Appendix 18 Wetland Related Reports

Appendix 18.1 NorthMet Project – Wetland Replacement Plan

POLYMET
MINING

NorthMet Project

Wetland Replacement Plan

Issue Date: October 2016

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

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.

PART FOUR: Aquatic Resource Impact[1] 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.)	**Type of Impact** (fill, excavate, drain, or remove vegetation)	**Duration of Impact** Permanent (P) or Temporary (T)[1]	**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]

[1]If 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)".
[2]Impacts 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).
[3]This is generally only applicable if you are applying for a de minimis exemption under MN Rules 8420.0420 Subp. 8, otherwise enter "N/A".
[4]Use *Wetland Plants and Plant Community Types of Minnesota and Wisconsin* 3rd Ed. as modified in MN Rules 8420.0405 Subp. 2.
[5]Refer to Major Watershed and Bank Service Area maps in MN Rules 8420.0522 Subp. 7.

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

☐ Check here if you are requesting a pre-application consultation with the Corps and LGU based on the information you have provided. Regulatory entities will not initiate a formal application review if this box is checked.

By signature below, I attest that the information in this application is complete and accurate. I further attest that I possess the authority to undertake the work described herein.

Signature: ______________________ Date: 10-13-16

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.

[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.

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.

Attachment D
Replacement/Compensatory Mitigation

Complete this part *if* your application involves wetland replacement/compensatory mitigation not 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 #

[1]Refer to the name and subpart number in MN Rule 8420.0526.
[2]Refer to the technique listed in *St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota*.
[3]If WCA and Corps crediting differs, then enter both numbers and distinguish which is Corps and which is WCA.

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.

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 ENV. PERMITTING

Signature: ____________________ Date: 10-13-16

JENNIFER SARAN

Table of Contents

Acronyms, Abbreviations, and Units

Acronym, Abbreviation, or Unit	Description
ACHP	Advisory Council on Historic Places
APE	Area of Potential Effect
BMP	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

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

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

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

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).

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 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 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 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 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. 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

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.

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 1and 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.

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.

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

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.

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.

- 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.

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

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)

- 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, 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.

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 on-site 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.

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.
(2) Applications include uses of the material other than stockpile storage
(3) Includes all Virginia formation rock

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.

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

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

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 ±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.

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. Make-up 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

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).

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

- 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)

- 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).

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 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.

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 in-pit 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 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.

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 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.

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.

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.

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.

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).

Table 9-1 Summary of Project Permits and Approvals

Unit of Government	Type of Permit/Approval/Action	Status
Federal		
U.S. Army Corps of Engineers	Section 404 Permit for Wetland Impacts	Submitted August 2013
	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
U.S. Forest Service	Land Exchange	In progress
	Section 106 NHPA Compliance	Consultation regarding resolution of adverse effects in progress
State		
Minnesota Department of Natural Resources	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
	Water appropriations permit for potable water well for mine site administration building	To be applied for if needed
	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

Unit of Government	Type of Permit/Approval/Action	Status
Minnesota Pollution Control Agency	Section 401 Water Quality Certification/Waiver	Reinitiated August 2016
	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
	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
Minnesota Department of Health	Radioactive Material Registration (for low-level radioactive materials in measuring instruments)	To be applied for if needed
	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

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.

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 (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 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 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

"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.

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)).

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 (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%).

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 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.

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.

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

- 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).

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

Rating	Attachment A Method		Alternate Method	
	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.

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 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.

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

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.

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).

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[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.

- *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

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).

- *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).

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

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.
(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.

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.

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.

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.

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	C
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

#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 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.

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.

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

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.

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:

- 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 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 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.

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 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.

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).

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.

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 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.

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

- 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 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 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 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 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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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	E
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	E
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	E
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	E
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	C
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	C
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	C
FTB	284	6	2.92	2.51	0.00	0.41	Alder thicket	Low	C
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	C
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	C

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	C
FTB	312	6	1.98	1.33	0.00	0.65	Shrub-carr	Low	C
FTB	314	3	24.87	5.70	0.00	19.17	Shallow marsh	Low	C
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	C
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	C
FTB	587	3	0.97	0.17	0.00	0.80	Shallow marsh	Low	C
FTB	590	3	5.43	5.38	0.00	0.05	Shallow marsh	Low	C
FTB	591	4	2.71	0.70	0.00	2.01	Deep marsh	Low	C
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	C
FTB	968	7	13.76	10.27	0.00	3.49	Coniferous swamp	Low	C
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	C
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

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	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 w etlands are located in St. Louis County, Major Watershed #3 – St. Louis County, and Bank Service Area (BSA) #1.
(3) The duration of all w etland impacts are permanent. The types of w etland impacts include excavation (E), fill (F), fragmentation (Fr), and containment system (C).

Large Table 2 Summary of Wetland Impacts(1)

Project Area	Circular 39 Wetland Classification	1	2	2	3	4	5	6	6	7	7	8	8		
	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**
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	508.25	0.00	758.20
	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 Connection Corridor	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
	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	1	0	0	1	1	0	1	0	0	0	4
Dunka Road and Utility Corridor	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
	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	11	0	6	0	2	0	21
FTB Area	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
	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
HRF	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
	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
Mine Site Alternative in DEIS adopted as part of Proposed Project and refined based on additional drilling and engineering with Cat 1 Stockpile Groundwater Containment System	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
	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
	Revise haul roads to reduce wetland fragmentation	Reduce wetland impacts
	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 65th Street New York, NY 10065
Erickson, William	1328 East 41st 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 37th 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 8th 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.

Community / Credit Type	Within Project Watershed			Outside Project Watershed[1]						Total Wetland Mitigation[1] (acres)	Credit Percent	Total Wetland Mitigation Credits[1]
	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			
Off-Site Restoration of drained 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 [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 Restoration that will not receive 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 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.

Wetland or Credit Type	Mitigation Credits Available				NorthMet Project Proposed Direct Wetland Impacts in Acres[1,2]			Total Credits Required for Mitigation at Base Ratio	No More Than 2 Apply			Total Applied Mitigation Credits [(6), (7)]	Applied Mitigation Ratio [(8)]
	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		Incentive for in-kind -0.25:1	Incentive for credits in-place -0.25:1	Incentive for credits in-advance [(5)] -0.25:1		
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**	1.63
									(275.92)				
Total Surplus Wetland Mitigation Credits for Project (Total Credit minus Total Applied Mitigation Credit)				**47.33**									

(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.

Wetland or Credit Type	Mitigation Credits				NorthMet Project Proposed Direct Wetland Impacts (acres)[1,2]	Credits Applied for 1:1 Replacement	Additional Mitigation Required [3] +0.5:1	Total Mitigation Credits Applied	Total Mitigation Ratio
	Zim Sod	Aitkin	Hinckley	Total					
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**	1.25:1 [5]
Total Surplus Wetland Mitigation Credits for Project (Total credits minus 1:1 credits minus additional mitigation required)						**403.33**			
Total Wetland Mitigation Credits 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	18A[a]	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		Lowland Organic Acid to Neutral	32[c]	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

[a]This ELTP is comparable to the Whalsten and Conic NRCS St. Louis County map units
[b]This ELTP is comparable to the Rifle NRCS St. Louis County map unit
[c]This ELTP is comparable to the Cathro NRCS St. Louis County map unit
[d]This 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)
Botrychium michiganese	Michigan Moonwort	RFSS	T59N, R13W, Sec. 2	Johnson-Groh (2004)
			T59N, R13W, Sec. 3	Johnson-Groh (2004)
			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]
Botrychium simplex	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)
			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)
Caltha natans	Floating Marsh Marigold	State Endangered RFSS	T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 10	Walton (2004)
			T59N, R13W, Sec. 11	Walton (2004)
			T59N, R13W, Sec. 12	Walton (2004)
Eleocharis nitida	Neat Spike Rush	State Special Concern RFSS	T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 9	Barr (2011)
			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)
Juncus vaseyi	Vasey's Rush	RFSS	T59N, R13W, Sec. 1	Walton (2004)
			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)
Ranunculus gmelinii	Small Yellow Water Crowfoot	RFSS	T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 2	Walton (2004)
			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)
Scirpus pedicellatus	Pedicellate Bulrush	RFSS	T59N, R13W, Sec. 3	Pomroy (2004)
			T59N, R13W, Sec. 9	Pomroy (2004)
			T59N, R13W, Sec. 10	Pomroy (2004)
			T59N, R13W, Sec. 13	Pomroy (2004)
Sparganium glomeratum	Clustered Bur-reed	RFSS	T59N, R13W, Sec. 1	Walton (2004)
			T59N, R13W, Sec. 2	Walton (2004)
			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)

(1) References:

Barr Engineering Company. (2008). Results of Sensitive Plant Species Surveys along Dunka Road and Pipeline Route.

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Foth and Van Dyke. (1999). Supplemental Site Specific Resource Information. PolyMet Mining Corporation NorthMet 1999 Exploration Project. Report Prepared for PolyMet Mining.

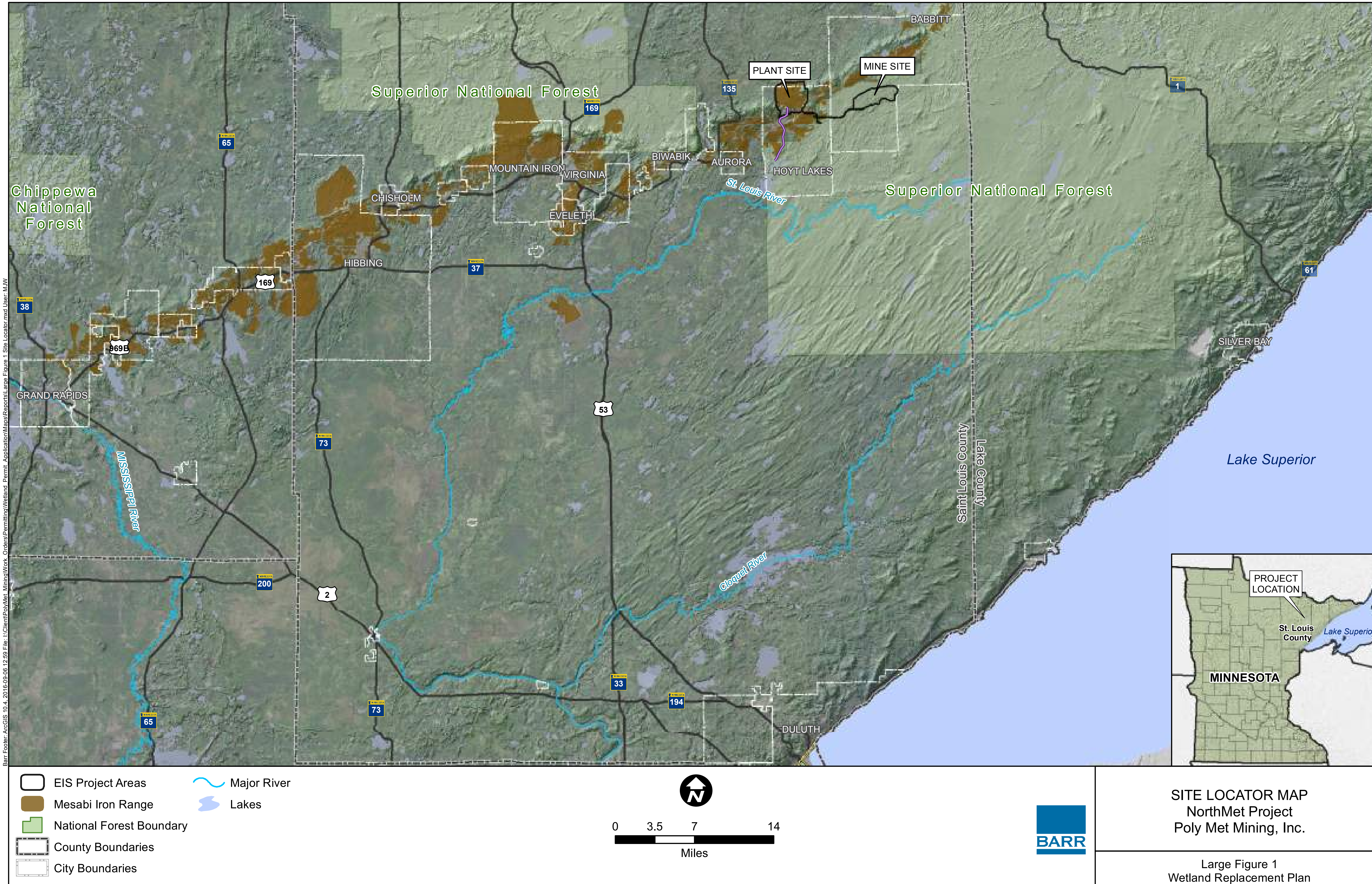
Groh-Johnson, C. (2004). *Botrychium (Moonwort) Rare Plant Surveys for Polymet Project July 2004.*

Pomroy, D. a. (2004). *2004 Rare Plant Survey at the PolyMet Mine Site Located in T59N R13W.*

Walton, G. (2004). Data Summary: Rare Plant Survey.

(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.*

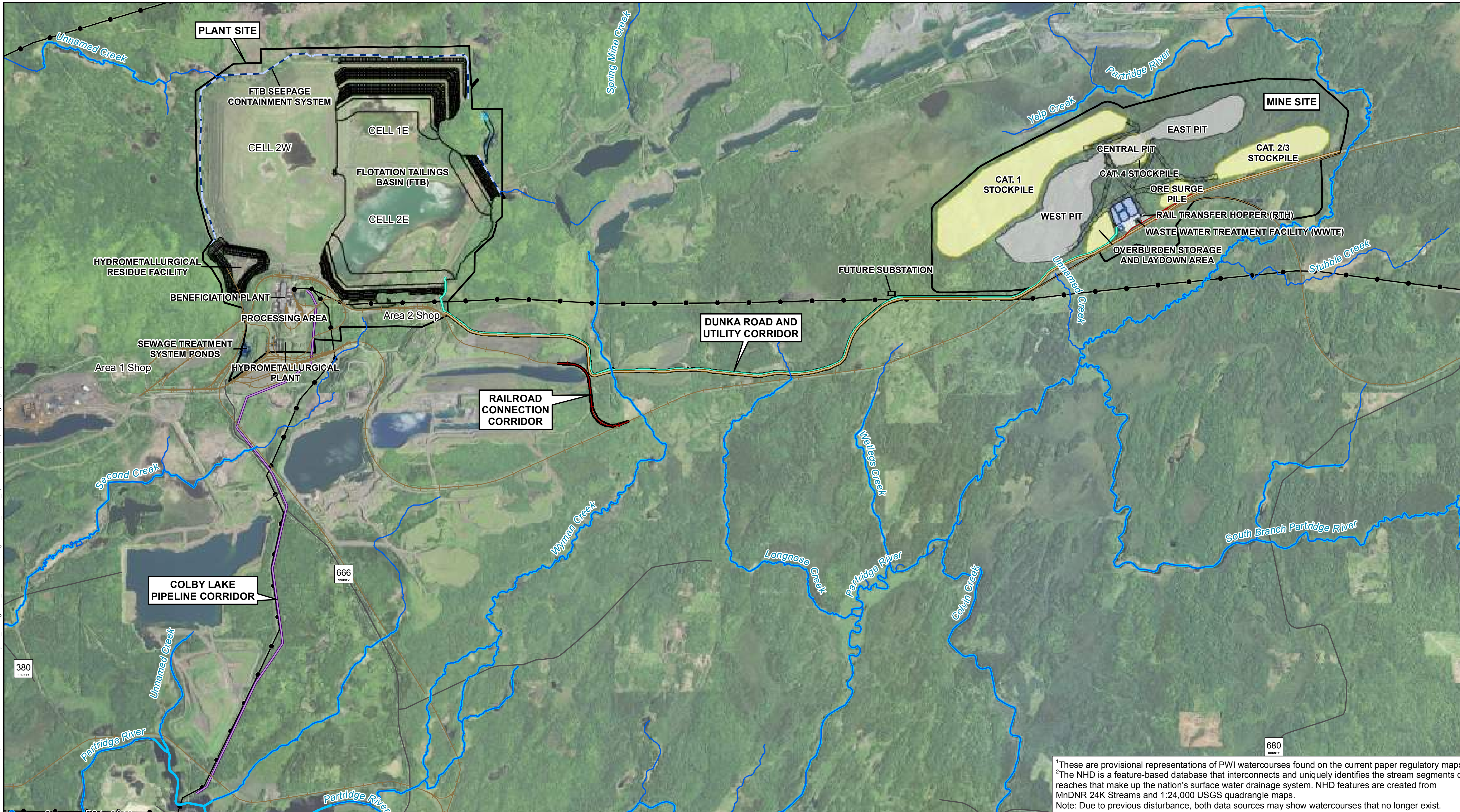
Large Figures



BARR

SITE LOCATOR MAP
NorthMet Project
Poly Met Mining, Inc.

Large Figure 1
Wetland Replacement Plan



[1]These are provisional representations of PWI watercourses found on the current paper regulatory maps.
[2]The NHD is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from MnDNR 24K Streams and 1:24,000 USGS quadrangle maps.
Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

EIS Project Areas
Mine Pits
Stockpiles
Haul Roads
Treated Water Pipeline
Dunka Road
Existing Private Railroad
Proposed Railroad Track
Electric Transmission Lines
Public Waters Inventory (PWI) Watercourses[1]
National Hydrography Dataset (NHD) Rivers & Streams[2]

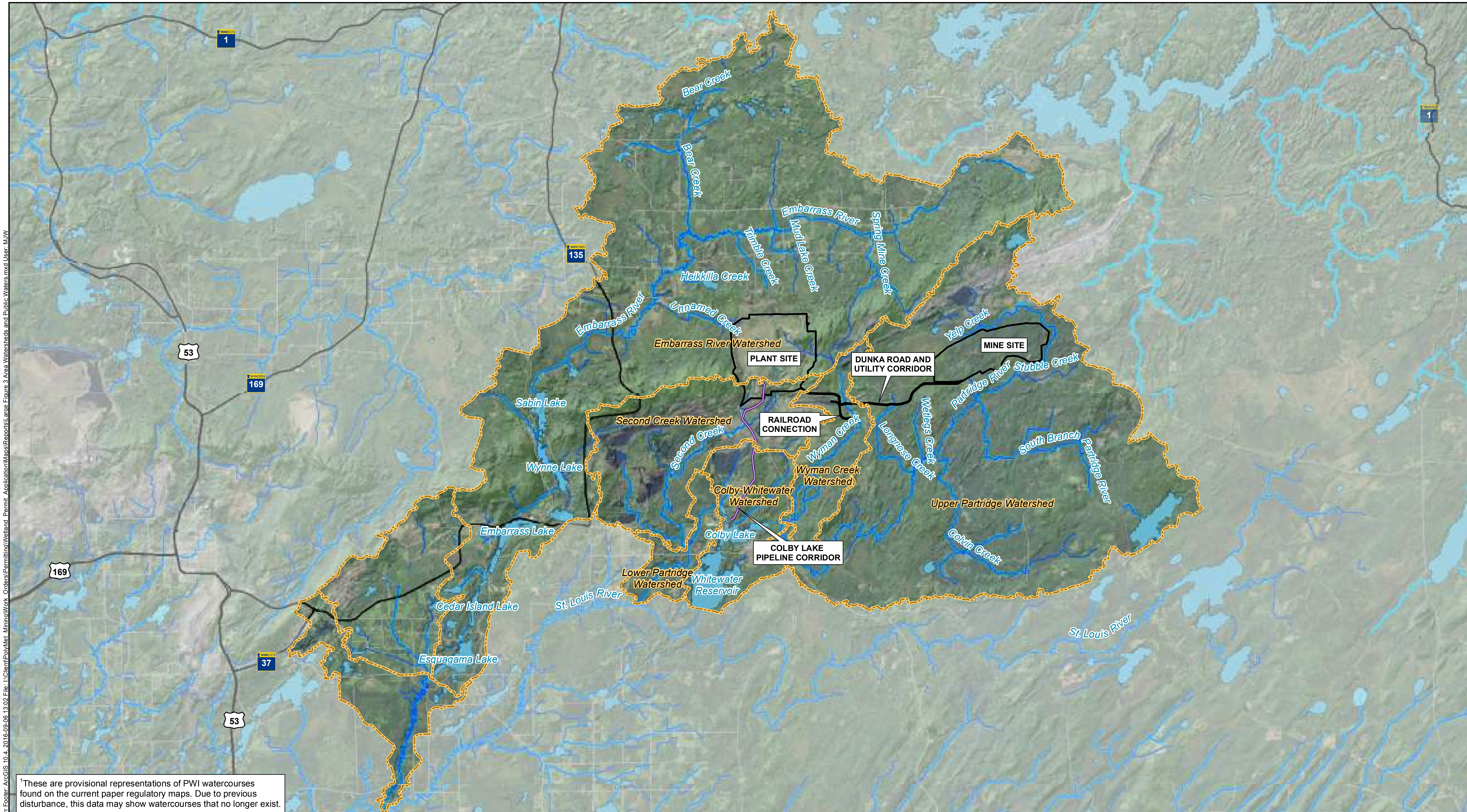
N

0 2,250 4,500 9,000
Feet

BARR

PROJECT AREAS
NorthMet Project
Poly Met Mining, Inc.

Large Figure 2
Wetland Replacement Plan



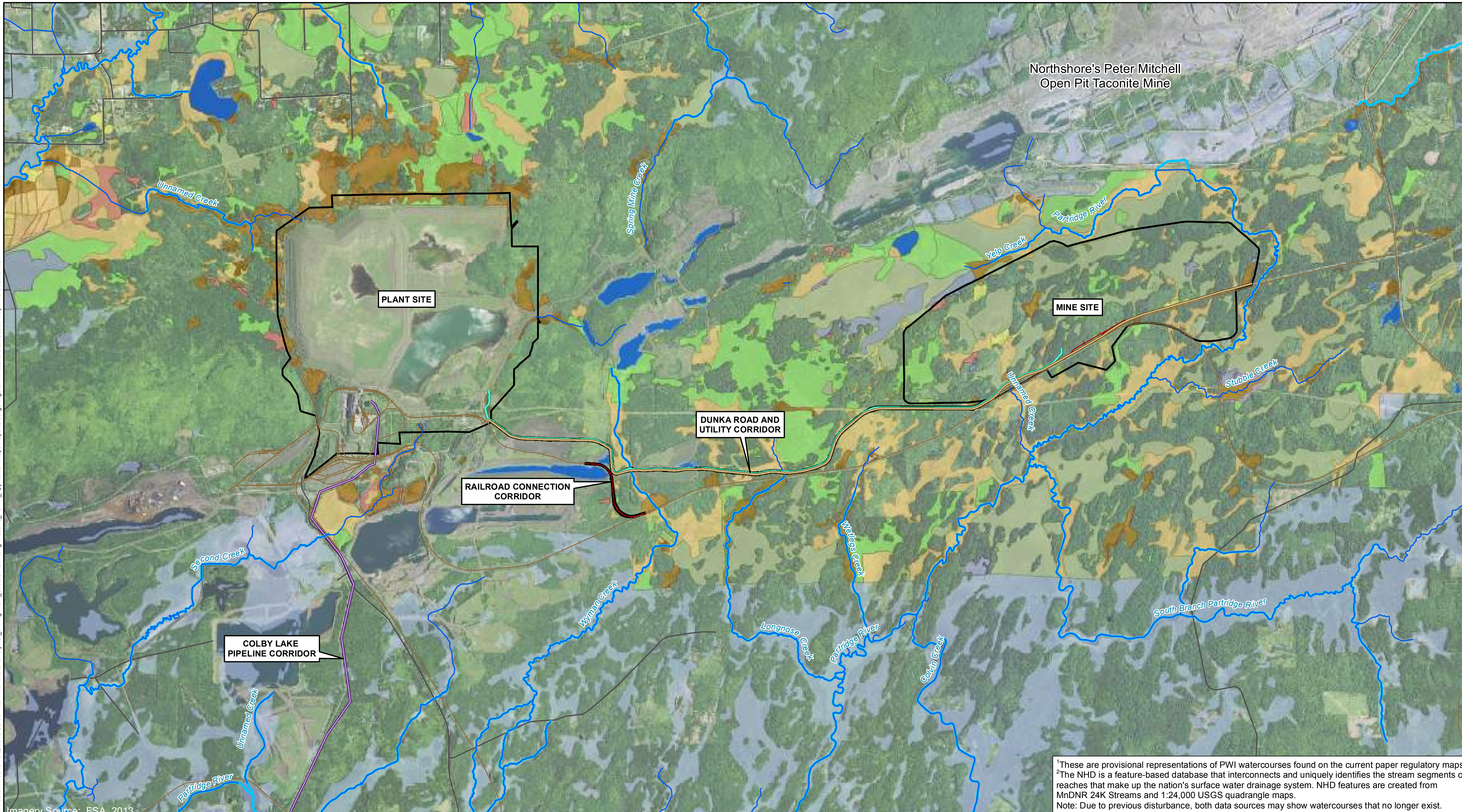
Watershed Boundaries
EIS Project Areas
Public Waters Inventory Basins[1]
Public Waters Inventory Watercourses[1]
Rivers and Streams

0 1.25 2.5 5
Miles

BARR

PROJECT AREA WATERSHEDS AND PUBLIC WATERS
NorthMet Project
Poly Met Mining, Inc.

Large Figure 3
Wetland Replacement Plan



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Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

EIS Project Areas
Treated Water Pipeline
Dunka Road
Existing Private Railroad
Proposed Railroad Track
Public Waters Inventory (PWI) Watercourses[1]

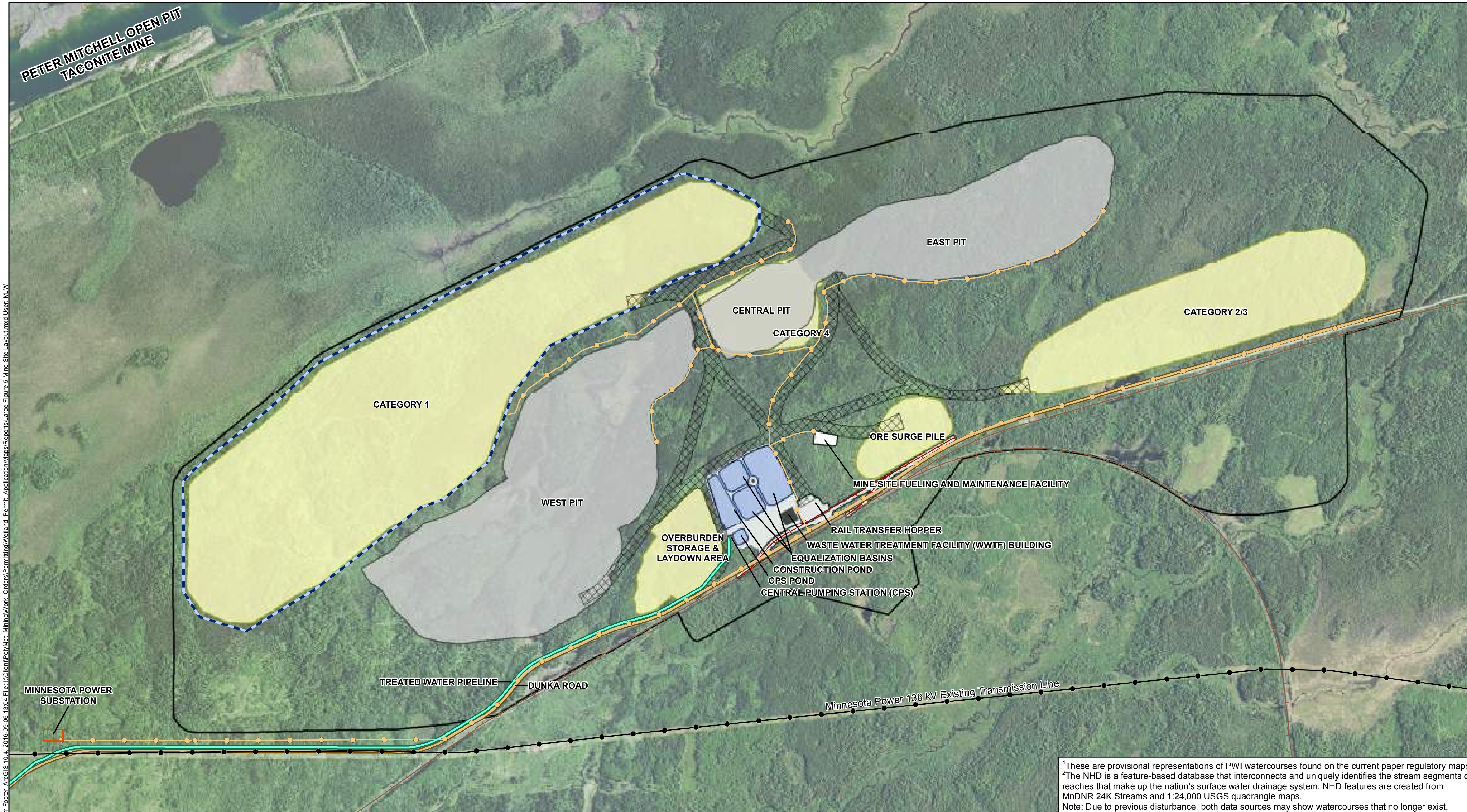
National Hydrography Dataset (NHD) Rivers & Streams[2]
National Wetlands Inventory
Eggers & Reed Wetland Types
Shrub Swamps (Alder thickets & Shrub-carrs)
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow; Wet meadow

0 0.5 1 2
Miles

BARR

WETLAND DELINEATION
NorthMet Project
Poly Met Mining, Inc.

Large Figure 4
Wetland Replacement Plan



[1]These are provisional representations of PWI watercourses found on the current paper regulatory maps.
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Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

- EIS Project Areas
- Mine Pits
- Stockpiles
- Haul Roads
- Proposed Transmission Lines
- Electric Transmission Lines
- Groundwater Containment System
- Treated Water Pipeline
- Dunka Road
- Existing Private Railroad
- Proposed Railroad Track

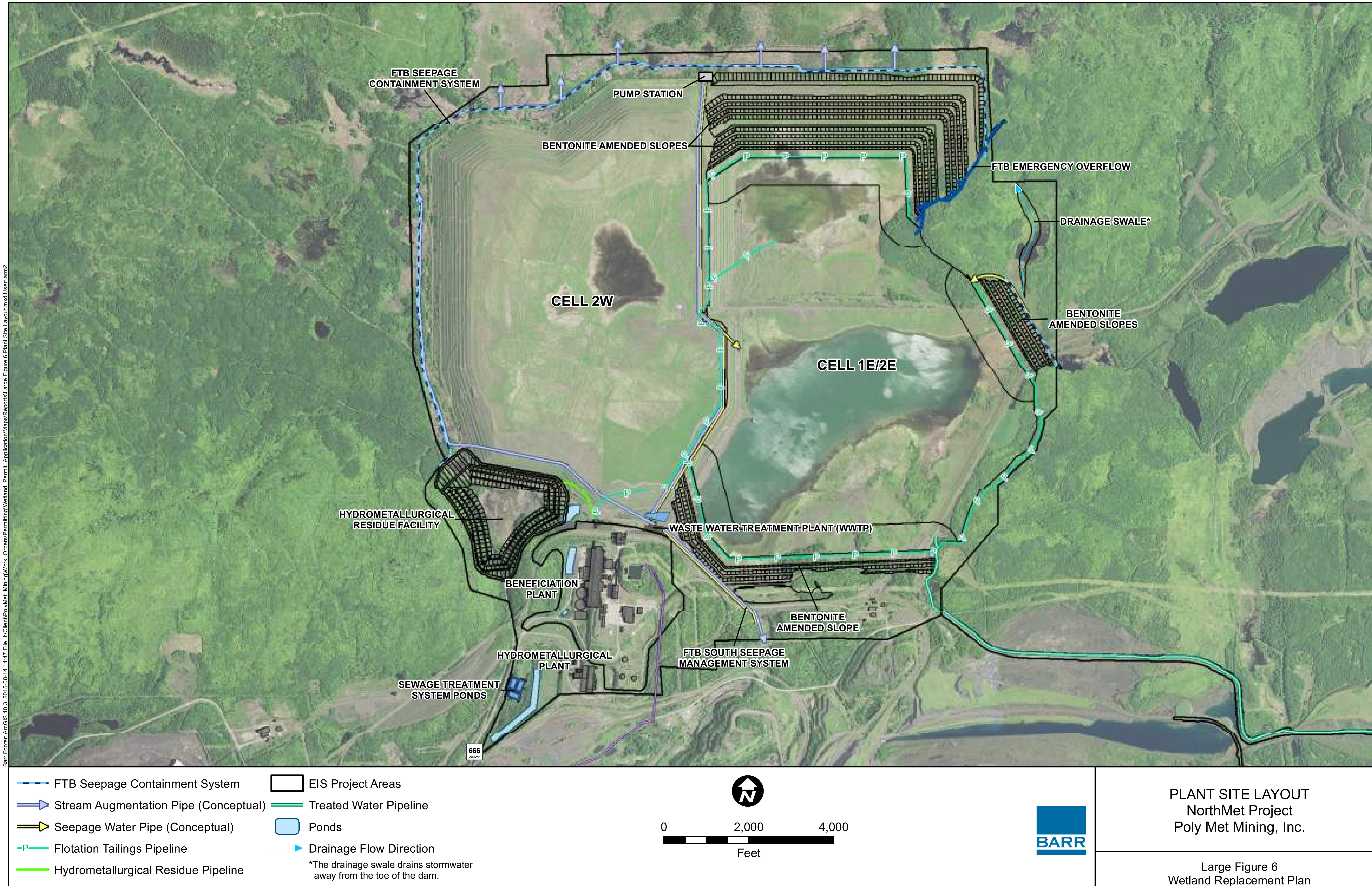
0 750 1,500 3,000
Feet

BARR

MINE SITE LAYOUT
NorthMet Project
Poly Met Mining, Inc.

Large Figure 5
Wetland Replacement Plan

Barr Footer: ArcGIS 10.4, 2016-09-06 13:04 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\Large Figure 5 Mine Site Layout.mxd User: MJW

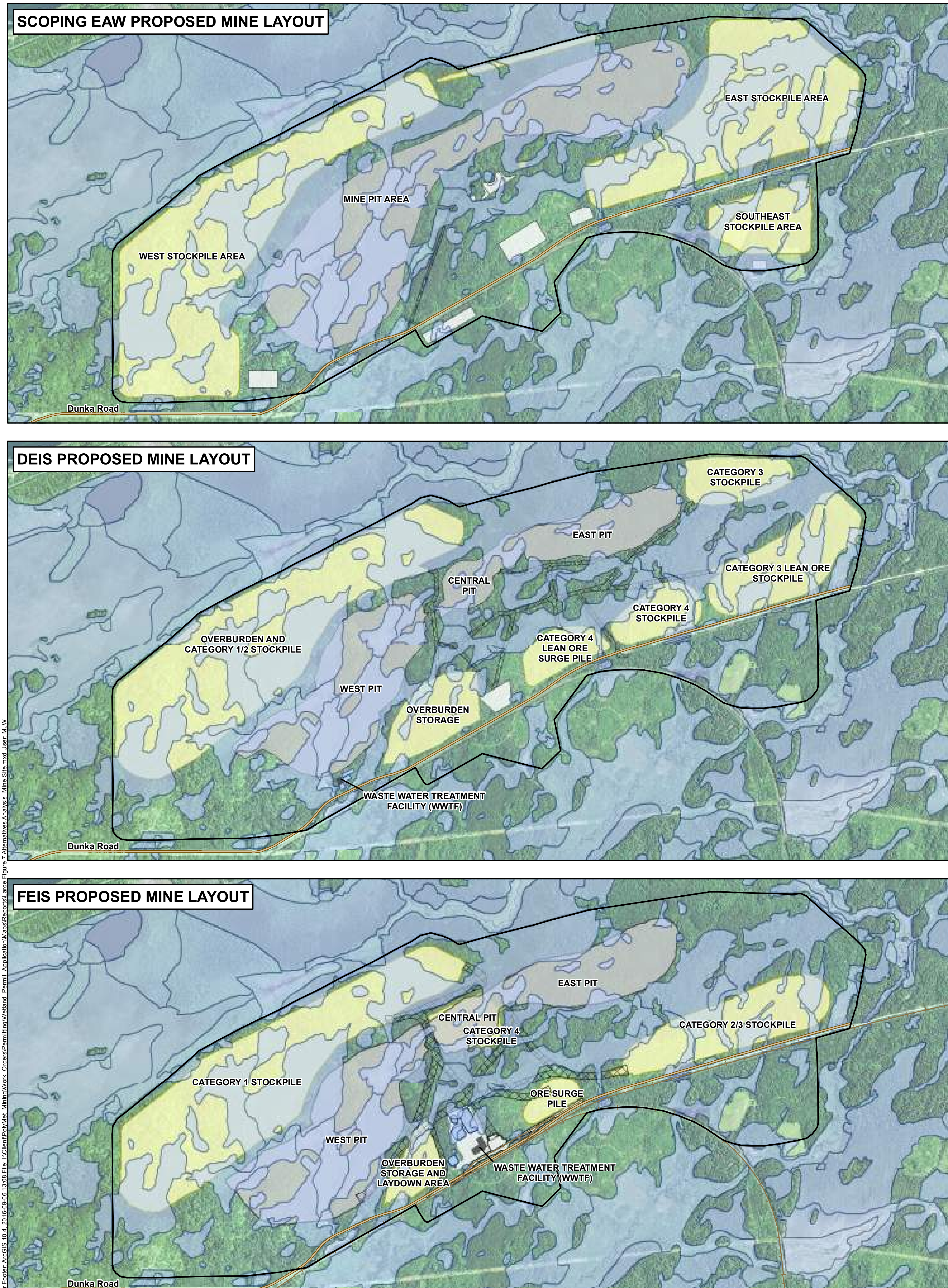


BARR

PLANT SITE LAYOUT
NorthMet Project
Poly Met Mining, Inc.

Large Figure 6
Wetland Replacement Plan

Barr Footer: ArcGIS 10.3, 2015-08-14 14:47 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\Large Figure 6 Plant Site Layout.mxd User: arm2



- EIS Project Areas
- Mine Pits
- Stockpiles
- Haul Roads
- Dunka Road
- Wetlands

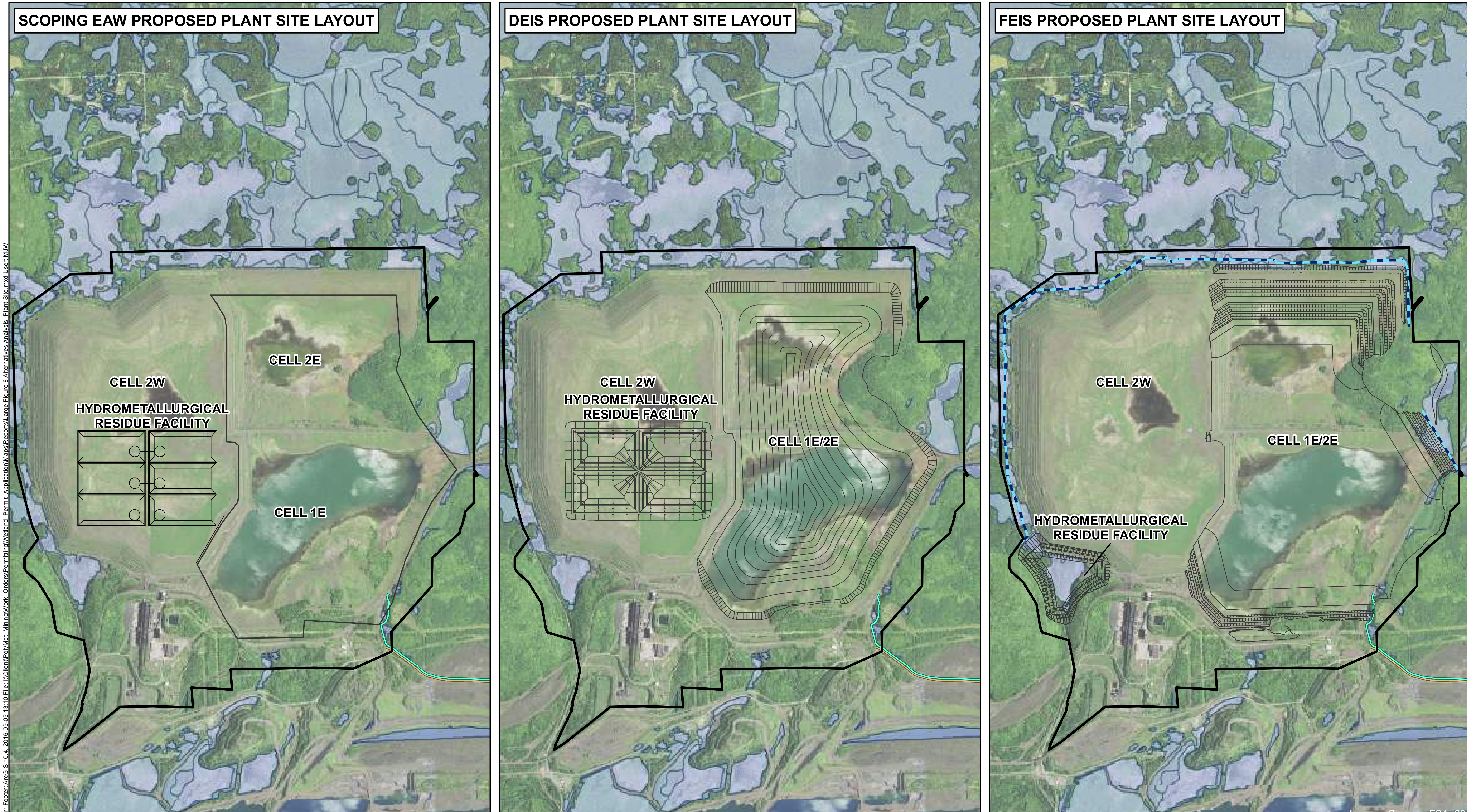
N

0 1,250 2,500 5,000
Feet

BARR

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

Large Figure 7
Wetland Replacement Plan



- EIS Project Areas
- Dunka Road
- Treated Water Pipeline
- FTB Seepage Containment System
- Wetlands

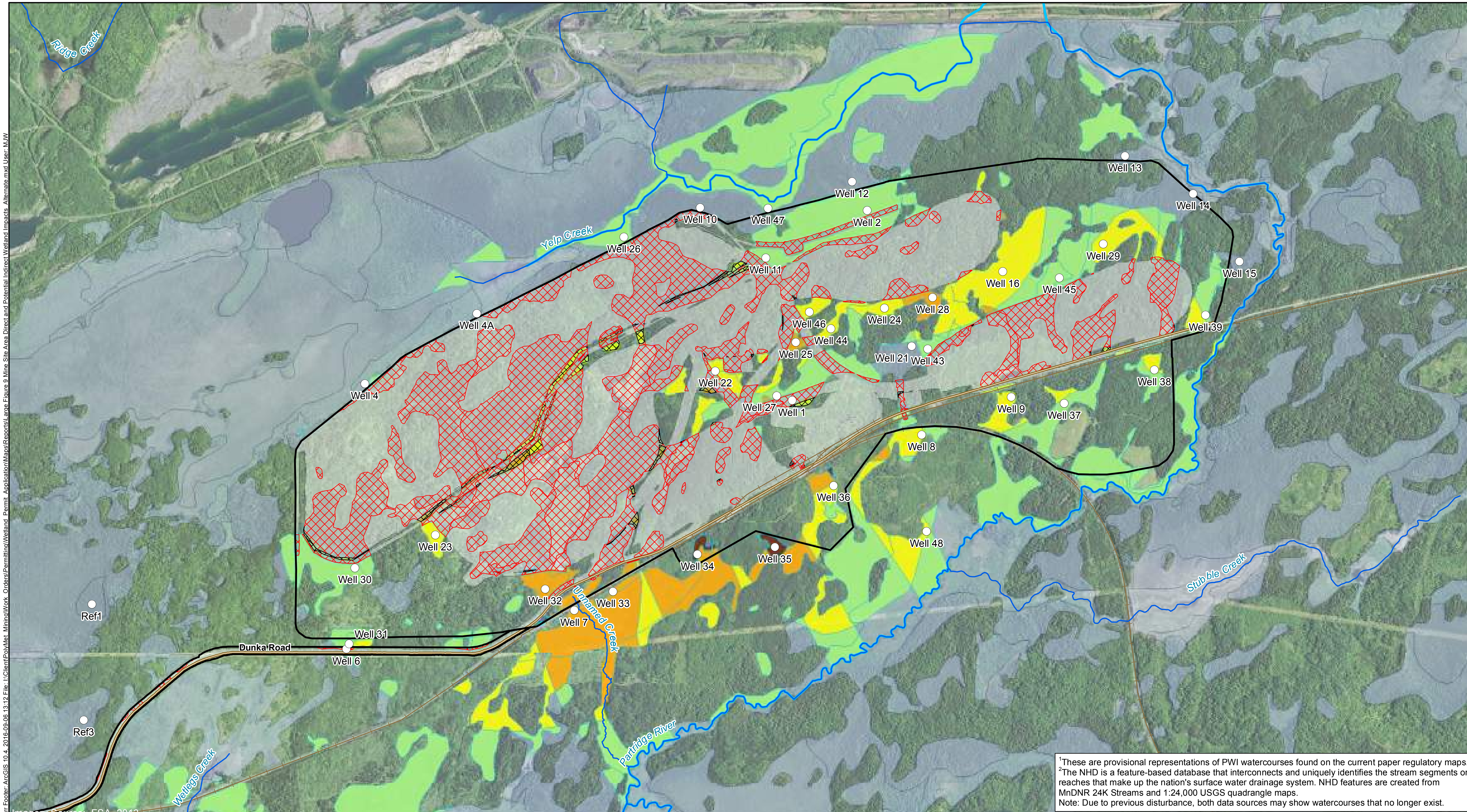
N

0 1,500 3,000 6,000
Feet

BARR

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

Large Figure 8
Wetland Replacement Plan



Wetland Hydrology Monitoring Locations
Dunka Road
Public Waters Inventory (PWI) Watercourses[1]
National Hydrography Dataset (NHD) Rivers & Streams[2]
EIS Project Areas
Areas Disturbed by Proposed Project Features

Direct Wetland Impacts
Fragmented Wetlands

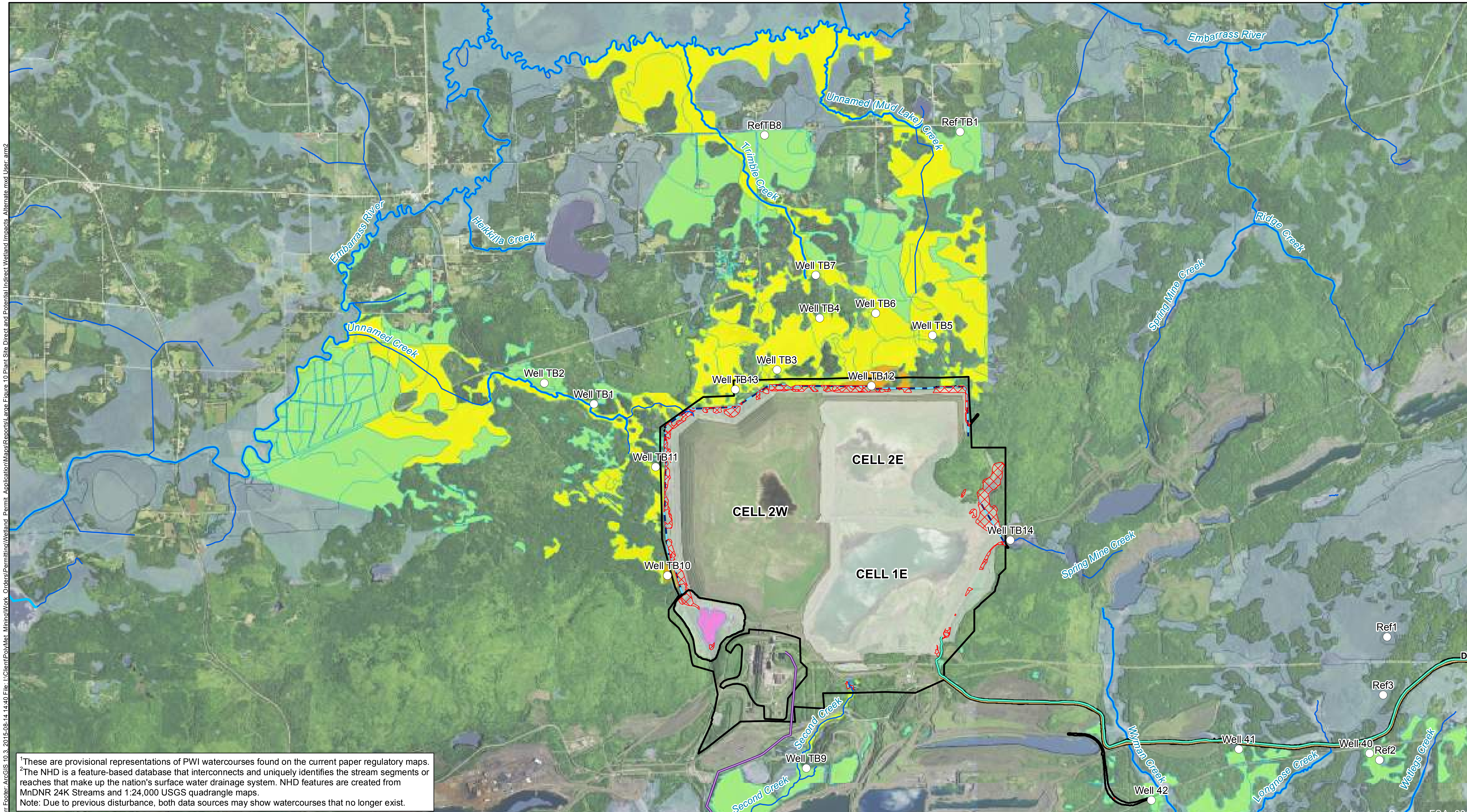
Potential Indirect Wetland Impact Factor Rating
5
4
3
2
1
No Impact

0 1,000 2,000 4,000
Feet

BARR

MINE SITE DIRECT AND POTENTIAL INDIRECT WETLAND IMPACTS
NorthMet Project
Poly Met Mining, Inc.

Large Figure 9
Wetland Replacement Plan



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Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

Barr Footer: ArcGIS 10.3, 2015-08-14 14:40 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\Large Figure 10 Plant Site Direct and Potential Indirect Wetland Impacts_Alternate.mxd User: arm2

- Wetland Hydrology Monitoring Locations
- EIS Project Areas
- FTB Seepage Containment System
- Dunka Road
- Public Waters Inventory (PWI) Watercourses[1]
- National Hydrography Dataset (NHD) Rivers & Streams[2]
- Areas Disturbed by Proposed Project Features
- Direct Wetland Impacts
- Fragmented Wetlands

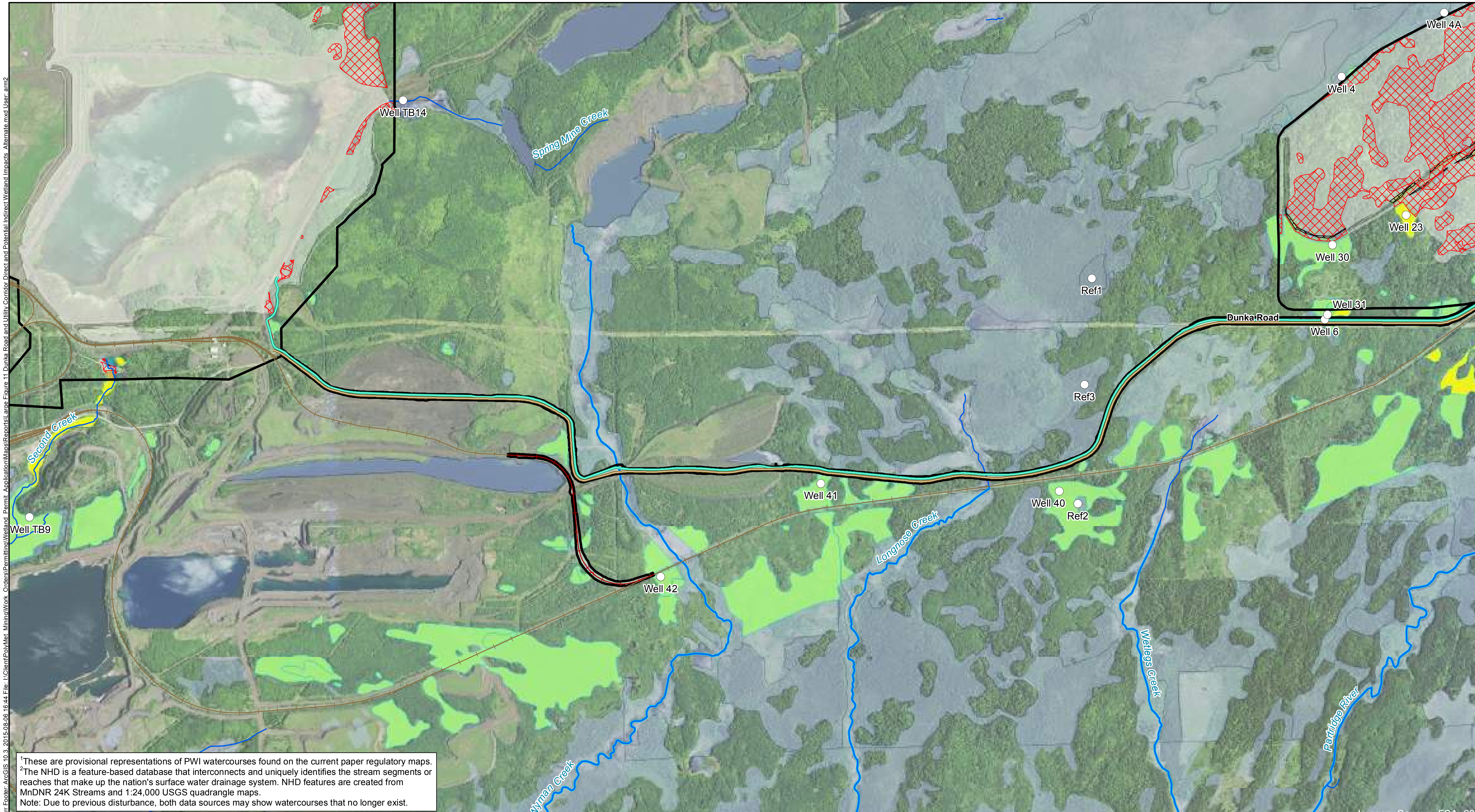
Potential Indirect Wetland Impact Factor Rating
- 5
- 4
- 3
- 2
- 1
- Exempt
- No Impact

0 2,000 4,000 8,000
Feet

BARR

PLANT SITE DIRECT AND POTENTIAL INDIRECT WETLAND IMPACTS
NorthMet Project
Poly Met Mining, Inc.

Large Figure 10
Wetland Replacement Plan



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Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

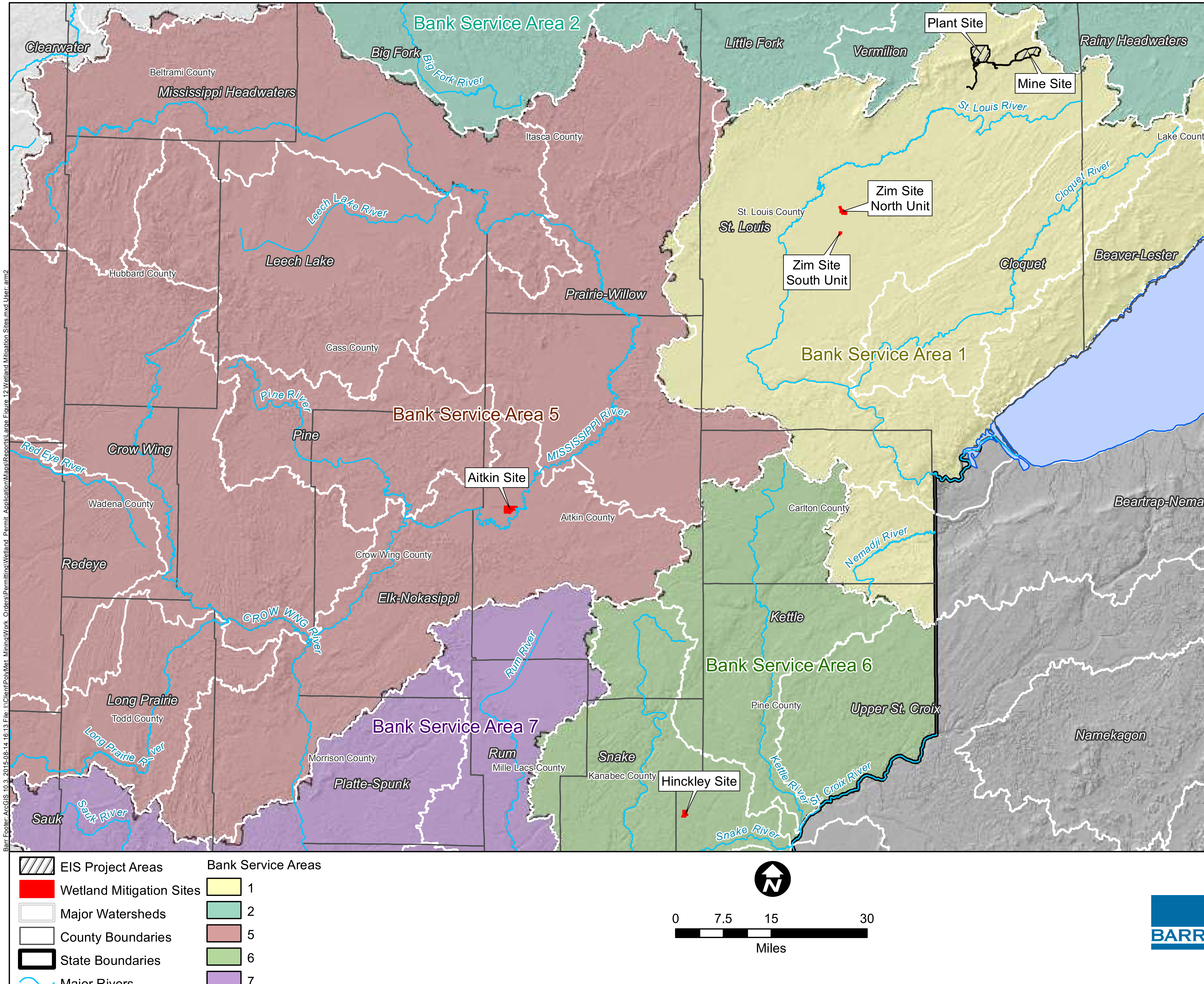
EIS Project Areas
Treated Water Pipeline
Dunka Road
Existing Private Railroad
Proposed Railroad Track
Public Waters Inventory (PWI) Watercourses[1]
National Hydrography Dataset (NHD) Rivers & Streams[2]

0 1,100 2,200 4,400
Feet

BARR

TRANSPORTATION CORRIDORS
DIRECT AND POTENTIAL INDIRECT
WETLAND IMPACTS
NorthMet Project
Poly Met Mining, Inc.

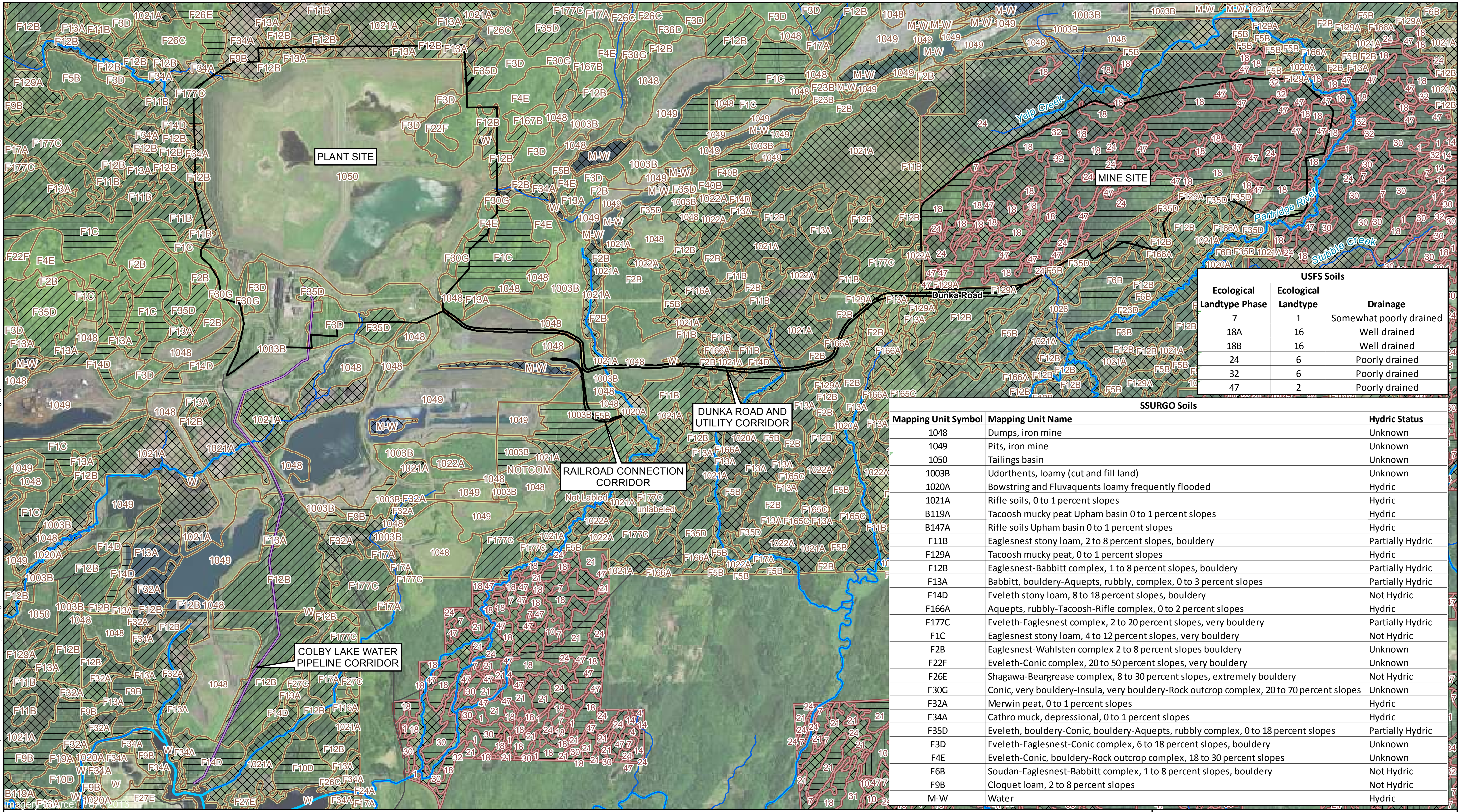
Large Figure 11
Wetland Replacement Plan



BARR

WETLAND MITIGATION SITES
NorthMet Project
Poly Met Mining, Inc.

Large Figure 12
Wetland Replacement Plan



USFS Soils		
Ecological Landtype Phase	Ecological Landtype	Drainage
7	1	Somewhat poorly drained
18A	16	Well drained
18B	16	Well drained
24	6	Poorly drained
32	6	Poorly drained
47	2	Poorly drained

SSURGO Soils		
Mapping Unit Symbol	Mapping Unit Name	Hydric Status
1048	Dumps, iron mine	Unknown
1049	Pits, iron mine	Unknown
1050	Tailings basin	Unknown
1003B	Udorthents, loamy (cut and fill land)	Unknown
1020A	Bowstring and Fluvaquents loamy frequently flooded	Hydric
1021A	Rifle soils, 0 to 1 percent slopes	Hydric
B119A	Tacoosh mucky peat Upham basin 0 to 1 percent slopes	Hydric
B147A	Rifle soils Upham basin 0 to 1 percent slopes	Hydric
F11B	Eaglesnest stony loam, 2 to 8 percent slopes, bouldery	Partially Hydric
F129A	Tacoosh mucky peat, 0 to 1 percent slopes	Hydric
F12B	Eaglesnest-Babbitt complex, 1 to 8 percent slopes, bouldery	Partially Hydric
F13A	Babbitt, bouldery-Aquepts, rubbly, complex, 0 to 3 percent slopes	Partially Hydric
F14D	Eveleth stony loam, 8 to 18 percent slopes, bouldery	Not Hydric
F166A	Aquepts, rubbly-Tacoosh-Rifle complex, 0 to 2 percent slopes	Hydric
F177C	Eveleth-Eaglesnest complex, 2 to 20 percent slopes, very bouldery	Partially Hydric
F1C	Eaglesnest stony loam, 4 to 12 percent slopes, very bouldery	Not Hydric
F2B	Eaglesnest-Wahlsten complex 2 to 8 percent slopes bouldery	Unknown
F22F	Eveleth-Conic complex, 20 to 50 percent slopes, very bouldery	Unknown
F26E	Shagawa-Beargrease complex, 8 to 30 percent slopes, extremely bouldery	Not Hydric
F30G	Conic, very bouldery-Insula, very bouldery-Rock outcrop complex, 20 to 70 percent slopes	Unknown
F32A	Merwin peat, 0 to 1 percent slopes	Hydric
F34A	Cathro muck, depressional, 0 to 1 percent slopes	Hydric
F35D	Eveleth, bouldery-Conic, bouldery-Aquepts, rubbly complex, 0 to 18 percent slopes	Partially Hydric
F3D	Eveleth-Eaglesnest-Conic complex, 6 to 18 percent slopes, bouldery	Unknown
F4E	Eveleth-Conic, bouldery-Rock outcrop complex, 18 to 30 percent slopes	Unknown
F6B	Soudan-Eaglesnest-Babbitt complex, 1 to 8 percent slopes, bouldery	Not Hydric
F9B	Cloquet loam, 2 to 8 percent slopes	Not Hydric
M-W	Water	Hydric

SSURGO Soils - Embarrass Subset (Mapping Unit Symbol)
Ecological Landtype Phase - USFS
Hydric Rating/Drainage Class
All Hydric/Poorly drained
Partially Hydric/Somewhat poorly drained
Not Hydric/Well drained
Unknown Hydric

EIS Project Areas
Public Waters Inventory (PWI) Watercourses[1]
National Hydrography Dataset (NHD) Rivers & Streams[2]

[1]These are provisional representations of PWI watercourses found on the current paper regulatory maps.
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Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

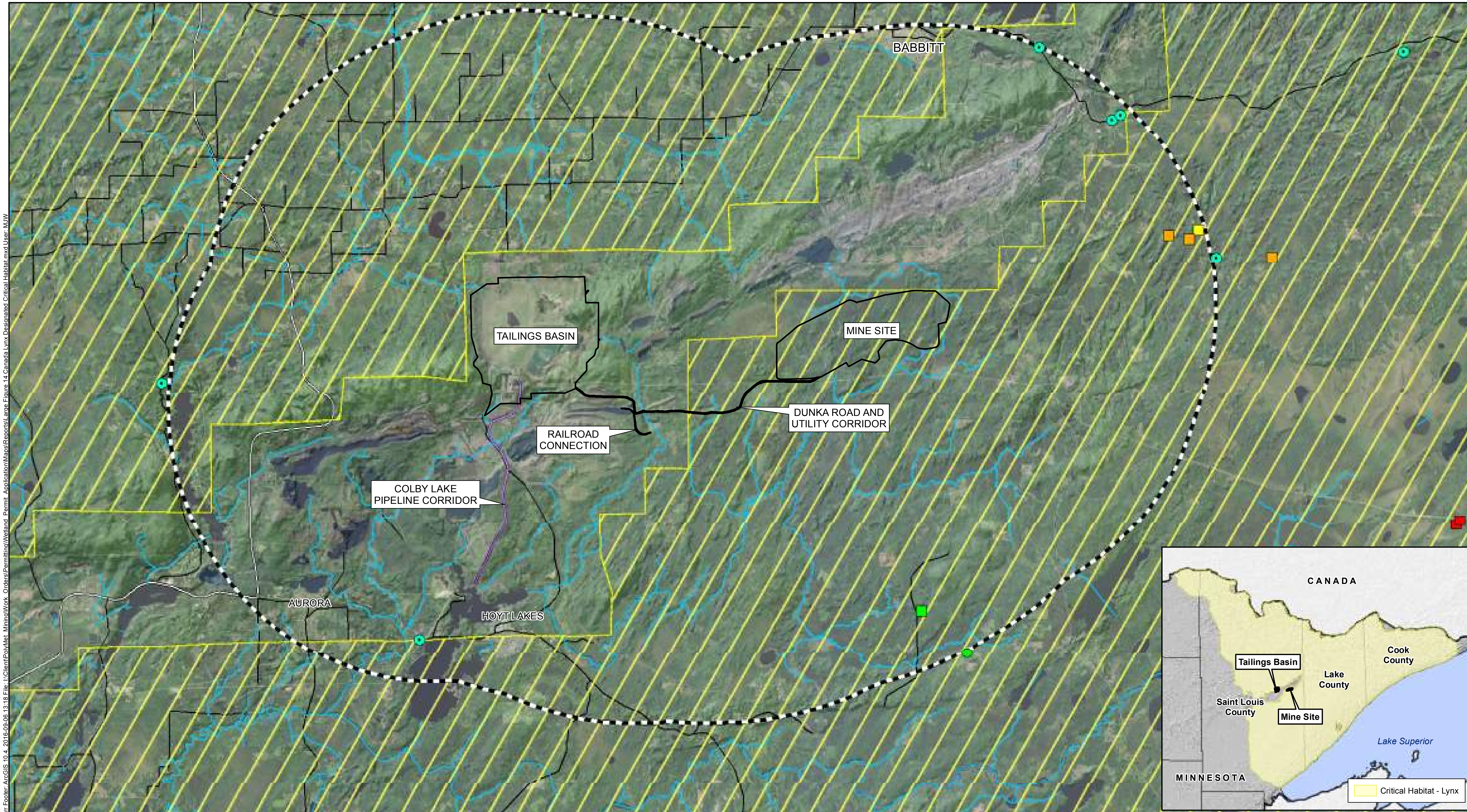
0 2,250 4,500 9,000
Feet

BARR

SOILS
NorthMet Project
Poly Met Mining, Inc.

Large Figure 13
Wetland Replacement Plan

Barr Footer: ArcGIS 10.4, 2016-09-06 13:17 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\Large Figure 13 Soils.mxd User: MJW



EIS Project Areas
Lynx Study Area
Critical Habitat Designation for Canada Lynx
Rivers & Streams
Lynx Sightings (Minnesota Lynx Database)

Lynx Scat Samples
Lynx 1 Scat Collection Site
Lynx 2 Scat Collection Site
Lynx 3 Scat Collection Site
Suspected Lynx 3 Scat Collection Site
Lynx 4 Scat Collection Site

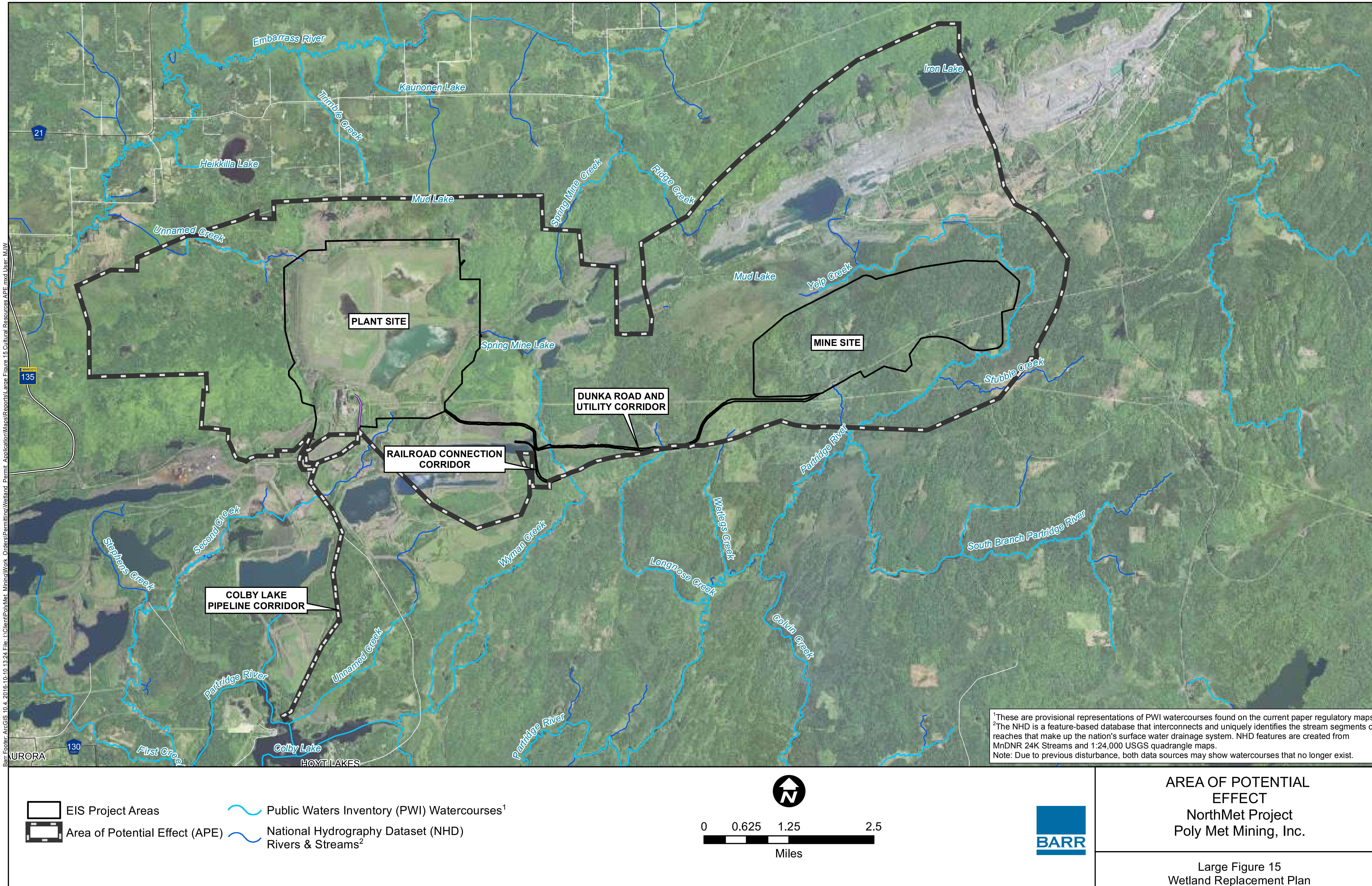
0 1 2 4
Miles

BARR

CANADA LYNX
DESIGNATED CRITICAL HABITAT
NorthMet Project
Poly Met Mining, Inc.

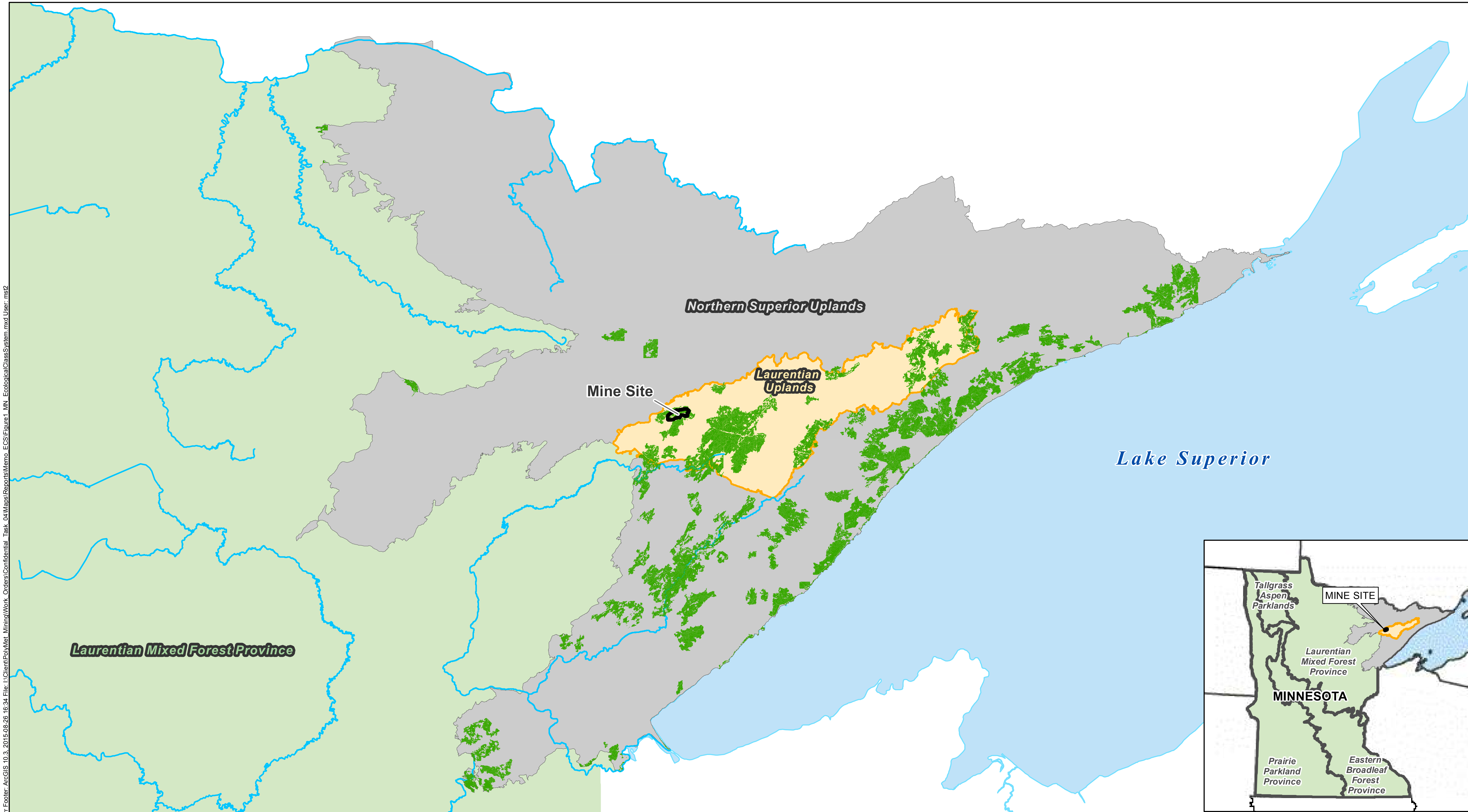
Large Figure 14
Wetland Replacement Plan

Barr Footer: ArcGIS 10.4, 2016-09-06 13:18 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\Large Figure 14 Canada Lynx Designated Critical Habitat.mxd User: MJW



AREA OF POTENTIAL EFFECT
NorthMet Project
Poly Met Mining, Inc.

Large Figure 15
Wetland Replacement Plan



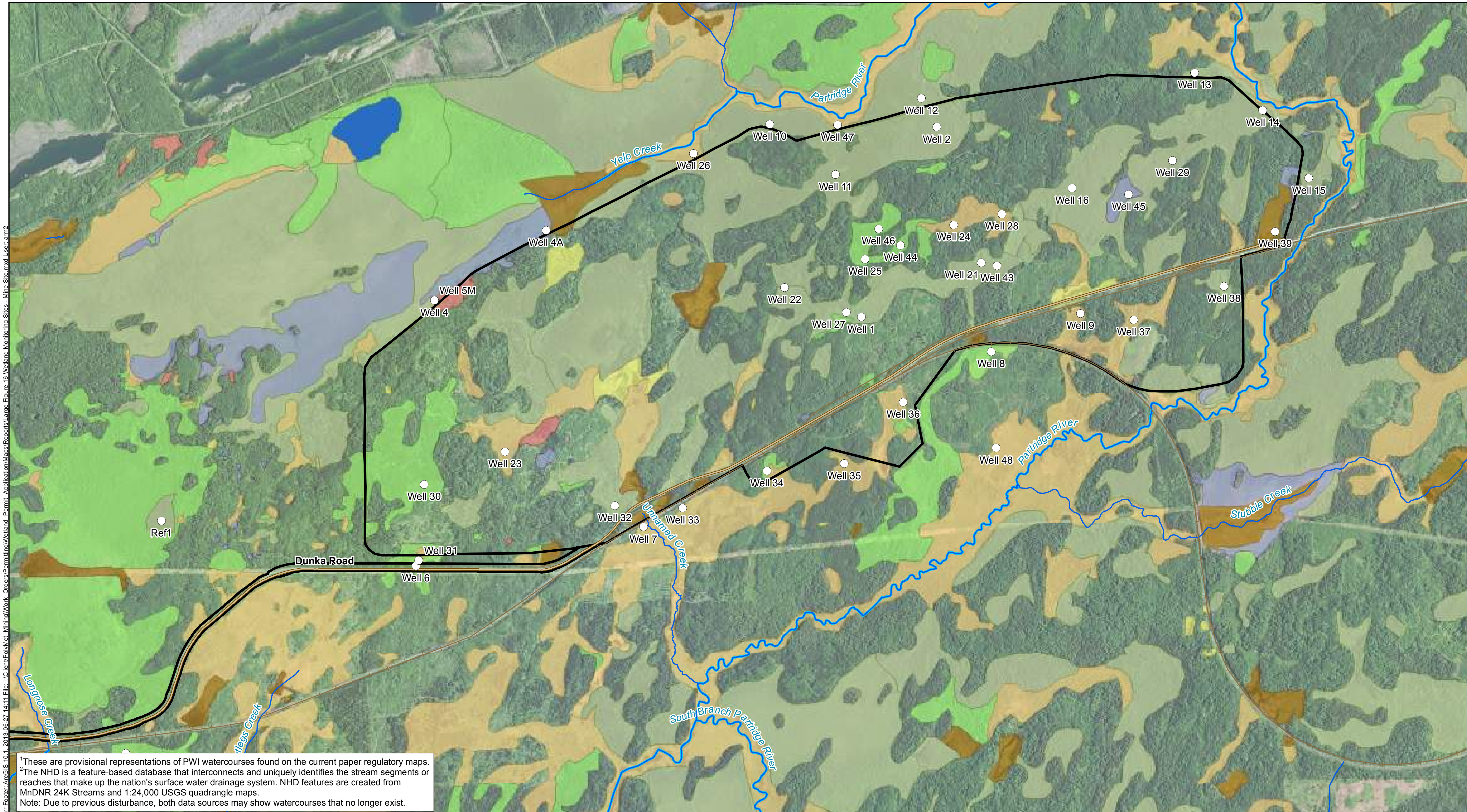
Mine Site
MDNR-MBS Native Plant Communities
Laurentian Uplands Subsection
Northern Superior Uplands Section
Ecological Provinces
Major River
Lakes

0 7.5 15
Miles

BARR

NATURAL COMMUNITIES
NorthMet Project
Poly Met Mining, Inc.

Large Figure 16
Wetland Replacement Plan



Barr Footer: ArcGIS 10.1, 2013-06-27 14:11 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\Large Figure 16 Wetland Monitoring Sites - Mine Site.mxd User: arm2

- Wetland Hydrology Monitoring Locations
- Dunka Road
- Railroads
- EIS Project Areas
- Public Waters Inventory (PWI) Watercourses[1]
- National Hydrography Dataset (NHD) Rivers & Streams[2]

Eggers & Reed Wetland Types

- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

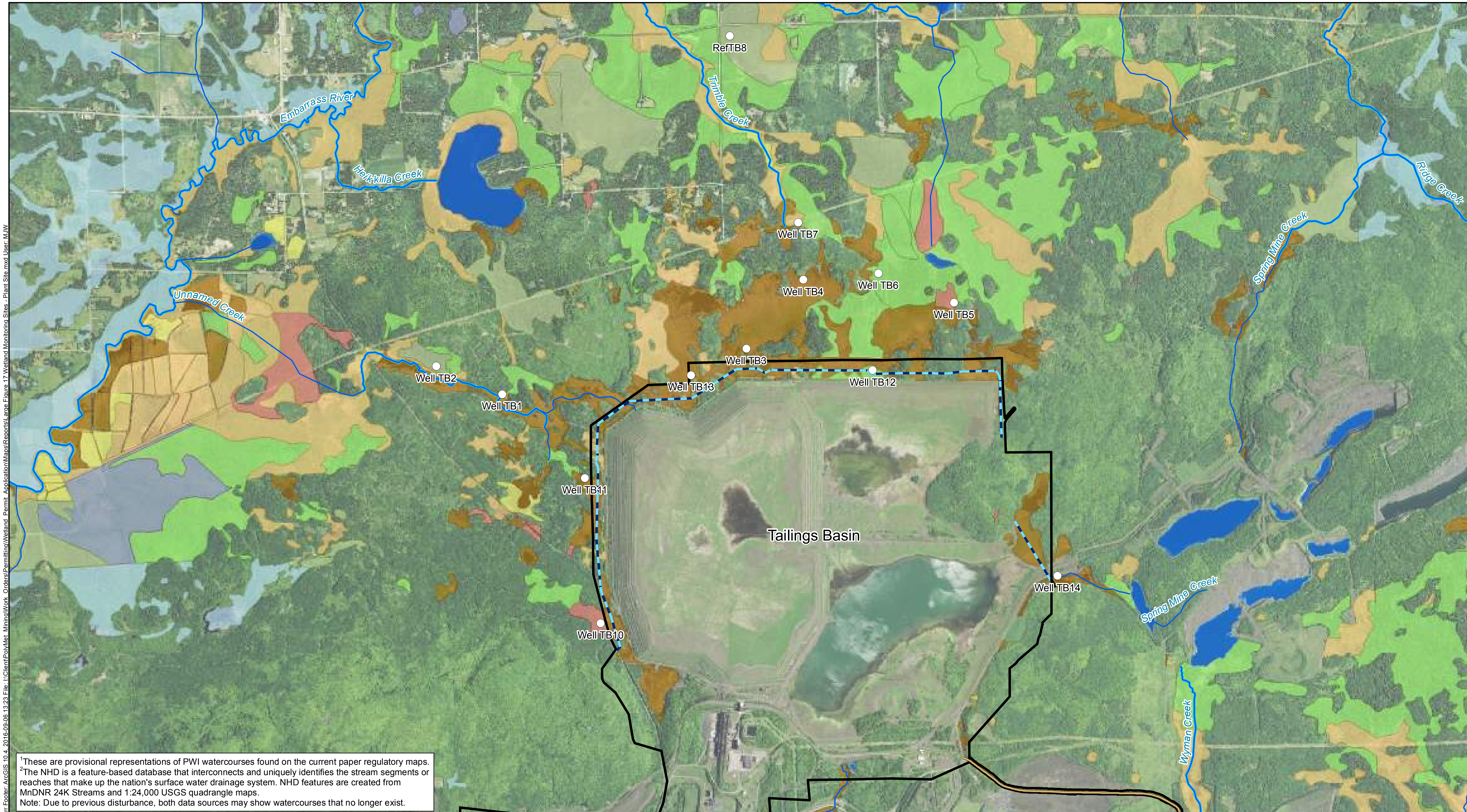
N

0 1,000 2,000 4,000
Feet

BARR

WETLAND MONITORING SITES - MINE SITE
NorthMet Project
Poly Met Mining, Inc.

Large Figure 17
Wetland Replacement Plan



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Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

- Wetland Hydrology Monitoring Locations
- Dunka Road
- EIS Project Areas
- FTB Seepage Containment System
- Public Waters Inventory (PWI) Watercourses[1]
- National Hydrography Dataset (NHD) Rivers & Streams[2]
- National Wetlands Inventory

Eggers & Reed Wetland Types
- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

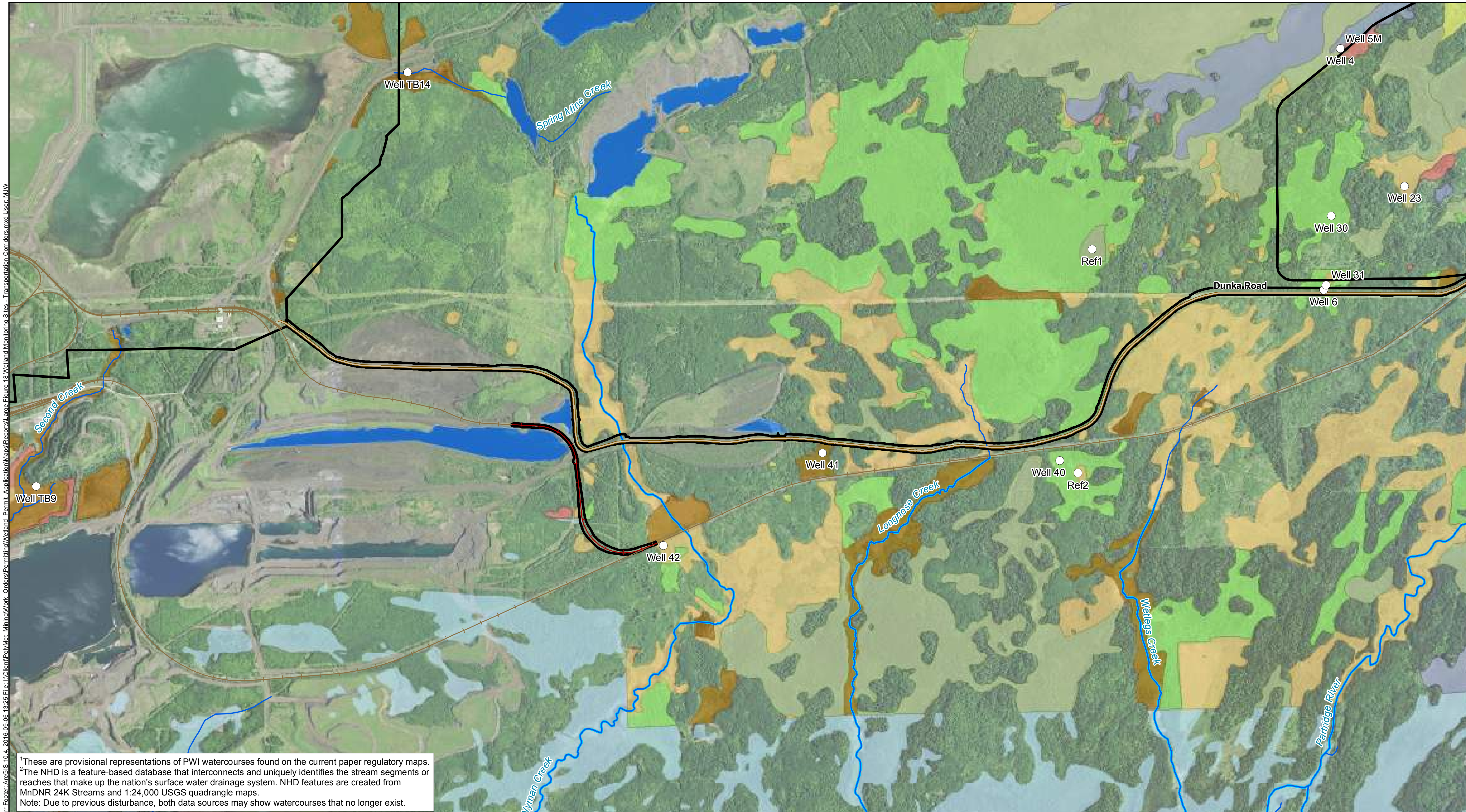
N

0 1,500 3,000 6,000
Feet

BARR

WETLAND MONITORING
SITES - PLANT SITE
NorthMet Project
Poly Met Mining, Inc.

Large Figure 18
Wetland Replacement Plan



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Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

- Wetland Hydrology Monitoring Locations
- Dunka Road
- Existing Private Railroad
- Proposed Railroad Track
- EIS Project Areas
- Public Waters Inventory (PWI) Watercourses[1]
- National Hydrography Dataset (NHD) Rivers & Streams[2]
- National Wetlands Inventory

Eggers & Reed Wetland Types

- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

N

0 1,100 2,200 4,400
Feet

BARR

WETLAND MONITORING SITES - TRANSPORTATION CORRIDORS
NorthMet Project
Poly Met Mining, Inc.

Large Figure 19
Wetland Replacement Plan

Attachments

Attachment A

NorthMet Project Wetland Data Package v11

POLYMET
MINING

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.

Table of Contents

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

Unit	Description
ac-ft/yr	acre-feet per year
dBA	Decibel
gpm	gallons per minute
g/cm^3	grams per cubic centimeter
$g/m^2/yr$	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
$µg/m^2/yr$	microgram per square meter per year

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.

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.

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).*

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.

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 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).

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, 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.

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.

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.

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 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.

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.

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.

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.

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.

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

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).

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).

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 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%).

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 wetland		789.54	566.04	26.39

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 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))."

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)).

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

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 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 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.

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

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.

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.

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/cm^3), which is consistent with inputs used for Class II air modeling.

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 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 ($g/m^2/yr$) 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.

For example, for a minimally vegetated ground surface with a surface area of 1.4 m^2, the deposition of 365 g to the 1.4 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 g/m^2/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/m^2/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Cadmium(4)	505	µg/m^2/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Chromium(4)	255	µg/m^2/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Copper(4)	3,520	µg/m^2/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Dust(2),(3)	365	g/m^2/yr	Dust from total particulate matter (TPM). A “no effects” deposition rate related to photosynthesis.
Lead(4)	1,800	µg/m^2/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Manganese(4)	5,580	µg/m^2/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Nickel(4)	938	µg/m^2/yr	Wet deposition adjusted by a factor of 1.6. Attachment D.
Selenium(4)	572	µg/m^2/yr	Selenium deposition as reported in Reference (24).

Parameter	Background Deposition Rate (wet + dry)	Units(1)	Comments
Sulfur(5),(6)	0.16	$g/m^2/yr$	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	$\mu g/m^2/yr$	Wet deposition adjusted by a factor of 1.6. Attachment D.
Zinc(4)	10,900	$\mu g/m^2/yr$	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/m^2/year, the deposition units in AERMOD, is as follows:

- 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 kg/ha x 0.33 = 1.25 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/m^2/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 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 $g/m^2/yr$ 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 $g/m^2/yr$.

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 $g/m^2/yr$ (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.

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.

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 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.

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.

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).

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.

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%).

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 acres of wetland		48.69	35.18	0.49

(1) Wetland 1155 is directly impacted by the HRF and FTB.
(2) Wetland 1159 is directly impacted by the HRF.

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.

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 +/- 20% of the No Action condition.

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).

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	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	17.40
989	Coniferous swamp	130.31

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.

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.
(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)).

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 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.

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.

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.

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 (m^2 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.

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)).

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 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 shrub-carr (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 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 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.
(2) Wetland 595 includes 3 separate areas.
(3) Previously identified in Reference (40) using the NWI.

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.

Table 5-15 Rating for Wetlands Potentially Indirectly Impacted in the Project Area

Rating	Attachment A Method		Alternate Method	
	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

(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).

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.

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 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 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).

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 pre-settlement 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 pre-settlement conditions and there will be no changes compared to existing conditions (Large Table 22).

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.

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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Large Table 1 Summary of Wetlands in Project Areas

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	E
Mine Site	19	3	1.68	0.05	1.63	Shallow marsh	High	E
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	E
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	E
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	E
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	E
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	E
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	E
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

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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	**4**		**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	862	6	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	C
FTB	272	4	1.11	1.10	0.01	Deep marsh	Low	C
FTB	278	6	1.04	0.23	0.81	Alder thicket	Low	C
FTB	279	6	4.84	3.33	1.51	Alder thicket	Low	C
FTB	282	3	14.25	7.42	6.83	Shallow marsh	Moderate	C
FTB	284	6	2.92	2.51	0.41	Alder thicket	Low	C
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	C
FTB	307	3	0.78	0.77	0.01	Shallow marsh	Low	C
FTB	308	4	7.17	1.95	5.22	Deep marsh	Low	C
FTB	309	2	0.02	0.02	0.00	Wet meadow	Low	C
FTB	312	6	1.98	1.33	0.65	Shrub-carr	Low	C
FTB	314	3	24.87	5.70	19.17	Shallow marsh	Low	C
FTB	573	3	0.12	0.00	0.12	Shallow marsh	Low	
FTB	582	4	27.49	8.11	19.38	Deep marsh	Low	C

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FTB	585	6	1.58	0.00	1.58	Alder thicket	Low	
FTB	586	4	1.89	1.53	0.36	Deep marsh	Low	C
FTB	587	3	0.97	0.17	0.80	Shallow marsh	Low	C
FTB	590	3	5.43	5.38	0.05	Shallow marsh	Low	C
FTB	591	4	2.71	0.70	2.01	Deep marsh	Low	C
FTB	593	4	9.80	8.47	1.33	Deep marsh	Low	C
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	C
FTB	968	7	13.76	10.27	3.49	Coniferous swamp	Low	C
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	C
FTB	1135	4	0.51	0.00	0.51	Deep marsh	Low	
FTB	1139	3	20.25	2.54	17.71	Shallow marsh	Low	C
FTB	1155	3	0.55	0.41	0.14	Shallow marsh	Low	C
FTB	1156	3	15.07	11.08	3.99	Shallow marsh	Low	C
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	T3	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	T6	6	0.07	0.07	0.00	Shrub-carr	Low	F
FTB	T7	3	0.92	0.92	0.00	Shallow marsh	Low	F
FTB	T8	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	E
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

Project Area	Circular 39 Wetland Classification / Eggers and Reed Wetland Community[1]	1 Seasonally Flooded	2 Fresh (Wet) Meadow	2 Sedge Meadow	3 Shallow Marsh	4 Deep Marsh	5 Shallow, Open Water	6 Shrub-Carr	6 Alder Thicket	7 Hardwood Swamp	7 Coniferous Swamp	8 Open Bog	8 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
	# of directly impacted wetlands	0	3	2	6	1	0	1	11	2	7	4	22	0	59
Railroad Connection Corridor	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
	# of directly impacted wetlands	0	0	0	1	0	0	1	1	0	1	0	0	0	4
Dunka Road and Utility Corridor	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
	# 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
	# of directly impacted wetlands	0	5	1	12	15	0	2	4	1	3	0	0	0	43
HRF	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
	# 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**

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
		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
931	Coniferous bog	0	0	0	0	0	0	0	0	0	0	0	0	1.54	2.78	0	0	0	0	0	0
949	Coniferous bog	0	0	0	0	0	0	0	0	0.30	1.50	0	0	0	0	0	0	0	0	0	0
972	Hardwood swamp	0	0	0	0	0	0	0.90	0	0	0	0	0	0	0	0	0	0	0	0	0
973	Alder thicket or Shrub-carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.47	4.59	3.93	0	0	0
984	Coniferous bog	0	0	0	0	14.64	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
997	Shallow marsh	0	0	0	0	0	0	0	0	0	0	1.15	0.36	0	0	0	0	0	0	0	0
999	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0.01	0.70	0	0	0	0	0	0	0	0
1004	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0.94	0	0	0	0	0	0	0
1005	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	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	Shallow marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.16	0	0	0	0	0
1136	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
1137	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	Deep marsh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.59	0.64		0	0	0
1144	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	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 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

Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Mine Pits																			
	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 (Existing) Conditions						Operations Conditions [1]						Reclamation 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	0%	1.95	1.60	0.35	17.9%	5.57	5.46	1.95	1.60	0.35	17.9%	5.57	5.46	1.95	1.60	0.35	18.1%	5.51	5.19
5	wet meadow	R	5.99	5.38	0.61	10.2%	9.82	9.63												
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				33.24	26.43	6.80	20.5%	4.89	4.60
9	shallow marsh	18%	8.04	6.24	1.80	22.4%	4.47	4.38	6.36	4.63	1.73	27.2%	3.68	3.61	8.04	6.31	1.73	21.5%	4.65	4.38
10	sedge meadow	0%	9.64	8.47	1.17	12.1%	8.24	8.08	9.64	8.47	1.17	12.1%	8.24	8.08	9.63	8.47	1.17	12.1%	8.25	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	11%	11.60	6.57	5.03	43.4%	2.31	2.26	10.13	5.19	4.94	48.8%	2.05	2.01	11.60	6.66	4.94	42.6%	2.35	2.21
14	wet meadow	R	4.44	4.11	0.33	7.4%	13.45	13.20							4.25	3.92	0.33	7.8%	12.86	12.11
16	shallow marsh	86%	15.07	14.76	0.31	2.1%	48.61	47.68	2.08	1.77	0.31	14.9%	6.71	6.58	15.06	14.76	0.31	2.0%	48.88	46.03
18	shallow marsh	R	38.67	19.77	18.90	48.9%	2.05	2.01												
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	30%	24.44	7.38	17.06	69.8%	1.43	1.41	0.10		0.10	100.0%	1.00	0.98	0.10		0.10	100.0%	1.00	0.94
22	shallow marsh	0%	3.47	2.04	1.43	41.2%	2.43	2.38	3.47	2.04	1.43	41.2%	2.43	2.38	3.47	2.04	1.43	41.1%	2.43	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	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
25	coniferous bog	NA	5.59	3.64	1.95	34.9%	2.87	2.81	5.59	3.64	1.95	34.9%	2.87	2.81	5.59	3.64	1.95	34.8%	2.87	2.70
27	coniferous swamp	R	13.33	12.26	1.07	8.0%	12.46	12.22												
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	alder thicket	30%	43.79	25.33	18.46	42.2%	2.37	2.33	21.11	8.42	12.69	60.1%	1.66	1.63	21.12	8.42	12.69	60.1%	1.66	1.57
33B	coniferous swamp	0%	9.16	4.60	4.56	49.8%	2.01	1.97	9.16	4.60	4.56	49.8%	2.01	1.97	9.16	4.60	4.56	49.8%	2.01	1.89
37	shrub-carr	R	11.22	8.83	2.39	21.3%	4.69	4.60												
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	alder thicket	-63%	70.31	32.76	37.55	53.4%	1.87	1.84	26.67	17.95	8.72	32.7%	3.06	3.00	29.15	20.43	8.72	29.9%	3.34	3.15
47	open bog	R	28.60	28.06	0.54	1.9%	52.96	51.95												
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	alder thicket	-3635%	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	alder thicket	R	23.44	19.56	3.88	16.6%	6.04	5.93	1.88	1.88	0.00				23.44	20.80	2.64	11.3%	8.89	8.37
53	alder thicket	0%	53.71	35.12	18.59	34.6%	2.89	2.83	53.71	35.12	18.59	34.6%	2.89	2.83	53.70	35.12	18.59	34.6%	2.89	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	coniferous swamp	36%	24.02	21.14	2.88	12.0%	8.34	8.18	15.41	12.53	2.88	18.7%	5.35	5.25	24.15	21.27	2.88	11.9%	8.38	7.89
53D	coniferous swamp	0%	1320.57	651.40	669.17	50.7%	1.97	1.94	1319.65	650.48	669.17	50.7%	1.97	1.93	1321.47	652.30	669.17	50.6%	1.97	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	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	alder thicket	0%	0.43	0.00	0.43	100.0%	1.00	0.98	0.43	0.00	0.43	100.0%	1.00	0.98	0.43	0.00	0.43	100.0%	1.00	0.94
54G	alder thicket	33%	6.48	4.94	1.54	23.8%	4.21	4.13	4.36	2.82	1.54	35.3%	2.83	2.78	6.47	4.94	1.54	23.8%	4.21	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	coniferous swamp	-12%	137.06	59.00	78.06	57.0%	1.76	1.72	54.12	26.55	27.57	50.9%	1.96	1.93	54.12	26.55	27.56	50.9%	1.96	1.85
58	alder thicket	0%	107.19	72.61	34.58	32.3%	3.10	3.04	107.19	72.61	34.58	32.3%	3.10	3.04	107.20	72.61	34.58	32.3%	3.10	2.92
60	alder thicket	R	28.48	21.77	6.71	23.6%	4.24	4.16							0.00					
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	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	hardwood swamp	0%	4.80	4.49	0.31	6.5%	15.48	15.19	4.80	4.49	0.31	6.5%	15.48	15.19	4.79	4.49	0.31	6.4%	15.68	14.77
68	coniferous swamp	23%	59.24	35.43	23.81	40.2%	2.49	2.44	24.73	11.81	12.92	52.2%	1.91	1.88	39.78	26.51	13.27	33.4%	3.00	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	coniferous bog	NA	13.10	9.18	3.92	29.9%	3.34	3.28	6.49	4.78	1.71	26.3%	3.80	3.72	6.49	4.78	1.71	26.3%	3.80	3.58
77	coniferous bog	NA	25.28	12.27	13.01	51.5%	1.94	1.91	15.20	3.11	12.09	79.5%	1.26	1.23	17.18	4.18	13.01	75.7%	1.32	1.24
78	coniferous bog	R	5.73	3.98	1.75	30.5%	3.27	3.21												
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	coniferous swamp	-41%	51.06	49.38	1.68	3.3%	30.39	29.81	10.32	10.08	0.24	2.3%	43.00	42.18	51.57	50.59	0.98	1.9%	52.65	49.58
82	coniferous bog	32%	113.19	50.79	62.40	55.1%	1.81	1.78	2.00	0.37	1.63	81.5%	1.23	1.20	1.99	0.36	1.63	81.8%	1.22	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	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	coniferous bog	R	5.07	3.66	1.41	27.8%	3.60	3.53												
86	coniferous bog	NA	8.25	5.78	2.47	29.9%	3.34	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	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	8.25	0.34	7.91	95.9%	1.04	1.02	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	coniferous swamp	R	17.43	14.89	2.54	14.6%	6.86	6.73												
96	coniferous bog	NA	39.02	21.72	17.30	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

Large Table 5

Wetland and Watershed Acreages During Existing Operations Conditions, and Reclamation Conditions – Mine Site

			Pre-Mining (Existing) Conditions						Operations Conditions (1)						Reclamation 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)
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	0.62	0.50	0.12	19.4%	5.17	5.07	0.62	0.50	0.12	19.4%	5.17	5.07	0.63	0.50	0.12	19.7%	5.08	4.78
106	coniferous bog	0%	168.57	84.99	83.58	49.6%	2.02	1.98	168.57	84.99	83.58	49.6%	2.02	1.98	168.58	84.99	83.58	49.6%	2.02	1.90
107	coniferous bog	NA	90.50	49.58	40.92	45.2%	2.21	2.17	42.80	33.51	9.29	21.7%	4.61	4.52	40.97	29.93	11.04	26.9%	3.71	3.49
107A	coniferous swamp	-1118%	4.40	2.66	1.74	39.5%	2.53	2.48	1.54	1.49	0.05	3.2%	30.80	30.21	1.92	1.68	0.24	12.6%	7.96	7.49
107B	shallow marsh	-67%	7.41	2.90	4.51	60.9%	1.64	1.61	4.44	2.82	1.62	36.5%	2.74	2.69	3.03	1.41	1.62	53.3%	1.88	1.77
107C	alder thicket	R	28.29	0.69	27.60	97.6%	1.03	1.01												
114	coniferous bog	R	8.00	7.27	0.73	9.1%	10.96	10.75												
120	shallow marsh	-23%	8.93	8.35	0.58	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	R	13.51	7.15	6.36	47.1%	2.12	2.08												
201	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												
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												
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

Likelihood of wetland hydrology impact based on wetland type for each analogue distance	Wetland Area (acres) within each Analogue Increment (feet)				Eggers and Reed Wetland Community[1]
	0-1,000 feet	1,000-2,000 feet	2,000-3,500 feet	3,500-10,000 feet	
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

Likelihood of wetland hydrology impact based on wetland type for each analogue distance	Wetland Area (acres) within each Analogue Increment (feet) 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

Eggers and Reed Wetland Community[1]	Hydrology	Wetlands within the Mine Site Groundwater Flow Paths (acres)				
		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 wetland		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 Treatment 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 and 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
West 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
Total acres of wetland			515.76

(1) Reference (13)

Large Table 12 Summary of Wildlife Species and Associated Habitat Types

								Wetland Habitats								Upland Habitats									
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 (Aspen)	Forest- Upland Deciduous	Grassland	Prairie	Shoreline-dunes-cliff/talus	Shrub/woodland- Upland	Wetland and Upland Habitats
BI	*Gavia immer*	Common Loon	NL	NL	x		1			x															W
BI	*Limnodromus griseus*	Short-billed Dowitcher	NL	NL	x		1								x										W
BI	*Melospiza georgiana*	Swamp Sparrow	NL	NL	x		3	x						x	x										W
BI	*Rallus limicola*	Virginia Rail	NL	NL	x		3				x			x	x										W
FI	*Ichthyomyzon fossor*	Northern Brook Lamprey	SPC	NL	x	x	1					x													W
IN	*Erebia mancinus*	Taiga Alpine	SPC	NL	x	x	1	x																	W
IN	*Erebia discoidalis*	Red-diked alpine	NL	NL			2	x						x											W
IN	*Lycaena epixanthe michiganensis*	Bog Copper	NL	NL	x		2	x						x											W
IN	*Oeneis jutta ascerta*	Jutta Arctic	NL	NL			2	x						x											W
IN	*Somatochlora brevicincta*	Quebec emerald	NL	NL		x	1								x										W
MO	*Lasmigona compressa*	Creek Heelsplitter	SPC	NL	x	x	1					x													W
MO	*Ligumia recta*	Black Sandshell	SPC	NL	x	x	2					x	x												W
RE	*Chelydra serpentina*	Common Snapping Turtle	SPC	NL	x		5			x	x	x	x		x										W
RE	*Glyptemys insculpta*	Wood turtle	T	NL		x	5	x	x			x		x	x										W
BI	*Aegolius funereus*	Boreal Owl	NL	NL	x	x	4	x						x				x	x						B
BI	*Ammodramus leconteii*	Le Conte's Sparrow	NL	NL	x		4							x	x						x	x			B
BI	*Anas rubripes*	American Black Duck	NL	NL	x		9	x	x		x				x			x	x	x	x			x	B
BI	*Botaurus lentiginosus*	American Bittern	NL	NL	x		5	x						x	x						x	x			B
BI	*Calidris alpina*	Dunlin	NL	NL	x		2								x								x		B
BI	*Calidris pusilla*	Semipalmated Sandpiper	NL	NL	x		2								x								x		B
BI	*Catharus fuscescens*	Veery	NL	NL	x		5	x	x									x	x	x					B
BI	*Circus cyaneus*	Northern Harrier	NL	NL	x		6	x						x	x						x	x		x	B
BI	*Cistothorus platensis*	Sedge Wren	NL	NL	x		5	x						x	x						x	x			B
BI	*Coccyzus erythropthalmus*	Black-billed Cuckoo	NL	NL	x		6		x					x				x	x	x				x	B
BI	*Contopus cooperi*	Olive-sided Flycatcher	NL	NL	x	x	4	x						x				x						x	B

Taxa[1]	Scientific Name	Common Name	State ETSC	Federal ESA or BGEPA (eagle)	SGCN	USFS RFSS	Number of habitats	Wetland Habitats								Upland Habitats									Wetland and Upland 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 (Aspen)	Forest- Upland Deciduous	Grassland	Prairie	Shoreline-dunes-cliff/talus	Shrub/woodland- Upland	
BI	*Contopus virens*	Eastern Wood-pewee	NL	NL	x		5		x									x	x	x		x			B
BI	*Setophaga castanea*	Bay-breasted Warbler	NL	NL	x	x	2	x										x							B
BI	*Calidris alpina*	Dunlin	NL	NL	x		2								x								x		B
BI	*Dolichonyx oryzivorus*	Bobolink	NL	NL	x		6							x	x	x					x	x		x	B
BI	*Empidonax minimus*	Least Flycatcher	NL	NL	x		4		x									x	x	x					B
BI	*Falcipennis canadensis*	Spruce Grouse	NL	NL	x		4	x						x				x						x	B
BI	*Falco peregrinus*	Peregrine Falcon	THR	NL	x		10	x			x		x	x	x		x				x	x	x	x	B
BI	*Haliaeetus leucocephalus*	Bald Eagle	SPC	THR	x	x	7		x	x		x						x	x	x				x	B
BI	*Melanerpes erythrocephalus*	Red-headed Woodpecker	NL	NL	x		8		x							x	x		x	x	x	x		x	B
BI	*Oporornis agilis*	Connecticut Warbler	NL	NL	x	x	2	x										x							B
BI	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	NL	NL	x		5		x									x	x	x		x			B
BI	*Picoides arcticus*	Black-backed Woodpecker	NL	NL	x		3	x										x						x	B
BI	*Pluvialis dominica*	American Golden-plover	NL	NL	x		2								x								x		B
BI	*Podiceps grisegena*	Red-necked Grebe	NL	NL	x		2				x				x										B
BI	*Poecile hudsonica*	Boreal Chickadee	NL	NL	x		2	x										x							B
BI	*Scolopax minor*	American Woodcock	NL	NL	x		4							x					x		x			x	B
BI	*Seiurus aurocapilla*	Ovenbird	NL	NL	x		4		x									x	x	x					B
BI	*Setophaga castanea*	Bay-breasted Warbler	NL	NL	x	x	2	x										x							B
BI	*Sphyrapicus varius*	Yellow-bellied Sapsucker	NL	NL	x		4		x									x	x	x					B
BI	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	NL	NL	x		3					x									x		x		B
BI	*Strix nebulosa*	Great grey owl	NL	NL		x		x										x							B
BI	*Tringa melanoleuca*	Greater Yellowlegs	NL	NL	x		2								x								x		B
BI	*Troglodytes*	Winter Wren	NL	NL	x		3	x	x									x							B
BI	*Tympanuchus phasianellus*	Sharp-tailed Grouse	NL	NL	x		6							x	x	x					x	x		x	B
BI	*Vermivora chrysoptera*	Golden-winged Warbler	NL	NL	x		3	x						x					x						B
BI	*Wilsonia canadensis*	Canada Warbler	NL	NL	x		4	x										x	x	x					B

Taxa[1]	Scientific Name	Common Name	State ETSC	Federal ESA or BGEPA (eagle)	SGCN	USFS RFSS	Number of habitats	Wetland Habitats								Upland Habitats									Wetland and Upland 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 (Aspen)	Forest- Upland Deciduous	Grassland	Prairie	Shoreline-dunes-cliff/talus	Shrub/woodland- Upland	
BI	*Zonotrichia albicollis*	White-throated Sparrow	NL	NL	x		7	x	x					x				x	x	x				x	B
MA	*Canis lupus*	Gray Wolf	SPC	THR	x	x	11	x						x	x	x		x	x	x	x	x	x	x	B
MA	*Lynx canadensis*	Canada lynx	NL	THR	x		7	x	x					x				x	x	x				x	B
MA	*Microtus chrotorrhinus*	Rock Vole	NL	NL	x		6		x					x				x	x				x	x	B
MA	*Sorex fumeus*	Smoky Shrew	SPC	NL	x		3	x										x					x		B
MA	*Spermophilus franklinii*	Franklin's Ground Squirrel	NL	NL	x		5							x	x						x	x		x	B
AM	*Plethodon cinereus*	Eastern Red-backed Salamander	NL	NL	x		3											x	x	x					U
BI	*Accipiter gentilis*	Northern Goshawk	NL	NL	x	x	3											x	x	x					U
BI	*Caprimulgus vociferus*	Whip-poor-will	NL	NL	x		2											x		x					U
BI	*Chordeiles minor*	Common Nighthawk	NL	NL	x		2										x						x		U
BI	*Dendroica caerulescens*	Black-throated Blue Warbler	NL	NL	x		3											x	x	x					U
BI	*Hylocichla mustelina*	Wood Thrush	NL	NL	x		3											x	x	x					U
BI	*Picoides dorsalis*	Three-toed woodpecker	NL	NL		x	1											x							U
BI	*Sturnella magna*	Eastern Meadowlark	NL	NL	x		2														x	x			U
BI	*Toxostoma rufum*	Brown Thrasher	NL	NL	x		2										x							x	U
BI	*Tryngites subruficollis*	Buff-breasted Sandpiper	NL	NL	x		4									x	x				x	x			U
IN	*Plebejus idas nabokovi*	Nabokov's Blue	SPC	NL	x	x	2											x						x	U
IN	*Oeneis macounii*	Macoun's Arctic	NL	NL	x		1											x							U
IN	*Phyciodes batesii*	Tawny Crescent	NL	NL	x		2											x						x	U
IN	*Pyrgus centaureae freija*	Grizzled Skipper	SPC	NL	x	x	1																	x	U
MA	*Taxidea taxus*	American Badger	NL	NL	x		7									x	x	x		x	x	x		x	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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

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		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

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		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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
T8	Wet meadow	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	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

(1) Reference (13)

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
T8	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		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)

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[(1)]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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
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

Wetland ID	Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Flotation Tailings Basin																			
		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 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 14 Summary of Wetlands within 500-Feet Increments – Flotation Tailings Basin Area

Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Floatation Tailings Basin																			
	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

Eggers and Reed Wetland Community(1)	Wetlands (acres) within 500-Feet Increments From the Edge of the Floatation Tailings Basin																			
	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
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

Eggers and Reed Wetland Community[1]	Wetlands (acres) within 500-Feet Increments From the Edge of the Floatation Tailings Basin																			
	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

Eggers and Reed Wetland Community[1]	Hydrology	Wetlands within the FTB Groundwater Flow Paths (acres)		
		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 wetland		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 Creek			
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	5.22

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

(1) Reference (13)

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

(1) Reference (13)

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 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	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%

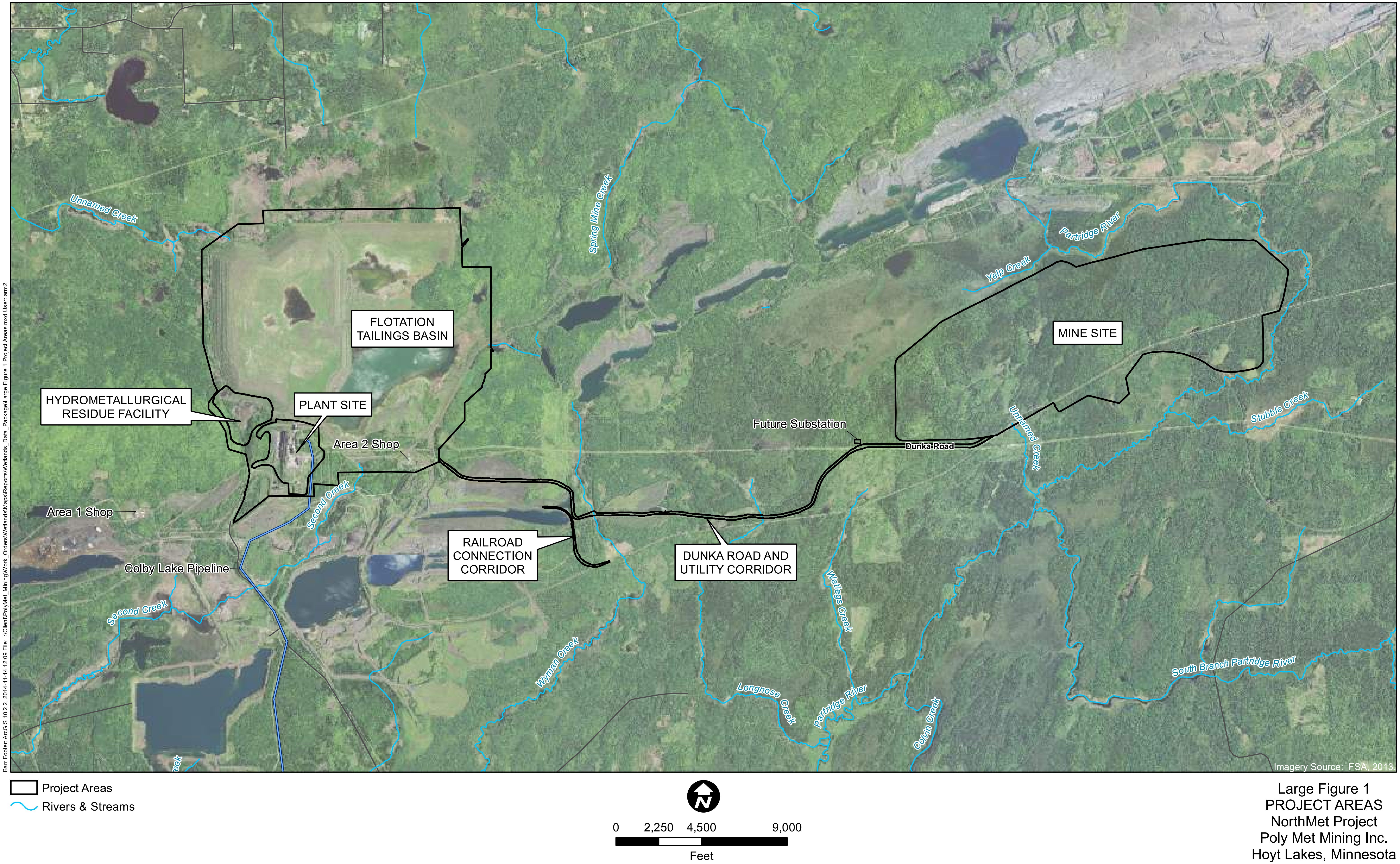
(1) The (-) represents a loss of deepwater acres and the (+) represents a gain of deepwater acres.

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		**-301.8**	**0**	**-301.8**	**0**	**382**	**382**
Total - Embarrass River Watershed without Project		**-127.0**	**0**	**-127.0**	**0**	**382**	**382**

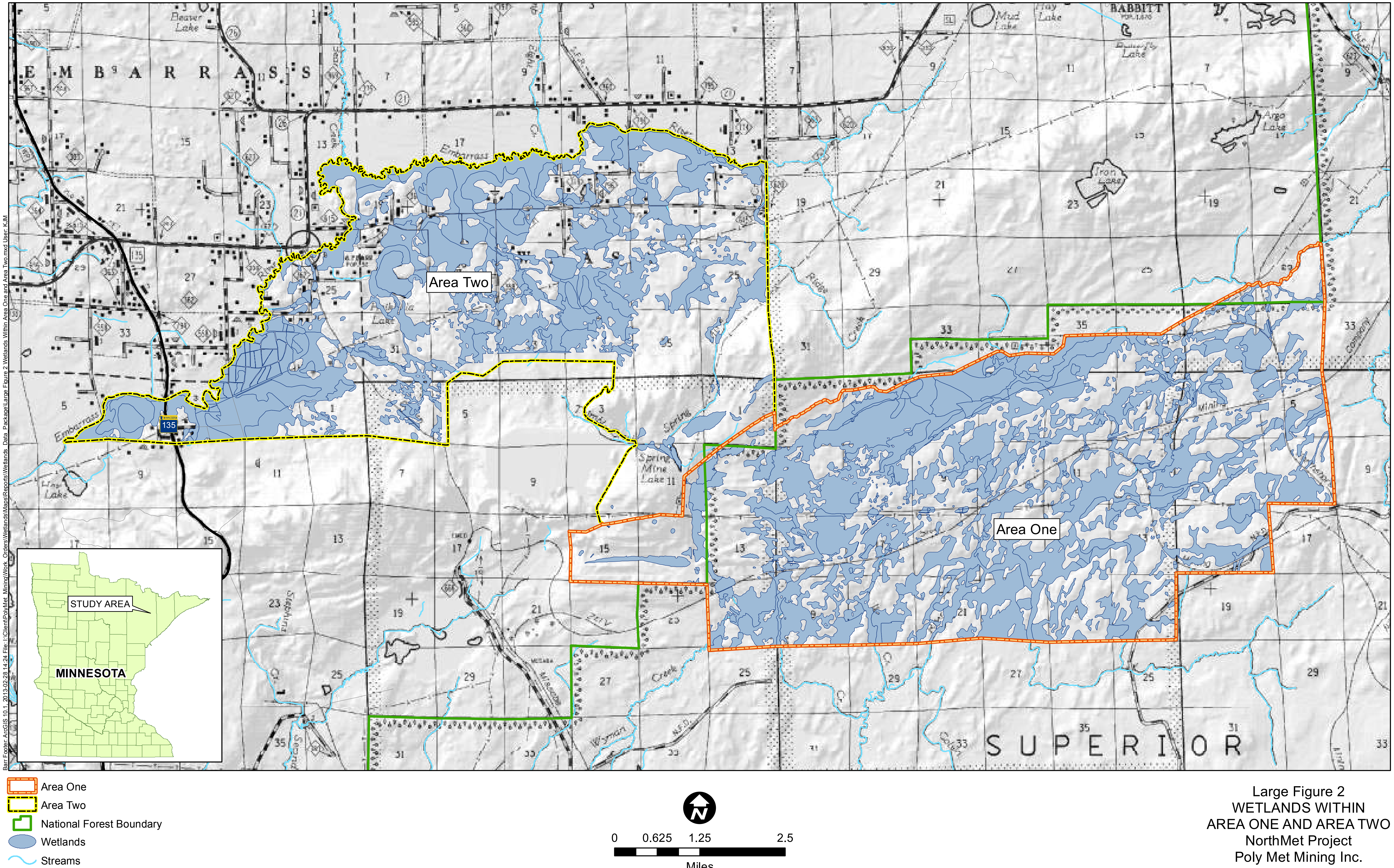
(1) The (-) represents a loss of water resources acres and the (+) represents a gain of water resources acres.
(2) These wetlands as exempt because the wetlands are located within the Cliffs Erie LLC (formerly LTVSMC) Permit To Mine Ultimate Tailings Basin Limit boundary and are not regulated by state and federal wetland regulations (Section 5.1).

Large Figures

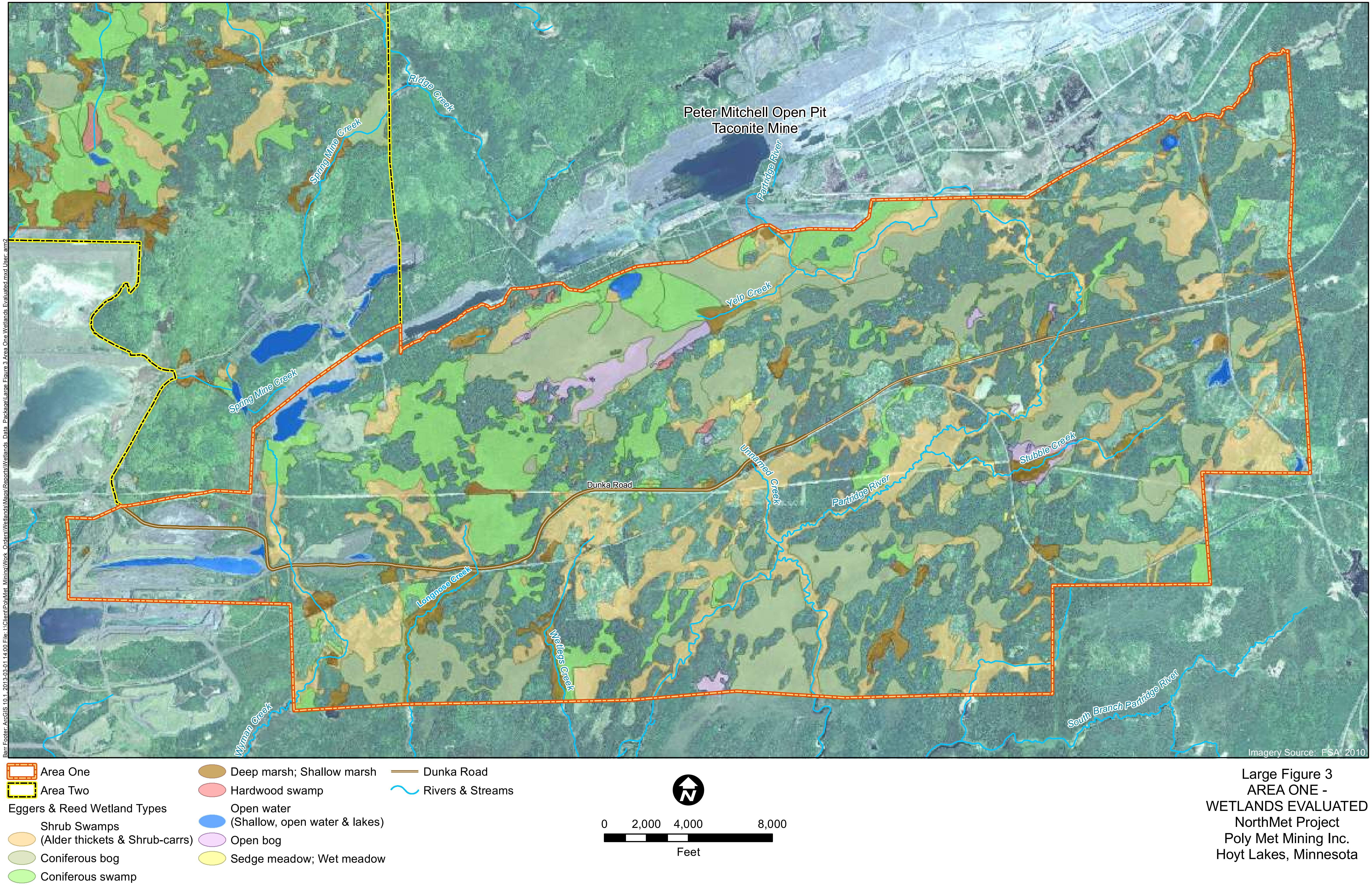


Barr Footer: ArcGIS 10.2.2, 2014-11-14 12:09 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetlands_Data_Package\Large Figure 1 Project Areas.mxd User: arm2

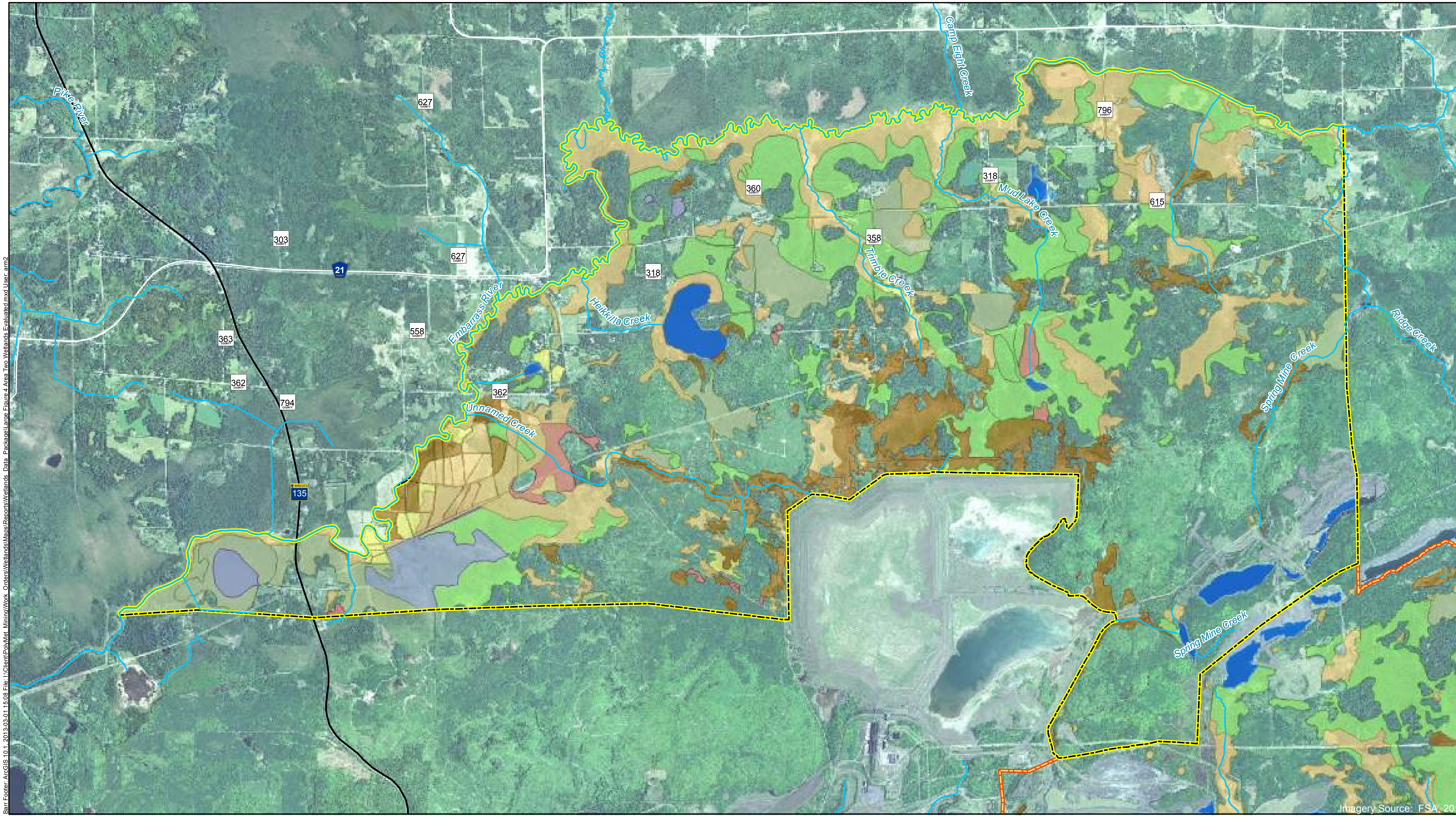
Large Figure 1
PROJECT AREAS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Large Figure 2
WETLANDS WITHIN
AREA ONE AND AREA TWO
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



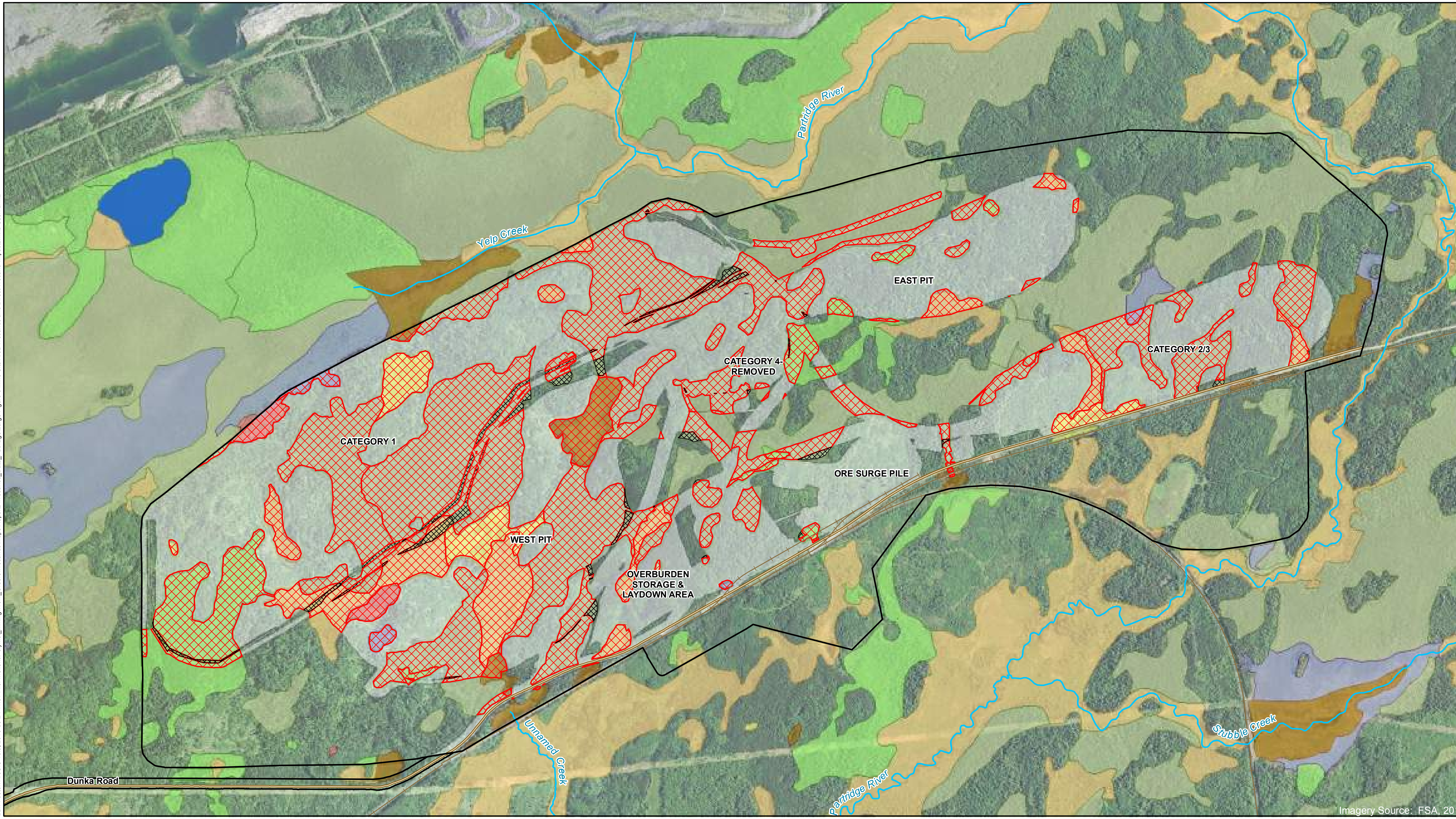
Large Figure 3
AREA ONE -
WETLANDS EVALUATED
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Area Two
Area One
Rivers & Streams
Eggers & Reed Wetland Types
Shrub Swamps (Alder thickets & Shrub-carrs)
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow; Wet meadow

0 2,000 4,000 8,000
Feet

Large Figure 4
AREA TWO -
WETLANDS EVALUATED
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Mine Site
Areas Disturbed by Proposed Project Features
Direct Wetland Impacts
Fragmented Wetlands

Eggers & Reed Wetland Types
Shrub Swamps (Alder thickets & Shrub-carrs)
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow; Wet meadow

0 750 1,500 3,000
Feet

Large Figure 5
MINE SITE AREA WETLANDS AND DIRECT WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

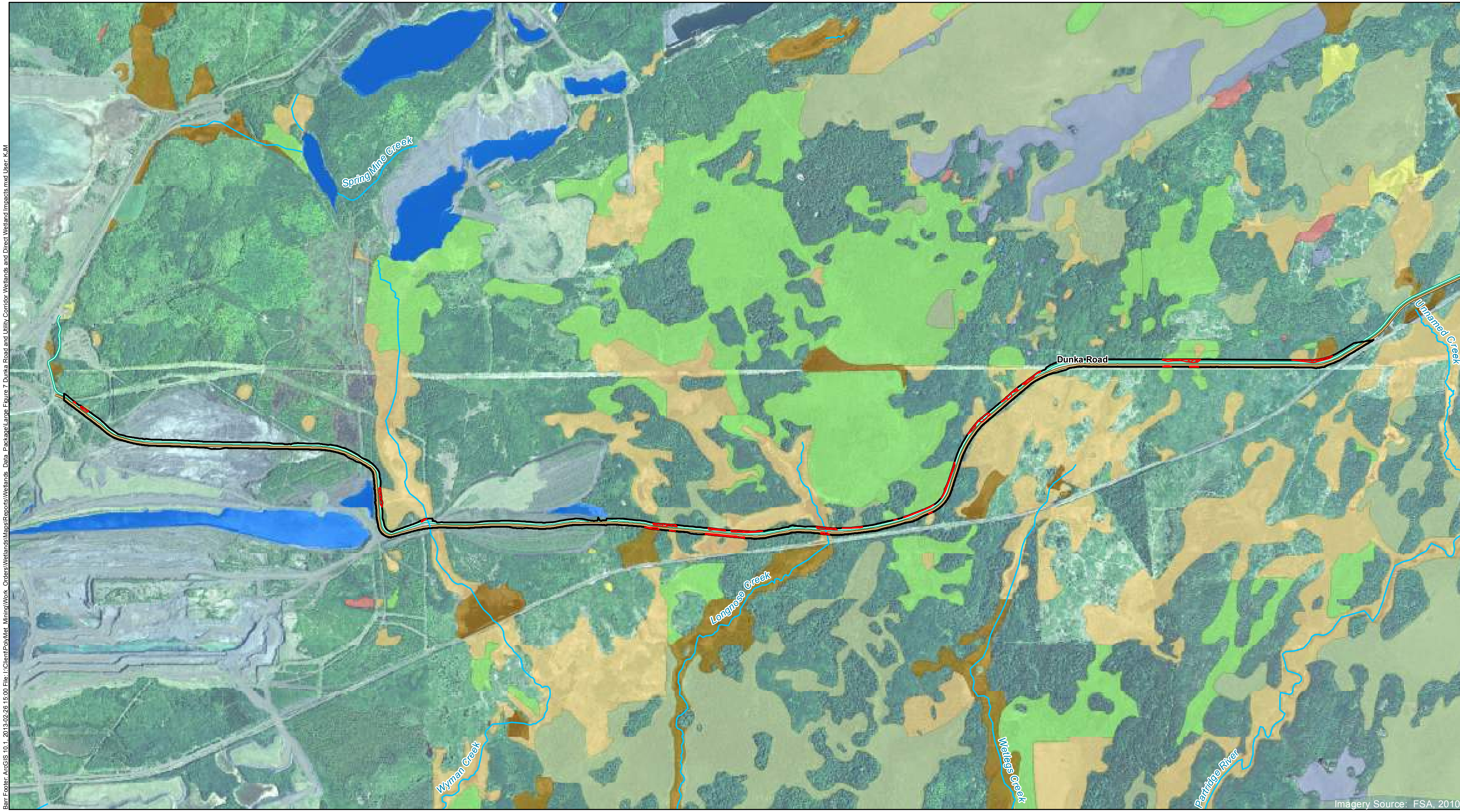
Railroad Connection Corridor
Proposed Track
Existing Railroad
Dunka Road
Areas Disturbed by Proposed Project Features
Direct Wetland Impacts

Eggers & Reed Wetland Types
Shrub Swamps (Alder thickets & Shrub-carrs)
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow; Wet meadow

N

0 250 500 1,000
Feet

Large Figure 6
RAILROAD CONNECTION CORRIDOR WETLANDS AND DIRECT WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



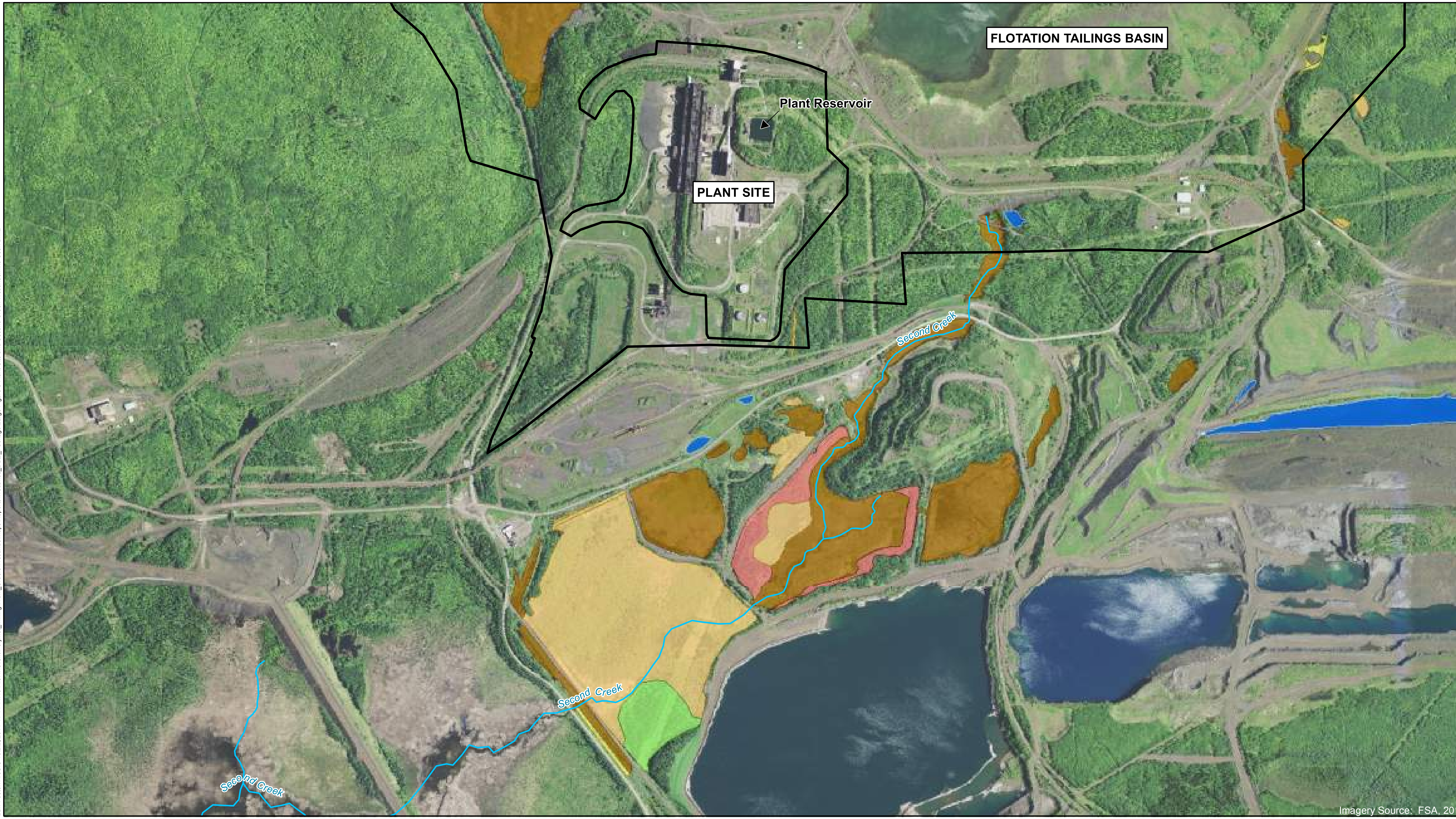
Dunka Road and Utility Corridor
Dunka Road
Treated Water Pipeline
Areas Disturbed by Proposed Project Features
Direct Wetland Impacts

Eggers & Reed Wetland Types
Shrub Swamps (Alder thickets & Shrub-carrs)
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow; Wet meadow

N

0 1,000 2,000 4,000
Feet

Large Figure 7
DUNKA ROAD AND UTILITY CORRIDOR WETLANDS AND DIRECT WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



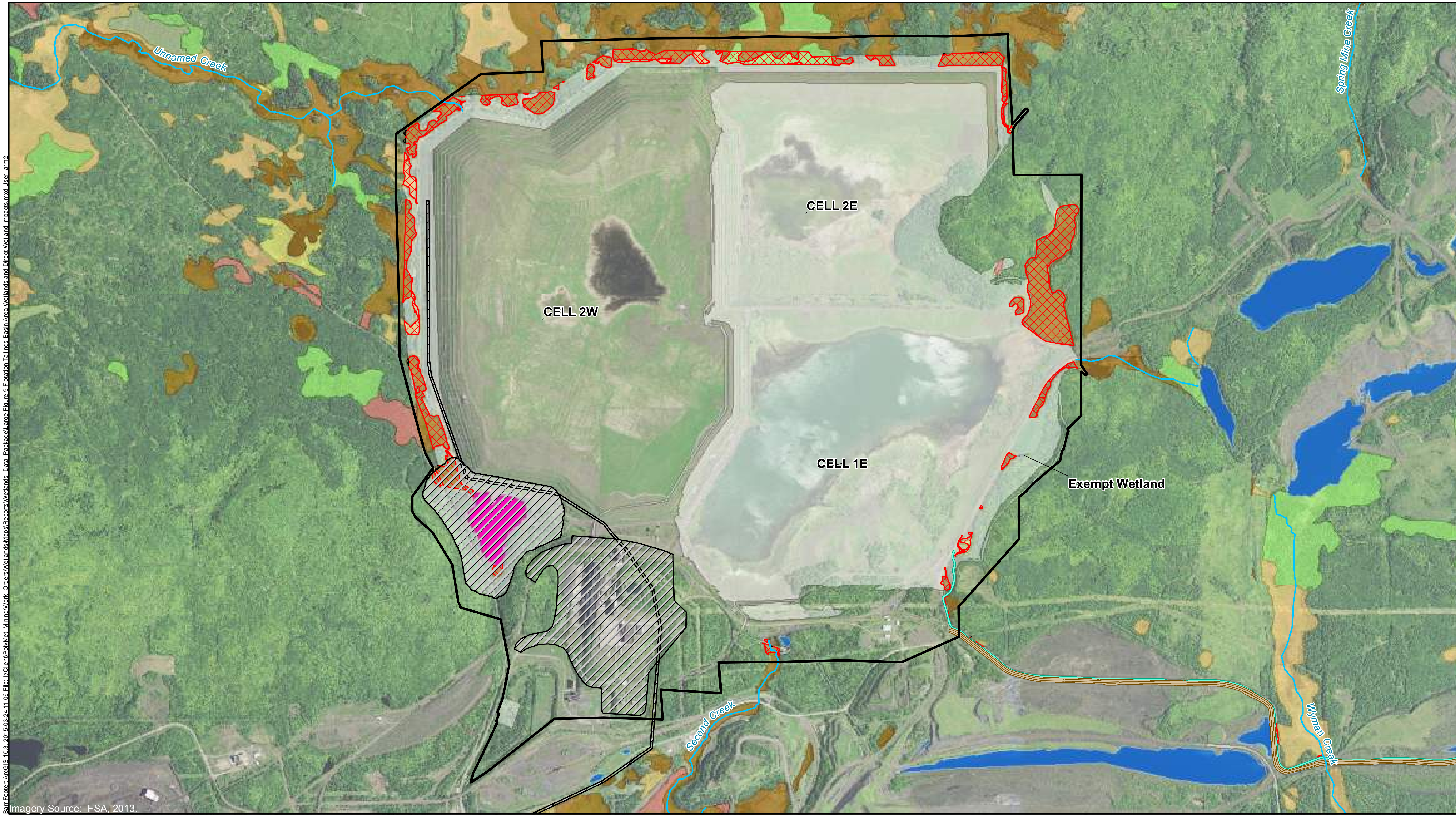
- Project Area
- Rivers & Streams

Eggers & Reed Wetland Types

- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

0 600 1,200 2,400
Feet

Large Figure 8
PLANT SITE AND
SECOND CREEK WETLANDS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

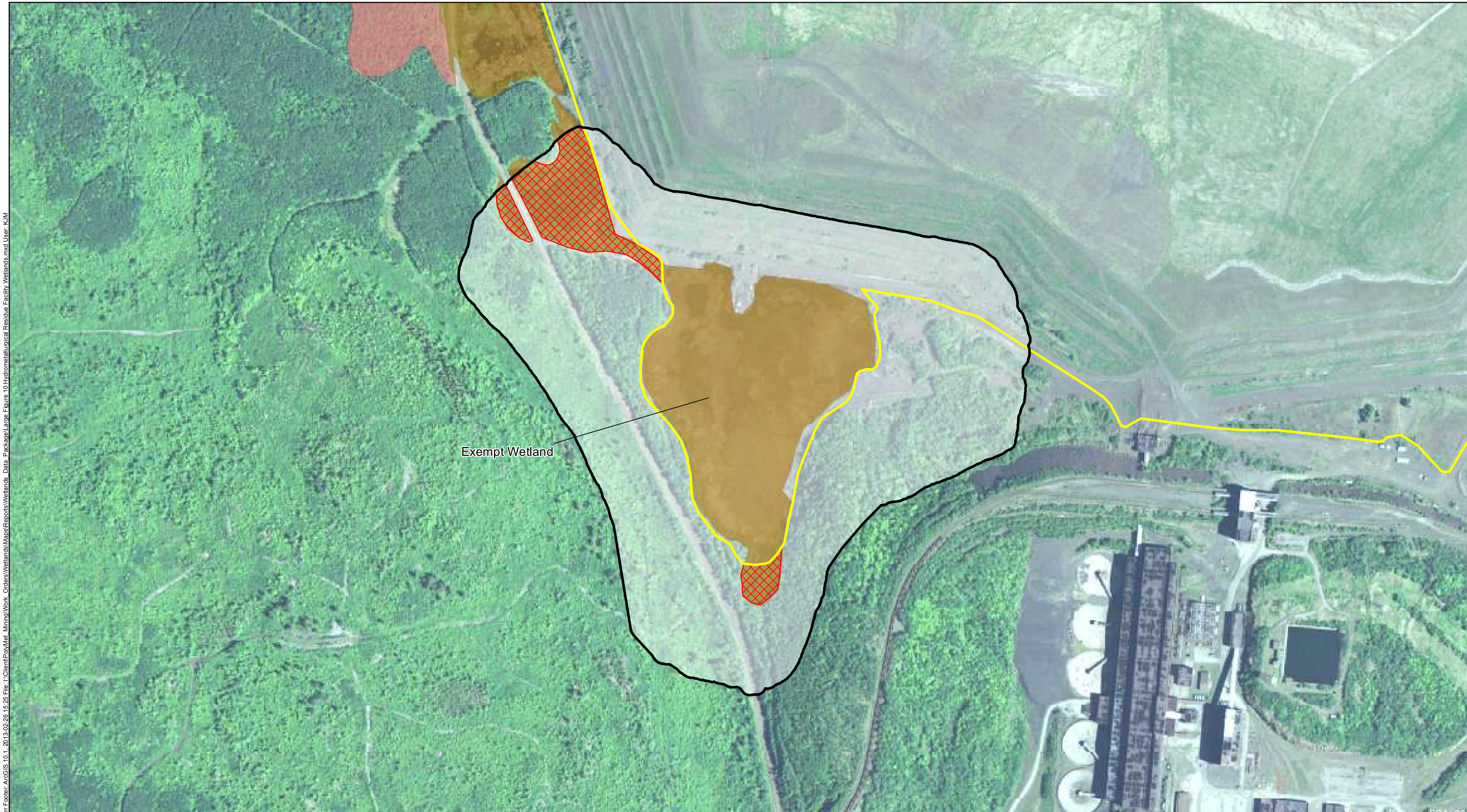


Tailings Basin
Areas Excluded from Tailings Basin Boundary
Dunka Road
Treated Water Pipeline
Areas Disturbed by Proposed Project Features
Direct Wetland Impacts
Fragmented Wetlands
Exempt Wetlands

Eggers & Reed Wetland Types
Shrub Swamps (Alder thickets & Shrub-carrs)
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow; Wet meadow

0 1,000 2,000 4,000
Feet

Large Figure 9
FLOTATION TAILINGS BASIN AREA WETLANDS AND DIRECT WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Hydrometallurgical Residue Facility

Cliffs Erie, LLC Permit to Mine Ultimate Tailings Basin Limit

Areas Disturbed by Proposed Project Features

Direct Wetland Impacts

Eggers & Reed Wetland Types

- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

N

0 250 500 1,000

Feet

Large Figure 10
HYDROMETALLURGICAL RESIDUE FACILITY
WETLANDS AND DIRECT WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

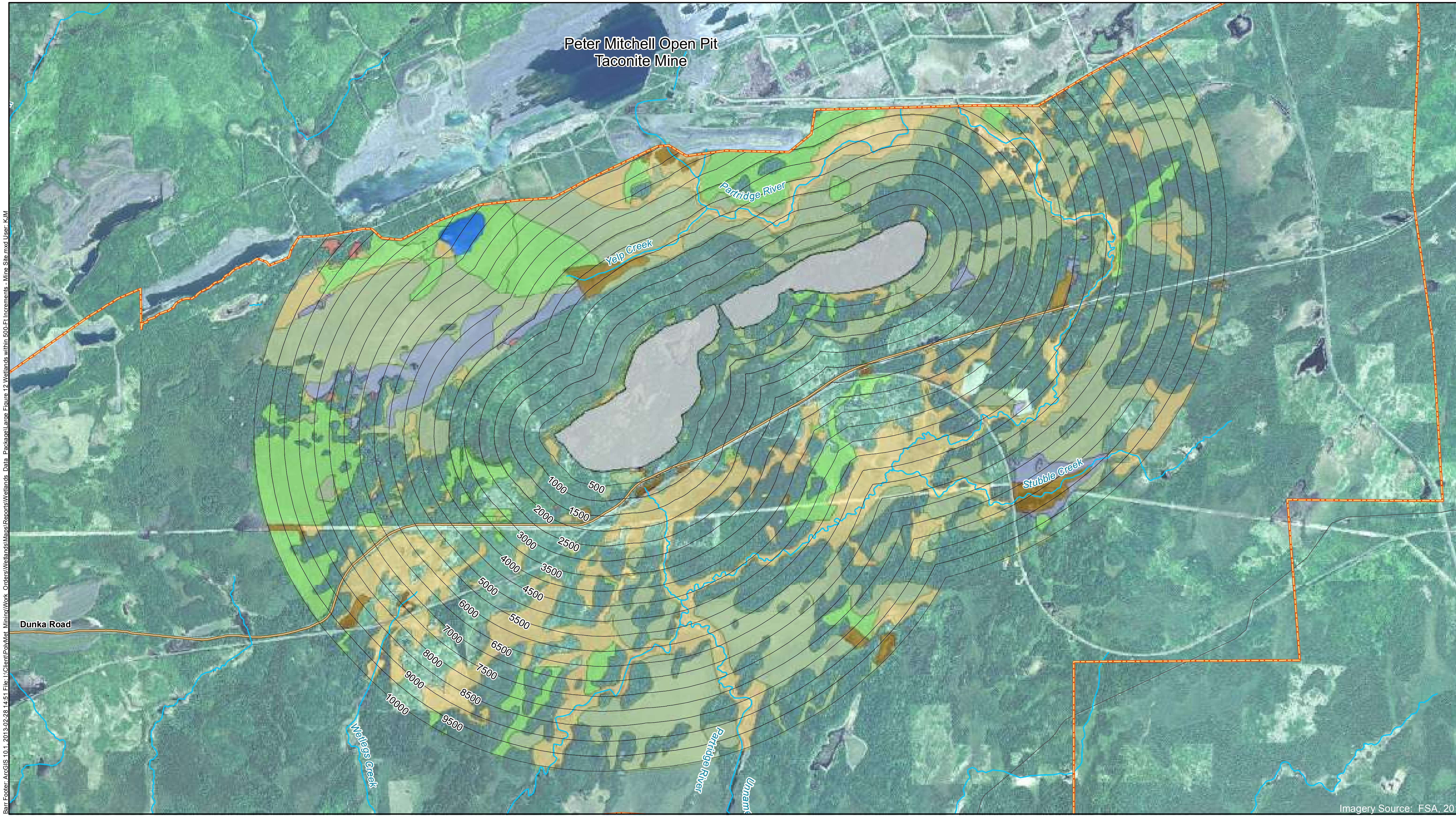
Colby Lake Water Pipeline Evaluation Area

Eggers & Reed Wetland Types

- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

0 750 1,500 3,000
Feet

Large Figure 11
COLBY LAKE WATER
PIPELINE WETLANDS
NorthMet Project
Poly Met Mining, Inc.
Hoyt Lakes, MInnesota



500-Ft Increments

Baseline Type Evaluation Study Areas

Area One

Eggers & Reed Wetland Types

Shrub Swamps (Alder thickets & Shrub-carrs)

Coniferous bog

Coniferous swamp

Deep marsh; Shallow marsh

Hardwood swamp

Open water (Shallow, open water & lakes)

Open bog

Sedge meadow; Wet meadow

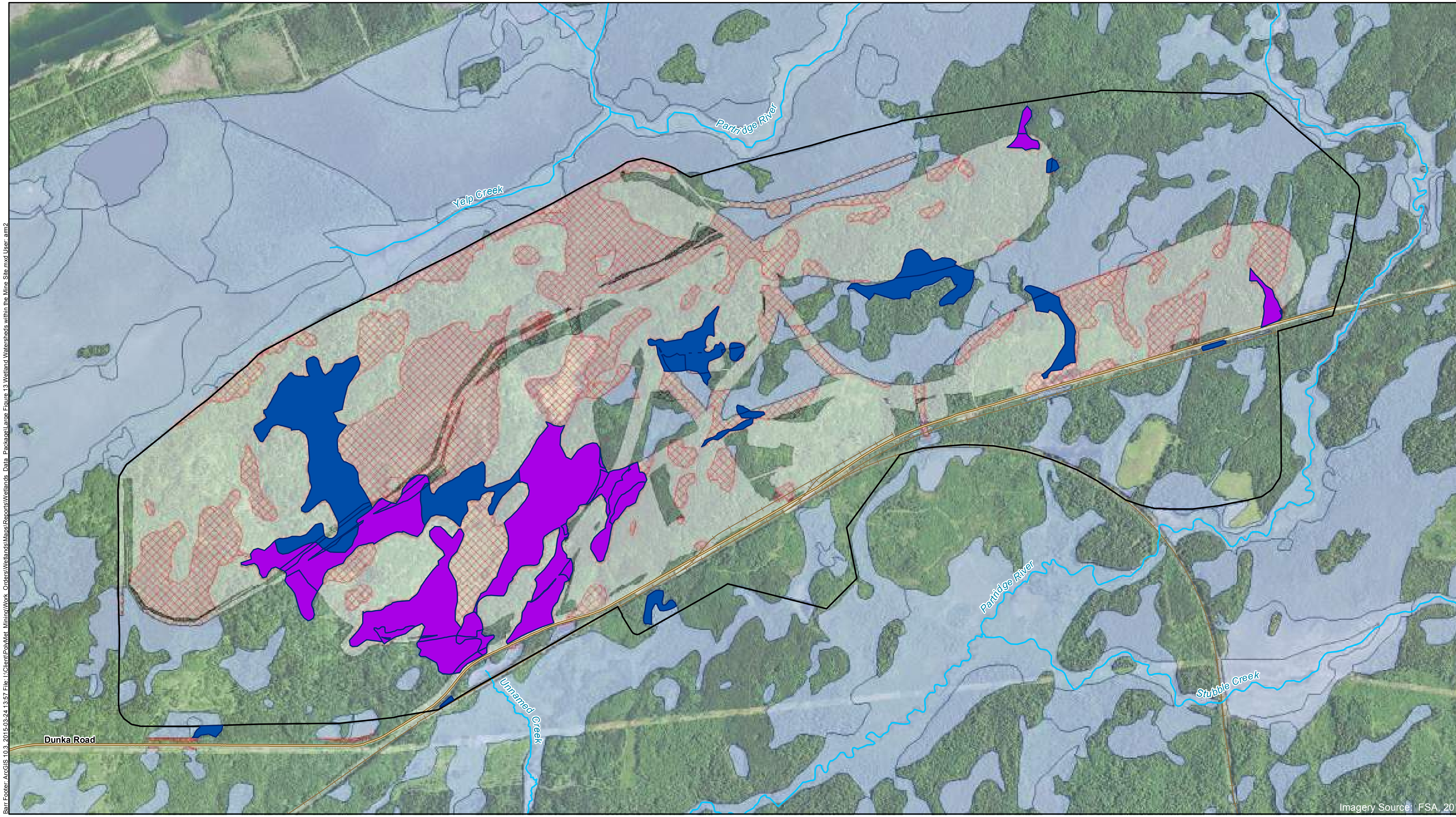
Dunka Road

Rivers & Streams

0 1,500 3,000 6,000

Feet

Large Figure 12
WETLANDS WITHIN 500-FT INCREMENTS - MINE SITE AREA
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



- Mine Site
- Areas Disturbed by Proposed Project Features
- Dunka Road
- Direct Wetland Impact
- Fragmented Wetland
- Wetland

Potential Indirect Wetland Impacts

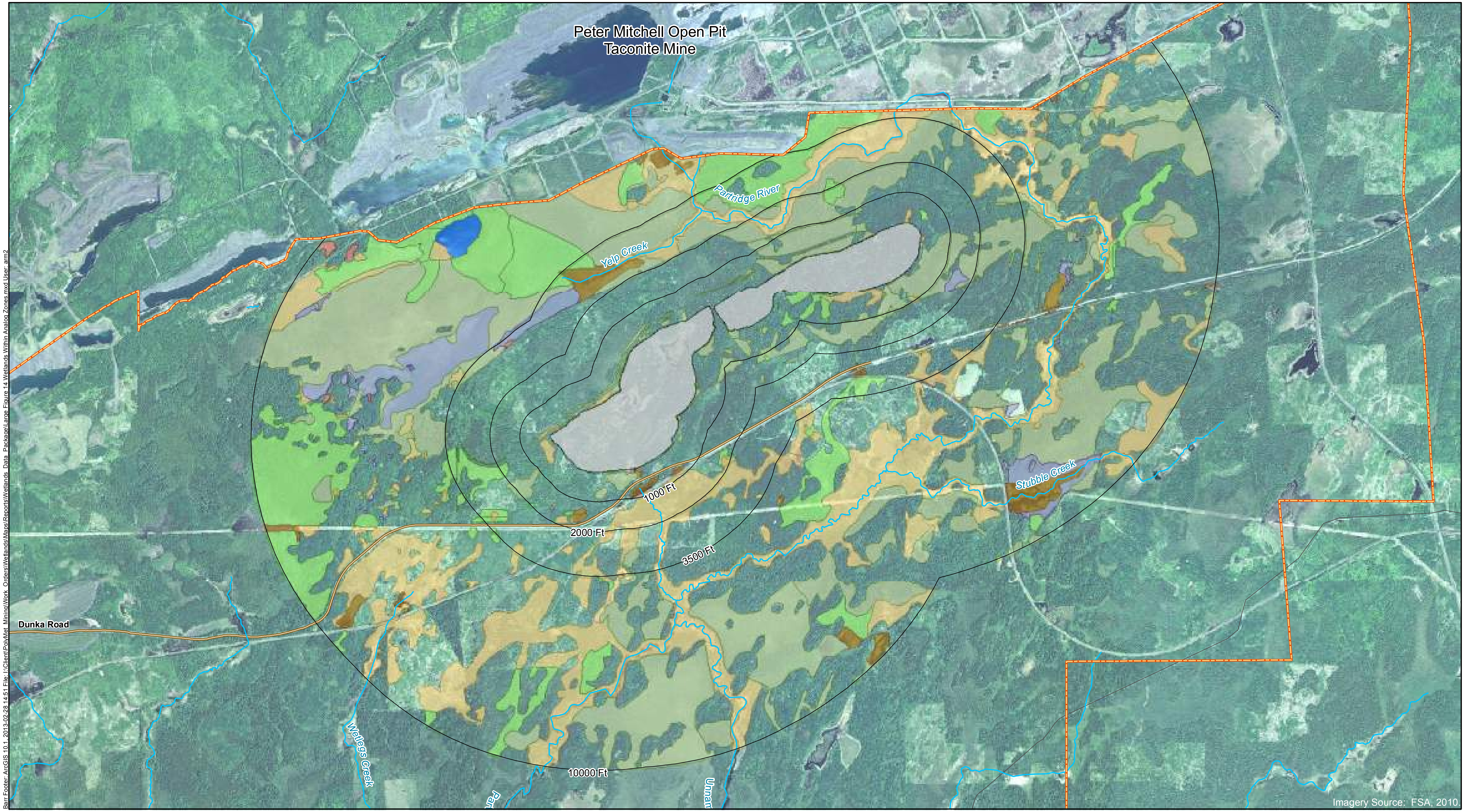
- Decrease in Yield per Wetland Acre of Greater Than 20%
- Increase in Yield per Wetland Acre of Greater Than 20%

N

0 750 1,500 3,000

Feet

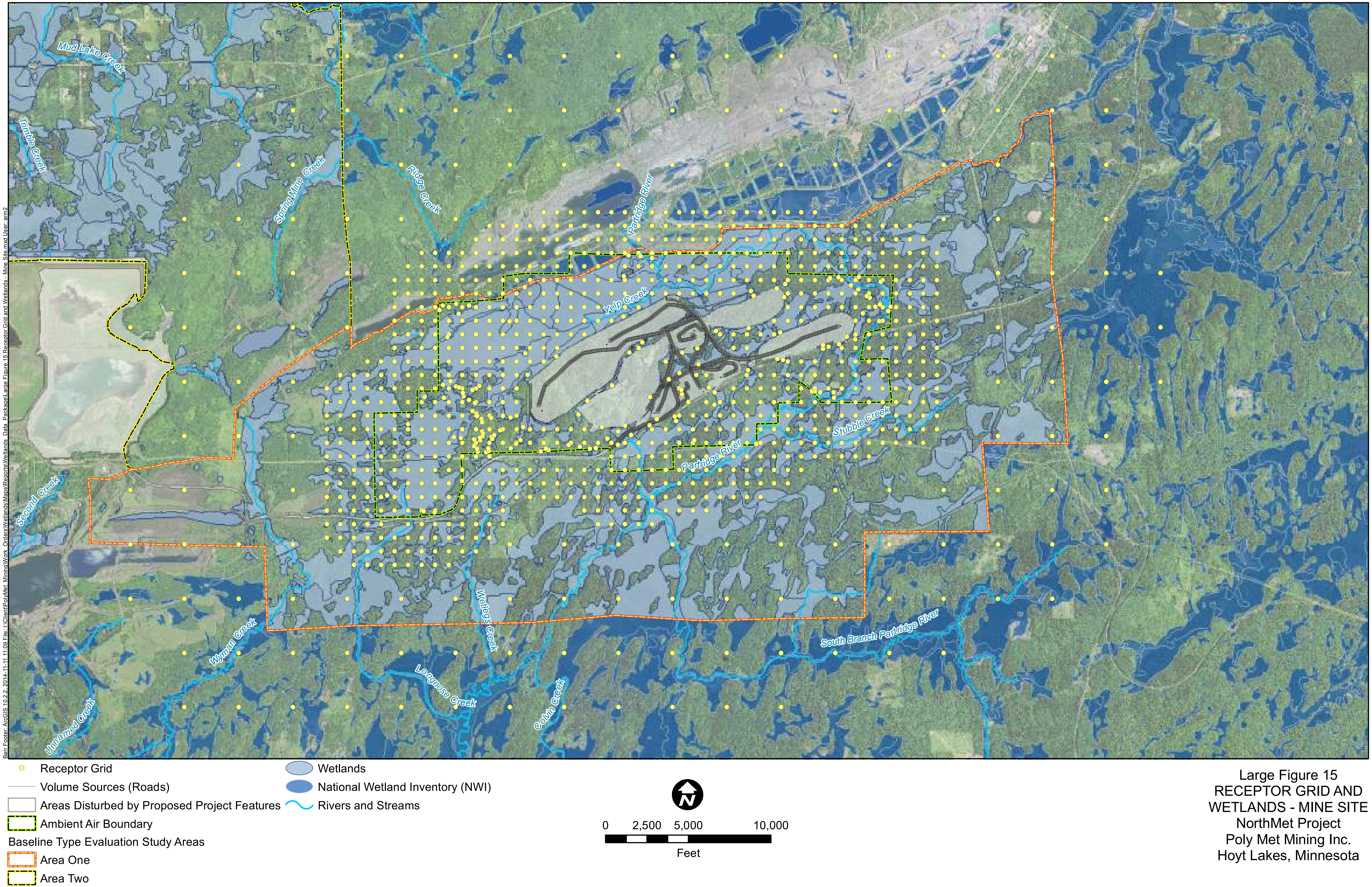
Large Figure 13
WETLANDS POTENTIALLY INDIRECTLY IMPACTED BY CHANGE IN WATERSHED AREA
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



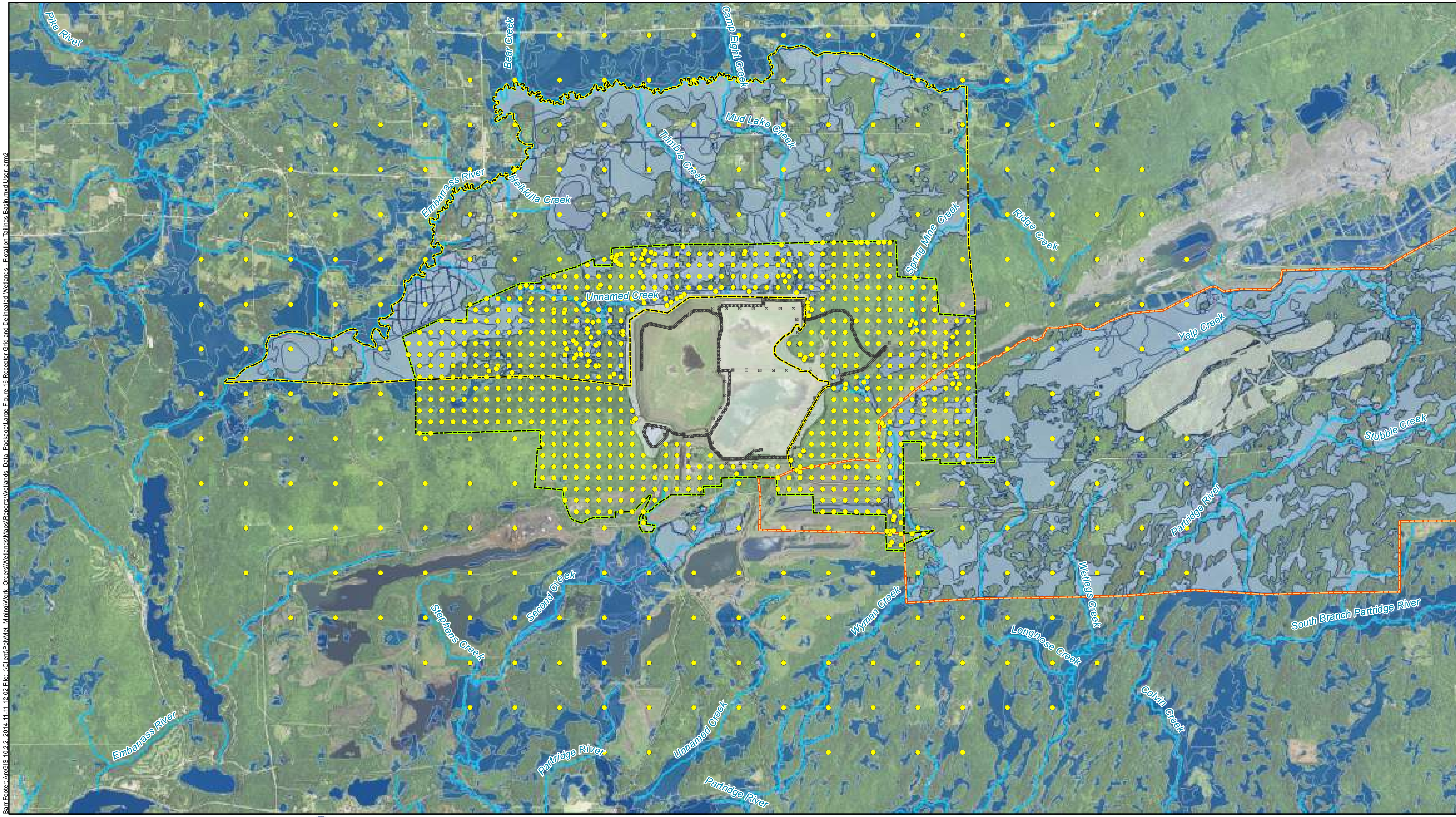
Analog Impact Zones (Feet)
20 Year Mine Pit
Baseline Type Evaluation Study Area One
Eggers & Reed Wetland Types
Shrub Swamps (Alder thickets & Shrub-carrs)
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow; Wet meadow
Dunka Road
Rivers & Streams

0 1,500 3,000 6,000
Feet

Large Figure 14
WETLANDS WITHIN ANALOG ZONES
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Large Figure 15
RECEPTOR GRID AND
WETLANDS - MINE SITE
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

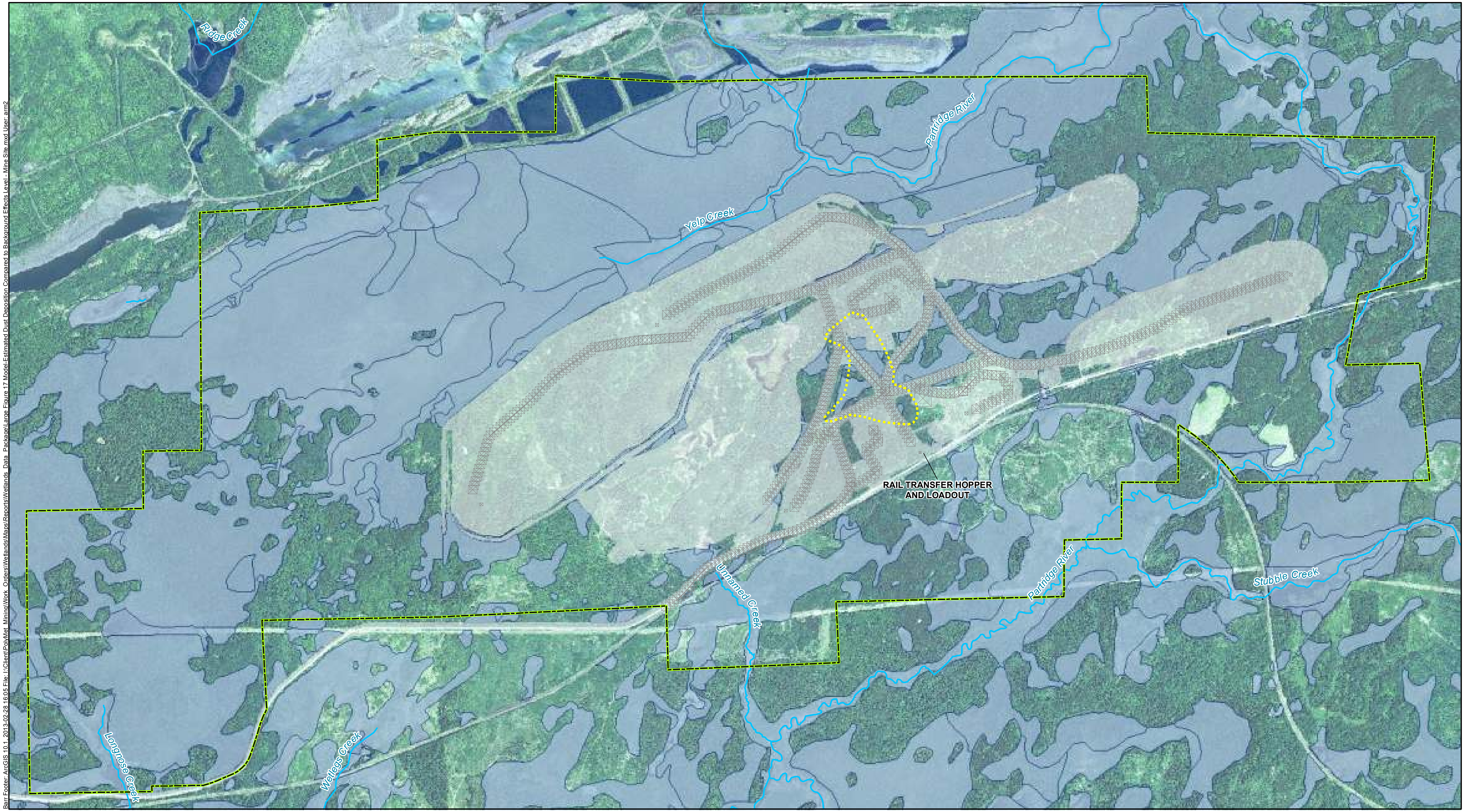


Receptor Grid
Volume Sources (Roads)
Areas Disturbed by Proposed Project Features
Ambient Air Boundary
Baseline Type Evaluation Study Areas
Area One
Area Two

Wetlands
National Wetland Inventory (NWI)
Rivers and Streams

0 0.625 1.25 2.5
Miles

Large Figure 16
RECEPTOR GRID AND WETLANDS - FLOTATION TAILINGS BASIN
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Extent of Highest Estimated Deposition Receptors with Deposition of 25% of Background

Rivers and Streams

Volume Sources (Roads)

Areas Disturbed by Proposed Project Features

Ambient Air Boundary

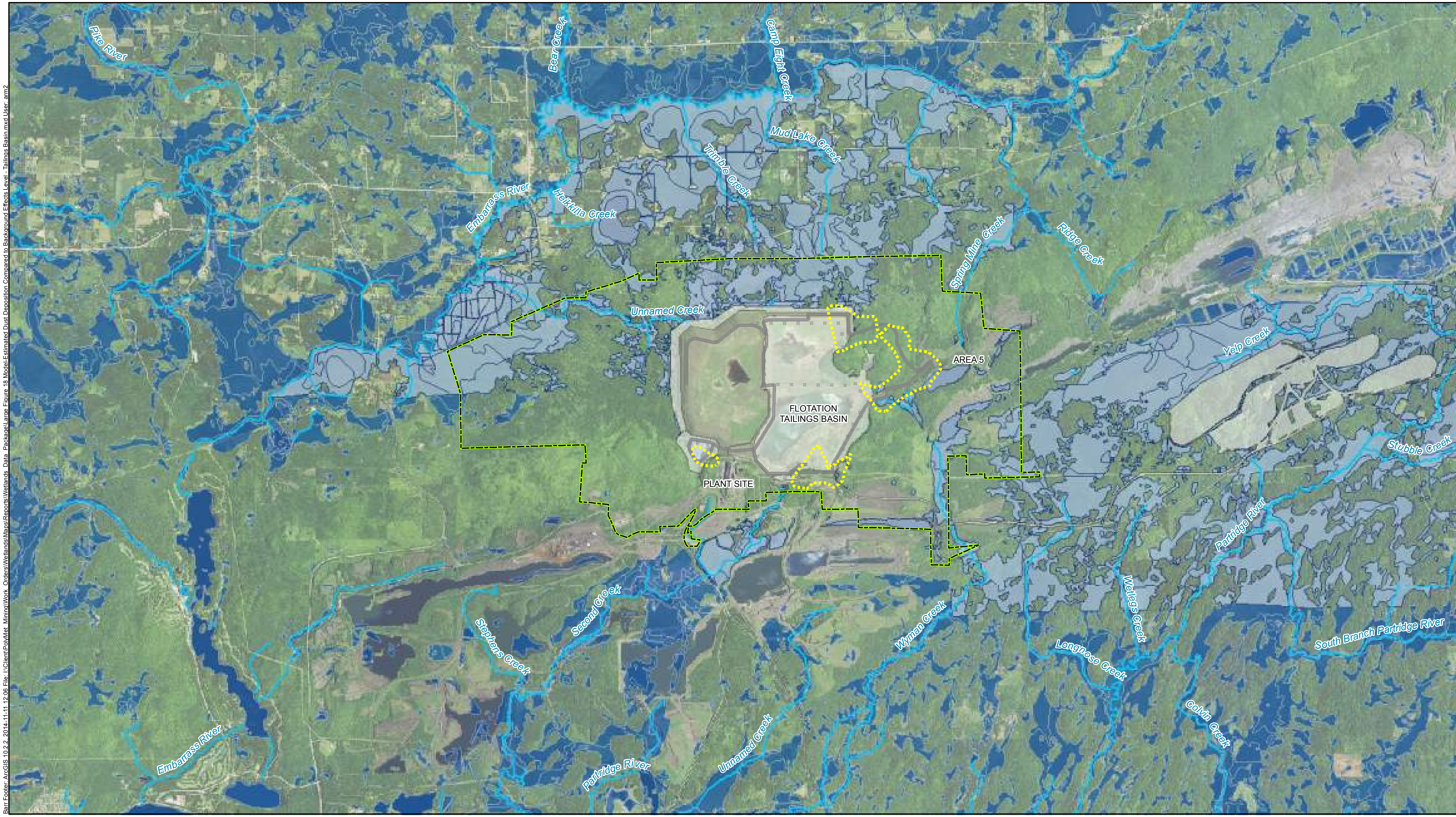
Wetlands

National Wetland Inventory (NWI)

0 1,000 2,000 4,000

Feet

Large Figure 17
MODEL-ESTIMATED DUST DEPOSITION COMPARED TO BACKGROUND EFFECTS LEVEL - MINE SITE
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Extent of Highest Estimated Deposition Receptors with Deposition of 50% of Background

Rivers and Streams

Volume Sources (Roads)

Areas Disturbed by Proposed Project Features

Ambient Air Boundary

Wetlands

National Wetland Inventory (NWI)

0 0.625 1.25 2.5

Miles

Large Figure 18
MODEL-ESTIMATED DUST DEPOSITION
COMPARED TO BACKGROUND
EFFECTS LEVEL - FLOTATION TAILINGS BASIN
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.2, 2014-11-11 12:06 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetlands_Data_Package\Large Figure 18 Model-Estimated Dust Deposition Compared to Background Effects Level - Tailings Basin.mxd User: arm2

Extent of Highest Estimated Deposition Receptors with Deposition of 100% of Background

Volume Sources (Roads)

Ambient Air Boundary

Areas Disturbed by Proposed Project Features

National Wetland Inventory (NWI)

Wetlands

Rivers and Streams

0 1,000 2,000 4,000

Feet

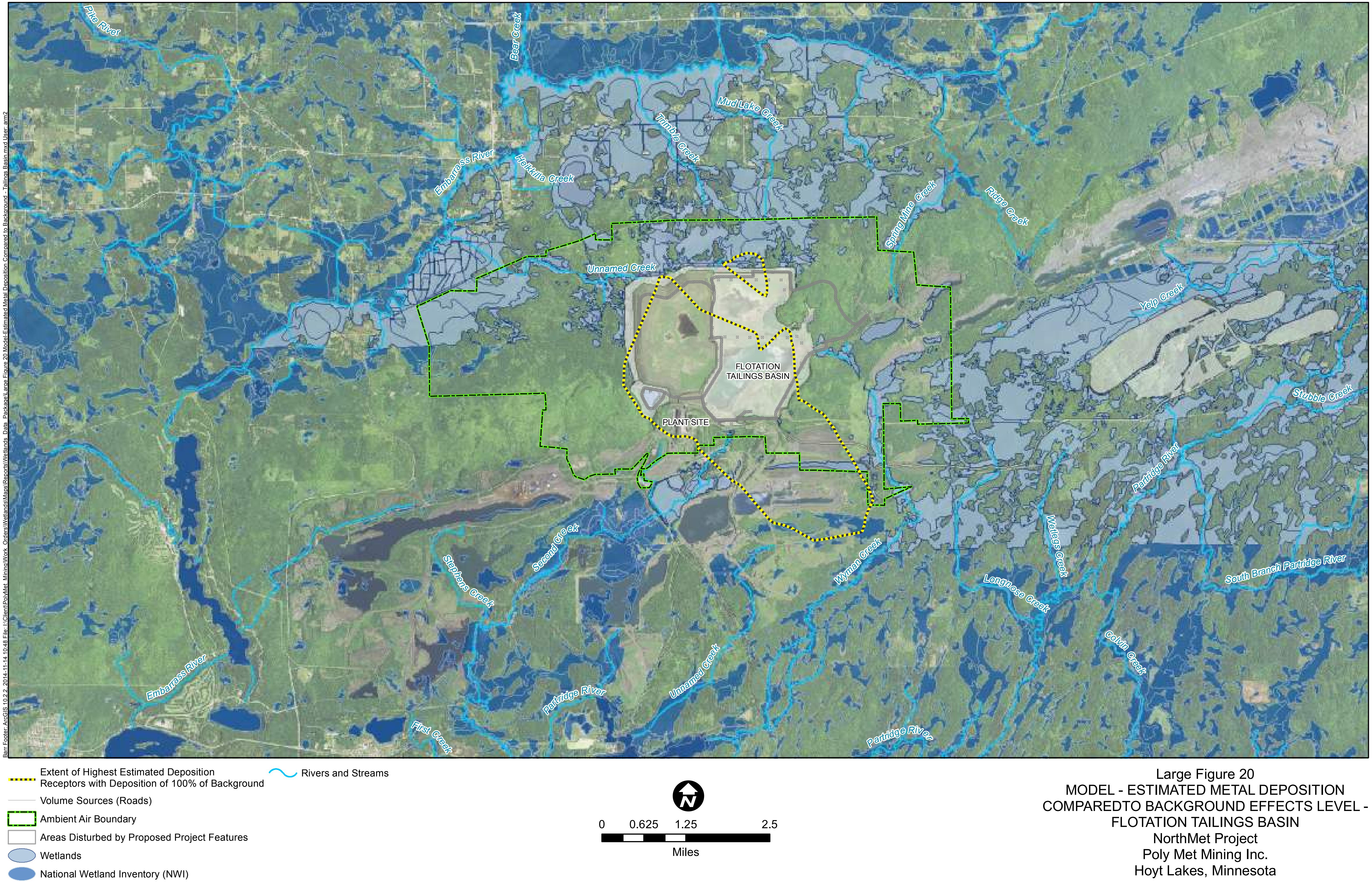
Large Figure 19

MODEL - ESTIMATED METAL DEPOSITION COMPARED TO BACKGROUND EFFECTS LEVEL - MINE SITE

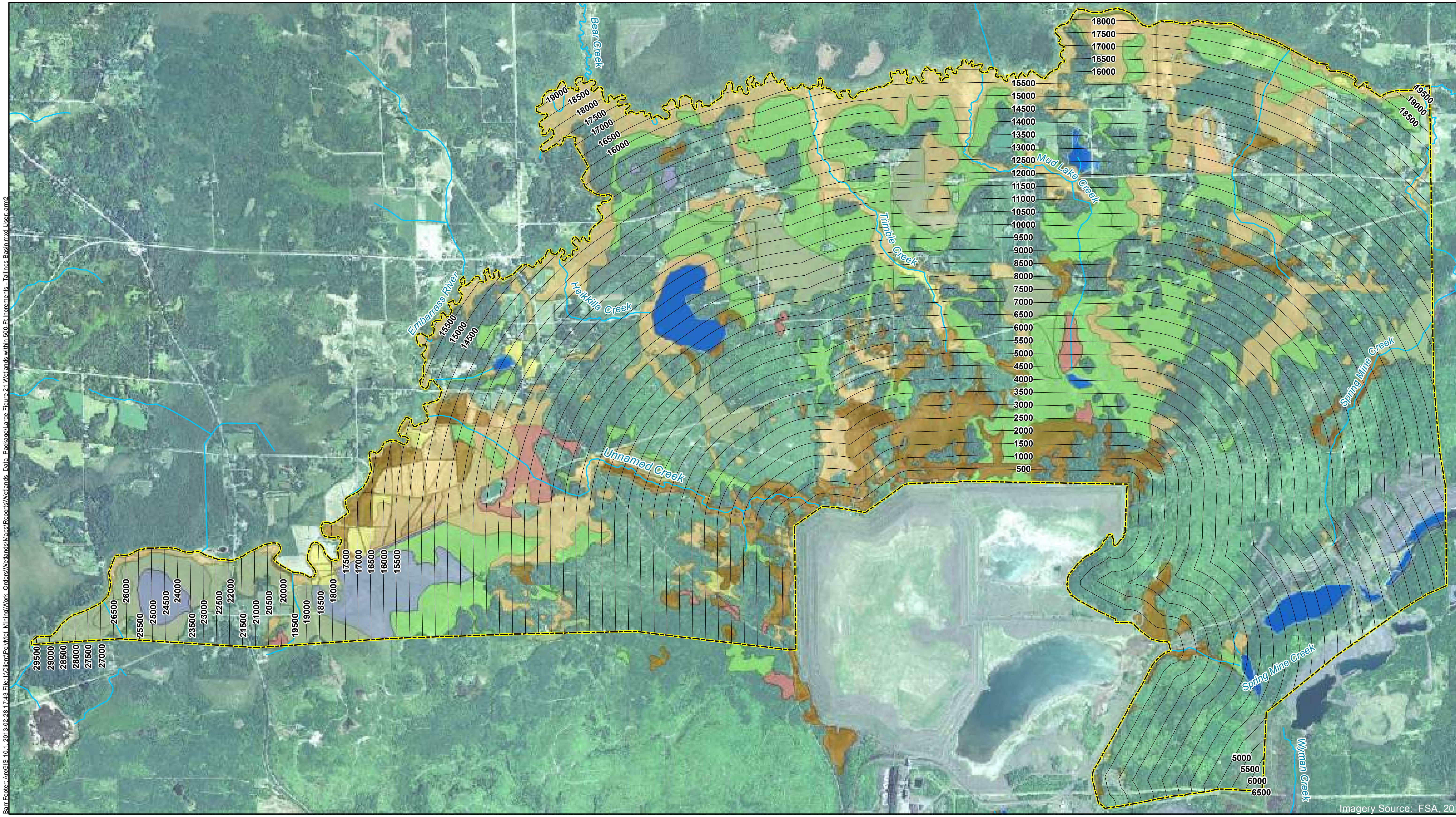
NorthMet Project

Poly Met Mining Inc.

Hoyt Lakes, Minnesota



Large Figure 20
MODEL - ESTIMATED METAL DEPOSITION
COMPAREDTO BACKGROUND EFFECTS LEVEL -
FLOTATION TAILINGS BASIN
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



500-Ft Increments

Baseline Type Evaluation Study Area Two

Area Two

Eggers & Reed Wetland Types

Shrub Swamps (Alder thickets & Shrub-carrs)

Coniferous bog

Coniferous swamp

Deep marsh; Shallow marsh

Hardwood swamp

Open water (Shallow, open water & lakes)

Open bog

Sedge meadow; Wet meadow

Rivers & Streams

0 1,750 3,500 7,000

Feet

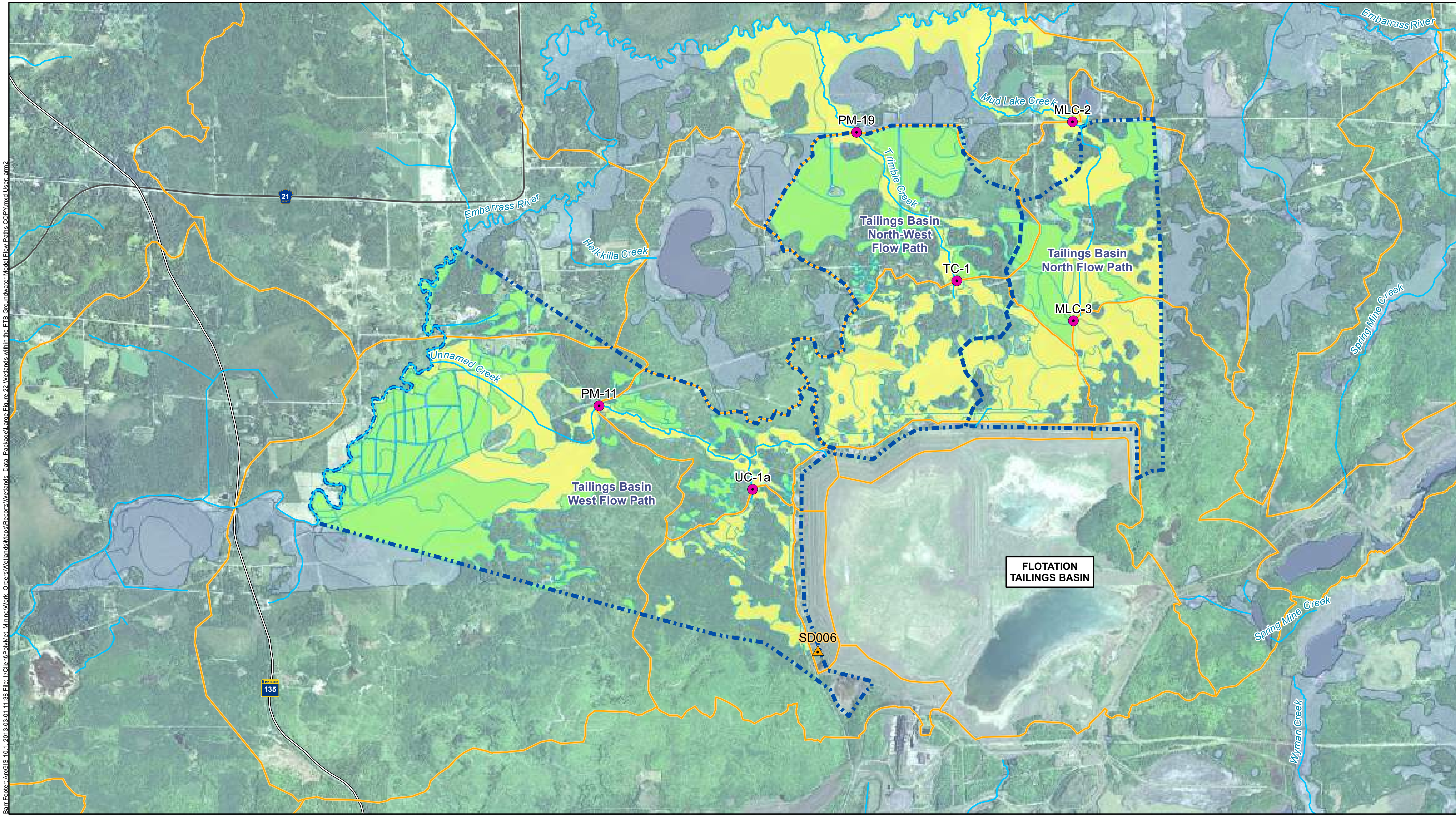
Large Figure 21

WETLANDS WITHIN 500-FT INCREMENTS - FLOTATION TAILINGS BASIN AREA

NorthMet Project

Poly Met Mining Inc.

Hoyt Lakes, Minnesota

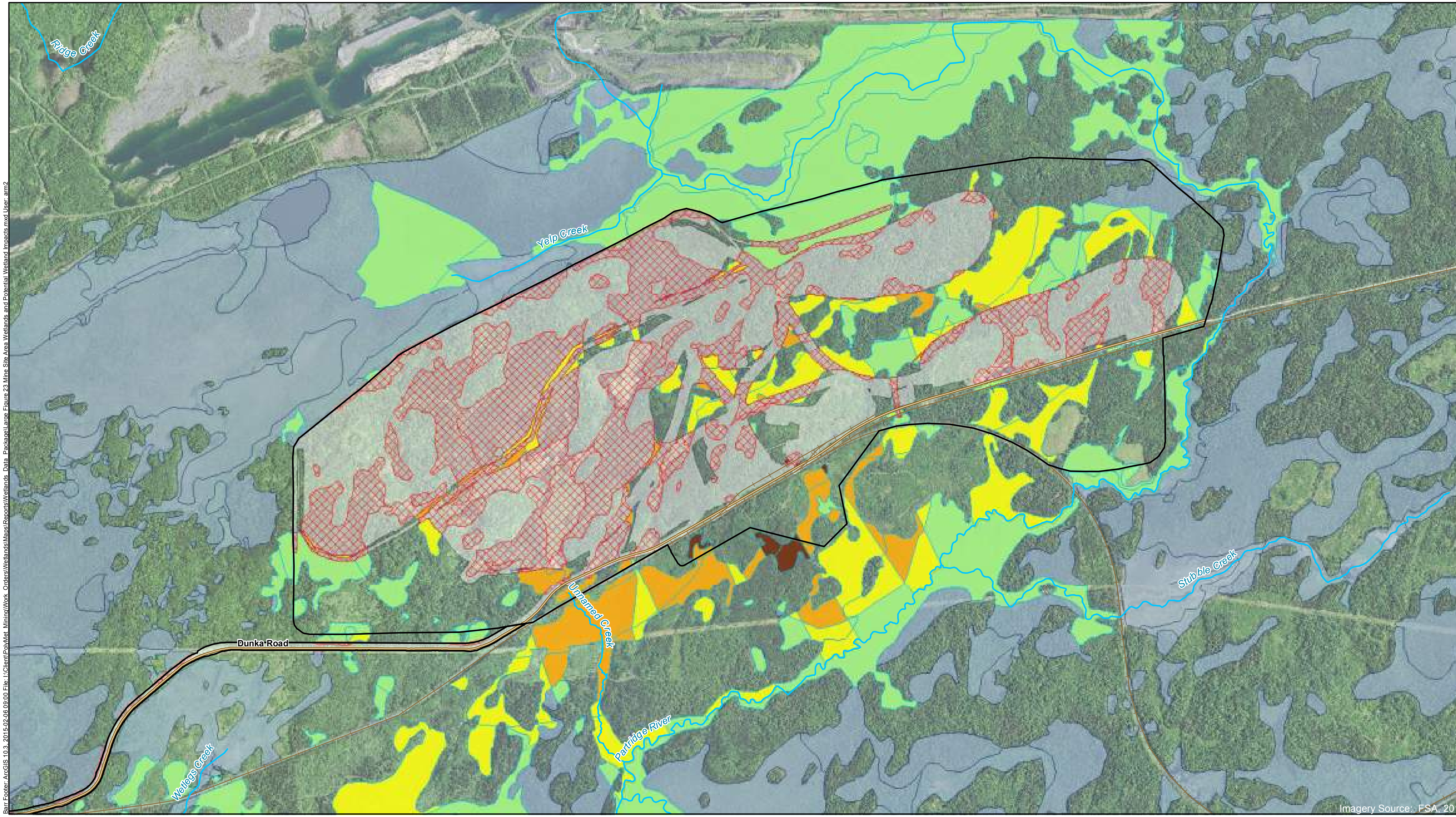


Surface Water Model Evaluation Location
Approximate Location of Project Surface Water Discharge
Rivers and Streams
Subwatersheds with Project
Groundwater Flow Path
Wetlands

Wetlands with Potential for Indirect Impacts
Surface Water and Groundwater
Groundwater Only

0 1,500 3,000 6,000
Feet

Large Figure 22
WETLANDS WITHIN THE FTB
GROUNDWATER MODEL FLOW PATHS
NorthMet Project
Poly Met Mining, Inc.
Hoyt Lakes, MN

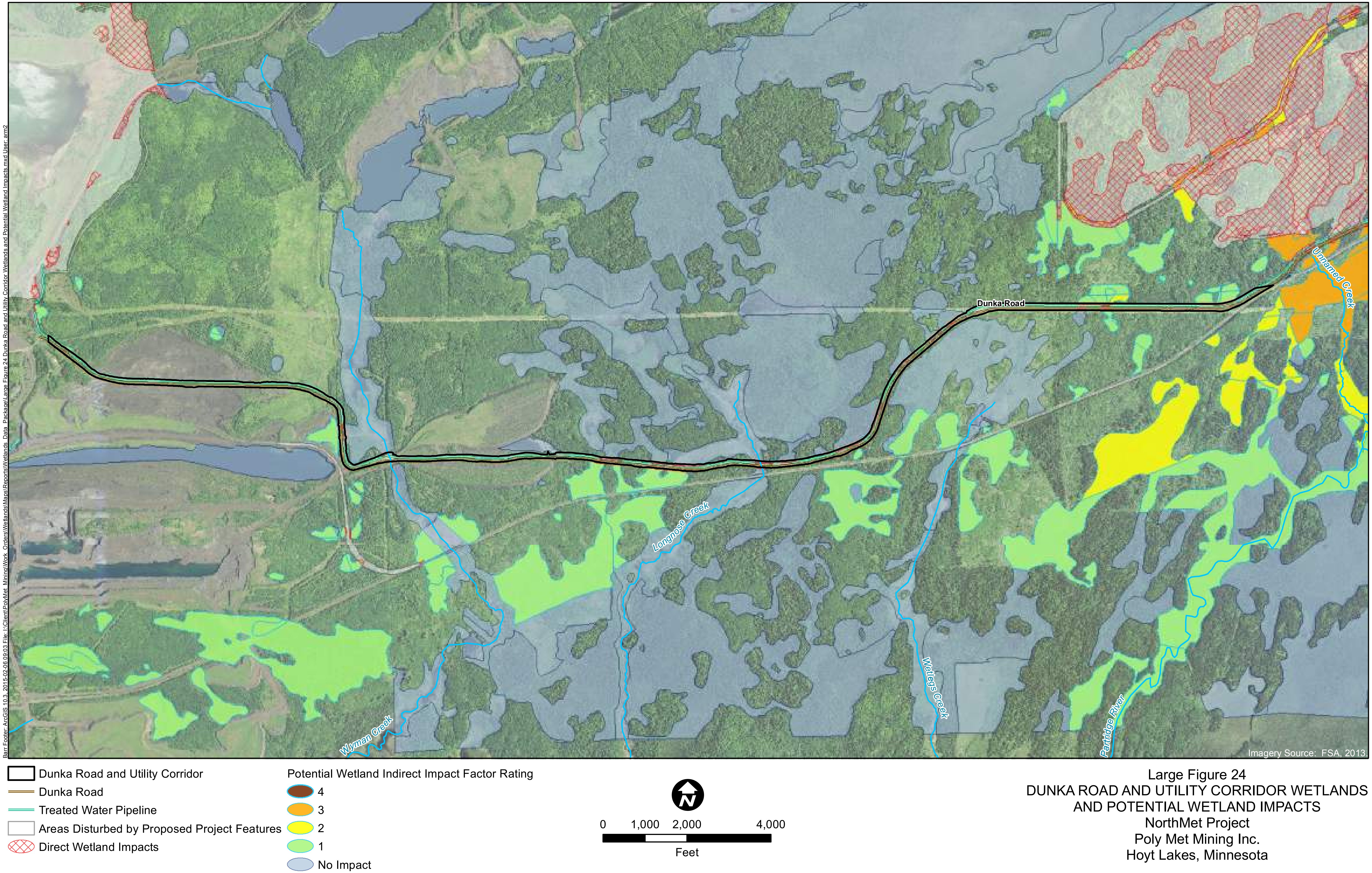


Mine Site
Areas Disturbed by Proposed Project Features
Dunka Road
Direct Wetland Impacts

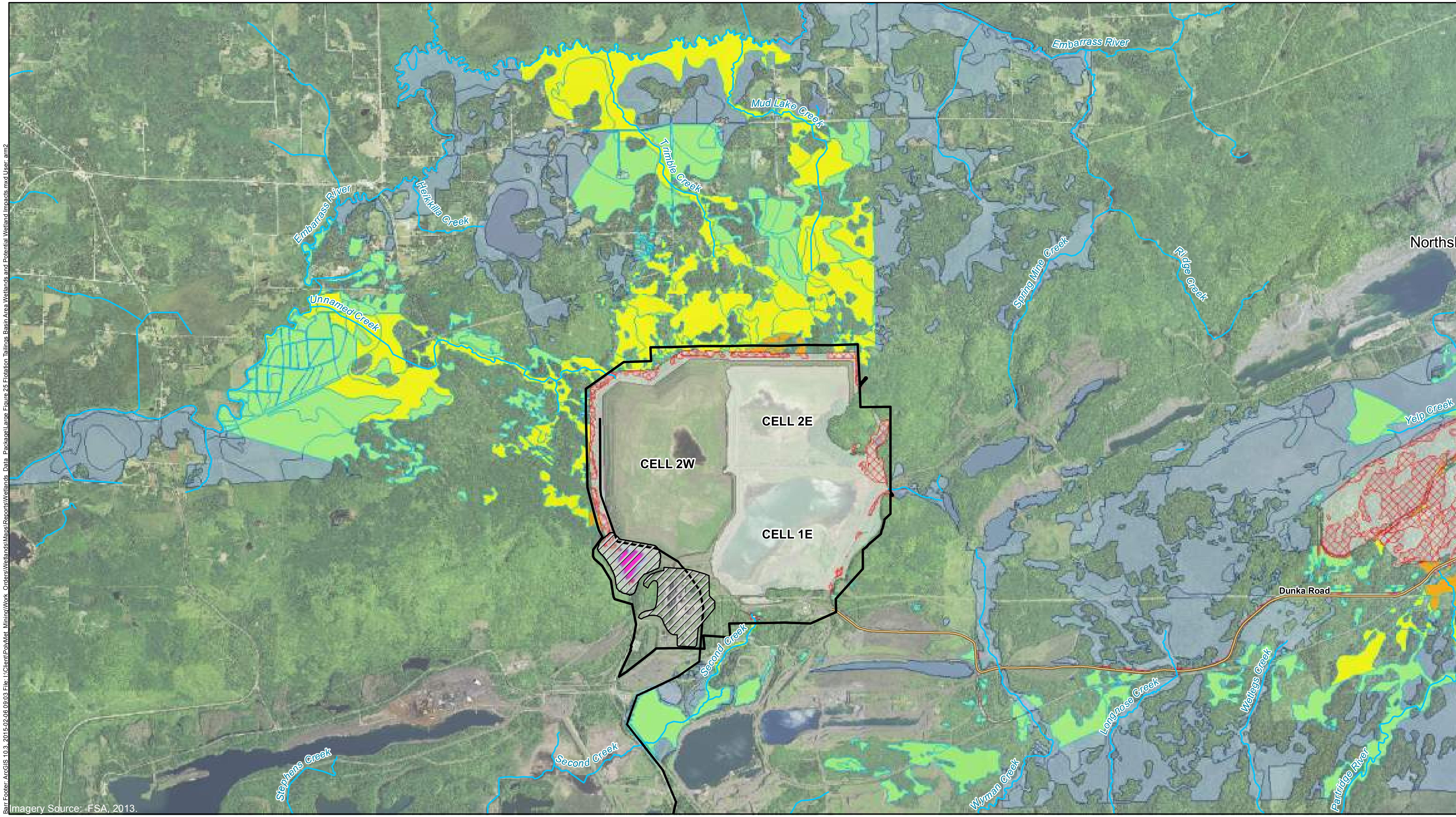
Potential Wetland Indirect Impact Factor Rating
5
4
3
2
1
No Impact

0 1,000 2,000 4,000
Feet

Large Figure 23
MINE SITE AREA WETLANDS AND POTENTIAL WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Large Figure 24
DUNKA ROAD AND UTILITY CORRIDOR WETLANDS AND POTENTIAL WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



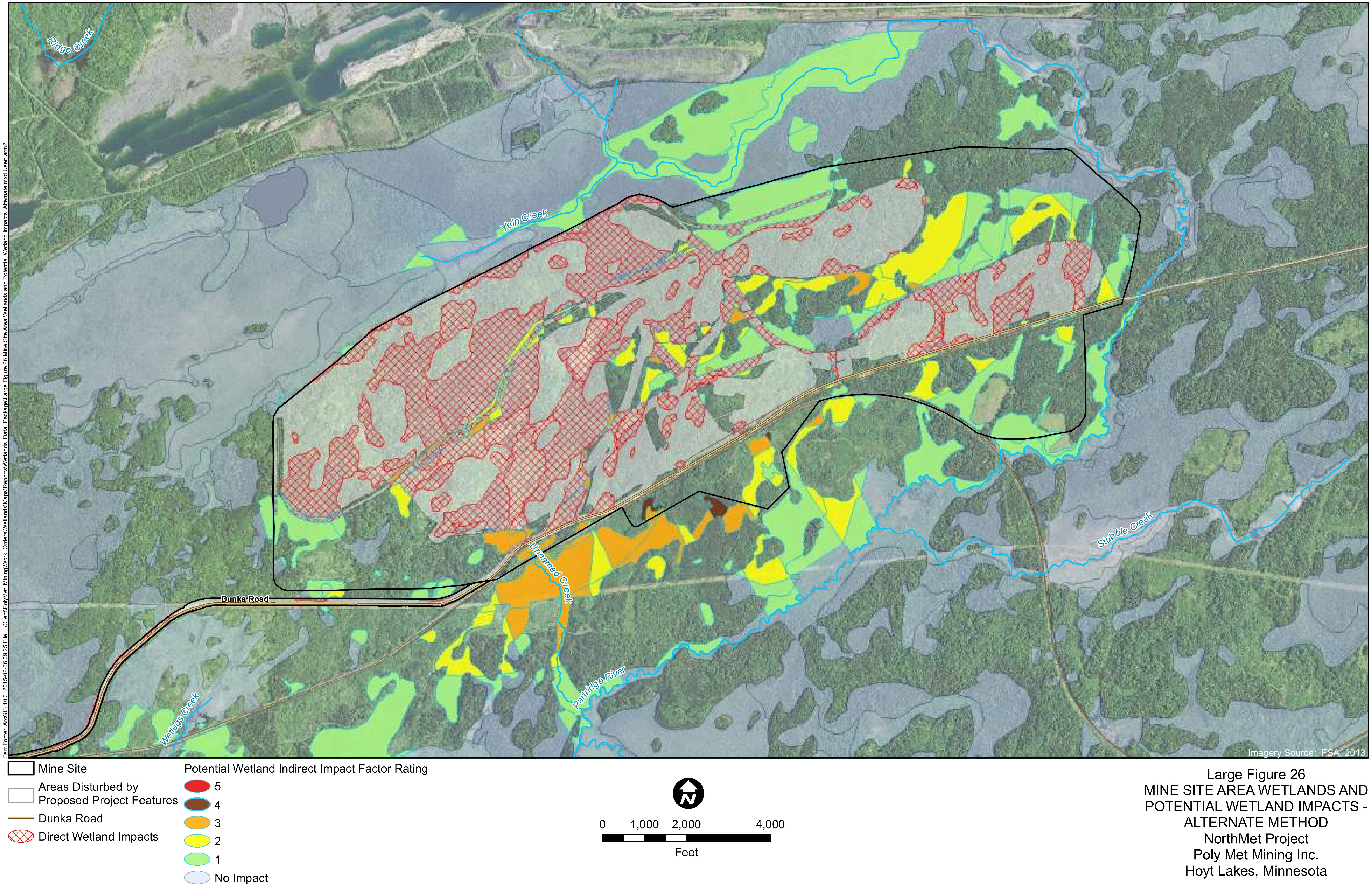
Tailings Basin
Areas Excluded from Tailings Basin Boundary
Areas Disturbed by Proposed Project Features
Dunka Road
Direct Wetland Impacts

Potential Wetland Indirect Impact Factor Rating
- 5
- 4
- 3
- 2
- 1
- Exempt

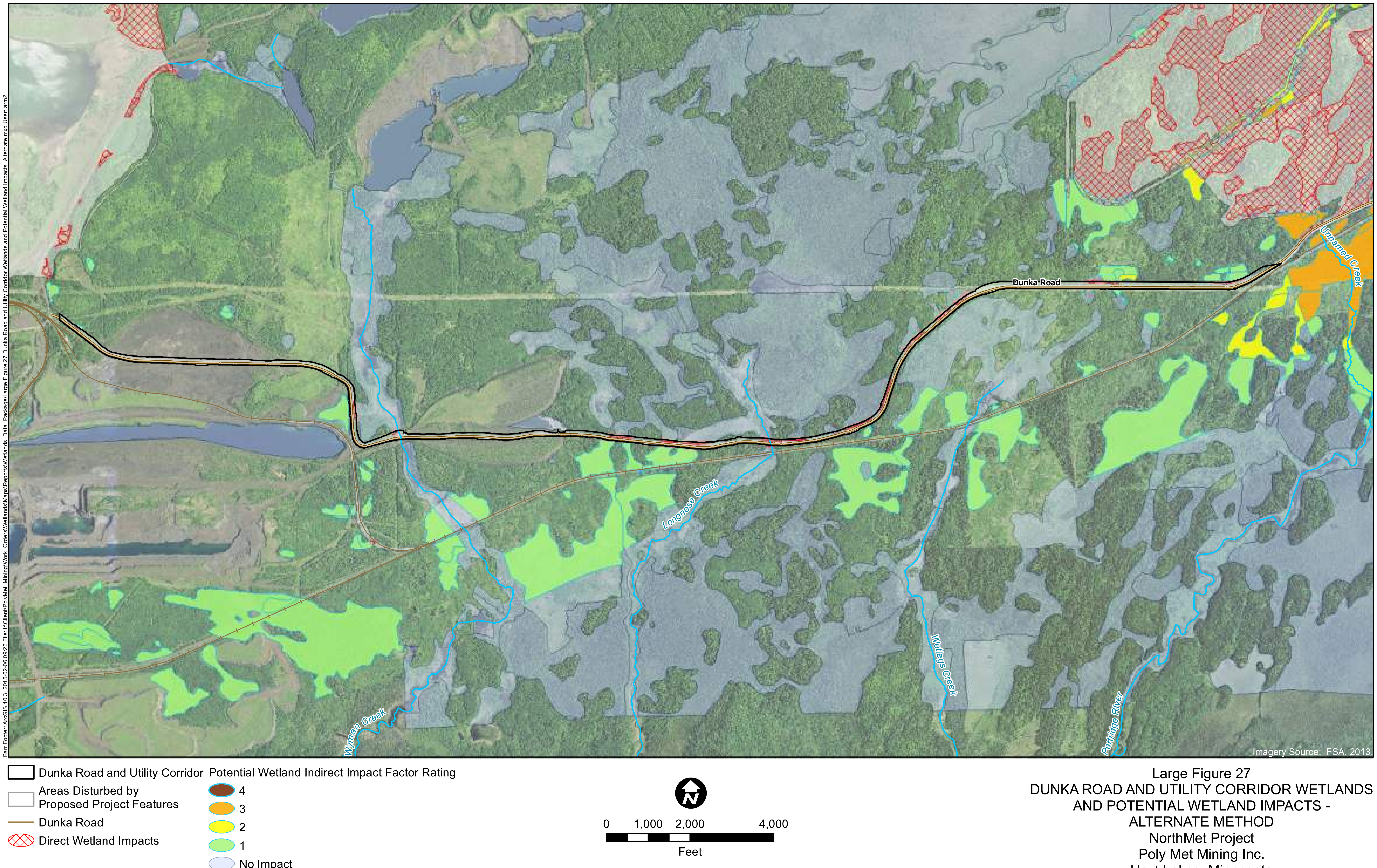
N

0 2,250 4,500 9,000
Feet

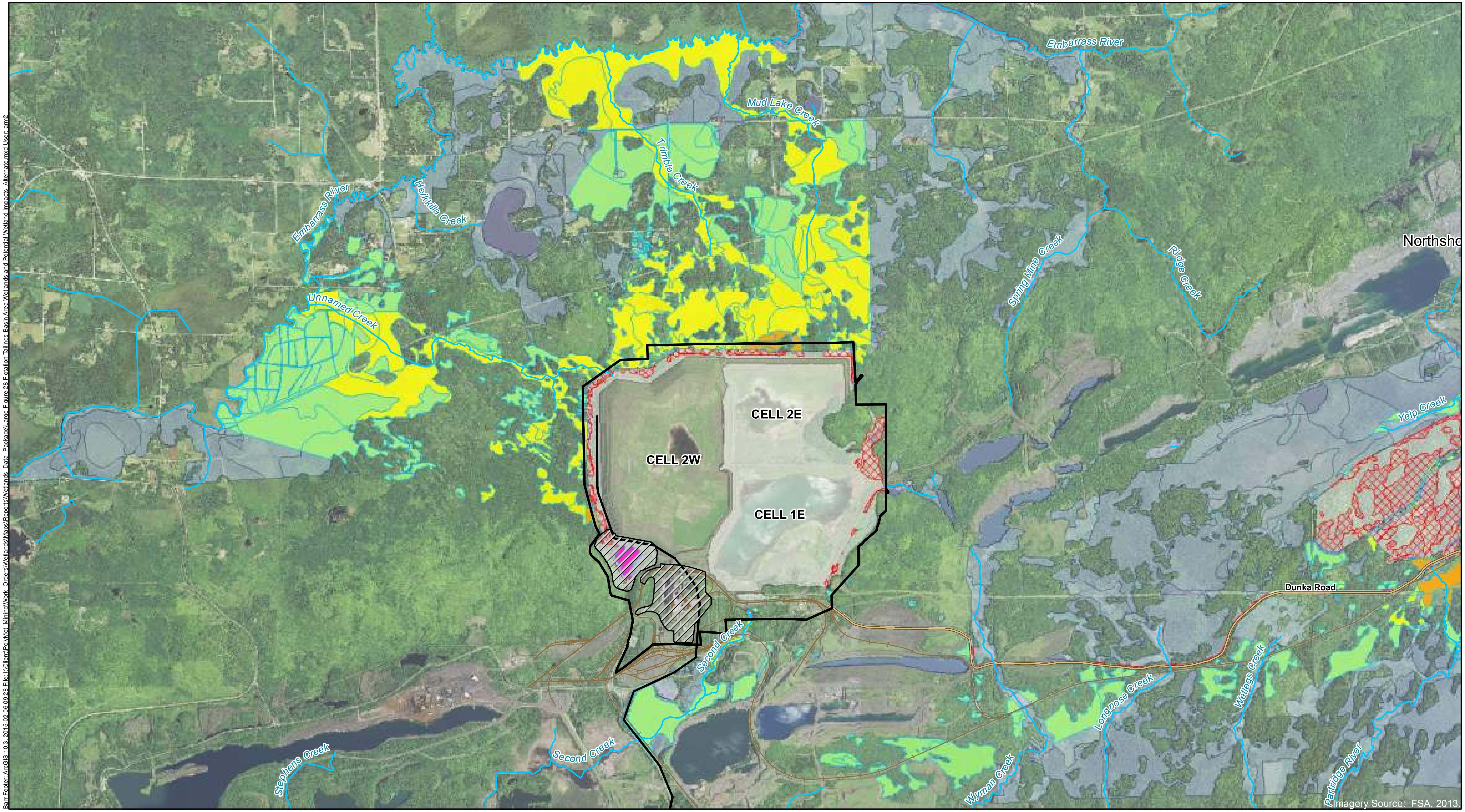
Large Figure 25
FLOTATION TAILINGS BASIN AREA WETLANDS
AND POTENTIAL WETLAND IMPACTS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Large Figure 26
MINE SITE AREA WETLANDS AND POTENTIAL WETLAND IMPACTS - ALTERNATE METHOD
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Large Figure 27
DUNKA ROAD AND UTILITY CORRIDOR WETLANDS AND POTENTIAL WETLAND IMPACTS - ALTERNATE METHOD
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

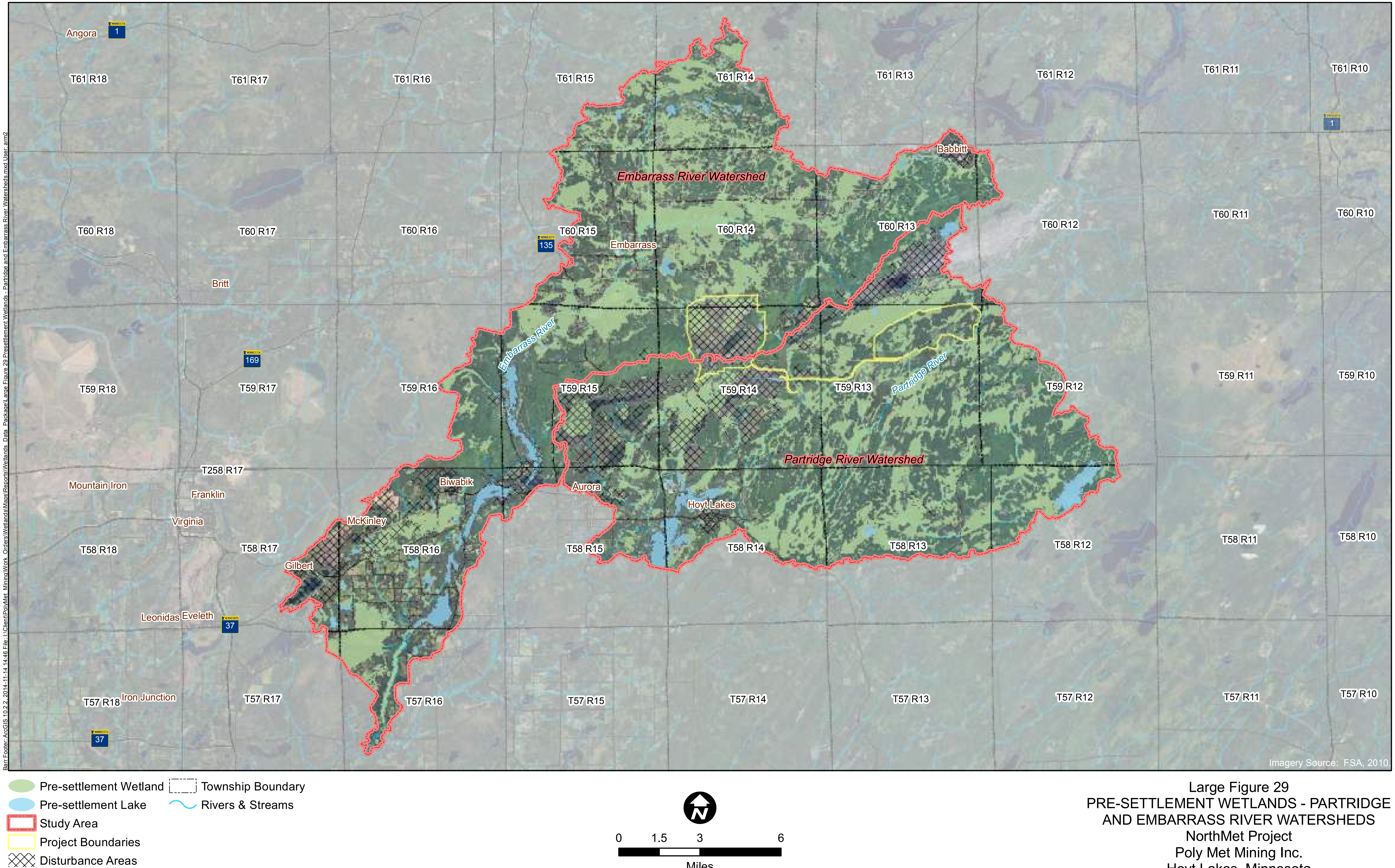


Tailings Basin
Areas Excluded from Tailings Basin Boundary
Dunka Road
Direct Wetland Impacts
No Impact

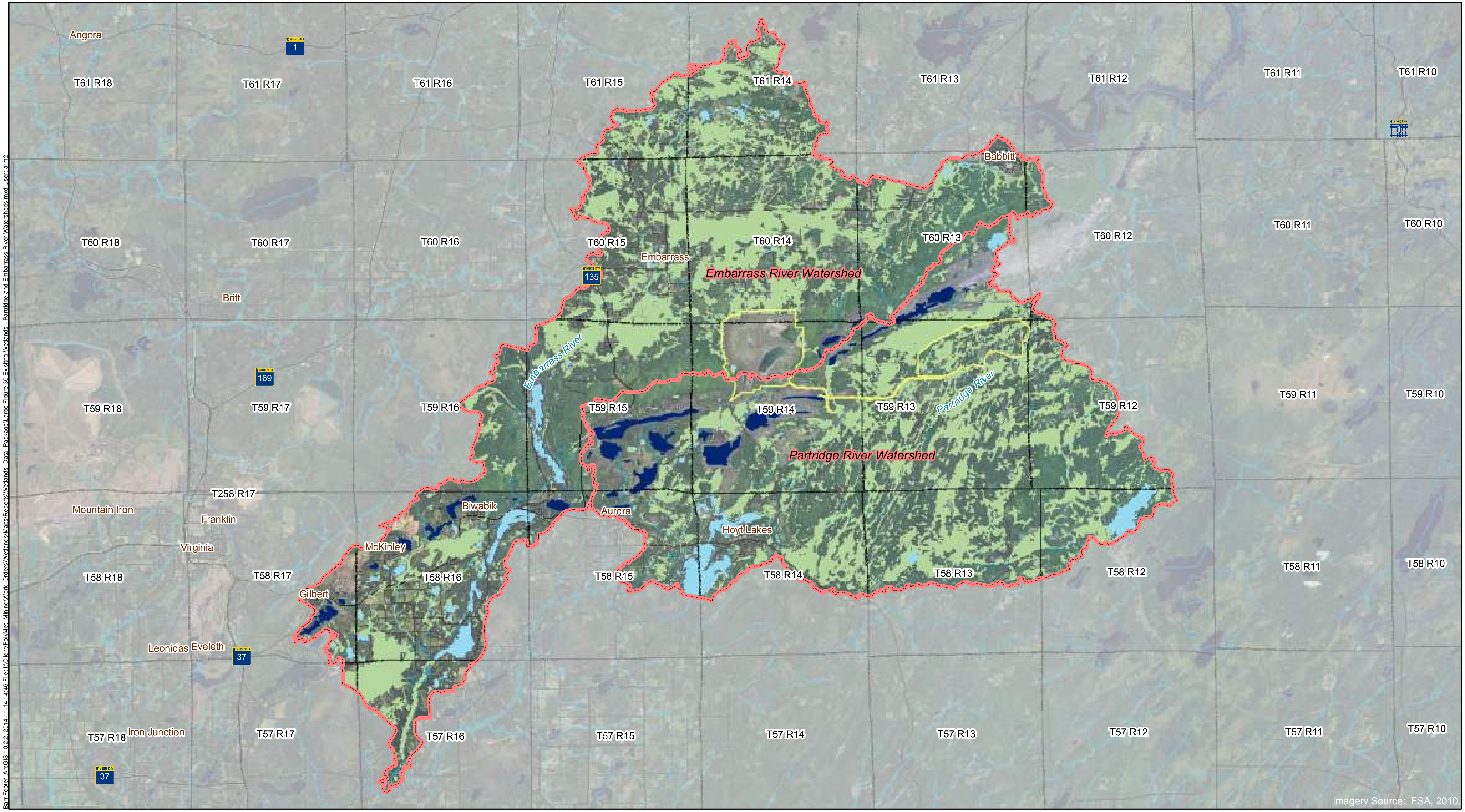
Potential Wetland Indirect Impact Factor Rating
- 5
- 4
- 3
- 2
- 1
- Exempt

0 2,250 4,500 9,000
Feet

Large Figure 28
FLOTATION TAILINGS BASIN AREA WETLANDS AND POTENTIAL WETLAND IMPACTS - ALTERNATE METHOD
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Large Figure 29
PRE-SETTLEMENT WETLANDS - PARTRIDGE AND EMBARRASS RIVER WATERSHEDS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Existing Wetland

Existing Lake

Existing Deepwater Habitat

Study Area

Project Boundaries

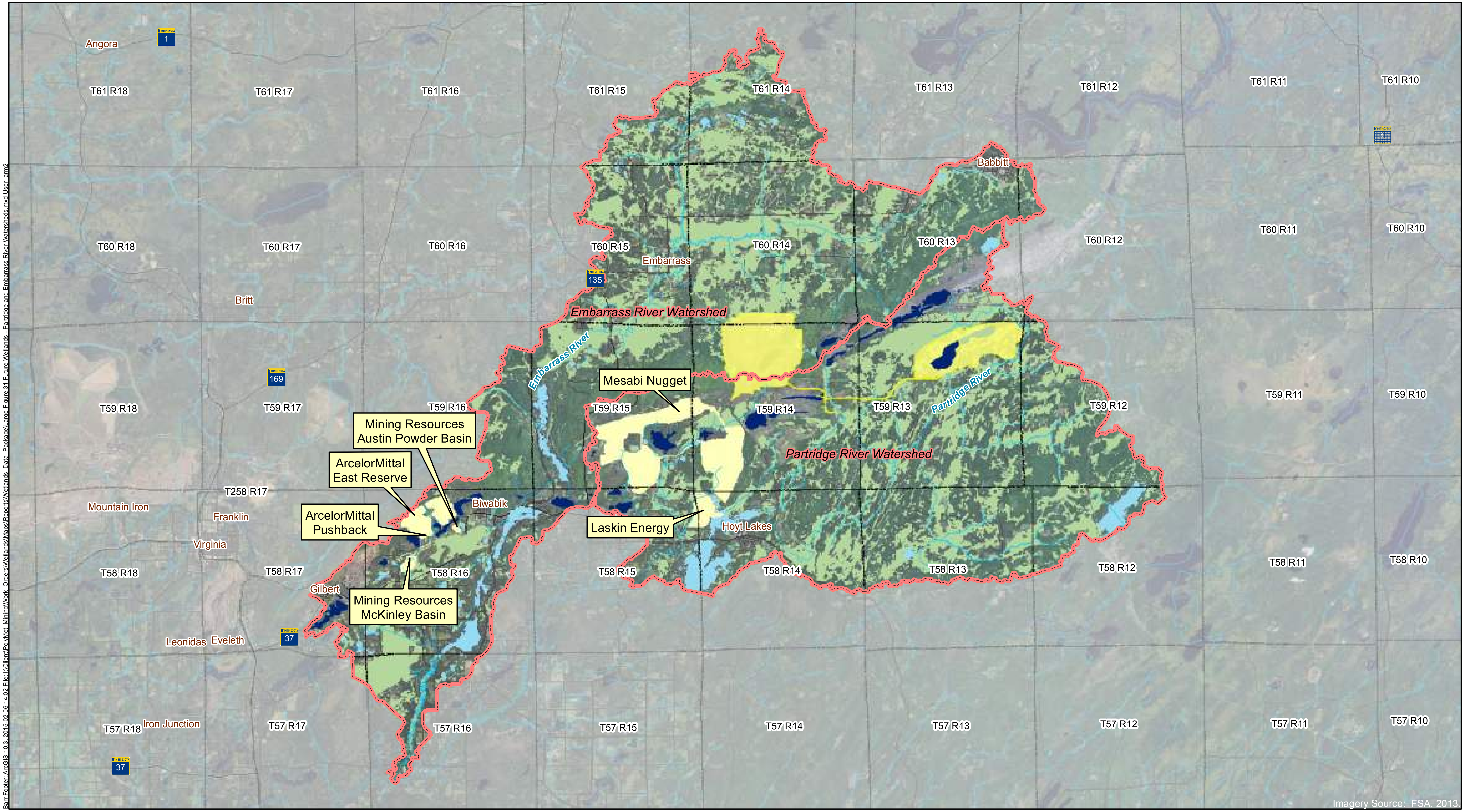
Township Boundary

Rivers & Streams

0 1.5 3 6

Miles

Large Figure 30
EXISTING WETLANDS - PARTRIDGE AND EMBARRASS RIVER WATERSHEDS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Future Wetland
Future Lake
Future Deepwater Habitat
Study Area
Project Boundaries
Other Project Areas
Township Boundary
Rivers & Streams

0 1.5 3 6
Miles

Large Figure 31
FUTURE WETLANDS - PARTRIDGE AND EMBARRASS RIVER WATERSHEDS
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

Table of Contents

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 sulfide-bearing 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.

1. 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:

<u>Mine to Plant Rail</u>

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 pre-settlement wetland, lakes, and deepwater acreage within the Partridge River and Embarrass River watersheds will be developed in GIS using the following steps:

1. 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 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

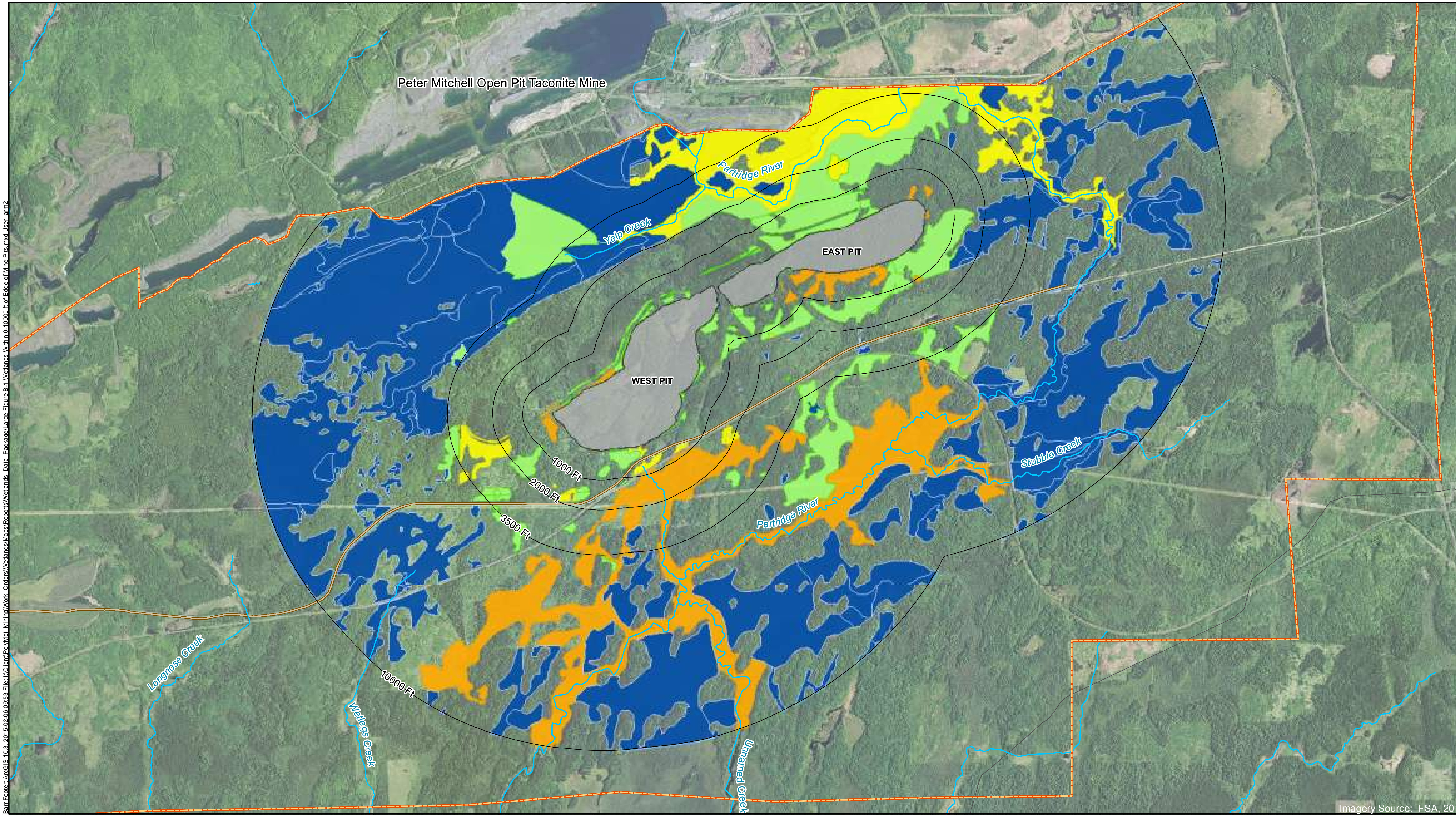
Reference 6 Surface Water IAP Group Summary Document, Date: May 20, 2011.

Reference 7 NorthMet Project Waste Characterization Data Package Version 5

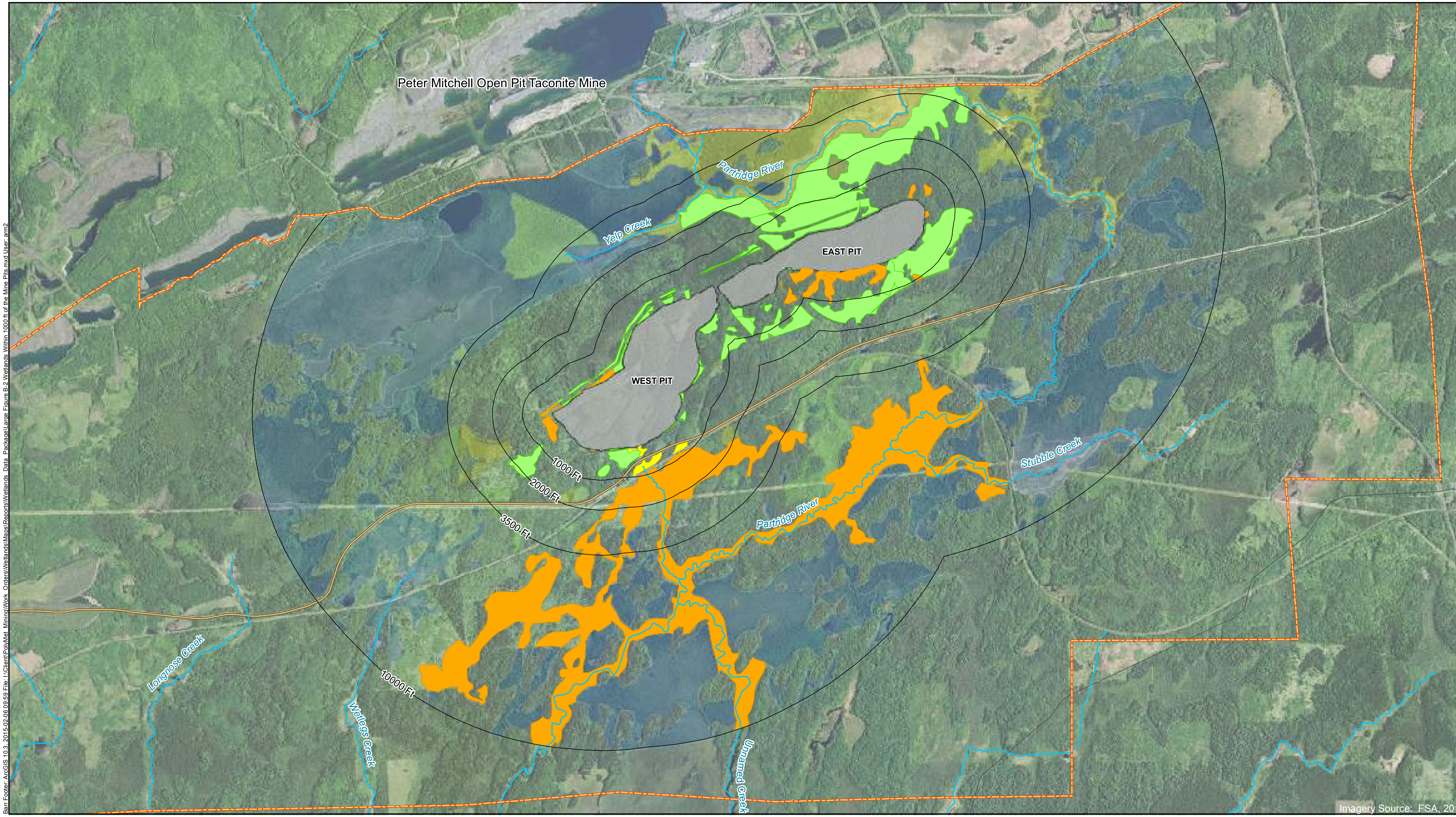
Reference 8 NorthMet Mine Site Water Modeling Work Plan Version 2

Attachment B

Wetlands within Analog Zones – Mine Site



Large Figure B-1
WETLANDS WITHIN 0 - 10,000 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

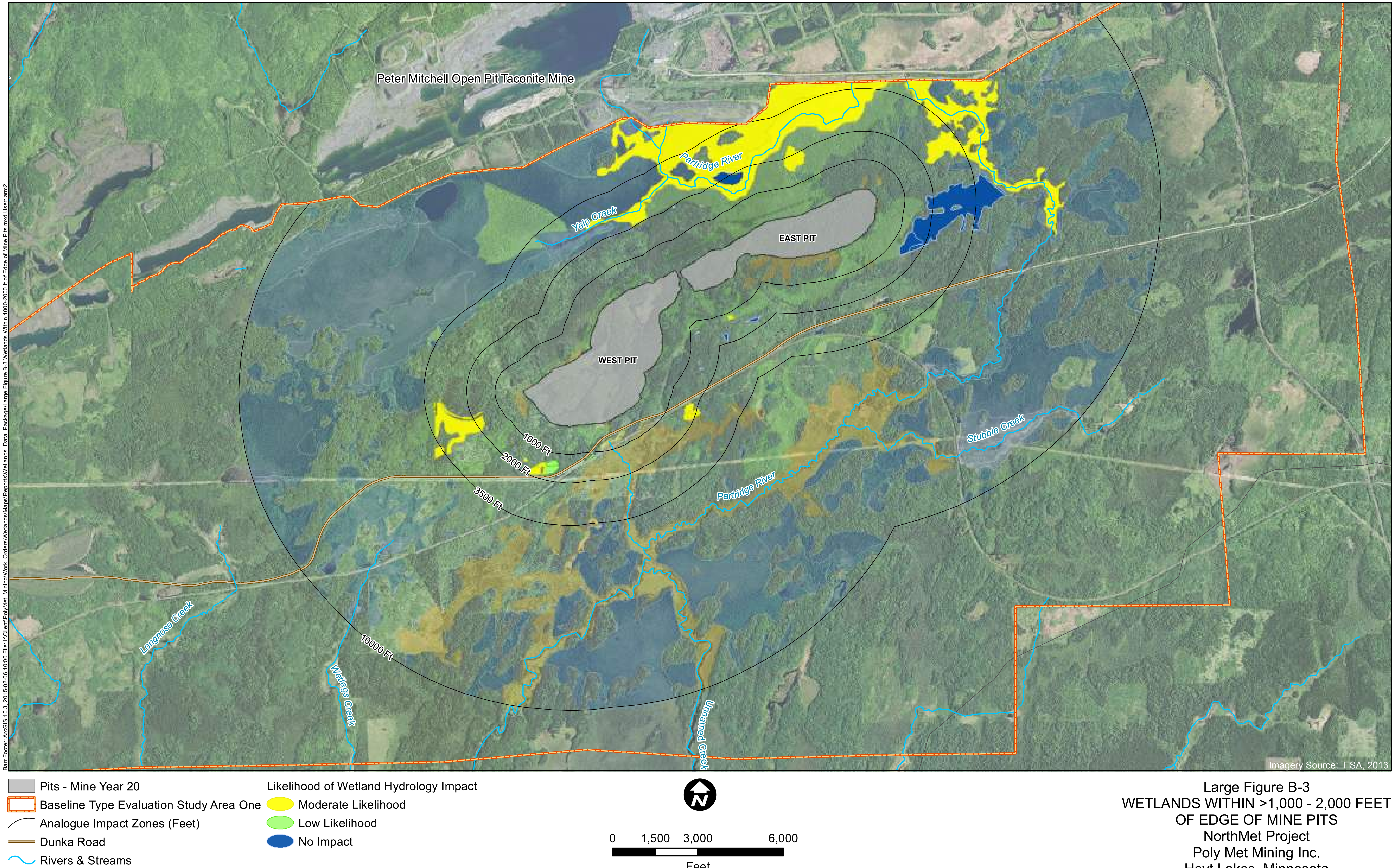


Pits - Mine Year 20
Baseline Type Evaluation Study Area One
Analogue Impact Zones (Feet)
Dunka Road
Rivers & Streams

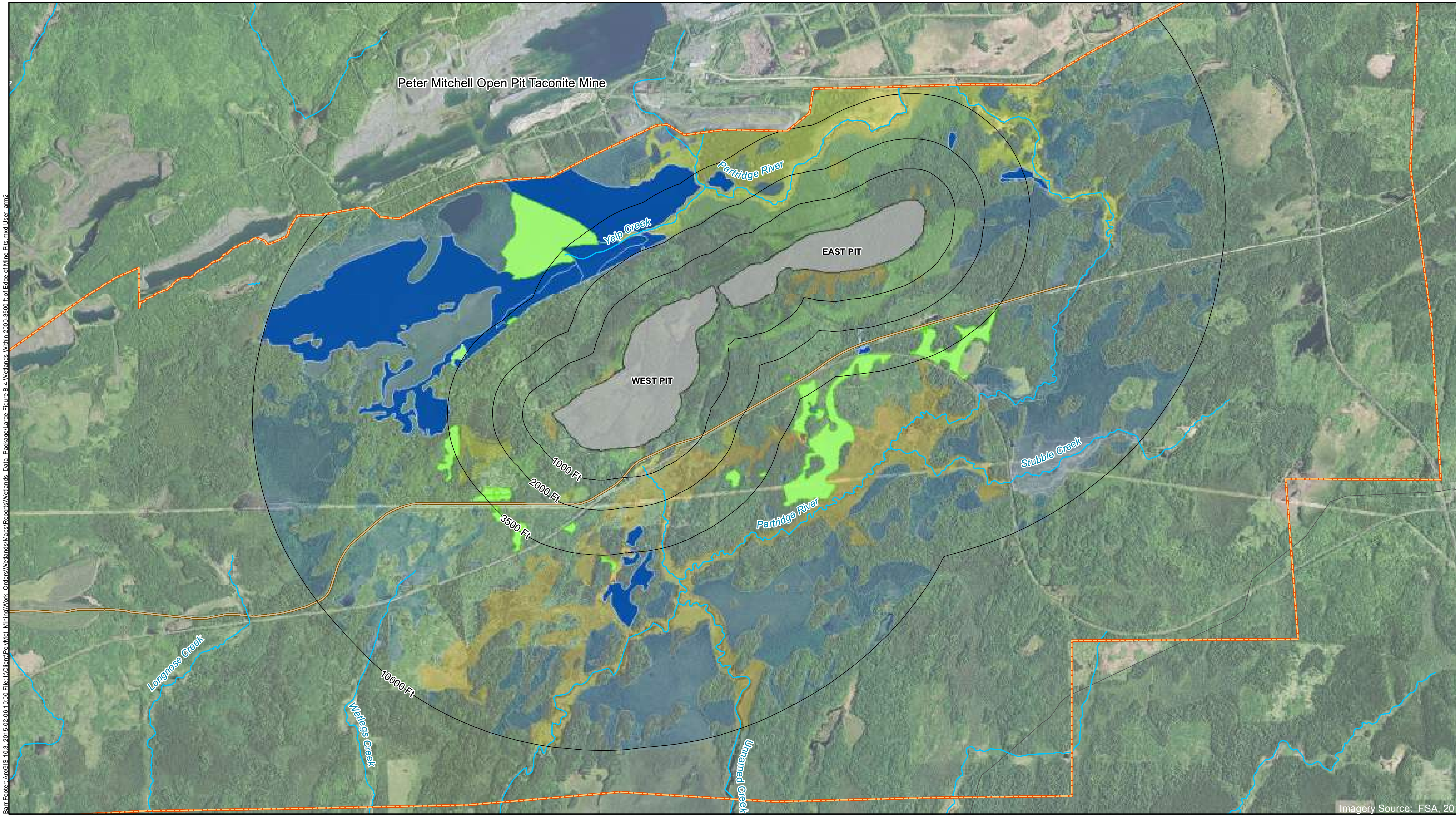
Likelihood of Wetland Hydrology Impact
High Likelihood
Moderate Likelihood
Low Likelihood
No Impact

0 1,500 3,000 6,000
Feet

Large Figure B-2
WETLANDS WITHIN 0 - 1,000 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Large Figure B-3
WETLANDS WITHIN >1,000 - 2,000 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

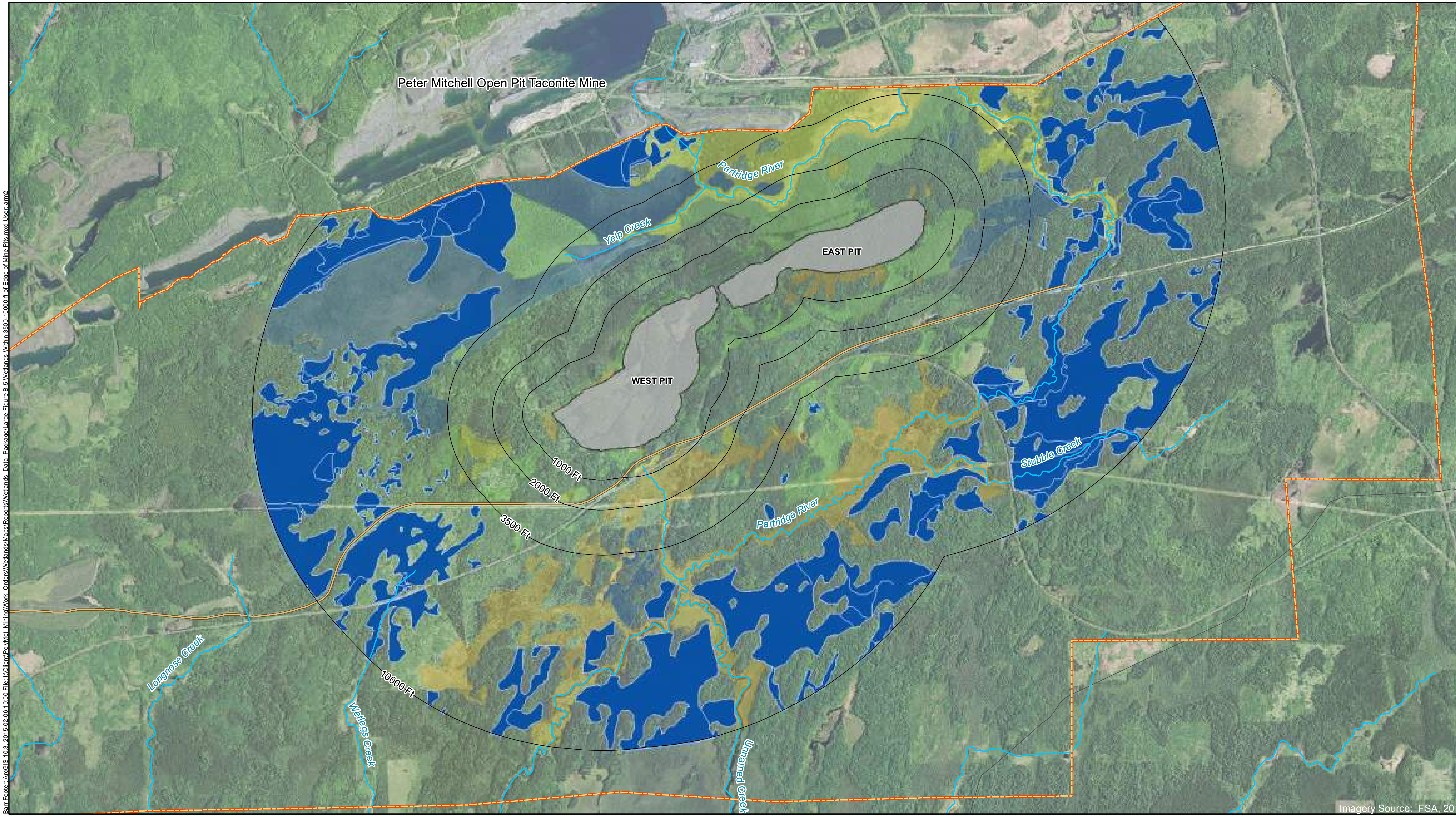


Pits - Mine Year 20
Baseline Type Evaluation Study Area One
Analogue Impact Zones (Feet)
Dunka Road
Rivers & Streams

Likelihood of Wetland Hydrology Impact
Low Likelihood
No Impact

0 1,500 3,000 6,000
Feet

Large Figure B-4
WETLANDS WITHIN >2,000 - 3,500 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Pits - Mine Year 20

Baseline Type Evaluation Study Area One

Analogue Impact Zones (Feet)

Dunka Road

Rivers & Streams

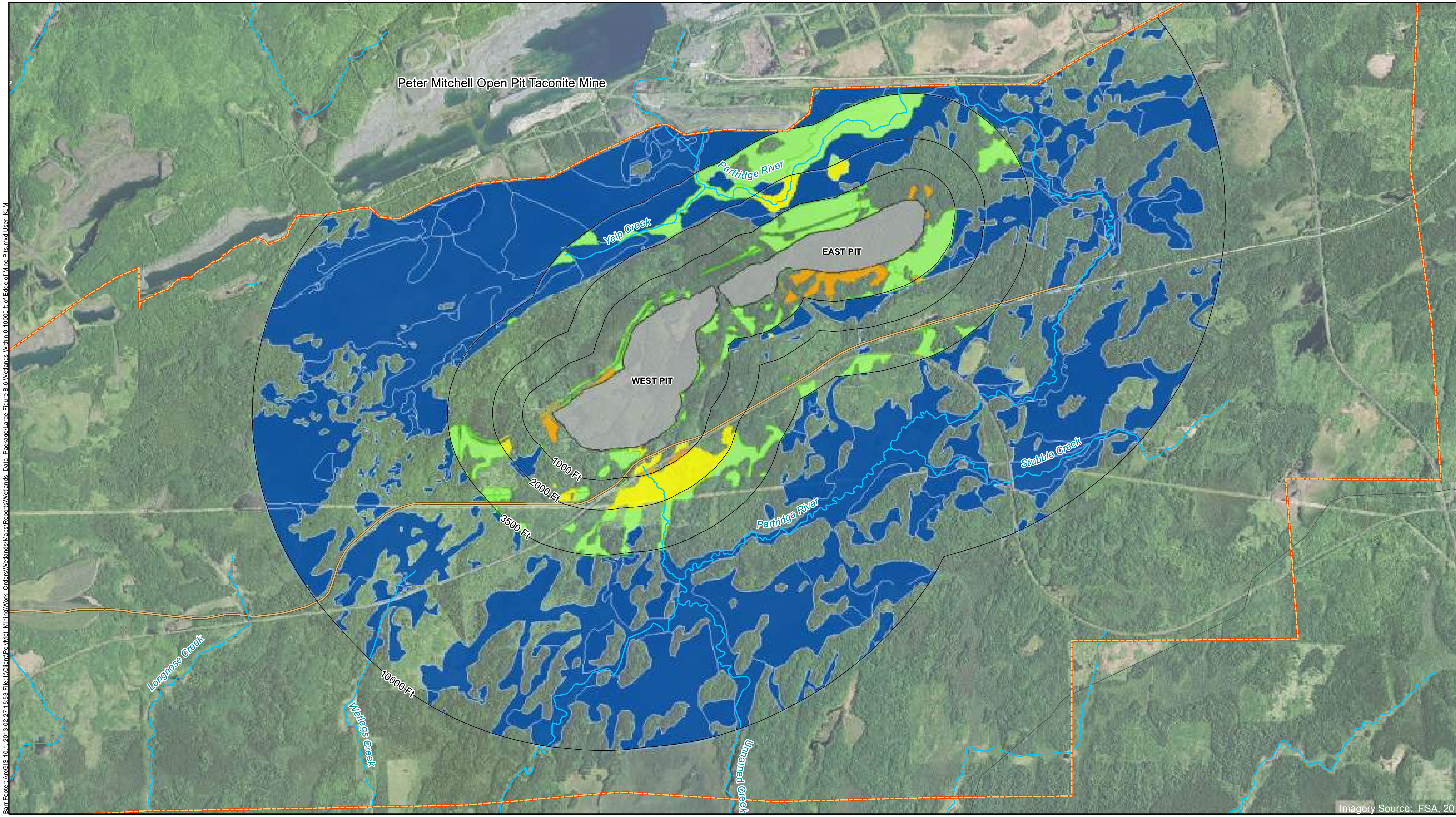
Likelihood of Wetland Hydrology Impact

No Impact

0 1,500 3,000 6,000

Feet

Large Figure B-5
WETLANDS WITHIN >3,500 - 10,000 FEET OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

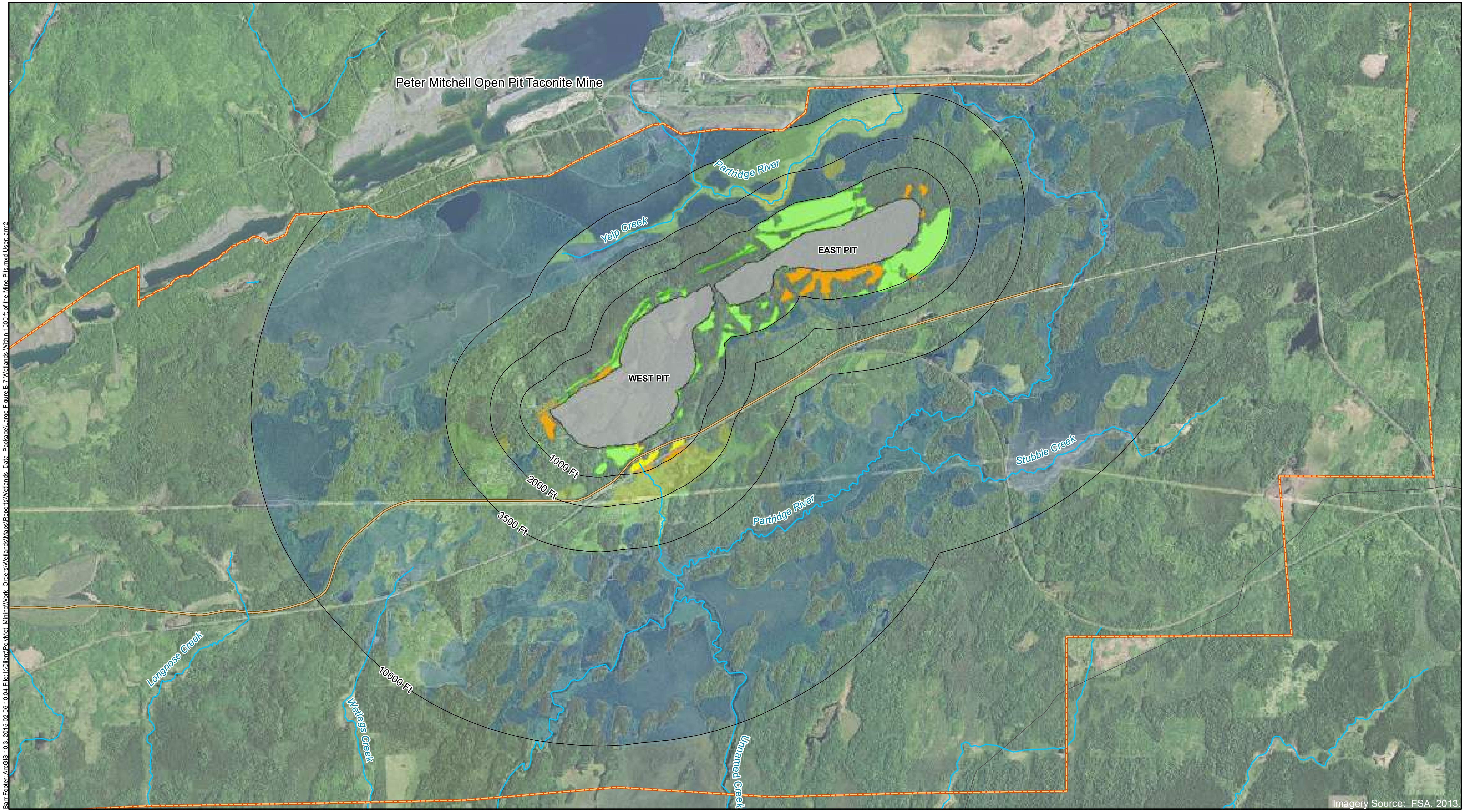


Pits - Mine Year 20
Baseline Type Evaluation Study Area One
Analogue Impact Zones (Feet)
Dunka Road
Rivers & Streams

Likelihood of Wetland Hydrology Impact
High Likelihood
Moderate Likelihood
Low Likelihood
No Impact

0 1,500 3,000 6,000
Feet

Large Figure B-6
WETLANDS WITHIN 0 - 10,000 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

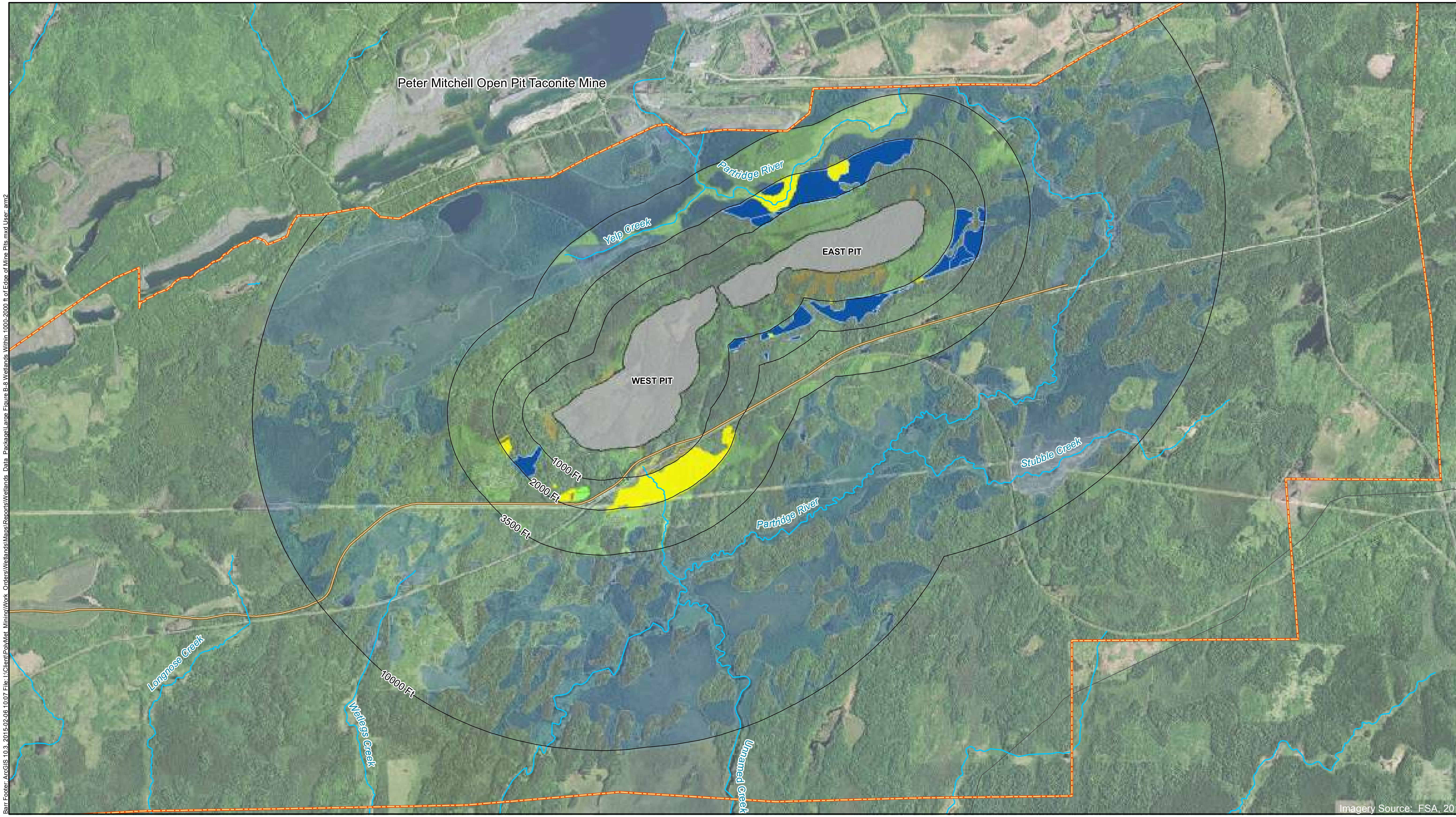


Pits - Mine Year 20
Baseline Type Evaluation Study Area One
Analogue Impact Zones (Feet)
Dunka Road
Rivers & Streams

Likelihood of Wetland Hydrology Impact
High Likelihood
Moderate Likelihood
Low Likelihood
No Impact

0 1,500 3,000 6,000
Feet

Large Figure B-7
WETLANDS WITHIN 0 - 1,000 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



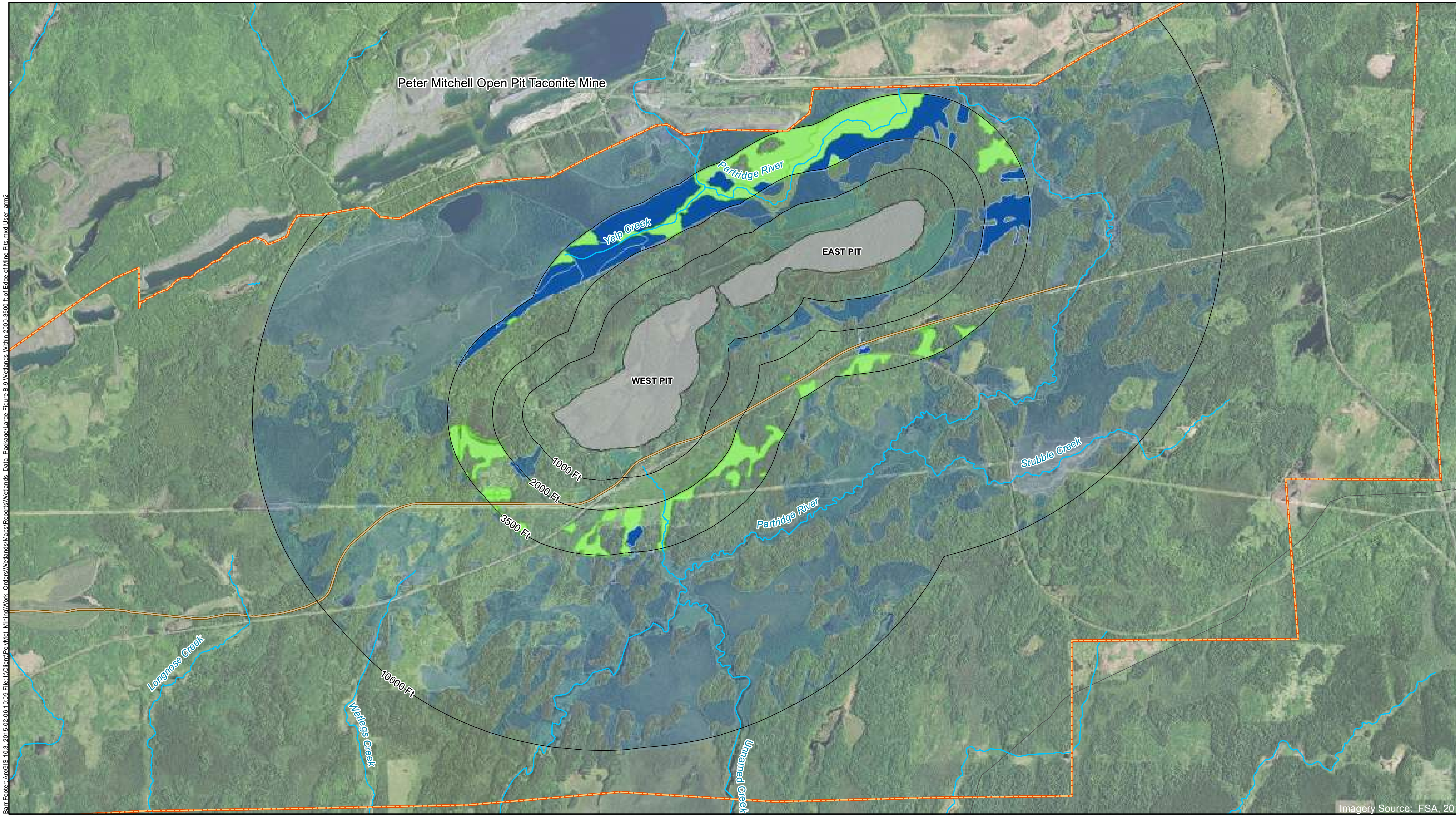
Pits - Mine Year 20
Baseline Type Evaluation Study Area One
Analogue Impact Zones (Feet)
Dunka Road
Rivers & Streams

Likelihood of Wetland Hydrology Impact
Moderate Likelihood
Low Likelihood
No Impact

N

0 1,500 3,000 6,000
Feet

Large Figure B-8
WETLANDS WITHIN >1,000 - 2,000 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

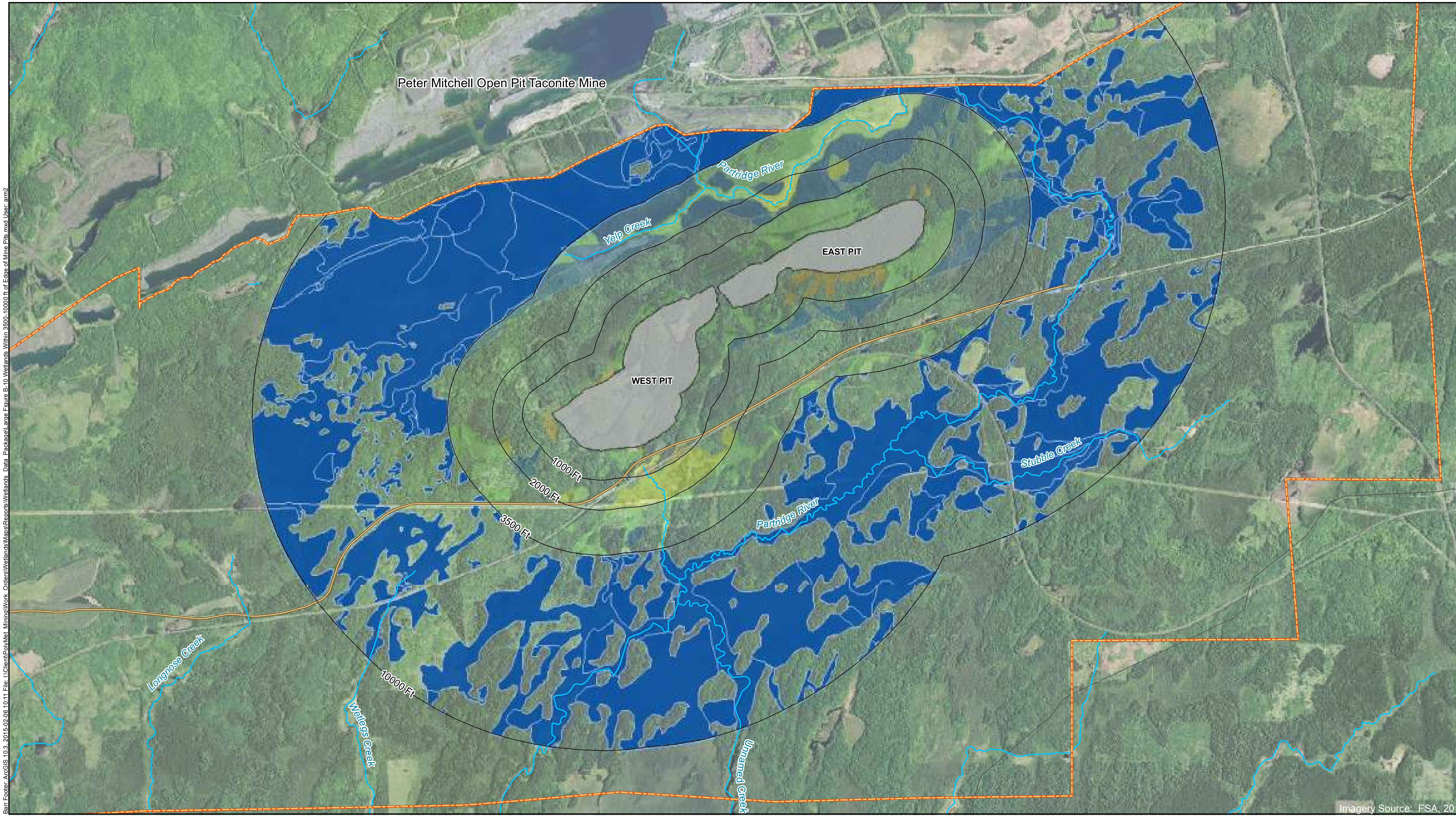


Pits - Mine Year 20
Baseline Type Evaluation Study Area One
Analogue Impact Zones (Feet)
Dunka Road
Rivers & Streams

Likelihood of Wetland Hydrology Impact
Low Likelihood
No Impact

0 1,500 3,000 6,000
Feet

Large Figure B-9
WETLANDS WITHIN >2,000 - 3,500 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



Pits - Mine Year 20
Baseline Type Evaluation Study Area One
Analogue Impact Zones (Feet)
Dunka Road
Rivers & Streams

Likelihood of Wetland Hydrology Impact
No Impact

0 1,500 3,000 6,000
Feet

Large Figure B-10
WETLANDS WITHIN >3,500 - 10,000 FEET
OF EDGE OF MINE PITS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota

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]						Category 1 Waste Rock				
	Center	East	West	Max			Center	East	West	Max	
Constituent	95% UCL	95% UCL	95% UCL	95% UCL	99th Percentile		95% UCL	95% UCL	95% UCL	95% UCL	99th Percentile
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	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	0.0976	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						Category 4 Waste 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:

[1]Ore data used in the previous emission inventory submittals was not separated into East and Central pit values.

[2]Because 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 Tailings			
Arsenic	81	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.
Cadmium	0.08	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.
Chromium	310	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.
Copper	547		
Lead	383		
Manganese	1400		
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 Tailings Chemistry			
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)	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 under-collection 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: From Sweet et al. (1998)					
Metal	**Reported Dry Deposition**	**Reported Wet Deposition**	**Reported Total Deposition (wet + dry)**	**Adjusted Wet Deposition**	**Adjusted Total Deposition (adjusted wet + dry)**	**% Change in Total Deposition (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).

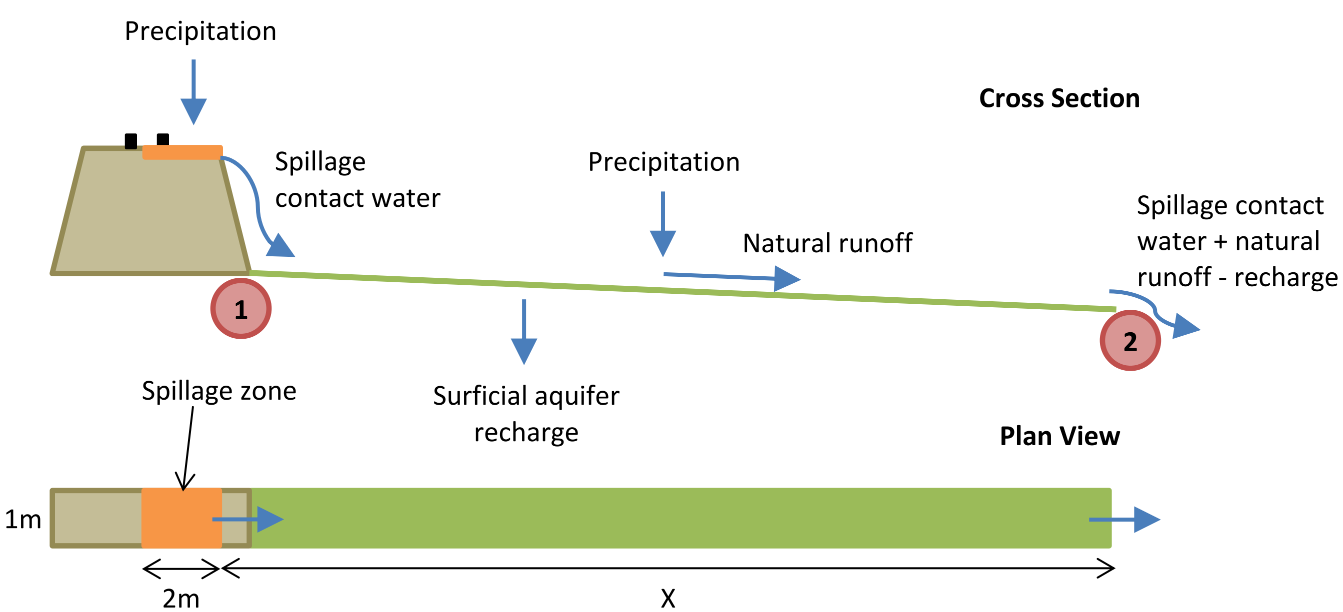


Figure 1 Rail spillage conceptual model schematic

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/m^2 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)

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.

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 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 m^2 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.

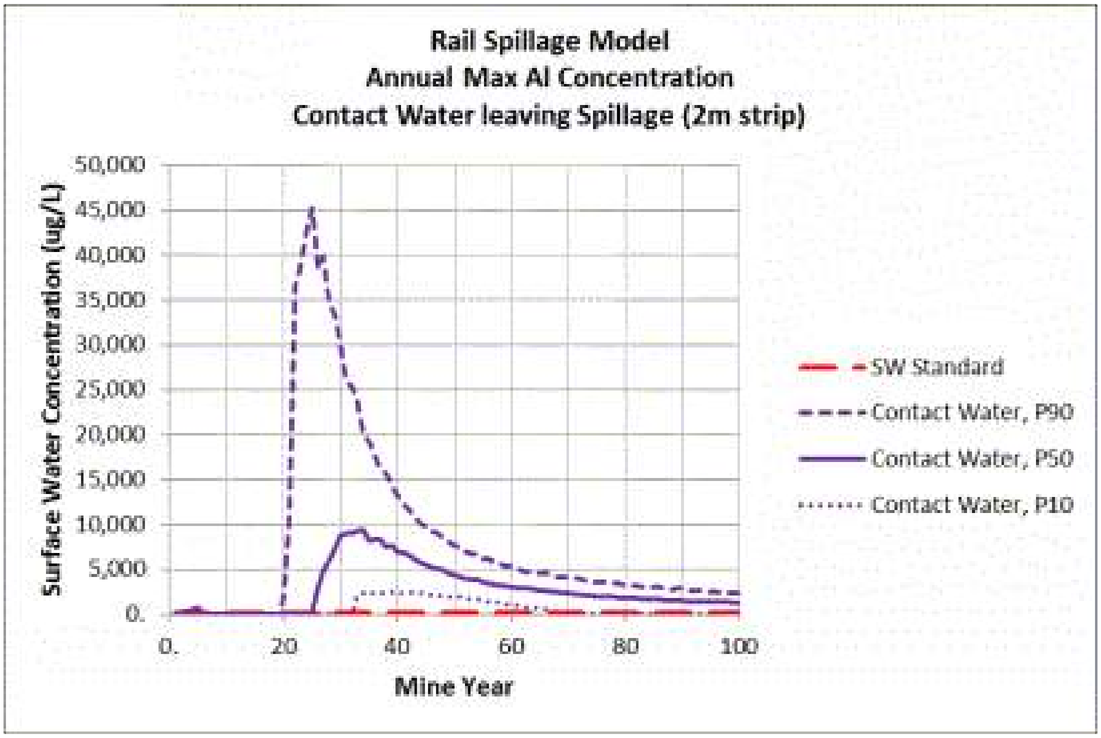


Figure 2 Aluminum concentrations at the edge of the spillage zone

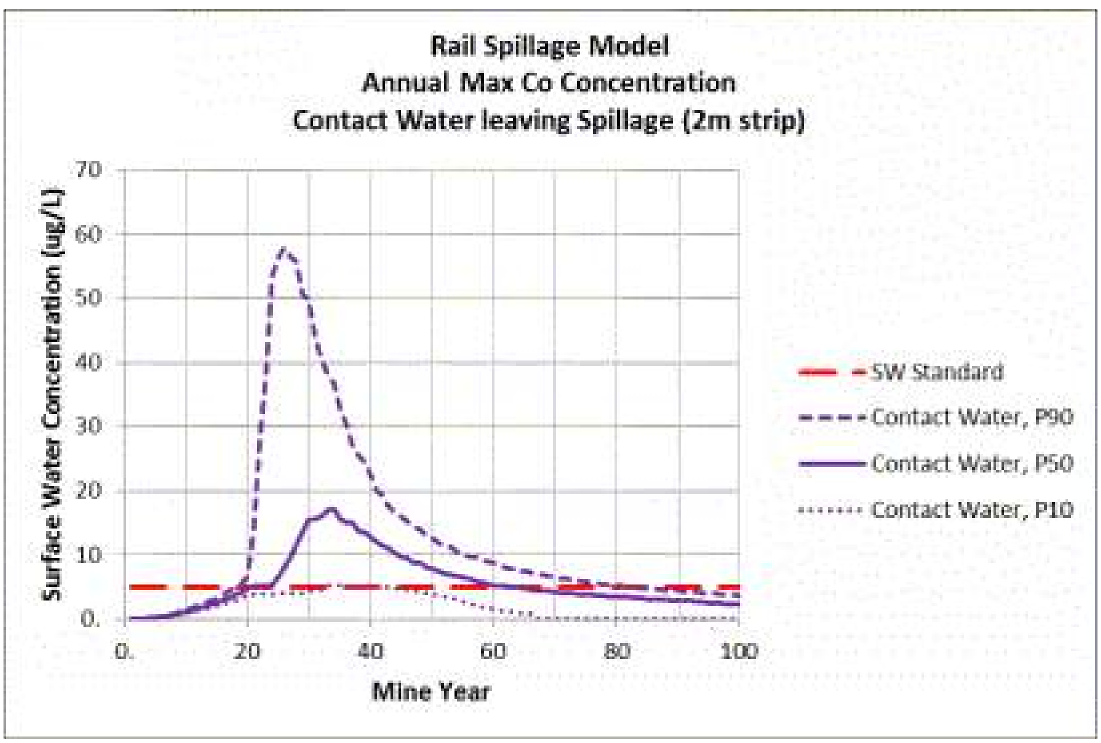


Figure 3 Cobalt concentrations at the edge of the spillage zone

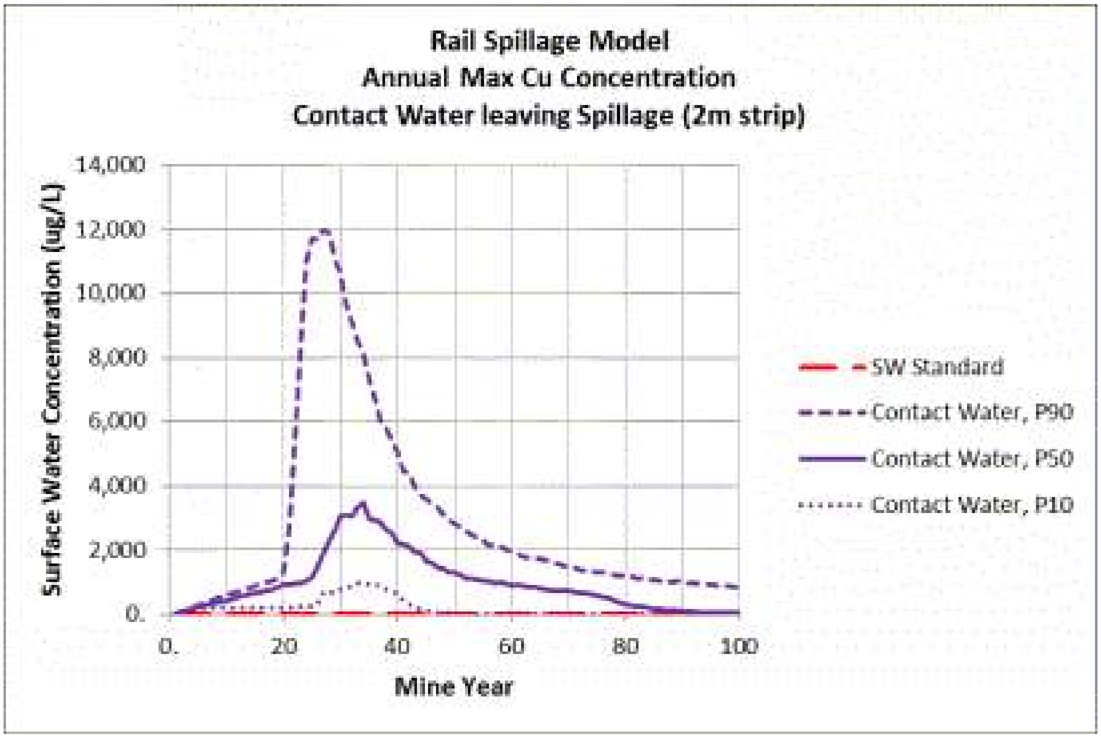


Figure 4 Copper concentrations at the edge of the spillage zone

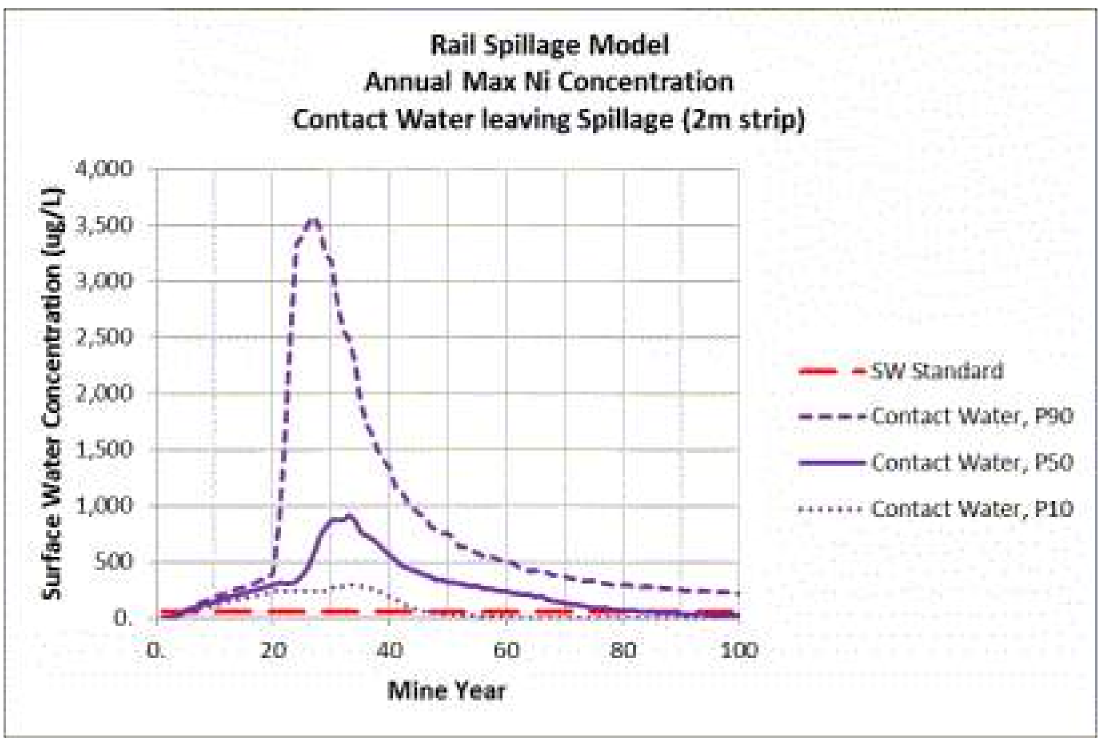


Figure 5 Nickel concentrations at the edge of the spillage zone

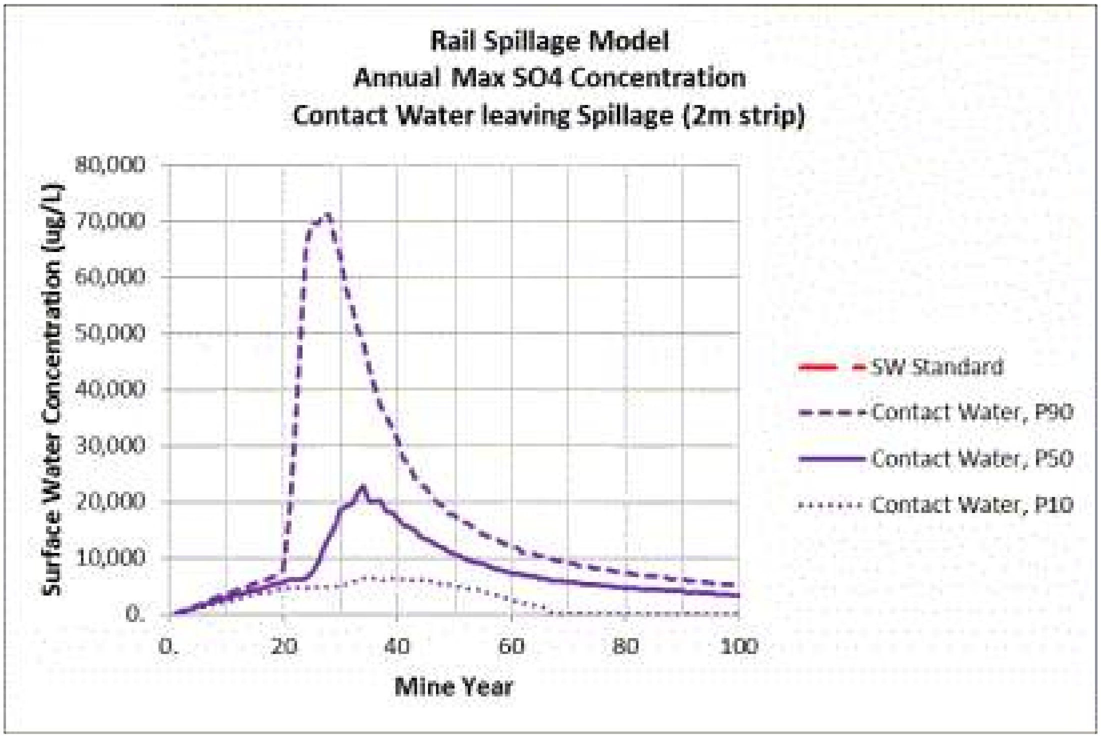


Figure 6 Sulfate concentrations at the edge of the spillage zone

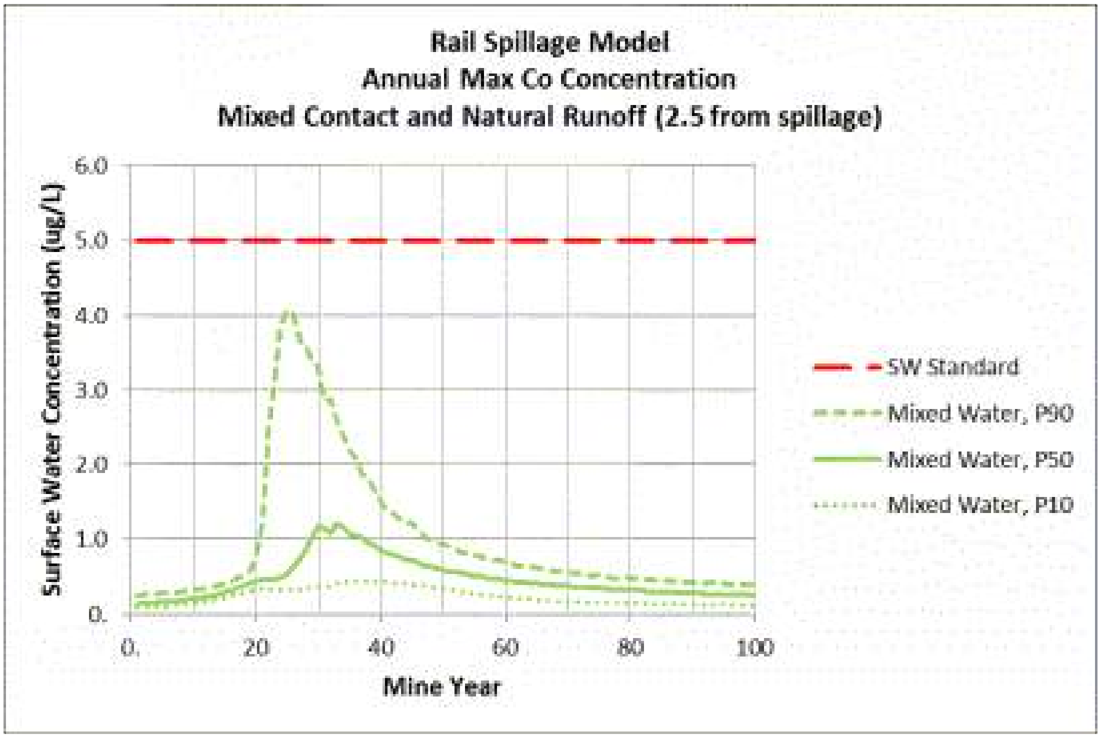


Figure 7 Cobalt concentrations at the edge of a 2.5-m buffer

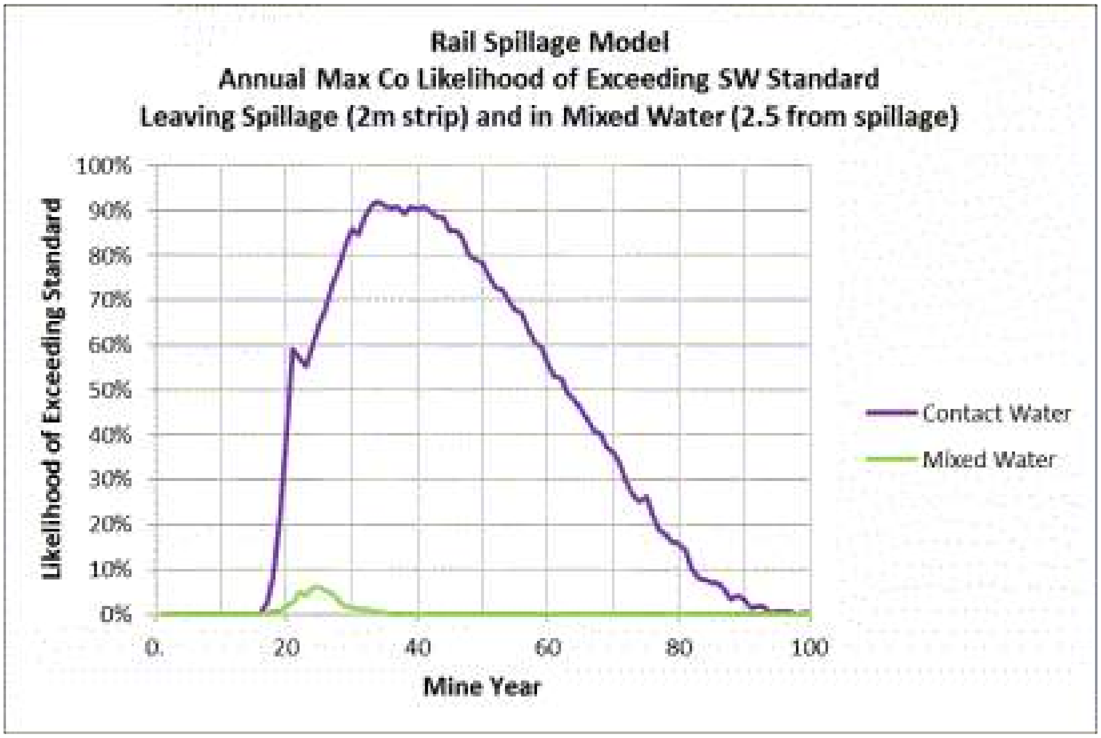


Figure 8 Cobalt likelihood of exceedance

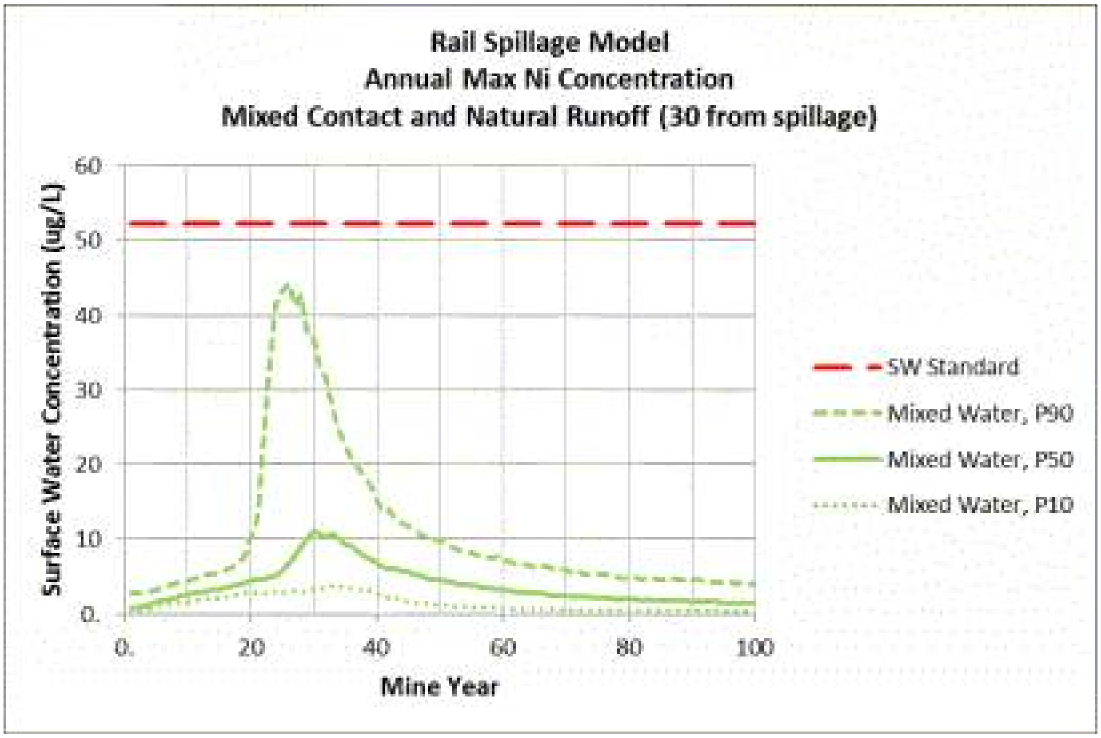


Figure 9 Nickel concentrations at the edge of a 30-m buffer

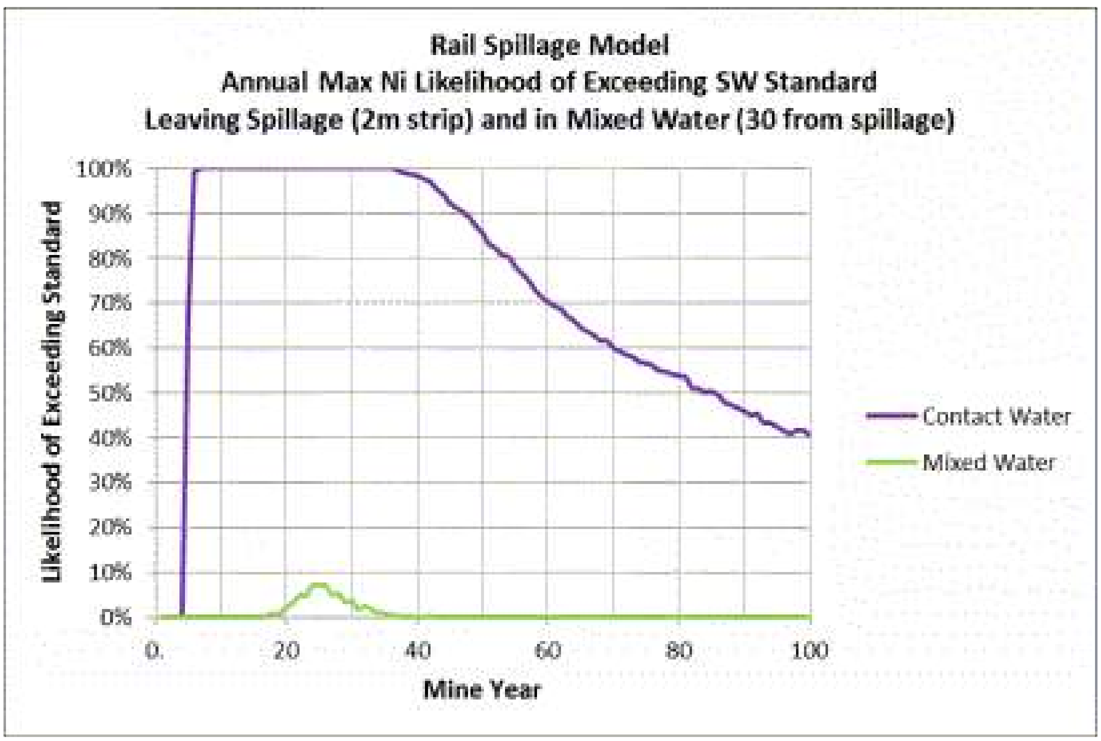


Figure 10 Nickel likelihood of exceedance

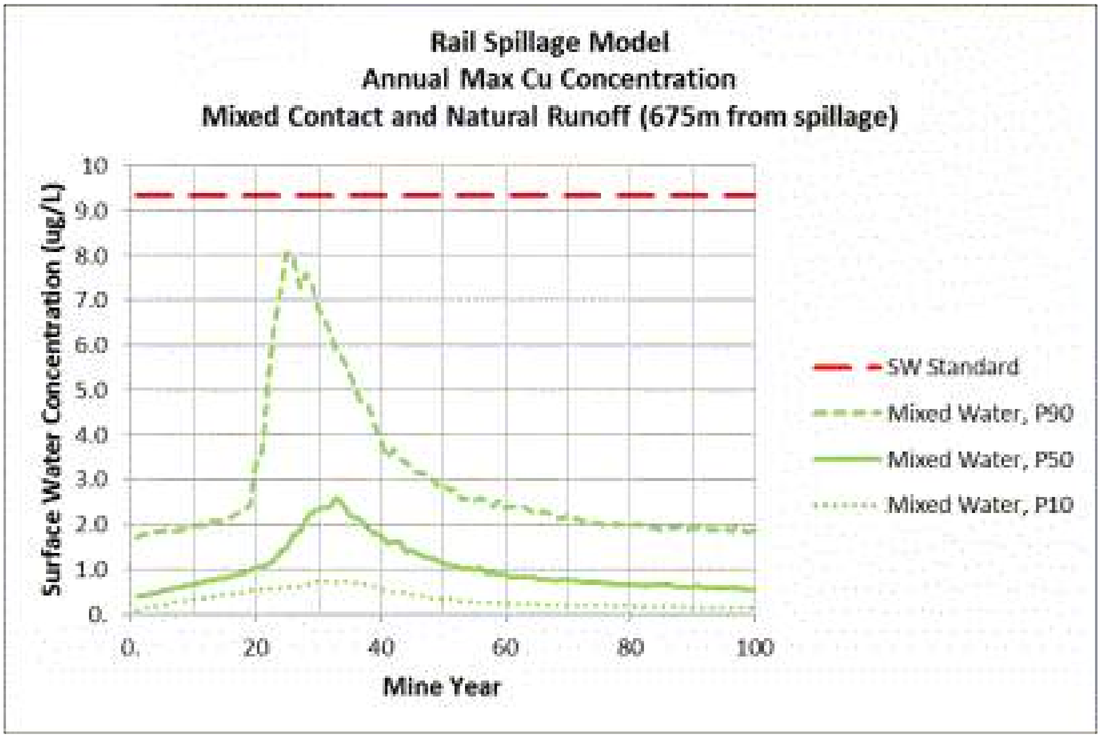


Figure 11 Copper concentrations at the edge of a 675-m buffer

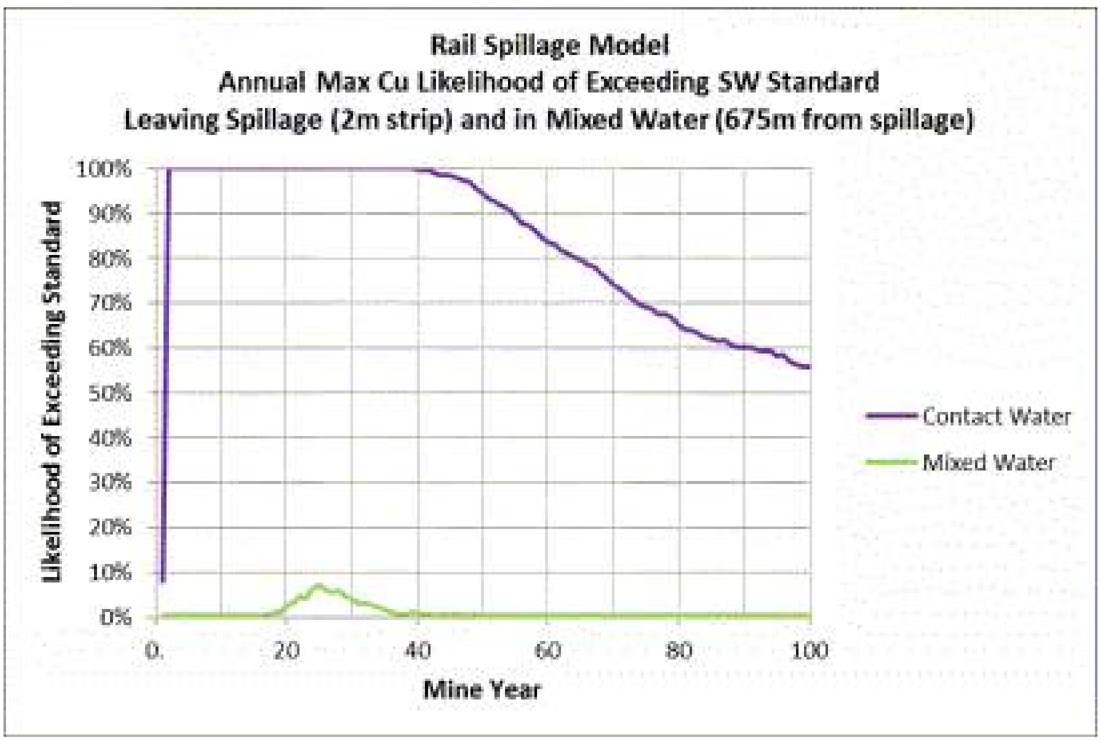


Figure 12 Copper likelihood of exceedance

Attachment F

Foreseeable 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

    i. 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

    i. The 10 year plan for St. Louis County road projects was provided: http://www.stlouiscountymn.gov/Portals/0/Library/Land-Property/Maps/Map%20Gallery/Transportation/Road-Construction-10YearPlan-2011-2020.pdf and is subject to change based on funding.

    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

POLYMET
MINING

NorthMet Project

Wetland Analysis Work Plan

Version 3

October 13, 2011

NorthMet Project
Wetland Analysis Work Plan
Version 3

Table of Contents

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 sulfide-bearing 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.

1. 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:

<u>Mine to Plant Rail</u>

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 pre-settlement wetland, lakes, and deepwater acreage within the Partridge River and Embarrass River watersheds will be developed in GIS using the following steps:

1. 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 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

BARR

Zim Wetland Mitigation Site

Wetland Mitigation Plan

Poly Met Mining, Inc.

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Zim Wetland Mitigation Site
Wetland Mitigation Plan

August 2016

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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 Subtotal1	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.
(2) Totals may not sum due to rounding.

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 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) 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 draw-downs, 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, non-invasive 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, 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.

5.6.4 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 clay-rich) 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**

Well ID	Current Land Use	During the Entire Growing Season										2012-2016	2013-2016	Drainage Status
		2012		2013		2014		2015		2016				
		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)	# 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)	
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
S3	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 swamp	Tamarack, black spruce, Labrador 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)	**39.04**

(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 swamp	Balsam fir, tamarack, and raspberry	Saturated 17 inches below the ground surface	Peat	3.08
				Total (acres)(1)	**15.87**

(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.
    - 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.
  - 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 guide 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);
    - 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

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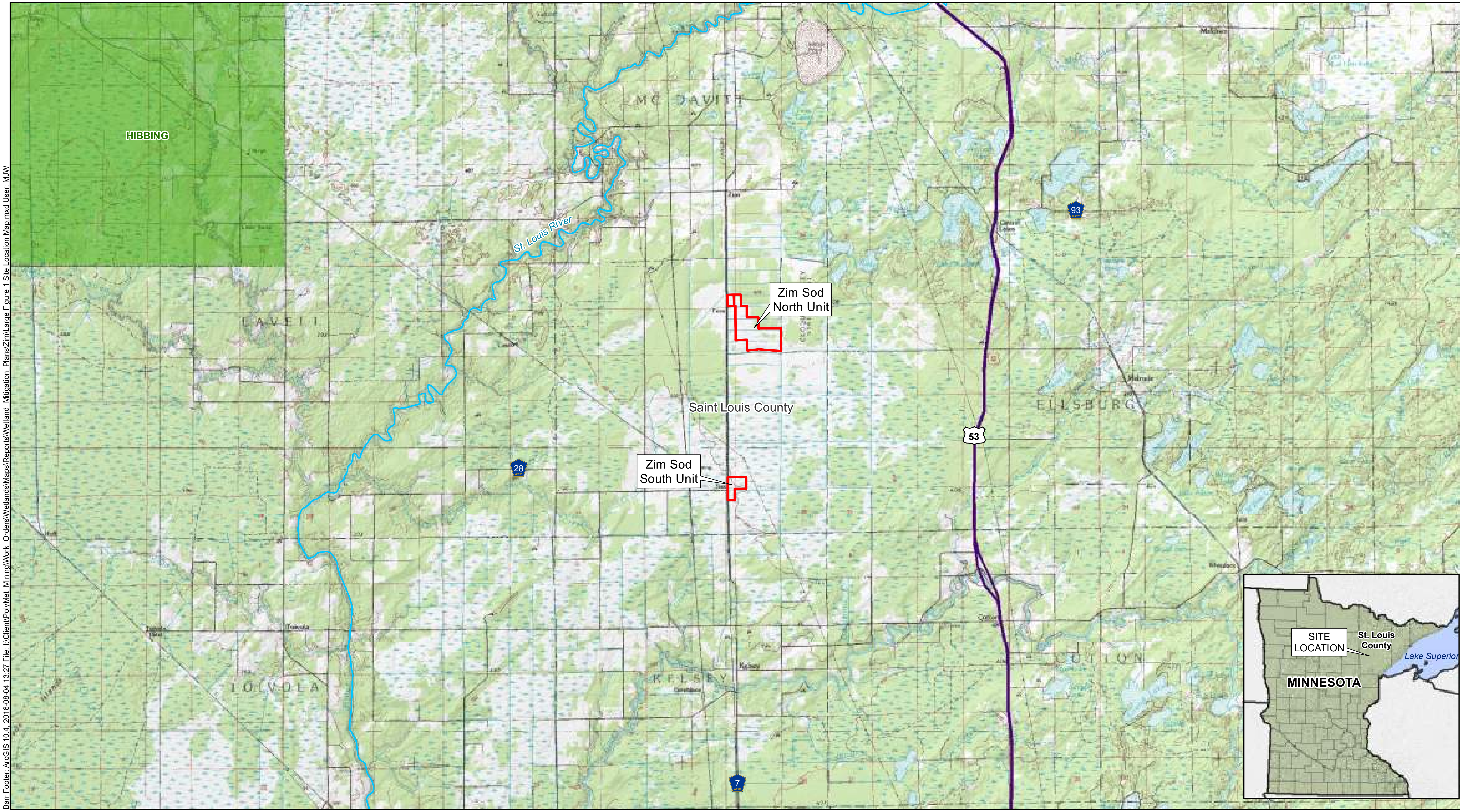
Large Figures



Project Boundaries
Municipality

0 1 2 4
Miles

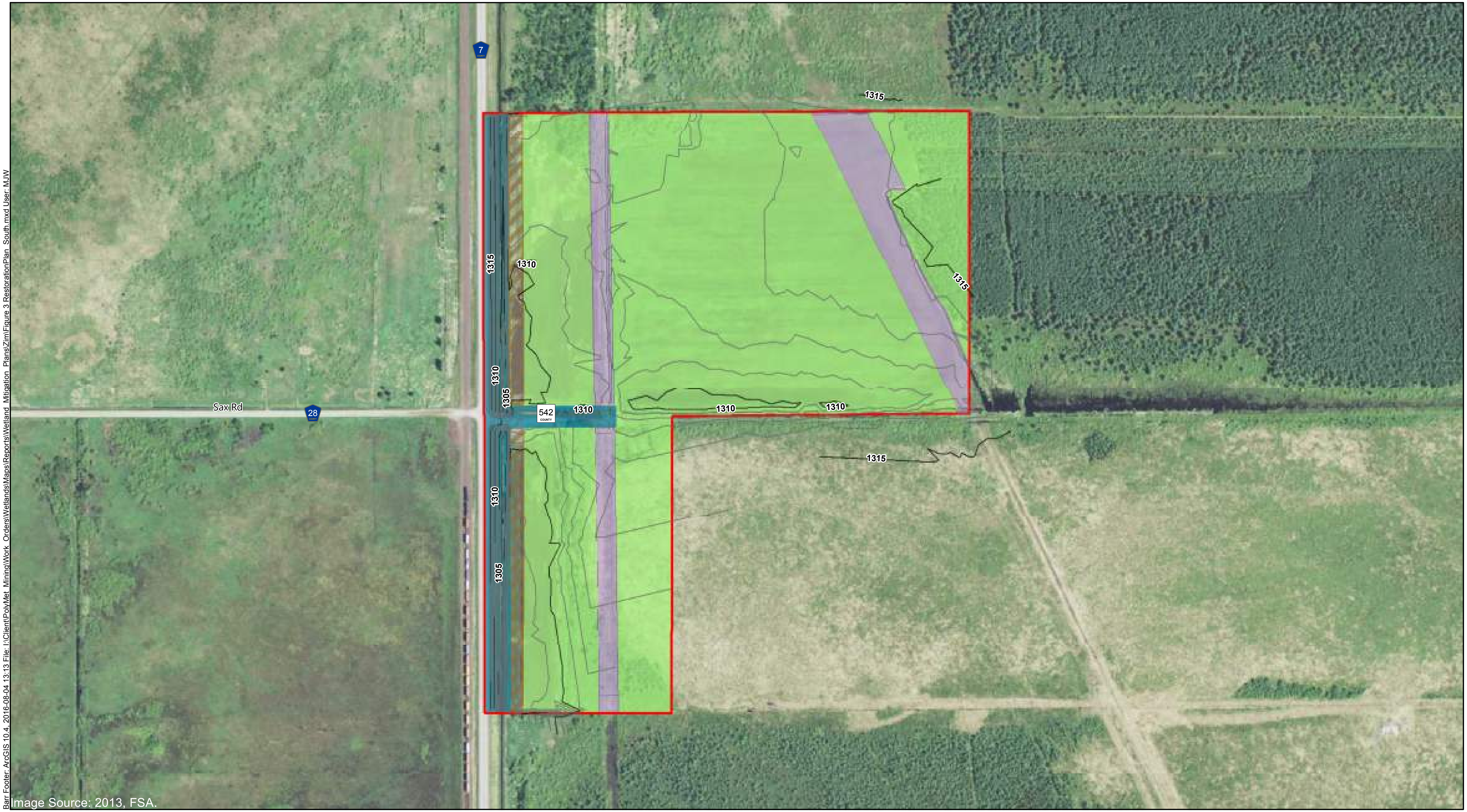
Large Figure 1
SITE LOCATION MAP
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota

Wetland Restoration Plan
Coniferous Bog/Swamp
Ditch
Homestead
None
ROW
Upland Buffer

Surface Elevation
5-Ft Contour
1-Ft Contour
North Unit Boundary

0 425 850 1,700
Feet

Large Figure 2
NORTH UNIT WETLAND RESTORATION PLAN
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota

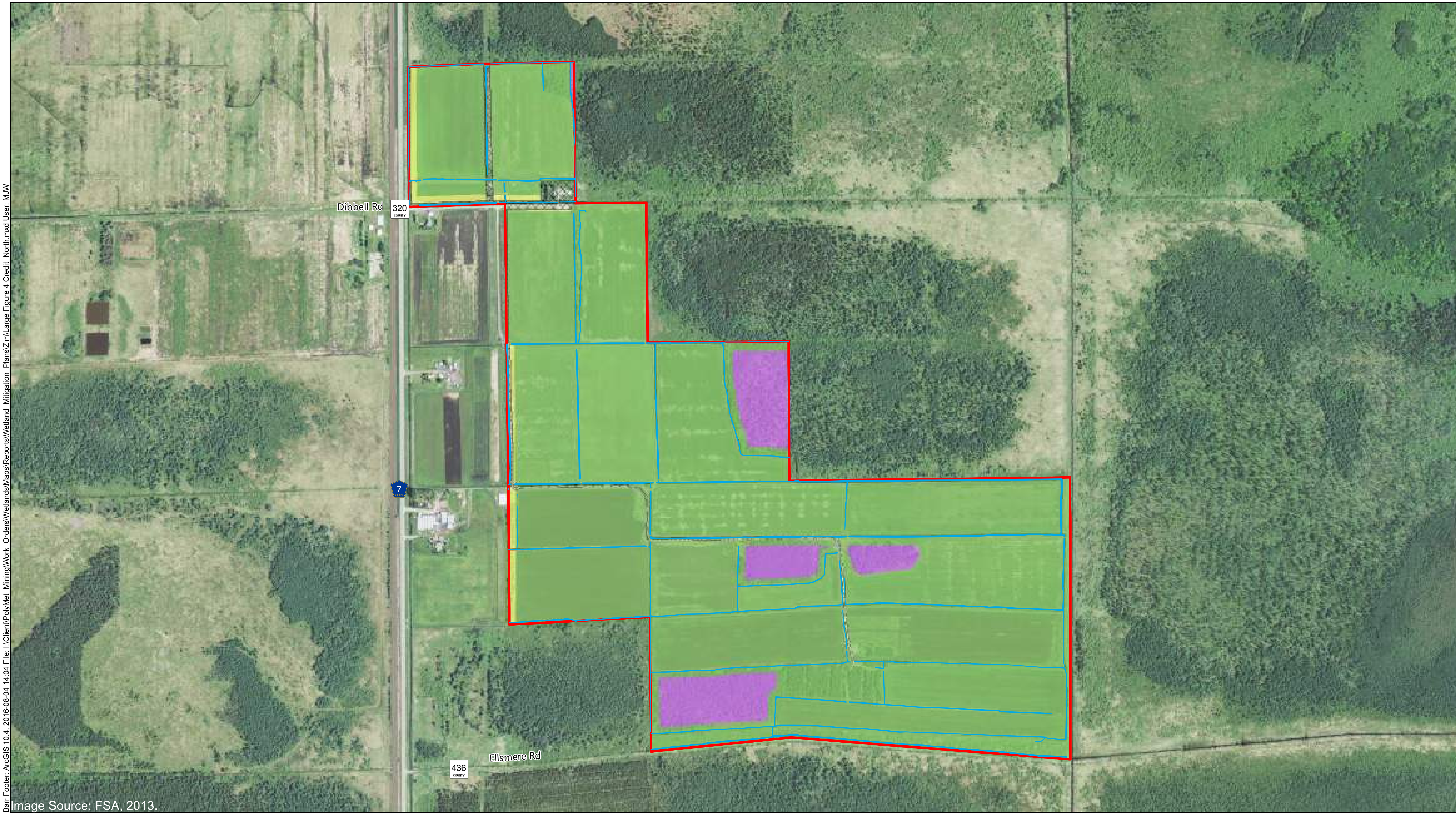


Wetland Restoration Plan
- Coniferous Bog/Swamp
- Open Bog
- ROW
- Upland Buffer

Surface Elevation Contours
- 5-Ft Contour
- 1-Ft Contour
- South Unit Boundary

0 200 400 800
Feet

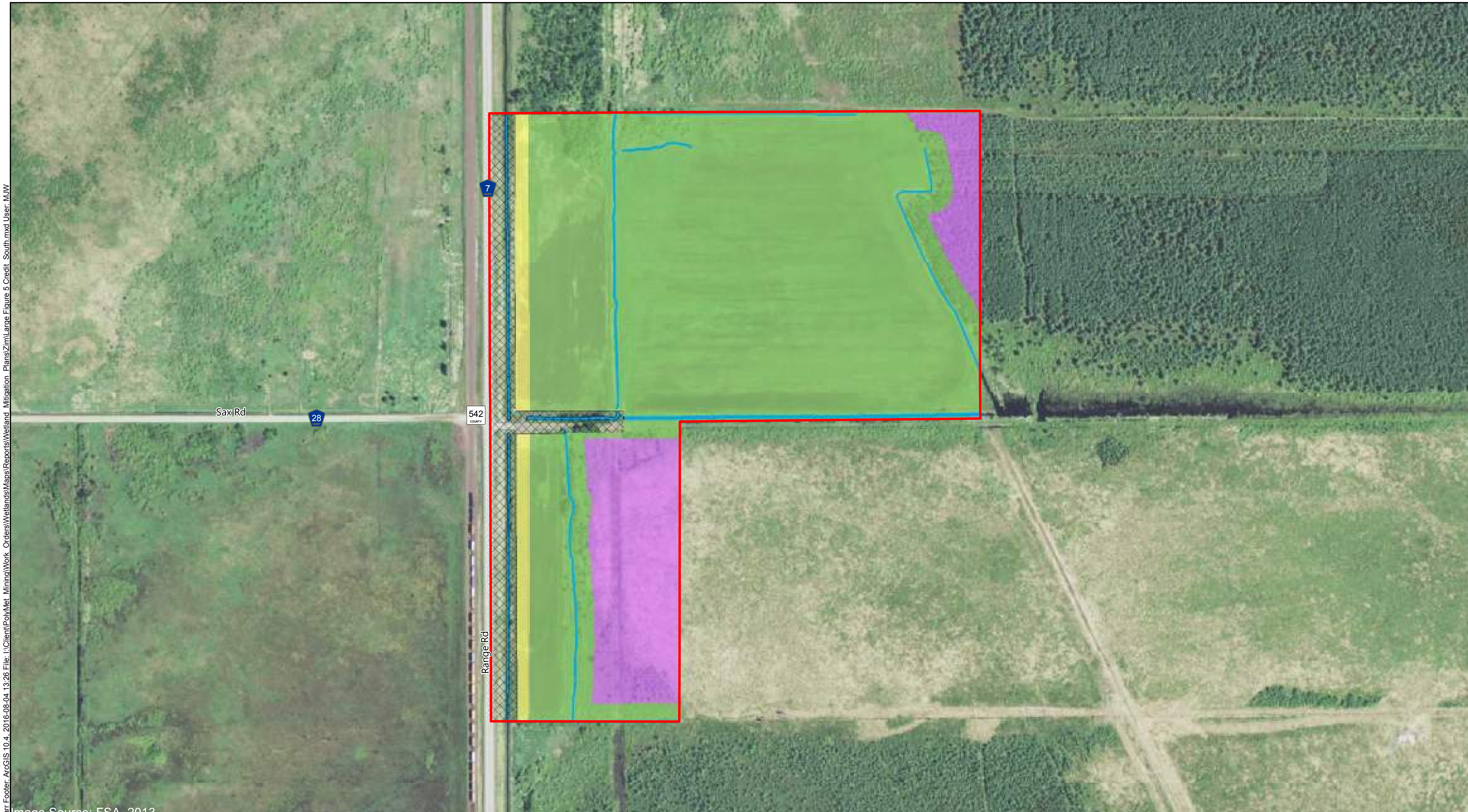
Large Figure 3
SOUTH UNIT WETLAND RESTORATION PLAN
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



Wetland Credits
- Drained - 100%
- Partially Drained - 50%
- Upland Buffer - 25%
- Impact - 0%
- No Credit - 0%
- Ditches
- North Unit Project Boundary

0 425 850 1,700
Feet

Large Figure 4
NORTH UNIT WETLAND MITIGATION CREDIT AREAS
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



Wetland Credits
- Drained - 100%
- Partially Drained - 50%
- Upland Buffer - 25%
- Impact - 0%
- No Credit - 0%
- Ditches
- South Unit Project Boundary

0 200 400 800
Feet

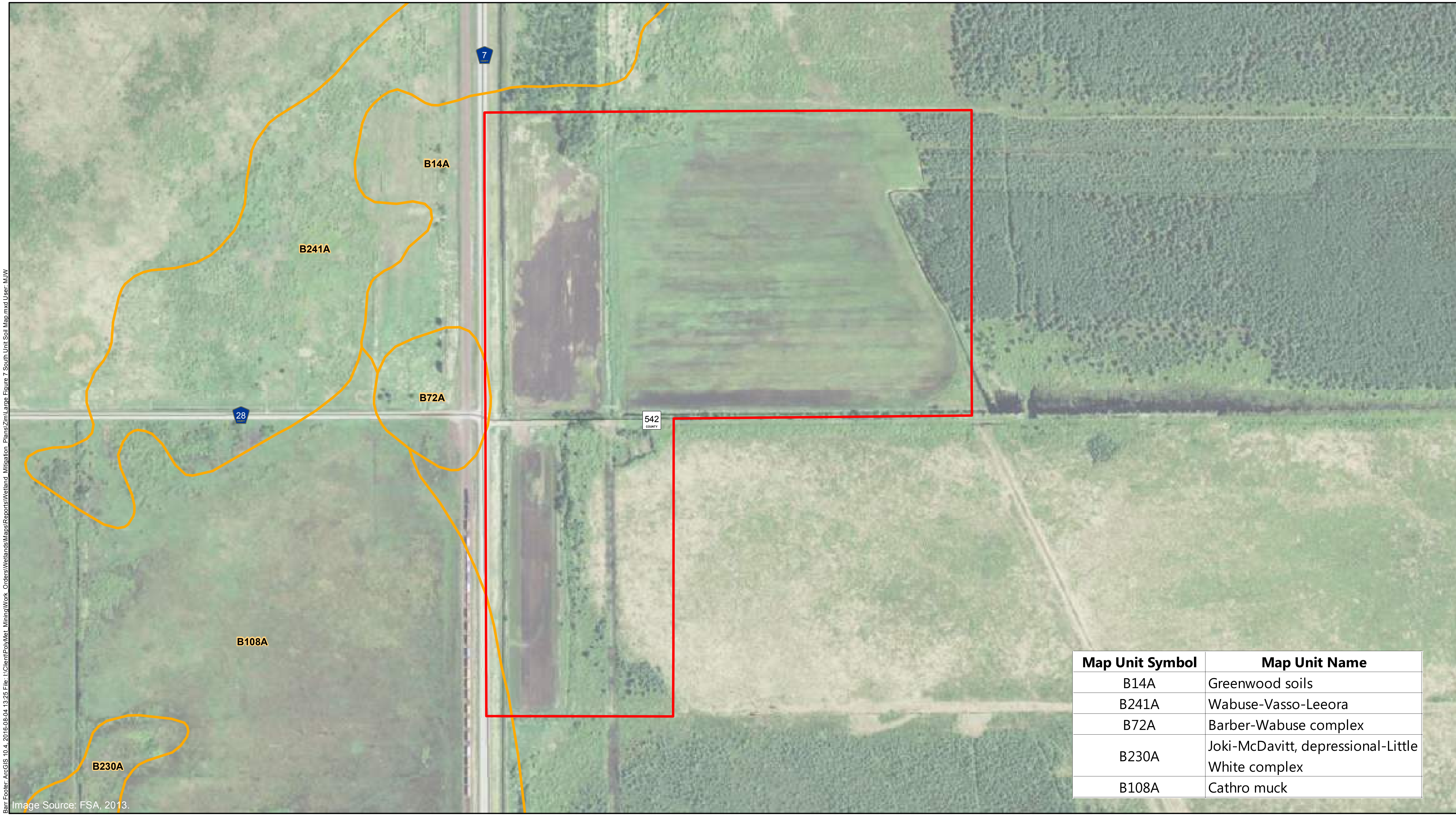
Large Figure 5
WETLAND MITIGATION CREDIT AREAS
Zim Wetland Mitigation Site South
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota

Map Unit Symbol	Map Unit Name
B14A	Greenwood Soils
F120A	Grayling-Cromwell complex

St. Louis County Soil Survey (2015) with Map Unit Symbol
Project Boundary

0 400 800 1,600
Feet

Large Figure 6
NORTH UNIT SOIL MAP
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

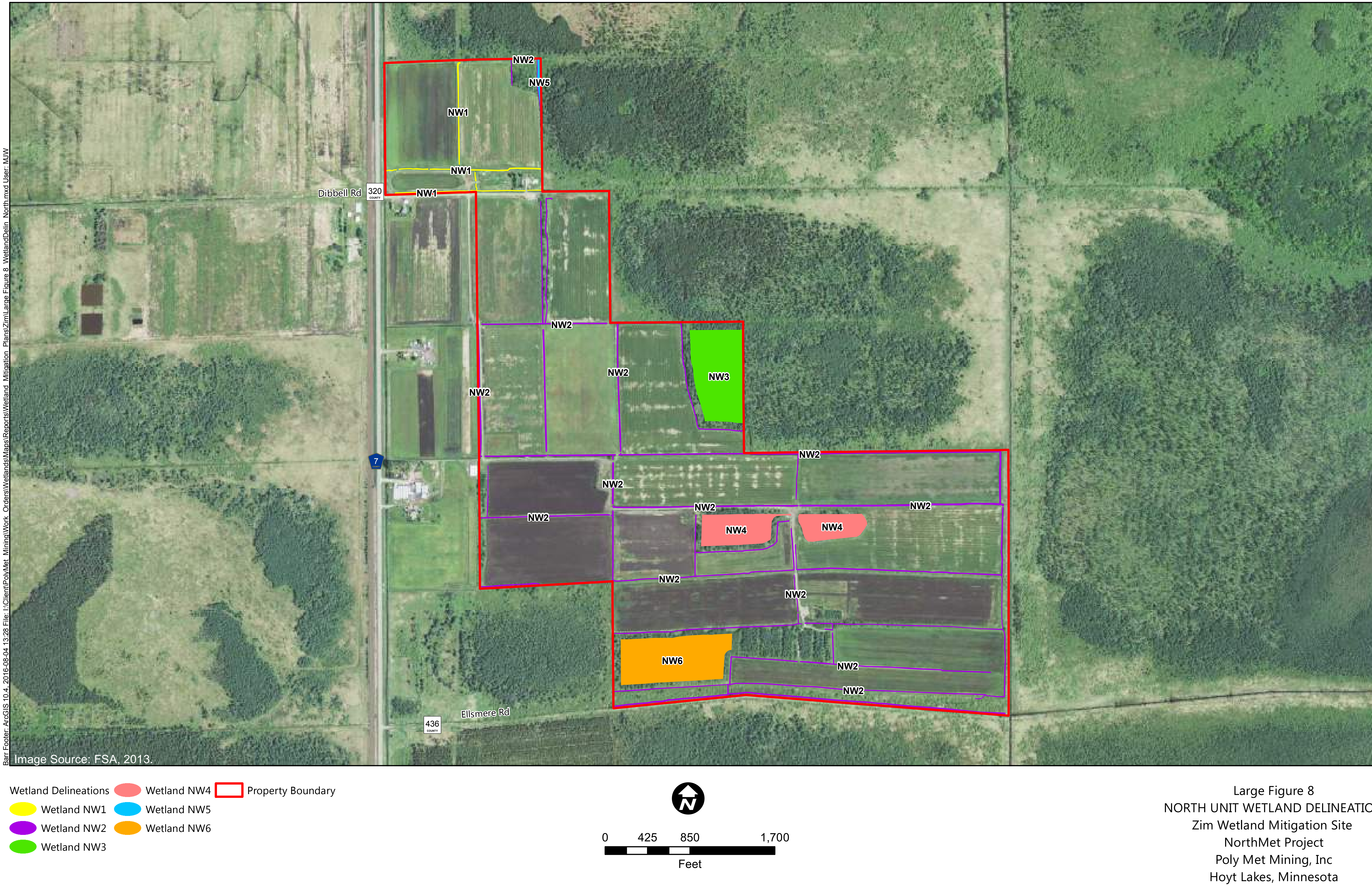


Map Unit Symbol	Map Unit Name
B14A	Greenwood soils
B241A	Wabuse-Vasso-Leeora
B72A	Barber-Wabuse complex
B230A	Joki-McDavitt, depressional-Little White complex
B108A	Cathro muck

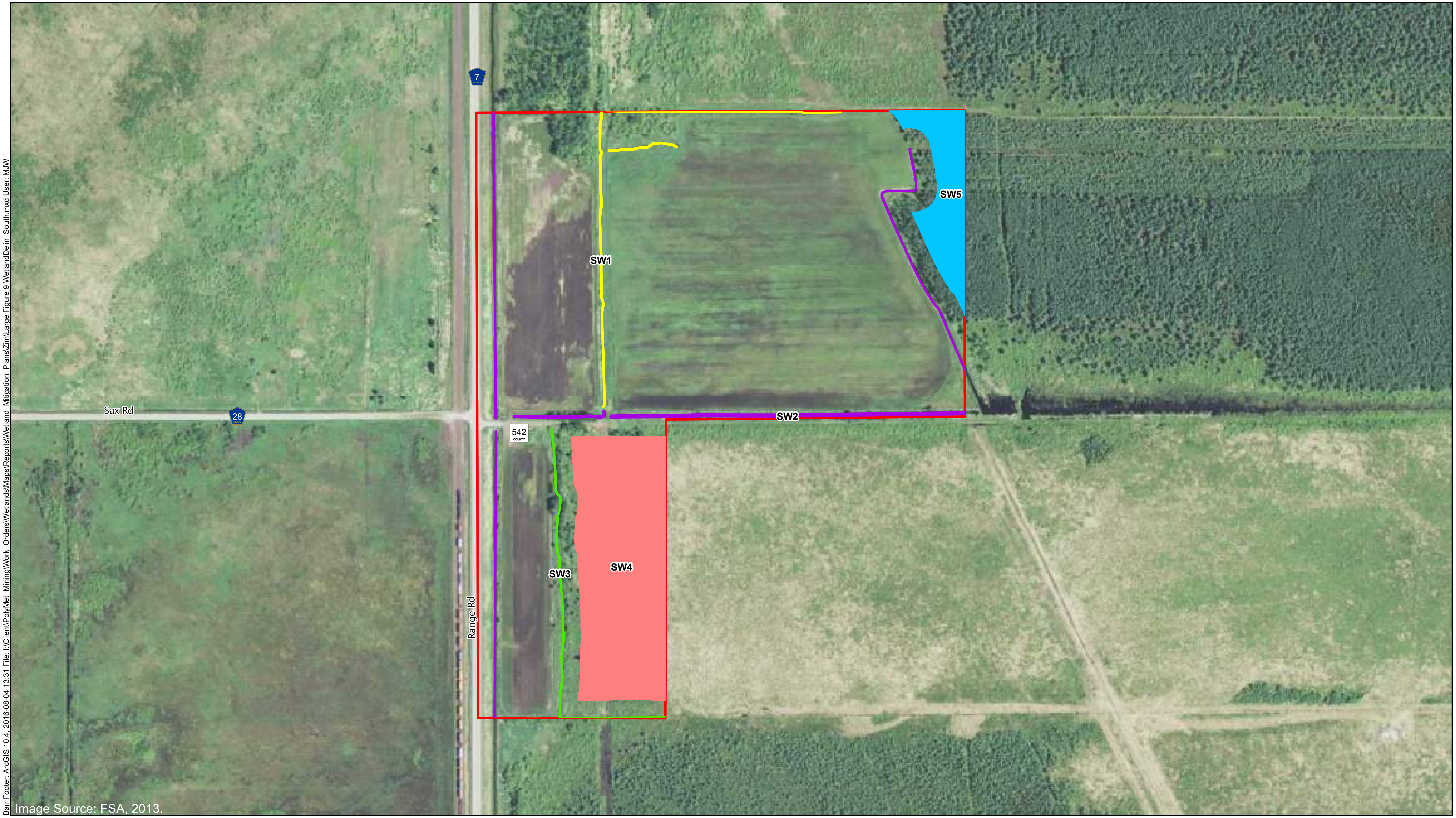
St. Louis County Soil Survey (2015) with Map Unit Symbol
Project Boundary

0 200 400 800
Feet

Large Figure 7
SOUTH UNIT SOIL MAP
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Large Figure 8
NORTH UNIT WETLAND DELINEATION
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



Wetland Delineations
Wetland SW1
Wetland SW2
Wetland SW3
Wetland SW4
Wetland SW5
Property Boundaries

0 200 400 800
Feet

Large Figure 9
SOUTH UNIT WETLAND DELINEATION
Zim Wetland Mitigation Site
NorthMet Project
PolyMet Mining, Inc
Hoyt Lakes, Minnesota

Property Boundary

Wetland Delineation

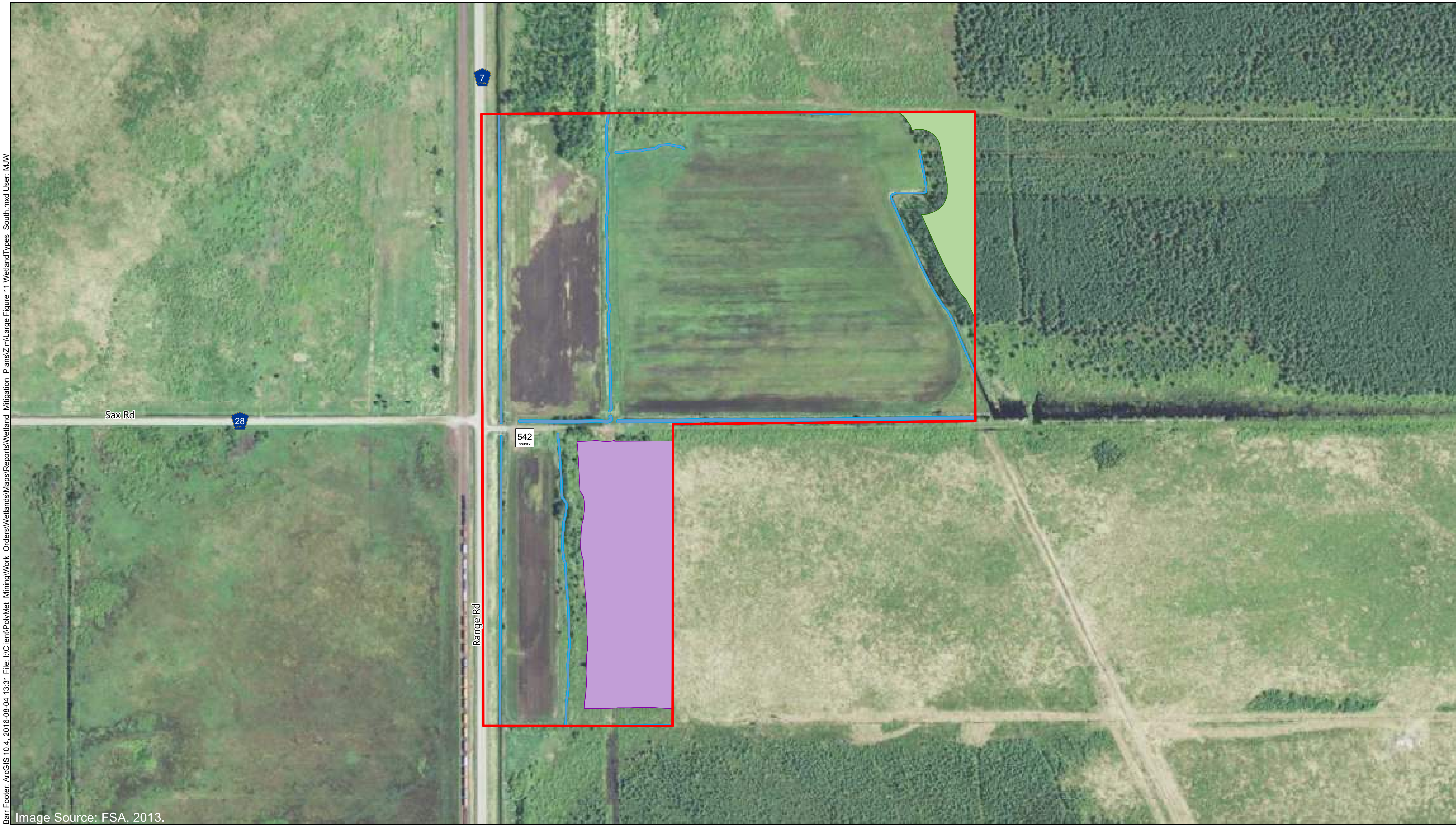
Coniferous swamp

Shallow, open water

0 425 850 1,700

Feet

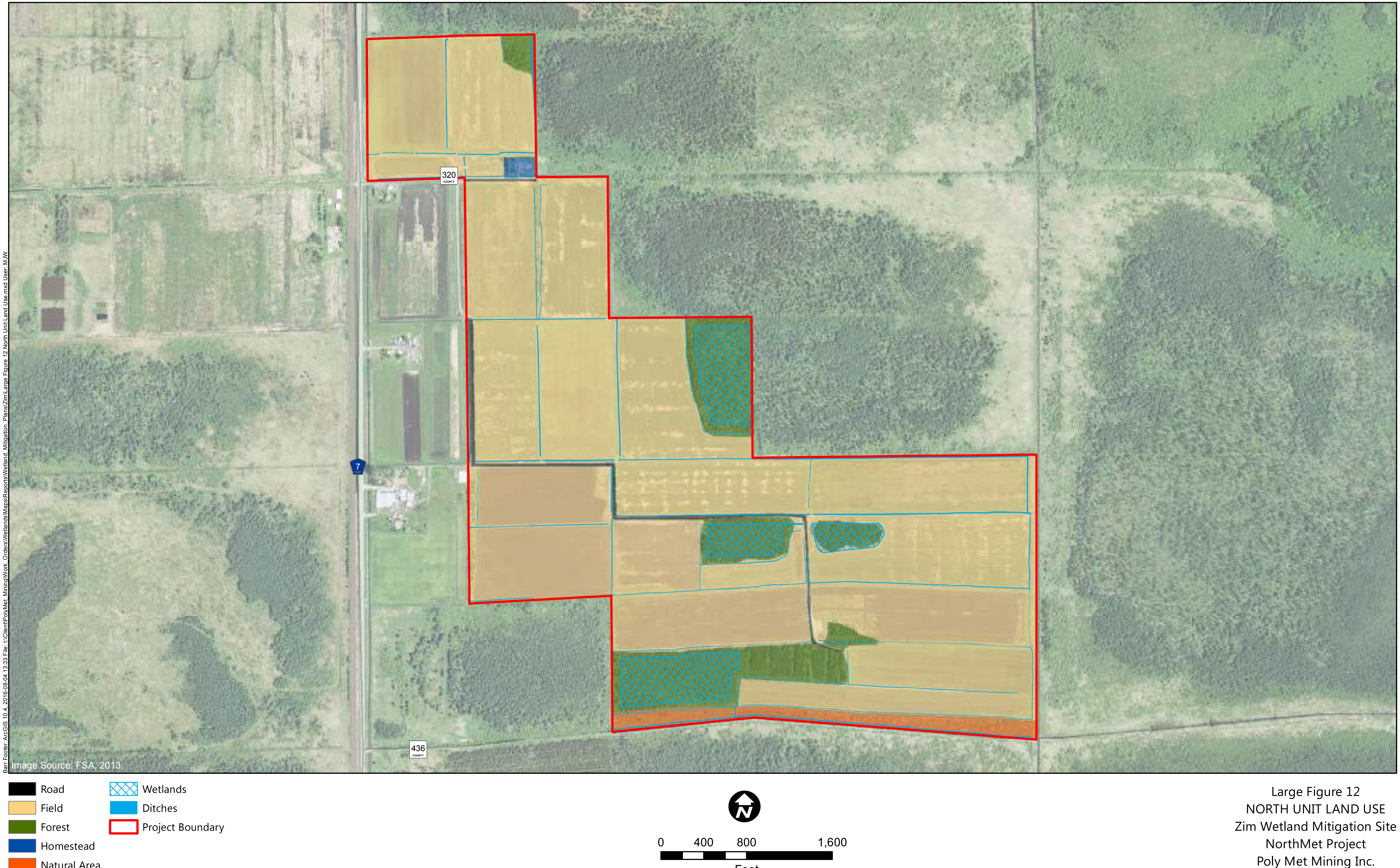
Large Figure 10
NORTH UNIT WETLAND TYPE
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



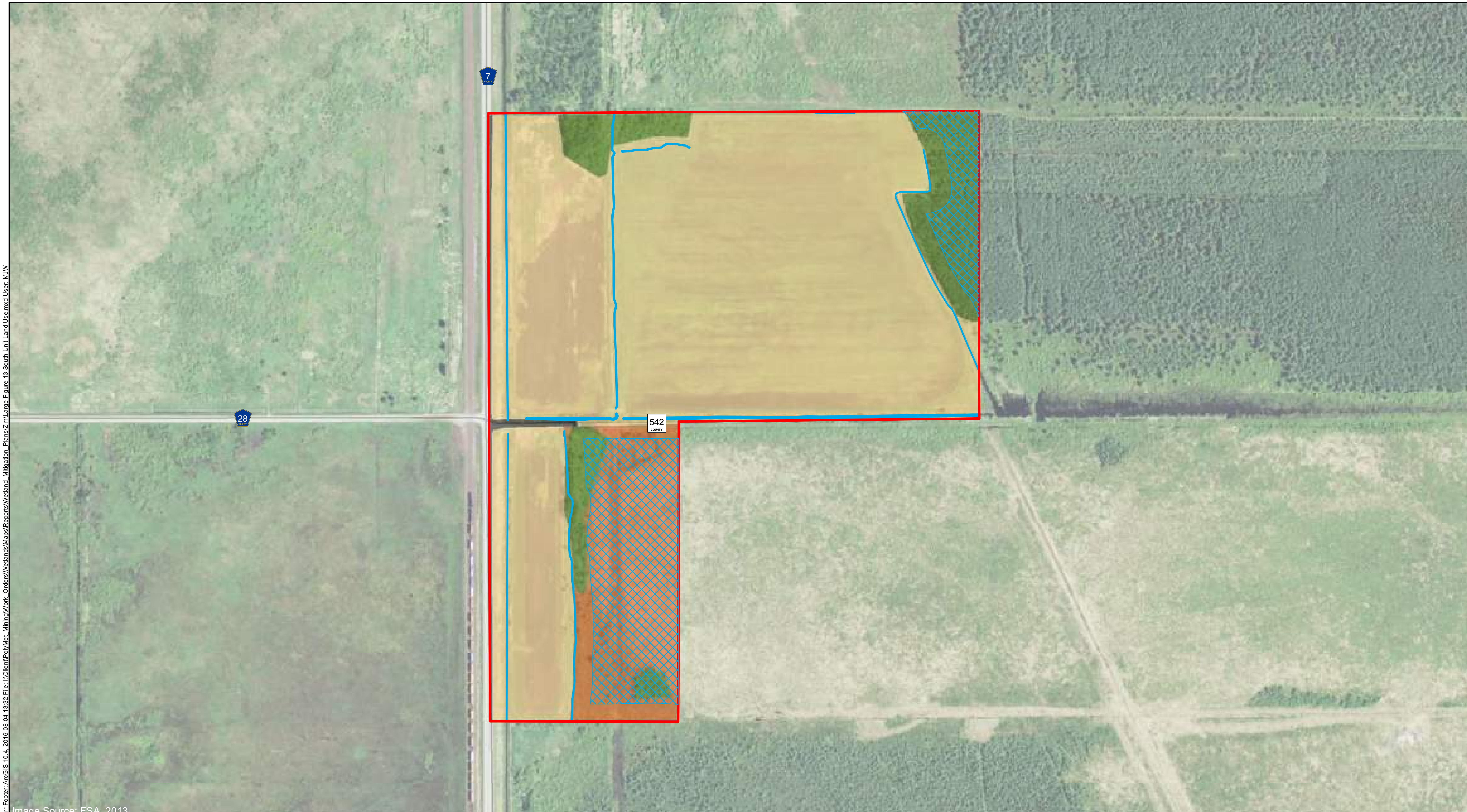
Property Boundaries
Wetland Delineation
Coniferous swamp
Open bog
Shallow, open water
Shrub swamp (Alder thickets & Shrub-carrs)

0 200 400 800
Feet

Large Figure 11
SOUTH UNIT WETLAND TYPE
Zim Wetland Mitigation Site
NorthMet Project
PolyMet Mining, Inc
Hoyt Lakes, Minnesota



Large Figure 12
NORTH UNIT LAND USE
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

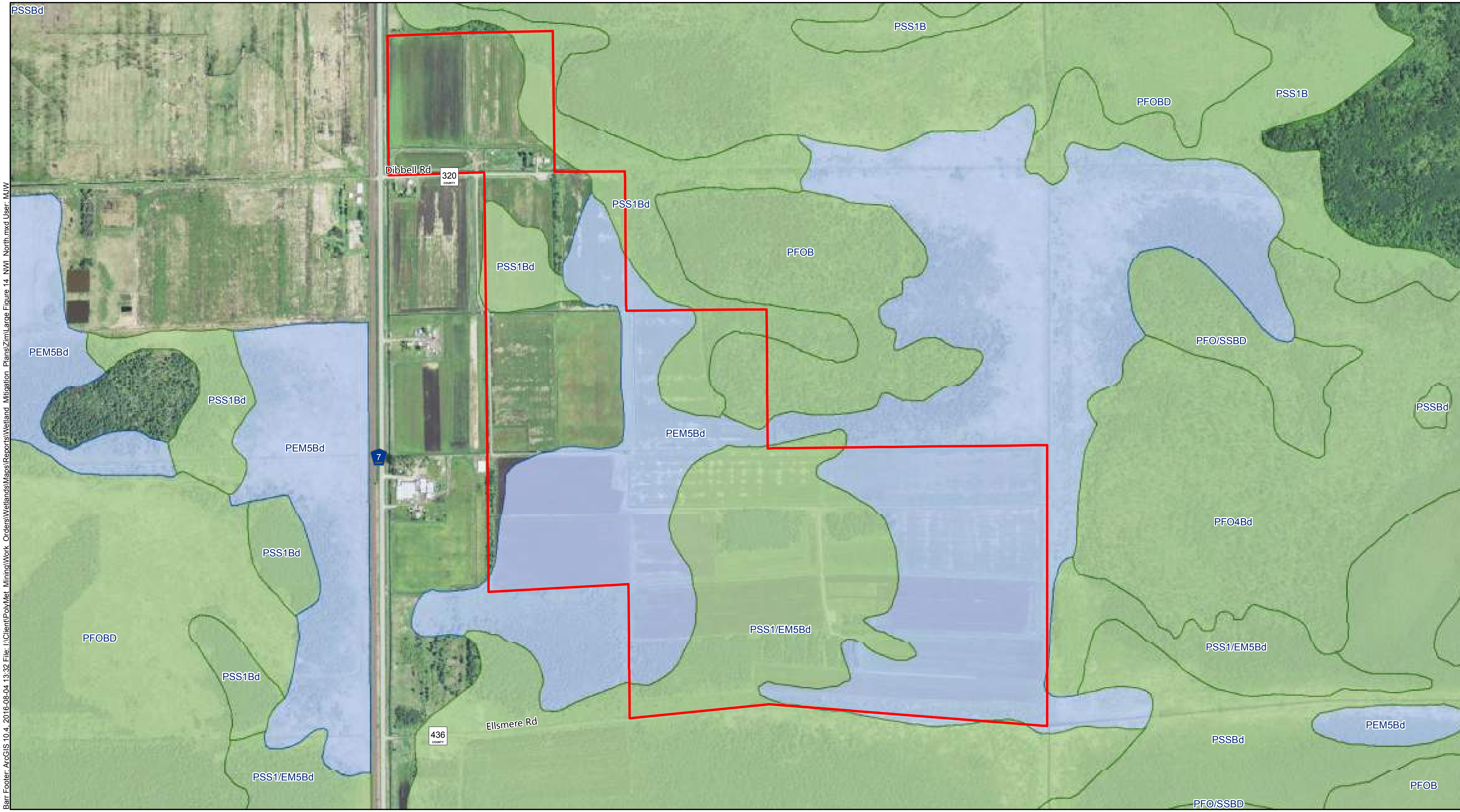


Bar Footer: ArcGIS 10.4, 2016-08-04 13:32 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetland_Mitigation_Plans\Zim\Large Figure 13 South Unit Land Use.mxd User: MJW

Road
Field
Forest
Natural Area
Wetlands
Ditches
Project Boundary

0 200 400 800
Feet

Large Figure 13
SOUTH UNIT LAND USE
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



National Wetlands Inventory (NWI)

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

Property Boundary

0 425 850 1,700

Feet

Large Figure 14

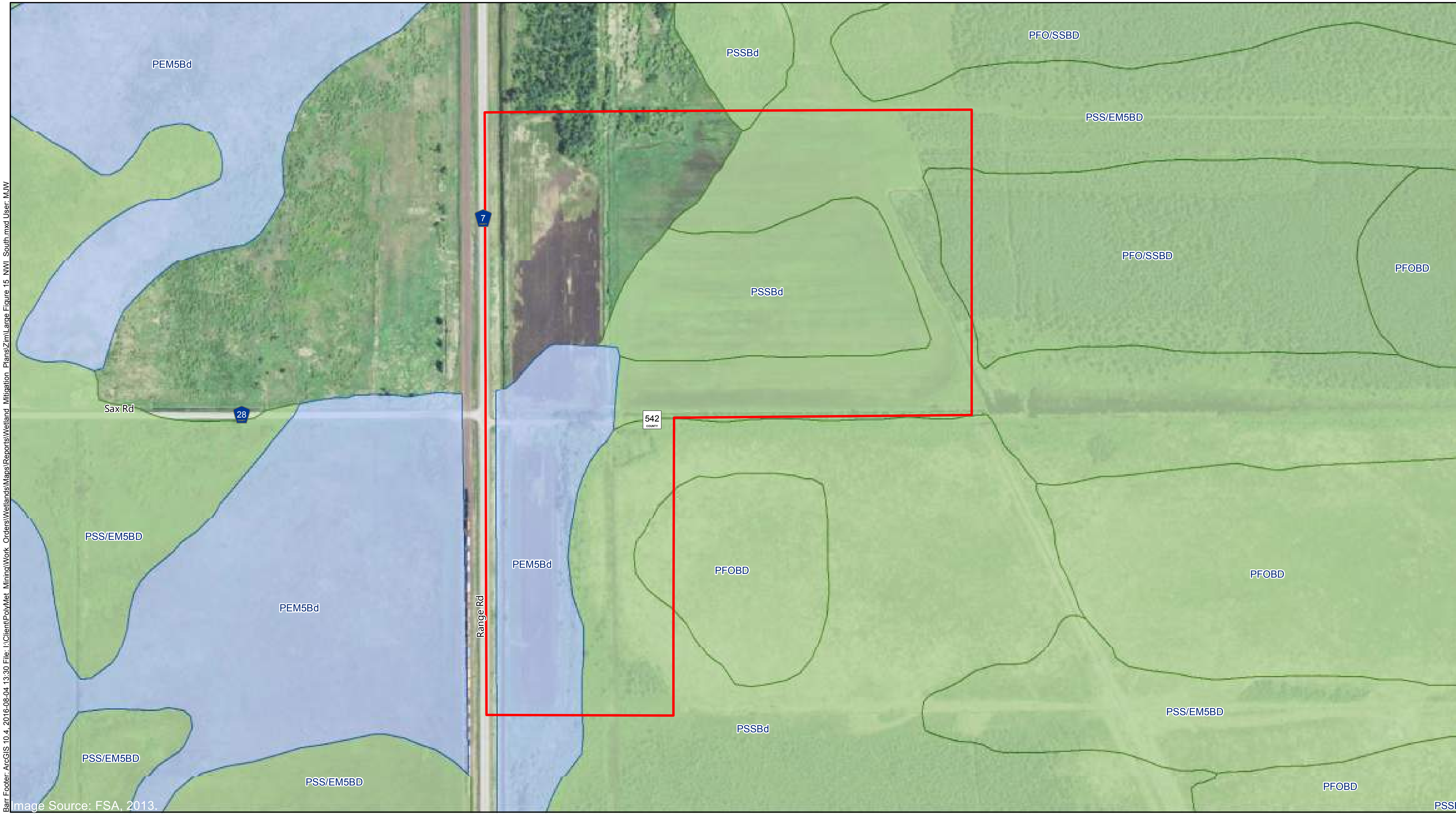
NORTH UNIT NATIONAL WETLAND INVENTORY

Zim Wetland Mitigation Site

NorthMet Project

Poly Met Mining, Inc

Hoyt Lakes, Minnesota

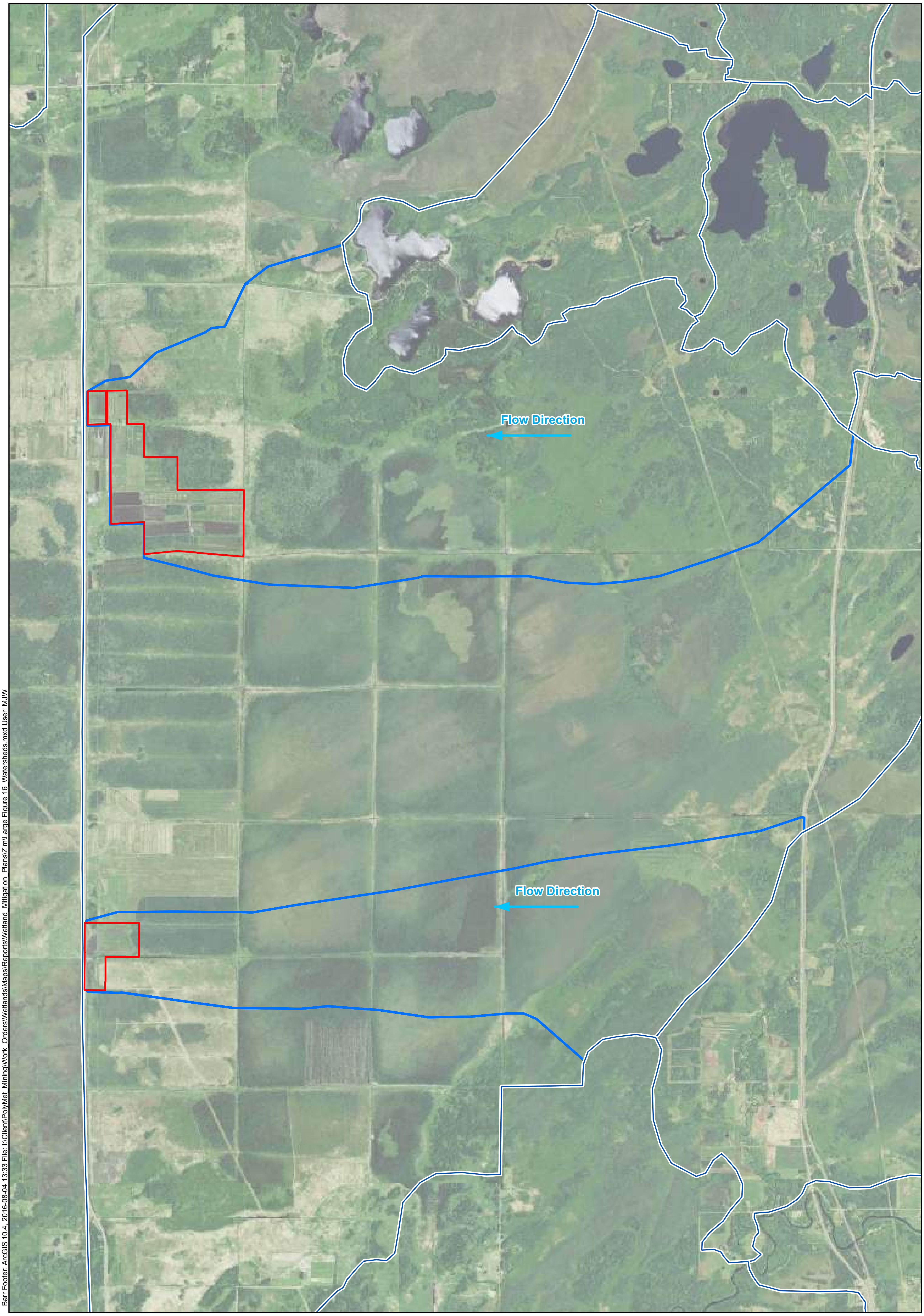


National Wetlands Inventory (NWI)
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine

Property Boundary

0 200 400 800
Feet

Large Figure 15
SOUTH UNIT NATIONAL WETLAND INVENTORY
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



Property Boundaries

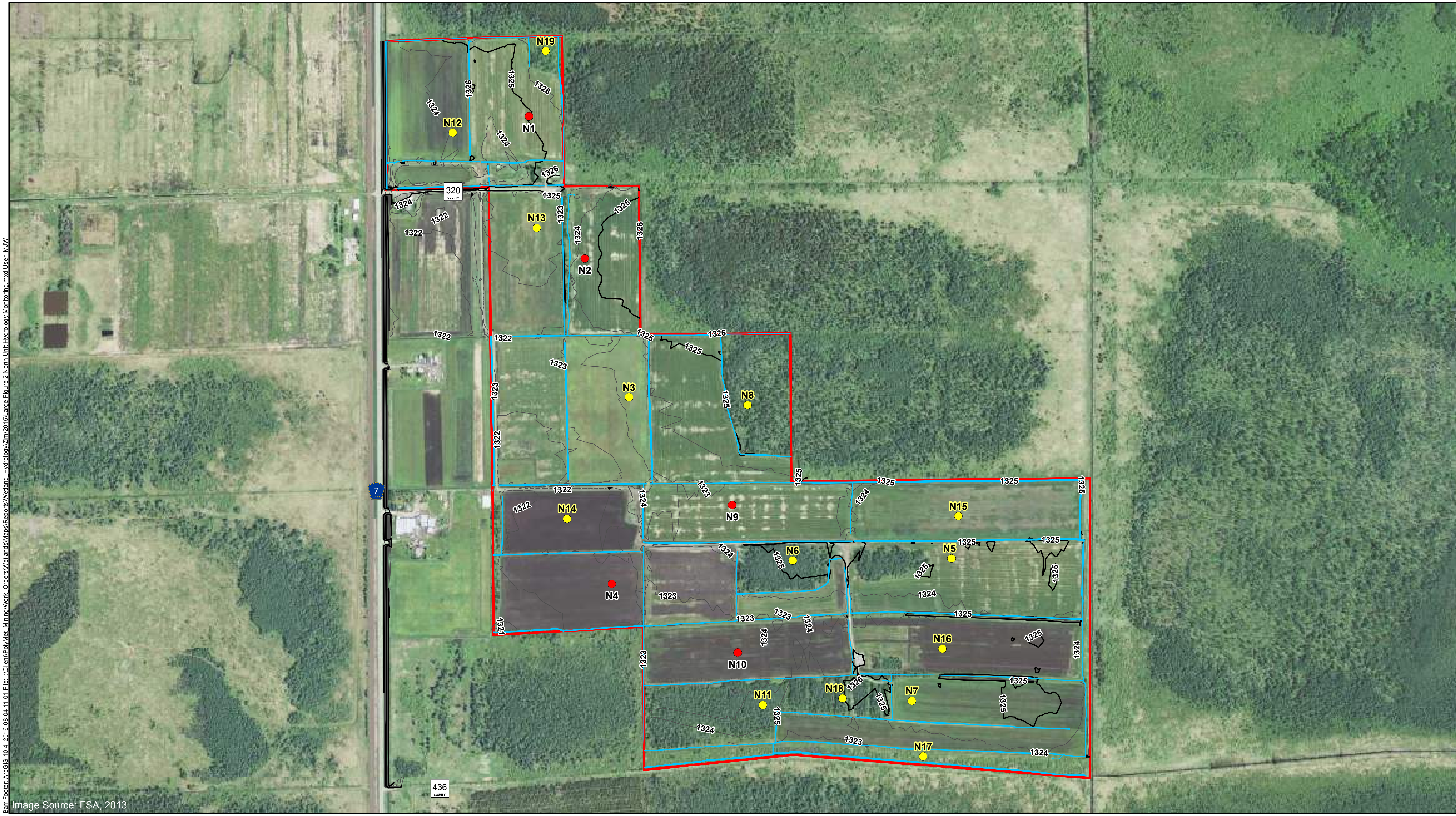
Level 8 Watersheds

Contributing Watersheds to North Unit and South Unit

0 1,750 3,500 7,000

Feet

LARGE FIGURE 16
CONTRIBUTING WATERSHEDS
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining, Inc
Hoyt Lakes, Minnesota



Monitoring Well

- Active Well
- Removed Well
- Ditches
- Project Boundary

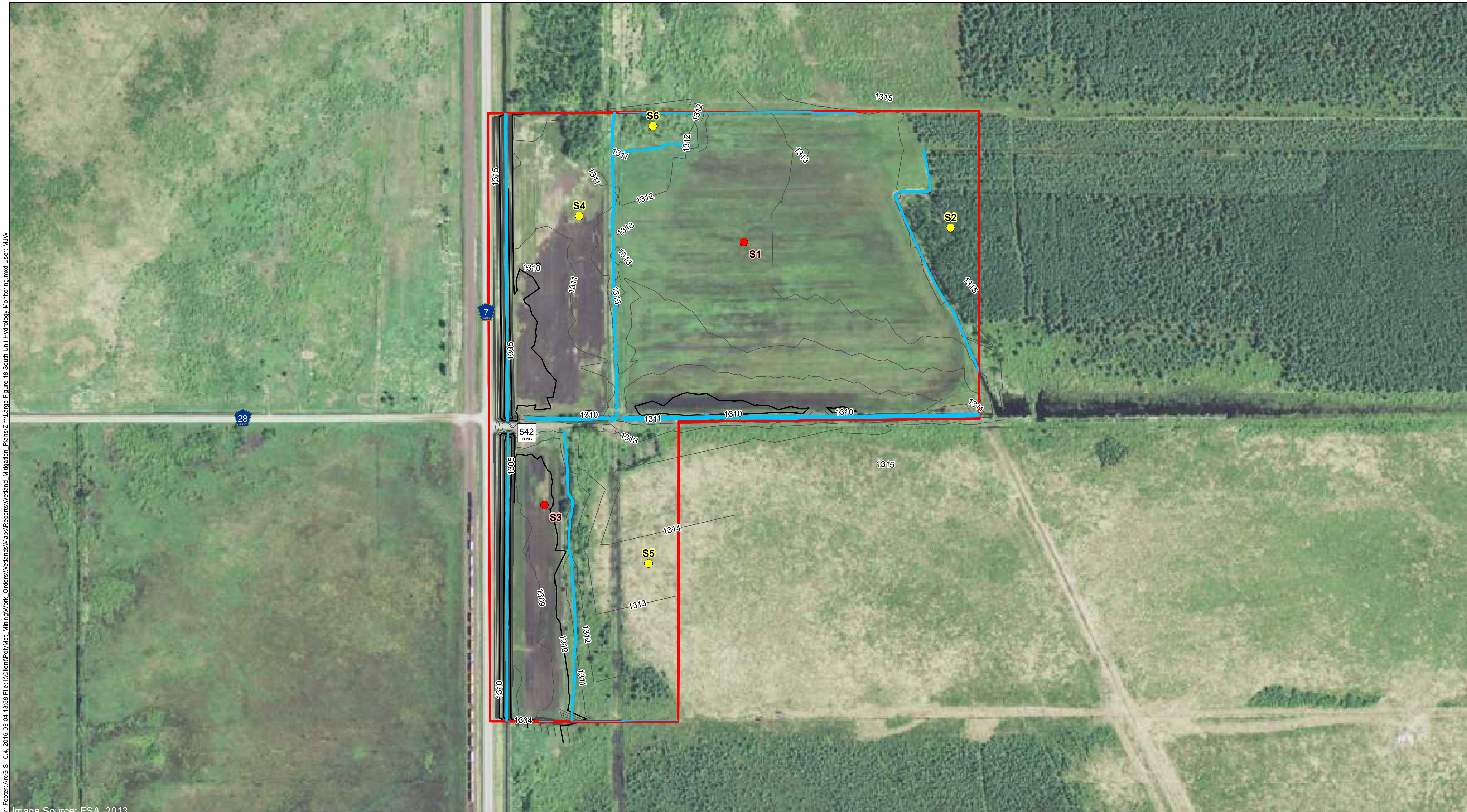
Elevation Contours

- 5-Foot
- 1-Foot

0 400 800 1,600

Feet

Large Figure 17
NORTH UNIT MONITORING WELL LOCATIONS
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Barr Footer: ArcGIS 10.4, 2016-08-04 13:58 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetland_Mitigation_Plans\Zim\Large Figure 18 South Unit Hydrology Monitoring.mxd User: MJW

Monitoring Well

Active

Removed Well

Ditches

Project Boundary

Elevation Contours

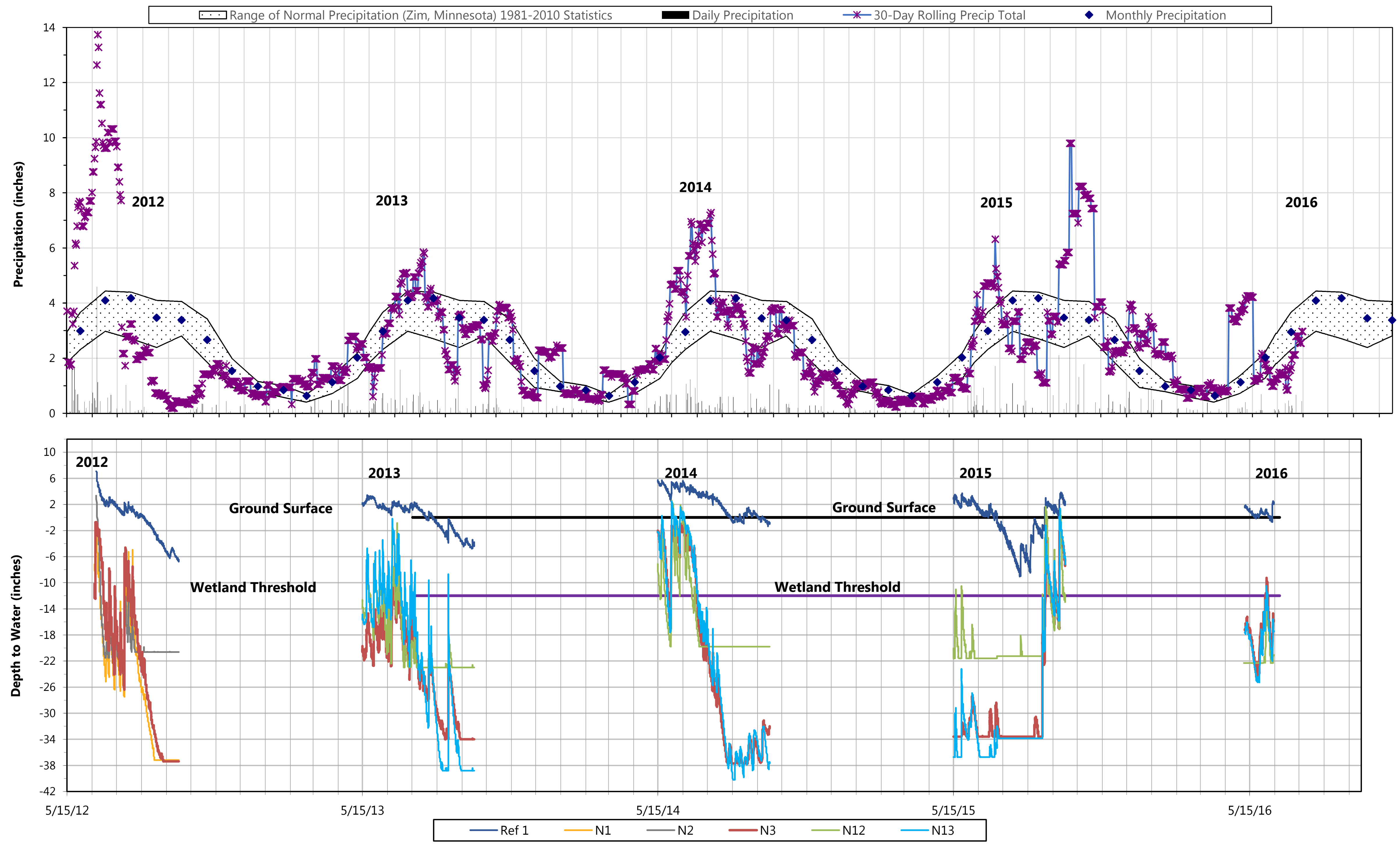
5-Foot

1-Foot

0 200 400 800

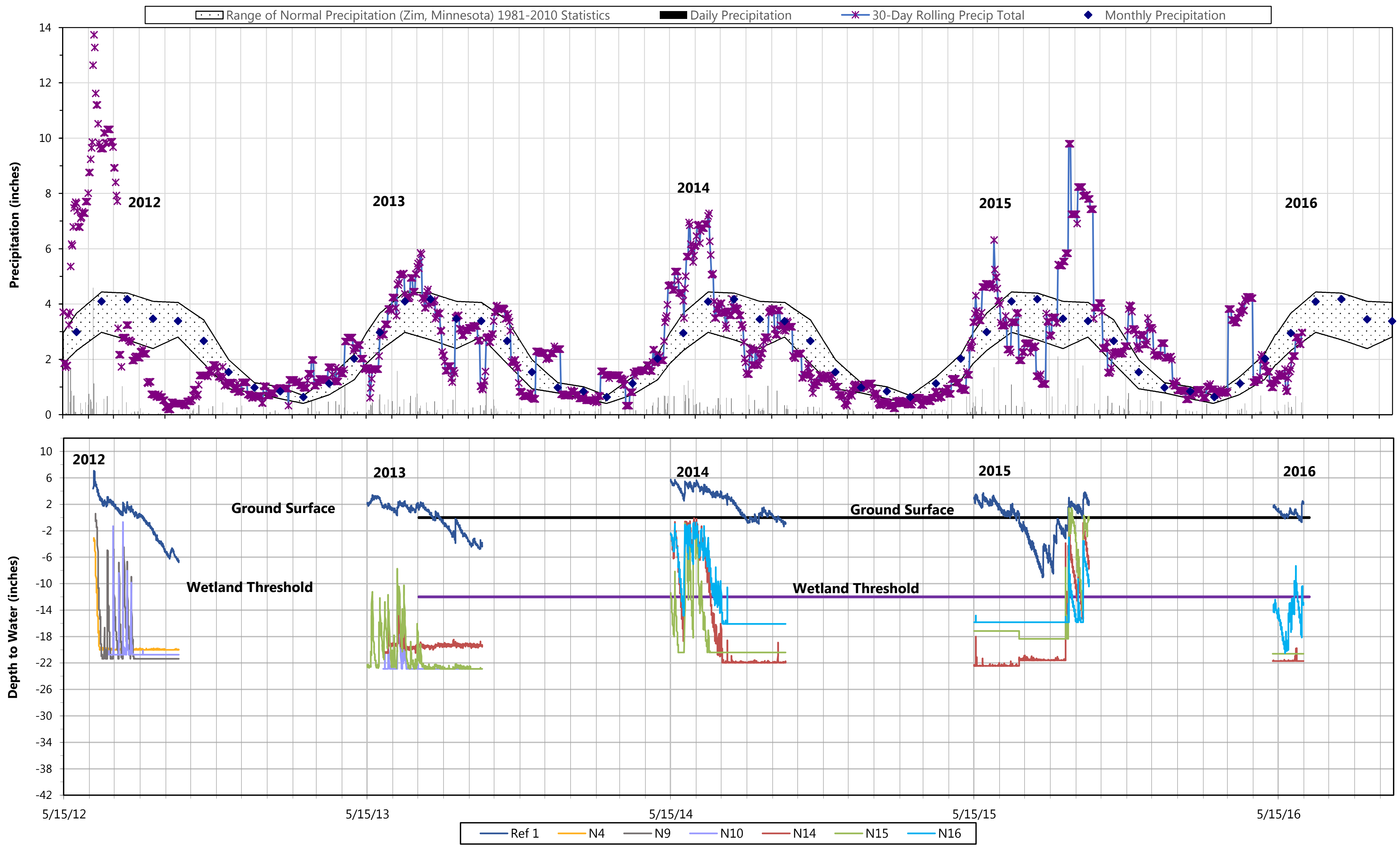
Feet

Large Figure 18
SOUTH UNIT MONITORING WELL LOCATIONS
Zim Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



NOTE: In 2016,
precipitation and logger data
is shown through June 14

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

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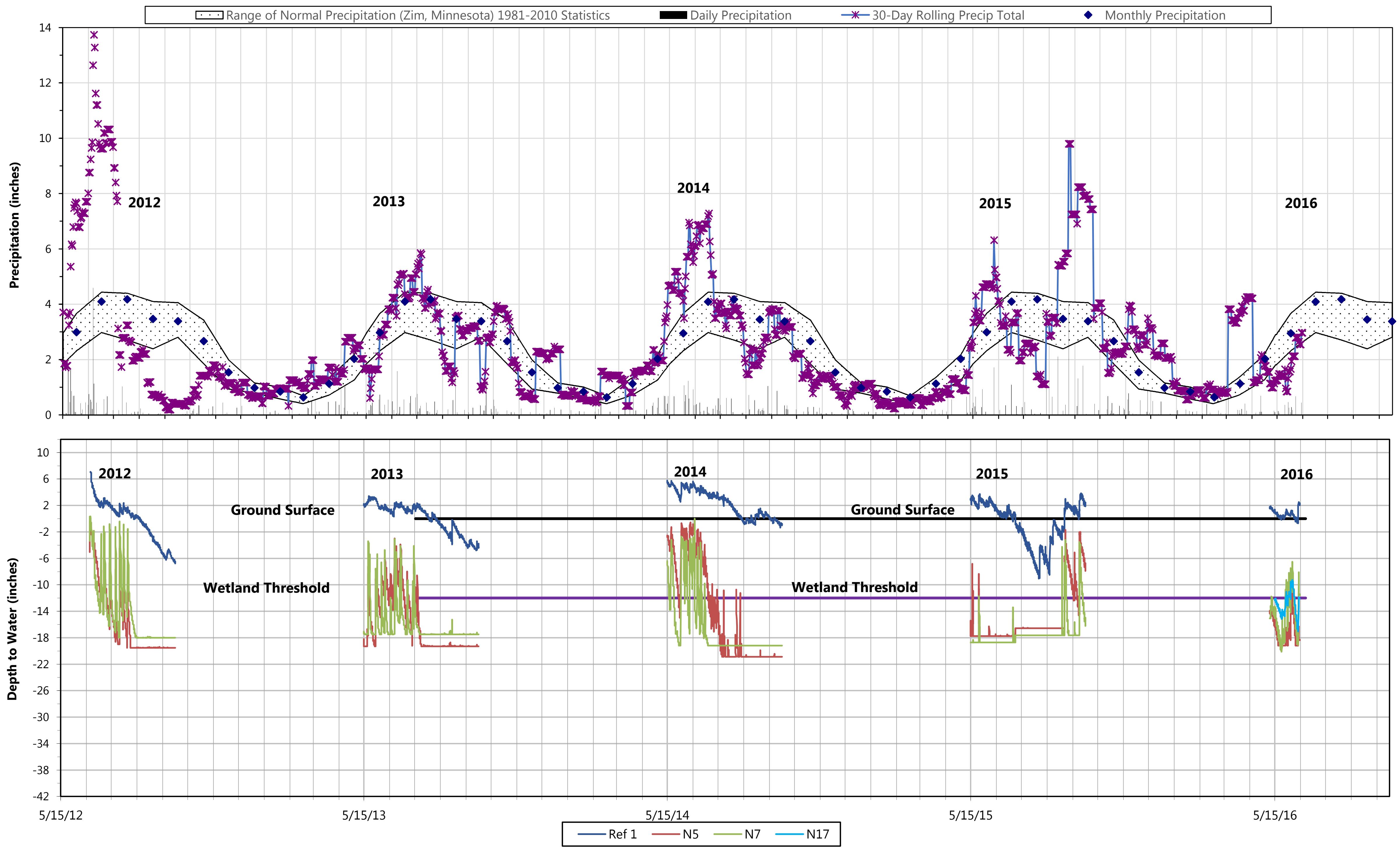
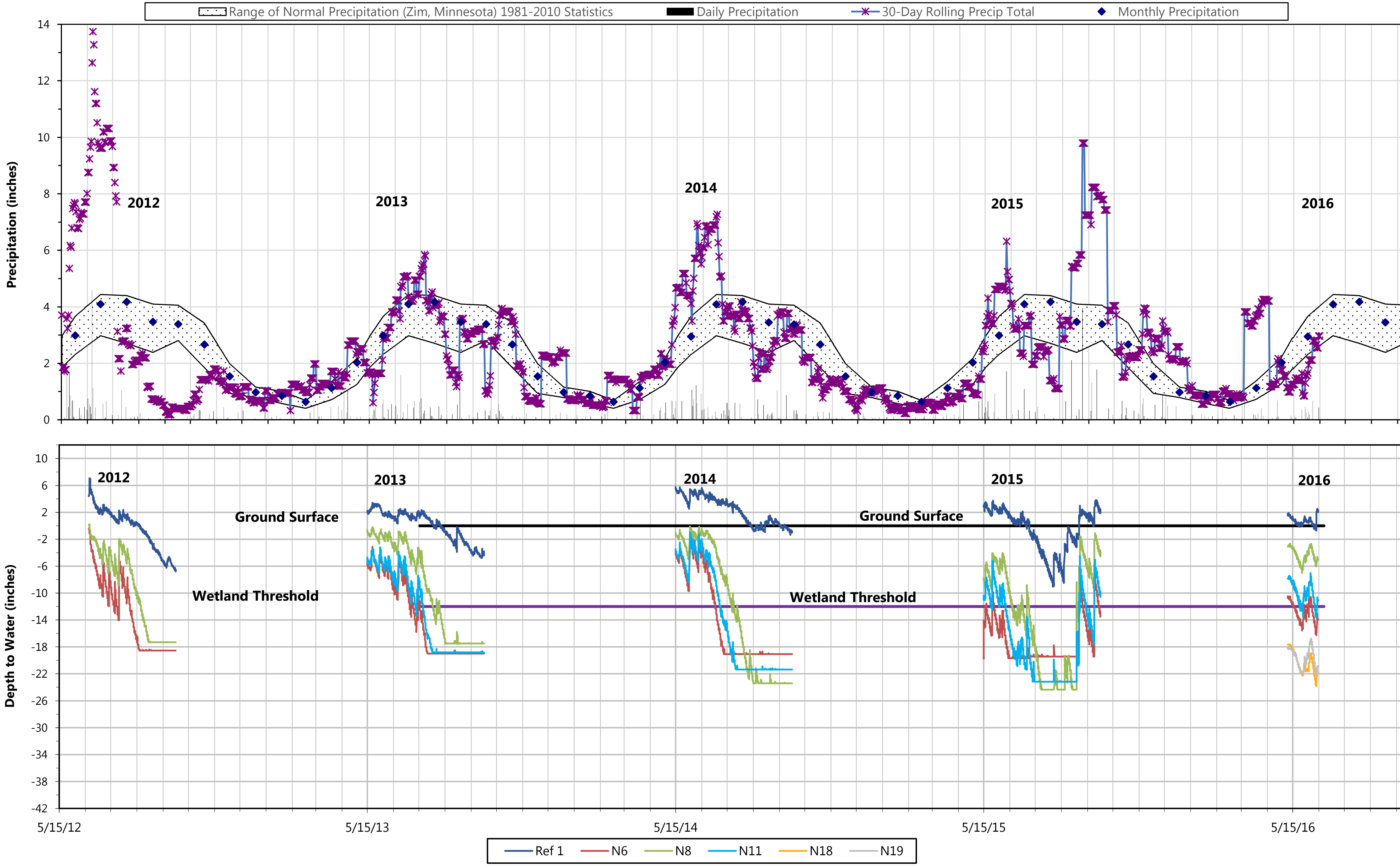


NOTE: In 2016,
precipitation and logger data
is shown through June 14

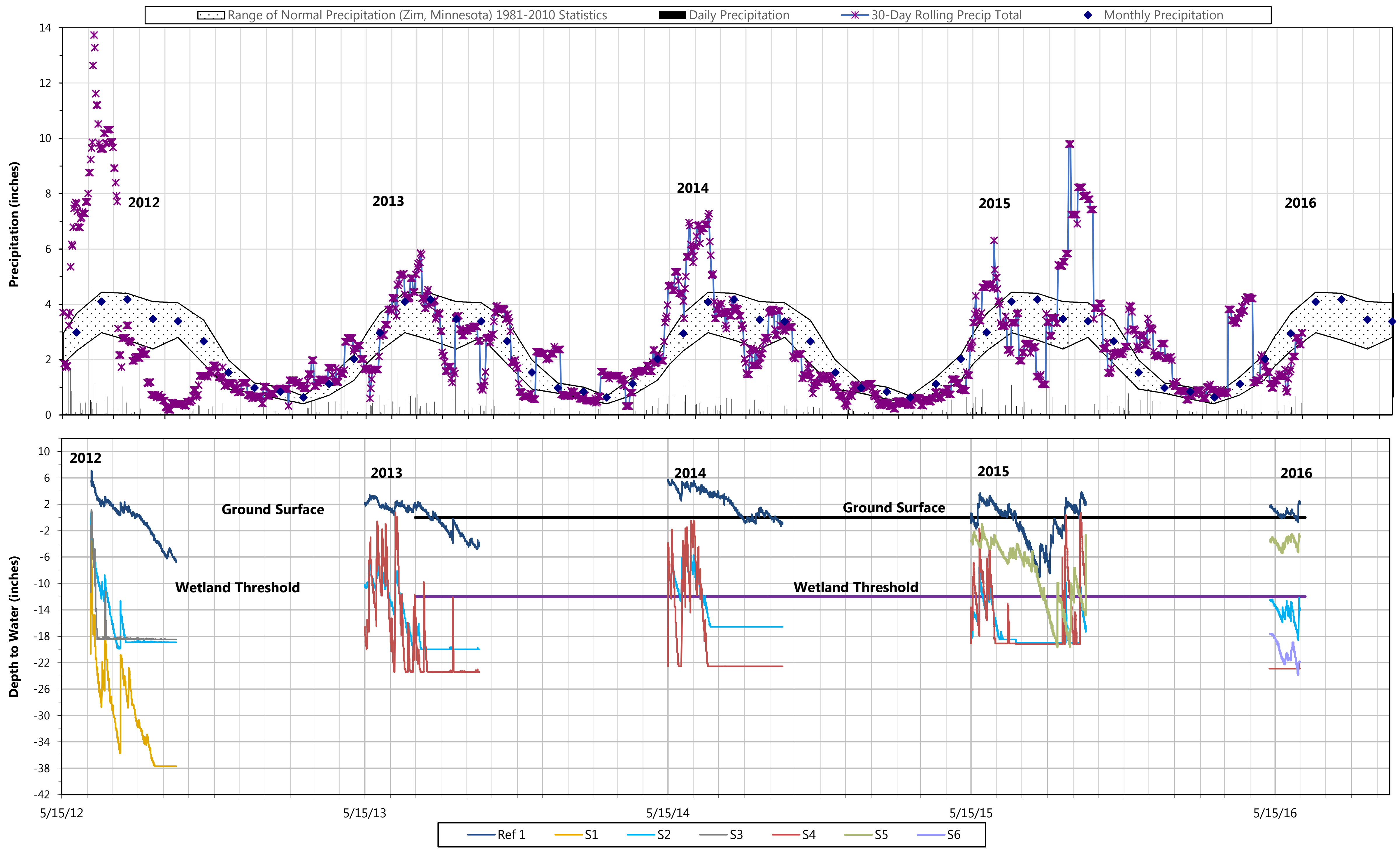
Large Figure 21
2012-2016 Hydrology Monitoring Data
North Unit Sod Fields: Wells N5, N7, and N17
Zim Sod Wetland Mitigation Site
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN



NOTE: In 2016, precipitation and logger data is shown through June 14

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

P:\Mpls\23 MN\69\2369862\WorkFiles\WO 008 Corps Wetlands Permit\WetlandMitigation\Zim\Hydrology Data\Hydrographs\2016 Data\Zim Cumulative graphs to 2016.xlsx



NOTE: In 2016,
precipitation and logger data
is shown through June 14

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

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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").

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 re-recorded. 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 me this day of , by (name(s) with marital status).

____
Notary Public

Notarial Stamp or Seal

SIGNATURE OF BANK APPLICANT (S),
IF DIFFERENT FROM FEE OWNER: ____

____

STATE OF MINNESOTA)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this day of , by (name(s) with marital status).

____
Notary Public

Notarial Stamp or Seal

BWSR Form: wca-bank-06 (easement).doc
Revised 2/12/03

ACCEPTANCE

The State accepts the foregoing Easement.

MINNESOTA BOARD OF WATER AND SOIL RESOURCES:

By: ____

Its: ____

STATE OF MINNESOTA)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this day of , by (name of person) as (title) of the Board of Water and Soil Resources.

____
Notary Public

Notarial Stamp or Seal

This instrument was drafted by the Board of Water and Soil Resources
One West Water Street, St. Paul, MN 55107

If there are additional holders of interest the subject real property CHECK HERE ☐ and attach their Consent and Subordination agreement [BWSR Form Number: wca-bank-03 (consent).doc].

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.

Community / Credit Type	Within Project Watershed: Zim Sod Wetland Mitigation (acres)	Within Project Watershed: Credit Percent	Within Project Watershed: Total Wetland Mitigation Credits	Outside Project Watershed[1]: Aitkin Wetland Mitigation (acres)	Outside Project Watershed[1]: Aitkin Wetland Mitigation Credits	Outside Project Watershed[1]: Hinckley Wetland Mitigation (acres)	Outside Project Watershed[1]: Hinckley Wetland Mitigation Credits	Outside Project Watershed[1]: Credit Percent	Outside Project Watershed[1]: Total Wetland Mitigation Credits	Total Wetland Mitigation[1] (acres)	Credit Percent	Total Wetland Mitigation Credits[1]
Off-Site Restoration of drained 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 [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 Restoration that will not receive 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 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.

Wetland or Credit Type	Mitigation Credits Available				NorthMet Project Proposed Direct Wetland Impacts in Acres[1,2]			Total Credits Required for Mitigation at Base Ratio	No More Than 2 Apply			Total Applied Mitigation Credits [(6), (7)]	Applied Mitigation Ratio [(8)]
	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		Incentive for in-kind -0.25:1	Incentive for credits in-place -0.25:1	Incentive for credits in-advance [(5)] -0.25:1		
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**	1.63
									(275.92)				
Total Surplus Wetland Mitigation Credits for Project (Total Credit minus Total Applied Mitigation Credit)				**47.33**									

(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.

Wetland or Credit Type	Mitigation Credits				NorthMet Project Proposed Direct Wetland Impacts (acres)[1,2]	Credits Applied for 1:1 Replacement	Additional Mitigation Required [3] +0.5:1	Total Mitigation Credits Applied	Total Mitigation Ratio
	Zim Sod	Aitkin	Hinckley	Total					
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**	1.25:1 [5]
Total Surplus Wetland Mitigation Credits for Project (Total credits minus 1:1 credits minus additional mitigation required)						**403.33**			
Total Wetland Mitigation Credits 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

US Army Corps of Engineers
St. Paul District

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 to10 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 DETERMINATION DATA FORM - 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):	K	Latitude:	5235290	Longitude:	530258	Datum:	NAD 83		
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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Former sod field adjacent to excavated ditch.
Point ID: 358

If yes, optional Wetland Site ID: (NW1)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		
Herb Stratum (Plot Size: 5 ft)			
1. Poa pratensis	25	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		
Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum:
% Sphagnum Moss Cover:

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 101-E-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 22	10YR 3/2						Oe	
2.	22 - 42	7.5YR 3/2						Oi	
3.	42 - 46	Gley 1, 4/10Y						Ifs	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] Surface Water Depth (inches):

Water table present? [ ] Water Table Depth (inches):

Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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-Wet

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5235300 | Longitude: 530269 | 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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW1

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 101-E-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil assumed, based on soil boring in adjacent field.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	2
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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-S-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5235290 | Longitude: 5302558 | Datum: NAD 83

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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? No
Hydric soil present? Yes
Indicators of wetland hydrology present? No
Is the sampled area within a wetland? No

General Remarks (explain any answers if needed):
Former sod field adjacent to excavated ditch.
Point ID: 358

If yes, optional Wetland Site ID: (NW1)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Poa pratensis	25	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- No Rapid Test for Hydrophytic Vegetation
- No Dominance Test is >50%
- No 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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Previously in sod production.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 101-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 22							Oe	
2.	22 - 42							Oi	
3.	42 - 48	Gley1,4/10Y						Ifs	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] **Surface Water Depth (inches):** ______

Water table present? [ ] **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) [ ] **Saturation Depth (inches):** ______

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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-S-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5235280	Longitude:	530257	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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW1

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 101-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Ditch approximately 2.5 feet deeper than adjacent field. Peat assumed, based on soil boring in adjacent field.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	6
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

2/15/2016 2:41:55 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Zim Site | Applicant/Owner: PolyMet Mining | City/County: St. Louis | State: MN | Sampling Date: 04/13/16

Investigator(s): KMS2 | Section: 2+ | Township: 55 | Range: 18W | Sampling Point: 102 East Wetland

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5235574 | Longitude: 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? Yes (If no, explain in remarks)

Eggers & Reed (primary): Coniferous Swamp
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?
Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Natural area east of Field N02.

If yes, optional Wetland Site ID: NW5

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Picea mariana	30	Yes	FACW
2.	Larix laricina	25	Yes	FACW
3.		0		
4.		0		
	Total Cover:	55		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Picea mariana	15	Yes	FACW
2.	Larix laricina	15	Yes	FACW
3.		0		
4.		0		
5.		0		
	Total Cover:	30		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Ledum groenlandicum	25	Yes	OBL
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover: 25

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	11	27.5
Sapling/Shrub Stratum	6	15
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	25	X 1	25
FACW Species	85	X 2	170
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	110 (A)		195 (B)

Prevalence Index = B/A = 1.77

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

4/15/2016 11:50:27 AM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 102 East Wetland

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 34	10YR 2/1						Oi	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Frozen.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [x] Surface Water Depth (inches): 1
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Ground still frozen, some snow and frozen pools present.

WETLAND DETERMINATION DATA FORM - 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 | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5235287 | 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 time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Former sod field adjacent to excavated ditch.
Point ID: 390

If yes, optional Wetland Site ID: (NW1)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa pratensis	25	Yes	FACU
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 102-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 20	10YR 3/2						Oe	
2.	20 - 47	7.5YR 3/2						Oi	
3.	47 - 48	Gley1 5/10Y						Is	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] **Surface Water Depth (inches):**

Water table present? [ ] **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5235279	Longitude:	530310	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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW1

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:		(A)
Total Number of Dominant Species Across All Strata:		(B)
Percent of Dominant Species That Are OBL, FACW or FAC:		(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	0	X 1	0	
FACW Species	0	X 2	0	
FAC Species	0	X 3	0	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	0	(A)	0	(B)

Prevalence Index = B/A = #Num!

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 102-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil assumed based on soil boring in adjacent field.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	**Surface Water Depth (inches):**	4
Water table present?	[x]	**Water Table Depth (inches):**	0
Saturation present? (includes capillary fringe)	[x]	**Saturation Depth (inches):**	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

2/15/2016 2:41:55 PM

WETLAND DETERMINATION DATA FORM - 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-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5234416 | Longitude: 530737 | Datum: NAD 83

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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? No
Hydric soil present? Yes
Indicators of wetland hydrology present? No
Is the sampled area within a wetland? No

General Remarks (explain any answers if needed):
Former sod field adjacent to excavated ditch.
Point ID: 773

If yes, optional Wetland Site ID: (NW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa pratensis	25	Yes	FACU
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ______ % Sphagnum Moss Cover: ______

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: **0** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW or FAC: **0.00%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	**25**	(A)	**100** (B)

Prevalence Index = B/A = **4.00**

Hydrophytic Vegetation Indicators:

No Rapid Test for Hydrophytic Vegetation
No Dominance Test is >50%
No 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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 109-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features 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.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5234423 | Longitude: 530759 | 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, explain in remarks)

Eggers & Reed (primary): Shallow, Open Water

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: NW2

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 109-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil assumed, based on soil boring in adjacent field.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	24
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Zim Site	Applicant/Owner:	PolyMet Mining	City/County:	St. Louis	State:	MN	Sampling Date:	05/10/12
Investigator(s):	KMS2/TPT	Section:	26+	Township:	55	Range:	18W	Sampling Point:	111-W-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5234620	Longitude:	531019	Datum:	NAD 83		
Cowardin Classification:	PFO2,4/SS1B	Circular 39 Classification:	Type 7	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Coniferous Swamp
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Well N8

If yes, optional Wetland Site ID: NW3

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Larix laricina	40	Yes	FACW
2. Abies balsamea	30	Yes	FAC
3.	0		
4.	0		
Total Cover:	70		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Larix laricina	20	Yes	FACW
2. Abies balsamea	20	Yes	FAC
3. Cornus alba	20	Yes	FACW
4.	0		
5.	0		
Total Cover:	60		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus idaeus	25	Yes	FAC
2. Impatiens capensis	20	Yes	FACW
3. Betula pumila	10	No	OBL
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	55		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover: 30

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	14	35
Sapling/Shrub Stratum	12	30
Herb Stratum	11	27.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	7	(A)
Total Number of Dominant Species Across All Strata:	7	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	10	X 1	10
FACW Species	100	X 2	200
FAC Species	75	X 3	225
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	185	(A)	435 (B)

Prevalence Index = B/A = 2.35

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 111-W-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1. 0 - 4	10YR 2/1	100					Oi	
2. 4 - 10	10YR 2/1						Oa	
3. 10 - 30	10YR 2/1	100					Oi	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	6

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Four years of monitoring data. Three out of four years met wetland hydrology.

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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: 113-N-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5234398 | Longitude: 530776 | Datum: NAD 83

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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Former sod field adjacent to excavated ditch.
Point ID: 823

If yes, optional Wetland Site ID: (NW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Poa pratensis	25	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

2/15/2016 2:41:56 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 113-N-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 37	10YR 3/2	50					Oe	
2.	-	7.5YR 3/2	50					Oi	
3.	37 - 41	10YR 3/1						SiC	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] **Surface Water Depth (inches):**

Water table present? [ ] **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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:	113-N-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5234250	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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW2

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 113-N-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ____ Depth (inches): ____

Hydric soil present? Yes

Soil Remarks: Soil assumed, based on soil boring in adjacent field.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	4
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Water depth assumed, based on adjacent ditch depths.

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WETLAND DETERMINATION DATA FORM - 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: 113-S-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5234263 | Longitude: 531288 | Datum: NAD 83

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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Former sod field adjacent to excavated ditch.
Point ID:889

If yes, optional Wetland Site ID: (NW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa pratensis	25	Yes	FACU
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 113-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 48	10YR 3/2	50					Oe	
2.	-	7.5YR 3/2	50					Oi	
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] **Surface Water Depth (inches):**

Water table present? [ ] **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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: 113-S-Wet

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5234252 | 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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW2

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 113-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks: Soil assumed, based on adjacent field SB.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	6
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Water depth estimated, based on nearby ditches.

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Zim Site	Applicant/Owner:	PolyMet Mining	City/County:	St. Louis	State:	MN	Sampling Date:	05/10/12
Investigator(s):	KMS2/TPT	Section:	26+	Township:	55	Range:	18W	Sampling Point:	117-N-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5234199	Longitude:	531141	Datum:	NAD 83		
Cowardin Classification:	PFO2/SS1	Circular 39 Classification:	Type 7,6	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Coniferous Swamp
Eggers & Reed (secondary): Shrub-Carr
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Well 6

If yes, optional Wetland Site ID: NW4

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Larix laricina	20	Yes	FACW
2.		0		
3.		0		
4.		0		
	Total Cover:	20		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Rubus idaeus	20	Yes	FAC
2.	Athyrium filix-femina	10	Yes	FAC
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	30		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: % Sphagnum Moss Cover: 10

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	4	10
Sapling/Shrub Stratum	0	0
Herb Stratum	6	15
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	20	X 2	40
FAC Species	30	X 3	90
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	50	(A)	130 (B)

Prevalence Index = B/A = 2.60

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 117-N-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 21	10YR 2/1	100					Oi	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	13

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Four years of monitoring data show that this wetland is partially drained.

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

2/15/2016 2:41:57 PM

WETLAND DETERMINATION DATA FORM - 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:	120-W-Up
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5234113	Longitude:	531309	Datum:	NAD 83		
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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Former sod field adjacent to excavated ditch.
Point ID: 1077

If yes, optional Wetland Site ID: (NW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa pratensis	25	Yes	FACU
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 120-W-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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:	120-W-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5234109	Longitude:	531296	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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW2

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:		(A)
Total Number of Dominant Species Across All Strata:		(B)
Percent of Dominant Species That Are OBL, FACW or FAC:		(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 120-W-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil assumed, based on adjacent field SB.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	4
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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:	121-S-Up
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5233927	Longitude:	531294	Datum:	NAD 83		
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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Former sod field adjacent to excavated ditch.
Point ID: 1227

If yes, optional Wetland Site ID: (NW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Poa pratensis	25	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 121-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 10	10YR 3/2						Oe	
2.	10 - 48	7.5YR 3/2						Oi	
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): **Type:** **Depth (inches):**

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] **Surface Water Depth (inches):**

Water table present? [ ] **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] **Aerial Photo** [ ] **Monitoring Well** [ ] **Stream Gauge** [ ] **Previous Inspections**

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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:	121-S-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5233891	Longitude:	531314	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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW2

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:		(A)
Total Number of Dominant Species Across All Strata:		(B)
Percent of Dominant Species That Are OBL, FACW or FAC:		(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0** (A)		**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 121-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil assumed, based on adjacent field SB.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	24
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Zim Site | Applicant/Owner: PolyMet Mining | City/County: St. Louis | State: MN | Sampling Date: 05/10/12

Investigator(s): KMS2/TPT | Section: 26+ | Township: 55 | Range: 18W | Sampling Point: 123-E-Wet

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5233808 | Longitude: 531060 | Datum: NAD 83

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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Well N11. Hydrology monitoring = drained

If yes, optional Wetland Site ID: drained

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Larix laricina	0		FACW
2.	Picea mariana	10	Yes	FACW
3.		0		
4.		0		
	Total Cover:	10		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Larix laricina	20	Yes	FACW
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	20		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Rubus idaeus	25	Yes	FAC
2.	Larix laricina	20	Yes	FACW
3.	Picea mariana	20	Yes	FACW
4.	Matteuccia struthiopteris	10	No	FAC
5.	Betula pumila	10	No	OBL
6.		0		
7.		0		
8.		0		
	Total Cover:	85		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover: 50

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	2	5
Sapling/Shrub Stratum	4	10
Herb Stratum	17	42.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	5	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	10	X 1	10
FACW Species	70	X 2	140
FAC Species	35	X 3	105
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	115 (A)		255 (B)

Prevalence Index = B/A = 2.22

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 123-E-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 24	10YR 2/1	100					Oe	
2.	-								
3.	-								
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)

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☑ Saturation Depth (inches): 9.8

Indicators of wetland hydrology present? No

Describe Recorded Data:

Three years of monitoring data - this wetland is drained.

Recorded Data: ☐ Aerial Photo ☑ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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:	126-S-Up
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5233708	Longitude:	531301	Datum:	NAD 83		
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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Former sod field adjacent to excavated ditch.
Point ID: 1234

If yes, optional Wetland Site ID: (NW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Poa pratensis	25	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25 (A)		100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 126-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features 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.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] **Surface Water Depth (inches):**

Water table present? [ ] **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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: 126-S-Wet

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5233700 | Longitude: 531301 | 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, explain in remarks)

Eggers & Reed (primary): Shallow, Open Water

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic?

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

If yes, optional Wetland Site ID: NW2

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ______ % Sphagnum Moss Cover: ______

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ______ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0** (A)		**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation in ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 126-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	-							Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- [ ] 2 cm Muck (A10) (LRR K, L, MLRA 149B)
- [ ] Coast Prairie Redox (A16) (LRR K, L, R)
- [x] 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ____ Depth (inches): ____

Hydric soil present? Yes

Soil Remarks: Soil assumed, based on adjacent field SB.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	36
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Zim Site | Applicant/Owner: PolyMet Mining | City/County: St. Louis | State: MN | Sampling Date: 04/13/16

Investigator(s): KMS2 | Section: 2+ | Township: 55 | Range: 18W | Sampling Point: 127 Wet

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5233675 | Longitude: 530918 | Datum: NAD 83

Cowardin Classification: PSS1Fd | Circular 39 Classification: Type 6 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shrub-Carr
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Natural area between the southernmost two ditches, western area.

If yes, optional Wetland Site ID: NW6

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Alnus incana	25	Yes	FACW
2.	Salix discolor	30	Yes	FACW
3.	Cornus alba	5	No	FACW
4.		0		
5.		0		
	Total Cover:	60		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Calamagrostis canadensis	40	Yes	OBL
2.	Carex lacustris	20	Yes	OBL
3.	Rubus idaeus	5	No	FAC
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	65		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	12	30
Herb Stratum	13	32.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	60	X 1	60
FACW Species	60	X 2	120
FAC Species	5	X 3	15
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	125 (A)		195 (B)

Prevalence Index = B/A = 1.56

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 127 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 30	7.5 YR 3/2						Oi	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] Saturation (A3)
- [x] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [x] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [x] 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)

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)
- [x] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [ ] FAC-Neutral Test (D5)

Field Observations:

	Present		
Surface water present?	[x]	Surface Water Depth (inches):	1
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Spring field visit. High water levels in adjacent ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Zim Site | Applicant/Owner: PolyMet Mining | City/County: St. Louis | State: MN | Sampling Date: 04/13/16

Investigator(s): KMS2 | Section: 2+ | Township: 55 | Range: 18W | Sampling Point: 128 Wet

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5233669 | Longitude: 531478 | Datum: NAD 83

Cowardin Classification: PSS1Fd | Circular 39 Classification: Type 6 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shrub-Carr
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Natural area between the southernmost two ditches, eastern area.

If yes, optional Wetland Site ID: NW7

VEGETATION

Tree Stratum (Plot Size: 30 ft)

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Salix discolor	30	Yes	FACW
2.	Alnus incana	25	Yes	FACW
3.	Cornus alba	5	No	FACW
4.		0		
5.		0		
	Total Cover:	60		

Herb Stratum (Plot Size: 5 ft)

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Calamagrostis canadensis	40	Yes	OBL
2.	Carex lacustris	20	Yes	OBL
3.	Rubus idaeus	5	No	FAC
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	65		

Woody Vine Stratum (Plot Size: 30 ft)

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	12	30
Herb Stratum	13	32.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	60	X 1	60
FACW Species	60	X 2	120
FAC Species	5	X 3	15
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	125	(A)	195 (B)

Prevalence Index = B/A = 1.56

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 128 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 30	7.5YR 3/2						Oi	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] Saturation (A3)
- [x] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [x] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [x] 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)

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)
- [x] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [x] Surface Water Depth (inches): 1
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [x] Saturation Depth (inches): 0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Spring field visit. Adjacent south ditch bank-full.

WETLAND DETERMINATION DATA FORM - 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: 26+ | Township: 55 | Range: 18W | Sampling Point: 201-E-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5228745 | Longitude: 530204 | Datum: NAD 83

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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Field adjacent to excavated ditch.
Point ID: 35

If yes, optional Wetland Site ID: (SW1)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa pratensis	25	Yes	FACU
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 201-E-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 14	10YR 2/1						Peat	
2.	14 - 20							SaC	
3.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks: Field previously used for sod production.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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: 26+ | Township: 55 | Range: 18W | Sampling Point: 201-E-Wet

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5228761 | Longitude: 530222 | Datum: NAD 83

Cowardin Classification: PUBHx | Circular 39 Classification: Type 5 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed):
Excavated ditch, oriented N/S, drains south.
Point ID: 121

If yes, optional Wetland Site ID: SW1

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Phalaris arundinacea	60	Yes	FACW
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	60		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	12	30
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	60	X 2	120
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	60	(A)	120 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 201-E-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 2	10YR 2/1						Peat	
2.	2 - 14							SaC	
3.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks: Excavated ditch, soils estimated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☑	Surface Water Depth (inches):	6
Water table present?	☑	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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: 26+ | Township: 55 | Range: 18W | Sampling Point: 201-S-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5228745 | Longitude: 530204 | Datum: NAD 83

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, explain in remarks)

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Point ID: 35

If yes, optional Wetland Site ID: (SW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Phalaris arundinacea	20	Yes	FACW
2.	Poa pratensis	20	Yes	FACU
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	40		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	8	20
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 50.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	20	X 2	40
FAC Species	0	X 3	0
FACU Species	20	X 4	80
UPL Species	0	X 5	0
Column Totals:	40	(A)	120 (B)

Prevalence Index = B/A = 3.00

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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Field adjacent to excavated ditch. Field previously cultivated for sod production.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 201-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 14	10YR 2/1						Peat	
2.	14 - 20							SaC	
3.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):**

Water table present? ☐ **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks: Sod field adjacent to excavated ditch.

WETLAND DETERMINATION DATA FORM - 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:	26+	Township:	55	Range:	18W	Sampling Point:	201-S-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5228738	Longitude:	530203	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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): No vegetation observed in ditch.

If yes, optional Wetland Site ID: SW2

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ **% Sphagnum Moss Cover:** ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Open water, no vegetation.

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 201-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 2	10YR 2/1						Peat	
2.	2 - 14	5YR 4/1						SaC	
3.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Excavated ditch, soils estimated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☑	Surface Water Depth (inches):	4
Water table present?	☑	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks: Drainage ditch

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WETLAND DETERMINATION DATA FORM - 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: 26+ | Township: 55 | Range: 18W | Sampling Point: 202-S-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5228748 | Longitude: 530251 | Datum: NAD 83

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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Former sod field adjacent to excavated ditch.
Point ID:139

If yes, optional Wetland Site ID: (SW2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa pratensis	25	Yes	FACU
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Former sod field. Numerous grasses and weeds.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 202-S-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 20	10YR 2/1						Peat	
2.	20 - 24							SaC	
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	2
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Ditch flow is blocked, so field is inundated.

WETLAND DETERMINATION DATA FORM - 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:	26+	Township:	55	Range:	18W	Sampling Point:	202-S-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5228739	Longitude:	530251	Datum:	NAD 83		
Cowardin Classification:	PABH6x	Circular 39 Classification:	Type 4, 5	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Deep Marsh
Eggers & Reed (secondary): Shallow, Open Water
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: SW2

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field. No vegetation observed in ditch.

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	0		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	0	0
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **#Num!**

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
#Type!	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

No vegetation, water too deep.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 202-S-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 20	10YR 2/1						Peat	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil estimated - water too deep.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	84
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Very wide ditch, and likely deeper than 7 feet.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Zim Site	Applicant/Owner:	PolyMet Mining	City/County:	St. Louis	State:	MN	Sampling Date:	05/10/12
Investigator(s):	KMS2/TPT	Section:	26+	Township:	55	Range:	18W	Sampling Point:	203-N-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5228993	Longitude:	530670	Datum:	NAD 83		
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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Forested wetland in the south unit. Well S2. Hydrology monitoring = drained

If yes, optional Wetland Site ID: drained

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Abies balsamea	30	Yes	FAC
2.	Larix laricina	30	Yes	FACW
3.		0		
4.		0		
	Total Cover:	60		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Abies balsamea	25	Yes	FAC
2.	Ledum groenlandicum	5	No	OBL
3.		0		
4.		0		
5.		0		
	Total Cover:	30		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Rubus idaeus	75	Yes	FAC
2.	Athyrium filix-femina	10	No	FAC
3.	Mentha arvensis	5	No	FACW
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	90		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	6	15
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	5	X 1	5
FACW Species	35	X 2	70
FAC Species	140	X 3	420
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	180 (A)		495 (B)

Prevalence Index = B/A = 2.75

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 203-N-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	17

Indicators of wetland hydrology present? No

Describe Recorded Data:

Four years of monitoring data. One out of four years met wetland hydrology criteria. Drained

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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: 26+ | Township: 55 | Range: 18W | Sampling Point: 204-E-Up

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5228715 | Longitude: 530155 | Datum: NAD 83

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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Edge of ditch adjacent to former sod field.
Point ID: 201

If yes, optional Wetland Site ID: (SW3)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Poa pratensis	25	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	25	(A)	100 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Excavated ditch spoils adjacent to ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 204-E-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 20	10YR 2/1						Peat	
2.	-								
3.	-								
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)

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Peat depth estimated from previous soil borings.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - 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:	26+	Township:	55	Range:	18W	Sampling Point:	204-E-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5228714	Longitude:	530153	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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Excavated ditch adjacent to former sod field.

If yes, optional Wetland Site ID: SW3

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Phalaris arundinacea	25	Yes	FACW
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover:

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	25	X 2	50
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	25	(A)	50 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Excvated/disturbed ditch.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 204-E-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 10	10YR 2/1						Peat	
2.	-								
3.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Excavated ditch, soil estimated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☑	Surface Water Depth (inches):	6
Water table present?	☑	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Zim Site	Applicant/Owner:	PolyMet Mining	City/County:	St. Louis	State:	MN	Sampling Date:	05/10/12
Investigator(s):	KMS2/TPT	Section:	26+	Township:	55	Range:	18W	Sampling Point:	205-N-Wet
Land Form:	Terrace	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	B14A Greenwood Soils, Upham Basin, 0-1%		
Subregion (LRR):	K	Latitude:	5228543	Longitude:	530265	Datum:	NAD 83		
Cowardin Classification:	PML1/SS2,4B	Circular 39 Classification:	Type 8	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Open Bog
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Open bog wetland in the south unit. Well S5

If yes, optional Wetland Site ID: SW4

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Ledum groenlandicum	30	Yes	OBL
2. Betula pumila	25	Yes	OBL
3. Chamaedaphne calyculata	10	No	OBL
4. Salix discolor	10	No	FACW
5.	0		
Total Cover:	75		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Calamagrostis canadensis	30	Yes	OBL
2. Rubus idaeus	10	Yes	FAC
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	40		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	15	37.5
Herb Stratum	8	20
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	95	X 1	95
FACW Species	10	X 2	20
FAC Species	10	X 3	30
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	115 (A)		145 (B)

Prevalence Index = B/A = 1.26

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 205-N-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 12	10YR 2/1	100					Oi	
2.	12 - 36	10YR 2/1	100					Oe	
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [x] Saturation Depth (inches): 4

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

One year of monitoring data. Water levels showed wetland hydrology, but not as long as the reference well.

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Zim Site | Applicant/Owner: PolyMet Mining | City/County: St. Louis | State: MN | Sampling Date: 04/13/16

Investigator(s): KMS2 | Section: 2+ | Township: 55 | Range: 18W | Sampling Point: 102 East Wetland

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5235574 | Longitude: 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? Yes (If no, explain in remarks)

Eggers & Reed (primary): Coniferous Swamp
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Natural area east of Field N02.

If yes, optional Wetland Site ID: NW5

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Picea mariana	30	Yes	FACW
2.	Larix laricina	25	Yes	FACW
3.		0		
4.		0		
	Total Cover:	55		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Picea mariana	15	Yes	FACW
2.	Larix laricina	15	Yes	FACW
3.		0		
4.		0		
5.		0		
	Total Cover:	30		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Ledum groenlandicum	25	Yes	OBL
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	25		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover: 25

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	11	27.5
Sapling/Shrub Stratum	6	15
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	5	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	25	X 1	25
FACW Species	85	X 2	170
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	110 (A)		195 (B)

Prevalence Index = B/A = 1.77

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 102 East Wetland

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 34	10YR 2/1						Oi	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks: Frozen.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [x] Surface Water Depth (inches): 1
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Ground still frozen, some snow and frozen pools present.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Zim Site | Applicant/Owner: PolyMet Mining | City/County: St. Louis | State: MN | Sampling Date: 05/10/12

Investigator(s): KMS2, TPT | Section: 26+ | Township: 55 | Range: 18W | Sampling Point: NW6

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5233808 | Longitude: 531060 | Datum: NAD 83

Cowardin Classification: PFO2,4D | Circular 39 Classification: Type 7 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Coniferous Swamp

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Associated with Well N11

If yes, optional Wetland Site ID: NW6

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Larix laricina	30	Yes	FACW
2.	Picea mariana	20	Yes	FACW
3.		0		
4.		0		
	Total Cover:	50		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Larix laricina	20	Yes	FACW
2.	Picea mariana	10	Yes	FACW
3.		0		
4.		0		
5.		0		
	Total Cover:	30		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Rubus idaeus	25	Yes	FAC
2.	Larix laricina	20	Yes	FACW
3.	Picea mariana	20	Yes	FACW
4.	Matteuccia struthiopteris	10	No	FAC
5.	Betula pumila	10	No	OBL
6.		0		
7.		0		
8.		0		
	Total Cover:	85		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ______ % Sphagnum Moss Cover: ______

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	10	25
Sapling/Shrub Stratum	6	15
Herb Stratum	17	42.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	7	(A)
Total Number of Dominant Species Across All Strata:	7	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	10	X 1	10
FACW Species	120	X 2	240
FAC Species	35	X 3	105
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	165 (A)		355 (B)

Prevalence Index = B/A = 2.15

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: NW6

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 24	10YR 2/1	100					Oe	
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	9.8

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Three years of monitoring data. This wetland is partially drained.

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Zim Site | Applicant/Owner: PolyMet Mining | City/County: St. Louis | State: MN | Sampling Date: 05/10/12

Investigator(s): KMS2, TPT | Section: 26+ | Township: 55 | Range: 18W | Sampling Point: SW5

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: B14A Greenwood Soils, Upham Basin, 0-1%

Subregion (LRR): K | Latitude: 5228993 | Longitude: 530670 | Datum: NAD 83

Cowardin Classification: PFO2,4D | Circular 39 Classification: Type 7 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Coniferous Swamp
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): Associated with Well S2.

If yes, optional Wetland Site ID: SW5

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Abies balsamea	30	Yes	FAC
2.	Larix laricina	30	Yes	FACW
3.		0		
4.		0		
	Total Cover:	60		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Abies balsamea	25	Yes	FAC
2.	Ledum groenlandicum	5	No	OBL
3.		0		
4.		0		
5.		0		
	Total Cover:	30		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Rubus idaeus	75	Yes	FAC
2.	Athyrium filix-femina	10	No	FAC
3.	Mentha arvensis	5	No	FACW
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	90		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	6	15
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	5	X 1	5
FACW Species	35	X 2	70
FAC Species	140	X 3	420
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	180	(A)	495 (B)

Prevalence Index = B/A = 2.75

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: SW5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	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.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
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- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
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- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	17

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Four years of monitoring data. One out of four years met wetland hydrology criteria. Partially drained wetland.

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

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

Wetland NW2

Southwest corner of field N09, view northeast, 7/8/2015

Wetland NW2

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

Wetland NW2

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

Wetland NW3

At monitoring Well N8, view south, 7/12/2013

At monitoring Well N8, view east, 10/25/2013

Wetland NW4

At monitoring Well N6, view east, 11/4/2014

At monitoring Well N6, view west, 10/21/2015

Wetland NW5

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

Wetland SW1

North-south ditch between field S01 and S02, view north, 7/26/2012

Wetland SW2

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

Wetland SW3

View south-southeast along edge of Wetland SW3, 4/13/2016

View south along edge of Wetland SW3, 7/26/2012

Wetland SW4

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

Wetland SW5

Well S2, view east, 7/12/13

Well S2, view east, 10/21/15

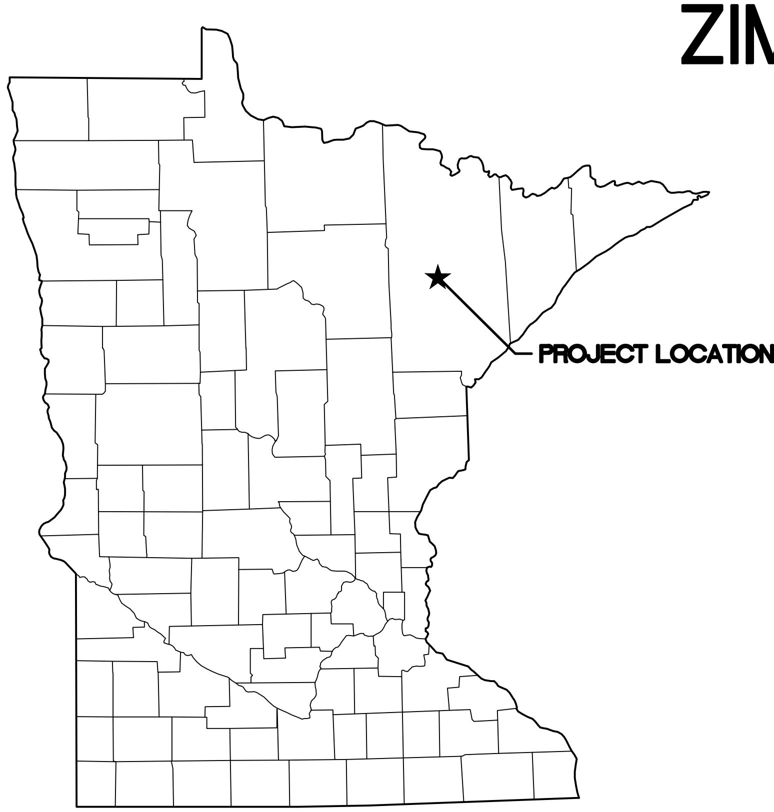
Appendix F

Wetland Mitigation Plan Drawings

POLYMET

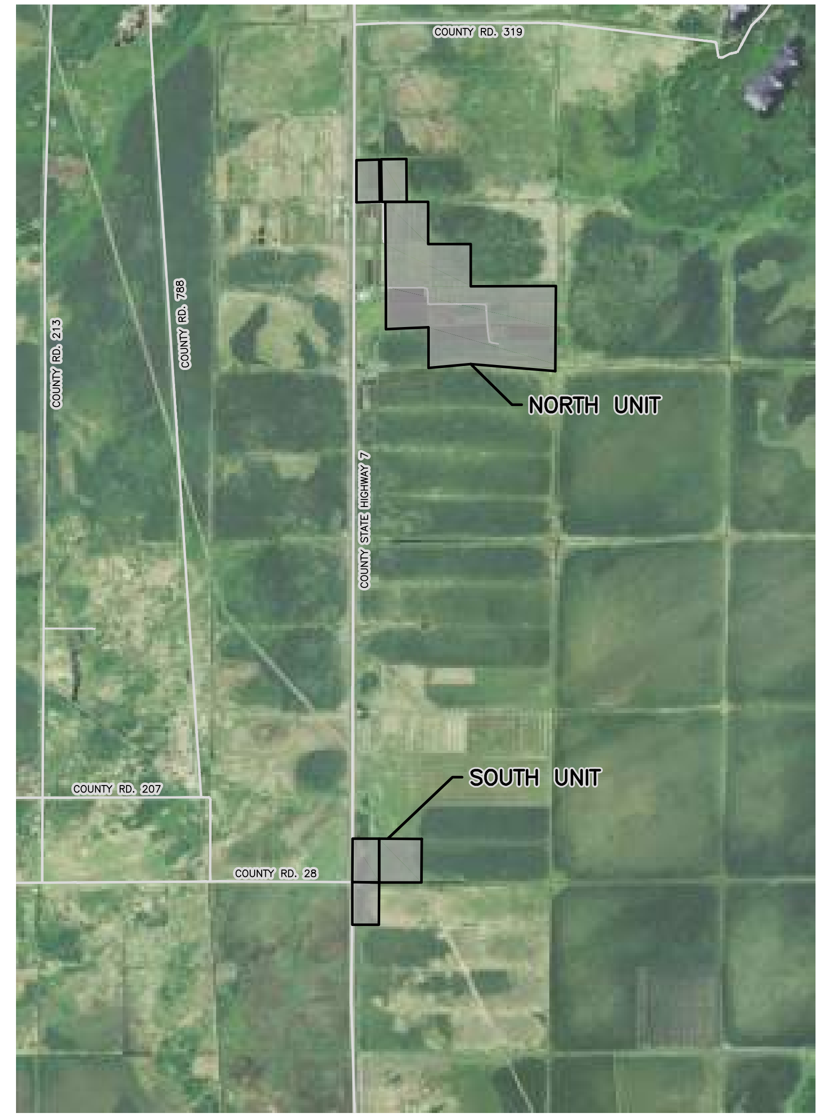
ZIM SOD WETLAND MITIGATION PLANS

ZIM, MINNESOTA

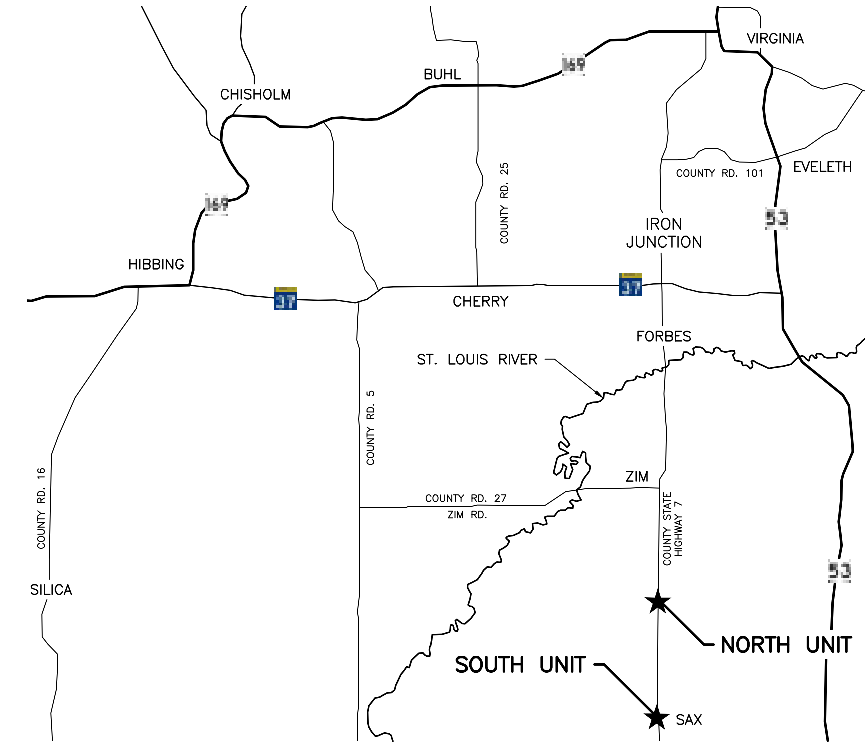


STATE MAP

CALL 48 HOURS BEFORE DIGGING
GOPHER STATE ONE CALL
TWIN CITIES AREA 651-454-0002
MN TOLL FREE 1-800-252-1166



PROJECT SITE



VICINITY MAP

INDEX

Sheet No.	Title
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 N01 – N06
CS-002	EXISTING CONDITIONS AND CULVERT SCHEDULE NORTH UNIT – FIELDS N07 – 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
CS-005	NORTH UNIT PLAN – FIELDS N01 TO N06
CS-006	NORTH UNIT PLAN – FIELDS N07 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

LEGEND

- MAJOR CONTOUR (1000)
- MINOR CONTOUR
- DRAIN TILES
- ROAD EDGE
- OVERHEAD POWER LINE (OE)
- UNDERGROUND PETRO LINE (EP)
- BORROW AREA
- RIGHT OF WAY (ROW)
- PROJECT BOUNDARY
- CULVERT
- DITCH
- POWER POLE
- NATURAL GAS POST
- ABANDONED DITCH

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**
ADDITIONAL FILE INFORMATION:

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
TITLE SHEET, PROJECT SITE, STATE MAP, VICINITY MAP, LEGEND AND INDEX OF SHEETS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

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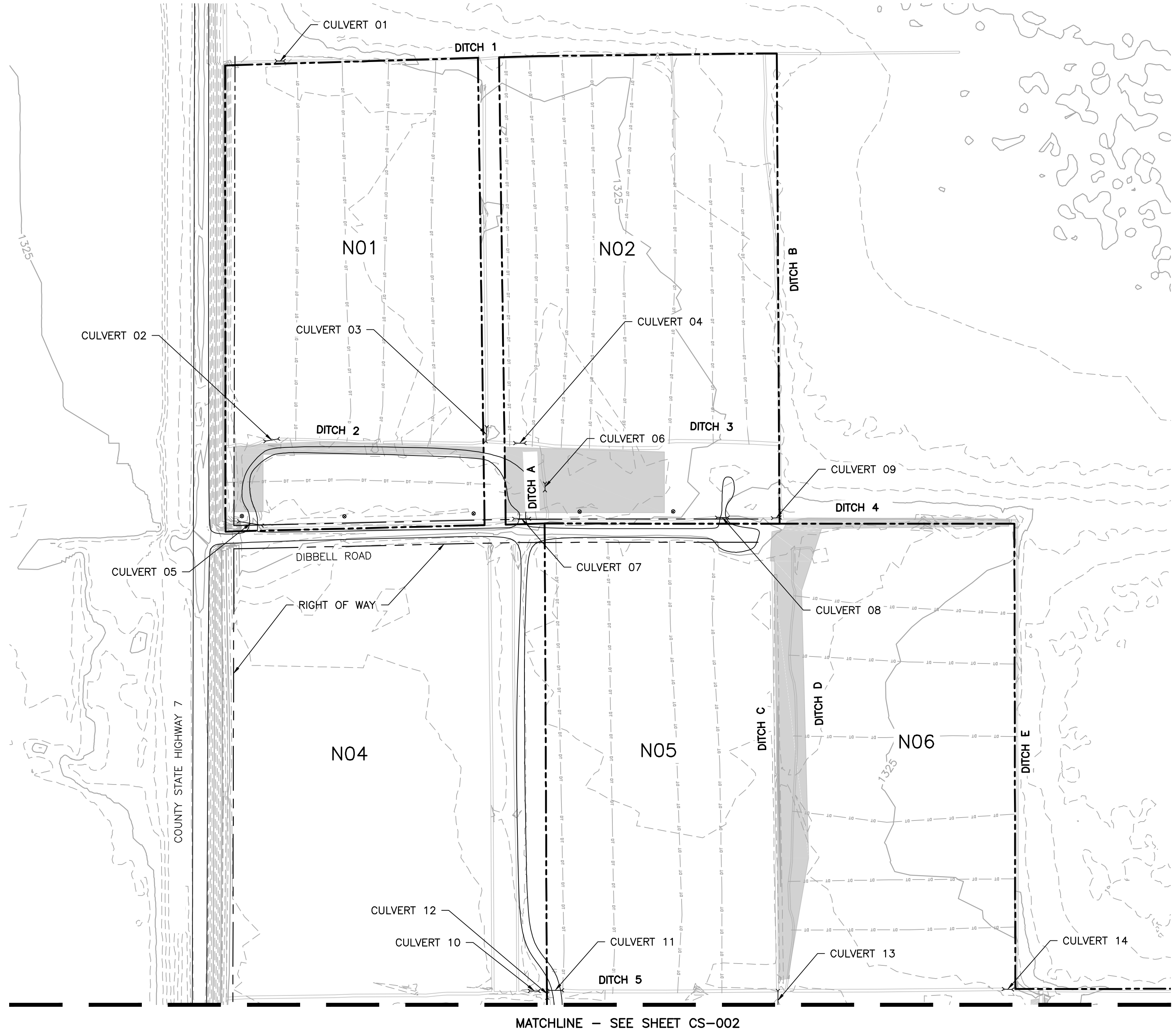

1 PLAN: EXISTING CONDITIONS – FIELDS N01–N06

0 200 400
SCALE IN FEET

CULVERT	UNIT	DITCH	LENGTH	ACTION
01	NORTH	1	14.3	REMOVE
02	NORTH	2	35.9	REMOVE
03	NORTH	-	38.9	REMOVE
04	NORTH	3	25.2	REMOVE
05	NORTH	4	64.8	NONE
06	NORTH	A	18.3	REMOVE
07	NORTH	4	41.2	NONE
08	NORTH	4	29.7	NONE
09	NORTH	4	18.3	REMOVE
10	NORTH	5	24.6	NONE
11	NORTH	5	36.6	REMOVE
12	NORTH	F	10.4	REMOVE
13	NORTH	G	53.7	REMOVE
14	NORTH	5	22.9	REMOVE
15	NORTH	6	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

CULVERT	UNIT	DITCH	LENGTH	ACTION
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

NOTES:

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.

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ISSUED	VERSION	DATE
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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
EXISTING CONDITIONS AND CULVERT SCHEDULE
NORTH UNIT – FIELDS N01 – N06

POLYMET MINING

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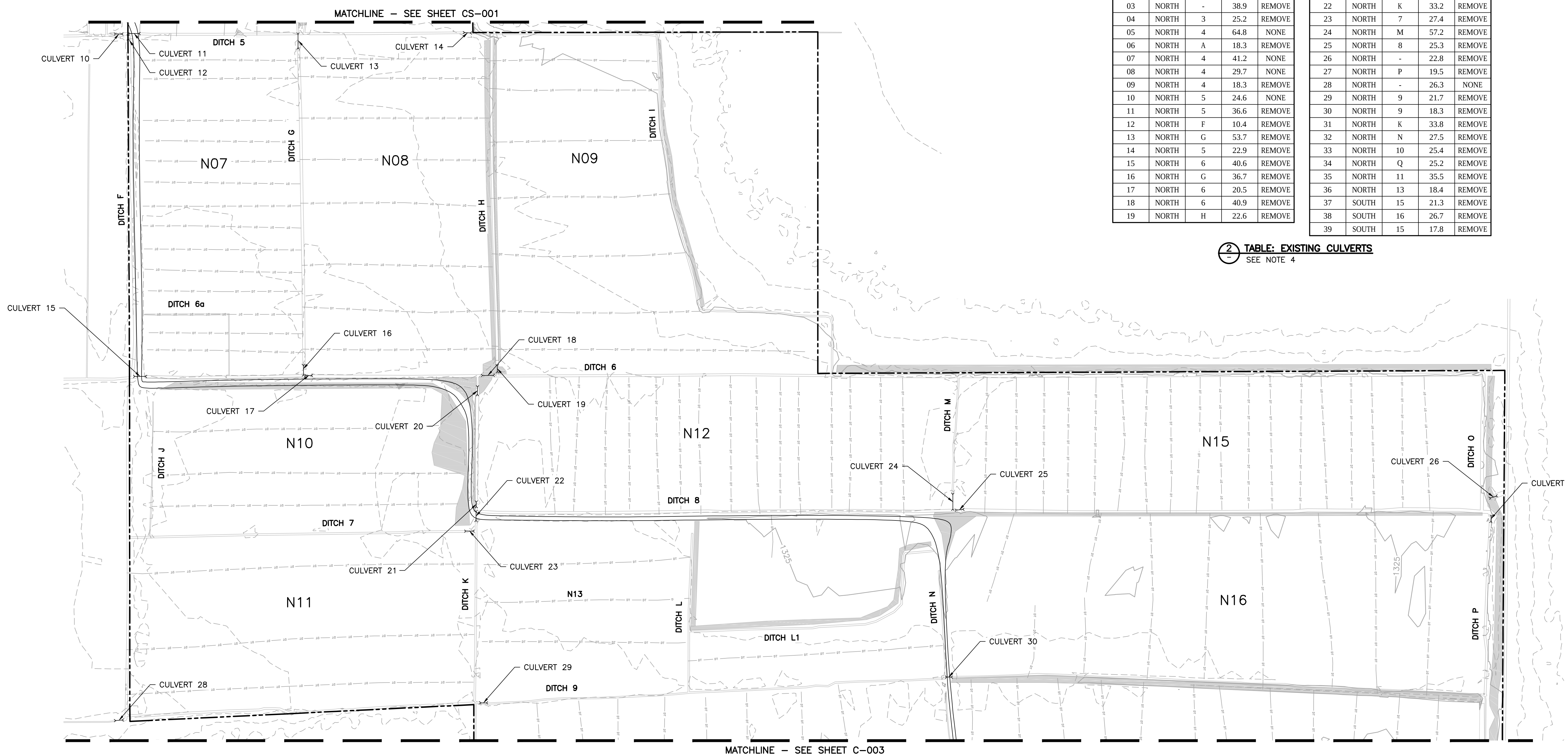

1 PLAN: EXISTING CONDITIONS – NORTH UNIT

0 500 1000
SCALE IN FEET

CULVERT	UNIT	DITCH	LENGTH	ACTION
01	NORTH	1	14.3	REMOVE
02	NORTH	2	35.9	REMOVE
03	NORTH	-	38.9	REMOVE
04	NORTH	3	25.2	REMOVE
05	NORTH	4	64.8	NONE
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07	NORTH	4	41.2	NONE
08	NORTH	4	29.7	NONE
09	NORTH	4	18.3	REMOVE
10	NORTH	5	24.6	NONE
11	NORTH	5	36.6	REMOVE
12	NORTH	F	10.4	REMOVE
13	NORTH	G	53.7	REMOVE
14	NORTH	5	22.9	REMOVE
15	NORTH	6	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

CULVERT	UNIT	DITCH	LENGTH	ACTION
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21	NORTH	K	17.1	REMOVE
22	NORTH	K	33.2	REMOVE
23	NORTH	7	27.4	REMOVE
24	NORTH	M	57.2	REMOVE
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30	NORTH	9	18.3	REMOVE
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32	NORTH	N	27.5	REMOVE
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34	NORTH	Q	25.2	REMOVE
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SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
EXISTING CONDITIONS AND CULVERT SCHEDULE
NORTH UNIT – FIELDS N07 – N16

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

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4300 MarketPointe Dr. #200
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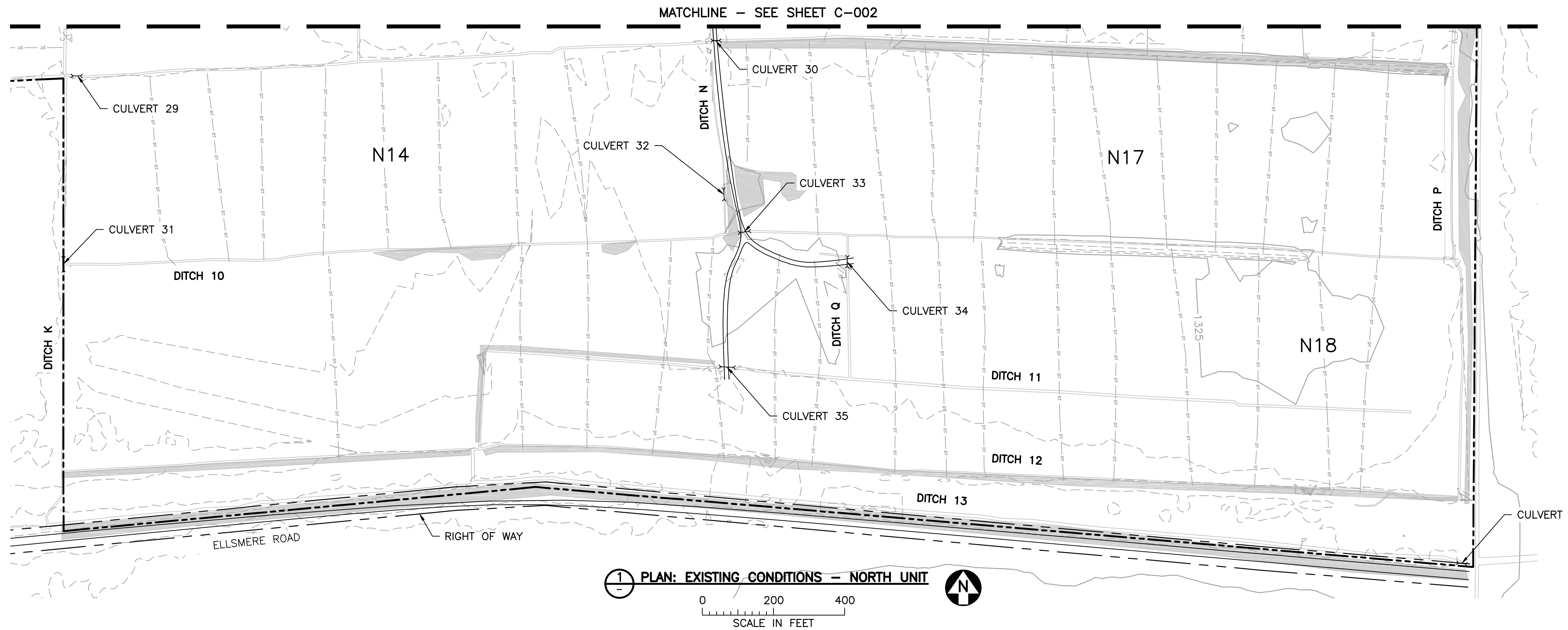

1 PLAN: EXISTING CONDITIONS – NORTH UNIT

CULVERT	UNIT	DITCH	LENGTH	ACTION
01	NORTH	1	14.3	REMOVE
02	NORTH	2	35.9	REMOVE
03	NORTH	-	38.9	REMOVE
04	NORTH	3	25.2	REMOVE
05	NORTH	4	64.8	NONE
06	NORTH	A	18.3	REMOVE
07	NORTH	4	41.2	NONE
08	NORTH	4	29.7	NONE
09	NORTH	4	18.3	REMOVE
10	NORTH	5	24.6	NONE
11	NORTH	5	36.6	REMOVE
12	NORTH	F	10.4	REMOVE
13	NORTH	G	53.7	REMOVE
14	NORTH	5	22.9	REMOVE
15	NORTH	6	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

CULVERT	UNIT	DITCH	LENGTH	ACTION
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

NOTES:

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 3 ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY LOCATION AND ACTUAL LENGTH.SEE SHEET CS-012 FOR CULVERT REMOVAL DETAIL.

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SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
EXISTING CONDITIONS AND CULVERT SCHEDULE
NORTH UNIT – FIELDS N14 – N18

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POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

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4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

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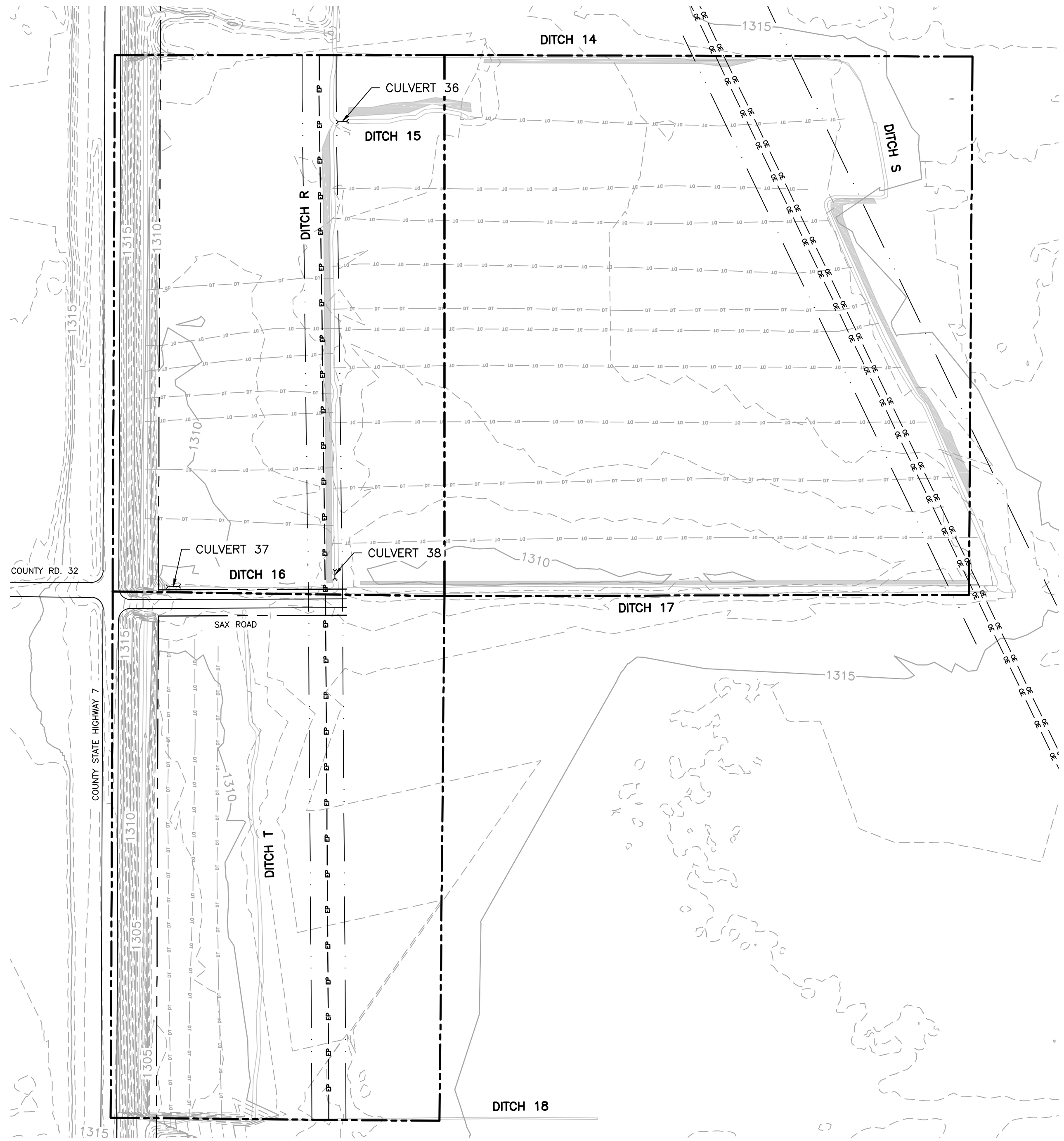

2 PLAN: EXISTING CONDITIONS – SOUTH UNIT

0 200 400
SCALE IN FEET

CULVERT	UNIT	DITCH	LENGTH	ACTION
01	NORTH	1	14.3	REMOVE
02	NORTH	2	35.9	REMOVE
03	NORTH	-	38.9	REMOVE
04	NORTH	3	25.2	REMOVE
05	NORTH	4	64.8	NONE
06	NORTH	A	18.3	REMOVE
07	NORTH	4	41.2	NONE
08	NORTH	4	29.7	NONE
09	NORTH	4	18.3	REMOVE
10	NORTH	5	24.6	NONE
11	NORTH	5	36.6	REMOVE
12	NORTH	F	10.4	REMOVE
13	NORTH	G	53.7	REMOVE
14	NORTH	5	22.9	REMOVE
15	NORTH	6	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

CULVERT	UNIT	DITCH	LENGTH	ACTION
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

NOTES:

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.

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PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
EXISTING CONDITIONS AND CULVERT SCHEDULE
SOUTH UNIT – FIELDS S01 – S03

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

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4300 MarketPointe Dr. #200
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INCHES 1 2

1 PLAN: NORTH UNIT – FIELDS N01 – N06

0 200 400 SCALE IN FEET

NOTES:

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
2. 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

CADD USER: Carlos Ballinas FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/3/2016 12:15 PM

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ZIM SOD WETLAND MITIGATION
NORTH UNIT PLAN – FIELDS N01 – N06

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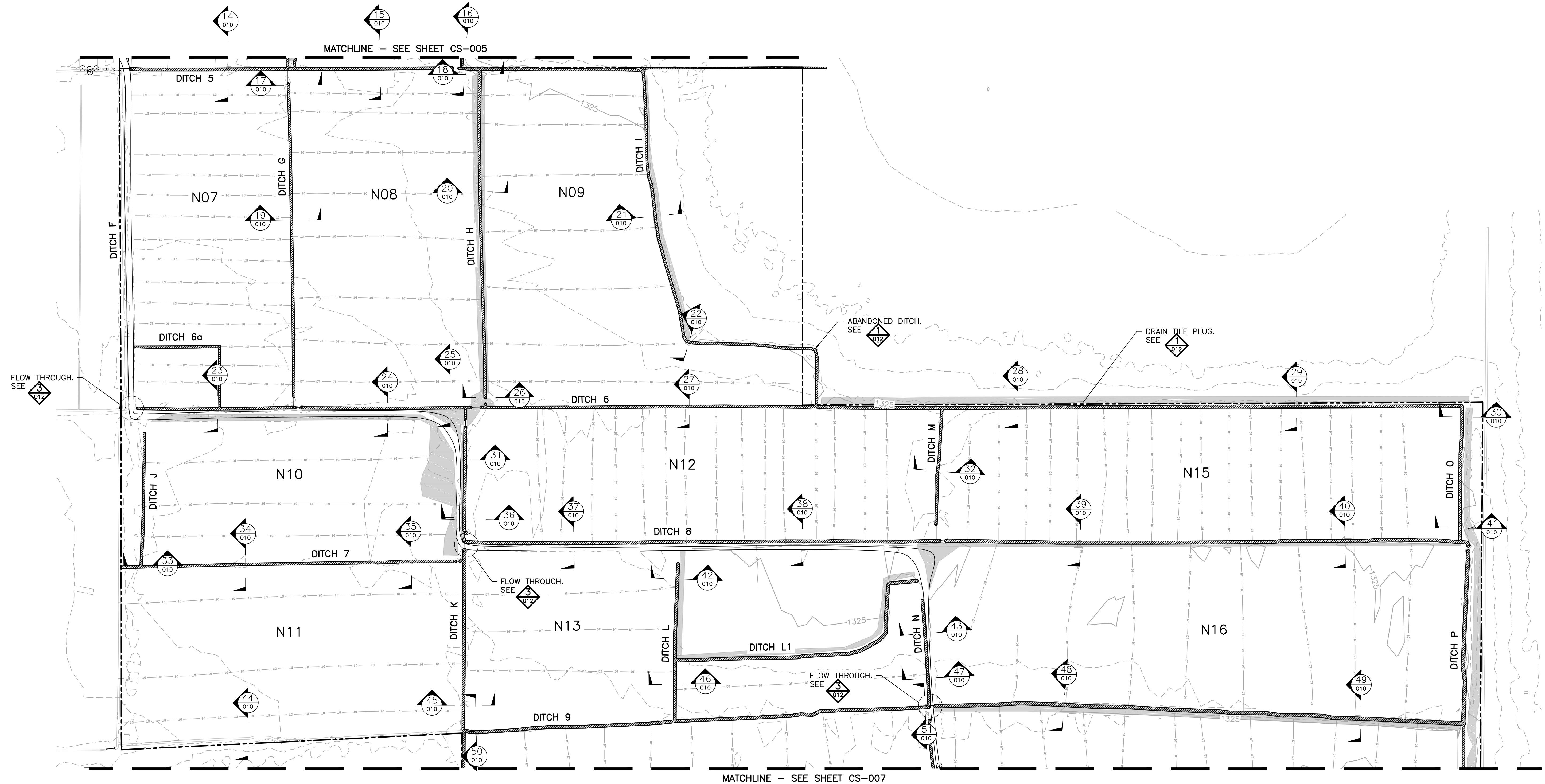

1 PLAN: NORTH UNIT – FIELDS N07 – N16

0 200 400
SCALE IN FEET

NOTES:

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
2. 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

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PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
NORTH UNIT PLAN – FIELDS N07 – N16

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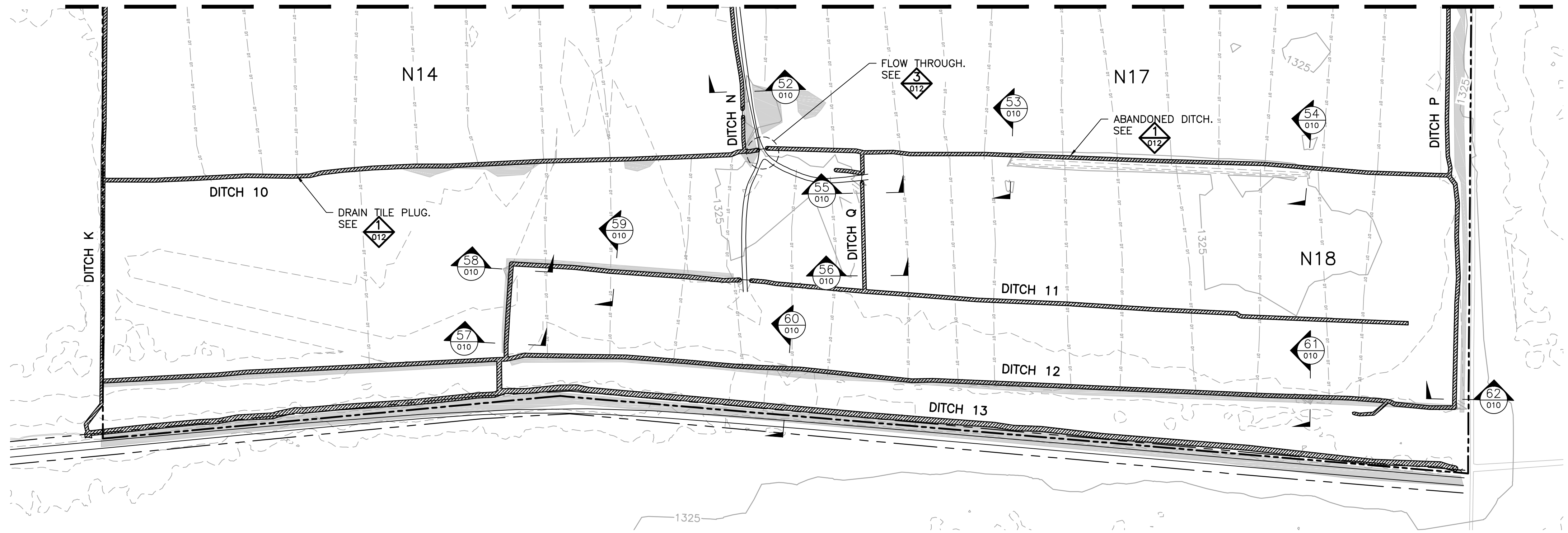
MATCHLINE – SEE SHEET CS–007



1 PLAN: NORTH UNIT – FIELDS N14 – N18

0 200 400 SCALE IN FEET

NOTES:

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
2. 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. EXISTING DRAIN TILES SHALL BE ABANDONED AS SPECIFIED IN SHEET CS–012.
5. FOR EROSION CONTROL FEATURES SEE SHEETS CS–013 TO CS–016

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PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
NORTH UNIT PLAN – FIELDS N14 – N18

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NORTHMET PROJECT
HOYT LAKES, MINNESOTA

POLYMET MINING

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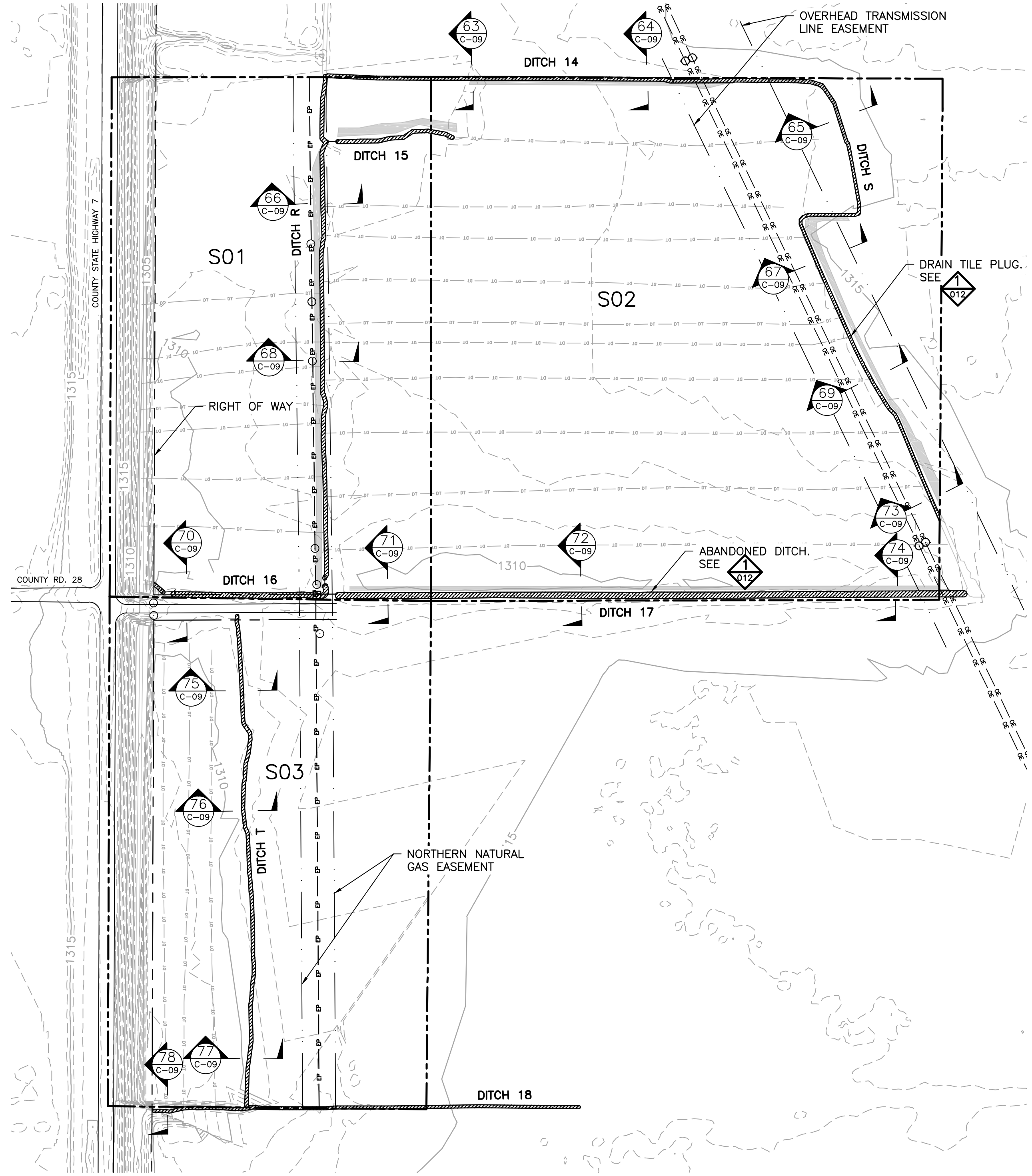

1 PLAN: NORTH UNIT – FIELDS S01 – S03

0 200 400 SCALE IN FEET

NOTES:

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
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4. EXISTING DRAIN TILES SHALL BE ABANDONED AS SPECIFIED IN SHEET CS-012.
5. FOR EROSION CONTROL FEATURES SEE SHEETS CS-013 TO CS-016

CADD USER: Carlos Ballinas FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-008.DWG PLOT SCALE: 1:2 PLOT DATE: 5/3/2016 12:15 PM

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
SOUTH UNIT PLAN – FIELDS S01 – S03

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DWG. NO. CS-008

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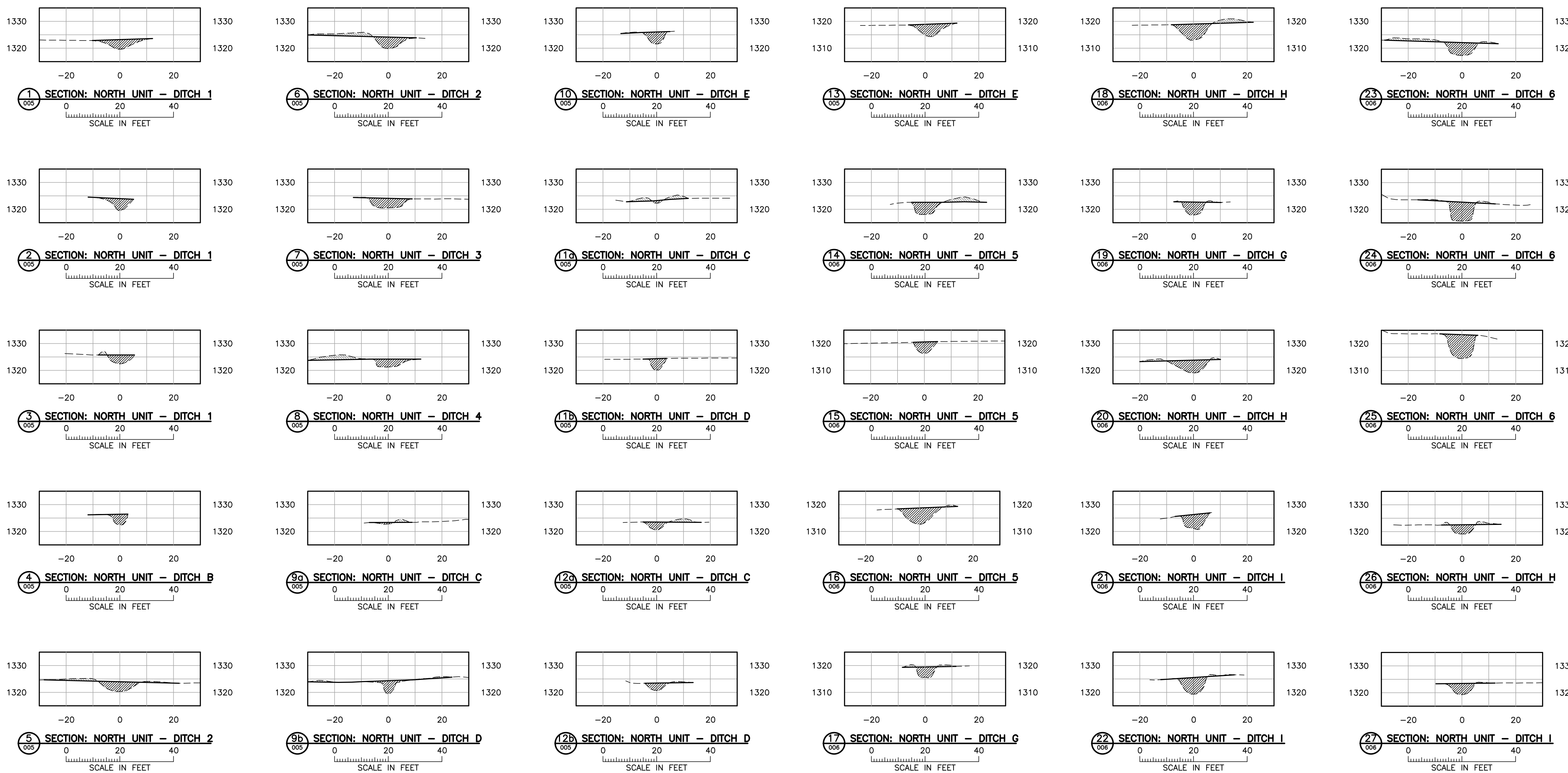

NOTES:

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
2. 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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PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
NORTH UNIT – SECTIONS 1 – 27

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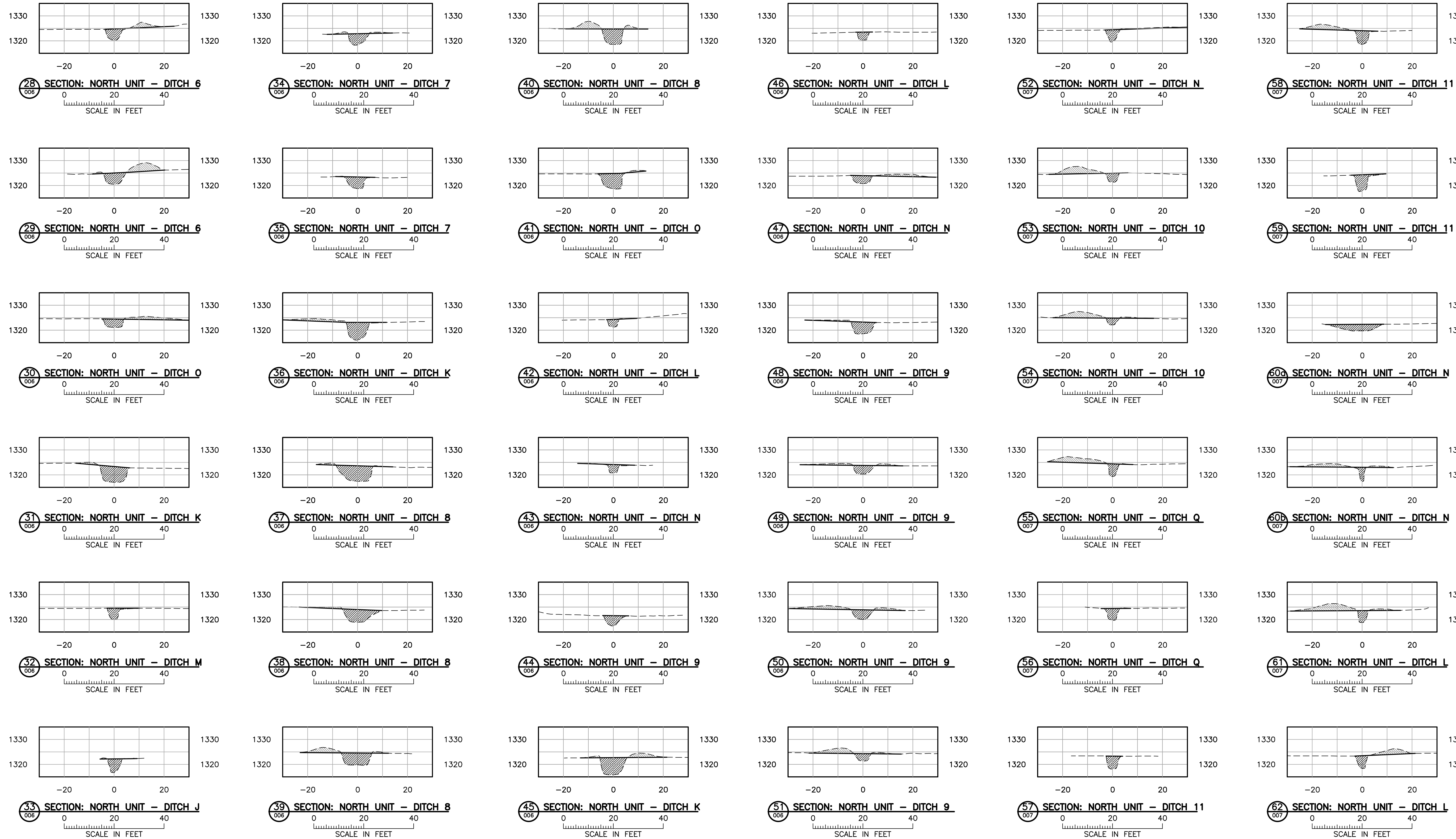

NOTES:

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
2. 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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ISSUE STATUS		
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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
NORTH UNIT – SECTIONS 28 – 62

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NORTHMET PROJECT
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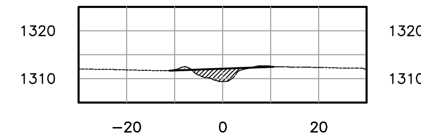

63 / 008 SECTION: SOUTH UNIT – DITCH 14
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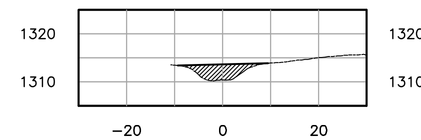

64 / 008 SECTION: SOUTH UNIT – DITCH 14
0 20 40
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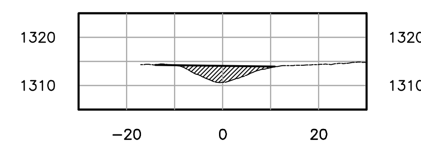
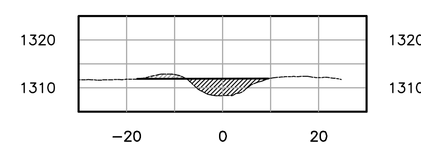
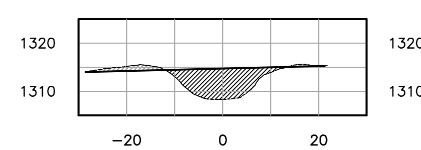


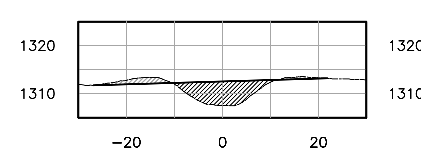
65 / 008 SECTION: SOUTH UNIT – DITCH S
0 20 40
SCALE IN FEET



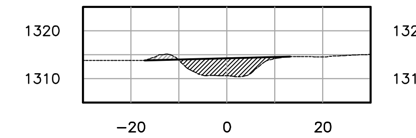
66 / 008 SECTION: SOUTH UNIT – DITCH R
0 20 40
SCALE IN FEET



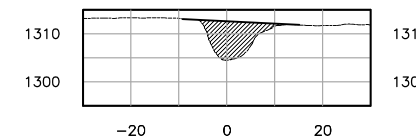
67 / 008 SECTION: SOUTH UNIT – DITCH S
0 20 40
SCALE IN FEET



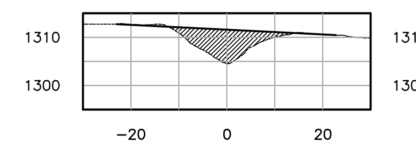
68 / 008 SECTION: SOUTH UNIT – DITCH R
0 20 40
SCALE IN FEET



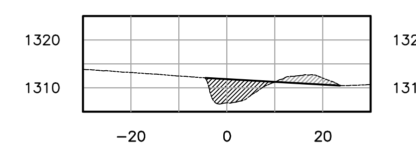
69 / 008 SECTION: SOUTH UNIT – DITCH S
0 20 40
SCALE IN FEET



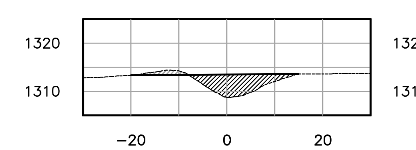
70 / 008 SECTION: SOUTH UNIT – DITCH 16
0 20 40
SCALE IN FEET



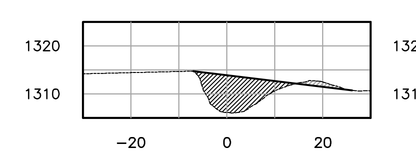
71 / 008 SECTION: SOUTH UNIT – DITCH 17
0 20 40
SCALE IN FEET



72 / 008 SECTION: SOUTH UNIT – DITCH 17
0 20 40
SCALE IN FEET



73 / 008 SECTION: SOUTH UNIT – DITCH S
0 20 40
SCALE IN FEET



74 / 008 SECTION: SOUTH UNIT – DITCH 17
0 20 40
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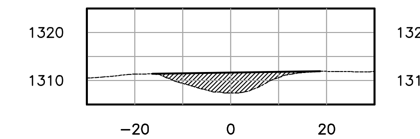
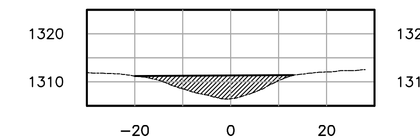
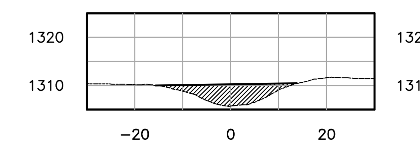


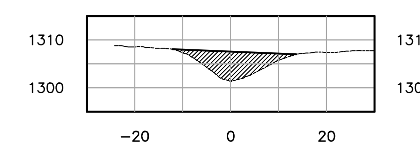
75 / 008 SECTION: SOUTH UNIT – DITCH T
0 20 40
SCALE IN FEET



76 / 008 SECTION: SOUTH UNIT – DITCH T
0 20 40
SCALE IN FEET



77 / 008 SECTION: SOUTH UNIT – DITCH T
0 20 40
SCALE IN FEET



78 / 008 SECTION: SOUTH UNIT – DITCH 18
0 20 40
SCALE IN FEET

NOTES:

1. DITCH LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.
2. 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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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		

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SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
SOUTH UNIT – SECTIONS 63 – 78

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-011
REV .

CADD USER: Carlos Ballinas FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-011.DWG PLOT SCALE: 1:2 PLOT DATE: 5/3/2016 12:15 PM

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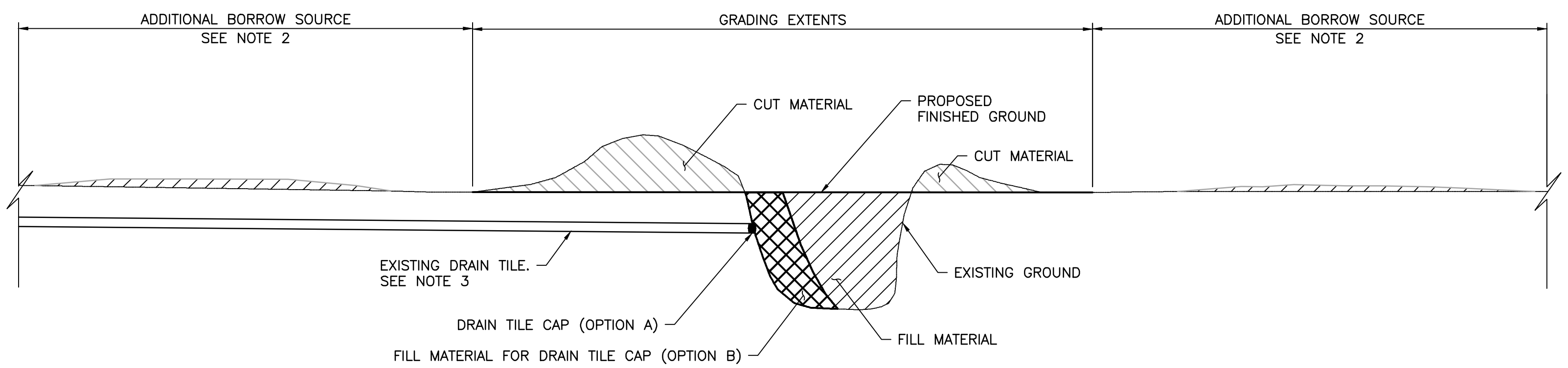
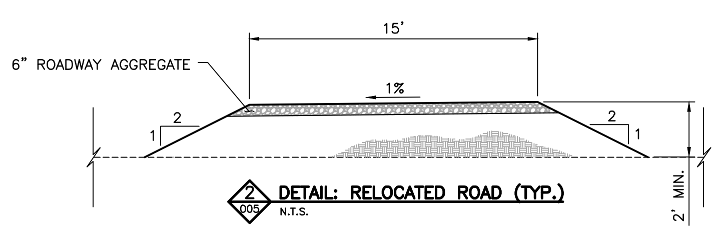
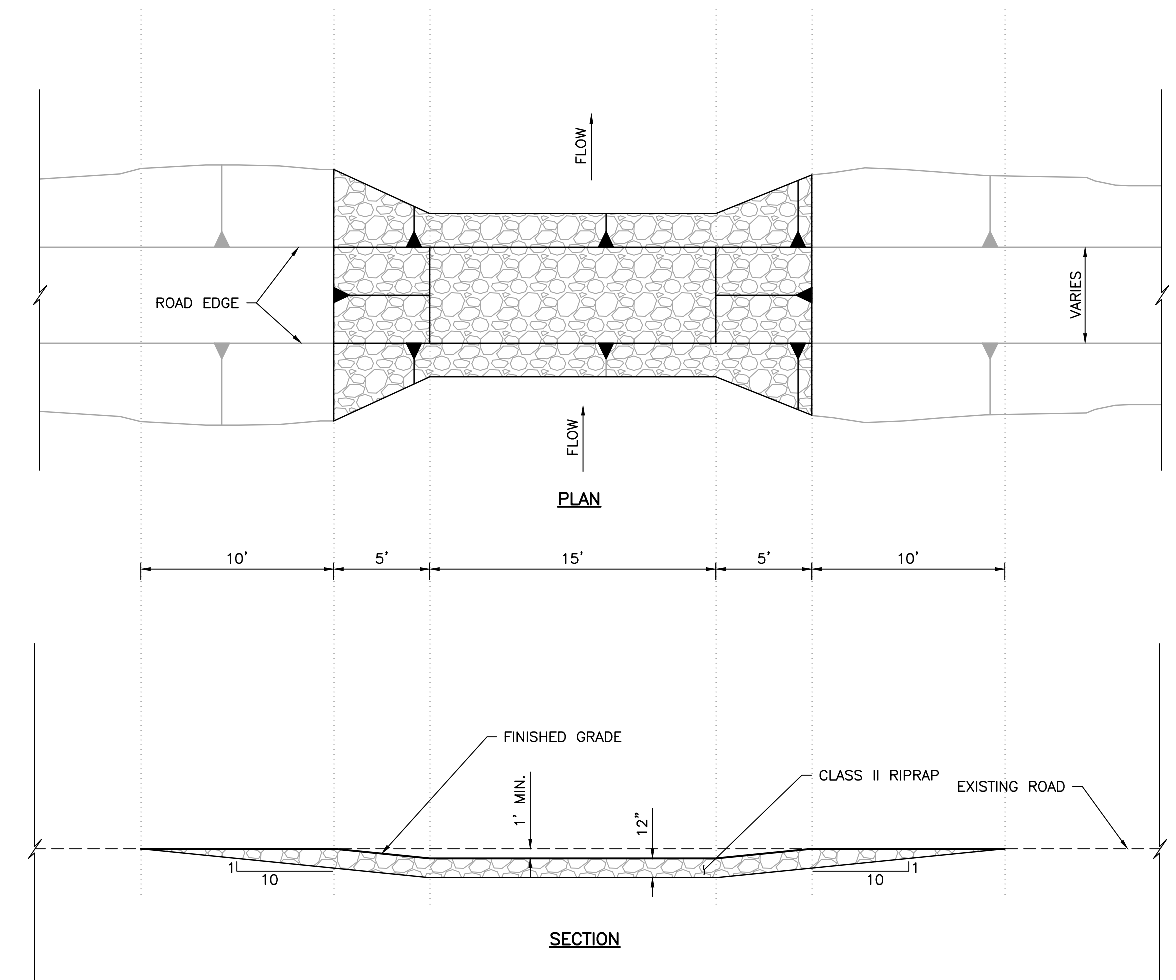


1 / D04 **DETAIL: DITCH ABANDONMENT (TYP.)**
N.T.S.



2 / D05 **DETAIL: RELOCATED ROAD (TYP.)**
N.T.S.



3 / D05 **DETAIL: ROAD FLOW THROUGH (TYP.)**
0 5 10
SCALE IN FEET

NOTES:

1. ABANDONED DITCHES SHALL BE FILLED WITH ADJACENT MATERIAL AND BORROW SOURCES AREAS SHOWN IN PLANS.
2. 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.
3. EXISTING DRAIN TILE SHALL BE ABANDONED BY:
   A. PLACEMENT OF PLASTIC CAP
   B. COMPACTED CLAY

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PRINTED NAME ____
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CHECKED: CMB2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLANDS MITIGATION NORTH AND SOUTH UNIT DETAILS

POLYMET MINING

POLY MET MINING INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

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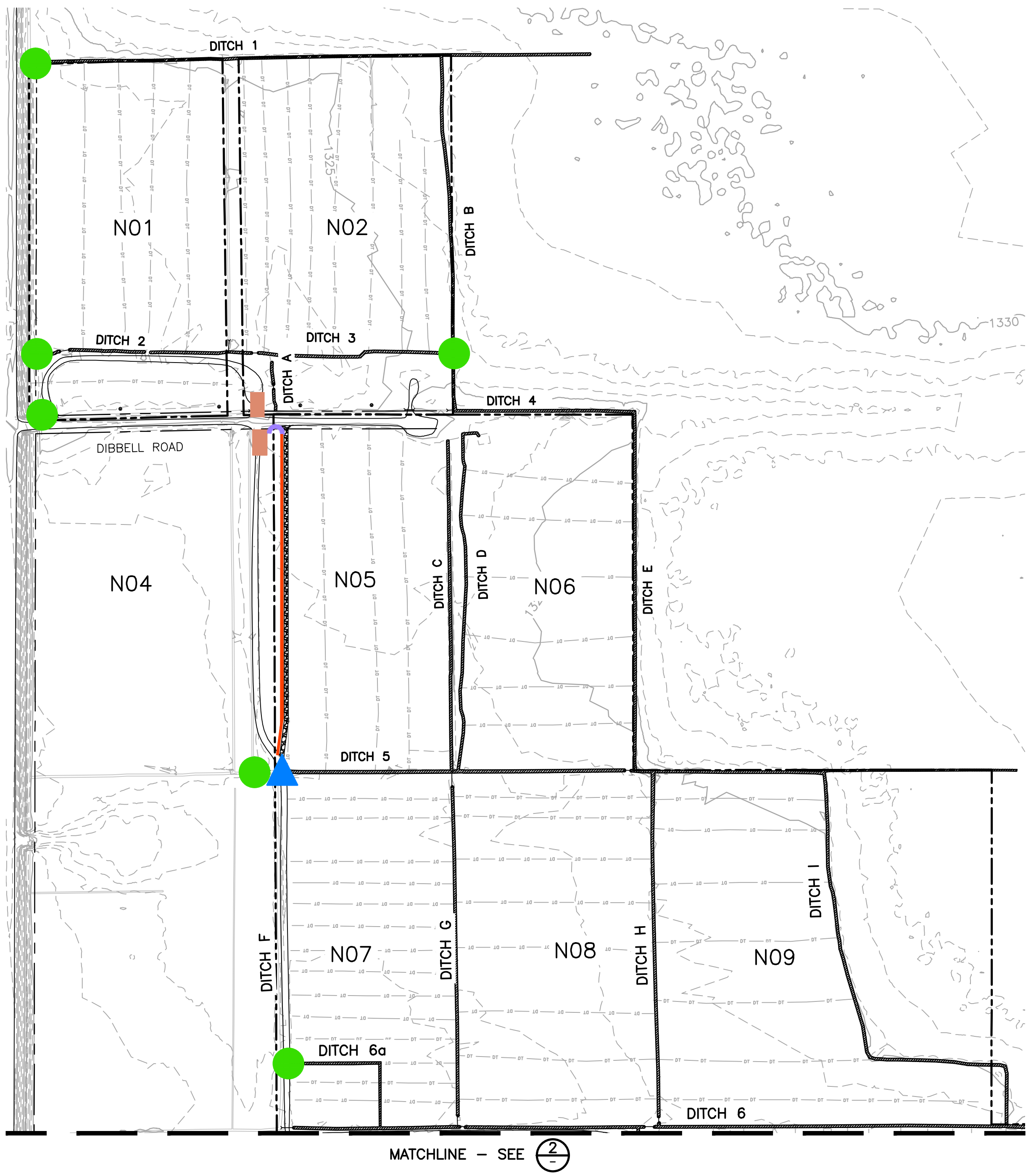

1 PLAN: EROSION CONTROL PLAN – FIELDS N01–N09

0 300 600
SCALE IN FEET

2 PLAN: EROSION CONTROL PLAN – FIELDS N10–N18

0 300 600
SCALE IN FEET

- ROCK SPILLWAY AT DITCH END– SEE 5/016
- ROAD FLOW THROUGH – SEE 3/012
- CONSTRUCTION ENTRANCE – SEE 2/013
- EROSION CONTROL LOG – SEE 1/013
- SEEDED EROSION CONTROL BLANKET – SEE 3/013

NOTES:

1. 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.

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PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
EROSION CONTROL PLAN
NORTH UNIT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

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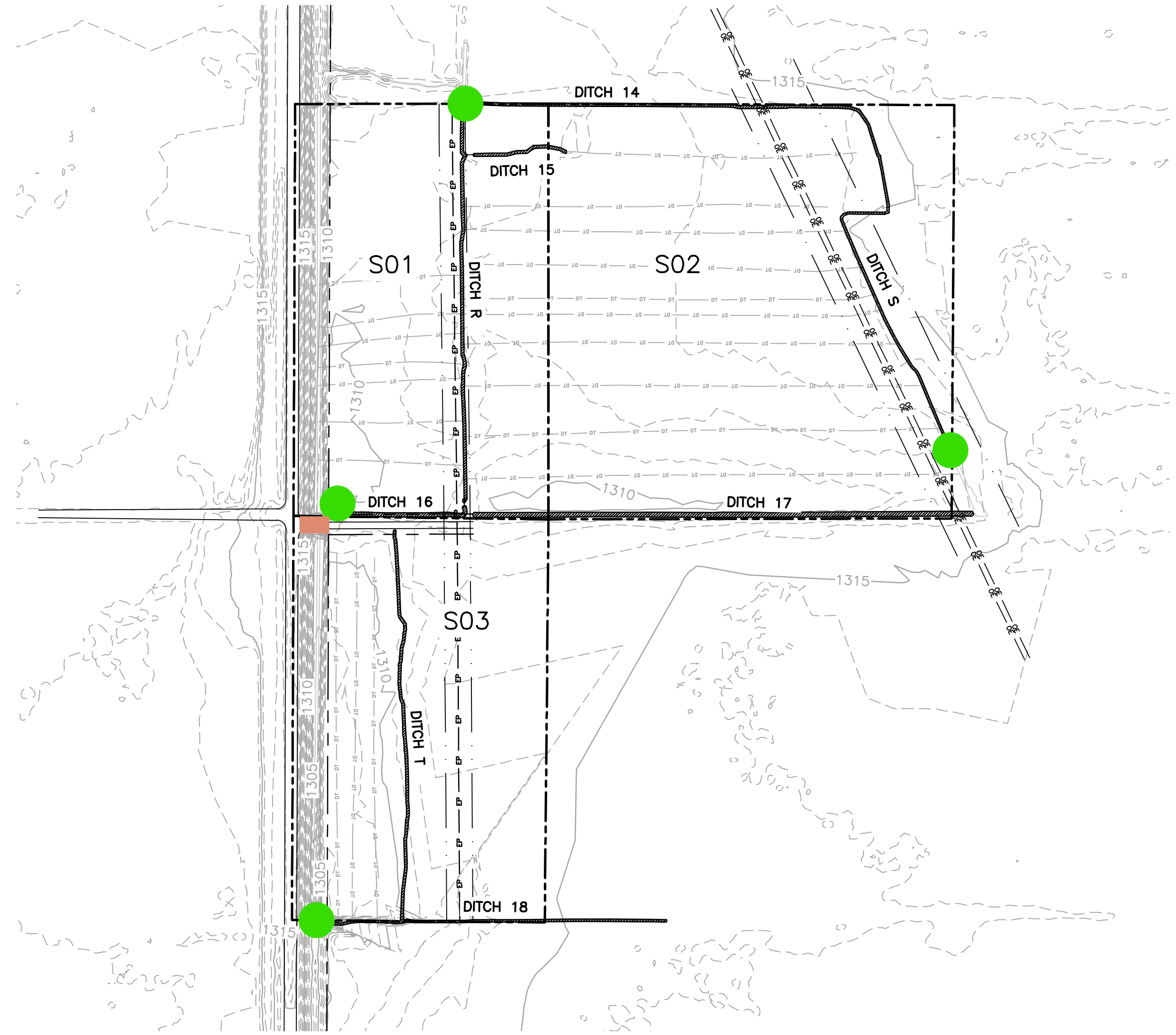

1 PLAN: EROSION CONTROL PLAN – FIELDS S01–S03

0 300 600
SCALE IN FEET

- ROCK SPILLWAY AT DITCH END– SEE 5/016
- ROAD FLOW THROUGH – SEE 3/012
- CONSTRUCTION ENTRANCE – SEE 2/013
- EROSION CONTROL LOG – SEE 1/013
- SEEDED EROSION CONTROL BLANKET – SEE 3/013

NOTES:

1. 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.

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ISSUED	VERSION	DATE
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DATE ______ LICENSE# ______

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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
EROSION CONTROL PLAN
SOUTH UNIT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-014

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PROJECT INFORMATION:
The project is located in the central portion of St. Louis County in McDavitt Township, approximately two and one half (2.5) miles south of the unicorporated community of Zim, Minnesota. Proposed construction will take place within Sections 2, 3, 10, 11, 14, 26, 27, and 34 of Township 55 North, and Range 18 West in St. Louis County, Minnesota. The site lies east of County State–Aid (CSAH) Highway 7 between County Road 320 (Dibbell Road) on the north and County Road 542 (Sax Road) on the south. (Latitude: 47.261328, Longitude: 92.591594)

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 vegetation, shrubs, and trees. All disturbed sloped areas will be stabilized with mulch, erosion control blanket, or rip–rap.

PROJECT SIZE:
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.

REGULATORY CONTEXT:
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 the project.

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 enviromental reviews, endangered or threatened species.

FIGURES:

Site Location and Vicinity Map:	Sheet G01
Sheet Existing Conditions Plan:	Sheet C01, C02
Site Plan	Sheet C03–C06
Stormwater Pollution Prevention Plan (SWPPP)	Sheet C10
Erosion Control Plan:	Sheet C11
Erosion Control Sections and Details:	Sheets C12
Erosion and Sedimentation Control Quantities	See Project Bid Form

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IMPLEMENTATION RESPONSIBILITIES:
1. The OWNER and CONTRACTOR are Permittee(s) as identified by the NPDES Permit.
2. CONTRACTOR shall be responsible for all on–site implementation of the SWPPP, including the activities of all of CONTRACTOR's subcontractors.
3. 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 SWPPP.
4. 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.
5. 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
Restored Wetlands by eliminating existing drainage systems.

SEQUENCE OF CONSTRUCTION
The following sequence describes, in general, the work on the site:
1. CONTRACTOR shall submit a detailed construction staging, erosion control staging, and stormwater management plan for the entire project for the duration of construction.
2. CONTRACTOR shall verify that all permits have been obtained and/or obtain the necessary permits.
3. CONTRACTOR shall perform site inspections, record keeping and record retention in accordance with all permits.
4. 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.
5. CONTRACTOR shall perform site grading, excavation, stockpiling work in accordance with the stormwater pollution prevention plan (SWPPP).
6. 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.
7. 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.
8. CONTRACTOR shall replace or repair erosion control and sediment control BMP's that are not functioning properly.
9. CONTRACTOR shall perform site restoration actvities for permanent vegetative establishment associated with outflow spillways and shall seed exposed areas with MNDOT Mix 34–171 as identified on the plans.
10. CONTRACTOR shall remove non–biodegradeable sediment control devices prior to submitting Notice Of Termination (NOT).
11. Submit notice of termination to MPCA within 30 days of final stabilization.

CONSTRUCTION ACTIVITY FIELD REQUIREMENTS:
A. All field requirements shall be perfomed in accordance with the requirements of the NPDES Permit and Stormwater Pollution Prevention Plan (SWPPP).
1. The CONTRACTOR must implement the SWPPP and provide BMPs identified in the SWPPP in an appropriate and functional manner.
2. 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.

B. EROSION PREVENTION PRACTICES
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 begins.
2. 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.
3. 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.
4. Temporary or permanent energy dissipation at drainage or pipe outlets must be provided within 24 hours of connecting to a surface water.

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.
2. 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.
3. 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 next precipitation event.
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.
5. 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.
6. 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, equivalent system must be installed at active project entrances and near active stockpiles by CONTRACTOR to minimize tracking from site.

D. DEWATERING AND BASIN DRAINING
CONTRACTOR shall be responsible for the following dewatering requirements:
1. No dewatering activities are anticipated with this project.
2. 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.

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.
2. 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.
3. 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.
   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.
4. 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.
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 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.
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 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 CONTRACTOR.

F. 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, 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.
3. 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.
4. Concrete washout containment is not expeced to be required on site.
5. Portable toilets brought to the property shall be made secure to prevent spillage from vandalism or other accidental spillage of internal liquids.

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.

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:
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 place if indicated by the plan.
4. Removal of sediments from storm water conveyances and permanent water quality basins.

CHANGES TO SWPPP
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 whenever:
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 the terms and conditions of this permit.
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 (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:

PREPARED BY:	TRAINING/CERTIFICATION	
Tom Tri, Senior Designer	Date of Training/Certification:	January, 2005
Water Resources	Certification Program:	University of Minnesota
Barr Engineering Company		Design of SWPPP – Mn/DOT, Arden Hills
ttri@barr.com	Recertification:	May 7, 2014
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:

RESPONSIBLE PERSONS IS PENDING CONTRACTOR SELECTION:

OWNER:

Polymet Mining Corporation
6500 County Road 666
P.O. Box 475
Hoyt Lakes, MN 55750
218–471–2150

CONTRACTOR:

Constuction Co.
P.O. Box
, MN
Main Phone: (218)
Main Fax: (218)

Construction Co.
P.O. Box
,MN
Office: (218)
Mobile: (218)

On–Site Representative
Construction Co.
P.O. Box
,MN

OWNER'S REPRESENTATIVES:

Kevin Pylka
Polymet Mining Corporation
Manager Env. Permitting & Compliance
6500 County Road 666
P.O. Box 475
Hoyt Lakes, MN 55750
218–471–2150

Mark Jacobson
Vice President
Barr Engineering Company
4300 MarketPointe Drive, #200
Office: (952) 832–2764
Mobile: (612) 240–3297
mjacobson@barr.com

Daniel Tix
Wetland Ecologist
Barr Engineering Company
4300 MarketPointe Drive, #200
Minneapolis, MN, 55435
Office: (952) 832–2918
Mobile: (612) 540–7848
dtix@barr.com

Barr Engineering Company
4300 MarketPointe Drive, #200
Minneapolis, MN 55435
Office: (952) 832–
Mobile:

1 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)
ZIM WETLAND MITIGATION SITE, ST. LOUIS COUNTY

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SIGNATURE ______
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DATE ______ REG. NO. ______

DRAWN: STD
CHECKED: CMB2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

POLYMET MINING
POLY MET MINING INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MARKETPOINTE DRIVE
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. CS–015
REV .

CADD USER: Carlos Ballinas FILE: K:\DESIGN\23690C29.99\MISC_NMG–00–CS–015.DWG PLOT SCALE: 1:2 PLOT DATE: 5/3/2016 12:15 PM

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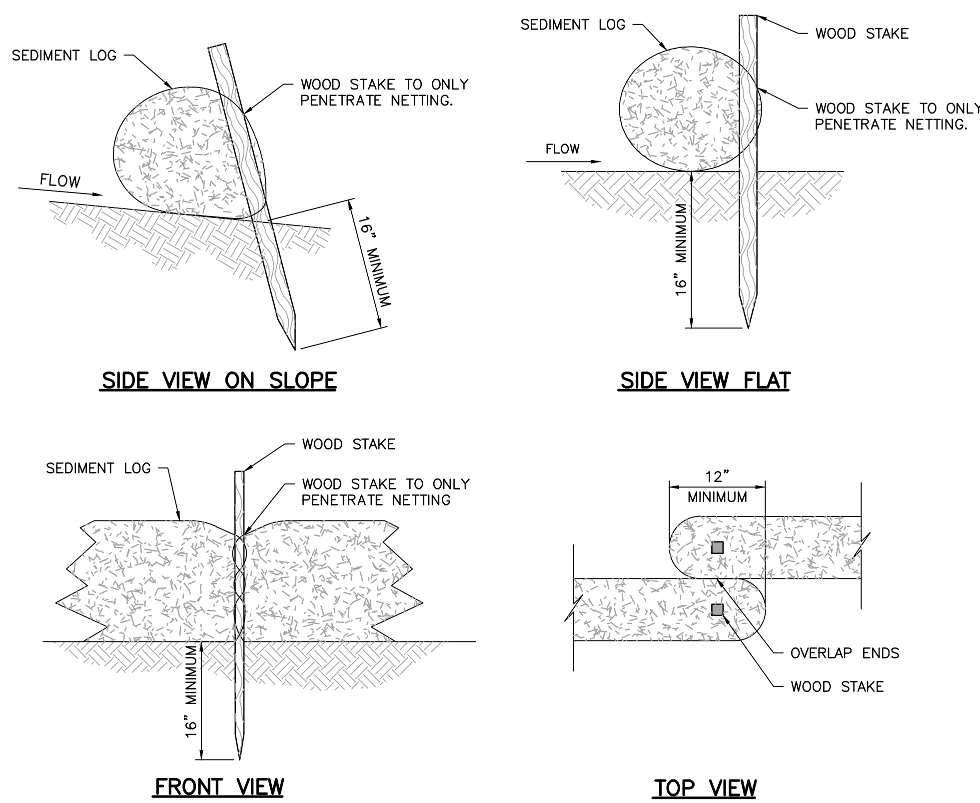
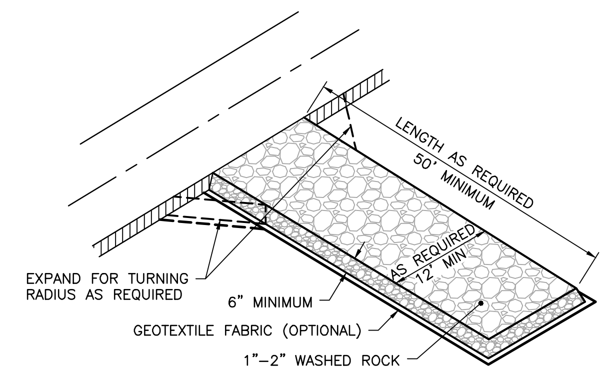


NOTES:

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 HEIGHT.
4. SEDIMENT LOG SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND REPAIRED OR REPLACED AS REQUIRED.

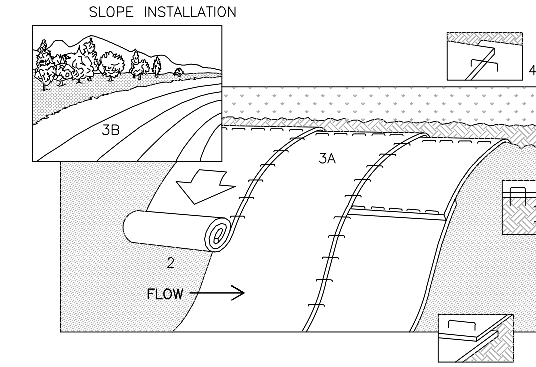
1/013 DETAIL: EROSION CONTROL LOG – STAKING
N.T.S.



NOTES:

1. 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.

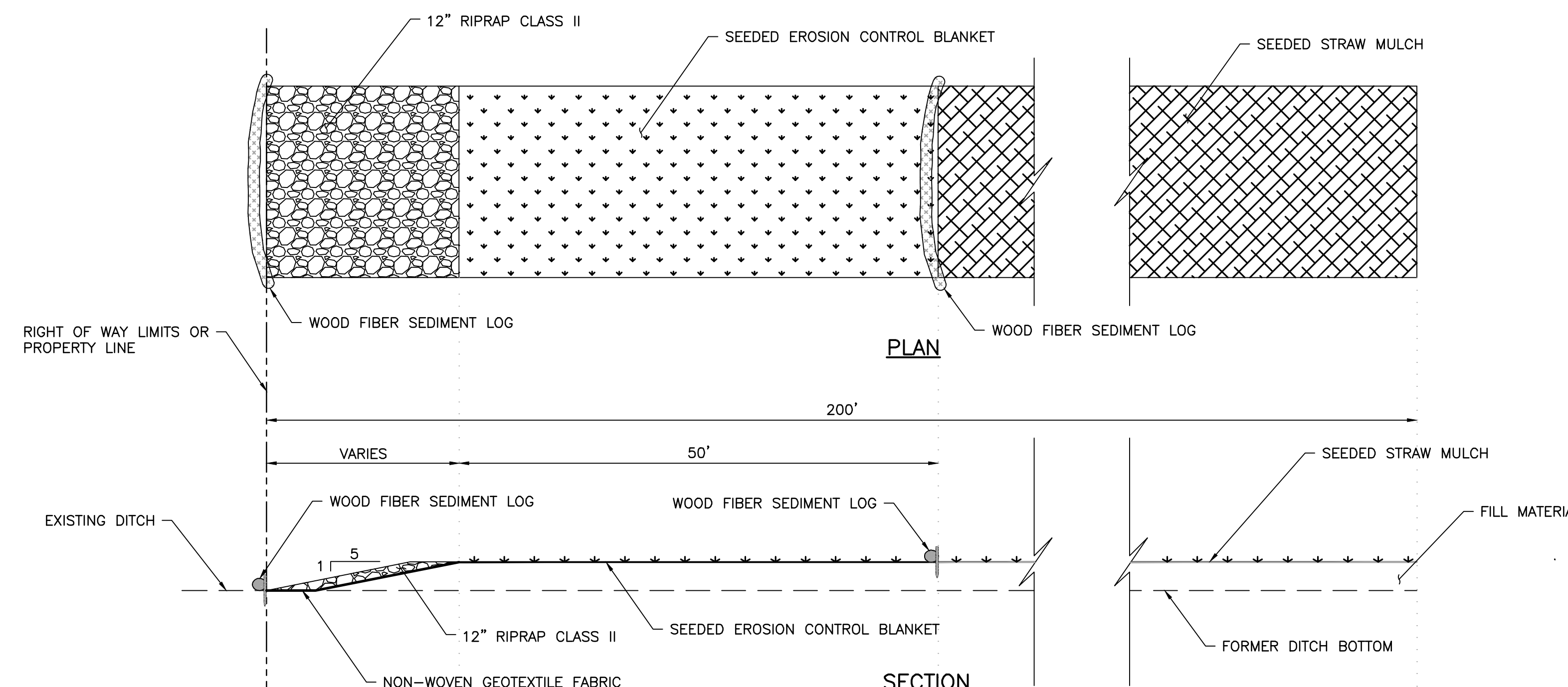
2/013 DETAIL: CONSTRUCTION ENTRANCE – ROCK
N.T.S.



NOTES:

1. 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 DEBRIS.
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.

3/013 DETAIL: EROSION CONTROL BLANKET – INSTALLATION
N.T.S.



5/013 DETAIL: ROCK SPILLWAY AT DITCH END
N.T.S.

34-171 Wetland Rehabilitation Seed Mix					
Wetland Seed Mix at 5.3 pounds per acre,		lbs/ac	% of mix		Seeds/sqft
Native Grasses, Rushes and Sedges					
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

4/– TABLE: SEED MIX
N.T.S.

PLANT DRAWING NUMBER:

ZIM SOD WETLAND MITIGATION
EROSION CONTROL DETAILS

VER NO	DATE	DESCRIPTION
.	.	.

DRAWING STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		

PERMIT DRAWINGS – NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE ____________
PRINTED NAME ____________
DATE ________ REG. NO. ________

DRAWN: STD
CHECKED: CMB2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

POLYMET MINING

POLY MET MINING INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
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Ph: 1-800-632-2277

DWG. NO. CS–016
REV .

CADD USER: Carlos Bollinas FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-016.DWG PLOT SCALE: 1:2 PLOT DATE: 5/3/2016 12:15 PM

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Attachment D

Hinckley Wetland Mitigation Site Wetland Mitigation Plan

Hinckley Wetland Mitigation Site

Wetland Mitigation Plan

Poly Met Mining, Inc.

August 2016

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
952.832.2600
www.barr.com

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 non-wetland 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		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.
(2) The upland buffer acres are distributed among the proposed wetland types..
(3) Totals may not sum due to rounding.

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 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 non-invasive 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, non-invasive 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, non-invasive 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

Well ID	Current Land Use	During the Entire Growing Season									2014-2016	2015-2016	Drainage Status
		2014			2015			2016			# 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)	
		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			
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

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

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

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 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 13

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*.
(2) *Spartina pectinata* will be added in selected locations.

7.2.4 Hardwood Swamp

The existing hardwood swamp wetland will be managed to minimize the prevalence of invasive, non-native 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.

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);
    - 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.

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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.

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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.

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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.

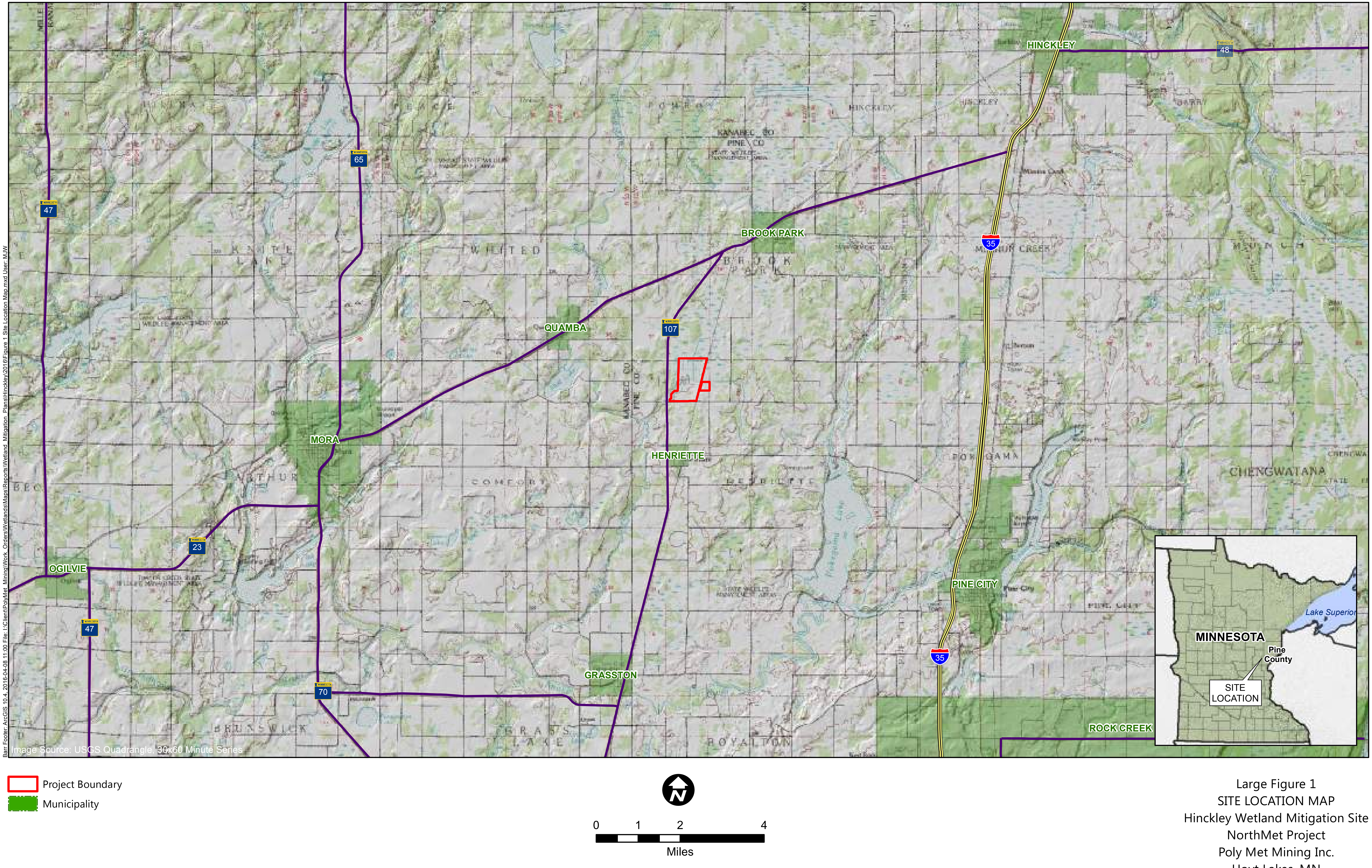
16. **Shaw, S.P. and C.G. Fredine.** *Wetlands of the United States - Their Extent and their Value to Waterfowl and Other Wildlife.* Washington, D.C. : U.S. Department of the Interior, 1956. p. 67. Circular 39.

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.

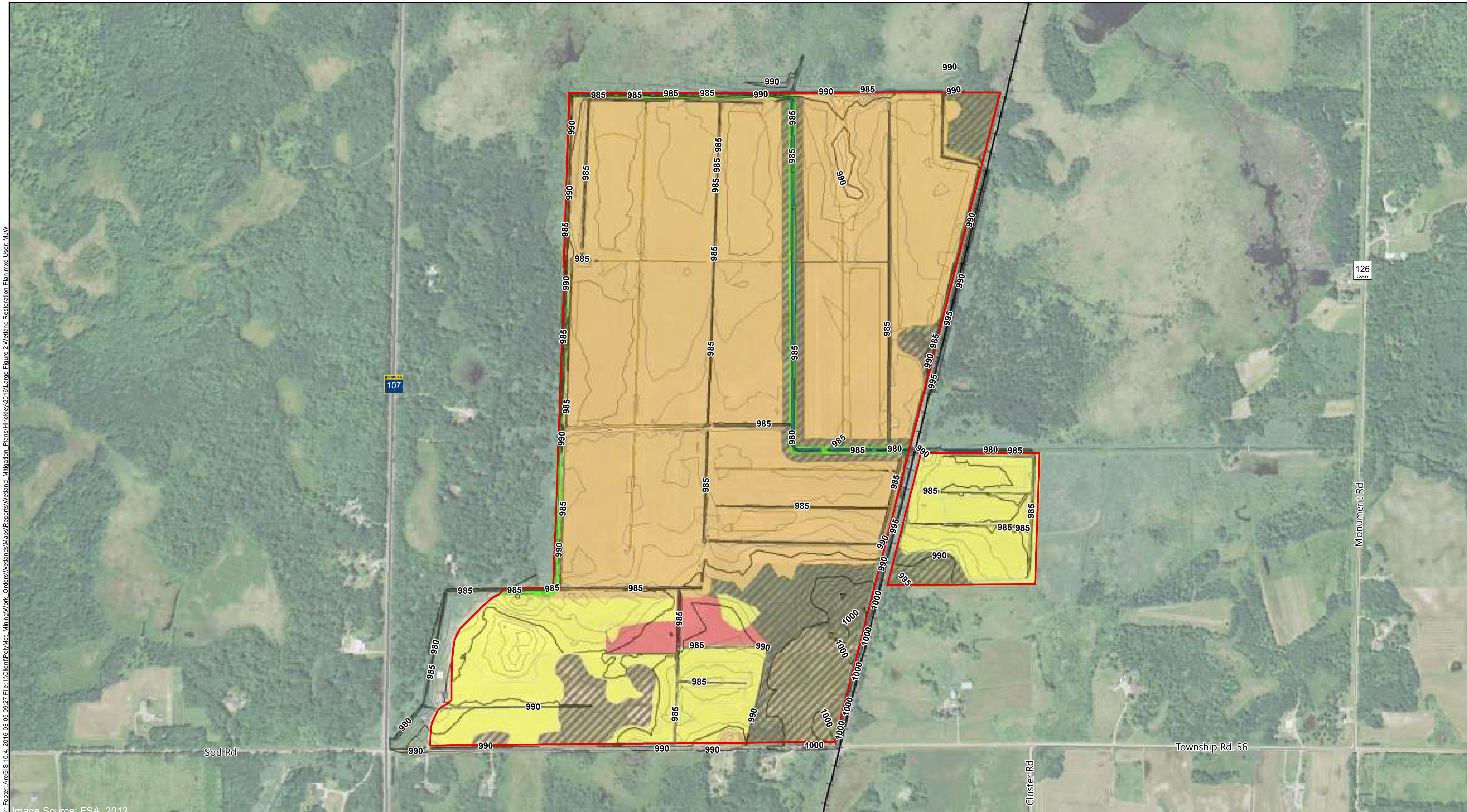
18. **10,000 Lakes Archaeology, Inc.** Cultural Resource Investigations for Proposed Wetland Mitigation at Four Locations in Northern Minnesota. December 1, 2015.

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



BNSF Railroad

Wetland Restoration Plan

Ditch

Ditch Maintenance Zone

Hardwood Swamp

Sedge meadow, Wet Meadow

Shrub Swamps (Alder thickets & Shrub-carrs)

Upland Buffer

Existing Surface Elevation

5-Ft Contour

1-Ft Contour

Project Boundary

0 375 750 1,500

Feet

Large Figure 2

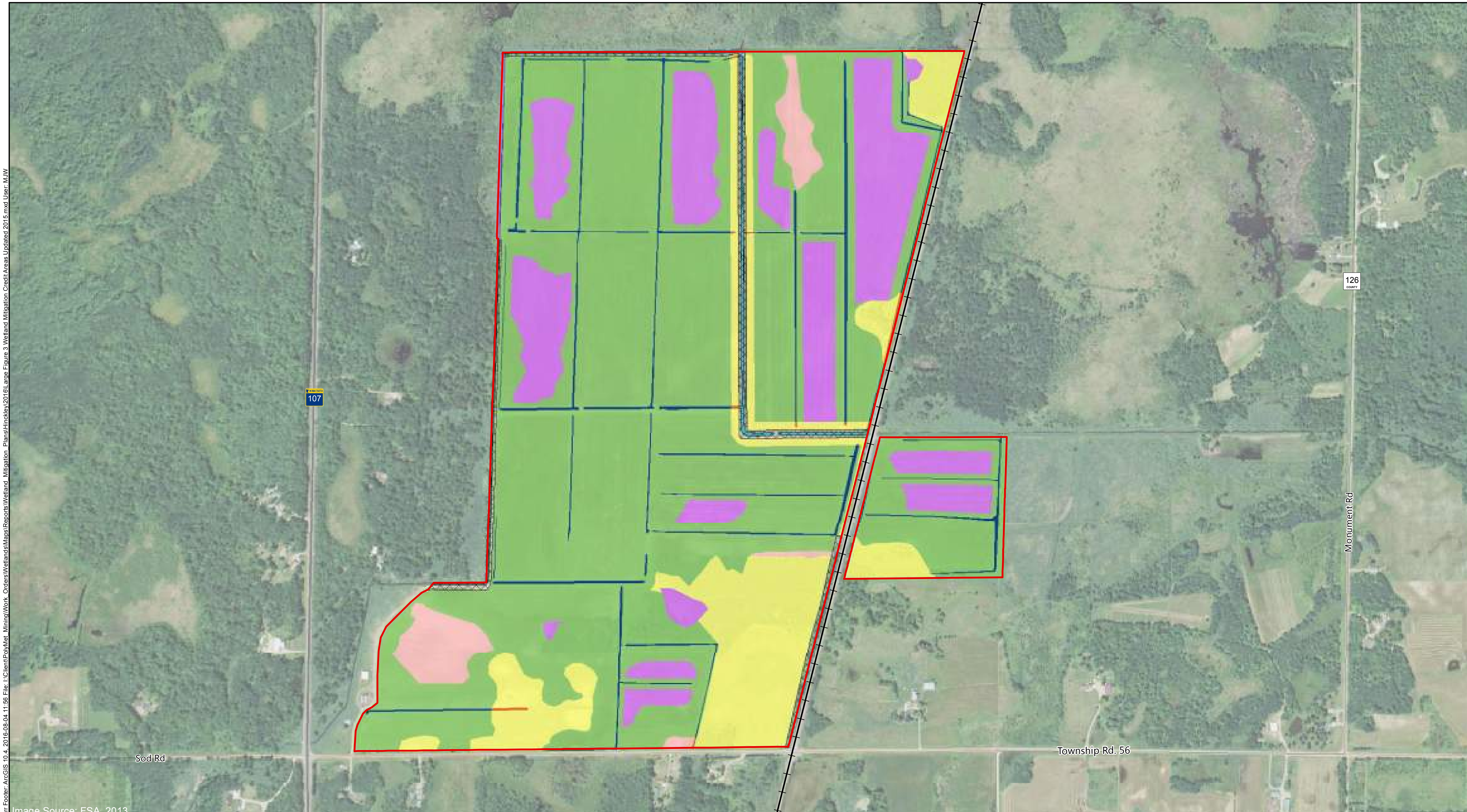
WETLAND RESTORATION PLAN

Hinckley Wetland Mitigation Site

NorthMet Project

Poly Met Mining Inc.

Hoyt Lakes, MN



Wetland Credits
- Drained - 100%
- Wetland Creation - 75%
- Partially Drained - 50%
- Filled - 50%
- Upland Buffer - 25%
- Impact - 0%
- No credit - 0%
- BNSF Railroad
- Ditches
- Project Boundary

0 325 650 1,300
Feet

Large Figure 3
WETLAND MITIGATION CREDIT AREAS
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Map Unit Symbol	Map Unit Name
Ac	Adolph silty clay loam
Af	Adolph fine sandy loam
Eg	Emmert gravelly loamy sand
Fs	Freer silt loam
Kn	Knife Lake silt loam
Mf	Milaca fine sandy loam
Mv	Milaca very fine sandy loam
Os	Onamia loamy fine sand
P	Peat
Wl	Warman loamy fine sand

Barr Footer: ArcGIS 10.4, 2016-04-08 11:31 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetland_Mitigation_Plans\Hinckley\2016\Figure 4 Soils.mxd User: MJW

BNSF Railroad
Pine County Soil Survey (1941) with Map Unit Symbol
Project Boundary

0 300 600 1,200
Feet

Large Figure 4
SOIL MAP
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Wetland Delineation

- Wetland 1
- Wetland 2
- Wetland 3
- Wetland 4
- Wetland 5
- Wetland 6
- Wetland 7
- Wetland 8
- Wetland 9
- Wetland 10
- Wetland 11
- Wetland 12
- Wetland 13
- Wetland 14
- Wetland 15
- Wetland 16
- Wetland 17
- Wetland 18
- Wetland 19
- BNSF Railroad
- Project Boundary

0 350 700 1,400

Feet

Large Figure 5
WETLAND DELINEATION
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

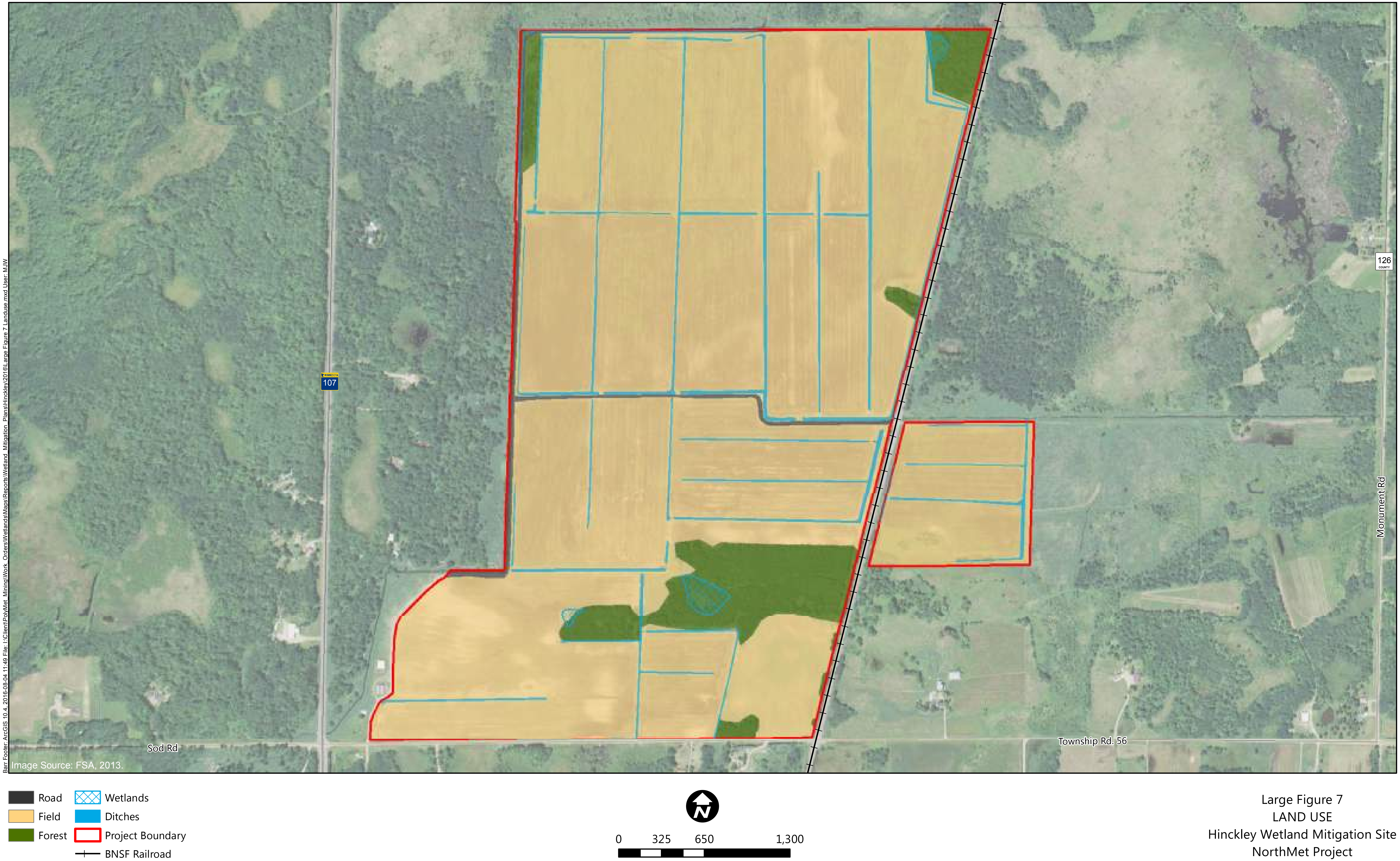
Wetland Type

- Fresh (wet) meadow
- Seasonally flooded basin
- Shallow marsh
- Shallow, Open Water
- Shrub Swamps (Alder thickets & Shrub-carrs)
- BNSF Railroad
- Project Boundary

0 350 700 1,400

Feet

Large Figure 6
WETLAND TYPE
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

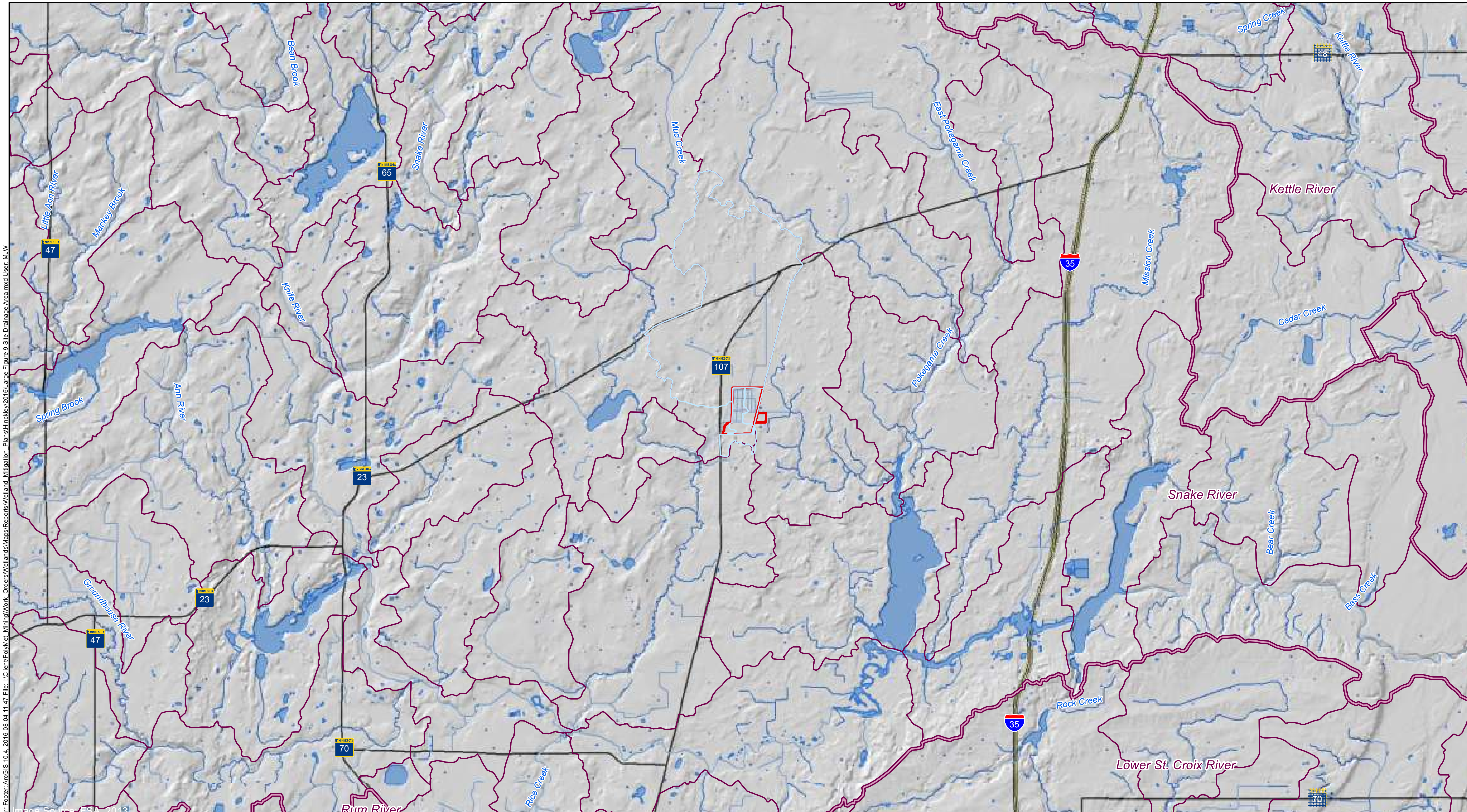


Large Figure 7
LAND USE
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

National Wetlands Inventory (NWI)
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Riverine
Project Boundary
BNSF Railroad

0 350 700 1,400
Feet

Large Figure 8
NATIONAL WETLAND INVENTORY
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Project Boundary
Watersheds - DNR Level 4
Watersheds - DNR Level 8
National Hydrography Dataset
Flowlines
Waterbodies

0 1 2 4
Miles

Large Figure 9
SITE DRAINAGE AREA
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

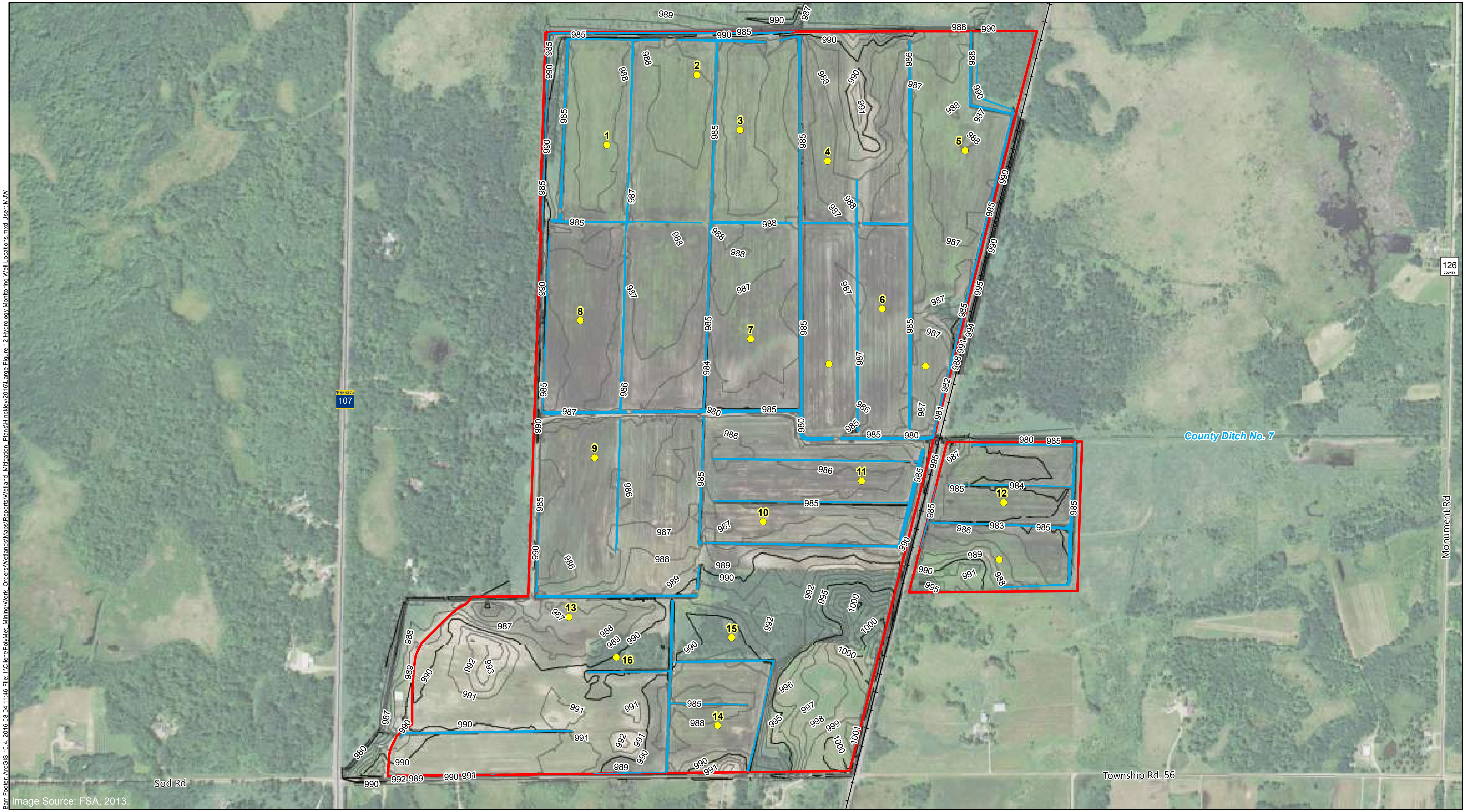
Project Boundary

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

Large Figure 11
1991 AERIAL PHOTO
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

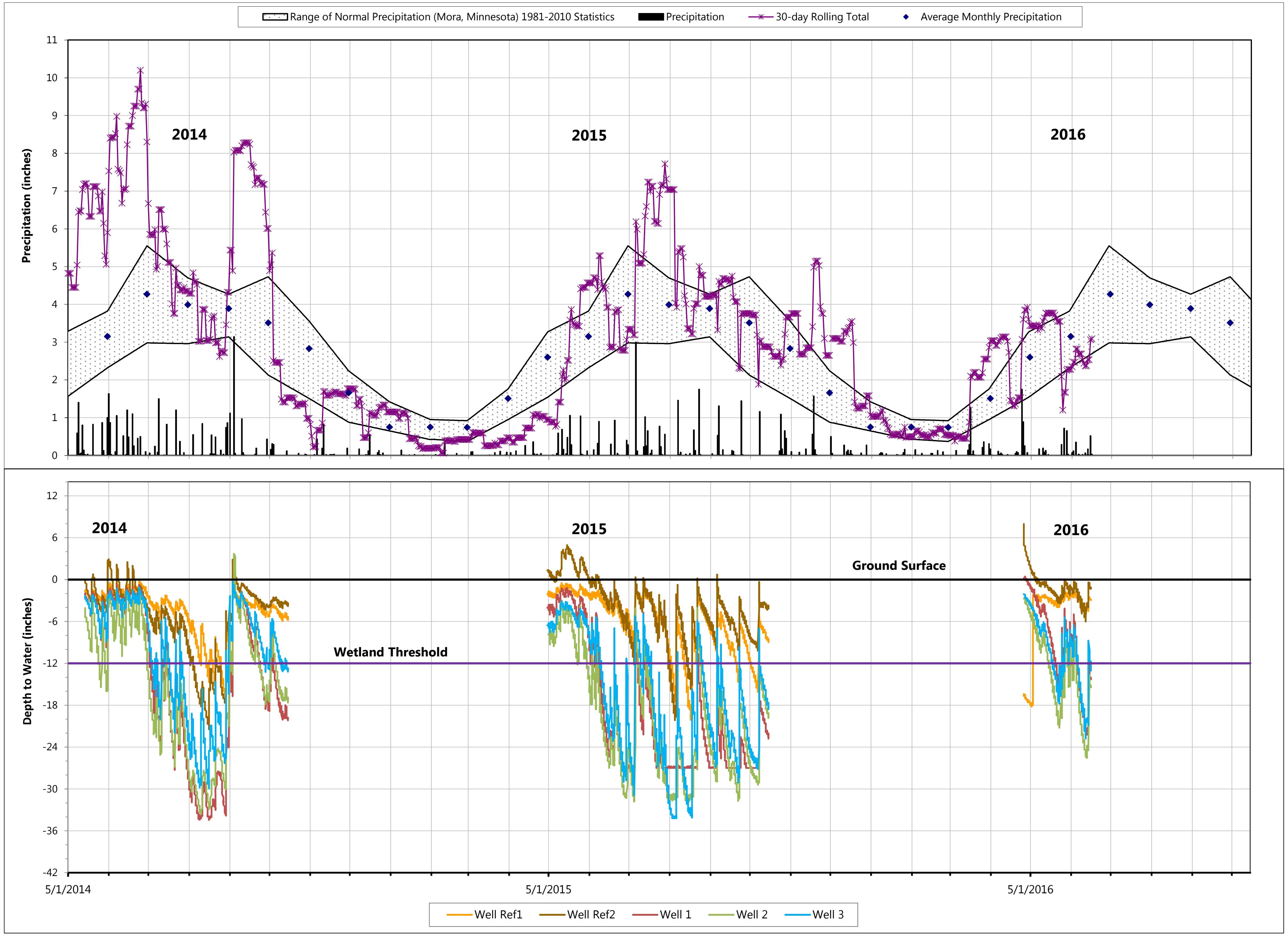


Monitoring Wells
Ditches
Project Boundary
BNSF Railroad

Elevation Contours
5-Foot
1-Foot

0 300 600 1,200
Feet

Large Figure 12
MONITORING WELL LOCATIONS
Hinckley Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



NOTE: In 2016, precipitation and logger data is shown through June 15

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

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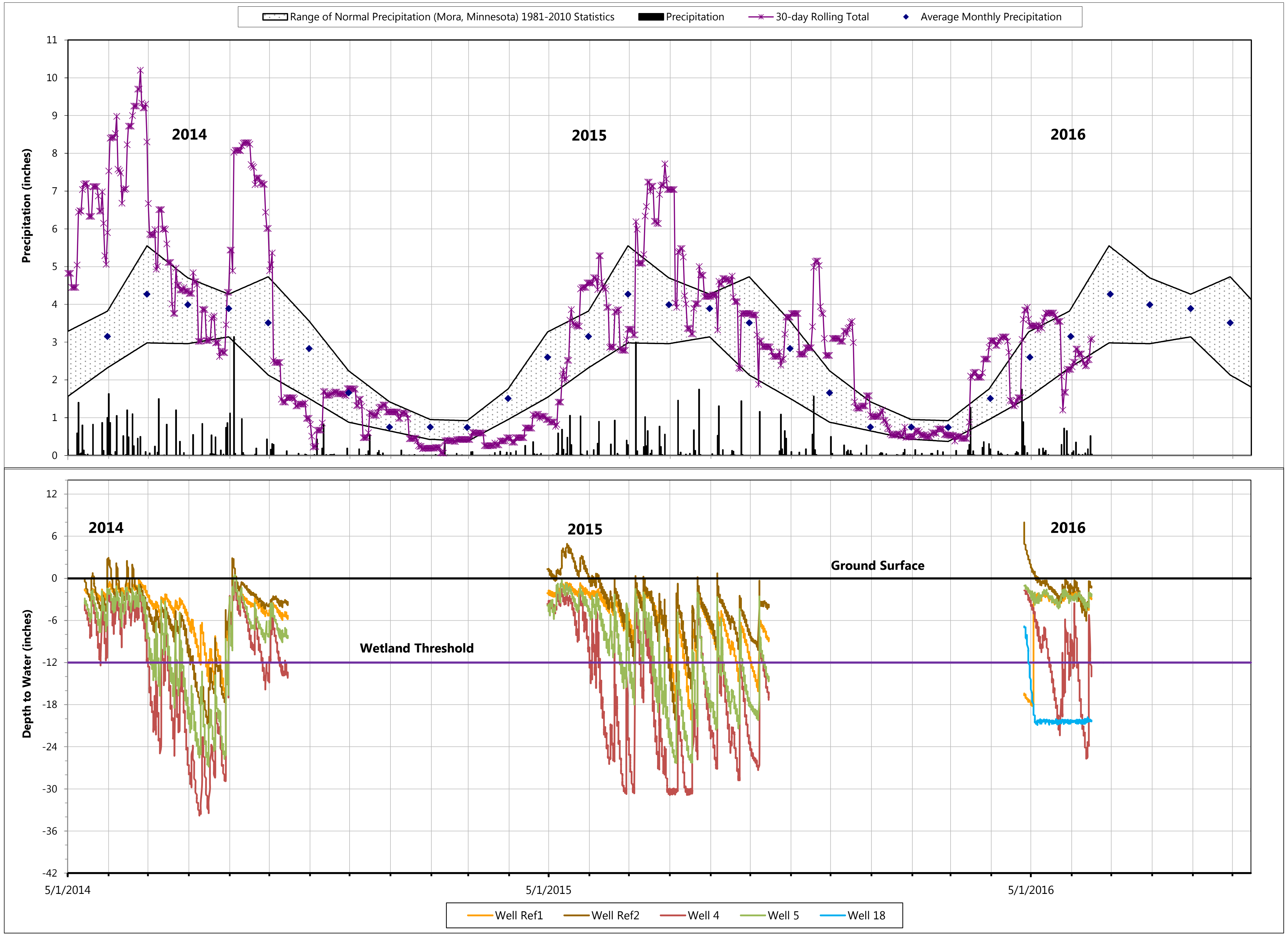

NOTE: In 2016, precipitation and logger data is shown through June 15

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

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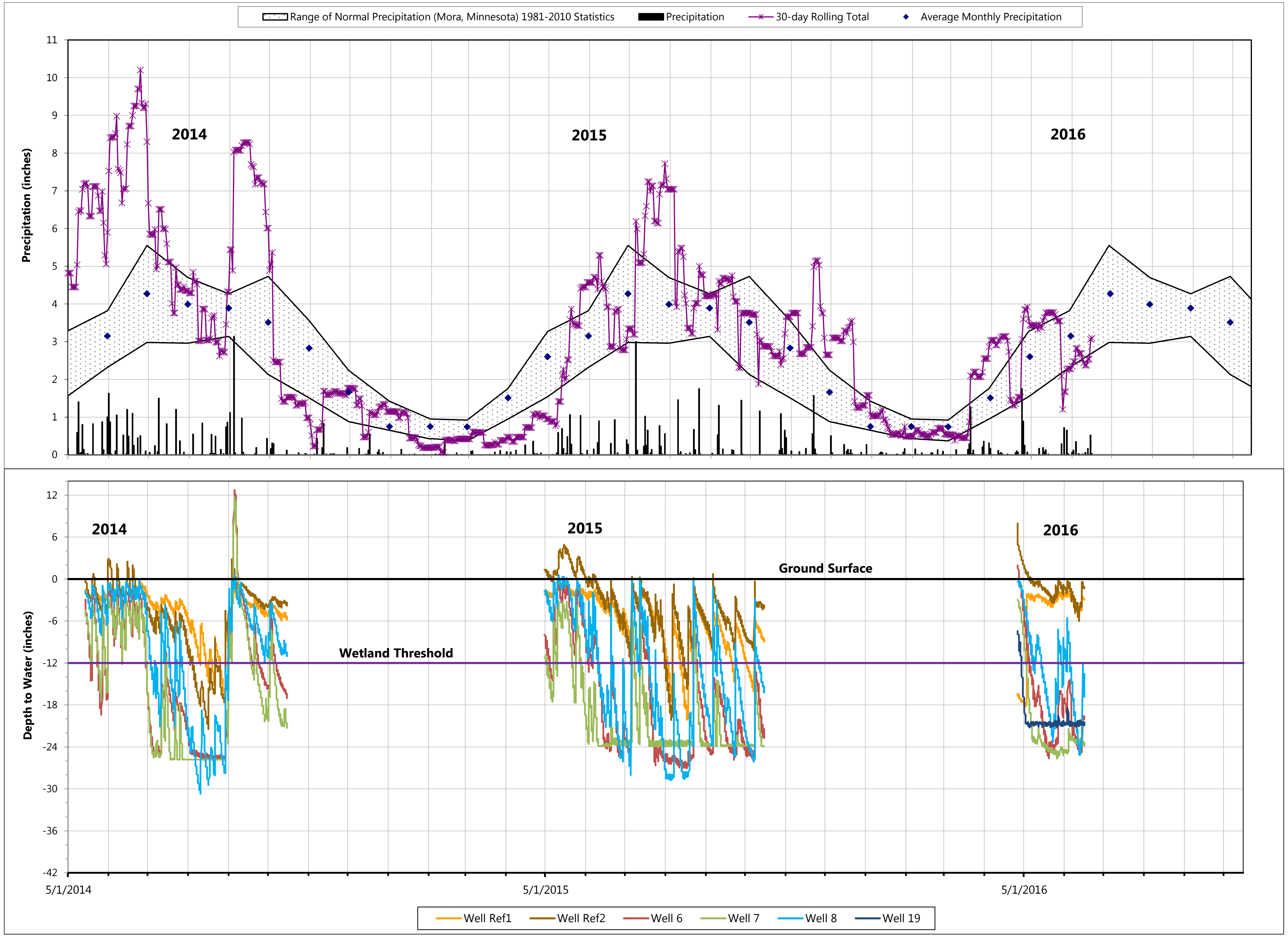
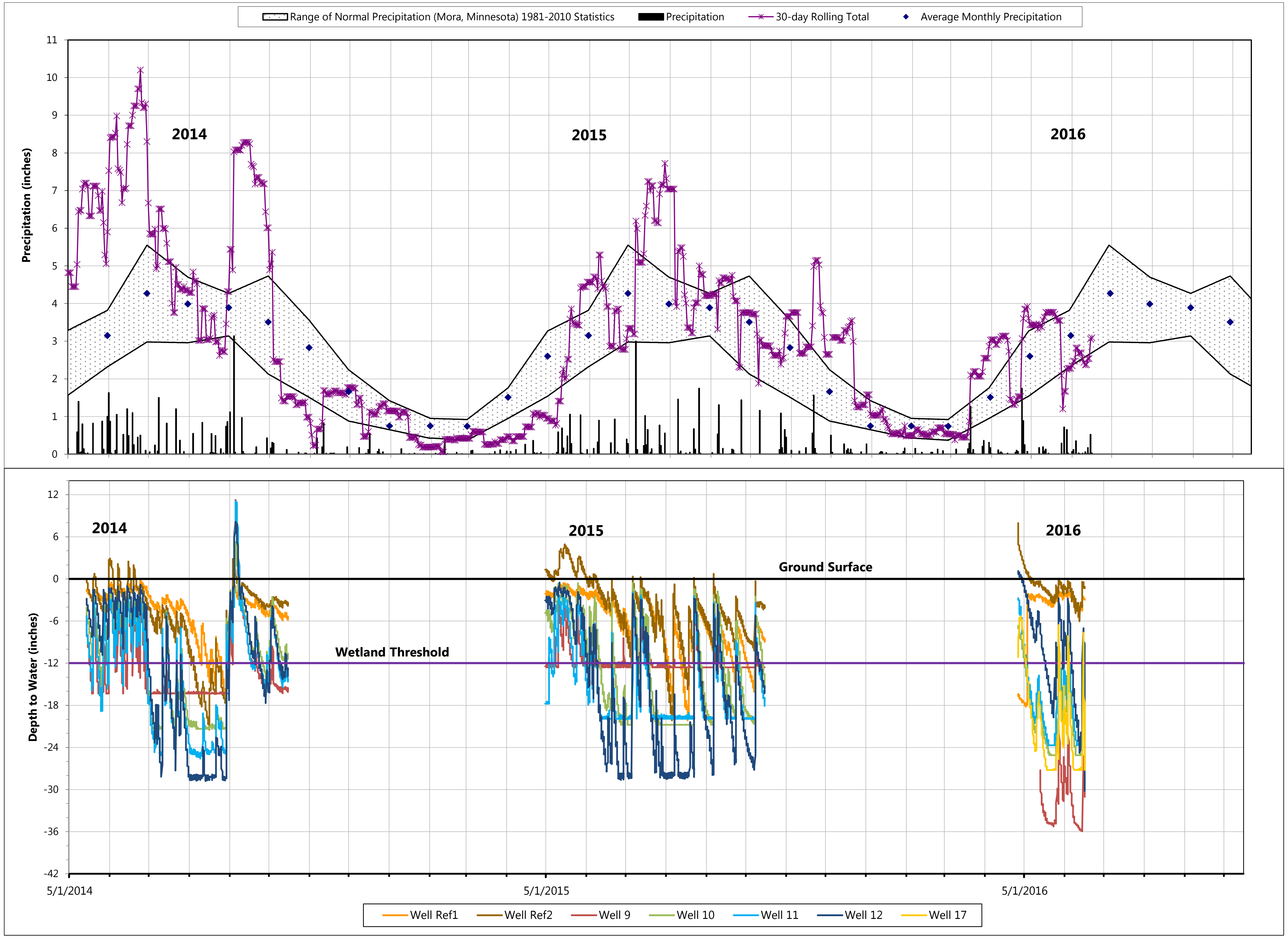


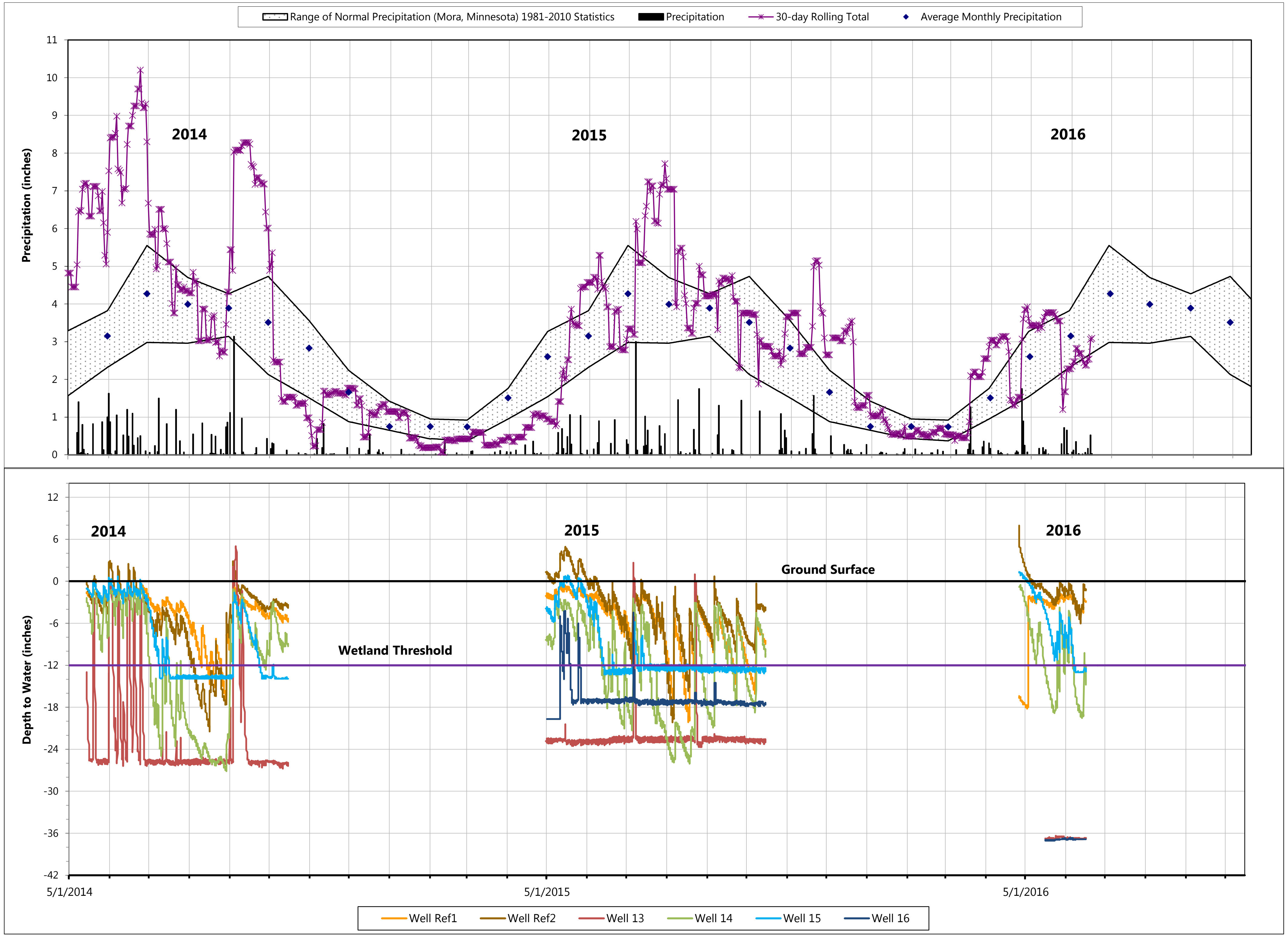
NOTE: In 2016, precipitation and logger data is shown through June 15

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



NOTE: In 2016, precipitation and logger data is shown through June 15

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



NOTE: In 2016, precipitation and logger data is shown through June 15

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

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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").

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 re-recorded. 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 me this day of , by (name(s) with marital status).

____
Notary Public

Notarial Stamp or Seal

SIGNATURE OF BANK APPLICANT (S),
IF DIFFERENT FROM FEE OWNER: ______________________________

____

STATE OF MINNESOTA)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this day of , by (name(s) with marital status).

____
Notary Public

Notarial Stamp or Seal

ACCEPTANCE

The State accepts the foregoing Easement.

MINNESOTA BOARD OF WATER AND SOIL RESOURCES:

By: ____

Its: ____

STATE OF MINNESOTA)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this day of , by (name of person) as (title) of the Board of Water and Soil Resources.

____
Notary Public

Notarial Stamp or Seal

This instrument was drafted by the Board of Water and Soil Resources
One West Water Street, St. Paul, MN 55107

If there are additional holders of interest the subject real property CHECK HERE ☐ and attach their Consent and Subordination agreement [BWSR Form Number: wca-bank-03 (consent).doc].

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.

Community / Credit Type	Within Project Watershed			Outside Project Watershed[1]						Total Wetland Mitigation[1] (acres)	Credit Percent	Total Wetland Mitigation Credits[1]
	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			
Off-Site Restoration of drained 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 [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 Restoration that will not receive 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 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.

Wetland or Credit Type	Mitigation Credits Available				NorthMet Project Proposed Direct Wetland Impacts in Acres(1,2)			Total Credits Required for Mitigation at Base Ratio	No More Than 2 Apply			Total Applied Mitigation Credits (6), (7)	Applied Mitigation Ratio (8)
	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		Incentive for in-kind -0.25:1	Incentive for credits in-place -0.25:1	Incentive for credits in-advance (5) -0.25:1		
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**	1.63
									(275.92)				
Total Surplus Wetland Mitigation Credits for Project (Total Credit minus Total Applied Mitigation Credit)	**47.33**												

(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.

Wetland or Credit Type	Mitigation Credits				NorthMet Project Proposed Direct Wetland Impacts (acres)[1,2]	Credits Applied for 1:1 Replacement	Additional Mitigation Required [3] +0.5:1	Total Mitigation Credits Applied	Total Mitigation Ratio
	Zim Sod	Aitkin	Hinckley	Total					
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**	1.25:1 [5]
Total Surplus Wetland Mitigation Credits for Project (Total credits minus 1:1 credits minus additional mitigation required)						**403.33**			
Total Wetland Mitigation Credits 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

US Army Corps of Engineers®
St. Paul District

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 to10 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 DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine | State: MN | Sampling Date: 07/20/15

Investigator(s): kms2 | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 1U

Land Form: Footslope | Local Relief: Convex | Slope %: 0 | Soil Map Unit Name: P-Peat

Subregion (LRR): K | Latitude: 5083463 | Longitude: 490761 | Datum: UTM, NAD 83, meters

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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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. West ditch

If yes, optional Wetland Site ID: (Wetland 1)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus idaeus	60	Yes	FAC
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	60		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Taraxacum officinale	5	No	FACU
2. Asclepias syriaca	15	Yes	UPL
3. Cirsium arvense	10	Yes	FACU
4. Phalaris arundinacea	15	Yes	FACW
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	45		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ______ % Sphagnum Moss Cover: ______

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	12	30
Herb Stratum	9	22.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	50.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	15	X 2	30
FAC Species	60	X 3	180
FACU Species	15	X 4	60
UPL Species	15	X 5	75
Column Totals:	105	(A)	345 (B)

Prevalence Index = B/A = 3.29

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 26	10YR 4/4	100					fine sandy loam	dry
2.	-								
3.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): **Type:** ______ **Depth (inches):** ______

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** ______

Water table present? ☐ **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):** ______

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ **Aerial Photo** ☐ **Monitoring Well** ☐ **Stream Gauge** ☐ **Previous Inspections**

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine | State: MN | Sampling Date: 07/20/15

Investigator(s): kms2 | Section: 5 | Township: 36N | Range: 22W | Sampling Point: 1W

Land Form: Stream channel | Local Relief: Concave | Slope %: 0 | Soil Map Unit Name: P-Peat

Subregion (LRR): K | Latitude: 5083465 | Longitude: 490756 | Datum: UTM, NAD 83, meters

Cowardin Classification: PUBG | Circular 39 Classification: Type 5 | Mapped NWI Classification: PEMA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow, Open Water
Eggers & Reed (secondary): Fresh (Wet) Meadow
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Indicators of wetland hydrology present? Yes
Is the sampled area within a wetland? 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).

If yes, optional Wetland Site ID: Wetland 1

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Salix interior	10	Yes	FACW
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	10		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Phalaris arundinacea	60	Yes	FACW
2.	Rubus idaeus	30	Yes	FAC
3.	Glyceria grandis	5	No	OBL
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	2	5
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	5	X 1	5
FACW Species	70	X 2	140
FAC Species	30	X 3	90
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	105	(A)	235 (B)

Prevalence Index = B/A = 2.24

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- Yes — 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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 36	10YR 2/1	100					muck	
2.	-								
3.	-								
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)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [x] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	8

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/31/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 2U

Land Form: Shoulder | Local Relief: Convex | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5083470 mN | Longitude: 490977 mE | Datum: UTM, NAD 83, meters

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, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation Yes Soil Yes Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil Yes Hydrology No naturally problematic? | Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 2)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Urtica dioica	60	Yes	FAC
2.	Sium suave	10	No	OBL
3.	Phalaris arundinacea	25	Yes	FACW
4.	Asclepias speciosa	10	No	FAC
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	105		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Echinocystis lobata	10	Yes	FACW
2.		0		
	Total Cover:	10		

% Bare Ground in Herb Stratum: | **% Sphagnum Moss Cover:**

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	21	52.5
Woody Vine Stratum	2	5

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: **3** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That Are OBL, FACW or FAC: **100.00%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	10	X 1	10
FACW Species	35	X 2	70
FAC Species	70	X 3	210
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	**115**	(A)	**290** (B)

Prevalence Index = B/A = **2.52**

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2769-2771

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 2U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 37	10YR 2/1	100					mucky silt loam	no redox, dry
2.	-								
3.	-								
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)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [x] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [x] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

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)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	07/31/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	2W
Land Form:	Ditch	Local Relief:	Concave	Slope %:	0	Soil Map Unit Name:	P- Peat		
Subregion (LRR):	K	Latitude:	5083467 mN	Longitude:	490978 mE	Datum:	UTM, NAD 83, meters		
Cowardin Classification:	PEMC/A	Circular 39 Classification:	Type 3/2			Mapped NWI Classification:			

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil Yes Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary): Fresh (Wet) Meadow
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: Wetland 2

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		
Herb Stratum (Plot Size: 5 ft)			
1. Urtica dioica	5	No	FAC
2. Phalaris arundinacea	80	Yes	FACW
3. Ambrosia artemisiifolia	5	No	FACU
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	90		
Woody Vine Stratum (Plot Size: 30 ft)			
1. Echinocystis lobata	10	Yes	FACW
2.	0		
Total Cover:	10		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover:

50/20 Thresholds:	**20%**	**50%**
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	18	45
Woody Vine Stratum	2	5

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	90	X 2	180
FAC Species	5	X 3	15
FACU Species	5	X 4	20
UPL Species	0	X 5	0
Column Totals:	100	(A)	215 (B)

Prevalence Index = B/A = 2.15

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2772-74

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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.	-								

[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)

- [ ] Histosol (A1)
- [x] Histic Epipedon (A2)
- [x] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- [x] 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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil disturbed, problematic

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- [ ] **Surface water present?** Surface Water Depth (inches):
- [ ] **Water table present?** Water Table Depth (inches):
- [x] **Saturation present? (includes capillary fringe)** Saturation Depth (inches): 0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 3U

Land Form: Ditch | Local Relief: Concave | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5083197 mN | Longitude: 491754 mE | Datum: UTM, NAD 83, meters

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil Yes Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

If yes, optional Wetland Site ID: (Wetland 3)

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

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1. Corylus cornuta	15	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	15		
Herb Stratum (Plot Size: 5 ft)			
1. Solidago canadensis	20	Yes	FACU
2. Cirsium arvense	10	Yes	FACU
3. Rubus idaeus	5	No	FAC
4. Lactuca canadensis	5	No	FACU
5. Ambrosia artemisiifolia	5	No	FACU
6.	0		
7.	0		
8.	0		
Total Cover:	45		
Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	3	7.5
Herb Stratum	9	22.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	5	X 3	15
FACU Species	55	X 4	220
UPL Species	0	X 5	0
Column Totals:	60 (A)		235 (B)

Prevalence Index = B/A = 3.92

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- No — Dominance Test is >50%
- No — 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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot photos: 12459-62

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 9	10YR 3/2						mucky peat	very dry
2.	9 - 27	10YR 2/2						mucky peat	dry
3.	27 - 36	10YR 2/2						muck	moist
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [x] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Disturbed area - agriculture drainage ditch.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- **Surface water present?** [ ] **Surface Water Depth (inches):**
- **Water table present?** [ ] **Water Table Depth (inches):**
- **Saturation present? (includes capillary fringe)** [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: No saturation observed within 36 inches of soil surface.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	07/30/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	3W
Land Form:	Ditch	Local Relief:	Concave	Slope %:	0	Soil Map Unit Name:	P- Peat		
Subregion (LRR):	K	Latitude:	5083199 mN	Longitude:	491756 mE	Datum:	UTM, NAD 83, meters		
Cowardin Classification:	PEMC/A	Circular 39 Classification:	Type 3/2	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil Yes Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary): Fresh (Wet) Meadow
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: Wetland 3

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 5, E side ditch

VEGETATION

	Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		
	Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	Salix nigra	5	Yes	OBL
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	5		
	Herb Stratum (Plot Size: 5 ft)			
1.	Phalaris arundinacea	10	Yes	FACW
2.	Sagittaria latifolia	5	No	OBL
3.	Alisma subcordatum	20	Yes	OBL
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	35		
	Woody Vine Stratum (Plot Size: 30 ft)			
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: % Sphagnum Moss Cover:

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	1	2.5
Herb Stratum	7	17.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	30	X 1	30
FACW Species	10	X 2	20
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	40 (A)		50 (B)

Prevalence Index = B/A = 1.25

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 12456-58 Remark: Open water

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 5	10YR 2/1	100	none				mucky peat	saturated
2.	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.	-								

[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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [x] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Area has been distrubed by ditch clearing.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

	Present		
Surface water present?	[x]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Stagnant ditch; saturated at the ground surface, often shallow standing water

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	09/28/15
Investigator(s):	cdf, bkb	Section:	5	Township:	39N	Range:	22W	Sampling Point:	4U
Land Form:	Footslope	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	P- Peat		
Subregion (LRR):	K	Latitude:	5081874 mN	Longitude:	491193 mE	Datum:	UTM, NAD 83, meters		
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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 4)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus macrocarpa	60	Yes	FACU
2. Acer saccharum	10	No	FACU
3. Populus tremuloides	15	No	FAC
4.	0		
Total Cover:	85		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1. Corylus americana	25	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	25		
Herb Stratum (Plot Size: 5 ft)			
1. Amphicarpaea bracteata	40	Yes	FAC
2. Pteridium aquilinum	15	Yes	FACU
3. Fragaria vesca	5	No	UPL
4. Asarum canadense	5	No	UPL
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	65		
Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 0 % Sphagnum Moss Cover: 0

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	17	42.5
Sapling/Shrub Stratum	5	12.5
Herb Stratum	13	32.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	25.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	55	X 3	165
FACU Species	110	X 4	440
UPL Species	10	X 5	50
Column Totals:	175 (A)		655 (B)

Prevalence Index = B/A = 3.74

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 4U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 4	10YR 3/2	100					Silt loam	dry
2.	4 - 12	10YR 6/3	100					Fine sandy loam	dry
3.	12 - 18	110YR 6/4	100					Fine sand	dry
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks: Powerdy dry soil; could not auger deeper than 18" because soil would not stay in auger.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ Surface Water Depth (inches):

Water table present? ☐ Water Table Depth (inches):

Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine | State: MN | Sampling Date: 07/20/15

Investigator(s): kms2 | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 4W

Land Form: Terrace | Local Relief: Concave | Slope %: 0 | Soil Map Unit Name: P-Peat

Subregion (LRR): K | Latitude: 5083458 | Longitude: 491715 | Datum: UTM, NAD 83, meters

Cowardin Classification: PSS1B | Circular 39 Classification: Type 3/1 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary): Seasonally Flooded Basin
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	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. NE Wetland

If yes, optional Wetland Site ID: Wetland 4

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Salix discolor	30	Yes	FACW
2.	Alnus incana	20	Yes	FACW
3.	Salix nigra	20	Yes	OBL
4.	Rubus idaeus	5	No	FAC
5.		0		
	Total Cover:	75		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Scirpus cyperinus	20	Yes	OBL
2.	Phalaris arundinacea	35	Yes	FACW
3.	Eutrochium purpureum	5	No	FAC
4.	Onoclea sensibilis	5	No	FACW
5.	Typha latifolia	2	No	OBL
6.	Carex lacustris	5	No	OBL
7.		0		
8.		0		
	Total Cover:	72		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	15	37.5
Herb Stratum	14.4	36
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	47	X 1	47
FACW Species	90	X 2	180
FAC Species	10	X 3	30
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	147 (A)		257 (B)

Prevalence Index = B/A = 1.75

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 4W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 4	10YR 2/2	98	7.5 YR 4/6	2	C		mucky silt	saturated
2.	4 - 8	10YR 3/2	80	10YR 3/4	20	C		mucky silt	with gravel, saturated
3.	8 - 10	10YR 2/1	100					silt loam	saturated
4.	10 - 15	10YR 3/1	40					clay loam	with sand, saturated
5.	10 - 15	10YR 2/1	40	10YR 3/4	20			clay loam/sand pockets	with gravel, saturated
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)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [x] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [x] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] Saturation (A3)
- [x] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [x] 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)

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)
- [x] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[x]	Water Table Depth (inches):	12
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [x] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 5U

Land Form: Terrace Plain | Local Relief: None | Latitude: 5082389 mN | Slope %: 0 | Soil Map Unit Name: P - Peat

Subregion (LRR): K | Longitude: 491761 mE | Datum: UTM, NAD 83, meters

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, explain in remarks)

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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: well12field

If yes, optional Wetland Site ID: (Wetland 5)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Asclepias syriaca	20	Yes	UPL
2.	Ambrosia artemisiifolia	15	Yes	FACU
3.	Taraxacum officinale	25	Yes	FACU
4.	Oxalis corniculata	15	Yes	FACU
5.	Lactuca canadensis	10	No	FACU
6.	Cirsium arvense	10	No	FACU
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	75	X 4	300
UPL Species	20	X 5	100
Column Totals:	95 (A)		400 (B)

Prevalence Index = B/A = 4.21

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 754-757

2/10/2016 4:30:50 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 5U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 9	10YR 2/1	100	none				mucky silt loam	no redox, dry
2.	9 - 22	10YR 4/2	60	10yr 42/1	40			fine sandy loam	dry
3.	22 - 36	10YR 4/2	100	none				loamy fine sand	no redox, dry
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)

- [ ] Histosol (A1)
- [x] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [x] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Disturbed area by agriculture

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	24

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 5W

Land Form: Ditch | Local Relief: None | Latitude: 5082393 mN | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Longitude: 491762 mE | Datum: UTM, NAD 83, meters

Cowardin Classification: PEMC/A | Circular 39 Classification: Type 3/1 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Shallow Marsh

Eggers & Reed (secondary): Seasonally Flooded Basin

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: Wetland 5

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.
Well 12 field-wet Ditch

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Phalaris arundinacea	20	Yes	FACW
2.	Typha latifolia	20	Yes	OBL
3.	Lemna minor	25	Yes	OBL
4.	Asclepias incarnata	5	No	OBL
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	70		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	14	35
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	50	X 1	50
FACW Species	20	X 2	40
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	70 (A)		90 (B)

Prevalence Index = B/A = 1.29

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2578-2580

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 5W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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				very fine sandy loam	no redox, saturated
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Disturbed area

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	1
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN
Sampling Date:	08/01/14						
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W
Sampling Point:	6U						
Land Form:	Summit	Local Relief:	Convex	Slope %:	0	Soil Map Unit Name:	P - Peat
Subregion (LRR):	K	Latitude:	5082241 mN	Longitude:	490993 mE	Datum:	UTM, NAD 83, meters
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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 6)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Asclepias syriaca	30	Yes	UPL
2.	Cirsium arvense	15	Yes	FACU
3.	Elymus repens	20	Yes	FACU
4.	Solidago canadensis	5	No	FACU
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	70		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover: 0

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2974-75 Adjacent to old corn field

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	14	35
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	40	X 4	160
UPL Species	30	X 5	150
Column Totals:	70	(A)	310 (B)

Prevalence Index = B/A = 4.43

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 6U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 7	10YR 3/2		none				loam	no redox, dry
2.	7 - 27	10YR 2/1		none				mucky sandy loam	no redox, dry
3.	27 - 34	10YR 5/4	90	10YR 4/6	9			loamy fine sand	moist
4.	27 - 34			2.5YR 5/2	1				
5.	34 - 42	10YR 6/4	40	10YR 6/1	40			loamy fine sand	moist
6.	34 - 42	10YR 4/6	20						

[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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** ______

Water table present? ☐ **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):** ______

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	08/01/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	6W
Land Form:	Toeslope	Local Relief:	Convex	Slope %:	0	Soil Map Unit Name:	P - Peat		
Subregion (LRR):	K	Latitude:	5082238 mN	Longitude:	490993 mE	Datum:	UTM, NAD 83, meters		
Cowardin Classification:	PEMC/A/B	Circular 39 Classification:	Type 3/1/2	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary): Seasonally Flooded Basin
Eggers & Reed (tertiary): Fresh (Wet) Meadow
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: Wetland 6

General Remarks (explain any answers if needed): 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 Pine county archived on the NRCS Web Soil Survey. Field east of well 9.
ID_Field: Field east of well 9

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Urtica dioica	70	Yes	FAC
2. Lemna minor	10	No	OBL
3. Rubus idaeus	10	No	FAC
4. Impatiens capensis	10	No	FACW
5. Polygonum lapathifolium	10	No	FACW
6.	0		
7.	0		
8.	0		
Total Cover:	110		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	22	55
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	10	X 1	10
FACW Species	20	X 2	40
FAC Species	80	X 3	240
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	110 (A)		290 (B)

Prevalence Index = B/A = 2.64

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Photos 2976-78

2/10/2016 4:30:51 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 6W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/1	100	none				mucky fine sandy loam	no redox, moist
2.	6 - 9	10YR 6/1	85	10YR 5/6	15			fine sandy loam	moist
3.	9 - 14	10YR 4/6	80	10YR 4/1	20			fine sandy loam	saturated
4.	14 - 41	7.5YR 4/2	80	10YR 5/4	20			very fine sandy loam	saturated
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☐	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	9

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 08/01/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 7U

Land Form: Summit | Local Relief: None | Latitude: 5081951 mN | Slope %: 0 | Soil Map Unit Name: Fs-Freer silt loam

Subregion (LRR): K | Longitude: 490778 mE | Datum: UTM, NAD 83, meters

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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 7)

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		
Herb Stratum (Plot Size: 5 ft)			
1. Elymus repens	60	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	60		
Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 20 | % Sphagnum Moss Cover: 0

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	12	30
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	60	X 4	240
UPL Species	0	X 5	0
Column Totals:	60 (A)		240 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2964-2970 Old corn field - may have cover crop Vegetation disturbed, problematic

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 7U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 15	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	95	10YR 4/6	5			fine sandy loam	dry
4.	26 - 36	7.5YR 4/3	60	2.5YR 5/2	25			clay loam	dry
5.	-			7.5YR 4/6	15				
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):**

Water table present? ☐ **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 08/01/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 7W

Land Form: Toeslope | Local Relief: Concave | Slope %: 0 | Soil Map Unit Name: Fs-Freer silt loam

Subregion (LRR): K | Latitude: 5081939 mN | Longitude: 490790 mE | Datum: UTM, NAD 83, meters

Cowardin Classification: PEMC | Circular 39 Classification: Type 3 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: Wetland 7

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Typha latifolia	20	Yes	OBL
2. Carex lacustris	15	Yes	OBL
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	35		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	7	17.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	35	X 1	35
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	35	(A)	35 (B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2971-2973

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 7W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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.	6 - 41	7.5YR 4/3	80	7.5YR 4/6	15			very fine sandy loam	saturated
5.	6 - 41			7.5YR 5/2	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)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [x] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: Soil disturbed

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [x] Saturation Depth (inches): 0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

2/10/2016 4:30:51 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	07/31/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	8U
Land Form:	Swale	Local Relief:	Concave	Slope %:	0	Soil Map Unit Name:	P - Peat		
Subregion (LRR):	K	Latitude:	5082188 mN	Longitude:	491224 mW	Datum:	UTM, NAD 83, meters		
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, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	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: well15wetland

If yes, optional Wetland Site ID: (Wetland 8)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus tremuloides	60	Yes	FAC
2. Acer rubrum	20	Yes	FAC
3.	0		
4.	0		
Total Cover:	80		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus tremuloides	30	Yes	FAC
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	30		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Lactuca canadensis	5	No	FACU
2. Impatiens capensis	25	Yes	FACW
3. Pteridium aquilinum	20	Yes	FACU
4. Corylus americana	10	No	FACU
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	60		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:	20%	50%
Tree Stratum	16	40
Sapling/Shrub Stratum	6	15
Herb Stratum	12	30
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	80.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	25	X 2	50
FAC Species	110	X 3	330
FACU Species	35	X 4	140
UPL Species	0	X 5	0
Column Totals:	170	(A)	520 (B)

Prevalence Index = B/A = 3.06

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Photos 2668-78

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 8U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 10	10YR 2/2	90	10YR 4/3	8			fine sandy loam	dry
2.	0 - 10			10YR 4/6	2				
3.	10 - 21	10YR 4/4	90	10YR 4/6	9			sandy loam	faint redox, dry
4.	10 - 21			10YR 4/1	1				
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=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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks: Redox distinct at 21"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks: Dry

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/31/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 8W

Land Form: Toeslope | Local Relief: Concave | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5082186 mN | Longitude: 491222 mE | Datum: UTM, NAD 83, meters

Cowardin Classification: PEMA | Circular 39 Classification: Type 1 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Seasonally Flooded Basin

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: Wetland 8

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

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Populus tremuloides	60	Yes	FAC
2.		0		
3.		0		
4.		0		
	Total Cover:	60		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Populus tremuloides	30	Yes	FAC
2.	Quercus alba	5	No	FACU
3.		0		
4.		0		
5.		0		
	Total Cover:	35		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Impatiens capensis	20	Yes	FACW
2.	Pteridium aquilinum	5	No	FACU
3.	Onoclea sensibilis	10	Yes	FACW
4.	Rubus idaeus	5	No	FAC
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	40		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: 25 | % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	7	17.5
Herb Stratum	8	20
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	30	X 2	60
FAC Species	95	X 3	285
FACU Species	10	X 4	40
UPL Species	0	X 5	0
Column Totals:	135	(A)	385 (B)

Prevalence Index = B/A = 2.85

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2674-78

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 8W

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 4	10YR 3/2	100	none				fine sandy loam	no redox, dry
2.	4 - 18	10YR 4/4	60	10YR 4/2	20			fine sandy loam	moist
3.	4 - 18			7.5YR 4/6	20				
4.	18 - 25	7.5YR 5/1	40	7.5YR 4/6	30			clay	moist
5.	18 - 25			7.5YR 4/3	30				
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☑ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): **Type:** coarse fragments **Depth (inches):** 25 -

Hydric soil present? Yes

Soil Remarks: Auger refusal at 25 inches below ground surface due to presence of coarse fragments. Site is located in toeslope in concave position and is likely to collect water.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	**Surface Water Depth (inches):**	
Water table present?	☐	**Water Table Depth (inches):**	
Saturation present? (includes capillary fringe)	☑	**Saturation Depth (inches):**	14

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks: Seasonally inundated, saturated within 14 inches of ground surface

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/31/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 9U

Land Form: Backslope | Local Relief: None | Latitude: 5081874 mN | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Longitude: 491193 mE | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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: well14wetland

If yes, optional Wetland Site ID: (Wetland 9)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Elymus repens	30	Yes	FACU
2.	Taraxacum officinale	10	No	FACU
3.	Trifolium repens	25	Yes	FACU
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	65		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: 10 | % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	13	32.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	65	X 4	260
UPL Species	0	X 5	0
Column Totals:	65	(A)	260 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- No — Dominance Test is >50%
- No — 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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Phot Plot: 2759-2764 Old corn stalks present

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 9U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 10	10YR 2/1	100	none				fine sandy loam	no redox, dry
2.	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 Coated Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):**

Water table present? ☐ **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) ☑ **Saturation Depth (inches):** 24

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	07/31/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	9W
Land Form:	Toeslope	Local Relief:	Concave	Slope %:	0	Soil Map Unit Name:	P- Peat		
Subregion (LRR):	K	Latitude:	5081878 mN	Longitude:	491204 mE	Datum:	UTM, NAD 83, meters		
Cowardin Classification:	PEMC/A	Circular 39 Classification:	Type 3/1	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary): Seasonally Flooded Basin
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed): 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 Pine county archived on the NRCS Web Soil Survey. Well 14 wetland. ID_Field: well14wetland

If yes, optional Wetland Site ID: Wetland 9

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Urtica dioica	15	Yes	FAC
2. Sium suave	10	No	OBL
3. Phalaris arundinacea	25	Yes	FACW
4. Asclepias incarnata	5	No	OBL
5. Cirsium arvense	5	No	FACU
6.	0		
7.	0		
8.	0		
Total Cover:	60		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 10 % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Plot Photos: 2765-67

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	12	30
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	15	X 1	15	
FACW Species	25	X 2	50	
FAC Species	15	X 3	45	
FACU Species	5	X 4	20	
UPL Species	0	X 5	0	
Column Totals:	60	(A)	130	(B)

Prevalence Index = B/A = 2.17

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 9W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 4	10YR 2/1	100	none				fine sandy loam	no redox, saturated
2.	4 - 10	10YR 3/2	90	10YR 5/2	10			fine sandy loam	saturated
3.	10 - 32	10YR 4/1	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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☐	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	4

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/20/15

Investigator(s): kms2 | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 10U

Land Form: Terrace Plain | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5082083 | Longitude: 490850 | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

	Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30 ft)				
1.	Populus tremuloides	80	Yes	FAC
2.		0		
3.		0		
4.		0		
	Total Cover:	80		
Sapling/Shrub Stratum (Plot Size: 15 ft)				
1.	Rubus idaeus	30	Yes	FAC
2.	Populus tremuloides	10	Yes	FAC
3.	Sambucus racemosa	10	Yes	FACU
4.	Betula papyrifera	10	Yes	FACU
5.	Acer negundo	10	Yes	FAC
	Total Cover:	70		
Herb Stratum (Plot Size: 5 ft)				
1.	Phalaris arundinacea	20	Yes	FACW
2.	Urtica dioica	5	No	FAC
3.	Rhamnus cathartica	5	No	FAC
4.	Lactuca biennis	2	No	FAC
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	32		
Woody Vine Stratum (Plot Size: 30 ft)				
1.	Vitis sp.	2	No	
2.		0		
	Total Cover:	2		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	16	40
Sapling/Shrub Stratum	14	35
Herb Stratum	6.4	16
Woody Vine Stratum	0.4	1

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	5	(A)
Total Number of Dominant Species Across All Strata:	7	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	71.43%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	0	X 1	0	
FACW Species	20	X 2	40	
FAC Species	142	X 3	426	
FACU Species	20	X 4	80	
UPL Species	0	X 5	0	
Column Totals:	182	(A)	546	(B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 10U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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
4.	3 - 8	10YR 2/1	100					fsl	
5.	3 - 8	2.5YR 5/3	100					fsl	
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: coarse fragments Depth (inches): 8 -

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 09/28/15

Investigator(s): cdf, bkb | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 10U-1

Land Form: Terrace Plain | Local Relief: None | Latitude: 5082149 mN | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Longitude: 490836 mE | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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. Forest

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Panicum virgatum	60	Yes	FAC
2. Setaria faberi	20	Yes	FACU
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	80		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ____ **% Sphagnum Moss Cover:** ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	16	40
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	50.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	60	X 3	180
FACU Species	20	X 4	80
UPL Species	0	X 5	0
Column Totals:	80	(A)	260 (B)

Prevalence Index = B/A = 3.25

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 10U-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 9	10YR 2/1	100					peat	dry
2.	9 - 24	10YR 5/4	70					loamy sand	dry
3.	9 - 24	7.5YR 4/6	20					loamy sand	dry
4.	9 - 24	10YR 5/6	10					loamy sand	dry
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** ______

Water table present? ☐ **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):** ______

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State: MN	Sampling Date: 09/28/15
Investigator(s):	cdf, bkb	Section:	5	Township:	39N	Range: 22W	Sampling Point: 10W-1
Land Form:	Toeslope	Local Relief:	Concave	Slope %:	0	Soil Map Unit Name:	P- Peat
Subregion (LRR):	K	Latitude:	5082124 mN	Longitude:	490872 mE	Datum:	UTM, NAD 83, meters
Cowardin Classification:	PEMB	Circular 39 Classification:	Type 2			Mapped NWI Classification:	

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	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. Forest

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

	Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Populus tremuloides	15	Yes	FAC
2.		0		
3.		0		
4.		0		
	Total Cover:	15		
	Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	Rubus idaeus	30	Yes	FAC
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	30		
	Herb Stratum (Plot Size: 5 ft)			
1.	Phalaris arundinacea	60	Yes	FACW
2.	Urtica dioica	5	No	FAC
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	65		
	Woody Vine Stratum (Plot Size: 30 ft)			
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	3	7.5
Sapling/Shrub Stratum	6	15
Herb Stratum	13	32.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	60	X 2	120
FAC Species	50	X 3	150
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	110	(A)	270 (B)

Prevalence Index = B/A = 2.45

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 10W-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 12	10YR 2/1	100					peat	moist
2.	12 - 15	2.5Y 3/1	100					sandy clay	moist
3.	15 - 32	10YR 5/3	80	7.5YR 4/6	20			loamy fine sand	moist
4.	15 - 32	10YR 4/2	20	5YR 4/6	20			loamy fine sand	moist
5.	15 - 32			5YR 7/6	2				
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [x] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [x] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 09/28/15

Investigator(s): cdf, bkb | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 10U-2

Land Form: Terrace Plain | Local Relief: None | Latitude: 5082115 mN | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Longitude: 490883 mE | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?
Are "normal circumstances" present? Yes
Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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. Forest

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Populus tremuloides	60	Yes	FAC
2.		0		
3.		0		
4.		0		
	Total Cover:	60		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Rubus idaeus	50	Yes	FAC
2.	Sambucus racemosa	10	No	FACU
3.		0		
4.		0		
5.		0		
	Total Cover:	60		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Phalaris arundinacea	20	Yes	FACW
2.	Parthenocissus quinquefolia	2	No	FACU
3.	Dryopteris carthusiana	1	No	FACW
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	23		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: **% Sphagnum Moss Cover:**

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	12	30
Herb Stratum	4.6	11.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	21	X 2	42
FAC Species	110	X 3	330
FACU Species	12	X 4	48
UPL Species	0	X 5	0
Column Totals:	143 (A)		420 (B)

Prevalence Index = B/A = 2.94

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 10U-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	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.	12 - 27			5YR 4/6	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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 09/28/15

Investigator(s): cdf, bkb | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 10W-2

Land Form: Toeslope | Local Relief: Concave | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5082133 mN | Longitude: 490858 mE | Datum: UTM, NAD 83, meters

Cowardin Classification: PEMB | Circular 39 Classification: Type 2 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Fresh (Wet) Meadow
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	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.

If yes, optional Wetland Site ID: Wetland 10

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Phalaris arundinacea	100	Yes	FACW
2. Urtica dioica	1	No	FAC
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	101		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	20.2	50.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	100	X 2	200
FAC Species	1	X 3	3
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	101	(A)	203 (B)

Prevalence Index = B/A = 2.01

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 10W-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 11	10YR 2/1	100					peat	moist
2.	11 - 32	10YR 5/3	70	7.5YR 5/6	20			loamy fine sand	moist
3.	11 - 32	10YR 4/2	30	7.5YR 4/6	30			loamy fine sand	moist
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [x] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] Microtopographic Relief (D4)
- [x] FAC-Neutral Test (D5)

Field Observations:

- **Surface water present?** [ ] **Surface Water Depth (inches):**
- **Water table present?** [ ] **Water Table Depth (inches):**
- **Saturation present? (includes capillary fringe)** [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Pit dug to 32 inches; returned to pit after 5 hours and water level was 17 inches below ground surface.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/20/15

Investigator(s): kms2 | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 11U

Land Form: Terrace Plain | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5082092 | Longitude: 490893 | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus tremuloides	80	Yes	FAC
2.	0		
3.	0		
4.	0		
Total Cover:	80		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Sambucus racemosa	20	Yes	FACU
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	20		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus idaeus	25	Yes	FAC
2. Lactuca biennis	20	Yes	FAC
3. Urtica dioica	20	Yes	FAC
4. Rubus allegheniensis	15	No	FACU
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	80		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Celastrus scandens	10	Yes	FACU
2.	0		
Total Cover:	10		

% Bare Ground in Herb Stratum: 10 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	16	40
Sapling/Shrub Stratum	4	10
Herb Stratum	16	40
Woody Vine Stratum	2	5

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	6	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	66.67%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	145	X 3	435
FACU Species	45	X 4	180
UPL Species	0	X 5	0
Column Totals:	190 (A)		615 (B)

Prevalence Index = B/A = 3.24

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 11U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/1	50					Oe	dry
2.	0 - 6	10YR 2/2	50						
3.	6 - 8	10YR 3/3	40					sl	dry
4.	6 - 8	7.5YR 2.5/3	30					sl	
5.	6 - 8	10YR 2/1	30					Oe	
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: coarse fragments Depth (inches): 8 -

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ Surface Water Depth (inches):

Water table present? ☐ Water Table Depth (inches):

Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: W11

Land Form: | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P - Peat

Subregion (LRR): K | Latitude: 5083274 mN | Longitude: 490842 mE | Datum: UTM, NAD 83, 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 (If no, explain in remarks)

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 1.

If yes, optional Wetland Site ID: Wetland 11

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Salix petiolaris	20	Yes	FACW
2.	Poa palustris	20	Yes	FACW
3.	Urtica dioica	10	No	FAC
4.	Carex vulpinoidea	20	Yes	OBL
5.	Salix bebbiana	5	No	FACW
6.	Carex lacustris	20	Yes	OBL
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	40	X 1	40
FACW Species	45	X 2	90
FAC Species	10	X 3	30
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	95	(A)	160 (B)

Prevalence Index = B/A = 1.68

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W11

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 3	10YR 2/1	100					Oa	
2.	3 - 16	10YR 2/2	100					Oe	
3.	16 - 33	10YR 2/1	100					Oa	
4.	33 - 35	10YR 3/1	100					Oe	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[x]	Water Table Depth (inches):	17.8
Saturation present? (includes capillary fringe)	[ ]	Saturation Depth (inches):	

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/20/15

Investigator(s): kms2 | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 12U

Land Form: Terrace Plain | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5082104 | Longitude: 490932 | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

	Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Populus tremuloides	10	Yes	FAC
2.		0		
3.		0		
4.		0		
	Total Cover:	10		

	Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Corylus cornuta	25	Yes	FACU
2.	Populus tremuloides	10	Yes	FAC
3.	Acer rubrum	5	No	FAC
4.		0		
5.		0		
	Total Cover:	40		

	Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	Pteridium aquilinum	30	Yes	FACU
2.	Vaccinium angustifolium	25	Yes	FACU
3.	Rubus allegheniensis	20	Yes	FACU
4.	Cornus racemosa	10	No	FAC
5.	Acer rubrum	5	No	FAC
6.		0		
7.		0		
8.		0		
	Total Cover:	90		

	Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	2	5
Sapling/Shrub Stratum	8	20
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	6	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	33.33%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	40	X 3	120
FACU Species	100	X 4	400
UPL Species	0	X 5	0
Column Totals:	140 (A)		520 (B)

Prevalence Index = B/A = 3.71

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 12U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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=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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: coarse fragments Depth (inches): 8 -

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):**

Water table present? ☐ **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	07/30/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	W12
Land Form:		Local Relief:	None	Slope %:	0	Soil Map Unit Name:	P - Peat		
Subregion (LRR):	K	Latitude:	5083259 mN	Longitude:	491182 mE	Datum:	UTM, NAD 83, 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 (If no, explain in remarks)

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 3.

If yes, optional Wetland Site ID: Wetland 12

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Trifolium pratense	25	Yes	FACU
2. Taraxacum officinale	20	Yes	FACU
3. Poa palustris	20	Yes	FACW
4. Salix petiolaris	20	Yes	FACW
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	85		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	17	42.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	50.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	0	X 1	0	
FACW Species	40	X 2	80	
FAC Species	0	X 3	0	
FACU Species	45	X 4	180	
UPL Species	0	X 5	0	
Column Totals:	85	(A)	260	(B)

Prevalence Index = B/A = 3.06

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W12

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/1	100					Oa	
2.	6 - 17	10YR 2/2	100					Oe	
3.	17 - 37	10YR 3/1	100					Oe	
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)

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	13.4
Saturation present? (includes capillary fringe)	☐	Saturation Depth (inches):	

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☑ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN
Sampling Date:	07/20/15	Investigator(s):	kms2	Section:	5	Township:	39N
Range:	22W	Sampling Point:	13U	Land Form:	Terrace Plain	Local Relief:	None
Slope %:	0	Soil Map Unit Name:	P- Peat	Subregion (LRR):	K	Latitude:	5082113
Longitude:	490965	Datum:	UTM, NAD 83, meters	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, explain in remarks)

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

	Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30 ft)				
1.	Populus tremuloides	60	Yes	FAC
2.		0		
3.		0		
4.		0		
	Total Cover:	60		
Sapling/Shrub Stratum (Plot Size: 15 ft)				
1.	Diervilla lonicera	60	Yes	UPL
2.	Cornus racemosa	20	Yes	FAC
3.	Rosa acicularis	5	No	FACU
4.	Ribes hirtellum	5	No	FACW
5.		0		
	Total Cover:	90		
Herb Stratum (Plot Size: 5 ft)				
1.	Vaccinium angustifolium	40	Yes	FACU
2.	Spiraea alba	15	Yes	FACW
3.	Solidago canadensis	5	No	FACU
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	60		
Woody Vine Stratum (Plot Size: 30 ft)				
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ______ % Sphagnum Moss Cover: ______

50/20 Thresholds:

	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	18	45
Herb Stratum	12	30
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	60.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	20	X 2	40
FAC Species	80	X 3	240
FACU Species	50	X 4	200
UPL Species	60	X 5	300
Column Totals:	210 (A)		780 (B)

Prevalence Index = B/A = 3.71

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

Vegetation Remarks: (include photo numbers here or on a separate sheet)

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 13U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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	C	M	ls	faint conc.
3.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: coarse fragments Depth (inches): 15 -

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- **Surface water present?** ☐ **Surface Water Depth (inches):**
- **Water table present?** ☐ **Water Table Depth (inches):**
- **Saturation present? (includes capillary fringe)** ☐ **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: W13

Land Form: | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P - Peat

Subregion (LRR): K | Latitude: 5083232 mN | Longitude: 491387 mE | Datum: UTM, NAD 83, 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 (If no, explain in remarks)

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 4.

If yes, optional Wetland Site ID: Wetland 13

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Trifolium pratense	25	Yes	FACU
2. Carex vulpinoidea	25	Yes	OBL
3. Poa palustris	10	No	FACW
4. Doellingeria umbellata	10	No	FACW
5. Solidago gigantea	10	No	FACW
6.	0		
7.	0		
8.	0		
Total Cover:	80		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	16	40
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	50.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	25	X 1	25
FACW Species	30	X 2	60
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	80	(A)	185 (B)

Prevalence Index = B/A = 2.31

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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W13

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/1	100					Oa	
2.	6 - 19	10YR 2/2	100					Oe	
3.	19 - 36	10YR 2/1	100					Oa	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [x] Water Table Depth (inches): 14.2
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/20/15

Investigator(s): kms2 | Section: 5 | Township: 39N | Range: 22W | Sampling Point: 14U

Land Form: Terrace Plain | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P- Peat

Subregion (LRR): K | Latitude: 5082122 | Longitude: 490998 | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 10)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus tremuloides	20	Yes	FAC
2.	0		
3.	0		
4.	0		
Total Cover:	20		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Vaccinium angustifolium	40	Yes	FACU
2. Ribes cynosbati	20	Yes	FACU
3. Corylus cornuta	15	No	FACU
4. Cornus racemosa	10	No	FAC
5.	0		
Total Cover:	85		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Solidago canadensis	30	Yes	FACU
2. Solidago gigantea	5	No	FACW
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	35		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	4	10
Sapling/Shrub Stratum	17	42.5
Herb Stratum	7	17.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	25.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	5	X 2	10
FAC Species	30	X 3	90
FACU Species	105	X 4	420
UPL Species	0	X 5	0
Column Totals:	140	(A)	520 (B)

Prevalence Index = B/A = 3.71

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 14U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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.	12 - 20	10YR 4/2	40	7.5YR 4/4	30			lfs	w/gravels
4.	-			7.5YR 4/6	25				
5.	-			7.5YR 3/4	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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	07/30/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	W14
Land Form:		Local Relief:	None	Slope %:	0	Soil Map Unit Name:	P - Peat		
Subregion (LRR):	K	Latitude:	5083240 mN	Longitude:	491667 mE	Datum:	UTM, NAD 83, 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 (If no, explain in remarks)

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 5.

If yes, optional Wetland Site ID: Wetland 14

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		
Herb Stratum (Plot Size: 5 ft)			
1. Carex lacustris	30	Yes	OBL
2. Carex vulpinoidea	20	Yes	OBL
3. Urtica dioica	5	No	FAC
4. Salix petiolaris	15	Yes	FACW
5. Trifolium repens	5	No	FACU
6.	0		
7.	0		
8.	0		
Total Cover:	75		
Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: ______ % Sphagnum Moss Cover: ______

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	15	37.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL Species	50	X 1	50	
FACW Species	15	X 2	30	
FAC Species	5	X 3	15	
FACU Species	5	X 4	20	
UPL Species	0	X 5	0	
Column Totals:	75	(A)	115	(B)

Prevalence Index = B/A = 1.53

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 5	10YR 2/1	100					Oa	
2.	5 - 19	10YR 2/2	100					Oe	
3.	19 - 24	10YR 3/1	100					Oa	
4.	24 - 34	10YR 2/1	100					Oa	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	6
Water table present?	[x]	Water Table Depth (inches):	1.44
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Recent and recurring beaver activity has dammed adjacent ditches and inundated this field.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: W15

Land Form: | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P - Peat

Subregion (LRR): K | Latitude: 5082906 mN | Longitude: 490833 mE | Datum: UTM, NAD 83, 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 (If no, explain in remarks)

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 8.

If yes, optional Wetland Site ID: Wetland 15

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa palustris	20	Yes	FACW
2.	Taraxacum officinale	20	Yes	FACU
3.	Salix petiolaris	20	Yes	FACW
4.	Trifolium pratense	20	Yes	FACU
5.	Doellingeria umbellata	5	No	FACW
6.	Solidago gigantea	5	No	FACW
7.		0		
8.		0		
	Total Cover:	90		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	50.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	50	X 2	100
FAC Species	0	X 3	0
FACU Species	40	X 4	160
UPL Species	0	X 5	0
Column Totals:	90	(A)	260 (B)

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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W15

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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.	-								

[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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	**Surface Water Depth (inches):**	
Water table present?	[x]	**Water Table Depth (inches):**	16.8
Saturation present? (includes capillary fringe)	[ ]	**Saturation Depth (inches):**	

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN
Sampling Date:	07/30/14	Investigator(s):	kms2, jtk	Section:	5	Township:	39N
Range:	22W	Sampling Point:	W16	Land Form:		Local Relief:	None
Slope %:	0	Soil Map Unit Name:	P - Peat	Subregion (LRR):	K	Latitude:	5082853 mN
Longitude:	491493 mE	Datum:	UTM, NAD 83, 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 (If no, explain in remarks)

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 6.

If yes, optional Wetland Site ID: Wetland 16

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Poa palustris	10	Yes	FACW
2.	Taraxacum officinale	30	Yes	FACU
3.	Doellingeria umbellata	10	Yes	FACW
4.	Salix petiolaris	10	Yes	FACW
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	60		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: 40 % Sphagnum Moss Cover:

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	12	30
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	75.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	30	X 2	60
FAC Species	0	X 3	0
FACU Species	30	X 4	120
UPL Species	0	X 5	0
Column Totals:	60	(A)	180 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Remnant corn stalks present

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 7	10YR 2/1	100					Oa	
2.	7 - 30	10YR 2/2	100					Oe	
3.	30 - 33	10YR 3/1	100					Oe w/ fine sand	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- [ ] Surface water present? — Surface Water Depth (inches):
- [x] Water table present? — Water Table Depth (inches): 22.9
- [ ] Saturation present? (includes capillary fringe) — Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: W17

Land Form: | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P - Peat

Subregion (LRR): K | Latitude: 5082399 mN | Longitude: 491224 mE | Datum: UTM, NAD 83, 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 (If no, explain in remarks)

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 10.

If yes, optional Wetland Site ID: Wetland 17

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Poa palustris	20	Yes	FACW
2. Urtica dioica	20	Yes	FAC
3. Trifolium pratense	25	Yes	FACU
4. Salix petiolaris	10	No	FACW
5. Solidago gigantea	10	No	FACW
6.	0		
7.	0		
8.	0		
Total Cover:	85		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	17	42.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 66.67% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	40	X 2	80
FAC Species	20	X 3	60
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	85	(A)	240 (B)

Prevalence Index = B/A = 2.82

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Remnant corn stalks present.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W17

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 11	10YR 2/1	100					Oa	
2.	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	C	M	silty clay loam	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): **Type:** **Depth (inches):**

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- [ ] **Surface water present?** **Surface Water Depth (inches):**
- [x] **Water table present?** **Water Table Depth (inches):** 28.8
- [ ] **Saturation present? (includes capillary fringe)** **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] **Aerial Photo** [x] **Monitoring Well** [ ] **Stream Gauge** [ ] **Previous Inspections**

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Hinckley Site | Applicant/Owner: PolyMet | City/County: Grasston, Pine County | State: MN | Sampling Date: 07/30/14

Investigator(s): kms2, jtk | Section: 5 | Township: 39N | Range: 22W | Sampling Point: W18

Land Form: | Local Relief: None | Slope %: 0 | Soil Map Unit Name: P - Peat

Subregion (LRR): K | Latitude: 5082496 mN | Longitude: 491769 mE | Datum: UTM, NAD 83, 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 (If no, explain in remarks)

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 12.

If yes, optional Wetland Site ID: Wetland 18

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Taraxacum officinale	25	Yes	FACU
2.	Trifolium pratense	25	Yes	FACU
3.	Cyperus diandrus	10	No	OBL
4.	Rumex crispus	10	No	FAC
5.	Carex vulpinoidea	10	No	OBL
6.		0		
7.		0		
8.		0		
	Total Cover:	80		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	16	40
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 0.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	20	X 1	20
FACW Species	0	X 2	0
FAC Species	10	X 3	30
FACU Species	50	X 4	200
UPL Species	0	X 5	0
Column Totals:	80	(A)	250 (B)

Prevalence Index = B/A = 3.13

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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					Oa	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[x]	Water Table Depth (inches):	14.2
Saturation present? (includes capillary fringe)	[ ]	Saturation Depth (inches):	

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Hinckley Site	Applicant/Owner:	PolyMet	City/County:	Grasston, Pine County	State:	MN	Sampling Date:	07/30/14
Investigator(s):	kms2, jtk	Section:	5	Township:	39N	Range:	22W	Sampling Point:	W19
Land Form:		Local Relief:	None	Slope %:	0	Soil Map Unit Name:	P - Peat		
Subregion (LRR):	K	Latitude:	5081948 mN	Longitude:	491131 mE	Datum:	UTM, NAD 83, 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 (If no, explain in remarks)

Are vegetation No Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 14.

If yes, optional Wetland Site ID: Wetland 19

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Trifolium pratense	25	Yes	FACU
2.	Carex vulpinoidea	20	Yes	OBL
3.	Carex scoparia	20	Yes	FACW
4.	Poa palustris	20	Yes	FACW
5.	Solidago gigantea	5	No	FACW
6.		0		
7.		0		
8.		0		
	Total Cover:	90		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	75.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	20	X 1	20
FACW Species	45	X 2	90
FAC Species	0	X 3	0
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	90	(A)	210 (B)

Prevalence Index = B/A = 2.33

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

Vegetation Remarks: (include photo numbers here or on a separate sheet)

Remnant corn stalks present.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 7	10YR 2/1	100					Oa	
2.	7 - 24	10YR 2/2	100					Oe	
3.	24 - 38	10YR 2/1	50	10YR 2/2	50			Oa/Oe	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[x]	Water Table Depth (inches):	17.2
Saturation present? (includes capillary fringe)	[ ]	Saturation Depth (inches):	

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [x] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

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

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

North Side of Site

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

North Side of Site

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

North Side of Site

Public Ditch from north ditch, view south, 11/4/15, #38

NE corner of site, forested area near RR tracks, 7/30/14, #12377

North Side of Site

NE corner of site, forested area, 7/30/14, #12375

NE corner of site at ditch corner, view north, 11/4/15, #43

East Side of Site

NE corner of site, east ditch, view south, 11/4/15, #47

East ditch along RR tracks, view north, 7/3/14, #12489

East Side of Site

Small forest along eastern edge next to RR tracks, 7/30/14, #12459

Box culvert under RR tracks, west side, 11/4/15, #114

East Side of Site

Box culvert at RR tracks, view east, 7/3/14, #12506

Box culvert at RR tracks, view west, 7/3/14, #12507

East Side of Site

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

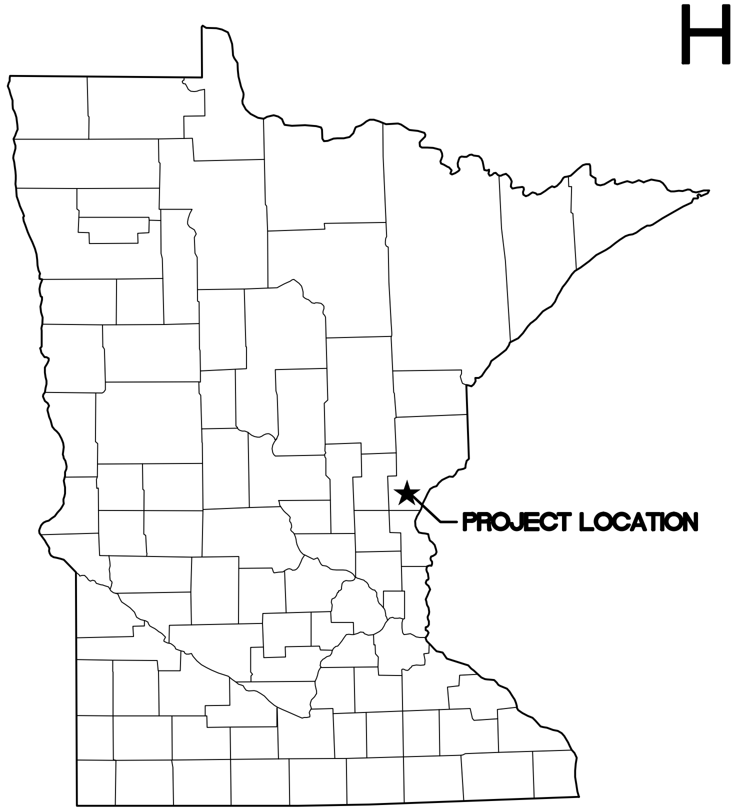
Central forest near Well 15, view north, 11/4/15, #160

South edge of site, view north to central forest, 7/31/14, #12754

Appendix F

Wetland Mitigation Plan Drawings

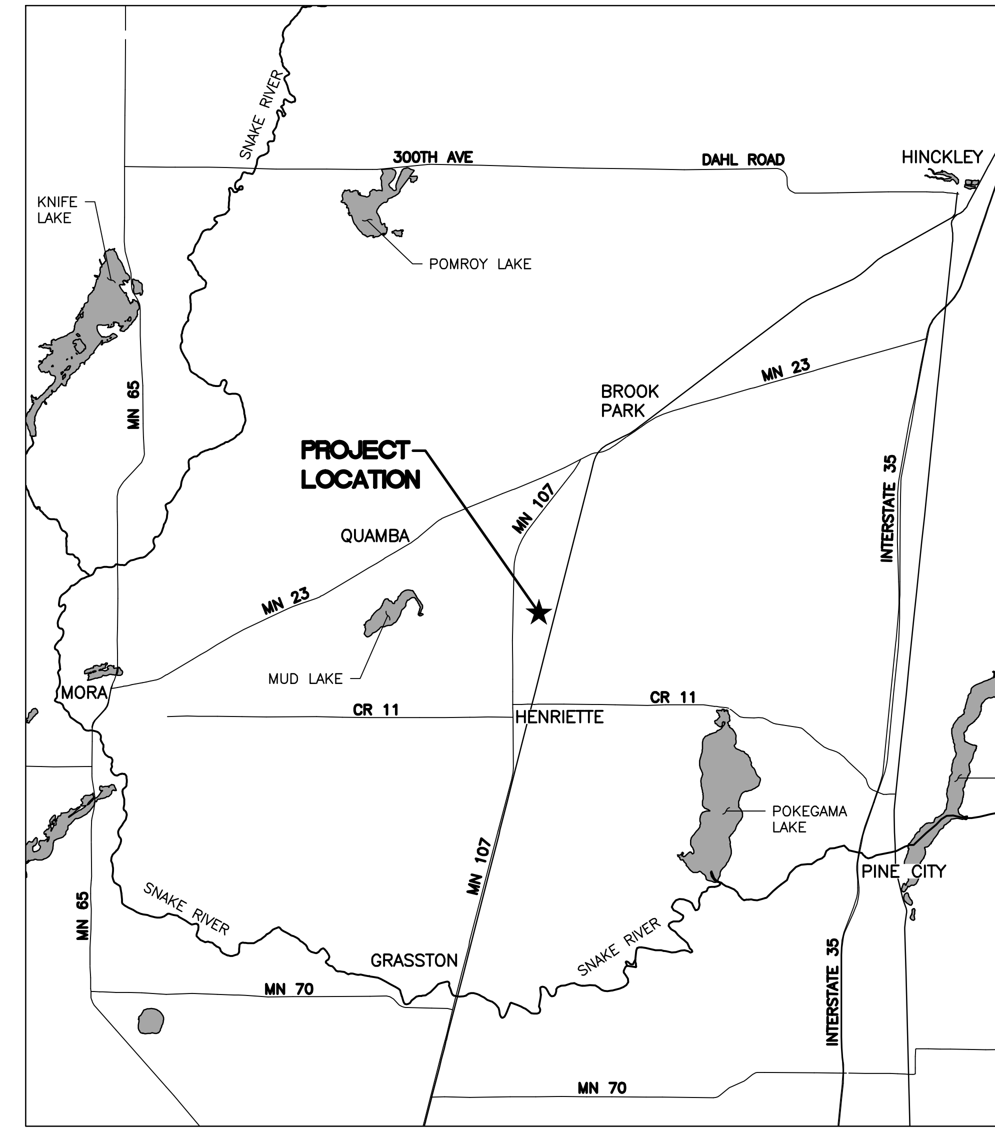
POLYMET
HINCKLEY WETLAND MITIGATION PLAN
HINCKLEY, MINNESOTA



STATE MAP

PROJECT SITE

0 2000 4000
SCALE IN FEET



VICINITY MAP

0 10,000 20,000
SCALE IN FEET

INDEX

DRAWING No.	SHEET TITLE	CURRENT REVISION
TS-201	TITLE SHEET, INDEX SHEET, AND SITE LOCATION MAP	0
CS-201	EXISTING CONDITIONS AND EXISTING CONDITIONS INDEX MAP	0
CS-202	EXISTING CONDITIONS - NW & NE SECTION 5 QUARTER SECTIONS	0
CS-203	EXISTING CONDITIONS - SW & SE SECTION 5 QUARTER SECTIONS	0
CS-204	SITE WETLAND MITIGATION PLAN AND MITIGATION PLAN INDEX MAP	0
CS-205	SITE WETLAND MITIGATION PLAN - NW & NE SECTION 5 QUARTER SECTIONS	0
CS-206	SITE WETLAND MITIGATION PLAN - SW & SE SECTION 5 QUARTER SECTIONS	0
CS-207	NW & NE QUARTER SECTION CROSS SECTIONS	0
CS-208	NW & NE QUARTER SECTION CROSS SECTIONS	0
CS-209	NW & NE QUARTER SECTION CROSS SECTIONS	0
CS-210	SW & SE QUARTER SECTION CROSS SECTIONS	0
CS-211	SW & SE QUARTER SECTION CROSS SECTIONS	0
CS-212	SW & SE QUARTER SECTION CROSS SECTIONS	0
CS-213	BORROW SOURCE PROFILES	0
CS-214	DETAILS	0
CS-215	EROSION CONTROL AND SITE RESTORATION PLAN	0
CS-216	EROSION CONTROL DETAILS	0
CS-217	STORMWATER POLLUTION PREVENTION PLAN (SWPPP)	0

NOTES:

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.

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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.

PRINTED NAME ________
SIGNATURE ________
DATE ________ LICENSE# ________

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
TITLE SHEET, INDEX SHEET, AND
SITE LOCATION MAP

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

POLYMET MINING

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TS-201 REV 0

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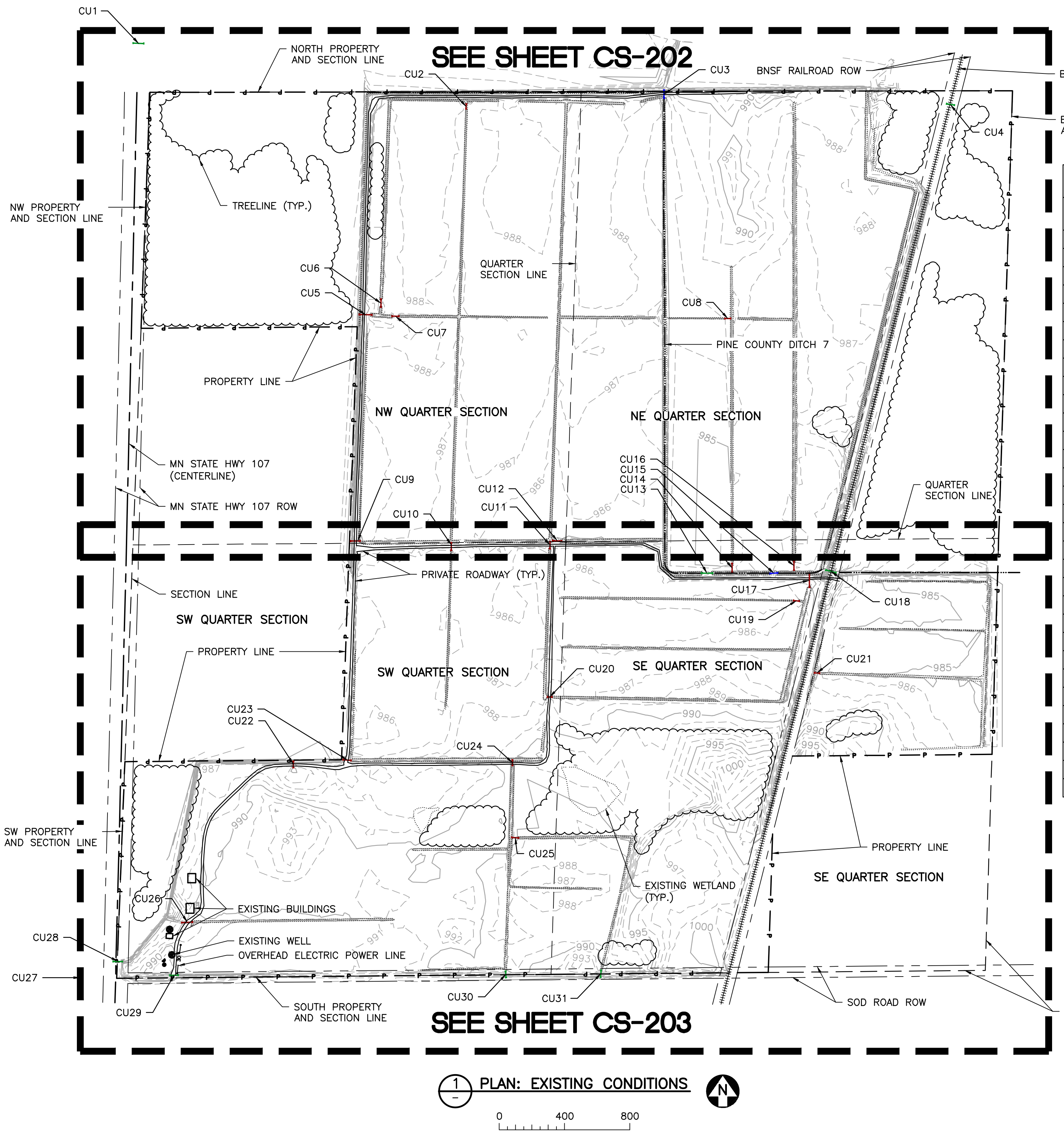

1 PLAN: EXISTING CONDITIONS

SURVEY CONTROL			
NAME	NORTHING	EASTING	ELEVATION
MNDOT 13MIN115	167372.637	443022.789	1000.582
MNDOT HENRIETTE	151606.125	444622.045	997.016

EXISTING CULVERT SCHEDULE

CULVERT No.	TYPE	DIAM. (IN)	LENGTH (FT)	NORTH / WEST INVERT ELEV.	SOUTH / EAST INVERT ELEV.	ACTION
CU1	RCP	24	58	996.10	994.94	NONE
CU2	CMP	24	23	983.75	984.11	REMOVE & BACKFILL
CU3	CMP	48	42	984.45	982.83	REMOVE & RESTORE
CU4	RCP	36	41	990.41	989.64	NONE
CU5	CMP	24	70	983.05	982.71	REMOVE & BACKFILL
CU6	CMP	24	42	982.45	982.44	REMOVE & BACKFILL
CU7	RCP	15	34	984.38	984.15	REMOVE & BACKFILL
CU8	RCP	27	28	985.13	985.21	REMOVE & BACKFILL
CU9	CMP	24	50	982.0	983.0	REMOVE & BACKFILL
CU10	RCP	30	40	983.0	983.0	REMOVE & BACKFILL
CU11	RCP	24	37	982.62	982.07	REMOVE & BACKFILL
CU12	CMP	24	49	981.68	980.54	REMOVE & BACKFILL
CU13	CMP	48	61	981.02	981.09	NONE
CU14	CMP	24	49	982.45	981.91	REMOVE & BACKFILL
CU15	RCP	40	42	980.63	981.29	REMOV & RESTORE
CU16	CMP	30	49	981.28	981.21	REMOVE & BACKFILL
CU17	CMP	30	80	980.0	981.0	REMOVE & BACKFILL
CU18	BOX CULVERT	96H x 120W	55	981.38	980.82	NONE
CU19	CMP	24	27	984.64	984.16	REMOVE & BACKFILL
CU20	CRCP	27	20	983.95	984.98	REMOVE & BACKFILL
CU21	RCP	16	24	984.85	984.44	REMOVE & BACKFILL
CU22	PVC	8	32	983.50	984.26	REMOVE & BACKFILL
CU23	CMP	48	42	982.31	982.2	REMOVE & BACKFILL
CU24	RCP	30	27	983.02	983.36	REMOVE & BACKFILL
CU25	RCP	15	35	984.74	985.12	REMOVE & BACKFILL
CU26	RCP	15	58	985.33	985.12	REMOVE & BACKFILL
CU27	CMPA	50H x 84W	30	980.64	980.08	NONE
CU28	BOX CULVERT	72H x 96W	50	981.16	981.82	NONE
CU29	CMP	16	43	988.48	988.57	NONE
CU30	CMP	24	32	988.59	988.91	NONE
CU31	CMP	12	35	989.32	989.73	NONE

NOTES:

1. THE INFORMATION SHOWN WAS OBTAINED FROM A COMBINATION OF A TOPOGRAPHIC SURVEY COMPLETED BY BARR ENGINEERING IN MAY, 2007 AND A BOUNDARY SURVEY COMPLETED BY STRAIGHTLINE SURVEYING, INC. IN AUGUST, 2015.
2. IN GENERAL, CONSTRUCTION LIMITS ARE BOUND BY THE PROPERTY LINES SHOWN EXCEPT FOR LOCATIONS WITHIN THE SOD ROAD ROW, MINNESOTA STATE HIGHWAY 107 ROW, OR THE RAILROAD ROW. CONTRACTOR SHALL LIMIT WORK TO THE CONSTRUCTION LIMITS, HAUL ROUTES, AND STAGING AREAS SHOWN IN THE DRAWINGS.
3. 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 CONTRACTOR TO THE SATISFACTION OF THE UTILITY OWNER.
4. CONTRACTOR SHALL NOTIFY GOPHER STATE ONE CALL BEFORE STARTING THE WORK. CALL 1-800-252-1166 OR 651-454-0002.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF IDENTIFIED CULVERTS IN ACCORDANCE WITH ALL LAWS AND REGULATIONS, AT AN OFFSITE LOCATION SELECTED BY THE CONTRACTOR.
6. SURVEY CONTROL MONUMENTS MNDOT **13MN115** AND MNDOT **HENRIETTE** NOT SHOWN. MNDOT **13MN115** LOCATED APPROXIMATELY 0.6 MILES NORTH OF PROJECT SITE AND MNDOT **HENRIETTE** LOCATED APPROXIMATELY 1.5 MILES SOUTH OF PROJECT SITE.

LEGEND:

- 990 — EXISTING MAJOR CONTOUR
- 988 — EXISTING MINOR CONTOUR
- SECTION LINE
- PROPERTY LINE
- ROADWAY CENTERLINE
- BNSF RAILROAD CENTERLINE
- ROADWAY & RAILROAD RIGHT-OF-WAY (ROW)
- EXISTING WETLAND
- CULVERT TO REMAIN
- CULVERT - REMOVE AND BACKFILL DITCH
- CULVERT - REMOVE AND RESTORE DITCH
- PINE COUNTY DITCH 7
- PRIVATE DRIVEWAY OR ROADWAY
- TREE LINE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING OVERHEAD ELECTRIC POLE
- EXISTING UTILITY
- EXISTING WELL
- BENCHMARK / SURVEY MONUMENT

ABBREVIATIONS:

CMP	CORRUGATED METAL PIPE
CMPA	CORRUGATED METAL PIPE ARCH
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE (PIPE)

BASIS OF DRAWING FILE:

DATE OF TOPGRAPHIC SURVEY: **05/15/2007 - 05/17/2007**
DATE OF BOUNDARY SURVEY: **08/11/2015**
COORDINATE SYSTEM: **PINE COUNTY**
HORIZONTAL DATUM: **NAD83(1996)**
VERTICAL DATUM: **NAVD88**

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS	ISSUED	VERSION	DATE
	FOR PERMITTING		
	FOR CONSTRUCTION		

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PRINTED NAME
SIGNATURE
DATE LICENSE#

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
EXISTING CONDITIONS &
EXISTING CONDITIONS INDEX MAP

POLYMET MINING
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-201
REV 0

1 PLAN: SITE WETLAND MITIGATION PLAN – NW & NE SECTION 5 QUARTER SECTIONS

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
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SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
EXISTING CONDITIONS
NW & NE SECTION 5 QUARTER SECTIONS

POLYMET MINING

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NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-202
REV 0

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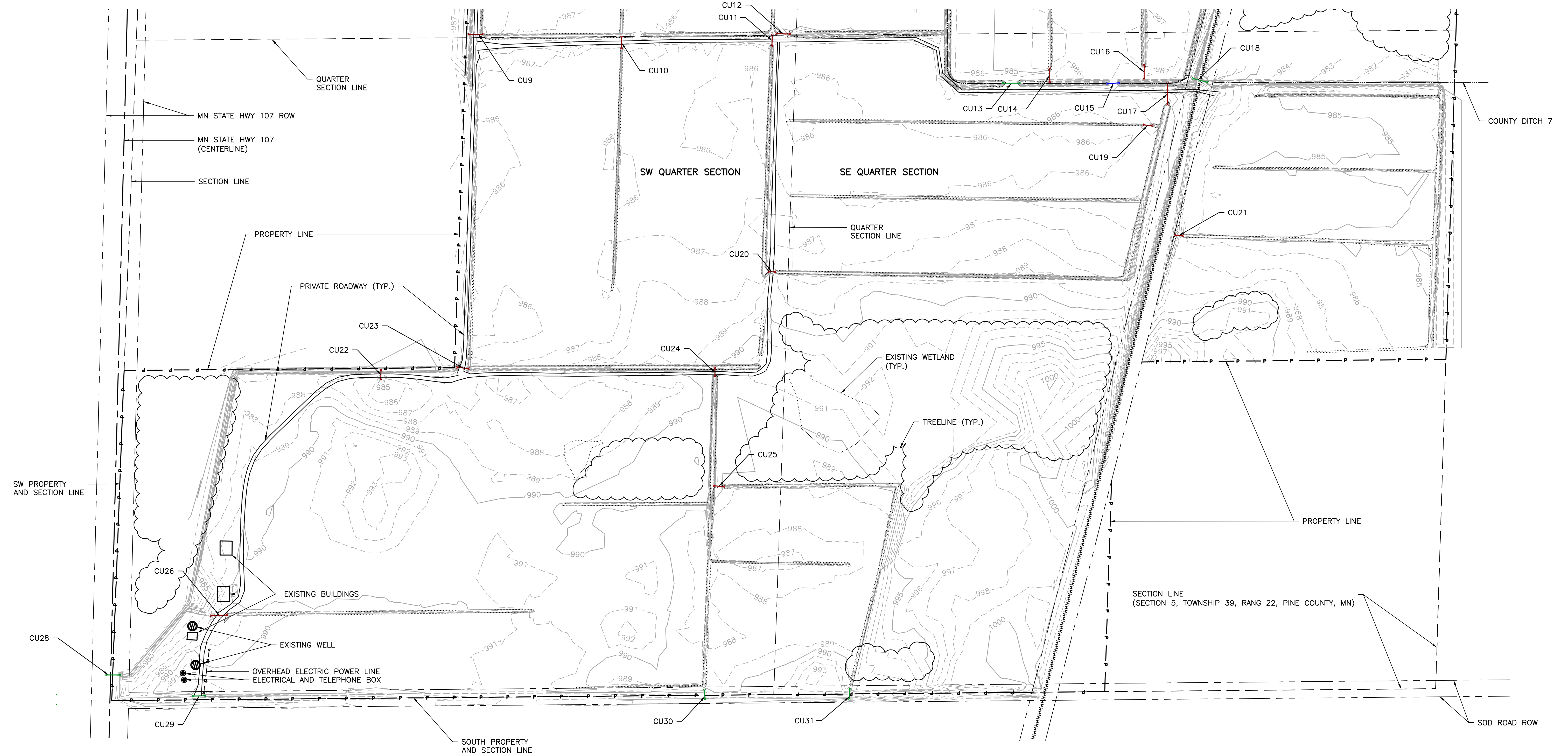

1 PLAN: SITE WETLAND MITIGATION PLAN – SW & SE SECTION 5 QUARTER SECTIONS

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SCALE IN FEET

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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		

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PRINTED NAME ______
SIGNATURE ______
DATE ______ LICENSE# ______

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

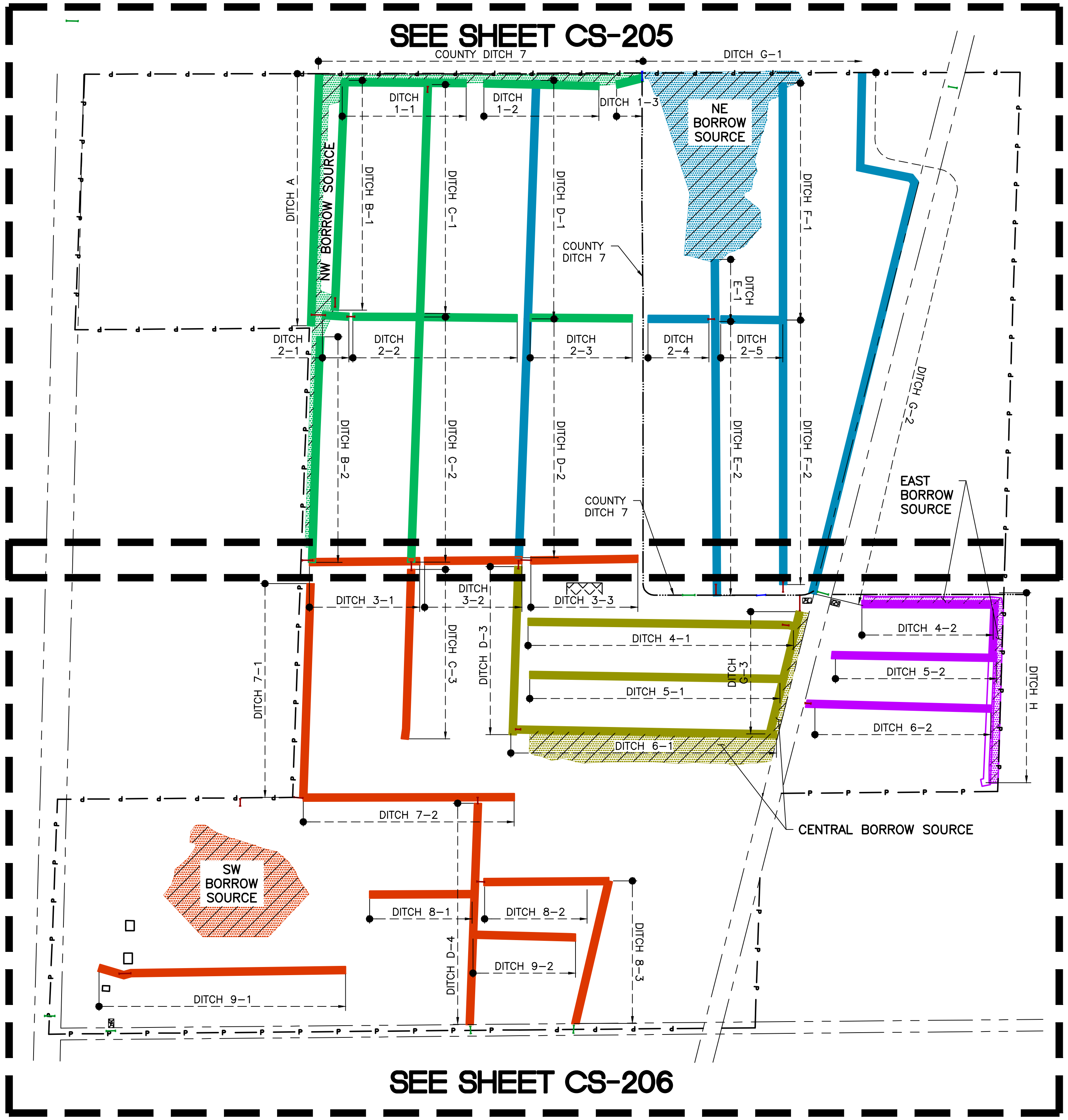
PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
EXISTING CONDITIONS
SW & SE SECTION 5 QUARTER SECTIONS

POLYMET MINING
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-203
REV 0



ESTIMATED DITCH FILL QUANTITIES

DITCH ALIGNMENT	DITCH SEGMENT	DITCH STATIONING		DITCH LENGTH (FT)	AVG X-SECTION AREA (SF)	ESTIMATED FILL VOL (CY)	ESTIMATED FILL VOL SUBTOTAL (CY)
A	1	00+00	14+50	1,450	70	3,800	3,800
B	1	00+00	13+00	1,300	75	3,700	3,900
	2	15+00	27+50	1,250	4	200	
C	1	00+00	13+00	1,300	40	2,000	4,400
	2	13+00	27+00	1,400	30	1,600	
	3	27+50	37+00	950	20	800	
D	1	00+00	13+50	1,350	50	2,500	10,500
	2	13+50	27+00	1,350	50	2,500	
	3	27+50	37+00	950	60	2,200	
	4	41+50	54+00	1,250	70	3,300	
E	1	00+00	03+50	350	20	300	1,200
	2	03+50	19+00	1,550	15	900	
F	1	00+00	13+50	1,350	30	1,500	4,600
	2	13+50	28+25	1,475	55	3,100	
G	2	12+00	45+00	3,300	60	7,400	9,900
	3	46+50	54+00	750	90	2,500	
H	1	00+00	11+00	1,100	35	1,500	1,500
1	1	00+00	07+00	700	40	1,100	2,600
	2	08+00	14+50	650	45	1,100	
	3	15+50	17+00	150	55	400	
2	1	00+00	01+50	150	40	300	3,100
	2	02+00	11+00	900	35	1,200	
	3	11+75	17+50	575	50	1,100	
	4	18+50	21+75	325	15	200	
	5	22+50	26+00	350	20	300	
3	1	00+00	06+00	600	45	1,000	3,500
	2	06+50	12+00	550	45	1,000	
	3	12+50	18+50	600	65	1,500	
4	1	00+00	15+00	1,500	15	900	1,400
	2	19+00	26+50	750	15	500	
5	1	00+00	14+00	1,400	30	1,600	2,300
	2	17+50	26+00	850	20	700	
6	1	00+00	14+50	1,450	45	2,500	3,700
	2	17+50	27+75	1,025	30	1,200	
7	1	00+00	12+00	1,200	10	500	4,100
	2	12+00	24+00	1,200	80	3,600	
8	1	00+00	06+00	600	25	600	1,800
	2	07+00	14+00	700	30	800	
	3	14+00	22+50	850	10	400	
9	1	00+00	14+00	1,400	30	1,600	2,100
	2	21+50	27+00	550	20	500	
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	H 4-2 5-2 6-2

LEGEND:

- NW BORROW SOURCE
- NE BORROW SOURCE
- SW BORROW SOURCE
- CENTRAL BORROW SOURCE
- 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 PLAN: SITE WETLAND MITIGATION PLAN AND INDEX MAP

0 400 800
SCALE IN FEET

NOTES:

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 TO FILL DITCHES.

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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.

PRINTED NAME ______
SIGNATURE ______
DATE ______ LICENSE# ______

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
SITE WETLAND MITIGATION PLAN
AND MITIGATION PLAN INDEX MAP

POLYMET MINING
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-204
REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-204.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 3:57 PM

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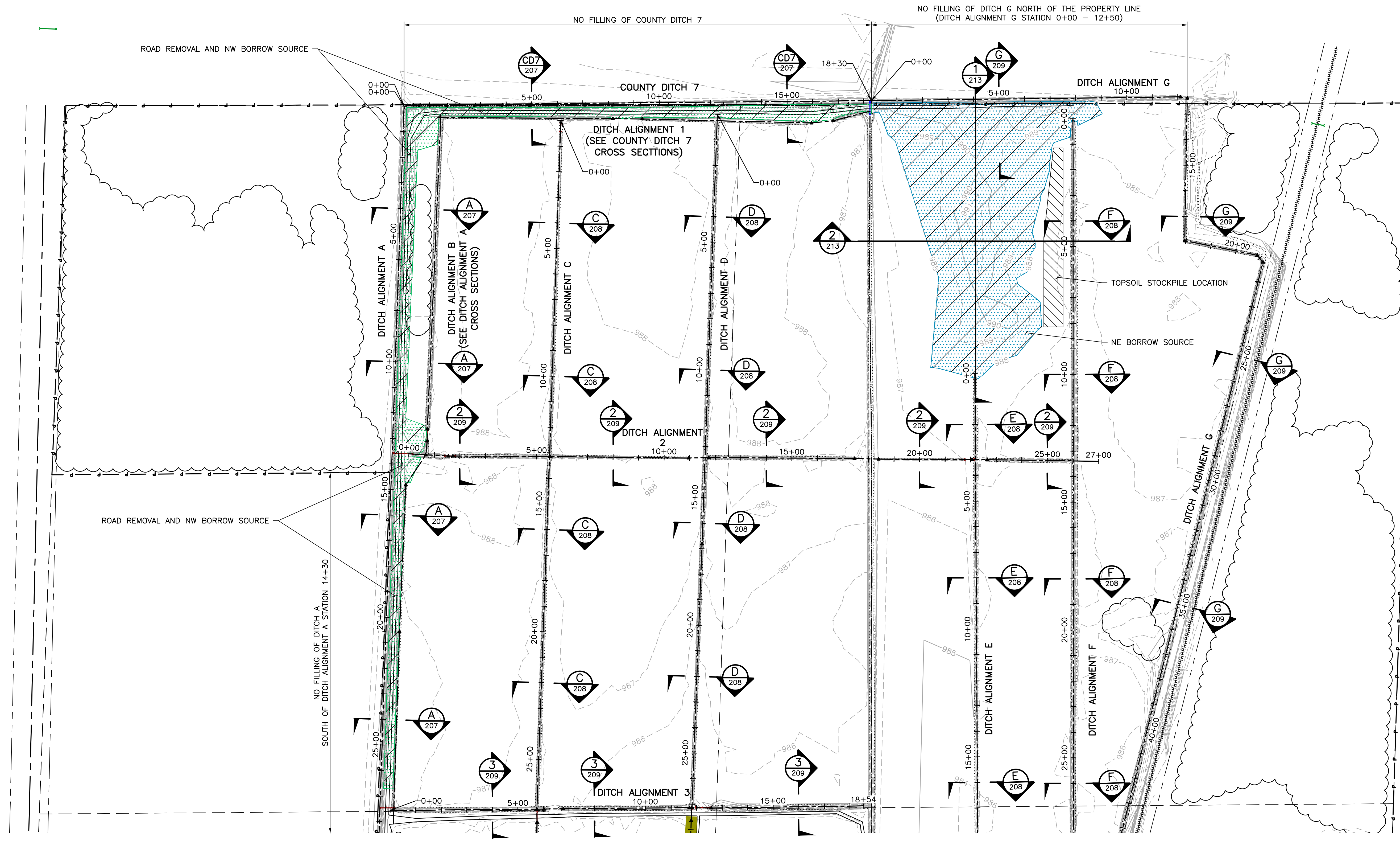

1 PLAN: SITE WETLAND MITIGATION PLAN – NW & NE SECTION 5 QUARTER SECTIONS

0 200 400
SCALE IN FEET

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 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).

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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.

PRINTED NAME ________
SIGNATURE ________
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DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
SITE WETLAND MITIGATION PLAN
NW & NE SECTION 5 QUARTER SECTIONS

POLYMET MINING
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-205 REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-205.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 3:48 PM

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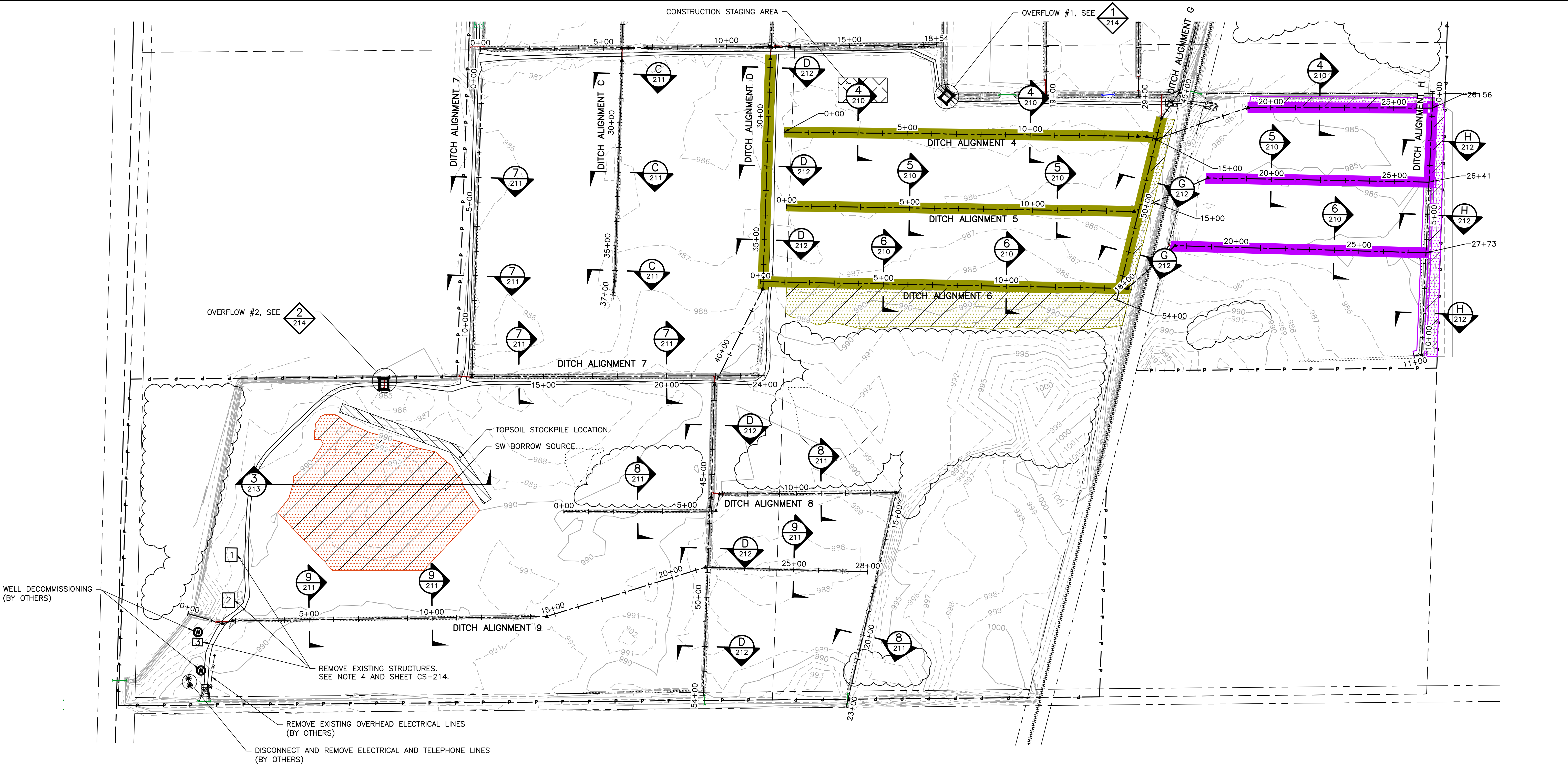

1/– PLAN: SITE WETLAND MITIGATION PLAN – SW & SE SECTION 5 QUARTER SECTIONS

0 200 400
SCALE IN FEET

N

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 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).
3. BURIED ELECTRICAL AND TELEPHONE LINES NOT SHOWN. REMOVAL OF ELECTRICAL LINES, TELEPHONE LINES, AND OTHER UTILITIES SHALL BE COMPLETED BY OTHERS AND VERIFIED BY CONTRACTOR PRIOR TO DEMOLITION OF EXISTING STRUCTURES.
4. CONTRACTOR SHALL DISPOSE OF DEMOLISHED BUILDING MATERIALS INCLUDING STRUCTURES 1 – 3 IN ACCORDANCE WITH ALL LAWS AND REGULATIONS, AT AN OFFSITE LOCATION SELECTED BY THE CONTRACTOR.

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
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SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
SITE WETLAND MITIGATION PLAN
SW & SE SECTION 5 QUARTER SECTIONS

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-206
REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-206.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 3:50 PM

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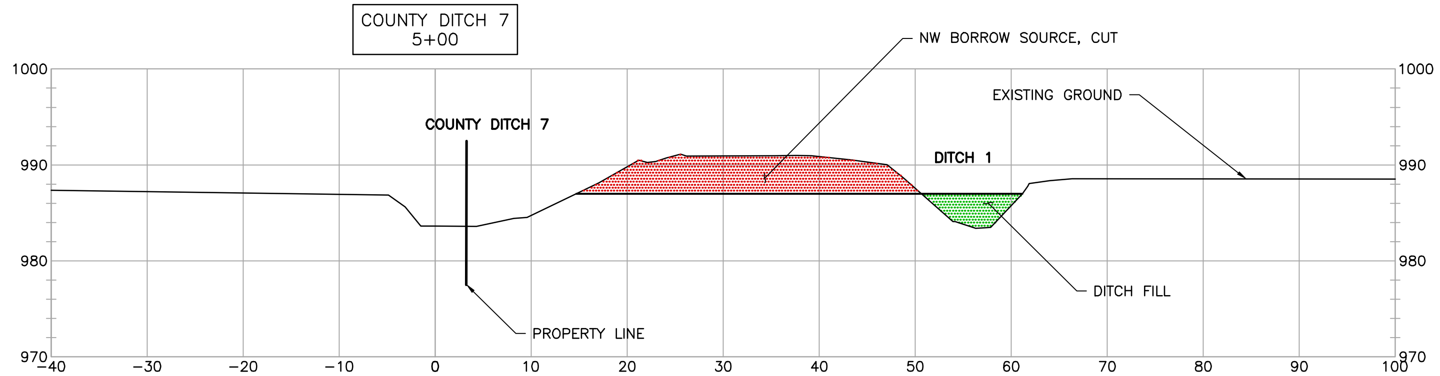

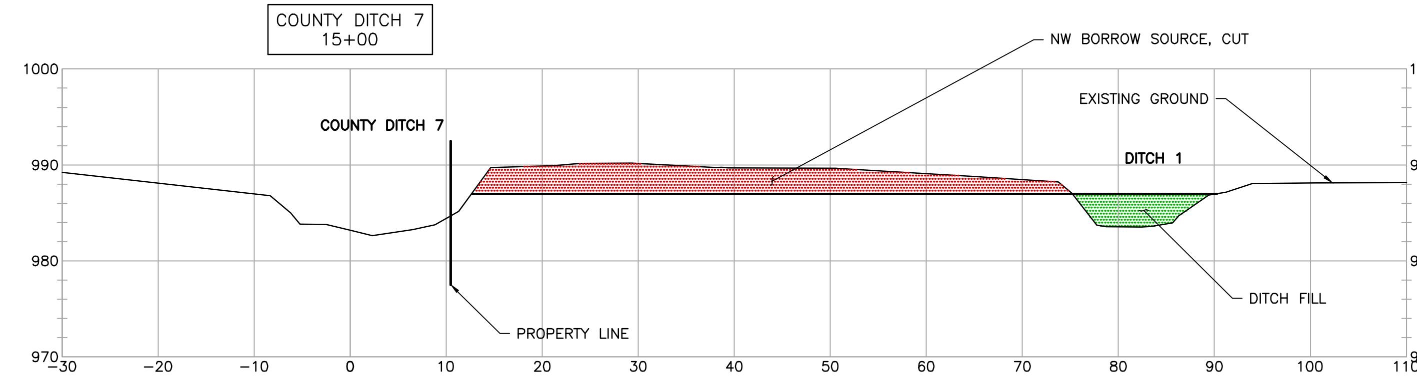

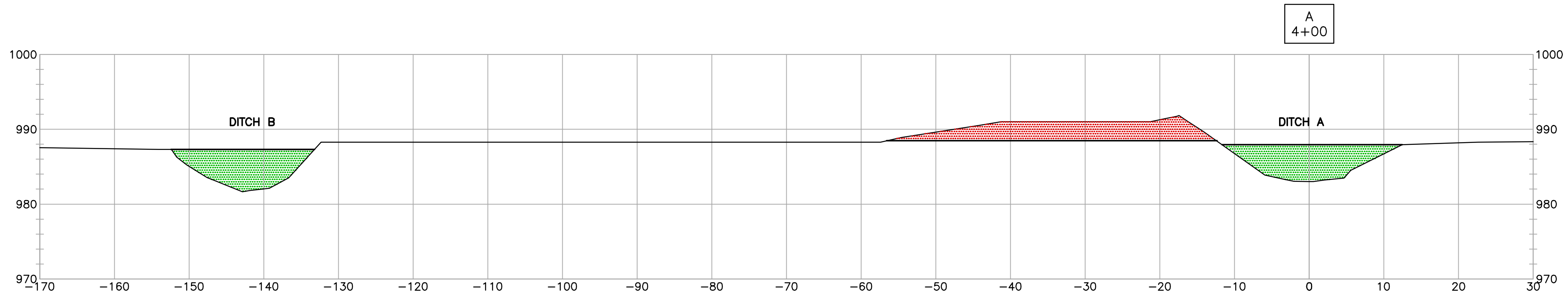

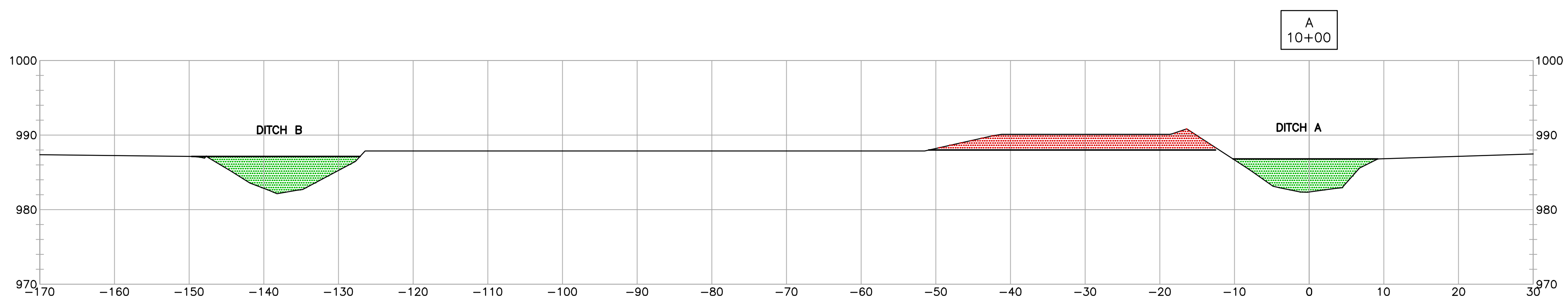

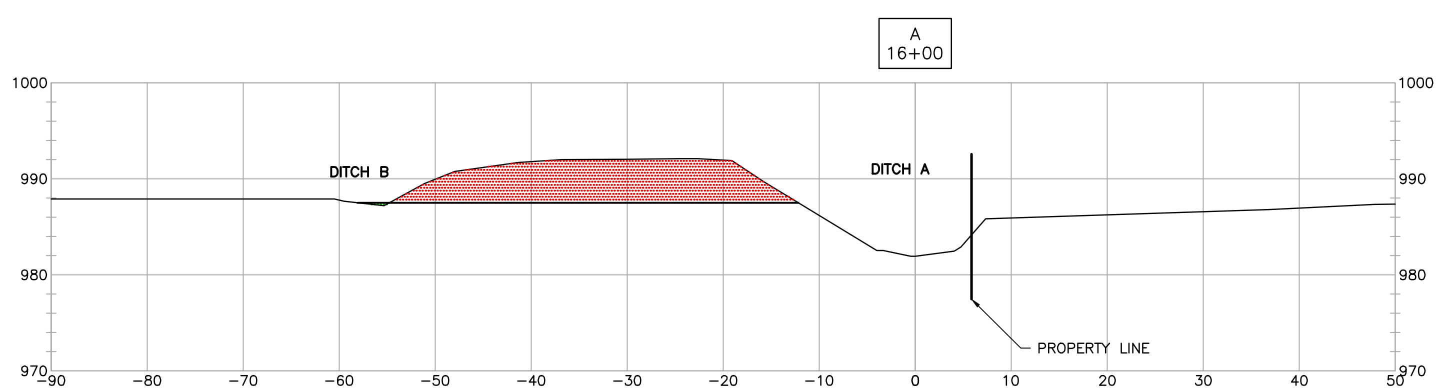

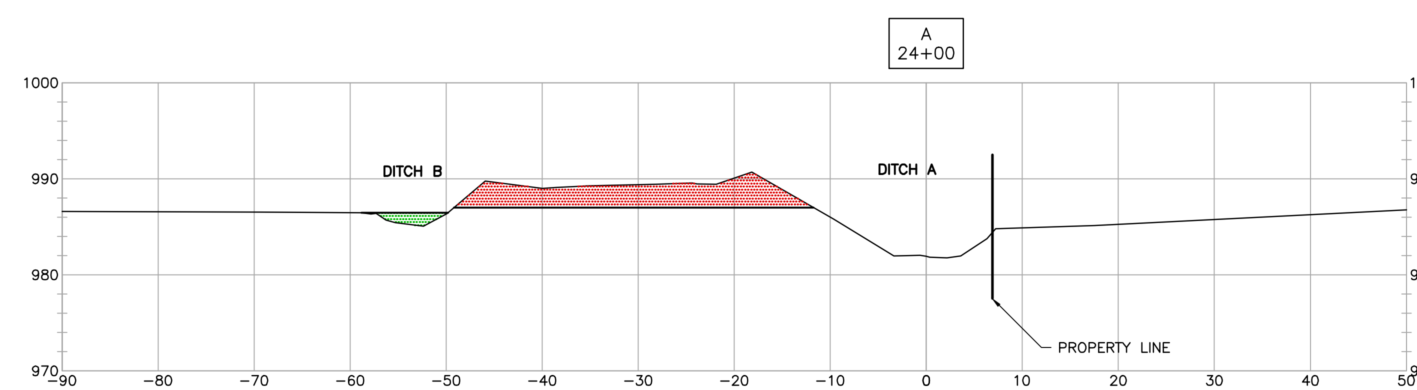

(1/205) CROSS SECTIONS: COUNTY DITCH 7, DITCH ALIGNMENTS A, B

0 10 20
SCALE IN FEET

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-207.DWG PLOT SCALE: 1:2 PLOT DATE: 4/25/2016 5:16 PM

INCHES 1 2

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
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FOR CONSTRUCTION		
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PRINTED NAME ____________
SIGNATURE ____________
DATE ________ LICENSE# ________

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
NW & NE QUARTER SECTION
CROSS SECTIONS

POLYMET MINING

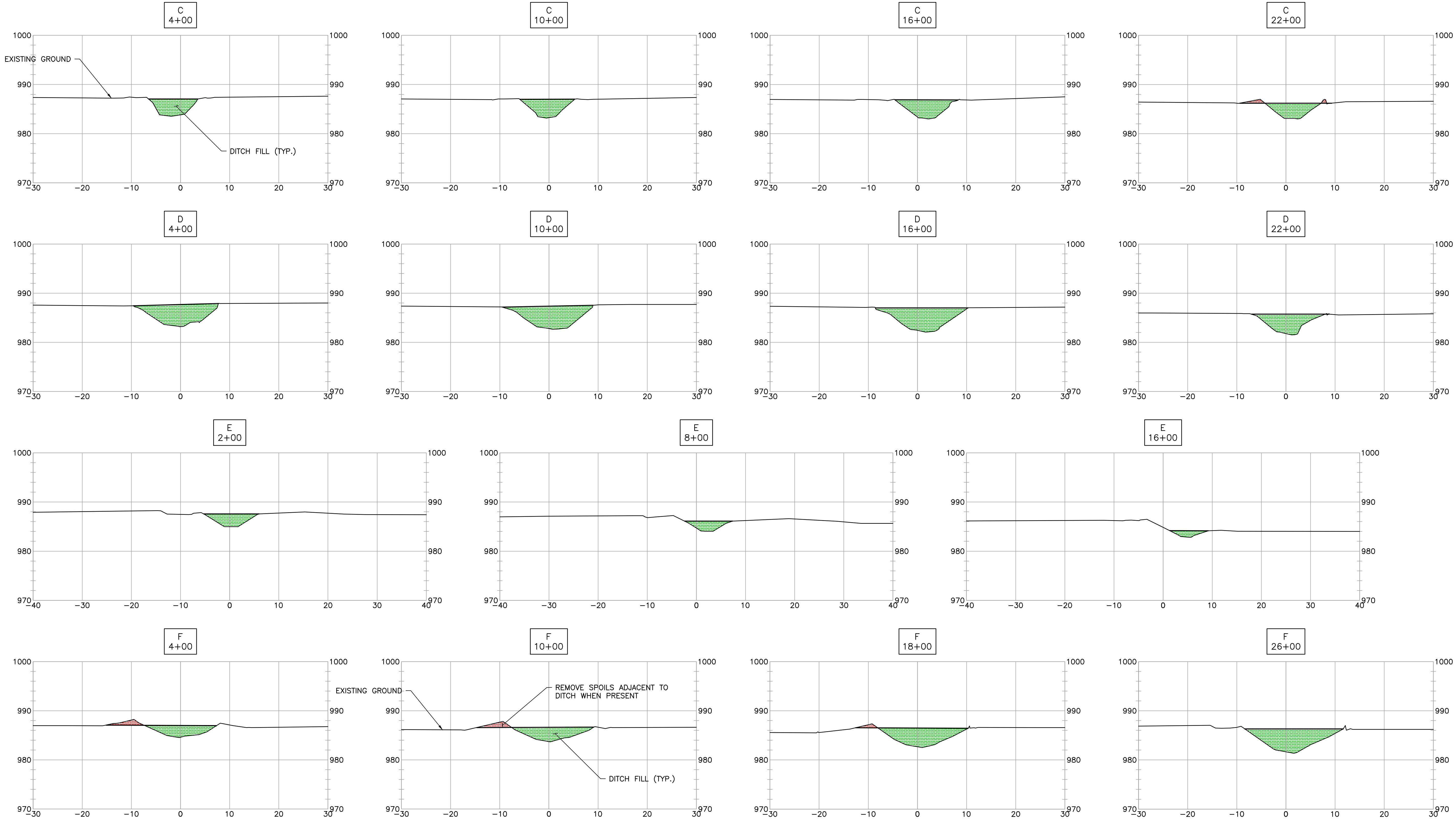
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-207

REV 0



1/205 CROSS SECTIONS: DITCH ALIGNMENTS C, D, E, F

0 10 20
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ____________
SIGNATURE ____________
DATE ________ LICENSE# ________

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

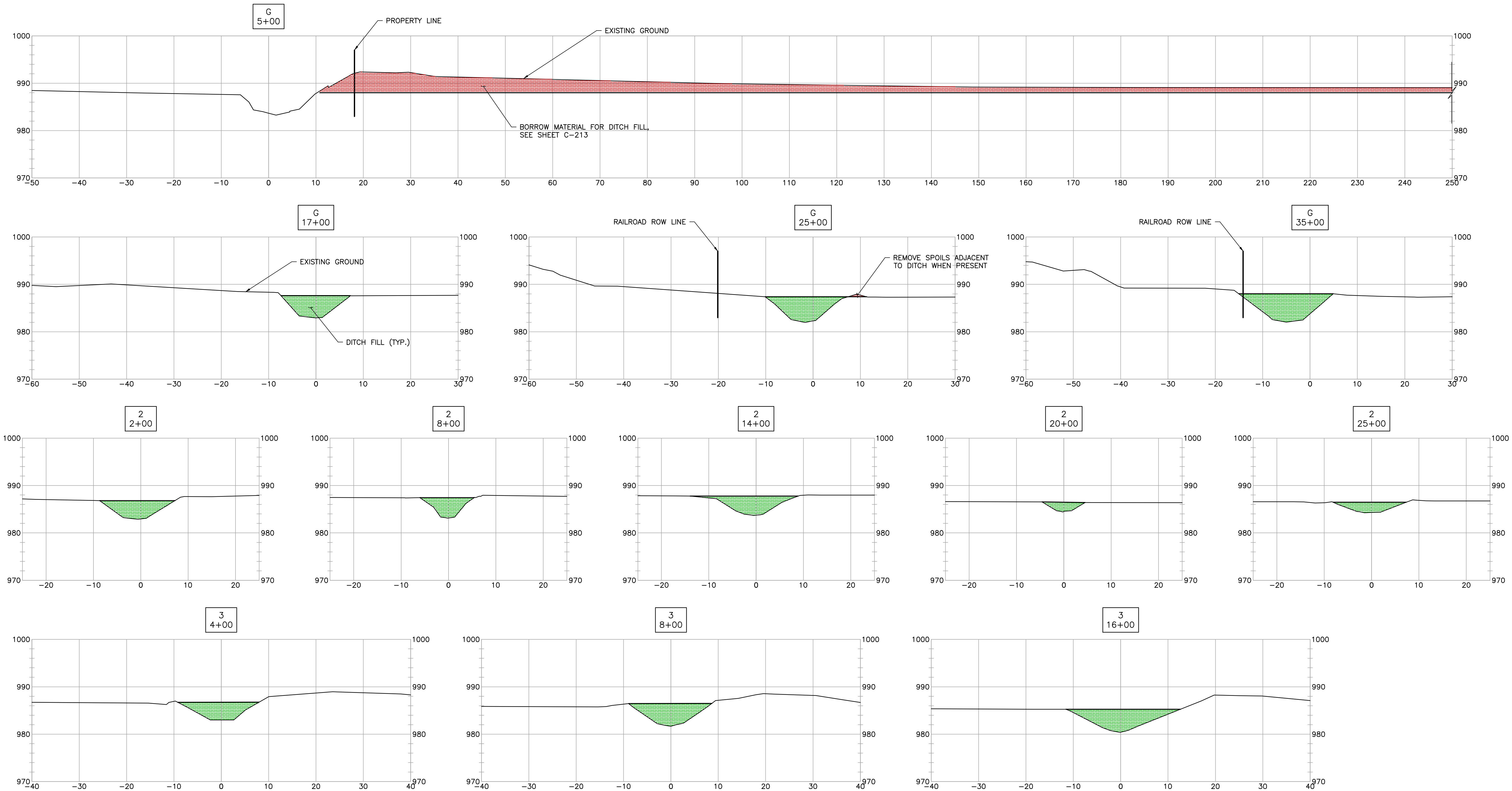
HINCKLEY WETLAND MITIGATION PLAN
NW & NE QUARTER SECTION
CROSS SECTIONS

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-208
REV 0

INCHES 1 2



1 / 205 CROSS SECTIONS: DITCH ALIGNMENTS G, 2, 3

0 10 20
SCALE IN FEET

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME

SIGNATURE

DATE LICENSE#

DRAWN: SBA

CHECKED: MAJ

BARR PROJECT NO.: 23/69-0862.00

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
NW & NE QUARTER SECTION
CROSS SECTIONS

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

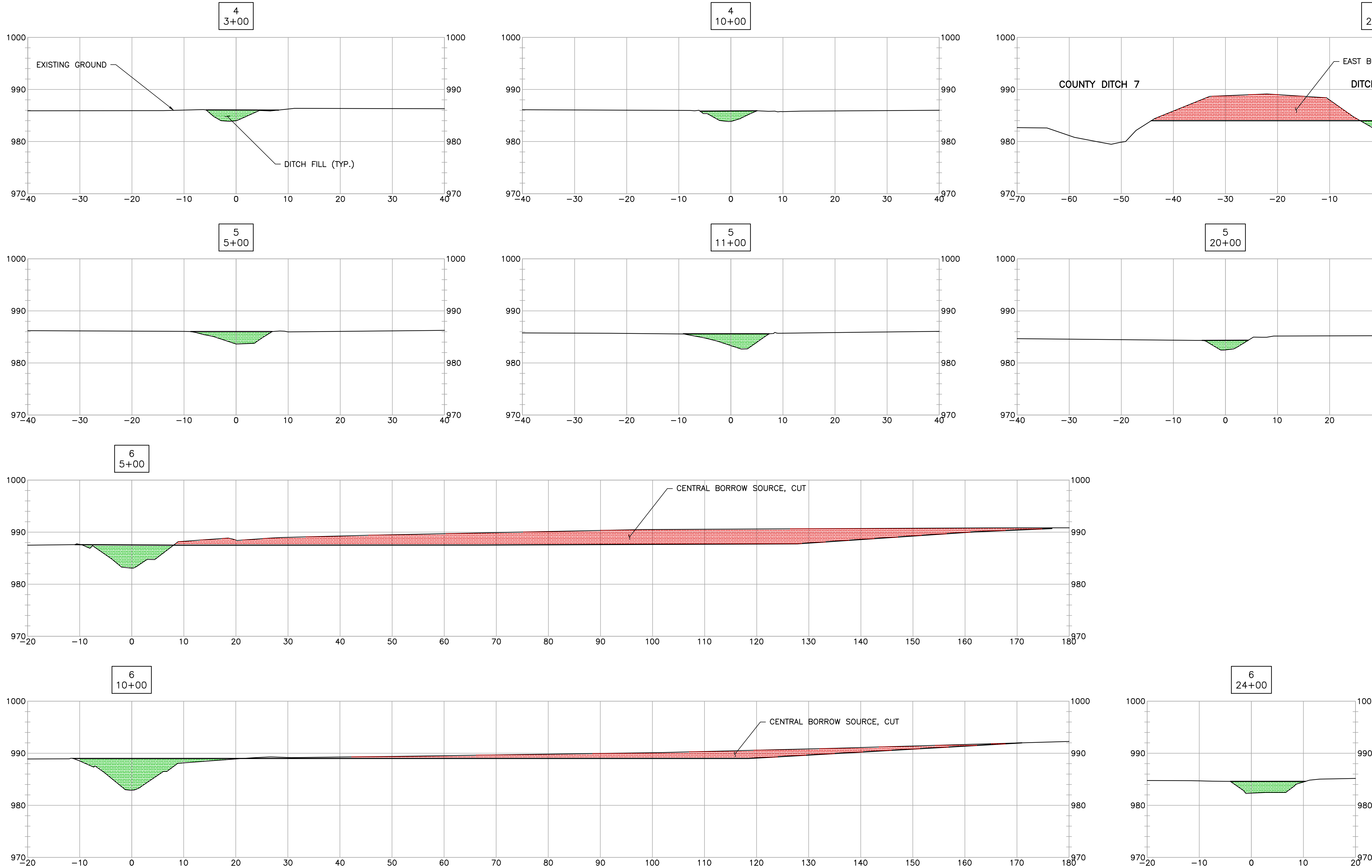
BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-209

REV 0

INCHES 1 2



CROSS SECTIONS: DITCH ALIGNMENTS 4, 5, 6

0 10 20
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME
SIGNATURE
DATE LICENSE#

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

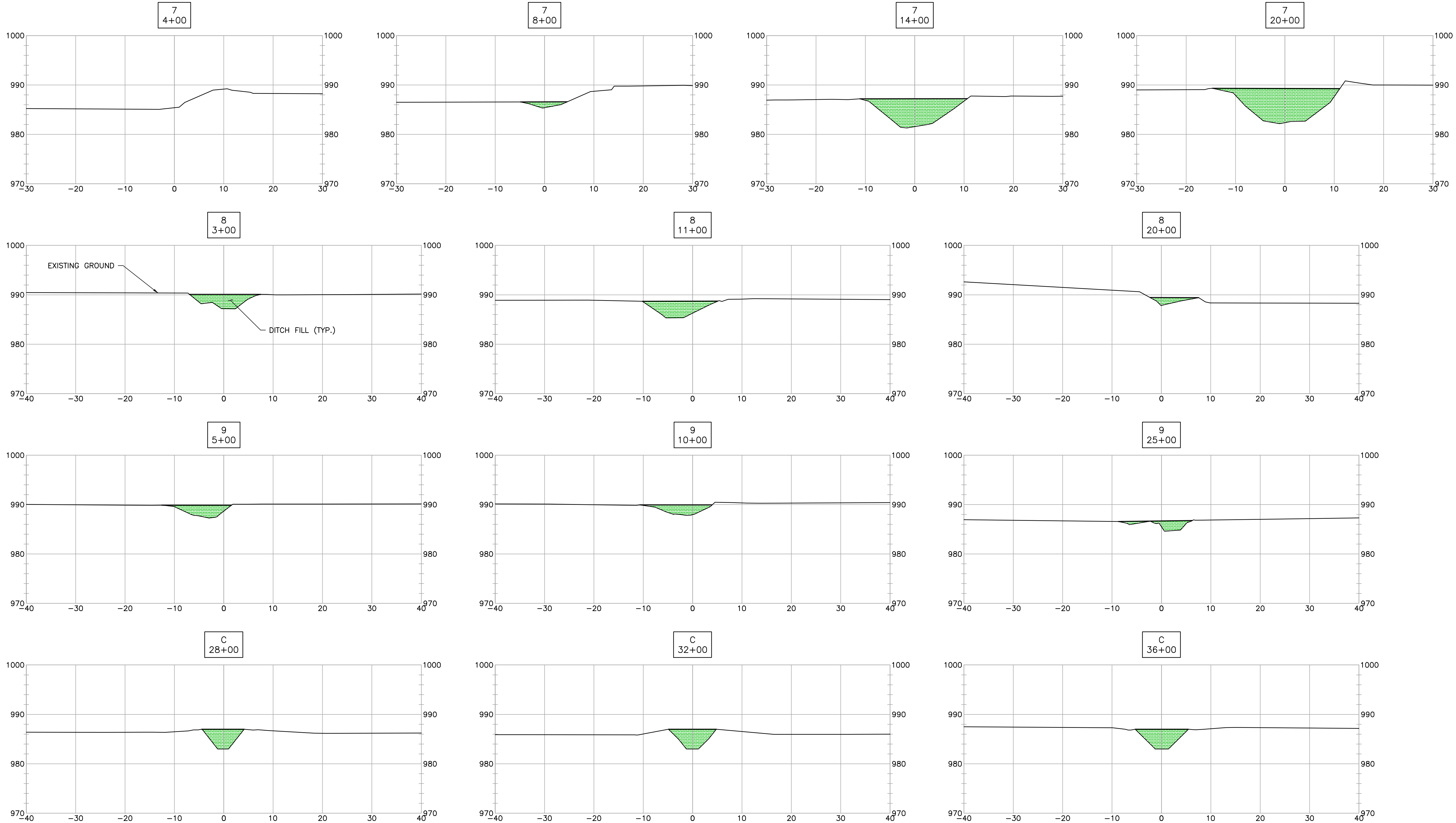
PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
SW & SE QUARTER SECTION
CROSS SECTIONS

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-210
REV 0



1
206
CROSS SECTIONS: DITCH ALIGNMENTS 7, 8, 9, C

0 10 20
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ____________
SIGNATURE ____________
DATE ________ LICENSE# ________

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
SW & SE QUARTER SECTION
CROSS SECTIONS

POLYMET MINING
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-211
REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-211.DWG PLOT SCALE: 1:2 PLOT DATE: 4/25/2016 6:42 PM

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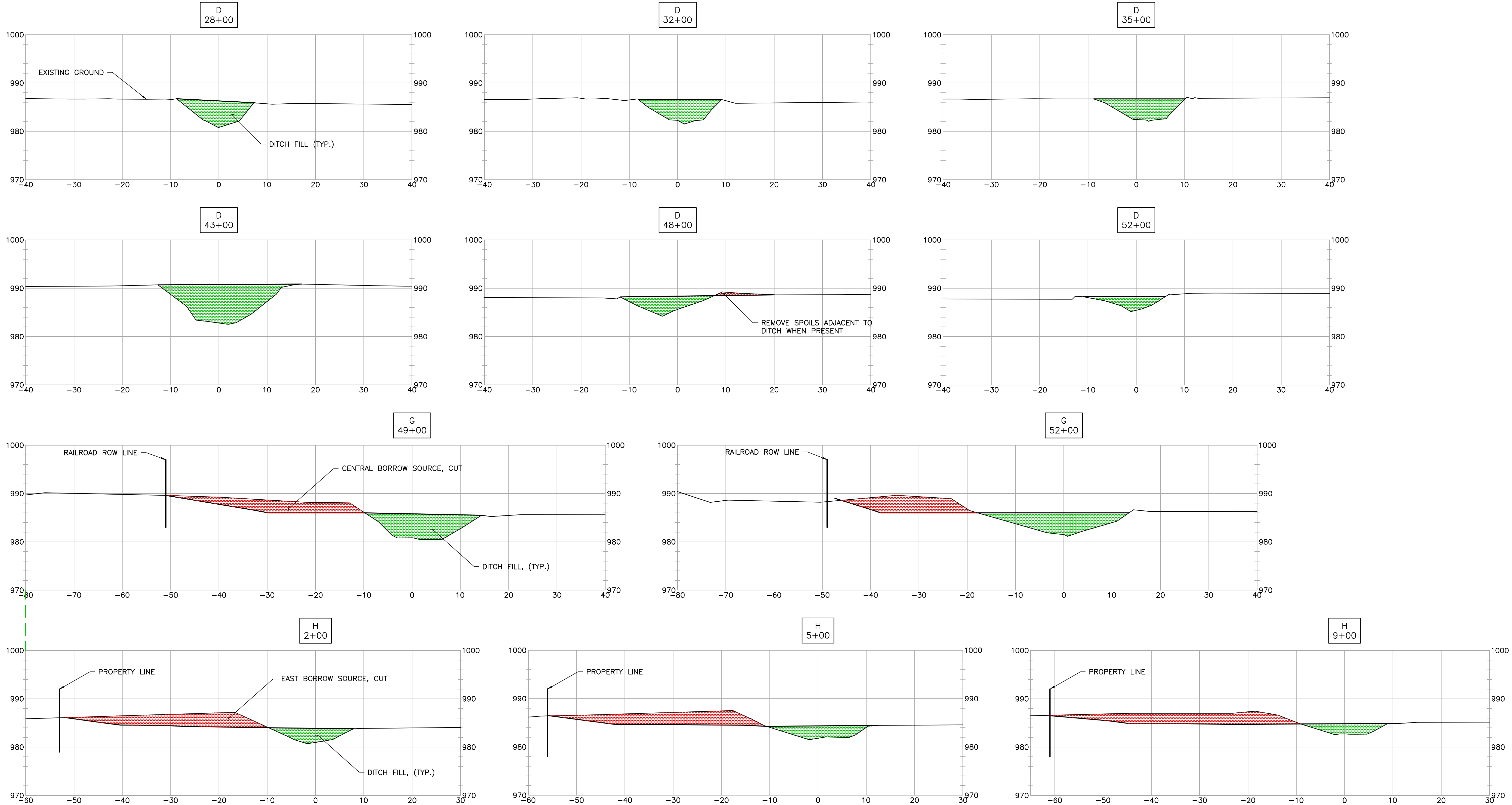

1 / 206 CROSS SECTIONS: DITCH ALIGNMENTS D, G, H

0 10 20
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
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FOR CONSTRUCTION		
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PRINTED NAME ______
SIGNATURE ______
DATE ______ LICENSE# ______

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
SW & SE QUARTER SECTION
CROSS SECTIONS

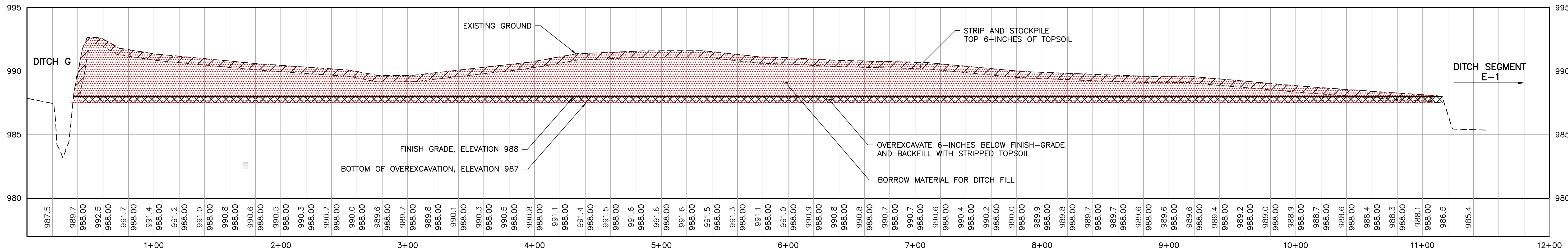
POLYMET MINING
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-212
REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-212.DWG PLOT SCALE: 1:2 PLOT DATE: 4/25/2016 7:17 PM

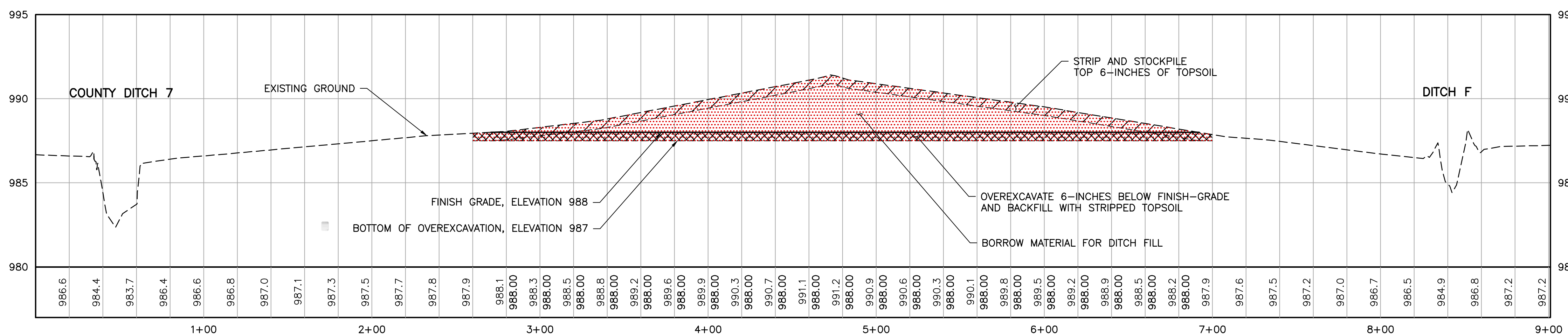
INCHES 1 2



1/205 PROFILE: NORTHEAST BORROW SOURCE – NORTH-SOUTH PROFILE

0 40 80 HORIZONTAL SCALE IN FEET

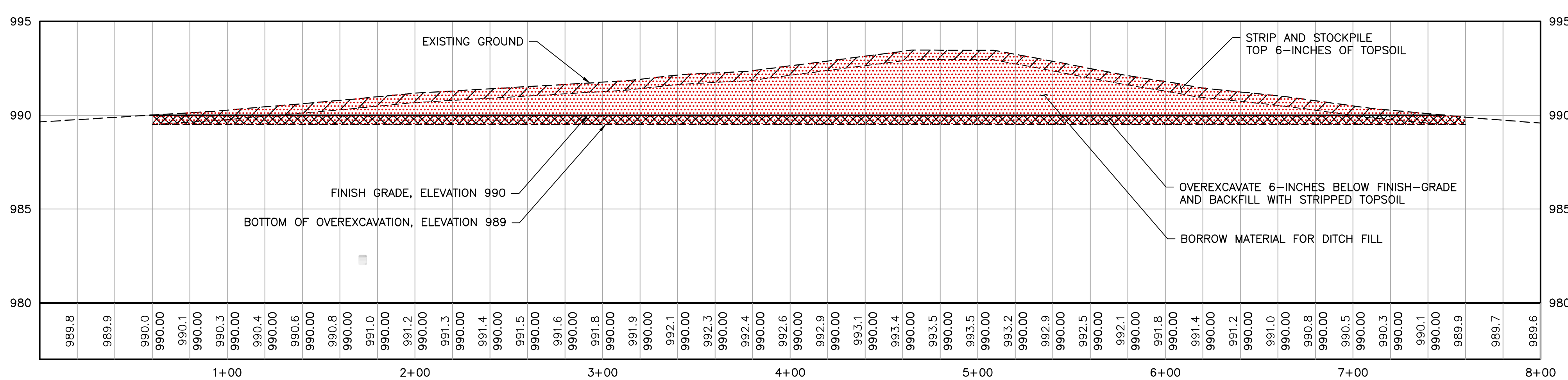
0 2 4 6 8 VERTICAL SCALE IN FEET



2/205 PROFILE: NORTHEAST BORROW SOURCE – WEST-EAST PROFILE

0 40 80 HORIZONTAL SCALE IN FEET

0 2 4 6 8 VERTICAL SCALE IN FEET



3/206 PROFILE: SOUTHWEST BORROW SOURCE

0 40 80 HORIZONTAL SCALE IN FEET

0 2 4 6 8 VERTICAL SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME ____
SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
BORROW SOURCE PROFILES

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-213

REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-213.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 11:38 AM

INCHES 1 2

1/206 DETAIL: OVERFLOW #1

CALLOUT

2/206 DETAIL: OVERFLOW #2

1/206 EXISTING STRUCTURE 1 WITH CONCRETE FLOOR
APPROXIMATE DIMENSIONS: 50' x 60'

2/206 EXISTING STRUCTURE 2 WITH DIRT FLOOR
APPROXIMATE DIMENSIONS: 50' x 60'

3/206 EXISTING STRUCTURE 3 (HOUSE)
APPROXIMATE DIMENSIONS: 40' x 30'

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-214.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 11:18 AM

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
DETAILS

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
	ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ____
SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

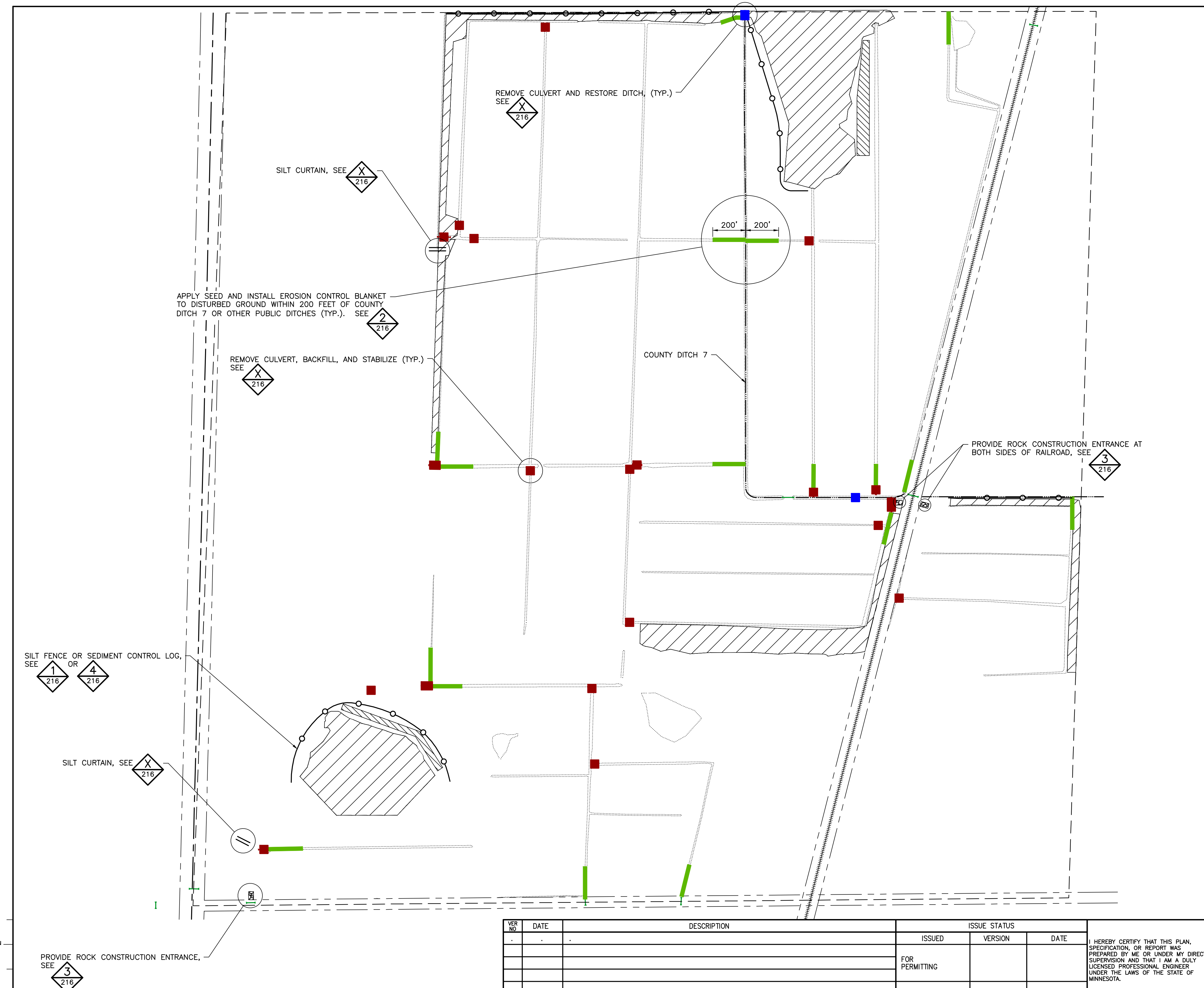
BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-214

REV 0

INCHES 1 2



1 PLAN: EROSION CONTROL & SITE RESTORATION PLAN

0 300 600
SCALE IN FEET

N

LEGEND:

- SILT FENCE OR SEDIMENT CONTROL LOG
- APPLY SEED AND INSTALL EROSION CONTROL BLANKET
- SILT CURTAIN
- CULVERT REMOVAL: BACKFILL DITCH, STABILIZE WITH SEED AND EROSION CONTROL BLANKET
- CULVERT REMOVAL: RESTORE DITCH CHANNEL, STABILIZE WITH EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE

NOTES:

1. EROSION AND SEDIMENT CONTROL IS REQUIRED AT THE LOCATIONS SHOWN AND ON DISTURBED SLOPES THAT DRAIN TOWARDS COUNTY DITCH 7 OR OTHER PUBLIC DITCHES IN ACCORDANCE WITH THE SWPPP.

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
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FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ____
SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
EROSION CONTROL AND
SITE RESTORATION PLAN

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

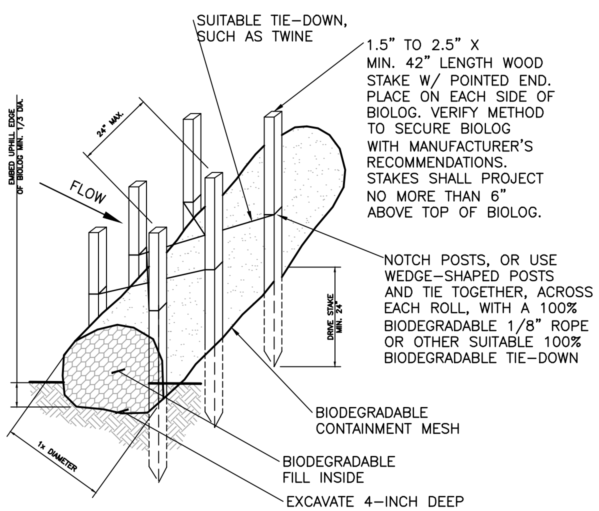
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-215

REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-215.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 2:43 PM

INCHES 1 2

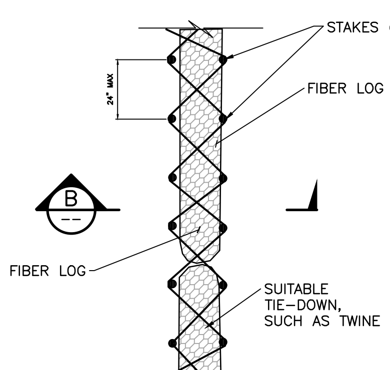


ISOMETRIC VIEW

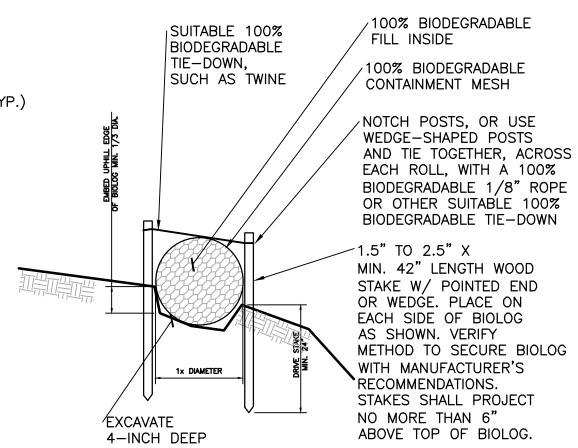
NOTES:

1. 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 100% BIODEGRADABLE.
5. BIOLOG SHALL BE NO LESS THAN 9" IN DIAMETER.

1 DETAIL: SEDIMENT CONTROL LOG
NOT TO SCALE

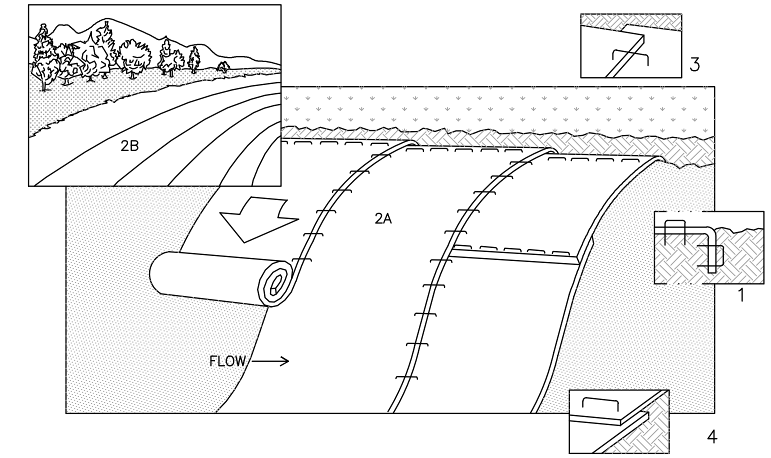


PLAN VIEW B
SINGLE ROW



SECTION VIEW B
SINGLE ROW

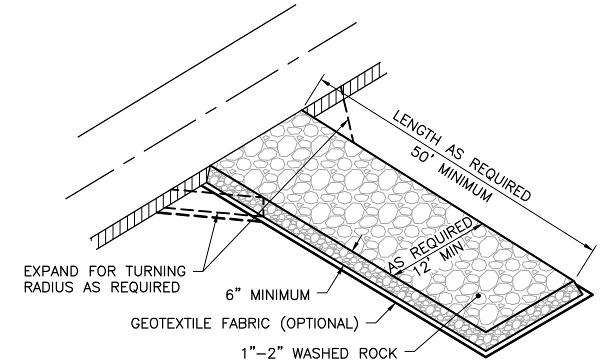
SLOPE INSTALLATION



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.

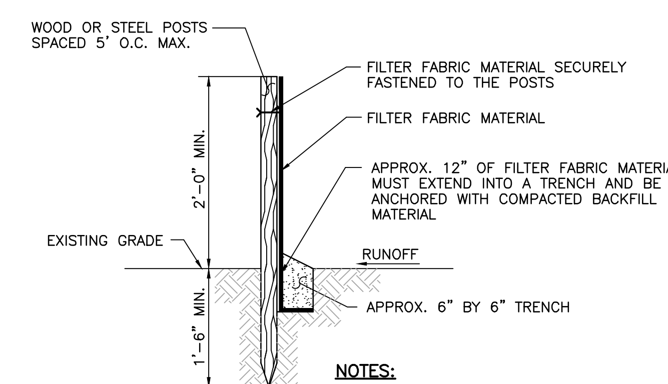
2 DETAIL: EROSION CONTROL BLANKET
NOT TO SCALE



NOTES:

1. 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.

3 DETAIL: ROCK CONSTRUCTION ENTRANCE
NOT TO SCALE



NOTES:

1. INSTALL SILT FENCE AT TOE OF SLOPE PRIOR TO EXCAVATION AND GRADING.
2. MACHINE SLICED SILT FENCE MEETING MnDOT SPECIFICATION 3886.1 ACCEPTABLE.

4 DETAIL: SILT FENCE
NOT TO SCALE

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
EROSION CONTROL DETAILS

VER NO	DATE	DESCRIPTION
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ISSUE STATUS	ISSUED	VERSION	DATE
	FOR PERMITTING		
	FOR CONSTRUCTION		
	NOT APPROVED FOR CONSTRUCTION		

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.

PRINTED NAME ______
SIGNATURE ______
DATE ______ LICENSE# ______

DRAWN: SBA
CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-216 REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-216.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 11:49 AM

INCHES 1 2

1 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)
HINCKLEY WETLAND MITIGATION SITE, PINE COUNTY

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 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 vegetation, shrubs, and trees. All disturbed sloped areas will be stabilized with mulch, erosion control blanket, or rip−rap.

PROJECT SIZE:
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.

REGULATORY 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 enviromental reviews, endangered or threatened species.

FIGURES:

Site Location and Vicinity Map:	Sheet TS−201
Sheet Existing Conditions Plan:	Sheet CS−201, CS−202, CS−203
Site Plan	Sheet CS−204, CS−205, CS−206
Stormwater Pollution Prevention Plan (SWPPP)	Sheet CS−217
Erosion Control Plan:	Sheet CS−215
Erosion Control Sections and Details:	Sheet CS−216
Erosion and Sedimentation Control Quantities	See Project Bid Form

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IMPLEMENTATION RESPONSIBILITIES:
1. The OWNER and CONTRACTOR are Permittee(s) as identified by the NPDES Permit.
2. CONTRACTOR shall be responsible for all on−site implementation of the SWPPP, including the activities of all of CONTRACTOR's subcontractors.
3. 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 SWPPP.
4. 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.
5. 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
Restored Wetlands by eliminating existing drainage systems.

SEQUENCE OF CONSTRUCTION
The following sequence describes, in general, the work on the site:

1. CONTRACTOR shall submit a detailed construction staging, erosion control staging, and stormwater management plan for the entire project for the duration of construction.
2. CONTRACTOR shall verify that all permits have been obtained and/or obtain the necessary permits.
3. CONTRACTOR shall perform site inspections, record keeping and record retention in accordance with all permits.
4. 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.
5. CONTRACTOR shall perform site grading, excavation, stockpiling work in accordance with the stormwater pollution prevention plan (SWPPP).
6. 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.
7. 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.
8. CONTRACTOR shall replace or repair erosion control and sediment control BMP's that are not functioning properly.
9. CONTRACTOR shall perform site restoration actvitities for permanent vegetative establishment by others and shall seed expose areas with a temporary cover crop.
10. CONTRACTOR shall remove non−biodegradeable sediment control devices prior to submitting Notice Of Termination (NOT).
11. Submit notice of termination to MPCA within 30 days of final stabilization.

CONSTRUCTION ACTIVITY FIELD REQUIREMENTS:
A. All field requirements shall be perfomed in accordance with the requirements of the NPDES Permit and Stormwater Pollution Prevention Plan (SWPPP).
1. The CONTRACTOR must implement the SWPPP and provide BMPs identified in the SWPPP in an appropriate and functional manner.
2. 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.
3. The CONTRACTOR shall keep and maintain an active rain guage on site to collect and contain daily precipitation events.

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 begins.
2. 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.
3. 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.
4. Temporary or permanent energy dissipation at drainage or pipe outlets must be provided within 24 hours of connecting to a surface water.

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.
2. 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.
3. 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 next precipitation event.
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.
5. 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.
6. 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, mud mats, equivalent system must be installed at active project entrance by CONTRACTOR to minimize tracking from site.

D. DEWATERING AND BASIN DRAINING
CONTRACTOR shall be responsible for the following dewatering requirements:
1. No dewatering activities are anticipated with this project.
2. 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 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 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.
2. 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.
3. 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.
   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.
4. 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.
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 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.
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 clear 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 CONTRACTOR.

F. 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.
2. 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 and leaks.
3. In the event of a spill, Contractor must immediately notify Owner.
4. 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.
5. Concrete washout containment is not expeced to be required on site.
6. Portable toilets brought to the property shall be made secure (anchored) to prevent spillage from vandalism or other accidental spillage of internal liquids.

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

− 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:
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 place if indicated by the plan.
4. Removal of sediments from storm water conveyances and permanent water quality basins.

CHANGES TO SWPPP
− 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 whenever:
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 the terms and conditions of this permit.
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 (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:

PREPARED BY:	TRAINING/CERTIFICATION	
Tom Tri, Senior Env. Scientist	Date of Training/Certification: January, 2005	
Water Resources	Certification Program:	University of Minnesota
Barr Engineering Company		Design of SWPPP − Mn/DOT, Arden Hills
ttri@barr.com	Recertification:	May 7, 2014
218−529−8226	Certification 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:

RESPONSIBLE PERSONS IS PENDING CONTRACTOR SELECTION

OWNER:	OWNER'S REPRESENTATIVES
Polymet Mining Corporation 6500 County Road 666 P.O. Box 475 Hoyt Lakes, MN 55750 218−471−2150	Kevin Pylka Polymet Mining Corporation Manager Env. Permitting & Compliance 6500 County Road 666 P.O. Box 475 Hoyt Lakes, MN 55750 218−471−2150
CONTRACTOR: Construction Co. P.O. Box , MN Main Phone: (218) Main Fax: (218)	Mark Jacobson Vice President Barr Engineering Company 4700 West 77th Street Minneapolis, MN 55435 Office: (952) 832−2764 Mobile: (612) 240−3297 mjacobson@barr.com
Construction Co. Office: (218) Mobile: (218)	Daniel Tix Wetland Ecologist Barr Engineering Company 4700 West 77th Street Minneapolis, MN 55435 Office: (952) 832−2918 Mobile: (612) 540−7848 dtix@barr.com
On−Site Representative Construction Co. Office: (218) Phone: (218)	Barr Engineering Company 4700 West 77th Street Minneapolis, MN 55435 Office: (952) 832− Mobile:

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ISSUE STATUS	ISSUED	VERSION	DATE
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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.

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DATE ____ LICENSE# ____

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BARR PROJECT NO.: 23/69−0862.00
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HINCKLEY WETLAND MITIGATION PLAN
STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

POLYMET MINING

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1−800−632−2277

DWG. NO. CS−217
REV 0

CADD USER: Seth B. Anderson FILE: K:\DESIGN\23690C29.99\MISC_NMG−00−CS−217.DWG PLOT SCALE: 1:2 PLOT DATE: 4/26/2016 11:41 AM

INCHES 1 2

Attachment E

Aitkin Wetland Mitigation Site Wetland Mitigation Plan

Aitkin Wetland Mitigation Site

Wetland Mitigation Plan

Poly Met Mining, Inc.

POLYMET
MINING

August 2016

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
952.832.2600
www.barr.com

Aitkin Wetland Mitigation Site
Wetland Mitigation Plan

August 2016

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List of Large Figures

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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).
(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.

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 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, 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 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

Well ID	Current Land Use	Precipitation during the entire Growing Season[1]													2012-2016	2013-2016	Drainage Status
		2012		2013		2014			2015			2016					
		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)	
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., Transline™) at recommended rates targeting stinging nettle, Canada thistle, and other broadleaf invasive, 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 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 wick-applied 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) The % of mix is calculated without *Spartina pectinate*.
(2) *Spartina pectinate* will be added in selected locations.

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, 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);
    - 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

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19. **General Land Office.** Survey Map of T047R26W. 1871.

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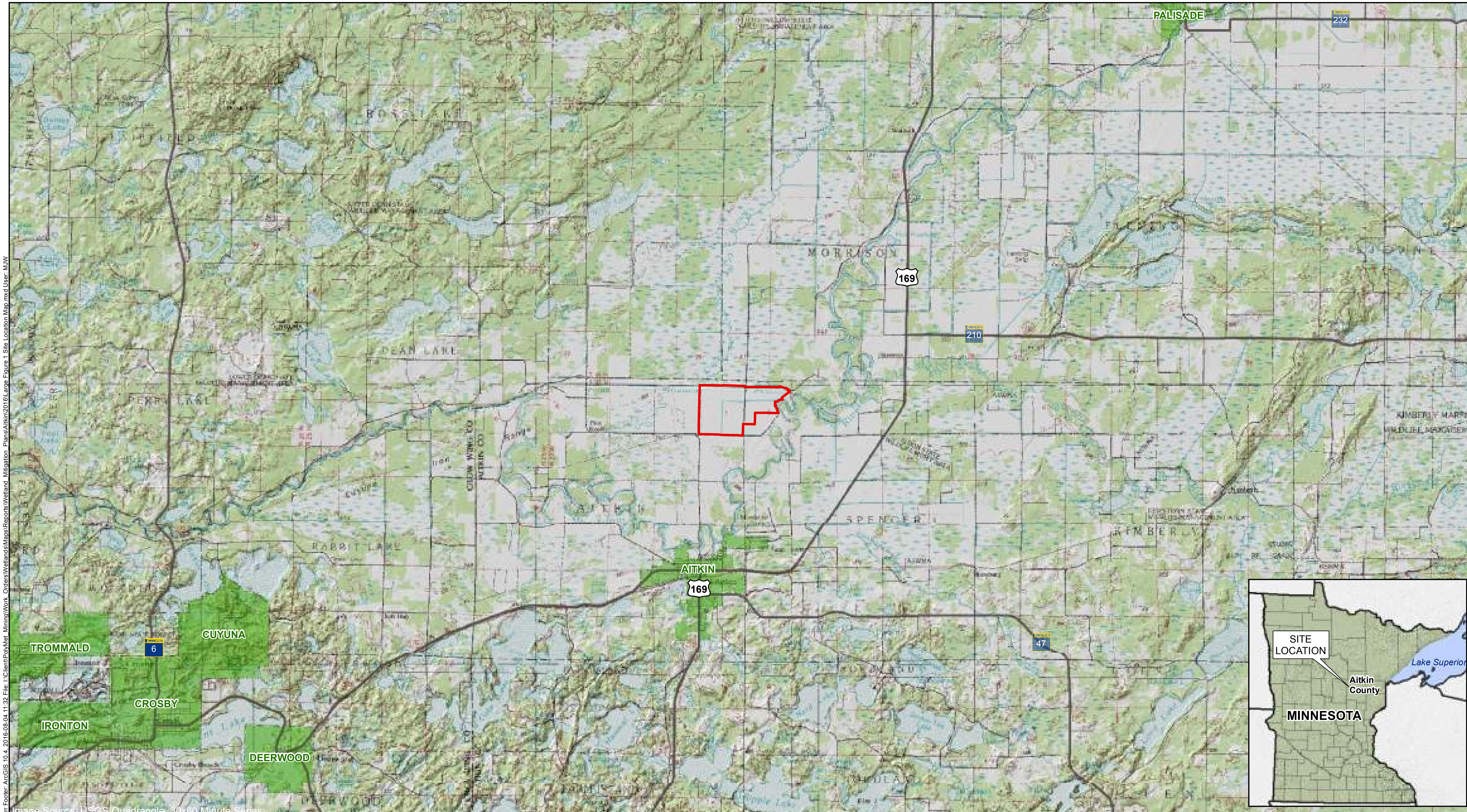
Large Figures



Project Boundary

Municipality

0 1 2 4

Miles

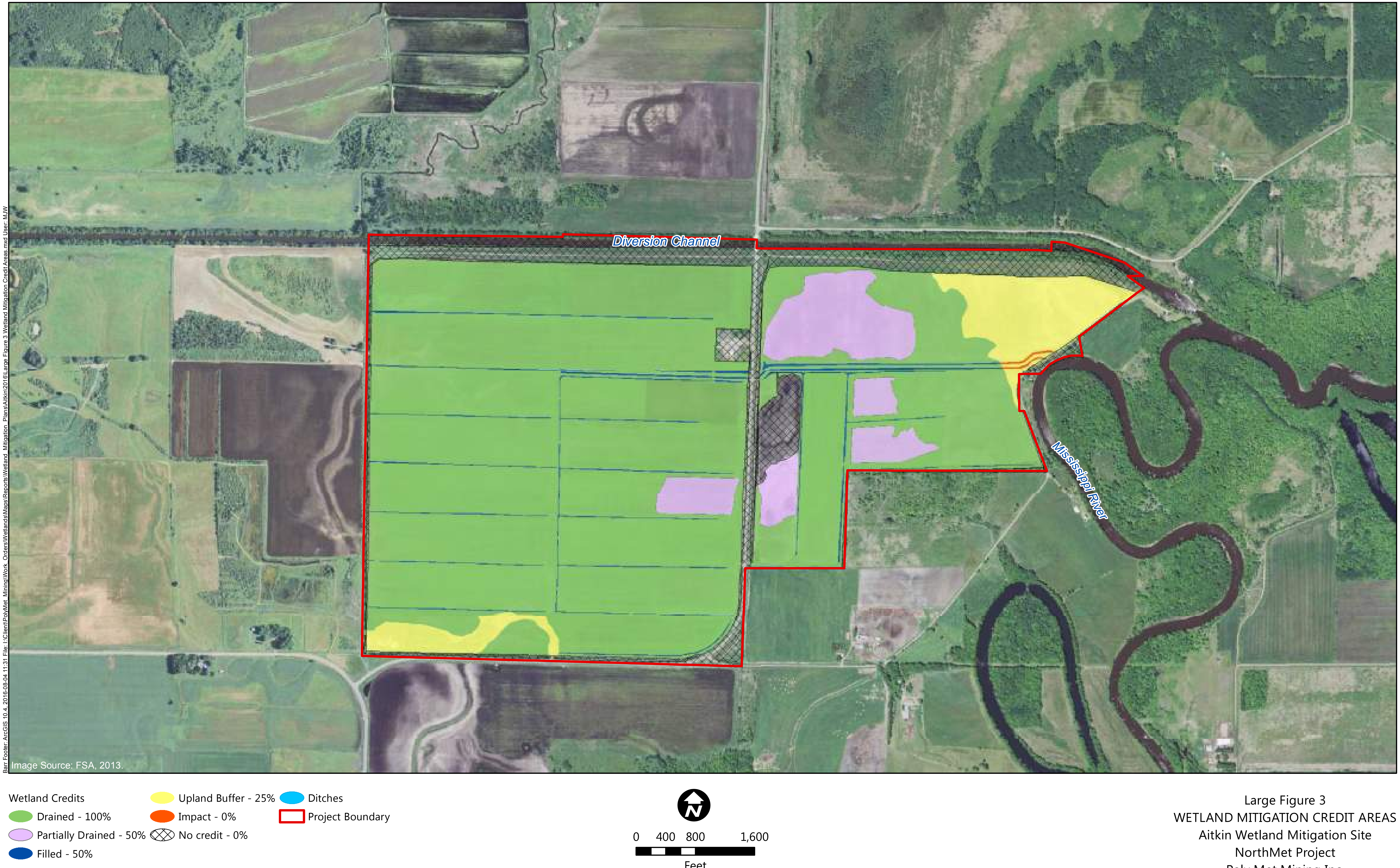
Large Figure 1
SITE LOCATION MAP
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Wetland Restoration Plan
- Coniferous Swamp
- Ditch
- Diversion Channel
- Hardwood Swamp
- Homestead
- Natural Area
- None
- ROW
- Shallow Marsh
- Upland Buffer

Existing Surface Elevation
- 5-Ft Contour
- 1-Ft Contour
- Project Boundary

0 400 800 1,600
Feet

Large Figure 2
WETLAND RESTORATION PLAN
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

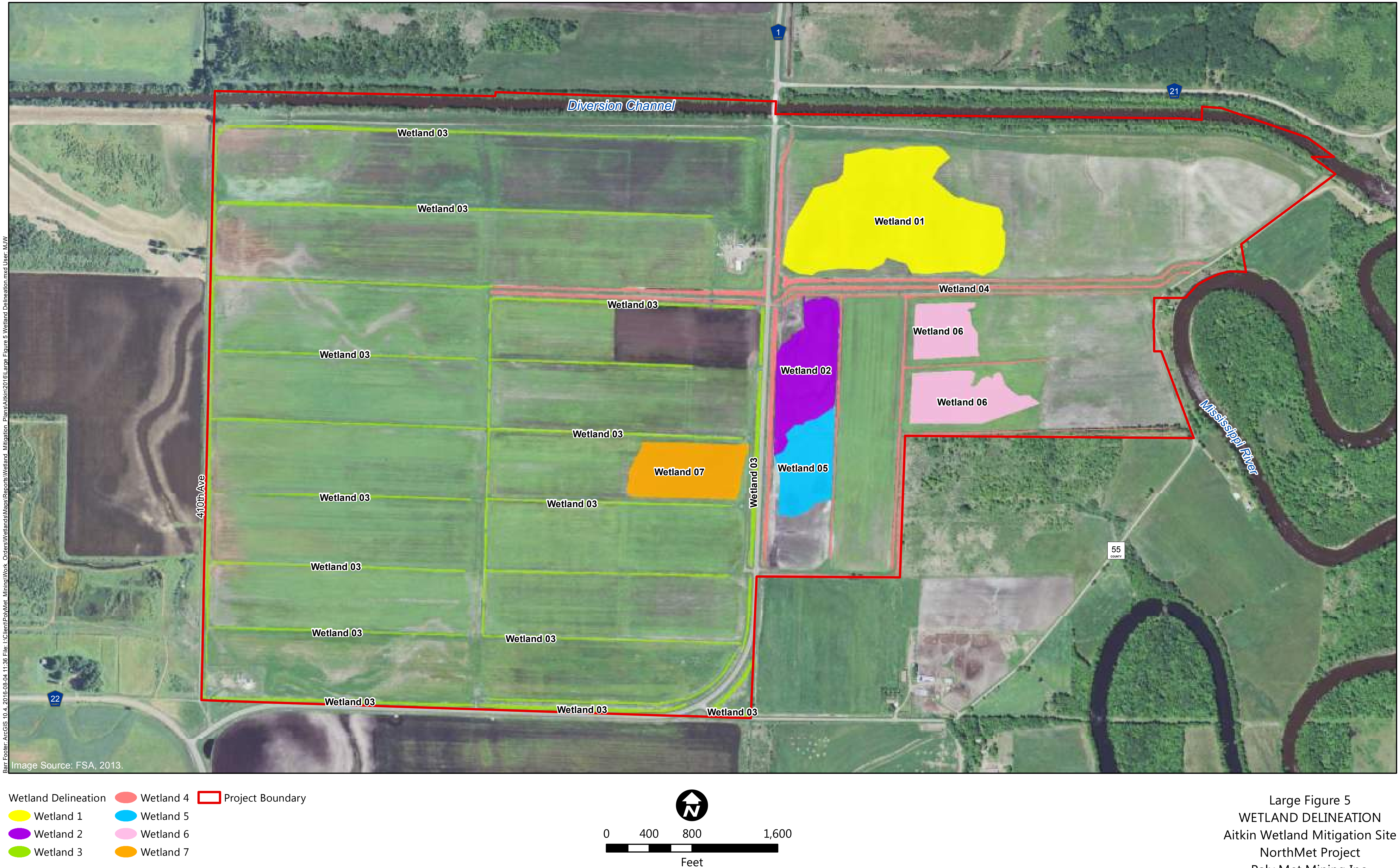


Large Figure 3
WETLAND MITIGATION CREDIT AREAS
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Map Unit Symbol	Map Unit Name
147	Spooner silt loam
532	Sago muck
625	Sandwick loamy sand
672	Willosippi loam
759	Waukenabo fine sandy loam
1154	Sax muck
1982	Baudette-Spooner complex
1983	Cathro muck, stratified substratum

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

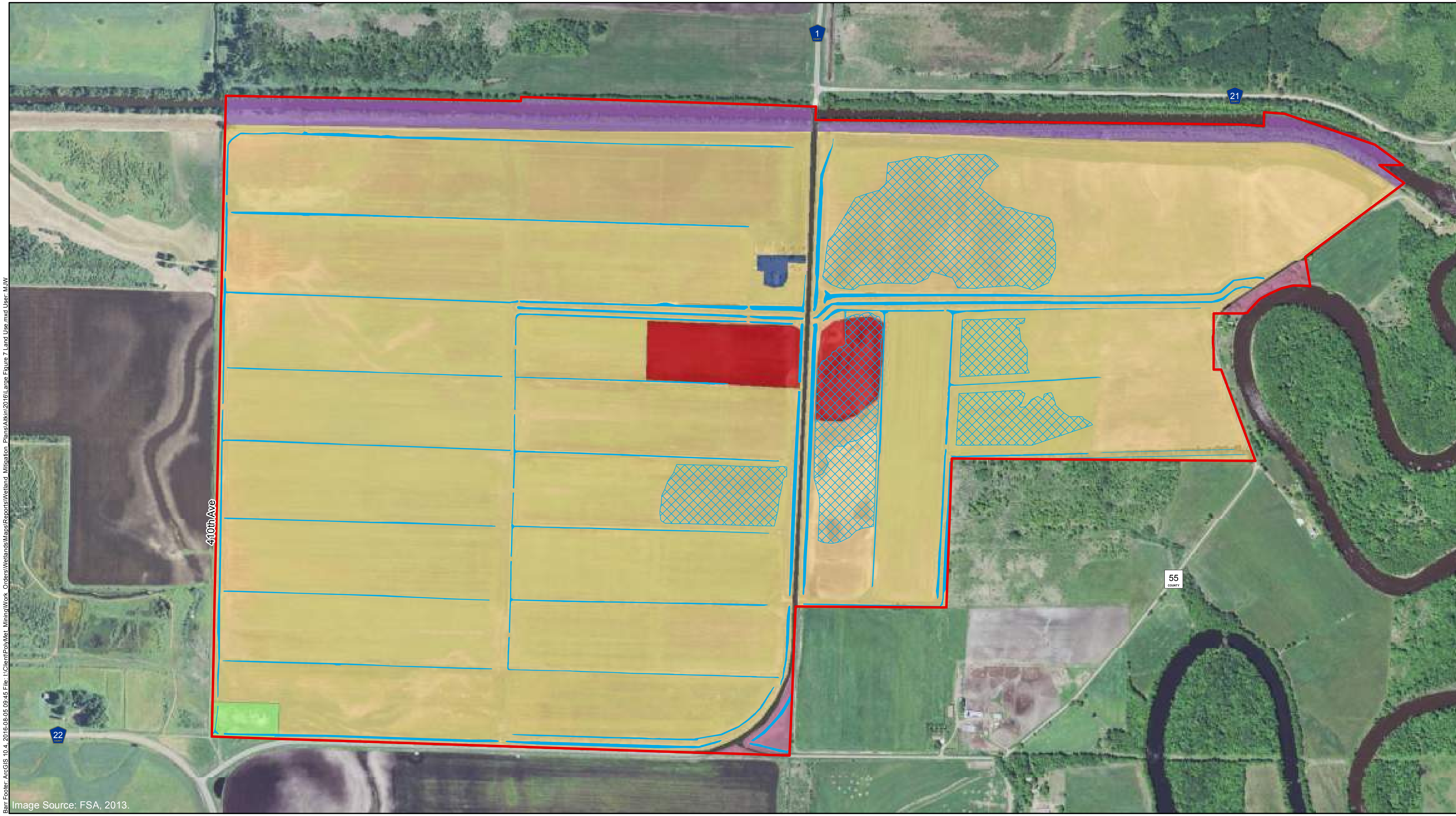


Large Figure 5
WETLAND DELINEATION
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Project Boundary
Wetland Type
Fresh (wet) meadow
Shallow marsh

0 400 800 1,600
Feet

Large Figure 6
WETLAND TYPE
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Road
Homestead
Levy/Diversion Channel
Peat Mining
Storage Area
Field
Non-Field Area
Wetland
Ditch
Project Boundary

N

0 400 800 1,600
Feet

Large Figure 7
LAND USE
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

National Wetlands Inventory (NWI)

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

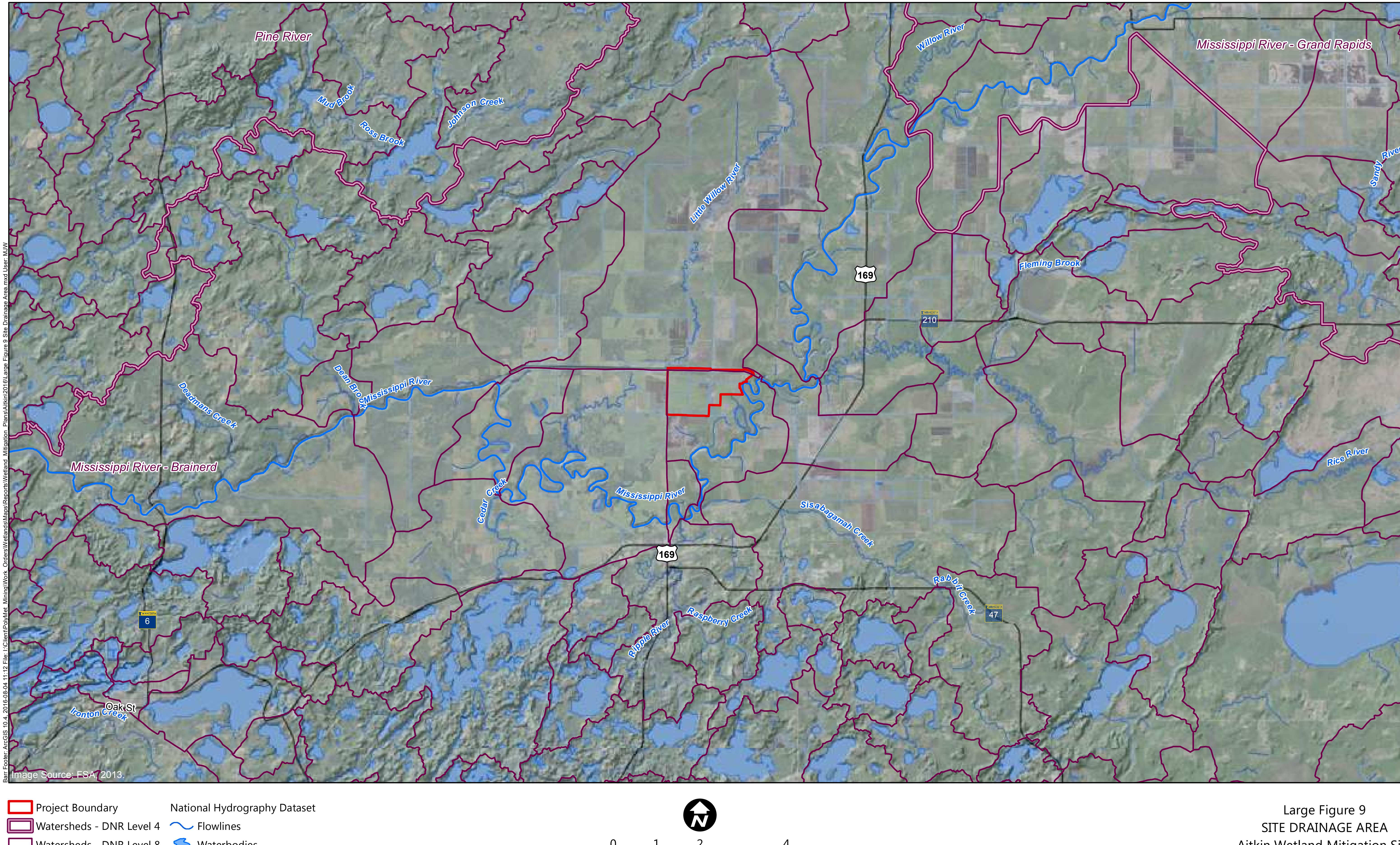
Riverine

Project Boundary

0 400 800 1,600

Feet

Large Figure 8
NATIONAL WETLAND INVENTORY
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Large Figure 9
SITE DRAINAGE AREA
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

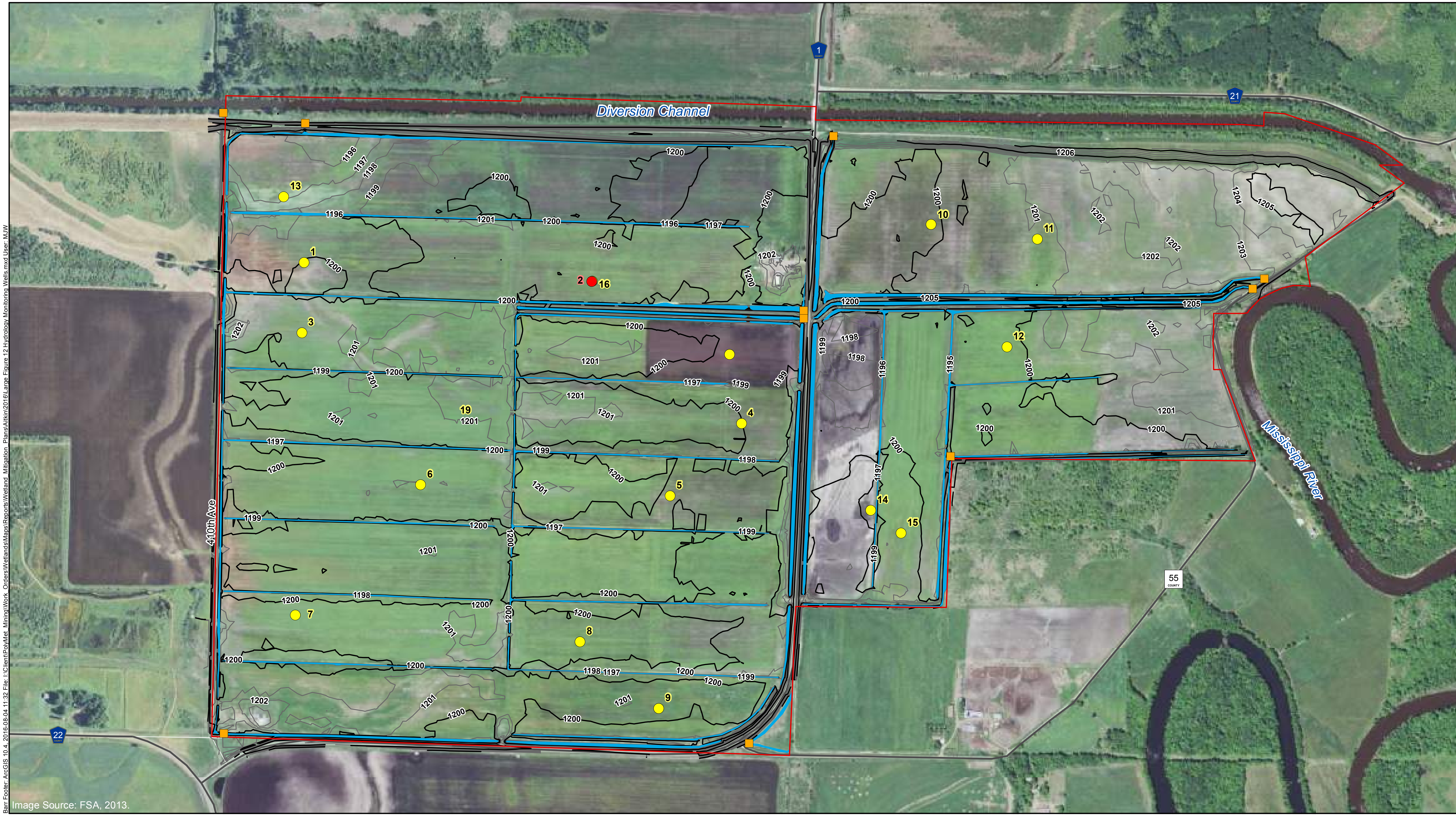
Large Figure 10
1940 AERIAL PHOTO
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Project Boundary

0 400 800 1,600

Feet

Large Figure 11
1991 AERIAL PHOTO
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Monitoring Well

- Active Well
- Removed Well

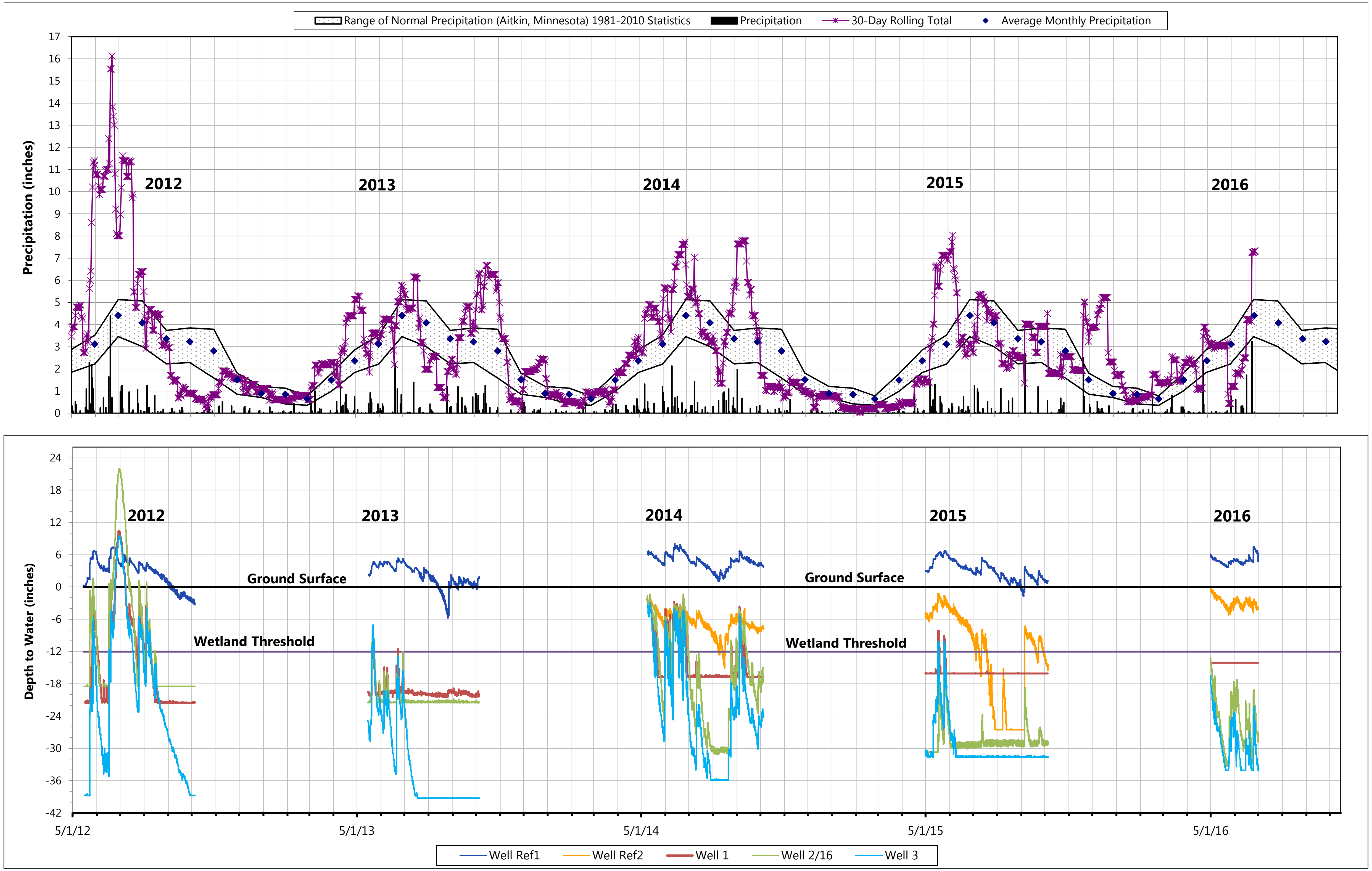
- Culverts
- Ditches
- Project Boundary

Elevation Contours

- 5-Ft Contour
- 1-Ft Contour

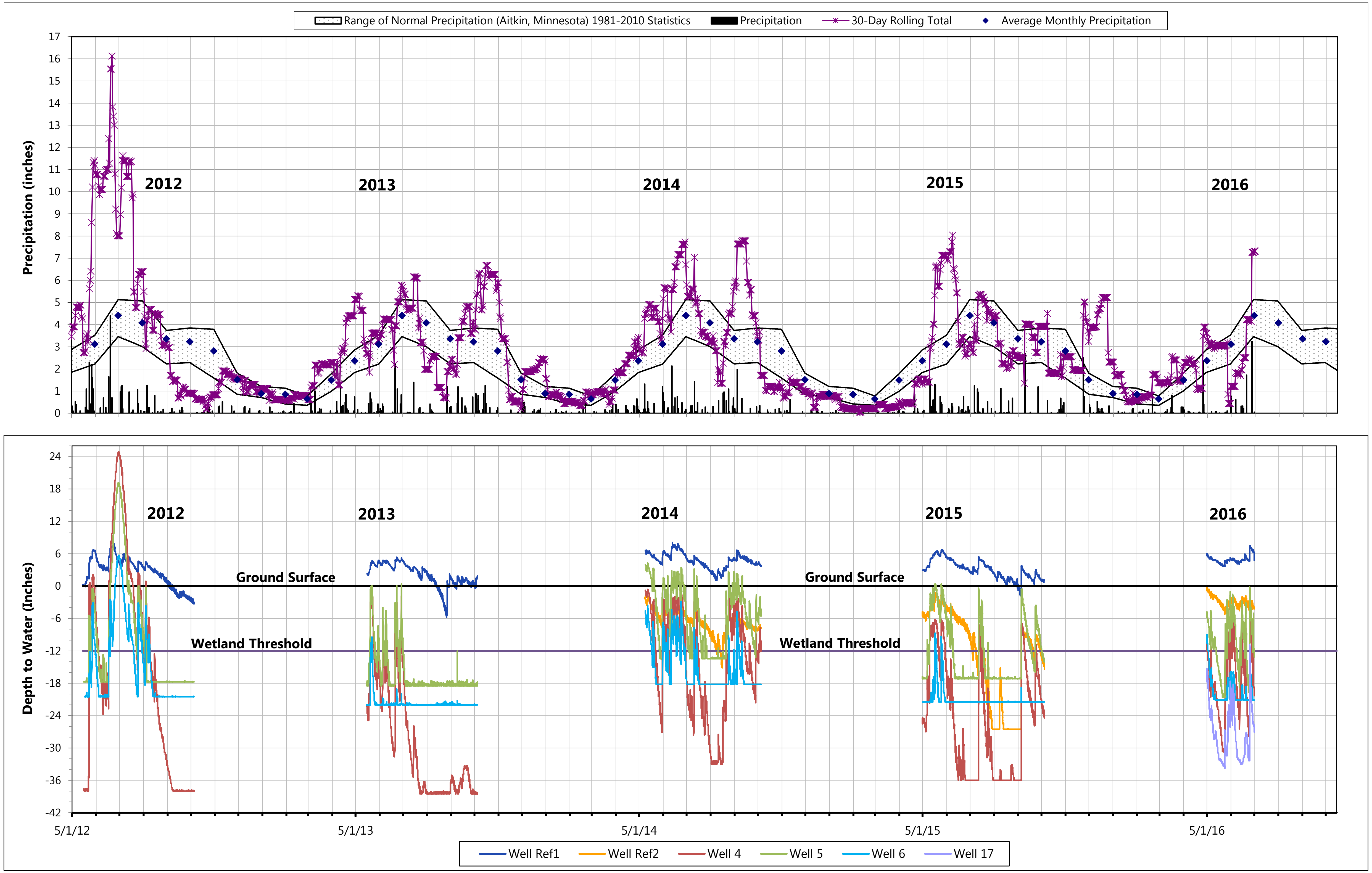
0 400 800 1,600
Feet

Large Figure 12
MONITORING WELL LOCATIONS
Aitkin Wetland Mitigation Site
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



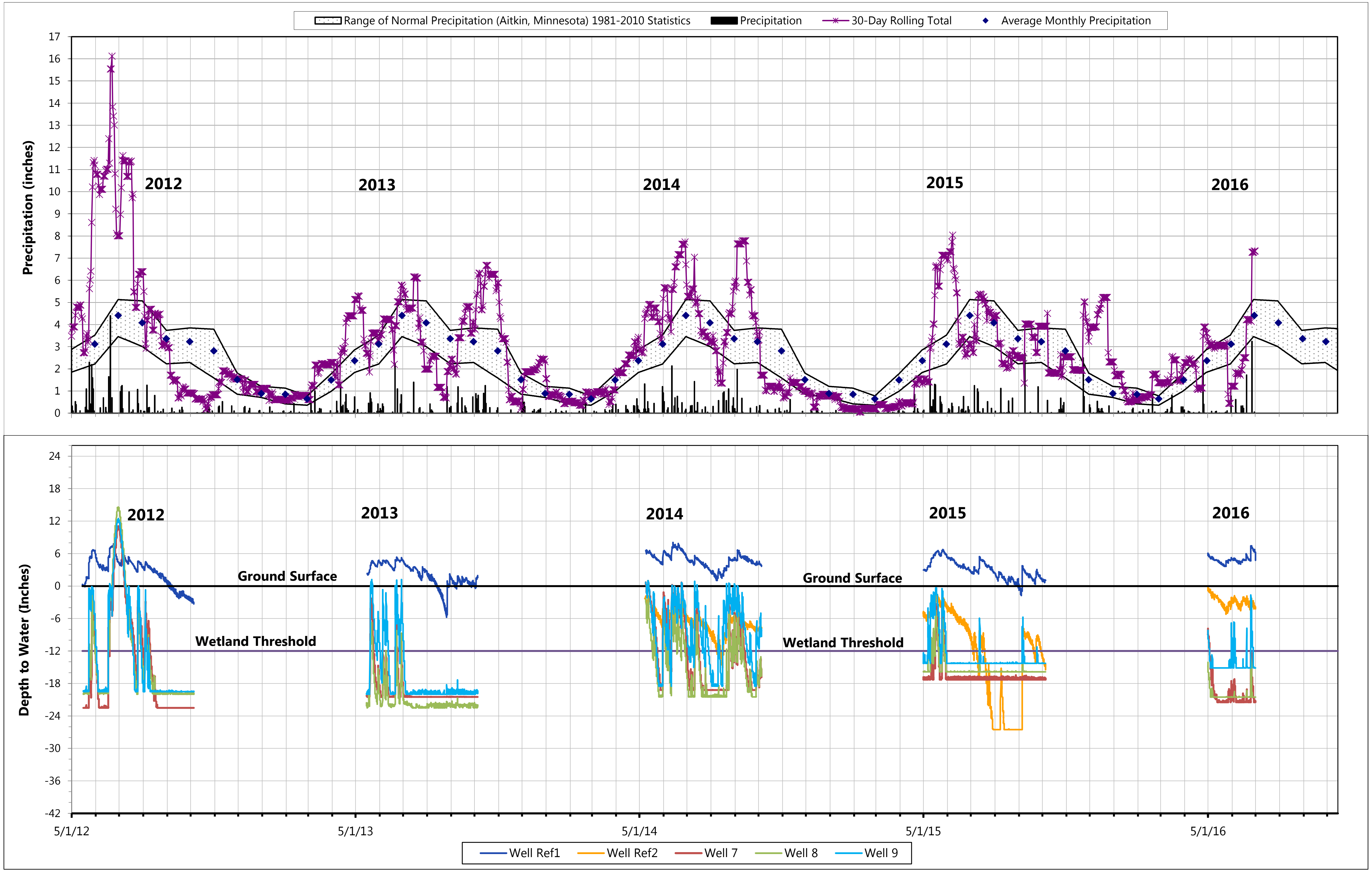
NOTE: In 2016, precipitation and logger data is shown through July 1

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



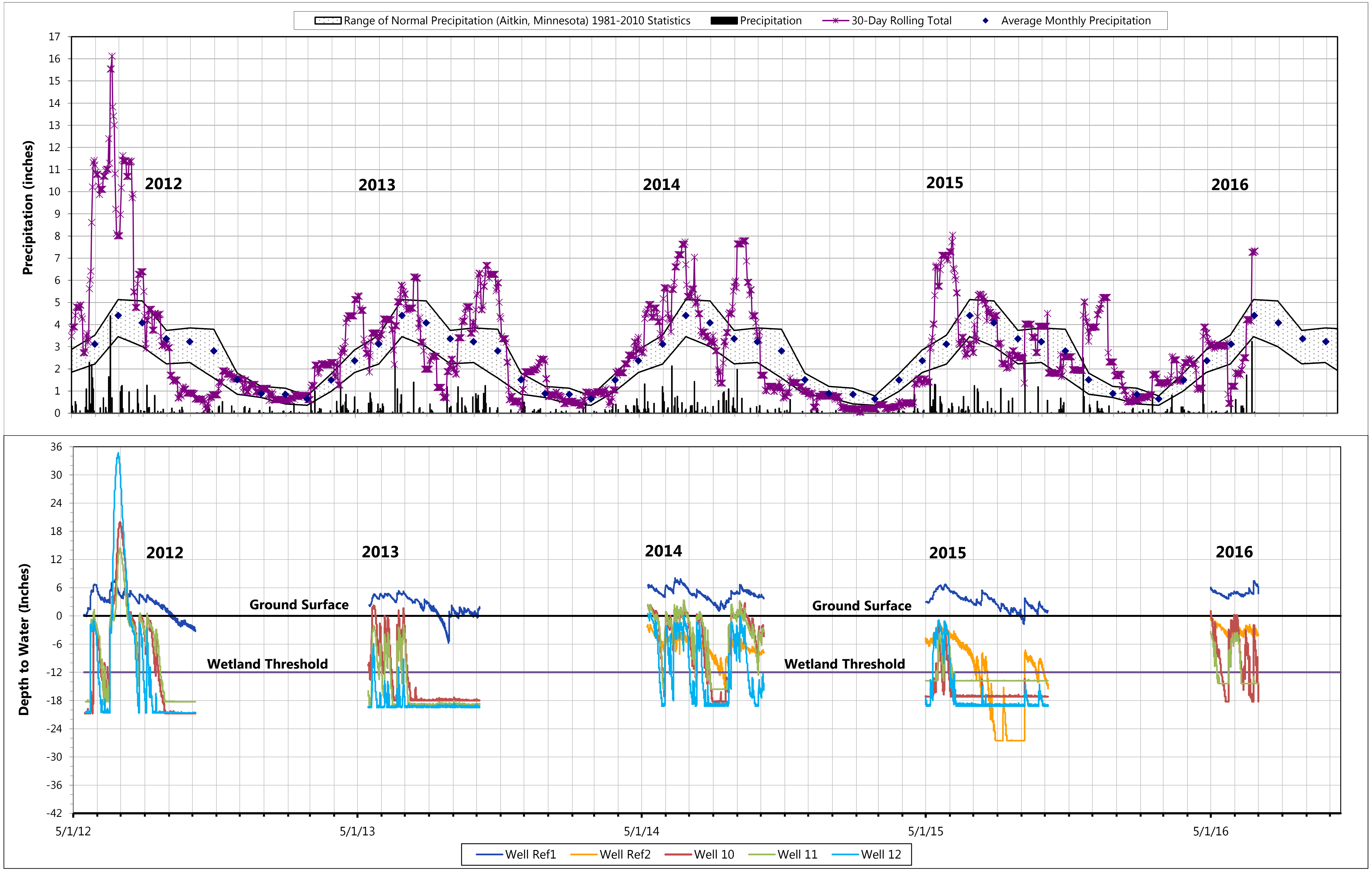
NOTE: In 2016, precipitation and logger data is shown through July 1

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



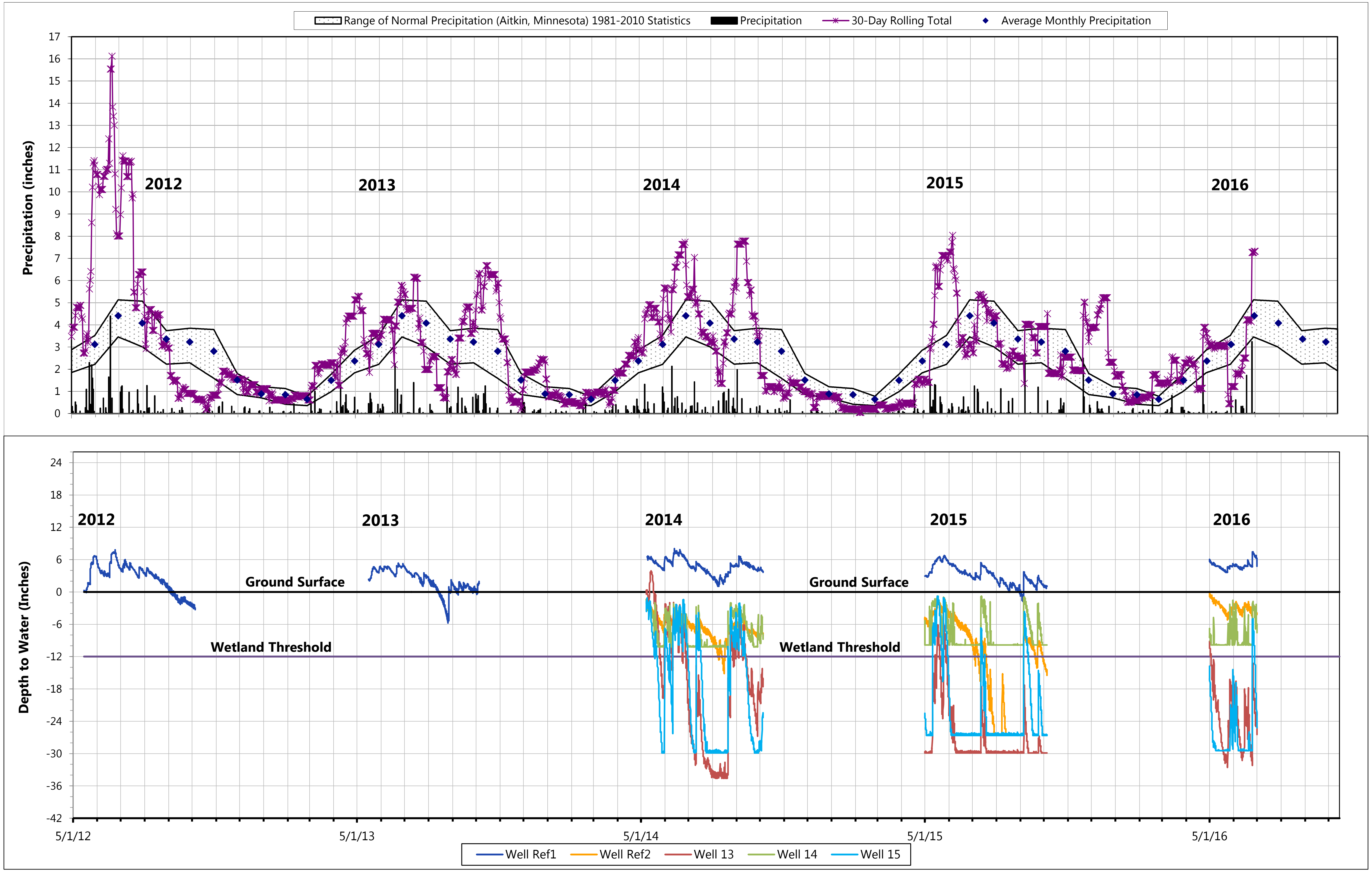
NOTE: In 2016, precipitation and logger data is shown through July 1

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



NOTE: In 2016,
precipitation and logger
data is shown through July 1

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



NOTE: In 2016, precipitation and logger data is shown through July 1

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

P:\Mpls\23 MN\69\2369862\WorkFiles\WO 008 Corps Wetlands Permit\WetlandMitigation\Aitkin Sod Farm\Hydrology Data\Hydrographs\Aitkin 2012-16 Cumulative Hydrographs.xlsx

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").

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 re-recorded. 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 me this day of , by (name(s) with marital status).

____
Notary Public

Notarial Stamp or Seal

SIGNATURE OF BANK APPLICANT (S),
IF DIFFERENT FROM FEE OWNER: ____

____

STATE OF MINNESOTA)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this day of , by (name(s) with marital status).

____
Notary Public

Notarial Stamp or Seal

ACCEPTANCE

The State accepts the foregoing Easement.

MINNESOTA BOARD OF WATER AND SOIL RESOURCES:

By: ____

Its: ____

STATE OF MINNESOTA)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this day of , by (name of person) as (title) of the Board of Water and Soil Resources.

____
Notary Public

Notarial Stamp or Seal

This instrument was drafted by the Board of Water and Soil Resources
One West Water Street, St. Paul, MN 55107

If there are additional holders of interest the subject real property CHECK HERE ☐ and attach their Consent and Subordination agreement [BWSR Form Number: wca-bank-03 (consent).doc].

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.

Community / Credit Type	Within Project Watershed			Outside Project Watershed[(1)]						Total Wetland Mitigation[(1)] (acres)	Credit Percent	Total Wetland Mitigation Credits[(1)]
	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			
Off-Site Restoration of drained 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 (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 Restoration that will not receive 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 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.

Wetland or Credit Type	Mitigation Credits Available				NorthMet Project Proposed Direct Wetland Impacts in Acres[1,2]			Total Credits Required for Mitigation at Base Ratio	No More Than 2 Apply			Total Applied Mitigation Credits [6], [7]	Applied Mitigation Ratio [8]
	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		Incentive for in-kind -0.25:1	Incentive for credits in-place -0.25:1	Incentive for credits in-advance [5] -0.25:1		
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**	1.63
									(275.92)				
Total Surplus Wetland Mitigation Credits for Project (Total Credit minus Total Applied Mitigation Credit)				**47.33**									

(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.

Wetland or Credit Type	Mitigation Credits				NorthMet Project Proposed Direct Wetland Impacts (acres)(1,2)	Credits Applied for 1:1 Replacement	Additional Mitigation Required (3) +0.5:1	Total Mitigation Credits Applied	Total Mitigation Ratio
	Zim Sod	Aitkin	Hinckley	Total					
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**	1.25:1 (5)
Total Surplus Wetland Mitigation Credits for Project (Total credits minus 1:1 credits minus additional mitigation required)						**403.33**			
Total Wetland Mitigation Credits 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

US Army Corps
of Engineers®
St. Paul District

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 to10 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

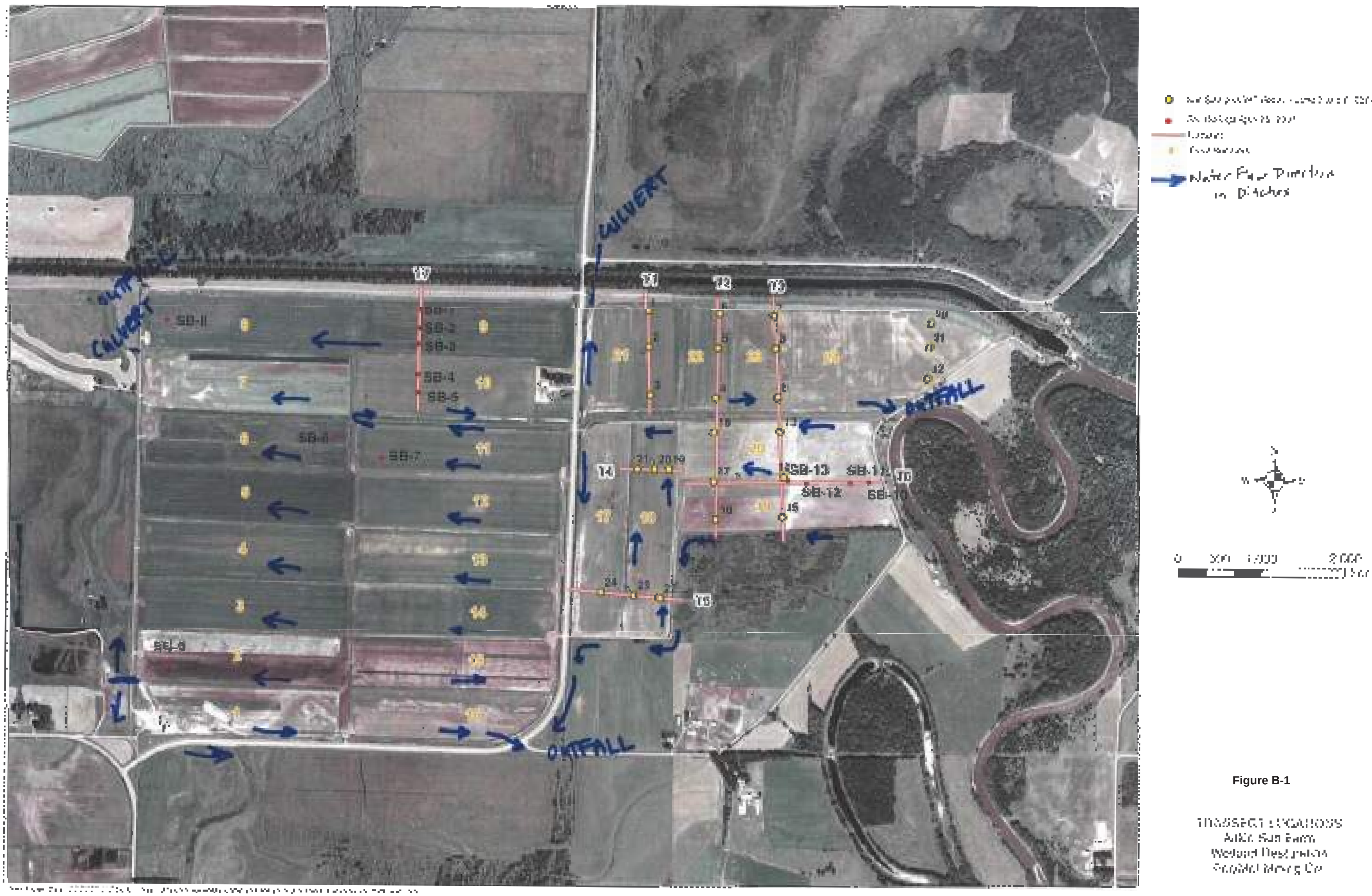


Figure B-1

TRANSECT LOCATIONS

Figure B-2

Legend for Soil Stratigraphy and Water Table Diagrams

Organic Soil

Sod/Oe = grass sod layer that is usually about 4 inches thick with peat soil

Oe = peat soil (Organic, Hemic)

Oa = mucky soil (Organic, Sapric)

Mineral Soil (ordered from coarse to fine textured)

s = sand

fs = fine sand

lfs = loamy fine sand

sl = sandy loam

fsl = fine sandy loam

l = loam

scl = sandy clay loam

fscl = fine sandy clay loam

cl = clay loam

si = silt

sicl = silty clay loam

sic = silty clay

sc = sandy clay

c = clay

Measured / observed water Table

Assumed Water Table - below the bore hole depth

Figure B-3

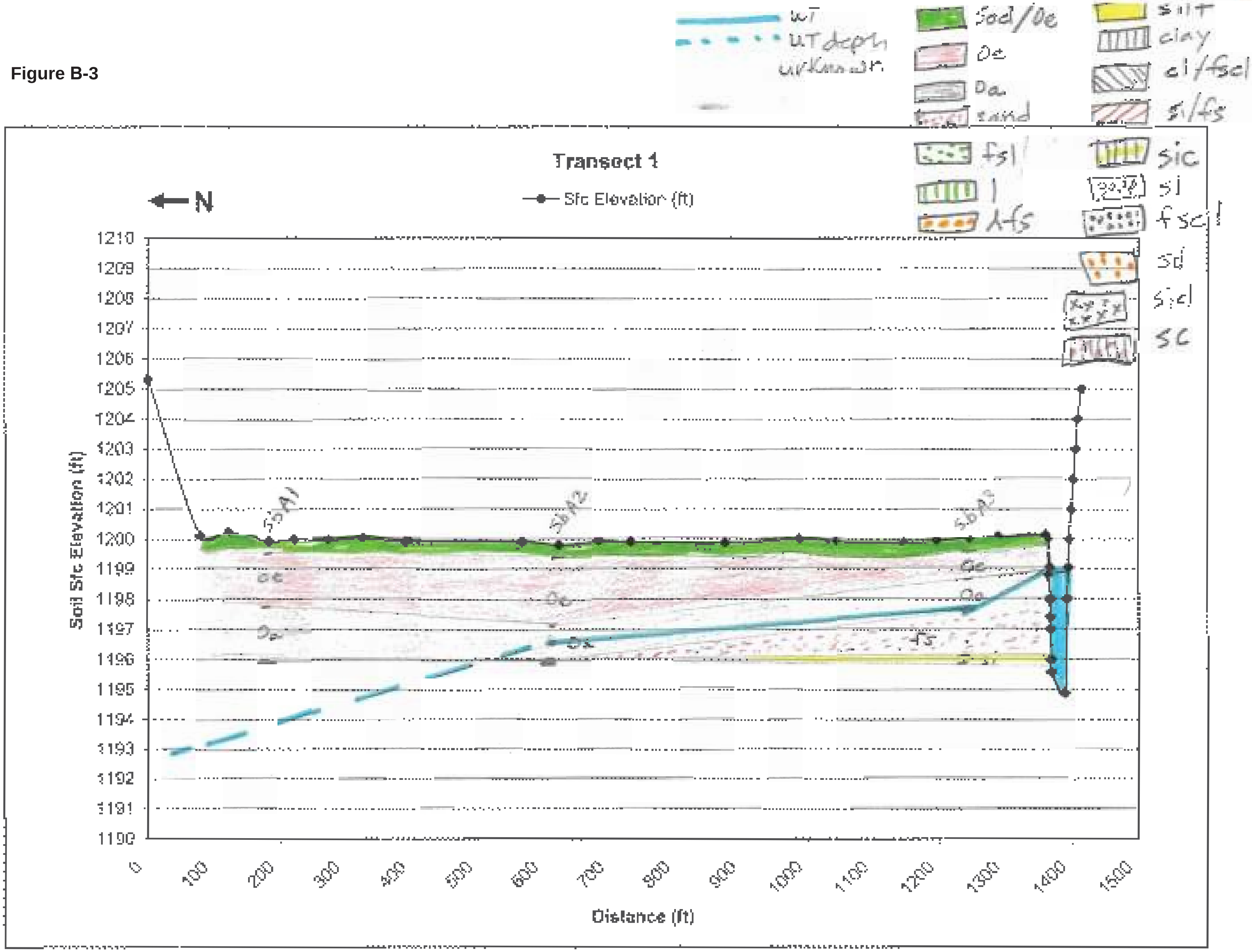

Transect 1
N
Sfc Elevation (ft)
Soil Sfc Elevation (ft)
Distance (ft)
WT
WT depth unknown
sod/Oe
Oe
Oa
sand
fsl
l
lfs
silt
clay
cl/fscl
sl/fs
sic
si
fscl
sd
sicl
sc
SbA1
SbA2
SbA3

Figure B-4

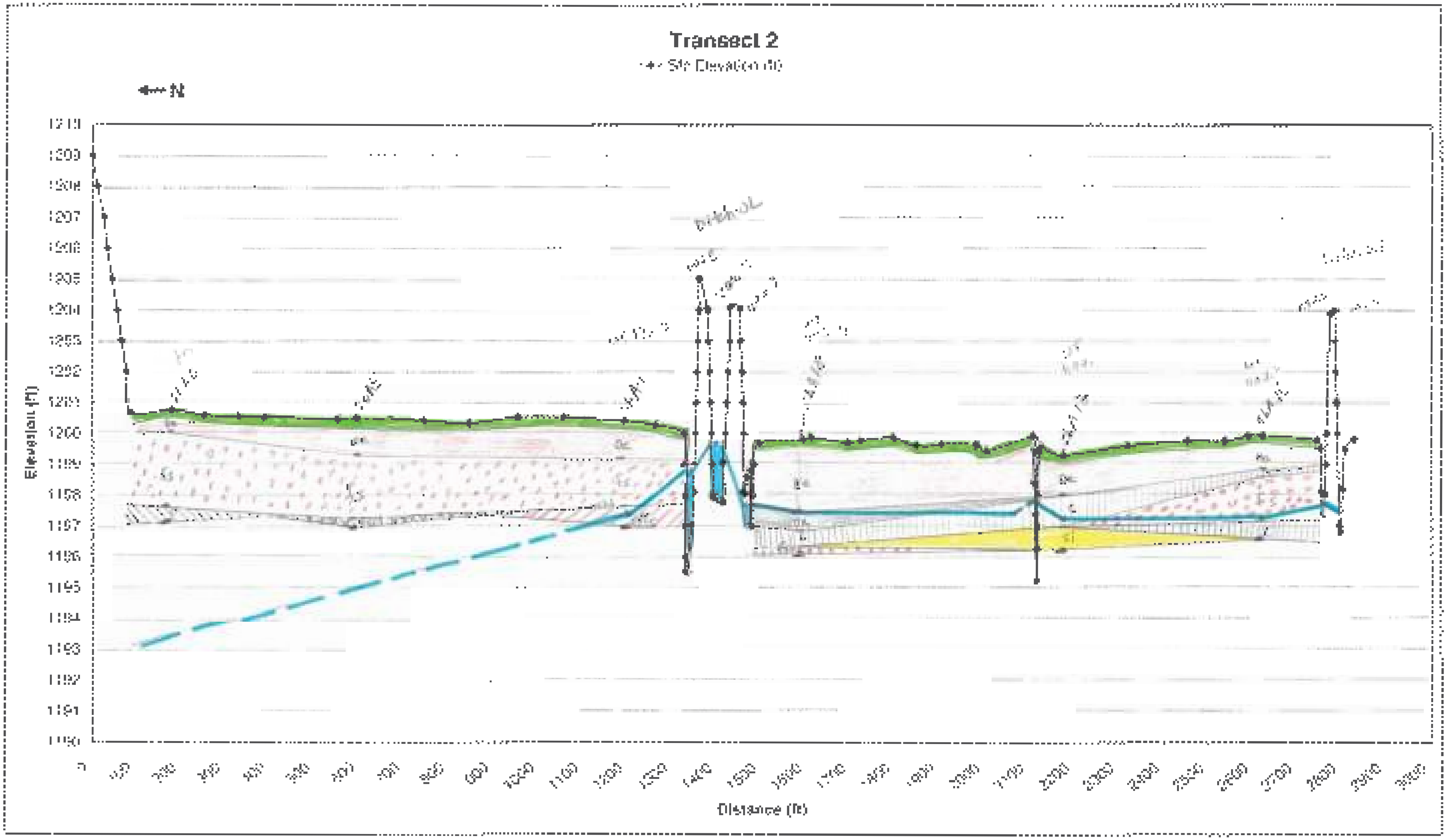
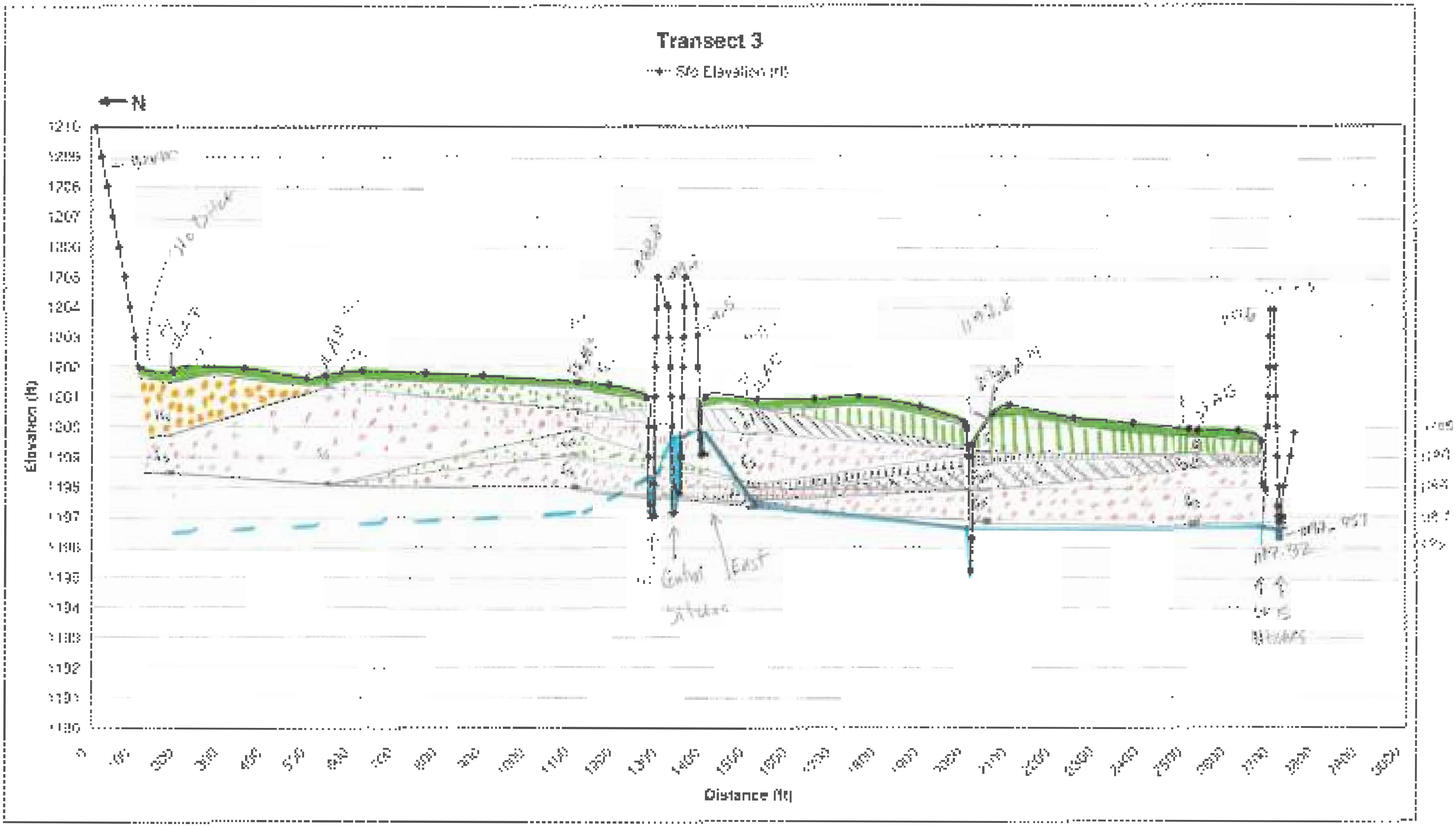


Figure B-5



Transect 3
Site Elevation (ft)
N
Elevation (ft)
Distance (ft)
Center
East

Figure B-6

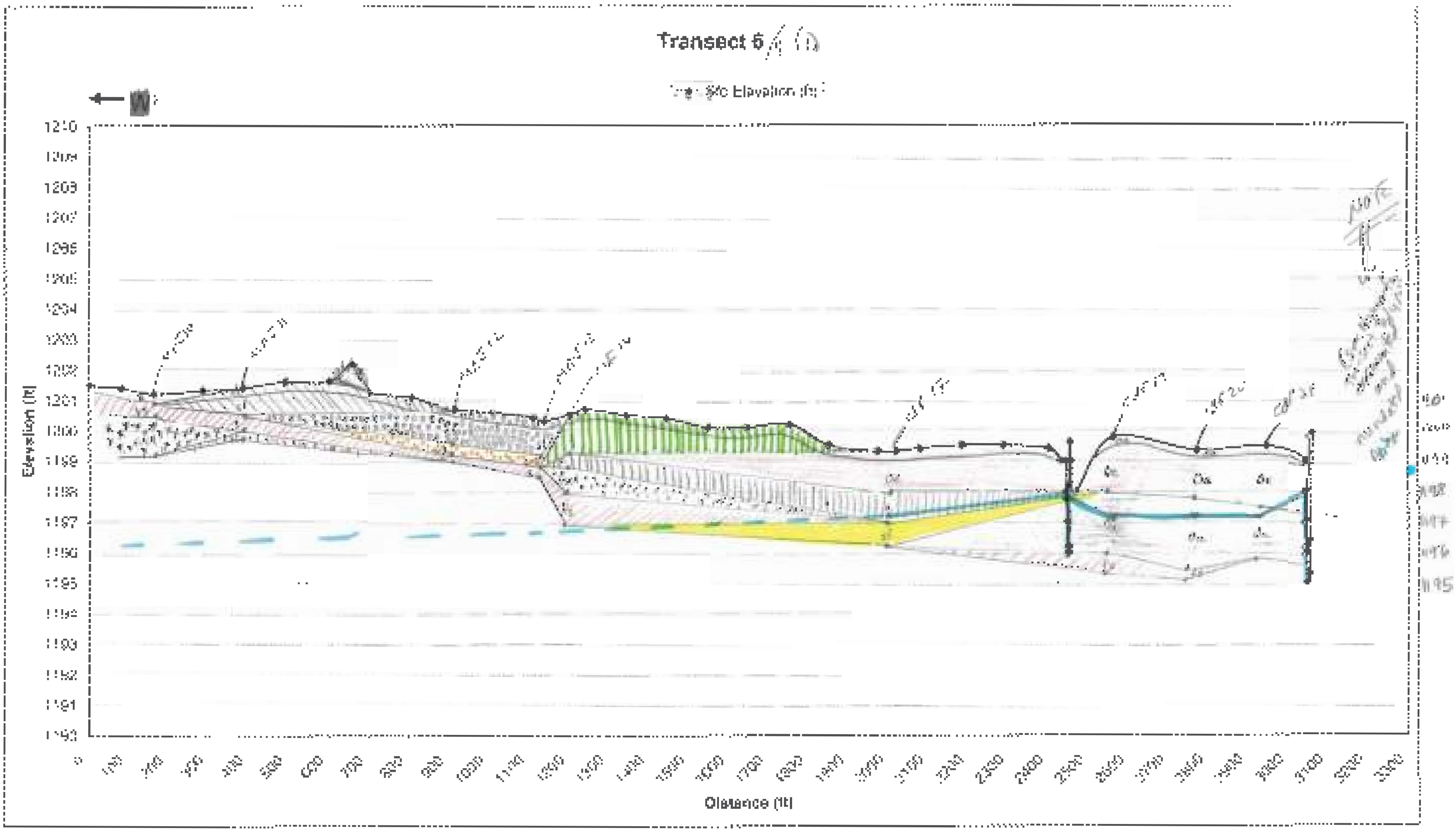
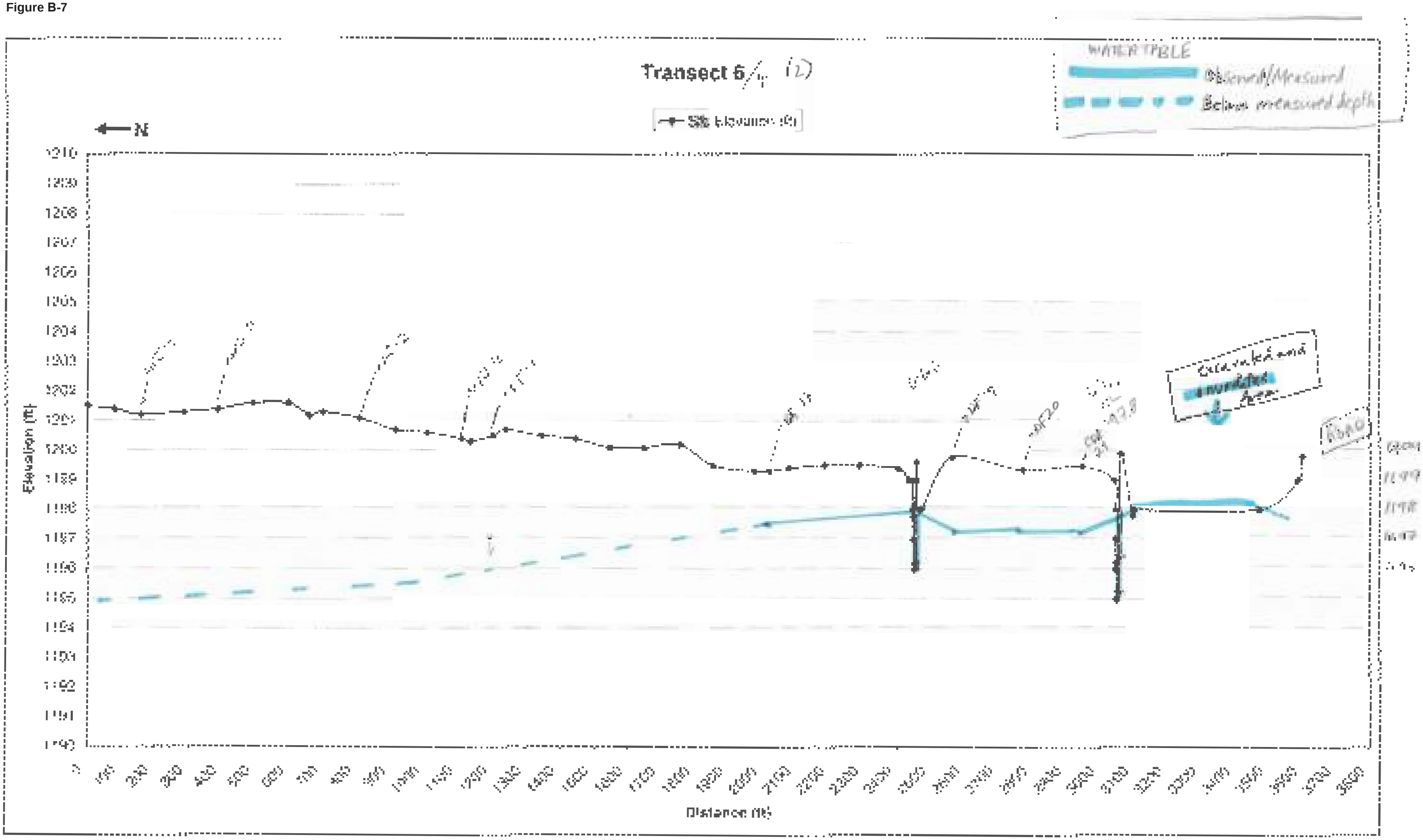


Figure B-7



Transect 6
WATER TABLE
Observed/Measured
Below measured depth
N
Silt Elevation (ft)
Elevation (ft)
Distance (ft)

Figure B-8

West Side

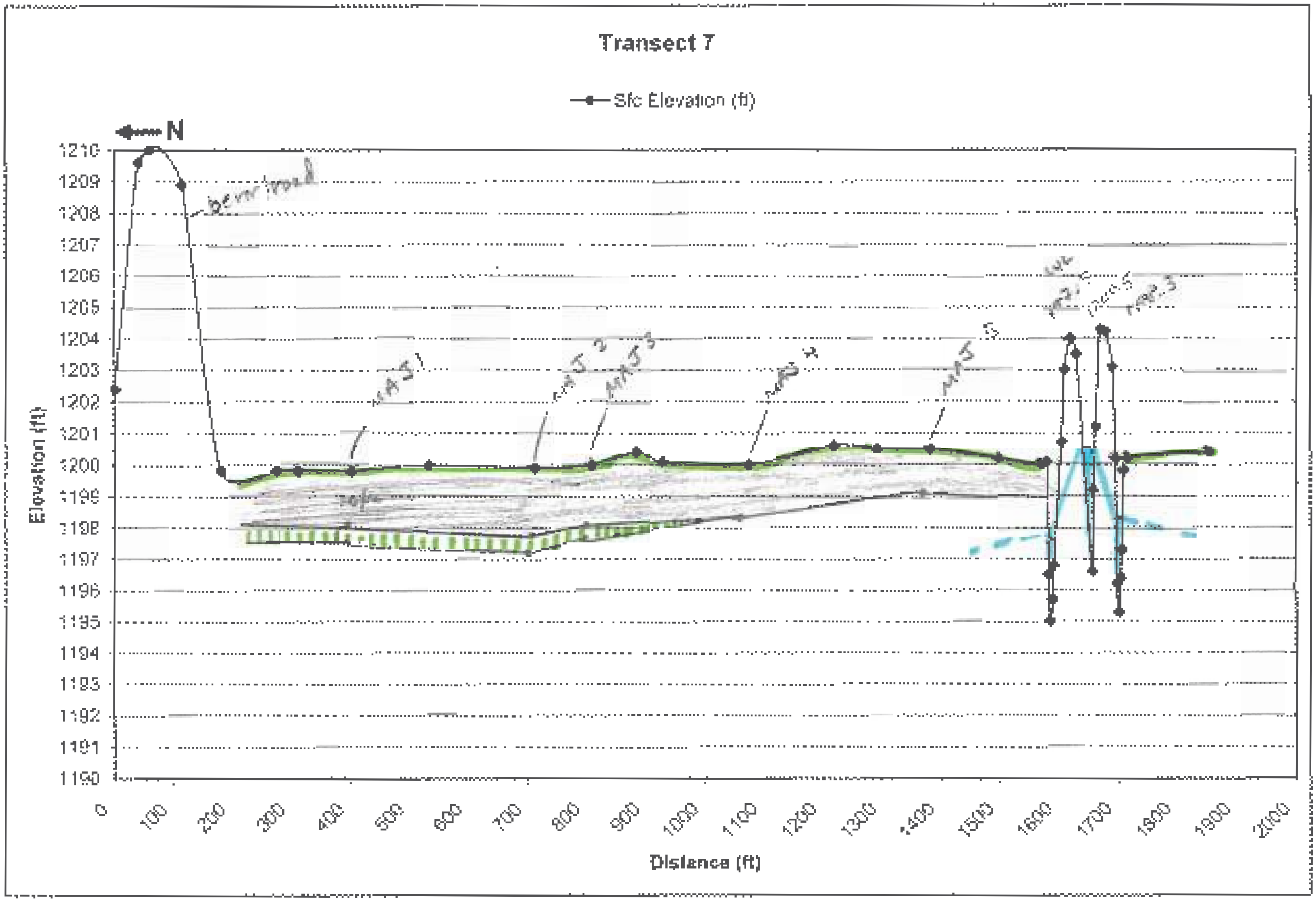
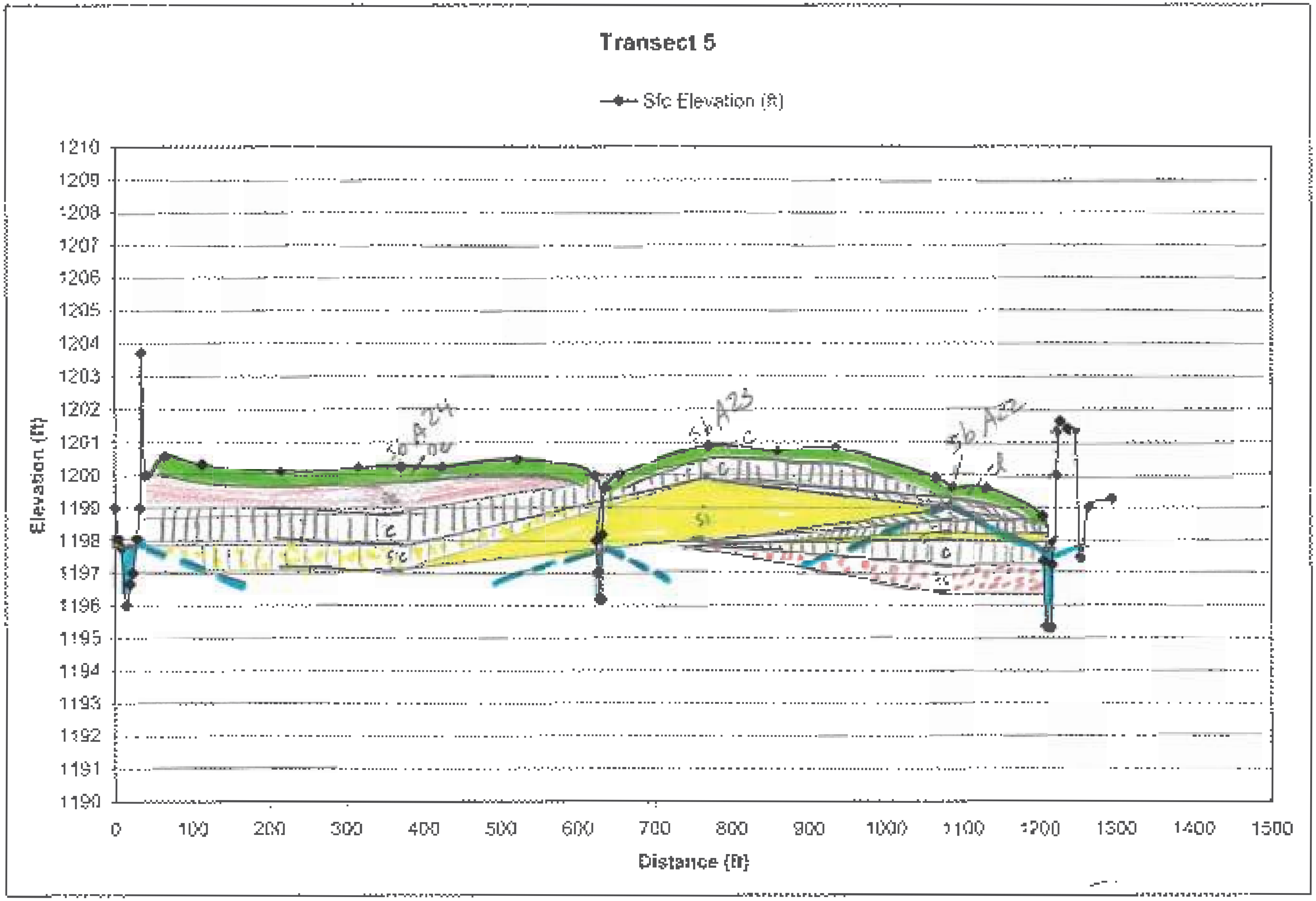


Figure B-9



Transect 5
Sfc Elevation (ft)
Elevation (ft)
Distance (ft)
1210
1209
1208
1207
1206
1205
1204
1203
1202
1201
1200
1199
1198
1197
1196
1195
1194
1193
1192
1191
1190
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
Sb A24
Sb A23
Sb A22
c
Sfc
Si

Appendix E

Wetland Data Forms

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 10/23/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: W1

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159900 N | Longitude: 447600 E | Datum: UTM, NAD 83, meters

Cowardin Classification: PEMC | Circular 39 Classification: Type 2 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Fresh (Wet) Meadow
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology No significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 10.

If yes, optional Wetland Site ID: Wetland 1

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Eleocharis acicularis	90	Yes	OBL
2. Alisma subcordatum	25	No	OBL
3. Hypericum majus	20	No	FACW
4. Polygonum lapathifolium	20	No	FACW
5. Carex aquatilis	5	No	OBL
6. Typha angustifolia	5	No	OBL
7. Epilobium ciliatum	5	No	FACW
8.	0		
Total Cover:	170		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	34	85
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	125	X 1	125
FACW Species	45	X 2	90
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	170	(A)	215 (B)

Prevalence Index = B/A = 1.26

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 8	10YR 2/1	100					mucky peat	no redox
2.	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	C	PL	silty clay	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [x] High Water Table (A2)
- [x] Saturation (A3)
- [x] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [x] Inundation Visible on Aerial Imagery (B7)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Water-Stained Leaves (B9)
- [x] 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)
- [ ] 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 (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[x]	Water Table Depth (inches):	11
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Frogs

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/18/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 2U

Land Form: Shoulder | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5158999 N | Longitude: 447542 E | Datum: UTM, NAD 83, meters

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Are vegetation No Soil No Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	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

If yes, optional Wetland Site ID: (Wetland 2)

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		
Herb Stratum (Plot Size: 5 ft)			
1. Phalaris arundinacea	85	Yes	FACW
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	85		
Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	17	42.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	85	X 2	170
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	85	(A)	170 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

2/10/2016 2:03:14 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 2U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 16	10YR 2/1	100					mucky peat	no redox
2.	16 - 27	2.5Y 4/2	70	10YR 3/2	20			silty clay loam	
3.	-			10YR 3/6	10				
4.	27 - 42	2.5Y 4/2	70	5GY 5/1	20			silt loam	
5.	-			10YR 4/6	10				
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)

- [x] Histosol (A1)
- [x] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [x] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- [x] 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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: none Depth (inches): -

Hydric soil present? Yes

Soil Remarks: The soil at the site is problematic because it has been drained.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [x] FAC-Neutral Test (D5)

Field Observations:

- **Surface water present?** [ ] **Surface Water Depth (inches):**
- **Water table present?** [ ] **Water Table Depth (inches):**
- **Saturation present? (includes capillary fringe)** [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 10/23/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 2W

Land Form: Depression | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159459 N | Longitude: 447467 E | Datum: UTM, NAD 83, meters

Cowardin Classification: PEM1d | Circular 39 Classification: Type 3 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: Wetland 2

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.

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Juncus canadensis	25	Yes	OBL
2.	Phalaris arundinacea	20	Yes	FACW
3.	Typha angustifolia	10	No	OBL
4.	Calamagrostis canadensis	10	No	OBL
5.	Alisma subcordatum	5	No	OBL
6.	Schoenoplectus tabernaemontani	5	No	OBL
7.		0		
8.		0		
	Total Cover:	75		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	15	37.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	55	X 1	55
FACW Species	20	X 2	40
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	75	(A)	95 (B)

Prevalence Index = B/A = 1.27

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 12	10YR 2/1	100					muck	no redox
2.	12 - 24	10YR 2/1	100					muck	no redox
3.	24 - 30	10YR 2/1	100					muck	no redox
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: No redox observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	1
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

2/10/2016 2:03:14 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/18/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 3U-1

Land Form: Shoulder | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5158393 N | Longitude: 446934 E | Datum: UTM, NAD 83, meters

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Wetter than normal.
Well 9 field, south ditch.
GPS Point I.D. 424

If yes, optional Wetland Site ID: (Wetland 3)

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Amaranthus retroflexus	5	No	FACU
2. Urtica dioica	55	Yes	FAC
3. Lactuca canadensis	5	No	FACU
4. Chenopodium album	5	No	FACU
5. Ambrosia trifida	10	No	FAC
6.	0		
7.	0		
8.	0		
Total Cover:	80		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 20 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	16	40
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	65	X 3	195
FACU Species	15	X 4	60
UPL Species	0	X 5	0
Column Totals:	80	(A)	255 (B)

Prevalence Index = B/A = 3.19

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3U-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	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	100					mucky peat	
5.	23 - 28	2.5Y 5/1	75	2.5Y 3/6,2.5Y 2.5/1	25			mucky sandy loam	
6.	28 - 33	2.5Y 4/1	85	7.5YR 4/6	15			sandy loam	

[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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: none Depth (inches): -

Hydric soil present? Yes

Soil Remarks: The soil at the site is problematic because it has been drained and has managed upland vegetation on it.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

2/10/2016 2:03:14 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/18/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 3U-2

Land Form: Ditch bank | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159040 N | Longitude: 447315 E | Datum: UTM, NAD 83, meters

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Wetter than normal.
Well 5 field, south ditch.
GPS Point I.D. 426

If yes, optional Wetland Site ID: (Wetland 3)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.	Phalaris arundinacea	90	Yes	FACW
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	90		

Woody Vine Stratum (Plot Size: 30 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	90	X 2	180
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	90	(A)	180 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3U-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 13	10YR 2/1	100					mucky very fine sandy loam	dry, ditch spoils, no redox
2.	13 - 38	10YR 2/1	100					mucky peat	
3.	-								
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)

- [ ] Histosol (A1)
- [x] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [x] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: none Depth (inches): -

Hydric soil present? Yes

Soil Remarks: The soil at the site is problematic because it has been disturbed from the addition of removal of sediment from ditch cleaning.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [x] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [ ] Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site Applicant/Owner: PolyMet City/County: Aitkin State: MN Sampling Date: 09/19/14

Investigator(s): KMS2 Section: 6 Township: 47N Range: 26W Sampling Point: 3U-3

Land Form: Terrace Local Relief: None Slope %: 0 Soil Map Unit Name: Cathro muck

Subregion (LRR): K Latitude: 5159388 N Longitude: 446130 E Datum: UTM, NAD 83, meters

Cowardin Classification: Upland Circular 39 Classification: Upland Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks) Eggers & Reed (primary): Upland

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed? Are "normal circumstances" present? Yes Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic? Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No	General Remarks (explain any answers if needed):	Wetter than normal. Well 1 field GPS Point I.D. 431
Hydric soil present?	Yes		
Indicators of wetland hydrology present?	No		
Is the sampled area within a wetland?	No	If yes, optional Wetland Site ID:	(Wetland 3)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Calystegia sepium	40	Yes	FAC
2.	Cirsium arvense	30	Yes	FACU
3.	Urtica dioica	20	Yes	FAC
4.	Rumex crispus	5	No	FAC
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	66.67%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	65	X 3	195
FACU Species	30	X 4	120
UPL Species	0	X 5	0
Column Totals:	95	(A)	315 (B)

Prevalence Index = B/A = 3.32

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3U-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 13	10YR 2/1	100					mucky silt loam	no redox
2.	13 - 23	2.5Y 5/3	50	2.5Y 5/2	30			silty clay loam	
3.	-			7.5YR 4/6	20				
4.	23 - 31	2.5Y 5/3	60	2.5Y 5/2	30			very fine sandy loam	
5.	-			10YR 4/6	10				
6.	31 - 37	10YR 4/2	85	10YR 4/6,4/1	15			fine sandy loam	

[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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☐	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	31

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks: Saturation is too deep to make hydrology indicator.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/18/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 3W-1

Land Form: Ditch | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5158391 N | Longitude: 446940 E | Datum: UTM, NAD 83, meters

Cowardin Classification: PEM1d | Circular 39 Classification: Type 3 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Shallow Marsh

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are "normal circumstances" present? Yes

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic?

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed):
Wetter than normal.
Well 9 field, south ditch.
GPS Point I.D. 423

If yes, optional Wetland Site ID: Wetland 3

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Spirodela polyrhiza	90	Yes	OBL
2.	Sium suave	20	No	OBL
3.	Sagittaria latifolia	20	No	OBL
4.	Alisma subcordatum	15	No	OBL
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	145		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	29	72.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	145	X 1	145	
FACW Species	0	X 2	0	
FAC Species	0	X 3	0	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	145	(A)	145	(B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3W-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/1						mucky sandy loam	
2.	6 - 21	2.5Y 4/2	55	7.5YR 4/6	40			very fine sandy loam	
3.	-			10GY 4/1	5				
4.	21 - 34	2.5Y 3/1	75	2.5Y 5/2	20			very fine sandy loam	
5.	-			10YR 4/6	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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: none Depth (inches): -

Hydric soil present? Yes

Soil Remarks: The soil at the site is problematic because it has been drained and has managed upland vegetation on it.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☐	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	6

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

2/10/2016 2:03:15 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/18/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 3W-2

Land Form: Depression | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159041 N | Longitude: 447322 E | Datum: UTM, NAD 83, meters

Cowardin Classification: PEM | Circular 39 Classification: Type 3 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed):
Wetter than normal.
Well 5 field, south ditch.
GPS Point I.D. 425

If yes, optional Wetland Site ID: Wetland 3

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Typha latifolia	20	Yes	OBL
2.	Rumex crispus	5	No	FAC
3.	Phalaris arundinacea	70	Yes	FACW
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | **% Sphagnum Moss Cover:**

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	20	X 1	20
FACW Species	70	X 2	140
FAC Species	5	X 3	15
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	95 (A)		175 (B)

Prevalence Index = B/A = 1.84

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3W-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 7	10YR 2/1	100					mucky peat	no redox
2.	7 - 24	5Y 4/1	95	10YR 4/6	5			very fine sandy loam	
3.	24 - 32	5Y 4/1	98	10YR 4/6	2			very fine sandy loam	
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)

- ☐ Histosol (A1)
- ☑ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☑ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: none Depth (inches): -

Hydric soil present? Yes

Soil Remarks: The soil at the site is problematic because it has been drained.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	3
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Aitkin Site	Applicant/Owner:	PolyMet	City/County:	Aitkin	State:	MN	Sampling Date:	09/19/14
Investigator(s):	KMS2	Section:	6	Township:	47N	Range:	26W	Sampling Point:	3W-3
Land Form:	Depression	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	Cathro muck		
Subregion (LRR):	K	Latitude:	5159385 N	Longitude:	446131 E	Datum:	UTM, NAD 83, meters		
Cowardin Classification:	PEM	Circular 39 Classification:	Type 3	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Shallow Marsh

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed):
Wetter than normal.
Well 3 field, south ditch
GPS Point I.D. 432

If yes, optional Wetland Site ID: Wetland 3

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		
Herb Stratum (Plot Size: 5 ft)			
1. Phalaris arundinacea	10	Yes	FACW
2. Lemna minor	10	Yes	OBL
3. Typha latifolia	5	Yes	OBL
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	25		
Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	5	12.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	15	X 1	15
FACW Species	10	X 2	20
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	25 (A)		35 (B)

Prevalence Index = B/A = 1.40

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 3W-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 7	10YR 2/1	100					mucky silt loam	no redox
2.	7 - 14	10YR 4/6	70	10Y 4/2	20			fine sandy loam	
3.	-			5GY 5/1	10				
4.	14 - 24	5GY 4/1	60	10GY 4/1	20			strata silt loam and loamy	
5.	-			N2.5/black	20				
6.	24 - 34	2.5Y 3/1	98	2.5Y 4/1	2			mucky silt loam	

[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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	3
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/18/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 4U-1

Land Form: Shoulder | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159595 N | Longitude: 448018 E | Datum: UTM, NAD 83, meters

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Upland

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Wetter than normal.
Well 11 field, south ditch
GPS Point I.D. 429

If yes, optional Wetland Site ID: (Wetland 4)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Phalaris arundinacea	70	Yes	FACW
2.	Agrostis gigantea	10	No	FACW
3.	Hordeum jubatum	5	No	FAC
4.	Asclepias syriaca	5	No	UPL
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	90		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	18	45
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	0	X 1	0	
FACW Species	80	X 2	160	
FAC Species	5	X 3	15	
FACU Species	0	X 4	0	
UPL Species	5	X 5	25	
Column Totals:	90	(A)	200	(B)

Prevalence Index = B/A = 2.22

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 4U-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 14	10YR 2/1	100					mucky silt loam	no redox
2.	14 - 22	10YR 2/1	100					loam	
3.	22 - 27	10YR 5/3	96	10YR 5/6	2			loamy sand	
4.	-			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=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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: none Depth (inches): -

Hydric soil present? Yes

Soil Remarks: The soil at the site is problematic because it has been drained.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ Surface Water Depth (inches):

Water table present? ☐ Water Table Depth (inches):

Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/19/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 4U-2

Land Form: Shoulder | Local Relief: Convex | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159695 N | Longitude: 447393 E | Datum: UTM, NAD 83, meters

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Wetter than normal.
Well 10 field, west ditch
GPS Point I.D. 433

If yes, optional Wetland Site ID: (Wetland 4)

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Phalaris arundinacea	95	Yes	FACW
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	95	X 2	190
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	95	(A)	190 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 4U-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features 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.	42 - 48	2.5Y 4/1	70	2.5Y 5/2	15			fine sandy loam	
5.	-			10YR 4.6	15				
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- Surface water present? ☐ Surface Water Depth (inches):
- Water table present? ☐ Water Table Depth (inches):
- Saturation present? (includes capillary fringe) ☐ Saturation Depth (inches):

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Aitkin Site	Applicant/Owner:	PolyMet	City/County:	Aitkin	State:	MN	Sampling Date:	09/18/14
Investigator(s):	KMS2	Section:	6	Township:	47N	Range:	26W	Sampling Point:	4W-1
Land Form:	Depression	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	Cathro muck		
Subregion (LRR):	K	Latitude:	5159590 N	Longitude:	448018 E	Datum:	UTM, NAD 83, meters		
Cowardin Classification:	PEM	Circular 39 Classification:	Type 3	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Shallow Marsh

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed):
Wetter than normal.
Well 11 field, south ditch
GPS Point I.D. 430

If yes, optional Wetland Site ID: Wetland 4

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Typha latifolia	70	Yes	OBL
2.	Lemna minor	20	Yes	OBL
3.	Carex comosa	5	No	OBL
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum:

% Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	95	X 1	95
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	95 (A)		95 (B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 4W-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 4	2.5Y 2.5/1	100					mucky loamy very fine sand	
2.	4 - 18	5Y 5/1	50	5GY 4/2	30			loamy very fine sand	
3.	-			10YR 4/6	20				
4.	18 - 32	10Y 4/1	95	10YR 4/6	5			loamy very fine sand	
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☑ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☐ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☑ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ______ Depth (inches): ______

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☑	Surface Water Depth (inches):	2
Water table present?	☑	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks: Frogs

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/19/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 4W-2

Land Form: Toeslope | Local Relief: Concave | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159695 N | Longitude: 447389 E | Datum: UTM, NAD 83, meters

Cowardin Classification: PEM | Circular 39 Classification: Type 3 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

Eggers & Reed (primary): Shallow Marsh

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

General Remarks (explain any answers if needed):
Wetter than normal.
Well 10 field, west ditch
GPS Point I.D. 434

If yes, optional Wetland Site ID: Wetland 4

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Typha angustifolia	30	Yes	OBL
2. Typha latifolia	30	Yes	OBL
3. Lemna minor	75	Yes	OBL
4. Sium suave	5	No	OBL
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	140		

Woody Vine Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	28	70
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	140	X 1	140	
FACW Species	0	X 2	0	
FAC Species	0	X 3	0	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	140	(A)	140	(B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 4W-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	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.	-								
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)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

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)
- ☑ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: ____ Depth (inches): ____

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☐	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 09/18/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 4W-3

Land Form: Depression | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5158999 N | Longitude: 447543 E | Datum: UTM, NAD 83, meters

Cowardin Classification: Type 3 | Circular 39 Classification: PEM | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?
Are "normal circumstances" present? Yes
Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	Yes

If yes, optional Wetland Site ID: Wetland 4

General Remarks (explain any answers if needed):
Wetter than normal.
Well 14 field, east edge
GPS Point I.D. 427

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Lemna minor	90	Yes	OBL
2.	Phalaris arundinacea	50	Yes	FACW
3.	Typha latifolia	40	Yes	OBL
4.	Alisma subcordatum	5	No	OBL
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	185		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	37	92.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	135	X 1	135
FACW Species	50	X 2	100
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	185	(A)	235 (B)

Prevalence Index = B/A = 1.27

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 4W-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 8	10YR 2/1	100					silt loam	
2.	8 - 16	2.5Y 4/2	55	10GY 5/1	40			sandy loam	
3.	-			10YR 4/6	5				
4.	16 - 32	2.5Y 4/2	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 Coated Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ 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)
- ☑ Loamy Mucky Mineral (F1) (LRR K, L)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

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)
- ☐ Dark Surface (S7) (LRR K, L)
- ☐ Polyvalue Below Surface (S8) (LRR K, L)
- ☐ Thin Dark Surface (S9) (LRR K, L)
- ☐ Iron-Manganese Masses (F12) (LRR K, L, R)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ☐ Red Parent Material (F21)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

Restrictive Layer (if present): Type: none Depth (inches): -

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ 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)

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)
- ☐ FAC-Neutral Test (D5)

Field Observations:

- **Surface water present?** ☐ **Surface Water Depth (inches):**
- **Water table present?** ☐ **Water Table Depth (inches):**
- **Saturation present? (includes capillary fringe)** ☑ **Saturation Depth (inches):** 8

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

2/10/2016 2:03:16 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 10/23/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 5U

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159891 N | Longitude: 447559 E | Datum: UTM, NAD 83, meters

Cowardin Classification: PEM2Eh | Circular 39 Classification: Type 3 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Eggers & Reed (primary): Sedge Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Well 10 Field Wetland

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Eleocharis acicularis	90	Yes	OBL
2.	Alisma subcordatum	25	No	OBL
3.	Hypericum majus	20	No	FACW
4.	Polygonum lapathifolium	20	No	FACW
5.	Carex aquatilis	5	No	OBL
6.	Typha angustifolia	5	No	OBL
7.	Epilobium ciliatum	5	No	FACW
8.		0		
	Total Cover:	170		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	34	85
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	125	X 1	125
FACW Species	45	X 2	90
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	170	(A)	215 (B)

Prevalence Index = B/A = 1.26

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 5U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 8	10YR 2/1	100					mucky peat	no redox
2.	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	C	PL	silty clay	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [x] High Water Table (A2)
- [x] Saturation (A3)
- [x] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [x] Inundation Visible on Aerial Imagery (B7)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Water-Stained Leaves (B9)
- [x] 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)
- [ ] 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 (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[x]	Water Table Depth (inches):	11
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Frogs

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 10/23/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: W5

Land Form: Depression | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5158999 N | Longitude: 447537 E | Datum: UTM, NAD 83, meters

Cowardin Classification: PEM1d | Circular 39 Classification: Type 2 | Mapped NWI Classification:

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 14.

If yes, optional Wetland Site ID: Wetland 5

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Juncus canadensis	25	Yes	OBL
2.	Phalaris arundinacea	20	Yes	FACW
3.	Typha angustifolia	10	No	OBL
4.	Calamagrostis canadensis	10	No	OBL
5.	Alisma subcordatum	5	No	OBL
6.	Schoenoplectus tabernaemontani	5	No	OBL
7.		0		
8.		0		
	Total Cover:	75		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ______ % Sphagnum Moss Cover: ______

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	15	37.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That Are OBL, FACW or FAC: **100.00%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	55	X 1	55
FACW Species	20	X 2	40
FAC Species	0	X 3	0
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	75	(A)	95 (B)

Prevalence Index = B/A = **1.27**

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W5

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 30	10YR 2/1	100					muck	no redox
2.	-								
3.	-								
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks: No redox observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[x]	Surface Water Depth (inches):	1
Water table present?	[x]	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 10/23/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 6U

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159981 N | Longitude: 447546 E | Datum: UTM, NAD 83, meters

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, explain in remarks)

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	No
Hydric soil present?	No
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Paired with the Well 10 wetland, and this upland plot is also paired with Well 11 wetland.

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Elymus repens	80	Yes	FACU
2.	Bromus arvensis	10	No	FACU
3.	Taraxacum officinale	5	No	FACU
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	95		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ **% Sphagnum Moss Cover:** ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	19	47.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	0.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	0	X 2	0
FAC Species	0	X 3	0
FACU Species	95	X 4	380
UPL Species	0	X 5	0
Column Totals:	95	(A)	380 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
No	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 6U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 8	10YR 2/1	100					sandy loam	no redox
2.	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=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)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present? [ ] **Surface Water Depth (inches):**

Water table present? [ ] **Water Table Depth (inches):**

Saturation present? (includes capillary fringe) [ ] **Saturation Depth (inches):**

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Aitkin Site	Applicant/Owner:	PolyMet	City/County:	Aitkin	State:	MN	Sampling Date:	10/23/14
Investigator(s):	KMS2	Section:	6	Township:	47N	Range:	26W	Sampling Point:	W6
Land Form:	Depression	Local Relief:	None	Slope %:	0	Soil Map Unit Name:	Cathro muck		
Subregion (LRR):	K	Latitude:	5159450 N	Longitude:	447898 E	Datum:	UTM, NAD 83, meters		
Cowardin Classification:	PEM1d	Circular 39 Classification:	Type 2	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow

Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 12.

If yes, optional Wetland Site ID: Wetland 6

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Beckmannia syzigachne	25	Yes	OBL
2.	Rumex crispus	15	No	FAC
3.	Artemisia annua	15	No	FACU
4.	Persicaria lapathifolia	25	Yes	FACW
5.	Galium boreale	25	Yes	FAC
6.	Salix petiolaris	10	No	FACW
7.		0		
8.		0		
	Total Cover:	115		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: ____ % Sphagnum Moss Cover: ____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	23	57.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	25	X 1	25
FACW Species	35	X 2	70
FAC Species	40	X 3	120
FACU Species	15	X 4	60
UPL Species	0	X 5	0
Column Totals:	115 (A)		275 (B)

Prevalence Index = B/A = 2.39

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W6

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 14	10YR 2/1	100					loamy peat	
2.	14 - 18	10Y 4/1	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=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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[ ]	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	6

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

8/4/2016 4:30:18 PM

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Aitkin Site | Applicant/Owner: PolyMet | City/County: Aitkin | State: MN | Sampling Date: 10/23/14

Investigator(s): KMS2 | Section: 6 | Township: 47N | Range: 26W | Sampling Point: 7U

Land Form: Terrace | Local Relief: None | Slope %: 0 | Soil Map Unit Name: Cathro muck

Subregion (LRR): K | Latitude: 5159717 N | Longitude: 448046 E | Datum: UTM, NAD 83, meters

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, explain in remarks)

Eggers & Reed (primary): Upland
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation Yes Soil Yes Hydrology Yes significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	No
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed):
Well 11 Field
Well data supports no hydrology for this point.

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Eleocharis acicularis	80	Yes	OBL
2.	Alisma subcordatum	25	Yes	OBL
3.	Persicaria lapathifolia	10	No	FACW
4.	Rumex crispus	5	No	FAC
5.	Carex aquatilis	5	No	OBL
6.		0		
7.		0		
8.		0		
	Total Cover:	125		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	25	62.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	110	X 1	110
FACW Species	10	X 2	20
FAC Species	5	X 3	15
FACU Species	0	X 4	0
UPL Species	0	X 5	0
Column Totals:	125 (A)		145 (B)

Prevalence Index = B/A = 1.16

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: 7U

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 20	10YR 2/1	100					mucky peat	no redox
2.	20 - 30	10YR 2/1	40	10YR 3/4	20			silty clay	
3.	20 - 30			10YR 4/1	40			silty clay	
4.	30 - 36	2.4Y 4/2	50	10YR 4/6	50			sand	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [x] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] Saturation (A3)
- [x] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [x] Inundation Visible on Aerial Imagery (B7)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Water-Stained Leaves (B9)
- [x] 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)
- [ ] 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 (D5)

Field Observations:

	Present		
Surface water present?	[ ]	Surface Water Depth (inches):	
Water table present?	[x]	Water Table Depth (inches):	10
Saturation present? (includes capillary fringe)	[x]	Saturation Depth (inches):	0

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks: Frogs. Wetland hydrology monitoring does not support evidence of hydrology in this wetland. Revised to an upland.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site:	Aitkin Site	Applicant/Owner:	PolyMet	City/County:	Aitkin	State:	MN	Sampling Date:	10/23/14
Investigator(s):	KMS2	Section:	6	Township:	47N	Range:	26W	Sampling 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		
Cowardin Classification:	PEM1d	Circular 39 Classification:	Type 2	Mapped NWI Classification:					

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in remarks)

Are vegetation Yes Soil Yes Hydrology No significantly disturbed?

Are vegetation No Soil No Hydrology No naturally problematic?

Are "normal circumstances" present? Yes

Eggers & Reed (primary): Fresh (Wet) Meadow
Eggers & Reed (secondary):
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present?	Yes
Hydric soil present?	Yes
Indicators of wetland hydrology present?	Yes
Is the sampled area within a wetland?	No

General Remarks (explain any answers if needed): Associated with Well 5.

If yes, optional Wetland Site ID: Wetland 7

VEGETATION

Tree Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
	Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: 15 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Potentilla norvegica	20	Yes	FAC
2.	Trifolium pratense	25	Yes	FACU
3.	Echinochloa crus-galli	20	Yes	FAC
4.	Rumex crispus	15	No	FAC
5.	Bidens cernua	10	No	OBL
6.	Carex vulpinoidea	20	Yes	OBL
7.	Glyceria striata	25	Yes	OBL
8.		0		
	Total Cover:	135		

Woody Vine Stratum (Plot Size: 30 ft)

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:

	20%	50%
Tree Stratum	0	0
Sapling/Shrub Stratum	0	0
Herb Stratum	27	67.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	80.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	55	X 1	55
FACW Species	0	X 2	0
FAC Species	55	X 3	165
FACU Species	25	X 4	100
UPL Species	0	X 5	0
Column Totals:	135 (A)		320 (B)

Prevalence Index = B/A = 2.37

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	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)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SOIL

Sampling Point: W7

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/2	100					loam	
2.	6 - 13	2.5YR 2.5/1	100					silt loam	
3.	13 - 21	10YR 2/1	100					peat	
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)

- [x] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] 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)
- [ ] Loamy Mucky Mineral (F1) (LRR K, L)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)

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)
- [ ] Dark Surface (S7) (LRR K, L)
- [ ] Polyvalue Below Surface (S8) (LRR K, L)
- [ ] Thin Dark Surface (S9) (LRR K, L)
- [ ] Iron-Manganese Masses (F12) (LRR K, L, R)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 149B)
- [ ] Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- [ ] Red Parent Material (F21)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: Depth (inches):

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] 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)

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)
- [ ] FAC-Neutral Test (D5)

Field Observations:

- Surface water present? [ ] Surface Water Depth (inches):
- Water table present? [ ] Water Table Depth (inches):
- Saturation present? (includes capillary fringe) [x] Saturation Depth (inches): 2

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: [ ] Aerial Photo [ ] Monitoring Well [ ] Stream Gauge [ ] Previous Inspections

Hydrology Remarks:

8/4/2016 4:30:18 PM

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

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

West Side of Property

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

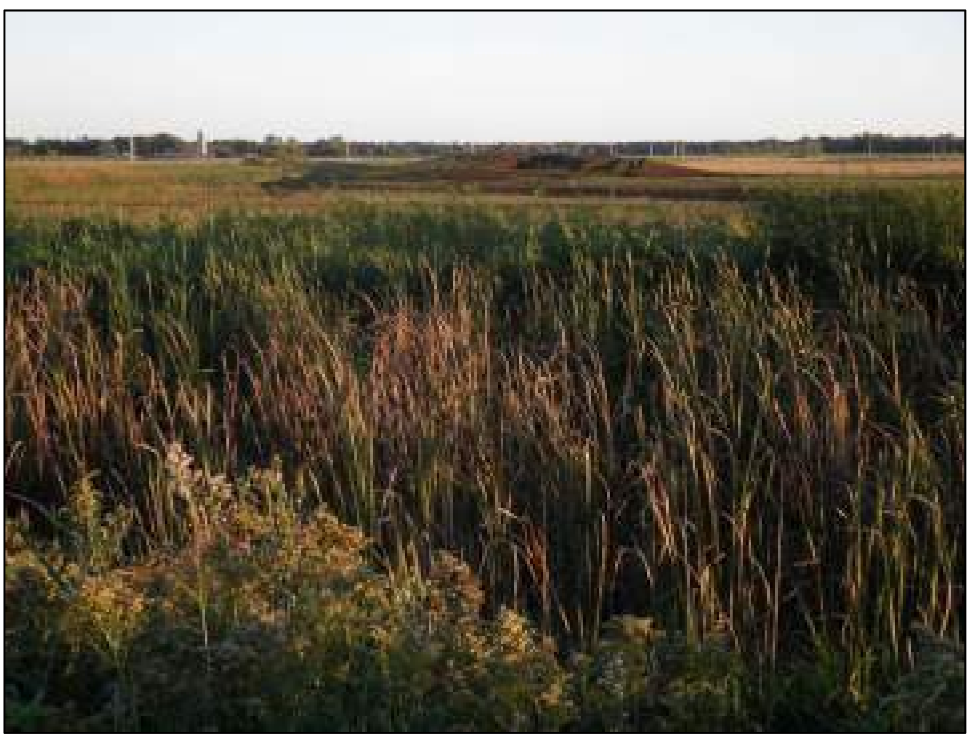
West Side of Property

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 Property

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 Property

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 Property

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

East Side of Property

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 Property

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

East side of property, north-central east-west ditch, view west, 9/17/14, #13553

East Side of Property

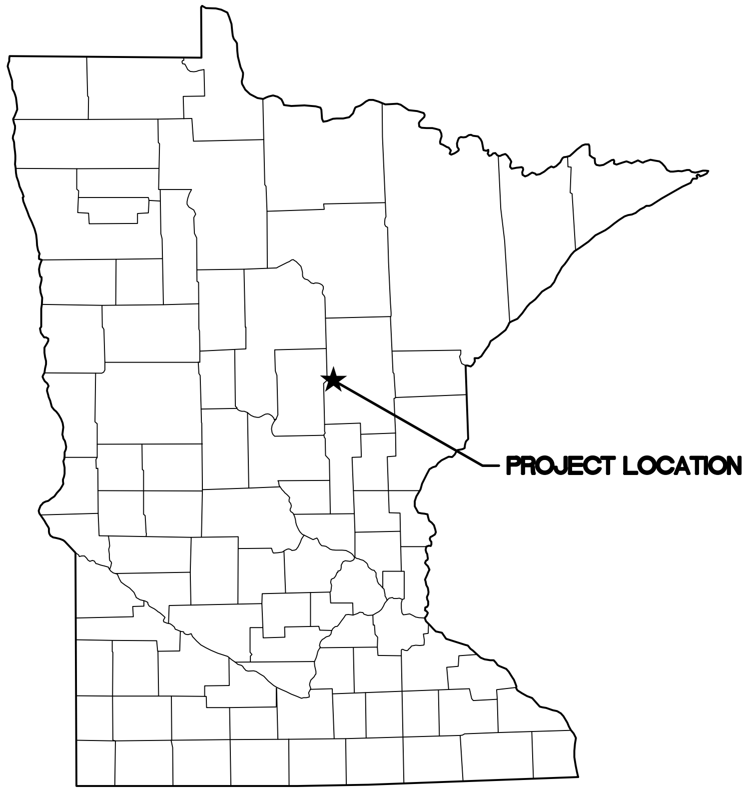
East side, middle private ditch, view east, 9/17/14, #13544

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



STATE MAP

PROJECT SITE

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

NOTES:

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.

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ____________

SIGNATURE ____________

DATE ________ LICENSE# ________

DRAWN: CMB2

CHECKED: .

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
TITLE SHEET, INDEX
AND SITE LOCATION MAP

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TS-101

REV 0

CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-TS-101.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:36 PM

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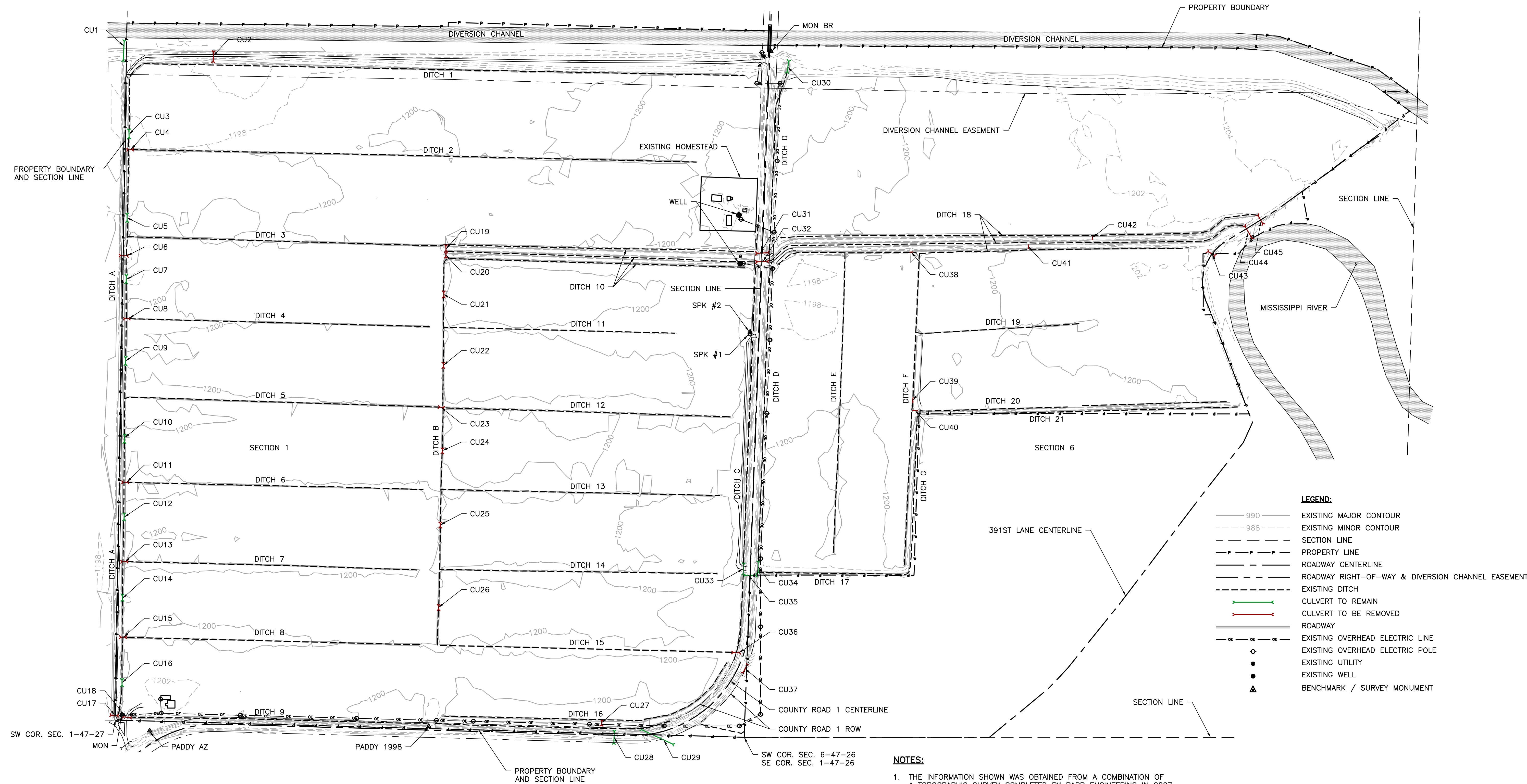

1 PLAN: EXISTING CONDITIONS

0 400 800
SCALE IN FEET

NOTES:

1. THE INFORMATION SHOWN WAS OBTAINED FROM A COMBINATION OF A TOPOGRAPHIC SURVEY COMPLETED BY BARR ENGINEERING IN 2007 AND A BOUNDARY SURVEY COMPLETED BY STRAIGHTLINE SURVEYING, INC. IN AUGUST, 2015.
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.
3. CONTRACTOR SHALL NOTIFY GOPHER STATE ONE CALL BEFORE STARTING THE WORK. CALL 1-800-252-1166.

BASIS OF DRAWING FILE:

DATE OF TOPOGRAPHIC SURVEY: 2007
DATE OF BOUNDARY SURVEY: 08/20/2015
COORDINATE SYSTEM: AITKIN COUNTY
HORIZONTAL DATUM: NAD83(1996)
VERTICAL DATUM: NAVD88

SURVEY CONTROL

NAME	NORTHING	EASTING	ELEVATION
MON BR	259,779.15	436,077.93	1211.97
SPK #2	257,488.08	435,906.88	1201.80
SPK #1	257,472.84	435,907.06	1202.21
PADDY 1998	254,267.02	433,283.02	1204.36
PADDY AZ	254,231.66	431,004.80	1203.21
MON BR	254,362.74	430,775.04	1201.06

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.	.	.

ISSUE STATUS

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CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
EXISTING CONDITIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-101
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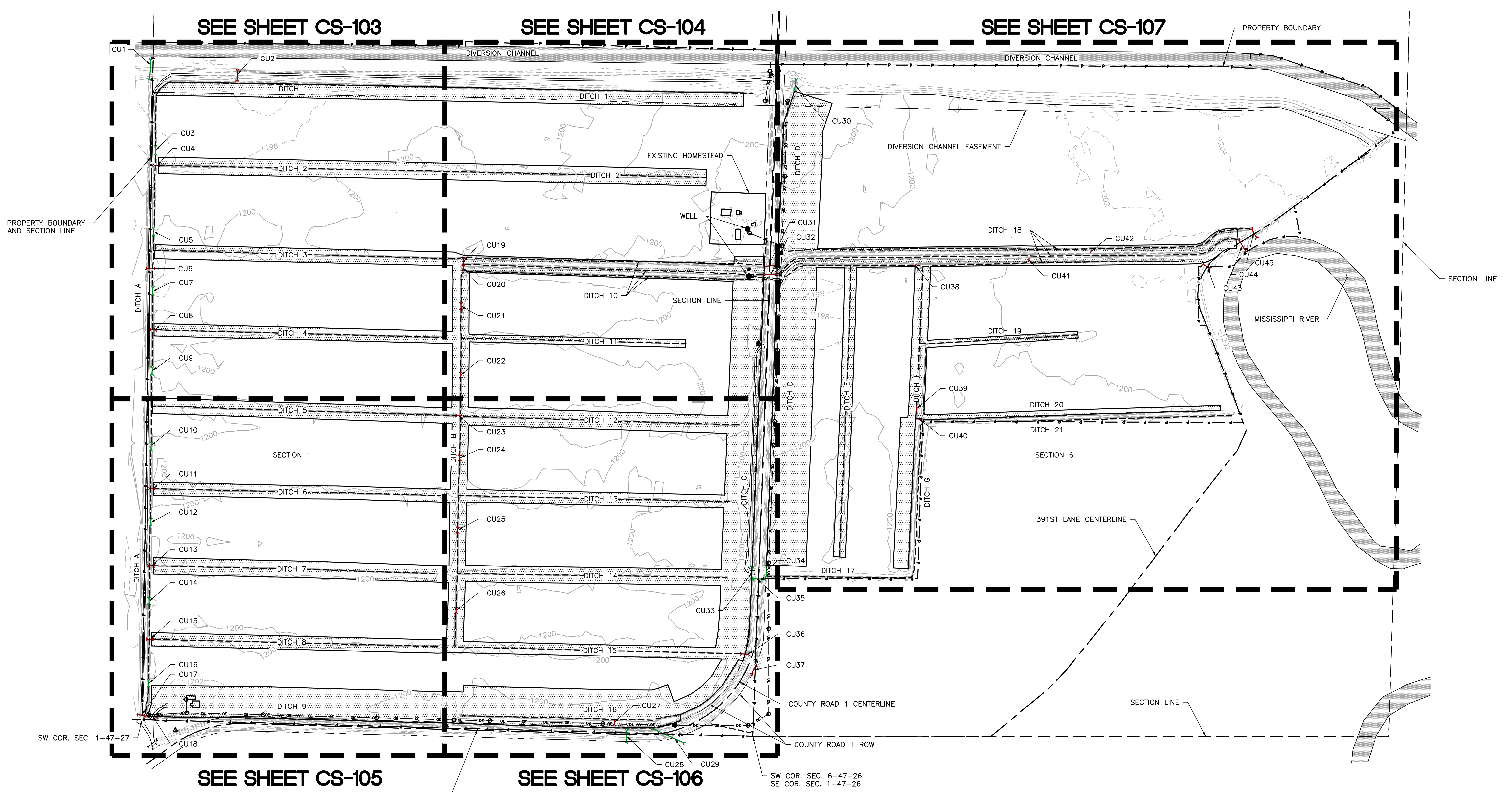

LEGEND:

APPROXIMATE GRADING AREA

1 PLAN: OVERALL SITE PLAN AND INDEX MAP

0 400 800
SCALE IN FEET

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CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
OVERALL SITE PLAN
AND INDEX MAP

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NORTHMET PROJECT
HOYT LAKES, MINNESOTA

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DWG. NO. CS-102

REV 0

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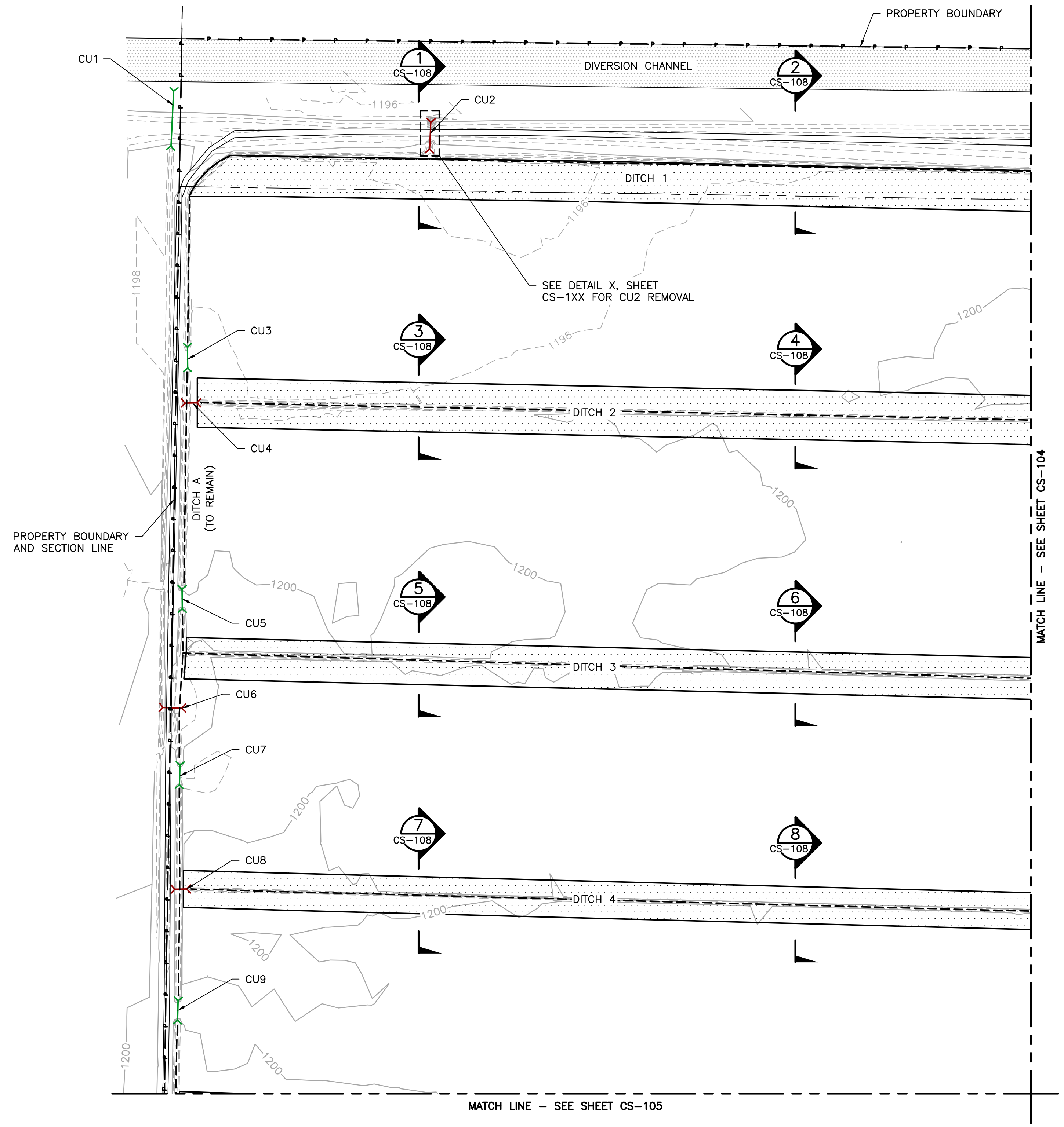

1 CS-102 PLAN: NORTH WEST UNIT GRADING PLAN

0 200 400
SCALE IN FEET

NORTHWEST UNIT EXISTING CULVERT SCHEDULE						
CULVERT No.	TYPE	DIAM. (IN)	LENGTH (FT)	NORTH / WEST INVERT ELEV.	SOUTH / EAST INVERT ELEV.	ACTION
CU1	CMP	18	156	1189.8	1197.1	TO REMAIN
CU2	CMP	18	61	1191.5	1193.6	TO BE REMOVED
CU3	CPEP	24	65	1193.9	1194.0	TO REMAIN
CU4	CMP	12	30	1193.7	1193.9	TO BE REMOVED
CU5	CPEP	24	65	1194.1	1194.3	TO REMAIN
CU6	CMP	15	34	1196.7	1196.1	TO BE REMOVED
CU7	CPEP	24	65	1194.6	1194.7	TO REMAIN
CU8	CPEP	12	25	1195.2	1195.0	TO BE REMOVED
CU9	CPEP	24	67	1194.0	1193.5	TO REMAIN

ESTIMATED DITCH FILL QUANTITIES				
DITCH ID	DITCH LENGTH (FT)	AVG X-SECTION AREA (SF)	ESTIMATED FILL VOLUME (CY)	GRADING SWADTH WIDTH (FT)
DITCH A	TO REMAIN			
DITCH 1	4900	28.7	5210	115
DITCH 2	4595	35.1	5980	140
DITCH 3	2635	29.5	2880	120
DITCH 4	2445	26.3	2390	105

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ISSUED	VERSION	DATE
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BARR PROJECT NO.: 23/69-0C29
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AITKIN WETLAND RESTORATION PLAN
NORTHWEST UNIT GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

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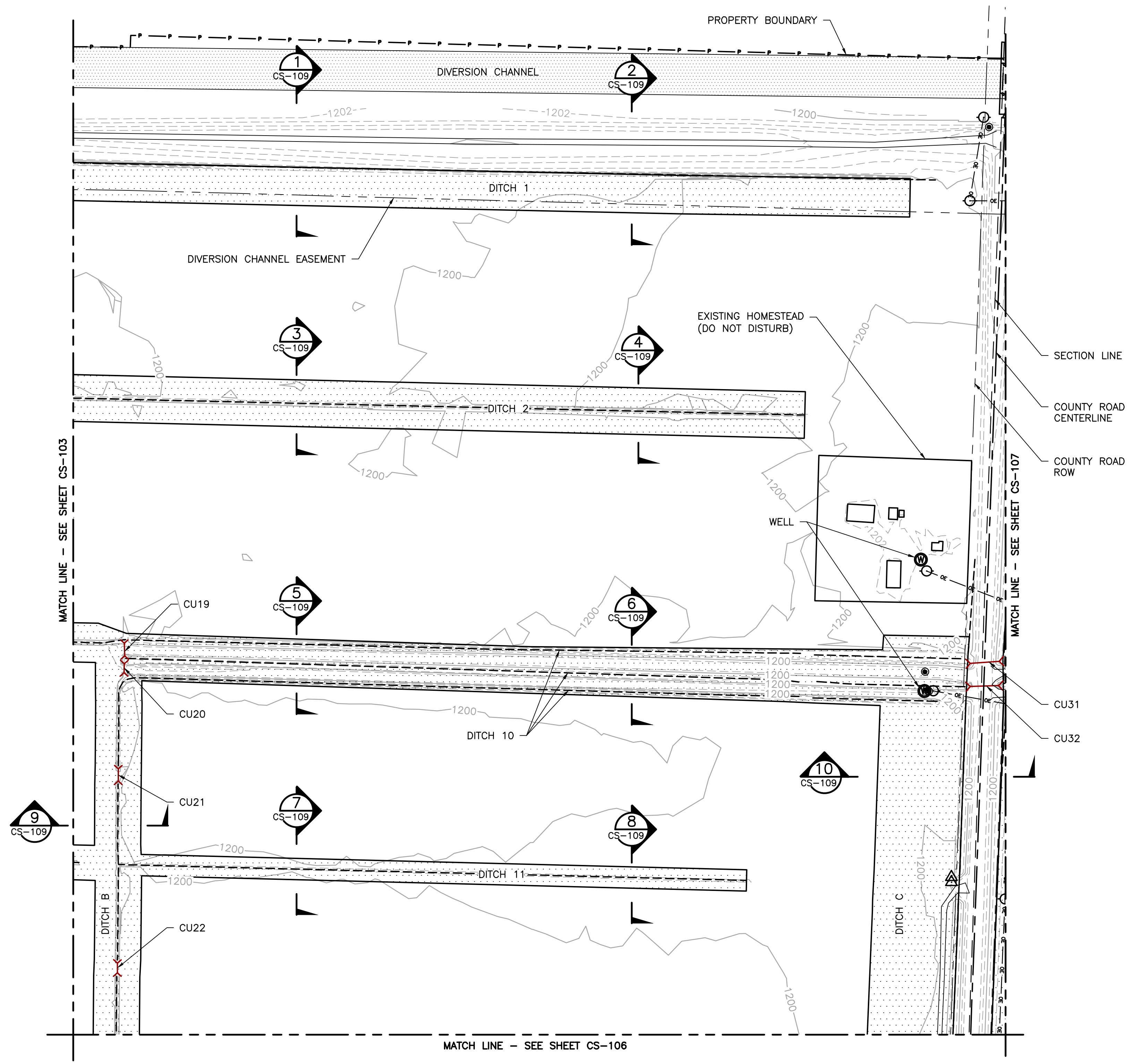

1 CS-102 PLAN: NORTH EAST UNIT GRADING PLAN

0 200 400
SCALE IN FEET

NORTHEAST UNIT EXISTING CULVERT SCHEDULE

CULVERT No.	TYPE	DIAM. (IN)	LENGTH (FT)	NORTH / WEST INVERT ELEV.	SOUTH / EAST INVERT ELEV.	ACTION
CU19	CMP	18	38	1197.4	1197.8	TO BE REMOVED
CU20	CMP	18	27	1197.4	1197.8	TO BE REMOVED
CU21	CMP	18	45	1195.3	1195.5	TO BE REMOVED
CU22	CMP	18	46	1195.8	1195.5	TO BE REMOVED
CU31	RCP	24	87	1194.5	1194.8	TO BE REMOVED
CU32	RCP	48	86	1194.7	1194.9	TO BE REMOVED

ESTIMATED DITCH FILL QUANTITIES

DITCH ID	DITCH LENGTH (FT)	AVG X-SECTION AREA (SF)		ESTIMATED FILL VOLUME (CY)	GRADING SWADTH WIDTH (FT)
DITCH 1	4900	28.7		5210	115
DITCH 2	4595	35.1		5980	140
DITCH 10	2525	CUT AREA	FILL AREA		
		178.6	165.4	-1230	-
DITCH 11	1890	16.1		1130	65
DITCH B	3160	34.7		4070	140
DITCH C	3645	64.3		8690	260

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CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
NORTHEAST UNIT GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

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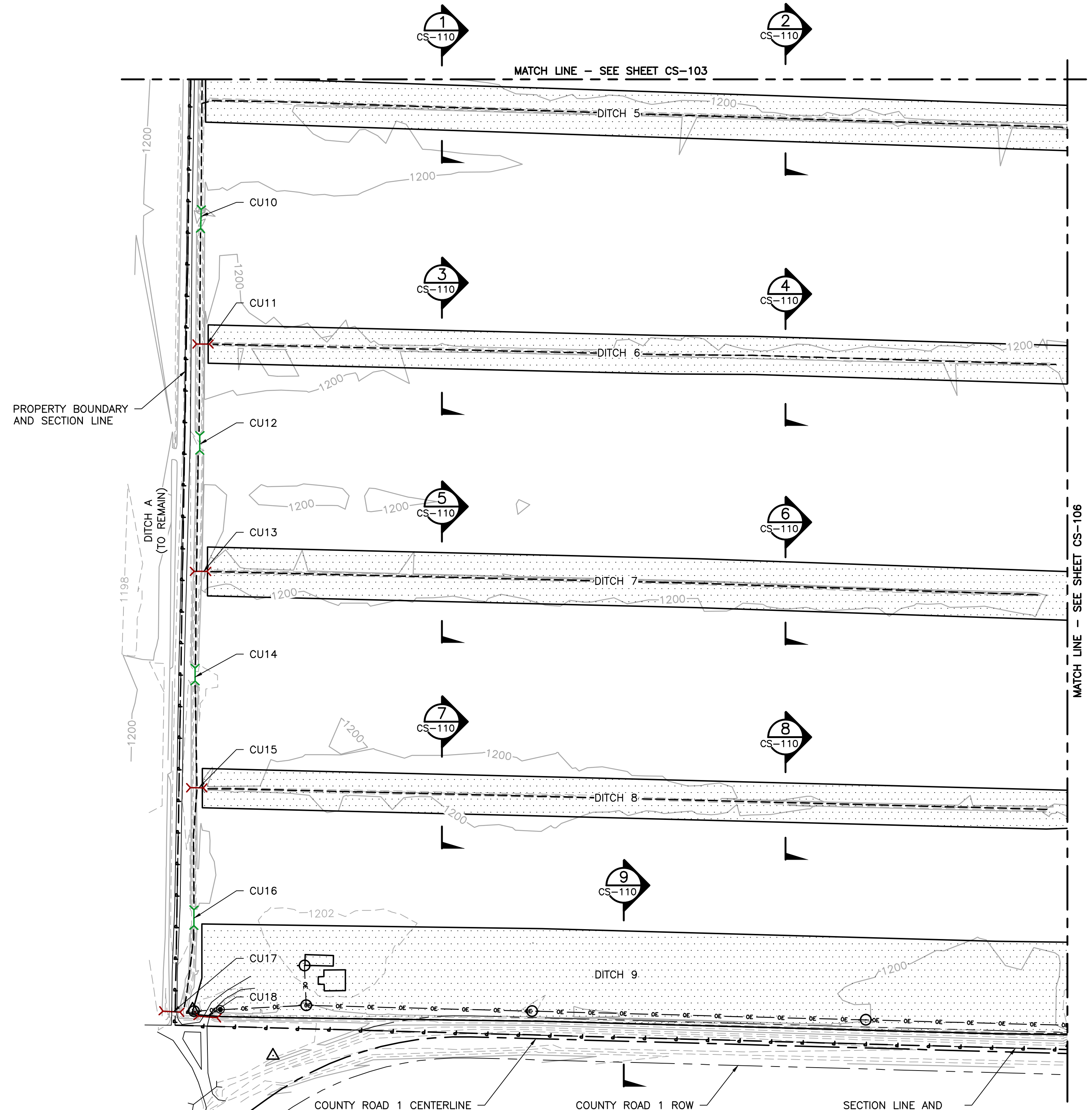

1 CS-102 PLAN: SOUTH WEST UNIT GRADING PLAN

0 200 400
SCALE IN FEET

SOUTHWEST UNIT EXISTING CULVERT SCHEDULE						
CULVERT No.	TYPE	DIAM. (IN)	LENGTH (FT)	NORTH / WEST INVERT ELEV.	SOUTH / EAST INVERT ELEV.	ACTION
CU10	CPEP	24	67	1193.8	1194.4	TO REMAIN
CU11	CPEP	12	26	1194.8	1195.2	TO BE REMOVED
CU12	CPEP	12	42	1197.4	1198.5	TO REMAIN
CU13	CPEP	12	29	1195.5	1195.2	TO BE REMOVED
CU14	CPEP	24	67	1194.6	1194.3	TO REMAIN
CU15	CMP	15	21	1195.9	1196.0	TO BE REMOVED
CU16	CMP	24	62	1194.3	1194.6	TO REMAIN
CU17	CMP	24	27	1196.9	1197.0	TO BE REMOVED
CU18	CMP	36	41	1196.4	1196.5	TO BE REMOVED

ESTIMATED DITCH QUANTITIES				
DITCH ID	DITCH LENGTH (FT)	AVG X-SECTION AREA (SF)	ESTIMATED FILL VOLUME (CY)	GRADING SWADTH WIDTH (FT)
DITCH A	TO REMAIN			
DITCH 5	2545	32.2	3040	130
DITCH 6	2390	27.2	2410	110
DITCH 7	2355	34.8	3040	140
DITCH 8	2395	27.9	2480	115
DITCH 9	2490	65.9	6080	265

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PRINTED NAME ____________
SIGNATURE ____________
DATE ________ LICENSE# ________

DRAWN: CMB2
CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
SOUTHWEST UNIT GRADING PLAN

POLYMET MINING

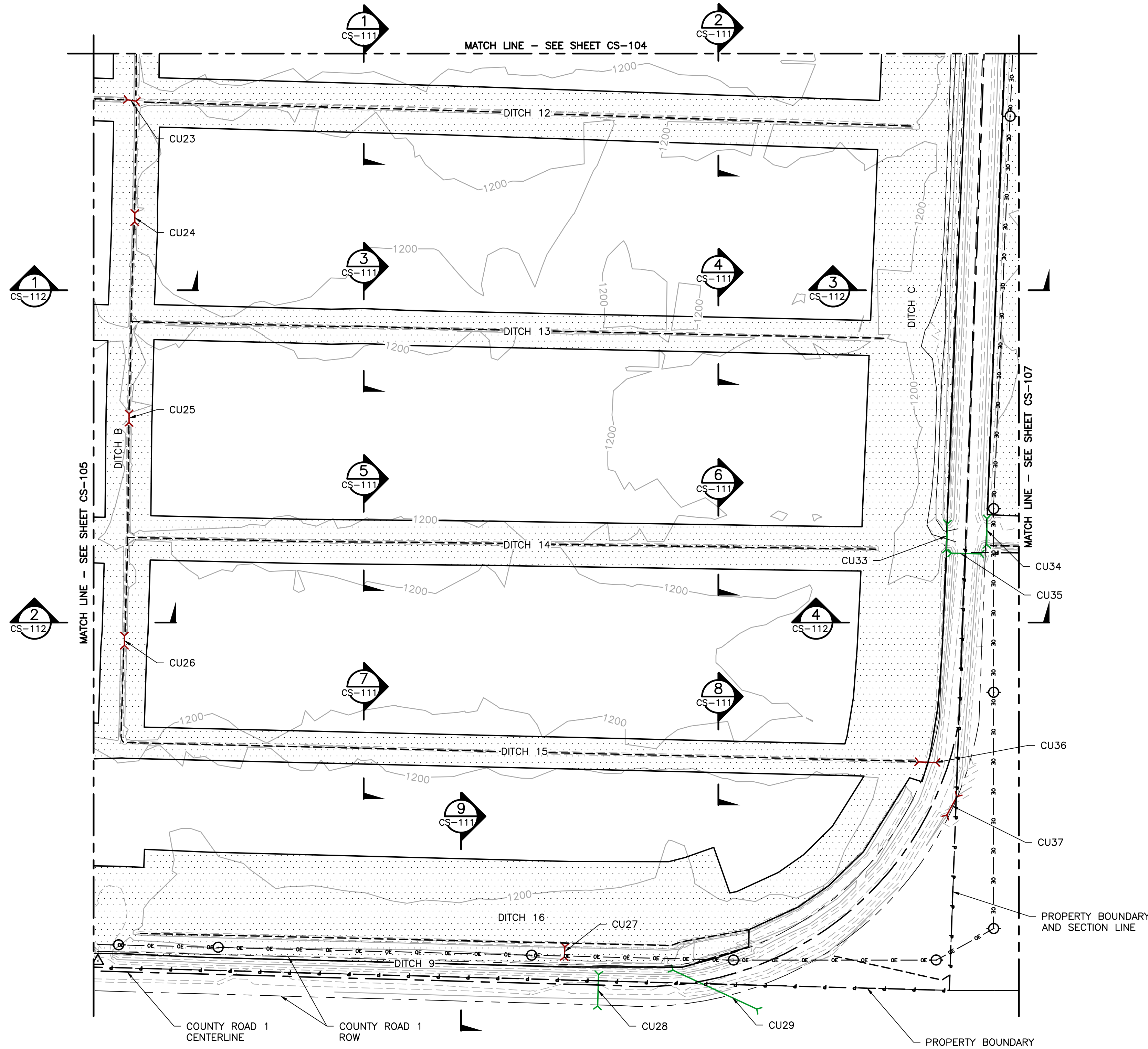
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-105

REV 0



1 CS-102 PLAN: SOUTH EAST UNIT GRADING PLAN

0 200 400
SCALE IN FEET

SOUTHEAST UNIT EXISTING CULVERT SCHEDULE						
CULVERT No.	TYPE	DIAM. (IN)	LENGTH (FT)	NORTH / WEST INVERT ELEV.	SOUTH / EAST INVERT ELEV.	ACTION
CU23	CMP	36	31	1195.1	1195.9	TO BE REMOVED
CU24	CPEP	24	41	1196.3	1196.1	TO BE REMOVED
CU25	CPEP	24	41	1196.2	1195.9	TO BE REMOVED
CU26	CMP	24	39	1196.4	1196.2	TO BE REMOVED
CU27	CPEP	12	34	1195.7	1196.3	TO BE REMOVED
CU28	RCP	24	87	1197.2	1199.1	TO REMAIN
CU29	RCP	36	251	1194.8	1194.8	TO REMAIN
CU33	CMP	24	79	1196.2	1197.8	TO REMAIN
CU34	CMP	24	80	1196.0	1195.4	TO REMAIN
CU35	RCP	36	91	1195.4	1195.9	TO REMAIN
CU36	CMP	12	32	1194.9	1196.1	TO BE REMOVED
CU37	CMP	15	64	1199.3	1198.8	TO BE REMOVED

ESTIMATED DITCH QUANTITIES				
DITCH ID	DITCH LENGTH (FT)	AVG X-SECTION AREA (SF)	ESTIMATED FILL VOLUME (CY)	GRADING SWADTH WIDTH (FT)
DITCH B	3160	34.7	4070	140
DITCH C	3645	64.3	8690	260
DITCH D	4000	83.2	12330	335
DITCH 9	2490	65.9	6080	265
DITCH 12	2345	37.3	3240	150
DITCH 13	2275	26.4	2230	105
DITCH 14	2265	33.5	2820	135
DITCH 15	2400	24.0	2140	95
DITCH 16	2495	30.0	2780	120

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
SOUTHEAST UNIT GRADING PLAN

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		

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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.

PRINTED NAME ____
SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: CMB2
CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

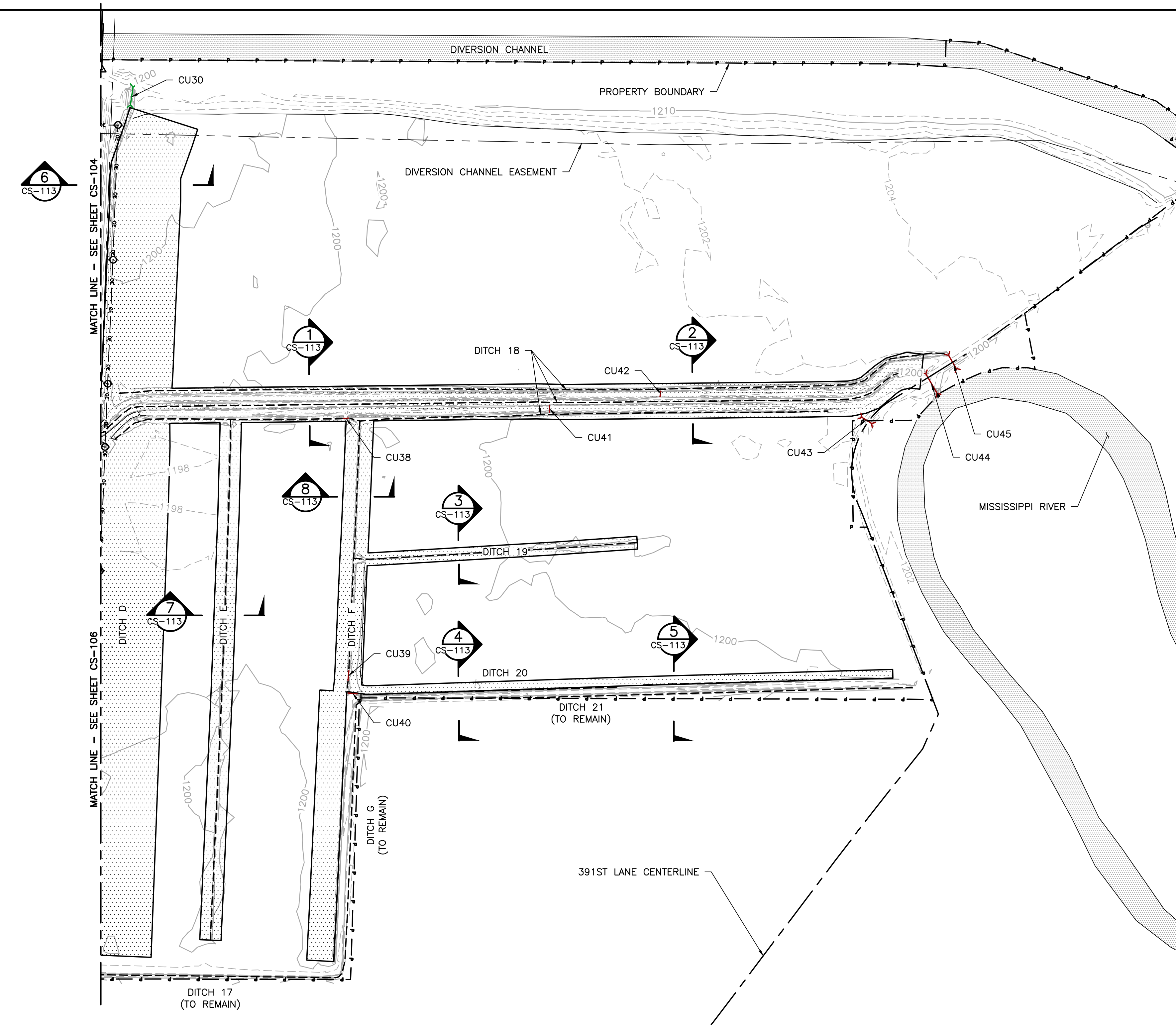
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-106

REV 0

CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-106.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 9:30 AM

INCHES 1 2



1 CS-102 PLAN: EAST UNIT GRADING PLAN

0 300 600
SCALE IN FEET

EAST UNIT EXISTING CULVERT SCHEDULE

CULVERT No.	TYPE	DIAM. (IN)	LENGTH (FT)	NORTH / WEST INVERT ELEV.	SOUTH / EAST INVERT ELEV.	ACTION
CU30	CMP	24	111	1190.1	1194.3	TO REMAIN
CU38	CMP	24	25	1194.8	1195.3	TO BE REMOVED
CU39	CPEP	12	46	1195.3	1195.3	TO BE REMOVED
CU40	CPEP	14	42	1196.7	1197.0	TO BE REMOVED
CU41	CMP	24	30	1198.8	1198.5	TO BE REMOVED
CU42	CMP	18	28	1198.8	1198.2	TO BE REMOVED
CU43	CMP	18	53	UNKNOWN	1199.7	TO BE REMOVED
CU44	CMP	54	106	1198.7	1180.7	TO BE REMOVED
CU45	CMP	18	72	1196.3	1192.5	TO BE REMOVED

<table>
<tr><th colspan="6">ESTIMATED DITCH QUANTITIES</th></tr>
<tr><th>DITCH ID</th><th>DITCH LENGTH (FT)</th><th colspan="2">AVG X-SECTION AREA (SF)</th><th>ESTIMATED FILL VOLUME (CY)</th><th>GRADING SWADTH WIDTH (FT)</th></tr>
<tr><td>DITCH D</td><td>4000</td><td colspan="2">83.2</td><td>12330</td><td>335</td></tr>
<tr><td>DITCH E</td><td>2450</td><td colspan="2">25.0</td><td>2270</td><td>100</td></tr>
<tr><td>DITCH F</td><td>2545</td><td colspan="2">31.9</td><td>3010</td><td>130</td></tr>
<tr><td>DITCH G</td><td colspan="5">TO REMAIN</td></tr>
<tr><td>DITCH 17</td><td colspan="5">TO REMAIN</td></tr>
<tr><td rowspan="2">DITCH 18</td><td rowspan="2">3950</td><td>CUT AREA</td><td>FILL AREA</td><td colspan="2"></td></tr>
<tr><td>268.7</td><td>137.1</td><td>-19260</td><td>-</td></tr>
<tr><td>DITCH 19</td><td>1335</td><td colspan="2">14.7</td><td>730</td><td>60</td></tr>
<tr><td>DITCH 20</td><td>2000</td><td colspan="2">10.2</td><td>760</td><td>40</td></tr>
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CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-107.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:16 PM

INCHES 1 2

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ______
SIGNATURE ______
DATE ______ LICENSE# ______

DRAWN: CMB2
CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
EAST UNIT GRADING PLAN

POLYMET MINING

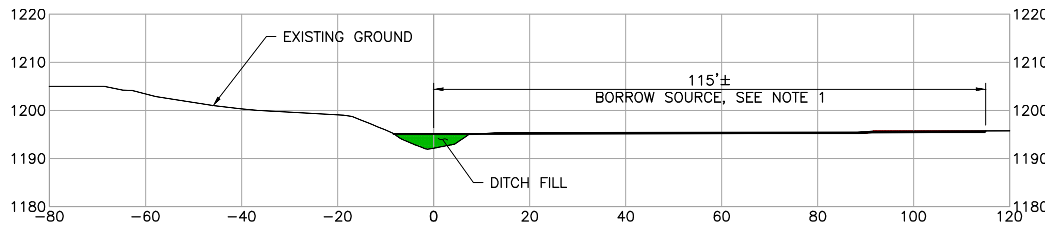
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-107

REV 0



1 CS-103 SECTION: DITCH 1 – CROSS SECTION

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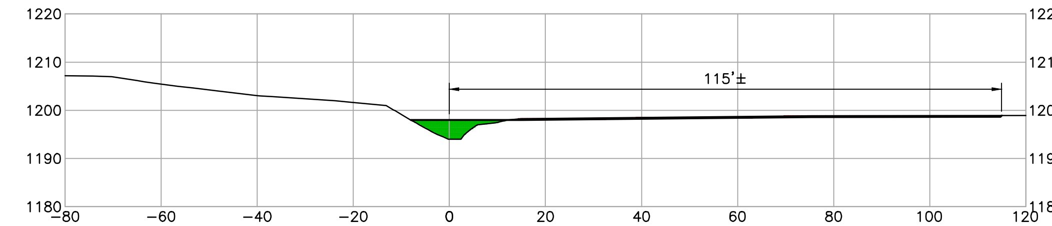
SCALE IN FEET



2 CS-103 SECTION: DITCH 1 – CROSS SECTION

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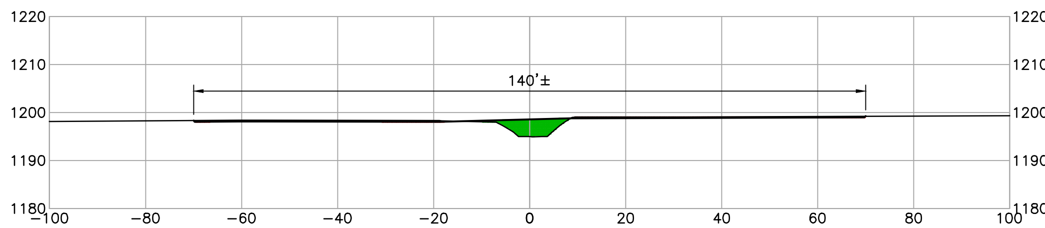

3 CS-103 SECTION: DITCH 2 – CROSS SECTION

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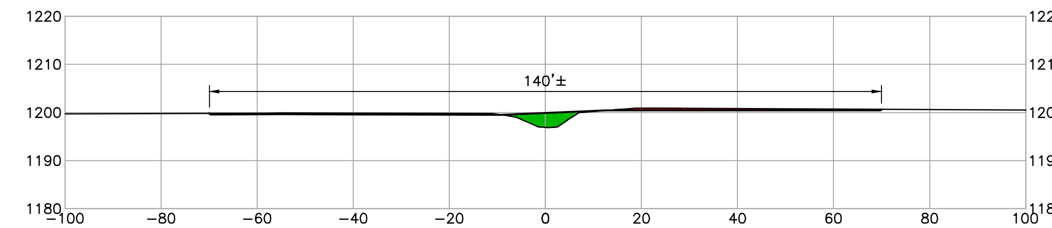

4 CS-103 SECTION: DITCH 2 – CROSS SECTION

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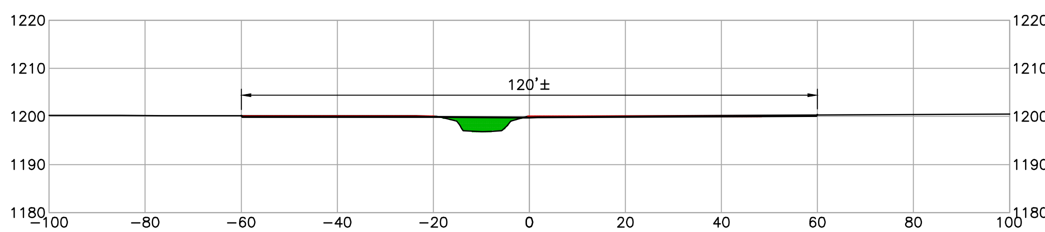

5 CS-103 SECTION: DITCH 3 – CROSS SECTION

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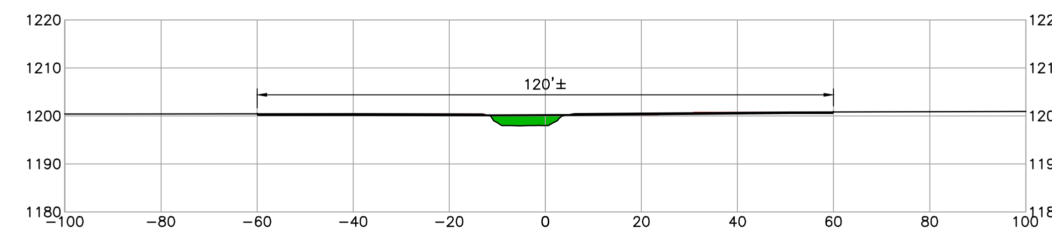
SCALE IN FEET



6 CS-103 SECTION: DITCH 3 – CROSS SECTION

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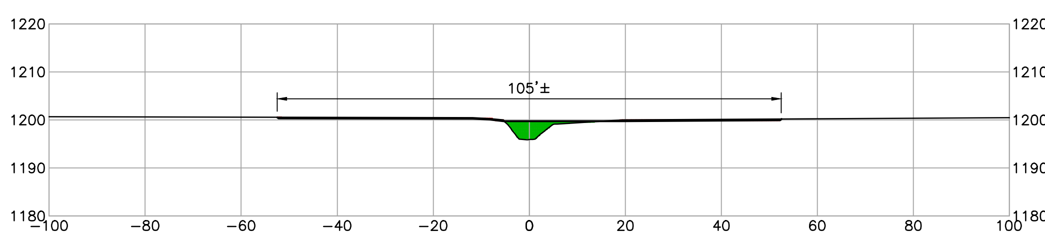

7 CS-103 SECTION: DITCH 4 – CROSS SECTION

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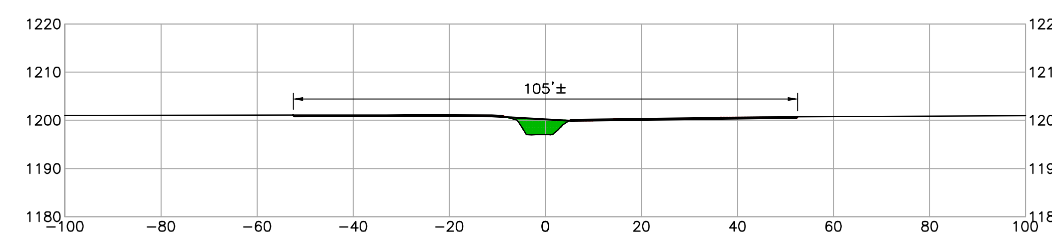

8 CS-103 SECTION: DITCH 4 – CROSS SECTION

0 20 40
SCALE IN FEET

NOTES:

1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.

CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-108.DWG PLOT SCALE: 1:2 PLOT DATE: 5/19/2016 8:54 AM

INCHES 1 2

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
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PRINTED NAME ____
SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: CMB2
CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
NORTHWEST UNIT CROSS SECTIONS

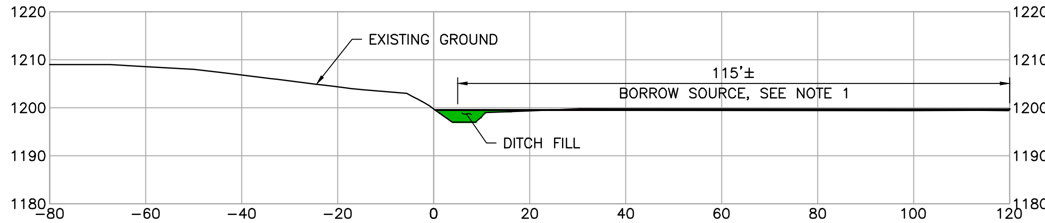
POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-108
REV 0



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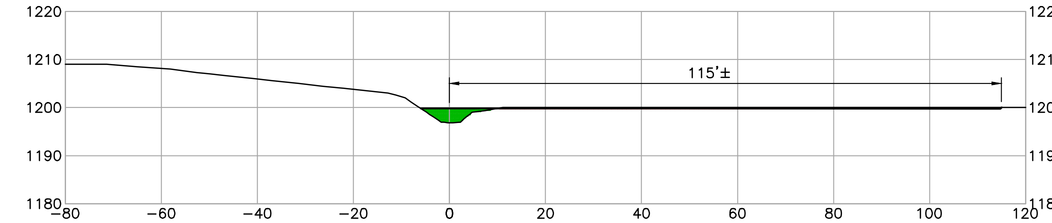

2 CS-104 SECTION: DITCH 1 – CROSS SECTION

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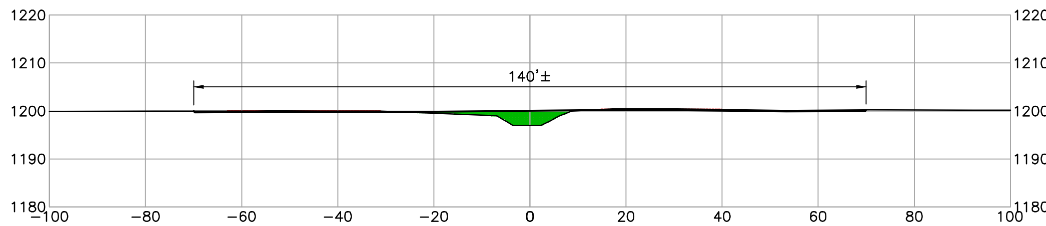

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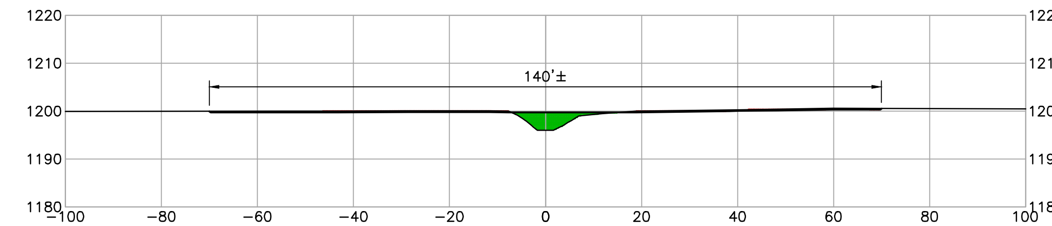
SCALE IN FEET



4 CS-104 SECTION: DITCH 2 – CROSS SECTION

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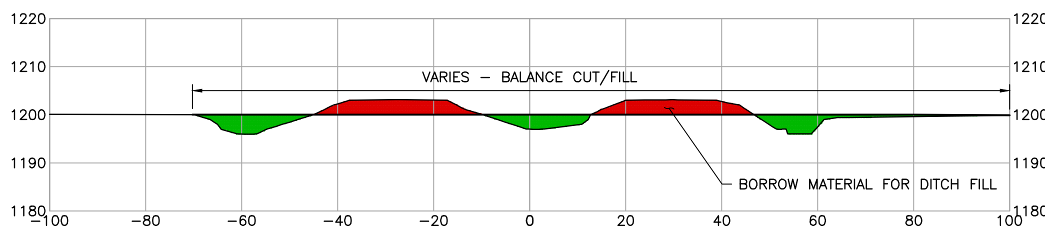

5 CS-104 SECTION: DITCH 10 – CROSS SECTION

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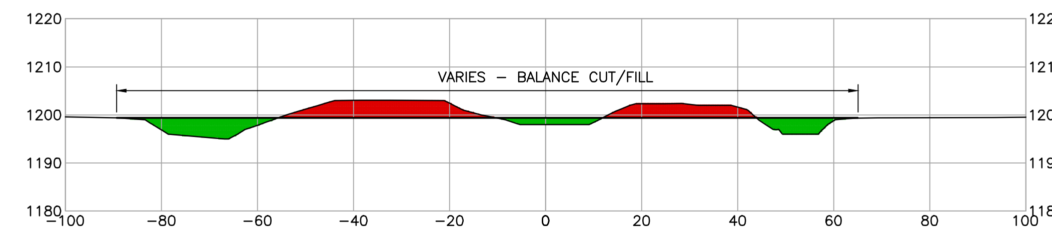
SCALE IN FEET



6 CS-104 SECTION: DITCH 10 – CROSS SECTION

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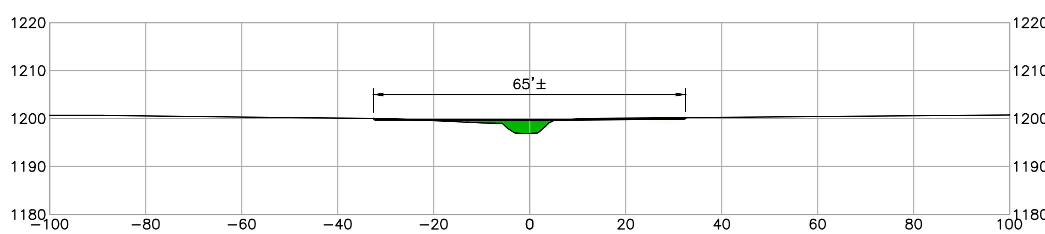
SCALE IN FEET



7 CS-104 SECTION: DITCH 11 – CROSS SECTION

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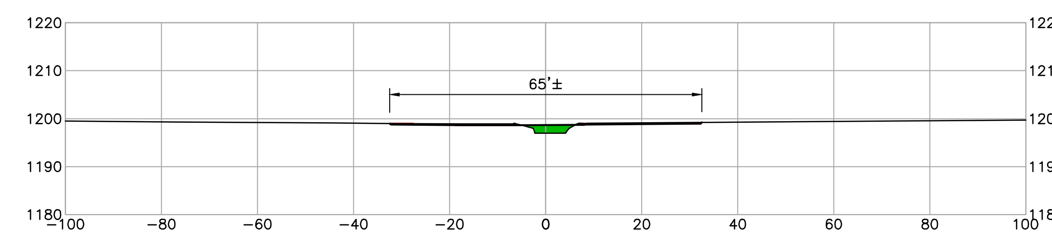

8 CS-104 SECTION: DITCH 11 – CROSS SECTION

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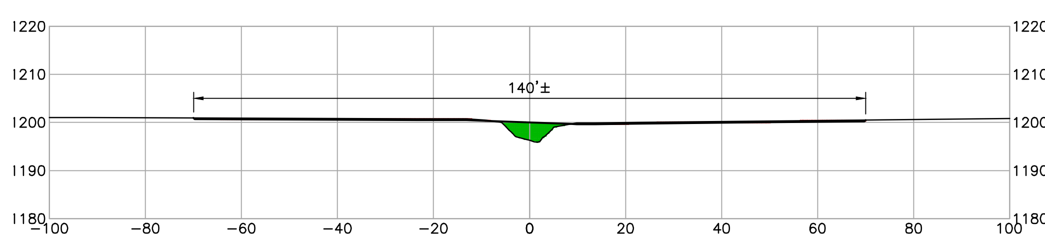

9 CS-104 SECTION: DITCH B – CROSS SECTION

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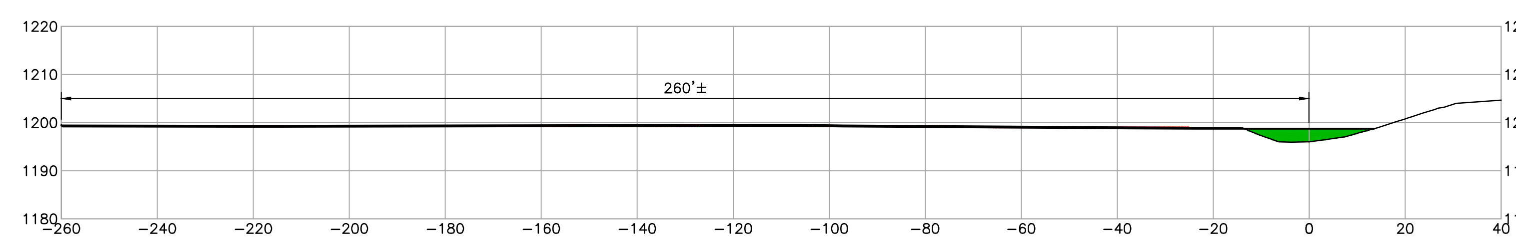

10 CS-104 SECTION: DITCH C – CROSS SECTION

0 20 40
SCALE IN FEET

NOTES:

1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
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FOR CONSTRUCTION		
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PRINTED NAME ____
SIGNATURE ____
DATE ____ LICENSE# ____

DRAWN: CMB2
CHECKED: .
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
NORTHEAST UNIT CROSS SECTIONS

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

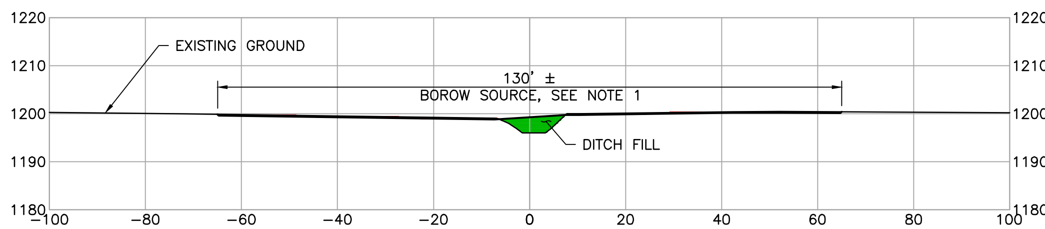
BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-109
REV 0

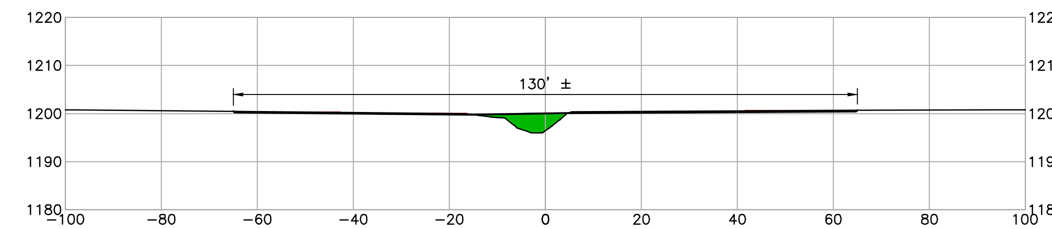
CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-109.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:02 PM

INCHES 1 2



1 CS-105 SECTION: DITCH 5 – CROSS SECTION

0 20 40 SCALE IN FEET



2 CS-105 SECTION: DITCH 5 – CROSS SECTION

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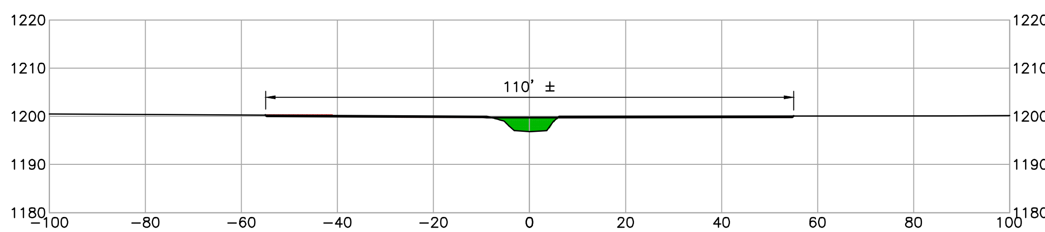

3 CS-105 SECTION: DITCH 6 – CROSS SECTION

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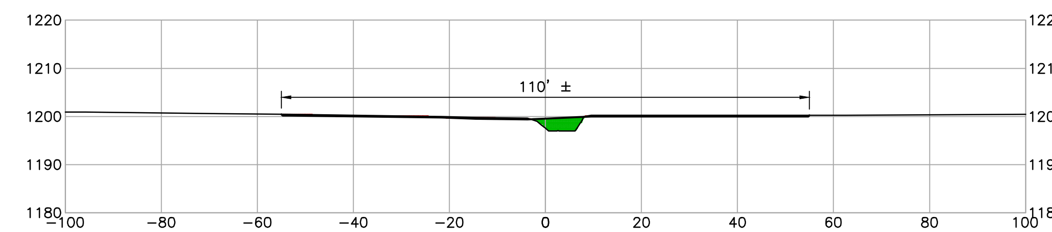

4 CS-105 SECTION: DITCH 6 – CROSS SECTION

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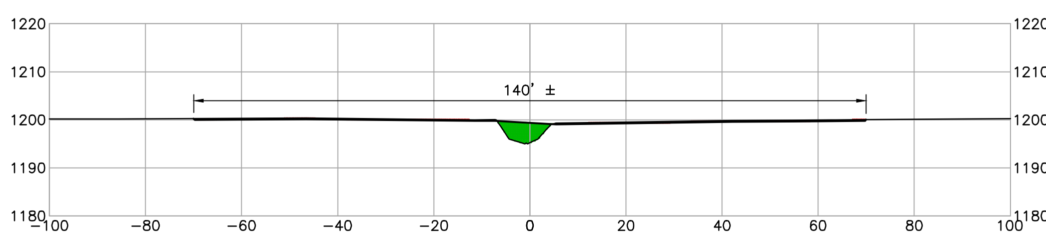

5 CS-105 SECTION: DITCH 7 – CROSS SECTION

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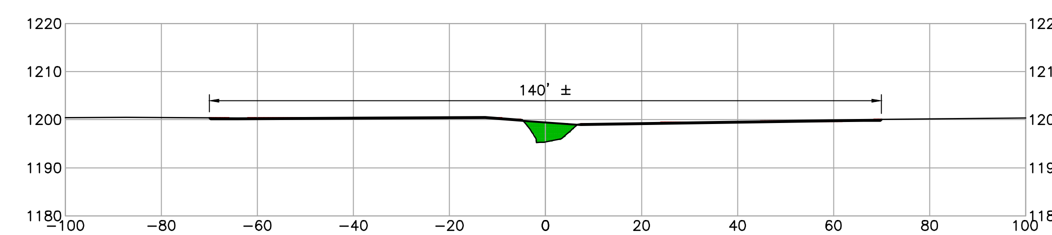

6 CS-105 SECTION: DITCH 7 – CROSS SECTION

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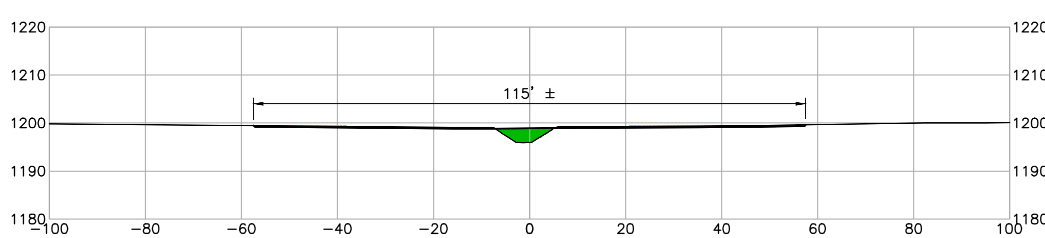

7 CS-105 SECTION: DITCH 8 – CROSS SECTION

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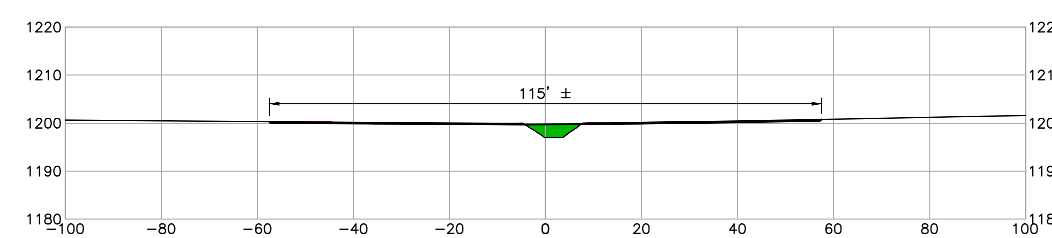

8 CS-105 SECTION: DITCH 8 – CROSS SECTION

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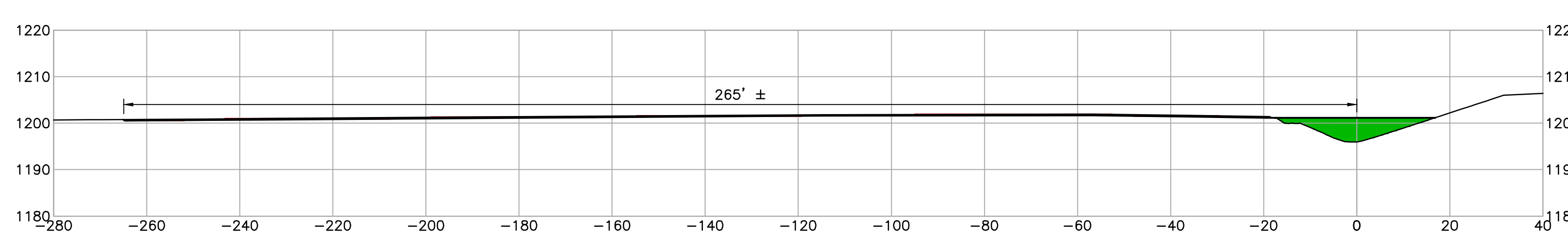

9 CS-105 SECTION: DITCH 9 – CROSS SECTION

0 20 40 SCALE IN FEET

NOTES:

1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ______

SIGNATURE ______

DATE ______ LICENSE# ______

DRAWN: CMB2

CHECKED: .

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
SOUTHWEST UNIT CROSS SECTIONS

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-110

REV 0

CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-110.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:04 PM

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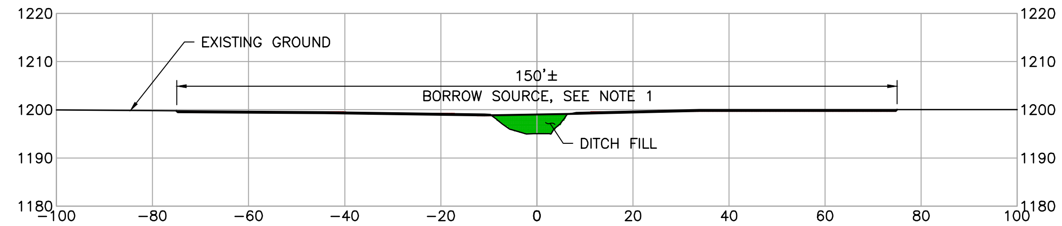

1 CS-106 SECTION: DITCH 12 — CROSS SECTION

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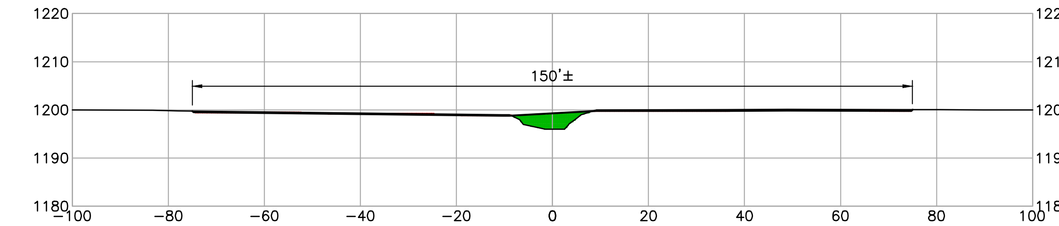

2 CS-106 SECTION: DITCH 12 — CROSS SECTION

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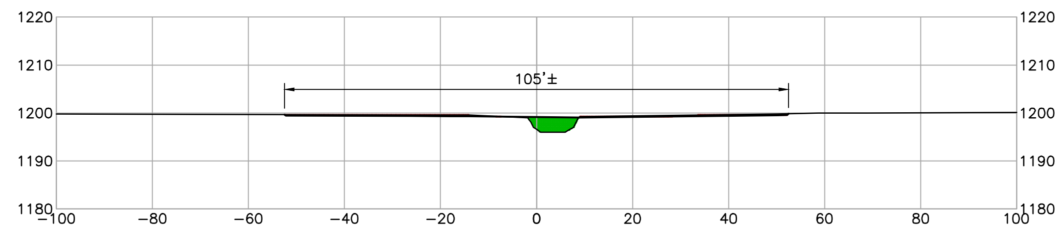

3 CS-106 SECTION: DITCH 13 — CROSS SECTION

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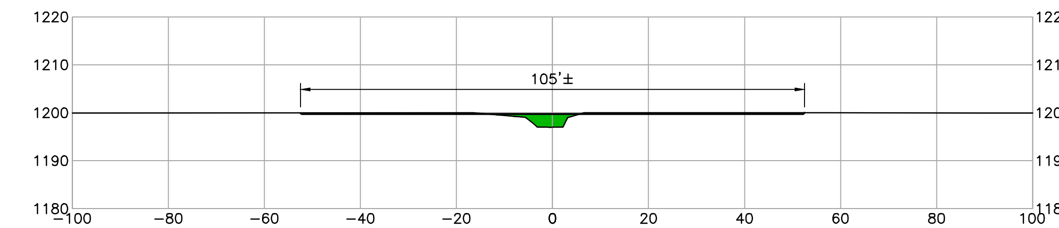

4 CS-106 SECTION: DITCH 13 — CROSS SECTION

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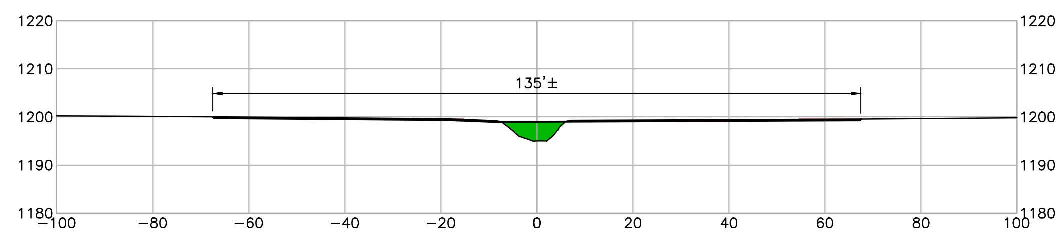
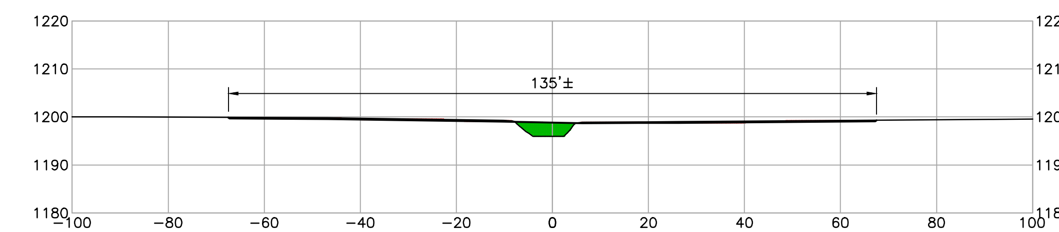


5 CS-106 SECTION: DITCH 14 — CROSS SECTION

0 20 40 SCALE IN FEET



6 CS-106 SECTION: DITCH 14 — CROSS SECTION

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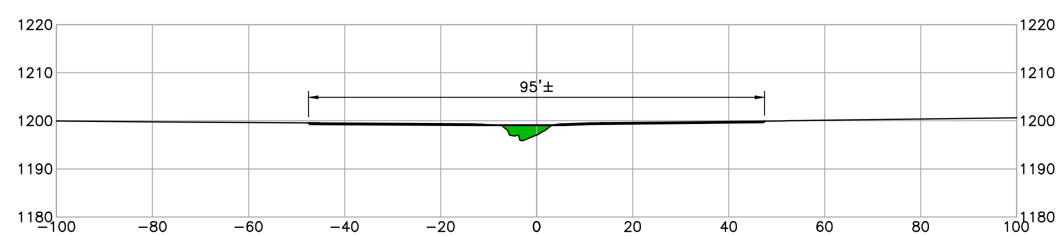

7 CS-106 SECTION: DITCH 15 — CROSS SECTION

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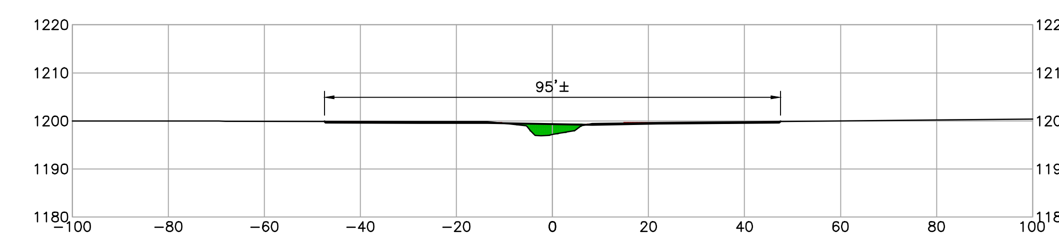

8 CS-106 SECTION: DITCH 15 — CROSS SECTION

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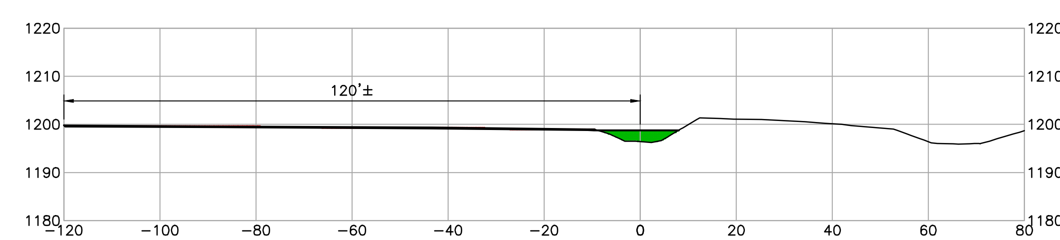

9 CS-106 SECTION: DITCH 16 — CROSS SECTION

0 20 40 SCALE IN FEET

NOTES:

1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
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BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
SOUTHEAST UNIT CROSS SECTIONS

POLYMET MINING

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

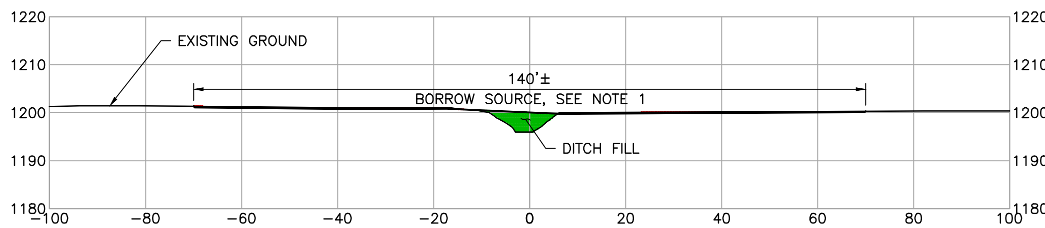
BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-111

REV 0

INCHES 1 2



1 CS-106 SECTION: DITCH B – CROSS SECTION

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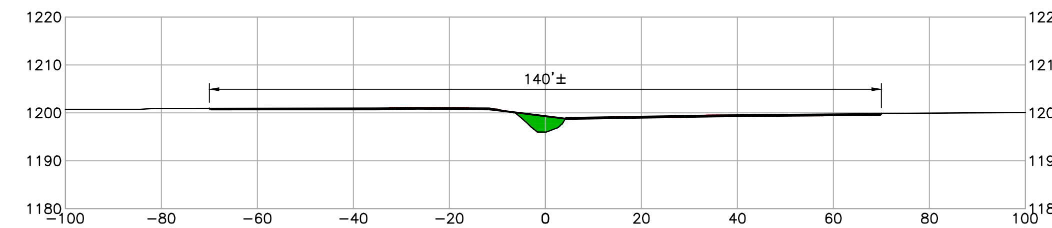

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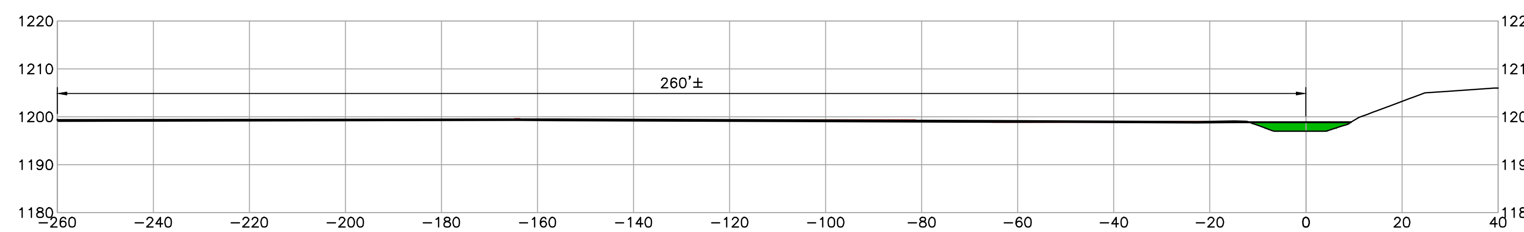

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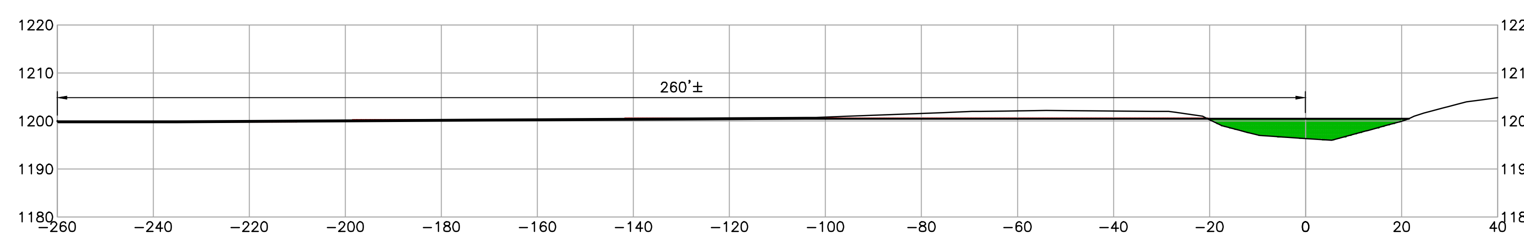
0 20 40 SCALE IN FEET



4 CS-106 SECTION: DITCH C – CROSS SECTION

0 20 40 SCALE IN FEET

NOTES:

1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.

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BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
SOUTHEAST UNIT CROSS SECTIONS

POLYMET MINING

POLYMET MINING, INC.
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4300 MarketPointe Dr. #200
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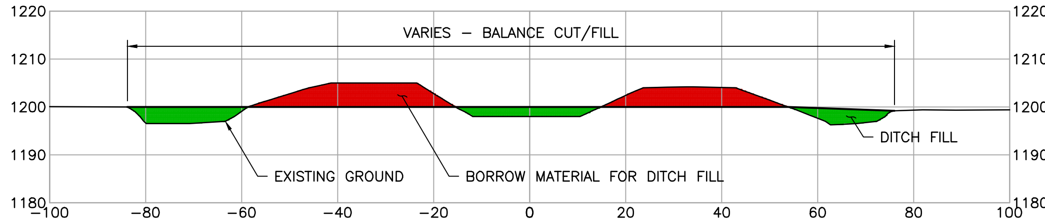
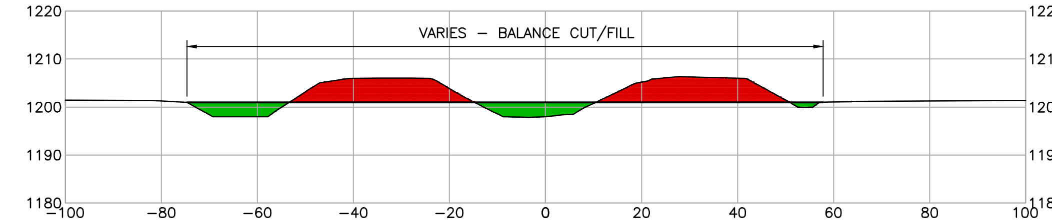
DWG. NO. CS-112

REV 0

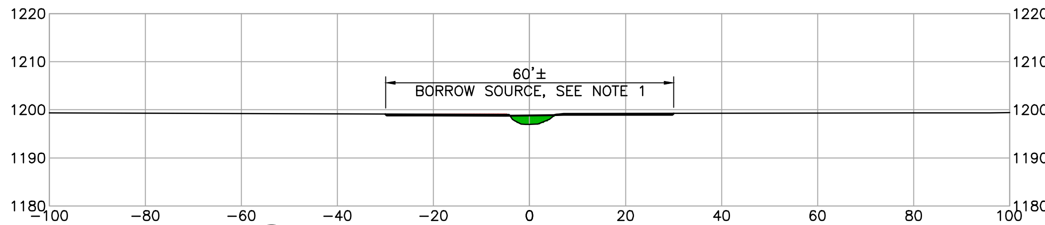
INCHES 1 2



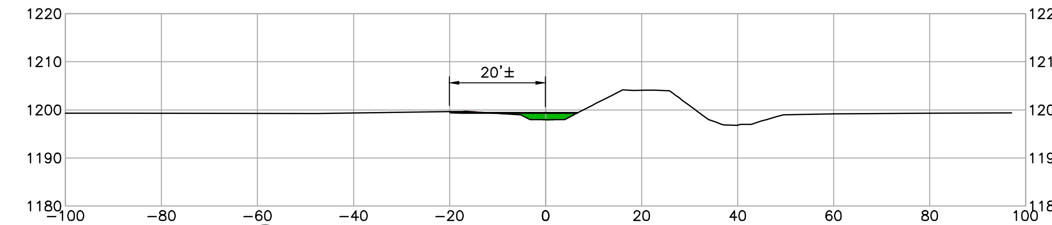
1 SECTION: DITCH 18 – CROSS SECTION
CS–107
0 20 40
SCALE IN FEET



2 SECTION: DITCH 18 – CROSS SECTION
CS–107
0 20 40
SCALE IN FEET



3 SECTION: DITCH 19 – CROSS SECTION
CS–107
0 20 40
SCALE IN FEET



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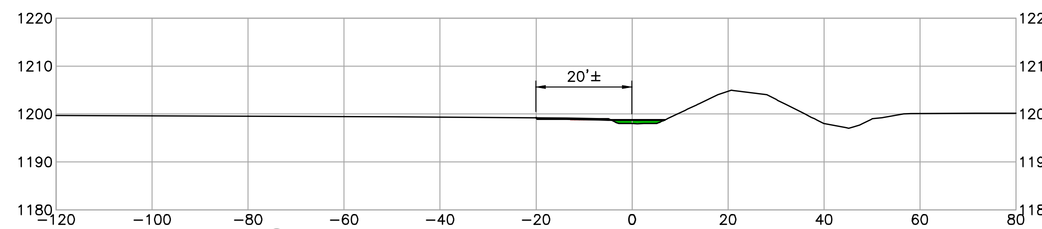
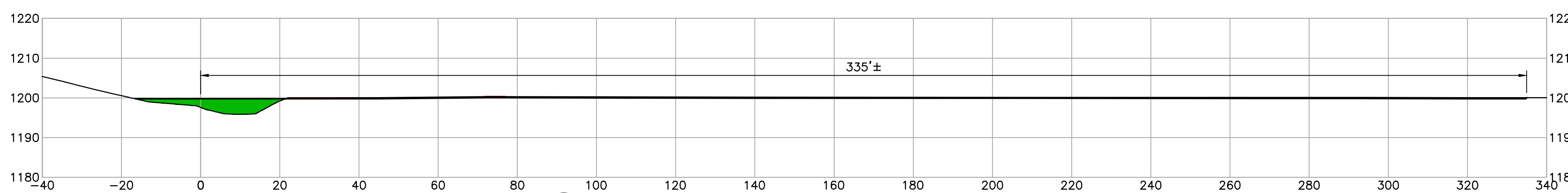
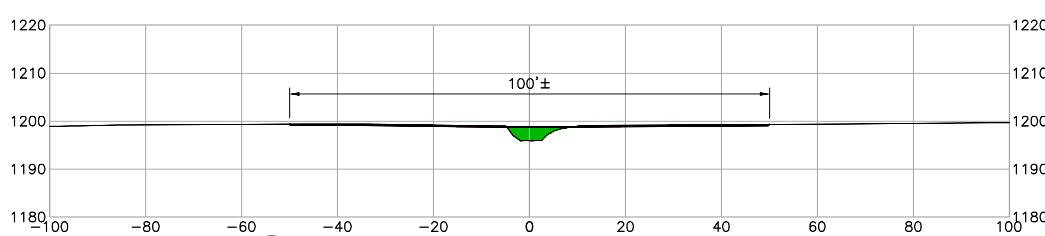
CS–107
0 20 40
SCALE IN FEET



5 SECTION: DITCH 20 – CROSS SECTION
CS–107
0 20 40
SCALE IN FEET



6 SECTION: DITCH D – CROSS SECTION
CS–107
0 20 40
SCALE IN FEET



7 SECTION: DITCH E – CROSS SECTION
CS–107
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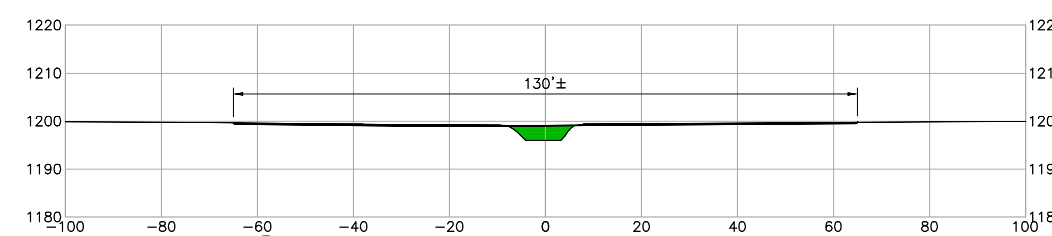
SCALE IN FEET



8 SECTION: DITCH F – CROSS SECTION
CS–107
0 20 40
SCALE IN FEET

NOTES:

1. USE TOP 3 INCHES OF NATIVE MATERIAL ADJACENT TO DITCH AS FILL MATERIAL.

VER NO	DATE	DESCRIPTION
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CHECKED: .
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
EAST UNIT CROSS SECTIONS

POLYMET MINING
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR
BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. CS–113
REV 0

CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG–00–CS–113.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:14 PM

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CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-114.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:21 PM

INCHES 1 2

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
TYPICAL DETAILS

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BARR PROJECT NO.: 23/69-0C29

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POLYMET MINING

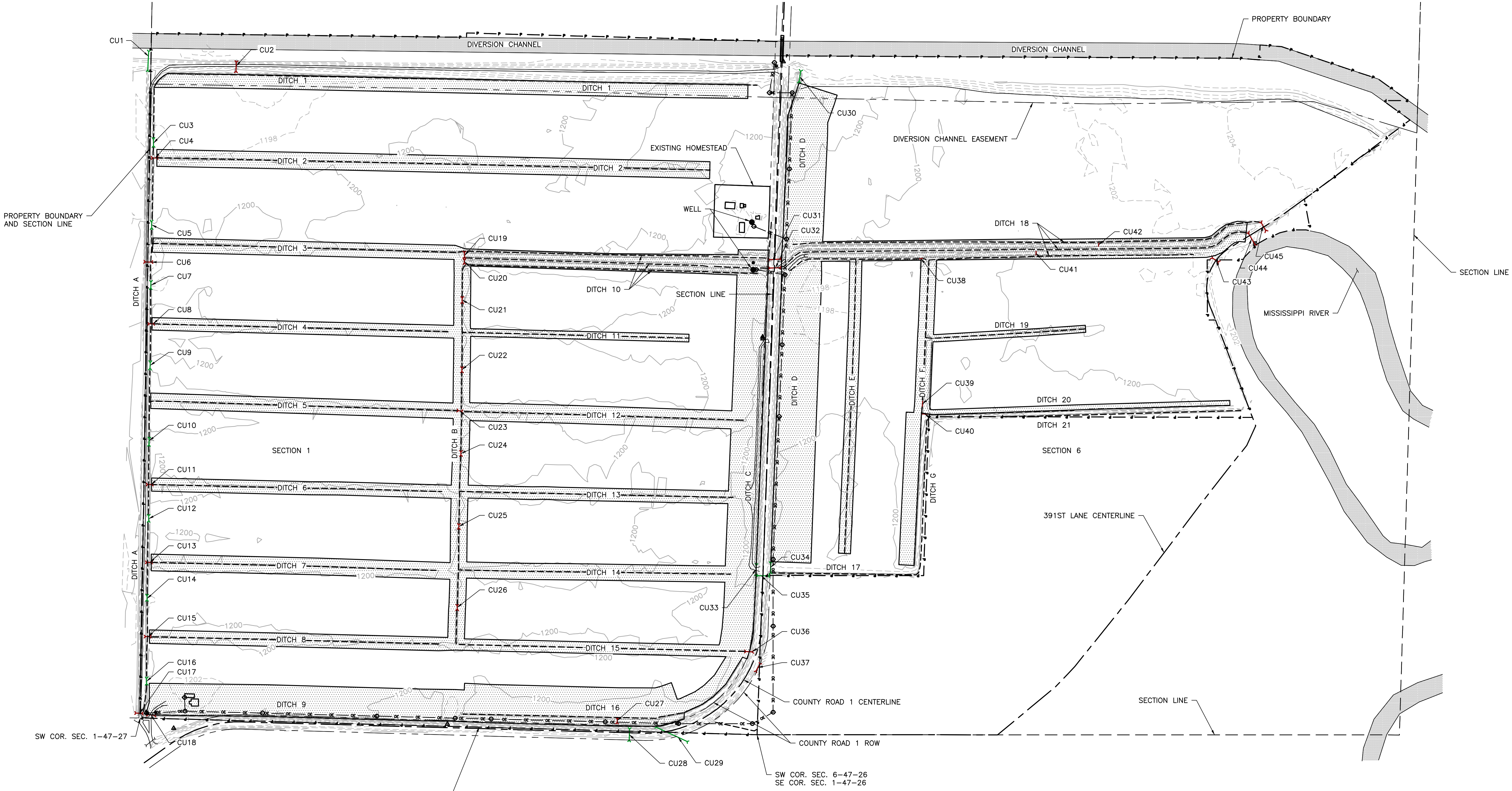
POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-114

REV 0



LEGEND:

APPROXIMATE GRADING AREA

1 PLAN: OVERALL SITE PLAN AND INDEX MAP

0 400 800
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
EROSION CONTROL PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

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4300 MarketPointe Dr. #200
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DWG. NO. CS-115

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CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-115.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:24 PM

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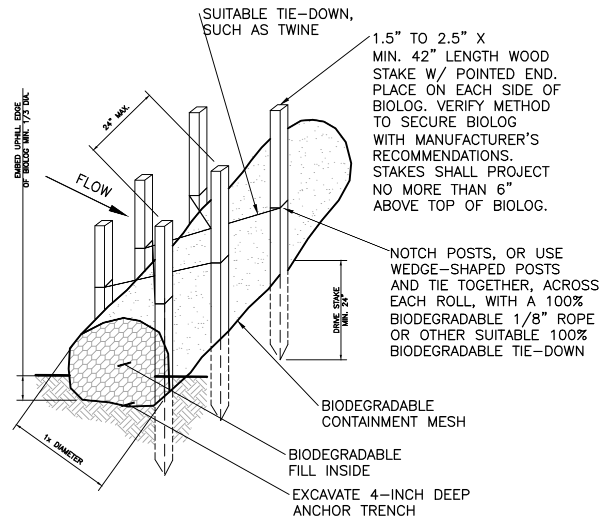
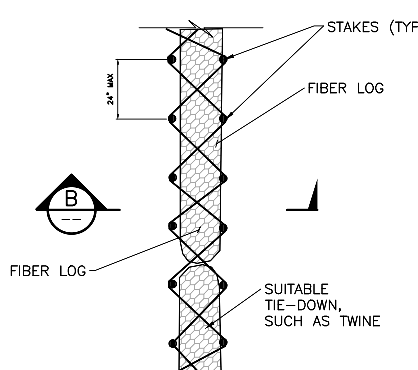


ISOMETRIC VIEW

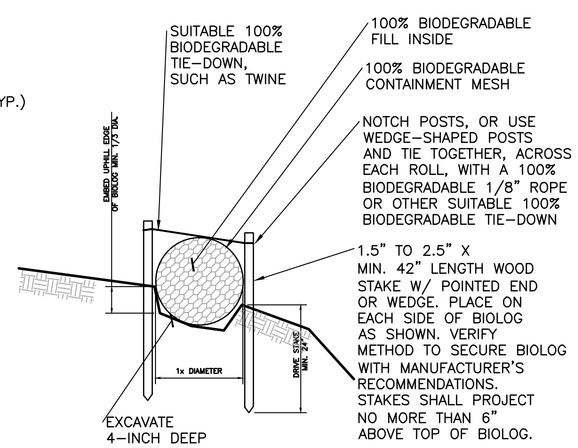
NOTES:

1. 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 100% BIODEGRADABLE.
5. BIOLOG SHALL BE NO LESS THAN 9" IN DIAMETER.

1 DETAIL: SEDIMENT CONTROL LOG
NOT TO SCALE

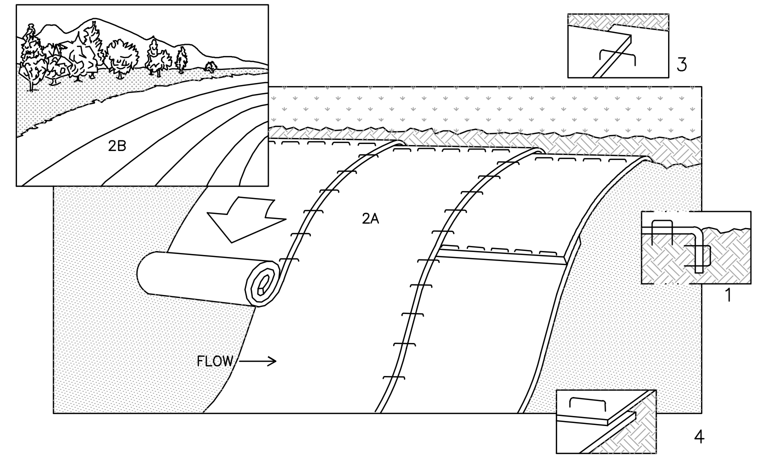


PLAN VIEW B
SINGLE ROW



SECTION VIEW B
SINGLE ROW

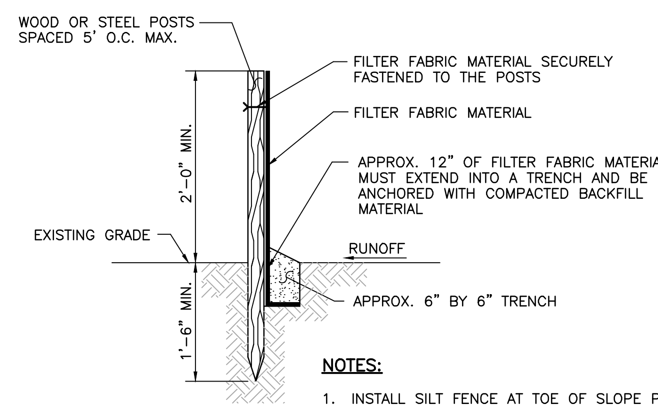
SLOPE INSTALLATION



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.

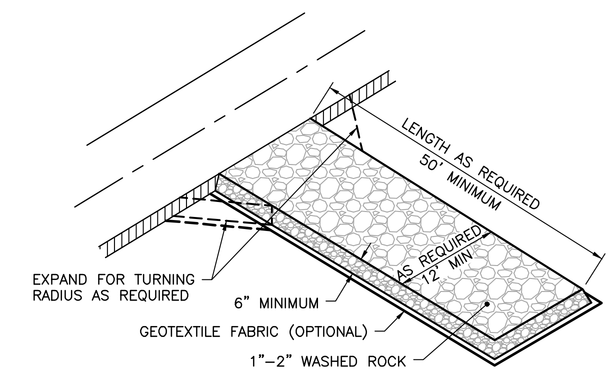
2 DETAIL: EROSION CONTROL BLANKET
NOT TO SCALE



NOTES:

1. INSTALL SILT FENCE AT TOE OF SLOPE PRIOR TO EXCAVATION AND GRADING.
2. MACHINE SLICED SILT FENCE MEETING MnDOT SPECIFICATION 3886.1 ACCEPTABLE.

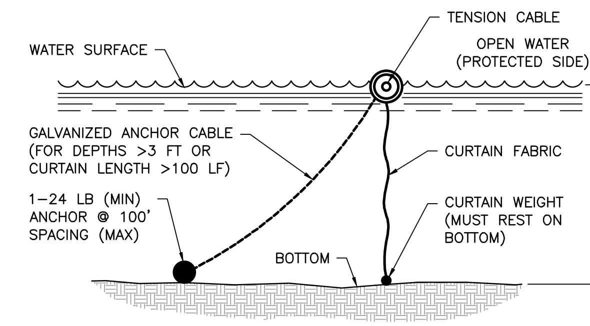
4 DETAIL: SILT FENCE
NOT TO SCALE



NOTES:

1. 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.

3 DETAIL: ROCK CONSTRUCTION ENTRANCE
NOT TO SCALE



NOTES:

1. SILT CURTAIN SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION ACTIVITIES IN AREAS BORDERING OPEN WATER.
2. 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'
4. 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.

5 DETAIL: FLOATING SILT CURTAIN
NOT TO SCALE

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
EROSION CONTROL DETAILS

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PRINTED NAME ____
SIGNATURE ____
DATE ____ LICENSE# ____

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CHECKED: MAJ
BARR PROJECT NO.: 23/69-0862.00
SCALE: AS SHOWN

POLYMET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CS-116
REV 0

CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG-00-CS-116.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:27 PM

INCHES 1 2

1 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)
AITKIN WETLAND MITIGATION SITE, AITKIN COUNTY

PROJECT INFORMATION:
The project is located in the west central portion of Aitkin County in Aitkin and Spencer Townships, approximately three (3.0) miles north of the city of Aitkin, Minnesota. Proposed construction will take place within Sections 1, of Township 47 North, and Range 27 West and Section 6, of Township 47 North, and Range 26 West in Aitkin County, Minnesota. The site lies northeast of the intersection of County State–Aid (CSAH) Highway 1 and CSAH 22 on the southwest corner, north and west of County Road 55, and and south of the Flood Diversion Channel of the Mississippi River. (Latitude: 46.5838, Longitude: –93.6871)

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 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 rip–rap.

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.

REGULATORY CONTEXT:
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 enviromental reviews, endangered or threatened species.

FIGURES:

Site Location and Vicinity Map:	Sheet TS–101
Sheet Existing Conditions Plan:	Sheet CS–101
Site Plan	Sheet CS 102–107
Stormwater Pollution Prevention Plan (SWPPP)	Sheet CS–120
Erosion Control Plan:	Sheet C
Erosion Control Sections and Details:	Sheets C
Erosion and Sedimentation Control Quantities	See Project Bid Form

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IMPLEMENTATION RESPONSIBILITIES:
1. The OWNER and CONTRACTOR are Permittee(s) as identified by the NPDES Permit.
2. CONTRACTOR shall be responsible for all on–site implementation of the SWPPP, including the activities of all of CONTRACTOR's subcontractors.
3. 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 SWPPP.
4. 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.
5. 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
Restored Wetlands by eliminating existing drainage systems.

SEQUENCE OF CONSTRUCTION
The following sequence describes, in general, the work on the site:
1. CONTRACTOR shall submit a detailed construction staging, erosion control staging, and stormwater management plan for the entire project for the duration of construction.
2. CONTRACTOR shall verify that all permits have been obtained and/or obtain the necessary permits.
3. CONTRACTOR shall perform site inspections, record keeping and record retention in accordance with all permits.
4. 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.
5. CONTRACTOR shall perform site grading, excavation, stockpiling work in accordance with the stormwater pollution prevention plan (SWPPP).
6. 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.
7. 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.
8. CONTRACTOR shall replace or repair erosion control and sediment control BMP's that are not functioning properly.
9. CONTRACTOR shall perform site restoration actvitities for permanent vegetative establishment by others and shall seed exposed areas with a temporary cover crop.
10. CONTRACTOR shall remove non–biodegradeable sediment control devices prior to submitting Notice Of Termination (NOT).
11. Submit notice of termination to MPCA within 30 days of final stabilization.

CONSTRUCTION ACTIVITY FIELD REQUIREMENTS:
A. All field requirements shall be perfomed in accordance with the requirements of the NPDES Permit and Stormwater Pollution Prevention Plan (SWPPP).
1. The CONTRACTOR must implement the SWPPP and provide BMPs identified in the SWPPP in an appropriate and functional manner.
2. 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.
3. The CONTRACTOR shall keep and maintain an active rain guage on site to collect and contain daily precipitation events.

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 begins.
2. 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.
3. 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.
4. Temporary or permanent energy dissipation at drainage or pipe outlets must be provided within 24 hours of connecting to a surface water.

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.
2. 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.
3. 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 next precipitation event.
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.
5. 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.
6. 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, mud mats, equivalent system must be installed at active project entrances and near active stockpiles by CONTRACTOR to minimize tracking from site.

D. DEWATERING AND BASIN DRAINING
CONTRACTOR shall be responsible for the following dewatering requirements:
1. No dewatering activities are anticipated with this project.
2. 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.
2. 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.
3. 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.
   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.
4. 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.
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 or sediment logs that are deemed to be nonfunctional within 24 hours of discovery.
7. 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.
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 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 CONTRACTOR.

F. 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, 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.
2. 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 on site to remedy any spills or leaks from equipment on site.
3. In the event of a spill, Contractor must immediately notify the Owner.
4. 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.
5. Concrete washout containment is not expeced to be required on site.
6. Portable toilets brought to the property shall be made secure (anchored) to prevent spillage from vandalism or other accidental spillage of internal liquids.

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.

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:
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 place if indicated by the plan.
4. Removal of sediments from storm water conveyances and permanent water quality basins.

CHANGES TO SWPPP
– 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 whenever:
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 the terms and conditions of this permit.
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 (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:

PREPARED BY:	TRAINING/CERTIFICATION	
Tom Tri, Senior Env. Scientis	Date of Training/Certification:	January, 2005
Water Resources	Certification Program:	University of Minnesota
Barr Engineering Company		Design of SWPPP – Mn/DOT, Arden Hills
ttri@barr.com	Recertification:	May 7, 2014
218–529–8226	Certification 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:

RESPONSIBLE PERSONS IS PENDING CONTRACTOR SELECTION

OWNER:

Polymet Mining Corporation

6500 County Road 666
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218–471–2150

CONTRACTOR:

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Mobile Phone: (612) 685–4303

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On–Site Representative

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Phone: (218)

OWNER'S REPRESENTATIVES

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Mobile:

VER NO	DATE	DESCRIPTION
.	.	.

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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.

PRINTED NAME ______
SIGNATURE ______
DATE ______ LICENSE# ______

DRAWN: ATD
CHECKED: .
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

AITKIN WETLAND RESTORATION PLAN
STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4300 MarketPointe Dr. #200
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. CS–117
REV 0

CADD USER: Andrew T. Dillon FILE: K:\DESIGN\23690C29.99\MISC_NMG–00–CS–120.DWG PLOT SCALE: 1:2 PLOT DATE: 5/23/2016 2:28 PM

INCHES

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

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
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Monitoring Plan for Potential Indirect Wetland Impacts

February 2016

Contents

List of Large Figures

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 pre-project 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., 285º).

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
    - 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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4. —. NorthMet Project Wetland Management Plan (v7). January 2015.

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8. —. Addendum to Wetland Hydrology Monitoring Plan. May 13, 2008.

9. —. Addendum to Wetland Hydrology Study Plan. April 12, 2010.

10. —. Wetland Hydrology Monitoring Report 2007-2009. March 2010.

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12. —. Potential Indirect Wetland Impact Vegetation Monitoring Plan Memorandum to Steve Eggers (USACE), Colleen Allen (MNDNR). Prepared for Poly Met Mining Inc. NorthMet Project. June 8, 2015.

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14. **Eggers, S.D. and D.M. Reed.** Wetland Plants and Communities of Minnesota and Wisconsin: Third Edition. *US Army Corps of Engineers.* [Online] 2011. http://www.myp.usace.army.mil/docs/wetlands/Cover.pdf.

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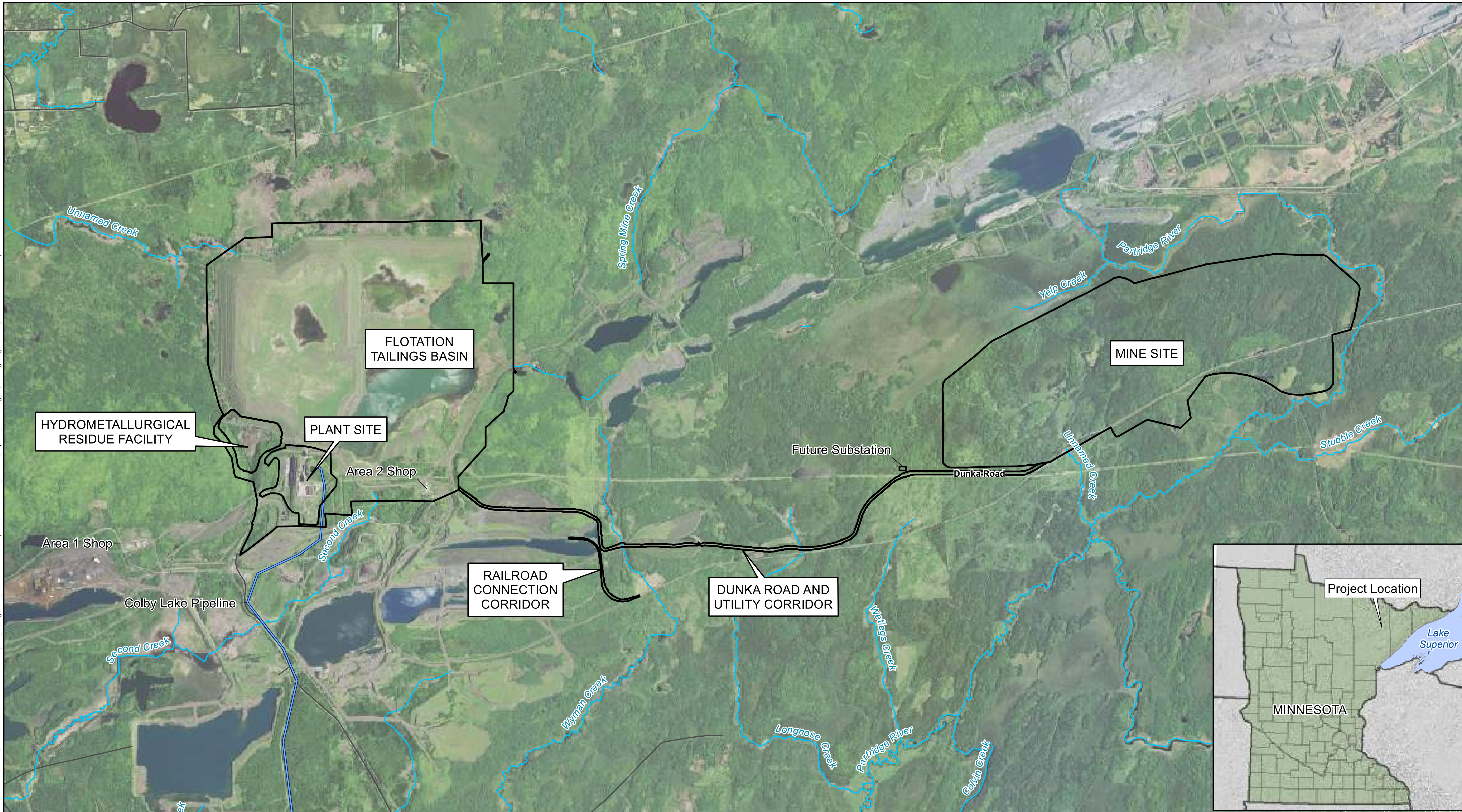
Large Figures



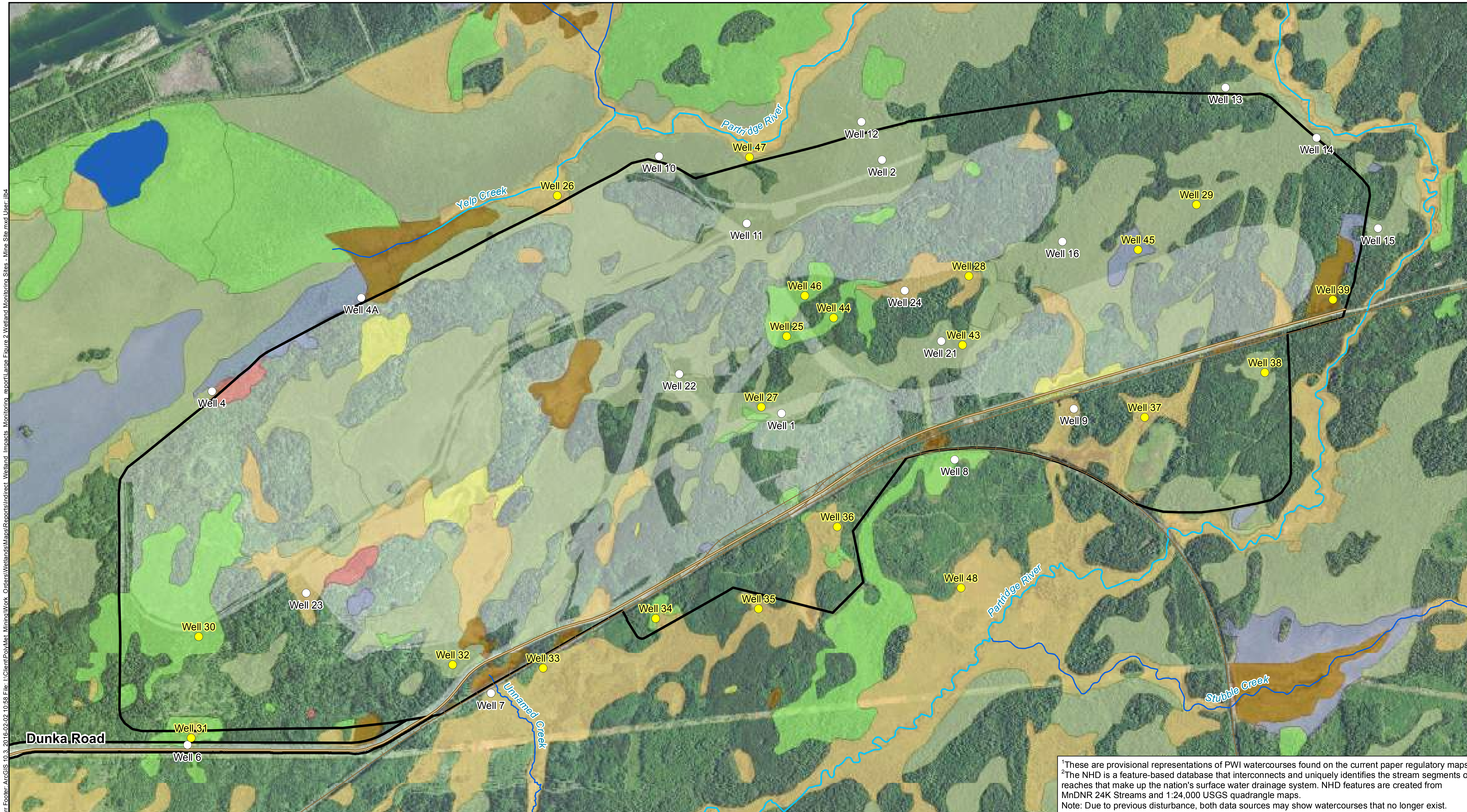
Project Areas

Rivers & Streams

0 2,250 4,500 9,000

Feet

Large Figure 1
PROJECT LOCATION
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, Minnesota



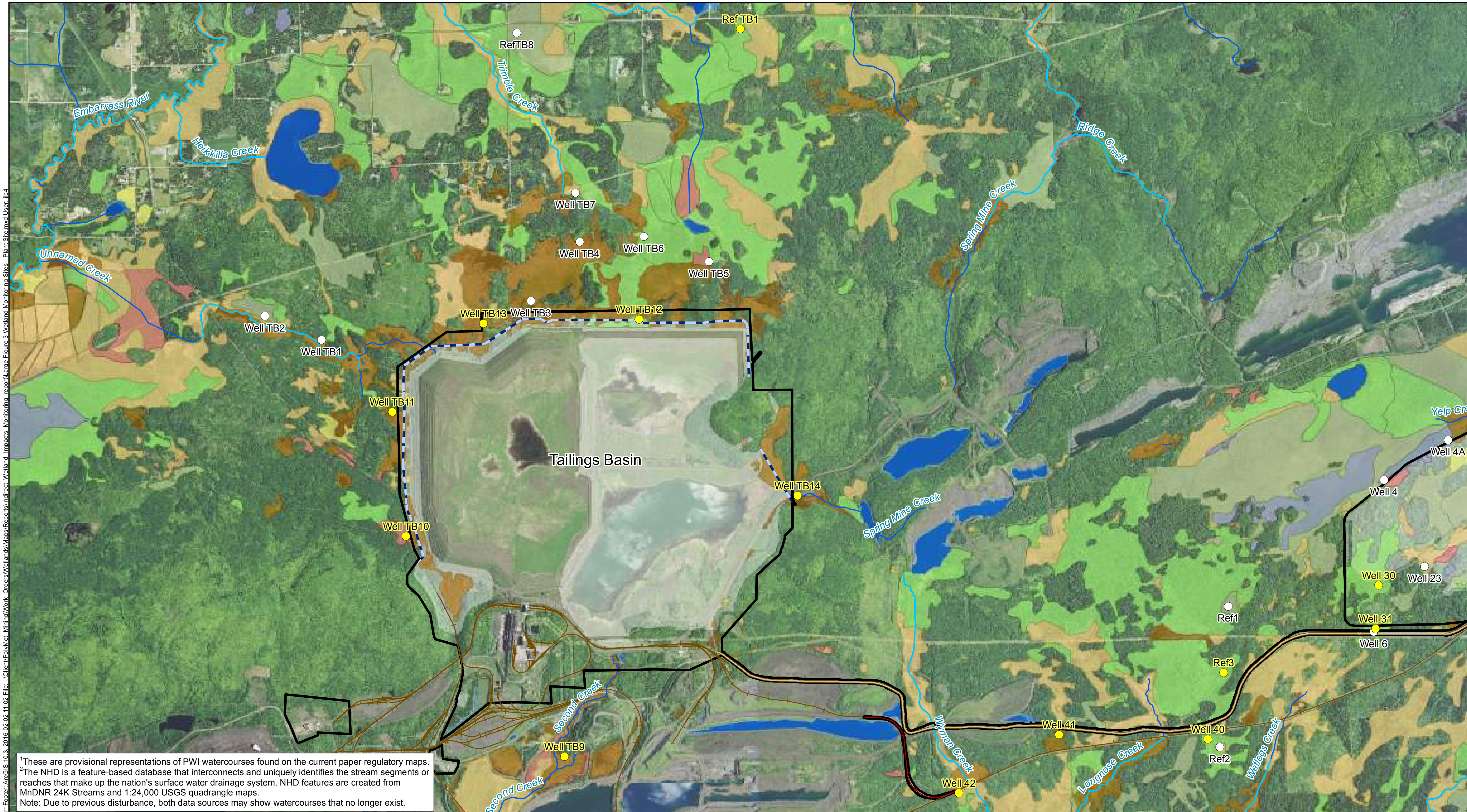
Wetland Hydrology Monitoring Locations
- Installed Prior to 2014
- Installed in 2014
- Dunka Road
- Railroads

Public Waters Inventory (PWI) Watercourses[1]
National Hydrography Dataset (NHD) Rivers & Streams[2]
Project Areas
Areas Disturbed by Proposed Project Features

Eggers & Reed Wetland Types
- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

0 750 1,500 3,000
Feet

Large Figure 2
MONITORING FOR POTENTIAL INDIRECT IMPACTS - HYDROLOGY AND VEGETATION
MINE SITE
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



[1]These are provisional representations of PWI watercourses found on the current paper regulatory maps.
[2]The NHD is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from MnDNR 24K Streams and 1:24,000 USGS quadrangle maps.
Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

Wetland Hydrology Monitoring Locations
- Installed Prior to 2014
- Installed in 2014
- Dunka Road
- Existing Private Railroad
- Proposed Railroad Track
- FTB Containment System
- Public Waters Inventory (PWI) Watercourses[1]
- National Hydrography Dataset (NHD) Rivers & Streams[2]
- Project Areas
- Areas Disturbed by Proposed Project Features

Eggers & Reed Wetland Types
- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

N

0 1,750 3,500 7,000
Feet

Large Figure 3
MONITORING FOR POTENTIAL INDIRECT IMPACTS - HYDROLOGY AND VEGETATION
PLANT SITE AND TRANSPORTATION AND UTILITY CORRIDOR
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Appendix 18.2 Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Twin Cities Field Office
4101 American Boulevard East
Bloomington, Minnesota 55425-1665
Phone: (952) 252-0092 Fax: (952) 646-2873

February 5, 2016

Superior National Forest
Brenda Halter
Forest Supervisor
8901 Grand Avenue Place
Duluth, Minnesota 55808-4300

FWS No. 03E19000-2016-B-0001 Proposed NorthMet Project and Land Exchange

Dear Ms. Halter:

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-eared bat (*Myotis septentrionalis*). The April 2015 Biological Assessment (BA) was submitted to the Service on August 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 commercial 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.mil)

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.

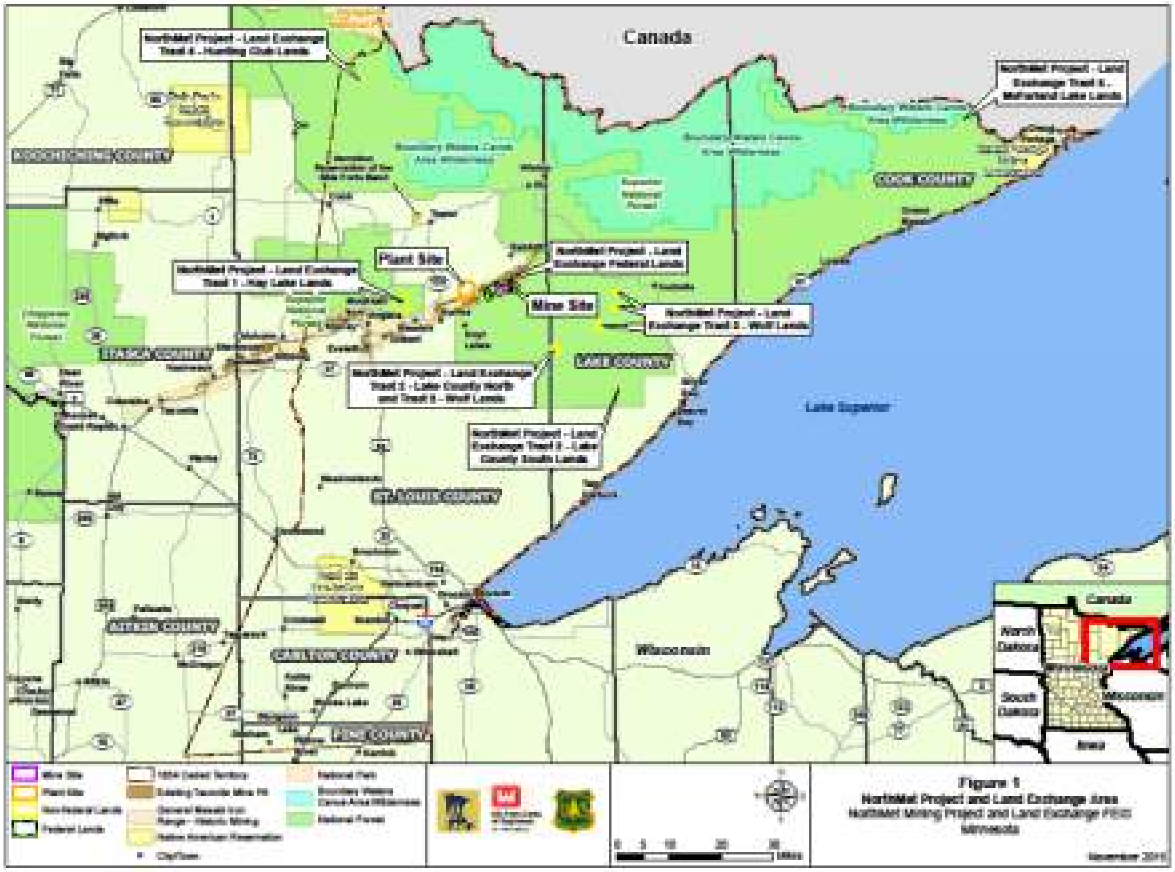

Figure 1. PolyMet NorthMet Project and Land Exchange Area in Northeastern Minnesota (2015 FEIS, Figure 1, p. ES-5).

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 non-federal 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).

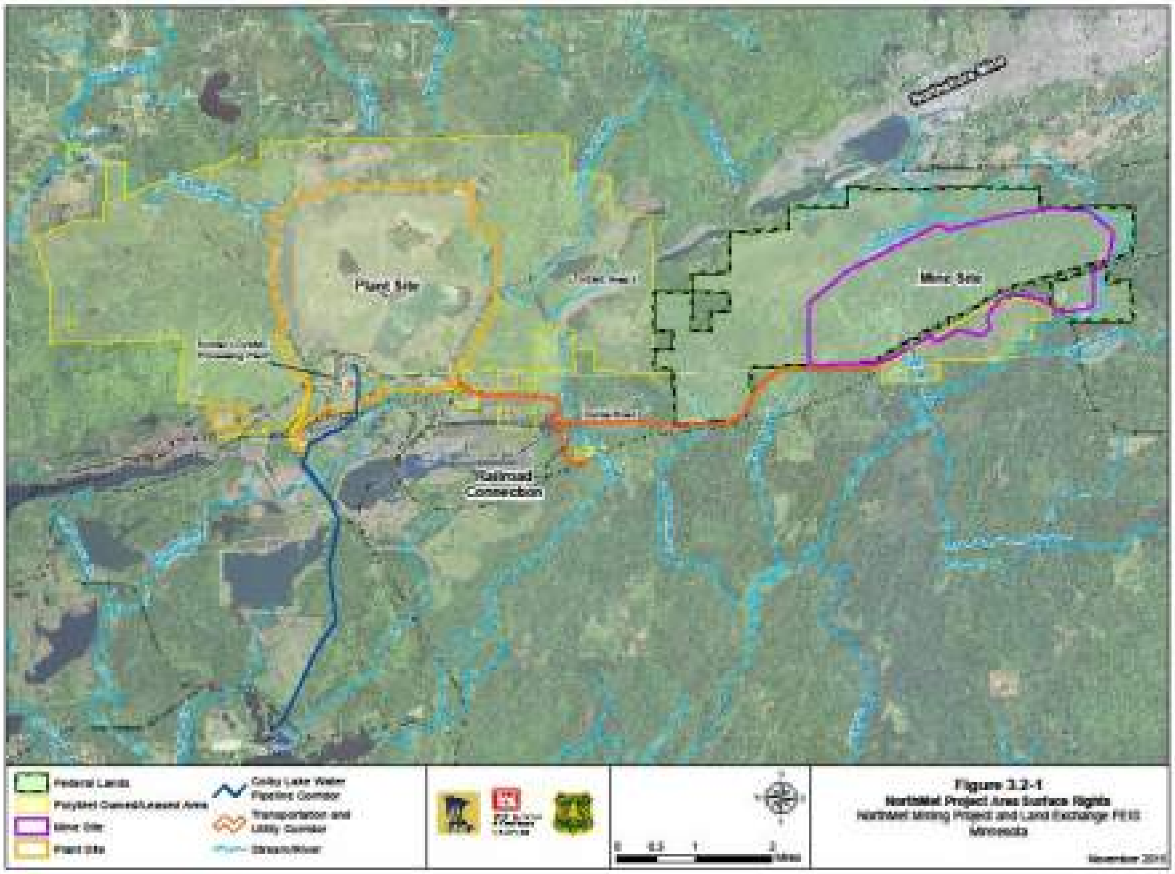

Figure 2. PolyMet Mine and Plant Site Locations (2015 FEIS, Figure 3.2-1, p. 3-9).

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.

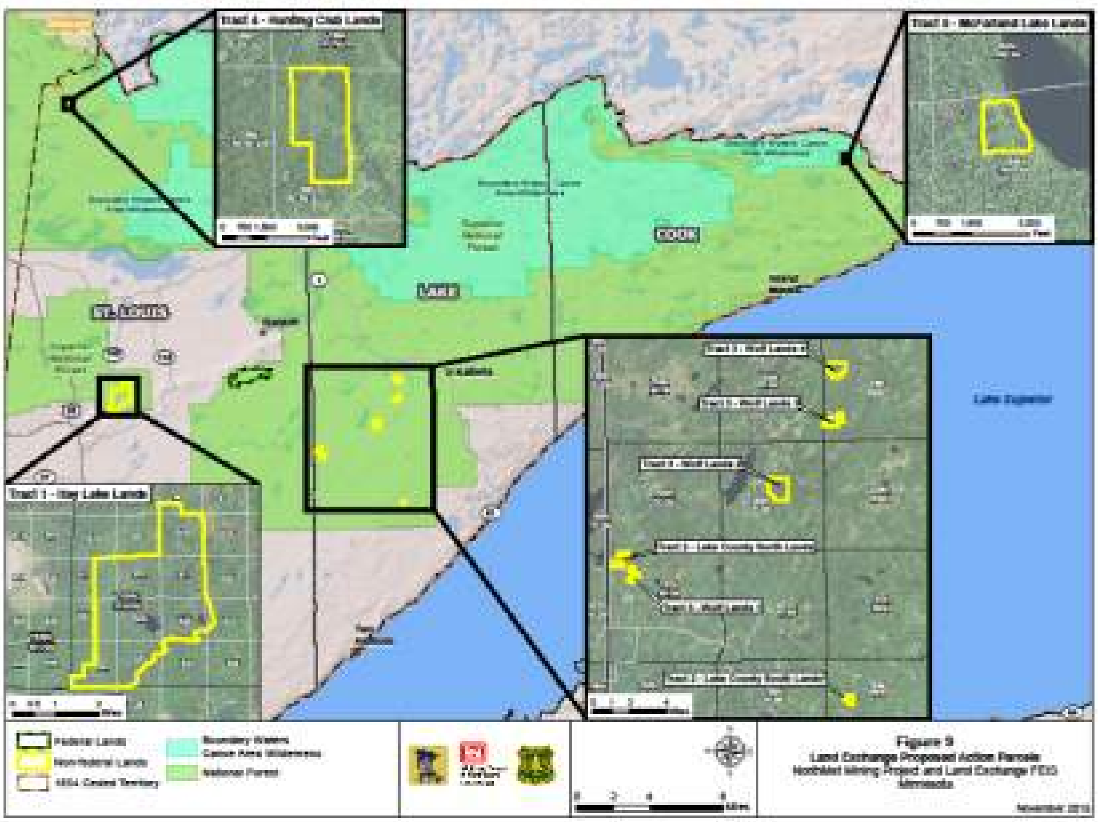

Figure 3. Non-federal Land Exchange Parcel Locations (2015 FEIS Figure 9, p. ES-33).

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 forest[1] habitat. In the northeastern U.S., lynx were most likely to occur in areas containing suitable habitat that were greater than 40 square miles (mi^2) (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 mi^2 (28 and 521 km^2), and female home ranges varied between 2 and 37 mi^2 (5 and 96 km^2) (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

[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 km^2 (39 mi^2) (Hoving 2001). Studies in the southern portion of the species' range have found average home ranges of 151 km^2 and 72 km^2 (58 and 28 mi^2) 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 (m^2) (215 ft^2) 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 mi^2 (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 mi^2 (100,891 km^2) 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 mi^2 (20,899 km^2) 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.

[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.

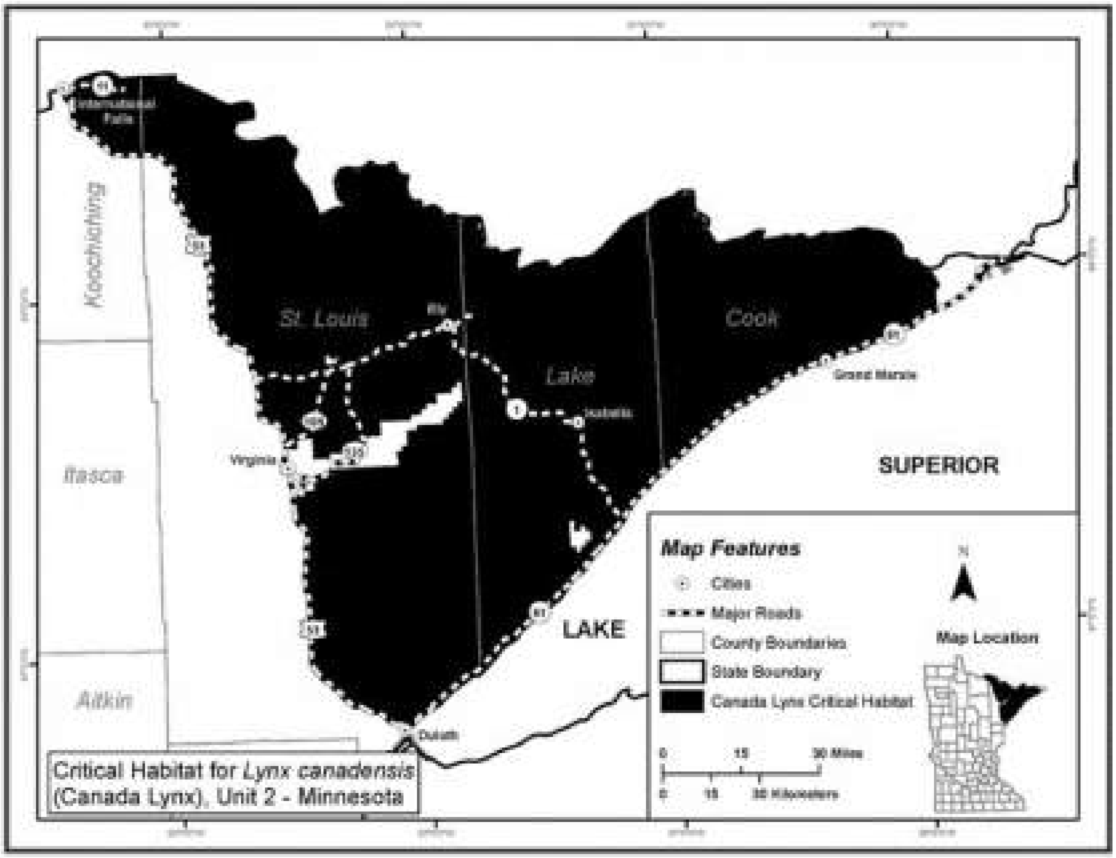

Figure 4. Unit 2 - Designated Critical Habitat for Lynx in Minnesota.

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 mi^2 (50 to 550 km^2). Midwest wolf packs tend to occupy territories on the lower end of this size range. Minnesota territory size, for example, averaged 39 to 40 mi^2 (102 km^2) (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/mi^2 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 mi^2 (3.2 wolves per 100 km^2) 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 mi^2 (70,579 km^2) 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 mi^2 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).

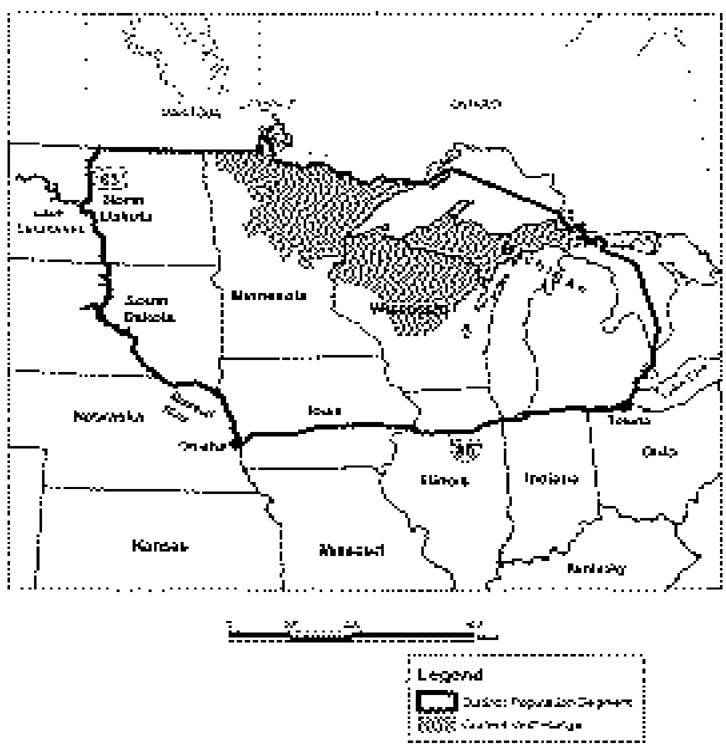

Figure 5. Gray Wolf Range in the Western Great Lakes DPS (76 FR 81671).

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 state-wide, of which Zones 1, 2, and 3 are considered critical habitat and cover 9,845 mi^2 (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 habitat[3] 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 non-reproductive 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).

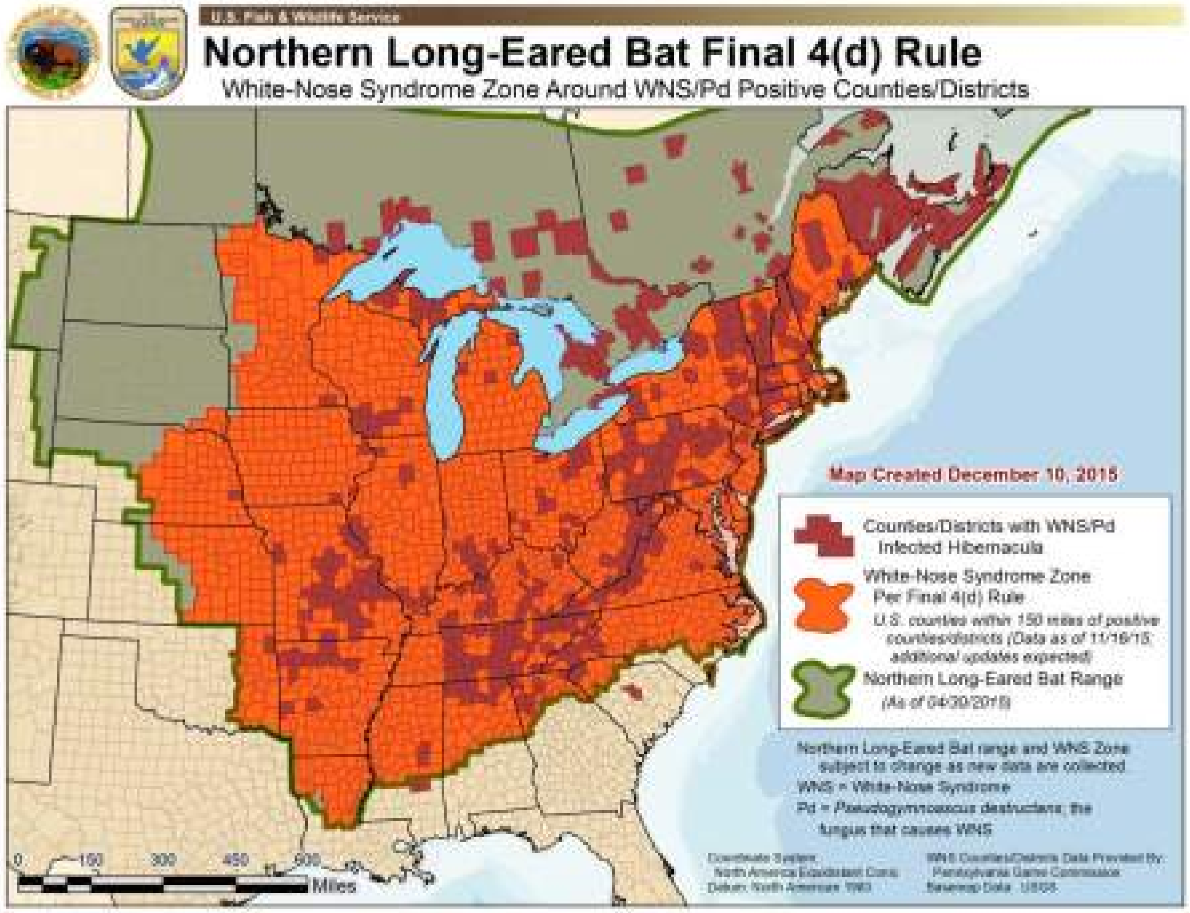

Figure 7. Northern Long-eared Bat Range and Current Zone of White-nose Syndrome.

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, on-going 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.)

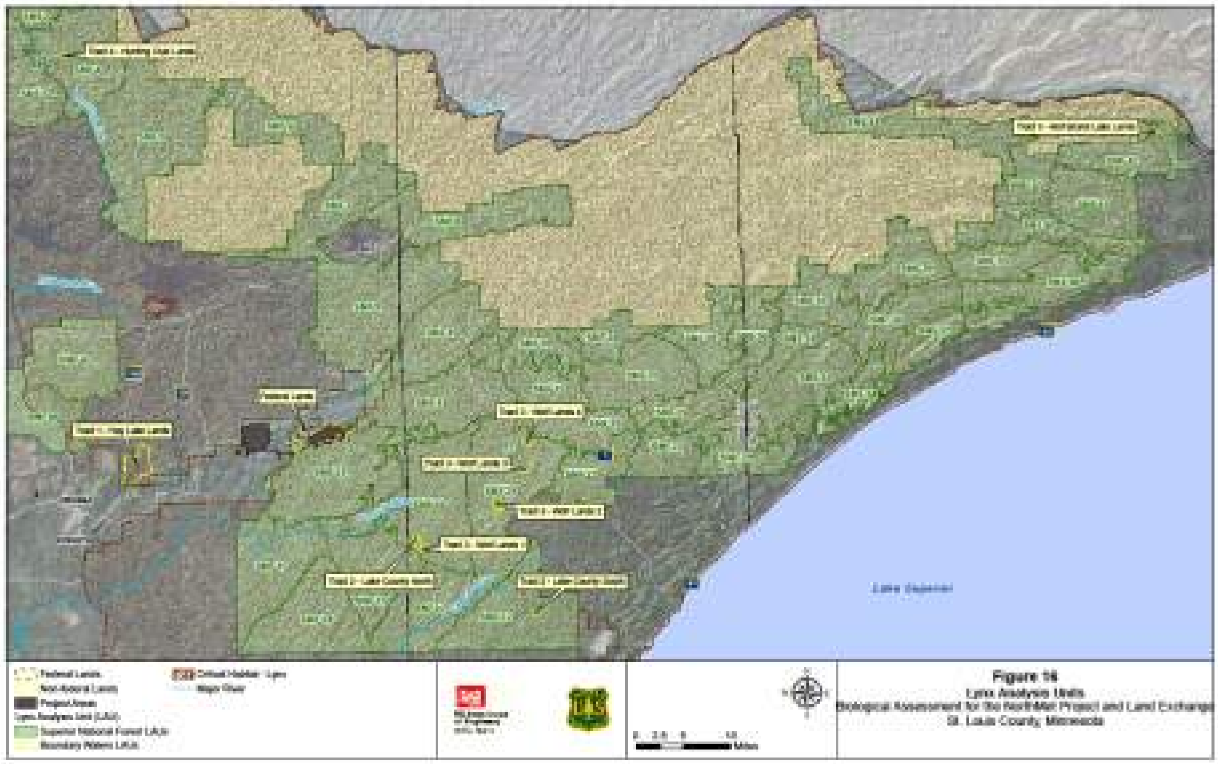

Figure 8. Lynx Analysis Units on the Superior National Forest (from BA Figure 16, p. 6-15).

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 mi^2 (26 to 39 km^2) (Mech 2004, 2006, 2008). Aerial survey results from radio-collared and non-radio-collared wolf packs in a large area (795 mi^2; 2,060 km^2) of the central Superior National Forest during winter 2003-2004 estimated that about 62 wolves were present, or 7 wolves per 100 mi^2 (259 km^2), or 0.7 wolf per 10 mi^2 (26 km^2) (Mech 2004). Using the same methodology during the winter of 2007-08, aerial survey results identified approximately 82 wolves present in a 795 mi^2 (2,060 km^2) area of the central Superior National Forest, or about 1 wolf per 10 mi^2 (26 km^2) (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 mi^2 (12,141 km^2), 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 (Anabat™), 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 mi^2 (0.84 km per km^2), 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/mi^2 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/$mile^2$. 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 mi^2 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

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

** 197 acres are upland

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 dBA[3].

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 dBL[4] 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 mi^2 to 83 mi^2 (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 mi^2), the habitat loss equals approximately 7 percent of an 83 mi^2 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 mi^2 (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.

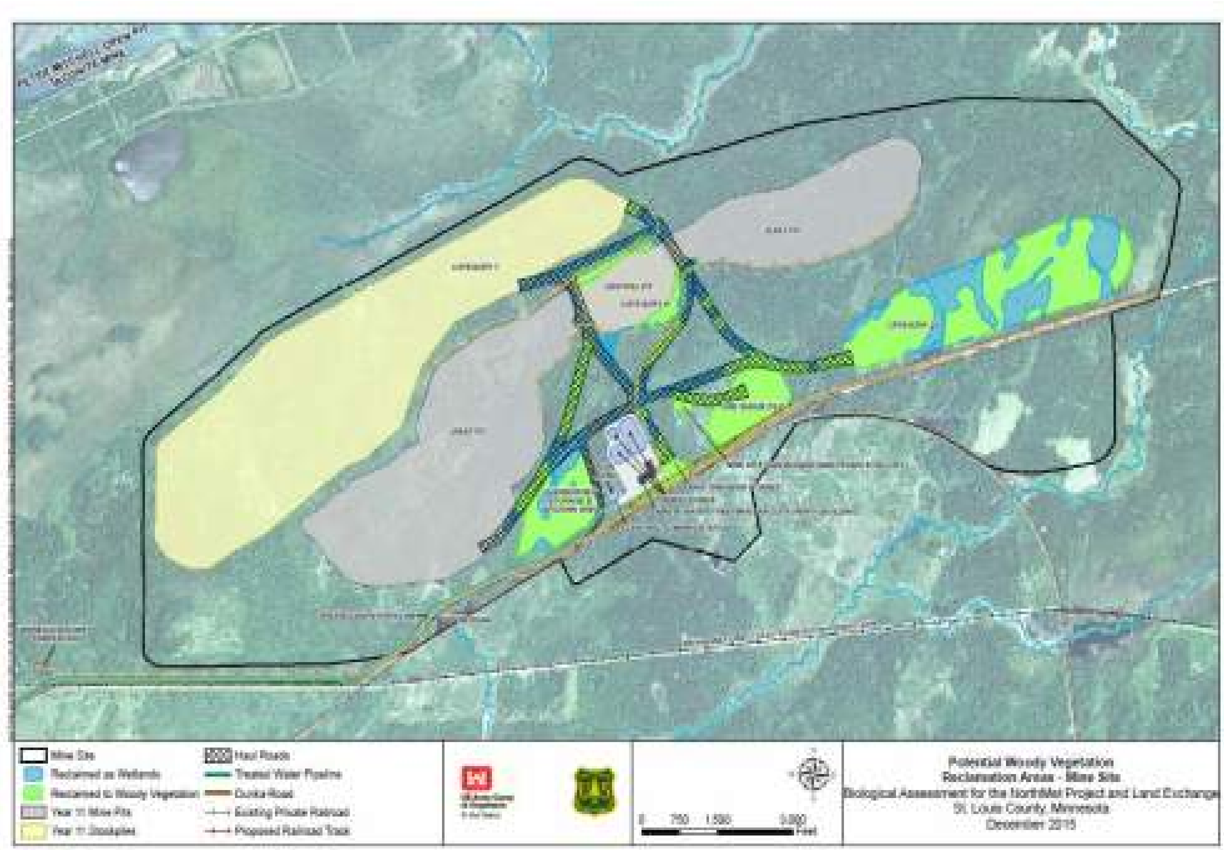

Figure 9. Reclamation areas with potential woody vegetation (PolyMet December 2015).

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.

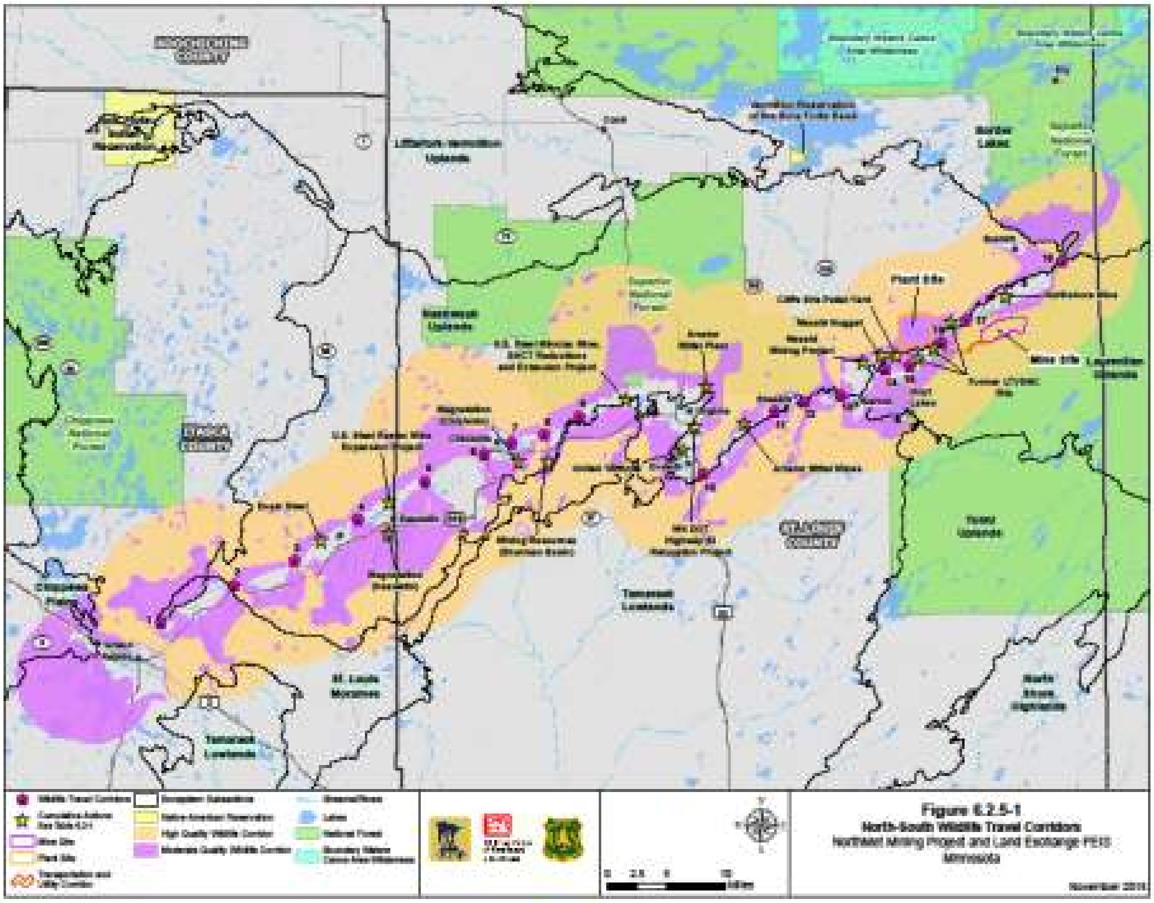

Figure 10. Wildlife travel corridors (from FEIS, Figure 6.2.5-1, p. 6-75).

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/mi^2, and at just the Mine Site, is 0.5 mi/mi^2. 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/mi^2 are best for wolf survival (Wydeven et al. 2001; Wydeven and Wiedenhoeft 2001), although wolves may tolerate road densities up to 1.2 mi/mi^2 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 highway-caused 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 long-eared 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. <u>This information shall be retained in all vehicles and appropriate rail cars that will be driven in association with the proposed PolyMet project</u>. 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 no later than January 31 of the following calendar year until all project activities are complete.

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 long-eared bat within the action area.

CR 5. Manage forests to ensure a continual supply of snags and other suitable northern long-eared 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 mine-related 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/mi^2 (0.3 lynx per km^2). Wolf density in Minnesota is 1.2 per 100 mi^2 or 0.012 per mi^2 (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 mi^2 (or 0.012 per mi^2), 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 mi^2 area (27,537 km^2), or 1 lynx per 43 mi^2 – approximately double the BA's estimate, or 0.023 lynx per 1 mi^2 for purposes of this analysis. We use the Erb et al. (2015) wolf density of 1.2 wolves per 100 mi^2 (3.2 wolves per 100 km^2) in Minnesota, or 0.012 per mi^2.

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 (PolyMet)	Propor-tion Traff Vol	XX	Adj Density: Lynx (Moen/ ENSR) and Wolf	Mortality Rate: Lynx (Moen/ ENSR) and Wolf	Transportation 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 2.0	0.0038/ 0.002 0.002	12	0.0456/0.024 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%

Field Definitions and Calculations (***** 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/mi^2 and wolf/mi^2)
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.