wetter than the normal range. The monitoring locations at the Site in 2016 had sustained water levels above the wetland threshold for 0 to 62 consecutive days during the 62 days monitoring during the beginning of the growing season when including wetter than normal periods (Table 4). During 2016, both reference wetlands met the minimum hydrology criteria with water levels within the wetland threshold for the entire 62 day monitoring period (Table 4). Two monitoring locations (Wells 10 and 11) met the minimum criteria for wetland hydrology in 2016.

6.5.6 Summary

Table 4 summarizes the hydrology criteria for the sod field monitoring locations for 2013-2016. Five of the monitoring locations on the Site had water levels above the wetland threshold for 14 or more consecutive days, in at least 50% of years during the 2013-2016 growing seasons. In addition, the monitoring locations had hydroperiods ranging from 0 to 47% of the reference wetland hydroperiods. Therefore, based on 2012-2016 monitoring data, all fields on the Site are at least partially drained by the adjacent drainage system.

Table 4 Summary of Wetland Hydrology Monitoring Criteria

	Current Land Use	Precipitation during the entire Growing Season ⁽¹⁾											2012-2016	2013-2016			
		2012		2013		2014		2015		2016							
Well ID		Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Percent of Well Ref2	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Percent of Well Ref2	Longest period - Water Level within 12 inches of Soil Surface (days)	Percent of Well Ref1	Percent of Well Ref2	# of years the Monitoring Location Meets Wetland Hydrology Criteria: 14 or more consecutive days of flooding, ponding, and/or a water table 12 inches or less below the soil surface (years/# monitoring years)	# of years the Monitoring Location Meets Wetland Hydrology Criteria: 14 or more consecutive days of flooding, ponding, and/or a water table 12 inches or less below the soil surface (years/# monitoring years)	Drainage Status
1	Field	35	25%	0	0%	8	5%	9%	1	1%	2%	0	0%	0%	1/5	0/4	drained
2/16	Field	34	24%	2	1%	8	5%	9%	8	5%	13%	0	0%	0%	1/5	0/4	drained
3	Field	29	21%	2	1%	7	5%	8%	0	0%	0%	0	0%	0%	1/5	0/4	drained
4	Field	36	26%	4	3%	22	15%	24%	11	7%	18%	1	2%	2%	2/5	1/4	drained
5	Field	36	26%	6	4%	37	25%	41%	29	19%	47%	10	16%	16%	3/5	2/4	partially drained
6	Field	30	21%	0	0%	7	5%	8%	0	0%	0%	0	0%	0%	1/5	0/4	drained
7	Field	32	23%	3	2%	19	13%	21%	4	3%	6%	0	0%	0%	2/5	1/4	drained
8	Field	32	23%	2	1%	8	5%	9%	4	3%	6%	0	0%	0%	1/5	0/4	drained
9	Field	32	23%	8	6%	30	20%	33%	12	8%	19%	2	3%	3%	2/5	1/4	drained
10	Field	37	26%	15	11%	43	29%	47%	5	3%	8%	16	26%	26%	4/5	3/4	partially drained
11	Field	36	26%	8	6%	39	27%	43%	8	5%	13%	15	24%	24%	3/5	2/4	partially drained
12(1)	Field	34	24%	2	1%	21	14%	23%	21	14%	34%				3/4	2/3	partially drained
13	Field					17	12%	19%	3	2%	5%	0	0%	0%		1/3	drained
14	Field					32	22%	35%	21	14%	34%	5	8%	8%		2/3	partially drained
15	Field					19	13%	21%	11	7%	18%	2	3%	3%		1/3	drained
17	Field											0	0%	0%		0/1	drained
Ref1	Shrub- carr	141		142		147			154			62			5/5	4/4	wetland
Ref2	Conifer swamp					91			62			62				4/4	wetland

Bolded numbers meet the criteria for water level within 12 inches of the soil surface for 14 consecutive days during the growing season when the antecedent precipitation is within the normal or drier than normal range.

(1) Well 12 was destroyed when the field was planted in 2016. No data is available because the logger was not found.

6.6 Wetland Delineation

Wetlands on the Site were field delineated in September and October 2014. Delineated wetlands include both excavated wetlands functioning as ditches and naturally-occurring partially drained wetlands, which are summarized in Large Figure 5 and Table 5. The wetland delineation incorporated hydrology monitoring data collected from the 2012, 2013, and 2014 growing seasons.

Barr conducted on-site wetland delineations according to the Routine On-Site Determination Method specified in the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual* (Reference (13)) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0* (Reference (14)). Soil borings were placed in and around the ditches, wetlands, and potential wetlands, and uplands; borings were taken to a depth of at least 15 inches below the ground surface, or until bedrock or large rocks were encountered. Representative soil samples from each boring were examined for the presence of hydric soil indicators. Soil textures were determined by feel. Soil colors were determined using a Munsell® soil color chart and were noted on Wetland Determination Data Forms (Appendix E). Hydrologic conditions were evaluated at each soil boring and this information was recorded on the Wetland Determination Data Forms in Appendix E. Vegetation was documented for each wetland and associated upland. The wetland indicator status for each species was noted using the current National Wetland Plant List (Reference (15)) for the Northcentral and Northeast region.

Wetland boundaries were located in the field using a Trimble GeoXH 6000 Global Positioning System (GPS) Unit, capable of recording positions with sub-foot horizontal accuracy. Wetland boundaries were later digitized in ArcView© Geographic Information System software. Delineated wetlands were classified using the Eggers and Reed Plant Community Classification System (Reference (7)), the U.S. Fish and Wildlife Service (USFWS) Circular 39 System (Reference (16)), and the USFWS Cowardin System (Reference (17)).

A total of 124.3 acres of wetlands were identified within the Site, including excavated wetlands functioning as ditches, partially drained farmed wetlands, and an excavated wetland resulting from topsoil harvesting (Table 5). Approximately 32.35 acres of excavated wetlands functioning as ditches were delineated across the Site and are classified as shallow marsh wetlands (Large Figure 6). Four partially drained farmed wetlands (78.81 acres) were also delineated, all of which are fresh (wet) meadow wetlands (Wetlands 1, 5, 6, and 7; Large Figure 6). One shallow marsh wetland (13.17 acres) that was excavated as part of a topsoil harvesting operation was delineated (Wetland 2; Large Figure 6).

The wetlands delineated across the Site are summarized in the sections below and in Table 5. Wetland data forms are provided in Appendix E. Photographs for each wetland are provided in Appendix F.

Table 5 Wetland Summary

Wetland Name	Wetland Type	Common Vegetation	Typical Hydrology	Soil	Acres
1	Fresh (wet) meadow spike-rush, American water plantain		Saturated at ground surface; shallow surface water in some areas	Mucky peat	40.84
2	Shallow marsh	Canadian rush, reed canary grass	Inundated with 1 inch of water	Muck	13.17
3	Shallow marsh	reed canary grass, duck weed	Saturated between 6 inches below ground surface and at the ground surface	Mucky peat, sandy loam, and silt loam	18.49
4	Shallow marsh	duckweed, reed canary grass, and cattail	Saturated between 8 inches below ground surface and at the ground surface; surface water present in some areas, up to 2 inches deep	Mucky fine sandy loam, loamy very fine sand, silt loam, sandy loam	13.86
5	Fresh (wet) meadow	Canadian rush, reed canary grass, narrow-leaf cattail, and Canada bluejoint	Saturated at ground surface; surface water present in some areas, up to 1 inch deep	Muck	9.33
6	Fresh (wet) meadow	American sloughgrass, curlytop knotweed, and northern bedstraw	Saturated 6 inches below the ground surface	Loamy peat, clay loam, silty clay loam	16.32
7	Fresh (wet) meadow	Fowl mannagrass, red clover, Norwegian cinquefoil, and barnyard grass	Saturated 2 inches below the ground surface		12.33
				TOTAL (acres) ⁽¹⁾	124.33

⁽¹⁾ Totals may not sum due to rounding.

Wetland 1

Wetland 1 is an approximately 40.84 acre partially drained fresh (wet) meadow, representing approximately 32.8% of the delineated wetland area across the Site. Wetland 1 is located in the northeastern part of the Site (Large Figure 5 and Large Figure 6). Wetland 1 was field delineated on October 23, 2014 and vegetation was dominated by spike rush (*Eleocharis acicularis*; OBL) and American water plantain (*Alisma subcordatum*; OBL). Soil was saturated 11 inches below the ground surface, and consists of mucky peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix E.

Wetland 2

Wetland 2 is an approximately 13.17 acre shallow marsh, representing approximately 10.6% of the delineated wetland area across the Site. Wetland 2 is a peat excavation area located in the central part of the Site (Large Figure 5 and Large Figure 6). Wetland 2 was field delineated on September 23, 2014 and vegetation was dominated by Canadian rush (*Juncus canadensis*; OBL) and reed canary grass (*Phalaris arundinacea*; FACW). Soil was saturated at the ground surface, with up to 1 inch of surface water present in some areas, and consists of muck. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix E.

Wetland 3

Wetland 3 is an approximately 18.49 acre shallow marsh, representing approximately 14.9% of the delineated wetland area across the Site. Wetland 3 is a network of excavated wetlands functioning as ditches, located in the western part of the Site (Large Figure 5 and Large Figure 6). Wetland 3 was field delineated on September 23, 2014 and vegetation was dominated by reed canary grass (FACW) and common duckmeat (*Spirodela polyrhiza*; OBL). Soil was saturated between 6 inches below the ground surface and at the ground surface and consists of mucky peat, sandy loam, and silt loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix E.

Wetland 4

Wetland 4 is an approximately 13.86 acre shallow marsh, representing approximately 11.2% of the delineated wetland area across the Site. Wetland 3 is a network of excavated wetlands functioning as ditches located in the eastern part of the Site (Large Figure 5 and Large Figure 6). Wetland 4 was field delineated on September 23, 2014 and vegetation was dominated by common duckweed (*Lemna minor*, OBL), reed canary grass FACW), and cattails (*Typha* sp.; OBL). Soil was saturated between 6 inches below the ground surface and at the ground surface, with up to 2 inches of surface water present in some areas. Soil consists of mucky fine sandy loam, loamy very fine sand, silty loam and sandy loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix E.

Wetland 5

Wetland 5 is an approximately 9.33 acre partially drained fresh (wet) meadow, representing approximately 7.5% of the delineated wetland area across the Site. Wetland 5 is located in the eastern part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 5 was collected on October 23, 2014 and vegetation was dominated by Canadian rush (*Juncus Canadensis*; OBL), reed canary grass (*Phalaris arundinacea*; FACW), narrow-leaf cattail (*Typha angustifolia*; OBL), and Canada bluejoint (*Calamagrostis Canadensis*; OBL). Soil was saturated at the ground surface, with shallow surface water present in some areas, and consists of muck. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix E.

Wetland 6

Wetland 6 is an approximately 16.32 acre partially drained fresh (wet) meadow, representing approximately 13.1% of the delineated wetland area across the Site. Wetland 6 is located in the eastern part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 6 was collected on October 23, 2014 and vegetation was dominated by American sloughgrass (*Beckmannia syzigachne*; OBL), curlytop knotweed (*Persicaria lapathifolia*; FACW), and northern bedstraw (*Galium boreale*; FAC). Soil was saturated 6 inches below the ground surface, and consists of loamy peat over clay loam and silty clay loam. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix E.

Wetland 7

Wetland 7 is an approximately 12.33 acre partially drained fresh (wet) meadow, representing approximately 9.9% of the delineated wetland area across the Site. Wetland 7 is located in the central part of the Site (Large Figure 5 and Large Figure 6). Data for Wetland 7 was collected on October 23, 2014 and vegetation was dominated by fowl mannagrass (*Glyceria striata*; OBL), red clover (*Trifolium pretense*; FACU), Norwegian cinquefoil (*Potentilla norvegica*; FAC), and barnyard grass (*Echinochloa crus-galli*; FAC). Soil was saturated 2 inches below the ground surface, and consists of loam, silt loam, and peat. Additional vegetation, hydrology, and soil characteristics associated with this wetland are provided in Table 5 and Appendix E.

6.7 Cultural Resources

10,000 Lakes Archaeology, Inc. (10,000 Lakes Archaeology) conducted Phase Ia background research for the Site in May and June 2015 (Reference (18)). This Phase Ia cultural resources investigation included a literature review and background research at the State Historic Preservation Office (SHPO), the Minnesota Historical Society (MHS), and Office of the State Archaeologist (OSA). Archaeologists examined the archaeological and historic site files, topographic maps, and historic maps to locate recorded archaeological and historic sites within the Site, as well as a 1-mile buffer surrounding the Site.

Archaeological sites are more likely to be located near water, on prominent topographic features, and near recorded archaeological sites; however these are not the only locations where archaeological sites might be found. Information obtained from the topographic maps, Minnesota State Archaeological Site Files, historic maps (General Land Office Historic plat maps and Trygg maps), and previously recorded sites can be used to identify, areas with a moderate to high potential for unrecorded archaeological sites.

The Site is located in a low area, which was historically wetland, with little topographic relief. However, it is also located adjacent to the Mississippi River; a significant landscape and cultural feature. Only the far eastern portion of the Site, adjacent to the Mississippi River, was upland historically (Reference (19)). Thus, because the easternmost portion of the Site was historically upland and is located close to a significant landscape and cultural feature, the far eastern edge has moderate to high potential for unrecorded archaeological sites. One small archaeological survey has taken place near, but not within, the Site. This survey (conducted in 2014) was located across the river from the Site, and located no archaeological resources (Reference (18)). Based on the results of the background research and topography, an

archaeological survey of the far eastern portion of the Site, totaling approximately 15 acres, was recommended prior to earthmoving activity in that area. This portion of the Site was historically upland and is located within 500 feet of the Mississippi River.

10,000 Lakes Archaeology conducted a Phase I archaeological survey to assess the presence of archaeological sites in the eastern portion of the Site. The survey entailed a pedestrian surface survey conducted by an archaeologist in five to ten meter transects while examining the ground surface for archaeological materials or features. The Phase I archaeological survey of the eastern portion of the Site resulted in the identification of one previously unrecorded small and localized archaeological site, consisting of five lithic flakes. No ground disturbing activity is planned in this area, and therefore the archaeological site will not be impacted by construction.

10,000 Lakes Archaeology recommended that there will be no adverse effect from Site construction on the archaeological site, and thus no further investigations are warranted. However, if construction plans change, additional surveys might be necessary. 10,000 Lakes Archaeology also states that if human remains are located during construction, all ground disturbing activity must cease and local law enforcement must be notified per *Minnesota Statutes*, *section 307.08*, *the Private Cemeteries Act*, which prohibits the intentional disturbance of human burials.

6.8 Site Constraints

The Site has an easement on the north end for the Mississippi River Diversion Channel (Diversion Channel). Aitkin County is the governmental entity holding interest in the Diversion Channel easement. A request will be made to the Aitkin County Board of Commissioners to release approximately 15.6 acres of land that has been historically farmed, from the easement. Should the 15. 6acres of farmland not be released from the easement, the wetland mitigation plan will be modified to remove that area from the proposed crediting. Work is proposed to remove a culvert and repair erosion within the Diversion Channel easement. Approval for that work will be pursued through Aitkin County with acknowledgment from the USACE, who originally constructed the Diversion Channel. There are also legally-mandated maintenance areas along the county ditches on the west side of the Site and along County Highway 1. Aitkin County is the drainage authority for County Ditches 1 and 27. Discussions will continue with Aitkin County to ensure that the proposed restoration activities do not impede future maintenance of the county ditches. No activities or credit are proposed within either the highway or ditch maintenance zones.

There is one residence and buildings located within the Site and additional properties with residences located outside of, but adjacent to the Site. These residences are elevated above the wetland restoration areas and the drainage on each of these properties will be maintained to protect the buildings from increased water levels. The homestead buildings on the western part of the Site are situated at elevation 1202 ft MSL or higher. Upon completion of the restoration activities, runoff from the homestead area will drain south at an approximately 2% gradient and flow into the western County Highway 1 ditch, about 350 feet to the south, which drains south and east to the Mississippi River.

7.0 Wetland Restoration Plan

The Site is currently in row crop agricultural production, which requires considerable control over the hydrology of the Site. From about 1998 to about 2012, the Site was primarily managed for sod production and previously had been managed as a wild rice production facility. The Site hydrology is controlled by a series of ditches throughout with outlet structures through the diversion channel dikes and crossing perimeter roads and dikes. Water levels in the ditches are typically maintained approximately 2 to 4 feet below the field elevations to ensure an aerated rooting zone without soil saturation. The goal for each step in the restoration process is to continually progress toward the final goal of establishing a variety of wetland communities with the appropriate hydrology and dominated by characteristic native vegetation within each community. The restoration construction plans are provided in Appendix G.

7.1 Aitkin Wetland Restoration Construction Plan

The overall objective of the plan is to restore the hydrology within the Site by removing the internal drainage system and constructing outlets to reestablish historic hydrologic conditions to the extent feasible, and meet the goals and performance standards described in Section 4.0 and Section 5.0. The hydrology will be restored by filling ditches and eliminating culverts with the exception of the south culvert crossing 391st Lane.

The restoration process will start with activities to restore the hydrology. Prior to filling ditches, silt fence/erosion control barriers will be installed downstream of the restoration areas within the primary outlet ditches. Culverts will be removed and internal ditches will be filled in accordance with the plan starting at upstream locations and working downstream. Water will discharge from the Site via sheetflow into the county ditches along the west, south, and east sides of the west half and along the west side of the east half of the Site.

The culverts under County Highway, 1 connecting the east and west parts of the Site, will be filled with grout following Minnesota Department of Transportation specifications and in accordance with a permit to be obtained from the Aitkin County Highway Department for work within a public right-of-way. The culverts that cross County Highway 1 near the south part of the Site will remain in place to maintain drainage from the road, as it currently exists. The south outlet across 391st Lane will be maintained in its current configuration, but that culvert will only receive runoff from an approximately 5 acre drainage area. The remainder of the east half drains southwesterly to County Ditch 11. The organic or mineral hydric soils removed from the dikes during construction would be utilized to fill the interior field ditches where practical. After the water supply has been reestablished, efforts will be focused on establishment of the targeted wetland communities as described in Section 4.0.

7.2 Vegetation Restoration Establishment

An adaptive management program is proposed to guide the development of the restored wetlands to the targeted conditions. The vegetative restoration community types proposed in Site are shown on Large Figure 2 and are summarized in Table 2. The vegetative restoration of the herbaceous layer in each wetland community will be conducted to promote the establishment of characteristic native species that

are present in the seed bank or that may be transported to the area from adjacent wetlands. The process for restoration of the wetlands is designed to meet the goals described in Section 4.0 and the performance objectives described in Section 5.0 in the most effective manner.

The goal of the vegetation restoration is to provide a setting and conditions in which the restoration areas will be restored to naturally self-sustaining and functioning wetlands to the extent feasible. The proposed wetland communities have been planned in areas that appear to match the natural hydrologic characteristics of each community type. However, during the restoration process, it is expected that the boundaries of the wetland communities may change to some degree and the plan will allow for adaptation to the conditions.

Where feasible, reference wetlands will be identified in the vicinity of the Site for each restoration community type that represent an approximation of the wetland communities anticipated after restoration. It is recognized that this process cannot be accomplished within a year or two, but will take time, and therefore, short-term interim goals are also included in the performance standards.

7.2.1 General Site Preparation

Prior to, or concurrent with, hydrologic restoration activities, existing, invasive, non-native vegetation will be removed from the Site through mechanical means or herbicide application. Areas where vegetation is present will be assessed to determine the most appropriate vegetation management treatments. Treatment methods that may be used include mowing (for annual weeds), selective herbicide application (for broadleaf weeds or invasive, non-native grasses), or broad-spectrum herbicide application (for areas where limited desirable species are present).

7.2.2 Natural Regeneration - All Communities

The proposed vegetation establishment and maintenance activities anticipated to meet the goals of the plan are listed for the conditions described as appropriate to the restoration schedule:

- Presence of reed canary grass or other non-native grasses. Spray grass-selective herbicide at
 label rates in early spring (prior to growth of desirable native vegetation) and late fall within
 wetland restoration areas containing reed canary grass or other invasive, non-native grasses and
 all dikes and ditch slopes adjacent to the wetland restoration areas. The purpose of this treatment
 is to kill reed canary grass and other actively growing invasive, non-native grasses while desirable
 native plants are dormant. Other restoration projects have had considerable success using this
 treatment recently.
- **Presence of broadleaf weeds.** Spray perimeter dikes and slopes adjacent to wetland restoration areas and wetland areas where warranted with a broadleaf herbicide (e.g., TranslineTM) at recommended rates targeting stinging nettle, Canada thistle, and other broadleaf invasive, nonnative species.
- Revegetate berms and dikes. Seed ditch banks and dikes with an appropriate native grass seed mix.

- **Hydrologic restoration and monitoring.** Construct hydrologic restoration activities as described in Section 7.1. Monitor water levels in restored wetlands to determine if target hydrology is present.
- **Presence of annual weeds**. Where annual weeds are present, mow to 6 to 8 inch height with low ground-pressure mower to prevent annual weeds from producing viable seed.
- **Vegetation characterization.** Characterize vegetation establishing in each wetland restoration area several times during each growing season to determine needed management and establishment procedures. Vegetation characterization will include documenting all problem species present, the approximate areal coverage of each species and approximate locations to guide management activities.
- **General weed control**. Continue treatments 1, 2, 5, and 6 annually until reed canary grass, stinging nettle, Canada thistle and other invasive, non-native species are adequately controlled (see list in Table 3).
- **Site-specific treatment.** Spot spray wetland restoration areas two times annually to control reed canary grass and other perennial invasive, non-native species for up to 8 years in shrub communities, 20 years in bog and forested communities, and 5 years in other communities following initial restoration. Extensive treatments may not be needed after a wetland dominated by characteristic native vegetation is established; such that the performance standards described in Section 5.0 are achieved.
- **Shallow marsh weed control.** Should narrow-leaved cattails, hybrid cattails or other invasive, non-native emergent species become denser than described in the performance standards, control measures will be implemented. An herbicide approved for use over water may be wickapplied selectively to the species in need of control.

7.2.3 Seeding/Planting - Shallow Marsh Community

Diverse, native, herbaceous wetland vegetation is expected to develop in the restoration wetlands from the existing seedbank and from the wetland vegetation that surrounds the Site (both through vegetative propagation and through seed transport), or by other seed dispersal methods. At the end of the first and second growing seasons, detailed assessments of the vegetation re-establishment will be conducted within the wetland areas. Based upon the results of the assessments per the performance standards in Section 5.0, areas that have not met the requirements may be seeded as follows:

- Shallow marsh drawdown vegetation development. Shallow marsh communities that have not developed adequate species diversity and cover after the second full growing season may be drawn down to expose the soils and promote vegetation development.
- **Emergent fringe seeding.** After the second full growing season, shallow marsh fringe areas that have not had adequate wetland vegetation cover established will be drawn down to expose the

soils and the emergent wetland fringe will be seeded with the seed mix shown in Table 6 at a rate of 5.6 pounds/acre.

• **Seeding for ditch filling areas.** Within the Shallow marsh areas, all of the areas graded for the filling of internal ditches will be seeded with the seed mix shown in Table 6 at 5.6 pounds per acre.

Table 6 Wetland Seed Mix

Scientific Name	Common Name	Wetland Indicator	Rate	% of Mix ⁽¹⁾			
Native Grasses, Rushes, and Sedges							
Beckmannia szyigachne	American slough grass	OBL	1.00 lbs/acre	17.9%			
Bromus ciliata	Fringed brome	FACW	1.00 lbs/acre	17.9%			
Calamagrostis candensis	Bluejoint	OBL	0.30 lbs/acre	5.4%			
Carex hystericina	Porcupine sedge	OBL	0.25 lbs/acre	4.5%			
Carex lacustris	Lake sedge	OBL	0.15 lbs/acre	2.7%			
Carex retrorsa	Knotsheath sedge	OBL	0.10 lbs/acre	1.8%			
Carex utriculata	Northwest Territory sedge	OBL	0.10 lbs/acre	1.8%			
Carex vulpinoidea	Fox sedge	OBL	0.21 lbs/acre	3.8%			
Elymus virginicus	Virginia wild-rye	FACW	1.80 lbs/acre	32.1%			
Glyceria canadensis	Rattlesnake manna grass	OBL	0.18 lbs/acre	3.2%			
Juncus dudleyii	Dudley's rush	FACW	0.10 lbs/acre	1.8%			
Scirpus atrovirens	Dark green bulrush	OBL	0.05 lbs/acre	0.9%			
Scirpus cyperinus	Wool grass	OBL	0.15 lbs/acre	2.7%			
Spartina pectinate ⁽²⁾	Prairie cordgrass	FACW	0.30 lbs/acre	NA			
Native Forbs							
Asclepias incarnata	Marsh milkweed	OBL	0.50 oz/acre	0.6%			
Doellingeria umbellata	Flat-topped aster	FACW	0.10 oz/acre	0.1%			
Eupatorium perfoliatum	Boneset	FACW	0.50 oz/acre	0.6%			
Eutrochium maculatum	Joe-Pye weed	OBL	0.62 oz/acre	0.7%			
Helianthus giganteus	Giant sunflower	FACW	0.13 oz/acre	0.1%			
Symphyotrichum lanceolatum	Eastern-lined aster	FACW	0.10 oz/acre	0.1%			
Thalictrum dasycarpum	Tall meadow rue	FACW	0.20 oz/acre	0.2%			
Verbena hastata	Blue vervain	FACW	0.70 oz/acre	0.8%			
Zizia aurea	Golden Alexander's	FAC	0.50 oz/acre	0.6%			

 $^{(1) \}quad \text{ The \% of mix is calculated without } \textit{Spartina pectinate}.$

7.2.4 Planting Hardwood Swamp Community

In the hardwood swamp community, tree seeding will be conducted within the first two years following construction. Trees will be planted in the spring of the second or third year after construction, depending on the success of herbaceous species establishment, the presence of invasive, non-native species, and the stability of site hydrology. Seeded and tree species planted in this area will likely include red maple,

⁽²⁾ Spartina pectinate will be added in selected locations.

balsam poplar, quaking aspen, yellow birch, American elm, and balsam fir; but the species mix will correspond closely to the species mix in a local hardwood swamp reference community. These trees will be planted at about 300 trees per acre. Tree survival will be closely monitored and corrective measures will be implemented if tree mortality surpasses 50%.

If tree densities do not appear to be on a trajectory to meet the performance standards after the fifth full growing season, bare root seedlings of similar species will be interplanted to achieve a stem densities of 210 trees per acre.

7.2.5 Seeding/Planting Coniferous Swamp Community

Coniferous swamp communities will be established initially by direct seeding tamarack at a rate of 4 ounces per acre. As tamarack seed does not exhibit dormancy, seeds may be planted in the spring.

If tree growth does not appear to be on a trajectory to meet the performance standards after the second or third full growing season, tree seedlings will be planted in the spring of the third or fourth year after construction, depending on the success of herbaceous species establishment, the presence of invasive species, and the stability of the hydrology. Trees planted in this area will be predominantly tamarack with some black spruce. These trees will be planted at about 300 trees per acre. Tree survival will be closely monitored and corrective measures will be implemented if tree mortality surpasses 50%.

If tree growth does not appear to be on a trajectory to meet the performance standards after the fifth full growing season, bare root seedlings of similar species will be interplanted to achieve stem densities of 210 trees per acre.

7.2.6 Upland Area Management

Existing vegetation in the upland areas will be managed to promote development of native plant communities. The primary maintenance activity will be control of invasive, non-native species and seeding to develop diverse, native communities. Protecting the Site from further disturbances and allowing natural colonization and successional processes will maintain ecosystem biodiversity and structure.

Establishment and management activities will include:

- Monitoring Site to identify invasive species and management needs prior to seeding. Particular attention will be paid to edges of the upland areas.
- Removing or treating with appropriate herbicides all invasive, non-native plant species.
- Seeding of upland buffers with the upland buffer seed mix (Table 7) at a rate of 8.5 pounds per
 acre native species when areas exceeding one acre in size lack the species diversity and density
 needed to meet the performance standards.

Table 7 Upland Buffer Seed Mix

Scientific Name	Common Name	Rate	% of Mix				
Native Grasses							
Elymus trachycaulus	Slender wheat grass	0.11 lbs/acre	1.3%				
Bromus ciliata	Fringed brome	2.00 lbs/acre	23.5%				
Calamagrostis candensis	Bluejoint	0.13 lbs/acre	1.5%				
Danthonia spicata	Poverty oats	0.50 lbs/acre	5.9%				
Elymus canadensis	Canada wild-rye	1.25 lbs/acre	14.7%				
Elymus virginicus	Virginia wild-rye	1.00 lbs/acre	11.8%				
Panicum virgatum	Switchgrass	1.00 lbs/acre	11.8%				
Poa palustris	Fowl bluegrass	0.90 lbs/acre	10.6%				
Sorghastrum nutans	Indian grass	0.48 lbs/acre	5.6%				
	Native Forbs						
Achillea millefolium	Yarrow	0.48 oz/acre	0.4%				
Chamaecrista fasiculata	Partridge Pea	0.32 oz/acre	0.2%				
Asclepia syriaca	Common Milkweed	0.12 oz/acre	0.1%				
Doellingeria umbellata	Flat-topped aster	0.64 oz/acre	0.5%				
Heliopsis helianthiodes	Common ox-eye	2.08 oz/acre	1.5%				
Eurybia macrophylla	Large-leaved aster	0.32 oz/acre	0.2%				
Oligoneuron rigidum	Stiff goldenrod	2.24 oz/acre	1.6%				
Monarda fistulosa	Wild Bergamot	2.56 oz/acre	1.9%				
Rudbeckia hirta	Black-eyed susan	4.16 oz/acre	3.1%				
Solidago nemoralis	Gray goldenrod	0.96 oz/acre	0.7%				
Solidago ptarmicoides	Upland white aster	0.64 oz/acre	0.5%				
Symphyotrichum ericoides	Heath aster	0.48 oz/acre	0.4%				
Symphyotrichum laeve	Smooth aster	0.96 oz/acre	0.7%				
Verbena stricta	Hoary Vervain	2.08 oz/acre	1.5%				

8.0 Wetland Management Schedule

The following schedule presents a preliminary plan of the expected activities for restoring wetlands at Site. However, with an adaptive management perspective, it should be recognized that the timing of specific establishment and management activities are likely to change as the restoration work progresses. The overall target for restoration activities at the Site is to complete the majority of the restoration work within the first four years of the Project. The Year 1 restoration work will begin within the first year after permit issuance. The remaining restoration activities will generally follow the conceptual schedule provided below.

The mitigation wetlands restored for the Project will require regular management to become established. This is critical in the first five to ten years and should be recognized as integral to the wetland mitigation process. Management will include both eliminating invasive, non-native species, creating ideal conditions for the native plants to flourish, and seeding/planting to supplement natural regeneration. Weeds can establish quickly as the wetlands develop particularly if the ground is bare at the time of restoration. Some weeds are very aggressive and will out-compete the desirable wetland seedlings. Therefore, weed removal and careful monitoring is important during the early stages of the restoration. As native plants grow and spread over the years, and as thatch builds, the Site will become less vulnerable to weed species. Removal of weeds will continue to be important during the first five to ten years to ensure that the native plant communities become established. Structures constructed to control hydrology within the restoration areas will be inspected annually during the 20-year monitoring period established and repairs will be made to maintain the goals of the plan.

After final certification of the restored wetlands by the appropriate regulatory agencies, the land owner of the Site will be required by the *declaration of restricted covenants* that will be recorded after completion of construction (examples provided in Appendix A), to regularly inspect and maintain those structures to sustain the goals of the approved plan.

8.1 Year 1

8.1.1 Fall/Winter

- Apply herbicide to areas where undesirable vegetation is present.
- Construct berms (around excluded homestead area) and fill ditches as shown on the plans.
- Complete hydrologic restoration construction as described in Section 7.1 and as shown on the wetland restoration plans (Appendix G).
- Prepare as-built report documenting construction in comparison to the approved plans.
- Spray grass-selective and broad-leaf herbicides on dikes and dike slopes adjacent to restoration areas.
- Seed dike, dike slopes, and other upland buffer areas with the seed mix in Table 7.

 Spray restoration fields containing at least 20% areal coverage of invasive, non-native grass species with grass-selective herbicide.

8.1.2 Spring/Summer

- Monitor water levels in restored wetlands.
- Seed tamarack and black spruce during late winter/early spring in conifer wetland communities.
- Characterize vegetation in restoration areas three times (May-August) followed by development of specific management objectives for the remainder of the year based on the findings.
- Mow wetlands in spring if annual weeds are present but no trees or shrubs are present.
- Apply grass-selective and broad-leaf herbicide to upland buffers, dikes, and dike slopes where invasive, non-native species are present.
- Spot spray wetland restoration areas to eliminate invasive, non-native species.

8.2 Year 2

8.2.1 Fall – End of First Full Growing Season

- Complete monitoring report, including documentation of wetland establishment activities completed during the previous year conducted in comparison to the plan and recommended actions for the following year.
- Seed hardwood swamp communities with seed available for hydrophytic hardwood species (e.g., red maple, quaking aspen, yellow birch, balsam poplar, black ash, etc.).
- Monitor water levels in restored wetlands.
- Apply herbicides as necessary to control invasive, non-native species in all communities.
- If species diversity or vegetative cover development is wetland herbaceous layers do not conform to performance standards, conduct seeding.

8.2.2 Spring/Summer

- Monitor water levels in restored wetlands.
- Spray grass-selective and broad-leaf herbicides (typically in early June) in upland areas adjacent to restoration areas where invasive, non-native grass and forb species are present before seed production is complete.
- Characterize vegetation in restoration areas approximately three times followed by development of specific management objectives for the remainder of the year based on the findings.
- Spot spray or wick-apply wetland restoration areas with grass-selective and non-selective or other appropriate herbicide to eliminate invasive, non-native species within wetland restoration areas.

Mow wetlands if annual weeds are present prior to seed production.

8.3 Year 3

8.3.1 Fall – End of Second Full Growing Season

- Complete monitoring report, including documentation of wetland establishment activities
 completed during the previous year conducted in comparison to the plan and recommended
 actions for the following year. Make recommendations for permanent water level control
 adjustments that may be needed for restored wetlands to better promote vegetation
 development that meets performance standards.
- Monitor water levels in restored wetlands.
- Apply herbicides as necessary to control invasive, non-native species in all communities.
- If species diversity or vegetative cover development in wetland herbaceous layers do not conform to performance standards, conduct seeding.
- If shallow marsh communities do not meet performance standards, draw down water levels and seed fringe areas.

8.3.2 Spring/Summer

- Monitor water levels in wetlands.
- Spray grass-selective and broad-leaf herbicides (typically in early June) on dikes and dike slopes
 adjacent to restoration areas where invasive, non-native grass and forb species are present before
 seed production is complete, reseed if bare soils are present within areas greater than five acres in
 size.
- Conduct tree planting in hardwood and conifer swamp communities if tree densities are insufficient to meet performance standards.
- Characterize vegetation in restoration areas in June and August followed by development of specific management objectives for the remainder of the year based on the findings.
- Spot spray or wick-apply with grass-selective, broad-leaved, or non-selective herbicide to eliminate invasive, non-native species within restored wetland areas.

8.4 Years 4-5

Many of the management activities described for Year 3 will be continued in Years 4 and 5 along with the monitoring activities. If tree development in hardwood and coniferous swamp communities does not meet performance standards, additional seedlings will be planted as described in Sections 7.2.4 and 7.2.5. The monitoring report completed after the fifth growing season will assess whether or not restored wetland communities (with the exception of forested communities) have met performance standards. If

performance standards have been met, then the initial five-year monitoring requirement would be complete.

8.5 Years 6-20

The establishment of forested wetland communities can take longer than five years, therefore active management will be completed for twenty years in forested communities. Many of the management activities described for Years 4-5 will be continued in Years 6-20 along with the monitoring activities. Management activities will focus on spot treatment and removal of invasive, non-native vegetation species and the development of diverse native species to conform to the performance standards. Monitoring of vegetation will be conducted at least twice per growing season to guide management decisions. Spot spraying, mowing, or other control methods will be conducted as needed to meet the performance standards. Should contiguous areas of the site larger than five acres in size contain fewer than two dominant, native species for more than one full growing season, those areas will be seeded with the wetland seed mix (Table 6).

9.0 Wetland Mitigation Monitoring

The wetland restoration area will be monitored for at least five years (twenty years for forest communities) beginning in the first full growing season after completing hydrologic restoration. Monitoring will document the progress and condition of the wetland communities at the Site. For all wetland types, an annual monitoring report will be prepared for years 1 through 5 following construction. For forested communities, monitoring results will also be included in reports prepared for years 8, 12, and 20 following construction. The monitoring reports will assess whether or not the restored wetlands are in conformance with performance standards.

Hydrologic parameters will be evaluated in the mitigation area most intensively during the first five years and then at a level deemed appropriate to the hydrologic characteristics of each area thereafter. Any significant modifications to the monitoring frequency proposed herein will be described in a revised monitoring plan to be submitted for review and approval prior to implementation. In addition to monitoring the restored wetlands, one reference wetland of each wetland restoration community type with relatively natural hydrologic conditions (if available) will be monitored within the general area of the Site. A monitoring plan will be submitted for review and approval prior to implementing the monitoring program; that plan will also include locations of proposed reference wetlands. Continuous recording wells will be utilized to the extent feasible.

9.1 Hydrologic Monitoring Years 1-5

9.1.1 Shallow Marsh

Hydrologic monitoring in these inundated wetland communities will be conducted using monitoring wells placed within each restored wetland area; continuous recording wells will be utilized to the extent feasible. Water levels will be recorded several times per day during the growing season.

9.1.2 All Other Communities

Hydrologic monitoring in these generally saturated wetland communities will be conducted using shallow wells placed within each restored wetland area: continuous recording wells will be utilized to the extent feasible. Water levels will be recorded several times per day throughout the growing season.

9.2 Hydrologic Monitoring Years 6-20

9.2.1 Forested Swamp Communities

If the monitoring conducted during Years 1-5 indicate a stable and consistent hydrologic regime similar to the reference wetlands, water levels will be recorded several times per day throughout the growing season during Years 6 – 20 for the forest communities, but data will only be collected at the end of the growing season.

In forest communities where water level fluctuations differ substantially from the reference wetlands, water levels will be recorded several times per day throughout the growing season until sufficiently

stabilized to meet performance standards. Water level data will be collected approximately two times during the growing season to assist in determining the need for any corrective actions.

9.3 Vegetation Monitoring

A detailed vegetation survey will be conducted once per year (typically in August) in each wetland mitigation community, as well asin the reference wetland communities, to evaluate the success of the restoration during the appropriate monitoring period for each community type. A time meander search will randomly sample 20% of each wetland restoration community. Documentation photographs will also be taken in August from fixed reference points around each restored wetland area.

9.4 Monitoring Report

The monitoring reports will describe the status of the wetland mitigation, summarize the results of the vegetative and hydrologic monitoring, and discuss management activities and corrective actions conducted during the previous year, and activities planned for the following year. Each report will be submitted to the USACE and MDNR within one month after the end of each monitoring year. The annual report will include the following information at a minimum:

- A brief description of the wetland mitigation area, including location, size, vegetative and hydrologic monitoring data, current wetland types, and desired wetland types.
- Preparation of an as-built survey within the first year after construction is complete along with a comparison of the as-built survey to the approved plans.
- A summary of water level measurements taken to date and a determination whether the hydrology in the wetlands meets the design elevations and wetland hydrology criteria as defined in the performance standards.
- Vegetation survey information, including species and percent areal coverage within each restored wetland community and a determination of whether the vegetation meets the performance criteria, specifically reporting:
 - Percent coverage of native species, hydrophytic species, and invasive, non-native species by plant community type (absolute and relative percent cover);
 - Percent of species facultative or wetter (FAC, FACW, and OBL);
 - o Percent cover by growth form/layer (herbaceous, shrub, and tree layer); and
 - o Summary data by community type such as species richness.
- A map of the various plant communities present within the restoration areas will be prepared as distinctly different communities develop.
- Color photographs of the Site taken in August of each year at designated photo-reference points.

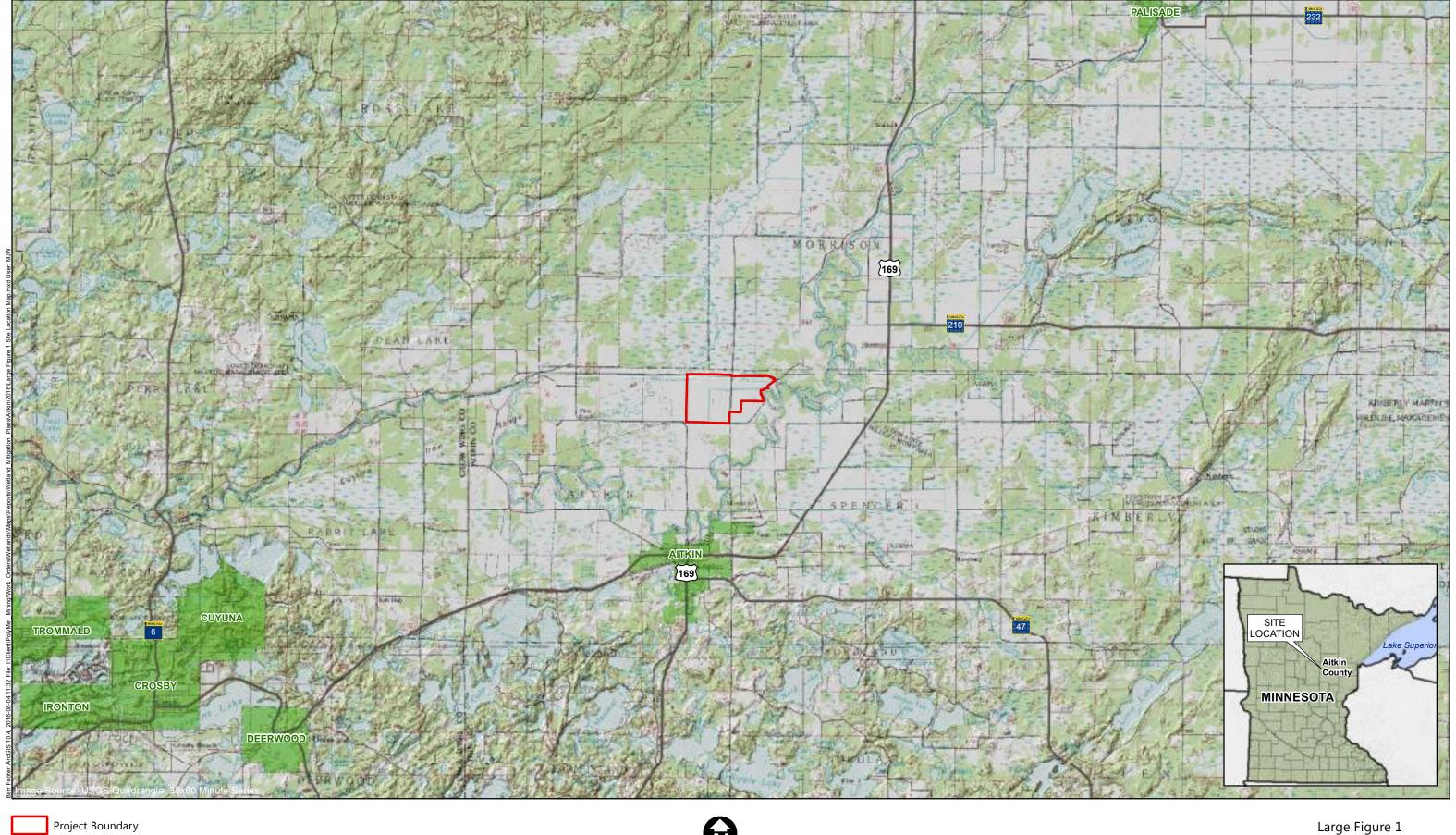
•	A summary of management activities and/or corrective actions conducted in the wetlands during the previous year and activities planned for the following year.

10.0 References

- 1. **Poly Met Mining Inc.** Revised Wetland Permit Application (v2). August 19, 2013.
- 2. Barr Engineering Co. Wetland Mitigation Plan (RS-20T) (Draft-02). August 3, 2007.
- 3. —. Wetland Mitigation Plan (RS20T) (Draft-03). [RS-20T Draft-03]. January 2008.
- 4. —. Aitkin Wetland Mitigation Site Hydrology Monitoring 2012-2015. March 2016.
- 5. **U.S. Army Corps of Engineers St. Paul District.** St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota. January 2009.
- 6. **Minnesota Board of Water & Soil Resources.** BWSR Guidance Concerning NRCS Developed Drainage Setback Tables (Version 2.0). October 2013.
- 7. **Eggers, Steve D. and Donald M. Reed.** Wetland Plants and Plant Communities of Minnesota and Wisconsin. s.l.: U.S. Army Corps of Engineers, St. Paul District, July 2015. Vol. Version 3.2.
- 8. **Minnesota Department of Natural Resources.** Invasive terrestrial plants. *Minnesota Department of Natural Resources*. [Online] 2002. http://www.dnr.state.mn.us/invasives/terrestrialplants/index.html.
- 9. **Oakes, E L and Bidwell, L E.** Water Resources of the Mississippi River Headwaters Watershed North-Central Minnesota. Washington, D.C.: U.S. Geological Survey, 1968.
- 10. **Natural Resources Conservation Service.** Soil Survey of Aitkin County, Minnesota. Washington, D.C.: U.S. Department of Agriculture, 1999.
- 11. —. WETS Climate Information. *U.S. Department of Agriculture NRCS*. [Online] 2007. http://www.wcc.nrcs.usda.gov/cgibin/getwetco.pl?state=mn.
- 12. **Federal Emergency Management Agency.** Flood Insurance Study, Aitkin County, Minnesota, Unincorporated Areas. 1981.
- 13. **U.S. Army Corps of Engineers, Environmental Laboratory.** Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1987.
- 14. **Ed. J.S. Wakeley, R.W. Lichvar, C.B. Noble, and J.F. Berkowitz.** *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0).* U.S. Army Engineer Research and Development Center, U.S. Army Corps of Engineers. Vicksburgh, MS: s.n., 2012. ERDC/EL TR-12-1.
- 15. **Lichvar, R. W., et al.** Northcentral and Northeast 2014 Regional Wetland Plant List. s.l.: U.S. Army Corps of Engineers, April 2014.

- 16. **Shaw, S.P. and C.G. Fredine.** *Wetlands of the United States Their Extent and their Value to Waterfowl and Other Wildlife.* Washington, D.C.: U.S. Department of the Interior, 1956. p. 67. Circular 39.
- 17. **Cowardin, L.M., V. Carter, F.C. Golet, R.T. LaRoe.** *Classification of Wetlands and Deepwater Habitats of the United States.* s.l.: U.S. Fish and Wildlife Service, 1979. p. 103. FWS/OBS079/31.
- 18. **10,000 Lakes Archaeology, Inc.** Cultural Resource Investigations for Proposed Wetland Mitigation at Four Locations in Northern Minnesota. December 1, 2015.
- 19. **General Land Office.** Survey Map of T047R26W. 1871.
- 20. **Barr Engineering Co.** Aitkin Wetland Mitigation Site Hydrology Monitoring 2012-2016 (through early-July). August 2016.

Large Figures



0 1 2
Miles

Municipality

Large Figure 1
SITE LOCATION MAP
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



800

Feet

1,600

Ditch

Homestead

ROW

Hardwood Swamp Upland Buffer

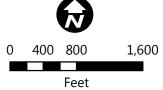
Diversion Channel Shallow Marsh Project Boundary

—— 1-Ft Contour

Large Figure 2
WETLAND RESTORATION PLAN
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Wetland Credits
Upland Buffer - 25%
Ditches
Impact - 0%
Partially Drained - 50%
No credit - 0%
Filled - 50%

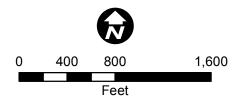


Large Figure 3
WETLAND MITIGATION CREDIT AREAS
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

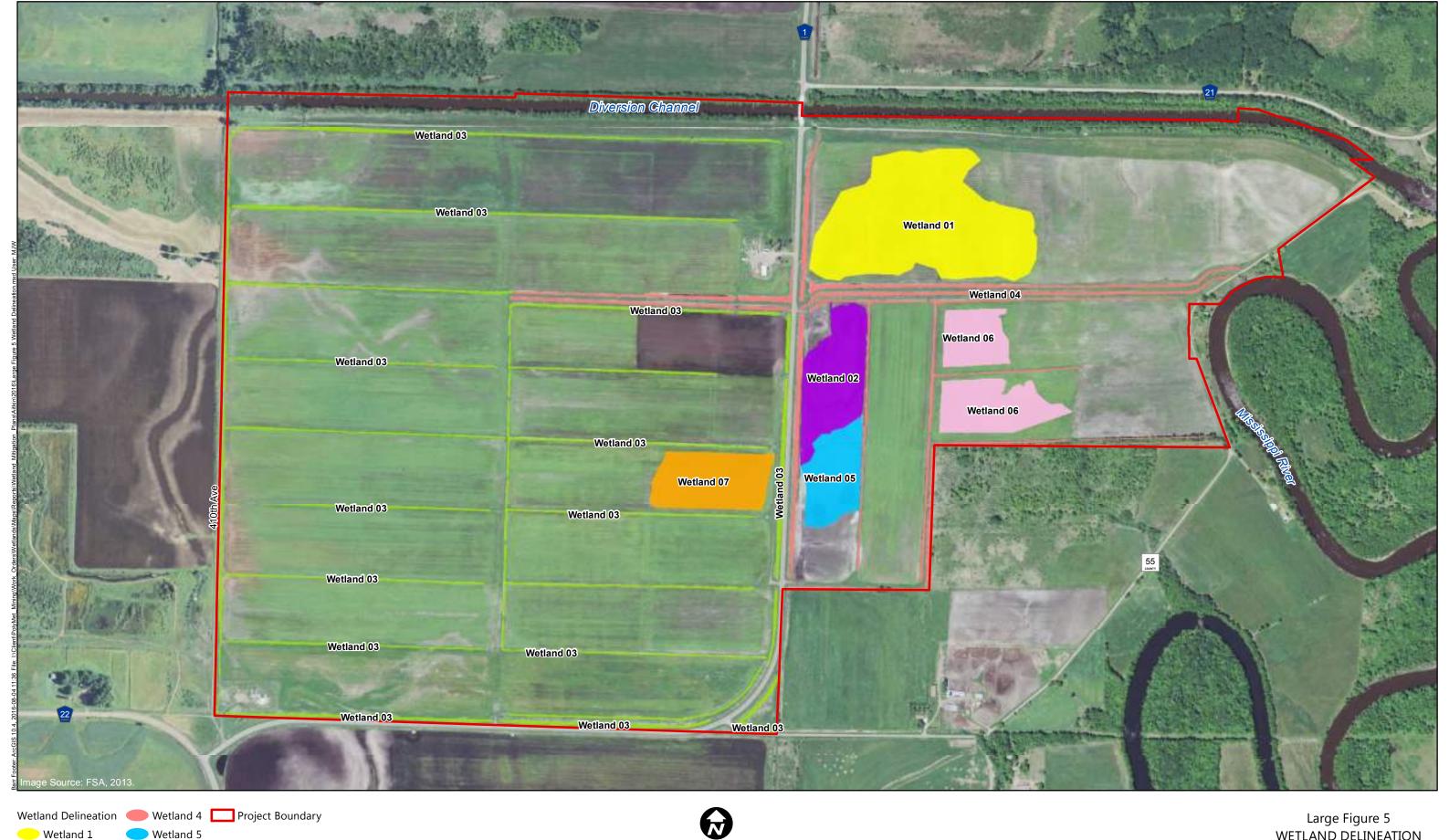


Aitkin County Soil Survey (2015) with Map Unit Symbol

Project Boundary



Large Figure 4
SOIL MAP
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



800

Feet

Wetland 2

Wetland 3

Wetland 6

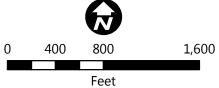
Wetland 7

1,600

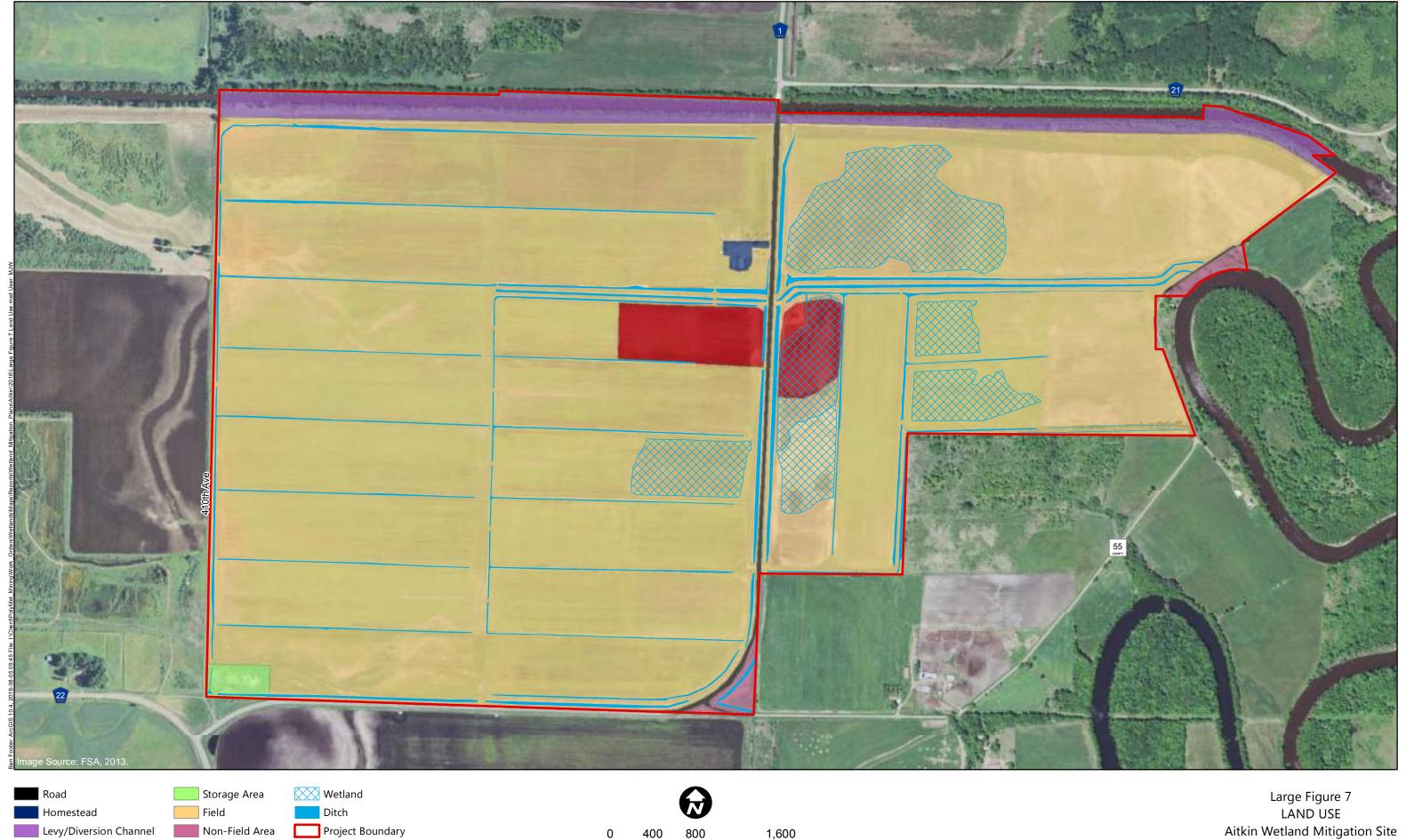
Large Figure 5
WETLAND DELINEATION
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Project Boundary
Wetland Type
Fresh (wet) meadow
Shallow marsh



Large Figure 6
WETLAND TYPE
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



800

Feet

1,600

Non-Field Area

Peat Mining

Project Boundary

Large Figure 7 LAND USE Aitkin Wetland Mitigation Site NorthMet Project Poly Met Mining Inc. Hoyt Lakes, MN



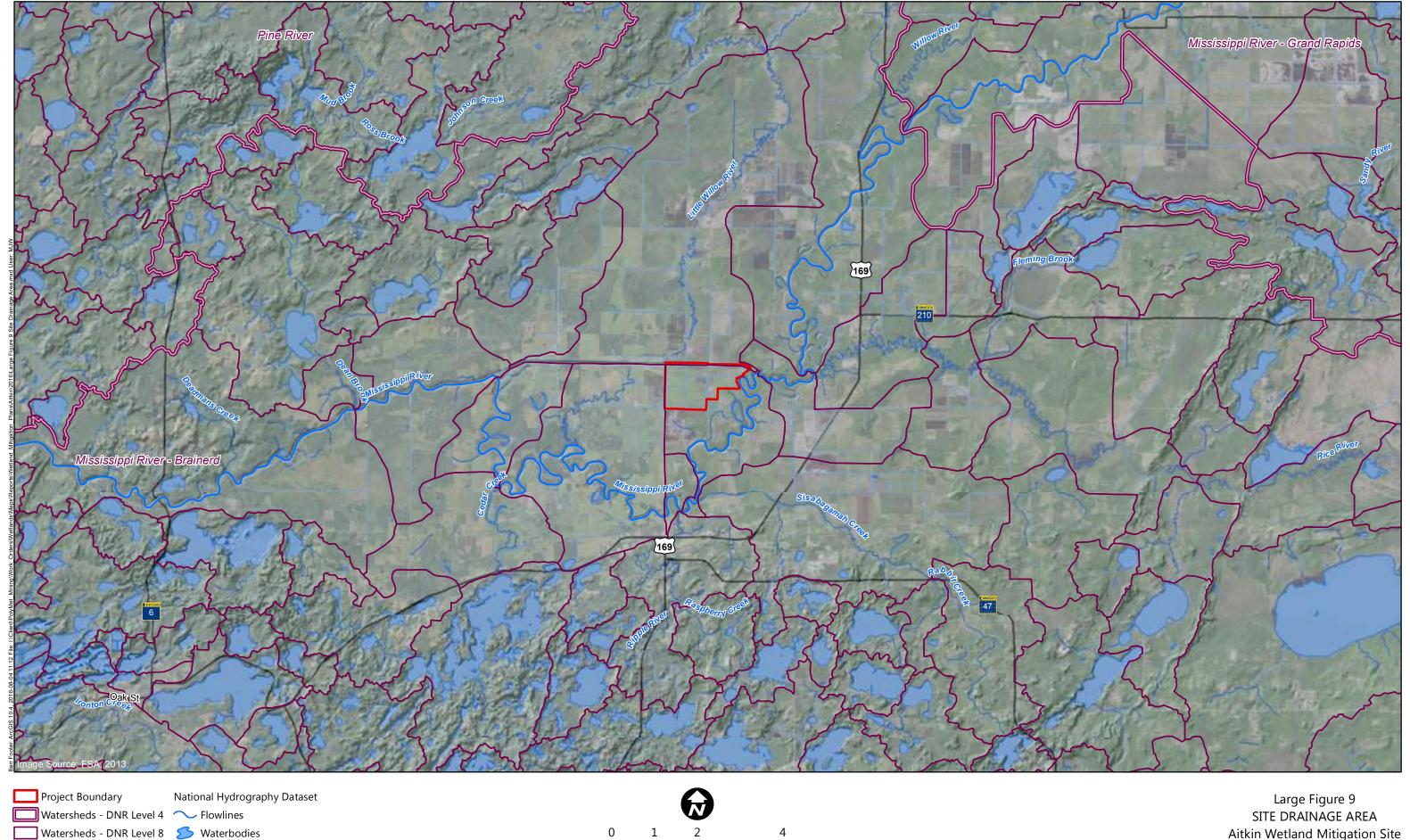
0 400 800 1,600 Feet

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

NATIONAL WETLAND INVENTORY
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Miles

Large Figure 9
SITE DRAINAGE AREA
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



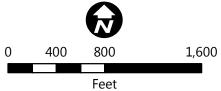
1,600

Feet

Large Figure 10 1940 AERIAL PHOTO Aitkin Wetland Mitigation Site NorthMet Project Poly Met Mining Inc. Hoyt Lakes, MN



Project Boundary



Large Figure 11
1991 AERIAL PHOTO
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



800

Feet

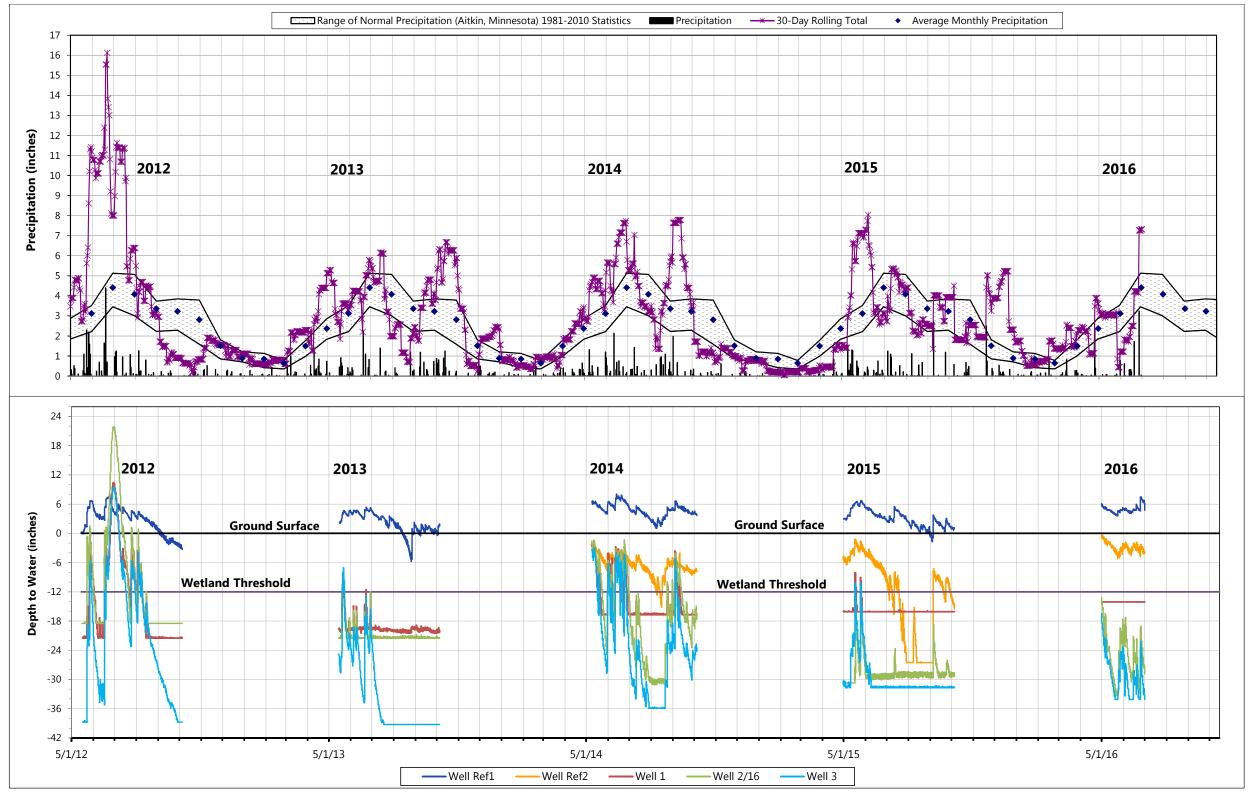
400

1,600

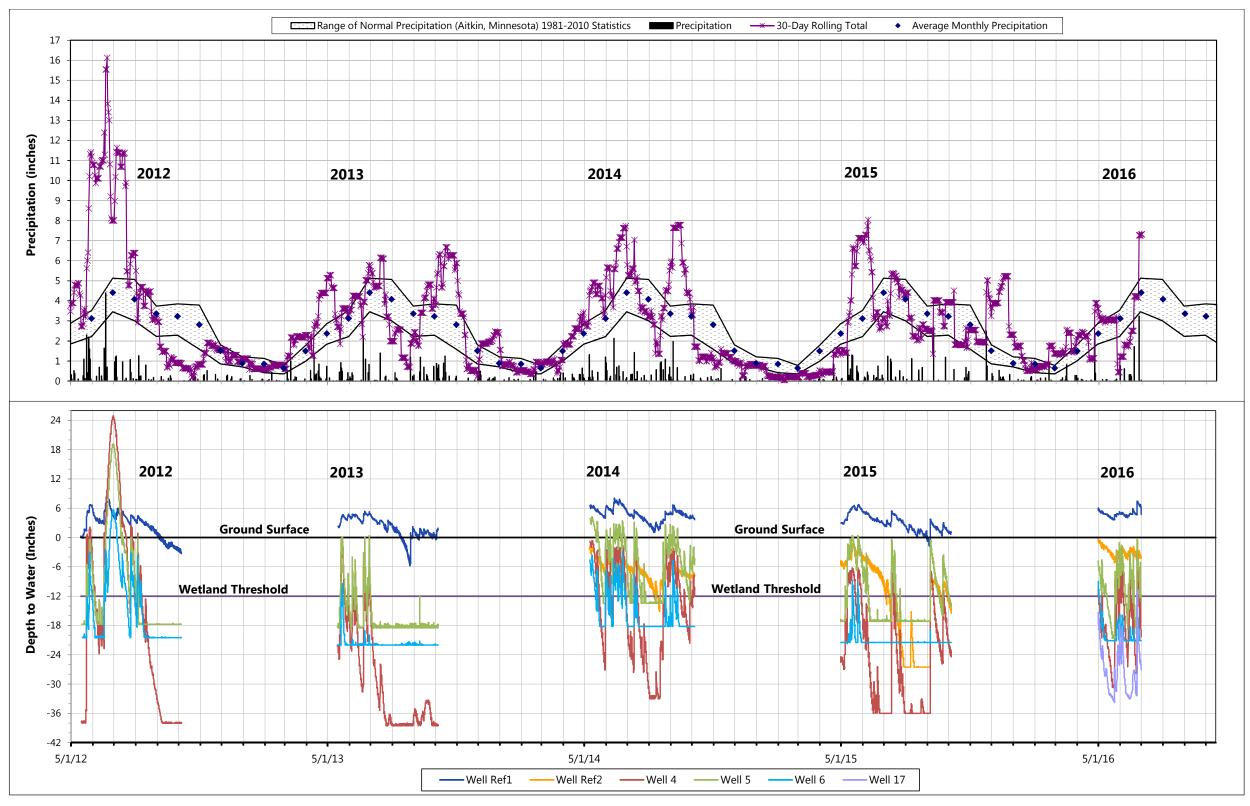
Removed Well

Project Boundary —— 1-Ft Contour

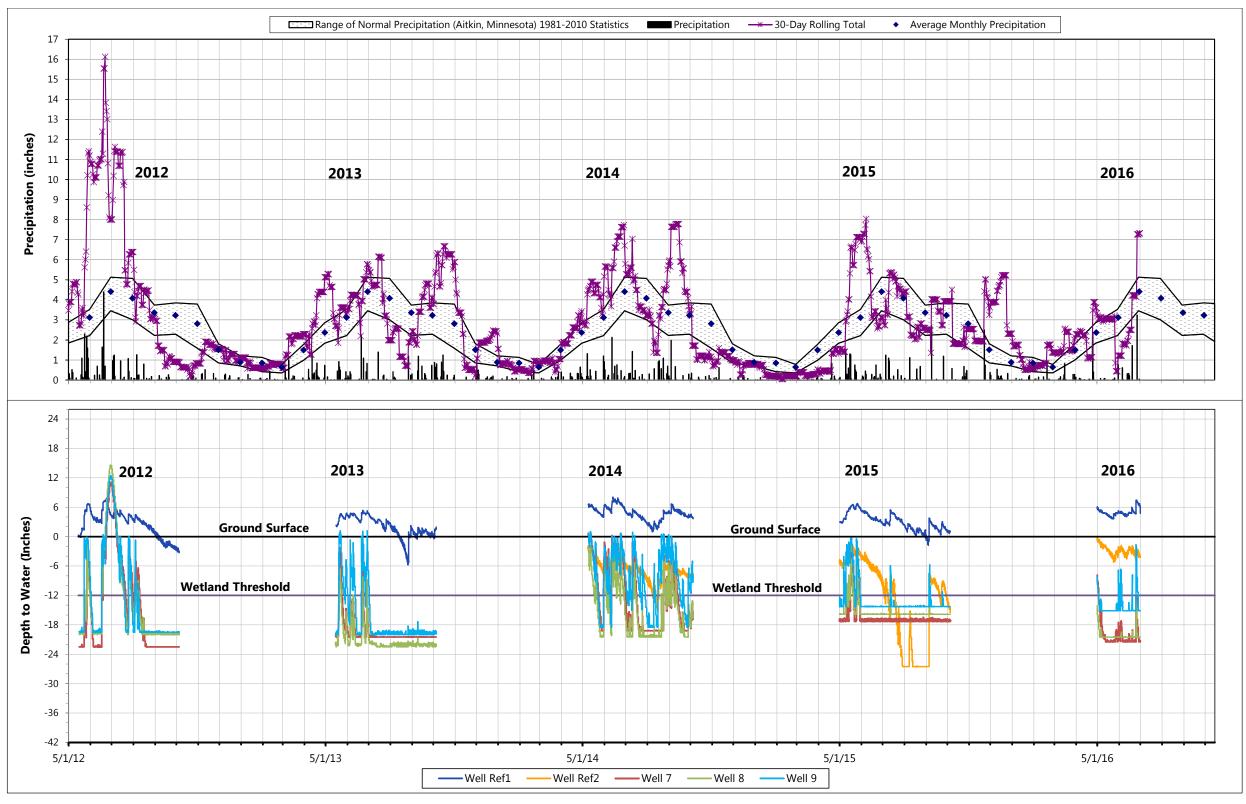
Large Figure 12
MONITORING WELL LOCATIONS
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



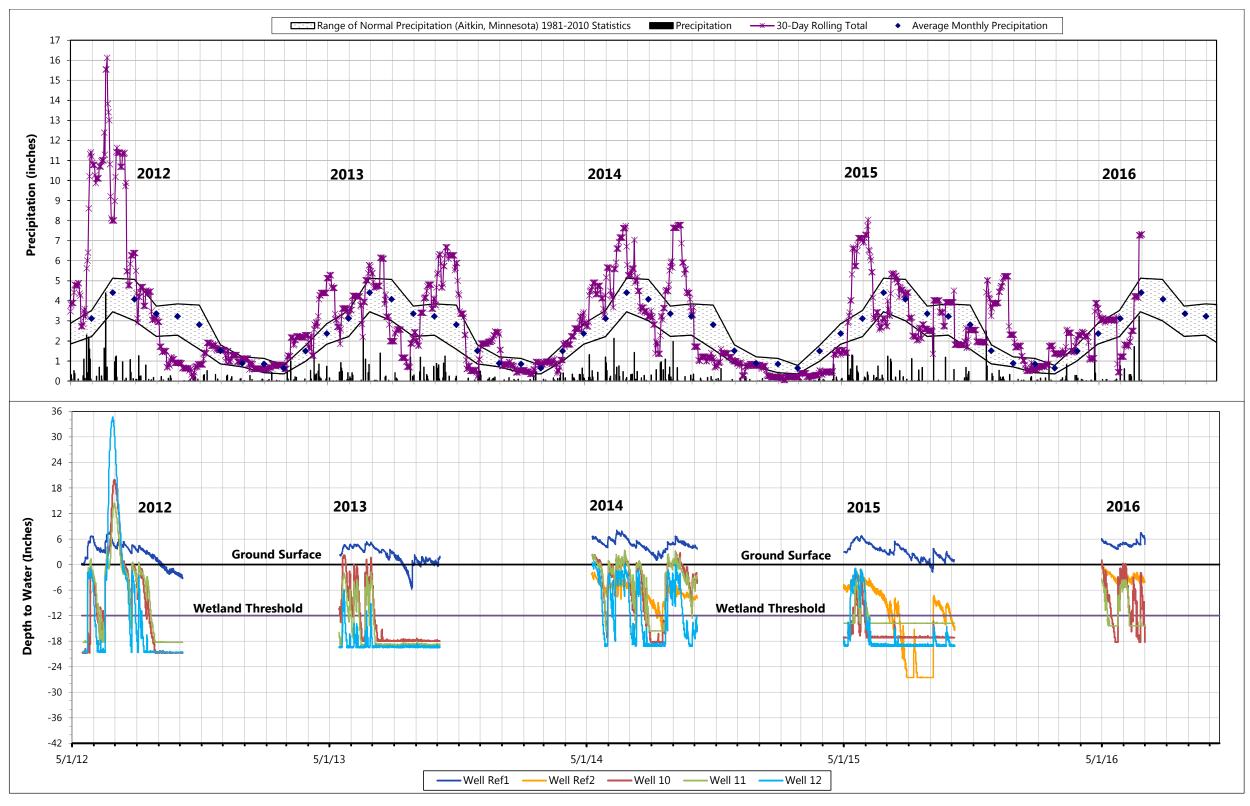
Large Figure 13
2012-2016 Hydrology Monitoring Data
Wells 1, 2/16, and 3
Aitkin Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



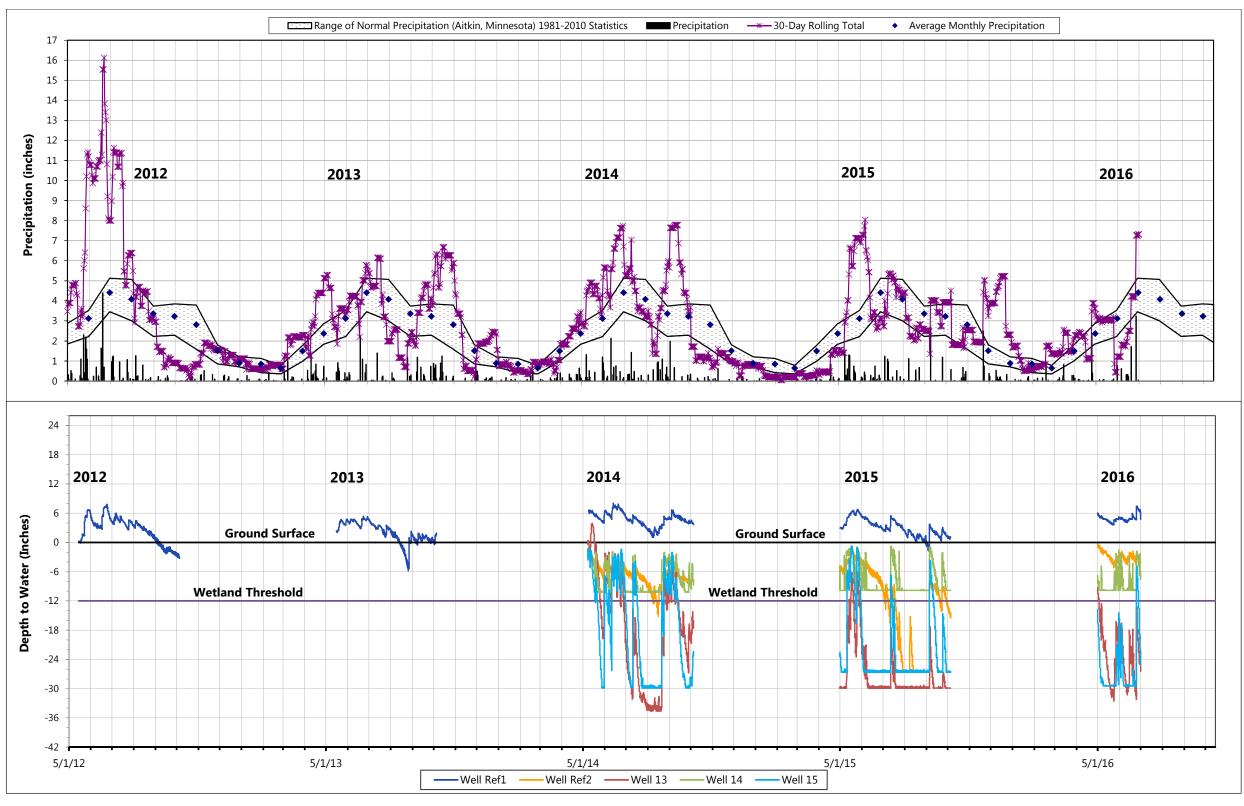
Large Figure 14
2012-2016 Hydrology Monitoring Data
Wells 4, 5, 6, and 17
Aitkin Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 15
2012-2016 Hydrology Monitoring Data
Wells 7, 8, and 9
Aitkin Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 16
2012-2016 Hydrology Monitoring Data
Wells 10, 11, and 12
Aitkin Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



Large Figure 17
2012-2016 Hydrology Monitoring Data
Wells 13, 14, and 15
Aitkin Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN

Appendices

Appendix A

Declaration of Restricted Covenants Example

-(Above Space is Reserved for Recording Information)—

PERPETUAL CONSERVATION EASEMENT FOR WETLAND BANK

Grantor:

Location: within Section 5, Township 39 North, Range 22 West, County of Pine

This Perpetual Conservation Easement for Wetland Replacement ("Easement") is made on (date) by the undersigned, hereinafter referred to collectively as the "Grantor":

RECITALS

- A. This Easement is made pursuant to and in furtherance of the Wetland Conservation Act of 1991, as amended, Minn. Stat. §103G.222, *et. seq.* ("WCA") and the rules implementing WCA, Minn. R. ch. 8420 ("WCA Rules").
- B. This Easement pertains to all or part of the real property in Pine County, Minnesota, which is legally described on *Exhibit A* attached hereto and made a part hereof ("Real Property").
 - C. The Real Property is the subject of a wetland bank plan pursuant to Minn. R.8420.0740.
- D. The Grantors include all of the following (1) all the fee owners of the Real Property and (2) the applicants under the bank plan if different from the fee owners. The term "Grantor" includes all of the Grantors if there is more than one. The Grantors are jointly and severally responsible for complying with the terms of this instrument. This Easement and the duties and restrictions contained in it shall also run with the land.
- E. WCA is administered by the State of Minnesota through its Board of Water and Soil Resources ("State").

Page 1 of 6

- F. The local government unit ("LGU") charged under WCA with approval of the subject wetland replacement plan ("replacement plan") is the Minnesota Department of Natural Resources Division of Lands and Minerals. The subject wetland mitigation plan includes all fully executed forms provided by the State, all supporting maps, engineering plans, drawings, monitoring plan, vegetation establishment plan and management plan and facilities maintenance plan. A complete copy of the replacement plan is on file at the LGU. The address of the LGU is 1525 Third Avenue East, Hibbing, MN 55746. The State is responsible for the acceptance of this Easement.
- G. The replacement plan requires the restoration or creation of a wetland on the portion of the Real Property designated in Exhibit B attached hereto and made a part hereof ("Replacement Area"). The replacement plan may also require the establishment of upland buffer within the Replacement Area. This Easement pertains to both wetlands and specified uplands within the Replacement Area.
- H. The Replacement Area is subject to the WCA, WCA Rules and all other provisions of law that apply to wetlands, except that the exemptions in Minn. Stat. §103G.2241 and Minn. R. 8420.0122 do not apply to the Replacement Area, pursuant to Minn. Stat. §103G.222, subd. 1(h) and Minn. R. 8420.0115.
- I. All references in this Easement to Minnesota Statutes and to Minnesota Rules are to the statutes and rules currently in effect and as amended or renumbered in the future.
- J. The purposes of this Easement are to maintain and improve the ecological values of the Replacement Area through the means identified in the replacement plan and to preserve the Replacement Area in a natural condition in perpetuity.

IN ADDITION, THE GRANTORS, FOR THEMSELVES, THEIR HEIRS, SUCCESSORSAND ASSIGNS COVENANT THAT THEY:

- 1. Shall establish and maintain wetlands and upland buffers within the Replacement Area as specified in the replacement plan approved by the LGU and on file at the offices of the LGU. The wetland and any specified upland buffer area shall be the size and type specified in the replacement plan. Grantor shall not make any use of the Replacement Area that would adversely affect any of the functions or values of the area. Those functions and values are identified in Minn. R. 8420.0540, subp. 10, or specified in the approved replacement plan.
- 2. Shall pay the costs of establishment, maintenance, repairs and reconstruction of the wetlands and specified upland buffers within the Replacement Area, which the LGU or the State may deem necessary to comply with the specifications for the Replacement Area in the approved replacement plan. The Grantor's obligations under this paragraph include the payment of any lawful taxes or assessments on the Real Property.
- 3. Shall establish and maintain visible monuments such as signs, numbered fence posts or survey posts at prominent locations along the boundary of the Replacement Area in accordance with the approved replacement plan. If numbered fence posts are used, Grantor's Replacement Plan must contain a survey or scaled drawing of the property that corresponds to the fence post numbering. Posts

must be at least 4 feet high and notably visible on the landscape. If signs are used, such signs must be have a surface area of at least one quarter (1/4) square feet, mounted on a fence post at least 4 feet above ground, and minimally contain the words "Boundary of Wetland Replacement Area - Subject to Perpetual Conservation Easement Restrictions – Contact MN Board of Water and Soil Resources or Local Soil and Water Conservation District for Further Information." Said monuments must be made of non-degradable material and shall be at least four feet in height.

- 4. Grants to the LGU, the State, and the agents and employees of the LGU and the State, reasonable access to the Replacement Area for inspection, monitoring and enforcement purposes. The LGU, the State, and the agents and employees of the State are hereby granted a perpetual ingress and egress easement ("Access Easement") for access to and from the Replacement Area. The Access Easement shall be over and across the area ("Access Area") that is specified on Exhibit A attached hereto and made a part hereof or, if not specified on Exhibit A, the most reasonably direct and convenient route between the Replacement Area and a public road. If all or any part of the Access Area is owned by a person or entity other than Grantor, then the owner has joined in this Easement for purposes of granting the Access Easement by signing below. The signed written consent and subordination of all other holders of interests in the Access Area has been or will be obtained by Grantor and recorded in the same manner as specified in paragraph 5 below. This Easement grants no access to or entry to the Real Property, the Replacement Area, or the Access Area to the general public.
- 5. Represents that Grantor is (a) the fee owner of the Real Property and (b) the applicant under the replacement plan, if different from the fee owner. Grantor represents that all other parties who may have an interest in the Real Property (e.g., mortgagees, contract for deed vendees, holders of easements, etc.) have consented and subordinated their interests to this Easement by signing below. If it is determined at any time that there is any other party who may have an interest in the Real Property that is prior to this Easement, then Grantor shall immediately obtain and record a consent and subordination agreement signed by such other party. Acceptance of this Easement does not release Grantor from the obligation to obtain and record a consent and subordination agreement signed by any party who may have an interest in the Real Property that is prior to this Easement, even if such interest was of record at the time of acceptance.
- 6. Will record this easement at Grantor's expense in the real property records of the county where the Real Property is located. Said recording shall take place within 30 days of the State's acceptance of this Easement. The Grantor shall provide the original copy of the recorded easement to the State prior to making any credits from this replacement area available for use.
- 7. Acknowledge that this Easement shall be unlimited in duration, without being rerecorded. This Easement shall be deemed to be a perpetual conservation easement pursuant to Minn. Stat. ch. 84C.
- 8. Acknowledge that, unless expressly authorized in writing by the LGU in the approved replacement plan, Grantor:
 - (a) Shall not produce agricultural crops on the Replacement Area, except that this provision does not restrict the harvest of the seeds of native vegetation if only the seed-head is

- removed in the process of harvest and does not involve the use of vehicular, motorized equipment;
- (b) Shall not cut hay, mow vegetation or cut timber on the Replacement Area except as allowed or prescribed in the Replacement Plan;
- (c) Shall not make any vegetative alterations on the Replacement Area that do not enhance or would degrade the ecological functions and values of the Replacement Area.

 Vegetative alterations shall be limited to those listed in the approved replacement plan;
- (d) Shall not graze livestock on the Replacement Area;
- (e) Shall not place any materials, substances or other objects, nor erect or construct any type of structure, temporary or permanent, on the Replacement Area.
- (f) Shall not allow vehicular traffic on the Replacement Area except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (g) Shall not alter the topography of the Replacement Area by any means including plowing, dredging, filling, mining or drilling except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (h) Shall not modify the hydrology of the Replacement Area in any way or by any means including pumping, draining, ditching, diking, impounding or diverting surface or ground water into or out of the Replacement Area except for the purpose of implementing construction or maintenance activities specifically authorized in the replacement plan.
- (i) Shall regularly inspect and maintain structures specified in the Replacement Plan in good working condition to sustain the goals in the approved Replacement Plan.
- 9. Acknowledge that the Grantor is responsible, at Grantor's cost, for weed control by complying with noxious weed control laws and emergency control of pests necessary to protect the public health on the Replacement Area.
- 10. Acknowledge that this Easement may be modified only by the joint written approval of the LGU and the State. If the Replacement Area has been used to mitigate wetland losses under the Federal Water Pollution Control Act, the U.S. Army Corps of Engineers (or successor agency) must also agree to the modification in writing.
- 11. Acknowledge that this Easement may be enforced, at law or in equity, by the LGU or the State. The LGU and the State shall be entitled to recover an award of reasonable attorney's fees from Grantor in any action to enforce this Easement. The right to enforce the terms of this Easement is not waived or forfeited by any forbearance or failure to act on the part of the State or LGU. If the subject Replacement Area is to be used partially or wholly to fulfill permit requirements under the Federal Water Pollution Control Act or a federal farm program, then the provisions of this Easement

that run to the State or the LGU may also be enforced by the United States of America in a court of competent jurisdiction.

12. Acknowledge that this Easement is not valid until the Easement has been accepted by the State, the Grantor has recorded this Easement and the State has received evidence of such recording.

SIGNATURE OF GRANTOR

SIGNATURE OF FEE OWNER(S):	
STATE OF MINNESOTA)) ss. COUNTY OF)	
This instrument was acknowledged before manual (name(s) with marital status).	ne this day of , by
Notarial Stamp or Seal	Notary Public
SIGNATURE OF BANK APPLICANT (S), IF DIFFERENT FROM FEE OWNER:	
STATE OF MINNESOTA)) ss. COUNTY OF) This instrument was acknowledged before re-	ne this day of by
This instrument was acknowledged before n (name(s) with marital status).	ne this day of , by
Notarial Stamp or Seal	Notary Public

ACCEPTANCE

The State accepts the foregoing Easement.

MINNESOTA BOARD OF WATER AND SOIL RESOURCES:

Ву:	<u> </u>				
Its:	_				
STATE OF MINNESOTA)) ss. COUNTY OF)					
This instrument was acknowledged before me person) as (title) of the Board of Water and Soi		day of	,	by	(name of
Notarial Stamp or Seal	Notary P	'ublic			
This instrument was drafted by the Board of Water and S One West Water Street, St. Paul, MN 55107	Soil Resou	rces			
If there are additional holders of interest the subject : Consent and Subordination agreement [BWSR Form		-			ach their

EXHIBIT A Legal Description of Real Property

EXHIBIT B Map or Survey of Bank Area

Appendix B Project Wetland Mitigation Crediting

Large Table 5

Mitigation Credit Summary⁽¹⁾
Poly Met Mining, Inc.

	Within Project Watershed				tside Project	Total Wetland		Total Wetland				
Community / Credit Type	Zim Sod Wetland Mitigation (acres)	Credit Percent	Total Wetland Mitigation Credits	Aitkin Wetland Mitigation (acres)	Aitkin Wetland Mitigation Credits	Hinckley Wetland Mitigation (acres)	Hinckley Wetland Mitigation Credits	Credit Percent	Total Wetland Mitigation Credits	Mitigation ⁽¹⁾	Credit Percent	Mitigation Credits ⁽¹⁾
Off-Site Restoration of draine	d wetland (2)											
Type 2 Fresh (Wet) Meadow	0		0	0	0	0	0		0	0	100%	0.0
Type 2 Sedge Meadow	0		0	0	0	56.17	56.17		56.17	56.17		56.17
Type 3 Shallow Marsh	0		0	21.22	21.22	0	0		21.22	21.22		21.22
Type 4 Deep Marsh	0		0	0	0	0	0		0	0		0
Type 5 Shallow, Open Water	0		0	0	0	0	0		0	0		0
Type 6 Shrub-Carr	0	100%	0	0	0	98.43	98.43	100%	98.43	98.43		98.43
Type 6 Alder Thicket	0		0	0	0	98.44	98.44		98.44	98.44		98.44
Type 7 Hardwood Swamp	0		0	147.95	147.95	7.40	7.40	•	155.35	155.35		155.35
Type 7 Coniferous Swamp	0		0	544.94	544.94	0	0		544.94	544.94		544.94
Type 8 Open Bog	7.54		7.54	0	0	0	0		0	7.54		7.54
Type 8 Coniferous Bog	443.09		443.09	0	0	0	0		0	443.09		443.09
Off-Site Restoration of partial	Off-Site Restoration of partially-drained wetland ⁽³⁾											
Type 2 Sedge Meadow	0		0	0	0	13.16	6.58	50%	6.58	13.16	50%	6.58
Type 3 Shallow Marsh	0		0	0.30	0.15	0	0		0	0.30		0
Type 7 Coniferous Swamp	0		0	25.15	12.58	0	0		12.58	25.15		12.58
Type 8 Open Bog	2.83	50%	1.42	0	0	0	0		0	2.83		1.42
Type 6 Shrub-Carr	0		0	0	0	62.46	31.23		31.23	62.46		31.23
Type 7 Hardwood Swamp	0		0	73.49	36.75	0.17	0		36.83	73.66		36.83
Type 8 Coniferous Bog	50.45		25.23	0	0	0	0		0	50.45		25.23
Off-Site Site Wetland Creation	1 (4)											
Type 2 Sedge Meadow	0		0	0	0	7.14	5.36		5.36	7.14		5.355
Type 6 Shrub-Carr	0	75%	0	0	0	2.52	1.89	75%	1.89	2.52	75%	1.89
Type 6 Alder Thicket	0		0	0	0	2.52	1.89		1.89	2.52		1.89
Off-Site Site Wetland Restora	tion that will	not receiv	e credit ⁽⁵⁾							<u>-</u>		
Type 3 Shallow Marsh	0		0	14.02	0	0	0		0	14.02		0
Type 7 Hardwood Swamp	0		0	0.02	0	0	0		0	0.02		0
Type 7 Coniferous Swamp	0		0	0.86	0	0	0		0	0.86		0
Off-Site Upland Buffer (6)	9.78	25%	2.45	64.26	16.07	57.31	14.33	25%	30.39	131.35	25%	32.84
Impact ⁽⁷⁾	0.03		-0.03	0.51	-0.51	0.32	-0.32		0.86	0.86		-0.86
No Credit ⁽⁸⁾	18.12			127.60		10.68				156.40		
Upland Buffer Total	9.78		2.45	64.26	16.07	57.31	14.33		30.39	131.35		32.84
Wetland Total	503.91		477.24	827.95	763.07	348.41	307.15		1,070.22	1,680.27		1,547.46
Total	531.84		479.69	1,020.32	779.14	416.72	321.48		1,100.61	1,968.88		1,580.30
(1) Totals may not add exactly due to re				,					.,	.,		.,

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ Credits for restoration of completely drained wetlands are worth 100% of the acreage restored based on USACE St. Paul District Policy (Restoration via re-establishment) and the Minnesota WCA Chap. 8420.0526 Subp. 3

⁽³⁾ Credits for restoration of partially-drained wetlands are worth 50% of the acreage restored based on USACE St. Paul District Policy (Restoration via rehabilitation) and the Minnesota WCA Chap. 8420.0526 Subp. 4

⁽⁴⁾ Credits for wetland creation are worth 75% of the acreage created based on USACE St. Paul District Policy (Wetland Creation) and the Minnesota WCA Chap. 8420.0526 Subp. 7 (per Minnesota Statute 103G.2251 modified August 1, 2011.)

⁽⁵⁾ Wetlands will be restored within areas (e.g., Diversion Channel easement) that will not receive credit.

⁽⁶⁾ Credits for upland buffers are worth 25% of the acreage of native, noninvasive vegetation established or maintained adjacent to the wetland based on USACE St. Paul District Policy (Preservation) and the Minnesota WCA Chap. 8420.0526 Subp. 1

⁽⁷⁾ Negative credits for ditches (wetlands) that are filled within upland buffer which is removed from the credit total.

⁽⁸⁾ Areas within a Site without construction including homesteads, building areas, easements, etc.

Large Table 6

Wetland Mitigation Utilizing USACE Credits⁽¹⁾
Poly Met Mining, Inc.

	Mit	tigation Cı	redits Avail	able	NorthMet Project Prop	Total Credits	No More Than 2 Apply			Total Applied	Applied		
Wetland or Credit Type	Zim	Aitkin	Hinckley	Total	Non-forested, Non- bog, and Low or Medium Quality (Base Ratio 1.5:1) ⁽³⁾	Bogs, Forested, and High Quality (Base Ratio 2:1) ⁽⁴⁾	Total Impact Acres	Required for Mitigation at Base Ratio	Incentive for in- kind -0.25:1	Incentive for credits in- place -0.25:1	Incentive for credits in- advance ⁽⁵⁾ -0.25:1	Mitigation Credits ^{(6), (7)}	Mitigation Ratio ⁽⁸⁾
Type 2 Fresh (Wet) Meadow	0	0	0	0	1.38	14.43	15.81	30.93				30.93	1.96
Type 2 Sedge Meadow	0	0	68.11	68.11	6.87	17.05	23.92	44.41	(5.98)			38.43	1.61
Type 3 Shallow Marsh	0	20.86	0	20.86	53.13	23.90	77.03	127.50	(5.22)		(5.22)	117.07	1.52
Type 4 Deep Marsh	0	0	0	0	74.20	0.09	74.29	111.48				111.48	1.50
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0				0	
Type 6 Shrub-Carr	0	0	131.23	131.23	1.40	2.49	3.89	7.08	(0.97)			6.11	1.57
Type 6 Alder Thicket	0	0	100.33	100.33	7.50	103.09	110.59	217.43				217.43	1.97
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	0.69	12.47	13.16	25.98	(3.29)			22.69	1.72
Type 7 Coniferous Swamp	0	557.52	0	557.52	0	84.43	84.43	168.86	(21.11)			147.75	1.75
Type 8 Open Bog	8.96	0	0	8.96	0	7.64	7.64	15.28				15.28	2.00
Type 8 Coniferous Bog	468.29	0	0	468.29	0	529.98	529.98	1,059.96	(117.07)	(117.07)		825.82	1.56
Wetland Impact													
Wetland Total	477.24	763.07	307.15	1,547.46	145.17	795.57	940.74	1,808.90				1,532.97	1.63
Upland Buffer	2.45	16.07	14.33	32.84								9	
Total	479.69	779.14	321.48	1,580.30		940.74		(153.64) (117.07) (5.22)		(5.22)	1,532.97		
Total	47 3.03	113.14	321.40	1,560.30		J4V.14		1,808.90 (275.92) 1,532.9				1,032.37	
-	otal Surplus Wetland Mitigation Credits for Project (Total Credit minus Total Applied Mitigation Credit)								1.63				

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Base ratio 1.5:1 per USACE St. Paul District Policy for wetlands that are not considered High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁴⁾ Base ratio 2:1 per USACE May 29, 2013 Draft Memorandum for wetlands that are High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

⁽⁵⁾ Based on USACE May 29, 2013 Draft Memorandum guidance for in-advance qualification assuming all mitigation will be constructed one full growing season before wetland impacts occur.

⁽⁶⁾ Total Applied Mitigation Credits = Total Credits Required for Mitigation at Base Ratio minus Incentive Credits.

⁽⁷⁾ Credits applied may include surplus credits from different wetland types.

⁽⁸⁾ The ratio of applied credits to project impacts (not including the surplus credits).

⁽⁹⁾ Includes 0.5 credit of upland buffer, applied from totals listed above.

Large Table 7

Wetland Mitigation Utilizing WCA Credits⁽¹⁾ Poly Met Mining, Inc.

	Mitigation Credits			NorthMet Project Proposed Direct	Credits Applied for	Additional Mitigation	Total Mitigation	Total		
Wetland or Credit Type	Zim Sod	Aitkin	Hinckley	Total	Wetland Impacts (acres) ^(1,2)	1:1 Replacement	Required ⁽³⁾ +0.5:1	Credits Applied	Mitigation Ratio	
Type 2 Fresh (Wet) Meadow	0	0	0	0	15.81	15.81	7.91	23.72	1.5:1	
Type 2 Sedge Meadow	0	0	68.11	68.11	23.92	23.92	11.96	35.88	1.5:1	
Type 3 Shallow Marsh	0	20.86	0	20.86	77.03	77.03	38.52	115.55	1.5:1	
Type 4 Deep Marsh	0	0	0	0	74.29	74.29	37.15	111.44	1.5:1	
Type 5 Shallow, Open Water	0	0	0	0	0	0	0	0	1.5:1	
Type 6 Shrub-Carr	0	0	131.23	131.23	3.89	3.89	1.95	5.84	1.5:1	
Type 6 Alder Thicket	0	0	100.33	100.33	110.59	110.59	55.30	165.89	1.5:1	
Type 7 Hardwood Swamp	0	184.70	7.49	192.18	13.16	13.16	6.58	19.74	1.5:1	
Type 7 Coniferous Swamp	0	557.52	0	557.52	84.43	84.43	42.22	126.65	1.5:1	
Type 8 Open Bog	8.96	0	0	8.96	7.64	7.64	3.82	11.46	1.5:1	
Type 8 Coniferous Bog	468.29	0	0	468.29	529.98	529.98	30.85	560.83	1:1 ⁽⁴⁾	
Wetland Total	477.24	763.07	307.15	1,547.46	940.74	940.74	236.23	1,176.97		
Upland Buffer	2.45	16.07	14.33	32.84						
Total	479.69	779.14	321.48	1,580.30	940.74	940.74	236.23	1,176.97		
(Total cred	-		Credits for Project mitigation required)		403.33		1.25:1 ⁽⁵⁾			
		Total W	etland Mitig	gation Cred	its Used for Project		1,176.97			

⁽¹⁾ Totals may not add exactly due to rounding.

⁽²⁾ The total includes fragmentation of wetlands (26.9 acres).

⁽³⁾ Additional required for mitigation out of the watershed at Aitkin and Hinckley sites.

⁽⁴⁾ Assumes 1:1 replacement for 473.3 acres compensated in-kind and in the watershed and 1.5:1 for the remaining 56.7 acres replaced out of the watershed.

⁽⁵⁾ The ratio of applied credits to project impacts (not including the total surplus credits).

Appendix C

USACE 2013 Memo: Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation – Compensation Ratios for Loss of Wetlands/Aquatic Resources



DRAFT MEMORANDUM

Date: 29 May 2013

Subject: Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation - Compensation Ratios for Loss of Wetlands/Aquatic Resources

I. Introduction

The St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota (2009) [District Policy] applies three factors to determine compensation ratios: in-place vs. out-of-place, in-kind vs. out-of-kind, and in-advance vs. not in-advance. The temporal loss issue is addressed by the in-advance vs. not-in-advance factor. The Federal Mitigation Rule states that compensation ratios of greater than 1:1 can be applied to account for factors including temporal loss and the difficulty of restoring or establishing certain wetlands/aquatic resources (332.3 (f)). This statement was incorporated into the St. Paul District Policy (page 23).

II. In-Advance Incentive per St. Paul District Policy

Compensatory mitigation must account for the temporal losses of wetland/aquatic resource functions associated with authorized impacts. Temporal losses can be minimized if compensation sites are established in advance of authorized impacts, which is typically the case for mitigation banking. In rare cases, permittee-responsible compensation could also establish compensation sites in advance of authorized impacts.

A reduction in the compensation ratio of 0.25 can be applied if a permittee-responsible compensation site establishes wetland hydrology and initial vegetation in advance of authorized impacts. At a minimum, the site must have wetland hydrology and hydrophytic vegetation established at least one full growing season (May-October) prior to the authorized discharge of dredged/fill materials (pages 14, 24). Further, the compensation site must meet the success criteria/performance standards applicable at that development stage of the site (page 14).

The intent of the <u>minimum</u> requirement that the compensation site must have wetland hydrology and hydrophytic vegetation established <u>at least</u> one growing season in advance is to confirm: (1) that the site is providing wetland functions in advance of authorized impacts; and (2) a reasonable assurance that the compensation site is on the correct trajectory for success. Success is defined by the performance standards developed for each compensation site. Great variability exists for establishing various wetlands/aquatic resources and the performance standards reflect this. The minimum of a single growing season can be sufficient for emergent, aquatic vegetation to colonize a shallow marsh restoration site and provide habitat, water quality functions, etc. At the opposite end of the spectrum are compensation sites involving restoration of forested wetlands, which may require 8 to 10 growing seasons to determine if hydrology and woody seedlings/shrubs/saplings indicate that the site is on the correct trajectory for success. It is true

that woody seedlings/shrubs/saplings would not provide the same habitat and other functions as a mature forested wetland, but the intent of the "in-advance" incentive per the St. Paul District Policy would be met.

Use of the 0.25 incentive for "in-advance" by permittee-responsible compensation has been so rare that St. Paul District has not developed a break-out of minimum requirements and timeframes by wetland type. Given the current review of large-scale mining projects and associated permittee-responsible compensation, there is now a need to do so. The timeframes listed by Table 1 represent the best case scenario (e.g., no substantial setbacks or corrective actions needed to establish target hydrology and initial vegetation). These timeframes are based on field observations of compensatory mitigation sites in Minnesota and Wisconsin during the past 35 years.

TABLE 1

Minimum Number of Growing Seasons Needed to Determine if a Compensation Site has Met the Requirements for the In-Advance Incentive

Seasonally Flooded Basin: 1 Growing Season
Shallow Marsh: 1 Growing Season
Sedge Meadow: 3 Growing Seasons
Open Bog: 3 to 5 Growing Seasons
Alder Thicket/Shrub-Carr: 5 Growing Seasons
Coniferous Bog: 8 to 10 Growing Seasons
Hardwood and Coniferous Swamps: 8 to 10 Growing Seasons

III. Compensation Ratios for Difficult-to-Replace, Rare and/or Exceptional Wetlands per the Federal Mitigation Rule and St. Paul District Policy

The Federal Mitigation Rule states that "difficult to replace" wetlands/aquatic resources includes bogs and forested wetlands (323.3(e)(3) and Preamble, page 19633). The majority of wetlands that would be impacted by the proposed NorthMet project are "difficult-to-replace" – coniferous bog, open bog, coniferous swamp and hardwood swamp.

St. Paul District Policy also states that compensation ratios can be raised on a case-by-case basis if the impacted wetland/aquatic resource provides rare or exceptional functions including plant communities that rate "exceptional" using MnRAM, or have a high rating using a Floristic Quality Assessment (FQA) (page 24). Most of the wetlands that would be impacted by the NorthMet project are of pre-European settlement condition and rate at the highest FQA levels for those plant communities in Minnesota. MnRAM vegetative diversity/integrity ratings would be "exceptional" for these pre-European settlement condition wetlands.

Therefore, the District Engineer may determine that a higher compensation ratio is required to offset losses of wetlands that are difficult to replace and/or provide an exceptional level of functions. For simplicity, these wetlands will be referred to as "high quality wetlands" in the following discussions.

District Policy states a base compensation ratio of 1.5:1, and a minimum of 1:1, with a provision for a case-by-case determination of higher ratios to account for factors including difficult to replace, rare and/or exceptional wetlands/aquatic resources. For low to moderate quality wetlands, the 1.5:1 base ratio would apply in accordance with District guidance. For impacts to high quality wetlands, the Corps may require additional compensation in accordance with District Policy. A value of 0.25 was assigned by the District Policy to each of the factors applied for determining compensation ratios. Given this precedent, it would be consistent to assign a value of +0.25 for difficult to replace wetlands, and +0.25 for wetlands

that have exceptional functional levels, to the base ratio of 1.5:1. Therefore, the base compensation ratio in these cases would start at 2:1. Compensation that is in-kind, in-place and/or in-advance could reduce this ratio in 0.25 increments.

IV. Analysis for NorthMet PSDEIS

To qualify for the 0.25 in-advance incentive, the proposed compensation by PolyMet for the NorthMet project would need to be established and meeting performance standards for hydrology and initial vegetation as shown by Table 1. Temporal loss of functions associated with forested wetland types would still be significant in any scenario (i.e., it will take 30 to 50 years for a non-forested compensation site to replace the functions of a forested wetland). But, as stated previously, the intent of the Policy's "in-advance" incentive would be met. This is no different than what is applied to mitigation banking sites. Credits consisting of forested wetlands can be fully released in as little as 10 years provided that performance standards are met.

Compensation proposed at the Zim Site would be expected to meet both in-kind (-0.25) and in-place (-0.25) incentives thereby reducing the compensation ratio for high-quality wetland impacts from 2:1 to 1.5:1. If in-advance, the ratio would be further reduced to 1.25:1. For low to moderate-quality wetlands, the recommended base ratio of 1.5:1, as proposed in the PSDEIS, would be required and could be reduced to 1.25:1 if in-kind and 1:1 if also in-advance.

Compensation proposed at the Hinckley and Aitkin Sites would be expected to meet in-kind resulting in a compensation ratio for high-quality wetland impacts of 1.75:1, and if in-advance, the ratio would be reduced to 1.5:1. For low to moderate-quality wetlands, the recommended base ratio of 1.5:1, as proposed in the PSDEIS, would be required and could be reduced to 1.25:1 if in-kind and 1:1 if also in-advance.

District guidance on compensatory mitigation emphasizes a functional approach to offset proposed project impacts be considered. While bogs and forested wetlands are characterized as difficult to replace, the proposed compensation sites for the NorthMet project are likely to achieve in-kind compensation to offset functional losses. The proposed mitigation sites were selected based on availability and the high likelihood of meeting performance criteria.

V. USEPA Comments on Compensation Ratios

USEPA recommended a compensation ratio of 2:1 or 3:1 to offset adverse impacts given the degree of temporal losses of wetland functions and scope of the losses (approximately 917 acres of direct impacts).

Temporal losses of wetland functions are addressed by the in-advance factor described above.

District Policy does not address the scale issue raised by USEPA. It is acknowledged that the proposed NorthMet project is a large scale impact that demands a comprehensive approach to offset those impacts.

No suitable quantitative wetland functional assessment method for northeast Minnesota exists to calculate the acres/wetland type/timeframe necessary for compensatory mitigation to offset proposed impacts. Lacking such a method, we employ an acreage surrogate as discussed above. A base ratio of 2:1, for high-quality wetlands as described in IV above, would be consistent with USEPA's recommendation of at least a 2:1compensation ratio. However, District Policy would allow for the compensation ratio to be reduced if it is in-kind, in-place and/or in-advance. Allowing for these incentives to reduce the base compensation ratio is integral to our policy. While USEPA has identified the scale of impacts and temporal loss of

functions as factors in their recommendation of a 2:1 or 3:1 compensation ratio, there is no scientific data to say what ratio is most accurate or appropriate.

If, however, large scale wetland losses in the Great Lakes Basin are not compensated for within that basin, a final ratio of 2:1 to 3:1 as recommended by USEPA could be warranted.

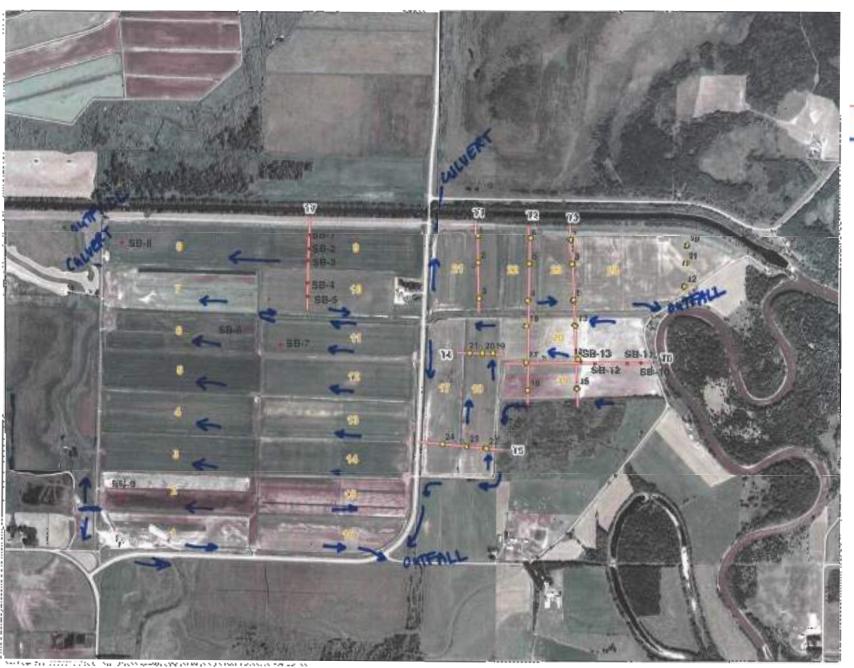
VI. Statement for NorthMet PSDEIS

St. Paul District has not made a final determination of the compensation ratios that would be required. Base compensation ratios would be either 2:1 or 1.5:1 depending on the location, quality of the wetland, wetland type, and timeframe of the compensation. A decision on whether proposed compensation would qualify for the 0.25 incentive for in-advance requires additional information including: (1) development of performance standards that would specify the hydrology and initial vegetation to be established; and (2) number of growing seasons that wetland compensation sites would be established in advance of authorized impacts.

In conclusion, the compensatory mitigation ratios proposed in the PSDEIS for the NorthMet project were based on recommended guidance. They assumed successful outcomes for the proposed compensatory mitigation sites. However, to address concerns expressed by USEPA, the base compensation ratios could be increased to 2:1 for impacts to high-quality, difficult to replace, bog and forested wetlands. For impacts to low and moderate quality wetlands, a base ratio of 1.5:1, as proposed in the PSDEIS, would be applied. Incentives to reduce the recommended base ratios would be considered at the time of permitting. District guidance on recommended compensation ratios takes these incentives into account. The final decision on compensatory mitigation ratios will be determined at the time of the permit decision based on current District guidance.

Appendix D

Soil and Water Transect Data



- Sur Sporpholive Republication on Itary.
- Av. (653 kga 4pt 955-950)
 Lotavet
- II COMPANIA
- Nates Face Directions in Distates



0 200 (7000 2,000

Figure B-1

TRABSECT LUCATIONS
ARKS Sub Barry
Wedood Dest patrox
Subject Moving Co.

Figure B-2

Legend for Soil Stratigraphy and Water Table Diagrams

Organic Soil

Sod/Oe = grass and layer that is usually about 4 inches thick with neat soil

Oc -- peat soil (Organic, Hemic)

Oa = mucky soil (Organic, Sapric)

Mineral Soil (ordered from charse to Euc textined)

s = sand

Is = fine sand

It's " loanty fine saml

si - sandy loam

fsl -- fine sandy loam

T≃ loam

sel = sanily elay loate

🦹 fact = line sandy clay loam

el « clay loam

si = sitt

siel = silty clay loam

sic = silty clay

¶ sc = sandy clay

c = clay



Measured lobserved water Table

Assumed Water Table - below the bore hole depth



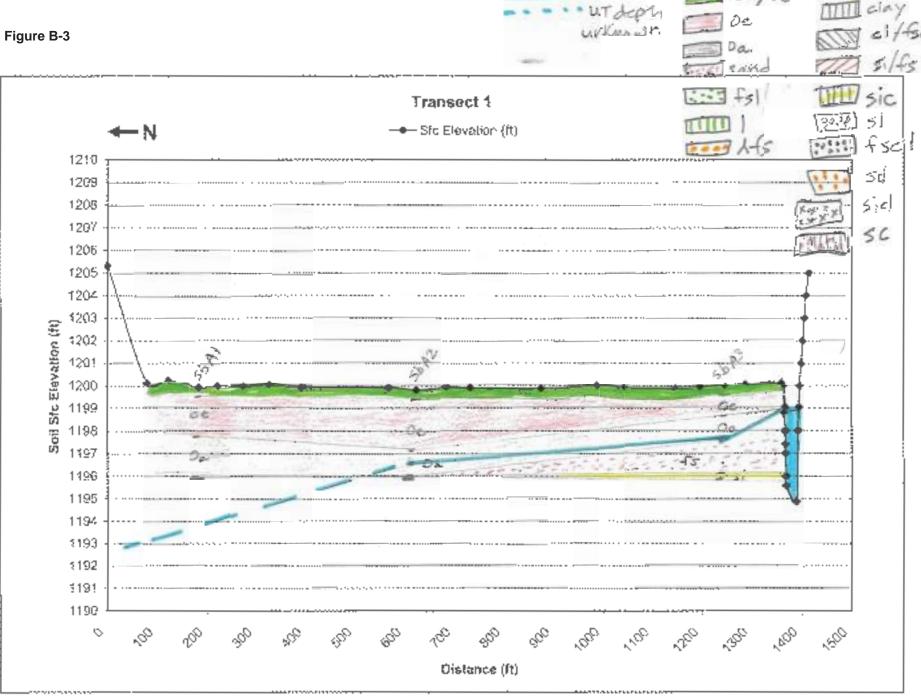


Figure B-4

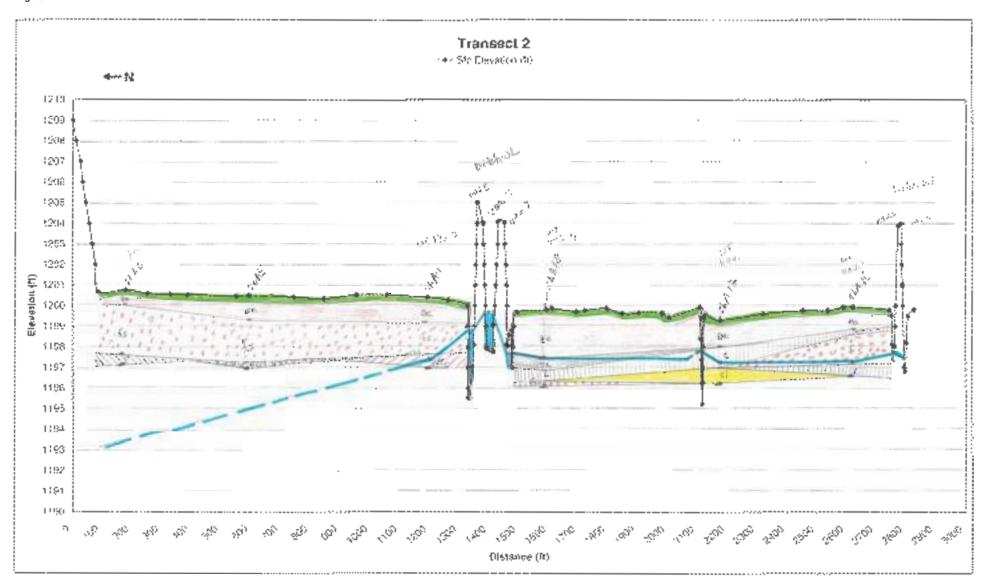


Figure B-5

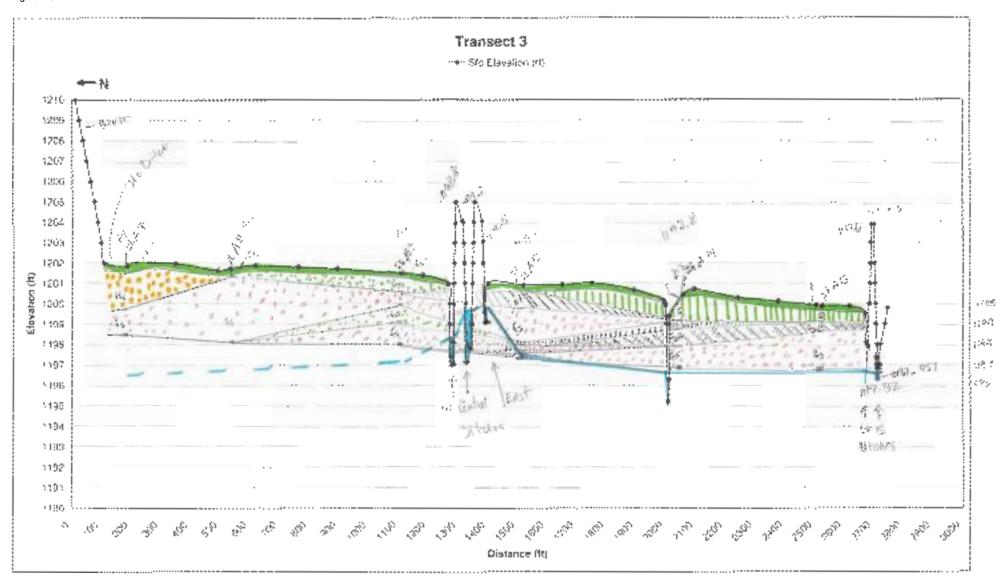


Figure B-6

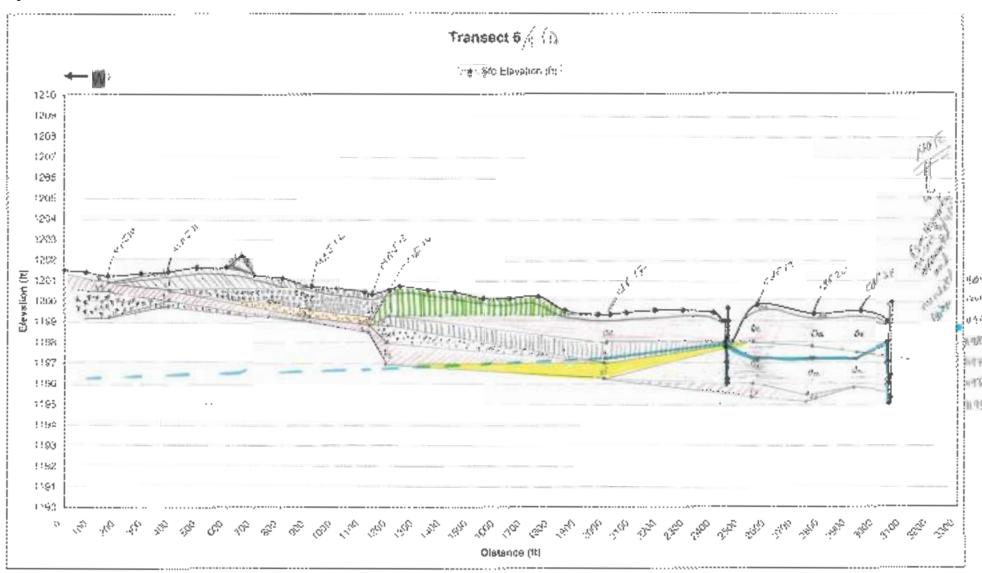
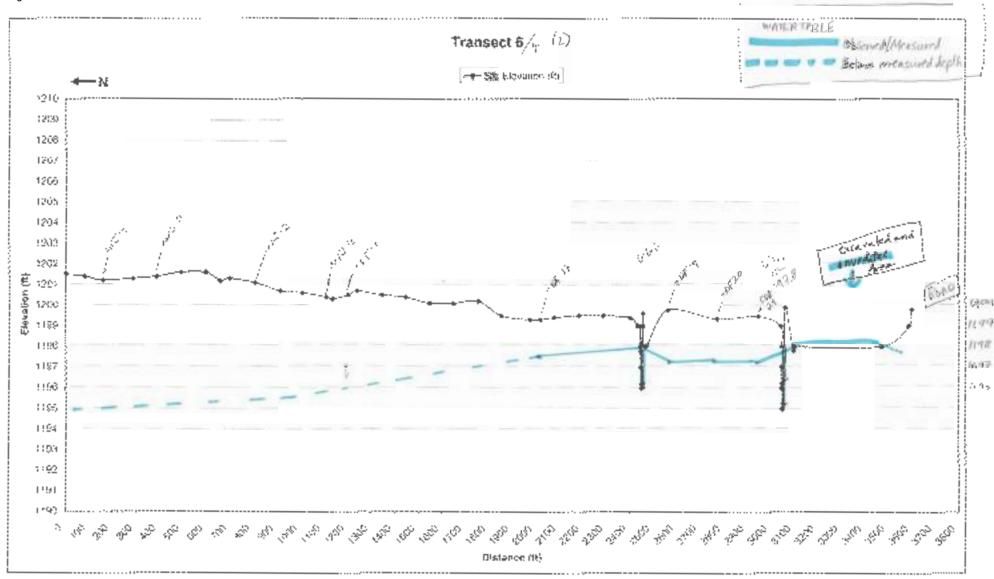


Figure B-7





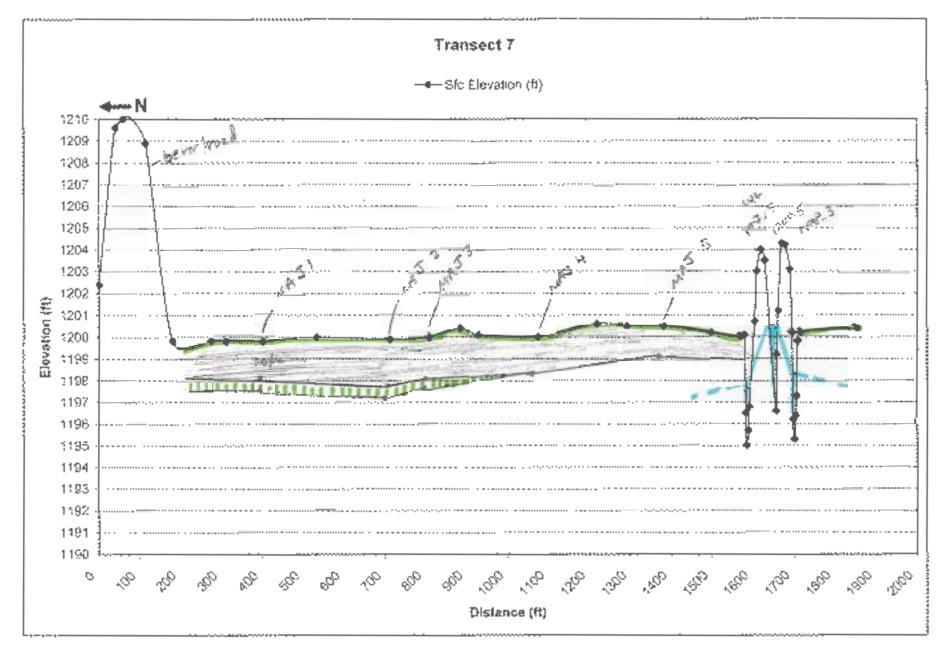
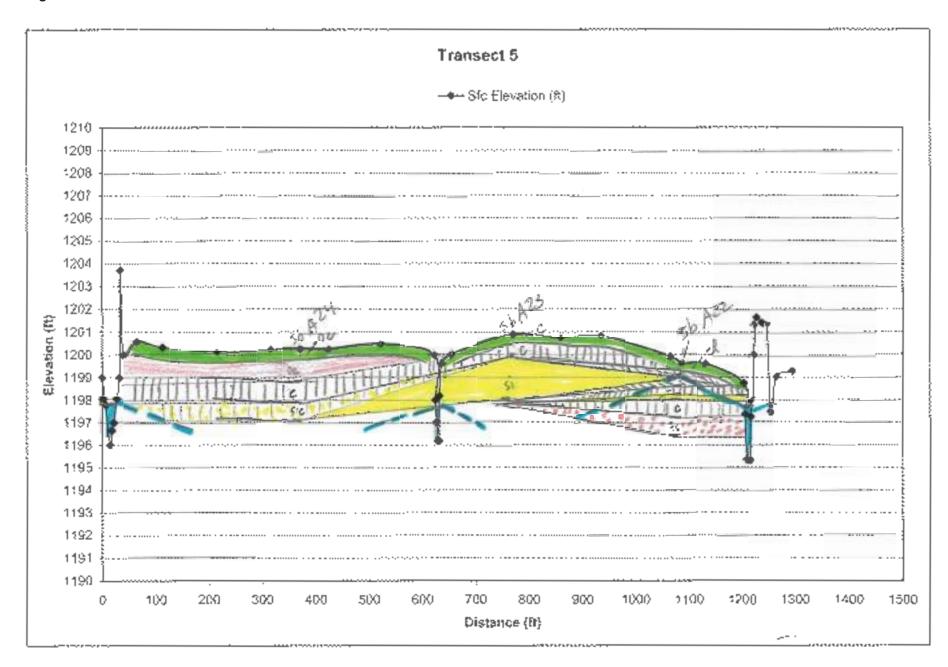


Figure B-9



Appendix E Wetland Data Forms

WETLAND DETE	RMINATION	DATA FORN	/I - Northc	entral and Northea	ast Region
Project/Site: Aitkin Site	Applicant/Owner	r: <u>PolyMet</u>	City/County: Aitkin	State: MN Samp	oling Date: 10/23/14
Investigator(s): KMS2	Section: 6	1	Township: 47N	Range: 26W Sam	pling Point: W1
Land Form: Terrace	Local Relief: N	lone .	Slope %: <u>0</u>	Soil Map Unit Name: Cathro muck	<u>K</u>
Subregion (LRR): <u>K</u>	Latitude: 5	159900 N	Longitude: 447600	<u>E</u> <i>Datum:</i> UTM, NAD 83	, meters
Cowardin Classification: PEMC	Circular 39 Clas	ssification: Type 2		Mapped NWI Classification:	<u> </u>
Are climatic/hydrologic conditions on the site typ	oical for this time of year?	Yes (If no, explain	n in remarks)	Eggers & Reed (primary): [Fresh (Wet) Meadow
Are vegetation Yes Soil Yes		ificantly disturbed?	Are "normal Ye	es Eggers & Reed (secondary):	
Are vegetation No Soil No	, , , _ ,	,	circumstances" present?	Eggers & Reed (tertiary): Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Atta	, ₆₃ <u>—</u>	3,	oint locations		oaturos oto
					eatures, etc.
Hydrophytic vegetation present?	Yes General Remarks Ves (explain any answer	Associated with We	II 10.		
Hydric soil present? Indicators of wetland hydrology present?	Yes (explain any answer freeded):				
Is the sampled area within a wetland?	No If yes, optional We	tland Site ID: Wetla	nd 1		
VEGETATION					
VEGETATION			_		
		Absolute Dominant	<u>Indicator</u>	50/20 Thresholds:	<u>20%</u> <u>50%</u>
<u>Tree Stratum</u> (Plot Size:	<u>30 ft</u>)	% Cover Species?	<u>Status</u>	Tree Stratum	0 0
1.		0		Sapling/Shrub Stratum	0 0
2.		0		Herb Stratum Woody Vine Stratum	$\frac{34}{0}$ $\frac{85}{0}$
3.		0		woody vine Stratum	0 0
4.		0		Dominance Test Worksheet:	
	Total Cover:	<u>0</u>		Number of Dominant Species	1 (A)
Sapling/Shrub Stratum (Plot Size:	<u>15 ft</u>)			That Are OBL, FACW or FAC:	
1.		0		Total Number of Dominant Species Across All Strata:	1 <i>(B)</i>
2.		0		Percent of Dominant Species	
3.		0		That Are OBL, FACW or FAC:	100.00% (A/B)
4.		0			
5.		0		Prevalence Index Worksheet:	
	Total Cover:	<u>0</u>	-	Total % Cover of:	Multiply by:
Herb Stratum (Plot Size:	<u>5 ft</u>			OBL Species	
Eleocharis acicularis		90 Yes		FACW Species 45	X 2 90
2. Alisma subcordatum		25 No No	II	FAC Species0	X 3 0
3. Hypericum majus		20		FACU Species0	X 40
4. Polygonum lapathifolium5. Carex aquatilis		20 No No	FACW OBL	UPL Species0	X 5 <u>0</u>
			OBL	Column Totals: 170	(A) 215 (B)
Typha angustifolia Epilobium ciliatum		5 No	FACW	Prevalence Index = L	B/A = 1.26
8.		0		Hydrophytic Vegetation Indicators:	
0.	Total Cover:			Yes Rapid Test for Hydrophy	vtic Vegetation
Woody Vine Stratum (Plot Size:		<u>170</u>		Yes Dominance Test is >50%	
,	<u>50 h</u> /			Yes Prevalence Index ≤ 3.0 [[1]
1.		0			ons [1] (provide supporting data
2.	Total Cover:	0		in vegetation remarks of	• •
WB 0 44 4 55 5		0		[1] Indicators of hydric soil & wetland hy	c Vegetation [1] (Explain) rdrology must be present, unless
% Bare Ground in Herb Stratum:		Sphagnum Moss Cover	r:	disturbed or problematic.	V
Vegetation Remarks: (include photo number	s nere or on a separate she	eet)		Hydrophytic vegetation present?	<u>Yes</u>

SOIL Sampling Point: W1

Profile Description: (Describe to the depth need	ed to document the indicator or co	nfirm the	abscence o	f indicators).		
Depth Matrix		ox Featur		1 101	T4	Domento
	% Color (moist)	<u></u>	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 8 10YR 2/1 10YR 2/1	100				mucky peat mucky peat	no redox no redox
2. 12 - 24 10YR 2/1	100				mucky peat	no redox
24 - 36 10YR 3/1	80 10YR 3/6	20		PL	silty clay	-
5						-
6						
[1] Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coa	ted Sand	Grains [2] Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)			Indi	cators for Problematic Hydric So	oils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR	PA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R,	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR I	K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S	8) (LRR F	R, MLRA 149	B)	5 cm Mucky Peat or Peat (S3) (Li	RR K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LR	R R, MLR.	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L,)		Polyvalue Below Surface (S8) (LF	RR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	. ,			Thin Dark Surface (S9) (LRR K, L	•
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19)	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A	·
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	
	_ , , , ,				Very Shallow Dark Surface (TF12	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland	,			: 🗀		
Restrictive Layer (if present): Type:	Deptl	i (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks:						
 HYDROLOGY						
Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required; ch	neck all that apply)			Secondar	y Indicators (minimum of two re	quired)
	Water-Stained Leaves ((RQ)			e Soil Cracks (B6)	FAC-Neutral Test (D5)
Surface Water (A1)	✓ Aquatic Fauna (B13)	<i>D1</i>)		_	ge Patterns (B10)	
✓ High Water Table (A2)	Marl Deposits (B15)			_	Trim Lines (B16)	
Saturation (A3)	Hydrogen Sulfide Odor	(C1)				
Water Marks (B1)			Danta (C2)		eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	un Liviing	KUUIS (C3)		tion Visible on Assial Imagen (CO	
☐ Drift Deposits (B3)	Presence of Reduced II	on (CA)			tion Visible on Aerial Imagery (C9,	1
Algal Mat or Crust (B4)	Recent Iron Reduction i		nils (CA)		d or Stressed Plants (D1)	
☐ Iron Deposits (B5)			ulis (Cu)		orphic Position (D2)	
✓ Inundation Visible on Aerial Imagery (B7)	☐ Thin Muck Surface (C7)			Shallo	w Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remari	(S)		Microt	opographic Relief (D4)	
Field Observations:					Indicators of wetland hydrolo	gy present? Yes
Surface water present?	Surface Water Depth (in	ches):			Describe Recorded Data:	
Water table present?	✓ Water Table Depth (inch	es):	11			
Saturation present? (includes capillary fringe)	✓ Saturation Depth (inches	s):	0			
Recorded Data: Aerial Photo M	onitoring Well Stream Gaug	9 <u> </u>	Previous Ins _i	pections	·	
Hydrology Remarks: Frogs						
Trydrology Homanior 110gs						

Project/Site:	Aitkin Site				Applicant/O	wner: Polyl	<u>Met</u>	City/County:	<u>Aitkin</u>	State:	MN	Sampling Date:	09/18/14
Investigator(s): k	(MS2 Shoulder				Section: Local Relie	<u>6</u> f: <u>None</u>		Township: Slope %:	47N 0 S	Range oil Map Unit Nam		Sampling Point: o muck	<u>2U</u>
Subregion (LRR):	<u>K</u>				Latitude:	<u>5158999 I</u>	<u>N</u>	Longitude:	<u>447542 E</u>	Datun	o: <u>UTM, N</u>	IAD 83, meters	
Cowardin Classific	cation: L	<u>Jpland</u>			Circular 39	Classification	<u>Upland</u>			Mapped NWI C	lassificatio	n:	
Are climatic/hydrol Are vegetation	5	ions or Soil	31	ical for this i Hydrology		? <u>No</u> significantly o		ain in remarks Are "normal circumstanc	<u>Yes</u>	Eggers & Reea Eggers & Reea Eggers & Reea	(secondar		
Are vegetation	_	Soil		Hydrology		naturally prob •		present?		Eggers & Reea	.,	3,	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes Yes No	General Remarks (explain any answers if needed):	Wetter than normal. Well 14 field, east edge. Also paired with Well 14 west edge (A10_W) GPS Point I.D. 428
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlan	nd Site ID: (Wetland 2)

Tree Stratum	(Plot Size: 30	<u>ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		_	0	<u>50%</u>
			0			Sapling/Shrub Stra	ntum	_	0	0
			0			Herb Stratum Woody Vine Stratu		_	17 0	42.
			0			Woody vine Stratt	III		0	U
			0			Dominance Test W	<u>/orksheet:</u>			
Sapling/Shrub Stratum	(Plot Size: 15	Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC	nt Species CW or FAC:	1	(A)	
	(0			Total Number of D		1	(B)	
			0			Percent of Domina			- `´	
			0			That Are OBL, FAC		100.00%	(A/B)	
			0						_	
			0			Prevalence Index V				
		Total Cover:	<u>0</u>			Total % Co			ultiply by:	_
Herb Stratum	(Plot Size: 5 ft	<u> </u>				OBL Species	0	X 1		0
Phalaris arundinacea			85	Yes	FACW	FACW Species	85	X 2	17	0
			0			FAC Species	0	X 3		0
			0			FACU Species	0	X 4		0
			0			UPL Species	0	X 5		0
			0			Column Totals:	85	(A)	17	0
			0			Prev	valence Index =	B/A =	2.0	0
			0			Hydrophytic Vegeta	tion Indicators:			
		Total Cover:	<u>85</u>			No Rapid T	est for Hydroph	vtic Vegetatio	า	
Woody Vine Stratum	(Plot Size: 30		<u>65</u>			 	nce Test is >509			
	(F. 101 21.201 <u>00</u>		0			III	nce Index ≤ 3.0			
			0				logical Adaptati ation remarks o			ing c
		Total Cover:	0			-	ation remarks o natic Hydrophyt)
are Ground in Herb Strat	um:		_	n Moss Cover	:	[1] Indicators of hydric	soil & wetland h			
etation Remarks: (includ	e photo numbers her	e or on a separate s	heet)			Hydrophytic vegetal	tion present?	<u>Yes</u>		
						11				

SOIL Sampling Point: 2U

### The soil at the site is problematic because it has been drained. #### The soil at the site is problematic because it has been drained. ###################################	(inches) Color (moist)	%	Color (moist)	% Т	Гуре [1]	Loc [2]	Texture	Remarks
27 - 42 2.5Y 4/2 70 5CY51 20 slit loam 1/Type: C**Concentration, D**Depiction, RM**Reduced Matrix, CS**-Covered or Coated Sand Grains (2) Location: PL**-Pore Lining, M**-Matrix, United Sail Indicators: (applicable to all LRRs, unless otherwise noted) 1/Type: C**-Concentration, D**-Depiction, RM**Reduced Matrix, CS**-Covered or Coated Sand Grains (2) Location: PL**-Pore Lining, M**-Matrix, United Sail Indicators: (applicable to all LRRs, unless otherwise noted) 1/Type: C**-Concentration, D**-Depiction, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) Location: PL**-Pore Lining, M**-Matrix, United Sail Indicators: (applicable to all LRRs, unless otherwise noted) 1/Type: C**-Concentration, D**-Depiction, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) Location: PL**-Pore Lining, M**-Matrix, United Sail Indicators: (applicable to all LRRs, unless otherwise (3) LRR K LL RLR 1499) 1/Type: C**-Concentration, D**-Depiction, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) Location: PL**-Pore Lining, M**-Matrix, United Sail Indicators: (applicable to all LRRs, unless otherwise (3) LRR K LL RLR 1499) 1/Type: C**-Concentration, D**-Depiction, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) LRR K LL RLR 1499) 1/Type: C**-Concentration, D**-Depiction, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) LRR K LL RLR 1499) 1/Type: C**-Concentration, D**-Depiction, RM**-Reduced Matrix, CS**-Coated Sand Grains (2) LRR K LL RLR 1499) 1/Type: C**-Concentration, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) LRR K LL RLR 1499) 1/Type: C**-Concentration, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) LRR K LL RLR 1499) 1/Type: C**-Concentration, RM**-Reduced Matrix, CS**-Covered or Coated Sand Grains (2) LRR K LL RLR 1499) 1/Type: C**-Concentration, RM**-Reduced Matrix, CS**-Covered Matrix, CS**-Coated Sand Grains (2) LRR K LL RLR 1499) 1/Type: C**-Concentration, RM**-Coated Matrix, CS**-Coated Matrix, CS**-Coated Sand Grains (2) LRR K LL R	0 - 16 10YR 2/1	100					mucky peat	no redox
Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains [2] Location: PL-Pore Lining, M-Matrix.	16 - 27 2.5Y 4/2	70 1	0YR 3/2	20			silty clay loam	
Trype: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coasted Sand Grains								
Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains [2] Location: PL-Pore Lining, M-Matrix. drick Soil Indicators: (applicable to all LRRs, unless otherwise noted) Historial (A1)	27 - 42 2.5Y 4/2						silt loam	
Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all LRRs, unless otherwise (applicable to all LRRs, unless otherwise (applicable to applicable to all LRRs, unless otherwise (applicable to applicable to all LRRs, unless otherwise (applicable to applicable to all LRRs, unless otherwise (applicable to all LRRs, unless	<u> </u>	 	UTR 4/0	=				
Histosof (A1) Gripped Matrix (S6) Z cm Muck (A10) (LRR K, L, MLRA 1498) Histos Epipedon (A2) Dark Surface (S7) (LRR R, MLRA 1498) Coast Prairie Redox (A16) (LRR K, L, R) Histosof (A2) Dark Surface (S7) (LRR R, MLRA 1498) S cm Mucky Peat or Peat (S3) (LRR K, L, R) Hydringen Sulfide (A4) Thin Dark Surface (S9) (LRR R, MLRA 1498) Dark Surface (S9) (LRR K, L) Hydringen Sulfide (A4) Dark Surface (S1) (LRR K, L) Polyvalue Below Surface (S8) (LRR K, L) Depleted Below Dark Surface (A111) Loamy Cleyed Matrix (F2) Thin Dark Surface (S9) (LRR K, L) Depleted Below Dark Surface (A111) Dapheted Matrix (F3) Iron Adanganese Masses (F12) (LRR K, L, R) Sandy Mucky Mineral (S1) Depleted Dark Surface (F6) Pedroon Floodplain Stoll (F12) All R K, L R Sandy Mucky Mineral (S1) Depleted Dark Surface (F7) Massic Spacial (TIA6) (MLRA 144A, 1498) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Massic Spacial (TIA6) (MLRA 144A, 1498) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TT12) Other (explain in soil remarks) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TT12) Other (explain in soil remarks) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TT12) Other (explain in soil remarks) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TT12) Other (explain in soil remarks) Indicators of hydrophytic vegetation on one required; check all that apply) Secondary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Indicators (Minimum of Nor Required) Indicators (Minimum of Nor Reduce	Type: C=Concentration, D=Depletion, RM	1=Reduced Ma	atrix, CS=Covered or Co	ated Sand G	rains [2]	Location: I	PL=Pore Lining, M=Matrix.	
Bisck Epipedron (AZ) Dark Surface (ST) (IRR R, MLRA 149B) Coast Pratire Redox (A16) (IRR K, L, R) Bisck Hissile (A3) Polyvalue Below Surface (S9) (IRR R, MLRA 149B) 5 cm Mucky Feat or Peat (S3) (IRR K, L, R) Hydroger Sullide (A4) This Dark Surface (S9) (IRR R, MLRA 149B) Dark Surface (S7) (IRR K, L) Stratilized Layers (A5) Loany Mucky Mineral (T1) (IRR K, L) Polyvalue Below Surface (S9) (IRR K, L) Depleted Below Dark Surface (A11) Loany Gieged Matrix (F3) This Dark Surface (S9) (IRR K, L) Thick Dark Surface (A12) Depleted Matrix (F3) Iron Manganese Masses (F12) (IRR K, L) Thick Dark Surface (A12) Depleted Matrix (F3) Iron Manganese Masses (F12) (IRR K, L) Sandy Mokey Mineral (S1) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 1449B) Sandy Geleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 1444, 145, 149B) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic Veg / Shallow Dark Surface (TF12) Iron manus Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic Veg / Shallow Dark Surface (TF12) Iron manus Indicators of hydrophytic vegetation and wetland hydrology must be present Veg / Shallow Dark Surface (TF12) Iron manus Indicators (Iron minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1)	dric Soil Indicators: (applicable to all LRR	Rs, unless oth	erwise noted)			Ind	icators for Problematic Hydric	Soils [3]:
Block Histlic (A3) Polyvalue Below Surface (S8) (LRR R. MLRA 149B) 5 cm Mucky Peal or Peal (S3) (LRR K. L. R) Pydrogen Sulfide (A4) Thin Dark Surface (S9) (LRR R. MLRA 149B) Dark Surface (S7) (LRR K. L) Popleted Below Dark Surface (A11) Loany Mucky Mineral (F1) (LRR K. L) Polyvalue Below Surface (S8) (LRR K. L) Popleted Below Dark Surface (A11) Loany Mucky Mineral (F2) Thin Dark Surface (S9) (LRR K. L) Popleted Below Dark Surface (A11) Loany Mucky Mineral (F2) Thin Dark Surface (S9) (LRR K. L) Popleted Below Dark Surface (A112) Depleted Matrix (F2) Thin Dark Surface (F6) Pedmont Foodpoin Soils (F19) (MLRA 149B) Sandy Mucky Milneral (S1) Redox Dark Surface (F6) Pedmont Foodpoin Soils (F19) (MLRA 144A 145, 149B) Sandy Redox (S9) Redox Dark Surface (F7) Mesic Spoulic (TA6) (MLRA 144A 145, 149B) Sandy Redox (S9) Redox Dark Surface (F7) Mesic Spoulic (TA6) (MLRA 144A 145, 149B) Sandy Redox (S9) Redox Dark Surface (F1) Other (explain in soil Indicators of Indicators of Indicators of Indicators of Indicators of Indicators of Indicators of Indicators of Indicators (Ininimum of two required) Surface Water (A1) Water Stained Leaves (B9) Surface (B16) FAC Neutral Test (D. Hydrogen Sulface (A1) Meri Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Presence of Reduced Iron (C4) Sulface Soil Cracks (B6) FAC Neutral Test (D. Hydrogen Sulface) (B16) Water Marks (B1) Presence of Reduced Iron (C4) Sulface Soil Cracks (B16) Sulface One (B16) Water Marks (B1) Presence of Reduced Iron (C4) Sulface One (B16) Water Marks (B1) Presence of Reduced Iron (C4) Sulface One (B16) Water Marks (B1) Presence of Reduced Iron (C4) Sulface One (B16) Water Saliew Applied One Sulface (B16) Other (explain in remarks) Microtopographic Relate (D4) Water Saliew Applied Observations: Indicators of wetland hydrology present? No Describe Recorded Data: Indicators of wetland hydrology present? No Describe Recorded Data:	Histosol (A1)		tripped Matrix (S6)			✓	2 cm Muck (A10) (LRR K, L, M	ILRA 149B)
Hydrogen Sulfide (A4)	Histic Epipedon (A2)		Oark Surface (S7) (LRR R,	. MLRA 149B,	3)		Coast Prairie Redox (A16) (LR	PR K, L, R)
Stratified Layers (A5) Loamy Mucky Mineral (F1) (LRR K, L) Polyvalue Below Surface (S8) (LRR K, L) Depleted Below Dark Surface (A11) Loamy Gleyed Matrix (F2) Thin Dark Surface (S9) (LRR K, L) Thick Dark Surface (A12) Depleted Matrix (F3) Presence of Reduced Iron (C4) Sandy Mucky Mineral (S1) Redox Depresent? Mater able (D2) Depleted Dark Surface (F6) Presence (S9) (LRR K, L) (LRK L, R) Depleted Matrix (F3) Depleted Matrix (F3) Presence (F6) Predom Floodplain Soils (F19) (MLRA 1444) (H8) Sandy Revox (S5) Depleted Dark Surface (F6) Predom Floodplain Soils (F19) (MLRA 1448) Sandy Revox (S5) Redox Depressions (F8) Redox Depression (F8) Redox Depressions (F8) Redox Depression (F8) Redox Depressions (F8) Redox Depression (F8) Redox D	Black Histic (A3)	□ F	Polyvalue Below Surface ((S8) (LRR R, I	MLRA 149B)		5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
Depleted Below Dark Surface (A11) Loamy Gleyed Matrix (F2) Thin Dark Surface (S9) (LRR K, L) Thick Dark Surface (A12) Depleted Matrix (F3) Iron-Manganese Masses (F12) (LRR K, L, R) Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Pledmont Floodplain Soils (F19) (MLRA 149B) Sandy Redox (S5) Redox Depressions (F8) Redox Depressions of Indicators of Indicators of Indicators of Indicators of Indicators (Indicators (Indicato	Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LF	RR R, MLRA	149B)		Dark Surface (S7) (LRR K, L)	
Trick Dark Surface (A12) Depleted Matrix (F.3) Iron-Manganese Masses (F.12) (LRR K. L. R) Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Pledmont Floodplain Solls (F19) (MLRA 1448) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Other (explain in soil remarks) Setrictive Layer (If present): Type: none Depth (inches): Hydric soil present? Yes If Remarks: The soil at the site is problematic because it has been drained ***TOROLOGY** Surface Water (A1) Water Stained Leaves (B9) Surface Soil Cracks (B4) FAC-Neutral Test (D. Hydrogen Sulfide Odor (C1) Dry-Season Water Table (A2) Aquatic Fauna (B13) Drainage Patterns (B10) Saturation (A3) Mart Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Hydrogen Sulfide Odor (C1) Dry-Season Water Table (C2) Sediment Deposits (B3) Presence of Reduced Iron (C4) Sutmed or Stressed Plants (D1) Iron Deposits (B3) Recent Iron Reduction in Titled Soils (C6) Geomorphic Position (D2) Iron Deposits (B5) Microlopographic Relief (D4) Water Table (A2) Apaiter Table (A2) Sulface Odor (C7) Shallow Aquitata (D3) Iron Deposits (B5) Microlopographic Relief (D4) Water Marks (B1) Microlopographic Relief (D4) Water Table (Pattern Becorded Data: Indicators of wetland hydrology present? No Describe Recorded Data: Indicators of wetland hydrology present? No Describe Recorded Data: Internation Pattern Basses Pattern Basses Pattern Basses Pattern Basses Patt			oamy Mucky Mineral (F1)	(LRR K, L)			Polyvalue Below Surface (S8)	(LRR K, L)
Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Pledmont Floodplain Soils (F19) (MLRA 1498) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 1498) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Other (explain in soil remarks) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Other (explain in soil remarks) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Other (explain in soil remarks) Indicators of hydrophytic vegetation and welland hydrology must be present? No person of hydrophytic vegetation and welland hydrology must be present? No person of hydrophytic vegetation (F12) Other (explain in remarks) Indicators of hydrophytic vegetation and welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? No person of welland hydrology present? N	Depleted Below Dark Surface (A11)		oamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K	(, L)
Sandy Mucky Mineral (\$1)			Pepleted Matrix (F3)					•
Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Indicators of hydrophylic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Indicators of hydrophylic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) Other (explain in soil remarks) Indicators of hydrophylic vegetation and wetland hydrology must be present? Yes If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is problematic because it has been drained. If Remarks: The soil at the site is probl	Sandy Mucky Mineral (S1)		Pedox Dark Surface (F6)				Piedmont Floodplain Soils (F1	9) (MLRA 149B)
Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) remarks)				7)				
Indicators of hydrophylic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) remarks	. , ,	_	•	,				
**Strictive Layer (if present): Type: none	L Sandy Redox (S5)							
### The soil at the site is problematic because it has been drained. #### The soil at the site is problematic because it has been drained. ###################################				alla konda a al-anon				
POROLOGY **etland Hydrology Indicators: **imary Indicators (minimum of one required; check all that apply) Surface Water (A1) High Water Table (A2) Aquatic Fauna (B13) Drainage Patterns (B10) Saturation (A3) Marl Deposits (B15) Moss Trim Lines (B16) Dry-Season Water Table (C2) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Presence of Reduced Iron (C4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) **Indicators of wetland hydrology present?** **No Describe Recorded Data:** **Indicators of wetland hydrology present?** **No Describe Recorded Data:** **Indicators of wetland hydrology present?** **No Describe Recorded Data:** **Indicators of wetland hydrology present?** **No Describe Recorded Data:** **Indicators of wetland hydrology present?** **No Describe Recorded Data:** **Indicators of wetland hydrology present?** **No Describe Recorded Data:** **No **No **No **No **No **No **No **Describe Recorded Data:** **No **Describe Recorded Data:** **No *	Indicators of hydrophytic vegetation and wetl	land hydrology	must be present, unless				Very Shallow Dark Surface (Ti	remarks) remarks)
surface Water (A1) Water-Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (D. High Water Table (A2) Aqualic Fauna (B13) Drainage Patterns (B10) Water Marks (B1) Hydrogen Sulfide Odor (C1) Dry-Season Water Table (C2) Sediment Deposits (B2) Oxidized Rhizospheres on Living Roots (C3) Crayfish Burrows (C8) Drift Deposits (B3) Presence of Reduced Iron (C4) Stunted or Stressed Plants (D1) Iron Deposits (B5) Thin Muck Surface (C7) Shallow Aquiltard (D3) Inundation Visible on Aerial Imagery (B7) Other (explain in remarks) Microtopographic Relief (D4) Iron Oberosent? Surface Water Depth (inches): Irrace water present? Water Table Depth	Indicators of hydrophytic vegetation and wether strictive Layer (if present): Type: no	<i>land hydrology</i> one	must be present, unless				Very Shallow Dark Surface (Ti	remarks) remarks)
Surface Water (A1) Water-Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (D1)	Indicators of hydrophytic vegetation and weth estrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem	<i>land hydrology</i> one	must be present, unless				Very Shallow Dark Surface (Ti	remarks) remarks)
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High Water Table (A2)	Indicators of hydrophytic vegetation and wetle estrictive Layer (if present): Type: no bil Remarks: The soil at the site is problem /DROLOGY etland Hydrology Indicators:	natic because it	Depti has been drained.				Very Shallow Dark Surface (TI Hydric soil present?	remarks) Yes
Saturation (A3) Marl Deposits (B15) Moss Trim Lines (B16) Dry-Season Water Table (C2) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Presence of Reduced Iron (C4) Sturted or Stressed Plants (D1) Geomorphic Position (D2) Thin Muck Surface (C7) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrology present? Indicators of wetland hydrology present? Moescribe Recorded Data:	I Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: no ill Remarks: The soil at the site is problem TOROLOGY etland Hydrology Indicators:	natic because it	must be present, unless of Depti has been drained.	th (inches):			Very Shallow Dark Surface (TI Hydric soil present? ry Indicators (minimum of two	required)
Water Marks (B1)	Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: no hill Remarks: The soil at the site is problem TOROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required)	natic because it	must be present, unless of Depti has been drained. at apply) Water-Stained Leaves	th (inches):		Surfa	Hydric soil present? Hydric soil present? ry Indicators (minimum of two ce Soil Cracks (B6)	remarks) Yes
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Presence of Reduced Iron (C4) Indicators of wetland hydrology present?	Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TDROLOGY etland Hydrology Indicators: imary Indicators (minimum of one required Surface Water (A1)	natic because it	must be present, unless of Depti has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13)	th (inches):		Surfa Drain	ry Indicators (minimum of two ce Soil Cracks (B10)	required)
Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrology present? Describe Recorded Data:	Indicators of hydrophytic vegetation and weth estrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TOROLOGY Total Remarks: The soil at the site is problem TOROLOGY Total Remarks: The soil at the site is problem Torology Indicators: Torontogy Indicators: Toro	natic because it	must be present, unless of Depti has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15)	th (inches):		Surfa Drain Moss	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B16) Trim Lines (B16)	required)
Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Indicators of wetland hydrology present?	Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: no pil Remarks: The soil at the site is problem TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required and the site is problem) Surface Water (A1) High Water Table (A2) Saturation (A3)	natic because it	must be present, unless of Depti has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15)	th (inches):		Surfa Drain Moss	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B16) Trim Lines (B16)	required)
Algal Mat or Crust (B4)	Indicators of hydrophytic vegetation and wetlestrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem of the problem of the site is problem.	natic because it	has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo	th (inches): (B9)		Surfa Drain Moss Dry-S	ry Indicators (minimum of two ce Soil Cracks (B10) Trim Lines (B16) Season Water Table (C2)	required)
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Indicators of wetland hydrology present? Describe Recorded Data:	Indicators of hydrophytic vegetation and wethestrictive Layer (if present): Type: no pil Remarks: The soil at the site is problem TDROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required and the site is problem) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	natic because it	must be present, unless of Depti has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere.	th (inches): (B9) r (C1) s on Living Ro		Surfa Drain Moss Dry-S Crayt	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B16) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8)	remarks) Yes required) FAC-Neutral Test (Ds
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Other (explain in remarks) Indicators of wetland hydrology present? Indicators of wetland hydrology present? Indicators of wetland hydrology present? Describe Recorded Data:	Indicators of hydrophytic vegetation and wethestrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required and the site is problem) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	natic because it	must be present, unless of Depti has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizospheres Presence of Reduced	th (inches): (B9) r (C1) s on Living Re	oots (C3)	Surfa Drain Moss Dry-S Crayf	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (remarks) Yes required) FAC-Neutral Test (Ds
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ater table present? Surface Water Depth (inches): Water Table Depth (inches): Describe Recorded Data:	Indicators of hydrophytic vegetation and wethestrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required and the site is problem) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	natic because it	must be present, unless of Depti has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction	th (inches): (B9) r (C1) s on Living Ro lron (C4) in Tilled Soils	oots (C3)	Surfa Drain Moss Dry-S Crayl Satur Stunt	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (ed or Stressed Plants (D1) norphic Position (D2)	remarks) Yes required) FAC-Neutral Test (Ds
ater table present? Water Table Depth (inches):	Indicators of hydrophytic vegetation and weth estrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TOROLOGY Letland Hydrology Indicators: Limary Indicators (minimum of one required and surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	natic because it	nust be present, unless of Depin has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo. Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	th (inches): r (C1) s on Living Ro lron (C4) in Tilled Soils	oots (C3)	Surfa Drain Moss Dry-S Crayf Saturt Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B16) Trim Lines (B16) Geason Water Table (C2) Gish Burrows (C8) aution Visible on Aerial Imagery (Ged or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	remarks) Yes required) FAC-Neutral Test (Ds
	Indicators of hydrophytic vegetation and wethestrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required and the site is problem) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	natic because it	has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	th (inches): (B9) Ir (C1) Is on Living Ro Iron (C4) In Tilled Soils (7)	oots (C3)	Surfa Drain Moss Dry-S Crayf Saturt Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B16) Trim Lines (B16) Geason Water Table (C2) iish Burrows (C8) aation Visible on Aerial Imagery (Ged or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4)	remarks) Yes required) FAC-Neutral Test (D.
turation present? (includes capillary fringe) Saturation Depth (inches):	Indicators of hydrophytic vegetation and wethestrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	natic because it	has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	th (inches): (B9) Ir (C1) Is on Living Ro Iron (C4) In Tilled Soils (7)	oots (C3)	Surfa Drain Moss Dry-S Crayf Saturt Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (ced or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydre	remarks) Yes required) FAC-Neutral Test (D.
	Indicators of hydrophytic vegetation and wethestrictive Layer (if present): Type: no poil Remarks: The soil at the site is problem TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required and the site is problem) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	natic because it	has been drained. at apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo. Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C. Other (explain in rema	th (inches): r (C1) s on Living Ro lron (C4) in Tilled Soils 7) rks)	oots (C3)	Surfa Drain Moss Dry-S Crayf Saturt Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (ced or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydre	remarks) Yes required) FAC-Neutral Test (Ds

Project/Site:	Aitkin Site				Applicant/O	wner: PolyMe	<u>et</u>	City/County.	: <u>Aitkin</u>	State:	MN	Sampling Date:	10/23/14
Investigator(s): k Land Form: Subregion (LRR):	KMS2 Depressio K	<u>n</u>			Section: Local Relien Latitude:	6 f: None 5159459 N		Township: Slope %: Longitude:	0	Range Soil Map Unit Name Datum	e: <u>Cathr</u>	Sampling Point: to muck NAD 83, meters	<u>2W</u>
Cowardin Classific	cation: E	PEM1d	<u>l</u>		Circular 39	Classification:	Type 3			Mapped NWI Cl	assificatio	n:	
Are climatic/hydrol	logic conditi	ons or	n the site typ	ical for this	time of year	? <u>Yes</u>	(If no, expla	ain in remarks	s)	Eggers & Reed	(primary):	Shallow Ma	<u>rsh</u>
Are vegetation	<u>Yes</u>	Soil	<u>Yes</u>	Hydrology	<u>Yes</u>	significantly dis	sturbed?	Are "normal circumstance		Eggers & Reed Eggers & Reed	•	ry):	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> r	naturally proble	matic?	present?		Eggers & Reed	(quaterna	ry):	
UMMARY C	F FIND	ING	S - Atta	ch site	map sh	owing sa	mpling _l	point loc	ations,	transects, i	mporta	ant features	s, etc.
							· ·		· · · · · ·		· · · · ·	·	

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Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes Yes Yes	General Remarks (explain any answers if needed):	This field has been mined for topsoil. Deeper water present south of wetland plot. Upland plot pair is the same as the one for the soil mining area on the west side of Hwy 1. This plot is on the west edge of the wetland. Well 14 field wetland.
Is the sampled area within a wetland?	<u>Yes</u>	If yes, optional Wetlan	nd Site ID: Wetland 2

			Absolute	<u>Dominant</u>	Indicator	50/20 Thresholds:			<u>20%</u>	<u>50%</u>
Tree Stratum	(Plot Size: 30	<u>2 ft</u>)	% Cover	Species?	<u>Status</u>	Tree Stratum		_	0	0
			0			Sapling/Shrub Stratu	m	_	0	0
			0			Herb Stratum		=	15	37.
			0			Woody Vine Stratum			0	0
			0			Dominance Test Wor	ksheet:			
		Total Cover:	0			Number of Dominant That Are OBL, FACW	Species or FAC:	2	2 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size: 15	<u>5 ft</u>)				Total Number of Dom			_	
			0			Species Across All S		2	2 <i>(B)</i>	
			0			Percent of Dominant			(4/5)	
			0			That Are OBL, FACW	or FAC:	100.00%	6 (A/B)	
			0			Prevalence Index Wor	rksheet:			
		Total Cover:	0			Total % Cover		1.0	ultiply by:	
Hart Orac as	(Blot Size: F		<u>0</u>				55	X 1		5
Herb Stratum	(Plot Size: 5	<u>"</u>)	1	1 1		OBL Species	20	X 2		.0
Juncus canadensis			25	Yes	OBL	FACW Species	0	-		0
Phalaris arundinacea			20	Yes No	FACW	FAC Species		X 3		_
Typha angustifolia	io		10	No	OBL OBL	FACU Species	0	X 4		0
Calamagrostis canadens Alisma subcordatum	15		5	No	OBL	UPL Species	0	X 5		0
Schoenoplectus tabernae	emontani		5		OBL	Column Totals:	75	(A)	9	5
Schoenopiecius tabelhad			0	No	ODL	Preval	ence Index =	B/A =	1.2	7
			0			Hydrophytic Vegetation	n Indicators:			
		Total Cover:	<u>75</u>			Yes Rapid Tes	t for Hydroph	ytic Vegetatio	n	
Woody Vine Stratum	(Plot Size: 30	0 ft)	<u>13</u>			<u> </u>	e Test is >50%			
			0			<u> </u>	e Index ≤ 3.0			
			0			No Morpholog	ical Adaptati	ons [1] (prov	ide support	ing o
		Total Cover:	<u>0</u>			-11		r on a separa ic Vegetation		1
		rotar oorer.	<u> </u>			[1] Indicators of hydric so				
Bare Ground in Herb Stratu	ım:	9	% Sphagnun	n Moss Cover	:	disturbed or problematic		,	-	
Bare Ground in Herb Stratu				n Moss Cover	:	disturbed or problematic Hydrophytic vegetation		Yes		

SOIL Sampling Point: 2W

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
0 - 12 10YR 2/1	100		muck	no redox
12 - 24 10YR 2/1	100		muck	no redox
24 - 30 10YR 2/1	100		muck	no redox
<u> </u>				
-		-		
Type: C=Concentration D=Depletion PM=F	Reduced Matrix, CS=Covered or Coated Sand Grains [21 Location: I	PL=Pore Lining, M=Matrix.	
rdric Soil Indicators: (applicable to all LRRs,			icators for Problematic Hydr	io Saile 121:
1	Stripped Matrix (S6)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2 cm Muck (A10) (LRR K, L,	
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	D)	Coast Prairie Redox (A16) (L	•
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149	<i>B)</i>	5 cm Mucky Peat or Peat (S.	
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (St	
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRF	•
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (Fi	12) (LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F	719) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA	144A, 145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
I Indicators of hydrophytic yegetation and wetland	d hydrology must be present, unless disturbed or problemation	:	Very Shallow Dark Surface (TF12) remarks)
3				
estrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
estrictive Layer (if present): Type: pil Remarks: No redox observed.	Depth (inches):		Hydric soil present?	Yes Yes
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY	Depth (inches):		Hydric soil present?	<u>Yes</u>
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY /etland Hydrology Indicators:		Seconda	Hydric soil present?	
estrictive Layer (if present): Type: pil Remarks: No redox observed. /DROLOGY /etland Hydrology Indicators: rimary Indicators (minimum of one required; of				
cestrictive Layer (if present): Type: Dil Remarks: No redox observed. DROLOGY Setland Hydrology Indicators: rimary Indicators (minimum of one required; of the control	heck all that apply)	Surfa	ry Indicators (minimum of tw	vo required)
estrictive Layer (if present): Type: oil Remarks: No redox observed. //DROLOGY //etland Hydrology Indicators: rimary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2)	heck all that apply)	Surfa Drain	ry Indicators (minimum of tw ce Soil Cracks (B6)	vo required)
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2)	heck all that apply)	Surfa Drain Moss	ry Indicators (minimum of tw ce Soil Cracks (B6) age Patterns (B10)	vo required)
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of the content	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15)	☐ Surfa ☐ Drain ☐ Moss ☐ Dry-S	ry Indicators (minimum of tw ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16)	vo required)
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Surfa Drain Moss Dry-S Crayfi	ry Indicators (minimum of tw ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2)	ro required) ☐ FAC-Neutral Test (D£
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of the content	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	Surfa Drain Moss Dry-S Crayf	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8)	ro required) ☐ FAC-Neutral Test (D5
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of the content	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Surfa Drain Moss Dry-S Crayl Satur	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery	ro required) ☐ FAC-Neutral Test (D5
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of the content o	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Surfa Drain Moss Dry-S Crayl Satur Stunt	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1)	ro required) ☐ FAC-Neutral Test (D5
pestrictive Layer (if present): Type: pil Remarks: No redox observed. POROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; of the content	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Surfa Drain Moss Dry-S Crayf Satur Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1)	ro required) ☐ FAC-Neutral Test (D£
estrictive Layer (if present): Type: pil Remarks: No redox observed. //DROLOGY //etland Hydrology Indicators: rimary Indicators (minimum of one required; continued) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Surfa Drain Moss Dry-S Crayf Satur Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2)	ro required) FAC-Neutral Test (D:
estrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) ield Observations:	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Surfa Drain Moss Dry-S Crayf Satur Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4)	ro required) FAC-Neutral Test (Distribution) (C9)
Pestrictive Layer (if present): Type: oil Remarks: No redox observed. YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of the content	heck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surfa Drain Moss Dry-S Crayf Satur Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hyde	ro required) FAC-Neutral Test (Distribution) (C9)
estrictive Layer (if present): Type: poil Remarks: No redox observed. POROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; continuation (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Veteld Observations: Surface water present?	theck all that apply) Water-Stained Leaves (B9) Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Surfa Drain Moss Dry-S Crayf Satur Stunt Geon	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hyde	ro required) FAC-Neutral Test (Distribution) (C9)

Project/Site:	Aitkin Site				Applicant/C	wner:	<u>PolyMet</u>	<u>t</u>	City/County:	Aitkin		State:	MN	Sampling Date:	09/18/14
Investigator(s): K Land Form: Subregion (LRR):	KMS2 Shoulder K				Section: Local Relie Latitude:		<u>іе</u> 8393 N		Township: Slope %: Longitude:	<u>0</u>	Soil Map U		Cathro	Sampling Point: muck AD 83, meters	<u>3U-1</u>
Cowardin Classific	cation: <u>L</u>	Jpland ,		t1	Circular 39			<u>Upland</u>	ŭ		Марреа	NWI Cla	ssification		
Are climatic/hydrol Are vegetation	Ü	sons or Soil	31	icai for this Hydrology	,		No antly dist	, , ,	in in remarks Are "normal circumstanc	Ye	<u>s</u> Eggers	& Reed () & Reed () & Reed ()	secondary	<u>Upland</u>):	
, and the second	_	Soil	_	Hydrology	_		y problem		present?		Eggers	& Reed (d	quaternary	•	
SUMMARY O	F FIND	ING	S - Atta	ch site	man sh	owir	na san	nnlina n	oint loc	ations	transe	cts in	nnorta	nt features	etc

Hydric soil present?	<u>No</u> Yes <u>No</u>	General Remarks (explain any answers if needed):	Wetter than normal. Well 9 field, south ditch. GPS Point I.D. 424
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlar	nd Site ID: (Wetland 3)

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum		_	0	0
			0			Sapling/Shrub Strate Herb Stratum	um	=	0	0
			0			Woody Vine Stratum	1	_	16 0	40
			0			Woody Vine Stratum				-
			0			Dominance Test Wo	<u>rksheet:</u>			
Sapling/Shrub Stratum	(Plot Size:	Total Cover:	<u>0</u>			Number of Dominan That Are OBL, FACV			1 (A)	
<u>Supring/Sin us Strutum</u>	(1 101 0120.	<u> </u>	0			Total Number of Doi			1 <i>(B)</i>	
			0			Species Across All				
			0			Percent of Dominan That Are OBL, FACV		100.009	% (A/B)	
			0						_	
			0			Prevalence Index Wo	orksheet:			
		Total Cover:	<u>0</u>			Total % Cove			fultiply by:	
Herb Stratum	(Plot Size:	<u>5 ft</u>				OBL Species	0	X 1	()
Amaranthus retroflexus			5	No	FACU	FACW Species _	0	X 2	()
Urtica dioica			55	Yes	FAC	FAC Species _	65	X 3	19	5
Lactuca canadensis			5	No	FACU	FACU Species	15	X 4	6)
Chenopodium album			5	No	FACU	UPL Species	0	X 5	()
Ambrosia trifida			10	No	FAC		80	(A)	25:	5
			0			Column Totals:	lence Index =	•	3.1	_
			0						3.1.	_
			0			Hydrophytic Vegetati				
		Total Cover:	<u>80</u>			 '	st for Hydroph ce Test is >509	•	on	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>					ce Test is >50; ce Index ≤ 3.0	•		
			0				gical Adaptati		ride supporti	ng d
			0				tion remarks o			
									F47 (F)	
		Total Cover:	<u>0</u>			No Problema	tic Hydrophyt	ic Vegetation	[1] (Explain)	
are Ground in Herb Strate	um: 20		_	n Moss Cover	:	No Problema [1] Indicators of hydric sidesturbed or problemati	soil & wetland h	•	,	

SOIL Sampling Point: 3<u>U-1</u>

Depth Matrix	R	edox Featur	es			
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 13 10YR 2/1	90 2.5Y 2.5/1	3			mucky sandy loam	
2	2.5Y 4/2	3				
3	2.5Y 4/6	3				
4. 13 - 23 2.5Y 2.5/1 2.5Y 5/1	100 75 2.5Y 3/6,2.5Y 2.5/1				mucky peat mucky sandy loam	
5. 23 - 26 2.51 3/1 28 - 33 2.5Y 4/1	85 7.5YR 4/6				sandy loam	
[1] Type: C=Concentration, D=Depletion, RM			Grains [2	Location: I	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRR	s, unless otherwise noted)			Ind	icators for Problematic Hydric So	ils [3]:
Histosol (A1)	Stripped Matrix (S6)			✓	2 cm Muck (A10) (LRR K, L, MLR.	A <i>149B)</i>
☐ Histic Epipedon (A2)	Dark Surface (S7) (LRR)	R. MLRA 149	<i>PB)</i>		Coast Prairie Redox (A16) (LRR k	
Black Histic (A3)	Polyvalue Below Surface			3)	5 cm Mucky Peat or Peat (S3) (LF	•
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (Dark Surface (S7) (LRR K, L)	, 2, 1.9
Stratified Layers (A5)	✓ Loamy Mucky Mineral (F				Polyvalue Below Surface (S8) (LR	PRK I)
					. , ,	
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	<i>()</i>			Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F	<i>-7)</i>			Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetla	and hydrology must be present, unles:	s disturbed or	r problematic.		Very Shallow Dark Surface (TF12)	remarks)
Restrictive Layer (if present): Type: nor	1e De	pth (inches)): -		Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required	; check all that apply)					
Surface Water (A1)	Water-Stained Leave			Seconda	ry Indicators (minimum of two red	quired)
☐ High Water Table (A2)		es (B9)			ry Indicators (minimum of two red ce Soil Cracks (B6)	quired) FAC-Neutral Test (D5)
Trigit Water Table (Fiz)	☐ Aquatic Fauna (B13)	• /		Surfa	ce Soil Cracks (B6)	<u> </u>
_	_	• /		Surfa Drain	,	<u> </u>
Saturation (A3)	Aquatic Fauna (B13) Marl Deposits (B15)			Surfa Drain Moss	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16)	<u> </u>
☐ Saturation (A3) ☐ Water Marks (B1)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od	dor (C1)	Roots (C3)	Surfa Drain Moss Dry-S	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Eeason Water Table (C2)	<u> </u>
☐ Saturation (A3) ☐ Water Marks (B1) ☐ Sediment Deposits (B2)	Aquatic Fauna (B13) Marl Deposits (B15)	dor (C1)	Roots (C3)	Surfa Drain Moss Dry-S Crayl	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) ceason Water Table (C2) ish Burrows (C8)	<u> </u>
 □ Saturation (A3) □ Water Marks (B1) □ Sediment Deposits (B2) □ Drift Deposits (B3) 	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od	dor (C1) res on Living	Roots (C3)	Surfa Drain Moss Dry-S Crayl	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Eeason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9)	<u> </u>
☐ Saturation (A3) ☐ Water Marks (B1) ☐ Sediment Deposits (B2) ☐ Drift Deposits (B3) ☐ Algal Mat or Crust (B4)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizospher	dor (C1) res on Living d Iron (C4)		Surfa Drain Moss Dry-S Crayl Satur	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9)	<u> </u>
 □ Saturation (A3) □ Water Marks (B1) □ Sediment Deposits (B2) □ Drift Deposits (B3) 	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizospher Presence of Reduced Recent Iron Reduction	dor (C1) res on Living d Iron (C4) on in Tilled Sc		Surfa Drain Moss Dry-S Crayl Satur Stunt	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Eeason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1)	<u> </u>
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Oc. Oxidized Rhizospher Presence of Reduce. Recent Iron Reductic. Thin Muck Surface (6)	dor (C1) res on Living d Iron (C4) on in Tilled Sc		Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) norphic Position (D2)	<u> </u>
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizospher Presence of Reduced Recent Iron Reduction	dor (C1) res on Living d Iron (C4) on in Tilled Sc		Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Eeason Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1)	<u> </u>
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizospher Presence of Reduced Recent Iron Reduction Thin Muck Surface (Company)	dor (C1) res on Living d Iron (C4) on in Tilled Sc (C7) narks)		Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) norphic Position (D2)	FAC-Neutral Test (D5)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Oc. Oxidized Rhizospher Presence of Reduce. Recent Iron Reductic. Thin Muck Surface (Co.) Other (explain in rem.)	dor (C1) res on Living d Iron (C4) on in Tilled Sc (C7) narks) (inches):		Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4)	FAC-Neutral Test (D5)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizospher Presence of Reduced Recent Iron Reduction Thin Muck Surface (Company)	dor (C1) res on Living d Iron (C4) on in Tilled Sc (C7) narks) (inches):		Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Occ Oxidized Rhizospher Presence of Reduced Recent Iron Reduction Thin Muck Surface (Companies) Other (explain in remove) Surface Water Depth Water Table Depth (in	dor (C1) res on Living d Iron (C4) on in Tilled Sc (C7) narks) (inches):		Surfa Drain Moss Dry-S Crayl Satur Stunt Geon	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Occ Oxidized Rhizospher Presence of Reduced Recent Iron Reduction Thin Muck Surface (Companies) Other (explain in remove) Surface Water Depth Water Table Depth (in	dor (C1) res on Living d Iron (C4) on in Tilled Sc (C7) narks) (inches): hes):		Surfa Drain Moss Crayl Saturt Second Shalle Micro	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)
Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Od Oxidized Rhizospher Presence of Reduced Recent Iron Reduction Thin Muck Surface (Control of the Control o	dor (C1) res on Living d Iron (C4) on in Tilled Sc (C7) narks) (inches): hes):	nils (C6)	Surfa Drain Moss Crayl Saturt Second Shalle Micro	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (C9) ed or Stressed Plants (D1) sorphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydrolo	FAC-Neutral Test (D5)

***	_			A11011	DATA TON	110101	1001	itiai ana mortificast megion	
Project/Site:	Aitkin Site			Applicant/Own	er: PolyMet	City/County: Aith	<u>kin</u>	State: MN Sampling Date: 09/18/14	
Land Form: Subregion (LRR):	_			Latitude:	<u>6</u> <u>None</u> 5159040 N	Township: 47N Slope %: 0 Longitude: 4473	Si	Range: 26W Sampling Point: 3U-2 Foil Map Unit Name: Cathro muck Datum: UTM, NAD 83, meters	
Cowardin Classific	cation: <u>Upla</u>	<u>na</u>		Circular 39 Cla	assification: Upland			Mapped NWI Classification:	
Are climatic/hydron Are vegetation Are vegetation	logic conditions <u>Yes</u> Soii <u>No</u> Soii	<u>Yes</u>	typical for this Hydrology Hydrology	<u>Yes</u> sig	No (If no, exp nificantly disturbed? urally problematic?	lain in remarks) Are "normal circumstances" present?	<u>Yes</u>	Eggers & Reed (primary): Upland Eggers & Reed (secondary): Eggers & Reed (tertiary): Eggers & Reed (quaternary):	
SUMMARY C	F FINDIN	GS - At	tach site	map sho	wing sampling	point locatio	ons, t	transects, important features, etc.	
Hydrophytic veget	,			neral Remarks olain any answ	Wetter than norm Well 5 field, south				_

Hydric soil present?	Yes Yes No	General Remarks (explain any answers if needed):	Wetter than normal. Well 5 field, south ditch. GPS Point I.D. 426
	<u>No</u>	If yes, optional Wetlar	nd Site ID: (Wetland 3)

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum			0	<u>50%</u>
			0			Sapling/Shrub Stratu Herb Stratum	ım		 	0 45
			0			Woody Vine Stratum	1		0	0
			0			,			<u> </u>	
			0			Dominance Test Wo				
0	(DI- (O' -	Total Cover:	<u>0</u>			Number of Dominan That Are OBL, FACV			1 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)	0			Total Number of Dor	ninant		4 (0)	
			0			Species Across All S	Strata:		1 (B)	
			0			Percent of Dominant That Are OBL, FACV		100.00)% (A/B)	
			0			Prevalence Index Wo				
		Total Cover:	0			Total % Cove			Multiply by:	
Herb Stratum	(Plot Size:		<u>u</u>			OBL Species	0	X 1		0
Phalaris arundinacea	(, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<u> </u>	90	Yes	FACW	FACW Species	90	X 2	18	0
Phalans arundinacea			90	162	FACW	- 	0	X 3		0
			0			FAC Species	0	X 4		0
			0			FACU Species	0	X 5		0
			0			UPL Species			-	_
			0			Column Totals:	90	(A)	18	_
			0				lence Index =		2.0	0
			0			Hydrophytic Vegetati	on Indicators:			
		Total Cover:	<u>90</u>		_		t for Hydroph		ion	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>					e Test is >50			
			0			 	e Index ≤ 3.0	• •		
			0			in vegetat	gical Adaptati ion remarks c	ons [1] (pro or on a sepai	rate support	niy a
		Total Cover:	0			- ·	tic Hydrophyt)
						[1] Indicators of hydric s	oil & wetland h	ydrology mus	t be present, u	nless
are Ground in Herb Strate	um:		% Sphagnun	n Moss Cover	<u></u>	disturbed or problemation	.			
are Ground in Herb Strate		_		n Moss Cover	: <u> </u>	disturbed or problematic Hydrophytic vegetatio		<u>Yes</u>		
		_		n Moss Cover	: 	-		<u>Yes</u>		

SOIL Sampling Point: 3<u>U-2</u>

Depth (inches) Matrix	Redox Features		
0 - 13 10YR 2/1	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
	100	mucky very fine sandy loam	dry, ditch spoils, no redox
13 - 38 10YR 2/1	100	mucky peat	
3			
ł			
)			
1] Type: C=Concentration, D=Depletion, RM	=Reduced Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs	s, unless otherwise noted)	Indicators for Problematic Hydric So	ils [3]:
Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLR)	4 <i>149B)</i>
✓ Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149B	B) 5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	✓ Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L))
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetla	and hydrology must be present, unless disturbed or problematic.	Very Shallow Dark Surface (TF12)	
Restrictive Layer (if present): Type: nor		Hydric soil present?	Yes
YDROLOGY Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required,	; check all that apply)	Secondary Indicators (minimum of two req	quired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surface Soil Cracks (B6)	✓ FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)	Drainage Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	Moss Trim Lines (B16)	
_		Dry-Season Water Table (C2)	
I VVALELIVIALKS (DT)	Hydrogen Sulfide Odor (C1)		
Water Marks (B1) Sediment Deposits (B2)	Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	Crayfish Burrows (C8)	
Sediment Deposits (B2)		☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9)	
Sediment Deposits (B2) Drift Deposits (B3)			
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Oxidized Rhizospheres on Living Roots (C3)	Saturation Visible on Aerial Imagery (C9)	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1)	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrological	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrological	
Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrolog Describe Recorded Data:	

Project/Site:	Aitkin Site				Applicant/O	wner: PolyMe	<u>et</u>	City/County:	<u>Aitkin</u>	S	tate:	MN	Sampling Date:	09/19/14
Investigator(s): <u>k</u> Land Form:	(MS2 Terrace				Section: Local Reliet	<u>6</u> : <u>None</u>		Township: Slope %:		F Soil Map Unit	Range: Name:		Sampling Point:	<u>3U-3</u>
Subregion (LRR):	<u>K</u>				Latitude:	5159 388 N		Longitude:	<u>446130 E</u>	L	Datum:	UTM, NA	AD 83, meters	
Cowardin Classific	cation: <u>l</u>	Jpland			Circular 39	Classification:	<u>Upland</u>			Mapped N	WI Clas	ssification		
Are climatic/hydrol	J		3,		,	_	, , ,	nin in remarks Are "normal	•	Eggers & I	"	3,	<u>Upland</u> /):	
_	<u>Yes</u> <u>No</u>	Soil Soil	<u>Yes</u> <u>No</u>	Hydrology Hydrology		significantly dis aturally proble		circumstanc present?	es"	Eggers & I Eggers & I	•	3,	y):	
MININA DV C	C EINIB	1110	0 44-	-114-					-45	4				-4-

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydric soil present?	<u>No</u> Yes No	General Remarks (explain any answers if needed):	Wetter than normal. Well 1 field GPS Point I.D. 431
3 03 7		If yes, optional Wetlar	nd Site ID: (Wetland 3)

To a Olivia	(Di. (O'	0.6	Absolute % Cover	Dominant Species?	<u>Indicator</u> Status	50/20 Thresholds:			20%	50%
Tree Stratum	(Plot Size: 30	<u>) </u>	<u> 70 00707</u>	Openico.	<u>Otatus</u>	Tree Stratum Sapling/Shrub Stra	.t.m	_	0	0
			0			Herb Stratum	tum	_	19	47.
			0			Woody Vine Stratu	m	_	0	0
			0			Dominance Test W		_		
		Total Course	0							
Sapling/Shrub Stratum	(Plot Size: 15	Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC	or FAC:		2 <i>(A)</i>	
Sapinity/Sirrub Stratum	(FIOL 312e. <u>13</u>	<u> </u>				Total Number of Do	ominant		- (D)	
			0			Species Across All	Strata:		B (B)	
			0			Percent of Domina		66.67%	(A/B)	
			0			That Are OBL, FAC	W or FAC:		- (A/D)	
			0			Prevalence Index V	/orksheet:			
		Total Cover:	<u>0</u>			Total % Cov		М	ultiply by:	
Herb Stratum	(Plot Size: 5	<u>ft</u>	_			OBL Species	0	X 1		0
Calystegia sepium			40	Yes	FAC	FACW Species	0	X 2		0
Cirsium arvense			30	Yes	FACU	FAC Species	65	X 3	19	5
Urtica dioica			20	Yes	FAC	FACU Species	30	X 4	12	0
Rumex crispus			5	No	FAC	UPL Species	0	X 5		0
			0			111	95	(A)	31	5
			0			Column Totals:	ralence Index =	` ′ -	3.3	_
			0						3.3	_
			0			Hydrophytic Vegeta				
		Total Cover:	<u>95</u>				est for Hydroph		n	
Woody Vine Stratum	(Plot Size: 30	<u>9 ft</u>					nce Test is >50%			
			0				nce Index ≤ 3.0 ogical Adaptati		ida sunnarti	ina r
			0			in veget	ation remarks o	r on a separa	te sheet)	y t
		Total Cover:	<u>0</u>			No Problem	atic Hydrophyti	ic Vegetation	[1] (Explain))
are Ground in Herb Stratu	m:	9	% Sphagnum	n Moss Cover:		[1] Indicators of hydric disturbed or problema		/drology must b	e present, ur	nless
station Domonico (includo	photo numbers he	ere or on a separate s	sheet)			Hydrophytic vegetat	ion present?	<u>No</u>		
etation Remarks: (include										

SOIL Sampling Point: 3<u>U-3</u>

(inches) Color (moist)	%	Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
0 - 13 10YR 2/1	100		 -		mucky silt loam	no redox
13 - 23 2.5Y 5/3	50	2.5Y 5/2	30		silty clay loam	
		7.5YR 4/6	20			
23 - 31 2.5Y 5/3	60	2.5Y 5/2			very fine sandy loam	
31 - 37 10YR 4/2	85	10YR 4/6 10YR 4/6,4/1			fine sandy loam	
Type: C=Concentration, D=Depletion, RM=		· · · · · · · · · · · · · · · · · · ·		Location:	PL=Pore Lining, M=Matrix.	
vdric Soil Indicators: (applicable to all LRRs				Inc	icators for Problematic Hydrid	: Soils [3]:
Histosol (A1)		Stripped Matrix (S6)		✓	2 cm Muck (A10) (LRR K, L, N	
Histic Epipedon (A2)		Dark Surface (S7) (LRR R)	MI RA 149R)		Coast Prairie Redox (A16) (LF	
Black Histic (A3)		Polyvalue Below Surface (•	3)	5 cm Mucky Peat or Peat (S3)	•
] Hydrogen Sulfide (A4)	H	Thin Dark Surface (S9) (LF		, _	Dark Surface (S7) (LRR K, L)	(2
Stratified Layers (A5)		Loamy Mucky Mineral (F1)	,		Polyvalue Below Surface (S8)	(IRR K I)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)	(ENT N, E)		Thin Dark Surface (S9) (LRR)	
Thick Dark Surface (A12)		Depleted Matrix (F3)			Iron-Manganese Masses (F12	•
		,				
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)	7)		Piedmont Floodplain Soils (F1	
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 14	14A, 145, 149B)
Sandy Redox (S5)		Redox Depressions (F8)			Red Parent Material (F21)	Other (explain in soil remarks)
I Indicators of hydrophytic vegetation and wetla	and hydrolog	gy must be present, unless	disturbed or problematic.		Very Shallow Dark Surface (T	F12) Temarks)
, , , , , , , , , , , , , , , , , , ,		•				
estrictive Layer (if present): Type:		Dept	th (inches):		Hydric soil present?	<u>Yes</u>
estrictive Layer (if present): Type: pil Remarks: /DROLOGY		Dept	th (inches):		Hydric soil present?	<u>Yes</u>
		Dept.	th (inches):		Hydric soil present?	Yes
estrictive Layer (if present): Type: oil Remarks: YDROLOGY	check all		th (inches):	Seconda	Hydric soil present?	
estrictive Layer (if present): Type: oil Remarks: /DROLOGY etland Hydrology Indicators:	check all					required)
estrictive Layer (if present): Type: oil Remarks: /DROLOGY /etland Hydrology Indicators: rimary Indicators (minimum of one required;	check all	that apply)		Surfa	ry Indicators (minimum of two	required)
estrictive Layer (if present): Type: pil Remarks: YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1)	check all	that apply) Water-Stained Leaves		Surfa	ry Indicators (minimum of two	required)
estrictive Layer (if present): Type: oil Remarks: YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3)	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13)	- (B9)	Surfa Drain Moss	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10)	required)
estrictive Layer (if present): Type: oil Remarks: YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15)	r (C1)	Surfa Drain Moss Dry-S	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16)	
estrictive Layer (if present): Type:	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo	r (C1)	Surfa Drain Moss Dry-s Cray	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2)	o required) [] FAC-Neutral Test (DS
estrictive Layer (if present): Type: oil Remarks: YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo	r (C1) s on Living Roots (C3)	Surfa	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8)	o required) FAC-Neutral Test (DE
estrictive Layer (if present): Type: poil Remarks: //DROLOGY fetland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere.	r (B9) r (C1) s on Living Roots (C3)	Surfa Drain Moss Dry- Crayi Saturi	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (o required) FAC-Neutral Test (DE
estrictive Layer (if present): Type: oil Remarks: YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required;] Surface Water (A1)] High Water Table (A2)] Saturation (A3)] Water Marks (B1)] Sediment Deposits (B2) Drift Deposits (B3)] Algal Mat or Crust (B4) I Iron Deposits (B5)	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere.	r (C1) s on Living Roots (C3) Iron (C4) in Tilled Soils (C6)	Surfa	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery (ed or Stressed Plants (D1)	o required) FAC-Neutral Test (DE
estrictive Layer (if present): Type: oil Remarks: /DROLOGY etland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction	r (B9) r (C1) s on Living Roots (C3) Iron (C4) in Tilled Soils (C6)	Surfa Drain Moss Dry-S Crayi Satun Stunn Geor	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) iish Burrows (C8) ation Visible on Aerial Imagery (o required) FAC-Neutral Test (DE
pestrictive Layer (if present): Type:	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	r (B9) r (C1) s on Living Roots (C3) Iron (C4) in Tilled Soils (C6)	Surfa Drain Moss Dry-S Crayi Satun Stunn Geor	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) iish Burrows (C8) ation Visible on Aerial Imagery (ed or Stressed Plants (D1) norphic Position (D2)	o required)
estrictive Layer (if present): Type:	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	r (C1) s on Living Roots (C3) Iron (C4) n in Tilled Soils (C6) 7)	Surfa Drain Moss Dry-S Crayi Satun Stunn Geor	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) iish Burrows (C8) ation Visible on Aerial Imagery (ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	o required)
estrictive Layer (if present): Type:	check all	that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C.	r (C1) s on Living Roots (C3) Iron (C4) in Tilled Soils (C6) 7) rks)	Surfa Drain Moss Dry-S Crayi Satun Stunn Geor	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) iish Burrows (C8) ation Visible on Aerial Imagery (ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydre	o required)
estrictive Layer (if present): Type: poil Remarks: POROLOGY Setland Hydrology Indicators: rimary Indicators (minimum of one required; Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) feld Observations: surface water present?		that apply) Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odo Oxidized Rhizosphere. Presence of Reduced Recent Iron Reduction Thin Muck Surface (C. Other (explain in rema	r (C1) s on Living Roots (C3) Iron (C4) in Tilled Soils (C6) 7) rks) nches):	Surfa Drain Moss Dry-S Crayi Satun Stunn Geor	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) iish Burrows (C8) ation Visible on Aerial Imagery (ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hydre	o required)

WETL	AND DET	ERMINATION DATA FO	RM - Northcent	ral and Northe	ast Region	
Project/Site: Aitkin	Site	Applicant/Owner: PolyMet	City/County: Aitkin	State: MN San	mpling Date: 09/18/14	
Investigator(s): KMS2 Land Form: Ditch Subregion (LRR): K Cowardin Classification: Are climatic/hydrologic co	PEM1d anditions on the site to	Section: <u>6</u> Local Relief: None Latitude: <u>5158391 N</u> Circular 39 Classification: <u>Type</u> ypical for this time of year? No (If no,	Longitude: 446940 E	Range: 26W Sar Map Unit Name: Cathro mu Datum: UTM, NAD 8 Napped NWI Classification: Eggers & Reed (primary):		
Are vegetation Yes Are vegetation No	Soil <u>Yes</u> Soil <u>No</u>	Hydrology Yes significantly disturbed? Hydrology No naturally problematic? ach site map showing sampling	Are "normal Yes E circumstances" E present?	Eggers & Reed (secondary): Eggers & Reed (tertiary): Eggers & Reed (quaternary):		
Hydrophytic vegetation pr Hydric soil present? Indicators of wetland hydr Is the sampled area within	rology present?	Yes General Remarks Yes (explain any answers if needed): Yes If yes, optional Wetland Site ID:	outh ditch.			
/EGETATION		Absolute Dom	mant mulcator	Thresholds:	<u>20%</u>	<u>5</u>
Tree Stratum	(Plot Size	: 30 ft) <u>% Cover</u> <u>Spec</u>	ies? Status Tree	Stratum	0	

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum		_	20% 0	50% 0
			0			Sapling/Shrub Stra	tum	_	0	0
			0			Herb Stratum		-	29	72.
			0			Woody Vine Stratu	m	_	0	0
			0			Dominance Test W	orksheet:			
		Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC		,	1 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>				Total Number of Do			_	
			0			Species Across All		•	1 <i>(B)</i>	
			0			Percent of Domina	nt Species		_	
			0			That Are OBL, FAC		100.00%	6 (A/B)	
			0			Provolence Index M	larkahaat:			
			0			Prevalence Index W				
		Total Cover:	<u>0</u>			Total % Cov		X 1	ultiply by:	_
Herb Stratum	(Plot Size:	<u>5 ft</u>				OBL Species	145	-	14	_
Spirodela polyrhiza			90	Yes	OBL	FACW Species	0	X 2		0
Sium suave			20	No	OBL	FAC Species	0	X 3		0
Sagittaria latifolia			20	No	OBL	FACU Species	0	X 4		0
Alisma subcordatum			15	No	OBL	UPL Species	0	X 5		0
			0			111	145	(A)	14	5
			0			Column Totals:	alence Index =	` ′	1.0	_
			0						1.0	U
			0			Hydrophytic Vegeta				
		Total Cover:	<u>145</u>				est for Hydroph		n	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>					nce Test is >509			
			0				ice Index ≤ 3.0 ogical Adaptati		ido eunno-4	ine -
			0				ogicai Adaptati ation remarks c			niy C
		Total Cover:	<u>0</u>			No Problem	atic Hydrophyt	ic Vegetation	[1] (Explain))
Bare Ground in Herb Strate	ım:		% Sphagnun	n Moss Cover	<u> </u>	[1] Indicators of hydric disturbed or problema		ydrology must l	be present, ui	ıless
		— s here or on a separate s	hoot)			Hydrophytic vegetat	ion present?	Yes		

SOIL Sampling Point: 3<u>W-1</u>

Profile Description: (Describe to the depth nee				indicators).		
Depth Matrix		dox Featur		1	T . ()	Donald a
(inches) Color (moist)	% Color (moist)	<u>%</u>	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 6 10YR 2/1 2.5Y 4/2	55 7.5YR 4/6	40			mucky sandy loam very fine sandy loam	
Z	10GY 4/1	5			very fille safidy loant	
3	75 2.5Y 5/2				very fine sandy loam	
5.	10YR 4/6	5				
6						
[1] Type: C=Concentration, D=Depletion, RM=F	Reduced Matrix, CS=Covered or Co	ated Sand	Grains [2]	Location: P	L=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)			Indi	cators for Problematic Hydric Soil	s [3]:
Histosol (A1)	Stripped Matrix (S6)			✓	2 cm Muck (A10) (LRR K, L, MLRA	<i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R	, MLRA 149	9B)		Coast Prairie Redox (A16) (LRR K,	L, R)
Black Histic (A3)	Polyvalue Below Surface (3)	5 cm Mucky Peat or Peat (S3) (LRI	R K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LI			, <u> </u>	Dark Surface (S7) (LRR K, L)	, , ,
Stratified Layers (A5)	✓ Loamy Mucky Mineral (F1)				Polyvalue Below Surface (S8) (LRF	? K. I.)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	(2,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			Thin Dark Surface (S9) (LRR K, L)	, ,
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (LR	PKIP)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	7)			Mesic Spodic (TA6) (MLRA 144A,	
		/			, , , , , , , , , , , , , , , , , , , ,	
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetlan	,				Very Shallow Dark Surface (TF12)	Tomanoj
Restrictive Layer (if present): Type: none	Dept	th (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks: The soil at the site is problemati	c because it has been drained and ha	as manageo	d upland vege	tation on it.		
HYDROLOGY						
Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required; of	check all that apply)			Secondar	y Indicators (minimum of two requ	uired)
Surface Water (A1)	Water-Stained Leaves	(B9)		Surfac	e Soil Cracks (B6)	▼ FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)			Draina	nge Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)			Moss	Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odo	r (C1)		Dry-S	eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizosphere.	s on Living	Roots (C3)	Crayfi.	sh Burrows (C8)	
Drift Deposits (B3)				Satura	ntion Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced	Iron (C4)			ed or Stressed Plants (D1)	
	Recent Iron Reduction	in Tilled So	oils (C6)	_	orphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface (C.	7)			w Aquitard (D3)	
☐ Inundation Visible on Aerial Imagery (B7)		rke)			opographic Relief (D4)	
	Other (explain in rema	IKS)			UDUUI ADI IIC INGIIGI (D4)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in rema	rks)		IVIICTOI		
Field Observations:				IVIICTOL	Indicators of wetland hydrolog	y present? Yes
Field Observations: Surface water present?	Surface Water Depth (i	nches):		INICTOL		y present? Yes
Field Observations: Surface water present? Water table present?	Surface Water Depth (inc	nches): hes):		Microt	Indicators of wetland hydrolog	y present? Yes
Field Observations: Surface water present?	Surface Water Depth (i	nches): hes):	6	Microt	Indicators of wetland hydrolog	y present? Yes
Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Surface Water Depth (inc	nches): hes): es):	6 revious Insp		Indicators of wetland hydrolog	y present? Yes
Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe)	Surface Water Depth (in Water Table Depth (inch	nches): hes): es):			Indicators of wetland hydrolog	y present? Yes

W	ETLAND DET	ERMINATION	DATA FOI	RM - North	central and l	Vorthe	ast Reg	ion	
Project/Site:	Aitkin Site	Applicant/Own	er: PolyMet	City/County: Aitk	<u>kin</u> State:	MN Sam	pling Date: 09/	<u>18/14</u>	
Investigator(s): Land Form: Subregion (LRR, Cowardin Classi	· -	Section: Local Relief: Latitude: Circular 39 Cl.	<u>5159041 N</u>	Township: 47N Slope %: 0 Longitude: 4473	Range: Soil Map Unit Name: 22 E Datum: Mapped NWI Clas	Cathro much	-	<u>'-2</u>	
Are climatic/hydr	rologic conditions on the site t	typical for this time of year?	No (If no, ex	rplain in remarks)	Eggers & Reed (p		Shallow Marsh		
Are vegetation	Yes Soil Yes	Hydrology Yes sig	nificantly disturbed?	Are "normal circumstances"	Yes Eggers & Reed (se Eggers & Reed (te				
Are vegetation	No Soil No	Hydrology <u>No</u> nati	ırally problematic?	present?	Eggers & Reed (q	uaternary):			
SUMMARY	OF FINDINGS - Att	ach site map sho	wing sampling	point location	ons, transects, im	portant f	eatures, e	tc.	
	'	Yes General Remarks (explain any answ if needed): Yes If yes, optional W	GPS Point I.D.	ith ditch.					
VEGETATI	ON								
			Absolute Domina	ant Indicator	50/20 Thresholds:		<u>2</u>	20%	<u>50%</u>
Tree Stratu	um (Plot Size	e: <u>30 ft</u>)	% Cover Specie	s? <u>Status</u>	Tree Stratum			0	0
1.			0		Sapling/Shrub Stratu	m		<u>0</u> 19	0 47.5
2.			0		Woody Vine Stratum		<u> </u>	0	0
3. 4.			0		Dominance Test Wor	ksheet:			
		Total Cover:	<u>0</u>		Number of Dominant That Are OBL, FACW		2	(A)	
1. Sapiing/Sn	<u>orub Stratum</u> (Plot Size	9: <u>15 π</u>)	0		Total Number of Dom Species Across All S		2	(B)	
2. 3.			0		Percent of Dominant That Are OBL, FACW		100.00%	(A/B)	
4.			0		Dunalan sa Indau Wa	ulanda nata			
5.		Total Cover:	0		Prevalence Index Wor Total % Cover		Mu	Itiply by:	
Herb Strati	um (Plot Size		<u>0</u>		OBL Species	20	X 1		20
Typha latif		<u> </u>	20 Yes	OBL	FACW Species	70	X 2	14	Ю
Rumex cri			5 No	FAC	FAC Species	5	X 3	1	5
	rundinacea		70 Yes	FACW	FACU Species	0	X 4		0
4.			0		II	٥	X 5		Λ

0

0

0

0

<u>95</u>

0

0

0

% Sphagnum Moss Cover:

Total Cover:

Total Cover:

(Plot Size: 30 ft

Vegetation Remarks: (include photo numbers here or on a separate sheet)

6.

7.

8.

2.

Woody Vine Stratum

% Bare Ground in Herb Stratum:

0

175 (B)

1.84

0 X 5

95

Rapid Test for Hydrophytic Vegetation

Prevalence Index = B/A =

Dominance Test is >50%

Prevalence Index ≤ 3.0 [1]

(A)

Morphological Adaptations [1] (provide supporting data

Yes

in vegetation remarks or on a separate sheet)

Problematic Hydrophytic Vegetation [1] (Explain) [1] Indicators of hydric soil & wetland hydrology must be present, unless

UPL Species

No

Yes

Yes

No

disturbed or problematic.

Hydrophytic vegetation present?

Column Totals:

Hydrophytic Vegetation Indicators:

SOIL Sampling Point: 3<u>W-2</u>

### Presence of Reduced Iron Call Sediment Deposits (B2) Drift Deposits (B3) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Indicators (B6) Presence of Reduced Iron Reduction in Tilled Soils (C6) Indicators (B8) Presence (B8) Presence (B8) Cother (explain in remarks) Drainager (B10) (inches) Color (moist)	%	Color (moist)	% Type [1]	Loc [2]	Texture	Remarks	
24 - 32 5V 4/1 98 10YR Ali6 2 very time sently loam Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Costed Sand Grains [2] Location: PL-Pore Liming, M-Matrix. Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Costed Sand Grains [2] Location: PL-Pore Liming, M-Matrix. Indicators (applicable to all LRRs, unless otherwise noted) Indicators for Problematic Hydric Soils [3]: Hester (A)	0 - 7 10YR 2/1	100				mucky peat	no redox
Type: C-Concentration, D-Depletion, RM-Reduced Matrix, CS-Covered or Coated Sand Grains	7 - 24 5Y 4/1	95	10YR 4/6	5		very fine sandy loam	
Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable	24 - 32 5Y 4/1	98	10YR 4/6	2		very fine sandy loam	
Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable to all the sile is problematic because it has been drained. Indicators: (applicable	<u> </u>					-	
Indicators: (applicable to all LRRs, unless otherwise noted) Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained. Indicators: (applicable to all the site is problematic because it has been drained.	-						
Histosof (A1) Suitpeed Matrix (S6) Z cm Muck (A10) (LRR K, L, MLRA 1498) Histosof (A2) Dark Surface (S7) (LRR R, MLRA 1498) Coast Prairie Redox (A16) (LRR K, L, R) Black Histo (A3) Polyvalue Below Surface (S8) (LRR R, MLRA 1498) S cm Mucky Peat or Peat (S3) (LRR K, L, R) Hydragen Sulfide (A4) Thin Dark Surface (S9) (LRR R, MLRA 1498) Dark Surface (S9) (LRR K, L) Depleted Below Dark Surface (A11) Learny Mucky Mineral (F1) (LRR K, L) Polyvalue Below Surface (S9) (LRR K, L) Depleted Below Dark Surface (A11) Learny Mucky Mineral (F2) Thin Dark Surface (S9) (LRR K, L) Depleted Below Dark Surface (A11) Depleted Matrix (F3) Iron Adargamese Massess (F12) (LRR K, L) Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Piedonon Floodplain Solic (F12) Amesic Spodic (TA6) (MLRA 144A, 1478) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Amesic Spodic (TA6) (MLRA 144A, 1478) Sandy Gleyed Matrix (S4) Depleted Dark Surface (F7) Amesic Spodic (TA6) (MLRA 144A, 1478) Indicators of hydraphytic vegetation and welland hydrology must be present. unless disturbed or problematic. Very Shallow Dark Surface (F112) Other (explain in soil vertical Hydrology Indicators: Internal Hydrology Indicators: Internal Hydrology Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1) Water Stained Leaves (B9) Surface Soil Cracks (B6) FAC Neutral Test (D. Hydrogen Sufface Odor (C1) Dy Season Water Table (C2) Sutration (A3) Amar Deposits (B15) Mass Trim Inters (B10) Surface Water (A15) Presence of Reduced fron (C4) Stunted or Stressed Plants (D1) Internal Deposits (B3) Recent fron Reduction in Titled Soils (C4) Centrophylic Relet (D4) Internal Deposits (B5) Mineral Fall (B4) Presence of Reduced fron (C4) Stunted or Stressed Plants (D1) Internal Hydrology Indicators (minimum Of two required) Stunted or Stressed Plants (D1) Internal Hydrology Indicators (minimum Of two require	Type: C=Concentration, D=Depletion, RM=	Reduced	Matrix, CS=Covered or Coa	ted Sand Grains [2]	Location: F	PL=Pore Lining, M=Matrix.	
Basck Epipedron (Az) Dark Surface (ST) (IRR R, MLRA 149B) Coast Pratie Redox (A16) (IRR K, L, R) Basck Histic (A3) Polyvalue Below Surface (SB) (IRR R, MLRA 149B) Dark Mucky Feat or Peat (S3) (IRR K, L, R) Hydroger Suilide (A4) Thin Dark Surface (S9) (IRR R, MLRA 149B) Dark Surface (S7) (IRR K, L) Startilized Layers (A5) Loany Mucky Mineral (T1) (IRR K, L) Polyvalue Below Surface (S7) (IRR K, L) Depleted Below Dark Surface (A11) V. Loany Gleyed Matrix (F2) If Inin Dark Surface (S9) (IRR K, L) Thick Dark Surface (A12) Depleted Matrix (F3) Inon Manganese Masses (F12) (IRR K, L) Thick Dark Surface (A12) Depleted Matrix (F3) Inon Manganese Masses (F12) (IRR K, L) Sandy Mokey Mineral (S1) Redox Dark Surface (F6) Pedmont Floodpoint Suils (F19) (MLRA 149B) Sandy Gleyed Matrix (S1) Depleted Dark Surface (F7) Mess: Spocic (TA6) (MLRA 144A, 145, 149B) Indicators of hydrophytic vegetation and welland hydrology must be present, unless disturbed or problematic Sandy Redox (S5) Type: none Depth (inches): Hydric soil present? Yes If Remarks: The soil at the site is problematic because it has been drained. DROLOGY Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1) Water Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (D. Hydrogen Sulfide Ordor (C1) Dy-Season Water Table (C2) Saluration (A3) Mart Deposits (B15) Moss Trim Lines (B16) Water Marks (B1) Presence of Reduced Iron (C4) Stanted or Siessed Plants (D1) Very Stallardon Visible on Aerial Imagery (B7) Thin Muck Surface (C7) Shallow Aquillard (D3) Marcoloopyraphic Reside (D4) Microloopyraphic Reside (D4) Very Stallardon Visible on Aerial Imagery (B7) Surface Water Depth (inches): Indicators of vettland hydrology present? Yes Very Stallardon Visible on Aerial Imagery (B7) Surface Water Depth (inches): Surface Water Depth (inches):	dric Soil Indicators: (applicable to all LRRs,	, unless o	therwise noted)		Ind	icators for Problematic Hydric	Soils [3]:
Black Hissiic (A3) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) 5 cm Mucky Peat or Peat (S3) (LRR K, L, R) Injectionge Sulfide (A4) Thin Dark Surface (S9) (LRR R, MLRA 149B) Dark Surface (S7) (LRR K, L) Injectionge Below Dark Surface (A11) Loany Mucky Mineral (F1) (LRR K, L) Polyvalue Below Surface (S8) (LRR K, L) Depleted Below Dark Surface (A112) Depleted Matrix (F2) Thin Dark Surface (S9) (LRR K, L) Sandy Mucky Mineral (S1) Redox Dark Surface (F6) Pedmont Foodpiain Soils (F19) (MLRA 149B) Sandy Cleyed Matrix (S4) Depleted Dark Surface (F6) Pedmont Foodpiain Soils (F19) (MLRA 149B) Sandy Redox (S5) Redox Dark Surface (F6) Pedmont Foodpiain Soils (F19) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Dark Surface (F7) Mesic Spoulic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Dark Surface (F7) Mesic Spoulic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Surface (F1) Other (explain in soil Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic. Surface Valuer (If present): Type: Inone Depth (inches): Hydric soil present? Yes Water Stained Hodrology Indicators: Imary Indicators (minimum of one required): check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1) Water Stained Leaves (B9) Surface Soil Cracks (B6) FAC Neutral Test (D. Hydrogonis (B15) Mass Trim Lines (B16) Water Marks (B1) Presence of Reduced Iron (C4) Surface Soil Cracks (B6) Presence of Reduced Iron (C4) Surface Soil Cracks (B6) Presence of Reduced Iron (C4) Surface Soil Cracks (B6) Surface Soil Cracks (B6) Presence of Reduced Iron (C4) Surface Soil Cracks (B6) Surface Soil Cracks (B6) Surface Soil Cracks (B6) Surface Soil Cracks (B6) Surface Soil Cracks (B7) Surfa	Histosol (A1)		Stripped Matrix (S6)		✓	2 cm Muck (A10) (LRR K, L, Mi	LRA 149B)
Hydrogen Sulfide (A4)	Histic Epipedon (A2)		Dark Surface (S7) (LRR R, I	MLRA 149B)		Coast Prairie Redox (A16) (LRI	R K, L, R)
Hydrogen Sulfide (A4)	Black Histic (A3)		Polyvalue Below Surface (S	: (1498 S.) (LRR R, MLRA 1498)	5 cm Mucky Peat or Peat (S3)	(LRR K, L, R)
Stratified Layers (A5)	Hydrogen Sulfide (A4)					Dark Surface (S7) (LRR K, L)	,
Depleted Below Dark Surface (A11)			, , ,	,			(LRR K, L)
Trick Dark Surface (A12)			, , , , , , , , , , , , , , , , , , , ,	· • • •			•
Sandy Mucky Mineral (S1)	•	<u> </u>	3 3				
Sandy Cleyed Matrix (S4) Depleted Dark Surface (F7) Mesic Spodic (TA6) (MLRA 144A, 145, 149B) Sandy Redox (S5) Redox Depressions (F8) Red Parent Material (F21) Other (explain in soil remarks) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) remarks Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic. Very Shallow Dark Surface (TF12) remarks Indicators of hydrophytic vegetation and wetland hydrology must be present. Type: none Depth (inches): Hydric soil present? Yes Indicators of hydrophytic vegetation and wetland hydrology must be present. Type: none Depth (inches): Hydric soil present? Yes Indicators of hydrophytic vegetation and wetland hydrology indicators: Hydric soil present? Yes Indicators of hydrophytic vegetation and wetland hydrology must be present. Hydric soil present? Other (explain in remarks) Mescondary Indicators (minimum of two required) Very Shallow Dark Surface (F2) Other (explain in remarks) Secondary Indicators (minimum of two required) Very Shallow Dark Surface (F2) Very Shallow Dark Surface (F2) Very Shallow Dark Surface (F2) Other (explain in remarks) Microtopographic Position (D2) Very Shallow Dark Surface (B4) Other (explain in remarks) Microtopographic Relief (D4) Very Shallow Dark Surface (B4) Other (explain in remarks) Microtopographic Relief (D4) Very Shallow Dark Surface (B4) Other (explain in remarks) Microtopographic Relief (D4) Very Shallow Park Surface (B4) Other (explain in remarks) Microtopographic Relief (D4) Very Shallow Dark Surface (B4) Other (explain in remarks) Microtopographic Relief (D4) Very Shallow Dark Surface (B4) Other (explain in remarks) Very Shallow Park Surface (B4) Other (explain in remarks) Very Shallow Park Surface (B4) Other (explain in remarks) Other (explain							
Sardy Redox (S5)						,	
Indicators of hydrophylic vegetation and wetland hydrology must be present, unless disturbed or problematic.			•			•	
strictive Layer (if present): Type: none Depth (inches): Hydric soil present? Yes Depth (inches): Depth (inches): Hydric soil present? Yes	Sandy Redox (S5)						
### Presence of Reduced fron (C4) Agral Mat or Crust (B4) Agral		., , ,	·				
### Presence of Reduced fron (C4) Algal Mat or Crust (B4) Algal Mat or Crust (B4) Algal Mat or Crust (B5) Algal Mat or Crust (B5) Algal Mat or Crust (B5) Algal Mat or Crust (B6) Algal Mat or Crust (B7) Algal Mat or Crust (B8) Algal Mat or Crust (B8) Algal Mat or Crust (B7) Algal Mat or Crust (B8) Algal Mat or Crust (B7) Algal Mat or Crust (B8) Algal Mat or Crust (B8) Algal Mat or Crust (B7) Algal Mat or Crust (B8) Algal Mat or Crust (B1) Algal	Indicators of hydrophytic vegetation and wetlar		gy must be present, unless di	· · · · · · · · · · · · · · · · · · ·		Very Shallow Dark Surface (TF	remarks)
Secondary Indicators (minimum of one required; check all that apply) Secondary Indicators (minimum of two required) Surface Water (A1) High Water Table (A2) Aqualic Fauna (B13) Marl Deposits (B15) Water Marks (B1) Sediment Deposits (B2) Driit Deposits (B3) Presence of Reduced Iron (C4) Algal Mat or Crust (B4) Recent Iron Reduction in Tilled Soils (C6) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Water Table Depth (inches): Water Table Depth (inches): Water Table Depth (inches): Water Table Depth (inches): Water Table (A2) Surface Soil Cracks (B6) Surface Soil Cracks (B6) V FAC-Neutral Test (D. Surface Soil Cracks (B6) C raylish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquiltard (D3) Microtopographic Relief (D4) Indicators of wetland hydrology present? Yes Describe Recorded Data:	estrictive Layer (if present): Type: none	е	gy must be present, unless di	· · · · · · · · · · · · · · · · · · ·		Very Shallow Dark Surface (TF	remarks)
Surface Water (A1) Water-Stained Leaves (B9) Surface Soil Cracks (B6) FAC-Neutral Test (Dispersion of the Neutral Test (estrictive Layer (if present): Type: none	е	gy must be present, unless di	· · · · · · · · · · · · · · · · · · ·		Very Shallow Dark Surface (TF	remarks)
Surface Water (A1)	estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemat	е	gy must be present, unless di	· · · · · · · · · · · · · · · · · · ·		Very Shallow Dark Surface (TF	remarks)
High Water Table (A2)	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. The soil at the site is problemated.	е	gy must be present, unless di	· · · · · · · · · · · · · · · · · · ·		Very Shallow Dark Surface (TF	remarks)
High Water Table (A2)	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated and the site is problemated. The soil at the site is problemated.	e tic becaus	gy must be present, unless do Depthe	· · · · · · · · · · · · · · · · · · ·	Secondai	Very Shallow Dark Surface (TF Hydric soil present?	remarks) Yes
Saturation (A3)	Indicators of hydrophytic vegetation and wetland pestrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemate TOROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required;	e tic becaus	py must be present, unless die Depthe e it has been drained.	h (inches):		Very Shallow Dark Surface (TF Hydric soil present? ry Indicators (minimum of two	remarks) Yes
Water Marks (B1) Water Marks (B1) Dry-Season Water Table (C2) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Presence of Reduced Iron (C4) Indicators of wetland hydrology present? Water Table Depth (inches): Water Table Depth (inches): Dry-Season Water Table (C2) Crayfish Burrows (C8) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrology present? Yes Describe Recorded Data:	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none of the none of the site is problemated. The soil at the site is pro	e tic becaus	gy must be present, unless de Depthe e it has been drained. that apply) Water-Stained Leaves (h (inches):	Surfac	Very Shallow Dark Surface (TF Hydric soil present? ry Indicators (minimum of two ce Soil Cracks (B6)	required)
Sediment Deposits (B2)	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated by the state of the soil at the site is problemated. The soil at the site is problemated by the state of the soil at the site is problemated. The soil at the site is problemated by the state of the soil at the site is problemated. The soil at the site is problemated by the soil at the site is problemated. The soil at the site is problemated by the soil at the site is problemated. The soil at the site is problemated by the soil at the site is problemated. The soil at the site is problemated by the soil at the site is problemated. The soil at the site is problemated by the soil at the site is problemated.	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13)	h (inches):	Surface	ry Indicators (minimum of two age Patterns (B10)	required)
Drift Deposits (B3)	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated.	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15)	h (inches):	Surface Draine Moss	ry Indicators (minimum of two ace Soil Cracks (B6) age Patterns (B16) Trim Lines (B16)	required)
Algal Mat or Crust (B4)	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. Th	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor	(C1)	Surface Draine Moss Dry-S	ry Indicators (minimum of two accessoil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2)	required)
Algal Mat or Crust (B4)	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. Th	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor	(C1)	Surface Draina Moss Dry-S Crayfi	ry Indicators (minimum of two accessors (B10) Trim Lines (B16) Season Water Table (C2) Sish Burrows (C8)	remarks) Yes required) FAC-Neutral Test (D.
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Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Other (explain in remarks) Indicators of wetland hydrology present? Indicators of wetland hydrology present? Surface Water Depth (inches): Indicators of wetland hydrology present? Describe Recorded Data:	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemate. The soil at the	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced In	(C1) on Living Roots (C3) ron (C4)	Surface Drain. Moss Dry-S Crayfi Satura	ry Indicators (minimum of two of two of the Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) Gish Burrows (C8) ation Visible on Aerial Imagery (Called or Stressed Plants (D1)	remarks) Yes required) FAC-Neutral Test (D.
Sparsely Vegetated Concave Surface (B8) Indicators of wetland hydrology present? Ves urface water present? Surface Water Depth (inches): Describe Recorded Data: Ves urface water table present? Water Table Depth (inches): 3	indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemate. The soil at the	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced Ir	(C1) on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Drain. Moss Dry-S Crayfi Satura Stunte	ry Indicators (minimum of two accessors (B6)) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) aution Visible on Aerial Imagery (Ced or Stressed Plants (D1)	remarks) Yes required) FAC-Neutral Test (D.
urface water present? □ Surface Water Depth (inches): ater table present? □ Water Table Depth (inches): 3 □ Describe Recorded Data:	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. Th	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced Ir Recent Iron Reduction i Thin Muck Surface (C7)	(C1) on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Draina Moss Dry-S Crayfa Satura Stunta Geom	ry Indicators (minimum of two of two sold Presents) ry Indicators (minimum of two of two sold Pracks (B6)) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) Gish Burrows (C8) aution Visible on Aerial Imagery (Called or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	remarks) Yes required) FAC-Neutral Test (D.
ater table present? Water Table Depth (inches): 3	Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: none positive layer layer (if present): Type: none positive layer layer layer (if present): Type: none positive layer	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced Ir Recent Iron Reduction i Thin Muck Surface (C7)	(C1) on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Draina Moss Dry-S Crayfa Satura Stunta Geom	ry Indicators (minimum of two of two sold Presents) ry Indicators (minimum of two of two sold Pracks (B6)) age Patterns (B10) Trim Lines (B16) Geason Water Table (C2) Gish Burrows (C8) aution Visible on Aerial Imagery (Called or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	remarks) Yes required) FAC-Neutral Test (D.
	Indicators of hydrophytic vegetation and wetland strictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated.	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced Ir Recent Iron Reduction i Thin Muck Surface (C7) Other (explain in remark	(C1) on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Draina Moss Dry-S Crayfa Satura Stunta Geom	ry Indicators (minimum of two	remarks) Yes required) FAC-Neutral Test (D.
aturation present? (includes capillary fringe) Saturation Depth (inches): 0	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. Th	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced Ir Recent Iron Reduction i Thin Muck Surface (C7) Other (explain in remark	(C1) on Living Roots (C3) ron (C4) in Tilled Soils (C6)	Surface Draina Moss Dry-S Crayfa Satura Stunta Geom	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Ced or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) stopographic Relief (D4) Indicators of wetland hydro	remarks) Yes required) FAC-Neutral Test (D.
	Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: none poil Remarks: The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated. The soil at the site is problemated.	e tic becaus	that apply) Water-Stained Leaves (Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor Oxidized Rhizospheres Presence of Reduced Ir Recent Iron Reduction i Thin Muck Surface (C7) Other (explain in remark	(C1) on Living Roots (C3) ron (C4) in Tilled Soils (C6)) ks)	Surface Draina Moss Dry-S Crayfa Satura Stunta Geom	ry Indicators (minimum of two ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery (Ced or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) stopographic Relief (D4) Indicators of wetland hydro	remarks) Yes required) FAC-Neutral Test (D.

WETLAND DETERM Project/Site: Aitkin Site	IINATION DATA FORI	M - Northcentral and City/County: Aitkin State:	Northeast Region MN Sampling Date: 09/19/14
Investigator(s): KMS2 Land Form: Depression Subregion (LRR): K Cowardin Classification: PEM Are climatic/hydrologic conditions on the site typical for Are vegetation Yes Soil Yes Hydrol Are vegetation No Soil No Hydrol	Section: 6 Local Relief: None Latitude: 5159385 N Circular 39 Classification: Type 3 this time of year? No (If no, explainly yes significantly disturbed? Togy No naturally problematic?	Township: 47N Range Slope %: 0 Soil Map Unit Nam Longitude: 446131 E Datur. Mapped NWI C ain in remarks) Eggers & Reec circumstances" present? Lange Soil Map Unit Nam Mapped NWI C Eggers & Reec Eggers & Reec Eggers & Reec Eggers & Reec	e: 26W Sampling Point: 3W-3 ne: Cathro muck n: UTM, NAD 83, meters classification: ((primary): Shallow Marsh ((secondary): ((tertiary): ((quaternary):
Indicators of wetland hydrology present? Yes	General Remarks (explain any answers if needed): Wetter than norma Well 3 field, south GPS Point I.D. 432	ıl. ditch	mportant features, etc.
Tree Stratum (Plot Size: 30 ft) 1. 2. 3. 4.	Absolute Species?		5 12. 0 0

			<u>Absolute</u>	<u>Dominant</u>	<u>Indicator</u>	30/20 Tillesilolus.			20 /0	2
Tree Stratum	(Plot Size:	<u>30 ft</u>) <u>% Cover</u>	Species?	<u>Status</u>	Tree Stratum			0	
			0			Sapling/Shrub Stratum		_	0	_
						Herb Stratum		_	5	1
			0			Woody Vine Stratum		-	0	
			0			Dominance Test Worksl	noot:			
			0			<u> </u>				
		Total Cover:	<u>0</u>			Number of Dominant Sp That Are OBL, FACW or			3 <i>(A</i>	1)
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)			Total Number of Domina			_	
			0			Species Across All Stra			3 <i>(B</i>)
			0			Percent of Dominant Sp			_	
			0			That Are OBL, FACW or		100.00%	% (A	/B)
			0							
			0			Prevalence Index Works	heet:			
		Total Cover:	<u>0</u>			Total % Cover of	<u> </u>		Multiply	by:
Herb Stratum	(Plot Size:	<u>5 ft</u>	1			OBL Species	15	X 1		15
Phalaris arundinacea			10	Yes	FACW	FACW Species	10	X 2		20
Lemna minor			10	Yes	OBL	FAC Species	0	Х3		0
Typha latifolia			5	Yes	OBL	† 	0	X 4		0
Турнанашена			0			FACU Species	0	-		0
			0			UPL Species		X 5		
			0			Column Totals:	25	(A)		35
						Prevalenc	e Index =	B/A =		1.40
			0				•			
			0			Hydrophytic Vegetation I				
		Total Cover:	0			Hydrophytic Vegetation I	ndicators:	•'	on	
Woody Vino Stratum	(Plot Size:	Total Cover:				Hydrophytic Vegetation I	ndicators: r Hydroph	ytic Vegetatio	on	
Woody Vine Stratum	(Plot Size:		0 25			Hydrophytic Vegetation I Yes Rapid Test fo	ndicators: r Hydroph est is >50%	ytic Vegetatio %	วท	
Woody Vine Stratum	(Plot Size:		0 25)			Hydrophytic Vegetation	ndicators: r Hydroph est is >509 dex ≤ 3.0 Il Adaptati	ytic Vegetatio % [1] ions [1] (prov	vide sup	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>	0 25) 0 0			Yes Rapid Test for Yes Dominance T Yes Prevalence In No Morphologica in vegetation	ndicators: r Hydroph est is >509 dex ≤ 3.0 Il Adaptati remarks c	ytic Vegetation [1] ions [1] (prover on a separa	vide sup ate shee	et)
Woody Vine Stratum	(Plot Size:		0 25)			Hydrophytic Vegetation	ndicators: r Hydroph est is >509 dex ≤ 3.0 Il Adaptati remarks c	ytic Vegetation [1] ions [1] (prover on a separa	vide sup ate shee	et)
Woody Vine Stratum Bare Ground in Herb Stra		<u>30 ft</u>	0 25) 0 0	ı Moss Cover	:	Yes Rapid Test for Yes Dominance T Yes Prevalence In No Morphologica in vegetation	ndicators: r Hydroph est is >50°; dex ≤ 3.0 rl Adaptati remarks o	ytic Vegetation [1] ions [1] (prover on a separation	vide sup ate shee [1] (Exp	et) plain)

SOIL Sampling Point: 3<u>W-3</u>

(inches) Color (moist)	% Color (moist)	% Type [1]	Loc [2]	Texture	Remarks
0 - 7 10YR 2/1	100			mucky silt loam	no redox
7 - 14 10YR 4/6	70 10Y 4/2	20		fine sandy loam	
. <u> </u>	5GY 5/1	10			
14 - 24 <u>5GY 4/1</u>	60 10GY 4/1			strata silt loam and loamy	
24 - 34 2.5Y 3/1	98 N2.5/black 2.5Y 4/1			mucky silt loam	
Type: C=Concentration, D=Depletion, RM=I			Location: I	PL=Pore Lining, M=Matrix.	
ydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)		Ind	icators for Problematic Hydri	c Soils [3]:
Histosol (A1)	Stripped Matrix (S6)		✓	2 cm Muck (A10) (LRR K, L, I	MLRA 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R	R. MLRA 149B)		Coast Prairie Redox (A16) (Li	
Black Histic (A3)	Polyvalue Below Surface	•	3)	5 cm Mucky Peat or Peat (S3	,
] Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (L		, _	Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	✓ Loamy Mucky Mineral (F1)			Polyvalue Below Surface (S8)	
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)			Thin Dark Surface (S9) (LRR	
Thick Dark Surface (A12)	Depleted Matrix (F3)			Iron-Manganese Masses (F12	·
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)			Piedmont Floodplain Soils (F.	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F.	7)		Mesic Spodic (TA6) (MLRA 1	
Sandy Redox (S5)	Redox Depressions (F8)	//			
				Red Parent Material (F21)	Other (explain in soil remarks)
Indicators of hydrophytic vegetation and wetlan	nd hydrology must be present, unless	disturbed or problematic.		Very Shallow Dark Surface (1	TF12) Temarks)
estrictive Layer (if present): Type:	Dep	oth (inches):		Hydric soil present?	<u>Yes</u>
oil Remarks:			-		
YDROLOGY					
YDROLOGY Vetland Hydrology Indicators:	check all that apply)		Seconda	ry Indicators (minimum of two	o required)
/DROLOGY /etland Hydrology Indicators:	check all that apply)	s (B9)		ry Indicators (minimum of two ce Soil Cracks (B6)	o required) FAC-Neutral Test (D5)
/DROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; of the control of the cont		s (B9)	Surfa	· · ·	
POROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; of the control of the cont	☐ Water-Stained Leaves	s (B9)	Surfa	ce Soil Cracks (B6)	
VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) Very High Water Table (A2) Very Saturation (A3)	☐ Water-Stained Leaves ☐ Aquatic Fauna (B13)	,	Surfa Drain Moss	ce Soil Cracks (B6) age Patterns (B10)	
YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of the state of the stat	 Water-Stained Leaves □ Aquatic Fauna (B13) □ Marl Deposits (B15) □ Hydrogen Sulfide Odd 	,	Surfa Drain Moss Dry-S	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16)	
VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) Pligh Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	 Water-Stained Leaves □ Aquatic Fauna (B13) □ Marl Deposits (B15) □ Hydrogen Sulfide Odd 	or (C1)	Surfa Drain Moss Dry-S Crayi	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2)	FAC-Neutral Test (D5
YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	 Water-Stained Leaves □ Aquatic Fauna (B13) □ Marl Deposits (B15) □ Hydrogen Sulfide Odd 	or (C1) es on Living Roots (C3)	Surfa	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8)	FAC-Neutral Test (D5
Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	 Water-Stained Leaves □ Aquatic Fauna (B13) □ Marl Deposits (B15) □ Hydrogen Sulfide Odd □ Oxidized Rhizosphere 	or (C1) es on Living Roots (C3) Uron (C4)	Surfa Drain Moss Dry-5 Crayl Saturi	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery	FAC-Neutral Test (D5
YDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	 Water-Stained Leaves □ Aquatic Fauna (B13) □ Marl Deposits (B15) □ Hydrogen Sulfide Odd □ Oxidized Rhizosphere □ Presence of Reduced 	or (C1) es on Living Roots (C3) I Iron (C4) In in Tilled Soils (C6)	Surfa	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1)	FAC-Neutral Test (D5
POROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; of a surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odd Oxidized Rhizosphere Presence of Reduced Recent Iron Reduction	or (C1) es on Living Roots (C3) I Iron (C4) n in Tilled Soils (C6)	Surfa Drain Moss Dry-5 Crayl Satur Stunt Geor	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) iish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2)	FAC-Neutral Test (D5
Tetland Hydrology Indicators: rimary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odd Oxidized Rhizosphere Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	or (C1) es on Living Roots (C3) I Iron (C4) n in Tilled Soils (C6)	Surfa Drain Moss Dry-5 Crayl Satur Stunt Geor	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) ish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3)	FAC-Neutral Test (DE
Vetland Hydrology Indicators: rimary Indicators (minimum of one required; of surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odd Oxidized Rhizosphere Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	or (C1) es on Living Roots (C3) I Iron (C4) In in Tilled Soils (C6) E7)	Surfa Drain Moss Dry-5 Crayl Satur Stunt Geor	ce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4)	FAC-Neutral Test (DE
High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7)	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odd Oxidized Rhizosphere Presence of Reduced Recent Iron Reduction Thin Muck Surface (C	or (C1) es on Living Roots (C3) I Iron (C4) n in Tilled Soils (C6) erry arks) inches):	Surfa Drain Moss Dry-5 Crayl Satur Stunt Geor	cce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hyd	FAC-Neutral Test (DE
Velland Hydrology Indicators: rimary Indicators (minimum of one required; of a surface Water (A1) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) ield Observations: urface water present?	Water-Stained Leaves Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odd Oxidized Rhizosphere Presence of Reduced Recent Iron Reduction Thin Muck Surface (C Other (explain in rema	or (C1) es on Living Roots (C3) I Iron (C4) en in Tilled Soils (C6) earks) inches): ches): 3	Surfa Drain Moss Dry-5 Crayl Satur Stunt Geor	cce Soil Cracks (B6) age Patterns (B10) Trim Lines (B16) Season Water Table (C2) sish Burrows (C8) ation Visible on Aerial Imagery ed or Stressed Plants (D1) norphic Position (D2) ow Aquitard (D3) topographic Relief (D4) Indicators of wetland hyd	FAC-Neutral Test (D5

Project/Site:	Aitkin Site				Applicant/Ou	wner: PolyM	<u>et</u>	City/County:	<u>Aitkin</u>	Sta	ate:	MN	Sampling Date:	09/18/14
Investigator(s): <u>K</u> Land Form: Subregion (LRR):	(MS2 Shoulder				Section: Local Relief. Latitude:	<u>6</u> None 5159595 N		Township: Slope %: Longitude:	0 3	Soil Map Unit N	lame:			<u>4U-1</u>
Sabregion (ERR). Cowardin Classific Are climatic/hydrol	cation:	I <u>pland</u> ons on			Circular 39 (Classification:	<u>Upland</u>	Longnade. ain in remarks		Mapped NW Eggers & Re	/I Clas	ssification	AD 83, meters : Upland	
Are vegetation	<u>Yes</u>	Soil	<u>Yes</u>	Hydrology Hydrology	<u>Yes</u>	<u></u> significantly di aturally proble	sturbed?	Are "normal circumstanc present?	Yes Yes	55	eed (s eed (t	secondary ertiary):	·):	
UMMARY O				3 03		31		oint loc	ations,	00		,	•	, etc.

S

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes Yes No	General Remarks (explain any answers if needed):	Wetter than normal. Well 11 field, south ditch GPS Point I.D. 429
Is the sampled area within a wetland?	No	If yes, optional Wetlan	nd Site ID: (Wetland 4)

Tues Ofmotores	(DI-4 Ci 20) <i>a</i>	Absolute % Cover	Dominant Species?	<u>Indicator</u> Status	50/20 Thresholds: Tree Stratum			20% 0	50%
Tree Stratum	(Plot Size: 30	<u>''11</u>)	70 0010.	<u> </u>	<u> </u>	Sapling/Shrub Stra	ntum	_	0 –	0
			0			Herb Stratum	ituiii	=	18	45
			0			Woody Vine Stratu	m	_	0 -	0
			0			Dominance Test W		_	<u> </u>	
		T: (:10: ::	0							
Sapling/Shrub Stratum	(Plot Size: 15	Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC	ont Species SW or FAC:	1	(A)	
Sapiniy/Sinub Stratum	(FIOT 312e. <u>13</u>	<u>, in</u>				Total Number of D	ominant		- (5)	
			0			Species Across Al	l Strata:	1	(B) -	
			0			Percent of Domina		100.00%	(A/B)	
			0			That Are OBL, FAC	CW or FAC:	100.0076	- (A/D)	
			0			Prevalence Index V	Vorksheet:			
		Total Cover:	<u>0</u>			Total % Co	ver of:	М	ultiply by:	
Herb Stratum	(Plot Size: 5)	<u>ft</u>)	_			OBL Species	0	X 1	()
Phalaris arundinacea		,	70	Yes	FACW	FACW Species	80	X 2	160)
Agrostis gigantea			10	No	FACW	FAC Species	5	X 3	15	5
Hordeum jubatum			5	No	FAC	FACU Species	0	X 4	()
Asclepias syriaca			5	No	UPL	7II '	5	X 5	25	5
			0			UPL Species	90	(A)	200	-
			0			Column Totals:	valence Index =	` ′	2.22	-
			0						2.22	-
			0			Hydrophytic Vegeta				
		Total Cover:	<u>90</u>				est for Hydroph		1	
Woody Vine Stratum	(Plot Size: 30	<u>) ft</u>					nce Test is >509			
			0				nce Index ≤ 3.0 logical Adaptati		do supportir	na 1
			0			in veget	ation remarks o	r on a separat	e sheet)	y c
		Total Cover:	<u>0</u>			No Problem	natic Hydrophyt	ic Vegetation [1] (Explain)	
Bare Ground in Herb Stratt	ım:	!	% Sphagnum	Moss Cover	: <u> </u>	[1] Indicators of hydric disturbed or problema		/drology must b	e present, uni	less
getation Remarks: (include	photo numbers he	re or on a separate s	sheet)			Hydrophytic vegetal	tion present?	<u>Yes</u>		

SOIL Sampling Point: 4U-1

Profile Description	on: (Describe to the depth r	needed to do	cument the indicator or c	onfirm the	abscence o	f indicators).		
Depth	Matrix			lox Featu		1 101	T . ()	Donald o
(inches)	Color (moist)	- % -	Color (moist)	% - ——	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 14	10YR 2/1 10YR 2/1	100					mucky silt loam loam	no redox
2. 14 - 22	101R 5/3		10YR 5/6				loamy sand	
3. <u></u>			10YR 5/2	2			,	-
5. 27 - 42	2.5Y 5/2	70	10YR 4/6	20			very fine sandy loam	
6			2.5Y 6/2	2	-			
[1] Type: C=Cond	centration, D=Depletion, RN	/I=Reduced I	Matrix, CS=Covered or Co.	ated Sand	Grains [2] Location: P	PL=Pore Lining, M=Matrix.	
Hydric Soil Indica	ators: (applicable to all LRF	Rs, unless ot	therwise noted)			Indi	icators for Problematic Hydric So	oils [3]:
Histosol (A1)			Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR	PA 149B)
☐ Histic Epipedo	on (A2)		Dark Surface (S7) (LRR R,	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR)	K, L, R)
Black Histic (A	13)		Polyvalue Below Surface (S	S8) (LRR I	R, MLRA 1491	B)	5 cm Mucky Peat or Peat (S3) (Li	RR K, L, R)
☐ Hydrogen Sulf	fide (A4)		Thin Dark Surface (S9) (LF	RR R, MLR	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Laye	ers (A5)	✓	Loamy Mucky Mineral (F1)	(LRR K, L)		Polyvalue Below Surface (S8) (LF	RR K, L)
Depleted Belo	w Dark Surface (A11)		Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)
Thick Dark Su	rface (A12)		Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L	RR K, L, R)
Sandy Mucky	Mineral (S1)		Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19)	(MLRA 149B)
Sandy Gleyed	Matrix (S4)		Depleted Dark Surface (F7)	")			Mesic Spodic (TA6) (MLRA 144A	, 145, 149B)
Sandy Redox	(S5)		Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
-	· vdrophytic vegetation and wet	Land hydrolog		dicturbed a	or problematic	. \Box	Very Shallow Dark Surface (TF12	"" " " " " " " " " " " " " " " " " " "
Restrictive Layer			•	th (inches	-	<u> </u>	Hydric soil present?	
Restrictive Layer	(if present): Type: no	ле	Бері	n (inches)·		rryunc son present:	<u>Yes</u>
Soil Remarks:	The soil at the site is problem	natic because	e it has been drained.					
LIVEROL OC	N/							
HYDROLOG Wetland Hydrolog								
, i	gy maicators. rs (minimum of one required	d: check all t	that apply)			Secondar	ry Indicators (minimum of two re	auired)
	<u> </u>	.,	Water-Stained Leaves	(R9)			ce Soil Cracks (B6)	FAC-Neutral Test (D5)
Surface Water	• /		Aquatic Fauna (B13)	(0))		_	age Patterns (B10)	The Wedital Test (Do)
High Water Ta						_	Trim Lines (B16)	
Saturation (A3)	•		Marl Deposits (B15)	r (C1)			• •	
Water Marks (,		Hydrogen Sulfide Odol Ovidinad Bhizaanhara		Deate (C2)		eason Water Table (C2)	
Sediment Dep	osits (B2)		Oxidized Rhizospheres	s on Living	KUUIS (C3)		ish Burrows (C8)	
Drift Deposits	(B3)		Presence of Reduced	Iron (CA)			ation Visible on Aerial Imagery (C9,	(
Algal Mat or C	rust (B4)		Recent Iron Reduction		inils (CA)		ed or Stressed Plants (D1)	
☐ Iron Deposits	<i>(B5)</i>				olis (CO)		norphic Position (D2)	
☐ Inundation Vis	sible on Aerial Imagery (B7)		Thin Muck Surface (C)			Shallo	ow Aquitard (D3)	
Sparsely Vege	etated Concave Surface (B8)		Other (explain in remai	(KS)		Microt	topographic Relief (D4)	
Field Observation	ns:						Indicators of wetland hydrolo	gy present? <u>No</u>
Surface water pre	esent?		Surface Water Depth (in	nches):			Describe Recorded Data:	
Water table prese	ent?		Water Table Depth (incl	hes):				
Saturation presen	nt? (includes capillary fring	e)	Saturation Depth (inche	es):				
Recorded Data:	Aerial Photo	Monitoring	g Well Stream Gaug	ne 🗆 F	Previous Insp	ections	•	
					. ov.ouo mop			
Hydrology Remai	rks:		,		1011040 1110			

Project/Site:	Aitkin Site				Applicant/O	wner: PolyMet		City/County:	<u>Aitkin</u>	State: MN	Sampling Date:	09/19/14
Investigator(s): <u>k</u> Land Form: Subregion (LRR): Cowardin Classific		<u>Jpland</u>			Section: Local Relien Latitude: Circular 39	6 f: Convex 5159695 N Classification:	<u>Upland</u>	Township: Slope %: Longitude:	<u>0</u>	,	Sampling Point: nro muck NAD 83, meters ion:	<u>4U-2</u>
Are climatic/hydrol	logic conditi	ions or	the site typi	ical for this	time of year	? <u>No</u>	V / /	in in remarks	•	Eggers & Reed (primary,		
Are vegetation	<u>Yes</u>	Soil	<u>Yes</u>	Hydrology	<u>Yes</u>	significantly distu	urbed?	Are "normal circumstance		Eggers & Reed (seconda Eggers & Reed (tertiary)	3,	
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> r	naturally problem	natic?	present?		Eggers & Reed (quatern	pary):	
SUMMARY C	F FIND	ING	S - Atta	ch site	map sh	owing san	npling p	oint loc	ations	, transects, impor	tant features	, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes No No	General Remarks (explain any answers if needed):	Wetter than normal. Well 10 field, west ditch GPS Point I.D. 433
Is the sampled area within a wetland?	No	If yes, optional Wetlar	nd Site ID: (Wetland 4)

			Absolute	<u>Dominant</u>	Indicator	50/20 Thresholds:		,	<u>20%</u>	<u>50%</u>
Tree Stratum	(Plot Size: 30 f	<u>†</u>)	% Cover	Species?	<u>Status</u>	Tree Stratum		_	0	0
			0			Sapling/Shrub Strat	tum	_	0	0
			0			Herb Stratum Woody Vine Stratui	-	_	19 0	47.
			0						<u> </u>	U
			0			Dominance Test We	orksheet:			
0 11 101 1 01 1	(0) (0) (5)	Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC	nt Species W or FAC:	1	(A)	
Sapling/Shrub Stratum	(Plot Size: <u>15 f</u>	<u>t</u>)				Total Number of Do	minant		-	
			0			Species Across All		1	(B)	
			0			Percent of Dominar		100.00%	(A/B)	
			0			That Are OBL, FAC	W or FAC:	100.00%	- (A/B)	
			0			Prevalence Index W	orksheet:			
		Total Cover:	<u>0</u>			Total % Cov	er of:	M	ıltiply by:	
Herb Stratum	(Plot Size: 5 ft)	_			OBL Species	0	X 1		0
Phalaris arundinacea			95	Yes	FACW	FACW Species	95	X 2	19	0
			0			FAC Species	0	Х 3		0
			0			FACU Species	0	X 4		0
			0			UPL Species	0	X 5		0
			0			Column Totals:	95	(A)	19	0
			0			-	alence Index =	_	2.0	_
			0			Hydrophytic Vegetat				_
		Total Cover:	0			J	st for Hydroph			
	(Dist 0: 201		<u>95</u>				ice Test is >50%		'	
Woody Vine Stratum	(Plot Size: 30 f	<u>!</u>					ce Index ≤ 3.0			
			0			No Morphol	ogical Adaptati	ons [1] (provi	de support	ng c
		Total Cover:	0			- II	ntion remarks o	•		
			<u>0</u>	Mana Causa		[1] Indicators of hydric	atic Hydrophyti soil & wetland hy			
Para Cround in Harb Stra	Second .		w.snnanniin	Moss Cover		disturbed or problemat	IC.			
Bare Ground in Herb Stra getation Remarks: (incluc						Hydrophytic vegetati		Yes		

SOIL Sampling Point: 4U-2

Depth Matrix	eeded to document the indicator or cor Redo	x Featur		indicators).		
(inches) Color (moist)	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1 0 - 24 10YR 2/1	50				fine sandy loam	stratified
2 10YR 4/2	50				loamy fine sand	stratified
3. 24 - 42 10YR 2/1	100				mucky loam	
4. <u>42 - 48</u> <u>2.5Y 4/1</u>	70 2.5Y 5/2	15			fine sandy loam	
5 -	10YR 4.6	15				
6	=Reduced Matrix. CS=Covered or Coat	ed Sand	Grains [2]	Location: F	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRR	·				icators for Problematic Hydric So.	ils [3]:
Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR)	
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, I	ΛΙ DΛ 1ΛΟ	OR)		Coast Prairie Redox (A16) (LRR K	
				, –		•
☐ Black Histic (A3)	Polyvalue Below Surface (S&		·	'	5 cm Mucky Peat or Peat (S3) (LR	K K, L, K)
Hydrogen Sulfide (A4) 	☐ Thin Dark Surface (S9) (LRF		•		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (L	LRR K, L))		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	
_					Very Shallow Dark Surface (TF12)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetla						•
Restrictive Layer (if present): Type:	Depth	(inches):		Hydric soil present?	<u>No</u>
YDROLOGY Wetland Hydrology Indicators:				•		
Primary Indicators (minimum of one required					ry Indicators (minimum of two req	
Surface Water (A1)	Water-Stained Leaves (L	<i>B9)</i>			ce Soil Cracks (B6)	FAC-Neutral Test (D.
☐ High Water Table (A2)	Aquatic Fauna (B13)			Draina	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)			Moss	Trim Lines (B16)	
Water Marks (B1)	Hydrogen Sulfide Odor ((C1)		Dry-S	eason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres of	on Living	Roots (C3)	Crayfi	ish Burrows (C8)	
<u> </u>	,	J	* *		ation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iro	on (C4)			ed or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in		oils (C6)	_		
Iron Deposits (B5)	Thin Muck Surface (C7)		• 7	_	norphic Position (D2)	
	Thiir Mack Sariace 1077				ow Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)		· a l		A Ainma	topographic Dollof (DA)	
Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Other (explain in remark	s)		IVIICTO	topographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8) Field Observations:		rs)		IVIICTO	Indicators of wetland hydrolog	gy present? <u>No</u>
Sparsely Vegetated Concave Surface (B8) Field Observations:				IVIICTO		gy present? <u>No</u>
<u> </u>	Other (explain in remark	ches):		Micro.	Indicators of wetland hydrolog	gy present? <u>No</u>
Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Other (explain in remark Surface Water Depth (inches	ches):		Micro.	Indicators of wetland hydrolog	gy present? <u>No</u>
Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe	Other (explain in remark Surface Water Depth (inches	:hes): es): s):	revious Inspe		Indicators of wetland hydrolog	gy present? <u>No</u>
Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? Saturation present? (includes capillary fringe	Other (explain in remark Surface Water Depth (inchese) Saturation Depth (inchese)	:hes): es): s):	Previous Inspe		Indicators of wetland hydrolog	gy present? <u>No</u>

WETLAND DET	ERMINATION DATA FOR	M - Northcentral and Northea	st Region
Project/Site: Aitkin Site	Applicant/Owner: PolyMet	City/County: Aitkin State: MN Sample	ling Date: 09/18/14
Investigator(s): KMS2 Land Form: Depression Subregion (LRR): K Cowardin Classification: PEM	Section: 6 Local Relief: None Latitude: 5159590 N Circular 39 Classification: Type 3	Slope %: Q Soil Map Unit Name: Cathro muck Longitude: 448018 E Datum: UTM, NAD 83, Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site Are vegetation Yes Soil Yes Are vegetation No Soil No SUMMARY OF FINDINGS - At	Hydrology Yes significantly disturbed? Hydrology No naturally problematic?	lain in remarks) Are "normal Yes Eggers & Reed (primary): circumstances" present? Eggers & Reed (secondary): Eggers & Reed (tertiary): Eggers & Reed (quaternary): Foint locations, transects, important fe	eatures, etc.
Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present? Is the sampled area within a wetland?	Yes General Remarks Wetter than norm Yes (explain any answers if needed): Well 11 field, soul GPS Point I.D. 43 Yes If yes, optional Wetland Site ID: We	th ditch	
VEGETATION			
<u>Tree Stratum</u> (Plot Siz	re: 30 ft) Absolute Dominar Species:	? Status Tree Stratum	20% 50% 0 0
1. 2.	0 0	Sapling/Shrub Stratum Herb Stratum Woody Vine Stratum	$ \begin{array}{c c} 0 & 0 \\ \hline 19 & 47.9 \\ \hline 0 & 0 \end{array} $
3. 4.	0 0 0 1 1 1 1 1 1 1	Dominance Test Worksheet: Number of Dominant Species	2 (A)

	Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum		_	0	<u>50%</u> 0
1.					0			Sapling/Shrub Stra	atum	=	0	0
2.					0			Herb Stratum		-	19	47.5
3.					0			Woody Vine Stratu	ım	_	0	0
4.					0			<u>Dominance Test W</u>	/orksheet:			
				otal Cover:	0			Number of Domina That Are OBL, FAC			2 <i>(A)</i>	
	Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)				Total Number of D			_	
					0			Species Across Al			2 <i>(B)</i>	
					0			Percent of Domina	nt Species			
					0			That Are OBL, FAC	CW or FAC:	100.00%	∕₀ (A/B) —	
					0			Prevalence Index V	Vorksheet:			
			т.	otal Cover:				Total % Co		Λ	lultiply by:	
		(DI=4 0:===		otal Cover.	<u>0</u>				95	X 1	iuitipiy by.	95
	Herb Stratum	(Plot Size:	<u>5 II</u>)		1 1		OBL Species	0	X 2		0
	Typha latifolia				70	Yes	OBL	FACW Species	U	^ _		U
	71							4 []				_
	Lemna minor				20	Yes	OBL	FAC Species	0	X 3		0
					20	Yes No	OBL OBL	FAC Species FACU Species	0	X 3 X 4		0
	Lemna minor				20 5 0			₹		-		
	Lemna minor				20 5 0			FACU Species	0	X 4		0
	Lemna minor				20 5 0 0			FACU Species UPL Species Column Totals:	0	X 4 X 5 (A)		0
	Lemna minor				20 5 0 0 0			FACU Species UPL Species Column Totals:	0 0 95 valence Index =	X 4 X 5 (A) B/A =		0 0 95 (
	Lemna minor		7.	otal Cover:	20 5 0 0 0 0			FACU Species UPL Species Column Totals: Prev Hydrophytic Vegeta	0 0 95 valence Index =	X 4 X 5 (A) B/A =	1.	0 0 95 (I
	Lemna minor Carex comosa	(Plot Size:		otal Cover:	20 5 0 0 0			FACU Species UPL Species Column Totals: Prev Hydrophytic Vegeta Yes Rapid T	0 0 95 valence Index =	X 4 X 5 (A) B/A =	1.	0 0 95 (I
	Lemna minor	(Plot Size:		otal Cover:	20 5 0 0 0 0 0 0			FACU Species UPL Species Column Totals: Prev Hydrophytic Vegeta Yes Rapid T Yes Domina	0 0 95 valence Index =	X 4 X 5 (A) B/A = ytic Vegetation	1.	0 0 95 (F
	Lemna minor Carex comosa	(Plot Size:		otal Cover:	20 5 0 0 0 0 0 0 95			FACU Species UPL Species Column Totals: Prev Hydrophytic Vegeta Yes Rapid T Yes Domina Yes Prevalet No Morpho	0 0 95 valence Index = ation Indicators: est for Hydroph nce Test is >509 nce Index ≤ 3.0 logical Adaptati	X 4 X 5 (A) B/A = ytic Vegetation [1] cons [1] (prov	n on ride suppo	0 0 95 .00
	Lemna minor Carex comosa	(Plot Size:	<u>30 ft</u>)	20 5 0 0 0 0 0 95			FACU Species UPL Species Column Totals: Prev Hydrophytic Vegete Yes Rapid T Yes Domina Yes Prevale No Morpho in veget	0 95 valence Index = ation Indicators: est for Hydroph nce Test is >50% nce Index ≤ 3.0 logical Adaptati ation remarks o	X 4 X 5 (A) B/A = ytic Vegetation [1] ons [1] (prover on a separa	on ride suppo te sheet)	0 0 95 .00
	Lemna minor Carex comosa	(Plot Size:	<u>30 ft</u>	otal Cover:	20 5 0 0 0 0 0 0 95			FACU Species UPL Species Column Totals: Prev Hydrophytic Vegeta Yes Rapid T Yes Domina Yes Prevalet No Morpho in veget No Problem	0 95 valence Index = ation Indicators: est for Hydroph nce Test is >50 nce Index ≤ 3.0 logical Adaptati ation remarks o natic Hydrophyt	X 4 X 5 (A) B/A = ytic Vegetation [1] (prover on a separatic vegetation)	n ride suppo te sheet) [1] (Explai	0 0 95 .00
	Lemna minor Carex comosa		<u>30 ft</u>	otal Cover:	20 5 0 0 0 0 0 95		OBL	FACU Species UPL Species Column Totals: Prev Hydrophytic Vegete Yes Rapid T Yes Domina Yes Prevale No Morpho in veget	0 95 valence Index = ation Indicators: est for Hydroph nce Test is >50% nce Index ≤ 3.0 logical Adaptati tation remarks o natic Hydrophytic	X 4 X 5 (A) B/A = ytic Vegetation [1] (prover on a separatic vegetation)	n ride suppo te sheet) [1] (Explai	0 0 95 .00

SOIL Sampling Point: 4W-1

Depth	SGY 4/2 30	Texture Remark mucky loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand PL=Pore Lining, M=Matrix. Indicators for Problematic Hydric Soils [3]: ✓ 2 cm Muck (A10) (LRR K, L, MLRA 149B) ☐ Coast Prairie Redox (A16) (LRR K, L, R) ☐ 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)	ks
2. 4-18 5Y 5/1 50 3 4. 18-32 10Y 4/1 95 5 6 [1] Type: C=Concentration, D=Depletion, RM=Reduce Hydric Soil Indicators: (applicable to all LRRs, unless Histosol (A1) [Histic Epipedon (A2) Black Histic (A3) Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	s otherwise noted) Dark Surface (S7) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand loamy very fine sand	
3	and Matrix, CS=Covered or Coated Sand Grains so otherwise noted) Dark Surface (S7) (LRR R, MLRA 149B) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	loamy very fine sand Coast Prairie Redox (A16) (LRR K, L, R)	
5	and Matrix, CS=Covered or Coated Sand Grains s otherwise noted) Stripped Matrix (S6) Dark Surface (S7) (LRR R, MLRA 149B) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	Indicators for Problematic Hydric Soils [3]: ✓ 2 cm Muck (A10) (LRR K, L, MLRA 149B) Coast Prairie Redox (A16) (LRR K, L, R)	
5	ed Matrix, CS=Covered or Coated Sand Grains [Southerwise noted] Stripped Matrix (S6) Dark Surface (S7) (LRR R, MLRA 149B) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	Indicators for Problematic Hydric Soils [3]: ✓ 2 cm Muck (A10) (LRR K, L, MLRA 149B) Coast Prairie Redox (A16) (LRR K, L, R)	
Hydric Soil Indicators: (applicable to all LRRs, unless Histosol (A1) Histic Epipedon (A2) Black Histic (A3) Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	s otherwise noted) Stripped Matrix (S6) Dark Surface (S7) (LRR R, MLRA 149B) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	Indicators for Problematic Hydric Soils [3]: ✓ 2 cm Muck (A10) (LRR K, L, MLRA 149B) ☐ Coast Prairie Redox (A16) (LRR K, L, R)	
Hydric Soil Indicators: (applicable to all LRRs, unless Histosol (A1) Histic Epipedon (A2) Black Histic (A3) Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	s otherwise noted) Stripped Matrix (S6) Dark Surface (S7) (LRR R, MLRA 149B) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	Indicators for Problematic Hydric Soils [3]: ✓ 2 cm Muck (A10) (LRR K, L, MLRA 149B) ☐ Coast Prairie Redox (A16) (LRR K, L, R)	
Histosol (A1) Histic Epipedon (A2) Black Histic (A3) Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	Stripped Matrix (S6) Dark Surface (S7) (LRR R, MLRA 149B) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	✓ 2 cm Muck (A10) (LRR K, L, MLRA 149B) Coast Prairie Redox (A16) (LRR K, L, R)	
Histic Epipedon (A2) Black Histic (A3) Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	Dark Surface (S7) (LRR R, MLRA 149B) Polyvalue Below Surface (S8) (LRR R, MLRA 149B) Thin Dark Surface (S9) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR K, L, R)	
Black Histic (A3) Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	Polyvalue Below Surface (S8) (LRR R, MLRA 149) Thin Dark Surface (S9) (LRR R, MLRA 149B)		
Black Histic (A3) Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	Polyvalue Below Surface (S8) (LRR R, MLRA 149) Thin Dark Surface (S9) (LRR R, MLRA 149B)		
Hydrogen Sulfide (A4) Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	Thin Dark Surface (S9) (LRR R, MLRA 149B)		
Stratified Layers (A5) Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	<u> </u>	✓ Dark Surface (S7) (LRR K, L)	
Depleted Below Dark Surface (A11) Thick Dark Surface (A12)	LOGITTY IVIGORY IVIIITOTAL (L. L.) (LIVIN IX, L.)	Polyvalue Below Surface (S8) (LRR K, L)	
Thick Dark Surface (A12)			
	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L)	
✓ Sandy Mucky Mineral (ST) 1	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (LRR K, L, R)	
	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA 149B)	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A, 145, 149B)	
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21) Other (expla	ain in soil
[3] Indicators of hydrophytic vegetation and wetland hydro	ology must be present, unless disturbed or problemation	. Very Shallow Dark Surface (TF12) remarks)	
Restrictive Layer (if present): Type:	Depth (inches):	Hydric soil present? Yes	
Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required; check a	all that apply)	Secondary Indicators (minimum of two required)	
✓ Surface Water (A1)	Water-Stained Leaves (B9)	Surface Soil Cracks (B6) FAC-Neutra	al Test (D.
✓ High Water Table (A2)	✓ Aquatic Fauna (B13)	Drainage Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)	Moss Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)	Dry-Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)	Crayfish Burrows (C8)	
Drift Deposits (B3)	_	Saturation Visible on Aerial Imagery (C9)	
	Presence of Reduced Iron (C4)	Stunted or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)	Geomorphic Position (D2)	
Iron Deposits (B5)	Thin Muck Surface (C7)	Shallow Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)	Microtopographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)		inici otopograpnic Kener (D4)	
Field Observations:		Indicators of wetland hydrology present?	<u>Yes</u>
	Surface Water Depth (inches): 2	Describe Recorded Data:	
Water table present?	Water Table Depth (inches): 0		
Out of the contract of the table of the contract of the contra	Saturation Depth (inches): 0		
Saturation present? (includes capillary fringe)	wing Well Carren Course Dravious Inc.		
Saturation present? (includes capillary fringe) Recorded Data: Aerial Photo Monito	ring Well 🔃 Stream Gauge 🔲 Previous Insp	pections	

							oonaan ama moranoade mogram
Project/Site:	Aitkin Site		A	Applicant/Own	er: PolyMet	City/County: Aitki	n State: MN Sampling Date: 09/19/14
Investigator(s): k	KMS2 Toeslope			Section: Local Relief:	<u>6</u> Concave	Township: 47N Slope %: 0	Range: <u>26W</u> Sampling Point: <u>4W-2</u> Soil Map Unit Name: <u>Cathro muck</u>
Subregion (LRR):	<u>K</u>			Latitude:	<u>5159695 N</u>	Longitude: 44738	<u>B9 E</u> Datum: <u>UTM, NAD 83, meters</u>
Cowardin Classific	cation: PEM		(Circular 39 Cla	essification: Type 3		Mapped NWI Classification:
Are climatic/hydroi	logic conditions d	on the site typica	l for this ti	ime of year?	No (If no, expla	ain in remarks)	Eggers & Reed (primary): Shallow Marsh
Are vegetation	<u>Yes</u> Soil	<u>Yes</u> Hy	vdrology	<u>Yes</u> sign	nificantly disturbed?	circumstances"	Yes Eggers & Reed (secondary): Eggers & Reed (tertiary):
Are vegetation	No Soil	<u>No</u> Hy	drology	No natu	ırally problematic?	present?	Eggers & Reed (quaternary):
SUMMARY C	F FINDING	SS - Attach	ı site ı	map shov	ving sampling µ	ooint location	ns, transects, important features, etc.
Hydrophytic veget	•	<u>Ye</u> Ye		eral Remarks lain any answe	Wetter than norma Wers Well 10 field, west		

Hydrophytic vegetation present? Hydric soil present?	Yes Yes	General Remarks (explain any answers if needed):	Wetter than normal. Well 10 field, west ditch GPS Point I.D. 434
Indicators of wetland hydrology present? Is the sampled area within a wetland?	<u>Yes</u> <u>Yes</u>	If yes, optional Wetlar	nd Site ID: Wetland 4

			Absolute % Cover	Dominant Species?	<u>Indicator</u> Status	50/20 Thresholds:		20%	50%
Tree Stratum	(Plot Size: 30	<u>) </u>	70 COVE	opecies:	Status	Tree Stratum	-	0 -	0
			0			Sapling/Shrub Stratum Herb Stratum	=	28	70
			0			Woody Vine Stratum	-	0	0
			0			 	=		
			0			<u>Dominance Test Worksheet:</u>			
0 11 101 1 01 1	(0) (0)	Total Cover:	<u>0</u>			Number of Dominant Species That Are OBL, FACW or FAC:		3 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size: 15	<u>'#</u>)	1			Total Number of Dominant		_	
			0			Species Across All Strata:		3 <i>(B)</i>	
			0			Percent of Dominant Species	400.000		
			0			That Are OBL, FACW or FAC:	100.009	/ ₆ (A/B)	
			0			Prevalence Index Worksheet:			
		Total Cover:	<u>0</u>			Total % Cover of:	Λ	fultiply by:	
Herb Stratum	(Plot Size: 5 f	<u>ft</u>)	_			OBL Species 140	X 1	14	0
Typha angustifolia			30	Yes	OBL	FACW Species0	X 2	(0
Typha latifolia			30	Yes	OBL	FAC Species0	X 3	(0
Lemna minor			75	Yes	OBL	FACU Species 0	X 4	(0
Sium suave			5	No	OBL	UPL Species 0	X 5	(0
			0			Column Totals: 140	(A)	14	0
			0			Prevalence Index =	•	1.0	
			0			Hydrophytic Vegetation Indicators	-		•
		Titilo	0				_		
	(2)	Total Cover:	<u>140</u>			Yes Rapid Test for Hydropl Yes Dominance Test is >50)II	
Woody Vine Stratum	(Plot Size: 30	<u>'IT</u>)				Yes Prevalence Index ≤ 3.0			
			0			No Morphological Adaptat	ions [1] (prov	ride supporti	ing a
			0			in vegetation remarks	or on a separa	ite sheet)	
		Total Cover:	<u>0</u>			No Problematic Hydrophy	_		
Bare Ground in Herb Stratu	ı m :	9	% Sphagnum	Moss Cover	: <u> </u>	[1] Indicators of hydric soil & wetland h disturbed or problematic.	ydrology must	be present, un	nless
etation Remarks: (include	photo numbers he	re or on a separate s	heet)			Hydrophytic vegetation present?	<u>Yes</u>		

SOIL Sampling Point: 4W-2

Depth Matrix	led to document the indicator or confirm the abscence of Redox Features	rindicators).	
· ————————————————————————————————————	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
1. 0 - 8 10YR 2/1	100	mucky fine sandy loam	no redox
2. 8 - 34 10Y 4/1	100	fine sandy loam	no redox
3			-
4			
5			
[1] Type: C=Concentration, D=Depletion, RM=R	educed Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, ι	unless otherwise noted)	Indicators for Problematic Hydric So	ils [3]:
Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K, L, MLR	A 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16) (LRR R	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 1498	3) 5 cm Mucky Peat or Peat (S3) (LF	RR K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)	✓ Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	✓ Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface (S8) (LF	P.R. K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (LRR K, L))
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses (F12) (L	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetland	I hydrology must be present, unless disturbed or problematic.	☐ Very Shallow Dark Surface (TF12)	mama aulia)
Restrictive Layer (if present): Type:	Depth (inches):	Hydric soil present?	<u>Yes</u>
YDROLOGY Wetland Hydrology Indicators:			
Primary Indicators (minimum of one required; cl	neck all that apply)	Secondary Indicators (minimum of two red	uning all
Surface Water (A1)			quirea)
	<i>Water-Stained Leaves (B9) Water-Stained Leaves (B9)</i>	Surface Soil Cracks (B6)	·
☐ High Water Table (A2)	✓ Water-Stained Leaves (B9)✓ Aquatic Fauna (B13)	☐ Surface Soil Cracks (B6) ☐ Drainage Patterns (B10)	·
☐ High Water Table (A2) ✓ Saturation (A3)			·
	Aquatic Fauna (B13)	☐ Drainage Patterns (B10)	·
Saturation (A3) Water Marks (B1)	Aquatic Fauna (B13) Marl Deposits (B15)	☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16)	·
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2)	FAC-Neutral Test (D
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1)	☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8)	FAC-Neutral Test (D
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3)	 □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) 	FAC-Neutral Test (D
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4)	 □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) 	FAC-Neutral Test (D
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Solis (C6)	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2)	FAC-Neutral Test (D.
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations:	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks)	 □ Drainage Patterns (B10) □ Moss Trim Lines (B16) □ Dry-Season Water Table (C2) □ Crayfish Burrows (C8) □ Saturation Visible on Aerial Imagery (C9) □ Stunted or Stressed Plants (D1) □ Geomorphic Position (D2) □ Shallow Aquitard (D3) 	FAC-Neutral Test (D.
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches):	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	FAC-Neutral Test (D
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present?	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	FAC-Neutral Test (D
✓ Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present?	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches):	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	FAC-Neutral Test (D
✓ Saturation (A3) ☐ Water Marks (B1) ☐ Sediment Deposits (B2) ☐ Drift Deposits (B3) ☐ Algal Mat or Crust (B4) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Sparsely Vegetated Concave Surface (B8) Field Observations: Surface water present? Water table present? (includes capillary fringe)	Aquatic Fauna (B13) Marl Deposits (B15) Hydrogen Sulfide Odor (C1) Oxidized Rhizospheres on Living Roots (C3) Presence of Reduced Iron (C4) Recent Iron Reduction in Tilled Soils (C6) Thin Muck Surface (C7) Other (explain in remarks) Surface Water Depth (inches): Water Table Depth (inches):	Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Imagery (C9) Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland hydrolo Describe Recorded Data:	FAC-Neutral Test (D

WETLAND DETER Project/Site: Aitkin Site	RMINATION DATA FORI		and Northeast Re	
Investigator(s): KMS2 Land Form: Depression Subregion (LRR): K Cowardin Classification: Type 3 Are climatic/hydrologic conditions on the site typical Are vegetation Yes Soil Yes Hy	Latitude: 5158999 N Circular 39 Classification: PEM al for this time of year? No (If no, explainly disturbed?	in in remarks) Eggers & Are "normal <u>Yes</u> Eggers &	Range: 26W Sampling Point: nit Name: Cathro muck Datum: UTM, NAD 83, meters NWI Classification: Reed (primary): Shallow Mars Reed (secondary): Reed (tertiary):	_
SUMMARY OF FINDINGS - Attacl Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	es General Remarks (explain any answers if needed): Wetter than normal Well 14 field, east 6 GPS Point I.D. 427	oint locations, transec	Reed (quaternary): cts, important features,	etc.
Is the sampled area within a wetland? VEGETATION Tree Stratum (Plot Size: 3	es If yes, optional Wetland Site ID: Wetland Absolute Species?	50/20 Throad	n ub Stratum n	20% 509 0 0 0 0 37 92. 0 0
4.	0	<u>Dominance</u>	Test Worksheet:	

Tree Stratum	(Plot Size:	<u>30 ft</u>	_	bsolute Cover	<u>Dominant</u> <u>Species?</u>	<u>Indicator</u> <u>Status</u>	50/20 Thresholds: Tree Stratum	.	_	0	0
				0			Sapling/Shrub Strat Herb Stratum	tum	_	37	92.
				0			Woody Vine Stratui	n	_	0	0
				0			Dominance Test We	orkshoot:			
		Total Co		0 			Number of Dominal				
Sapling/Shrub Stratum	(Plot Size:		over.	<u>U</u>			That Are OBL, FAC		3	(A)	
Sapinig/Sinub Stratum	(F10t 312e.	<u>13 II</u>		0			Total Number of Do		3	- 3 <i>(</i> B)	
				0			Species Across All			- (<i>D)</i>	
				0			Percent of Dominar That Are OBL, FAC		100.00%	(A/B)	
				0			mat Arc OBE, I Ac			_	
				0			Prevalence Index W	orksheet:			
		Total Co	over:	0			Total % Cov			ultiply by	
Herb Stratum	(Plot Size:	<u>5 ft</u>)				OBL Species	135	X 1	1	35
Lemna minor				90	Yes	OBL	FACW Species	50	X 2	1	00
Phalaris arundinacea				50	Yes	FACW	FAC Species	0	X 3		0
Typha latifolia				40	Yes	OBL	FACU Species	0	X 4		0
Alisma subcordatum				5	No	OBL	UPL Species	0	X 5		0
				0			Column Totals:	185	(A)	2	235
				0				alence Index =	B/A =	1	.27
				0			Hydrophytic Vegetat			•	
		T: (:10		0			J			_	
Manda Vina Charles	(Plot Size:	Total Co	over:	<u>185</u>			<u> </u>	est for Hydroph ace Test is >50°		п	
Woody Vine Stratum	(FIOL SIZE.	<u>30 11</u>					Yes Prevalen	ce Index ≤ 3.0	[1]		
				0				ogical Adaptati			rting (
		Total Co		0			-II	ntion remarks o	•	,	!\
		Total Co	over:	<u>0</u>				atic Hydrophyt			
							[1] Indicators of hydric		ydrology must b	e present,	unless
Bare Ground in Herb Stratum	:	_	% S	Sphagnun	n Moss Cover	·	disturbed or problemat	ic.			

SOIL Sampling Point: 4W-3

Profile Description: (Describe to the depth nee	eded to de				f indicators).		
Depth Matrix	0/		ox Featur		L 101	Tarritoria	Damada
(inches) Color (moist)	%	Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 8 10YR 2/1 2.5Y 4/2	100 55	10GY 5/1	40			silt loam sandy loam	
2.		10YR 4/6	5			Sandy Idam	
3	45	10Y 4/6	40	-		sandy loam and silt loam	
5.		10Y 5/1	15				
6							
[1] Type: C=Concentration, D=Depletion, RM=	Reduced	Matrix, CS=Covered or Coa	ited Sand	Grains [2] Location: F	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless o	therwise noted)			Ind	icators for Problematic Hydric Soi	ls [3]:
Histosol (A1)		Stripped Matrix (S6)			✓	2 cm Muck (A10) (LRR K, L, MLRA	1 <i>49B)</i>
Histic Epipedon (A2)		Dark Surface (S7) (LRR R,	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR K,	L, R)
☐ Black Histic (A3)		Polyvalue Below Surface (S	58) (LRR F	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LR	R K, L, R)
☐ Hydrogen Sulfide (A4)		Thin Dark Surface (S9) (LR	R R, MLR.	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	✓	Loamy Mucky Mineral (F1)	(LRR K, L,)		Polyvalue Below Surface (S8) (LRI	R K, L)
Depleted Below Dark Surface (A11)		Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)	
Thick Dark Surface (A12)		Depleted Matrix (F3)				Iron-Manganese Masses (F12) (LR	PR K, L, R)
Sandy Mucky Mineral (S1)		Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (N	MLRA 149B)
Sandy Gleyed Matrix (S4)		Depleted Dark Surface (F7))			Mesic Spodic (TA6) (MLRA 144A,	•
Sandy Redox (S5)		Redox Depressions (F8)				Red Parent Material (F21)	
_ , , , ,	., .,	,				Very Shallow Dark Surface (TF12)	Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetlar		,				-	.,
Restrictive Layer (if present): Type: none	9	Dept	h (inches	·):		Hydric soil present?	<u>Yes</u>
Soil Remarks:							
L HYDROLOGY							
Wetland Hydrology Indicators:	ahaak all	that anniel			Casanda		reina di
Primary Indicators (minimum of one required;	спеск ан		(DO)			ry Indicators (minimum of two req	
Surface Water (A1)		Water-Stained Leaves	(B9)			ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)		Aquatic Fauna (B13)			Drain.	age Patterns (B10)	
Saturation (A3)		Marl Deposits (B15)				Trim Lines (B16)	
Water Marks (B1)		Hydrogen Sulfide Odor	(C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)		Oxidized Rhizospheres	on Living	Roots (C3)	Crayf	ish Burrows (C8)	
Drift Deposits (B3)					Satur	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)		Presence of Reduced I			Stunt	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)		Recent Iron Reduction	in Tilled S	oils (C6)	Geon	orphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)		Thin Muck Surface (C7)	")		Shallo	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)		Other (explain in remar	ks)		Micro	topographic Relief (D4)	
Field Observations:						Indicators of wetland hydrolog	y present? Yes
Surface water present?		Surface Water Depth (in	iches):			Describe Recorded Data:	
Water table present?		Water Table Depth (incl	nes):				
Saturation present? (includes capillary fringe)	✓	Saturation Depth (inche	es):	8			
Recorded Data: Aerial Photo	Monitorin	g Well Stream Gaug	e P	Previous Insp	ections	•	
Hydrology Remarks:							

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region																			
Projec		<u>Aitkin Si</u>						er: PolyMet		City/County					ing Date:	_			
Invest	nvestigator(s): KMS2 Section:						:	<u>6</u>		Township:	<u>47N</u>	Rai	Range: 26W Samp			oling Point: 5U			
							elief:	<u>None</u>		Slope %:	0	Soil Map Unit Na	il Map Unit Name: Cathro muck						
Subregion (LRR): K Latitude:							!	5159 89 1 N		Longitude:	_		NAD 83 r	meters					
Cowardin Classification: PEM2Eh Circular 39 Cla												559 E Datum: <u>UTM, NAD 83, meters</u> Mapped NWI Classification:							
Are climatic/hydrologic conditions on the site typical for this time of year?										n in romark	al.	• • • • • • • • • • • • • • • • • • • •			dae Meed	014			
							<u>Yes</u> nificantly dist	turbod2			Eggers & Re 'es Eggers & Re	4 37		edge Mead	<u>JW</u>				
									ces	Eggers & Re Eggers & Re									
		No OF FIN	Soil	<u>No</u>		<u> </u>		wing sampling point loca							_4	-4-			
SUIVI	WARY (JF FIN	DING	iS - Atta	cn si	te map s	snov	ving san	npiing p	oint ioc	ation	s, transects	ımport	ant re	atures,	etc.	1		
-	ophytic vege		sent?			General Rei		Well 10 Field Wetland											
Hydric soil present? Yes (explain any ansi if needed):							answe	275											
Indicators of wetland hydrology present? Yes									_										
Is the	sampled ar	ea within a	a wetlan	d?	<u>No</u>	If yes, optio	nal W	etland Site I	D:										
VEG	ETATIO	ON																	
								Absolute	Dominant	Indicato	or	50/20 Threshold	s:			20%		<u>50%</u>	
	Tree Stratu	m		(Plot Size:	30 ft)	% Cover	Species?	Status		Tree Stratum				0		0	
				(<u>55 11</u>							Sapling/Shrub S	tratum		:	0		0	
1.								0				Herb Stratum				34		85	
2.						0				Woody Vine Stra	ntum		•	0		0			
3.								0				Daminanaa Taat	Mortoboot	l-				_	
4.								0				Dominance Test							
	Total Cover: <u>Sapling/Shrub Stratum</u> (Plot Size: 15 ft)						<u>0</u>				Number of Dominant Species That Are OBL, FACW or FAC:				1 (1 <i>(A)</i>			
1.								0			$\neg \parallel$	Total Number of Species Across		1 <i>(B)</i>					
2.								0				•		_		_ `			
3.								0			Percent of Dominant Spe That Are OBL, FACW or								
4.							0						_						
5.								0				Prevalence Index	evalence Index Worksheet:						
Total Cover:								<u>0</u>				Total % 0	Total % Cover of:			Multiply by:			
<u>Herb Stratum</u> (Plot Size: <u>5 ft</u>))					OBL Species				(1 125			
1.	Eleocharis	ris acicularis			90	Yes	OBI	_	FACW Species		45	X 2		90	0				
2.	Alisma sub	cordatum						25	No			FAC Species		0	Х3		(0	
3.	Hypericum	ricum majus				20	No	FAC	W	FACU Species 0 X 4				0					
4.	Polygonum lapathifolium						20	No	FAC	W	UPL Species		0	X 5	0				
5.	Carex aquatilis							5	No	OBI	-	•						5 (B)	
6.	Typha angustifolia							5	No	OBI	-	Column Totals.							
7.	Epilobium ciliatum						5	No	FAC	W		Prevalence Index = B/A = 1.26							
8.								0			Hydrophytic Vegetation In								
						Total Cov	er:	<u>170</u>				Yes Rapid Test for Hydrophytic Vegetation							
<u>Woody Vine Stratum</u> (Plot Size: <u>30 ft</u>))		Yes Dominance Test is										
1.								0			-		lence Index nological Ad			vido -	unnorti	na doto	
2.							0					iological Ad etation rem					ng uata		
						Total Cov	er:	0				No Problematic Hydrophytic Vegetation [1] (Explain)							

% Sphagnum Moss Cover:

% Bare Ground in Herb Stratum:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Problematic Hydrophytic Vegetation [1] (Explain)

Yes

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present?

SOIL Sampling Point: 5U

Profile Description: (Describe to the depth need Depth Matrix		nfirm the		f indicators).		
<u> </u>	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
	100				mucky peat	no redox
8 - 12 10YR 2/1	100				mucky peat	no redox
3. 12 - 24 10YR 2/1	100				mucky peat	no redox
4. 24 - 36 10YR 3/1	80 10YR 3/6	20	С	PL	silty clay	
5						
6	adused Matrix CS=Covered or Cost	and Cond	Croino II	1 Location	PL=Pore Lining, M=Matrix.	
[1] Type: C=Concentration, D=Depletion, RM=R		eu Sanu	Grains [2			ile (2).
Hydric Soil Indicators: (applicable to all LRRs, u	_			, , , , , , , , , , , , , , , , , , ,	icators for Problematic Hydric So	
✓ Histosol (A1)	Stripped Matrix (S6)		0.001		2 cm Muck (A10) (LRR K, L, MLR.	
☐ Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, N	MLRA 149	9B)		Coast Prairie Redox (A16) (LRR K	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S&	8) (LRR F	R, MLRA 1491	3)	5 cm Mucky Peat or Peat (S3) (LF	RR K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRF	R R, MLR.	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (L	LRR K, L,)		Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L,)
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L.	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A,	•
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	·
						Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland	I hydrology must be present, unless dis	sturbed o	r problematic		Very Shallow Dark Surface (TF12)) remarks)
Restrictive Layer (if present): Type:	Depth	(inches):		Hydric soil present?	<u>Yes</u>
HYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required; ch	heck all that apply)			Seconda	ry Indicators (minimum of two red	quired)
Surface Water (A1)	Water-Stained Leaves (L	<i>B9)</i>		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
✓ High Water Table (A2)	✓ Aquatic Fauna (B13)			Drain	age Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)			Moss	Trim Lines (B16)	
✓ Water Marks (B1)	Hydrogen Sulfide Odor ((C1)		Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres of	on Living	Roots (C3)	Crayi	ish Burrows (C8)	
	,	J	, ,		ation Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iro	on (C4)			ed or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in	n Tilled S	oils (C6)	_	• •	
Iron Deposits (B5)	Thin Muck Surface (C7)		0.10 (00)		norphic Position (D2)	
✓ Inundation Visible on Aerial Imagery (B7)	_	ام		_	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remark	S)		Micro	topographic Relief (D4)	
Field Observations:					Indicators of wetland hydrolo	gy present? Yes
Surface water present?	Surface Water Depth (inc	ches):			Describe Recorded Data:	
Water table present?	✓ Water Table Depth (inche)	es):	11			
Saturation present? (includes capillary fringe)	Saturation Depth (inches	;):	0			
Recorded Data: Aerial Photo M	onitoring Well Stream Gauge	· _ P	Previous Insp	ections	1	
Hydrology Remarks: Frogs						

WETLAND DETERM	MINATION DATA	FORM - North	icentral and Northe	ast Region
Project/Site: <u>Aitkin Site</u>	Applicant/Owner: PolyMet	City/County: Aitk	<u>kin</u> State: <u>MN</u> Sam	ppling Date: 10/23/14
Investigator(s): KMS2	Section: 6	Township: 47N	Range: 26W San	npling Point: <u>W5</u>
Land Form: Depression	Local Relief: None	Slope %: 0	Soil Map Unit Name: Cathro muc	k
Subregion (LRR): K	<i>Latitude:</i> 5158999 N	Longitude: 4475	,	_
DELM !	<u></u>			<u>5, meters</u>
Cowardin Classification: PEM1d	Circular 39 Classification:	<u>Type 2</u>	Mapped NWI Classification:	
Are climatic/hydrologic conditions on the site typical fo	or this time of year? Yes	(If no, explain in remarks)		Fresh (Wet) Meadow
Are vegetation Yes Soil Yes Hydro	ology <u>No</u> significantly distu	arbed? Are "normal circumstances"	Yes Eggers & Reed (secondary): Eggers & Reed (tertiary):	
Are vegetation No Soil No Hydro	ology No naturally problem	atic? present?	Eggers & Reed (quaternary):	
SUMMARY OF FINDINGS - Attach s				features, etc.
Hydrophytic vegetation present? Yes		ated with Well 14.	· ·	<u> </u>
Hydric soil present? Yes	(explain any answers			
Indicators of wetland hydrology present? Yes	if needed):			
Is the sampled area within a wetland? No	If yes, optional Wetland Site ID	Wetland 5		
VEGETATION				
			50/20 Thresholds:	20% 50%
To 2011 1 2011	Absolute	<u>Dominant</u> <u>Indicator</u> <u>Species?</u> <u>Status</u>		
<u>Tree Stratum</u> (Plot Size: 30 ft) 70 GOVE	openico: otatao	Tree Stratum Sapling/Shrub Stratum	0 0
1.	0		Herb Stratum	15 37.5
2.	0		Woody Vine Stratum	$\frac{10}{0}$ $\frac{0}{0}$
3.	0			
4.	0		Dominance Test Worksheet:	
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 f</u> t	Total Cover: 0		Number of Dominant Species That Are OBL, FACW or FAC:	2 (A)
			Total Number of Dominant	
1.	0		Species Across All Strata:	2 <i>(B)</i>
2.	0		Percent of Dominant Species	100.00% (A/B)
3.	0		That Are OBL, FACW or FAC:	100.00 /6 (A/D)
4. <u></u>	0		Prevalence Index Worksheet:	
J.	Total Cover: 0		Total % Cover of:	Multiply by:
Herb Stratum (Plot Size: 5 ft	,		OBL Species 55	X 1 55
)	V		X 2 40
1. Juncus canadensis	25	Yes OBL FACW	1 AON OPECIES	X3 0
2. Phalaris arundinacea	20	Ne	FAC Species	
3. Typha angustifolia4. Calamagrostis canadensis	10	No OBL	FACU Species0	X 4 <u>0</u>
5. Alisma subcordatum	5	No OBL	UPL Species0	X 5 <u>0</u>
Schoenoplectus tabernaemontani	5	No OBL	Column Totals:75	(A) 95 (B)
7.	0	NO OBE	Prevalence Index =	B/A = 1.27
8.	0		Hydrophytic Vegetation Indicators:	
	Total Cover: 75		Yes Rapid Test for Hydroph	ytic Vegetation
Woody Vine Stratum (Plot Size: 30 ft	<u>15</u>		Yes Dominance Test is >509	%
,	0		Yes Prevalence Index ≤ 3.0	[1]
1. <u> </u>	0			ions [1] (provide supporting data
2.	Total Cover: 0		in vegetation remarks of No Problematic Hydrophyt	or on a separate sneet) ic Vegetation [1] (Explain)
	10tai 00761. <u>U</u>			
% Bare Ground in Herb Stratum:	% Sphagnum	Moss Cover:	[1] Indicators of hydric soil & wetland h disturbed or problematic.	yurology must be present, unless
Vegetation Remarks: (include photo numbers here	or on a separate sheet)		Hydrophytic vegetation present?	<u>Yes</u>
	•		<u>II </u>	

SOIL Sampling Point: W5

(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2] Texture	Remarks
0 - 30 10YR 2/1	100	muck	no redox
-			
<u> </u>			
1 Type: C=Concentration, D=Depletion, RM=Re	educed Matrix, CS=Covered or Coated Sand Grains [2]	Location: PL=Pore Lining, M=Matrix.	
dric Soil Indicators: (applicable to all LRRs, u	nless otherwise noted)	Indicators for Problematic Hy	rdric Soils [3]:
Histosol (A1)	Stripped Matrix (S6)	2 cm Muck (A10) (LRR K,	L, MLRA 149B)
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)	Coast Prairie Redox (A16,) (LRR K, L, R)
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149B)	5 cm Mucky Peat or Peat	(S3) (LRR K, L, R)
] Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRR R, MLRA 149B)	Dark Surface (S7) (LRR K	(, L)
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)	Polyvalue Below Surface	(S8) (LRR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)	Thin Dark Surface (S9) (L	RR K, L)
Thick Dark Surface (A12)	Depleted Matrix (F3)	☐ Iron-Manganese Masses ((F12) (LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	Piedmont Floodplain Soils	
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	Mesic Spodic (TA6) (MLR.	
Sandy Redox (S5)	Redox Depressions (F8)	Red Parent Material (F21)	Unit (Capitali III 3011
			romarke)
?] Indicators of hydrophytic vegetation and wetland	hydrology must be present, unless disturbed or problematic.	Very Shallow Dark Surface	
-	hydrology must be present, unless disturbed or problematic. Depth (inches):	Very Shallow Dark Surface Hydric soil presen	(11 12)
I Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed.			-
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed.			-
i) Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: pil Remarks: No redox observed. VDROLOGY Vetland Hydrology Indicators:	Depth (inches):		nt? Yes
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. **TOROLOGY** Tetland Hydrology Indicators: rimary Indicators (minimum of one required; characters)	Depth (inches):	Hydric soil presei	nt? <u>Yes</u>
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. POROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; characters) Surface Water (A1)	Depth (inches):	Hydric soil present	nt? Yes
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. POROLOGY Tetland Hydrology Indicators: rimary Indicators (minimum of one required; character) Surface Water (A1) High Water Table (A2)	Depth (inches):	Secondary Indicators (minimum of Surface Soil Cracks (B6)	nt? Yes
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. POROLOGY Tetland Hydrology Indicators: Timary Indicators (minimum of one required; character): Surface Water (A1) High Water Table (A2)	Depth (inches): Depth (inches):	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10)	nt? Yes
indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; character): Surface Water (A1) High Water Table (A2) Saturation (A3)	Depth (inches): Depth (inches):	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16)	nt? Yes
if Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: No redox observed. VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; ch of Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1)	Depth (inches): Depth (inches): Depth (inches): Depth (inches): Depth (inches): Depth (inches): Depth (inches):	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2)	two required) FAC-Neutral Test (DE
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; change of the property of the pro	Depth (inches): Depth (inches):	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8)	two required) FAC-Neutral Test (DE
is Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: oil Remarks: No redox observed. VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; ch of Surface Water (A1) of High Water Table (A2) of Saturation (A3) Water Marks (B1) Sediment Deposits (B2) orift Deposits (B3)	Depth (inches): Depth	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image	two required) FAC-Neutral Test (DE
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. TOROLOGY Tetland Hydrology Indicators: Inimary Indicators (minimum of one required; change water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4)	Depth (inches): Depth	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1)	two required) FAC-Neutral Test (DE
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. DROLOGY Total Hydrology Indicators: Timary Indicators (minimum of one required; check the surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5)	Depth (inches): Depth	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1) Geomorphic Position (D2)	two required) FAC-Neutral Test (D.)
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. DROLOGY Lettand Hydrology Indicators: Limary Indicators (minimum of one required; chest) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Depth (inches): Depth	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3)	nt? Yes two required) FAC-Neutral Test (D.)
estrictive Layer (if present): Type: oil Remarks: No redox observed. VDROLOGY Vetland Hydrology Indicators: rimary Indicators (minimum of one required; chell) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8) ield Observations: urface water present?	Depth (inches): Depth	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4)	rydrology present? Yes
Indicators of hydrophytic vegetation and wetland estrictive Layer (if present): Type: Dil Remarks: No redox observed. DROLOGY Setland Hydrology Indicators: Simary Indicators (minimum of one required; check) Surface Water (A1) High Water Table (A2) Saturation (A3) Water Marks (B1) Sediment Deposits (B2) Drift Deposits (B3) Algal Mat or Crust (B4) Iron Deposits (B5) Inundation Visible on Aerial Imagery (B7) Sparsely Vegetated Concave Surface (B8)	Depth (inches): Depth	Secondary Indicators (minimum of Surface Soil Cracks (B6) Drainage Patterns (B10) Moss Trim Lines (B16) Dry-Season Water Table (C2) Crayfish Burrows (C8) Saturation Visible on Aerial Image Stunted or Stressed Plants (D1) Geomorphic Position (D2) Shallow Aquitard (D3) Microtopographic Relief (D4) Indicators of wetland I	rydrology present? Yes Fac-Neutral Test (Displayer)

Project/Site:	Aitkin Site				Applicant/O	wner: PolyMet	<u>!</u>	City/County:	<u>Aitkin</u>	St	tate:	MN	Sampling Date:	10/23/14
Investigator(s): <u>K</u> Land Form:	(MS2 Terrace				Section: Local Reliei	<u>6</u> ∵ None		Township: Slope %:		R Soil Map Unit I	_		Sampling Point:	<u>6U</u>
Subregion (LRR):					Latitude:	5159981 N		Longitude:	_	,			AD 83, meters	
Cowardin Classific	cation: L	<u>Jpland</u>			Circular 39	Classification:	<u>upland</u>			Mapped NI	NI Clas	ssification:		
Are climatic/hydrol	3		31				, ,	ain in remarks Are "normal	•	Eggers & F Eggers & F	"	, ,	<u>Upland</u>):	
Are vegetation	<u>Yes</u>	Soil	<u>Yes</u>	Hydrology	<u>Yes</u>	significantly dist	urbed?	circumstanc present?		Eggers & F	•			
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> n	aturally problem	natic?	present:		Eggers & F		, ,		

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No	General Remarks	Paired with the Well 10 wetland, and this upland plot is also paired with Well 11 wetland.
Hydric soil present?	No	(explain any answers	
Indicators of wetland hydrology present?	No	if needed):	
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetland	nd Site ID:

VEGETATION

			<u>Absolute</u>	<u>Dominant</u>	<u>Indicator</u>	50/20 Thresholds:			<u>20%</u>	<u>50%</u>
Tree Stratum	(Plot Size: 30	<u>0 ft</u>)	% Cover	Species?	<u>Status</u>	Tree Stratum		_	0	0
			0			Sapling/Shrub Stra Herb Stratum	atum	_	0	0
			0			Woody Vine Stratu	ım	_	19 0	47. 0
			0			,				
			0			Dominance Test W				
Cardinar/Ohmah Chartana	(Diet Ciese 1	Total Cover:	<u>0</u>			Number of Domina That Are OBL, FAC	nnt Species CW or FAC:		0 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size: 15	<u>51l</u>)	1			Total Number of D	ominant		_	
			0			Species Across Al	l Strata:		1 <i>(B)</i> —	
			0			Percent of Domina		0.00%	∕₀ (A/B)	
			0			That Are OBL, FAC	SW or FAC:	0.00		
			0			Prevalence Index V	Vorksheet:			
		Total Cover:	<u>0</u>			Total % Co	ver of:	N	fultiply by:	
Herb Stratum	(Plot Size: 5	<u>ft</u>	_			OBL Species	0	X 1		0
Elymus repens			80	Yes	FACU	FACW Species	0	X 2		0
Bromus arvensis			10	No	FACU	FAC Species	0	X 3		0
Taraxacum officinale			5	No	FACU	FACU Species	95	X 4	38	30
			0			UPL Species	0	X 5		0
			0			Column Totals:	95	(A)	38	80
			0				/alence Index =	•	4.0	_
			0			Hydrophytic Vegeta				
		T: (:10: ::	0			J	est for Hydroph			
	(5) (6)	Total Cover:	<u>95</u>				nce Test is >509)II	
Woody Vine Stratum	(Plot Size: 30	<u> </u>	1				nce Index ≤ 3.0			
			0			No Morpho	logical Adaptati	ons [1] (prov	ide support	ing c
		TatalOnic	0				ation remarks o			
		Total Cover:	<u>0</u>				natic Hydrophyt	_		
Bare Ground in Herb Stratu	m:	!	% Sphagnum	n Moss Cover:	<u> </u>	[1] Indicators of hydric disturbed or problema		/drology must	be present, u	nless
getation Remarks: (include	photo numbers he	ere or on a separate s	sheet)			Hydrophytic vegeta	tion present?	<u>No</u>		

SOIL Sampling Point: 6U

Profile Description: (Describe to the depth nee	eded to document the indicator or confirm the abscence Redox Features	of indicators).		
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
0 - 8 10YR 2/1	100		sandy loam	no redox
8 - 16 10YR 2/1	100		loamy sand	no redox
3. 16 - 24 10YR 4/3	100		fine sand	no redox
4				
5				
6				
[1] Type: C=Concentration, D=Depletion, RM=I	Reduced Matrix, CS=Covered or Coated Sand Grains	[2] Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)	Inc	icators for Problematic Hydric So	• •
Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLR	4 <i>149B)</i>
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
☐ Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 1-	19B)	5 cm Mucky Peat or Peat (S3) (LF	RR K, L, R)
☐ Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L,)
Thick Dark Surface (A12)	Depleted Matrix (F3)		Iron-Manganese Masses (F12) (L	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)		Piedmont Floodplain Soils (F19) (MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)		Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlan	nd hydrology must be present, unless disturbed or problema	otic	Very Shallow Dark Surface (TF12)	
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>No</u>
Soil Remarks:				
 HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; o	check all that apply)	Seconda	ry Indicators (minimum of two red	quired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)	Drair	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)	Moss	Trim Lines (B16)	
Water Marks (B1)	☐ Hydrogen Sulfide Odor (C1)	Dry-S	Season Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres on Living Roots (C3)) Cray	fish Burrows (C8)	
Drift Deposits (B3)	, , ,		ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)		ed or Stressed Plants (D1)	
	Recent Iron Reduction in Tilled Soils (C6)		norphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)		ow Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)		topographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)		- Where		
Field Observations: Surface water present?	Surface Water Death /inches)		Indicators of wetland hydrolo	gy present? <u>No</u>
	Surface Water Depth (inches):	=	Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches):	_		
	Monitoring Well Stream Gauge Previous In	spections		
Hydrology Remarks:				

WETLAND DETERMINATION	DATA FOR	M - Northc	entral and North	ieast Re	gion	
Project/Site: Altkin Site Applicant/Own	er: PolyMet	City/County: Aitkin	State: MN S	Sampling Date:	10/23/14	
Investigator(s): KMS2 Section:	<u>6</u>	Township: 47N	Range: 26W	Sampling Point:	<u>W6</u>	
Land Form: Depression Local Relief:	None	Slope %: <u>0</u>	Soil Map Unit Name: Cathro	<u>muck</u>		
Subregion (LRR): <u>K</u> Latitude:	<u>5159450 N</u>	Longitude: 447898	<u> Datum: UTM, NA</u>	D 83, meters		
Cowardin Classification: PEM1d Circular 39 Cla	assification: Type 2		Mapped NWI Classification:			
Are climatic/hydrologic conditions on the site typical for this time of year?	Yes (If no, expla	ain in remarks)	Eggers & Reed (primary):	Fresh (Wet)	Meadow	
	nificantly disturbed?	Are "normal Ye		:		
	-	circumstances" present?	Eggers & Reed (tertiary):			
Are vegetation No Soil No Hydrology No national	ırally problematic?	present.	Eggers & Reed (quaternary));		
SUMMARY OF FINDINGS - Attach site map show	wing sampling p	point locations	s, transects, importar	nt features	, etc.	
Hydrophytic vegetation present? Yes General Remarks Hydric soil present? Yes (explain any answ	Associated with W	/ell 12.				
if needed).	33					
Indicators of wetland hydrology present? Is the sampled area within a wetland? No If yes, optional W	etland Site ID: Wet	land 6				
VEGETATION						
VEGETATION		_				
	Absolute Dominan		50/20 Thresholds:		<u>20%</u>	<u>50%</u>
<u>Tree Stratum</u> (Plot Size: <u>30 ft</u>)	<u>% Cover</u> <u>Species?</u>	<u>Status</u>	Tree Stratum		0	0
1.	0		Sapling/Shrub Stratum Herb Stratum		0	<u> </u>
2.	0		Woody Vine Stratum		0	57.5 0
3.	0					
4.	0		<u>Dominance Test Worksheet:</u>			
Total Cover:	<u>0</u>		Number of Dominant Species That Are OBL, FACW or FAC:		3 (A)	
<u>Sapling/Shrub Stratum</u> (Plot Size: <u>15 ft</u>)			Total Number of Dominant		_	
1.	0		Species Across All Strata:		3 <i>(B)</i>	
2.	0		Percent of Dominant Species			
3.	0		That Are OBL, FACW or FAC:	100.00	0% <i>(A/B)</i>	
4.	0		Prevalence Index Worksheet:			
5. Total Cover:	0		Total % Cover of:		Multiply by:	
Herb Stratum (Plot Size: 5 ft	<u>u</u>			25 X 1		25
	Voc.		· — — ,	35 X 2		70
Beckmannia syzigachne Rumex crispus	25 Yes No		TAOV opecies	40 X 3		20
3. Artemisia annua	15 No	FACIL	TAC Species	15 X 4	-	60
Persicaria lapathifolia	25 Yes	FACW	TACO Species	0 X5		0
5. Galium boreale	25 Yes	FAC	UPL Species	_		
6. Salix petiolaris	10 No	FACW	Column rotals.	15 (A)		75 (B)
7.	0		Prevalence Inde		2.3	39
8.	0		Hydrophytic Vegetation Indicate	ors:		
Total Cover:	<u>115</u>		Yes Rapid Test for Hydro		tion	
Woody Vine Stratum (Plot Size: 30 ft)			Yes Dominance Test is >			
1.	0		Yes Prevalence Index ≤ No Morphological Adap		ovido suppor	rtina data
2.	0		in vegetation remark			ting data
Total Cover:	<u>0</u>		No Problematic Hydrop	hytic Vegetatio	n [1] (Explai	n)
% Bare Ground in Herb Stratum:	% Sphagnum Moss Cov		'1] Indicators of hydric soil & wetlar disturbed or problematic.	nd hydrology mus	it be present, ι	unless
Vegetation Remarks: (include photo numbers here or on a separate s	heet)		Hydrophytic vegetation present?	Yes Yes		
<u> </u>			·			

SOIL Sampling Point: W6

Profile Description: (Describe to the depth nee				f indicators).		
Depth Matrix (inches) Color (moist)	% Color (moist)	ox Featui %	res Type [1]	Loc [2]	Texture	Remarks
0 - 14 10YR 2/1	100		- 170-1-1		loamy peat	
14 - 18 101 (2/1	80 7.5YR 5/8	20			clay loam	
3. 18 - 21 10Y 6/1	90 7.5YR 5/8	10			silty clay loam	
4						
5					-	
6 [1] Type: C=Concentration, D=Depletion, RM=F	Reduced Matrix, CS=Covered or Coa	ted Sand	Grains [2	Location: I	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,	unless otherwise noted)			Ind	icators for Problematic Hydric So	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR)	4 <i>149B)</i>
Histic Epipedon (A2)	Dark Surface (S7) (LRR R,	MLRA 14	9B)		Coast Prairie Redox (A16) (LRR k	(, L, R)
Black Histic (A3)	Polyvalue Below Surface (S	8) (LRR F	R, MLRA 149	B)	5 cm Mucky Peat or Peat (S3) (LR	PR K, L, R)
☐ Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LR	R R, MLR	A 149B)		Dark Surface (S7) (LRR K, L)	
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LR	R K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L))
☐ Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (Li	RR K, L, R)
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (I	MLRA 149B)
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A,	145, 149B)
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	Other (explain in soil
[3] Indicators of hydrophytic vegetation and wetlan	d hydrology must he present upless d	isturhed d	or problematic		Very Shallow Dark Surface (TF12)	"-"-"'
Restrictive Layer (if present): Type:		inches			Hydric soil present?	Yes
Soil Remarks: HYDROLOGY Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required; of	check all that apply)			Seconda	ry Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (<i>(B9)</i>		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)			Drain	age Patterns (B10)	
Saturation (A3)	Marl Deposits (B15)			Moss	Trim Lines (B16)	
☐ Water Marks (B1)	Hydrogen Sulfide Odor	(C1)		Dry-S	Geason Water Table (C2)	
Sediment Deposits (B2)	Oxidized Rhizospheres	on Living	Roots (C3)	Crayf	ish Burrows (C8)	
Drift Deposits (B3)	_			Satur	ation Visible on Aerial Imagery (C9)	
Algal Mat or Crust (B4)	Presence of Reduced II			Stunt	ed or Stressed Plants (D1)	
☐ Iron Deposits (B5)	Recent Iron Reduction I	n Tilled S	oils (C6)	Geon	norphic Position (D2)	
Inundation Visible on Aerial Imagery (B7)	Thin Muck Surface (C7))		Shallo	ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remari	ks)		Micro	topographic Relief (D4)	
Field Observations:					Indicators of wetland hydrolog	gy present? Yes
Surface water present?	Surface Water Depth (in	ches):			Describe Recorded Data:	
Water table present?	Water Table Depth (inch	es):				
Saturation present? (includes capillary fringe)	Saturation Depth (inches	s):	6			
Recorded Data: Aerial Photo	Monitoring Well Stream Gaug	e	Previous Ins	ections	1	
Hudrology Domorko		_				
Hydrology Remarks:						

Project/Site:	Aitkin Site				Applicant/C	<i>Dwner:</i> PolyMe	<u>et</u>	City/County:	<u>Aitkin</u>	Sta	te:	MN	Sampling Date:	10/23/14
Investigator(s): <u>k</u> Land Form:	<u>(MS2</u> Terrace				Section: Local Relie	<u>6</u> f: None		Township: Slope %:		Ra. Soil Map Unit N	-		Sampling Point:	<u>7U</u>
Subregion (LRR):					Latitude:	5159717 N		Longitude:	_	,			D 83, meters	
Cowardin Classific	cation:	<u>Upland</u>			Circular 39	Classification:	<u>Upland</u>			Mapped NW	'I Clas	sification:		
Are climatic/hydrol Are vegetation	logic condit <u>Yes</u>	tions or Soil	<u>Yes</u>	Hydrology	<u>Yes</u>	significantly dis	sturbed?	ain in remarks Are "normal circumstanc present?	<u>Yes</u>	Eggers & Re Eggers & Re Eggers & Re	eed (s eed (te	econdary, ertiary):		
Are vegetation	<u>No</u>	Soil	<u>No</u>	Hydrology	<u>No</u> /	naturally proble	matic?	present:		Eggers & Re	eed (q	uaternary	<i>):</i>	

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Hydric soil present? Indicators of wetland hydrology present?	Yes Yes No	General Remarks (explain any answers if needed):	Well 11 Field Well data supports no hydrology for this point.
Is the sampled area within a wetland?	<u>No</u>	If yes, optional Wetlan	nd Site ID:

Tree Stratum	(Plot Size:	<u>30 ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status	50/20 Thresholds: Tree Stratum	_	20% 0	<u>50%</u> 0
			0			Sapling/Shrub Stratum Herb Stratum	_	25	0 62.5
			0			Woody Vine Stratum	_	0	02.5
			0			Dominance Test Worksheet:	-		
		Total Cover:	0			Number of Dominant Species That Are OBL, FACW or FAC:	;	2 <i>(A)</i>	
Sapling/Shrub Stratum	(Plot Size:	<u>15 ft</u>)	0			Total Number of Dominant		- (B)	
			0			Species Across All Strata:		- (<i>D</i>)	
			0			Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	6 (A/B)	
			0			Prevalence Index Worksheet:		_	
		Total Cover:	0 <u>0</u>			Total % Cover of:	M	ultiply by:	
Herb Stratum	(Plot Size:		<u>u</u>			OBL Species 11		11	0
Eleocharis acicularis	(1 101 0120.	<u> </u>	80	Yes	OBL	FACW Species 1	0 X 2	2	20
Alisma subcordatum			25	Yes	OBL		5 X 3	1	5
Persicaria lapathifolia			10	No	FACW	FAC Species	0 X 4		0
Rumex crispus			5	No	FAC	FACO Species	0 X 5		0
Carex aquatilis			5	No	OBL	UPL Species	-	14	_
			0			Column Totals.	- ` ′ -		_ `
			0			Prevalence Index	_,,,,	1.1	6
			0			Hydrophytic Vegetation Indicate			
		Total Cover:	<u>125</u>			Yes Rapid Test for Hydro		n	
Woody Vine Stratum	(Plot Size:	<u>30 ft</u>				Yes Prevalence Index ≤ 3			
			0			No Morphological Adap		ide supporti	ina da
			0			in vegetation remark	s or on a separa	te sheet)	
		Total Cover:	<u>0</u>			No Problematic Hydrop	ytic Vegetation	[1] (Explain))
are Ground in Herb Strate	um:	_	% Sphagnun	n Moss Cover	:	[1] Indicators of hydric soil & wetlan disturbed or problematic.	d hydrology must i	oe present, ur	ıless
etation Remarks: (include	e photo numbers	here or on a separate s	sheet)			Hydrophytic vegetation present?	Yes		

SOIL Sampling Point: 7<u>U</u>

Profile Description: (Describe to the depth needs		nfirm the		indicators).		
<u> </u>	% Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
0 - 20 10YR 2/1	100				mucky peat	no redox
20 - 30 10YR 2/1	40 10YR 3/4	20			silty clay	
3. 20 - 30	10YR 4/1	40			silty clay	
4. <u>30 - 36</u> <u>2.4Y 4/2</u>	50 10YR 4/6	50			sand	
5						
6						
[1] Type: C=Concentration, D=Depletion, RM=Re	duced Matrix, CS=Covered or Coa	ted Sand	Grains [2	Location:	PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs, un	nless otherwise noted)			Ind	icators for Problematic Hydric Sc	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)				2 cm Muck (A10) (LRR K, L, MLR	A 149B)
Histic Epipedon (A2)	Dark Surface (S7) (LRR R, I	MLRA 149	9B)		Coast Prairie Redox (A16) (LRR I	(, L, R)
✓ Black Histic (A3)	Polyvalue Below Surface (Se	8) (LRR R	R, MLRA 149E	3)	5 cm Mucky Peat or Peat (S3) (LF	RR K, L, R)
Hydrogen Sulfide (A4)	Thin Dark Surface (S9) (LRI	R R, MLR.	A 149B)		Dark Surface (S7) (LRR K, L)	
☐ Stratified Layers (A5)	Loamy Mucky Mineral (F1) ((LRR K, L))		Polyvalue Below Surface (S8) (LF	PR K, L)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)				Thin Dark Surface (S9) (LRR K, L)
Thick Dark Surface (A12)	Depleted Matrix (F3)				Iron-Manganese Masses (F12) (L	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)				Piedmont Floodplain Soils (F19) (•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)				Mesic Spodic (TA6) (MLRA 144A)	•
Sandy Redox (S5)	Redox Depressions (F8)				Red Parent Material (F21)	
	_ , , , , ,					Other (explain in soil remarks)
[3] Indicators of hydrophytic vegetation and wetland					Very Shallow Dark Surface (TF12	,
Restrictive Layer (if present): Type:	Depth	(inches	·):		Hydric soil present?	<u>Yes</u>
Soil Remarks:						
HYDROLOGY						
Wetland Hydrology Indicators:						
Primary Indicators (minimum of one required; che	eck all that apply)			Seconda	ry Indicators (minimum of two red	quired)
Surface Water (A1)	Water-Stained Leaves (B9)		Surfa	ce Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	✓ Aquatic Fauna (B13)			Drain	age Patterns (B10)	
✓ Saturation (A3)	Marl Deposits (B15)			_	Trim Lines (B16)	
	Hydrogen Sulfide Odor	(C1)		Drv-S	Season Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres		Roots (C3)		ish Burrows (C8)	
Sediment Deposits (B2)	Oxidized Trilizospheres	on Ening	110013 (00)		ation Visible on Aerial Imagery (C9)	
☐ Drift Deposits (B3)	Presence of Reduced Ir	on (C4)				
Algal Mat or Crust (B4)	Recent Iron Reduction is		oils (C6)		ed or Stressed Plants (D1)	
Iron Deposits (B5)	Thin Muck Surface (C7)		0.10 (00)		norphic Position (D2)	
✓ Inundation Visible on Aerial Imagery (B7)	<u> </u>				ow Aquitard (D3)	
Sparsely Vegetated Concave Surface (B8)	Other (explain in remark	(3)		Micro	topographic Relief (D4)	
Field Observations:					Indicators of wetland hydrolo	gy present? <u>No</u>
Surface water present?	Surface Water Depth (inc	ches):			Describe Recorded Data:	
Water table present?	✓ Water Table Depth (inch)	es):	10			
Saturation present? (includes capillary fringe)	✓ Saturation Depth (inches	s):	0			
Recorded Data: Aerial Photo Mo	onitoring Well Stream Gauge	P P	Previous Insp	ections	<u> </u>	
Hydrology Remarks: Frogs. Wetland hydrology	monitoring does not support evidence	e of hydro	ology in this w	etland. Revise	ed to an upland.	

WETLAND DETER	RMINATION DATA FO	RM - Northcentral and Northea	st Region
Project/Site: Aitkin Site	Applicant/Owner: PolyMet	City/County: Aitkin State: MN Samp	ling Date: 10/23/14
Investigator(s): KMS2	Section: 6	Township: 47N Range: <u>26W</u> Samp	oling Point: W7
Land Form: Depression	Local Relief: None	Slope %: 0 Soil Map Unit Name: Cathro muck	
Subregion (LRR): K	Latitude: 5159047 N	Longitude: 446986 E Datum: UTM, NAD 83,	meters
DEM.	Circular 39 Classification: Type		motors
			rook (Mat) Maadaw
Are climatic/hydrologic conditions on the site typic.	ral for this time of year? Yes (If no,	explain in remarks) Eggers & Reed (primary): Fi Are "normal Yes Eggers & Reed (secondary):	resh (Wet) Meadow
Are vegetation Yes Soil Yes H	Hydrology <u>No</u> significantly disturbed?	circumstances" Eggers & Reed (secondary):	
Are vegetation No Soil No H	Hydrology No naturally problematic?	present? Eggers & Reed (quaternary):	
-		ng point locations, transects, important fe	eatures, etc.
Hydric soil present? Y Indicators of wetland hydrology present? Y	Yes General Remarks (explain any answers if needed): No If yes, optional Wetland Site ID:	ith Well 5. Wetland 7	
VEGETATION			
	About to Don	inant Indicator 50/20 Thresholds:	20% 50%
<u>Tree Stratum</u> (Plot Size:	24.0	mant mucator —	0 0
Tree Stratum (F10t Size.	3011)	Sapling/Shrub Stratum	0 0
1.	0	Herb Stratum	27 67.5
2.	0	Woody Vine Stratum	0 0
3.	0	Dominance Test Worksheet:	
4.	0		
	Total Cover: 0	Number of Dominant Species That Are OBL, FACW or FAC:	4 <i>(A)</i>
Sapling/Shrub Stratum (Plot Size:	<u>15 ft</u>)	Total Number of Dominant	
1.	0	Species Across All Strata:	5 <i>(B)</i>
2.	0	Percent of Dominant Species	00 000((A/D)
3.	0	That Are OBL, FACW or FAC:	80.00% (A/B)
4.	0	Prevalence Index Worksheet:	
5.	00	Total % Cover of:	Multiply by:
(0) (0)	-		X 1 55
Herb Stratum (Plot Size:	<u>5 ft</u>)	OBL Species	
Potentilla norvegica	20 Ye	-	X 2 0
Trifolium pratense	25 Ye	TAC Species	X 3 165
3. Echinochloa crus-galli	20 Ye	FACU Species	X 4 100
4. Rumex crispus	15	UPL Species 0	X 5 0
5. Bidens cernua	10 N	Column Totals: 135	(A) <u>320</u> (B)
6. Carex vulpinoidea	20 Ye	Prevalence Index = B	3/A = 2.37
7. Glyceria striata8.	25 Ye	Hydrophytic Vegetation Indicators:	
0.		No Rapid Test for Hydrophyt	tic Vegetation
Manda Man Otata and (Plot Sino)	133	Yes Dominance Test is >50%	•
Woody Vine Stratum (Plot Size:		Yes Prevalence Index ≤ 3.0 [1	
1.	0		ns [1] (provide supporting data
2.	0	in vegetation remarks or	•
	Total Cover: 0	No Problematic Hydrophytic	
% Bare Ground in Herb Stratum:	% Sphagnum Moss	Cover: [1] Indicators of hydric soil & wetland hydric soil & wetla	drology must be present, unless
Vegetation Remarks: (include photo numbers I	here or on a separate sheet)	Hydrophytic vegetation present?	<u>Yes</u>
· · · · · · · · · · · · · · · · · · ·	<u> </u>	<u> </u>	

SOIL Sampling Point: W7

Profile Description: (Describe to the depth nee	ded to document the indicator or confirm the abscence Redox Features	of indicators).		
(inches) Color (moist)	% Color (moist) % Type [1]	Loc [2]	Texture	Remarks
0 - 6 10YR 2/2	100		loam	
2.5YR 2.5/1	100		silt loam	
3. 13 - 21 10YR 2/1	100		peat	
4				
5				
6. ————————————————————————————————————	Reduced Matrix, CS=Covered or Coated Sand Grains	21 Location: PL	=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (applicable to all LRRs,		<u> </u>	ators for Problematic Hydric Soi	ils [3]:
✓ Histosol (A1)	Stripped Matrix (S6)		2 cm Muck (A10) (LRR K, L, MLRA	• •
Histic Epipedon (A2)	☐ Dark Surface (S7) (LRR R, MLRA 149B)		Coast Prairie Redox (A16) (LRR K	
Black Histic (A3)	Polyvalue Below Surface (S8) (LRR R, MLRA 149	_	5 cm Mucky Peat or Peat (S3) (LR	•
Hydrogen Sulfide (A4)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)		Dark Surface (S7) (LRR K, L)	(
Stratified Layers (A5)	Loamy Mucky Mineral (F1) (LRR K, L)		Polyvalue Below Surface (S8) (LRI	RKI)
Depleted Below Dark Surface (A11)	Loamy Gleyed Matrix (F2)		Thin Dark Surface (S9) (LRR K, L)	•
Thick Dark Surface (A12)	Depleted Matrix (F3)		ron-Manganese Masses (F12) (LF	
Sandy Mucky Mineral (S1)	Redox Dark Surface (F6)	_	Piedmont Floodplain Soils (F19) (N	
	<u> </u>	_		•
Sandy Gleyed Matrix (S4)	Depleted Dark Surface (F7)	_	Mesic Spodic (TA6) (MLRA 144A,	<u></u>
Sandy Redox (S5)	Redox Depressions (F8)		Red Parent Material (F21)	Other (explain in soil remarks)
	d hydrology must be present, unless disturbed or problemati	C.	Very Shallow Dark Surface (TF12)	,
Restrictive Layer (if present): Type:	Depth (inches):		Hydric soil present?	<u>Yes</u>
Soil Remarks:				
 HYDROLOGY				
Wetland Hydrology Indicators:				
Primary Indicators (minimum of one required; o	check all that apply)	Secondary	Indicators (minimum of two req	uired)
Surface Water (A1)	Water-Stained Leaves (B9)	Surface	Soil Cracks (B6)	FAC-Neutral Test (D5)
☐ High Water Table (A2)	Aquatic Fauna (B13)		ne Patterns (B10)	
	Marl Deposits (B15)	_	rim Lines (B16)	
Saturation (A3)	Hydrogen Sulfide Odor (C1)	_	ason Water Table (C2)	
Water Marks (B1)	Oxidized Rhizospheres on Living Roots (C3)		h Burrows (C8)	
Sediment Deposits (B2)	omazea imzesprisies en zimig neete (ee)		ion Visible on Aerial Imagery (C9)	
Drift Deposits (B3)	Presence of Reduced Iron (C4)		or Stressed Plants (D1)	
Algal Mat or Crust (B4)	Recent Iron Reduction in Tilled Soils (C6)		rphic Position (D2)	
☐ Iron Deposits (B5)	Thin Muck Surface (C7)		Aquitard (D3)	
Inundation Visible on Aerial Imagery (B7)	Other (explain in remarks)		pographic Relief (D4)	
Sparsely Vegetated Concave Surface (B8)		IVIICIOIO	родгарніс Кенег (Б4)	
Field Observations:	Confee Meter Broth (to to)		Indicators of wetland hydrolog	gy present? Yes
Surface water present?	Surface Water Depth (inches):		Describe Recorded Data:	
Water table present?	Water Table Depth (inches):			
Saturation present? (includes capillary fringe)	Saturation Depth (inches): 2			
	Monitoring Well Stream Gauge Previous Ins	pections		
Hydrology Remarks:				
1				

Appendix F Site Photographs

Aitkin Wetland Mitigation Site – Site Photographs West Side of Property



View ESE from NW corner of property at levee, 9/15/14, #13278



West edge County Ditch 27, view north, 9/16/14, #13432



West side of property, internal private ditch, view east, 9/16/14, #13430



Central private ditch on west side of property, view to the north, 9/16/14, #13413



Central private ditch on west side of property, view to the east, 9/16/14, #13387



Central private ditch on west side of property, view to the south, 9/16/14, #13500



West side, central private ditch, south of homestead, view west, 11/5/15, #208



Artesian well on west side of property, 9/15/14, #13368



West side of Highway 1, view west, 9/17/14, #14819



West side of property, view south to peat stockpile, 9/16/14, #13484



West side of Highway 1 at curve, view north, 9/18/14, #13656



Roadside ditch on west side of Highway 1, view south, 9/18/14, #13643



East side of Highway 1 at levee, view south, 9/17/14, #13523



East side of property, plowing NE field, view east, 4/28/15, #285



Looking east from Highway 1 to east side north fields, 9/17/14, #13525



East side of property, peat mining and private ditch, 9/17/14, #13529



East side of Highway 1, peat mining area, view east, 9/17/14, #14816



Eastern edge of east side of property, view SW, 9/17/14, #13567



East side of property, north-central east-west ditch, view west, 9/17/14, #13553



East side, middle private ditch, view east, 9/17/14, #13544

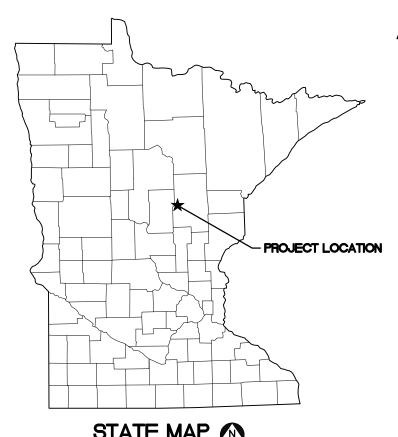


East of Highway, south part of east peat mining area, view NW, 9/17/14, #14805

Appendix G

Wetland Mitigation Plan Drawings

POLYMET AITKIN WETLAND RESTORATION PLAN AITKIN, MINNESOTA



<u> </u>	<u> </u>	<u> </u>	IVI/	<u> </u>	
					V

DRAWING No.	SHEET TITLE	CURRENT REVISION
TS-101	TITLE SHEET, INDEX SHEET, AND SITE LOCATION MAP	0
CS-101	EXISTING CONDITIONS	0
CS-102	OVERALL SITE PLAN AND INDEX MAP	0
CS-103	SITE WETLAND MITIGATION PLAN - NORTHWEST UNIT	0
CS-104	SITE WETLAND MITIGATION PLAN - NORTHEAST UNIT	0
CS-105	SITE WETLAND MITIGATION PLAN - SOUTHWEST UNIT	0
CS-106	SITE WETLAND MITIGATION PLAN - SOUTHEAST UNIT	0
CS-107	SITE WETLAND MITIGATION PLAN - EAST UNIT	0
CS-108	NORTHWEST UNIT CROSS SECTIONS	0
CS-109	NORTHEAST UNIT CROSS SECTIONS	0
CS-110	SOUTHWEST UNIT CROSS SECTIONS	0
CS-111	SOUTHEAST UNIT CROSS SECTIONS	0
CS-112	SOUTHEAST UNIT CROSS SECTIONS	0
CS-113	EAST UNIT CROSS SECTIONS	0
CS-114	TYPICAL DETAILS	0
CS-115	EROSION CONTROL PLAN	0
CS-116	EROSION CONTROL DETAILS	0
CS-117	STORMWATER POLLUTION PREVENTION PLAN (SWPPP)	0



PROJECT SITE (1)

- GOPHER STATE ONE CALL, CALL BEFORE YOU DIG. 1-800-252-1166 (MN TOLL FREE) 651-454-0002 (TWIN CITIES AREA)
- 2. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD—LOCATING ALL SITE UTILITIES, PRIVATE AND PUBLIC, PRIOR TO STARTING THE WORK. ALL UTILITIES DAMAGED BY THE CONTRACTOR SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE UTILITY OWNER.

/ER NO	DATE	DESCRIPTION	ISSUE STATUS				
		•	ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN.	
			SPECIFICATION PREPARED BY FOR SUPERVISION		PECIFICATION, OR REPORT WAS REPARED BY ME OR UNDER MY DIRECT UPERVISION AND THAT I AM A DULY CENSED PROFESSIONAL ENGINEER DRAWI	DRAWN: CMB2	
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			CONSTRUCTION			PRINTED NAME	BARR PROJECT NO.: 23/69-0C29
			NOT APPROVED FOR CONSTRUCTION			DATE LICENSE#	SCALE:
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AND SITE LOCATION MAP POLYMET MINING

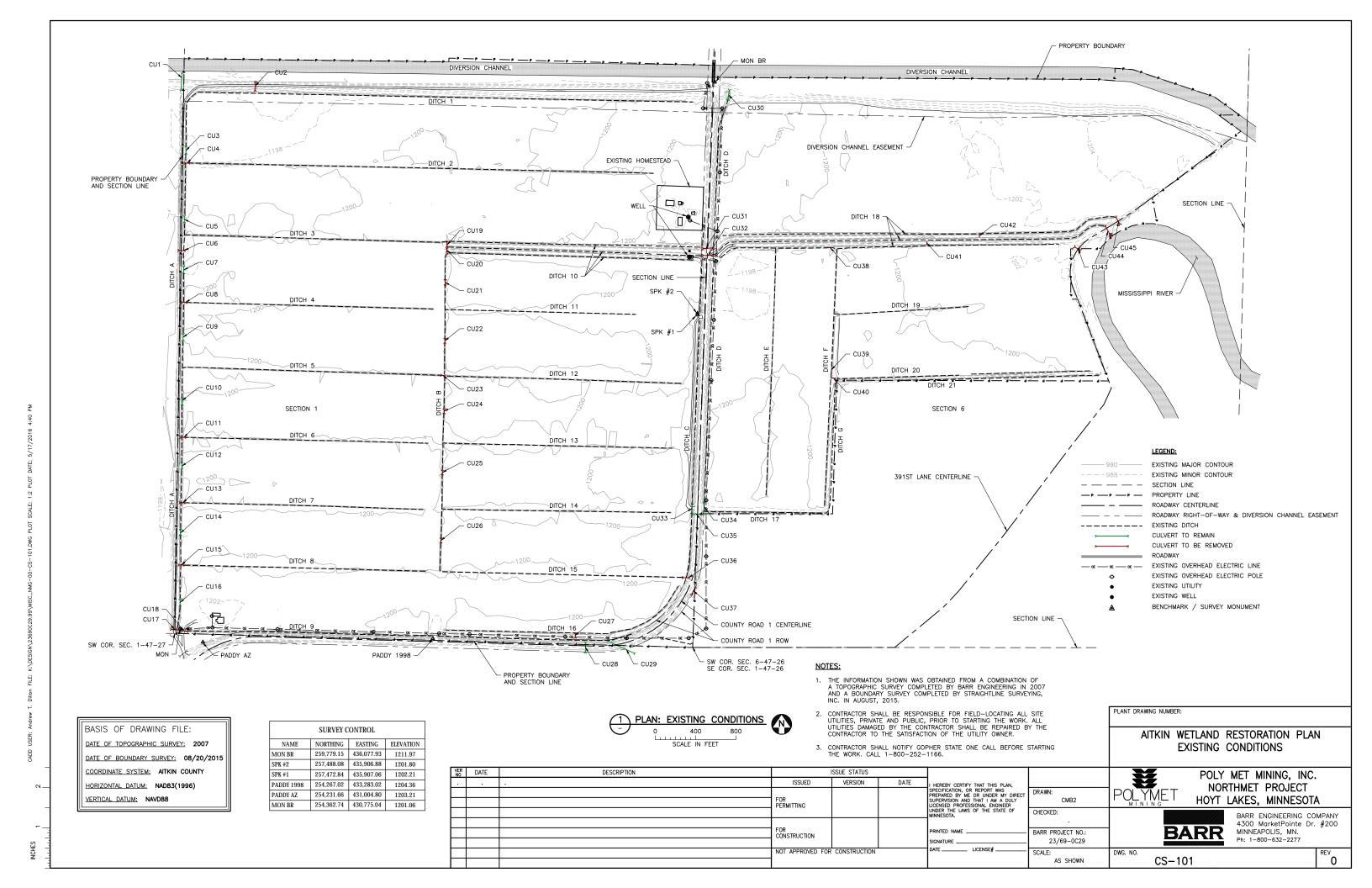
POLY MET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA

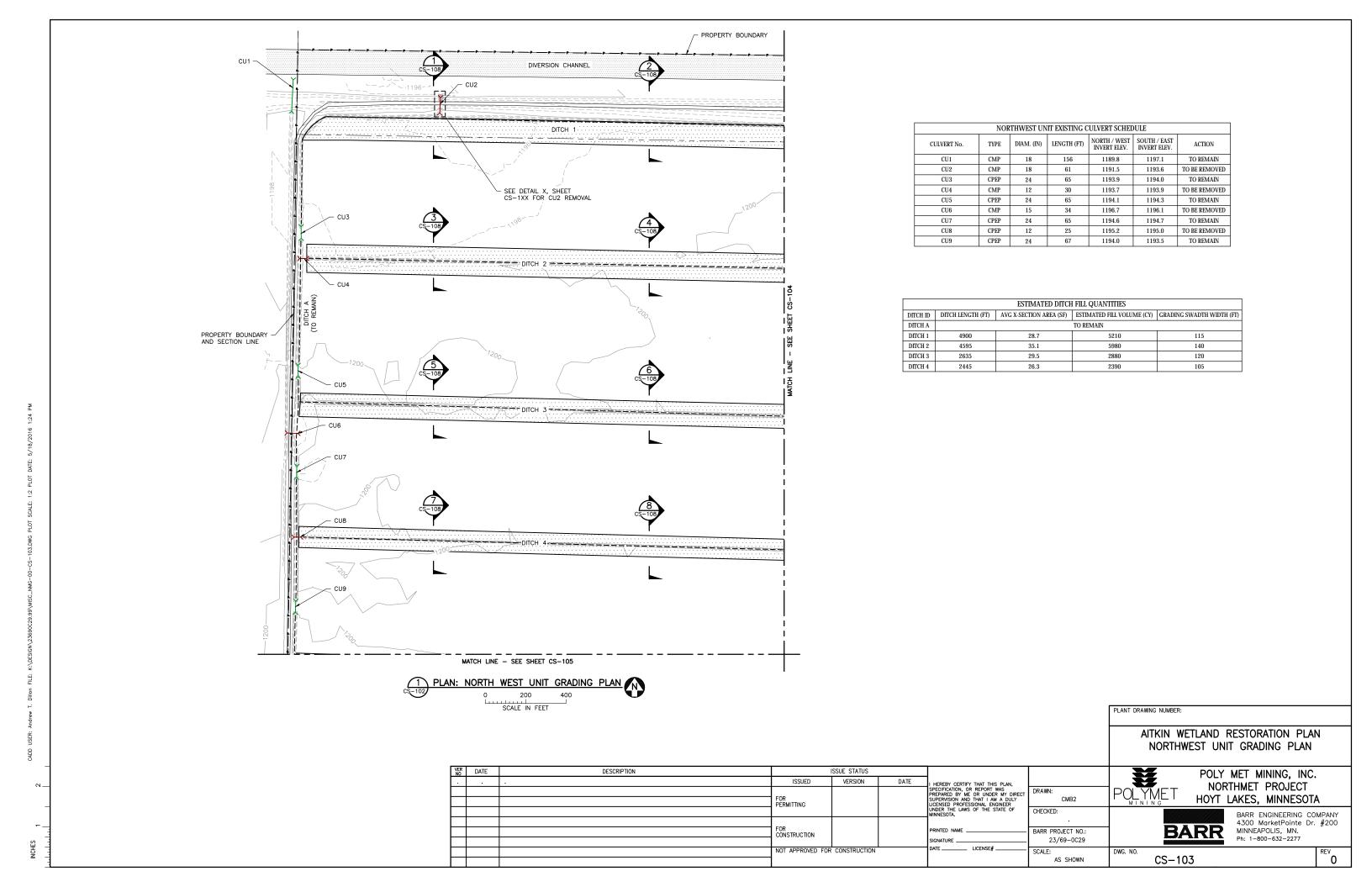
AITKIN WETLAND RESTORATION PLAN TITLE SHEET, INDEX

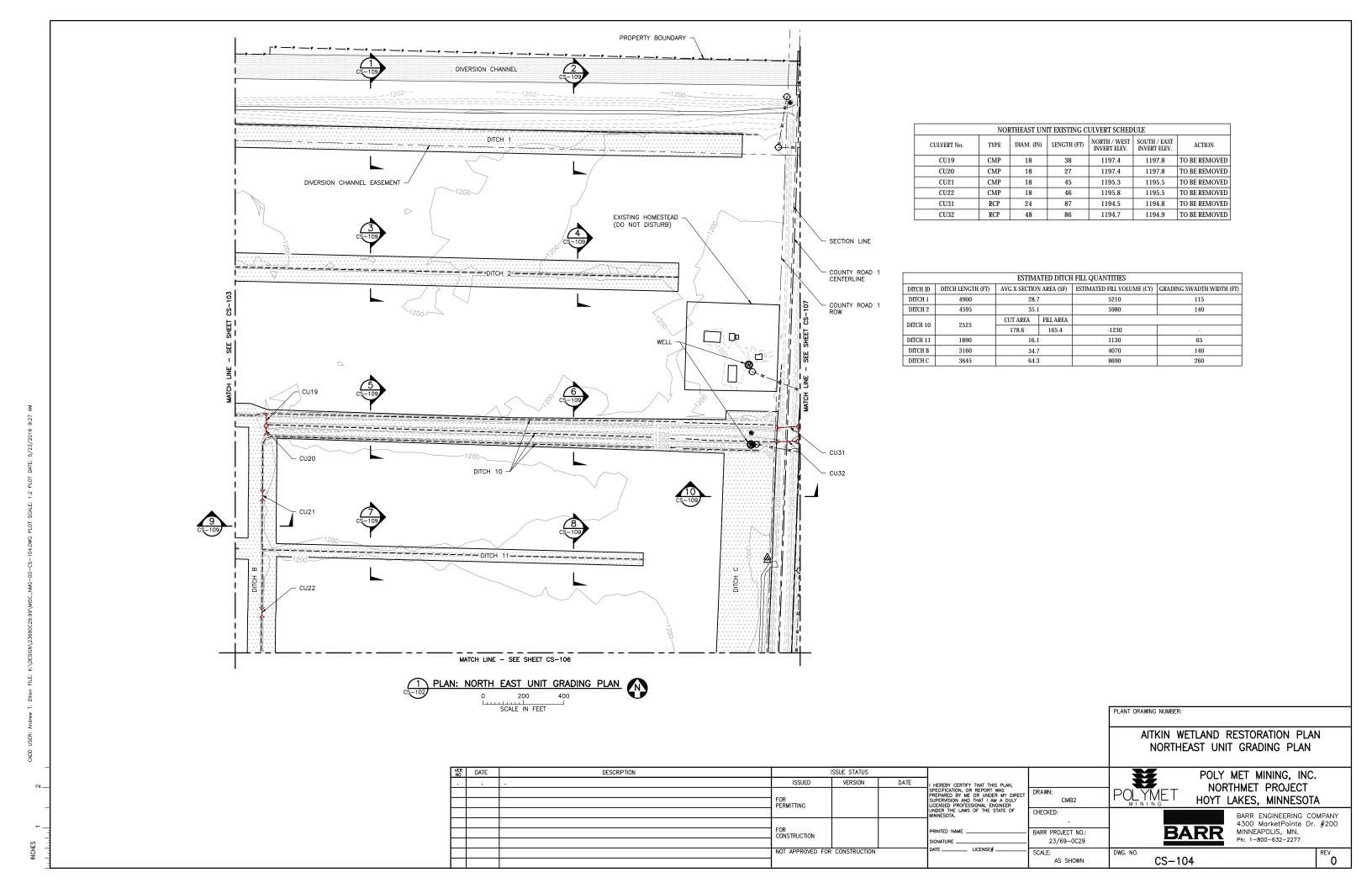
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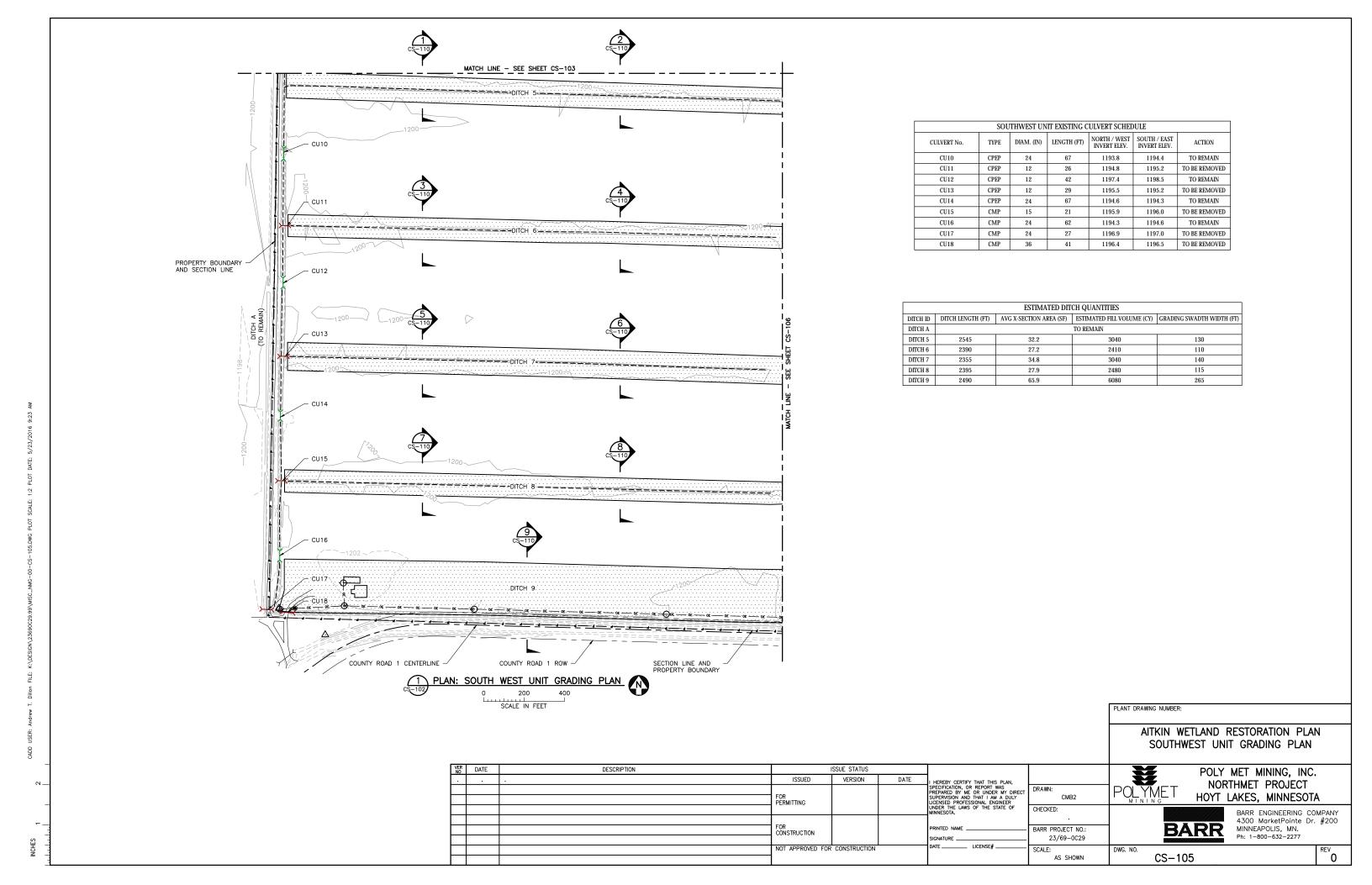
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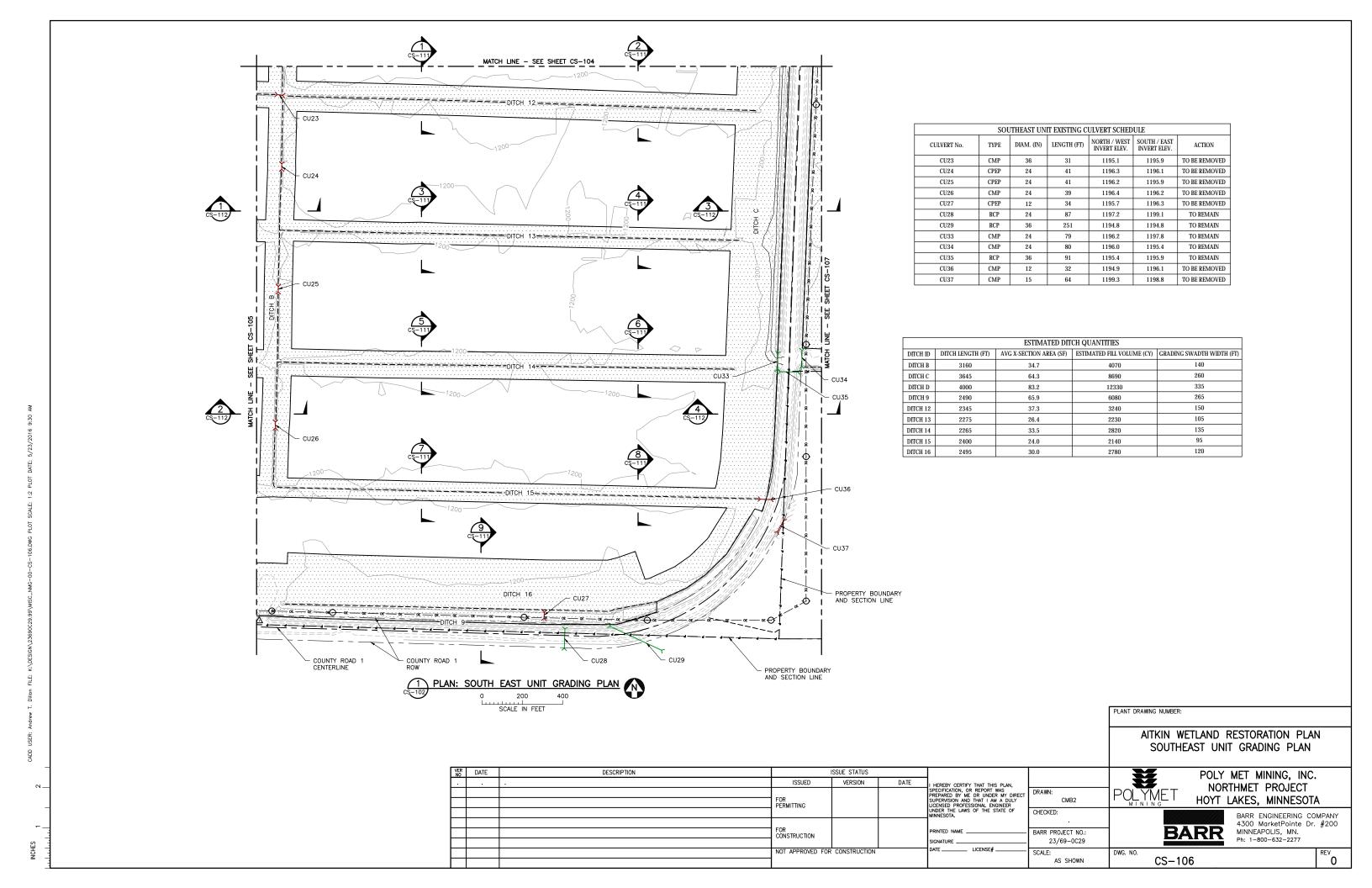
TS-101

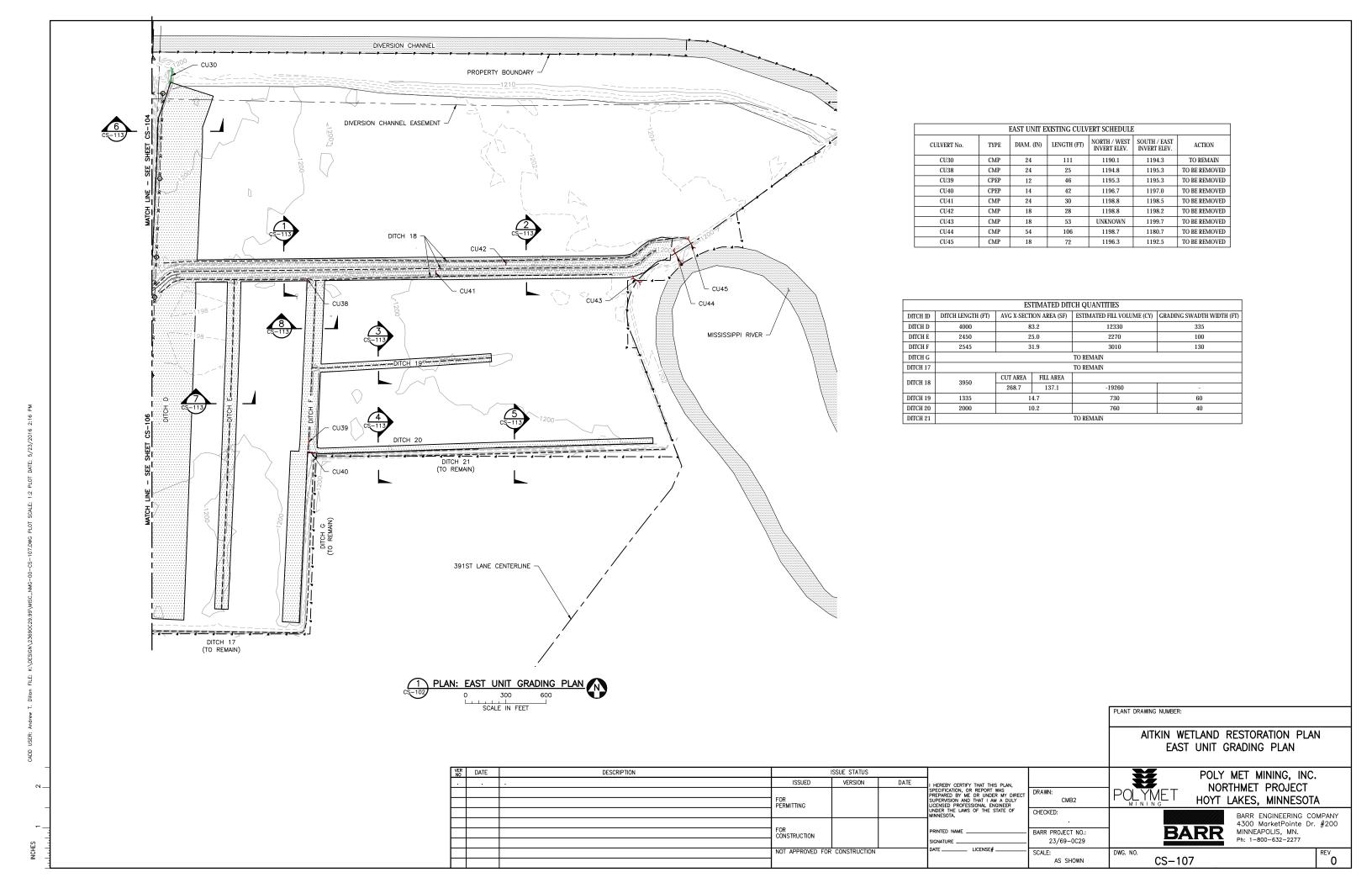


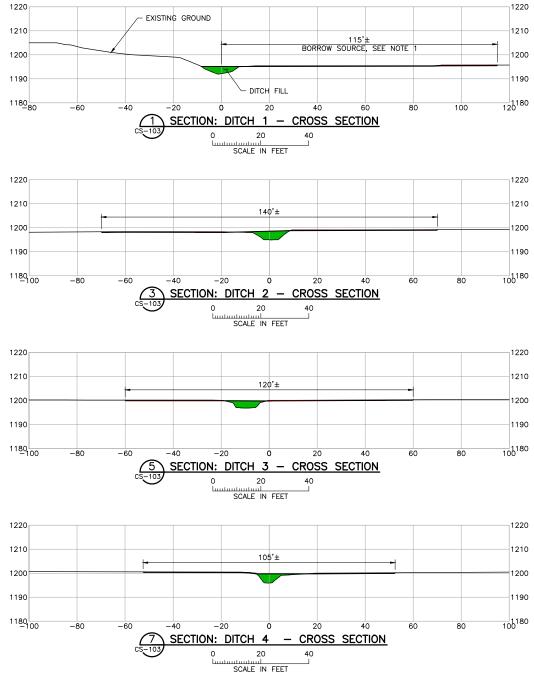






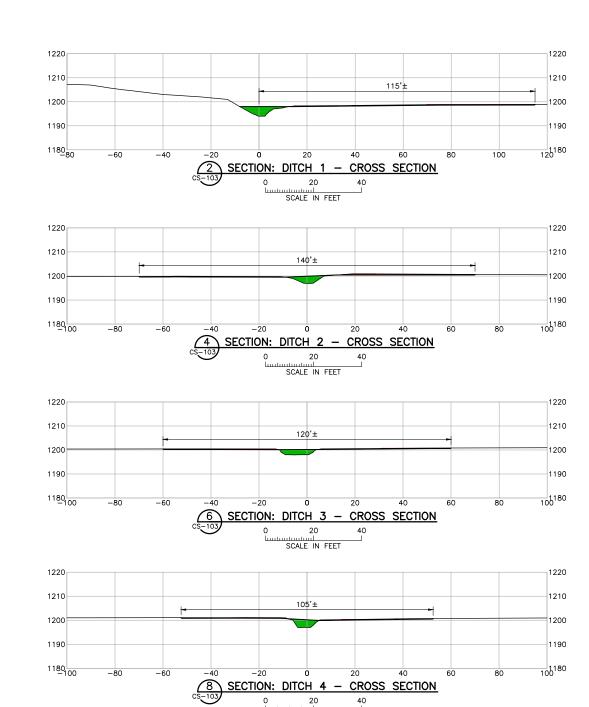








1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.



SCALE IN FEET

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN NORTHWEST UNIT CROSS SECTIONS

VER NO	DATE	DESCRIPTION	ISSUE STATUS					3 4
			ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN,		3
			FOR PERMITTING			SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF	DRAWN: CMB2 CHECKED:	POLY
			FOR CONSTRUCTION			MINNESOTA. PRINTED NAME SIGNATURE	BARR PROJECT NO.: 23/69-0C29	
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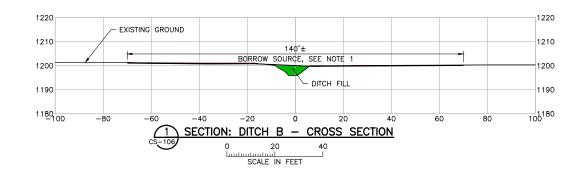
CS-108

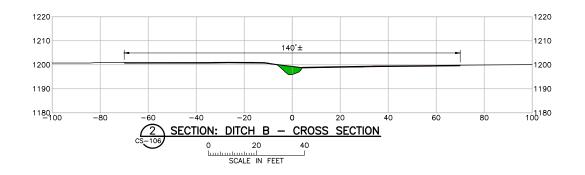
POLYMET MINING, INC. NORTHMET PROJECT HOYT LAKES, MINNESOTA

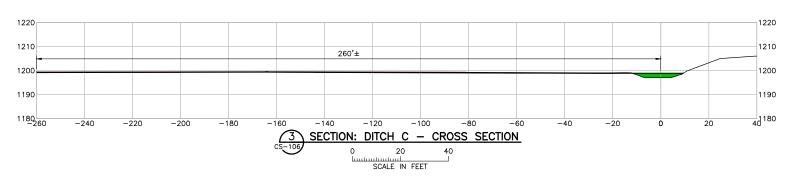
BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. Ph: 1-800-632-2277

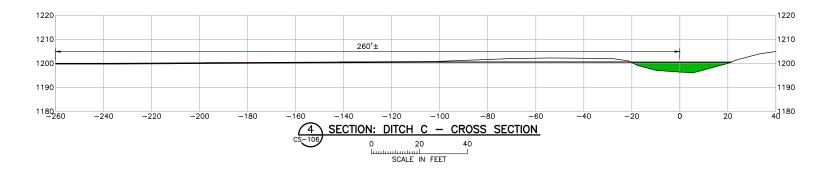
Ph: 1-800-632-2277

INCHES 1









PLANT DRAWING NUMBER:

CS-112

AITKIN WETLAND RESTORATION PLAN SOUTHEAST UNIT CROSS SECTIONS

1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.

VER NO	DATE	DESCRIPTION	ISSUE STATUS				
			ISSUED	VERSION	DATE	I HEREBY CERTIFY THAT THIS PLAN,	
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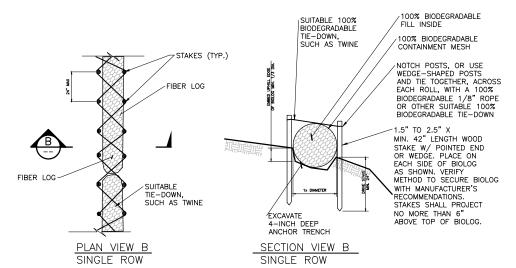
BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS, MN. BARR

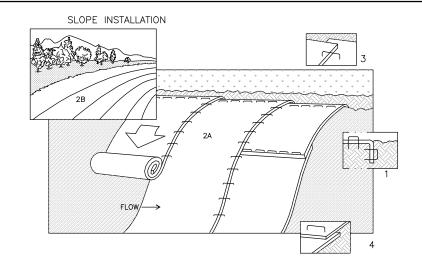
Ph: 1-800-632-2277 REV 0

NOTES:

- CORE MATERIAL SHALL BE BIODEGRADABLE OR RECYCLABLE, SUCH AS COCONUT FIBERS OR OTHER ENGINEER—APPROVED MATERIAL. CORE MATERIAL SHALL BE COMPRESSED AND STUFFED INTO A NETTING.
- 2. CONTAINMENT MESH (NETTING) SHALL BE 100% BIODEGRADABLE MATERIAL SUCH AS BURLAP, TWINE, ETC.
- 3. BIOLOG SHALL BE PLACED AS INDICATED ON THE PLANS AND WITHIN 24 HOURS OF VEGETATATION REMOVAL.
- 4. SECURE BIOLOG IN A METHOD ADEQUATE TO PREVENT DISPLACEMENT AS A RESULT OF NORMAL RAIN EVENTS, SUCH THAT FLOW IS NOT ALLOWED UNDER THE BIOLOG. ALL MATERIALS USED TO SECURE BIOLOG SHALL BE
- 5. BIOLOG SHALL BE NO LESS THAN 9" IN DIAMETER.



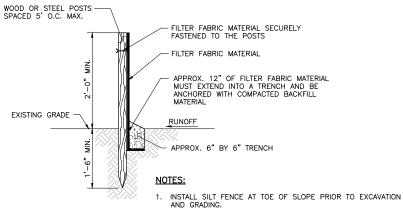




NOTES:

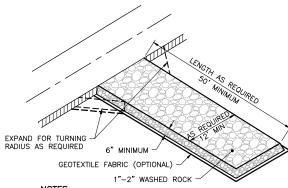
- 1. REFER TO GENERAL STAPLE PATTERN GUIDE FOR CORRECT STAPLE PATTERN RECOMMENDATIONS FOR SLOPE INSTALLATIONS.
- 1. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
- 2. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE.
- 3. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 6" OVERLAP, WITH THE UPHILL BLANKET ON TOP
- 4. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH APPROXIMATELY 6" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART.
- 5. SLOPE SURFACE SHOULD BE SMOOTH AND FREE OF ROCKS, LUMPS OF DIRT, GRASS, AND STICKS. BLANKET SHALL BE PLACED FLAT ON SOIL SURFACE TO ENSURE PROPER SOIL CONTACT.





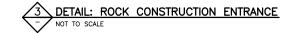
2. MACHINE SLICED SILT FENCE MEETING MnDOT SPECIFICATION 3886.1 ACCEPTABLE.

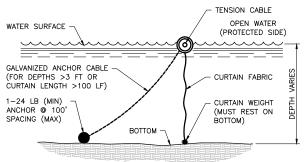




NOTES:

- ENTRANCE SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND REPAIRED OR REPLACED AS REQUIRED TO PREVENT TRACKING OFFSITE.
- 2. ENTRANCE SHALL BE REMOVED IN CONJUNCTION WITH FINAL GRADING AND SITE STABILIZATION.





NOTES:

- 1. SILT CURTAIN SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION ACTIVITIES IN AREAS BORDERING OPEN WATER.
- ANCHOR TENSION CABLE AT SHORE AT BOTH END WITH STEEL POSTS OF DIAMETER AND LENGTH SUFFICIENT TO PREVENT BENDING AND PULL-OUT.
- 3. ELIMINATE ANCHOR AND CABLE FOR WATER DEPTHS LESS THAN 3'-0" OR DISTANCE BETWEEN SHORE ANCHORS FOR TENSION CABLE OF LESS THAN 100'
- ANCHOR WEIGHT SHALL BE HEAVY ENOUGH TO HOLD CURTAIN VERTICAL IN CURRENT AND WAVES TYPICAL FOR THE SITE.
- 5. SILT CURTAIN MATERIALS SHALL CONFORM TO NDDOT SPECIFICATION 262.
- 6. SILT CURTAIN SHALL BE MAINTAINED AND REPAIRED OR REPLACED AS REQUIRED TO PREVENT DISCHARGE OF SEDIMENT.
- 7. ACCUMULATED SEDIMENT SHALL BE REMOVED PRIOR TO REMOVAL OF SILT CURTAIN.
- 8. SILT CURTAIN SHALL BE REMOVED FOLLOWING SITE STABILIZATION OR AS DIRECTED BY ENGINEER.



PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN **EROSION CONTROL DETAILS**

VER DATE DESCRIPTION ISSUE STATUS POLYMET MINING, INC. HEREBY CERTIFY THAT THIS PLAN, PECIFICATION, OR REPORT WAS REPARED BY ME OR UNDER MY DIRECT UPERVISION AND THAT I AM A DULY CORSED PROFESSIONAL ENGINEER NOER THE LAWS OF THE STATE OF UNDER THE LAWS OF THE STATE OF ISSUED VERSION DATE NORTHMET PROJECT POLTMET DRAWN: HOYT LAKES, MINNESOTA ATD FOR PERMITTING CHECKED: BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 BARR BARR PROJECT NO. MINNEAPOLIS, MN. CONSTRUCTION Ph: 1-800-632-2277 23/69-0862.00 IGNATURE _ NOT APPROVED FOR CONSTRUCTION 0 AS SHOWN CS-116

The Storm Water Pollution Prevention Plan (SWPPP) is required for the General Permit Authorization to Discharge Stormwater Associated with Construction Activity (NPDES Permit) as required by the Minnesota Pollution Control Agency (MPCA) under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS).

The project is a wetlands mitigation project, restoring existing agricultural land into wetland. The project will consist of regrading the site to eliminate internal drainage slowing runoff to infiltrate stormwater. Existing drainage system culverts will be removed and internal ditches and swales will be filled. The site will be established with native vegetation, shrubs, and trees. All disturbed sloped areas will be stabilized with mulch, erosion control blanket, or

PROJECT SIZE:

The total project area with in the construction limits is approximately 1070 acres, some of which will be disturbed during construction. There is approximately 0.0 acres of existing impervious surface that will be removed from the site and the project will not add any additional impervious surface

Special or Impaired Waters: This project discharges to county road ditches that discharge to the Mississippi River which is an Outstanding Resource Value Water (ORVW) at the east end of the project and also to the Flood Diversion Channel of the Mississippi River to the north of the Project.

No other special or impaired waters such as trout waters, wetlands, calcareous fens, will be affected by the Project. The Project will not affect properties listed by the National Register of Historic Places or archaeological sites and is not subject to additional regulations due to any formal environmental reviews, endangered or threatened

FIGURES: Site Location and Vicinity Map: Sheet TS-101 Sheet Existing Conditions Plan: Sheet CS-101 Site Plan
Stormwater Pollution Prevention Plan (SWPPP) Sheet CS 102-107 Sheet CS-120 Frosion Control Plan: Erosion Control Sections and Details:
Erosion and Sedimentation Control Quantities See Project Bid Form

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IMPLEMENTATION RESPONSIBILITIES:

- The OWNER and CONTRACTOR are Permittee(s) as identified by the NPDES Permit.

 CONTRACTOR shall be responsible for all on—site implementation of the SWPPP, including the activities of all of CONTRACTOR's subcontractors.
- CONTRACTOR shall provide a person(s) knowledgable and experienced in the application of erosion prevention and sediment control BMP's to oversee all installation and maintenance of BMP's and implementation of the
- CONTRACTOR shall provide person(s) meeting the <u>training requirements of the NPDES Permit</u> to conduct inspection and maintenance of all erosion prevention and sediment control BMP's in accordance with the requirements of the Permit. One of these individual(s) must be available for an on site inspection within 72 hours upon request by MPCA. CONTRACTOR shall provide training documentation for these individual(s) as required by the NPDES Permit. This training documentation shall be recorded in or with the SWPPP before
- the start of construction.

 Following Final Stabilization and the Termination of Coverage for the NPDES Permit, the OWNER is expected to furnish long term operation and maintenance (O & M) of the permanent storm water management system.

STORMWATER TREATMENT DESIGNS

g existing drainage systems.

SEQUENCE OF CONSTRUCTION

- CONTRACTOR shall submit a detailed construction staging, erosion control staging, and stormwater management plan for the entire project for the duration of construction.

 CONTRACTOR shall verify that all permits have been obtained and/or obtain the necessary permits.
- CONTRACTOR shall perform site inspections, record keeping and record retention in accordance with all permits.

 CONTRACTOR shall install all perimeter and down-gradient erosion control and sediment control best-management-practices (BMP's), construction entrances prior to site grading, excavation, stockpiling or
- disturbing existing vegetative cover.

 CONTRACTOR shall perform site grading, excavation, stockpiling work in accordance with the stormwater pollution prevention plan (SWPPP)
- Shown on plans & in conformance w/NPDES permit, continously during the Work.
- CONTRACTOR shall stabilize all exposed soil areas immediately to limit soil erosion but in no case stabilization must be completed within 7 days after construction activity in that portion of the site has temporarily or permanently ceased with a temporary cover crop as necessary.
- CONTRACTOR shall replace or repair erosion control and sediment control BMP's that are not functioning
- properly.
 CONTRACTOR shall perform site restoration activities for permanent vegetative establishment by others and
- shall seed exposed areas with a temporary cover crop.

 CONTRACTOR shall remove non-biodegradeable sediment control devices prior to submitting Notice Of Termination (NOT).
- Submit notice of termination to MPCA within 30 days of final stabilization.

CONSTRUCTION ACTIVITY FIELD REQUIREMENTS:

- All field requirements shall be performed in accordance with the requirements of the NPDES Permit and Stormwater Pollution Prevention Plan (SWPPP).

 The CONTRACTOR must implement the SWPPP and provide BMPs identified in the SWPPP in an appropriate and functional properties.
- The CONTRACTOR shall respond to changing site conditions and implement/supplement erosion prevention and sediment control measures utilized to provide adequate protection of disturbed soils and adequate prevention of sediment transport off—site. At a minimum, the following storm water pollution prevention construction activity field requirements shall be furnished by the CONTRACTOR.

 The CONTRACTOR shall keep and maintain an active rain guage on site to collect and contain daily
- precipitation events.

<u>EROSION PREVENTION PRACTICES:</u>
B. CONTRACTOR shall be responsible for the following erosion prevention practices:

- The CONTRACTOR shall attempt to phase all work to minimize erosion and maintain vegetative cover to the extent possible. The location of areas not to be disturbed must be delineated on the site before construction
- All exposed soils must be stabilized immediately and in no case completed no later than 7 days after the construction activity in that portion of the site has temporarily or permanently ceased, including stockpiles with significant silt, clay or organic components.

 The normal wetted perimeter of any temporary or permanent drainage ditch that drains water from a
- construction site or diverts water around a site must be stabilized by CONTRACTOR within 200 feet from the property edge, or from the point of discharge to any surface water within 24 hours of connecting to a surface water. Temporary or permanent ditch swales being used as a sediment containment system do not need to be stabilized until they are no longer used as a sediment containment system, after which they must be stabilized within 24 hours.
- Temporary or permanent energy dissipation at drainage or pipe outlets must be provided within 24 hours of connecting to a surface water.

SEDIMENT CONTROL PRACTICES
CONTRACTOR shall be responsib

- TRACTOR shall be responsible for the following sediment control practices:

 CONTRACTOR must install all down gradient perimeter controls before any up gradient disturbance begins. CONTRACTOR shall maintain perimeter controls until final stabilization.
- CONTRACTOR shall provide grading and BMP installation to limit all slopes of 3H:1V or steeper to an unbroken length of 75
- CONTRACTOR state provide gracing and communications and communications state of the tor less.

 Timing and installation of sediment control devices can be adjusted by CONTRACTOR to accommodate short-term activities such as clearing and grubbing or vehicle passage. Any short-term activity must be completed as quickly as possible and the sediment control practices must be installed immediately after the activity is completed and in all cases prior to the
- 4. If present, all storm sewer inlets and outlets shall be protected by CONTRACTOR with appropriate BMP's during the work. These practices shall remain in place until the potential sources for discharging sediment to inlets have been stabilized by CONTRACTOR.
- Temporary soil stockpiles must have silt fence, sediment control logs, or other effective sediment controls. Soil Stockpiles shall not be placed within surface waters or stormwater conveyances except to fill ditches and swales according to grading plans. CONTRACTOR shall install silt fence protection or sediment control logs around the limits of all temporary soil stockpile areas. All soil stockpiles that remain undisturbed for a period greater than 7 days shall be protected and
- stabilized by CONTRACTOR with cover of mulch, erosion control blanket, or plastic sheeting.

 CONTRACTOR shall implement measures to control vehicle tracking off site onto CSAH 1 or any other roads. Erosion control construction entrances to minimize the tracking of sediment shall be constructed of rock pads, slash mulch, mul mats, equivalent system must be installed at active project entrances and near active stockpiles by CONTRACTOR to minimize

- <u>DEWATERING AND BASIN DRAINING</u> CONTRACTOR shall be responsible for the following dewatering requirements:
- No dewatering activities are anticipated with this project.
 However, if dewatering is necessary, CONTRACTOR's dewatering activities that have sediment—laden discharge must discharge into a temporary or permanent sedimentation basin when possible, otherwise it must be discharged through some form of best management practice (BMP) by CONTRACTOR to prevent sediment from leaving the site. These BMPs may included the use of flocculents and/or polyacrilimides to satisfactorily remove sediment from the discharge. If these products are used, they cannot directly discharge to surface water. Prior to discharge, the CONTRACTOR shall perform a visual test to ensure adequate treatment is obtained in the basin or BMP and apply additional treatment as required to ensure adequate treatment. The discharge must be dispersed over an accepted energy dissipation measure and not adversely affect the receiving water or downstream landowners or wetlands.

E. INSPECTIONS AND MAINTENANCE

- CONTRACTOR shall be reponsible for performing the following inspections and maintenance:

 1. When inspections find erosion prevention and sediment control BMP's that are nonfunctional, all nonfunctional BMP's must be repaired, replaced or supplemented with functional BMP's within 24 hours after discovery or otherwise in accordance with the NPDES Permit requirements. The CONTRACTOR shall also place any additional erosion control measures deemed necessary by the ENGINEER or MPCA within 24 hours of notice.
- The CONTRACTOR must routinely inspect the site once every 7 days during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours.

 All inspections and maintenance conducted during construction must be recorded in writing by CONTRACTOR and retained with the SWPPP by CONTRACTOR. Maintenance must be completed by CONTRACTOR in conformance with NPDES permit.
- CONTRACTOR's records must include:
 a. Date and time of inspections.
 - b. Name of person conducting inspection

- b. Name of person conducting inspection.

 c. Finding of inspection including corrective action.

 d. Details of corrective action (date. Time. Party competing maintenance).

 e. Date and amount of rainfall greater than 0.5 inches in 24 hours collected on site.

 f. Documentation of changes to SWPPP.

 In areas of project where final stabilization is complete inspections can be reduced to once a month until stabilized areas have achieved the minimum of 70% vegetation cover sufficient for the CONTRACTOR to submit the Notice of Termination (NOT). These areas shall be inspected by CONTRACTOR for monthly and may be suspended during frozen conditions in winter months provided that inspections resume within 24 hours of first spring runoff or prior to resuming construction following any winter stoppage, whichever is first.
- any winter stoppage, whichever is tirst.

 All erosion control measures must be installed and maintained by CONTRACTOR according to the details included in the construction documents and in accordance with the product manufacturer's recommendations.

 All silt must be removed from silt fence by CONTRACTOR when it reaches a height equal to one—half of the height of the silt fence. CONTRACTOR shall repair or replace silt fence or sediment logs that are deemed to be nonfunctional within 24
- hours of discovery.

 Temporary and permanent sedimentation basins must be drained and sediment removed by CONTRACTOR once the sediment collected reaches one half the storage volume within 72 hours of discovery, or as soon as field conditions allow.

 All sediment deposits within surface waters or stormwater conveyances must be removed and restabilized by CONTRACTOR within 7 days of discovery, including deltas and storm sewer sediment deposits. The CONTRACTOR shall be responsible for obtaining ALL permits required, if necessary, for such sediment removal,
- CONTRACTOR shall be responsible for keeping existing paved surfaces clean of sediment. Construction entrances shall be checked daily by CONTRACTOR. If the entrance becomes inundated with sediment, the entrance will be cleaned or replaced as appropriate by CONTRACTOR. Streets and paved roads leading to and from the construction entrance shall be checked daily by CONTRACTOR for evidence of off-site sediment tracking onto paved surfaces. These areas will be swept clean of any tracked materials by CONTRACTOR as soon as possible and within 24 hours of discovery. CONTRACTOR shall extend sweeping to the extremity of any sediment tracking that occurs off site. All sweeping must be accomplished using a two step wetting and sweeping method. Dry sweeping which causes a dust cloud is prohibited.
- 10. All infiltration/filtration areas must be inspected by CONTRACTOR to ensure that no sediment from ongoing construction is accumulating over the infiltration/filtration area. Sediment accumulated over infiltration/filtration must be removed by

POLLUTION PREVENTION MEASURES

VER DATE

- <u>FOLCUTION PREVENTION MEASURES</u>
 CONTRACTOR shall be responsible for implementing the following pollution management measures on the site:

 Solid waste: collected sediment, removed drain tile, removed wood structures, culverts, asphalt, concrete millings, floating debris, paper, plastic, fabric, construction and demolition debris and other wastes must be disposed of properly and must comply with MPCA disposal requirements.
- comply with MPCA disposal requirements. Hazardous materials: oil, gasoline, paint and any hazardous substances must be stored in appropriate containers. All tanks containing hazardous materials must be double walled or contain secondary containment to prevent spills, leaks or other discharges. Restricted access to storage area must be provided to prevent vandalism. Storage and disposal of hazardous waste must comply with MPCA regulations. Contractor must have an emergency spill kit on site to remedy any spills or leaks from equipment on site
- noth equipment of a spill, Contractor must immediately notify the Owner. A defined area of the site must be designated for use as a wash area for trucks and other equipment. No engine deareasing allowed on site.
- Concrete washout containment is not expeced to be required on site.

 Portable toilets brought to the property shall be made secure (anchored) to prevent spillage from vandalism or other accidental spillage of internal liquids

The CONTRACTOR shall keep appropriate records of inspections and maintenance of erosion prevention and sediment control measures, precipitation and all other records required by the NPDES permit during the

— The SWPPP, all changes to it, and inspections and maintenance records must be kept at the site during construction by the permittee who has operational control of the portion of the site. CONTRACTOR and OWNER must keep the SWPPP on file for three years after the submittal of the notice of termination. Including the records of all inspection and maintenance conducted during construction.

NOTICE OF TERMINATION

- Permittee must ensure final stabilization of the site and submit the Notice of Termination within 30 days of final stabilization.

- Final stabilization can be achieved in the following way:
 All soil disturbing activities are complete and a uniform perennial vegetative cover with a density of 70% over the entire pervious surface has been achieved, including stabilization of all ditches and
- All permanent stormwater treatment systems meet the requirements of the NPDES Permit. Removal of all temporary synthetic and structural BMPs. BMPs designed to decompose on site may be left in place if indicated by the plan.
- Removal of sediments from storm water conveyances and permanent water quality basins.

- The Permittee must amend the SWPPP as necessary to include additional requirements. Such as additional There is a change in design, construction, operation or maintenance.
 Weather or seasonal conditions that have significant effect on discharge. Inspection is required within

 - 24 hours of a rainfall event greater than one-half inch.
 - Inspection or investigation by site operators, local, state or federal officials indicate the SWPPP is not effective.
 The SWPPP is not achieving the general objectives of controlling pollutants or the SWPPP is not
 - consistent with the terms and conditions of this permit.

 The MPCA determines that discharge may cause or contribute to non-attainment of any applicable water quality standards or the SWPPP does not incorporate the requirements related to an approved

total maximum daily load (TMDL).

— This Stormwater Pollution Prevention Plan was prepared by individual(s) trained in accordance with the

Permit's training requirements for preparation SWPPPs. Individual(s) preparing this SWPPP: PREPARED BY TRAINING / CERTIFICATION

Date of Training/Certification: January, 2005

Tom Tri, Senior Env. Scientis Water Resources Certification Program: University of Minnesota
Design of SWPPP - Mn/DOT, Arden Hills Barr Engineering Company

Recertification: May 7, 2014 May 7, 2017 218-529-8226 Certification Expiration:

RESPONSIBLE PERSONS:

RESPONSIBLE PERSONS:

— Below is a list of people responsible for this project who are knowledgeable and experienced in the application of erosion prevention and sediment control BMPs. They shall oversee the implementation of the SWPPP, inspection, and maintenance of erosion prevention, and sediment control BMPs before and during

Responsible persons:

RESPONSIBLE PERSONS IS PENDING CONTRACTOR SELECTION

OWNER'S REPRESENTATIVES OWNER: Kevin Pylka Polymet Mining Corporation Manager Env. Permitting & Compliance 6500 County Road 666 P.O. Box 475 Polymet Mining Corporation

6500 County Road 666 P.O. Box 475 Hoyt Lakes, MN 55750 218-471-2150 Hoyt Lakes, MN 55750 218-471-2150

CONTRACTOR:

Burns Excavating, Inc. 2625 County Road 21 Watertown, MN 55388 Main Phone: (952) 995-3112 Mobile Phone: (612) 685-4303

Minneapolis, MN 55435 Office: (952) 832-2764 Mobile: (612) 240-3297 miacobson@barr.com Daniel Tix Wetland Ecologist

Vice President

Barr Engineering Company 4300 Market Pointe Road, Suite 200

Steve Burns Office: (952) 995-3112 Mobile Phone: (612) 685-4303

Harr Engineering Company 4300 Market Pointe Road, Suite 200 Minneapolis, MN 55435 Office: (952) 832-2918 Mobile: (612) 540-7848 dtix@barr.com

On-Site Representative

RINTED NAME

IGNATURE ___

____ LICENSE#

Barr Engineering Company 4300 Market Pointe Road, Suite 200 steve@burnsexcavating.net Minneapolis, MN 55435 Office: (952) 832-2600

BARR PROJECT NO.

23/69-0029

AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

DESCRIPTION ISSUE STATUS VERSION ISSUED DATE HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS REPEARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY ICENSED PROFESSIONAL ENGINEER INDER THE LAWS OF THE STATE OF DRAWN: POLYMET FOR PERMITTING ATD CHECKED:

NOT APPROVED FOR CONSTRUCTION

CONSTRUCTION

BARR

BARR ENGINEERING COMPANY 4300 MarketPointe Dr. #200 MINNEAPOLIS. MN.

POLY MET MINING. INC.

NORTHMET PROJECT

HOYT LAKES, MINNESOTA

Ph: 1-800-632-2277

CS-117

Attachment F

Monitoring Plan for Potential Indirect Wetland Impacts



Monitoring Plan for Potential Indirect Wetland Impacts NorthMet Project

Prepared for Poly Met Mining Inc.

February 2016

Monitoring Plan for Potential Indirect Wetland Impacts February 2016

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Acronyms

Acronym	Description
FTB	Flotation Tailings Basin
MDNR	Minnesota Department of Natural Resources
NPC	Native Plant Community
USACE	U.S. Army Corps of Engineers
WCA	Wetland Conservation Act

1.0 Introduction

This document describes the monitoring plan for potential indirect wetland impacts for the Poly Met Mining Inc. (PolyMet) NorthMet Project (Project). The Project is located in St. Louis County, northeast of Hoyt Lakes, Minnesota, as shown in Large Figure 1.

As described in Reference (1), Reference (2), and Reference (3), an analysis was conducted to establish an estimate of potential indirect wetland impacts; this analysis was based on the following six factors:

- Changes in wetland watershed areas (during operation and long-term closure)
- Groundwater drawdown resulting from open pit mine dewatering
- Groundwater drawdown resulting from operation of the Flotation Tailings Basin (FTB) including groundwater seepage containment
- Changes in stream flow near the Mine Site and FTB and associated impacts to wetlands abutting the streams (during operation and long-term closure)
- Wetland fragmentation from Project elements such as open pits, stockpiles, haul roads, etc.
- Potential change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and FTB operations

Each wetland was assessed to determine whether it could potentially be affected by any of the six factors listed above. A wetland could potentially be indirectly impacted by none of the factors, or up to a maximum of six factors. A potential indirect impact rating was developed based on the number of factors that may potentially affect a wetland – from No Impact (0 factors) to 6 (all six factors potentially indirectly impacting the wetland).

The analysis was conducted in order to help identify wetlands that would be the focus of monitoring for potential indirect impacts. Monitoring will occur within all wetlands containing a potential indirect wetland impact factor rating of 3-5 and a sampling of those wetlands with factor ratings of 1-2. Therefore, wetlands selected for inclusion in the monitoring plan reflect the results of the potential indirect wetland impact analysis. For more information on the analysis of potential indirect wetland impacts, see (Reference (1)).

Hydrology, vegetation, and wetland boundaries will be monitored, documented, and compared with baseline monitoring and reference wetlands to determine if indirect impacts occur at the Site. A total of 61 monitoring wells, including five reference wells have been installed to document potential indirect wetland impacts (Large Figure 2 and Large Figure 3). The monitoring program summarized below will continue for the life of the Project and post-Project. As described in Section 6.0, an adaptive approach will be used to continue to evaluate the monitoring strategy. Section 7.0 describes proposed mitigation should indirect impacts occur.

The outline of this document is:

Section 2.0	Description of the hydrology monitoring that will be conducted as part of the monitoring program
Section 3.0	Description of the vegetation monitoring that will be conducted as part of the monitoring program
Section 4.0	Description of the wetland boundary evaluation
Section 5.0	Description of the potential indirect wetland impact assessment
Section 6.0	Description of the adaptive management strategy
Section 7.0	Description of proposed mitigation for potential indirect impacts

2.0 Hydrology Monitoring

Wetland hydrology monitoring, as described in the Wetland Management Plan (Reference (4)), will occur at the Mine Site and the Plant Site. The objective of wetland hydrology monitoring is to document preproject hydrology conditions, and, during Project operations, assess whether the wetlands have been impacted by the potential indirect impacts discussed above an in Reference (5) and Reference (6). Locations of wetland hydrology monitoring wells for assessment of potential indirect wetland impacts are shown on Large Figure 2 and Large Figure 3.

The pre-project wetland hydrology monitoring study has followed the protocols described in Reference (7), Reference (8), and Reference (9). The objectives of wetland hydrology monitoring are to:

- Gain a better understanding of the wetland hydrology at the Project site, i.e., defining whether specific wetlands are recharging the surficial deposits aquifer or are discharging to surface waters.
- Collect baseline hydrology data that could be used to assess the effect of the Project on wetland hydrology.
- Determine the potential for indirect wetland impacts resulting from the Project.

Wetland hydrology monitoring will be conducted during operation of the Mine Site and Plant Site to document potential indirect wetland impacts. The wetland hydrology monitoring plan has been developed as described in the Revised Wetland Permit Application (Reference (6)). The plan was developed with the purpose of meeting the Section 404 and Wetland Conservation Act (WCA) permit conditions, which will describe the purpose, methods, and criteria to be implemented to document potential indirect wetland impacts.

2.1 Pre-Project Mine Site Area Wetland Monitoring

Large Figure 2 shows the locations of all current monitoring wells in the Mine Site and Transportation Corridor (Mine Site area). As described in Reference (4), pre-project hydrology monitoring at the Mine Site area began in 2005, and has continued yearly through 2015, and will continue in 2016. There are 46 wetland hydrology monitoring wells in the Mine Site area, including three monitoring wells located in reference wetlands (Large Figure 2).

Hydrology monitoring at the Mine Site has evolved over time, and wells were installed in 2005, 2008, 2010, and 2014. In 2005, there were 20 shallow manual wells and 4 recording wells initially installed at 19 locations in the Mine Site area (Reference (10)). In 2008, two wells were removed because they were located within future stockpile footprints, two new wells were added and one well was relocated out of the potential direct impact area (Reference (8)). Starting in 2008, all monitoring locations were instrumented with recording wells so water levels could be recorded every 2 to 4 hours. The monitoring wells were typically placed to a depth of 2 to 5 feet below the ground surface.

In 2010, two wells were relocated because they were determined to be in areas that will be directly impacted by the Project (Reference (9)). During 2008 through 2010, there were 21 locations monitored at the Mine Site (References (10) and Reference (11)). In 2014, wetland monitoring wells were installed at 25 additional locations at the Mine Site and Transportation and Utility Corridors. All wells were installed following the protocols described in Reference (7).

Two reference wetlands were selected in 2008, located west of the Mine Site (Reference (8)). In 2014, a third reference wetland was selected, located to the southwest of the Mine Site (Reference (5)). One shallow monitoring well was installed in each reference wetland. The purpose of monitoring the reference wetlands is to document the natural hydrology fluctuations in wetlands that will not be affected by the Project to facilitate interpretation of the Project data in relation to climatic fluctuations.

2.2 Pre-Project Plant Site Area Wetland Monitoring

Large Figure 3 shows the locations of all current monitoring wells in the Plant Site area. As described in Reference (4), pre-project hydrology monitoring began in 2010, and has continued yearly through 2015, and will continue in 2016.

There are 15 wetland hydrology monitoring wells in the Plant Site area. Wells were installed in 2010 and 2014, following the protocols described in Reference (7). Electronic water level data were collected every 4 hours during the six growing seasons. The monitoring wells were typically placed to a depth of 2 to 5 feet below the ground surface.

Shallow monitoring wells were initially installed at eight locations, including a reference wetland location, near the Plant Site in 2010, primarily north and west of the FTB (Reference (9)). In 2014, shallow monitoring wells were installed at seven additional locations in the Plant Site area, including a second reference wetland location.

One reference wetland was selected in 2010, located approximately 2.2 miles north of the Plant Site (Large Figure 3). In 2014, a second reference wetland was selected was installed approximately 2.2 miles northeast of the FTB (Large Figure 3). One shallow monitoring well was installed in each reference wetland. The purpose of monitoring the reference wetlands is to document the natural hydrology fluctuations in wetlands that will not be affected by the Project to facilitate interpretation of the Project data in relation to climatic fluctuations.

3.0 Vegetation Monitoring

Vegetation monitoring, as described in the Potential Indirect Wetland Impact Vegetation Monitoring Plan (Reference (12)), will occur in wetlands that may be potentially indirectly impacted by the Project. The objectives of vegetation monitoring are to:

- Establish baseline vegetation community data at all wetland hydrology monitoring well locations.
- Use the wetland hydrology and vegetation data to monitor whether changes occur over time in order to determine if indirect wetland impacts result from the Project.

Wetland vegetation monitoring will be conducted pre-Project (baseline conditions), during operation of the Mine Site and Plant Site, and post-Project. The plan was developed with the purpose of meeting the Section 404 and WCA permit conditions, which will describe the purpose, methods, and criteria to be implemented to document potential indirect wetland impacts.

Pre-project baseline vegetation monitoring was conducted in June 2015 by establishing vegetation relevés at each of the 61 well locations (Large Figure 2 and Large Figure 3). Subsequent vegetation monitoring will continue every two years for the first six years and every five years after that, unless triggers for hydrology or vegetation indicate the need for more frequent vegetation monitoring (as described in Section 5.1).

3.1 Vegetation Monitoring Protocol

The protocol described in the following sections summarizes methodology for locating the vegetation relevés and monitoring potential indirect wetland impacts for the Project. The time periods for monitoring include pre-Project (baseline conditions), during the Project, and post-Project.

The Potential Indirect Wetland Impact Vegetation Monitoring Plan (Reference (12)), was provided for review to the U.S. Army Corps of Engineers (USACE) and Minnesota Department of Natural Resources (MDNR) – Lands and Minerals. Based on comments from the USACE, bryophyte transects and collection of bryophytes was included in the survey for each relevé.

3.1.1 Establishing and Monumenting Relevés

The relevé center was be established near each associated shallow groundwater well; however, the shallow groundwater well is not located in the relevé. This is because repeated visits to the wells could result in changes in vegetation that are not related to changes in hydrology. The center of the relevé was recorded with a GPS unit. Where feasible, a distance and bearing from the relevé center to the associated well was recorded as a secondary means of re-establishing the relevé center on subsequent monitoring visits. Relevés were laid out, wherever feasible, with the centerline of the relevé on a north-south axis. If laying out the relevé on a north-south axis resulted in portions of the relevé lying outside of the vegetation community type associated with the well, then the centerline was rotated to get all or as much of the relevé within the same vegetation community type. Where relevés could not be laid out on a north-south axis, the orientation of the centerline through the relevé was recorded (e.g., 285°).

Photographs were taken, at a minimum, from the relevé center in all four cardinal directions, and from the relevé corners, facing inward to the center. Photographs were intermediate to wide-angle to maximize the view of all strata.

3.1.2 Vegetation Relevé Monitoring

Vegetation relevé monitoring was conducted to characterize baseline conditions in the wetlands and will continue in the future in order to evaluate whether potential indirect impacts result from the Project. The relevé monitoring will be replicated every two years for the first six years, and every five years after that to determine if the wetlands are potentially indirectly impacted by the Project. Vegetation will be monitored in 61 permanent relevés, which include five reference relevés. Each relevé is located near one of the existing 61 shallow groundwater monitoring wells (Large Figure 2 and Large Figure 3).

Each relevé measures 10-meters by 10-meters in non-forested communities. Relevés in forested communities are 20-meters by 20-meters for shrub and tree strata, with a 10-meter by 10-meter herbaceous and vine plot nested within the larger relevé. The size for the relevés was selected based on the MDNR relevé method, which uses the same size for relevés (Reference (13)). The four corners of each relevé were flagged and the points were located using GPS (with sub-meter accuracy) so that the relevé is easily located in subsequent years of monitoring.

Vegetation in the monitoring relevés will continue to be inventoried during June or July when most plant species will be readily identified by botanists/ecologists. Surveyors will continue to record the species name and cover class for all plant species present within the plot. All vascular plants observed within the plots will continue to be identified to the genus level and preferably to species. All plant species that cannot be identified in the field will also be recorded so their cover can be estimated; voucher specimens will be collected for later identification. The botanical team will continue to estimate the absolute cover of each plant species identified within the relevé.

The vegetation monitoring includes characterization of the vegetation community structure, including the relevé and wetland community in which each well is located. The documentation includes vegetation community type (see Section 3.1.4 below), type(s) of observed disturbance(s), disturbance level and extent, percent cover of forested canopy, percent sphagnum cover, percent non-sphagnum bryophyte cover, and percent cover by four stratum classes. The four stratum classes are defined as trees (woody plants 3 inches or more in diameter at breast height), sapling/shrub stratum (woody plants less than 3 inches in diameter at breast height and greater than one meter tall), herbaceous layer (consists of all herbaceous plants including herbaceous vines, regardless of size, and woody plants less than 1 meter tall), and woody vines (consists of all woody vines greater than 1 meter in height).

3.1.3 Vegetation Meander Survey

In addition to the relevé survey, timed vegetation meander surveys (meander survey) are also conducted in the vicinity of the relevé, within the wetland community where each monitoring well is located. The meander survey is only conducted within the wetland community type specified for the monitoring well (Attachment A of Reference (12)). The purpose of this meander survey is to document additional species

within the wetland community that were not observed and identified during the relevé survey. The additional documentation of plant species along the meander survey augments the relevé inventory, and yields a more comprehensive measure of species richness at each plot.

At the beginning of the meander survey, the biologist meanders for at least 20 minutes, documenting every plant species observed while walking through the wetland community. During this 20 minutes, the biologist meanders for 15 minutes while recording every observed species; during the final 5 minutes, if more than 2 new species are observed and recorded, the biologist continues to meander for an additional 5 minutes (for a total time of 25 minutes). At the end of the meander survey, the estimated cover for each observed species is estimated by the biologist.

3.1.4 Vegetation Community Monitoring

Vegetation community characterization and mapping is conducted for each relevé, and for community types immediately adjacent to the vegetation community in which the relevé is located. Adjacent community types are determined according to the Eggers and Reed community types (Reference (14)) and the Native Plant Community (NPC) classification system based on MDNR ecological land classifications (NPC), documented to the NPC Class Code level (e.g., APn80) (Reference (15)). Baseline data includes documentation of the adjacent community types in close proximity to the wells and their dominant vegetation. Photographs were and will continue to be taken within the adjacent vegetation communities.

4.0 Wetland Boundary Evaluation

As described in the Revised Wetland Permit Application (Reference (6)) and the Potential Indirect Wetland Impact Vegetation Monitoring Plan (Reference (12)), portions of the monitored wetlands will be reviewed every five years to evaluate potential changes in wetland boundaries. Wetland boundaries will be field-delineated and located using a GPS with sub-foot horizontal accuracy. The field-based delineation will map at least 10 percent of the wetland boundary at each of the wetlands with monitoring locations (Large Figure 2 and Large Figure 3).

Pre-Project wetland boundaries have already been delineated and approved, as described in Reference (1) and Reference (6).

5.0 Potential Indirect Wetland Impact Assessment

As described in the Potential Indirect Wetland Impact Vegetation Monitoring Plan (Reference (12)), the hydrology, vegetation, and vegetation community monitoring data collected as part of this monitoring program will be evaluated to determine if adverse, indirect wetland impacts occur as a result of the Project. The evaluation of the cause of impacts should consider other sources of disturbance, including beaver activity, or introduction of invasive species and other factors, such as logging, that may be unrelated to Project activity. In addition, the evaluation will consider natural variability by comparison of the results to the reference wetland results.

5.1 Triggers for More Frequent Vegetation Monitoring

If any of the following hydrology and vegetation triggers is met, the vegetation monitoring interval may be decreased.

5.1.1 Hydrology Triggers

There are two hydrology triggers to consider, as described in the Wetland Data Package (Reference (5)):

- 1. Because a 50% reduction of the baseline wetland hydrology is considered to indicate an adverse wetland impact, a 25% reduction of the baseline wetland hydroperiod will be considered the hydrology trigger for evaluating whether the vegetation monitoring interval should be reduced.
- 2. Alternatively- Use Table 2: Summary of Potential Wetland Community Changes Due to Drawdown (Reference (5)) as a guideline to indicate the potential of water level drawdown for each wetland community type. If water level drawdown, as documented in hydrology monitoring, continues to be within the "None" Impact Sensitivity Category, no hydrology impact triggers will be met. If water level drawdown reaches the lower range of the "Moderate" Impact Sensitivity Category, the hydrology trigger will be met.

5.1.2 Vegetation Triggers

The meander vegetation survey can indicate broad changes in vegetation. The vegetation plot surveys can provide more detailed documentation of the changes.

There are triggers that may indicate the potential development of adverse indirect impacts. The vegetation triggers that are indicative of potential indirect impacts:

- 12% change in species richness;
- 12% change in living tree cover;
- Appearance of non-native invasive species in a relevé where none were previously recorded, or a 12% increase in non-native invasive cover or number of species in relevés where non-native invasive species were previously recorded; or

• A 12% reduction of native hydrophytes in the relevé.

5.2 Regulatory Impact Criteria

The triggers identified in Section 5.1 are based on regulatory impact criteria, but are more stringent in order to proactively avoid potential development of adverse indirect impacts. These triggers would be used to determine whether the monitoring frequency needs to be increased or whether other adaptive management measures need to be implemented. Regulatory criteria that may indicate an adverse, indirect wetland impact are as follows:

- 1. A 50% reduction of the baseline wetland hydroperiod. Antecedent moisture conditions based on precipitation data and reference wetland hydrology data will be considered in the evaluation of the wetland hydroperiod. The hydroperiod of a wetland is equal to the length of time and portion of the year the wetland holds ponded water or saturation within 12 inches of the soil surface. This period of time generally varies from year-to-year based on climatic conditions. Therefore, the judgment of surpassing this threshold will be evaluated considering the baseline pre-project monitoring data for each wetland conducted from 2005 through 2015.
- 2. Change in vegetation species composition and/or cover as described below, inconsistent with vegetation changes in the reference wetlands.
 - 25% change in species richness;
 - 25% change in living tree cover;
 - Appearance of non-native invasive species in a relevé where none were previously recorded, or a 25% increase in non-native invasive cover or number of species in relevés where non-native invasive species were previously recorded; or
 - o A 25% reduction of native hydrophytes in the relevé.
- 3. Changes in monitored wetland boundaries inconsistent with changes in boundaries of reference wetlands.

5.3 Reporting

The data for hydrology, vegetation, and wetland boundary monitoring will be compiled into annual reports to be submitted to the USACE, MDNR, and Minnesota Pollution Control Agency. Annual reports will include methods, results, and evaluation of potential adverse indirect wetland impacts. Vegetation and wetland boundary monitoring data will only be included in years in which that monitoring was conducted. PolyMet will discuss the results of monitoring on an annual basis with the agencies and will determine if there is a need to modify this monitoring plan.

6.0 Adaptive Management

As described in the Revised Wetland Permit Application Reference (6)), an adaptive approach will be used to evaluate the most effective monitoring strategy for potential indirect effects. The monitoring plan will be updated annually based on results from the previous year. If indirect impacts are observed, additional monitoring may be developed to focus in those areas and/or to focus on a specific impact factor. Additional monitoring may include new monitoring locations in other wetlands and more detailed delineation and vegetation data collection.

The adaptive monitoring plan will be incorporated in two phases. Phase I of the adaptive monitoring plan will be broad-based monitoring to identify changes to wetlands or changes that may affect wetlands or surface waters. Phase II monitoring may be implemented to provide a more detailed assessment in a given area to analyze a potential impact factor. If necessary, the Phase II monitoring will be designed and implemented as needed to address the changes identified in Phase I monitoring. Phase II will be used to determine the need for additional mitigation or to develop a plan to control the changes identified in Phase I and minimize future impacts to wetlands.

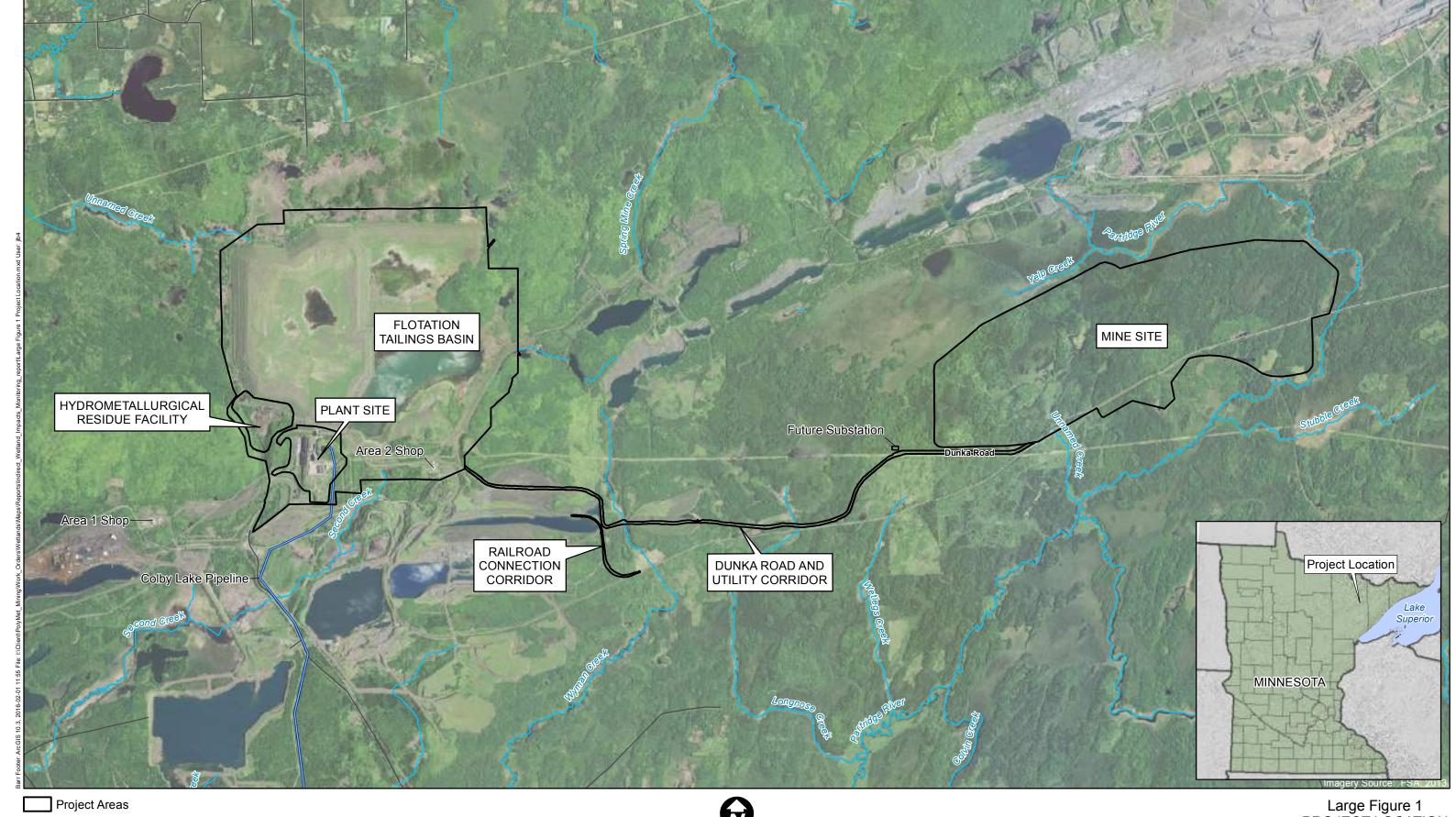
7.0 Impact Mitigation

As described in the Wetland Permit Application (Reference (6)), if indirect wetland impacts, occur, based on the criteria described Section 17.6 of Reference (6), PolyMet will work with the USACE and MDNR to respond, which will include compensatory mitigation for any documented indirect impacts. Compensatory mitigation would be based on the St. Paul District USACE Policy for wetland mitigation (Reference (16)) and as described in Section 16.3 of Reference (6). Compensatory loss of wetland area may be mitigated in accordance with the mitigation ratios of direct wetland impacts described in Section 15.0 of Reference (6). Partial drainage or other changes to the wetlands, that do not result in the wetland loss but exceed the threshold levels established in Section 17.6 of Reference (6), may be mitigated at a lower ratio depending on the extent and degree of the changes to wetland function. The minimum ratio of mitigation credit to impact would be 0.25:1.

8.0 References

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Large Figures



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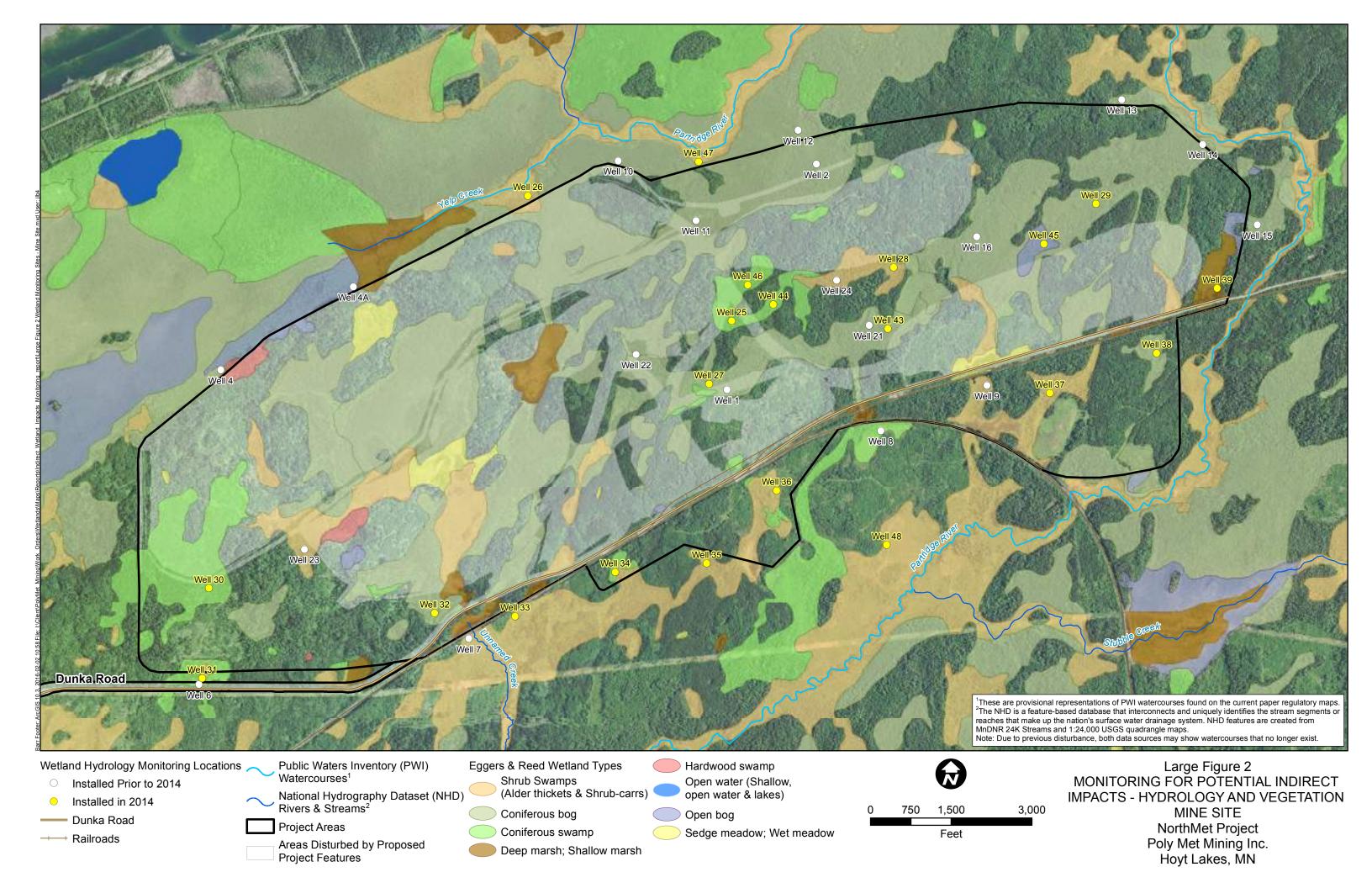
Project Areas

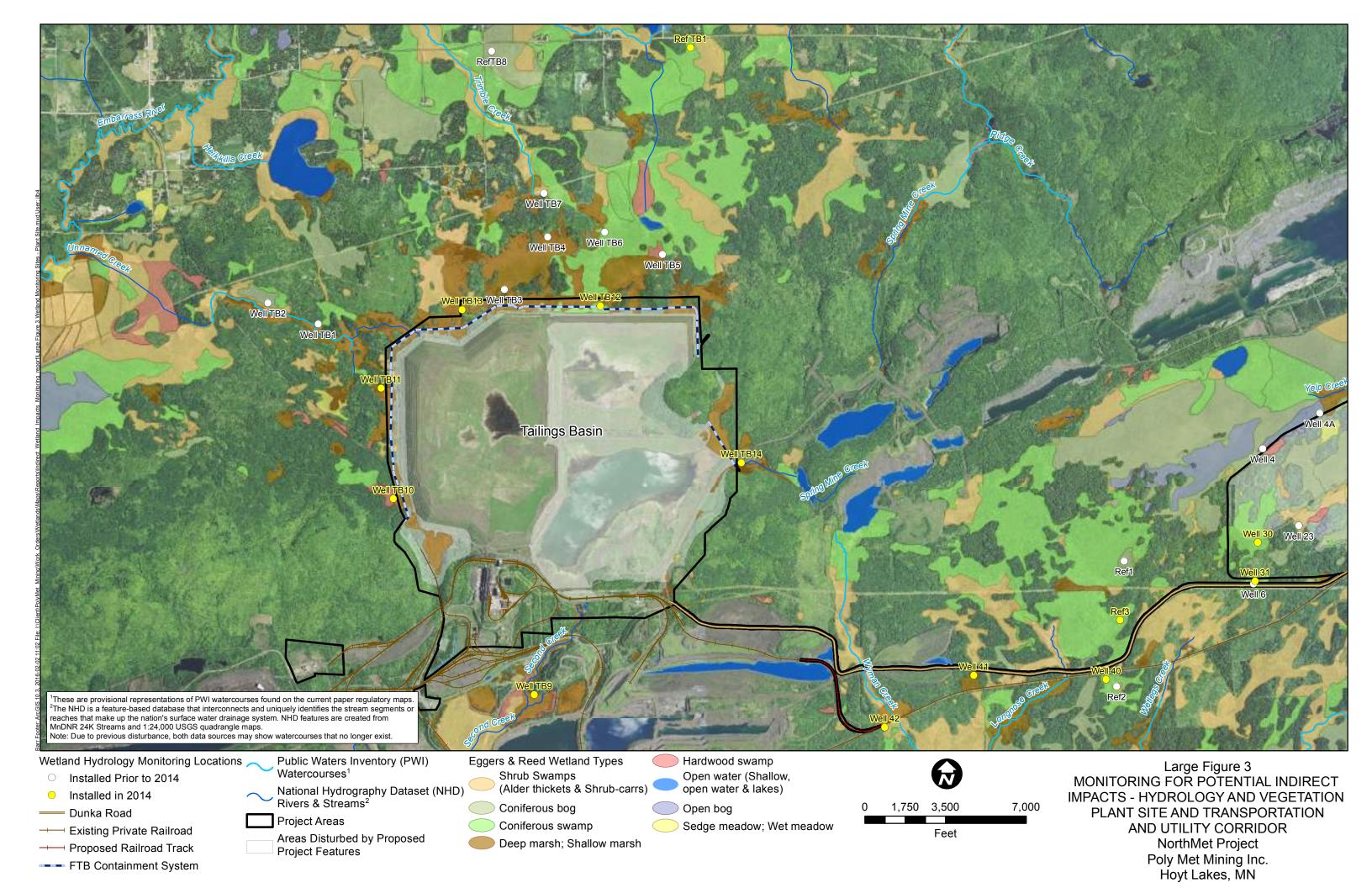
Rivers & Streams

0 2,250 4,500

Feet

Large Figure 1
PROJECT LOCATION
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



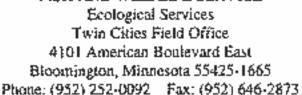


Appendix 18.2 Biological Opinion



United States Department of the Interior

FISH AND WILDLIFE SERVICE





February 5, 2016

Superior National Forest Brenda Haher Forest Supervisor 8901 Grand Avenue Place Duleth, Mtnaesoia 55808-4300 |

FWS No. 03E19000-2016-B-0001 Proposed NorthMei Project and Land Exchange

Dear Ms. Halier:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion and is based on our review of the Superior National Forest and U.S. Army Corps of Engineers. Biological Assessment for PolyMet's Proposed NorthMet Project and Land Exchange, and potential effects to Canada lynx (Lynx canadensis), Canada lynx critical habitat, gray wolf (Canis lupis), gray wolf critical habitat, and northern long-cared bat (Myotis septentrionalis). The April 2015 Biological Assessment (BA) was submitted to the Service on Angest 24, 2015, along with a request to initiate formal consultation under section 7 of the Endangered Species. Act (ESA) of 1973, as amended, 16 U.S.C. 1531 et seq.; we received it on August 27.

This biological opinion is based on the best available scientific and continercial data including meetings, electronic mail correspondence, and telephone calls with the Superior National Forest U.S. Army Corps of Engineers, and PolyMet personnel, Service files, pertinent scientific literature, discussions with recognized species authorities, and other scientific sources. A complete administrative record is on file at the Twin Cities Ecological Services Field Office.

Please contact the Service if the project changes or new information reveals effects of the proposed action to proposed or listed species or critical habitat to an extent not covered in your BA. If you have any questions or comments on this biological opinion, please contact Ms. Ann Belleman, Fish and Wildlife Biologist, via email at ann_belleman@fws.gov.

Sincerely,

Peter Fasbender Field Supervisor

Enclosure

cc: Dan Ryan, SNF District Biologist (dryan@fs.fed.us)

Susan Catton, SNF Forest Wildlife Biologist (scatton@fs.fed.us)
Michael Jimenez, SNF NEPA Project Manager (mjimenez@fs.fed.us)

Ralph Augustin, USACE Project Manager (ralph.j.augustin@usace.army.ml);

BIOLOGICAL OPINION

Effects to Canada Lynx, Gray Wolf, and Northern Long-eared Bat From the Proposed NorthMet Project and Land Exchange

FWS No. 03E19000-2016-B-0001

Prepared by: U.S. Fish and Wildlife Service Twin Cities Field Office

February 2016

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INTRODUCTION

This document transmits the Fish and Wildlife Service's (Service) Biological Opinion (Opinion) based on our review of the proposed NorthMet Project and Land Exchange within the Superior National Forest in St. Louis, Lake, and Cook Counties, Minnesota and its effects on Canada lynx (*Lynx canadensis*), Canada lynx critical habitat, gray wolf (*Canis lupis*), gray wolf critical habitat, and northern long-eared bat (*Myotis septentrionalis*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. 1531 *et seq*. The Superior National Forest's August 20, 2015 request for formal consultation was received on August 27, 2015.

This Opinion is based on information provided in the April 2015 Biological Assessment (U.S. Army Corps of Engineers and U.S. Department of Agriculture (USDA) Forest Service 2015), the Final Environmental Impact Statement (Minnesota Department of Natural Resources et al. 2015), and other sources of information. Early communication on this proposed action between the Service and Superior National Forest began in 2005 and continued until the Biological Assessment was submitted. An initial draft Opinion was submitted to the Superior National Forest and U.S. Army Corps of Engineers for review on December 23, 2015 and the revisions from subsequent discussions between the Service, Superior National Forest, U.S. Army Corps of Engineers, and PolyMet are reflected in this final Opinion. A complete administrative record of this consultation is on file at the Service's Twin Cities Field Office.

The Superior National Forest found that the proposed action may affect and is likely to adversely affect Canada lynx, Canada lynx critical habitat, gray wolf, gray wolf critical habitat, and northern long-eared bat.

Consultation History

On August 21, 2013, the Service received a draft Biological Assessment from the U.S. Army Corps of Engineers and USDA Forest Service's Superior National Forest (Forest or SNF) for early coordination and comment. Between December 2013 and April 2015, the Service received updated versions of the draft Biological Assessment from the Forest that were reviewed and subsequently discussed by phone and through electronic mail, in-person meetings, and formal correspondence. The Forest provided the final Biological Assessment for the proposed actions on August 24, 2015, which included a request to initiate formal section 7 consultation under the ESA. (See Appendix 1 for a comprehensive history.)

BIOLOGICAL OPINION

Description of the Proposed Action

We have summarized (verbatim and paraphrased) portions of the proposed PolyMet Mining Inc. NorthMet Project descriptions from the 2015 Biological Assessment (BA) and 2015 Final Environmental Impact Statement (FEIS) as they relate to Canada lynx (lynx), gray wolf (wolf), critical habitats for lynx and wolf, and northern long-eared bat (NLEB) because the description is complex and lengthy. Refer to either document for a more complete description of the proposed activities, both of which we incorporate into this Opinion by reference.

PolyMet Mining Inc. (PolyMet) proposes the NorthMet Project (Project) to open-pit mine and process polymetallic ore that contains copper, nickel gold, platinum, palladium, and cobalt for approximately 20 years, The Project is located in Township 58 North, Range 14 West, Sections 5, 6, 8, 9, 13, 14, 15, 16, 17, 23, and 24; Township 59 North, Range 13 West, Sections 1, 2, 3, 4, 9, 10, 11, 12, 15, 16, 17, and 18; Township 59 North, Range 14 West, Sections 3, 4, 5, 8, 9, 10, 11,13, 14, 15, 16, 17, 20, 23, 24, 29, and 32; and Township 60 North, Range 14 West, Sections 32, 33, and 34 in St. Louis County, on the eastern end of the Mesabi Iron Range and about 60 miles north of Duluth, and 6 miles south Babbitt, Minnesota (Figure 1).

The U.S. Army Corp of Engineers (USACE) and USDA Forest Service (hereafter USFS) have separate proposed actions on which consultation is occurring. The USACE has an application under the Clean Water Act from PolyMet to impact wetlands and other waters of the U.S. associated with the construction and operation of the NorthMet mine. The USFS is considering transferring approximately 6,495 acres of federal lands within the Superior National Forest to PolyMet in exchange for 7,075 acres of non-federal lands offered by PolyMet. The purpose of the land exchange is to eliminate a conflict between PolyMet's desire to surface mine and the United States' surface rights, including USFS administration of National Forest System land. Because the NorthMet Project is dependent on the land exchange, it is considered an interrelated activity, and as such, its effects to listed species and critical habitat must be considered in this biological opinion.

Upon completion of the land exchange, the applicant (PolyMet) intends to develop their private lands. Development of the private lands is not a USFS decision, and the USFS will not retain discretion or authority over subsequent development of the private lands once the exchange is completed. The proposed future development is an indirect effect of the proposed land exchange, however, and would not occur but for the land exchange, as is described later in this document. That is, the subsequent mining of the post-exchange private lands is reasonably certain to occur because the land exchange was proposed to facilitate PolyMet's desire to mine the lands. Off-site Wetland Mitigation Sites are also included in the proposed action.

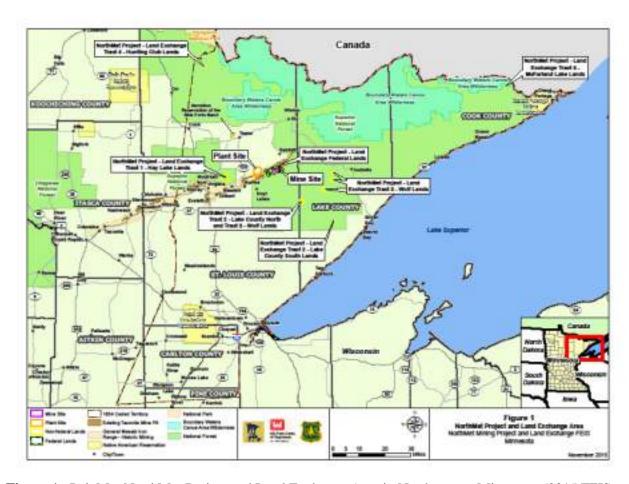


Figure 1. PolyMet NorthMet Project and Land Exchange Area in Northeastern Minnesota (2015 FEIS, Figure 1, p. ES-5).

The proposed mining and processing activities are described through four components and include the Mine Site, Plant Site, Dunka Road and Utility Corridor, and railroad connection corridor (we also combine and discuss the latter two as the Transportation/Utility Corridor) (Figure 2). Under the land exchange, the portions of the Mine Site, Dunka Road and Utility Corridor, and lands adjacent to the Mine Site that are administered by the USFS will no longer be part of the SNF and as mentioned, will not be subject to USFS management plans and policies. PolyMet is proposing to purchase and transfer all or a portion of 7,075 acres of nonfederal lands to the USFS, which include the following areas: Hay Lake lands (4,926 acres), Hunting Club (160 acres), Lake County North and South (382 acres), McFarland Lake lands (31 acres), and Wolf lands 1, 2, 3, and 4 (1,576 acres) (Figure 3).

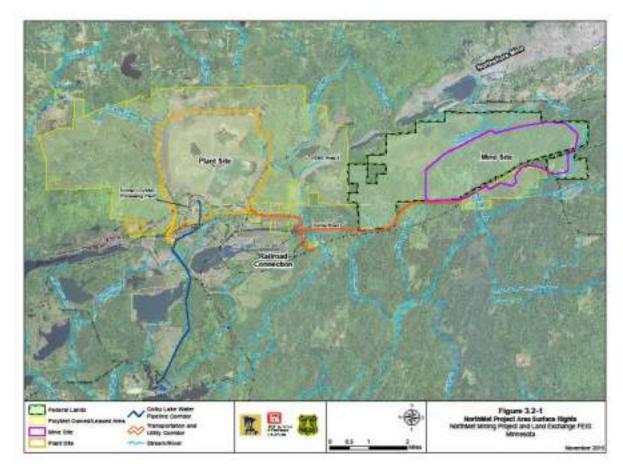


Figure 2. PolyMet Mine and Plant Site Locations (2015 FEIS, Figure 3.2-1, p. 3-9).

There are approximately 3,015 acres of federal lands at the Mine Site, of which approximately 2,719 acres are currently under federal ownership and administered by the USFS, along with 3,776 acres adjacent to the Mine Site. The Plant Site covers 4,515 acres of non-federal lands and the Transportation/Utility Corridor covers 120 acres under mixed ownership. The Project will directly impact approximately 913 acres of wetlands, including 758 acres at the Mine Site, 147 acres at the Plant Site, and 7.5 acres within the Transportation/Utility Corridor. PolyMet is proposing to purchase 2,169 acres as mitigation for wetland impacts from the Project (Wetland Mitigation Sites). The Wetland Mitigation Sites (WMS) include the following: Aitkin WMS in west-central Aitkin County, Hinckley WMS in southwest Pine County, and Zim North and Zim South WMSs in south-central St. Louis County (see BA Figure 13, p. 4-15). On the Wetland Mitigation Sites, 1,603 acres will be restored or converted to wetlands and 197 acres will be used as upland buffer.

The Mine Site includes development of up to 528 acres of open mine pits, up to 794 acres of overburden (material lying over the bedrock) and waste rock stockpiles, and 397 acres of infrastructure, including haul roads, railroad spur and transfer hopper, power distribution system, waste water treatment facility, and water collection systems (see BA Figure 4, p. 3-4). The vegetation will be stripped for these activities and developments. There will be three separate

open pits, with mining occurring on the east and west pits during the first 10 years and ending the east pit mining in year 11. The central and west pit mining is planned through year 16, during which time the central and east pits will converge into one.

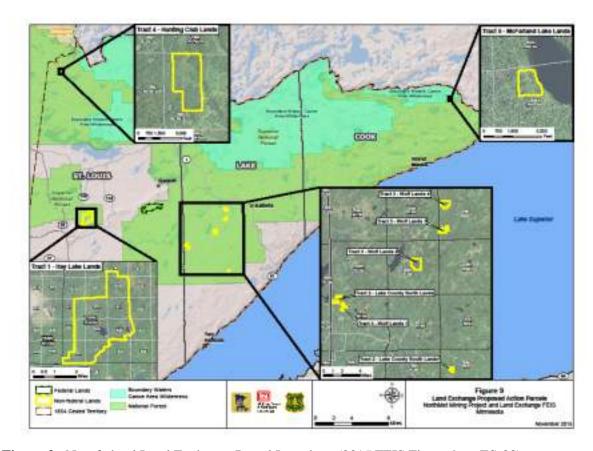


Figure 3. Non-federal Land Exchange Parcel Locations (2015 FEIS Figure 9, p. ES-33).

Ore will be excavated using drilling and blasting methods at the Mine Site, then loaded and hauled by railroad approximately 8 miles west to the Plant Site for processing. Waste rock and overburden will be stockpiled according to geochemical properties, based on percent sulfur content, with Category 1 having the lowest content and Category 4 the highest.

The Plant Site was previously used as a taconite processing facility by the LTV Steel Mining Company (LTVSMC). PolyMet will upgrade existing facilities and construct new facilities to produce copper concentrates, nickel concentrates, and base and precious metal precipitates for off-site shipment and treatment. Infrastructure will include various processing buildings and facilities, sewage treatment ponds and a waste water treatment plant, roads, and rail connections. Tailings from ore processing will be placed in a tailings basin built on the existing LTVSMC taconite tailings basin, along with reducing and/or augmenting stream flow in four tributaries.

The Transportation and Utility Corridors connect the Plant and Mine Sites. The Dunka Road will be widened, a water pipeline will be constructed adjacent to the road, and a new railroad spur will be built to connect to existing tracks. In addition to significant vehicle and train traffic to and within the Project area, there will also be transport of goods to off-site locations via rail and

existing highways.

Upon completion of mining activities after a minimum of 20 years, much of the infrastructure at the Plant Site will be razed, and most roads and other storage pads will be reclaimed. Disturbed areas will be reclaimed and revegetated. At the Mine Site, buildings and other structures also will be demolished and removed. The Category 1 stockpile will be reclaimed with grasses and forbs but woody vegetation will be removed to prevent damage to the liner system. Category 2/3 and 4 stockpiles will be progressively combined into the east pit. Mine pits will eventually be flooded and pit walls either fenced off or sloped and revegetated. Up to 397 acres of reclamation will occur at the Mine Site, some of it progressively as mining activities allow; approximately half will be suitable for woody vegetation more conducive to future Canada lynx (lynx), gray wolf (wolf), and northern long-eared bat (NLEB) use.

The Mine Site is used by wildlife, based on surveys, and opportunistic and anecdotal information. There are a variety of habitat types that will be affected by the Project including upland and lowland coniferous, deciduous, and mixed forests and wetlands. About 1,719 acres of the Mine Site will be directly disturbed by mining activities and this disturbance along with other mining-related activities within the Mine and Plant Sites, Transportation/Utility Corridor (collectively, Project area) and adjacent areas are likely to adversely affect lynx, wolf, critical habitats for lynx and wolf, and NLEB. The Transportation and Utility Corridors are mostly disturbed lands and are little used by wildlife. The Plant Site has been operated as an industrial facility for decades and has minimal value to wildlife.

Conservation Measures

In January 2016, PolyMet stated that it would carry out the following conservation measures. The Service's analysis of effects and conclusions below are based on an assumption that these activities will be implemented as described here.

These measures are based, in part, on conservation measures identified by the USFS during its review of the Project, measures in the *Lynx Conservation Assessment and Strategy 3rd edition* (Interagency Lynx Biology Team 2013) that are applicable to lynx populations throughout the contiguous U.S. and therefore apply to lynx in and around the Project area; measures identified in the *Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species: 4(d) Rule for the Northern Long-Eared Bat (USFWS 2016)*, and measures identified in the *Minnesota Wolf Management Plan* (MDNR 2001) that can benefit wolves in Minnesota.

1. Reclaim Project Area

PolyMet will reclaim about 397 acres to wetland and upland habitat at the Mine Site, including the Waste Rock Stockpiles, the Overburden Storage and Laydown Area, and the Ore Surge Pile. The stockpiles will be revegetated using a mixture of native grasses and forbs. In addition to reclamation efforts mandated by State of Minnesota law, that reclamation will include up to 202 acres identified as feasible for woody vegetation growth and planted with native trees to expedite forest

regeneration of lynx, wolf, and NLEB habitat; efforts will include collaboration with the USFS and Minnesota Department of Natural Resources (MDNR) regarding appropriate habitat restoration (e.g., tree species selection, planting density, etc.). Over time, these reclaimed areas may increasingly be used by lynx, wolves, northern long-eared bats, and their prey as coniferous and deciduous forests become established. Lynx tracking surveys at waste rock stockpiles located east of the Project area found that lynx hunt for snowshoe hare that reside in early successional shrubland and forestland habitats that have established on these waste rock stockpiles. As disturbed areas are reclaimed, they would also improve lynx, wolf, and northern long-eared bat habitat connectivity with forestlands in the vicinity of the Project.

During operation of the mine, reclamation will occur as feasible in areas where no additional disturbance is planned. However, the majority of the reclamation work will occur once operation of the mine ends.

2. Maintain Vegetated Buffers

The Project design will include measures to reduce impacts to lynx, northern long-eared bats, and wolves by minimizing the disturbance areas and new road construction, and reclaiming areas when Project activities cease. The perimeter around most of the Project area perimeter has an existing vegetative buffer. The design and operation of the Project will retain the existing vegetative buffer around the perimeter of the Mine Site, Dunka Road and railroad corridors, and Plant Site to reduce light and noise effects on lynx, northern long-eared bat, and wolf. In addition, existing and newly constructed roads (built to access the Project area) will be reclaimed after Project closure.

3. Limit Public Access to Project Area

Public access to the Project area is currently limited, and will continue to be limited during development, operation, and reclamation. PolyMet will continue to maintain an active security patrol to discourage unauthorized access and to escort trespassers off their property.

4. Minimize Road Construction and Reclaim Unused Roads

Modifications to dirt and gravel roads traversing lynx and wolf habitat within the Project area will be minimized. This will include restricting new pavement or other upgrades (e.g., straightening of curves, widening of roadway, etc.) along most of the Project's road network. Roads will be planned and designed in a manner that will discourage significant increases in traffic speeds or increased width of the right of way.

Plowed roads and groomed over-the-snow routes may allow competing carnivores such as coyotes to access lynx and wolf habitat in the winter, increasing competition for prey (Buskirk et al. 2000). However, plowed or created snow roads will be necessary to access the Project areas during construction, operation, and closure. Several studies suggest that lynx may not avoid roads, except at high traffic volumes. Therefore, at this time, there is no compelling evidence to recommend management of road density to conserve lynx. There is evidence, however, that road density can impact wolf use of an area. Therefore, the number of new roads

constructed in support of the Project will be minimized and roads will be reclaimed once they are no longer needed for the Project.

5. Educate Employees and Public

Direct mortality from vehicular collisions has affected lynx and wolf in northern Minnesota. In order to reduce the risk of wildlife-vehicle collisions, speed limits will be enforced along Project roads to benefit lynx, wolf, and other wildlife. A maximum 40 mph speed limit will be maintained on the Project's main roads and lower speed limits will be maintained on other roads in the Project area. Observing the posted speed limits will be part of PolyMet's standard rules and regulations required for staff and contractors that access the Project areas.

PolyMet will provide training for employees to: 1) make them aware of the importance of the area to wildlife such as lynx and wolf, 2) report sick, injured, or dying wildlife along roads or railroads to security staff, 3) ensure that wastes or other harmful materials are not dumped off the Project area, and 4) raise awareness of other actions that could be harmful to wildlife or their habitats such as illegal trapping or hunting. If employees report a dead animal along the road PolyMet will move the carcass away from the road edge far enough for scavenging wolves or lynx to be safely away from the line of traffic, and out of sight of traffic. PolyMet will also require that contractors and vendors accessing the site also follow these practices.

PolyMet will continue to restrict access to its property, reducing opportunities for illegal hunting; however, lynx and wolf may be mistakenly trapped or shot by legal predator hunters pursuing bobcats or other furbearers. PolyMet will consult with the USFS, and/or MDNR to obtain USFS and MDNR species identification materials to distribute to employees in order to help reduce or eliminate the incidence of illegal trapping and shooting of lynx and wolf in the region. PolyMet will also use various informational and media resources to inform the public of the possible presence of lynx and wolf within the Project area. PolyMet will consult with MDNR to identify websites and other sources of wildlife information that would be made available through the PolyMet website.

6. Lynx Monitoring

Limited research has been conducted on lynx in the contiguous U.S. and in the region. PolyMet will support and collaborate with USFS' on-going lynx occupancy surveys and DNA collection in the action area (as defined in the biological opinion) and elsewhere on the Superior National Forest as part of the on-going larger occupancy study project. Monitoring wildlife travel corridors for lynx and general wildlife use within the action area will be part of this effort and methodologies will incorporate those already being used for lynx and wolves as well as methods appropriate for wildlife in general. Within three months of the completed USFS land exchange and a USACE 404 permit for the NorthMet project, PolyMet will provide \$150,000 to the U.S. Forest Service for this monitoring, with precise terms and payment schedule to be determined at the time of the first payment. Monitoring will be accomplished by conducting initial surveys prior to implementation of any Project activities (e.g., vegetation removal) to collect baseline information. PolyMet will coordinate with USFS to schedule the initial survey such that it does not interfere with the overall Project schedule. Subsequent monitoring will occur at least during

years 1, 2, 4, 6, 8, and 10 and additionally as identified through on-going collaboration with the USFS. All data will be provided to the USFS at the end of each field season per agreement (and others as appropriate) for use and incorporation into analyses and reporting.

7. Preserve and Protect Habitat

PolyMet has avoided and minimized impacts to lynx, northern long-eared bat, and wolf habitats during design of the Project, to the extent practicable. In order to preserve and protect undisturbed habitat adjacent to the Project areas, PolyMet will manage these areas to provide suitable habitat for use by lynx, northern long-eared bat, wolf, and other wildlife.

This management will include the ongoing periodic harvesting of upland and wetland forestlands in these areas which should provide early successional habitat favored by snowshoe hare, a primary prey species for lynx. In addition, these forestlands would likely be used by lynx and wolf as a travel corridor between lands adjacent to the Project area, and for foraging and roosting habitat by northern long-eared bat.

PolyMet intends to clear trees outside of the bat's pup season, from June 1 through July 31, to the extent practicable, in order to avoid potential indirect take of the northern long-eared bat, per the final 4(d) rule published on January 14, 2016. In the event that trees need to be cleared during the pup season, PolyMet will contact USFWS prior to any tree clearing, to determine whether any known, occupied maternal roost trees are documented within 150 feet of the proposed tree clearing. PolyMet will not remove any known occupied maternal roost trees or other trees within 150 feet of a known occupied roost tree during the pup season.

Northern Long-eared Bat Final 4(d) Rule

The Service published the NLEB Final 4(d) Rule (81FR1900) on January 14, 2016 and it goes into effect on February 16, 2016. It addresses both purposeful take and incidental take of the NLEB, with certain differences distinguished based on the occurrence of the disease white-nose syndrome (WNS). The final 4(d) rule prohibits purposeful take of NLEBs throughout the species' range, except:

- when necessary to protect human health (e.g., public health monitoring for rabies or removal of hazardous trees for the protection of human life and property);
- in instances of removal of NLEBs from human structures; or
- for the authorized capture and handling of NLEBs by individuals permitted to conduct these same activities for other bat species until May 3, 2016.

"Incidental take" is defined at 50 CFR 17.3 as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, an otherwise lawful activity." Incidental take within the context of the final 4(d) rule is regulated relative to the geographic location of the proposed activity and the occurrence of WNS. The WNS zone provides the boundary for implementation of the final rule and is defined as the set of counties with confirmed evidence of the fungus (*Pseudogymnoascus destructans*, or Pd) that causes WNS, plus a 150-mile (241 km) buffer from the Pd-positive county line to account for the spread of the fungus from one year to the next. In

instances where the 150-mile (241 km) buffer line bisects a county, the entire intersected county is included in the WNS zone. The final 4(d) rule does not prohibit incidental take resulting from otherwise lawful activities in areas not in the WNS zone. That is, in areas outside the WNS zone, there are no prohibitions on incidental take.

For NLEBs within the WNS zone but outside of hibernacula, the final 4(d) rule establishes separate incidental take prohibitions for activities involving tree removal and those that do not involve tree removal. Incidental take of NLEBs outside of hibernacula that results from activities other than tree removal is not prohibited if they do not result in the incidental take of NLEBs inside hibernacula or otherwise impair essential behavioral patterns at known hibernacula.

For areas of the country impacted by WNS (i.e., areas inside the WNS zone), incidental take is prohibited under the following circumstances:

- if it occurs within a hibernaculum;
- if it results from tree removal activities that are within 0.25 mile (0.4 km) of a known, occupied hibernaculum; or,
- the activity cuts or destroys a known, occupied maternity roost tree or other trees within a 150 foot radius from the maternity roost tree during the pup season from June 1 through July 31.

Known, occupied maternity roost trees are defined as trees that have had female NLEBs or juvenile bats tracked to them or the presence of female or juvenile bats is known as a result of other methods. Known, occupied maternity roost trees are considered known roosts as long as the tree and surrounding habitat remain suitable for the NLEB.

Status of the Species/Critical Habitat

Canada Lynx

An interagency Canada lynx coordination effort was initiated in March 1998 in response to the emerging awareness of the uncertain status of lynx populations and habitat in the contiguous United States and the onset of the listing process. The Service, USFS, Bureau of Land Management, and National Park Service participated in this effort. As a result of those efforts, three products important to the conservation of lynx on federally managed lands were produced: The Scientific Basis for Lynx Conservation (Ruggiero et al. 1999); the Lynx Conservation Assessment and Strategy (LCAS; Ruediger et al. 2000); and Lynx Conservation Agreements (CA) among the Service and various land management agencies. The CA promotes the conservation of lynx and its habitat on federal lands and identifies actions the federal agencies agree to take to reduce or eliminate potential adverse effects or risks to lynx and their habitat. The LCAS was produced in 1999 to provide a consistent and effective approach to conservation of lynx on federal lands and was used as a basis for assessing the effects of Forest Plans on lynx.

The LCAS was revised into a 3rd edition in 2013 based on new information. This information included Kolbe et al. (2007) and Bunnell et al. (2006) who published information on the effects of snowmobiling on lynx, and Squires and Ruggiero (2007) and Squires et al. (2010) who

documented the importance of multilayered stands as snowshoe hare (*Lepus americanus*) habitat. Ongoing research in Minnesota and Maine has also contributed to our understanding of lynx and snowshoe hares (e.g., Fuller et al. 2007; Homyack et al. 2007; Hoving et al. 2005; Moen et al. 2008a; Moen et al. 2010).

Species Description

The lynx is a medium-sized cat with long legs, large and well-furred paws, long tufts on the ears, and a short tail whose tip is entirely surrounded by black; the tips of bobcat tails are black only on the upper side (McCord and Cardoza. 1982). The lynx's long legs and large, well-furred paws make it highly adapted for hunting in deep snow. Adult males average 10 kilograms (22 pounds) in weight and 85 centimeters (33.5 inches) in length (head to tail), and females average 8.5 kilograms (19 pounds) and 82 centimeters (32 inches) (Quinn and Parker 1987).

Life History

Lynx evidently require large areas containing boreal forest¹ habitat. In the northeastern U.S., lynx were most likely to occur in areas containing suitable habitat that were greater than 40 square miles (mi²) (Hoving 2001). The requirement for large areas also is demonstrated by home ranges that encompass many square miles. The size of lynx home ranges varies with sex, age, abundance of prey, season, and the density of lynx populations (Aubry et al. 2000; Hatler 1988; Koehler 1990; Mowat et al. 2000; Poole 1994; Slough and Mowat 1996). Generally, it is believed that larger home ranges, such as have been documented in some areas in the southern extent of the species' range in the west, are a response to lower-density snowshoe hare populations (Apps 2000; Koehler and Aubry 1994; Squires and Laurion 2000).

Long-distance movements (greater than 60 mi; 97 kilometers (km)) are characteristic of lynx (Moen et al. 2010; Mowat et al. 2000). Lynx disperse primarily when snowshoe hare populations decline (Koehler and Aubry 1994; O'Donoghue 1997; Poole 1997; Ward and Krebs 1985). However, subadult lynx also disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. Lynx also make exploratory movements outside their home ranges (Moen et al. 2010) and are capable of moving extremely long distances (greater than 300 mi, 483 km) (Brainerd 1985; Mech 1977; Mowat et al. 2000; Poole 1997).

Recent studies of Minnesota lynx show that male home ranges varied between 11 and 201 mi² (28 and 521 km²), and female home ranges varied between 2 and 37 mi² (5 and 96 km²) (Burdett 2007). Home ranges varied during the breeding season; males tended to expand the size of their home ranges, presumably to search for females, and females tended to contract their home ranges as the birthing period approached (Burdett 2007). A study of radio-collared lynx in Minnesota documented approximately 40 percent of male and female lynx making long distance movements outside of their home range between Ontario, Canada and Minnesota (Moen et al. 2010). Of those lynx that made long-distance movements, females tended to move 62 to 124 mi (100 to 200 km) and did not return to their original home ranges, while males moved 31 to 49 mi (50 to 80 km) back and forth between Ontario and Minnesota (Moen et al. 2010). While topographic

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¹ The term "boreal forest" broadly encompasses most of the vegetative descriptions of this transitional forest type that makes up lynx habitat in the contiguous U.S. (Agee 2000).

features may influence in mountainous western states, lynx in Minnesota tended to move in nearly straight paths (Moen et al. 2010).

Snow conditions also determine the distribution of lynx (Ruggiero et al. 1999). Lynx are morphologically and physiologically adapted for hunting snowshoe hares and surviving in areas that have cold winters with deep, fluffy snow for extended periods. These adaptations provide lynx with a competitive advantage over potential competitors, such as bobcats (*Lynx rufus*) or coyotes (*Canis latrans*) (Buskirk et al. 2000; McCord and Cardoza. 1982; Ruediger et al. 2000; Ruggiero et al. 1999). Bobcats and coyotes have a higher foot load (more weight per surface area of foot), which causes them to sink into the snow more than lynx. Therefore, bobcats and coyotes cannot efficiently hunt in fluffy or deep snow and are at a competitive disadvantage to lynx. Long-term snow conditions presumably limit the winter distribution of potential lynx competitors such as bobcats (McCord and Cardoza. 1982) or coyotes.

Canada lynx prey primarily on snowshoe hares, especially in the winter when they comprise 35 to 97 percent of the diet (Koehler and Aubry 1994). Lynx may modify hunting behavior and switch to alternate prey when hare densities are low (O'Donoghue et al. 1998a; O'Donoghue et al. 1998b). Other prey species include red squirrel (*Tamiasciurus hudsonicus*), other small rodents, small carnivores, and birds, including ruffed grouse (Moen et al. 2004). Recent research indicates that the red squirrel is not an important prey species for lynx in northeastern Minnesota (Burdett 2007; Hanson and Moen 2008), similar to lynx in Montana (Squires and Ruggiero 2007), where red squirrels comprised only two percent of the winter diet of lynx. In Minnesota, Hanson and Moen (2008) found that snowshoe hare remains were found in 76 percent of the lynx scat in their study, while no evidence of red squirrels remains were detected.

Snowshoe hares have evolved to survive in areas that receive deep snow (Koehler and Aubry 1994) and prefer coniferous habitats with dense shrub understories that provide food, abundant cover to escape predators, and thermal protection during extreme weather (Fuller and Heisey 1986; Hodges and Sinclair 2005; Koehler and Aubry 1994; Monthey 1986; Pietz and Tester 1983; Wirsing et al. 2002; Wolfe et al. 1982). Early successional forest stages generally have greater understory structure than do mature forests and therefore support higher hare densities (Newbury and Simon 2005; Pietz and Tester 1983). It may take more than a few years, however, for conditions to become suitable for hares after disturbances (e.g., clearcuts and fire); such areas may not be optimal until 15-30 years after the initial disturbance, during what may be described as the sapling/large shrub stage – before the onset of self-thinning (Buskirk et al. 2000; Hoving et al. 2004; Koehler and Brittell 1990; Monthey 1986; Thompson et al. 1989). In central Labrador, for example, hare densities peaked thirty years after clearcuts, with hare densities 37 times higher than in recent clearcuts (Newbury and Simon 2005). Potvin et al. (2005) found that hare densities would likely peak no sooner than 15 years after clearcuts in southwestern Quebec and that optimal conditions took longer to develop in some boreal forest types (e.g., black spruce, *Picea mariana*). Peak densities may develop sooner in more southern forests (Newbury and Simon 2005; Potvin et al. 2005).

In the northeastern U.S., lynx were most likely to occur in areas containing suitable habitat greater than 100 km² (39 mi²) (Hoving 2001). Studies in the southern portion of the species' range have found average home ranges of 151 km² and 72 km² (58 and 28 mi²) for males and

females, respectively (Aubry et al. 2000). Home range size is likely inversely related to density of snowshoe hare (Apps 2000; Koehler and Aubry 1994; Poole 1994; Squires and Laurion 2000).

Lynx use coarse woody debris, such as downed logs, root wads, and windfalls, to provide denning sites with security and thermal cover for kittens (Koehler 1990; Koehler and Brittell 1990; McCord and Cardoza. 1982; Moen et al. 2008a; Mowat et al. 2000; Squires et al. 2008; Squires and Laurion 2000). Mowat et al. (2000) summarized lynx selection of den sites in northern Canada and Alaska as, "... female lynx appear to select den sites in a number of forest types ... do not appear constrained to select specific stand types; rather, the feature that was consistently chosen was the structure at the site itself. Wind-felled trees were the most common form of protection selected by female lynx, although other structures such as roots and dense live vegetation were also used." Downed logs and overhead cover must be available throughout the home range of females with kittens to provide alternative den and nursery sites, and security when lynx kittens are old enough to travel (Bailey 1974).

Den sites found in Minnesota were primarily in low-lying areas with dense vertical and horizontal cover (Moen et al. 2008a). They also found that all den sites studied in Minnesota were associated with a downed tree, with disturbance area varying from 20 square meters (m²) (215 ft²) to more than 1 hectare (2.5 acres). Lynx den sites consistently had lower stem density than the surrounding area, with greater than 80 percent of tree stems being coniferous species. Lowland and upland conifer types made up greater than 70 percent of the area within 100m (328 ft) of den sites and the percentage of those cover types decreased with greater distance from the den sites. These findings are consistent with USFS definitions for suitable denning habitat.

Lynx breed in spring and females give birth in late May to early June, with litters of up to five kittens. Hare densities are correlated positively with litter size, and age at first breeding is lower when hare populations are high. During the low phase of the hare cycle, few if any kittens are born (Brand and Keith 1979; Poole 1994; Slough and Mowat 1996). Litter sizes may be smaller in the southern lynx range due to lower peak hare densities (Koehler 1990; Squires and Laurion 2000), although large litter sizes do occur. Kittens wean at about 12 weeks after birth and stay with females during their first winter when they may hunt cooperatively; family units then break up at the onset of breeding, about mid-March (Quinn and Parker 1987).

The most commonly reported causes of lynx mortality include kitten starvation (Koehler 1990; Quinn and Parker 1987) and human-caused mortality (Bailey et al. 1986; Ward and Krebs 1985). Significant lynx mortality due to starvation (up to two-thirds of deaths) has been demonstrated in cyclic populations of the northern taiga during the first two years of hare scarcity (Poole 1994; Slough and Mowat 1996). Where trapping of lynx occurs legally, mortality of adults may be almost entirely human-caused during hare population lows (Poole 1994). Lynx are also killed by vehicles, disease, and other mammal species, although the significance of these factors to lynx populations is uncertain (Bailey et al. 1986; Brand and Keith 1979; Carbyn and Patriquin 1983; Shenk 2009; Ward and Krebs 1985). During a lynx irruption in Minnesota in 1971-1974 when the state allowed take by trappers, 96 percent of 128 mortalities were caused by trapping or shooting, whereas 4 percent were killed by cars (Henderson 1977). Through August 2009, of the 118 lynx that died of known or suspected causes in Colorado since the state began reintroducing the species in 1999, approximately 29.7 percent were human-induced through either collisions

with vehicles or shot, 18.6 percent died of starvation or disease/illness, and 37.3 percent were from unknown causes (Shenk 2009).

Linear features such as roads may benefit lynx from an energetic perspective, but may also have negative effects if they increase human exposure and the chance of incidental mortality (Moen et al. 2010). Of the 63 lynx mortalities recorded in Minnesota since 2000, 29 died after being trapped, 16 from unknown causes, 9 from vehicle collisions, 7 from being shot, and 2 died after collisions with trains (U.S. Fish and Wildlife Service, unpubl.data). Although there is no longer a legal harvest in Minnesota, lynx that travel long-distances into Canada are susceptible to legal harvest there (Moen et al. 2010), with 4 of the 29 trapped Minnesota lynx taken as legal harvest in Canada.

Buskirk et al. (2000) suggested that when other snowshoe hare predators, particularly coyotes, can access lynx winter hunting areas via compacted snow, they may compete for prey sufficiently to affect local lynx populations, and some study results support that theory (Bunnell et al. 2006, Burghardt-Dowd 2010). Results from the Kolbe et al. (2007) study had contrasting results, whereby coyotes did not use compacted roads any more than uncompacted roads. Overall, studies of coyote use of compacted roads and trails in winter have yielded variable results and while there may be some low level of competition for prey between lynx and coyotes, it's likely variable both spatially and temporally depending on prey availability and composition (Interagency Lynx Biology Team 2013).

Buskirk et al. (2000) also suggested that direct killing by coyotes, bobcats, and mountain lions (*Puma concolor*) could affect lynx numbers where these competitors' ranges overlap substantially with lynx; in addition, Quinn and Parker (1987) stated that "(G)ray wolves will kill lynx that they catch in the open." Bobcat home ranges often exhibit elevational or latitudinal separation from those of Canada lynx, which are better adapted to deep snow. The paws of lynx support twice as much weight on snow than bobcats (Quinn and Parker 1987). Bobcats are thought to displace Canada lynx where both felids are locally sympatric. Hybridization of lynx with bobcats has been confirmed in Maine, Minnesota, and New Brunswick with DNA analysis (Homyack et al. 2008; Schwartz et al. 2004). The hybrid animals had external physical characteristics of both species (Homyack et al. 2008).

Status of the Species and Distribution

The Canada lynx range is associated closely with the distribution of North American boreal forest inhabited by snowshoe hares (Agee 2000). It extends from Alaska and across much of Canada with southern extensions into the western U.S., including the Cascades Range and Northern and Southern Rocky Mountains western Great Lakes region, and the northeastern U.S. from Maine to New York ((Interagency Lynx Biology Team 2013).

Within the contiguous United States' transitional boreal forest, there are core areas for Canada lynx in Maine, Minnesota, Montana, Washington and likely Idaho (68 Federal Register 40076-40101, July 3, 2003). Status of Canada lynx in the Minnesota/Great Lakes region is summarized below. Outside of Minnesota in the Great Lakes region, lynx may also occur in Wisconsin and Michigan, but there is no current evidence of reproduction there and suitable habitat is limited

and disjunct from occupied habitat in Minnesota and Canada (68 Federal Register 40076-40101, July 3, 2003).

Minnesota/Western Great Lakes Region

In Minnesota, recent and historical lynx records are primarily in the northeastern part of the state, especially in the Northern Superior Uplands Ecological Section. Historically, this area was dominated by red pine (*Pinus resinosa*) and white pine (*P. strobus*) mixed with aspen (*Populus spp.*), paper birch (*Betula papyrifera*), spruce, balsam fir (*Abies balsamifera*) and jack pine (*P. banksiana*) (MDNR 2011). Unlike elsewhere within the Great Lakes and Northeast regions, most lynx habitat in northeastern Minnesota is on public lands, particularly the Superior National Forest. Mixed deciduous-boreal forest suitable for lynx habitat encompasses most of the SNF, which has been mapped into Lynx Analysis Units to promote lynx management under the SNF Land and Resource Management Plan (USDA 2004). The 2000 LCAS provided guidance for developing Lynx Analysis Units (LAUs) on federal lands in the contiguous. They do not depict actual lynx home ranges but approximate the size of a female's home range and contain year-round habitat components. The precise area of lynx occupancy in Minnesota is unknown; however, Moen et al. (2008b) estimated it to be 10,632 mi² (6,804,480 ac).

Harvest and bounty records for Minnesota, which are available since 1930, indicate approximate 10-year population cycles, with highs in 1940, 1952, 1962, and 1973 (Henderson 1977; McKevley et al. in Ruggiero et al. 1999). Lynx abundance in Minnesota appears to be directly related to population levels in nearby Canada (Mech 1980) and based on trapping records, lynx abundance in Minnesota appears to lag fluctuations in Manitoba, Ontario, and Saskatchewan by about 3 years (McKelvey et al. in Ruggiero et al. 1999). During a 47-year period (1930–1976) before cessation of legal harvest, the Minnesota lynx harvest ranged from 0 to 400 per year (Henderson 1977) and lynx were captured in the state through periods presumed to represent both population highs and lows.

In the 1990s, there were only five verified records of lynx in Minnesota (M. Don Carlos, MDNR 1994; S. Loch 2006, pers. comm.) but beginning in about 2000, their numbers evidently began to rebound. Through May 2015, genetic analyses of 1,085 samples have identified 299 individual lynx, of which 154 were males and 144 were females. There were 42 samples of lynx/bobcat hybrids, of which 13 were individuals – 8 males and 5 females (SNF 2015, unpubl. data). Lynx have been detected in more than 10 counties; however, the majority of lynx were detected in St. Louis, Lake, and Cook Counties where most of the data collection has been focused (Catton and Loch 2011). This number of lynx represents only a subset of the actual number present in the state since 2000, which is unknown.

In northern Minnesota, structural components of forests such as blowdown and deadfalls appear to be more important than forest cover type in determining lynx denning habitat (Interagency Lynx Biology Team 2013, p. 46). Most den sites in Minnesota are found in blowdown and are associated with small patches of uplands surrounded by low-lying wetland areas (Moen and Burdett 2009, pp.).

Lynx researchers have confirmed at least nine lynx dens in Minnesota by following the activities of radio-collared females in the years 2004-2006 (R. Moen 2006, pers. comm.). Moen et al.

(2008a) located kittens every year in which females were radio-collared, totaling 33 kittens in 10 litters, from 2004 through 2007.

Snowshoe hare harvest in Minnesota (the only available long-term index to hare abundance in the state) shows a very inconsistent pattern from 1941-2000. Hare abundance, as indicated by harvest, peaked in the early 1940s and 1950s along with lynx harvest, but not in the early 1950s or 1960s. In contrast, hare harvest was double any previous year from 1977-1980, yet lynx did not increase. Based on on-going northern Minnesota surveys, snowshoe hare numbers were high through the late 2000s (Erb 2009), with some slight 10-year ups and downs. Spring 2015 survey results suggest the current hare population may have declined, which would be expected with a fluctuating 10-year cycle, but the upcoming winter survey will likely provide more conclusive information (Erb 2015, pers. comm.). Canada lynx may not be legally trapped in Minnesota, where they are a protected species, but in the last 10 years, at least 15 lynx have been captured incidentally by trappers in pursuit of other species – 8 of these lynx died as a result (U.S. Fish and Wildlife Service, Bloomington, Minnesota, unpubl. data).

In previous biological opinions for federal actions that are ongoing in Minnesota, the Service anticipated various levels of take. These anticipated levels of take are described below, along with the actual recorded take that may be ascribed to each action. The Service monitors all known take and mortality of lynx in Minnesota in cooperation with the USFS.

- 2004 Up to 2 lynx per year, but no more than 20 in total, over the 15 years after the approval of the Revised Land and Resource Management Plans, Chippewa and Superior National Forests. These plans were approved in July 2004. Thus, the Service has anticipated that this take would occur between July 2004 and July 2019. Thus far, only one incidental take has been ascribed to the USFS's implementations of these plans a lynx was killed by a vehicle in April 2005 on the Superior National Forest.
- 2005 Trunk Highway 371 North, Federal Highway Administration 1 lynx over a 30 year period (2005-2035). Thus far, no take may be ascribed to this action. 2005 Trunk Highway 1, Federal Highway Administration up to 3 lynx, over a 30 year period (2005-2035). Thus far, no take has been ascribed to this action.
- 2005 Trunk Highway 53, Federal Highway Administration 3 lynx over the life of the project, a period of approximately 30 years from the start of project construction. Thus far, no take has been ascribed to this action.
- 2007 Paving of Forest Road (Denley Road), in St. Louis and Lake Counties, Minnesota, Superior National Forest 1 lynx killed by a vehicle as frequently as once every 10 years, on the 10.4 miles of FR 424 to be reconstructed. Thus far, no take has been ascribed to this action.
- 2007 Mittal Steel, Minorca Mine Inc. East Reserve Project, U.S. Army Corps of Engineers 1 lynx killed by a vehicle once every 16 years in the action area. Thus far, no take has been ascribed to this action.

- 2009 Mesabi Nugget, U.S. Environmental Protection Agency 1 lynx killed by a vehicle during the 30 year project period. Thus far, no take has been ascribed to this action.
- 2011 Continued Implementation of the Revised Superior National Forest Land and Resource Management Plan, USFS –1 lynx per year over the life of the Forest Plan of 10 years. Thus far, no take has been ascribed to the continued implementation of the Superior National Forest Plan.

Collectively, we anticipated the above actions would result in take of an average of 2.42 lynx per year, or 2 to 3 per year within their combined action areas in Minnesota. In general, the amount of incidental take we anticipate in an Opinion is based on the best scientific information available, and we consider both qualitative and quantitative factors to derive an amount of take that is as reasonable and logical as possible. The Service also relies upon professional judgment to ensure the Incidental Take Statement represents the best estimate we are able to produce. During the approximately 15 years during which the Service has collected lynx mortality data in Minnesota, 63 lynx deaths have been recorded, of which 47 were due to human causes (vehicle and rail collisions, trapping (including 4 in Canada), and shooting; only 1 of these resulted from a federal action that had undergone consultation).

Northeast

The boreal forest of the Northeast historically and presently occurs primarily in Maine, where habitat hosts a resident, breeding population of lynx. Maine's lynx population is directly connected to substantive lynx populations and habitat in southeastern Quebec and northern New Brunswick. Lynx numbers in Maine apparently increased since the mid-1980s to early 2000s coinciding with increased habitat from extensive clearcutting in the 1970's and 1980's to address a spruce budworm outbreak (Hoving et al. 2004, Simons-Legaard et al. 2013, Vashon et al. 2012). This habitat is aging and the amount of habitat (Simons 2009) and lynx populations (Vashon et al. 2012) are believed to be declining. Lynx habitat and populations will decline by 50 to 60 percent in the next 15 to 20 years (Simons 2009). Small numbers of breeding lynx were discovered in northern New Hampshire and Vermont in 2007 that persisted through about 2013 (Interagency Lynx Biology Team 2013, p. 40). However, forested habitats are very limited and highly fragmented in those states and New York. Lynx occurring in New York since 1900 have been dispersers.

Northern Rocky Mountains/Cascades

In this region, the majority of lynx occurrences are associated at a broad scale with the "Rocky Mountain Conifer Forest" and within this type, most occurrences are in moist Douglas fir (*Pseudotsuga menziesii*) and western spruce/fir forests (McKelvey et al. *in* Ruggiero et al. 2000). Most of the lynx occurrences are in the 4,920 to 6,560 feet (ft) (1,500 to 2,000 m) elevation range in northwestern Montana and at higher elevations in more southerly latitudes (6,500 to 9,800 ft in Wyoming) (McKelvey et al. *in* Ruggiero et al. 2000). In the Cascades, potential lynx habitat occurs generally above 4,000 ft (Interagency Lynx Biology Team 2013, p. 64). These habitats are found in the Rocky Mountains of Montana, Idaho, eastern Washington, and Utah, in the Wallowa Mountains and Blue Mountains of southeast Washington and northeastern Oregon,

and the Cascade Mountains in Washington and Oregon. A substantial proportion of the verified lynx occurrences in the U.S. and confirmed breeding are from this region. The boreal forest of Washington, Montana, and Idaho is contiguous with that in adjacent British Columbia and Alberta, Canada.

The Northern Rocky Mountains and Cascade Region support the most viable resident lynx populations in the contiguous U.S., while recognizing that at best, lynx in the contiguous U.S. are naturally rare. Strong evidence exists to support the presence of resident lynx populations throughout much of the forest types considered lynx habitat in Montana and Washington. Resident lynx populations probably exist in contiguous habitats in Idaho and northwestern Wyoming, whereas lynx have probably always occurred intermittently in Oregon and Utah, although the historical or current presence of resident populations in these two states has not been confirmed.

Southern Rocky Mountains

It is unclear whether lynx in this region historically occurred as a resident population or if historic records were of periodic dispersers. If a resident lynx population occurred historically in the Southern Rocky Mountains, then this native population has been lost. Isolation from potential source populations may have led to the extirpation of lynx in this region. Although habitats in the Southern Rockies are far from source populations and more isolated, it is still possible that dispersers could arrive in the Southern Rocky Mountains during highs in the population cycle.

From 1999 through 2006, Colorado Division of Wildlife (CDOW; now Colorado Parks and Wildlife or CPW) reintroduced 218 lynx from Canada and Alaska into southwestern Colorado (Shenk 2009). No lynx were released in 2007, 2008 or 2009 and in 2010, the CDOW determined that the state's population was apparently viable and self-sustaining. As of August 2009, CDOW had tracked 37 of the released animals and confirmed 118 mortalities (Shenk 2009). Reproduction was first documented in 2003 and a total of 42 dens were found during 2003-2009 surveys. All of the dens have been scattered throughout the high elevation areas of Colorado, except one den was found in southeastern Wyoming in 2004 (Shenk 2006, 2009). Preliminary CPW 2014-2015 monitoring efforts (snow tracking, scat/hair samples, and camera detections) focused in the San Juan Mountain Range resulted in newly documented resident lynx in the LaGarita Mountains north of Creede and near the New Mexico border. Adult females with kittens were detected at cameras documenting at least some reproduction in the San Juan Mountains study area (Colorado Parks and Wildlife 2015).

Lynx Critical Habitat

On September 12, 2014, the Service published a revised designation of critical habitat for the contiguous U.S. Distinct Population Segment (DPS) of Canada lynx (79FR54782). Critical habitat is defined as the physical and biological features and associated primary constituent elements (PCEs) laid out in a specific quantity and spatial arrangement to be essential to the conservation of the species. Lynx critical habitat PCEs are found in boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

- a. Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow, and mature multistoried stands with coniferous boughs touching the snow surface;
- b. Winter snow conditions that are generally deep and fluffy for extended periods of time;
- c. Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and
- d. Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

The Service designated approximately 38,954 mi² (100,891 km²) of critical habitat in five units within portions of Idaho, Maine, Minnesota, Montana, Washington, and Wyoming. Northeastern Minnesota is considered Unit 2 (Figure 4) and is located in portions of Koochiching, St. Louis, Lake, and Cook Counties; Unit 2 consists of 8,069 mi² (20,899 km²) of designated critical habitat and includes the majority of the Superior National Forest. Approximately 73,976 acres of Superior National Forest lands are outside of Lynx Analysis Units (LAU)² but within designated critical habitat (USDA 2011). These areas were not included in the LAU development, primarily because of the mixed ownership patterns. The Unit 2 area was occupied at the time of listing and it contains the physical and biological features essential to the conservation of lynx. This area is essential because it is the only area in the Great Lakes Region for which there is evidence of recent lynx reproduction. It likely acts as a source for, or provides connectivity to, more peripheral portions of the lynx's range in the region. The Superior National Forest has designated critical habitat but the Chippewa National Forest does not.

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² LAUs are used to facilitate analyses and monitoring of effects from management actions on lynx habitat. They approximate the size of a female's home range and contain year-round habitat components.

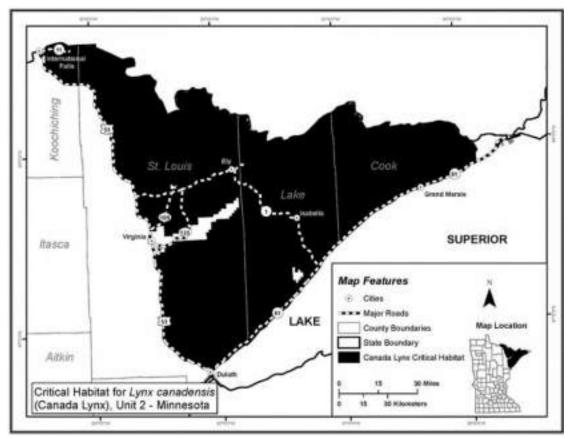


Figure 4. Unit 2 - Designated Critical Habitat for Lynx in Minnesota.

Gray Wolf

Species Description

Gray wolves are the largest wild members of the Canidae, or dog family, with adults ranging from 18 to 80 kilograms (kg) (40 to 175 pounds (lb)) depending upon sex and subspecies (Mech 1974). The average weight of male wolves in Wisconsin is 35 kg (77 pounds (lb)) and ranges from 26 to 46 kg (57 to 102 lb), while females average 28 kg (62 lb) and range from 21 to 34 kg (46 to 75 lb) (Wisconsin Department of Natural Resources 1999). Wolf fur color is frequently a grizzled gray, but it can vary from pure white to coal black. Wolves may appear similar to coyotes and some domestic dog breeds (such as the German shepherd or Siberian husky) (*Canis lupus familiaris*). Wolves' longer legs, larger feet, wider head and snout, and straight tail distinguish them from both coyotes and dogs.

The taxonomic status of wolves in the western Great Lakes region has long been debated. Most recently, they have been considered as a mixed population of *C. lupus*, *C. lycaon* (eastern wolf), and their intercrosses (e.g., Fain et al. 2010; Wheeldon et al. 2010). These varying interpretations of the taxonomic status of western Great Lakes wolves are summarized in the 2011 published proposed rule to delist the Western Great Lakes DPS of the gray wolf (50 CFR Part 17 Vol. 76 No. 87 May 5, 2011).

Life History

Wolves are primarily predators of medium and large mammals. Wild prey species in Minnesota include white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), beaver (*Castor canadensis*), and snowshoe hare, with small mammals, birds, and large invertebrates sometimes being taken (Mech 1974; Stebler 1944; Wisconsin Department of Natural Resources 1999). Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species. In the Western Great Lakes, during the last 25 years, wolves have also killed domestic animals including horses (*Equus caballus*), cattle (*Bos taurus*), sheep (*Ovis aries*), goats (*Capra hircus*), llamas (*Lama glama*), pigs (*Sus scrofa*), geese (*Anser sp.*), ducks (*Anas sp.*), turkeys (*Meleagris gallopavo*), chickens (*Gallus sp.*), guinea fowl (*Numida meleagris*), pheasants (*Phasianus colchicus*), dogs, cats (*Felis catus*), and captive white-tailed deer (USDA APHIS - Wildlife Services 2008, 2009; Wydeven 1998; Wydeven et al. 2001; Wydeven and Wiedenhoeft 1999, 2000, 2001, 2005).

Wolves are social animals, normally living in packs of 2 to 12 individuals. In Minnesota, the average pack size ranges between 4.9 and 5.6, according to surveys conducted between 1988 and 2008 (Erb 2008b; Erb and Benson 2004). Packs are primarily family groups consisting of a breeding pair, their pups from the current year, offspring from one or two previous years, and occasionally an unrelated wolf. Packs typically occupy, and defend from other packs and individual wolves, a territory of 20 to 214 mi² (50 to 550 km²). Midwest wolf packs tend to occupy territories on the lower end of this size range. Minnesota territory size, for example, averaged 39 to 40 mi² (102 km²) (Erb 2008a; Erb and Benson 2004).

Wolves are sexually mature at 22 months but generally only the alpha pair breed (Mech 1974). The alpha pair normally inhibits sexual contact between other mature members. Breeding takes place from January through March, and gestation is 60-63 days. Litters are born from early April into May; they range from 1 to 11 pups, but generally include 4 to 6 pups (Michigan Department of Natural Resources 1997, 2008; U.S. Fish and Wildlife Service 1992). Normally a pack has a single litter annually, but the production of two or three litters in one year has been documented in Yellowstone National Park (Smith et al. 2009; Smith et al. 2005). Pups remain at the den site for 6 to 8 weeks. Throughout the summer, wolves use two to three rendezvous sites (Fuller et al. 2003). In September, when the pups are large enough to travel with the pack, rendezvous sites are abandoned and the pack moves as a single unit.

Yearling wolves frequently disperse from their natal packs, although some remain with them. Adult wolves and pups older than 5 months also may disperse but at much lower frequencies (Fuller 1989). Dispersers may range over large areas as lone animals after leaving their natal pack, or they may locate suitable unoccupied habitat and a member of the opposite sex and begin their own pack. These dispersal movements allow a wolf population to quickly expand and colonize areas of suitable habitat that are nearby, or even those that are isolated by a broad expanse of unsuitable habitat.

Wolves are susceptible to disease, predation, human persecution, starvation, and accidents. Survival of pups in summer is difficult to estimate but has ranged from 0.48 to 0.89. Survival of

pups is likely related to prey biomass (Fuller 1989). Survival of yearlings and adults in the Great Lakes region has varied from 0.61 to 0.82 (Fuller 1989; Gogan et al. 2004; Wydeven et al. 1995).

Potential and favorable wolf habitat is defined by several elements such as low human population density, sufficient prey density, road density, vegetation cover, and special landscape patterns (Mladenoff et al. 1997; Mladenoff et al. 1995). Gray wolves are generalists that can live in most any habitat that supports ungulate prey. Wolf densities are directly related to the densities of their primary ungulate prey (Fuller 1989); thus forested areas occupied by white-tailed deer and moose are critical. Additionally, the habitat should be suitable for smaller prey such as beaver and snowshoe hare, which may be seasonally important (Mech 1970). Moose, deer, and snowshoe hare tend to forage in areas of regenerating upland forest, and conifer forest is an important component of thermal cover for all. Riparian aspen forest is important for beavers. Patch structure is only important in that it may alter prey densities or include areas of high road and human densities, thereby indirectly altering wolf distribution (Fuller 1997).

In Wisconsin, Mladenoff et al. (1995) and Mladenoff et al. (1999) indicated that re-colonizing wolf packs selected territories that contained no urban land, very little farmland, and were 93 percent forested. Road density was the best predictor of suitable habitat for breeding packs (Mech et al. 1988a; Mladenoff et al. 1995; Thiel 1985). While wolves will use roads and readily cross them, generally, areas with road densities of less than 1 mi/mi² are best for wolf survival (Wydeven et al. 2001; Wydeven & Wiedenhoeft 2001; Fuller 1997).

Status of the Species and Distribution

Most of the gray wolf populations in the United States are currently protected under the ESA pursuant to the February 2015 reinstatement of final rules; however, gray wolves in Montana, Idaho, the eastern third of Washington and Oregon, and north-central Utah retain their delisted status. Gray wolves are considered threatened in Minnesota, nonessential experimental in Wyoming, and endangered in the remaining conterminous states and Mexico (50 CFR 17.11(h)). Within this broad area, there are separate regulations establishing non-essential experimental populations in the Northern Rocky Mountains and for the Mexican wolf (*C. lupus baileyi*) in Arizona and New Mexico (50 CFR 17.84(i), (k), and (n)). Since 2003, the status of the gray wolf under the ESA has been subject to several regulatory changes and resulting litigation in numerous Federal Courts, including rules to delist and reinstate protections.

The estimated population of wolves covering Canada and occupied portions of the U.S. is at least 60,000 (International Wolf Center 2016; USFWS 2016). In the contiguous U.S., they occur in Minnesota, Wisconsin, Michigan, portions of the northern Rocky Mountains, central Idaho, and Arizona/New Mexico, and more recently, in Washington and Oregon, with an estimated population size of over 5,500 in 2015.

Numbers of wolves in the Western Great Lakes DPS core range (Figure 5) remain above the levels that would be cause for significant concern to the Service. After federal de-listing in 2012, wolf harvest seasons were established in Minnesota and population surveys were conducted annually. In the first two winters post-harvest, wolf population estimates varied from approximately 2,200 to 2,400 (MN DNR 2015). In December 2014, following the third

consecutive wolf harvest season, wolves in Minnesota were returned to the list of federally threatened species as a result of a court ruling. The 2014-15 mid-winter estimated wolf population was 2,221, or 1.2 wolves per 100 mi² (3.2 wolves per 100 km²) of occupied range, with a 90 percent confidence interval ranging from 1,789 to 2,719 wolves. There has been no statistically significant change in the population size over the past 3 years. Wolves have an estimated occupied range of 27,251 mi² (70,579 km²) in Minnesota (Erb et al. 2015).

As of April 2015, the Wisconsin statewide minimum wolf population was estimated to be 746 to 771, an increase of 12.5 percent from the previous year. The range of contiguous wolf packs covers approximately 23,750 mi² in the northern and central forested regions of the state, with three isolated packs occurring in the southwestern and western parts of the state. Wolves have been observed in most counties in the state (WI DNR 2016). Michigan wolf numbers changed from 687 in 2010-2011 to 636 in 2013-2014 (Bump 2014, pers. comm.; USFWS 2016). This represents an approximate 7 percent decrease in wolf numbers; however, wolves were hunted during the period of wolf delisting (until December 2014). These population estimates individually and combined (1,382 at a minimum) are well above the numbers that might cause concern at the individual state level (100) or combined (200).



Figure 5. Gray Wolf Range in the Western Great Lakes DPS (76 FR 81671).

Gray Wolf Critical Habitat

Critical habitat for gray wolf was designated in northeastern Minnesota and Michigan's Isle Royale National Park in March 1978. In Minnesota, five regulatory zones were created statewide, of which Zones 1, 2, and 3 are considered critical habitat and cover 9,845 mi² (Figure 6). Zone 1 fully protects wolves whereas Zones 2-5 allow for regulated take of depredating wolves,

with most take likely occurring in Zone 4.



Figure 6: Gray Wolf Management Zones in Minnesota (*Note*: Zones 1, 2, and 3 are also considered critical habitat).

Northern Long-eared Bat

The Service published its decision to list the northern long-eared bat (NLEB) as a threatened species on April 2, 2015 (80 FR 17974-18033) and the effective date of this final rule was May 4, 2015. The final rule determined that critical habitat designation for the NLEB was not determinable at the time. The following information on NLEB life history and biology, threats, distribution, and overall status is summarized from that rule.

Life History and Biology

The NLEB is a temperate, insectivorous, migratory bat that hibernates in mines and caves in the winter and spends summers in wooded areas. The key stages in its annual cycle are: hibernation, spring staging and migration, pregnancy, lactation, volancy/weaning, fall migration and swarming. NLEB generally hibernate from mid-fall through mid-spring each year. Spring migration period likely runs from mid-March to mid-May each year, with timing varying depending on the portion of the range. Females depart shortly after emerging from hibernation and are pregnant when they reach their summer area. Parturition (birth) occurs in late May or early June (Caire et al. 1979, p. 406; Easterla 1968, p. 770; Whitaker and Mumford 2009, p. 213) but may occur as late as July (Whitaker and Mumford 2009, p. 213), with nursing continuing until weaning, which is shortly after young become volant (able to fly) in mid- to late-July. Fall migration likely occurs between mid-August and mid-October.

Summer habitat and ecology

Suitable summer habitat³ for NLEB consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. This includes forests and woodlots containing potential roosts, as well as linear features

such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure.

Many species of bats, including the NLEB, consistently avoid foraging in or crossing large open areas, choosing instead to use tree-lined pathways or small openings (Patriquin and Barclay 2003, Yates and Muzika 2006). Further, wing morphology of the species suggests that they are adapted to moving in cluttered habitats. Thus, isolated patches of forest may not be suitable for foraging or roosting unless the patches are connected by a wooded corridor.

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies (typically consisting of females and young). NLEB actively form colonies in the summer (Foster and Kurta 1999) and exhibit fission-fusion behavior (Garroway and Broders 2007), where members frequently coalesce to form a group (fusion), but composition of the group is in flux, with individuals frequently departing to be solitary or to form smaller groups (fission) before returning to the main unit (Barclay and Kurta 2007). As part of this behavior, NLEBs switch tree roosts often (Sasse and Pekins 1996), typically every 2 to 3 days (Foster and Kurta 1999; Owen et al. 2002; Carter and Feldhamer 2005; Timpone et al. 2010). NLEB maternity colonies range widely in size, although a maximum of 30-60 individuals may be most common early in the season, with the colony size decreasing post-lactation of young (Service 2014). NLEB show some degree of interannual fidelity to single roost trees and/or maternity areas. Male NLEB are routinely found with females and young in maternity colonies. NLEB use networks of roost trees often centered around one or more central-node roost trees (Johnson et al. 2012). NLEB roost networks also include multiple alternate roost trees and male and nonreproductive female NLEB may also roost in cooler places, like caves and mines (Barbour and Davis 1969, Amelon and Burhans 2006).

NLEB roost in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags [typically greater than or equal to 3 inches diameter at breast height (dbh)]. NLEB are known to use a wide variety of roost types, using tree species based on presence of cavities or crevices or presence of peeling bark. Occasionally, NLEB have also been found roosting in structures like barns and sheds, particularly when suitable tree roosts are unavailable.

Females give birth to a single offspring, typically in late-May or early June (Caire et al. 1979, p. 406; Easterla 1968, p. 770; Whitaker and Mumford 2009, p. 213). Lactation then lasts 3 to 5 weeks with pups typically becoming volant between early July and early August.

Migration

Males and non-reproductive females may summer near hibernacula, or migrate to summer habitat further from their hibernaculum. The NLEB is not considered to be a long distance migrant and typically migrates 40-50 mi from hibernacula. Migration is an energetically demanding behavior for the NLEB, particularly in the spring when their fat reserves and food supplies are low and females are pregnant.

Winter habitat and ecology

Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g. abandoned or active mines and railroad tunnels. Other landscape features that may also be used by NLEBs during the winter have yet to be documented. Generally, NLEBs remain at hibernacula from October to April, depending on local climate. In southern portions of the species' range, they may be at hibernacula only from November to December; in some northern areas they may leave hibernacula for summer habitat between March and mid-May.

Hibernacula for NLEBs typically have significant cracks and crevices for roosting; relatively constant, cool temperatures (0-9 degrees Celsius); high humidity; and, minimal air currents. Specific areas where they hibernate have very high humidity and droplets of water are often visible on their fur. Surveyors may find them in small crevices or cracks, often with only the nose and ears visible.

NLEBs tend to roost singly or in small groups, with hibernating population sizes ranging from a few individuals to around 1,000 (U.S. Fish and Wildlife Service 2014 and unpublished data). The northern long-eared bat exhibits more winter activity than other cave species; individuals often move between hibernacula throughout the winter (Griffin 1940, Whitaker and Rissler 1992, Caceres and Barclay 2000). NLEB have shown a high degree of philopatry to hibernacula used, returning to the same ones every year.

Spring Staging and Fall Swarming habitat and ecology

Upon arrival at hibernacula in mid-August to mid-November, NLEB "swarm," a behavior in which large numbers of bats fly in and out of cave entrances from dusk to dawn, while relatively few roost in caves during the day. Swarming continues for several weeks and mating occurs during the latter part of the period. After mating, females begin hibernation, with most bats of both sexes hibernating by the end of November (by mid-October in northern areas).

After hibernation ends in late March or early April (as late as May in some northern areas), most NLEB migrate to summer roosts. Females emerge from hibernation before males. Reproductively active females store sperm from autumn copulations through winter and ovulation takes place after the bats emerge from hibernation in spring. The period after hibernation and just before spring migration is typically referred to as "staging," a time when bats forage and a limited amount of mating occurs. This period can be as short as a day for an individual, but not all bats emerge on the same day.

In general, NLEB use roosts in the spring and fall similar to those selected during the summer. Suitable spring staging and fall swarming habitat is typically within 5 miles of a hibernaculum and consists of forested habitats similar to where they may roost, forage, and travel. This includes forested patches and linear features such as fencerows, riparian forests and other wooded corridors. These wooded areas may be comprised of dense or loose aggregates of trees with variable amounts of canopy closure. Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1,000 ft from the next nearest suitable roost tree, woodlot, or wooded fencerow.

Threats

No other threat is as severe and immediate for the NLEB as the disease white-nose syndrome (WNS). It is unlikely that NLEB populations would be declining so dramatically without the impact of WNS. Since the disease was first observed in New York in 2007 (later biologists found evidence from 2006 photographs), WNS has spread rapidly in bat populations from the Northeast to the Midwest and the Southeast. Population numbers of NLEB have declined by 99 percent in the Northeast, which along with Canada, has been considered the core of the species' range. Although there is uncertainty about how quickly WNS will spread through the remaining portions of this species' range, it is expected to spread throughout. In general, the Service believes that WNS has significantly reduced the redundancy and resiliency of the NLEB.

Although significant NLEB population declines have only been documented due to the spread of WNS, other sources of mortality could further diminish the species' ability to persist as it experiences ongoing dramatic declines. Specifically, declines due to WNS have significantly reduced the number and size of NLEB populations in some areas of its range. This has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand. These impacts could potentially be seen on two levels. First, individual NLEB sickened or struggling with infection by WNS may be less able to survive other stressors. Second, NLEB populations impacted by WNS, with smaller numbers and reduced fitness among individuals, may be less able to recover making them more prone to extirpation. The status and potential for these impacts will vary across the range of the species.

Bats affected but not killed by WNS during hibernation may be weakened by the effects of the disease and may have extremely reduced fat reserves and damaged wing membranes. These effects may reduce their capability to fly or to survive long-distance migrations to summer roosting or maternity areas.

In areas where WNS is present, there are additional energetic demands for NLEBs. For example, WNS-affected bats have less fat reserves than non-WNS-affected bats when they emerge from hibernation (Reeder et al. 2012; Warnecke et al. 2012) and have wing damage (Meteyer et al. 2009; Reichard and Kunz 2009) that makes migration and foraging more challenging. Females that survive the migration to their summer habitat must partition energy resources between foraging, keeping warm, successful pregnancy and pup-rearing, and healing, and may experience reduced reproductive success. In addition, with wing damage, there may be an increased chance of WNS-affected bats being killed or harmed as a result of proposed actions. Again, this is particularly likely if activities such as timber harvest or burns are conducted early in the spring (April – May) when bats have just returned, have damaged wings, and are exposed to colder temperatures when torpor is used more frequently.

Over the long-term, sustainable forestry benefits NLEB by maintaining suitable habitat across a mosaic of forest treatments. However, forest practices can have a variety of impacts on the NLEB depending on the quality, amount, and location of the lost habitat, and the time of year of clearing. Depending on their characteristics and location, forested areas can function as summer maternity habitat, staging and swarming habitat, migration or foraging habitat, or sometimes,

combinations of more than one habitat type. Impacts from tree removal to individuals or colonies would be expected to range from indirect impact (e.g., minor amounts of forest removal in areas outside NLEB summer home ranges or away from hibernacula) to minor (e.g., largely forested areas, areas with robust NLEB populations) to significant (e.g., removal of a large percentage of summer home range, highly fragmented landscapes, areas with WNS impacts).

Lastly, there is growing concern that bats, including the NLEB (and other bat species) may be threatened by the recent surge in construction and operation of wind turbines across the species' range. Mortality of NLEB has been documented at multiple operating wind turbines/farms. The Service is now working with wind farm operators to avoid and minimize incidental take of bats and assess the magnitude of the threat.

Rangewide Status

The NLEB ranges across much of the eastern and north central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993; Caceres and Pybus 1997; Environment Yukon 2011) (Figure 7). In the United States, the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east through the Gulf States to the Atlantic Coast (Whitaker and Hamilton 1998; Caceres and Barclay 2000; Amelon and Burhans 2006). The species' range includes the following 37 states (plus the District of Columbia): Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, the species has been most frequently observed in the northeastern United States and in the Canadian Provinces of Quebec and Ontario, with sightings increasing during swarming and hibernation (Caceres and Barclay 2000). However, throughout the majority of the species' range it is patchily distributed, and historically was less common in the southern and western portion of the range than in the northern portion of the range (Amelon and Burhans 2006).

Although they are typically found in low numbers in inconspicuous roosts, most records of NLEB are from winter hibernacula surveys (Caceres and Pybus 1997). More than 780 hibernacula have been identified throughout the species' range in the United States, although many hibernacula contain only a few (1 to 3) individuals (Whitaker and Hamilton 1998). Known hibernacula (sites with one or more winter records of NLEBs) include: Alabama (2), Arkansas (41), Connecticut (8), Delaware (2), Georgia (3), Illinois (21), Indiana (25), Kentucky (119), Maine (3), Maryland (8), Massachusetts (7), Michigan (103), Minnesota (15), Missouri (more than 269), Nebraska (2), New Hampshire (11), New Jersey (7), New York (90), North Carolina (22), Oklahoma (9), Ohio (7), Pennsylvania (112), South Carolina (2), South Dakota (21), Tennessee (58), Vermont (16), Virginia (8), West Virginia (104), and Wisconsin (67). NLEB are documented in hibernacula in 29 of the 37 states in the species' range. Other states within the species' range have no known hibernacula (due to no suitable hibernacula present, lack of survey effort, or existence of unknown retreats).



Figure 7. Northern Long-eared Bat Range and Current Zone of White-nose Syndrome.

The current range and distribution of NLEB must be described and understood within the context of the impacts of WNS. Prior to the onset of WNS, the best available information on NLEB came primarily from surveys (mostly focused on Indiana bat or other bat species) and some targeted research projects. In these efforts, NLEB was very frequently encountered and was considered the most common myotid bat in many areas. Overall, the species was considered to be widespread and abundant throughout its historic range (Caceres and Barclay 2000).

WNS has been particularly devastating for NLEB in the northeast, where the species was believed to be the most abundant. There are data supporting substantial declines in NLEB populations in portions of the Midwest due to WNS. In addition, WNS has been documented at more than 100 NLEB hibernacula in the southeast, with apparent population declines at most sites. WNS has not been found in any of the western states to date and the species is considered rarer in the western extremes of its range. We expect further declines as the disease continues to spread across the species' range.

Status of the Northern Long-eared Bat in Minnesota

Prior to 2014, there was little information on NLEB summer populations in the state. In 2014, passive acoustic surveys conducted at a new proposed mining area in central St. Louis County detected the presence of NLEB at each of 13 sites sampled. Calls that were assigned to NLEB accounted for approximately 14 percent of all recorded bat calls (Smith et al. 2014). Also in 2014, acoustic and mist-net data were collected by a pipeline project proponent that surveyed an approximately 125-ft-wide and 300-mile-long corridor through the northern third of the state. Positive detections were recorded in Hubbard, Cass, Crow Wing, Aitkin, and Carlton Counties, and NLEBs were the most common species captured by mist-net (Merjent 2014). In 2015, ongoing mist-net surveys at Camp Ripley Training Center, Morrison County, resulted in capture of 7 NLEB (15 percent of total captures). Mist-net surveys on the Superior and Chippewa National Forests resulted in the capture of 45 NLEBs (59 percent of total captures) and 20 NLEBs (34 percent of total captures), respectively (Swingen et al. 2015).

Currently, there are 17,370,394 ac of forest in Minnesota considered potential NLEB summer habitat. Based on a 58.7 percent NLEB occupancy rate (pre-WNS), the Service estimated 10,196,421 ac may be occupied by NLEB (USFWS 2016; Table 2.4, p. 28).

The NLEB is known from 15 hibernacula in Minnesota; however, the status of most is unknown. An estimated 3,000 NLEB are thought to hibernate within the largest known hibernaculum in Minnesota, the Soudan Mine in St. Louis County. WNS has not been detected in Minnesota; however, the fungus that causes WNS was detected in 2011–2012. Currently, only Soudan Mine and Mystery Cave in Minnesota are known to harbor the fungus that causes WNS and to our knowledge, the fungus has not actually caused WNS in bats within the state.

Conservation Needs of the Species

The species' conservation needs define what is needed in terms of reproduction, numbers, and distribution to ensure the species is no longer in danger of extinction. The conservation needs should be defined in the species' recovery outline or plan. Since there is no recovery plan or recovery outline available at this time, we will outline the conservation needs based on our current understanding of the species.

The primary conservation need of the NLEB is to reduce the threat of WNS. This includes minimizing mortality in WNS-affected areas and slowing the rate of spread into currently unaffected areas. In addition, NLEB that continue to exist within WNS-affected areas need to be able to continue to survive and reproduce in order to stabilize and/or increase the populations. This can be done by reducing the other threats to the species, as listed above. Therefore, efforts to protect hibernacula from disturbances need to continue. These should include restricting human access to hibernacula particularly during the hibernation period, constructing/installing suitably designed gates where appropriate and maintaining the gates, and restoring microhabitat conditions in hibernacula that have been altered. Efforts should also be made to protect and restore (in some cases) adequate fall swarming habitat around hibernacula. Known maternity habitat should be maintained, and the removal of known roost trees, particularly when pregnant females and/or young are present should be reduced. Research to identify important hibernacula

and summer areas and to delineate the migratory relationship between summering and wintering populations should also be pursued.

Northern Long-eared Bat Critical Habitat

Critical habitat has not been proposed for the NLEB.

Environmental Baseline

The environmental baseline is defined as the impacts from federal, state or private actions and other human or natural activities in the action area, the anticipated impacts from all federal projects in the action area that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process.

Action Area

Action area, as defined by the ESA's implementing regulations (50 CFR 402.02), is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Action is defined in the regulations as "...all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to: (a) actions intended to conserve listed species or their habitat; (b) the promulgation of regulations; (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or (d) actions directly or indirectly causing modifications to the land, water, or air.

For the PolyMet Project, the area where "land, water, or air" is likely to be affected relative to threatened and endangered species and critical habitat includes those lands that are proposed for exchange with the USFS, including the area in and around the sites proposed for mining and processing, and the other non-federal sites. The action area was divided into three distinct parts: (1) the Mine and Plant Sites and associated Transportation and Utility Corridors with roads and related infrastructure (as mentioned, we sometimes refer to these collectively as Project area), plus an approximate 6-mile buffer for the effects analyses; (2) the land exchange parcels; and (3) the Wetland Mitigation Sites. This action area is based on proposed project activities and for (1) above, includes a surrounding area into which Project-related noise and vibrations are expected to emanate beyond the immediate mining activities footprint (see FEIS pp. 4-293 to 4-302 and 5-526 to 5-555 for a detailed description and maps of estimated ranges of noise and vibrations). We also consider several wildlife movement corridors that were identified in the BA and because one of these is outside of the 6-mile buffer, we extend the northeast side of the action area to include wildlife corridor #18, as described later in the Effects of the Action section.

From the information in the FEIS, we considered the maximum noise and air vibration outputs likely to occur during 24 hours of operation and identified a 3- to 6-mile radius as appropriate. The actual radius of this 'buffer' area likely varies due to types of noise and weather-related factors, such as prevailing winds, and other considerations. That is, the effects within the 6-mile buffer actually may be less in some areas; e.g., where noise attenuates and other effects also diminish within a closer distance. Within the action area's northwest, west, and southwest sides,

the 6-mile buffer encompasses access roads and highways from nearby communities (e.g., Highways 166 and 135) where additional traffic will occur due to the Project. We recognize that Project-related effects will vary over time; for example, blasting and other extremely loud noises and vibrations will occur primarily at the Mine Site every 2 to 3 days and will decrease as mine pits become deeper, such that noise eventually will be attenuated by pit walls. However, we identified the outermost perimeter for maximum extent of potential wildlife disturbances as the action area.

The activities considered in this BO are located within portions of four Ranger Districts (Laurentian, Kawishiwi, Tofte, and Gunflint) in the SNF and we consider those lands on the Mine and Plant Sites and Transportation/Utility Corridor, within 6 miles of this Project area, and northeast to wildlife corridor #18, and the individual non-federal land parcels and Wetland Mitigation Sites as the action area. However, because much of the lynx, wolf and NLEB information in the BA and associated literature is reported for the entire, or portions of the Forest, rather than for the specific action area, we include information from this broader scale but which can be extrapolated to the action area. The entire Forest boundary encompasses over 3 million acres (includes federal, state, county, and other ownerships), of which 445,000 acres are water, and the proposed project is situated both inside and outside the Forest boundary.

Status of the Species within the Action Area

Canada Lynx

In Minnesota, the deepest snows occur in the northeast corner of the state (Minnesota DNR, http://climate.umn.edu/doc/snowmap.html), which includes the action area. Most lynx habitat in northeastern Minnesota is on public lands, particularly the Superior National Forest, and lynx are present on both the SNF and Chippewa National Forest. Mixed deciduous-boreal forest suitable for lynx habitat encompasses most of the Forests, which have been mapped into LAUs to facilitate lynx management under the 2000 and 2013 LCAS (Figure 8). Currently, the LAUs within the action area have greater than 95 percent habitat in a suitable condition (see Table 1). The 2000 and 2013 LCAS guidance for lynx habitat in any LAU is no more than 30 percent may be in an unsuitable condition (that is, at least 70 percent must be in a suitable condition). The analysis area for direct and indirect effects to lynx includes portions of LAUs 12 (Mine and Plant Sites) and 4, 16, 21, and 22 (land exchange parcels; see Table 1). (Note: the Hay Lake land exchange parcel is not within a LAU. It lies within the SNF boundary in an area that is surrounded by private lands and mining activity to the east, south, and west. While the land exchange will consolidate USFS lands into a more contiguous block and some of the upland forest would be considered suitable lynx habitat, this block, in general, is disjunct from other USFS lands, including nearby LAUs, and it was not conducive to including in a LAU.)

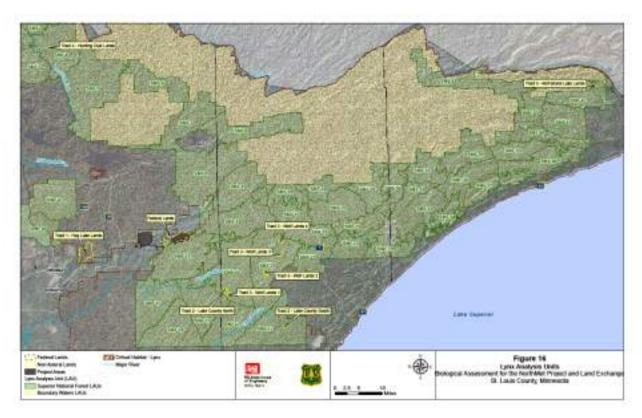


Figure 8. Lynx Analysis Units on the Superior National Forest (from BA Figure 16, p. 6-15).

Table 1. Condition of LAUs on the Superior National Forest before and after land exchange and project (USDA Forest Service 2015; Table adapted from BA Table 5, p. 6-16).

Lynx Analysis Unit	Land Ownership	Suitable Lynx Habitat Before Land Exchange & Project (acres all ownerships/acres USFS lands)	Unsuitable Lynx Habitat Before Land Exchange & Project (acres all ownerships/acres USFS lands)	Acres Total Suitable Lynx Habitat After Land Exchange & Project
SNF 12	Federal	69,131/47,908	2,737/31	67,412/41,413
SNF 4	Hunting Club	49,994/28,903	2,470/1,289	49,994/29,054
SNF 16	Lake County North and Wolf Lands 1	70743/29,316	3,127/350	70,743/29,705
SNF 21	Wolf Lands 2, 3, 4	69,632/32,984	2,931/272	69,632/34,434
SNF 22	Lake County South	57,107/40,217	913/344	57,107/40,330
SNF 42	McFarland Lake	27,775/19,609	534/13	27,775/19,640
Not in LAU	Hay Lake	n/a	n/a	4,675*
Net Gain (Loss) to Federal Estate within LAUs (excludes Hay Lake lands)				(4,361)
Net Gain (Loss) to Federal Estate for all exchange lands				314

^{*}Hay Lake lands are not in an LAU but there would be a gain in overall LAU acres by USFS from the land exchange. *Note*: All affected LAUs currently have >95 percent suitable habitat. After the land exchange and project, SNF 12 will have 93.7 percent suitable habitat.

Lynx occur within the defined action area. The SNF maintains a database to document the genetically confirmed Canada lynx within Minnesota, which includes samples from the Forest's survey and monitoring program and other studies, as mentioned in the Status of the Species section above. The MDNR summarized all reports of Canada lynx observations in Minnesota reported to them since the species received federal threatened status in March 2000 through November 11, 2006. Over that time, the MDNR received 426 reports, of which 63 reports (15 percent) were verified as lynx.

The BA (p. 5-5) indicated that a lynx survey was conducted for the Birch Lake Project and Maturi Project for Franconia Minerals Corporation, which is about 12 miles northeast of the Mine Site. Several lynx were found during the study, based on DNA analysis of scat samples and track locations. During a winter 2006 survey of seven townships surrounding the Project, tracks and scat of four female lynx were identified; they were concentrated in areas approximately 5 miles east and south of the Mine Site. No lynx or their sign were seen on the federal and non-federal lands during other wildlife surveys in 2000, 2004, 2008, 2009, and 2010; however, SNF biologists observed lynx tracks at the proposed Mine Site during a site visit in February 2010 (BA, pp. 6-17, 6-20).

According to the BA (p. 6-17), the Forest's genetic reference collection has 128 lynx DNA sample collection points that have occurred within 6 miles of the Project since February 2004, as well as within 6 miles of the federal lands and all of the non-federal lands, except Hunting Club and McFarland Lake lands; however, lynx DNA has been found within 10 miles of Hunting Club and McFarland Lake lands and lynx sightings have also occurred near the Hay Lake lands. Lynx DNA also has been collected within 10 miles of the Hinckley Wetland Mitigation Site, but not within 10 miles of the other Wetland Mitigation Sites.

It is difficult to estimate the abundance of highly mobile species that are rare and present at low densities. Assuming that about 25 percent of northeast Minnesota is suitable lynx habitat, coupled with assumptions about residence time and detectability, Moen et al. (2008b) estimated the number of lynx that might be resident in northeastern Minnesota at a given time as between 190 and 250 individuals. Recent research supports the hypothesis that lynx can persist without immigration, based on reproductive rates of females, movement rates, and the distribution of potential denning habitat in northeastern Minnesota (Moen et al. 2008a; Moen et al. 2004; Moen et al. 2008b).

Gray Wolf

National Forests, and the prey species found in their various habitats, are important to wolf conservation and recovery in the western Great Lakes states. The SNF is operated and managed under the current Forest Plan in conformance with standards and guidelines that follow the 1992 Recovery Plan's recommendations for the wolf.

The wolf population is variable but generally stable on the SNF (Berg and Benson 1998; Mech and Karns 1977) and on average, is about 1 wolf per 10 to 15 mi² (26 to 39 km²) (Mech 2004, 2006, 2008). Aerial survey results from radio-collared and non-radio-collared wolf packs in a

large area (795 mi²; 2,060 km²) of the central Superior National Forest during winter 2003-2004 estimated that about 62 wolves were present, or 7 wolves per 100 mi² (259 km²), or 0.7 wolf per 10 mi² (26 km²) (Mech 2004). Using the same methodology during the winter of 2007-08, aerial survey results identified approximately 82 wolves present in a 795 mi² (2,060 km²) area of the central Superior National Forest, or about 1 wolf per 10 mi² (26 km²) (Mech 2008). This density estimate is the same as estimates from similar winter 2005-2006 surveys (Mech 2006) and was the highest wolf population recorded in the study area since 1971 (Mech 1973, 1986, 2008). Assuming that wolf density was similar to the 2007-2008 density estimates throughout the Forest, which covers approximately 4,688 mi² (12,141 km²), the Service estimated approximately 484 wolves on the Superior National Forest in 2008.

The BA (p. 6-89) indicated that gray wolf tracks, scat, and signs of wolf kills were observed during wildlife surveys on the federal lands, Transportation/Utility Corridor, and Plant Site in 2000, 2004, 2008, and 2009. Tracks were observed on the Dunka Road, mine exploration roads, along railroad grades and utility rights-of-ways, and north of the proposed Mine Site on Northshore Mine roads during all seasons. In addition, several wolves responded to calls from the proposed Mine Site during 2004. Gray wolf tracks and scat were also recorded on the following land exchange parcels: Hay Lake, Wolf Lands 3 and 4, and Lake County North during the surveys. There are no recorded observations of wolves in the township with McFarland Lake lands, although these and other non-federal lands involved in the land exchange and Wetland Mitigation Sites are within the current wolf range.

Northern Long-eared Bat

The SNF initiated annual acoustic monitoring in 2009 and our understanding of NLEB occurrence, distribution, and habitat use on the Forest has improved significantly since then. From 2013 to 2015, mist-netting, radio-telemetry, habitat characterization, and acoustic survey efforts have been completed and while the sample size is still small, available data are providing insights into bat presence and reproductive female NLEB habitat use. Acoustic monitoring data will be used to identify baseline bat activity levels and observe how those levels may change in response to WNS. Only 2 NLEB were detected out of 4,554 bat detections (less than 0.1 percent) over a 6 year period. However, NLEB typically do not forage in larger open areas where most transects were located (USFS Forest Service 2015). In 2013, 34 bats were captured at eight locations, of which 13 were NLEB; in 2014, 44 bats were captured at 5 sites on the SNF, of which 24 were NLEB; and, in 2015, 76 bats were captured at 10 locations, of which 45 were NLEB. Both reproductive adults and non-reproductive juveniles have been captured and 5 reproductive female NLEB in 2013 and 10 reproductive female NLEB in 2014 were equipped with radio-transmitters, which resulted in subsequent detections of multiple maternity roost sites. In 2013, three maternity roosts were identified in live aspen and four additional maternity roosts were in dead aspen and white pine. In 2014, 14 maternity roosts were in aspen (13 live and 1 dead), 2 in live red maple, 1 in live black ash and 1 in an unknown snag. In 2015, 7 transmitters were deployed on adult female bats (6 NLEB) on the Forest, resulting in identification of 21 roost trees, with the most common being quaking aspen (Populus tremuloides; 10) and red maple (Acer rubrum; 4) (Swingen et al. 2015).

Other results of mist-net surveys conducted in 2013 and 2014 in Minnesota have indicated a range of relative abundance for NLEB. Based on the frequency and proximity to SNF of positive NLEB detections in Minnesota and the prevalence of suitable habitat for the species on the SNF, it is reasonable to assume that the species is widespread in the action area. Because survey data analyses are not yet complete, we cannot estimate roost tree density or the proportion of the SNF that is inhabited by NLEB within a useful level of precision. The SNF is also working with the MDNR, the Chippewa National Forest, and the Service to increase our collective knowledge of NLEB distribution and habitat use in northern Minnesota.

The BA (pp. 5-6) indicated that 2014 survey data (based on passive sonic (AnabatTM), direct observation) confirmed NLEB use of the Mine Site, Dunka Road, and Utility Corridor for foraging and travel to and from foraging and roost sites. The Mine Site also may have roost sites but the surveys provided no conclusive evidence of any. Direct observations and survey data suggested that NLEBs used the area around existing Plant Site buildings for foraging and that other infrastructure may have potential for limited roost sites, but evidence is also inconclusive. The BA (p. 6-75) indicated that USFS 2014 bat survey results identified NLEB present and foraging at the Plant Site, the forest/open edge area to the east of the Tailings Basin (within 50 meters of the road) and adjacent to and near the LTV Steel Mining Company process buildings, but not within the Tailings Basin. There was no evidence of NLEB hibernacula, or conditions suitable for hibernacula, on the Mine or Plant Sites or buildings, Dunka Road, and Utility Corridor.

The SNF assumes that forest comprised primarily of trees greater than 9 years old functions as suitable summer habitat for the NLEB. This type of habitat is abundant and well distributed across the SNF on public lands (federal, state and county). SNF suitable summer habitat is distributed among several forest types, but is mostly comprised of hardwood forest, especially aspen/birch (see Table 6 in the BA). The NLEB typically uses summer habitats in northeast Minnesota from early April to late September (Nordquist 2006).

A pilot study initiated by the SNF in 2013 confirmed that NLEB use cracks and crevices in live and dead quaking aspen, live red maple, live black ash (*Fraxinus nigra*) and white pine (Grandmaison et al. 2013). Seven maternity roost trees were located in 2013 and 18 in 2014 on the SNF. Live aspen were the predominant trees used, ranging in size from 9 to 18 inches dbh (Catton 2014). Data from this study should be considered preliminary as the study continues, but thus far has confirmed the following: maternity roost trees were large (greater than 11 inches dbh) with heights ranging from 23.5 to 70.6 ft; canopy closure in the stands around roost trees was high (62 to 98 percent), although maternity roost trees had some level of exposure to sunlight during the day. In 2014, lactating females were found between mid-June and early July (Catton 2014).

There are four known or suspected NLEB hibernacula within 5 miles of the SNF. Section 30 Mine is located on private land just outside of Ely, Minnesota and NLEBs were documented wintering in this site in the 1990s. The mine is not monitored on a regular basis. Soudan Mine, the largest known hibernaculum in the state, is located approximately 5 miles outside the SNF boundary. A third known hibernaculum is located at Tettegouche State Park and is located approximately 4 miles outside of the SNF boundary – but about 9 miles from the nearest USFS

lands. This site is also not regularly monitored but was known to house wintering NLEBs in 1990 and 2003. The fourth site is the Jack Lake mine, located within the Boundary Waters Canoe Areas Wilderness on the Tofte Ranger District. This is a suspected hibernaculum and has never been monitored in the winter for bats; however, during a SNF site visit in September 2014, bats were found using it.

The SNF also has a small amount of swarming and staging areas – lands within five miles of hibernacula. A total of 15,150 acres of National Forest lands meet the criteria for swarming or staging areas. Fall swarming dates at the Soudan mine have been documented as early August to mid-October and spring staging activity has been documented from late April to mid-June (Nordquist 2015).

Conservation Needs of NLEB in the Action Area

The conservation needs of the species in the action area are similar to the needs rangewide. The SNF provides habitat for summering, migrating, staging and swarming NLEBs. Therefore, within the action area the conservation needs include: 1) providing suitable habitat conditions for foraging and roosting by the NLEB; 2) reducing the removal of roost trees; 3) searching for previously unidentified areas of maternity and hibernation activity; and, 4) conducting research to understand the migration patterns of the NLEB that use the area during the summer; during spring and fall staging and swarming periods; and, if hibernacula are found in the action area, during winter.

The Forest has initiated NLEB acoustic monitoring routes to identify baseline bat activity levels and observe how those levels change over time, and results of those studies were summarized briefly (see the previous section). The Forest is also working in partnership with the MDNR, the Chippewa National Forest, and the Service to further their knowledge of NLEB distribution and habitat use in northern Minnesota. These measures, in addition to the continued implementation of conservation measures required under the Forest Plan, will contribute to conservation needs of the NLEB in general and within the action area.

Factors Affecting Species and their Habitats within the Action Area

Canada lynx

In the 2000 LCAS, the Lynx Biology Team identified potential risk factors to lynx that are within the authority and jurisdiction of the federal land management agencies. Because effects to lynx are closely tied to habitat, most of the identified risks to lynx are also potential risks to lynx critical habitat. These risk factors include management of timber, wildland or prescribed fire, roads and trails, recreation, grazing, and other human developments such as agriculture. Risk factors that have recently become more pervasive include climate change, oil and gas leasing, and mining exploration and other mining activities. Roads, railroads, utility corridors, land ownership patterns, and developments may affect lynx movements. Risks of direct lynx mortality may come from trapping, shooting, predator control, vehicle collisions, and competition or predation as influenced by human activities. Other large-scale risk factors to lynx and lynx critical habitat are fragmentation and degradation of lynx habitat, for example, from non-native

invasive plant species, climate change, or changes in land ownership.

Several of these potential risk factors affecting lynx are proposed in the action area post-land exchange, including mining activities and associated vegetation removal, infrastructure development such as roads, railroads, utility corridors, buildings, and water treatment ponds; associated fragmentation and degradation of habitat; and timber management. Other activities, such as increased recreational use from changes to land use patterns, also may occur. Wildland or prescribed fires are less likely due to full suppression actions in and surrounding the Project area, although they may occur on the other non-federal land exchange parcels. While vegetation will be removed from the Mine and Plant Sites and connecting corridors, timber management may occur on surrounding areas and on non-federal exchange parcels.

Vegetation and Timber

Vegetation management occurs across the range of lynx and can directly affect important habitats and prey. Stand structure, composition, and arrangement are important elements of habitat for snowshoe hares and lynx and as such, alterations to these elements will have varying effects depending on changes (e.g., clearcut versus uneven-aged harvests). The 2013 LCAS (p. 72) indicates that vegetation management promoting high stem density and dense horizontal cover can increase snowshoe hare densities, whereas reducing the density of, for example, sapling-sized conifers in young regenerating forests, reduces the amount and density of horizontal cover, which is needed to sustain snowshoe hares.

Mining

Removal of habitat for the mining operation will result in long-term, and in some areas – permanent, loss of suitable habitat and in turn contribute to habitat fragmentation. In larger mining operations, land exchanges may occur to consolidate private ownership of the surface above a deposit prior to mine development. Depending on lands exchanged, this could retain lynx habitat in public ownership, but could still result in a net loss of habitat. Development of road and railroad access to facilitate development can also directly impact lynx habitat, contribute to fragmentation, facilitate increased competition as a result of snow-compacted routes, and result in direct mortality (LCAS 2013, p. 83).

Roads

Road access to Canada lynx habitat increases the likelihood of human-related adverse effects, simply by increasing the number of humans present in the area. Human-related causes were confirmed for 5 of 11 lynx deaths in Minnesota among radio- and GPS-collared lynx in a recent study (trapping (2), automobile (1), shooting (1) and train (1) (Moen et al. 2008a). Of the remaining six, four died of unknown causes with suspected human involvement (Moen et al. 2008). Six additional lynx deaths have been confirmed in Minnesota due to collisions with vehicles on roads since the species was listed as threatened in 2000 (USFWS, Twin Cities Field Office, Bloomington, MN, unpubl. data).

These deaths have occurred on a wide variety of roads with average daily traffic volume ranging from 19 to 19,400 vehicles per day (USFWS, Twin Cities Field Office, Bloomington, MN, unpubl. data). There have been four documented lynx road mortalities on the Superior National Forest between 2001 and 2015. These mortalities took place on Cook County Highway 12 (Gunflint Trail), Forest Road 172, Lake County Hwy. 2, and MN Trunk Highway 61 (USFWS, Twin Cities Field Office, Bloomington, MN, unpubl. data). No lynx-vehicle collisions have been reported on roads associated with mining projects, even though lynx have been observed using mine roads at the Northshore Mine and former Cliffs Erie mine site near the Project area (ENSR 2006). Twenty-two lynx were struck and killed by vehicles in Maine between 2000 and 2009; 16 of these deaths occurred on logging roads and 6 occurred on state paved highways. Most mortality on logging roads were on 2-lane dirt haul roads that are open to and used frequently by the public (M.McCollough 2009, pers. comm.). In Colorado, nine lynx deaths due to vehicle collisions have been recorded since 1999 and five other lynx from Colorado were killed in adjacent states (K. Broderdorp et al. 2006, Shenk 2008). As in Minnesota, estimated traffic volumes vary widely among roadkill locations, from 480 to 27,600 vehicles per day.

Roads are a factor in human-caused lynx mortality where they provide access to areas where lynx occur, increasing the risk of negative interactions between people and lynx. Throughout the Forest (outside the Boundary Waters Canoe Area Wilderness, or BWCAW), high and low standard roads bisect many areas that provide potential or suitable lynx habitat. Some temporary roads, such as those used in mineral exploration or mining projects may stay open for more years (greater than 20 years) than those used for resource management (less than 10 years). If these roads remain accessible to the public, then human-lynx conflicts may increase. Further, these corridors may increase potential competition with other predators through increased snow compaction. Effective road closures in appropriate circumstances can reduce the potential effects to lynx and lynx critical habitat.

Lynx populations characteristically fluctuate during approximately 10-year cycles in response to changes in numbers of their primary prey, snowshoe hare. As previously mentioned, on-going northern Minnesota surveys indicated snowshoe hare numbers were high through the late 2000s, with some slight 10-year ups and downs (Erb 2009). Spring 2015 survey results suggested the current hare population may have declined, which would be expected with a fluctuating 10-year cycle, but the upcoming 2015-2016 winter survey will likely provide more conclusive information (Erb 2015, pers. comm.). Reduced prey densities and reduced movement of lynx from Canada may reduce their density in the action area but this would likely be followed by a cyclic increase.

The Superior National Forest is currently implementing the 2004 Forest Plan, which contains direction based on the LCAS and Canada Lynx Conservation Agreement between the USFS and the Service (2000). These apply to all activities implemented by the USFS that occur within LAUs. Thus, the aforementioned risk factors are being minimized and managed to promote the conservation of lynx within the Superior National Forest.

Human Presence and Associated Recreational Activities

The 2013 LCAS (p. 80) indicated that our understanding of the effects of outdoor recreation on

lynx and their habitat is incomplete. The effects, if any, may depend on the type of activity and the context within which it occurs. Activities that may impact lynx include loss of habitat, reductions in habitat availability due to disturbance, or changes in competition for snowshoe hare prey. Some anecdotal information suggests that lynx are quite tolerant of humans; however, lynx likely exhibit a variety of behavioral responses to human presence (Staples 1995, Mowat et al. 2000). Other anecdotal reports also suggest that lynx are not displaced by human presence, including moderate levels of snowmobile traffic (Mowat et al. 2000).

Lynx that conduct long-distance movements from Minnesota to Ontario are vulnerable to legal harvest in Canada whereas lynx trapping is no longer legal in Minnesota. Lynx may be captured in Minnesota incidental to legal trapping for other mammals. In the last 10 years, at least 15 lynx have been captured incidentally by trappers in pursuit of other species and 8 of them died as a result. Additionally, six lynx have been documented as shot and killed in Minnesota; two of these mortalities were within the SNF proclamation area (U.S. Fish and Wildlife Service, unpubl.data). Some lynx that make movements from Minnesota into Ontario are harvested there, particularly those that go long distances. Four lynx that were radio collared in Minnesota have been legally trapped and killed in Canada since 2000 and two died of unknown causes (U.S. Fish and Wildlife Service, unpubl.data).

Gray wolf

Various land management practices on the Superior National Forest may affect wolves and wolf habitat. These practices include management of timber, wildland or prescribed fire, wildlife habitat management, recreation, construction and maintenance of roads and trails, minerals exploration, and other human developments. Further, developments by other landowners or agencies within the boundaries of the Forests (on other ownerships or by authorization on National Forest System land) such as roads, railroads, utility corridors, and others may affect wolf movements. Risks of direct wolf mortality may come from shooting, trapping, predator control, vehicle collisions, and competition or predation as influenced by human activities. Other large-scale risk factors are disease, fragmentation and degradation of wolf habitat, and climate change. These risk factors are discussed below.

Prey habitat

Wolf density is heavily dependent on prey availability (Fuller et al. 2003), but prey availability is not likely to threaten wolves in Minnesota. Moose (*Alces alces*) and woodland caribou (*Rangifer tarandus caribou*) were the dominant ungulate species in northeast Minnesota before European settlement around the turn of the 20th century. Today white-tailed deer (*Odocoileus virginianus*) have replaced caribou and are the primary prey species in the state; beaver (*Castor canadensis*) are seasonally important prey on the SNF.

Conservation of primary wolf prey in Minnesota is a high priority for the MDNR. They manage ungulates to ensure a harvestable surplus for hunters and non-consumptive users, and to minimize conflicts with humans. To ensure a harvestable surplus for hunters, the MDNR must account for all sources of natural mortality, including loss to wolves, and adjust hunter harvest levels accordingly. In addition to regulating human harvest of deer and moose, the MDNR also

monitors and improves habitat for these species. Land management carried out by other public agencies and by private land owners in Minnesota's wolf range, including timber harvest and prescribed fire, incidentally and significantly improves habitat for deer. About one-half of the Minnesota deer harvest is in the Forest Zone, which encompasses most of the occupied wolf range in the state (Cornicelli 2007).

Deer, moose, and beaver are closely associated with forage from young upland forest less than 10 years old. Deer and moose also rely on upland conifer greater than nine years old for thermal and hiding cover. Currently, the Forest provides ample habitat for prey species, and densities of these species (particularly deer) have been high. Prey availability is not likely to threaten wolves on the SNF.

The potential implications of climate change to prey habitat in northern Minnesota are difficult to predict but continue to be studied regionally (e.g., Galatowitsch et al. 2009) and within the SNF (USDA 2011). The effects that climate change may have on prey habitat and availability is uncertain at this time and goes beyond the time frame of this project.

Human access

Human settlement and roads are considered to be major determinants in wolf distribution. These activities have multiple effects, including increased human presence causing an increase in illegal poaching and legal predator control, increased chance of introduced diseases and parasites via pets (e.g., canine parvovirus), and potential deterrence to colonization of otherwise suitable habitat (Gogan et al. 1997; Mech and Goyal 1995).

Road density correlates directly and indirectly with various forms of human-related wolf mortality factors. A rural area with more roads generally has a greater human density, more vehicular traffic, greater access by hunters and trappers, more farms and residences, and more domestic animals. As a result, there is a greater likelihood that wolves in such an area will encounter humans, domestic animals, and various human activities. These encounters may result in wolves being hit by motor vehicles, being controlled by government agents after becoming involved in depredations on domestic animals, being shot intentionally by unauthorized individuals, being trapped or shot accidentally, or contracting diseases from domestic dogs (Mech et al. 1988b; Mech and Goyal 1993; Mladenoff et al. 1995). Based on mortality data from radio-collared Wisconsin wolves from 1979 to 1999, natural causes of death predominated (57 percent of mortalities) in areas with road densities below 1.35 mi per mi² (0.84 km per km²), but human-related factors produced 71 percent of the wolf deaths in areas with higher road densities (Wydeven et al. 2001; Wydeven and Wiedenhoeft 2001).

The Recovery Plan recommends that density of higher standard roads (equivalent to USFS Objective Maintenance Level (OML) 3, 4, and 5) remain below 1 mi/mi² in critical habitat to limit the extent of associated effects to wolves. The SNF high standard road density outside the BWCAW is 0.45 miles/mile². Although the Recovery Plan addresses the impacts from low standard roads (generally equivalent to USFS OML 1 and 2, temporary, and some unclassified roads), it does not recommend a density threshold for them. Low standard roads may have a greater potential for human impact on wolves than high standard roads due to the potential for human access for trapping and shooting. These roads typically are accessed by recreational

motor vehicles or on foot.

Radiotelemetry studies are a good way to accurately estimate illegal mortality (Fuller 1989); however, only a few radiotelemetry studies have taken place in Minnesota. Data from north-central Minnesota from 16 diagnosed mortalities of radio-collared wolves over a 12-year period (1994 to 2005) show that human-related causes resulted in 69 percent of the diagnosed mortalities. These data include one wolf accidentally snared, two vehicle collisions, and eight (50 percent of all diagnosed mortalities) that were shot (DelGiudice 2005). Results from a smaller mortality dataset of radio-collared wolves studied between 1987 and 1991 in and adjacent to Voyageurs National Park, showed that all mortality inside the park was due to natural causes (for example, killing by other wolves or starvation), whereas the majority (60 to 80 percent) of mortality outside the park was human-induced (for example, shooting and trapping) (Gogan et al. 2004). Despite the difficulty in measuring the extent of illegal killing of wolves and accidental human-caused mortality, these killings have not been of sufficient magnitude to stop the growth of the wolf numbers in Minnesota.

In addition to illegal mortality, the current Endangered Species sub-permit to USDA Wildlife Services (WS) allows WS and designated WS employees to capture and kill wolves in response to verified depredation of domestic livestock in accordance with regulations 50 CFR 17.40(d)(2)(i)(B)(4). Lethal wolf control is not allowed in federal wolf management Zone 1 in extreme northeastern Minnesota under this sub-permit. Zone 1 stretches from Voyageurs National Park on the west to Taconite Harbor (on Lake Superior) on the east (Figure 6). This area is generally remote with minimal livestock production (USDA APHIS - Wildlife Services 2008). From 1996 to 2009, an average of 146 wolves (95 percent confidence interval of 132 to 159) were taken as a result of depredation control in Minnesota (USDA APHIS - Wildlife Services 2008, 2009).

These deaths have not resulted in a significant decline in wolf numbers in Minnesota, which remain far above recovery goals (U.S. Fish and Wildlife Service 2014). It is important to note that despite the difficulty in measuring the extent of illegal killing of wolves, all sources of wolf mortality, including legal (e.g., depredation control) and illegal human-caused mortality, have not been of sufficient magnitude to stop the continuing growth of the wolf population in Minnesota.

Other factors

Den site disturbance may occur during timber harvest, site preparation, prescribed burning, minerals exploration and other activities; however, wolves at dens and rendezvous sites have been known to tolerate nearby activities. In addition, wolves have large home ranges in Minnesota with available and abundant suitable habitat. The SNF is currently implementing the guidelines set forth in the Recovery Plan for all Forest activities, as directed by the current Forest Plan. Thus, the aforementioned risk factors are being minimized and managed appropriately to promote the conservation of gray wolf.

Northern long-eared bat

No other threat is as severe and immediate for the NLEB as white-nose syndrome and while the fungus that causes WNS is present in the Tower-Soudan mine hibernaculum in northeastern Minnesota, the disease itself is not yet apparent. It is unlikely that NLEB populations would be declining so dramatically without the impact of WNS. However, other factors may affect NLEB, such as habitat loss primarily due to forest conversion, and to a lesser degree, unsustainable forest management, wind energy development, environmental contaminants, and fire.

Forest management activities, unlike forest conversion, typically result in temporary impacts to the habitat of NLEB, but like forest conversion, may also cause direct injury or mortality to individuals. The net effect of forest management may be positive, neutral, or negative, depending on the type, scale, and timing of various practices. The primary potential benefit of forest management to the species is perpetuating forests on the landscape that provide suitable roosting and foraging habitat.

Climate change may also affect this species, as NLEB are particularly sensitive to changes in temperature, humidity, and precipitation. Climate change may indirectly affect the NLEB through changes in food availability and the timing of hibernation and reproductive cycles.

Environmental contaminants, in particular insecticides, other pesticides, and inorganic contaminants, such as mercury and lead, may also have detrimental effects on NLEB. Contaminants may bio-accumulate (become concentrated) in the tissues of bats, potentially leading to a myriad of sub-lethal and lethal effects. There is currently no evidence that the natural or manmade factors mentioned above separately or cumulatively have been contributing to significant range-wide population effects on the NLEB prior to the onset of WNS.

EFFECTS OF THE ACTION

Effects of the action are defined as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline" (50 CFR §402.02). Direct effects are defined as the direct or immediate effects of the action on the species or its habitat. Direct effects result from the agency action, including the effects of interrelated and interdependent actions. Indirect effects are caused by or result from the agency action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the immediate footprint of the project area, but would occur within the action area as defined.

The following information addresses factors affecting lynx, wolf, and NLEB, with factors specific to the individual species identified where appropriate. The BA (p. 6-1) indicated that the area for direct and indirect effects analyses included those areas within 6 miles of the Project, or approximately 250 mi² plus the area that extends to wildlife corridor #18. The 6-mile buffer was originally identified by the Service in 2006 as the minimum area that could be impacted by the Project and we further refined the rationale for the 6-mile radius action area based on information in the BA and FEIS (see Action Area subsection above), as well as the lands specific to the other land exchange parcels and Wetland Mitigation Sites.

In the effects analysis, we reach the following conclusions and explain the rationale behind these conclusions. We conclude that the land exchange, in and of itself, will not result in negative effects to lynx, wolf, and NLEB. However, the land exchange will lead to the subsequent development of the newly private lands, which will be an indirect effect of and caused by the proposed land exchange, thereby resulting in significant adverse effects and potential take of lynx, wolf, and NLEB.

Species habitat effectiveness (including quality and quantity) and use of the Mine and Plant Sites and surrounding area within the exchange parcel will be reduced due to vegetation removal and subsequent habitat fragmentation, increasing human presence, noise, increasing traffic, and other factors as mining activities progress. Permeability within the landscape, including the wildlife travel corridors identified in the BA, also may be reduced due to activities at the Mine and Plant Sites and associated transportation infrastructure and traffic. These activities may create an additional impediment to lynx, wolf, and prey movements. The proposed mine could result in an increase in recreational activities due to the increase in human activity in the area. These effects cannot be described precisely, but may increase the incidence of human-wildlife encounters and could contribute towards the general reduction in the value of the mining area to wildlife, including lynx and wolves. Considering the environmental baseline and the additional effects that may be caused by the PolyMet mine, we believe that loss of habitat, reduced habitat effectiveness and fragmentation, including various types of noise, and transportation impacts within and around the Project area represent an adverse effect to lynx, wolf, and NLEB.

Habitat

** 197 acres are upland

The BA (pp. 4-1 to 4-15) provided a description of existing vegetation conditions within the Project-area. We briefly summarize the associated acres below (Table 2) and provide additional contextual information.

Table 2. Summary of acres affected by PolyMet Project.

POLYMET PROJECT	Total Acres	Acres Disturbed by Project	Acres Federal
Total project area	7,650	3,918	6,495
Mine Site	3,015	1,719	2,719
Plant site	4,515	2,189	0
Road/utility & RR corridors	120*	<10	0
Lands adjacent to Mine Site	3,776	0	3,776
Non-federal exchange parcels	7,075	n/a	n/a
Wetland Mitigation Sites	2,169**	n/a	n/a
* Most all acres currently disturbed			

The Mine and Plant Sites provide habitat suitable for all species, although most of it occurs on the 3,015-acre Mine Site and on lands surrounding it. Most of the mature forest habitat is in the central and western portions of the Mine Site, with the largest trees reaching approximately 16

inches dbh. There will be incremental clearing of all vegetation with heavy equipment, totaling 1,719 ac at the Mine Site (550 ac, or 32 percent, during the first 2 years and the remainder by year 11); 914 ac of wetlands also will be removed. Some surrounding habitat within the Mine Site will remain intact, including some forest cover.

The 4,515-ac Plant Site has 2,756 ac (61 percent) of land already disturbed by previous taconite mining; the remaining 1,760 ac include aspen/birch forest (14 percent), grass/shrubland (7 percent), upland coniferous forest (2 percent), and lowland coniferous forest (1 percent). New mining-related activities will result in 2,189 ac of disturbance and when combined with other activities, only 422 ac of forested habitat will remain at the Plant Site. Wetlands cover 245 ac, of which approximately 147 ac will be excavated and/or filled.

Vegetation conditions in the Transportation and Utility Corridors are disturbed (approximately 94 ac out of 120 ac) due to prior use during former taconite operations. There is cropland/grassland and shrubland along these corridors (8 percent and 6 percent, respectively).

The federal lands surrounding the Mine and Plant Sites and connecting corridor area cover 3,776 ac, of which 2,870 ac (76 percent) are wetlands, including part of the One Hundred Mile Swamp, and are comprised mostly of greater than 70 year-old black spruce, northern white cedar, and tamarack forest. These wet areas probably have limited lynx, wolf, and NLEB use except during winter months by lynx and wolf, although lowland conifer cover types in general may have increased lynx use during the denning season (dens often are located near this type; Moen et al. 2008a). The BA (p. 4-3) indicated that the lands not disturbed by mining activities and adjacent to the Mine Site will be managed for timber and wildlife habitat.

Mining activities will include construction of various water features. In addition to water-filled pits post-mining, there will be a flotation tailings basin and seepage capture systems, storm water dikes and ditches, drainage swale, and stream reductions and/or augmentations.

Approximately 397 acres lost to mining will be reclaimed after mine closure and will be characterized as grassland/herbaceous (54 percent), wetland and/or grassland/herbaceous (27 percent), and wetland (18 percent); some progressive reclamation may occur within some areas as phases of mining are completed. The west pit will not be reclaimed, but will remain as a 320-acre open pit lake. Only 202 of 397 acres of the reclamation will be suitable for regeneration by shrubs and trees (J. Saran pers. comm. 2016) – the habitat cover conducive to lynx, wolf, and NLEB. In general, reclaimed mine sites often lack diversity that typically occurs prior to mining, and habitat used by these species may take many decades longer to become suitable.

Noise and Vibration

The major sources of noise from the Mine Site will be blasting and drilling, and vehicle/train traffic, including haul trucks and train horns, with noise levels ranging from 89-115 dBA³.

³ Noise is measured in logarithmic decibels (dB), where change between two values is perceived based on the ratio (e.g., a change from 1 to 2 would be perceived as the same amount of change from 4 to 8); the logarithmic A-weighted decibel (dBA) is a scale emphasizing the range between 1,000 and 8,000 cycles per second, which is the range of sound frequencies most audible to the human ear (see FEIS 4.2.8, p. 4-293).

Ambient noise levels from most of the Mine Site currently range from approximately 35 to 45 dBA. Noise from heavy equipment, such as graders, bull-dozers, and support trucks, will range from 75 to 95 dBA. (A car horn at 3 meters and a nearby thunderclap are equivalent to approximately 120 dBA.) Blasting noises and vibrations within most of the Mine Site will be similar to a loud clap of thunder and are expected to occur once every 2 to 3 days. Typically, rock blasting generates a single event noise level ranging from 111to 115 dBL⁴ at 50 ft from the blasting site (BA p. 6-74). Other sources of noise, such as at the Plant Site and the Transportation and Utility Corridors, will likely be similar to the Mine Site heavy equipment levels.

Transportation and Utility Corridors

New roads will be constructed in the Project area and mostly within the Mine Site. They will be well-traveled and there will be noise and activity associated with construction and operations, 24 hours per day and year-round for up to 20 years. The BA indicated that cars and light trucks will travel up to 45 miles per hour (mph) and large trucks will travel up to 40 mph back and forth between the Plant and Mine Sites (approximately 8.5 mi one-way); that has since been lowered to 40 mph (see Conservation Measure #5 above). As mentioned in Conservation Measure #5, PolyMet will post and enforce speed limits on their lands. Ore trains will travel up to 25 mph, with approximately 22 round-trips daily (approximately 9.5 mi one-way) (Saran 2016, pers. comm.).

Additional project-related commuter and service-related traffic will occur on the various roads accessing the Project area from nearby towns, such as Aurora, Hoyt Lakes, Biwabik, and Virginia (approximately 6, 6, 10, and 20 miles, respectively, to the west or south), and will include approximately 150 employee vehicles and 40 service vehicles per day, traveling via the County Road 666 Main gate and North Gate (from Highway 135). Transport of other products from the Plant Site to locations off-site will include approximately 80 round-trips per month on roads, as well as rail travel of a 100-car train once per month, a 30-car train 4 times per month, both year round, and a 100-car train once per week from April to October.

Private Land Exchange Parcels

The Project involves the transfer of approximately 6,495 acres of USFS-administered lands to PolyMet, in exchange for 7,075 acres of privately owned lands. According to the BA (pp. 6-24 to 6-28, 6-39, 6-40), portions of the non-federal lands have been harvested during the past 20 years, with much of the harvest occurring on Lake County Lands North and South, and Wolf Lands 2 and 3. Regenerating forests on these parcels (as well as the other parcels) likely provide habitat for prey species such as snowshoe hares and ungulates, and foraging opportunities at various forest successional stages for lynx, wolf, and NLEB. About 267 acres consist of aquatic habitat, which is unlikely to be used by lynx, wolf, or their prey species, except perhaps during winter. All exchange parcels will come under USFS management. LAUs SNF# 4, 16, 21, 22, and 42 will not actually gain acres because the lands are already encompassed by these LAUs, but they will gain acres under USFS management, and the LAUs will all continue to have at least 95 percent suitable habitat for lynx (see Table 1). Hay Lake lands are not within or near any LAU, so will

⁴ Air vibration from blasting is measured in linear decibels (dBL), where a change between two values is perceived based on the difference (e.g., a change from 1 to 2 would be perceived as the same amount of change from 4 to 5).

not necessarily be subject to LCAS-related lynx management as described in the Forest Plan; however, these lands do fall within lynx critical habitat, so will be managed according to relevant Forest Plan conservation measures. The Hay Lake lands occur outside of wolf critical habitat but within wolf management Zone 4, so are covered by existing Forest Service wolf management guidelines. Future actions on the Hay Lake lands may also be subject to ESA section 7 review for lynx, wolf, or NLEB.

The BA indicated that the majority of habitat on the non-federal lands consists of immature and mature age classes of upland and lowland coniferous and deciduous forest. After the land exchange, the USFS will have a net gain of 580 ac, most of which provide potential habitat for lynx, wolf, and NLEB. The land exchange will consolidate USFS land ownership and management of these lands will remain relatively unchanged. It is unlikely new roads will be constructed on these lands except those used primarily for timber production and recreation. Therefore, there will be little to no change in existing road densities in these areas. Given that these lands will not be directly or indirectly impacted by the mining project, are not expected to be developed in the near future, and will remain mostly in timber production with limited recreational use, effects to lynx, wolf, and NLEB may be beneficial or adverse in the short-term (e.g., timber harvest) but overall, likely will be neutral. As such, the private land exchange parcels will not be discussed further.

Wetland Mitigation Sites

The BA (pp. 6-26, 6-28, 6-38) indicated that under the proposed action, approximately 2,169 acres of Wetland Mitigation Site lands will be purchased (off-Forest) by PolyMet as compensatory mitigation for impacts to wetlands and other waters of the U.S. These lands are currently used for sod production, but will be restored to native wetland and upland vegetation. Approximately 1,603 acres of wetland and 197 acres of upland will be restored or created at the Wetland Mitigation Sites. These sites could provide habitat for lynx wolves, and NLEB, but there have been no recent records of lynx in or adjacent to the Sites, and wolves are rare on or adjacent to these lands; NLEB presence is unknown.

It is unlikely that new roads will be constructed to improve access to Wetland Mitigation Sites, as these lands are in somewhat remote locations and are little used by the public. There will be little change in impacts from recreational activities to lynx, wolves, and NLEB, or changes affecting lynx and wolf movements. After restoration, the combined total acres of wetlands and uplands will be approximately 1,603 ac and 197 ac, respectively, which could provide a limited amount of wolf and NLEB habitat. However, these acres are unlikely to be used by lynx primarily due to the distant location of contiguous suitable habitat. Also, the open, mostly wetland habitat that will dominate these mitigation sites is generally unsuitable for all three species. Overall effects to lynx, wolf, and NLEB will most likely be neutral; therefore, the Wetland Mitigation Sites will not be discussed further.

Climate Change

Our analyses under the ESA include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on

Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

In 2003, the Service determined that climate change was not a threat to lynx within the contiguous U.S. DPS because the best available science we had at that time (Hoving 2001) was too uncertain in nature (68 FR 40083). Since that time, new information on regional climate changes and potential effects to lynx habitat has been developed (e.g., Danby and Hik 2007; Gonzalez et al. 2007; Knowles et al. 2006), and this new information suggests that climate change may be an issue of concern for the future conservation of lynx because lynx distribution and habitat is likely to shift northward and upward in elevation in areas with significant altitudinal gradation within its currently occupied range as temperatures increase (Gonzalez et al. 2007). This information, combined with the information in Hoving (2001), still needs to be evaluated further to determine how climate change might affect lynx and lynx habitat.

The potential implications of climate change to wolves and wolf prey habitat in northern Minnesota are difficult to predict but have been studied regionally (e.g., Galatowitsch et al. 2009) and within the Superior National Forest (USDA 2011). The effects that climate change may have on prey habitat and availability is uncertain at this time and goes beyond the time frame of this project.

Climate change may also affect NLEB, as they are particularly sensitive to changes in temperature, humidity, and precipitation. Climate change may indirectly affect the NLEB through changes in food availability and the timing of hibernation and reproductive cycles. However, we have no evidence that the proposed Project will appreciably increase greenhouse gases (e.g., due to increased traffic volume) to the degree in which it will affect the climate in the action area. Therefore, climate change will not be addressed further.

Effects from Specific Project Activities

1. Activity: After the federal parcel land exchange, there will be mechanical tree and vegetation clearing and complete removal in a large portion of the Mine Site and part of the Plant Site. Some clearing of forested habitat also will occur along existing roads, railroad tracks, and the utility right-of-way.

Subactivity: Actual disturbance to the 3,015-ac Mine Site area will be 1,719 ac and at the 4,515-ac Plant Site will be 2,189 ac (of which 1,103 ac (50 percent) are already disturbed and have little vegetation from previous mining-related activities; another 25 percent is wetlands).

Transportation/Utility Corridor clearing will be minimal because most of the 120-ac corridor is already developed and disturbed. Heavy equipment will be used to remove all trees, vegetation, soil, and overburden. The clearing at the Mine Site will be incremental, with 550 ac removed during the first 2 years and the remainder removed by year 11; 914 ac of wetlands will also be removed.

Stressor: The change in land ownership will result in subsequent mining development. There will be immediate loss of lynx, wolf, and NLEB habitat and associated prey species that use these same habitats. There will also be noise from heavy equipment involved in vegetation and overburden removal.

Exposure: Lynx, wolves, and NLEB will be exposed to human presence, vegetation removal activities, and associated noise in and around the Mine and Plant Sites and along the connecting Transportation/Utility Corridor through year 11, when this vegetation removal will be completed. The Mine Site and eastern portion of the Transportation and Utility Corridors are within LAU SNF#12 and lynx critical habitat, whereas the western portion of the Corridor and the Plant Site are outside; the entire Project area is outside of wolf critical habitat. The BA identified the Transportation/Utility Corridor as being located adjacent to areas with potential for "moderate and high quality wildlife travel corridors." The immediate loss of habitat will expose lynx and wolves to habitat fragmentation, decreased access to travel corridors, decreased habitat effectiveness, and expose adjacent habitats to increased resource use by lynx, wolves, and prey species. Effects to wildlife travel corridors are addressed under the next mining activity discussion. Individual NLEBs, particularly those associated with maternity roosting areas, also will be exposed to the loss of habitat and fragmentation.

Response - Harm: Adult or young lynx, wolves, their prey, and NLEBs could be injured or killed by tree felling and other vegetation removal activities, including at or near any active den sites or maternity roost sites that may be present. Immediate loss of forested habitat eliminates foraging opportunities and subsequently displaces lynx, wolves, NLEBs, and their prey (snowshoe hare, ungulates, insects, etc.). Habitat loss may result in lynx, wolves, and NLEB having to abandon the area temporarily or permanently, including portions of existing home ranges, territories, or maternity roosting sites, to find suitable habitat with adequate prey or new roost sites. Disturbances forcing NLEBs to flee during daylight hours increase their risk of being preyed upon. Similarly, displaced lynx or wolves may come in contact with other predators, including other wolf packs, resulting in lynx or wolf injury or death. It will further fragment the remaining habitat, particularly on the east side of the action area, and may restrict or prevent access to existing (terrestrial) wildlife travel corridors between habitats to the north and south of the Project area, in turn forcing lynx and wolves to travel farther to find available suitable habitat. All three species also could be forced into areas with less suitable habitat. They may experience decreased fitness from less prey and have to expend energy resources to travel elsewhere in search of resources, potentially decreasing reproductive success.

Response-Harass: Lynx, wolves, and NLEB could be annoyed by the noise of heavy equipment, other motorized vehicles, and human presence during the vegetation removal process to the point that they abandon suitable habitat, portions of home ranges or territories, active den sites, wolf rendezvous sites, or maternity roosting sites, and leave the general area. Because noise and disturbance levels will vary depending on factors such as loudness and duration of noise, habitat

type (e.g., forested or open), and current weather conditions such as wind direction, these effects may be either temporary or permanent.

Consequences/Intensity: Effects will vary depending on when vegetation removal activities will occur in the Project area and on quality and quantity of adjacent habitat in the action area. We mostly focus on the Mine Site for this activity because of its inclusion in the land exchange, along with a block of undeveloped, suitable habitat occurring within in it that is contiguous with habitat outside the Mine Site. Effects to habitat at the Mine Site will likely impart greater impacts to these species than from the forested area along the corridor connecting it to the Plant Site, most of which is already disturbed, as is a significant portion of the Plant Site. Death or injury of individuals could occur, not only directly from vegetation removal but from interactions and conflicts with other predators, as lynx, wolves, and NLEB are displaced by vegetation removal disturbances. They may subsequently experience decline of body condition or reduced fitness, especially if it occurs during the energy-demanding denning or pup season. Reproductive efforts could be impaired, leading to failed litters or starvation of kittens and pups. Loss of habitat will further fragment habitat in the area, which already has been significantly diminished by other nearby mining projects.

The Mine Site's 1,719 acres of lynx, wolf and NLEB habitat that will be removed includes 1,333 ac of lynx denning, wolf cover, and NLEB roosting habitat. The loss of 3,918 ac at the Mine and Plant Sites combined in the context of a lynx home range size and density of lynx, which ranges from approximately 1 lynx per 43 mi² to 83 mi² (27,520 to 53,120 ac) in northeastern Minnesota, equals 14 percent and 7 percent, respectively, of a home range. In the context of a wolf territory and density (density is similar to the size of a territory, although territories in Minnesota typically range from 25 to 150 mi²), the habitat loss equals approximately 7 percent of an 83 mi² territory. Loss of suitable habitat will not only further fragment remaining habitat in the general vicinity but likely will affect adjacent suitable habitats due to increased use, and other factors mentioned above.

LAU SNF #12 encompasses 70,980 ac, of which 47,908 ac are administered by the USFS; the loss of 6,495 ac from the land exchange will equal a 13.6 percent reduction in acreage (to 41,413 ac) administered by the SNF (BA p. 6-14; Table 1 above). The exchange also will result in a loss of 1,719 ac of lynx habitat in LAU SNF# 12 (a decrease of 2 percent suitable habitat within that LAU), most of which will be permanent (a small amount will be reclaimed), However, the remaining portion of LAU SNF #12 will have 93.7 percent suitable habitat after the land exchange, which is well above the 70 percent minimum per the 2000 and 2013 LCAS management guidance and SNF Forest Plan. The BA also indicated that there is suitable habitat available to the east and southeast of the Mine Site. The land exchange of 6,495 ac from the USFS to PolyMet will result in these lands no longer being managed by the USFS for lynx and lynx critical habitat. However, the critical habitat boundary will not change and will continue to include the east-southeast side of the Project area (i.e., Mine Site, part of the Transportation and Utility Corridors, and surrounding lands).

There will be effects to the lynx critical habitat PCEs ((a) presence of snowshoe hares and their preferred habitat conditions; (c) sites for denning that have abundant coarse woody debris; and (d) matrix habitat) for similar reasons discussed above and in the following activities. PCE (b)

deep and fluffy winter snow conditions, will likely be affected by changes to snow conditions in areas that are converted from forest cover to openings and mine pits (and later, mine pit lakes). Effects to lynx critical habitat are evaluated at the scale of the entire Unit. Therefore, even if all 6,495 ac included under the land exchange were disturbed in perpetuity, the loss of these critical habitat acres relative to the 8,069 mi² (5,164,160 ac) size of Unit 2 equals 0.13 percent. However, the disturbance of 1,719 ac of habitat will be substantially less than this (0.03 percent) relative to Unit 2; both amounts are essentially insignificant at that scale. Also, abundant habitat is available in the vicinity that will be managed for wildlife and other resources, and will continue to provide the physical and biological features and associated PCEs that support lynx critical habitat.

Squires et al. (2013) study results from population-level modeling in the Northern Rockies indicated that changes to vegetation structure can increase landscape resistance to lynx movements; however, there is no evidence that this was causing genetic isolation (Schwartz et al., 2002). Although lynx are capable of crossing hundreds of kilometers of unsuitable habitat, as evidenced by verified locations in prairie ecosystems (McKelvey et al., 2000), lynx in the Northern Rockies are sensitive to changes in forest structure and tend to avoid forest openings (Koehler, 1990; Squires et al., 2010). We anticipate that mining activities will similarly increase landscape resistance to lynx (and wolves) within the Project area at a minimum and both species may avoid much of the disturbed and open spaces due to lack of quality habitat and foraging opportunities, subsequently forcing them to move elsewhere to find suitable habitat, prey, and den sites.

Loss of most of the lynx, wolf, and NLEB habitat will be permanent except for those areas where reclamation of forested habitat will occur. In those areas, it will take at least several decades from when initial mining activities begin until they are reclaimed and regenerate to suitable habitat conditions. However, PolyMet intends to manage for wildlife habitat adjacent to the Project area, some of which already provides suitable habitat for these species and will continue to with appropriate management.

Scale/Extent of Effect on Reproduction, Population: One or more lynx, wolf, or NLEB home ranges or territories could be affected, both temporarily and permanently. Localized impacts to individuals or packs are likely to occur. Although significant at the local scale, effects to rangewide numbers, reproduction, and distribution for the species are unlikely to be substantial. (Maximum habitat loss of 3,918 ac from mining activity at both Mine and Plant Sites would equal less than 0.1 percent of lynx, wolf, or NLEB habitat in Minnesota.) Loss of NLEB habitat due to forest conversion and management has been identified as a threat to NLEB. The final 4(d) rule biological opinion indicated that while NLEB mortalities related to forest management impacts could further diminish the species' ability to persist, NLEB populations would not be declining so dramatically without WNS. There are large tracts of land adjacent to the Mine Site and within the action area, such as the adjacent USFS lands to the northeast, east and southeast, which are managed to provide lynx, wolf, and NLEB habitat, and lynx and wolf critical habitat. Abundant habitat for all three species also occurs outside of Minnesota.

Conservation Measure: PolyMet addressed some of these effects in Conservation Measures #1, 2, and 7 (see Conservation Measures beginning on page 6 of this Opinion). Reclamation of 397 acres

will occur, including seeding and/or planting of woody vegetation (trees and shrubs) on up to 202 acres of lands suitable for this type of vegetation (Figure 9). Planting/seeding of woody vegetation rather than with grasses and forbs will expedite forest regeneration on those 202 ac instead of waiting for only natural succession to occur. Depending on the amount and density of seeding and/or planting, and other site conditions, it will still take at least 10 years – and possibly longer – for habitat to become suitable for lynx, wolves, NLEB, and their prey. We anticipate that the slivers of reclaimed habitat along the Mine Site's central pit and haul roads will provide limited value to lynx, wolves, and their prey due to fragmented location, small size, and linear shape of the slivers. These slivers of reclaimed acres cover approximately one-half of the 202 ac, or about 100 ac, which likely will be marginal for lynx and wolf use. NLEBs will forage and roost in interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, woodlots, and linear features such as fencerows, riparian forests, and other wooded corridors. However, they consistently avoid foraging in or crossing large open areas and instead, use tree-lined pathways or small openings (Patriquin and Barclay 2003, Yates and Muzika 2006). Therefore, the entire 202 ac reclaimed with trees may be more conducive to NLEB use than lynx and wolf.

The reclaimed habitat in the eastern portion of the Mine Site (labeled as Category 2/3 in Figure 9) will be contiguous with adjacent suitable habitat, and more likely to be used by these species and their prey. The surrounding forested lands within the Project area not disturbed by mining operations will be retained and managed as wildlife habitat; however, 2,870 ac (76 percent) are wetlands, comprised mostly of greater than 70 year-old lowland forest. The wet areas probably have limited lynx, wolf, and NLEB use except during winter months by lynx and wolves, but as previously mentioned, Moen (2008a) found that lynx use of the lowland conifer cover type tends to increase during the denning season. PolyMet indicated that they will include timber harvest in its management of these surrounding lands, which will regenerate the forest and perpetuate lynx, wolf, and NLEB habitats. However, these actions also would result in short-term adverse effects during and immediately after timber harvest, depending on timing, size, and type of harvest implemented (e.g., even-aged (clearcut) versus uneven-aged management). Finally, PolyMet intends to clear trees outside of the NLEB's pup season from June 1 through July 31, which will eliminate or reduce disturbance impacts to any potential NLEBs maternity roosting activities.

There are no known lynx or wolf den sites in the area and the likelihood for a den to occur within the Project's area of disturbance is probably low. As previously mentioned, lynx detections from an intensive 3-month winter survey were concentrated approximately 5 miles east and southeast of the Project area. One set of lynx tracks was identified at the Mine Site in February 2010 but none were detected during five other surveys (2000, 2004, 2008, 2009, and 2010). The limited evidence of lynx activity in the action area appears to concentrate toward the outer, eastern and southeastern edges of the action area. Also, the Project area is located adjacent to areas already disturbed by on-going mining activities. There are no records of lynx or wolf dens in the action area and lynx and wolf use in and near the Mine Site appears to be low.

Vegetation removal will include 1,333 ac of potential lynx and wolf denning habitat at the Mine Site. The proportion of this area relative to habitat that supports denning in Minnesota is extremely small. Moen (2008a) indicated that approximately 25 percent (approximately 2.1 million acres) of the landscape in northeastern Minnesota (St. Louis, Lake and Cook Counties -

covering approximately 8.4 million ac) consists of suitable lynx denning habitat. Therefore, removal of 1,333 ac of denning habitat (less than 0.1 percent) would not limit lynx populations in Minnesota. In addition, vegetation removal will occur outside of the period from June 1 to July 31 (per Conservation Measure #7, which is intended to minimize effects to the NLEB). This will further minimize the chances of any direct harm to or death to denning lynx or wolves, including young that could occur as a result of the removal of vegetation. The amount of denning habitat for wolves is likely even greater than that for lynx; therefore, we also expect the removal of 1,333 acres of habitat to no significant effect on the number of wolves in Minnesota.

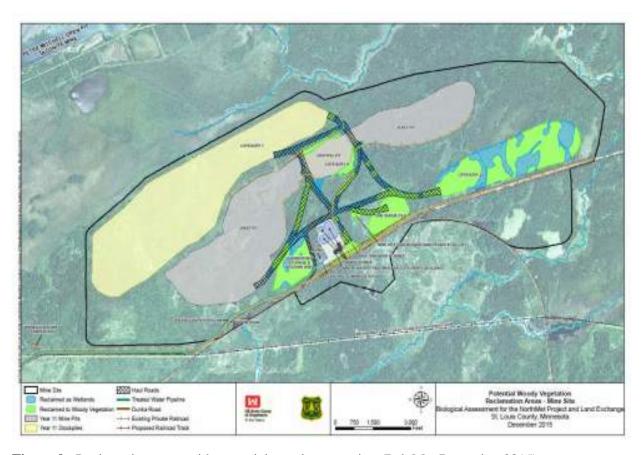


Figure 9. Reclamation areas with potential woody vegetation (PolyMet December 2015).

2. Activity: Pre-production and infrastructure construction followed by subsequent mining activities.

Subactivity: After vegetation clearing, the Dunka Road will be widened between the Plant and Mine Sites and a new railroad spur line and water pipeline will be constructed in the Transportation and Utility Corridors. Development of water management features (ponds, ditches, dikes, etc.), containment systems, storage, fueling, and maintenance areas, and infrastructure at the Plant Site, as well as corridor-related construction will occur first. These will be followed by subsequent mining-related activities, including drilling and blasting of rock; heavy equipment use (such as excavators and bull-dozers); piling, loading, and unloading mined material into stockpiles, haul trucks, and trains; and associated transportation (see transportation below under Activity 3 – Transportation and Utility Corridors).

Stressor: Lights, glare, noise and vibrations from these activities.

Exposure: Along with increased human presence, lynx, wolves, and NLEB could be exposed to lights, glare, noise and vibrations from construction and subsequent mining-related activities for 24 hours per day, year-round, for a minimum of 20 years. The area of exposure will extend beyond the Project area depending on a variety of conditions (type of noise, prevailing wind direction, daytime versus nighttime activities etc.), and is likely to include adjacent areas not being mined that have suitable lynx, wolf, and NLEB habitat, lynx critical habitat, and some of the terrestrial wildlife travel corridors (most likely corridors #15, 16, 17, and 18; Figure 10).

Exposure to lights will be associated mostly with the Mine Site. The loudest noises and vibrations (blasting and drilling) are expected to occur every 2 to 3 days at the Mine Site but other loud noises throughout the project area will be on-going. The air-blasts were estimated to reach 125 dBL at corridor # 17, 115 dBL at #16, and between 105-110 dBL at corridors #15 and 18 (see FEIS Fig. 5.2.8-2, p. 5-537). (*Note*: potential wildlife movement, or travel, corridors were identified through two separate geographic information system spatial analyses by Emmons and Olivier 2006 and Barr 2009. These spatial exercises were based on vegetation cover data, and economic and other information, to identify where in the Iron Range wildlife travel corridors likely still existed that connected adjacent large blocks of habitat to the northwest and southeast of the Iron Range. Subsequent data on wildlife use of these corridors is mostly opportunistic or anecdotal.)

Wildlife travel corridors #16 and 17, particularly access to these areas, would most likely be directly affected by mining-related activities. Corridor #16 is located approximately 1 mile southeast of the existing Plant Site; it is 0.6 mi wide and the FEIS (pp. 5-448 and 6-77) identified it as being important but of moderate quality (the existing LTVSMC Tailings Basin is located within the corridor but provides poor quality habitat, currently obstructs animal movement, and is unlikely to be used much by wildlife). Corridor #17 is located approximately 0.5 mi northwest of the Mine Site, is 0.25 mi wide between two existing open mine pits, and is crossed by roads (Barr 2009); it was identified as important with high quality habitat. However, the north side of this corridor likely will be lost to Northshore Mining's mine pit expansion (Barr 2009). Wildlife travel corridor #15 is approximately 2 miles to the southwest of the Plant Site and is at least 900 ft wide (0.17 mi) at its narrowest point; #18 is approximately 6 miles northeast of the Mine Site and at least 1,100 ft wide (0.2 mi), is crossed by several roads, and follows the course of a river. The approximate distance between wildlife corridors #15 and #16 is 2 miles, #16 and #17 is 3 miles, and #17 and #18 is 9 miles.

Exposure to the various water impoundment features and any potential contaminants released into them, such as mercury, is unlikely to affect lynx or wolves. There is potential to indirectly affect NLEB through ingestion of contaminated insect prey. However, NLEBs primarily forage in, or adjacent to forested areas rather than in openings such as the tailings basin or other ponds within the Project area. The BA (pp. 6-76 to 6-78) indicated that process water collected and stored in ponds, and the substrates within the various ponds will not be conducive to growth and reproduction of algae, macroinvertebrates, and other biota. It further stated that mercury will be sequestered in solids, such as tailings, such that concentrations in the water column should be

low – similar to background levels. Management of water levels in some of the impoundments also will limit aquatic insect use, and therefore, NLEB use.

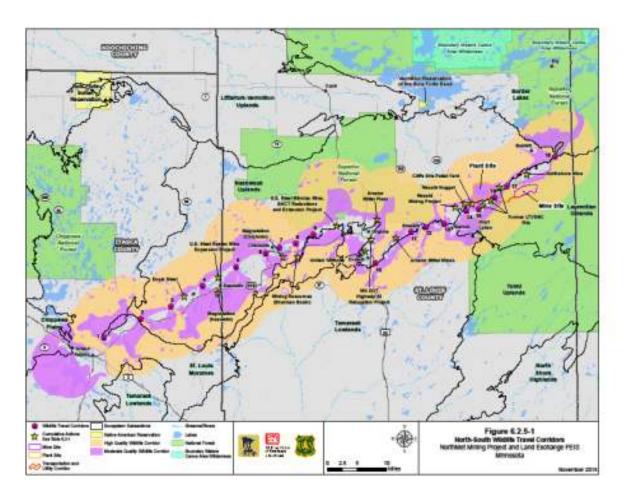


Figure 10. Wildlife travel corridors (from FEIS, Figure 6.2.5-1, p. 6-75).

Response - Harm: Lynx, wolves, and NLEB could be harmed by the loudest decibel levels emanating from blasting and drilling, given that these species have more sensitive hearing than humans. However, these noises and vibrations will occur where habitat has been removed and in conjunction with other on-going activities and noise, and it is unlikely they would be in close enough proximity to suffer harm to their hearing. Noise and other mining-related effects may diminish the habitat quality within the remainder of the Project area and adjacent habitats and travel corridors, contribute to fragmentation effects (from loss of habitat) and force lynx, wolves, and NLEB to travel farther to find available suitable habitat and prey resources.

Response-Harass: Lynx, wolves, and NLEB could be annoyed by the perpetual lights, noises, and vibrations of mining rock material, heavy equipment use, loading and dumping, and transportation sounds to the degree that they may leave the area and/or abandon portions of home ranges or territories, den sites, wolf rendezvous sites, or maternity roost sites either temporarily or permanently.

Consequences/Intensity: The level of effects from lights on individual lynx and wolves is unknown; lights could also act in combination with other activities' effects that annoy individuals. NLEBs foraging in lighted areas may increase their risk of predation (leading to death) or it may deter bats from flying in those areas. Bats that significantly alter their foraging patterns may increase their energy expenditures resulting in reduced reproductive rates, depending on the context (e.g., duration, location, extent, type) of the lighting. However, some studies also show a beneficial effect from concentrating prey.

The extent of the noise and vibration effects will vary considerably depending and many factors, including type and duration of activity producing the sounds, duration and decibel levels of the noises and vibrations, time of day and season (e.g., nighttime versus daytime; summer with abundant foliage that dampens noise versus winter with reduced foliage), weather conditions such as prevailing wind direction and speed, and other factors. The FEIS (section 5.2.8) provided a detailed description of noise and vibration modeling results. The loudest decibels from blasting and drilling will attenuate within varying distances from the Mine and Plant Sites and Transportation/Utility Corridor, again depending on several factors mentioned above. While the loudest noises and vibrations may extend beyond the action area perimeter during some time periods, in general, most other noises and vibrations will likely attenuate closer to the Project area during mining activities.

Similar to effects from habitat loss, lynx, wolves, and NLEB may experience potential decline in body condition or reduced fitness resulting from displacement from or reluctance or inability to access portions of home ranges, territories, roost sites, or adjacent suitable habitats due to noise and vibrations. There could also be reproductive failure (e.g., kitten or pup starvation) from diminished prey and foraging opportunities in affected areas. They also may die or become injured if they interact with other predators while forced into other areas to search for prey or new roost sites.

Consequences also extend to terrestrial wildlife travel corridors and their use by lynx and wolves. Prior to the cumulative development of mine features across the Iron Range, wildlife travel was relatively unrestricted between northwestern and southeastern blocks of habitat. Currently, wildlife movement is restricted because of the extensive landscape changes, including large mine pits, rock stockpiles, mining infrastructure, regional development associated with the Iron Range, and highways (Emmons and Olivier 2006). As mentioned above, travel corridor #16 was identified as important but with moderate quality habitat and per the FEIS (p. 5-448) current use is limited. At Corridor #17, Northshore mining operations to the north may completely eliminate that portion of the corridor, regardless of effects from the proposed PolyMet mine. Proposed PolyMet operations will not physically reduce the corridor size but will likely affect its quality and potentially its use, due to on-going mining noise and activity – particularly near the Mine Site and relative to the large habitat block to the southeast. Effects would likely vary depending on factors such as location, types, duration, and daily or seasonal occurrence of disturbances. Reduced or restricted access to travel corridors #16 and 17 could indirectly affect adjacent corridors due to increased use from displaced lynx, wolves, and their prey. The FEIS (Table 6.2.5-1, p. 6-78) indicated that other reasonably foreseeable projects may affect nearby travel corridors (such as #15, 18, and others), including blocking or encroaching into them, However, the nearest corridors will likely continue to provide at least some habitat for wildlife

use. The PolyMet mine impacts could further reduce permeability through these corridors and increase habitat fragmentation.

The net loss of and changes to lynx and wolf habitat, and lynx critical habitat due to development of the mine and associated activities will increase the distance between larger blocks of what the BA indicated as "high quality" habitat to the north and south of the project area (see Figure 9 above). The high quality habitat currently at the proposed Mine Site and between there and the Plant Site covers approximately 7 miles west to east, by 2 miles north to south, and is contiguous with wildlife corridor #17. Some of the high quality habitat to the south of this corridor will be removed and remaining habitat will be affected by noise and other activities. If these disturbances deter lynx and wolves from moving through, then the distance they would be forced to travel to access the next nearest wildlife travel corridors leading to other suitable habitats and prey would increase. The additional distances to access adjacent corridors #15 and 18 are approximately 2 and 9 miles, respectively, depending on where in the Project area wildlife are located.

Scale/Extent of Effect on Reproduction, Population: We cannot precisely ascertain the effects that lights, glare, excessive loud noises and vibrations would have on lynx, wolf, or NLEB reproduction or species numbers in the action area. If there are occupied home ranges, territories, or maternity roost sites in the vicinity, then foraging, denning, or roosting activities could be disrupted to the point of precluding use of portions of home ranges or territories, reproductive failure, or death of individuals. In addition, the continuous band of private lands and development in this eastern portion of the Iron Range that separates adjacent lynx critical habitat, LAUs, and wolf habitat currently extends for more than 30 miles in a southwest to northeast direction and as mentioned, much of it is already developed (other mines, towns, roads, etc.). A mentioned, we cannot predict with certainty how much mining-related impacts within the action area may affect individual lynx, wolf, and NLEB reproduction or numbers, or their use of the action area because there is little baseline information from which to assess these effects.

Cumulative fragmentation and degradation of lynx, wolf, and NLEB habitat in the action area could result in it becoming increasingly impervious, in particular to lynx and wolf use and travel, with energetic and potentially, reproductive costs for all three species. Effects to local use of habitats by these species in the action area will be negative and significant. Likewise, the ability for each species to cross through the Iron Range will be further diminished by the proposed action. Due to the small proportion of each species habitat that will be affected, however, impacts to the rangewide numbers, reproduction, and distribution of the each species will not be great (refer to Figures 1, 4, 5, and 7). The Iron Range occupies a relatively marginal portion of the range of lynx in Minnesota.

Conservation Measure: There are no measures specifically addressing effects from this activity. However, CM #1 and 2 address reclamation of habitat and maintaining vegetated buffers; #6 will incorporate surveys and monitoring of lynx and wolves within the action area, including wildlife travel corridors; and #7 addresses wildlife habitat management in adjacent areas and restricts vegetation removal outside of the NLEB pup season.

3. Activity: Transportation and Utility Corridors including infrastructure construction, reconstruction, and/or expansion, on-going maintenance, use via various types of vehicles, trucks, and train cars, and traffic. Note: some of this will occur during pre-production activities with similar effects.

Subactivity: Some clearing of forested habitat will occur along existing roads, railroad tracks, and the utility ROW, and the Dunka Road will be widened between the Plant and Mine Sites. A new railroad spur line and water pipeline in the corridor will also be constructed, and associated maintenance will be on-going. There will be subsequent mining-related vehicle and train travel on roads and railroad tracks between the Mine and Plant Sites and from the Plant Site to off-site destinations.

Stressor: In addition to the effects from pre-production and mining activities covered above, there will be a considerably higher volume of vehicle and train traffic and associated speeds and noise that will occur within potential lynx and wolf home ranges, territories, and/or foraging areas. The higher traffic volumes, road density, and noise may prevent or restrict lynx and wolves from using or crossing roads to access suitable habitat and travel corridors.

Exposure: This activity may affect NLEB for similar reasons (such as habitat loss, noise) already discussed above relative to habitat; therefore, we focus this activity's effects to lynx and wolf. Transportation infrastructure and associated traffic will further fragment habitat in the action area and may restrict lynx and wolf use of the habitat that provides access through travel corridors #16 and 17, and indirectly affect #15 and 18 through increased use if wildlife shift their use to these corridors (addressed above).

Traffic volume resulting from mining and related activities will increase on access and haul roads and highways, and railroad tracks within the action area, particularly on the west side. Increased traffic volume will increase the probability for lynx and wolf mortality by vehicle and train collisions. In addition, vegetation alongside roads and railroad tracks that already attracts prey, particularly deer, and subsequently wolves and lynx, exposes them to the increased traffic levels and mortality risk.

While existing roads will be used, the new access and haul roads and rail spur will increase road density. Current road density in Township 59 North, which includes the Mine Site and federal lands, is 2.2 mi/mi², and at just the Mine Site, is 0.5 mi/mi². The existing roads in the action area, including the Dunka Road (between the Mine and Plant Sites), State Hwy. 135, and County Hwy. 666, will experience increased traffic volume from the proposed Project. While the Transportation/Utility Corridor is outside the wildlife travel corridors, it runs parallel and perpendicular to them and increased traffic would potentially affect wildlife use of these passages.

Baseline annual average daily traffic volumes in the action area range from approximately 1,850 vehicles on Hwy. 135 to anywhere from 140 to 810 on Hwy. 666 (increases closer to the town of Hoyt Lakes) (Saran 2016, pers. comm.). There will be an increase of approximately 346 vehicle trips per day and 45 train trips per day, totaling 391 per day in the action area above existing traffic levels. The total miles of vehicle and train travel per day in the action area is estimated to be 3,608 mi and 423 mi, respectively, totaling 4,031 mi per day. Vehicle speeds (mostly from

light trucks and maintenance vehicles) will range from 30 to 40 mph and trains will travel at speeds ranging from 15 to 25 mph.

Snow compaction of existing and new roads used for mining-related activities could provide access into lynx and wolf habitats not previously used by competing carnivores, such as coyotes. However, lynx research related to snow compaction and competitive interactions is limited and has resulted in somewhat different conclusions based on spatial and temporal factors (see Interagency Lynx Biology Team 2013 p. 82). If such competition were to occur, then both lynx and wolves would be exposed to other predators and associated interactions or conflicts, and increased numbers of competing predators seeking similar prey species – which could result in decreased fitness, which was discussed above.

Response - Harm: The risk of death or injury by vehicle or train collision will increase due to estimated traffic volume and associated speeds for the duration of mine construction and operation.

Response-Harass: The traffic volume and associated noise could also annoy lynx and wolves such that they develop an avoidance or reluctance to cross roads and railroad tracks.

Consequences/Intensity: Current road density at the Mine Site will increase during mining activities, mostly at the Mine Site which, when combined with other on-going activities on roads, could displace lynx and wolves. As mentioned, road density was the best predictor of suitable habitat for breeding packs (Mech et al. 1988a; Mladenoff et al. 1995; Thiel 1985). While wolves will use roads and readily cross them, generally, areas with road densities of less than 1 mile/mi² are best for wolf survival (Wydeven et al. 2001; Wydeven and Wiedenhoeft 2001), although wolves may tolerate road densities up to 1.2 mi/mi² provided large roadless areas are nearby (such as that provided by the BWCAW). However, because most of the new roads will be within the Mine Site and surrounded by other mining activities, effects from an increase in road density essentially will be overshadowed by other disturbances.

Lynx are known to travel on and readily cross most roads and their use of roads and other linear features is probably based on the energetic efficiency of moving along a road compared to moving through a forest. It is more energetically efficient to walk on or alongside of a road, whether within a home range or while on a long-distance movement (Moen et al 2010). Lynx and wolf use of roads may allow them access to and save energetic costs in finding prey, but may also increase the risk of mortality due to vehicle strikes. In addition, attractive roadside vegetation may be conducive to higher prey densities which, in addition to increased probability for mortality, could disturb lynx and wolf prey foraging because of disruptions from traffic, or presence of humans or other animals.

While PolyMet will reduce the vehicle speed limit from 45 to 40 mph in the portion of the Project area under their ownership, vehicles traveling at or below 40 mph still present a risk for collision, given the mortalities that have occurred on other low-volume, low-speed Forest roads in Minnesota and elsewhere. There could be a reduction in the mortality rate in the future as traffic volumes continue but lynx and wolves increase their avoidance of the Project area and adjacent habitats; however, we have no baseline information from which to assess this. Yet given the amount of future land disturbance and associated mining activities, noise, human presence,

traffic, and other perturbations that will occur, it is likely that the transportation corridor will be used less by lynx and wolves during operations. Transportation-related barriers to lynx and wolf, when combined with habitat fragmentation, may further impede habitat use or access to wildlife corridors, and indirectly decrease habitat effectiveness, similar to the effects addressed under the previous two activities.

Scale/Extent of Effect on Reproduction, Population: The extent to which fragmentation from roads and urbanization can impact connectivity of meso-carnivore populations likely depends on the physical design of highway improvements, the surrounding environmental features, the density of increased urbanization, and the increased traffic volume (Clevenger and Waltho, 2005; Grilo et al., 2009). Effects resulting in reduced fitness would be difficult to measure; however, mortalities from collision are measurable. Carnivores are especially vulnerable to highwaycaused mortality in areas with dense and high traffic volume roadways (Clevenger et al., 2001). For example, 20 percent of mortalities (13 out of 65) of reintroduced lynx in Colorado were due to vehicle collisions (Devineau et al., 2010), as well as 19 percent (16 out of 83) of reintroduced lynx in the Adirondack Mountains of New York (Aubry et al., 2000). In Germany, 45 percent of the mortalities of subadult Eurasian lynx (Lynx lynx) are caused by traffic (Kramer-Schadt et al., 2004). In southeastern British Columbia, lynx avoided crossing highways within their home ranges (Apps, 2000). As previously mentioned, four lynx have been killed by vehicles in northeastern Minnesota – on Cook County Highway 12 (Gunflint Trail), (Superior NF) Forest Road 172, Lake County Hwy. 2, and MN Trunk Highway 61 (USFWS, Twin Cities Field Office, Bloomington, MN, unpubl. data). No lynx-vehicle collisions have been reported on roads associated with mining projects, even though lynx have been observed using mine roads at the Northshore Mine and former Cliffs Erie Mine Site near the Project area (ENSR 2006); two lynx have been killed by trains in Minnesota.

Numerous assumptions have to be made to estimate the numbers of lynx and wolves that would likely be hit by vehicles and trains as a result of increased traffic on roads and railroad tracks. Road-related mortalities of gray wolves have been studied in Wisconsin (Kohn et al. 2000); however for lynx, we do not have a similar study on which to base an estimate of the quantitative impact. The likely frequency of lynx-vehicle collisions may be less than that for wolves due to the lower predicted densities of lynx in northern Minnesota. In addition, lynx populations fluctuate markedly during approximately 10-year cycles, whereas wolf densities will likely be relatively stable. The probability of lynx getting hit by vehicles will likely vary in proportion to lynx density throughout the population cycle. However, because such data are insufficient and interactions are complex, we are unable to differentiate these variables with any confidence or precision. Therefore, we assume that lynx are equally susceptible to being taken by vehicles as are wolves and that the factors considered for wolves will also determine the likely number of lynx taken, See Appendix 2 for the complete description of how we quantified transportation-related mortalities for lynx and wolves that we anticipate may occur.

We do not know if transportation-related effects and associated mortalities would have a measurable effect on lynx or wolf reproduction or species numbers in the action area, although loss of an individual would likely have a short-term localized impact. The likely worst case scenario would be loss of a female lynx or wolf and that year's litter of kittens or pups. However, these effects are not likely affect to lynx and wolf populations within the range of the species.

Conservation Measures: PolyMet addressed some of these effects in CMs #3, 4, and 5. Because most project-related roads and railroad tracks will be on private property, access will be limited to employees only. They intend to minimize road construction and reclaim unused roads. Some roads will be reclaimed upon completion of mining activities in approximately 20 years, thereby reducing the transportation corridor use and decreasing road density; the roads on the private lands will also remain closed to the public. Finally, adherence to posted speed limits will be part of employee safety training, but depending on whether or not employees adhere to the required safety conservation measures will affect the probability of lynx and wolf mortality. Employee education will also include lynx identification and reporting. All animal carcasses will be moved out of sight along the transportation corridor between the Mine and Plant Sites to prevent attracting predators to roadsides and railroad tracks and associated vehicle- and train-strikes.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

There are numerous mining projects already occurring in or adjacent to the action area and at least one being considered in the Mesabi Iron Range; the latter will require separate consultation, as appropriate, pursuant to section 7 of the ESA. Within the action area, there are four on-going operations (FEIS p. 6-72): Cliffs Erie Pellet Yard, Mesabi Mining, Mesabi Nugget, and Northshore Mine - Northshore Ultimate Pit Progression Project. Only the Northshore project has a proposed expansion that is in its initial stages.

In addition to on-going and future mining activities, other future activities on non-federal lands that are reasonably certain to occur and could affect lynx, wolves, and NLEB and their habitats include timber harvest, prescribed burning, road construction and maintenance, recreation, minerals exploration, and fragmentation through human developments. Large-scale mining operations on non-Forest land could result in irreversible or irretrievable loss of lynx and wolf prey habitat, as well as foraging and roosting habitat for NLEB in an area that already has highly fragmented habitat. State, county, and private land timber harvest, related road construction activities, and fire management are not subject to federal management and would not necessarily provide the same level of protection and conservation for threatened and endangered species and their habitats as occurs on the Forest's administered lands. However, timber harvest that regenerates suitable forest habitat and increases numbers and distribution of snowshoe hare, ungulate prey, and foraging areas for NLEB, could also have beneficial effects on these species.

In addition to loss of suitable habitat for these species, including lynx critical habitat, potential increased pressure on adjacent lynx and wolf habitat from disturbed or displaced individuals, impacts to wildlife movement corridors, and human disturbances could result from these various types of activities. These include additional traffic and an increased potential for collisions with lynx and wolves. Lynx and wolves in this part of their range may also be limited by non-habitat factors such as illegal take by hunters and trappers, and collision with vehicles. Lynx may be

further constrained by a low population size, hybridization with bobcats, and competition with other predators. Recreational activities associated with non-federal lands are expected to continue in the action area and are reasonably certain to remain stable or increase in conjunction with human population increases in northern Minnesota.

Conclusion

We have concluded that the proposed land exchange between the Superior National Forest and the Applicant (PolyMet) will result in development of the private lands. The land exchange, in and of itself, will not result in negative effects to lynx, wolf, lynx and wolf critical habitats, and northern long-eared bat, but the exchange will lead to the subsequent development of the private lands, which will result in significant adverse effects to these three species in the action area. The Forest indicated that future development of the subsequent private land is outside of their jurisdiction. We conclude that the mining development is an indirect effect of, and caused by, the proposed land exchange, allowing for the exemption of incidental take to extend to the USFS and the Applicant; this exemption is effective only if the Reasonable and Prudent Measures (RPM, see Incidental Take Statement, below) are implemented.

The USFS's proposed action (land exchange) will ultimately lead to development of the federal exchange parcel and the remaining private land, which will lead to the subsequent adverse effects to these three species and lynx and wolf critical habitats, including take. Therefore, the USFS would be exempt from any take resulting from the subsequent development of PolyMet's NorthMet mine if the RPMs are implemented. Since development of the subsequent private parcel is beyond the authority of the USFS, their exemption to the take prohibition would not lapse regardless of future activity, or lack thereof, by the Applicant. The Applicant's exemption of incidental take depends upon implementation of the agreed upon Conservation Measures described above and implementation of the RPMs.

After reviewing the current status of Canada lynx, gray wolf, and northern long-eared bat, the environmental baseline for the action area, the effects of the proposed PolyMet mine and land exchange parcels in St. Louis, Lake, and Cook counties, Wetland Mitigation Sites, and the cumulative effects, it is the Service's opinion that the action, as proposed, is not likely to jeopardize the continued existence of Canada lynx, gray wolf, or northern long-eared bat. It is also not likely to adversely modify critical habitat for lynx or wolf.

Based on the assumptions regarding traffic volume, susceptibility to vehicle collisions, traffic speeds, lynx and wolf densities, and current likelihood of vehicle collisions, we estimate that the proposed action will result in approximately one lynx and one wolf taken; take that is likely to occur due to other effects of the project is not likely to be directly detectable and will be expressed in terms of the 3,918 acres of lynx, wolf, and NLEB habitat (less than 0.1 percent in Minnesota) that will be destroyed over the 20-year life of the project. Although destructive locally to the species and their habitats, rangewide effects on numbers, reproduction, and distribution will be minimal for each species. Populations of these three species continue to be wide-ranging across portions of the contiguous United States. Therefore, the estimated proportional impacts to Canada lynx, gray wolves, and northern long-eared bats in the contiguous U.S. would be less than that anticipated for the species in Minnesota alone. This level

of impact would not result in an appreciable effect on the survival and recovery of Canada lynx, gray wolf, and northern long-eared bat in the contiguous U.S.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by PolyMet for the exemption in section 7(o)(2) to apply. PolyMet has a continuing duty to regulate the activity covered by the incidental take statement. If PolyMet fails to assume and implement the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, PolyMet must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

Amount or Extent of Take Anticipated

In this biological opinion, we described the anticipated incidental take in terms of one lynx and one wolf killed by a vehicle or train every 20 years in the action area. See Appendix 2 for a detailed description of how we quantified these amounts of take. We also described incidental take through a surrogate of acres of habitat for the lynx, wolf, and northern long-eared bat primarily due to vegetation and overburden removal at the Mine and Plant Sites, and along the Transportation and Utility Corridors. Vegetation removal on all these sites/corridors totals no more than 3,918 ac, including 1,719 ac at the Mine Site, less than 10 ac along the Transportation and Utility Corridors, and 2,189 ac at the Plant Site. The loss of 3,918 ac equals 7 to 14 percent of one lynx home range and 7 percent of one wolf territory. While the potential for future forest management actions on lands surrounding the Mine and Plant Sites and Transportation/Utility Corridor was mentioned in the BA, no specific actions, locations, or acreages were provided, so additional acres of lynx, wolf, and northern long-eared bat habitat removal or alteration are unknown. Any incidental take that may occur as a result of those future actions is not the subject of this incidental take statement.

If NLEB are present or use an area proposed for vegetation removal or other mining-related activities, incidental take of NLEB could occur. The Service anticipates incidental take of the NLEB will be difficult to detect for the following reasons: (1) the individuals are small and occupy summer habitats where they are difficult to find; (2) the NLEB forms small, widely dispersed maternity colonies under loose bark or in the cavities of trees and males and non-reproductive females may roost individually, which makes finding the species or occupied habitats difficult; (3) finding dead or injured specimens during or following project implementation is unlikely; (4) the precise distribution and density of the species within its summer habitat in the action area is unknown; and, (5) in many cases incidental take will be non-lethal and undetectable. However, while incidental take may occur, it is not prohibited provided specific actions are implemented (see Terms and Conditions below) under the January 2016 final 4(d) rule for NLEB.

Effect of the Take

In the attached biological opinion, we concluded that the anticipated incidental take would not jeopardize the continued existence of the Contiguous United States Distinct Population Segment of Canada lynx, gray wolf, and northern long-eared bat. Similarly, we concluded that while there may be adverse effects to critical habitat for both lynx and wolf, it will not be adversely modified. The Conservation Measures that PolyMet has committed to will also minimize the potential for take of lynx, wolf and NLEB, as described above.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures (RPM) are necessary and appropriate to minimize take of Canada lynx, gray wolf, and northern long-eared bat.

RPM 1. Implement proposed action Conservation Measures to reduce the likelihood of vehicle collisions with lynx and wolf (see T&C 3 below).

RPM 2. Implement measures to reduce the likelihood of injuring or killing any northern longeared bats during vegetation removal, other mining-related activities, and forest management.

Terms and Conditions

In order to be exempt from incidental take, PolyMet must comply with the following terms and conditions (T&C), which implement the Reasonable and Prudent Measures described above. These terms and conditions are non-discretionary.

T&C 1. If any hibernacula are found in the Project area, PolyMet will not conduct any activities that disturb or disrupt hibernating individuals when they are present and will not physically alter the hibernaculum's entrance or environment when bats are not present. This includes not conducting any tree removal within 0.25 miles (0.4 km) of any known NLEB hibernacula.

T&C 2. Reporting Requirements:

a. Any vehicle collisions with lynx or wolf must be reported within 72 hours to the U.S. Fish and Wildlife Service, Twin Cities Field Office, Bloomington, Minnesota (952-252-0092). These reports shall include all known information regarding the incident, including the species involved, date of incident, fate of the animal (e.g., dead), location of the carcass and any tissue collected for DNA analysis (see CR1 below), geographic coordinates of the accident location, sex of the animal, and approximate age (i.e., adult, juvenile, yearling). To ensure that any incident will be reported, each employee who will drive on roads or travel by rail associated with the project as described in this biological opinion shall be provided information to enable them to identify, in particular Canada lynx, as discussed above. This information shall be retained in all vehicles and appropriate rail cars that will be driven in association with the proposed PolyMet project. See Appendix 3 for identification information.

Contact numbers for reporting lynx mortality will be included on the information sheet. The information on the following website could be used for this purpose: http://www.nrri.umn.edu/lynx/information/bobcat.html

- b. PolyMet shall make all reasonable efforts to educate personnel to report any sick, injured, and/or dead bats (regardless of species) located in the Project area immediately to the Service's Twin Cities Field Office (TCFO) (952-252-0092) and/or the Minnesota Department of Natural Resources (MDNR; see http://www.dnr.state.mn.us/wns/index.html or call 1-888-345-1730). No one, with the exception of trained staff or researchers contracted to conduct bat monitoring activities, should attempt to handle any live bat, regardless of its condition. If an injured bat is found, if possible, effort should be made by trained staff (with rabies vaccination) to transfer the animal to a wildlife rehabilitator. If needed, TCFO and/or MDNR will assist in species determination for any dead or moribund bats. Any dead bats believed to be NLEB will be transported on ice to the TCFO or MDNR. If an NLEB is identified, TCFO will contact the appropriate Service law enforcement office. Care must be taken in handling dead specimens to preserve biological material in the best possible state. In conjunction with the care of sick and injured fish or wildlife and the preservation of biological materials from dead specimens, the USFS has the responsibility to ensure that information relative to the date, time, and location of NLEB, when found, and possible cause of injury or death of each is recorded and provided to the Service. In the extremely rare event that someone has been bitten by a bat, please keep the bat in a container and contact the local health department.
- c. PolyMet shall provide the Service with an annual report summarizing the activities completed per the proposed action Conservation Measures and this biological opinion's Reasonable and Prudent Measures/Terms and Conditions, including the extent of the area (e.g., acres) affected by each. Any wildlife monitoring data submitted to the Superior National Forest that is subsequently analyzed and documented will also be included in annual reports as it becomes available. Mortalities of lynx, wolf, and northern long-eared bat must also be reported and such reports can be consolidated and combined with the other required information.

d. This report shall be provided to the Service <u>no later than January 31 of the following calendar year until all project activities are complete.</u>

The Service concludes that no more than one Canada lynx and one gray wolf will be incidentally taken, and up to 3,918 acres of habitat for lynx, wolf, and NLEB will be removed as a result of the proposed action during the 20-year duration of this biological opinion. (*Note*: We included acres of NLEB habitat here; however, incidental take related to vegetation removal is not prohibited in areas of the country inside the WNS zone provided the measures listed under the final 4(d) rule (and at the top of p. 10 of this Opinion) are implemented. Therefore, we have not addressed them in the RPMs.) The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. PolyMet must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act, directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation Recommendations (CR) are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery programs, or to develop information.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their or their habitats, the Service requests notification of the implementation of any conservation recommendations.

- **CR 1**. Report any sightings of Canada lynx to the Service's Twin Cities Field Office at (952) 252-0092 and provide the date and location (geographic coordinates if available). If feasible, allow access by MDNF and/or USFS personnel to follow up on any lynx sightings and collect DNA as soon as possible after observations, particularly in winter.
- **CR 2**. Remove and reclaim any roads and mining-related areas as soon as they become unnecessary for ongoing activities.
- **CR3.** Consider busing employees to reduce traffic volume at least through areas where there is suitable habitat on either side of the road or near wildlife travel corridors.
- **CR 4**. Assist with or participate in on-going federal and state investigations on northern longeared bat within the action area.
- **CR 5**. Manage forests to ensure a continual supply of snags and other suitable northern longeared bat maternity roost trees, and to maximize snowshoe hare density for lynx.

CR 6. Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution by angling lights downward or via other light minimization measures.

REINITIATION – CLOSING STATEMENT

This concludes formal consultation for the potential effects of the proposed PolyMet NorthMet Project in St. Louis, Lake, and Cook Counties, Minnesota, and associated land exchange and wetland mitigation actions on Canada lynx, gray wolf, critical habitat for lynx and wolf, and northern long-eared bat. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In addition, PolyMet will strictly adhere to the proposed action Conservation Measures stated in the Description of the Proposed Action section. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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Appendix 1. Complete consultation history.

- 4/12/2005. USFWS early coordination letter to MDNR, cc'd to USACE and tribes.
- 6/3/2005. Environmental Assessment Worksheet released.
- 6/8/2005. USFWS proves comment letter to USACE on the Polymet Mine Public Notice for proposed 404 wetland impacts.
- 9/5/2006. ENSR Cooperation released 2006 Canada Lynx Assessment (Final Report) to inform the NEPA process and development of a Biological Assessment.
- 11/2009. Feasibility Analysis for Threatened, Endangered, and Sensitive Species and Habitat Assessment for the Proposed PolyMet Land Exchange released to inform the NEPA process.
- 10/2010. Draft EIS released.
- 1/19/2011. USFWS briefing paper discussing BA needs.
- 1/26/2010. USFWS submits comments on the Draft EIS.
- 1/10-3/4/2011. Draft Alternative EIS versions released for comment.
- 5/3/2011. USFWS meeting with USFS and USACE to discussing BA needs.
- 9/1/2011. Draft table of contents for the Biological Assessment provided to USFWS.
- 11/21/2011. USFWS email to USFS discussing BA data needs and formal section 7 process.
- 12/20/2011. USFWS email to AeCom discussing BA data needs.
- 3/12/2012. USFWS briefing paper to Congressman Chip Kravaack discussing BA needs.
- 11/13/2012. Tribal/Gantt chart meetings (occurred regularly).
- 2/28/2013. Meeting with USFS, USACE, project consultants, and PolyMet staff to discuss BA needs.
- 8/21/2013. Doug Bruner, USACE submitted the first draft Biological Assessment for Polymet's Proposed NorthMet Project and Land Exchange that included may affect, likely to adversely affect determinations for Canada lynx (*Lynx canadensis*) and its critical habitat and a not likely to jeopardize determination for gray wolf, but if listed and critical habitat reinstated, likely to adversely affect for both.
- 12/5/2013. MDNR, USFS and USACE released the Supplemental Environmental Impact Statement for public comment.
- 12/20/2013. Dan Ryan, USFS submitted an updated draft Biological Assessment for the proposed project that included species determination and analysis for impacts to Canada lynx, gray wolf (*Canis lupus*) and their critical habitat, and the northern long-eared bat (*Myotis septentrionalis*). Determinations were as follows: LAA Canada lynx; NLAA Canada lynx CH; no jeopardy under formal conferencing for NLEB, but if listed, NLAA; and no jeopardy for gray wolf, but if relisted, LAA gray wolf and NLAA gray wolf CH.

3/13/2014. USFWS provided comments on the Supplemental EIS under NEPA. A decision was subsequently made by all agencies to postpone further comment on the BA until new analysis was conducted.

5/28/2014. Dan Ryan, USFS informed the Service that they will be taking over the lead in consultation and will wait until all BA comments are classified to determine next steps in the consultation process.

7/9/2014. The Service met with USFS staff to discuss the draft Biological Assessment.

7/14/2014. Biologist Andrew Horton participated in a site visit at the proposed mine with USFS, USACE, project consultants, and PolyMet staff.

10/29/2014. The Service participated in a conference call between USFS, USACE, PolyMet, ERM and Barr consulting to discuss the draft Biological Assessment.

11/18/2014. Dan Ryan, USFS submitted an updated draft Biological Assessment for the proposed project that included the same species determination for Canada lynx, gray wolf and the northern long-eared bat.

12/5/2014. The Service provided formal comments to USFS on the draft BA.

3/4/2015. Dan Ryan, USFS submitted an updated draft Biological Assessment for the proposed project that included the same species determination for Canada lynx, gray wolf and the northern long-eared bat.

3/6/2015. USFWS provided comments by email to USFS on the draft BA.

3/4/2015. Dan Ryan, USFS submitted an updated draft Biological Assessment for the proposed project that included species determinations as follows: LAA Canada lynx; LAA Canada lynx CH; LAA northern long-eared bat; and LAA gray wolf, LAA gray wolf CH.

8/24/2015. Michael Jimenez, USFS submitted by email, the final Biological Assessment for the proposed project that included a request for initiation of formal consultation dated August 20, 2015.

12/10/2015: The Service met with and participated via conference call with PolyMet, SNF, and USACE staff to discuss changes to the BA's Conservation Measures.

12/21/2016. The Service, SNF, USACE, and PolyMet had a conference call to further revise and clarify the BA's Conservation Measures.

1/21/2016. The Service, SNF, USACE, and PolyMet had a conference call to finalize BA Conservation Measures.

Appendix 2. PolyMet Project calculation of anticipated lynx and wolf mortalities from vehicle/train collisions.

To estimate the number and frequency of lynx and wolf vehicle collisions as a result of the minerelated traffic on roads, we used the preliminary results of a study of wolves in northwest Wisconsin (Kohn et al. 2000). In that study, 3 wolves were confirmed dead from automobile collisions in a 44-mile (mi) length of U.S. Highway 53 during a seven-year (yr) study period; i.e., approximately 0.01 wolf/mi/yr (3/44 = 0.07 dead per mi, 0.07 per mi/7 yrs = 0.01/mi/yr). However, even intensive studies such as this one may not document all road-related mortality within a study area (Clarke et al. 1998). In the 2000 Kohn et al. study, the likelihood of detecting wolf-automobile collisions during the winter was probably high because a biologist drove the road every day looking for signs of wolves crossing the road, but the likelihood of detecting incidents during summer was probably low (E. Anderson 1996, pers. comm.). To account for this, we extrapolate that Kohn et al. (2000) documented 50 percent of the wolf mortalities due to automobile collisions on Highway (Hwy.) 53 during their study – i.e., actual mortality was double, or 0.02 wolf/mi/yr.

Based on information in the BA (p. 6-31 to -32), at the Project area (Mine and Plant Sites and interconnecting Transportation and Utility Corridors), there will be up to 1,316 mi per day of vehicle traffic. Trains will cover up to 418 mi per day, including groups of 16-20 ore cars, each making 22 round trips per day (or 44 one-way trips). In addition, there will be 151 employee vehicles per day and 40 service vehicles per day entering the project area from off-site locations via existing highways, primarily State Hwy. 135 and St. Louis County Hwy. 666.

In the 2000 Kohn et al. study, traffic volume on Hwy. 53 was 4700 vehicles per day, whereas we estimated Project-related vehicle traffic volume within the entire action area as follows: 1,316 mi per day divided by 8.5 mi (approximate one-way distance on road between Plant and Mine Sites), or 155 vehicle trips per day in the project area; plus 151 employee trips and 40 service vehicle trips (total 191 trips) per day from off-site to the Project area (primarily via State Hwy. 135 and St. Louis County Hwy. 666); then, using 6 mi (action area radius distance around Project area) for each of the two highway segments = 12 mi within action area; 12 X 191 trips off-site = 2,292 mi per day); totaling 346 vehicle trips per day in the action area covering 3,608 mi total. (*Note*: the Project area (defined above) is different than the action area (as defined by the ESA), which we defined as the Project area plus an approximate 6-mile buffer around it that incorporates the two main highway segments, totaling 12 mi. The Opinion includes additional discussion of wildlife travel corridor #18, which is beyond the outer perimeter of our defined action area; however, we have not included it in this calculation because of the minor amount of traffic (e.g., logging roads) that exists between the Project area and this corridor).

Estimated train traffic volume within the project area will be 418 mi per day divided by 9.5 mi (Saran 2016, pers. comm.; the rail line is approximately 1 mile longer than the road segment), or 44 train trips per day. Off-site train trips of a 100-car trip once per month and a 30-car train 4 times per month total 5 trips per month or 0.6 trips/day, covering the 6-mi action area radius distance = 3.6 mi per day. There will also be a 100-car train trip once per week for 31 weeks (April to October), or 31 trips in 214 days which equals 0.15 trips per day (covering 6 mi = 0.9 or 1 mi rounded up). (*Note*: we recognize this latter train trip will not be year-round; however, to

simplify the calculation, we include it equally in the overall calculation (the result would not change significantly from a 31-week versus year-round time period). The total train traffic volume in the action area will be 44 + 0.6 + 0.15 = 45 train trips per day in the action area. The total number of miles covered by train per day = 418 + 3.6 + 1 = 423 within the action area.

The total number of vehicle and train trips per day is 346 + 45 = 391 trips (one-way) per day on all sections of road and railroad track in the action area. The total miles of vehicle and train travel per day in the action area = 3,608 mi + 423 mi = 4,031 mi/day.

To estimate the frequency of lynx and wolf deaths due to vehicle/train collisions on the roads and railroad tracks mentioned above, we make the following assumptions:

- 1. The probability of death due to vehicle and train collisions is likely to be proportional to traffic volume.
- 2. Total traffic volume within the action area will be 346 vehicles/day and 45 train trips/day, or 391 trips (one-way) per day, covering 4,031 mi.
- 3. The risk of vehicle strike versus train strike will be the same.
- 4. Posted speed limits off-site will be similar to those on WI Hwy. 53 and greater than in the Project area, which will be no more than 40 mph.
- 5. The likelihood of lynx mortality can be expected to be directly proportional to lynx density in the vicinity of the roads, which will approximate that summarized by Moen et al. (2006), approximately 0.01158, or 0.012 lynx/mi² (0.3 lynx per km²). Wolf density in Minnesota is 1.2 per 100 mi² or 0.012 per mi² (Erb et al. 2015).

Note: There is little available information regarding vehicle/train mortalities for lynx and wolves and the above assumptions do not account for differences in highway/road types and associated traffic volumes and speeds in the action area (e.g., Forest roads with low traffic volumes and speeds versus State highways with high traffic volumes and speeds); habitat characteristics adjacent to the various road segments; seasonal variations in lynx, wolf, and prey use of available habitat, road/rail crossings; and wildlife travel corridors within the action area; lynx and wolf densities in the action area; and other potential factors that are most likely important to fully understanding the vehicle/train-strike risk for lynx and wolves.

Precise lynx and wolf density data are not available for the action area, and density is not evenly distributed for lynx across northeastern Minnesota due to the heterogeneous spatial arrangement of suitable habitat. To estimate lynx density in the project area, we considered both the BA's density estimate of 1 lynx per 83 mi² (or 0.012 per mi²), which was based on a 3-month winter survey in 2006 (2006 was at the end of a 3-year lag period following the Thunder Bay, Ontario peak density), and the information in Moen (2008b), which was based on interpretation of a broad data set of historical records and telemetry, and suggested a maximum population of approximately 250 lynx in a 10,632 mi² area (27,537 km²), or 1 lynx per 43 mi² – approximately double the BA's estimate, or 0.023 lynx per 1 mi² for purposes of this analysis. We use the Erb et al. (2015) wolf density of 1.2 wolves per 100 mi² (3.2 wolves per 100 km²) in Minnesota, or 0.012 per mi².

We recognize that the east half of the action area likely provides more suitable lynx and wolf habitat than the west half due to the existing level of development in the latter – and therefore, lynx and wolf densities likely would be lower in the west half. We also realize that the probability for mortality from collision might be higher in the west half of the action area (but outside of the Project area) due to existing highways and associated traffic volume and speed. However, because lynx and wolf densities in the west half likely are most likely lower, we presume that the probability for collision-related mortality is somewhat diluted. We also recognize that lynx have been killed on low-volume and low-speed Forest roads. Therefore, we consider the various differences in roads and lynx and wolf density as essentially equal for this estimation. Based on our assumptions and the calculations displayed in Table A-1, we anticipate that a mortality level ("take") of one lynx (versus two) and one wolf from vehicle/train collision over the 20-year duration of this project is a reasonable and logical estimate.

Appendix 2 - Table 1: Data for estimated lynx and wolf mortality calculations.

ROAD SEGMENT	Wolf Mortality Rate (WI study)	Density: Lynx (Moen/ENSR) and Wolf	Traff Vol (WI study)	Traff Vol (PolyM et)	Propor- tion Traff Vol	xx	Adj Density: Lynx (Moen/ ENSR) and Wolf	Mortality Rate: Lynx (Moen/ ENSR) and Wolf	Trans porta tion Miles	No. Lynx (Moen/ENSR) and Wolf Per Year	No. Lynx (Moen/ENSR) and Wolf for 20-yr Project (Rounded Up)	Percent of MN Pop: Lynx (max/ min) and Wolf
Project area	0.02	0.023/0.012 0.012	4700	199	23.62	0.001	3.83/2.0 2.0	0.0038/ 0.002 0.002	8.7	0.029/0.0174 0.0174	0.58/0.35 0.35	
6-mile buffer outside project area	0.02	0.023/0.012 0.012	4700	192	24.48	0.001	3.83/2.0	0.0038/ 0.002 0.002	12	0.0456/0.024	0.912/0.48 0.48	
TOTAL										0.0813/0.0427 0.0427	1.49/0.83 0.83 (2/1/1)	0.8%/0.8% 0.05%

<u>Field Definitions and Calculations</u> (* Use range of lynx data from two different analyses by Moen and ENSR)

Wolf Mortality Rate (WI study) – wolf mortality rate (wolves/mi/yr)

Density: Lynx (Moen/ENSR)* and Wolf – lynx and wolf density (lynx/mi² and wolf/mi²)

Traff Vol (WI study) – traffic volume in WI wolf study (vehicles per day)

Traff Vol (PolyMet) – traffic volume in proposed PolyMet project (combined vehicles and trains per day)

Proportion Traff Vol – proportional difference in traffic volume (4,700 vehicles per day in WI study / # vehicles and trains per day in project

XX – WI study mortality rate / proportional difference in traffic volume

Adj Density: Lynx (Moen/ENSR) and Wolf – adjusted lynx and wolf density; density of lynx 0.023 (Moen)/0.012 (ENSR) and wolf 0.012 versus density of wolves 0.0006 (WI study)

Mortality Rate: Lynx (Moen/ENSR) and Wolf - mortality rate for lynx equals the adjusted lynx density multiplied by XX

Transportation Miles – number of miles of proposed project road segments (Note: in the Project area, we adjusted this to account for the difference in road versus rail distances (8.5 and 9.5 mi, respectively) between Mine and Plant Sites and the number of associated vehicle and train trips; 155 veh X 8.5 mi = 1,316 mi and 44 train X 9.5 mi = 418 mi; we summed these and divided by 199 total # trips = 8.7 average road and rail miles.)

No. Lynx (Moen/ENSR) and Wolf Per Year – number lynx/lynx/wolf per year = estimated miles of roads X mortality rate

No. Lynx (Moen/ENSR) and Wolf for 20-yr Project – Take for life of the project = 20 years X previous column

Percent of MN Pop: Lynx (max/min) and Wolf – proportion of the MN population of lynx - 250 maximum/130 minimum and wolf - 2,221

Appendix 3. How to identify Canada lynx.



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Lynx or Bobcat?

The following information is adapted from the website, http://oden.nrri.umn.edu/lynx/information/bobcat.html.

Canada lynx (*Lynx canadensis*) and bobcats (*Lynx rufus*) are medium-sized cats (2-3 times larger than a large house cat, smaller than a mountain lion) that are similar in appearance. There are several physical characteristics to distinguish between Canada lynx and bobcat:

The black tail, ear tufts, and large feet characteristic of Canada lynx are shown clearly in the photo above.

- Tail: A lynx's tail has a black tip all around, with the appearance of being dipped in a bottle of ink. A bobcat's tail is striped with black bands towards the end and has a black tip.
- Ears: Lynx have longer ear tufts than bobcats.
- Feet: Lynx have much larger feet than bobcats.

While not a physical characteristic, a lynx is more likely to provide humans with a "good" view, often remaining in an area for a period of time while people watch it. Bobcats are more secretive and elusive than lynx.

Contact numbers for reporting lynx mortality (1) FWS Law Enforcement at (651) 778-8360; or cell phone (651) 775-2758; (2) USDA Forest Service Special Agent at (218) 626-4386; (3) MN DNR Conservation Officer Supervisor at (218) 834-1406.