Water Appropriations Consolidated Permit Application

Individual Non-Irrigation

Prepared for
Poly Met Mining, Inc.



July 2016

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4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
952.832.2600
www.barr.com

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List of Acronyms and Abbreviations

Acronym or Abbreviation	Description
BIF	Biwabik Iron Formation
CE	Cliffs Erie, LLC
CPS	Central Pumping Station
CWMP	Comprehensive Water Management Plan
FEIS	Final Environmental Impact Statement
FTB	Flotation Tailings Basin
General Permit	Water Appropriations General Permit for Temporary Projects (Permit #1997-0005)
GPM	Gallons per Minute
HRF	Hydrometallurgical Residue Facility
Individual Permits	Individual Non-Irrigation Water Appropriations Permits
LTVSMC	LTV Steel Mining Company
MDNR	Minnesota Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standard
Project	NorthMet Project
PolyMet	Poly Met Mining, Inc.
SDS	State Disposal System
SWPPP	Stormwater Pollution Prevention Plan
USGS	U.S. Geological Survey
WWTF	Waste Water Treatment Facility
WWTP	Waste Water Treatment Plant

1.0 Introduction

Poly Met Mining, Inc. (PolyMet) is proposing to develop the NorthMet Project (Project) copper-nickel-platinum-group elements (PGE) mine and associated processing facilities. The Project is described in the NorthMet Mining Project and Land Exchange Final Environmental Impact Statement (FEIS) (Reference (1)). The Project is located south of the city of Babbitt and north of the city of Hoyt Lakes in St. Louis County, Minnesota, as shown on Large Figure 1.

The Project consists of the Mine Site, the Plant Site, and the Transportation and Utility Corridors that connect them. The Mine Site is a greenfield site that will be developed into an open pit mine and is located approximately six miles south of the city of Babbitt and two miles south of the Northshore Mining Company's active, open pit taconite mine (known as the Peter Mitchell Mine). Development of the Mine Site for the Project will include construction of new facilities, including mine pits, ore handling facilities, waste rock stockpiles, an overburden storage area, mine water management systems, a Waste Water Treatment Facility (WWTF), and supporting infrastructure. The Plant Site, located west of the Mine Site, is a brownfield site, including a former taconite process plant and tailings basin previously operated by LTV Steel Mining Company (LTVSMC). Redevelopment of the Plant Site for the Project will include refurbishment of former LTVSMC processing facilities and construction of new facilities. Plant Site features will include a Beneficiation Plant, a Hydrometallurgical Plant, other processing facilities, a Flotation Tailings Basin (FTB), a Hydrometallurgical Residue Facility (HRF), a Waste Water Treatment Plant (WWTP), a Sewage Treatment System, and other ancillary facilities (e.g., Colby Lake water pipeline). The Beneficiation Plant will produce Flotation Tailings throughout the 20 years of ore processing. Flotation Tailings, which are the materials remaining after metallic sulfide minerals are liberated from the finely ground ore in the flotation process, will be deposited in the FTB, which will be placed on top of a portion of the existing former LTVSMC tailings basin. In this permit application, 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. The Mine Site and the Plant Site are connected by approximately 7- to 8-mile-long Transportation and Utility Corridors, which will include new and upgraded infrastructure to link activities at the Mine Site and Plant Site. The location of the Project is shown in Large Figure 1.

This document presents the information required by the Minnesota Department of Natural Resources (MDNR) for the issuance of five Individual Non-Irrigation Water Appropriations Permits (Individual Permits) to PolyMet for the Project. Application forms are included in Appendix A. To provide context, this document also describes the overall Project water appropriations permitting approach. Separately from this application, PolyMet will request MDNR approval for transfer of an existing permit for water appropriation from Colby Lake (Permit #49-135).

As shown on Large Figure 1, portions of the Project are located within the municipal boundaries of both Hoyt Lakes and Babbitt; therefore, copies of this application has been submitted to both of these cities and the North St. Louis Soil and Water Conservation District, as required by Minnesota Rules, subpart

3(D). Cover letters documenting these submittals are included in Appendix B, and an affidavit will be submitted separately to the MDNR to document the mailing of these copies.

The Project will include four phases:

- Pre-operation construction, which will last for approximately 18 to 24 months, will include temporary dewatering for construction of infrastructure and engineering controls, and for overburden stripping in preparation for mining.
- Operation, which will last approximately 20 years, will include dewatering of the mine pits, and dewatering for operation of engineering controls.
- Reclamation, which will take place after mining ceases, will include pumping water from the mine pits, treating it, then returning it to the pits, in order to improve water quality in the flooded pits.
- Long-term closure, which will last for an unknown duration, does not include water appropriations.

This application for Individual Permits provides information on expected appropriations schedules and rates from the pre-operation construction phase through the operation phase. The planned permit coverage is based on current estimates of water flow rate and duration. If water flow rate or duration differs from what is expected to the extent that a change in water appropriation permit coverage is required, PolyMet will apply for amendments or additional permit coverage, as required.

Appropriations from the mine pits will continue, subject to applicable permit terms, into the reclamation phase. If appropriations sources, rates, or quantities change substantially during reclamation, PolyMet will apply for amendments or additional permit coverage, as required.

The outline of this application is:

Section 1.0	Provides an introduction and outline of this application document.
Section 2.0	Summarizes the statute and rule requirements related to water appropriation and the applicability of those requirements to the Project.
Section 3.0	Describes the overall Project water appropriations permitting approach, the Project water conservation and reuse strategy, and the water that will be released from the Project.
Section 4.0	Provides information on location and ownership of proposed appropriation locations.
Section 5.0	Describes the need for the appropriations and establishes that the appropriations are reasonable and practical, including information on proposed pumping rates, schedules and volumes.
Section 6.0	Provides the additional information required for dewatering.

Section 7.0	Provides the additional information required for appropriations associated with mining. Addresses certain Individual Permit requirements common to the Mine Site and Plant Site.
Section 8.0	Describes the Project's compliance with groundwater sustainability and water supply management requirements.
Section 9.0	Presents the proposed water appropriations monitoring plan.
Section 10.0	Lists references.

2.0 Regulatory Context

"Waters of the state," which include both surface water and groundwater, may not be appropriated without a water use (or "appropriation") permit from MDNR except in limited circumstances (Minnesota Statutes section 103G.271, subdivision 1). Chapter 103G of the Minnesota Statutes and Chapter 6115 of the MDNR's rules set forth the requirements for appropriating waters of the state. Appropriation is broadly defined as the "withdrawal, removal, or transfer of water from its source regardless of how the water is used" (Minnesota Statutes, section 103G.005, subdivision 4). Types of withdrawals that do not require an appropriation permit include:

- withdrawals of less than 10,000 gallons per day and totaling no more than 1 million gallons per year (Minnesota Rules, part 6115.0620(C))
- recapture of water that has been previously appropriated, such as collection of tailings basin seepage by the FTB Seepage Containment System (Minnesota Rules, part 6115.0620(E))
- management of stormwater, which does not meet the definition of "waters of the state[1]" because it is "… spread and diffused over the land" (Minnesota Rules, part 6115.0630, subpart 18)
- test pumping of a groundwater source (Minnesota Rules, part 6115.0620(B)

MDNR rules require permit applications for each non-exempt surface or groundwater "source" from which water is proposed to be appropriated (Minnesota Rules, part 6115.0660, subpart 1). The term "source" is not expressly defined in the applicable statute or rule, however prior MDNR practice has been to treat each mine pit as a "source." Two forms of appropriation permit coverage are available: individual appropriations permits and General Permits (e.g. Temporary Projects General Permit 1997-0005). Individual appropriations permits are required for users withdrawing more than 10,000 gallons of water per day or greater than one million gallons per year for agricultural, irrigation, and non-irrigation purposes (Minnesota Rules, part 6115.0620). PolyMet is not applying for coverage under the Temporary Projects General Permit.

Requirements for appropriations under Individual Permits vary depending on the type of source (surface water or groundwater) and the purpose of the appropriation (irrigation, public water supply, dewatering, and mining) (Minnesota Rules, part 6115.0660 – .0720). Key regulatory requirements for Individual Permits include the following:

- All permit applications must provide the information specified in Minnesota Rules, part 6115.0660.
- Minnesota Rules, part 6115.0670 identifies review and analysis that MDNR must conduct with respect to each permit application.

[1] "Waters of the state" means "any waters, surface or underground, except those surface waters which are not confined but are spread and diffused over the land" (Minnesota Rules, part 6115.0630, subpart 18).

- Applications for permits for dewatering and permits for appropriations related to mining and mineral processing are subject to additional requirements and substantive standards (Minnesota Rules, part 6115.0720).

- Monitoring and recordkeeping is required under all permits. The quantity of water appropriated must be recorded, and for appropriations of groundwater, water levels must be monitored. (Minnesota Rules, part 6115.0750, subpart 3).

- Appropriations of groundwater must comply with the groundwater sustainability standard (Minnesota Statutes, section 103G.287, subdivision 5).

- Appropriations that involve "consumptive uses" above specified volumes must comply with water supply management requirements (Minnesota Statutes, section 103G.265, subdivisions 3 and 4).

There are two other regulatory elements concerning PolyMet's water appropriation proposal. First, Minnesota Statutes, section 103G.271, subdivision 7 and the applicable regulations authorize assignment of existing permits. PolyMet intends to obtain a transfer of Permit No. 49-135 from Cliffs Erie, L.L.C. (CE) as authorized by Minnesota law and contemplated by PolyMet's agreement with CE. PolyMet will proceed with this permit transfer under separate communications with MDNR.

Second, some of the water withdrawn by PolyMet will be used to augment streamflow, to avoid ecologic and hydrologic impacts. These activities will be monitored and reported under MDNR's water appropriation permit requirements under Minnesota Rules, chapter 6115; however, they are a topic for interagency co-ordination because they also have implications under Minnesota Pollution Control Agency's (MPCA) water quality protection requirements under Minnesota Rules chapters 7050 and 7052.

3.0 NorthMet Water Appropriations Overview

PolyMet will pump groundwater to mine ore, operate engineering controls, and construct buildings and other infrastructure that extend below the water table. PolyMet will also pump surface water from Colby Lake when make-up water is needed for mineral processing. The Project Water Management Plans (Reference (2) and Reference (3)) emphasize conservation and reuse. Water appropriated for mining activities will be used as process water for the Beneficiation Plant to the extent possible, minimizing the amount of make-up water that will be needed from Colby Lake, and minimizing the amount of appropriated water that may be released off-site. Excess water from the Project will be treated at the Plant Site WWTP, then discharged to Trimble Creek, Unnamed Creek, and Second Creek. Discharge quality will meet applicable effluent limits and surface water quality standards, and discharge quantity will be managed to meet the zero discharge requirements of the New Source Performance Standard (NSPS),[2] and to minimize ecologic and hydrologic impacts to the receiving waters.

The following subsections present an overview of the NorthMet water appropriations permitting approach, summarize the Project water conservation and reuse strategies and methods, describe Project discharges, and present Project plans for stream augmentation.

3.1 Water Appropriations Permitting Approach

The overall Project water appropriations permitting approach is as follows:

- Obtain coverage under Individual Permits for all withdrawals that require a water appropriations permit.
- Request MDNR approval of a transfer to PolyMet of the interest in the existing Colby Lake water appropriations Permit #49-135 that is currently held by Cliffs Erie, LLC (under separate communications).

Large Figure 2 and Large Figure 3 present flow diagrams of anticipated permitted Project water appropriations during the pre-operation construction phase and operation phase, respectively.

3.1.1 Individual Permits

This consolidated application is for five Individual Permits: one permit for each of the three mine pits, one for dewatering during construction and operations of Mine Site Infrastructure, and one for dewatering during construction and operations of Plant Site Infrastructure. Individual Permit application forms are included in Appendix A. Application information required by Minnesota statutes and rules, as described in Section 2.0, is provided in Sections 4.0 through 7.7 of this application document. The five Individual Permits are summarized in Table 3-1.

[2] 40 C.F.R., section 440.104.

Table 3-1 Summary of NorthMet Individual Permits

Individual Permit	Location	Dewatering Activities	Dewatering Time Frame	Form Number
East Pit	Mine Site	• overburden stripping • pit dewatering	Pre-operation construction phase to Mine Year 20	1
Central Pit	Mine Site	• overburden stripping • pit dewatering	Operation phase (Mine Year 11 to 20)	2
West Pit	Mine Site	• overburden stripping • pit dewatering	Operation phase (Mine Year 2 to 20)	3
Mine Site Infrastructure	Mine Site	• temporary construction dewatering • Category 1 Stockpile Groundwater Containment System operation • Stockpile underdrain operation (if needed)	Pre-operation construction phase to Mine Year 20	4
Plant Site Infrastructure	Plant Site	• temporary construction dewatering • Hydrometallurgical Residue Facility (HRF) wick drain operation (if needed)	Pre-operation construction phase to Mine Year 20	5

3.1.2 Exempt Sources

Several Project water withdrawals will be exempt from water appropriations permitting requirements. As listed in Table 3-2, exempt sources involve management of stormwater, non-mechanical dewatering, and collection of previously appropriated water.

Table 3-2 NorthMet Sources That Do Not Require a Water Appropriations Permit

Water Source	Location	Appropriations Period	Source Water	Rationale
Test pumping during installation of groundwater monitoring wells	Mine Site and Plant Site	Pre-operation construction	Groundwater	Exempt in rule (Minnesota Rules, part 6115.0620(C)
Stormwater pumped/diverted from construction areas	Mine Site and Plant Site	Pre-operation construction, and construction during operation	Stormwater	Stormwater is an exempt source
Mine water collection on lined or compacted features (e.g., waste rock stockpiles, ore surge pile, haul roads)	Mine Site	Operation	Stormwater	Stormwater is an exempt source
Flotation Tailings Basin (FTB) seepage capture systems	Plant Site	Operation	Tailings basin seepage	Previously appropriation water
Hydrometallurgical Residue Facility (HRF) drainage collection system	Plant Site	Operation	HRF drainage	Previously appropriation water

3.1.3 Permit Transfer

PolyMet plans to obtain make-up water from Colby Lake under the terms of an existing MDNR Water Appropriations Permit, #49-135, currently held jointly by CE and Minnesota Power. Pursuant to its agreement with CE, PolyMet will seek transfer and amendement of CE's interest in the permit to PolyMet in accordance with the requirements of Minnesota law. This permit transfer and amendment request will be submitted separately from this permit application.

3.2 Water Conservation and Reuse

The overall Project water management strategy is integrated across the Mine and Plant Sites in order to maximize water conservation and recycling. Appropriated groundwater from the Mine Site will be routed to the Plant Site to serve as process water, minimizing the amount of make-up water that will be withdrawn from Colby Lake. All water described below as being pumped to the FTB will be used as process water at the Beneficiation Plant. The strategy includes the following activities:

- Groundwater appropriated for dewatering associated with overburden stripping and mining will be treated and pumped to the FTB.
- Groundwater withdrawn by the Category 1 Stockpile Groundwater Containment System will be treated and pumped to the FTB.

- Mine Site runoff and most construction stormwater will be treated and pumped to the FTB.
- Process water will be recycled between the Beneficiation Plant and the FTB.
- Process water will be recycled between the Hydrometallurgical Plant and the HRF.
- Seepage from the Tailings Basin will be captured, and as much as possible will be returned to the FTB for reuse as process water. Seepage in excess of what can be recycled to the FTB will be treated at the WWTP, then discharged to the environment as stream augmentation. Discharge quality will meet applicable effluent limits and surface water quality standards, and discharge quantity will be managed to meet the zero discharge requirements of the NSPS and to minimize ecologic and hydrologic impacts to the receiving waters.

The integrated water management strategy is expected to provide 88% to 98% of the process water needed by the Project, minimizing the amount of make-up water appropriated from Colby Lake. The amount of make-up water needed will vary over the course of operations, depending primarily on the amount of pit dewatering. When pit dewatering rates are higher, Colby Lake appropriations rates will be lower. Large Figure 4 shows the annual average flows in Mine Year 10, illustrating the extent of water recycling that has been designed into the Project.

3.3 Stream Augmentation

Because the FTB seepage capture systems will block seepage from the existing LTVSMC tailings basin that currently flows to Trimble Creek, Unnamed Creek, Second Creek, and Unnamed (Mud Lake) Creek. PolyMet has agreed to augment flow in these streams to avoid ecologic and hydrologic impacts. The stream augmentation objective, as stated in the FEIS, is to limit the change in average annual flow to ±20% of existing conditions (conditions before the implementation of short term mitigation measures as part of the CE Consent Decree) (Section 5.2.2 of Reference (1)).

PolyMet will augment the streamflow by discharging treated effluent from the WWTP to the headwater areas of Trimble Creek, Unnamed Creek, and Second Creek under the terms of a National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit, and diverting runoff that currently flows into the Tailing Basin, so that it flows to the Unnamed (Mud Lake) Creek watershed via a drainage swale. Section 3.4 summarizes additional regulatory requirements applicable to this augmentation.

3.4 Discharges

During the pre-operation construction phase, appropriated water will either be pumped to the Construction Mine Water Basin or released off-site under terms of an MPCA stormwater construction permit and associated Stormwater Pollution Prevention Plan (SWPPP). Water that will be released off-site during pre-operation construction is illustrated on Large Figure 2.

During the operation phase, the Project will discharge treated effluent from the WWTP to augment water flows in Trimble Creek, Unnamed Creek, and Second Creek under terms of an MPCA NPDES/SDS permit.

The three receiving waters are in the St. Louis River watershed of the Great Lakes Basin. Trimble and Unnamed Creeks are tributaries of the Embarrass River, and Second Creek is a tributary of the Partridge River.

The WWTP discharge rate (annual average mean) is estimated to vary from approximately 1,700 to 2,700 gpm, as shown in Figure 3-1. The discharge will include water appropriated from the Mine Site and from Colby Lake that has been added to the FTB pond, has seeped down through the tailings to the toe of the Tailings Basin, been captured by the FTB seepage capture systems, and routed to the WWTP for treatment. WWTP discharge and associated appropriations flows during operations are illustrated on Large Figure 3.

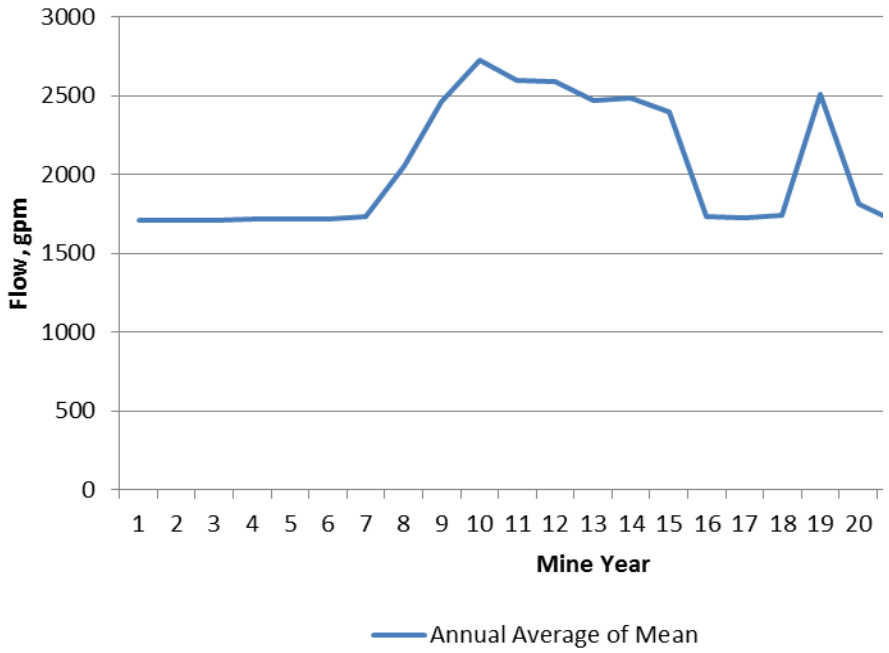


Figure 3-1 Annual Average Waste Water Treatment Plant Discharge Rate based on Mean Flows

4.0 Location and Ownership

Large Figure 5 shows the configuration of the Mine Site in Mine Year 11 and the approximate locations of the pumping installations associated with the East Pit, Central Pit, West Pit and Mine Site Infrastructure Permits. Some temporary construction dewatering activities associated with the Mine Site Infrastructure Permit that will occur at various locations (e.g. construction of new buildings, miscellaneous construction dewatering, etc.) are listed, but not specifically shown, on Large Figure 5.

Large Figure 6 shows the configuration of the Plant Site during the construction phase and the approximate locations of the primary pumping installations associated with the Plant Site Infrastructure Permit. Some temporary construction dewatering activities associated with the Plant Site Infrastructure Permit that will occur at various locations (e.g. miscellaneous construction dewatering) are listed, but not specifically shown, on Large Figure 6.

Under Minnesota Rules, part 6115.0660, subpart 2, the permit applicant must provide "written evidence of ownership, or control of, or license to use, the land overlying the groundwater source or abutting the surface water source from which water will be appropriated." PolyMet will assume ownership of the surface lands at the Mine Site, including the appropriation points, upon completion of the pending land exchange with the U.S. Forest Service, as shown on Large Figure 5. In addition, PolyMet currently leases the private mineral rights underlying the Mine Site. These mineral rights not only provide PolyMet with access to the subsurface at the Mine Site for purposes of mining, they also provide the legal basis for accessing surface lands as necessary to carry out mining activities, which include water appropriation from surface water and groundwater sources. Accordingly, PolyMet has the requisite control of Mine Site water appropriation sources to satisfy the requirements of Minnesota Rules, part 6115.0660, subpart 2.

PolyMet controls the lands overlying the groundwater source or abutting the surface water source from which water will be appropriated at the Plant Site, as shown on Large Figure 6. Specifically, under its contractual arrangements with CE, PolyMet currently holds equitable title to the Plant Site and all necessary rights for possession, access, and use of the Plant Site. Upon completion of certain conditions, CE is required to convey fee simple title to PolyMet. The current and future rights held by PolyMet provide it with sufficient control of the Plant Site to satisfy the access requirements of Minnesota Rules 6115.0660, subpart 2.

5.0 Statement of Justification for Individual Permits

Dewatering is necessary for PolyMet to construct mining facilities, mine copper-nickel ore from open pits, and operate environmental controls. The dewatering proposed under the five Individual Permits is reasonable and practical, as detailed in the following subsections, and is necessary for the Project to provide the social and economic benefits documented in Section 5.2.10 of the FEIS (Reference (1)).

5.1 Overview and Pumping Schedule

PolyMet is applying for five Individual Permits: one permit for each of the three mine pits, one for dewatering during construction and operations of Mine Site Infrastructure, and one for dewatering during construction and operations of Plant Site Infrastructure.

Table 5-1 provides an overview of the Individual Permits, the installations covered under each permit, and the schedule for pumping from each installation. The pumping schedule was estimated based on the Project schedule as detailed in the FEIS and the preliminary schedule for construction of Project infrastructure.

Table 5-1 Individual Permit Overview

Individual Permit	Installation	Dewatering schedule
East Pit	Overburden stripping	Pre-operation construction phase
	East Pit Sump	Mine Years 1 to 20
Central Pit	Overburden stripping	Mine Year 11
	Central Pit Sump	Mine Years 11 to 20
West Pit	Overburden stripping	Intermittent, Mine Years 2 to 11
	West Pit Sump 1 and Sump 2	Mine Years 2 to 20

Individual Permit	Installation	Dewatering schedule
Mine Site Infrastructure	Ore Surge Pile foundation, sumps, and overflow ponds construction	Pre-operation construction
	Construction of new buildings	Pre-operation construction
	Mine water pond construction	Intermittent, pre-operation construction to Mine Year 6
	Stormwater pond construction	Intermittent, pre-operation construction to Mine Year 2
	Category 4 Waste Rock Stockpile foundation, sumps, and overflow ponds construction	Intermittent, pre-operation construction and Mine Year 3
	Category 2/3 Waste Rock Stockpile foundation, sumps, and overflow ponds construction	Intermittent, pre-operation construction to Mine Year 6
	Category 1 Waste Rock Stockpile foundation construction	Intermittent, pre-operation construction to Mine Year 6
	Category 1 Stockpile Groundwater Containment System construction	Intermittent, pre-operation construction to Mine Year 5
	Category 1 Stockpile Groundwater Containment System operation	Mine Years 1 to 21
	Category 2/3 Waste Rock Stockpile underdrains, if needed	Mine Years 1 to 19
	Category 4 Waste Rock Stockpile underdrains, if needed	Mine Years 1 to 11
	Ore Surge Pile underdrains, if needed	Mine Years 1 to 20
	Miscellaneous construction dewatering	Intermittent, as needed
Plant Site Infrastructure	Flotation Tailings Basin (FTB) Seepage Containment System construction	Intermittent, pre-operations construction and Mine Year 7
	Sewage Treatment System construction	Pre-operations construction
	Hydrometallurgical Residue Facility (HRF) construction	Intermittent, Pre-operations construction and Mine Year 3
	HRF wick drains, if needed	Pre-operations construction to Mine Year 20
	Colby Lake pipeline upgrades	Pre-operations construction
	Miscellaneous construction dewatering	Intermittent, as needed

5.2 Hydrogeology and Hydrology of Water Sources

5.2.1 Mine Site

Water appropriations at the Mine Site will be primarily drawn from two hydrogeologic units: the unconsolidated deposits (known as the "surficial aquifer", Section 5.2.1.1) and bedrock (Section 5.2.1.2).

These hydrogeologic units and the field investigations performed for the Project are described in detail in the FEIS (Section 4.2.2.2.1 of Reference (1)) and Project documents (Section 4.3 of Reference (4)). See also the test hole data and long-term water level measurements referenced in Section 5.2.1.3 of this application, and hydrologic studies referenced in Section 5.2.1.4 of this application. This information provides the basis for the groundwater appropriation estimates supporting PolyMet's four Mine Site Individual Permit applications.

5.2.1.1 Mine Site Surficial Aquifer

The Mine Site is covered with peat and glacigenic sediments, including outwash and bouldery till. Based on drilling, geophysics, and outcrop mapping, the depth to bedrock across the Mine Site ranges from 0 to approximately 60 feet. The thickest unconsolidated deposits are generally associated with wetland areas, which tend to fill pre-existing depressions in bedrock. The depth to groundwater is typically less than 10 feet. Field testing of the various unconsolidated deposits found a range of hydraulic conductivity values from 0.012 to 31 feet/day. The ability of the surficial aquifer to transmit water, however, is related to the thickness of the sediments. Groundwater flow paths are likely short because of the thin and discontinuous nature of the surficial aquifer. Work conducted to-date has not identified laterally continuous outwash sand or gravel deposits that might be preferential groundwater conduits within the surficial deposits. There are no private wells in the surficial aquifer in the vicinity of the Mine Site.

The water table is generally a subdued replica of the land surface, with upland areas generally associated with groundwater divides. In general, groundwater levels fluctuate seasonally, rising in spring and early summer in response to snowmelt and rainfall, and falling through late summer/fall into winter lows. The magnitude of groundwater elevation fluctuation varies by well across the Mine Site, but the overall annual fluctuation of water levels observed at a single well is typically less than four feet.

Wetlands extend into the Mine Site. Information from well logs, soil borings, soil mapping, and wetland characterization suggest that, in some areas, wetlands have minimal hydraulic connection to the underlying groundwater. A 2010 field survey, for example, found that most of the wetlands on the Mine Site (69%) were “ombrotrophic bogs”, a type of wetlands almost entirely supported (with water and minerals) by direct precipitation (Section 4.2.3.1.2 of Reference (1)).

5.2.1.2 Mine Site Bedrock

The NorthMet Deposit is located within the Partridge River Intrusion of the Duluth Complex, which sub-crops at the Mine Site and dips to the southeast. Underlying the Duluth Complex is the Virginia Formation, a metasedimentary rock, which sub-crops to the north of the Mine Site. Mining will occur near the contact between the Duluth Complex and the Virginia Formation, and during mining operations, the Virginia Formation will be exposed along portions of the northern wall of the East Pit. Underlying the Virginia Formation is the Biwabik Iron Formation (BIF), which is the source of taconite iron ore. The BIF is used regionally as a water resource (for example, by the City of Biwabik); however, there are no residential or community wells in the immediate vicinity of the Mine Site. Current drilling and interpolation of geology between drill holes indicates there will be approximately 130-150 feet of separation between the BIF and the final extent of the mine pits.

Groundwater flow within bedrock is primarily through fractures (i.e., secondary porosity features). The BIF is generally considered to be the most permeable bedrock unit, followed by the Virginia Formation, with the Duluth Complex having hydraulic conductivity at least one order of magnitude lower. Specific capacity tests conducted in the Virginia Formation wells P-3 and P-4 indicate that the upper portion of the Virginia Formation is more permeable than the lower portion. This is consistent with observations from the Duluth Complex, where the upper 200 to 300 feet of the formation is more extensively fractured and jointed, potentially resulting in increased permeability. Additional information on bedrock hydrogeology is presented in Section 4.3.3.2 of Reference (4).

5.2.1.3 Mine Site Test Hole Data

Since 2005, a number of subsurface investigations have been conducted at the Mine Site to develop and refine the hydrogeologic and geologic models of the site. The investigations are summarized in Section 4.3.1 of Reference (4). Hydrogeologic data collection locations are shown on Large Figure 2 of Reference (4).

Boring logs for surficial and bedrock borings at the Mine Site are provided in Attachment A to Reference (4). At the Mine Site, PolyMet has measured groundwater levels at 21 locations in the surficial aquifer for between three and ten years each, and at five locations in bedrock for up to nine years. Water level records are provided in Large Table 1 and Large Table 2 of Attachment B to Reference (4).

Hydrologic testing of the unconsolidated and bedrock material at the Mine Site was performed in three separate phases between 2005 and 2006. Individual test results are documented in References (5), (6), and (7).

5.2.1.4 Mine Site Hydrology

PolyMet developed a MODFLOW model of the Mine Site (Attachment B to Reference (4)), which was calibrated for existing conditions using measured groundwater elevations in wells completed in the surficial aquifer and bedrock, as well as estimates of baseflow in the Partridge River. This model is the basis for projected water appropriations due to mine pit dewatering as well as the capture efficiency of the Category 1 Stockpile Groundwater Containment System. The MODFLOW model was not used to quantify groundwater drawdown at the Mine Site (Section 5.2.2.3.2 of Reference (1)); potential impacts to groundwater elevations from Mine Site appropriations are discussed in Section 8.1.2.1. The model met its calibration objectives and was reviewed and accepted during the environmental review process. Key conclusions of the modeling effort relevant to water appropriations included:

- Groundwater flow into the mine pits is estimated to increase from approximately 220 gallons per minute (gpm) to 870 gpm between Mine Year 1 and Mine Year 11 as the pits expand horizontally and vertically. Groundwater flow into the East Pit is anticipated to begin decreasing in Mine Year 12 as the pit is backfilled with rock and flooded. Groundwater flow into the West Pit is expected to peak at Mine Year 11 and thereafter range from 40 gpm to 50 gpm.
- The Category 1 Stockpile Groundwater Containment System is capable of capturing 91% to more than 99% of the drainage from the Category 1 Waste Rock Stockpile (Attachment E to Reference

(8)). The capture percentage of the containment system varies through time due to the influence of the mine pits on the groundwater gradients in the vicinity of the stockpile. The majority of the drainage not captured in the containment system eventually flows to the mine pits.

PolyMet also developed hydrologic models to estimate the run-on that will be collected by the Category 1 Stockpile Groundwater Containment System and the mine pit dewatering. These models include a probabilistic model of monthly and annual precipitation, evaporation, and runoff (the Mine Site GoldSim model, Section 5.2 of Reference (4)); and a calculation of runoff from design snowmelt events (Section 2.1 of Reference (3)). Runoff water will be collected along with the groundwater appropriations during mine pit dewatering and operation of the Category 1 Stockpile Groundwater Containment System.

5.2.1.5 Watershed Hydrology

PolyMet developed a hydrologic/hydraulic model for the Partridge River upstream of Colby Lake using XP-SWMM software (Sections 5.2.4.3 and 6.4 of Reference (4)). The purpose of the model is to evaluate the potential impacts of the Project on the Partridge River flows and stream morphology and on the Colby Lake and Whitewater Reservoir water levels. The XP-SWMM model is designed to estimate relative impacts to streamflow, as opposed to calculating future flows. That is, future flows are estimated based on observed flows scaled by the relative difference between an existing conditions XP-SWMM model and a future conditions XP-SWMM model.

The model was originally calibrated to U.S. Geological Survey (USGS) gage data on the Partridge River upstream of Colby Lake from water year 1985 and validated against the remainder of the 1978-1988 gage period. Since the initial model calibration, the USGS gage data has been modified to account for augmentation due to historical mine pit dewatering. The model met its calibration objectives and was reviewed and accepted during the environmental review process.

The results of the XP-SWMM model are discussed in Section 8.1.2.2 with respect to the impact of Mine Site appropriations on the hydrology of the Partridge River and Colby Lake.

5.2.2 Plant Site

Water appropriations at the Plant Site will be drawn from one hydrogeologic unit: the unconsolidated deposits (known as the "surficial aquifer", Section 5.2.2.1). The surficial aquifer and the field investigations performed for the Project are described in detail in the FEIS (Section 4.2.2.4.1 of Reference (4)) and Project documents (Section 4.3 of Reference (9)). See also the test hole data and long-term water level measurements, referenced in Section 5.2.2.2 of this application and hydrologic studies referenced in Section 5.2.2.3 of this application.

5.2.2.1 Plant Site Surficial Aquifer

The unconsolidated surficial deposits in the vicinity of the Plant Site are peat, glacial till, and reworked sediments. The existing LTVSMC tailings basin was constructed on top of these materials, which were used in starter dams in several locations before LTVSMC tailings deposition. Soil borings advanced through the LTVSMC tailings and into the underlying native materials reveal that the dominant till lithology underlying

the LTVSMC tailings basin is an unsorted sandy loam with pebbles, cobbles, and boulders. Some areas are stratified, with lenses of sorted sediment. In places, the till is overlain by up to 10 feet of organic peat.

The thickness of surficial deposits (depth to bedrock) along the containment system alignment to the west, northwest, and north sides of the LTVSMC tailings basin ranges from 3.5 to 42.5 feet. The average thickness of surficial deposits along these alignments is 19.5 feet. Peat was encountered in some borings, ranging in thickness from less than a foot to several feet. No substantial surficial deposits are present along the southern and much of the eastern sides of the LTVSMC tailings basin, where the basin abuts bedrock. Surficial deposits underlie a portion of the alignment of the East Dam.

Most of the area between the existing LTVSMC tailings basin and the Embarrass River is covered by wetlands and minor surface water features. Unlike the ombrotrophic bogs at the Mine Site, where sphagnum peat has elevated the bog and reduced connection between the surface water and water table, the wetlands between the LTVSMC tailings basin and Embarrass River likely represent surficial expressions of the water table, and reflect, at least in part, groundwater and surface water flow from LTVSMC tailings basin seepage.

Field testing of the surficial deposits indicates a range of hydraulic conductivity values from 0.15 to 130 feet/day. The geometric mean conductivity of 4.4 feet/day is considered to be the best representation of in situ conditions in the glacial till surrounding the LTVSMC tailings basin (Section 4.2.2.4.1 of Reference (1).

5.2.2.2 Test Hole Data

Since 2008, a number of subsurface investigations have been conducted at the Plant Site to develop and refine the hydrogeologic models of the site. The investigations are summarized in Section 4.2.2.4.1 of Reference (4)). The investigations that are the most applicable to this appropriations permit are the geotechnical investigations performed in 2013/2014 to support the design of the FTB Seepage Containment System. Test hole locations, boring logs, and testing results from surficial and bedrock borings along the FTB Seepage Containment System alignment are provided in Attachment F of Reference (10).

In addition to subsurface testing associated with the FTB Seepage Containment System design, PolyMet has measured groundwater levels in the Plant Site surficial aquifer and the LTVSMC tailings basin at 28 locations for between 2 and 12 years each. Water level records are provided in Attachment A to Reference (9).

5.2.2.3 Hydrologic Studies

PolyMet developed a MODFLOW model of the Tailings Basin (Attachment A to Reference (9)), which was calibrated for existing conditions using measured groundwater elevations in the surficial aquifer and the LTVSMC tailings basin. This model is the basis for the estimated seepage rates from the Tailings Basin under existing conditions and with the Project. The estimated seepage under existing conditions, however, is understood to exceed the capacity of the surficial aquifer.

The quantity of water flowing through the saturated unconsolidated deposits in the vicinity of the Tailings Basin has been estimated based on observed hydraulic gradients and estimates of hydraulic conductivity and aquifer thickness. The saturated thickness of the surficial aquifer encountered in soil borings at the LTVSMC tailings basin toe averages approximately 23 feet. The thickness of the surficial aquifer increases to the north and northwest, as the thickness of the surficial deposits increase toward the Embarrass River. The estimated total groundwater flow through the aquifer downgradient of the LTVSMC tailings basin and toward the west, northwest, and north, is approximately 200 gpm (Table 5.2.2-37 of Reference (1)).

Because the seepage rate from the LTVSMC tailings basin exceeds the capacity of the surficial aquifer to transmit groundwater, the excess seepage upwells to the ground surface. As discussed in Section 5.2.1.4, the wetlands between the LTVSMC tailings basin and Embarrass River likely represent surficial expressions of the water table and reflect, at least in part, the flow from LTVSMC tailings seepage.

5.3 Proposed Pumping Rates and Quantities

5.3.1 Methods to Estimate Proposed Pumping

Two methods were used to estimate pumping from appropriated sources: 1) results of probabilistic water modeling conducted for the FEIS, and 2) engineering estimates based on the area to be dewatered, the depth to the water table, typical soil properties, and pumping duration. Methods and assumptions for pumping estimates derived from probabilistic modeling are summarized in Section 5.3.1.1, and methods and assumptions for pumping estimates derived from engineering estimates are summarized in Section 5.3.1.2. Large Table 1 provides additional detail on pumping estimation assumptions and methods.

5.3.1.1 Probabilistic Water Modeling

Results of the probabilistic water modeling conducted for the FEIS were used to estimate pumping rates for the installations listed in Table 5-2. The FEIS Mine Site water model was run for a duration of 200 years using a monthly time step for 500 realizations (individual transient model runs with probabilistic inputs) (Reference (4)). For each month of the simulation, results are summarized for this application as the 90th percentile (P90) values. This indicates that for any given month, 90% of all model realizations are less than or equal to the P90 value. Results may be further summarized for a specific year of the simulation by taking the average or the maximum value of the monthly statistics.

The range of annual precipitation values used in the probabilistic water balance was developed based on the current 30-year climate normal period (1981-2010) and ranges from approximately 20 to 40 inches of precipitation per year (Section 5.2.1.1 of Reference (4)).

The probabilistic model uses pit inflow rate estimated by the Mine Site MODFLOW model as the mean or most likely value of groundwater inflow. The uncertainty in the groundwater inflow rate is represented with a probability distribution that scales the model-estimated inflow values, based on examination of the model during the environmental review process. This log-normal distribution is defined such that the mean is the model-estimated value (scaling factor of 1.0) and the 95% confidence interval extends from approximately 0.75 to 2.0 times the model-estimated value. Because the probabilistic modeling

incorporates uncertainty and variability, the P90 results were not multiplied by an additional "uncertainty factor" to obtain the pumping estimates.

The dewatering pumping schedule for the installations listed in Table 5-2 was based on the Project schedule as presented in the FEIS and is still relevant for permitting and planned operations.

Table 5-2 Probabilistic Model Results used to Estimate Pumping Rates

Individual Permit	Installation	Values used for pumping estimate
East Pit	East Pit Sump	P90 monthly groundwater inflow P90 monthly net precipitation
Central Pit	Central Pit Sump	P90 monthly groundwater inflow P90 monthly net precipitation
West Pit	West Pit Sump	P90 monthly groundwater inflow P90 monthly net precipitation
Mine Site Infrastructure	Operation of the Category 1 Stockpile Groundwater Containment System	P90 monthly total inflow

5.3.1.2 Engineering Estimates

The total amount to be pumped during construction dewatering was calculated using information such as construction area, depth of excavation, approximate depth to water table, typical material properties, assumed construction method, and the preliminary construction schedule. Pumping amounts for construction dewatering are order-of-magnitude estimates that include both groundwater and precipitation. Uncertainty factors were applied to the calculated amounts, based on the level of uncertainty associated with the various components of the engineering estimate, as detailed in Large Table 1. Engineering estimates are the basis of total pumping volumes for the following installations:

- mine pit overburden stripping (East, Central, and West Pits)
- mine water pond construction (Mine Site Infrastructure)
- stormwater infrastructure construction (Mine Site Infrastructure and Plant Site Infrastructure)
- Category 1 Stockpile Groundwater Containment System construction (Mine Site Infrastructure)
- stockpile foundation, sump, and overflow pond construction (Mine Site Infrastructure)
- Ore Surge Pile foundation, sump, and overflow pond construction (Mine Site Infrastructure)
- stockpile underdrain operation (Mine Site Infrastructure)
- construction of new buildings (Mine Site Infrastructure)

- FTB Seepage Containment System construction[3] (Plant Site Infrastructure)
- Sewage Treatment System construction (Plant Site Infrastructure)
- HRF foundation construction (Plant Site Infrastructure)
- HRF wick drain construction and operation (Plant Site Infrastructure)
- Colby Lake pipeline upgrades (Plant Site Infrastructure)
- Miscellaneous construction dewatering (Mine Site Infrastructure and Plant Site Infrastructure)

5.3.1.3 Maximum Daily, Monthly, and Annual Pumping Rates

For each of the individual permits, PolyMet summed the estimated pumping rates of all installations included in the permit on a monthly basis, according to the schedule set out in the FEIS and the preliminary construction schedule. The maximum monthly pumping rate was identified as the highest of all summed monthly pumping rates. As a conservative estimate, the maximum annual pumping rate was set equal to the maximum monthly pumping rate. For the Individual Permits for the mine pits, the maximum daily pumping rate was also set equal to the maximum monthly pumping rate. For the Mine Sit Infrastructure and Plant Site Infrastructure Permits, the maximum daily pumping rate was derived from short-term construction dewatering that lasts less than one month. When the preliminary construction schedule shows multiple short-term dewatering installations occurring in the same month, the estimate conservatively assumes that they occur concurrently.

5.3.2 Pumping Rates and Quantities

Table 5-3 summarizes estimated pumping rates and quantities for each Individual Permit. Pumping rates include both the flow of appropriated groundwater and the flow of water that originates as precipitation. In practice, these flows cannot be physically separated. During operations, flow monitoring will record the total flow, and PolyMet will pay the appropriations fee for the entire recorded volume pumped under the Individual Permits, despite the fact that some fraction of that water is precipitation.

For the Mine Site Infrastructure Permit and the Plant Site Infrastructure Permit, which each include multiple installations, the maximum daily pumping rate and the total pumped quantity estimated for each installation are itemized in Table 5-4 and Table 5-5, respectively.

[3] Conservatively assuming open trench construction methods. In-situ construction methods would result in less pumping.

Table 5-3 Estimated Pumping Summary: by Individual Permit

Individual Permit	Maximum Daily Rate[1] (gpm)	Maximum Monthly Rate[1][2] (gpm)	Maximum Annual Rate[1] (gpm)	Maximum Annual Volume (MG)	Average Annual Rate[3] (gpm)
East Pit	1,900[4]	1,900	1,900[5]	1,000[6]	200 – 800
Central Pit	1,300[4]	1,300	1,300[5]	675[6]	50 – 250
West Pit	1,500[4]	1,500	1,500[5]	800[6]	150 – 550
Mine Site Infrastructure	5,050[7]	1,800	1,800[5]	950[8]	50 – 500
Plant Site Infrastructure	3,750[7]	1,300	1,300[5]	500[8]	250 – 300

Note: Pumping rates include appropriated groundwater along with stormwater runoff and precipitation. In practice, it will not be practical to split the contribution of appropriated groundwater with runoff and precipitation.

(1) Maximum daily, monthly, and annual pumping rates for the Individual Permits occur in different time periods. Rates cannot be summed.

(2) Highest monthly value of all installations included in permit have been combined: P90 for pit dewatering and operation of the Category 1 Stockpile Groundwater Containment System; engineering estimate for other installations with uncertainty factors applied and rounded up to the nearest 50 pgm.

(3) Range of the average monthly P50 values, on an annual basis, over the years of the appropriation, plus any appropriations associated with scheduled overburden stripping, rounded up to the nearest 50 gpm. This information is provided for context.

(4) Maximum daily rate set equal to maximum monthly rate, because mine pit rates are estimated in GoldSim on a monthly basis.

(5) To be conservative, maximum annual rate is set equal to maximum monthly rate.

(6) Maximum annual volume is calculated from the maximum annual rate.

(7) Maximum daily rate is driven by short-term construction dewatering that lasts less than one month. To be conservative, all short-term dewatering installations scheduled for a given month are assumed to occur concurrently.

(8) To be conservative, maximum annual volume is calculated from the maximum annual rate or set equal to the permit total volume, whichever is lower.

Table 5-4 Estimated Pumping by Installation: Mine Site Infrastructure Permit

Installations	Pumping schedule	Maximum Daily Rate[1] (gpm)	Total Volume[2] (MG)
Ore Surge Pile foundation, sumps, and overflow ponds construction	Intermittent during pre-operation construction	150	5
Construction of new buildings	Intermittent during pre-operation construction	100	10
Mine water pond construction	Intermittent, pre-operation construction to Mine Year 6	200	30
Stormwater pond construction	Intermittent, pre-operation construction to Mine Year 2	700	35
Category 4 Waste Rock Stockpile foundation, sumps, and overflow ponds construction	Intermittent, pre-operation construction to Mine Year 3	800	25
Category 2/3 Waste Rock Stockpile foundation, sumps, and overflow ponds construction	Intermittent, pre-operation construction to Mine Year 6	1,450	120
Category 1 Waste Rock Stockpile foundation construction	Intermittent, Pre-operation construction to Mine Year 6	3,400	40
Category 1 Stockpile Groundwater Containment System construction	Intermittent, pre-operation construction to Mine Year 5	300	70
Category 1 Stockpile Groundwater Containment System operation	Continuous, Mine Years 1 to 21	700	3,120
Category 2/3 Waste Rock Stockpile underdrains, if needed	Continuous, Mine Years 1 to 19	50	190
Category 4 Waste Rock Stockpile underdrains, if needed	Continuous, Mine Years 1 to 11	25	45
Ore Surge Pile underdrains, if needed	Continuous, Mine Years 1 to 20	25	90
Miscellaneous construction dewatering	Intermittent as needed	100	20
	Total Mine Site Infrastructure	**N/A[3]**	**3,800[4]**

Note: Pumping rates and volumes include appropriated groundwater along with stormwater runoff and precipitation. In practice, it will not be practical to split the contribution of appropriated groundwater with runoff and precipitation.

(1) Maximum daily rate from engineering estimate for temporary construction dewatering with uncertainty factor applied, rounded up to nearest 25 gpm.

(2) Engineering estimate of volume for temporary construction dewatering with uncertainty factor applied, rounded up to nearest 5 MG,

(3) Maximum daily rates for the individual installations occur in different time periods. Rates cannot be summed. Maximum daily rate is driven by short-term construction dewatering that lasts less than one month. To be conservative, all short-term dewatering installations scheduled for a given month are assumed to occur concurrently.

(4) Total volume rounded up to the nearest 25 MG.

Table 5-5 Estimated Pumping by Installation: Plant Site Infrastructure Permit

Installations	Pumping schedule	Maximum Daily Rate[1] (gpm)	Total Volume[2] (MG)
Flotation Tailings Basin (FTB) Seepage Containment System construction dewatering	Intermittent, pre-operation construction and Mine Year 7	3,350	300
Sewage Treatment System construction dewatering	Pre-operation construction	100	5
Hydrometallurgical Residue Facility (HRF) construction dewatering, if needed	Intermittent, pre-operation construction to Mine Year 3	2,850	130
HRF wick drain operation, if needed	Mine Year 1 through 20	150	35
Colby Lake pipeline upgrades (construction dewatering)	Pre-operation construction	300	15
Miscellaneous construction dewatering	Intermittent as needed	100	15
	Total Plant Site Infrastructure	**N/A[3]**	**500[4]**

Note: Pumping rates and volumes include appropriated groundwater along with stormwater runoff and precipitation. In practice, it will not be practical to split the contribution of appropriated groundwater with runoff and precipitation.

(1) Maximum daily rate from engineering estimate for temporary construction dewatering with uncertainty factor applied, rounded up to nearest 25 gpm.

(2) Engineering estimate of volume for temporary construction dewatering with uncertainty factor applied, rounded up to nearest 5 MG.

(3) Maximum daily pumping rates for the individual installations occur in different time periods. Rates cannot be summed. Maximum daily rate is driven by short-term construction dewatering that lasts less than one month. To be conservative, all short-term dewatering installations scheduled for a given month are assumed to occur concurrently.

(4) Total volume rounded up to the nearest 25 MG.

5.3.3 Methods of Appropriation

Method of appropriation will vary by installation. Mine pit overburden stripping dewatering will occur via separate mobile pumping systems prior to pit development; flow from stripping may be directed to the mine pit collection sumps once the sumps are constructed.

Water management within the pits (see Section 2.1.3 of Reference (4)) will occur as part of mine development, with the pit floors sloped toward collection sumps. The sumps will be excavated as part of mine operations. Pumps in the sumps will either be submersible pumps or pumps on a raft floating in the sump. Hoses will connect the pumps to pipes which may connect to additional pumps at the rim of the pits conveying the water for treatment. The size and location of the sumps and pumps will change as the pits expand in size and depth, requiring periodic evaluation of the pumping system. The pumping system capacities will be designed to handle groundwater inflows and the average annual runoff volumes from a snowmelt event (Section 2.1.3 of Reference (3)). Flow meters will be installed to track pumped rates and volumes from the mine pit collection sumps.

The Category 1 Stockpile Groundwater Containment System (Section 2.1.2 of Reference (8)) will consist of a cutoff wall (a low permeability compacted soil hydraulic barrier) combined with a drainage collection system around the perimeter of the stockpile near the stockpile toe. The final configuration of the containment system will completely encircle the stockpile. Stockpile drainage collected in the drain pipes will flow by gravity to a collection sump where it will be pumped to the WWTF. Collection sumps will have emergency overflows to the East or West Pits. Flow meters will be installed to track pumped rates and volumes from the collection sumps to the WWTF.

If stockpile underdrains are needed, the water collected would flow by gravity to underdrain sumps, and then be pumped for treatment on-site or off-site as determined through the NPDES/SDS permitting process.

Construction dewatering (under the Mine Site Infrastructure Permit and the Plant Site Infrastructure Permit) will be accomplished via temporary dewatering wells and movable pumps and piping. Most construction dewatering will be groundwater dewatering; however run-on and standing water may be pumped from construction areas, if needed. Pumping of standing water is anticipated only for construction of the FTB Seepage Containment System and the HRF foundation.

5.4 Alternatives Considered

The objective of all proposed appropriations is to construct and operate Project features below the water table, with two exceptions, which are described below. Dewatering is the only alternative available to accomplish this objective. By using water appropriated for mineral processing, PolyMet will limit the need to appropriate water from other sources.

The objective of the Category 1 Stockpile Groundwater Containment System is to limit potential groundwater impacts from the Project's only permanent stockpile. During the environmental review process, this option was determined to be the preferred alternative to accomplish this objective (Section 3.2.3.3 of Reference (1)).

The objective of the underdrains on temporary waste rock stockpiles and the temporary Ore Surge Pile and HRF wick drains, if they are needed, is to support the integrity and performance of the liner systems, which will limit potential groundwater impacts from the Project's temporary stockpiles, Ore Surge Pile and the HRF. The underdrains may be necessary under both the stockpiles and the associated sumps and ponds. There are alternative ways to construct the foundation systems of these infrastructure, but, use of underdrains and wick drains for foundation drainage, if needed, are the preferred methods to accomplish the desired objective.

6.0 Additional Requirements and Conditions for Dewatering (Minnesota Rules, part 6115.0710)

6.1 Reasonable Necessity for Dewatering (Minnesota Rules, part 6115.0710 (A))

All proposed dewatering covered by the five Individual Permits is necessary to construct and operate the Project. Implementation of PolyMet's proposal for dewatering is practical and consistent with standard industry practice.

6.2 Excess water can be discharged without adversely affecting the public interest in the receiving waters (Minnesota Rules, part 6115.0710 (B))

The discharge destination will vary by installation, as indicated on Table 6-1.

Most water withdrawn under the four Mine Site Individual Permits will be discharged to the FTB, from where it will be recycled for use in mineral processing. Water used in mineral processing will be routed to the FTB and some may eventually emerge as seepage from the FTB, which will then be collected, treated, and discharged as treated effluent from the WWTP as authorized under the terms of an NPDES/SDS permit for the Project.

PolyMet has evaluated potential effects of the discharge from the WWTP, (Section 8.1.2.3) and determined that the discharge will not cause exceedances of any applicable State surface water quality standards (Section 6.5 of Reference (4) and Section 6.7 of Reference (9)). Furthermore, the carrying capacity of the outlet to which waters will be discharged is adequate. The discharge quantity will be managed to "replace" water that is captured by the FTB seepage capture systems, in order to avoid adverse ecologic and hydrologic impacts to the receiving waters that could result from operation of the NorthMet FTB seepage capture systems (Section 3.3).

Some dewatering installations under the Mine Site Infrastructure Permit and the Plant Site Infrastructure Permit will be discharged off-site under the terms of an MPCA construction stormwater permit and associated SWPPPs prepared in accordance with the NPDES/SDS Construction Stormwater General Permit (R1000001), using best management practices to prevent adverse water quality, hydrologic, or ecologic effects.

Therefore, discharge of appropriated water will not negatively affect the public interest in the receiving waters.

Table 6-1 Dewatering Discharge Destination, by Installation

Individual Permit	Installation	Dewatering Discharge Destination[1]
East Pit	Overburden stripping	Flotation Tailings Basin (FTB)
	East Pit Sump	FTB
Central Pit	Overburden stripping	FTB
	Central Pit Sump	FTB
West Pit	Overburden stripping	FTB
	West Pit Sump 1 and Sump 2	FTB
Mine Site Infrastructure	Ore Surge Pile foundation, sumps, and overflow ponds construction	FTB
	Construction of new buildings	FTB or off-site
	Mine water pond construction	FTB or off-site
	Stormwater pond construction	FTB or off-site
	Category 4 Waste Rock Stockpile foundation, sumps, and overflow ponds construction	FTB
	Category 2/3 Waste Rock Stockpile foundation, sumps, and overflow ponds construction	FTB
	Category 1 Waste Rock Stockpile foundation construction	FTB
	Category 1 Stockpile Groundwater Containment System construction	FTB
	Category 1 Stockpile Groundwater Containment System operation	FTB
	Category 2/3 Waste Rock Stockpile underdrains, if needed	FTB or off-site
	Category 4 Waste Rock Stockpile underdrains, if needed	FTB or off-site
	Ore Surge Pile underdrains, if needed	FTB or off-site
	Miscellaneous construction dewatering	FTB or off-site
Plant Site Infrastructure	FTB Seepage Containment System construction	FTB or off-site
	Sewage Treatment System construction	Off-site
	Hydrometallurgical Residue Facility (HRF) construction	FTB or off-site
	HRF wick drains, if needed	FTB or Waste Water Treatment Plant (WWTP)
	Colby Lake pipeline upgrades	Off-site
	Miscellaneous construction dewatering	FTB or off-site

(1) PolyMet will provide Minnesota Department of Natural Resources more precise discharge locations during permitting.

6.3 Proposed Dewatering is Not Prohibited by Any Existing Law (Minnesota Rules, part 6115.0710 (C))

No existing law prohibits the proposed dewatering under any of the five Individual Permits.

7.0 Additional Requirements and Conditions for Mining and Processing (Minnesota Rules, part 6115.0720)

7.1 Plans and Specifications (Minnesota Rules, part 6115.0720, subpart 1(A))

Construction plans have been developed based on the permit-level design with associated specifications incorporated. This permit-level design has been used to determine the required withdrawal of waters of the state for construction and operations. The use, storage, and disposal of waters of the state are described in this permit application in Sections 6.2 and 7.2 and shown in permit-level designs of the FTB, WWTF, and WWTP. Construction plans are attached in Appendix C for the following features:

- Mine Site and Dunka Road Earthwork Permit Application Support Drawings
- Category 1, 2/3, and 4 Stockpiles and Ore Surge Pile Design Permit Application Support Drawings
- Mine Site Mechanical Infrastructure Permit Application Support Drawings
- Mine Site Stormwater Permit Application Support Drawings
- Plant Site Stormwater Permit Application Support Drawings
- Category 1 Stockpile Groundwater Containment System Permit Application Support Drawings
- FTB Seepage Containment and Stream Augmentation Systems Permit Application Support Drawings
- Hydrometallurgical Residue Facility Permit Application Support Drawings
- Flotation Tailings Basin Permit Application Support Drawings
- Waste Water Treatment Facility Permit Application Support Drawings
- Waste Water Treatment Plant Permit Application Support Drawings

Other engineering design drawings, including construction level details for buildings, the Sewage Treatment Systems, and Colby Lake pipeline repairs will not be completed until further geotechnical investigations are completed. The construction dewatering estimated for these systems, as provided in this application have been adequately estimated for those features.

7.2 Consumption of Appropriated Water in Mineral Processing (Minnesota Rules, part 6115.0720, subpart 1(B))

Appropriated water that is sent to the FTB (Table 6-1) will be used for mineral processing. The water will be recirculated between the FTB and the Beneficiation Plant, with relatively small losses due to evaporation within the plant and water in the concentrate product. Water will be lost during mineral processing at the Beneficiation Plant at an average rate of approximately 48 gpm (Section 2.1.1 of Reference (2)).

There will also be minor losses of appropriated water associated with waste water treatment, from the following processes:

- Operation of the WWTF will result in a loss of approximately 5 gpm in the chemical precipitation sludge (Section 6.1.2.4 of Reference (4)).
- Seepage and evaporation loss from the double-lined WWTF equalization basins will be minimal and will total less than 0.1 gpm (Section 6.1.2.4 of Reference (4)).
- Operation of the WWTP will not result in a loss of appropriated water during operations, because all non-effluent water (filter backwash and reject concentrate) will be returned either to the FTB Pond or to the WWTF (Section 6.1.4 of Reference (9)).

7.3 Criteria Used for Estimating Appropriations (Minnesota Rules, part 6115.0720, subpart 1(C))

Criteria used for estimating appropriation rates for the water withdrawn under the five Individual Permits, including information on climatic data and uncertainty, are presented in Section 5.3.

7.4 Details of Water Released (Minnesota Rules, part 6115.0720, subpart 1(D))

Information regarding the source, rate, and volume of water released from the Project via the WWTP is discussed in Section 3.4. Water from some dewatering installations may be discharged off-site under terms of an MPCA construction stormwater permit and associated SWPPPs. Estimates of the source, rate, and volume of water that may be released off-site (installations noted on Table 6-1) are provided in Table 5-4 and Table 5-5 for the Mine Site and the Plant Site, respectively.

7.5 Hydrologic and Hydraulic Impacts (Minnesota Rules, part 6115.0720, subpart 1(E))

PolyMet assessed potential hydrologic and hydraulic impacts in the Partridge River watershed and the Embarrass River watershed due water appropriations and other aspects of Project operations. The findings of this assessment are summarized below.

7.5.1 Potential Effects on the Partridge River

Stream augmentation will minimize hydrologic and hydraulic impacts on Second Creek, a tributary of the Partridge River; however, the development of the Mine Site may result in changes to the tributary areas for surface runoff flow and changes to groundwater recharge flow to the Partridge River. The resulting impacts to Partridge River hydrology were addressed during the environmental review process, and the major conclusions from the FEIS are summarized below.

The XP-SWMM model for the Partridge River (see Section 5.2.1.5 of this application) was used to evaluate the effects on stream flow from watershed area changes (Section 5.2.2.3.2 of Reference (1)). Key conclusions of the modeling effort include:

- The primary difference between existing conditions and future conditions as estimated in the XP-SWMM models is the resulting change in the total tributary area to the Partridge River as Mine Site development alters subwatershed divides and diverts runoff for treatment. The total

watershed area tributary to each model output location during future conditions ranges from 94% to 99% of the existing-conditions watershed area.

- Basic statistics characterizing flow patterns at different locations along the Partridge River during Project operations indicate that average and high flows will change by less than 10% throughout the stages of Mine Site development. The changes in average and high flows will be greatest in the vicinity of the Mine Site but decrease to less than 5% below the confluence of the Partridge River with the South Branch of the Partridge River (SW004a) and less than 3% immediately upstream of Colby Lake (SW006). Low flows will decrease by less than 10%.

- The effect of changes in Partridge River flow on water levels in Colby Lake and Whitewater Reservoir is expected to be minimal. PolyMet assessed the combined impact of changes in Partridge River flow and project appropriations from Colby Lake under Water Appropriation Permit 49-135 (Section 6.4.2 of Reference (4)). The combined effect of the Project will cause water level fluctuations in Colby Lake and Whitewater Reservoir that are within the conditions of the existing Permit No. 49-135 and are estimated to be less than past water level fluctuations during previous mining appropriations.

Overall, these results demonstrate that changes in watershed area in the Partridge River watershed are expected to have minimal hydrologic and hydraulic effects. There are no anticipated hydrologic or hydraulic impacts that would preclude issuing the relevant Individual Permits for the Partridge River watershed under the applicable Minnesota statutes or rules.

7.5.2 Potential Effects on the Embarrass River

PolyMet will minimize hydrologic and hydraulic impacts to the Embarrass River by managing excess water in a manner that complies with the requirements of Minnesota Rules, part 6115.0720, subpart 2(C). Specifically, PolyMet will use the water management strategy referred to as stream augmentation, as described in Section 3.3, to address potential reductions in stream flow resulting from the FTB seepage capture systems. The rate of discharge from the WWTP to tributaries of the Embarrass River will be managed so that the average annual flow in receiving waters is maintained at ±20% of existing conditions. The MDNR, in response to comments on the FEIS, stated that "Moderate changes to flow within these systems are expected to be protected by riparian vegetation, and these reaches are expected to be stable under moderate changes to stream flow and sediment supply." (p. A-335 of Reference (1)). Discharges from the WWTP also will meet State water quality standards imposed under the Project's NPDES/SDS permit. Therefore, the discharge from the WWTP is not expected to cause adverse hydrologic or hydraulic effects in the receiving waters of the Embarrass River and will be in compliance with applicable Minnesota statutes and rules.

7.5.3 Potential Effects Due to Drawdown

7.5.3.1 Mine Site

Water levels at the Mine Site will be drawn down due to pit dewatering. At the Mine Site, the FEIS concluded that due to the heterogeneity of the Mine Site surficial aquifer, and based on previous studies

of mine pits in northeastern Minnesota, it was not reasonable to attempt to quantify drawdown at the Mine Site using the MODFLOW model (Section 5.2.2.3.1 of Reference (1)). Therefore, an analog study was performed using data from the Canisteo Pit as well as the Minntac West Pit, which are located 70 and 29 miles from the Mine Site, respectively. Based on the analog site evaluation, the FEIS reached the following conclusions with respect to potentially measurable drawdown at the Mine Site:

- 0 to 1,000 feet from the pit rim: groundwater drawdown from pit dewatering may occur and may be measurable;
- 1,000 to 1,700 feet from the pit rim: groundwater drawdown from pit dewatering may occur, but may be difficult to distinguish from natural variations in background water levels;
- 1,700 to 3,200-plus feet from the pit rim: groundwater drawdown from pit dewatering may occur, but would likely only occur under certain hydrogeologic conditions, and may not be discernible from natural variability; and
- Beyond 3,200 feet from the pit: no drawdown effects would be expected.

There are few surface water bodies within the 0- to 1,000-foot zone or the 1,000- to 1,700-foot zone surrounding the Mine Site pit rims where groundwater drawdown may occur and would potentially be distinguishable from natural variations. Potentially impacted surface waters within these first two zones include Unnamed (West Pit Outlet) Creek and the headwaters of the Partridge River. The proposed Category 1 Stockpile Groundwater Containment System, with its low-permeability cutoff wall keyed into bedrock, would minimize effects of pit drawdown on the headwaters of the Partridge River.

The potential indirect impacts on wetlands due to change in wetland hydrology from groundwater drawdown at the Mine Site were assessed in the FEIS using the results of the analog site evaluation and consideration of wetland type and connection to groundwater (Section 5.2.3.2.2 of Reference (1)). Potentially impacted wetlands within the first two analog zones include portions of One Hundred Mile Swamp, to which impacts would be minimized by the proposed Category 1 Stockpile Groundwater Containment System and its low-permeability cutoff wall keyed into bedrock. As part of its wetland monitoring plan developed as part of the federal and state permitting process, PolyMet will conduct monitoring of wetland hydrology and vegetation communities to document the extent and magnitude of wetland responses, if any (potential indirect effects), from disturbances related to the Project. In particular, wetlands that have a higher potential for indirect effects as a result of groundwater drawdown will be monitored in accordance with the wetland monitoring plan.

7.5.3.2 Plant Site

At the Plant Site, potential drawdown from construction dewatering at the Plant Site will be temporary and localized to the areas immediately adjacent to the construction areas, and any potential drawdown from the use of the HRF wick drains, if needed, will be localized to the area immediately below the HRF. Water that is currently flowing to the wetlands north and west of the LTVSMC tailings basin will be managed in accordance with an MPCA construction stormwater permit and associated SWPPP. No

hydrologic or hydraulic effects are expected at the Plant Site as a result of the construction dewatering activities or the dewatering from the HRF wick drains, if they are used.

7.6 Prioritization of Water Supply Sources and Other Mining-Specific Requirements

Minnesota Rules part 6115.0720 subpart 2(A and B) directs the applicant to use available surplus water from mining operations or facilities, and to prioritize water supply sources based on various criteria. The water appropriations PolyMet is requesting under the terms of the five Individual Permits will consist entirely of surplus water generated by dewatering that is necessary for mining operations. Water from these dewatering installations will be primarily conserved through recycling within the Project facilities and operations, with some treated effluent used for stream augmentation purposes as described in Sections 3.3 and 7.5.2 of this application. Project water uses and appropriations installations are consistent with the top two priority water supply sources under Minnesota Rules, part 6115.0720 subpart 2(B): 1) runoff from the mining areas, and 2) water from active mine pits and tailing basins.

Minnesota Statutes, section 103G.297 contains additional provisions applicable to mining activities. These provisions include requirements that the proposed use of waters:

- will be necessary for the mining of deposits of ore, and another more feasible and economic method of mining the ore is not reasonably available;
- will not substantially impair the interests of the public in, or beneficial public uses of, lands or waters except as authorized by permit;
- will not endanger public health or safety; and
- will be in the public interest, and the proposed public benefits will warrant the proposed water use

The Project has met these requirements of Minnesota Statutes, section 103G.297, as documented in the review of alternatives, potential economic and social effects, and cumulative impacts of the FEIS (Reference (1)). Also, the more detailed discussions in the other sections of this application provide further support for the MDNR commissioner's determinations under Minnesota Statues Section 103G.297.

7.7 Restoration of Surface Water Flow

Minnesota Rules part 6115.0720 subpart 2(C) calls for the permittee to manage discharge of appropriated water in a manner that will restore the flow in areas where a mining operation will cause reductions in watercourse flow. Stream augmentation at the Plant Site, as described in Section 3.3 and Section 7.5.2, will restore the flow to Unnamed (Mud Lake) Creek, Trimble Creek, Unnamed Creek, and Second Creek that would otherwise be reduced by operation of the FTB seepage capture systems.

8.0 Compliance with Sustainability and Water Supply Management Requirements

The overall Project water appropriations permitting approach is designed to meet the State groundwater sustainability standard (Minnesota Statutes, section 103G.287 subdivision 5), applicable water supply management requirements of the State of Minnesota (Minnesota Statutes, section 103G.265), and other State and local plans related to water appropriations.

8.1 Groundwater Sustainability Standard

The FEIS concluded that the Project is not expected to have a significant effect on groundwater hydrology in the Partridge River or Embarrass River watersheds (Sections 5.2.2.3.2 and 5.2.2.3.3 of Reference (1)). This permit application builds upon that analysis. The following subsections demonstrate that the proposed groundwater appropriations are sustainable to continue to supply the needs of future generations and will not harm ecosystems, degrade water, or reduce water levels beyond the reach of public water supply and private domestic wells. Thus, PolyMet's proposed appropriations will comply with Minnesota's groundwater sustainability standard from Minnesota Statutes, section 103G.287 subdivision 5.

8.1.1 Groundwater Appropriations are Sustainable

Groundwater resources that could be affected by the Project are the Mine Site surficial aquifer and bedrock in the Partridge River watershed and the Plant Site surficial aquifer, which is primarily in the Embarrass River watershed, with a small section in the Partridge River watershed, as described in Section 5.2.

The Mine Site surficial aquifer, like most glacial aquifers in the region, is generally thin, discontinuous, and limited in yield (Reference (11)). The dewatering at the Mine Site is expected to result in relatively localized effects on the Mine Site surficial aquifer, as described in Section 7.5.3.1. No private wells have been identified that pump from the surficial aquifer in the vicinity of the Mine Site.

The only bedrock unit that is considered to be an aquifer in the vicinity of the Project is the BIF, which serves as a source of municipal water supply for some Iron Range cities (Reference (11)). Mine Site pit dewatering will draw water from the Duluth Complex and the Virginia Formation, bedrock units which are not used for water supply in the area (Reference (11)). The mine pits will not extend into the BIF, thus dewatering is not expected to affect the BIF (Section 3.2.4 of Reference (12)).

The Plant Site surficial aquifer, similar to the surficial aquifer at the Plant Site, is a glacial aquifer that is generally thin, discontinuous, and limited in yield (Reference (11)). The temporary construction dewatering and the dewatering from the HRF wick drains, if needed, at the Plant Site are expected to result in highly localized effects on the Plant Site surficial aquifer, as described in Section 7.5.3.2. This will minimize the potential for Project water appropriations from the Plant Site surficial aquifer to affect downgradient users of groundwater.

In summary, the effects of the proposed appropriations on groundwater resources are not expected to negatively affect the groundwater supply in the Partridge River watershed or the Embarrass River watershed.

8.1.2 Effects on Ecosystems

PolyMet also assessed the potential for impacts to ecosystems due to drawdown associated with water appropriations, hydrologic changes, and discharges from the Project. The results of that assessment are presented below.

8.1.2.1 Effects Due to Drawdown

Although drawdown of the water table associated with water appropriations is not anticipated to be significant and is not expected to impact aquatic ecosystems by lowering water levels in surface water bodies and wetlands, there is some potential for such an impact. This issue was addressed during the environmental review process. PolyMet will conduct monitoring during Project construction and operations as described in this subsection so that it is able to implement adaptive management measures if necessary to avoid and minimize any drawdown effects.

Section 7.5.3.1 of this application discusses the potential drawdown of groundwater at the Mine Site and the potential effect this drawdown could have on wetlands at the Mine Site, which were matters discussed in the FEIS (Section 5.2.2.3.2 of Reference (1)). As a result of this possibility, PolyMet, during the project, will conduct ongoing monitoring for potential indirect wetland impacts in accordance with the wetland monitoring plan.

Similarly, Section 7.5.3.2 of this application discusses the anticipated temporary impact from the Plant Site appropriations. Wetland monitoring at the Plant Site will also be completed in accordance with the monitoring plan to evaluate potential changes as a result of the proposed appropriations and operation of the FTB Seepage Containment System.

8.1.2.2 Effects Due to Hydrologic Changes

Project water appropriations are not expected to cause adverse hydrologic or hydraulic effects (as discussed in Section 7.5.1 as well as in the preceding subsections of this Section 8.1.2). Therefore, effects to ecosystems due to hydrologic changes are not anticipated.

8.1.2.3 Effects Due to Discharge

Discharges from the WWTP are not expected to adversely affect ecosystems, because the discharges will not cause adverse hydrologic changes (Section 8.1.2.2 of this application), nor will they cause exceedances of applicable surface water quality standards that are protective of ecosystems (Section 6.7 of Reference (9)).

Construction dewatering from some Project installations may be discharged off-site under the terms of an MPCA construction stormwater permit and associated SWPPP (Table 6-1). Best management practices

(BMPs) will be used to avoid adverse effects to ecosystems from authorized off-site discharge during construction dewatering.

8.1.3 Effects on Water Resources

PolyMet assessed the net effects of the water appropriation, including the planned groundwater appropriations, on surface water and groundwater quality, and determined that the water appropriation is not projected to degrade water resources. Analysis conducted for the FEIS determined that:

- The water appropriation is not projected to cause exceedances of applicable surface water quality standards (Section 6.5 of Reference (4) and Section 6.7 of Reference (9)).

- The water appropriation is not projected to cause exceedances of applicable groundwater quality standards at the property boundary (Section 6.3 of Reference (4) and Section 6.5 of Reference (9)).

8.1.4 Effects on Public or Private Wells

Potential drawdown effects on private or public wells associated with the proposed appropriations at the Mine Site and the Plant Site were evaluated. The evaluation indicates that the Project's water appropriations will not interfere with private or public wells.

At the Mine Site, mine pit dewatering is expected to result in groundwater drawdown, but due to the relatively low hydraulic conductivity of the bedrock, the effect is expected to be localized. There may be measureable decreases in groundwater levels within a 1,000-foot distance from the mine pit rims (see Section 7.5.3.1). However, no public or private wells are known to exist in the vicinity of the Mine Site. This indicates that the appropriations will not reduce water levels beyond the reach of public water supply or private domestic wells, and no impacts to other groundwater users are expected.

Plant Site construction dewatering is expected to result in drawdown in the surficial aquifer that is minor, temporary, and localized (Section 7.5.3.2). Plant Site dewatering from the HRF wick drains, if needed, would be longer term, but would also be minor and localized (Section 7.5.3.2). Public records indicated that approximately 38 residential wells are located in the area between the Plant Site and the Embarrass River, some of which draw water from the surficial aquifer and some from bedrock. The closest well is more than one mile from the Plant Site boundary (Figure 4.2.2-18 of Reference (1)) The drawdown from dewatering at the Plant Site will not reduce water levels beyond the reach of these private domestic wells, no public water supply wells are present in the vicinity of the Plant Site, and no impacts to other groundwater users are expected.

8.2 Water Supply Management Rules (Minnesota Statutes, section 103G.265)

8.2.1 Regulatory Context

Minnesota Statutes, section 103G.265, governs water supply management and establishes various thresholds that apply to consumptive use of waters of the state. "Consumptive use" is defined as "water that is withdrawn from its source for immediate further use in the area of the source and is not directly returned to the source" (Minnesota Statutes, section 103G.005, subdivision 8). The volume thresholds in the consumptive use provisions of section 103G.265 are applied in this Section 8.2 to each permit or plan, consistent with the applicable statutory requirements.[4]

PolyMet has evaluated water appropriation on a permit-by-permit basis. For the purposes of consumptive use analysis in this Section 8.2, however, and based on MDNR's request, PolyMet also evaluated water appropriations based on two separate geographic areas, the Mine Site and the Plant Site. More specifically, PolyMet has evaluated consumptive use in the context of two general plans for appropriation of water, one relating to the Mine Site (which includes all four Individual Permits applicable to the Mine Site) and one at the Plant Site. These two plans reflect the geographic separation of the two Sites (which are located approximately 7 to 8 miles apart), along with the fact that the water appropriations from the two Sites are not from the same hydrogeologic units.

Minnesota Statutes, section 103G.265, subdivision 3 states that a water appropriation permit involving consumptive use of more than 2,000,000 gallons per day on average over a 30-day period may be approved where "the water remaining in the basin of origin will be adequate to meet the basin's water resources needs during the specified life of the consumptive use." The "basin of origin" refers to the "drainage basin of the Great Lakes" (Minnesota Statutes, section 103G.005, subdivision 6). Minnesota Statutes section 103G.265, subdivisions 2 and 4 contain provisions related to diversion of water, but because the Project will not divert water from the Great Lakes Basin, these statutory provisions related to diversions do not apply. Minnesota Statutes section 103G.265 subdivision 4 also governs consumptive use from the Great Lakes Basin of greater than 5,000,000 gallons on average per day (over a 30-day period), but this threshold will not be exceeded by the Project.

8.2.2 NorthMet Consumptive Use

8.2.2.1 Estimation Methods

PolyMet has calculated consumptive use estimates based on the estimates of pumping rates described in Section 5.3.1.

For this evaluation, all estimated pumping rates were summed on a monthly basis based on the Mine Site and Plant Site geographic areas and alternatively, on the permit-by-permit approach based on the five

[4] *See* Minnesota Statutes, section 103G.265, which applies the thresholds to each "water use permit or plan that requires a permit…"

Individual Permits identified in this application. The analysis uses the appropriations schedules and assumptions described in Section 5.3.1.

8.2.2.2 Consumptive Use Estimates

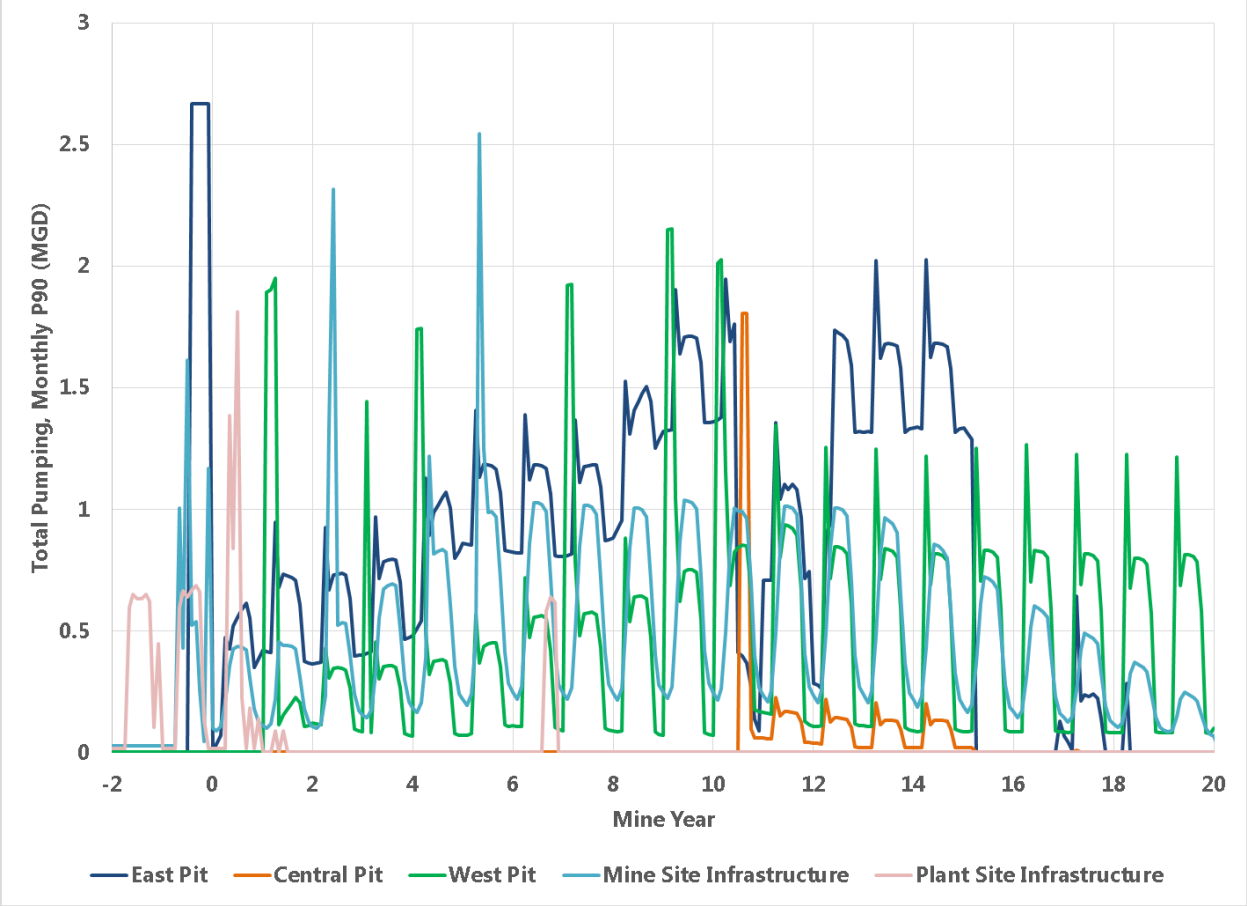


Figure 8-1 Monthly Total Pumping: Permit by Permit Basis

Figure 8-1 shows the estimated monthly consumptive use over time based on the permit-by-permit approach. Figure 8-2 shows the estimated monthly consumptive use over time for the geographical approach. Using either the permit-by-permit approach or the geographical approach, the water appropriation is above the 2,000,000 gallon-per-day average threshold as set forth in Minnesota Statutes, section 103G.265; prompting further consumptive use analysis (in Section 8.2.3). However, both approaches result in overall water appropriations below the 5,000,000 gallon-per-day average threshold documented in Minnesota Statutes section 103G.265 subdivision 4.

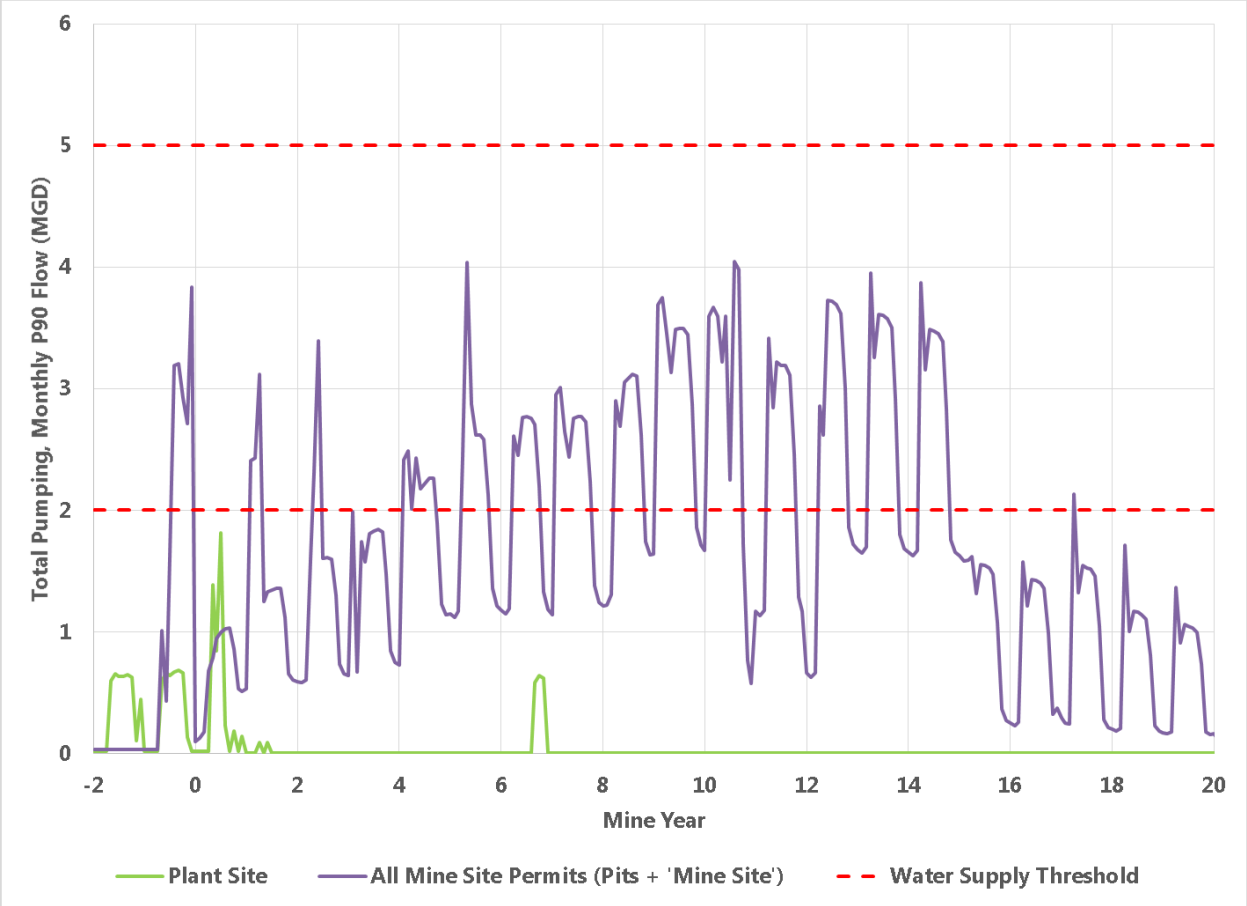


Figure 8-2 Monthly Total Pumping: Mine Site and Plant Site Basis

The pattern of Mine Site consumptive use, shown on Figure 8-1 and Figure 8-2, is primarily influenced by the following factors:

- Overburden stripping results in spikes in monthly appropriations during discrete stripping episodes that occur first during pre-operation construction, and continue through Mine Year 11.
- Construction dewatering for episodic expansion of the stockpile foundations and the Category 1 Stockpile Groundwater Containment System also results in spikes in monthly appropriations.
- Operation of the Category 1 Stockpile Groundwater Containment System shows regular seasonal effects, with higher pumping rates in the summer than in the winter. Pumping rates are estimated to increase as the stockpile is expanded, then decrease when reclamation of the stockpile begins in Mine Year 14.
- The maximum 30-day average pumping rates are estimated to occur in Mine Years 9 and 10, coinciding with the final overburden stripping episodes for the West Pit.

The pattern of Plant Site consumptive use (Figure 8-1 and Figure 8-2) shows primarily the effects of construction dewatering for the FTB Seepage Containment System over two construction seasons during the pre-operation construction phase, and again in Mine Year 7 when the eastern segment of the system will be constructed.

Based on Figure 8-1 and Figure 8-2, estimated consumptive use can be summarized as follows:

- Estimated consumptive use does not exceed 5 million gallons per day average over a 30-day period at either the Mine Site, or the Plant Site regardless of whether the permit-by-permit or geographic approach is used. Therefore, proposed appropriations will not trigger the Great Lakes Basin consumptive-use requirements of Minnesota Statutes, section 103G.265, subdivision 4.
- Estimated consumptive use from all installations at the Plant Site does not exceed 2 million gallons per day average over a 30-day period regardless of whether the permit-by-permit or geographic approach is used.
- Estimated consumptive use at the Mine Site exceeds 2 million gallons per day average over a 30-day period under either the permit-by-permit or geographic approach. Therefore, to inform the Commissioner's review of this application, PolyMet has provided information on the adequacy of Lake Superior Basin water resources in accordance with Minnesota Statutes, section 103G.265.

8.2.3 Adequacy of Lake Superior Basin Water Resources

8.2.4 Description of Relevant Water Resources

The water resources of interest encompass the Great Lakes Basin as defined in Minnesota Statutes , section 103G.005. Within the Great Lakes Basin, the relevant water resources are those in the St. Louis River watershed, specifically in the Partridge River watershed and the Embarrass River watershed.

Surface water resources of the Partridge River watershed include the Partridge River and its tributaries, ten lakes larger than 10 acres, and numerous smaller water bodies (Reference (13)). Surface water resources of the Embarrass River watershed include the Embarrass River and its tributaries, 42 lakes larger than 10 acres, and numerous smaller water bodies (Reference (13)).

As shown on Large Figure 1, portions of the Project are within the city of Hoyt Lakes and the city of Babbitt municipal boundaries. The city of Hoyt Lakes draws their municipal water supply from Colby Lake, within the Partridge River watershed, and the city of Babbitt draws their municipal water supply from a glacial aquifer within neither the Partridge River nor the Embarrass River watersheds.

The cities of Aurora, Biwabik, Belgrade, and McKinley are also located within these watersheds. Aurora is within the Partridge River watershed and draws their municipal water supply from the St. James Pit. The cities of Biwabik, Belgrade, and McKinley are in the Embarrass River watershed. Biwabik and McKinley currently draw their municipal water supply from former mine pits: the Canton Pit and the Corsica Pit, respectively. Belgrade draws their municipal water supply from the glacial aquifer within the Embarrass River watershed.

Groundwater resources of the Partridge River watershed and the Embarrass River watershed are described in Section 8.1.

8.2.5 Project Effect on Great Lakes Basin Water Supply

The Project could potentially affect surface water resources in the Partridge River watershed or Embarrass River watershed as a result of groundwater withdrawals and other watershed changes associated with the Project; however, these potential impacts are minimal. Changes in streamflow in the Partridge River are projected to be less than 10% from existing conditions (Section 8.1.2.2). Changes in streamflow in the Embarrass River watershed will be minimized by Project stream augmentation (Section 3.4). Given the minimal impacts to surface waters in the Partridge River and Embarrass River watersheds, the net effect of the Project, including estimated consumptive use of groundwater, is not expected to impact surface water supply in the Great Lakes Basin during the appropriations period.

The Project is not expected to adversely affect groundwater supply in the Partridge River watershed or Embarrass River watershed, as described in Sections 8.1.1 and 8.1.4 above.

In summary, considering the net effects of the Project on surface water and groundwater supplies of the Partridge River watershed and Embarrass River watershed, the water remaining in the Lake Superior Basin will be adequate to meet the basin's water resources needs during the life of the Project.

8.3 Other State and Local Plans

Minnesota Statutes, section 103G.271, subdivision 2 requires that appropriations must be consistent with state, regional, and local water and related land resources management plans. Compliance with other applicable water management plans is described in the following sections.

8.3.1 Minnesota Statewide Drought Plan

In 1990, Minnesota Statutes, section 103G.293 mandated that MDNR establish a drought plan to minimize conflicts and negative impacts on Minnesota's natural resources and economy. MDNR developed the Minnesota Statewide Drought Plan which provides the framework for preparing for and responding to droughts. This plan uses a staged approach to implementing drought response actions, and it is available at: http://files.dnr.state.mn.us/natural_resources/climate/drought/drought_plan_matrix.pdf.

This application includes detailed information that can assist MDNR in its in watershed management decisions implementing the Minnesota Statewide Drought Plan when necessary. In particular, Sections 4.3, 4.4, and 6.2 through 6.5 of Reference (4) and Sections 4.2 through 4.5, 6.3, and 6.5 through 6.7 of Reference (9) provides information related to Project water that may be relevant to drought response considerations.

8.3.2 St. Louis County Land Ordinance 27 and St. Louis County Comprehensive Water Management Plan

St. Louis County Land Ordinance 27 contains policies, statements, goals, and plans for private and public land and water use in St. Louis County. Section 21 of this Ordinance provides a management plan for the St. Louis, Cloquet, and Whiteface Corridors in which portions of the Project are located. The Ordinance includes standards for several aspects of development, including the following management requirements applicable to Project water appropriations:

- water supply
- extractive use standards – general standards for sand and gravel or mineral mining
- geology and mineral resource management – general standards for the location of surface disturbances associated with this development

In addition, the St. Louis County Comprehensive Water Management Plan (CWMP) provides analysis of water and related land resources coupled with a recommended series of strategies designed to achieve the County's water management goals (Reference (14)).

PolyMet will meet the requirements of St. Louis County Ordinance 27 and CWMP, to the extent they are applicable and are not superseded by State law, by complying with the MDNR and MPCA requirements under the terms of the following permits to be issued for the Project:

- NPDES/SDS permits (MPCA) (regulating water quality)
- Permit to Mine (MDNR) (regulating mineral mining)
- Individual Permits for water appropriation (MDNR) (regulating water supply)

8.3.3 Local Water Resources Management Plans

Source Water Assessments for the cities of Babbitt, Aurora and Hoyt Lakes are publically available from the Minnesota Department of Health. The primary purpose of these documents is to assess the susceptibility of each community's drinking water supply to contamination; however, they also provide information related to the local management of drinking water resources. A summary of drinking water supply management information for each city is provided below:

- The city of Hoyt Lakes currently obtains drinking water from Colby Lake, which is within the Partridge River watershed. The Inner Emergency Response Area, as documented on the city of Hoyt Lakes' Source Water Assessment (Reference (15)), is more than three miles from the Plant Site and seven miles from the Mine Site. The text of the Source Water Assessment states that the Outer Source Water Management Area "generally follows the boundary of the sub-watersheds for Colby and Whitewater Lakes." The boundary of this sub-watershed, as shown in the FEIS[5], is located approximately one mile south of the Plant Site and more than five miles from the Mine Site. As described in Section 7.5.3, potential drawdown effects at the Plant Site are expected to be localized and minor in nature and potential drawdown effects from the Mine Site are not expected beyond 3,200 feet from the pit edge. Therefore, the Outer Source Water Management Area for Colby Lake is outside the area of expected drawdown effects related to the proposed water appropriation. Other effects from the Project on water levels in Colby and Whitewater

[5] The boundaries of the sub-watershed for Colby and Whitewater Lakes as shown in the FEIS differ from the boundaries documented on the Source Water Assessment. The FEIS boundaries, which are more current than those in the November 2002 Source Water Assessment, are assumed to be more accurate.

Lakes, including the combined impact of changes in Partridge River flow and Project appropriations from Colby Lake under Water Appropriation Permit 49-135, are described in Section 7.5.1. The combined effect of the Project will cause water level fluctuations in Colby Lake and Whitewater Reservoir that are within the conditions of the existing Permit No. 49-135 and are estimated to be less than past water level fluctuations during previous mining appropriations.

- The city of Babbitt currently obtains drinking water from wells completed in a glacial aquifer below the city. The source area for water entering these wells, encompassed within the Drinking Water Supply Management Area (Reference (16), is located outside the Partridge River and Embarrass River watersheds and is approximately five miles northeast of the Mine Site. As described in Section 8.1.4, the proposed water appropriations are not projected to interfere with public wells, including those located in the city of Babbitt.

- The city of Aurora currently obtains drinking water from the St. James Pit, which is located in the Partridge River watershed. The Source Water Assessment (Reference (17) defines both an Inner Emergency Response Area, designed to help the city address contaminant releases which present an imminent (acute) health concern to water users, and an Outer Source Water Management Area designed to enable protection of water users from long-term (chronic) health effects related to low levels of chemical contamination or the periodic presence of contaminants at low levels in the surface water used by the city. The nearest boundary of the Outer Source Water Management Area is one mile from the Plant Site and more than seven miles from the Mine Site. As described in Section 7.5.3, potential drawdown effects at the Plant Site are expected to be localized and minor in nature, and potential drawdown effects from the Mine Site are not expected beyond 3,200 feet from the pit edge. Therefore, the Outer Source Water Management Area for the St. James Pit is outside the area of expected drawdown effects related to the proposed water appropriation.

9.0 Proposed Monitoring Plan

Monitoring in connection with water appropriations will measure flow rates and water levels to document appropriation rates and monitor potential effects of permitted dewatering. This section presents the proposed monitoring plan, including the proposed monitoring strategy, station locations and numbers, and frequency of water level monitoring and flow data collection. The contents of this proposed monitoring plan are subject to change prior to issuance of the water appropriations permits. Monitoring results will be reported to the State based on requirements in the relevant permits.

In addition to stations that will monitor the potential effects of permitted withdrawals, the water appropriation monitoring plan also includes stations that will monitor the stream augmentation program to evaluate potential hydrologic or ecological effects associated with decreased surface water flow in creeks downstream of the FTB seepage capture systems (Section 2.5 of Reference (2)).

The water appropriations monitoring plan includes four types of monitoring:

- Groundwater monitoring to identify the effects of permitted groundwater withdrawals on groundwater levels.
- Surface water monitoring to identify the effects of permitted groundwater withdrawals on surface water flow downstream of the Mine Site and the Plant Site,
- Internal appropriation source monitoring to document the volume of water withdrawn during operations by Project infrastructure (such as the mine pits and the Category 1 Stockpile Groundwater Containment System).
- Stream augmentation monitoring to document the collected seepage flows, the augmentation flows, the streamflow, and ecologic conditions in Unnamed (Mud Lake) Creek, Trimble Creek, Unnamed Creek, and Second Creek.

The water appropriation monitoring plan is summarized in a series of figures and tables, as follows:

- Large Figure 7 through Large Figure 10 show the proposed monitoring stations for groundwater, surface water, internal appropriations, and stream augmentation.
- Large Table 2 through Large Table 5 describe the purpose, type, and frequency of monitoring, the proposed parameter groups to be monitored, and the proposed frequency and method of reporting.

Information included on the figures and tables is described further in the following sections.

9.1 Groundwater Monitoring

Groundwater monitoring will measure the effects of permitted groundwater withdrawals on groundwater levels. Therefore, groundwater monitoring focuses on water levels in the bedrock at the Mine Site, as shown on Large Figure 7. Large Table 2 lists the Mine Site groundwater monitoring stations and describes their location and purpose.

Effects of Plant Site groundwater withdrawals are expected to be localized; therefore, no groundwater monitoring at the Plant Site is proposed.

9.2 Surface Water Monitoring

Surface water monitoring will monitor the flow in the Partridge River to assess changes associated with mine pit dewatering and in the Embarrass River to assess changes associated with seepage collection and stream augmentation. Large Table 3 lists the surface water monitoring stations and describes their purpose and location. The proposed surface water monitoring stations are shown on Large Figure 8. Continuous flow monitoring will occur at each of these locations via stream gages.

9.3 Internal Appropriation Source Monitoring

Internal appropriation source monitoring will measure flows from infrastructure that will withdraw groundwater during operations. Large Table 4 lists the internal appropriation sources and describes their purpose and location. The proposed internal appropriation source monitoring stations are shown on Large Figure 9. Continuous flow monitoring will occur at each of these locations via flow meters. If underdrain systems are constructed at any of the temporary stockpiles, PolyMet will establish internal monitoring stations to measure those flows. Likewise, if wick drains are used at the HRF, PolyMet will establish an internal monitoring station to measure those flows.

9.4 Temporary Construction Dewatering Monitoring

The volume of water pumped from each temporary construction dewatering installation will be measured within 10% accuracy using industry standard methods appropriate to the specific installation. Temporary construction dewatering monitoring methods and locations will be described in annual reports for the year that the temporary dewatering occurs.

9.5 Stream Augmentation Monitoring

Stream augmentation monitoring is part of the overall appropriations monitoring program to measure flow rates and water levels to evaluate potential effects of permitted dewatering. During the environmental review process, PolyMet committed to augment flow in Unnamed (Mud Lake) Creek, Trimble Creek, Unnamed Creek, and Second Creek to maintain average annual flow within ±20% of existing conditions for purposes of maintaining hydrology and existing aquatic ecology (Section 5.2.2.3.3 of Reference (1)).

9.5.1 Monitoring Approach

Four types of monitoring are proposed:

- Flow monitoring will record the amount of water collected by the FTB seepage capture systems from the headwater area of each creek. Flow will be measured at appropriate locations in the return piping system. Continuous flow monitoring will occur at each of these stations via flow meters.

- Augmentation flow monitoring will record the amount of water the Project delivers to the headwater area of each creek. Augmentation flows to Trimble Creek, Unnamed Creek, and Second Creek will be measured at the surface water discharge monitoring stations via flow meters. Augmentation flow to Unnamed (Mud Lake) Creek will be measured at the outlet of the drainage swale.

- Aquatic biota monitoring will document the characteristics of the biotic community in a channelized portion of each creek. It will be conducted each spring after snowmelt, following MPCA-recommended protocol.

- In-stream flow monitoring will be conducted in a channelized portion of each creek, if suitable locations can be found. The creeks are extremely low gradient streams, intermittently channelized, with extensive beaver activity. Field reconnaissance will be conducted in consultation with the MDNR to determine where suitable locations can be found for which accurate flow rating curves could be developed. Continuous flow monitoring will occur at each of these stations via stream gages.

The proposed stream augmentation monitoring stations are shown on Large Figure 10. Proposed locations may be refined during permitting, and final locations will be determined based on final engineering, stream channel characteristics, accessibility, and consultations with the MDNR.

9.5.2 Implementation Goals and Considerations

PolyMet will discharge treated effluent to the headwater areas of Trimble Creek, Unnamed Creek, and Second Creek, as well as divert flow through a drainage swale to the headwater area of Unnamed (Mud Lake) Creek, to replace flow captured by the FTB seepage capture systems (see Sections 3.3. and 3.4). The goal will be to maintain average annual flow in these streams within ±20% of natural conditions.

The existing characteristics of Unnamed (Mud Lake) Creek, Trimble Creek, Unnamed Creek, and Second Creek present unique challenges for evaluating the effectiveness of stream augmentation flows relative to this goal. These streams flow at very low velocity through wetlands with only intermittent channels, which results in low precision for stream gages. In addition, water levels are largely influenced by beaver activity, vegetative conditions, and seepage from the existing Tailings Basin. Because of this, stream flow data alone cannot be used to assess performance relative to the goal of maintaining average annual flows within ±20% of existing conditions. During the initial period of operations, discharge rates to each subwatershed will be based on the modeling work conducted for the FEIS using the GoldSim model and will be proportionate to the volume that is collected by the FTB seepage capture systems. The monitoring approach outlined above will provide the data necessary to allow PolyMet to make adjustments to augmentation flow rates, as needed, to achieve the objectives of minimizing ecologic impacts, if any, in the receiving waters.

10.0 References

1. **Minnesota Department of Natural Resources, U.S. Army Corps of Engineers, and U.S. Forest Service.** NorthMet Mining Project and Land Exchange Final Environmental Impact Statement. November 2015.

2. **Poly Met Mining Inc.** NorthMet Project Water Management Plan - Plant (v5). July 2016.

3. —. NorthMet Project Water Management Plan - Mine Site (v5). July 2016.

4. —. NorthMet Project Water Modeling Data Package Volume 1 - Mine Site (v14). February 2015.

5. **Barr Engineering Co.** Hydrogeologic Investigation - Phase I, PolyMet NorthMet Mine Site, RS-02 Draft-02. November 2006.

6. —. Hydrogeologic Investigation - Phase II, PolyMet NorthMet Mine Site, RS-10 Draft-02. November 2006.

7. —. Phase III Hydrogeologic Investigation: RS10A – Hydrogeological – Drill Hole Monitoring, PolyMet NorthMet RS-10A Draft-01. March 2007.

8. **Poly Met Mining Inc.** NorthMet Project Rock and Overburden Management Plan (v8). July 2016.

9. —. NorthMet Project Water Modeling Data Package Volume 2 - Plant Site (v11). March 2015.

10. —. NorthMet Project Geotechnical Data Package Vol 1 - Flotation Tailings Basin (v7). July 2016.

11. **Minnesota Pollution Control Agency.** Ground Water Profile: Arrowhead Region. [Online] http://www.pca.state.mn.us/index.php/view-document.html?gid=6482.

12. **Barr Engineering Co.** Hydrogeology of Fractured Bedrock in the Vicinity of the NorthMet Project (v3). December 2014.

13. **Minnesota Pollution Control Agency.** St. Louis River Watershed Monitoring and Assessment Report. March 2013.

14. **St. Louis County, Minnesota Planning and Development Department; St. Louis Soil and Water Conservation Districts.** St. Louis County, Minnesota Comprehensive Water Management Plan Update 2010 – 2020. *St. Louis County Minnesota.* [Online] 2010. http://www.stlouiscountymn.gov/Portals/0/Library/government/County-Plans-Ordinances/2010-2020-Comprehensive-Water-Management-Plan.pdf.

15. **City of Hoyt Lakes, Minnesota.** Source Water Assessment. November 2002.

16. **Minnesota Department of Health.** Babbitt Drinking Water Supply Management Area - (DWSMA) MN-00841 - Vulnerable. n.d.

17. **City of Aurora, Minnesota.** Source Water Assessment. n.d.

18. **Marinelli, Fred and Niccoli, Walter L.** Simple Analytical Equations for Estimating Ground Water Inflow to a Mine Pit. *Ground Water.* March-April 2000. Vol. 38, No. 2, pp. 311-314.

19. **Golder Associates.** Underdrain Piping Calculations Technical Memorandum. January 5, 2013.

Large Tables

Large Table 1 Pumping Estimation Methods and Assumptions

Flow Source	Installations	Estimate Methods and Key Assumptions	Uncertainty Factor	Rationale for uncertainty factor
Pit groundwater	East Pit Central Pit West Pit	MODFLOW results with an uncertainty factor applied in GoldSim (GoldSim P90 = 1.3x MODFLOW)	1.0	GoldSim includes uncertainty, P90 used
Net precipitation onto pits	East Pit Central Pit West Pit	GoldSim results including precipitation variability (P90 snowmelt is approximately 8.1-inches (in) over one month)	1.0	GoldSim includes uncertainty, P90 used
Category 1 Stockpile Groundwater Containment System flow	Category 1 Stockpile Groundwater Containment System	GoldSim results including precipitation variability (P90 monthly precipitation is approximately 4.9-in)	1.0	GoldSim includes uncertainty, P90 used
Mine Site construction area dewatering	East Pit Central Pit West Pit Category 1 Waste Rock Stockpile construction Category 2/3 Waste Rock Stockpile construction Category 4 Waste Rock Stockpile construction Ore Surge Pile construction Category 1 Stockpile Groundwater Containment System construction Mine water pond construction Stormwater pond construction Construction of new buildings	Depth of excavation from 8-ft to 20-ft Depth to water table from 0-ft to 5-ft Porosity of mineral soils 47% Porosity of peat 89% Assumed 50% of pore water dewatered, remainder excavated with soil	1.5	50% increase to reflect uncertainty in pore water dewatering
Mine Site excavation groundwater inflows	East Pit Central Pit West Pit Category 1 Waste Rock Stockpile construction Category 2/3 Waste Rock Stockpile construction Category 4 Waste Rock Stockpile construction Ore Surge Pile construction Category 1 Stockpile Groundwater Containment System construction Mine water pond construction Stormwater pond construction	Inflow to excavations from surficial aquifer and bedrock is estimated based on Reference (18) Estimated surficial aquifer hydraulic conductivity (the primary sensitive parameter) is 2.9 ft/day	6.0	The maximum surficial aquifer hydraulic conductivity used in GoldSim modeling near the pits is approximately 18 ft/day, resulting in an estimated high-end inflow approximately 6 times higher
Mine Site excavation runoff	East Pit Central Pit West Pit Category 1 Waste Rock Stockpile construction Category 2/3 Waste Rock Stockpile construction Category 4 Waste Rock Stockpile construction Ore Surge Pile construction	Monthly runoff from open areas assumed to be approximately 3.2-in	1.5	Results in runoff similar to the GoldSim peak P90 used for the precipitation on the Category 1 Waste Rock Stockpile

Flow Source	Installations	Estimate Methods and Key Assumptions	Uncertainty Factor	Rationale for uncertainty factor
Stockpile foundation underdrains	Category 2/3 Waste Rock Stockpile underdrains, if needed Category 4 Waste Rock Stockpile underdrains, if needed Ore Surge Pile underdrains, if needed	Inflow from soil compression based on consolidation theory and laboratory consolidation tests, with depth to bedrock from 14-ft to 26-ft and stockpile height from 40-ft to 145-ft (Reference (19))	6.0	Consistent with excavation groundwater uncertainty
Plant Site standing water in wetlands	Flotation Tailings Basin (FTB) Seepage Containment System construction Hydrometallurgical Residue Facility (HRF) construction	Wetlands assumed to represent 50% to 75% of construction footprint Wetlands assumed to contain 2-ft of standing water	2.0	100% increase to reflect uncertainty in depth of water to drain
Plant Site excavation runoff	FTB Seepage Containment System construction HRF construction seepage collection	Total direct precipitation and runoff assumed to equal 5 times the average monthly direct precipitation from GoldSim inputs	1.0	Conservatism included in runoff assumption
Plant Site excavation groundwater inflows (1)	FTB Seepage Containment System construction	Assumed 5 gpm per linear foot of excavation for initial dewatering Assumed 0.087 gpm per linear foot of excavation for steady groundwater inflows	3.0 (initial) 6.0 (steady)	100% increase from Mine Site construction area dewatering uncertainty due to uncertain soils Consistent with Mine Site excavation groundwater uncertainty
Plant Site excavation groundwater inflows (2)	HRF construction	Assumed 0.05 gpm per linear foot of excavation due to shallow nature of system	6.0	Consistent with Mine Site excavation groundwater uncertainty
Plant Site construction area dewatering (1)	Colby Lake pipeline upgrades	Assumed 200 gpm continuous dewatering during construction in Muskeg soils	1.5	Consistent with Mine Site Mine Site construction area dewatering uncertainty
Plant Site construction area dewatering (2)	Sewage Treatment System construction	Assumed 50 gpm continuous dewatering during construction of sewage sump	1.5	Consistent with Mine Site Mine Site construction area dewatering uncertainty
HRF wick drains	HRF wick drain operation, if needed	Assumed porosity of 50% Volume of water removed during liner pre-loading estimated based on subgrade deflection estimates Volume during operations estimated based on stockpile foundation underdrain rates	2.0	100% increase to reflect uncertainty in pore water dewatering

Large Table 2 Water Appropriation Monitoring: Groundwater

Existing Station ID	Proposed Appropriation Station ID	Bedrock or Surficial Aquifer	Description	Monitoring Type	Parameter Group(s)	Frequency	Reporting	Overlapping Monitoring
MW-2	GW402	Surficial Aquifer	Monitors groundwater downgradient from the West Pit.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
MW-12	GW412	Surficial Aquifer	Monitors groundwater north of the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
MW-14	GW414	Surficial Aquifer	Monitors groundwater northwest of the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
MW-15	GW415	Surficial Aquifer	Monitors groundwater west of the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
MW-16	GW416	Surficial Aquifer	Monitors groundwater downgradient from the West Pit and the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
GW-M001	GW419	Surficial Aquifer	Monitors groundwater downgradient of the Category 4 Waste Rock Stockpile.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW430	Surficial Aquifer	Monitors groundwater downgradient from the East Pit.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	--
	GW468	Surficial Aquifer	Monitors groundwater between the West Pit and the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
	GW470	Surficial Aquifer	Monitors groundwater north of the West Pit, north of the Mine Site boundary.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
	GW499	Surficial Aquifer	Monitors groundwater north of the West Pit	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW502	Bedrock	Monitors groundwater downgradient from the West Pit.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
OB-5	GW505	Bedrock	Monitors groundwater adjacent to the East Pit.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
OB-1	GW507	Bedrock	Monitors groundwater between the West Pit and the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW508	Bedrock	Monitors groundwater between the West Pit and the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW509	Bedrock	Monitors groundwater north of the West Pit	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
	GW510	Bedrock	Monitors groundwater north of the West Pit, north of the Mine Site boundary.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW512	Bedrock	Monitors groundwater north of the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW514	Bedrock	Monitors groundwater northwest of the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW515	Bedrock	Monitors groundwater west of the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW516	Bedrock	Monitors groundwater downgradient from the West Pit and the Category 1 Stockpile Groundwater Containment System.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	NPDES/SDS
--	GW530	Bedrock	Monitors groundwater downgradient from the East Pit.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	--
--	GW531	Bedrock	Monitors groundwater adjacent to the Category 2/3 Stockpile	Appropriation	Water Levels	Monthly; Year-round	Annual Report	--
--	GW532	Bedrock	Monitors groundwater adjacent to the West Pit.	Appropriation	Water Levels	Monthly; Year-round	Annual Report	--

Large Table 3 Water Appropriation Monitoring: Surface Water

Water Body	Existing Station ID	Proposed Appropriation Station ID	Description	Monitoring Type	Parameter Group(s)	Frequency	Reporting	Overlapping Monitoring
Partridge River	PM-2 / SW002	SW402	Monitors Partridge River upstream of the Mine Site.	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Partridge River	SW004c	SW413	Monitors Partridge River upstream of the confluence with the South Branch of the Partridge River, and downstream of the confluence with Unnamed Creek which is the future West Pit overflow.	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Partridge River	SW006	SW414	Monitors Partridge River upstream of Colby Lake. This is the location of the historical United States Geological Survey (USGS) gage.	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	--
Embarrass River	PM-12.2	SW008	Monitors Embarrass River upstream of the Plant Site.	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Embarrass River	PM-13 / SW005	SW005	Monitors Embarrass River downstream of the Plant Site.	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS

Large Table 4 Water Appropriation Monitoring: Appropriation Sources

Internal Appropriation Source	Existing Station ID	Proposed Appropriation Station ID	Description	Monitoring Type	Parameter Group(s)	Frequency	Reporting	Overlapping Monitoring
East Pit	--	WS401	Flow from East Pit dewatering	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
West Pit	--	WS402	Flow from West Pit dewatering	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
West Pit	--	WS403	Flow from West Pit dewatering	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Central Pit	--	WS404	Flow from Central Pit dewatering	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Category 1 Stockpile Groundwater Containment System	--	WS411	Flow from the Category 1 Stockpile Groundwater Containment System sump	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Category 1 Stockpile Groundwater Containment System	--	WS412	Flow from the Category 1 Stockpile Groundwater Containment System sump	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Central Pumping Station (CPS) Pond	--	WS414	Flow from CPS Pond: this is the combined flow from the Waste Water Treatment Facility (WWTF) treated effluent, construction mine water basin, and Overburden Storage and Laydown Area drainage that goes to the Plant Site via the Treated Water Pipeline	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Category 2/3 Stockpile Underdrain	--	GW491	Flow from the Category 2/3 Stockpile underdrain system (if underdrain is installed)	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Category 2/3 Stockpile Underdrain	--	GW492	Flow from the Category 2/3 Stockpile underdrain system (if underdrain is installed)	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Category 2/3 Stockpile Underdrain	--	GW493	Flow from the Category 2/3 Stockpile underdrain system (if underdrain is installed)	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Category 4 Stockpile Underdrain	--	GW494	Flow from the Category 4 Stockpile underdrain system (if underdrain is installed)	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Ore Surge Piile Underdrain	--	GW495	Flow from the Ore Surge Pile underdrain system (if underdrain is installed)	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	NPDES/SDS
Hydrometallurgical Residue Facility (HRF) Wick Drain	__	GW496	Flow from the HRF wick drain system (if installed)	Appropriation	Continuous Flow Monitoring	Continuous flow monitoring; Year-round	Annual Report	--

Note: Temporary construction dewatering installations will be measured within 10% accuracy using industry standard methods appropriate to the specific installation.

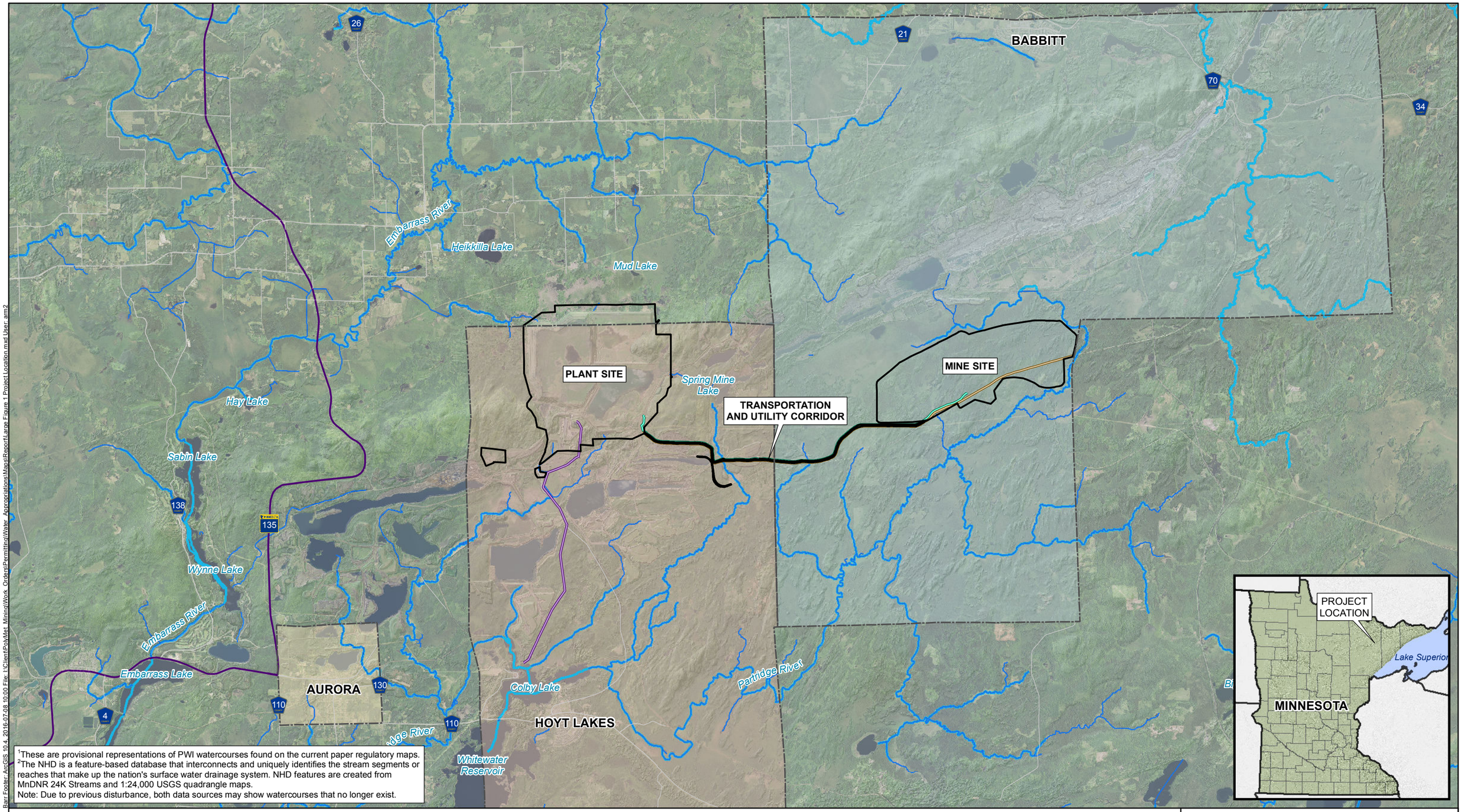
Large Table 5 Water Appropriation Monitoring: Stream Augmentation Monitoring

Water Body	Existing Station ID	Proposed Appropriation Station ID	Description	Monitoring Type	Parameter Group(s)	Frequency of Monitoring	Frequency of Reporting	Overlapping Monitoring
Seepage Flow Monitoring								
Unnamed Creek	(New Station)	WS008	Monitor amount of seepage extracted from Unnamed Creek watershed	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	--
Trimble Creek	(New Station)	WS007	Monitor amount of seepage extracted from Trimble Creek watershed	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	--
Second Creek	(New Station)	WS003	Monitor amount of seepage extracted from Second Creek watershed	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS
Unnamed (Mud Lake) Creek	(New Station)	WS006	Monitor amount of seepage extracted from Unnamed (Mud Lake) Creek watershed	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	--
Augmentation Flow Monitoring								
Unnamed Creek	(New Station)	SD002	Monitor Waste Water Treatment Plant (WWTP) discharge flow to headwater wetlands of Unnamed Creek for stream augmentation. Monitoring point is at the WWTP.	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS
Trimble Creek	(New Station)	SD003	Monitor WWTP discharge flow to headwater wetlands of Trimble Creek for stream augmentation. Monitoring point is at the WWTP.	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS
Second Creek	(New Station)	SD004	Monitor WWTP discharge flow to Second Creek for stream augmentation. Monitoring point is at the WWTP.	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS
Unnamed (Mud Lake) Creek	(New Station)	SA001	Monitor flow from Drainage Swale to headwaters area of Unnamed (Mud Lake) Creek	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	--
Biotic Survey								
Unnamed Creek	PM-11 / SW003	SW003	Monitor Unnamed Creek in a channelized location, downstream of surface water discharge outfall	Stream Augmentation	Aquatic Biotic Survey	Annually	Annual Report	NPDES/SDS
Trimble Creek	TC-1a	SA003	Monitor Trimble Creek in a channelized location, downstream of surface water discharge outfall	Stream Augmentation	Aquatic Biotic Survey	Annually	Annual Report	NPDES/SDS
Second Creek	PM-7 / SD026	SW020	Monitor Second Creek in a channelized location, downstream of surface water discharge outfall	Stream Augmentation	Aquatic Biotic Survey	Annually	Annual Report	NPDES/SDS
Unnamed (Mud Lake) Creek	MLC-1	SA002	Monitor Unnamed (Mud Lake) Creek in a channelized location, downstream of the drainage swale	Stream Augmentation	Aquatic Biotic Survey	Annually	Annual Report	NPDES/SDS

Water Body	Existing Station ID	Proposed Appropriation Station ID	Description	Monitoring Type	Parameter Group(s)	Frequency of Monitoring	Frequency of Reporting	Overlapping Monitoring
In-Stream Flow Monitoring								
Unnamed Creek		SW003	Monitor Unnamed Creek in a channelized location (1)	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS
Trimble Creek		SA003	Monitor Trimble Creek in a channelized location(1)	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS
Second Creek		SW020	Monitor Second Creek in a channelized location(1)	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS
Unnamed (Mud Lake) Creek		SA002	Monitor Unnamed (Mud Lake) Creek in a channelized location(1)	Stream Augmentation	Continuous Flow Monitoring	Year-round	Annual Report	NPDES/SDS

(1) In-stream flow monitoring is contingent on identifying suitable locations for which accurate flow rating curves could be developed. The creeks are extremely low gradient streams, intermittently channelized, with extensive beaver activity. Field reconnaissance, in consultation with the Minnesota Department of Natural Resources, will be conducted to determine if suitable locations can be found.

Large Figures



[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
Colby Lake Pipeline
Treated Water Pipeline
Dunka Road
Public Waters Inventory (PWI) Watercourses[1]
National Hydrography Dataset (NHD) Rivers & Streams[2]

Municipal Boundary
Aurora
Babbitt
Hoyt Lakes

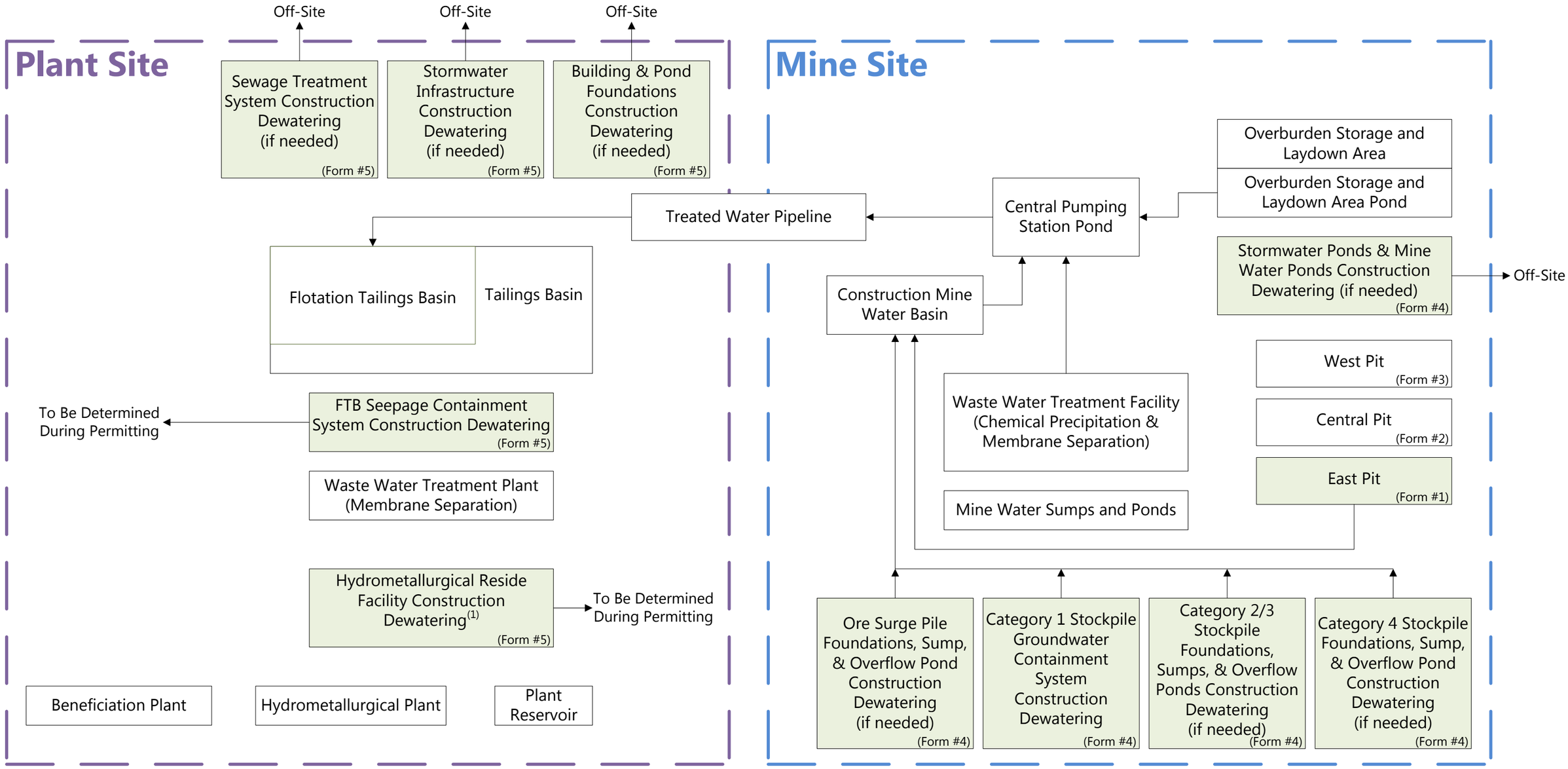
0 0.875 1.75 3.5
Miles

BARR

PROJECT LOCATION
NorthMet Project
Poly Met Mining Inc.

Large Figure 1
Water Appropriations Permit

Barr Footer: ArcGIS 10.4; 2016-07-08 10:00; File: I:\Client\PolyMet Mining\Work Orders\Permitting\Water Appropriations\Maps\ReportLarge\ Figure 1 Project Location.mxd User: am2



Legend
→ = Water
▭ = Water Management Feature
▭ = Individual Non-Irrigation Water Appropriation Permit Coverage

Notes:
(1) The Hydrometallurgical Residue Facility will be built several years after the start of operations, in approximately Mine Year 3.

WATER APPROPRIATIONS DURING PRE-OPERATION CONSTRUCTION
NorthMet Project
Poly Met Mining Inc.

Large Figure 2
Water Appropriations Permit

Plant Site

Mine Site

Treated Water Pipeline

Central Pumping Station Pond

Overburden Storage and Laydown Area

Overburden Storage and Laydown Area Pond

Flotation Tailings Basin

Tailings Basin

Construction Mine Water Basin

West Pit (Form #3)

Central Pit (Form #2)

East Pit (Form #1)

Waste Water Treatment Facility (Chemical Precipitation & Membrane Separation)

FTB Seepage Containment System

Waste Water Treatment Plant (Membrane Separation)

Mine Water Sumps and Ponds

Hydrometallurgical Residue Facility[1]

Double Liner & Leak Collection System[1]

Wick Drains (if needed) (Form #5)

Ore Surge Pile

Underdrain System (if needed) (Form #4)

Category 1 Stockpile Expansion

Groundwater Containment System (Form #4)

Category 2/3 Stockpile Expansion

Underdrain System (if needed) (Form #4)

Category 4 Stockpile Expansion

Underdrain System (if needed) (Form #4)

Beneficiation Plant

Hydrometallurgical Plant

Plant Reservoir

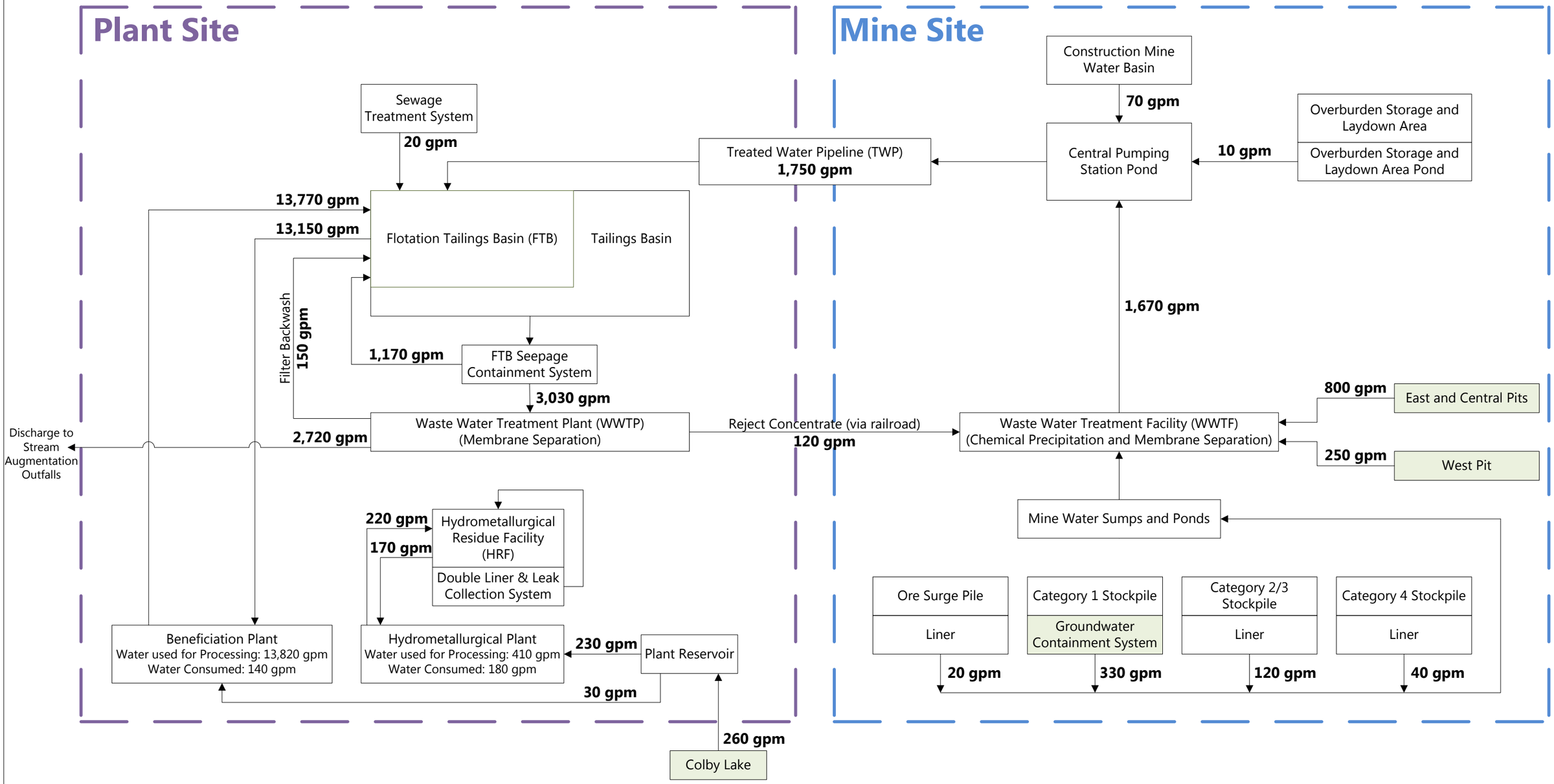
Colby Lake
Permit Transfer

Legend
→ = Water
= Water Management Feature
= Permit Transfer
= Individual Non-Irrigation Water Appropriation Permit Coverage

Notes:
[1] The Hydrometallurgical Residue Facility will be built several years after the start of operations, in approximately Mine Year 3.

WATER APPROPRIATIONS DURING OPERATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 3
Water Appropriations Permit

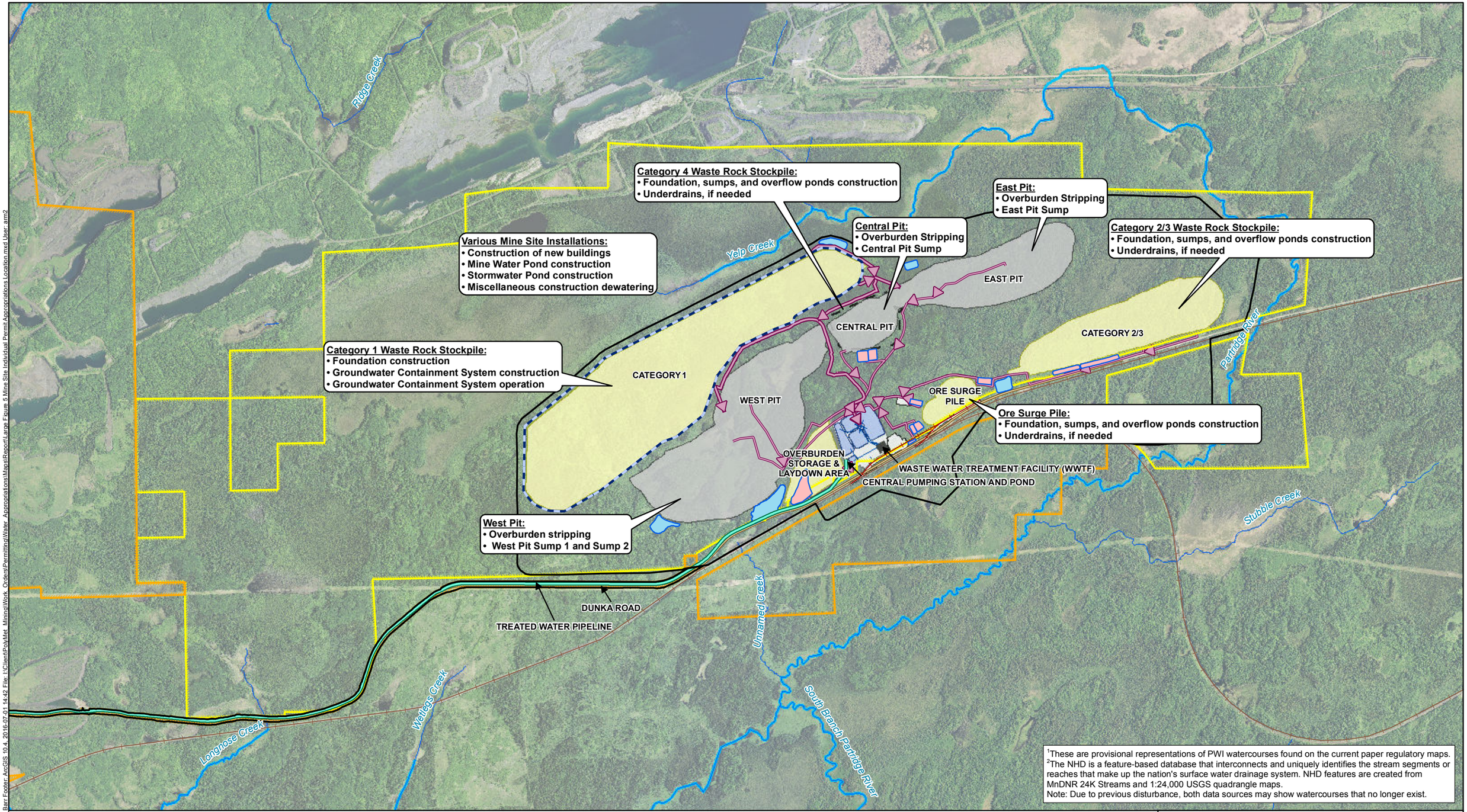


Legend
XX → = Approximate Water Flow in Gallons Per Minute (gpm)
= Water Appropriation Source

Notes:
This figure is not a comprehensive water balance. For clarity, it shows flows that are key to the NorthMet Project's overall water use strategy, and omits flows such as inflows due to net precipitation and outflows due to potential liner leakage and other potential losses. Because not all flows are shown, and because flow rates are rounded, total flows may not equal the sum of their contributing parts. Water flows were obtained from the Mine Site Water Modeling Data Package (Reference (4)) and the Plant Site Water Modeling Data Package (Reference (9)).

ANNUAL AVERAGE FLOWS IN MINE YEAR 10
NorthMet Project
Poly Met Mining Inc.

Large Figure 4
Water Appropriations Permit



[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
Layout - Mine Year 11
Mine Pit
Active Stockpile
Removed Category 4 Stockpile
East Pit: Appropriation Installation Locations
Groundwater Containment System
Mine Water Pipe
Mine Drainage Ponds and Sumps
Stormwater Ponds
Existing Private Railroad
Proposed Railroad Track
Contracts for Deed/Other Agreements Between PolyMet and Cliffs
USFS Federal Land Exchange Parcel
Public Waters Inventory (PWI) Watercourses[1]
National Hydrography Dataset (NHD) Rivers & Streams[2]

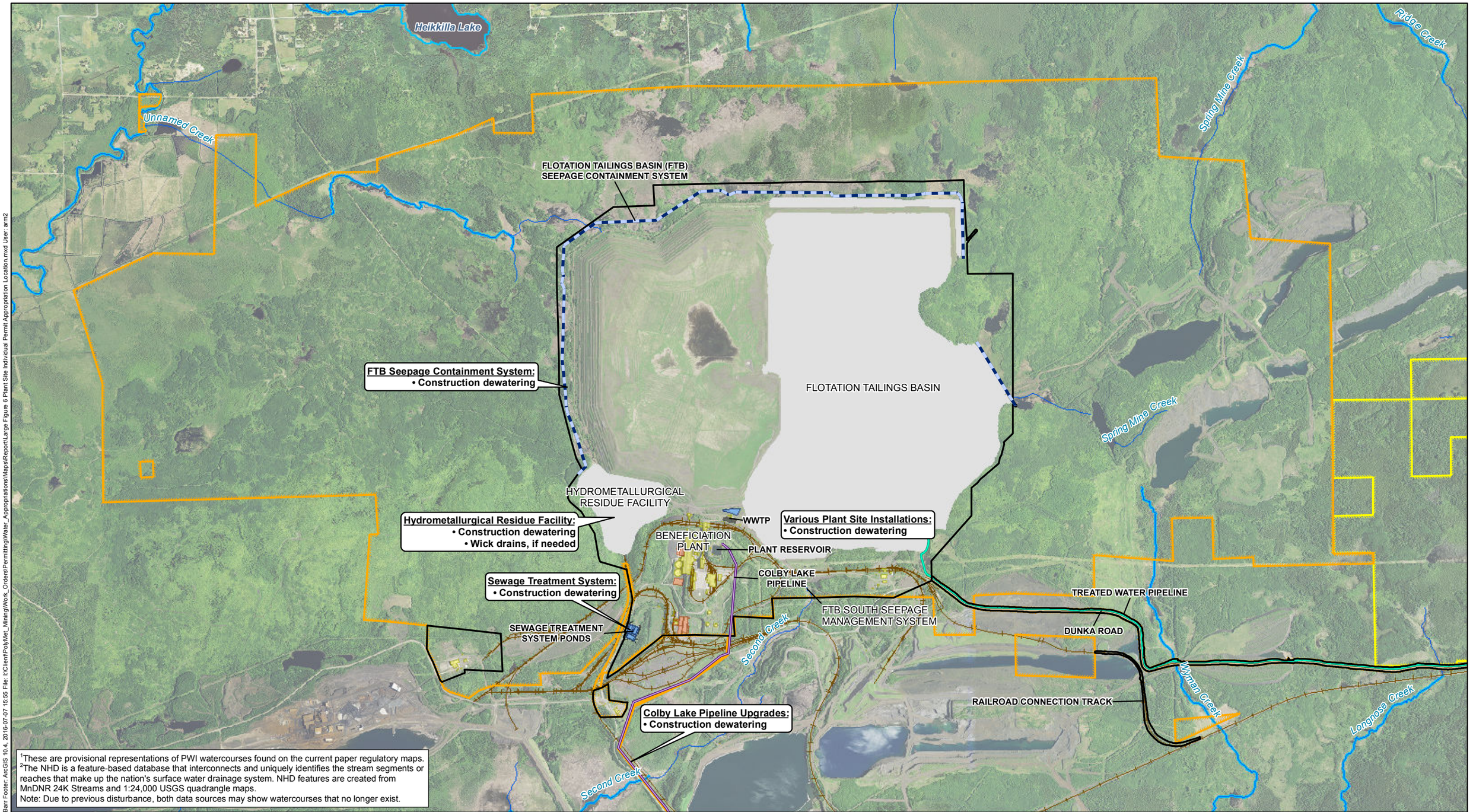
0 1,250 2,500 5,000
Feet

BARR

MINE SITE INDIVIDUAL PERMITS APPROPRIATION INSTALLATION LOCATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 5
Water Appropriations Permit

Barr Foster ArcGIS 10.4, 2016-07-01 14:42 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Water_Appropriations\Maps\Report\Large_Figure_5-Mine_Site_Individual_Permit_Appropriations_Location.mxd User: amn2



[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.

Existing Buildings
Mine Year 11
New Project Buildings
Railroads

Sewage Treatment System:
Appropriation Installation Locations

EIS Project Areas
Contracts for Deed/Other Agreements Between PolyMet and Cliffs
USFS Federal Land Exchange Parcel

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

Note: Flotation tailings transport piping and Tailings Basin water return piping not shown. Please refer to Permit Application Support Drawings.

N

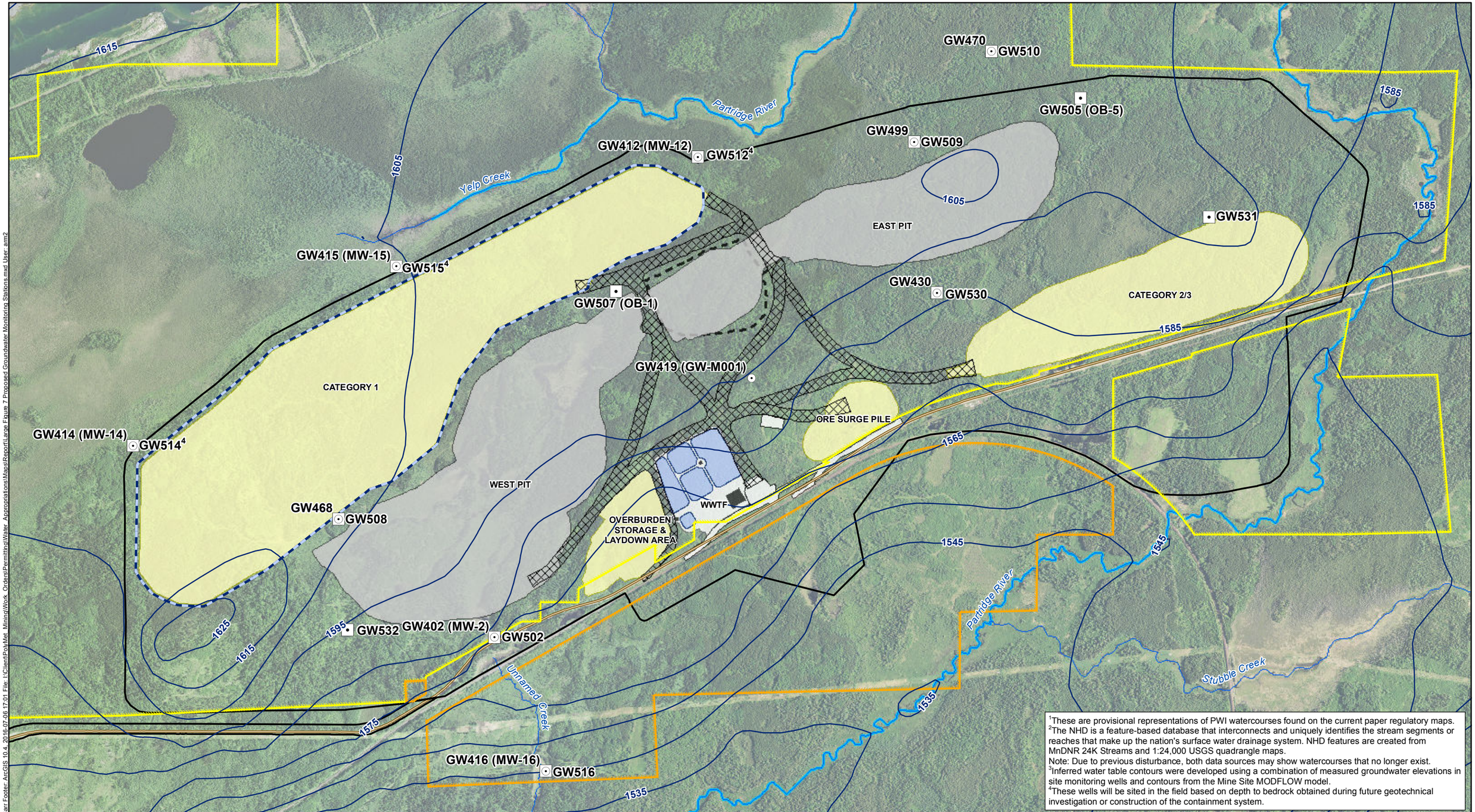
0 1,500 3,000 6,000
Feet

BARR

PLANT SITE INDIVIDUAL PERMIT APPROPRIATION AND INSTALLATION LOCATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 6
Water Appropriations Permit

Barr Footer: ArcGIS 10.4, 2016-07-07 15:55 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Water_Appropriations\Maps\Report\Large Figure 6 Plant Site Individual Permit Appropriation Location.mxd User: arm2



[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.
[3]Inferred water table contours were developed using a combination of measured groundwater elevations in site monitoring wells and contours from the Mine Site MODFLOW model.
[4]These wells will be sited in the field based on depth to bedrock obtained during future geotechnical investigation or construction of the containment system.

Water Appropriations Monitoring Station
- Surficial Aquifer
- Bedrock Aquifer

GW505 (OB-5) Proposed Appropriation Monitoring Station ID (Current Monitoring Station ID)

EIS Project Areas
Mine Layout - Year 11
- Mine Pit
- Active Stockpile
- Removed Stockpile
- Haul Roads
- Groundwater Containment System

- Groundwater Elevation Contours[3] (ft)
- Public Waters Inventory (PWI) Watercourses[1]
- National Hydrography Dataset (NHD) Rivers & Streams[2]
- Contracts for Deed/Other Agreements Between PolyMet and Cliffs
- USFS Federal Land Exchange Parcel

0 750 1,500 3,000
Feet

BARR

PROPOSED GROUNDWATER MONITORING STATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 7
Water Appropriations Permit

Barr Footer: ArcGIS 10.4, 2016.07.06 17:01 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Water_Appropriations\Maps\Report\Large_Figure_7_Proposed_Groundwater_Monitoring_Stations.mxd User: arm2

Pike River
Bear Creek
PM-12.2
Embarrass River
Trimble Creek
Mud Lake Creek
Ridge Creek
Northshore Mine
SW402 (SW002)
Unnamed Creek
PM-13
Spring Mine Creek
Yelp Creek
One Hundred Mile Swamp
Plant Site
Mine Site
Embarrass River Watershed
Stubble Creek
Area 1 Shops
SW413
Sabin Lake
Second Creek
Partridge River
Wedges Creek
Longnose Creek
Stephens Creek
Wynne Lake
COLBY LAKE PIPELINE
Wyman Creek
Unnamed Creek
COLBY LAKE PUMPHOUSE
SW414 (SW006)
Embarrass Lake
First Creek
Colby Lake
Partridge River Watershed
South Branch Partridge River
HOYT LAKES
Cranberry Creek
Colvin Creek
Whitewater Reservoir
Embarrass River
Saint Louis River

[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.

Proposed Monitoring Stations
- Surface Water
- SW402 (SW002) Proposed Appropriation Monitoring Station ID (Current Monitoring Station ID)

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

N

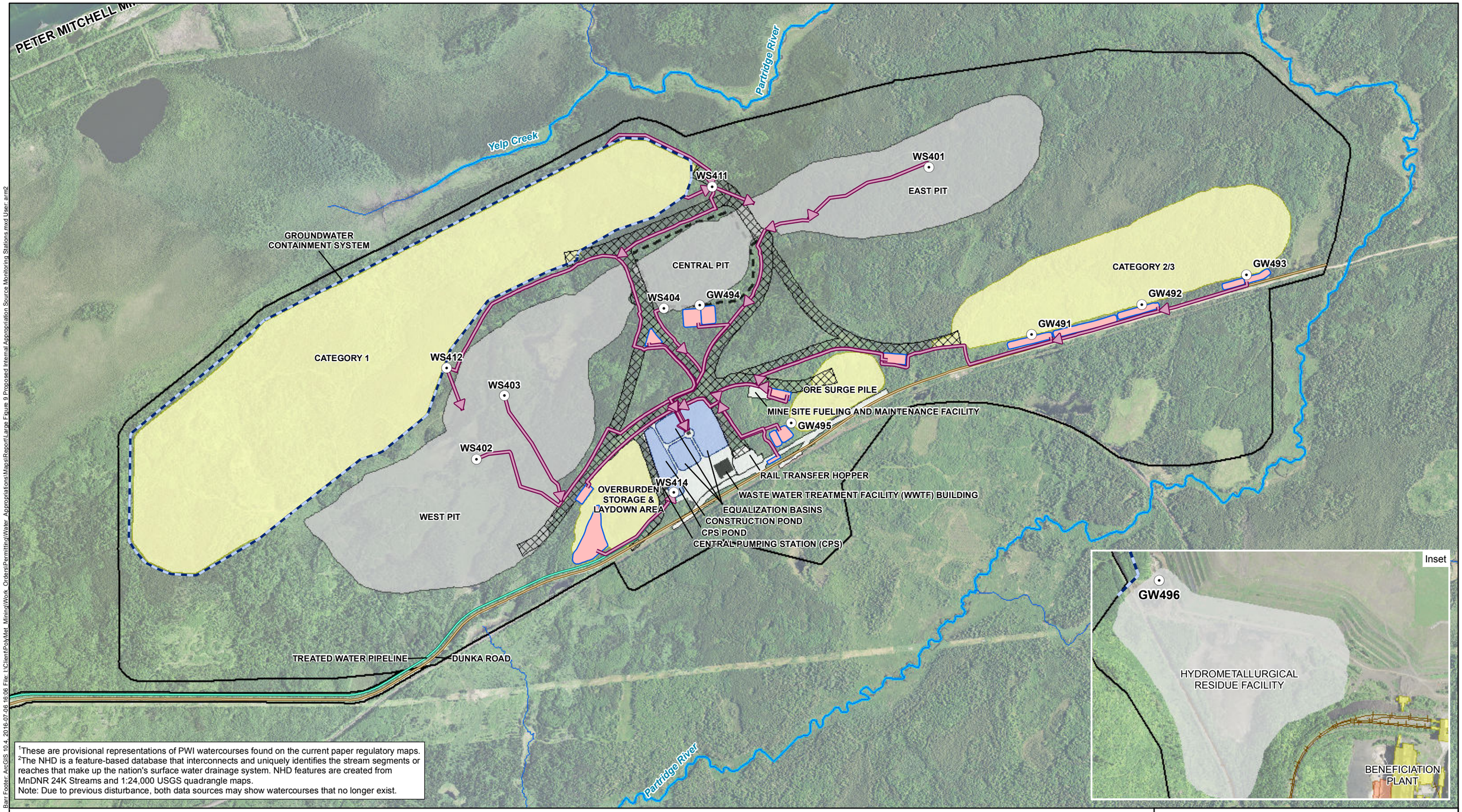
0 0.75 1.5 3
Miles

BARR

PROPOSED SURFACE WATER MONITORING STATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 8
Water Appropriations Permit

Barr Foster ArcGIS 10.4 2016-07-06 15:49 File: J:\Client\PolyMet Mining\Work Orders\Permitting\Water Appropriations\Maps\Report\Large Figure 8 Proposed Surface Water Monitoring Stations.mxd User: amr2



[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.

Internal Appropriation Source Monitoring Stations

WS401 Proposed NPDES/SDS Monitoring Station ID

EIS Project Areas

Mine Layout - Year 11

Mine Pit

Active Stockpile

Removed Stockpile

Haul Roads

Mine Drainage Ponds and Sumps

Pipes

Public Waters Inventory (PWI) Watercourses[1]

National Hydrography Dataset (NHD) Rivers & Streams[2]

0 750 1,500 3,000

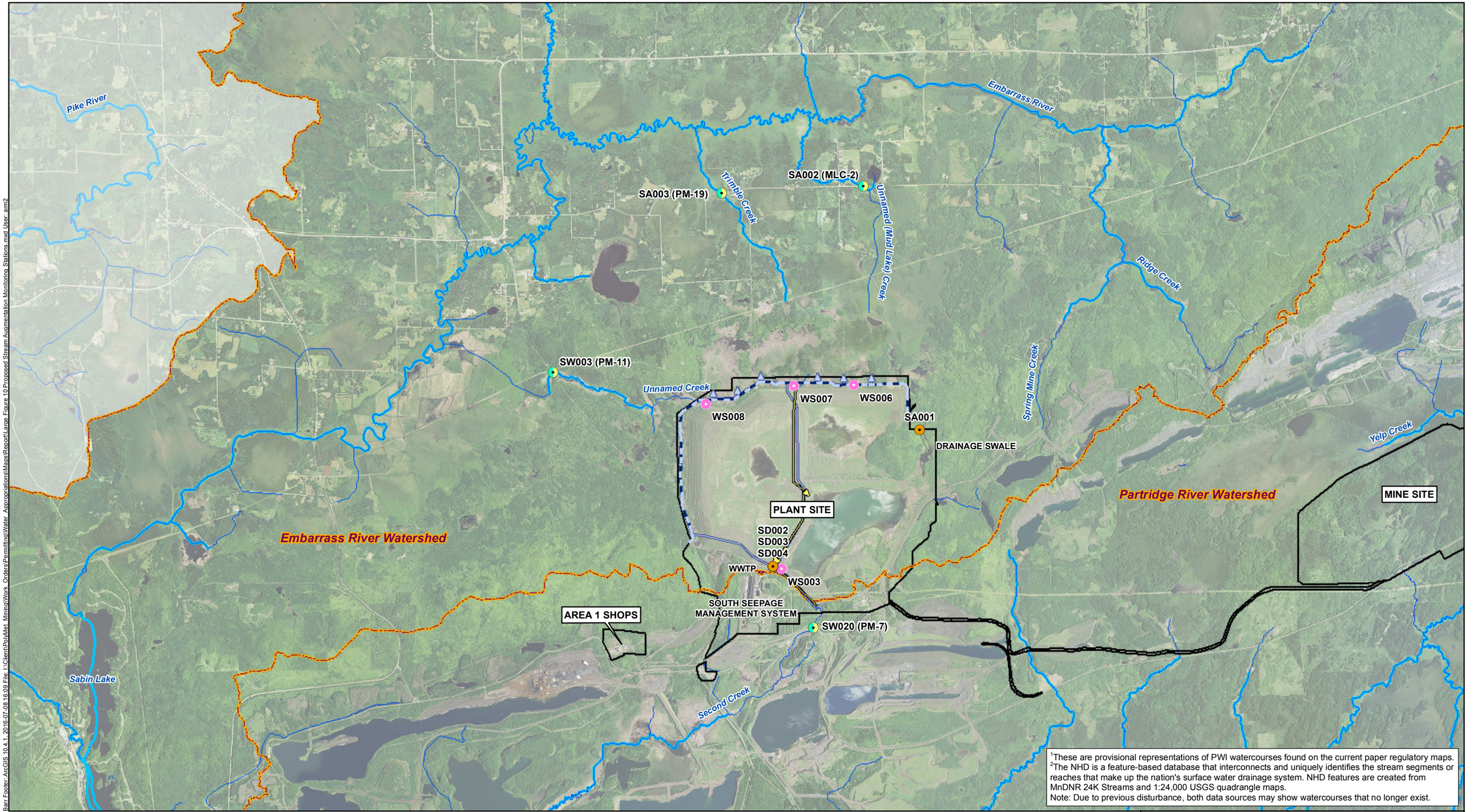
Feet

BARR

PROPOSED INTERNAL APPROPRIATION SOURCE MONITORING STATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 9
Water Appropriation Permit

Barr Footer: ArcGIS 10.4, 2016-07-06 16:06 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Water_Appropriations\Maps\Report\Large_Figure_9_Proposed_Internal_Appropriation_Source_Monitoring_Stations.mxd User: arm2



[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.

Proposed Monitoring Stations
- Flow and Biotic*
- Stream Augmentation Flow
- Seepage Flow

- EIS Project Areas
- FTB Containment System
- Surface Water Discharge Pipe
- Seepage Water Pipe

- Watershed Divide
- Public Waters Inventory (PWI) Watercourses[1]
- National Hydrography Dataset (NHD) Rivers & Streams[2]

0 0.5 1 2
Miles

SW002 (MCL-2) Proposed Appropriation Monitoring Station ID (Current Monitoring Station ID)

*Final locations for flow and biotic monitoring locations will be sited in the field in consultation with the MDNR based on accessibility and stream characteristics.

BARR

PROPOSED STREAM AUGMENTATION MONITORING STATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 10
Water Appropriations Permit

Barr Ficter ArcGIS 10.4.1, 2016-07-08 15:09 File: \\Client\PolyMet Mining\Work Orders\Permitting\Water Appropriations\Maps\Report\Large Figure 10 Proposed Stream Augmentation Monitoring Stations.mxd User: am2

Appendices

Appendix A

Application Forms

Form 1

A-02623-04
(Rev. 3/06)
Minnesota
DNR Waters

Permit Application for Appropriation of Waters of the State
NON-IRRIGATION

P.A. No.	
Date(s) Served	
☐ SWCD	
☐ WSD	
☐ CITY	

NOTICE OF WARNING: All information provided on this form is considered to be public information in accordance with the Minnesota Data Privacies Act (M.S. 15.1611 to 15.1698).

SEE INSTRUCTIONS...TYPE OR PRINT CLEARLY

1. Applicant Name (landowner or renter)	2. Business Name
Poly Met Mining, Inc.	Poly Met Mining, Inc.
3. Authorized Agent (if applicable)	**4.** Phone Numbers (with area codes)
Brad Moore	(218) 471-2150
5. Mailing Address	**6.** City, State, Zip Code
PO Box 475	Hoyt Lakes, MN 55750

7. Purpose (Explain what the water will be used for) ☐ Public Water Supply ☒ Commercial/Industrial ☐ Water Level Maintenance ☐ Pollution Containment ☐ Temporary (1 year or less) ☐ Other _____

8. Source of Water ("X" one and complete) ▷ Additional information MUST be supplied for each source. Refer to instructions (8 & 9) for requirements.

a. ☐ One well
b. ☐ _____ manifolded wells
c. ☐ Stream, ditch, or river (name) _____
d. ☐ Wetland, lake, or impoundment (name) _____
e. ☒ Other **East Pit: overburden stripping and pit dewatering**

9. Point of Taking/Pumping Site

a. _____ 1/4 of _____ 1/4 of _____ 1/4
b. Section No. 2
c. Township No. 59
d. Range No. 13
e. County St. Louis

10. Means of Taking and Rate

a. ☒ Stationary Pump(s) at TBD gpm
b. ☐ Portable Pump at _____ gpm
c. ☐ Gravity Flow at _____ gpm/cfs
d. ☐ Other _____ gpm/cfs (circle one)

11. Method of Measurement

a. ☒ Flow Meter
b. ☐ Timing Device
c. ☐ Electric Power Consumption
d. ☐ Other _____

12. Means of Distribution

a. ☐ pipe _____ diam. _____ length
b. ☐ tank _____ gal. capacity
c. ☐ channel _____ length
d. ☒ other TBD

13. Legal Description-Land Owned/Rented *

Township No.	Range No.	Section	Fractional Sect. Gov't. Lots

* Rental Agreement MUST Be Submitted

14. Months of Appropriation

☐ JAN ☐ JUL
☐ FEB ☐ AUG
☐ MAR ☐ SEP
☐ APR ☐ OCT
☐ MAY ☐ NOV
☐ JUN ☐ DEC

15. Schedule of Appropriation ("X" one and complete)

a. ☒ Continuous ____ hrs./day ____ days/mo. ____ mo./yr.
b. ☐ Seasonal
c. ☐ Temporary

Beginning date TBD
End date TBD

16. Total Annual Use (Gallons per Year)

1,000 million gallons per year (maximum annual pumping)

17. Discharge To and Quantity

a. ☐ Stream, Ditch or River _____ (name) ( ) MGY
b. ☐ Wetland, Lake or Impoundment _____ (name) ( ) MGY
c. ☐ Sewer System ( ) MGY
d. ☒ Other Flotation Tailings Basin (1,000) MGY

18. Discharge Point TBD

a. _____ 1/4 of _____ 1/4 of _____ 1/4
b. Section No. _____
c. Township No. _____
d. Range No. _____
e. County _____

19. Means of Discharge and Rate

a. ☐ _____ (no.) stationary pump(s) at _____ gpm ea.
b. ☐ _____ (no.) portable pump(s) at _____ gpm ea.
c. ☐ Gravity Flow at _____ gpm/cfs
d. ☒ Other TBD _____ gpm/cfs (circle one)

20. Additional Requirements:

a. ☒ Map or Air Photo which shows:
1) Point of Taking or Pumping Site
2) Test Hole Location 3) Boundaries of Property Controlled and Area of Use 4) Discharge Point
b. ☒ $150 Minimum Application Fee will be billed after receipt of application.
c. ☒ Statement of Justification/Alternative Sources
d. ☒ Additional Documents Required

I hereby make application pursuant to Minnesota Statutes Chapter 103G.261 and all supporting rules for a permit to appropriate water in accordance with all supporting maps, plans, and other information submitted with this application. The information submitted and statements made concerning this application are true and correct to the best of my knowledge.

21. Signature of Landowner or Authorized Agent	22. Date
[signature]	7/11/16

IMPORTANT: Submit this application and all supporting data to the DNR Office serving you (see back for addresses).
APPLICANT: KEEP A COPY FOR YOUR RECORDS.

This information is available in an alternative format upon request.

Form 2

A-02623-04
(Rev. 3/06)
Minnesota
DNR Waters

Permit Application for Appropriation of Waters of the State
NON-IRRIGATION

P.A. No.

Date(s) Served
☐ SWCD _____
☐ WSD _____
☐ CITY _____

NOTICE OF WARNING: All information provided on this form is considered to be public information in accordance with the Minnesota Data Privacies Act (M.S. 15.1611 to 15.1698).

SEE INSTRUCTIONS...TYPE OR PRINT CLEARLY

1. Applicant Name (landowner or renter) Poly Met Mining, Inc.	**2.** Business Name Poly Met Mining, Inc.
3. Authorized Agent (if applicable) Brad Moore	**4.** Phone Numbers (with area codes) (218) 471-2150
5. Mailing Address PO Box 475	**6.** City, State, Zip Code Hoyt Lakes, MN 55750

7. Purpose (Explain what the water will be used for) ☐ Public Water Supply ☒ Commercial/Industrial ☐ Water Level Maintenance ☐ Pollution Containment ☐ Temporary (1 year or less) ☐ Other _____

8. Source of Water ("X" one and complete) ▷ Additional information MUST be supplied for each source. Refer to instructions (8 & 9) for requirements.
- a. ☐ One well
- b. ☐ _____ manifolded wells
- c. ☐ Stream, ditch, or river (name) _____
- d. ☐ Wetland, lake, or impoundment (name) _____
- e. ☒ Other **Central Pit: overburden stripping and pit dewatering**

9. Point of Taking/Pumping Site
- a. _____ 1/4 of _____ 1/4 of _____ 1/4
- b. Section No. 2, 3
- c. Township No. 59
- d. Range No. 13
- e. County St. Louis

10. Means of Taking and Rate
- a. ☒ Stationary Pump(s) at TBD gpm
- b. ☐ Portable Pump at _____ gpm
- c. ☐ Gravity Flow at _____ gpm/cfs
- d. ☐ Other _____ gpm/cfs (circle one)

11. Method of Measurement
- a. ☒ Flow Meter
- b. ☐ Timing Device
- c. ☐ Electric Power Consumption
- d. ☐ Other _____

12. Means of Distribution
- a. ☐ pipe ____ diam. ____ length
- b. ☐ tank _____ gal. capacity
- c. ☐ channel _____ length
- d. ☒ other TBD

13. Legal Description-Land Owned/Rented *

Township No.	Range No.	Section	Fractional Sect. Gov't. Lots

* Rental Agreement MUST Be Submitted

14. Months of Appropriation
- ☐ JAN ☐ JUL
- ☐ FEB ☐ AUG
- ☐ MAR ☐ SEP
- ☐ APR ☐ OCT
- ☐ MAY ☐ NOV
- ☐ JUN ☐ DEC

15. Schedule of Appropriation ("X" one and complete)
- a. ☒ Continuous ____ hrs./day ____ days/mo. ____ mo./yr.
- b. ☐ Seasonal Beginning date TBD
- c. ☐ Temporary End date TBD

16. Total Annual Use (Gallons per Year)
675 million gallons per year (maximum annual pumping)

17. Discharge To and Quantity
- a. ☐ Stream, Ditch or River _____ (name) ( ) MGY
- b. ☐ Wetland, Lake or Impoundment _____ (name) ( ) MGY
- c. ☐ Sewer System ( ) MGY
- d. ☒ Other Flotation Tailings Basin) (700) MGY

18. Discharge Point TBD
- a. _____ 1/4 of _____ 1/4 of _____ 1/4
- b. Section No. _____
- c. Township No. _____
- d. Range No. _____
- e. County _____

19. Means of Discharge and Rate
- a. ☐ _____ (no.) stationary pump(s) at _____ gpm ea.
- b. ☐ _____ (no.) portable pump(s) at _____ gpm ea.
- c. ☐ Gravity Flow at _____ gpm/cfs
- d. ☒ Other TBD _____ gpm/cfs (circle one)

20. Additional Requirements:
- a. ☒ Map or Air Photo which shows:
  1) Point of Taking or Pumping Site
  2) Test Hole Location 3) Boundaries of Property Controlled and Area of Use 4) Discharge Point
- b. ☒ $150 Minimum Application Fee will be billed after receipt of application.
- c. ☒ Statement of Justification/Alternative Sources
- d. ☒ Additional Documents Required

I hereby make application pursuant to Minnesota Statutes Chapter 103G.261 and all supporting rules for a permit to appropriate water in accordance with all supporting maps, plans, and other information submitted with this application. The information submitted and statements made concerning this application are true and correct to the best of my knowledge.

21. Signature of Landowner or Authorized Agent	**22.** Date
Brad Moore	7/11/16

IMPORTANT: Submit this application and all supporting data to the DNR Office serving you (see back for addresses).
APPLICANT: KEEP A COPY FOR YOUR RECORDS.

This information is available in an alternative format upon request.

Form 3

A-02623-04
(Rev. 3/06)
Minnesota
DNR Waters

Permit Application for Appropriation of Waters of the State
NON-IRRIGATION

P.A. No.

Date(s) Served
☐ SWCD
☐ WSD
☐ CITY

NOTICE OF WARNING: All information provided on this form is considered to be public information in accordance with the Minnesota Data Privacies Act (M.S. 15.1611 to 15.1698).

SEE INSTRUCTIONS...TYPE OR PRINT CLEARLY

1. Applicant Name (landowner or renter) Poly Met Mining, Inc.	2. Business Name Poly Met Mining, Inc.
3. Authorized Agent (if applicable) Brad Moore	4. Phone Numbers (with area codes) (218) 471-2150
5. Mailing Address PO Box 475	6. City, State, Zip Code Hoyt Lakes, MN 55750

7. Purpose (Explain what the water will be used for) ☐ Public Water Supply ☒ Commercial/Industrial ☐ Water Level Maintenance ☐ Pollution Containment ☐ Temporary (1 year or less) ☐ Other _____

8. Source of Water ("X" one and complete) ▷ Additional information MUST be supplied for each source. Refer to instructions (8 & 9) for requirements.
- a. ☐ One well
- b. ☐ _____ manifolded wells
- c. ☐ Stream, ditch, or river (name) _____
- d. ☐ Wetland, lake, or impoundment (name) _____
- e. ☒ Other **West Pit: overburden stripping and pit dewatering**

9. Point of Taking/Pumping Site
- a. _____ 1/4 of _____ 1/4 of _____ 1/4
- b. Section No. 3, 9, 10
- c. Township No. 59
- d. Range No. 13
- e. County St. Louis

10. Means of Taking and Rate
- a. ☒ Stationary Pump(s) at TBD gpm
- b. ☐ Portable Pump at _____ gpm
- c. ☐ Gravity Flow at _____ gpm/cfs
- d. ☐ Other _____ gpm/cfs (circle one)

11. Method of Measurement
- a. ☒ Flow Meter
- b. ☐ Timing Device
- c. ☐ Electric Power Consumption
- d. ☐ Other _____

12. Means of Distribution
- a. ☐ pipe ____ diam. ____ length
- b. ☐ tank _____ gal. capacity
- c. ☐ channel _____ length
- d. ☒ other TBD

13. Legal Description-Land Owned/Rented *

Township No.	Range No.	Section	Fractional Sect. Gov't. Lots

* Rental Agreement MUST Be Submitted

14. Months of Appropriation
☐ JAN ☐ JUL
☐ FEB ☐ AUG
☐ MAR ☐ SEP
☐ APR ☐ OCT
☐ MAY ☐ NOV
☐ JUN ☐ DEC

15. Schedule of Appropriation ("X" one and complete)
- a. ☒ Continuous ____ hrs./day ____ days/mo. ____ mo./yr.
- b. ☐ Seasonal Beginning date TBD
- c. ☐ Temporary End date TBD

16. Total Annual Use (Gallons per Year)
800 million gallons per year
(maximum annual pumping)

17. Discharge To and Quantity
- a. ☐ Stream, Ditch or River _____ (name) ( ) MGY
- b. ☐ Wetland, Lake or Impoundment _____ (name) ( ) MGY
- c. ☐ Sewer System ( ) MGY
- d. ☒ Other Flotation Tailigs Basin) (800) MGY

18. Discharge Point TBD
- a. _____ 1/4 of _____ 1/4 of _____ 1/4
- b. Section No. _____
- c. Township No. _____
- d. Range No. _____
- e. County _____

19. Means of Discharge and Rate
- a. ☐ _____ (no.) stationary pump(s) at _____ gpm ea.
- b. ☐ _____ (no.) portable pump(s) at _____ gpm ea.
- c. ☐ Gravity Flow at _____ gpm/cfs
- d. ☒ Other TBD _____ gpm/cfs (circle one)

20. Additional Requirements:
- a. ☒ Map or Air Photo which shows:
  1) Point of Taking or Pumping Site
  2) Test Hole Location 3) Boundaries of Property Controlled and Area of Use 4) Discharge Point
- b. ☒ $150 Minimum Application Fee will be billed after receipt of application.
- c. ☒ Statement of Justification/Alternative Sources
- d. ☒ Additional Documents Required

I hereby make application pursuant to Minnesota Statutes Chapter 103G.261 and all supporting rules for a permit to appropriate water in accordance with all supporting maps, plans, and other information submitted with this application. The information submitted and statements made concerning this application are true and correct to the best of my knowledge.

21. Signature of Landowner or Authorized Agent	22. Date
Brad Moore	7/11/16

IMPORTANT: Submit this application and all supporting data to the DNR Office serving you (see back for addresses).
APPLICANT: KEEP A COPY FOR YOUR RECORDS.

This information is available in an alternative format upon request.

Form 4

A-02623-04
(Rev. 3/06)
Minnesota
DNR Waters

Permit Application for Appropriation of Waters of the State
NON-IRRIGATION

P.A. No.

Date(s) Served
☐ SWCD
☐ WSD
☐ CITY

NOTICE OF WARNING: All information provided on this form is considered to be public information in accordance with the Minnesota Data Privacies Act (M.S. 15.1611 to 15.1698).

SEE INSTRUCTIONS...TYPE OR PRINT CLEARLY

1. Applicant Name (landowner or renter) Poly Met Mining, Inc.	**2.** Business Name Poly Met Mining, Inc.
3. Authorized Agent (if applicable) Brad Moore	**4.** Phone Numbers (with area codes) (218) 471-2150
5. Mailing Address PO Box 475	**6.** City, State, Zip Code Hoyt Lakes, MN 55750

7. Purpose (Explain what the water will be used for) ☐ Public Water Supply ☒ Commercial/Industrial ☐ Water Level Maintenance ☐ Pollution Containment ☐ Temporary (1 year or less) ☐ Other _____

8. Source of Water ("X" one and complete) ▷ Additional information MUST be supplied for each source. Refer to instructions (8 & 9) for requirements.
- a. ☐ One well
- b. ☐ _____ manifolded wells
- c. ☐ Stream, ditch, or river (name) _____
- d. ☐ Wetland, lake, or impoundment (name) _____
- e. ☒ Other **Mine Site Infrastructure: dewatering**

9. Point of Taking/Pumping Site Various, see application text
- a. _____1/4 of _____1/4 of _____1/4
- b. Section No. _____
- c. Township No. _____
- d. Range No. _____
- e. County _____

10. Means of Taking and Rate
- a. ☒ Stationary Pump(s) at TBD gpm
- b. ☒ Portable Pump at TBD gpm
- c. ☐ Gravity Flow at _____ gpm/cfs
- d. ☐ Other _____ gpm/cfs (circle one)

11. Method of Measurement
- a. ☐ Flow Meter
- b. ☐ Timing Device
- c. ☐ Electric Power Consumption
- d. ☒ Other various, see application

12. Means of Distribution
- a. ☐ pipe_____ diam._____ length
- b. ☐ tank_____ gal. capacity
- c. ☐ channel_____ length
- d. ☒ other TBD

13. Legal Description-Land Owned/Rented *

Township No.	Range No.	Section	Fractional Sect. Gov't. Lots

* Rental Agreement MUST Be Submitted

14. Months of Appropriation
- ☐ JAN ☐ JUL
- ☐ FEB ☐ AUG
- ☐ MAR ☐ SEP
- ☐ APR ☐ OCT
- ☐ MAY ☐ NOV
- ☐ JUN ☐ DEC

15. Schedule of Appropriation ("X" one and complete)
- a. ☒ Continuous ____hrs./day ____days/mo. ____mo./yr.
- b. ☐ Seasonal Beginning date TBD
- c. ☐ Temporary End date TBD

16. Total Annual Use (Gallons per Year)

950 million gallons per year (maximum annual pumping)

17. Discharge To and Quantity
- a. ☐ Stream, Ditch or River _____ (name) ( ) MGY
- b. ☐ Wetland, Lake or Impoundment _____ (name) ( ) MGY
- c. ☐ Sewer System
- d. ☒ Other Various, see application text (various) MGY

18. Discharge Point Various
- a. _____1/4 of _____1/4 of _____1/4
- b. Section No. _____
- c. Township No. _____
- d. Range No. _____
- e. County _____

19. Means of Discharge and Rate
- a. ☐ _____ (no.) stationary pump(s) at _____ gpm ea.
- b. ☐ _____ (no.) portable pump(s) at _____ gpm ea.
- c. ☐ Gravity Flow at _____ gpm/cfs
- d. ☒ Other TBD _____ gpm/cfs (circle one)

20. Additional Requirements:
- a. ☒ Map or Air Photo which shows:
  1) Point of Taking or Pumping Site
  2) Test Hole Location 3) Boundaries of Property Controlled and Area of Use 4) Discharge Point
- b. ☒ $150 Minimum Application Fee will be billed after receipt of application.
- c. ☒ Statement of Justification/Alternative Sources
- d. ☒ Additional Documents Required

I hereby make application pursuant to Minnesota Statutes Chapter 103G.261 and all supporting rules for a permit to appropriate water in accordance with all supporting maps, plans, and other information submitted with this application. The information submitted and statements made concerning this application are true and correct to the best of my knowledge.

21. Signature of Landowner or Authorized Agent	22. Date
B [signature] Moore	7/11/16

IMPORTANT: Submit this application and all supporting data to the DNR Office serving you (see back for addresses).
APPLICANT: KEEP A COPY FOR YOUR RECORDS.

This information is available in an alternative format upon request.

Form 5

A-02623-04 (Rev. 3/06)
Minnesota DNR Waters

Permit Application for Appropriation of Waters of the State
NON-IRRIGATION

P.A. No.

Date(s) Served
☐ SWCD ____
☐ WSD ____
☐ CITY ____

NOTICE OF WARNING: All information provided on this form is considered to be public information in accordance with the Minnesota Data Privacies Act (M.S. 15.1611 to 15.1698).

SEE INSTRUCTIONS...TYPE OR PRINT CLEARLY

1. Applicant Name (landowner or renter) Poly Met Mining, Inc.	**2.** Business Name Poly Met Mining, Inc.
3. Authorized Agent (if applicable) Brad Moore	**4.** Phone Numbers (with area codes) (218) 471-2150
5. Mailing Address PO Box 475	**6.** City, State, Zip Code Hoyt Lakes, MN 55750

7. Purpose (Explain what the water will be used for) ☐ Public Water Supply ☒ Commercial/Industrial ☐ Water Level Maintenance ☐ Pollution Containment ☐ Temporary (1 year or less) ☐ Other ____

8. Source of Water ("X" one and complete) ▷ Additional information MUST be supplied for each source. Refer to instructions (8 & 9) for requirements.
- a. ☐ One well
- b. ☐ ____ manifolded wells
- c. ☐ Stream, ditch, or river (name) ____
- d. ☐ Wetland, lake, or impoundment (name) ____
- e. ☒ Other **Plant Site Infrastructure: dewatering**

9. Point of Taking/Pumping Site Various, see application text
- a. ____ 1/4 of ____ 1/4 of ____ 1/4
- b. Section No. ____
- c. Township No. ____
- d. Range No. ____
- e. County ____

10. Means of Taking and Rate
- a. ☐ Stationary Pump(s) at ____ gpm
- b. ☒ Portable Pump at TBD gpm
- c. ☐ Gravity Flow at ____ gpm/cfs
- d. ☐ Other ____ gpm/cfs (circle one)

11. Method of Measurement
- a. ☐ Flow Meter
- b. ☐ Timing Device
- c. ☐ Electric Power Consumption
- d. ☒ Other various, see application

12. Means of Distribution
- a. ☐ pipe ____ diam. ____ length
- b. ☐ tank ____ gal. capacity
- c. ☐ channel ____ length
- d. ☒ other TBD

13. Legal Description-Land Owned/Rented *

Township No.	Range No.	Section	Fractional Sect. Gov't. Lots

* Rental Agreement MUST Be Submitted

14. Months of Appropriation
☐ JAN ☐ JUL ☐ FEB ☐ AUG ☐ MAR ☐ SEP ☐ APR ☐ OCT ☐ MAY ☐ NOV ☐ JUN ☐ DEC

15. Schedule of Appropriation ("X" one and complete)
- a. ☐ Continuous ____ hrs./day ____ days/mo. ____ mo./yr.
- b. ☐ Seasonal
- c. ☒ Temporary

Beginning date TBD
End date TBD

16. Total Annual Use (Gallons per Year)
500 million gallons per year (maximum annual pumping)

17. Discharge To and Quantity
- a. ☐ Stream, Ditch or River ____ (name) ( ) MGY
- b. ☐ Wetland, Lake or Impoundment ____ (name) ( ) MGY
- c. ☐ Sewer System ( ) MGY
- d. ☒ Other Various, see application text (various) MGY

18. Discharge Point Various
- a. ____ 1/4 of ____ ____
- b. Section No. ____
- c. Township No. ____
- d. Range No. ____
- e. County ____

19. Means of Discharge and Rate
- a. ☐ ____ (no.) stationary pump(s) at ____ gpm ea.
- b. ☐ ____ (no.) portable pump(s) at ____ gpm ea.
- c. ☐ Gravity Flow at ____ gpm/cfs
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20. Additional Requirements:
- a. ☒ Map or Air Photo which shows:
  1) Point of Taking or Pumping Site
  2) Test Hole Location 3) Boundaries of Property Controlled and Area of Use 4) Discharge Point
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I hereby make application pursuant to Minnesota Statutes Chapter 103G.261 and all supporting rules for a permit to appropriate water in accordance with all supporting maps, plans, and other information submitted with this application. The information submitted and statements made concerning this application are true and correct to the best of my knowledge.

21. Signature of Landowner or Authorized Agent	**22.** Date
Brad Moore	7/11/16

IMPORTANT: Submit this application and all supporting data to the DNR Office serving you (see back for addresses).
APPLICANT: KEEP A COPY FOR YOUR RECORDS.

This information is available in an alternative format upon request.

Appendix B

Notification to Local Government Officials

POLYMET
MINING

100 King Street West, Suite 5700, Toronto, Ontario, Canada, M5X 1C7
Tel: +1 (416) 915-4149

444 Cedar Street, St. Paul, MN 55101, Tel: +1 (651) 389-4100

6500 County Road 666, Hoyt Lakes, MN 55750-0475
Tel: +1 (218) 471-2150 / Fax: +1 (218) 225-4429

www.polymetmining.com

VIA HAND DELIVERY (HARD COPY)

July 11, 2016

Charles Bainter, Secretary of the Board
North St. Louis Soil and Water Conservation District
Northland Office Building
307 1st Street South, Suite 114
Virginia, MN 55792

RE: Poly Met Mining, Inc.'s Water Appropriation Permit Application for the NorthMet Project

Dear Mr. Bainter:

Please find enclosed a copy of Poly Met Mining, Inc.'s (PolyMet) consolidated application to the Minnesota Department of Natural Resources (MDNR) for individual water appropriation permits (Application) for its NorthMet Project (Project).

We are submitting a copy of this Application for your review, pursuant to Minnesota Rules 6115.0660, subpart 3(D), as the Project is in North St. Louis County, with portions of the Project outside of municipal boundaries. PolyMet does not expect these appropriations to have an impact on available water supply or area water resources, as described in the FEIS and this Application.

This Application contains the following materials:

- Documentation on PolyMet's proposed approach to water appropriation permitting;
- Five separate applications for individual water appropriation permits; and
- Supporting figures, tables, and technical information.

This Application is based primarily on the extensive data collection and technical analyses conducted as part of the development of the Final Environmental Impact Statement (FEIS) for the NorthMet Project and Land Exchange. When necessary for the water appropriation permitting process, the Application expands upon such information.

If any questions or concerns arise during your review of this Application, please do not hesitate to contact me at 218-461-7746 or ckearney@polymetmining.com.

Sincerely,

Christie Kearney

Christie M. Kearney, P.E.
Environmental Site Director

POLYMET
MINING

100 King Street West, Suite 5700, Toronto, Ontario, Canada, M5X 1C7
Tel: +1 (416) 915-4149

444 Cedar Street, St. Paul, MN 55101, Tel: +1 (651) 389-4100

6500 County Road 666, Hoyt Lakes, MN 55750-0475
Tel: +1 (218) 471-2150 / Fax: +1 (218) 225-4429

www.polymetmining.com

VIA HAND DELIVERY (HARD COPY)

July 11, 2016

Mayor Mark Skelton
City of Hoyt Lakes
Municipal Building
206 Kennedy Memorial Drive
Hoyt Lakes, MN 55750

RE: Poly Met Mining, Inc.'s Water Appropriation Permit Application for the NorthMet Project

Dear Mayor Skelton:

Please find enclosed a copy of Poly Met Mining, Inc.'s (PolyMet) consolidated application to the Minnesota Department of Natural Resources (MDNR) for individual water appropriation permits (Application) for its NorthMet Project (Project).

We are submitting a copy of this Application for your review, pursuant to Minnesota Rules 6115.0660, subpart 3(D), as a portion of the Project is within the Hoyt Lakes municipal boundary. PolyMet does not expect these appropriations to have an impact on your municipal water supply or area water resources, as described in the FEIS and this Application.

This Application contains the following materials:

- Documentation on PolyMet's proposed approach to water appropriation permitting;
- Five separate applications for individual water appropriation permits; and
- Supporting figures, tables, and technical information.

This Application is based primarily on the extensive data collection and technical analyses conducted as part of the development of the Final Environmental Impact Statement (FEIS) for the NorthMet Project and Land Exchange. When necessary for the water appropriation permitting process, the Application expands upon such information.

If any questions or concerns arise during your review of this Application, please do not hesitate to contact me at 218-461-7746 or ckearney@polymetmining.com.

Sincerely,

Christie M. Kearney, P.E.
Environmental Site Director

POLYMET
MINING

100 King Street West, Suite 5700, Toronto, Ontario, Canada, M5X 1C7
Tel: +1 (416) 915-4149

444 Cedar Street, St. Paul, MN 55101, Tel: +1 (651) 389-4100

6500 County Road 666, Hoyt Lakes, MN 55750-0475
Tel: +1 (218) 471-2150 / Fax: +1 (218) 225-4429

www.polymetmining.com

VIA HAND DELIVERY (HARD COPY)

July 11, 2016

Mayor Andrea Zupancich
City of Babbitt
71 South Drive
Babbitt, MN 55706

RE: Poly Met Mining, Inc.'s Water Appropriation Permit Application for the NorthMet Project

Dear Mayor Zupancich:

Please find enclosed a copy of Poly Met Mining, Inc.'s (PolyMet) consolidated application to the Minnesota Department of Natural Resources (MDNR) for individual water appropriation permits (Application) for its NorthMet Project (Project).

We are submitting a copy of this Application for your review, pursuant to Minnesota Rules 6115.0660, subpart 3(D), as a portion of the Project is within the Babbitt municipal boundary. PolyMet does not expect these appropriations to have an impact on your municipal water supply or area water resources, as described in the FEIS and this Application.

This Application contains the following materials:

- Documentation on PolyMet's proposed approach to water appropriation permitting;
- Five separate applications for individual water appropriation permits; and
- Supporting figures, tables, and technical information.

This Application is based primarily on the extensive data collection and technical analyses conducted as part of the development of the Final Environmental Impact Statement (FEIS) for the NorthMet Project and Land Exchange. When necessary for the water appropriation permitting process, the Application expands upon such information.

If any questions or concerns arise during your review of this Application, please do not hesitate to contact me at 218-461-7746 or ckearney@polymetmining.com.

Sincerely,

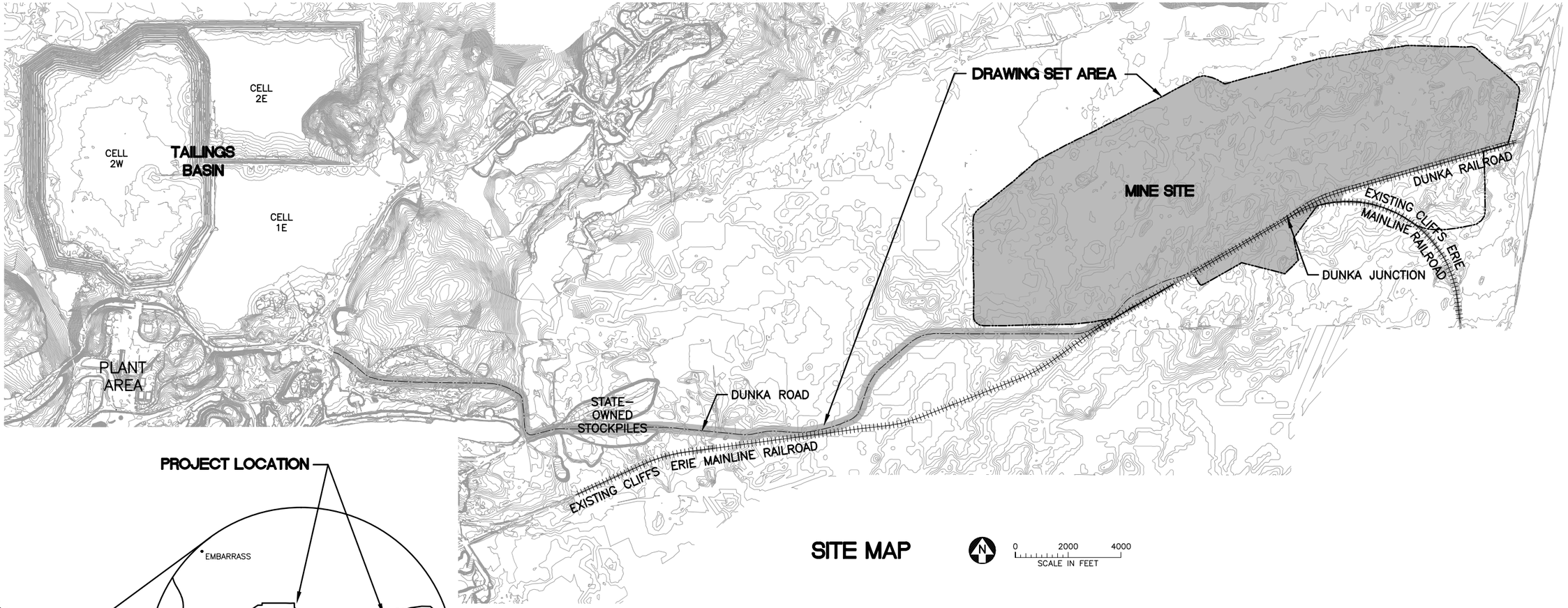
Christie M. Kearney, P.E.
Environmental Site Director

Appendix C

Permit Application Support Drawings

Mine Site and Dunka Road Earthwork

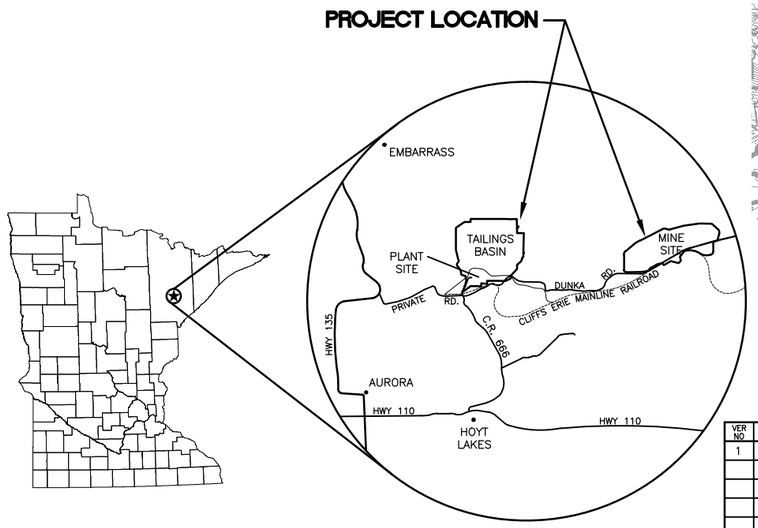
POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
MINE SITE AND DUNKA ROAD EARTHWORK
HOYT LAKES, MINNESOTA



SITE MAP

N

0 2000 4000
SCALE IN FEET



LOCATION MAP
NOT TO SCALE

N

VICINITY MAP
NOT TO SCALE

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
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 PAUL T. SWENSON
SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
LOCATION MAP AND SITE MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. EW-001
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMG-00-TS-002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 9:53 AM

INCHES 1 2

GENERAL LEGEND

EXISTING

- EXISTING CONTOUR – MAJOR (1000)
- EXISTING CONTOUR – MINOR
- EXISTING POWER POLE
- EXISTING RAILROAD
- WATER EDGE/CREEK CENTER LINE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING UNIMPROVED TRAIL
- RIGHT OF WAY (R/W)
- PROPERTY LINE
- MINE SITE BOUNDARY
- EXISTING STRUCTURES
- TREE LINE
- WETLAND BOUNDARY
- EXISTING OVERHEAD ELECTRIC (OE)
- EXISTING UNDERGROUND ELECTRIC (UE)
- EXISTING VALVE
- EXISTING CULVERT
- PROPOSED MINE DRAINAGE CULVERT

PROPOSED

- PROPOSED CONTOUR – MAJOR (1000)
- PROPOSED CONTOUR – MINOR
- PROPOSED ROADS

PROPOSED OTHER FACILITY

- OTHER FACILITY PROPOSED CONTOUR – MAJOR (1000)
- OTHER FACILITY PROPOSED CONTOUR – MINOR

ABBREVIATIONS

CATEGORY 1 STOCKPILE	–	CATEGORY 1 WASTE ROCK STOCKPILE
CATEGORY 2/3 STOCKPILE	–	CATEGORY 2/3 WASTE ROCK STOCKPILE
EW	–	EARTHWORK

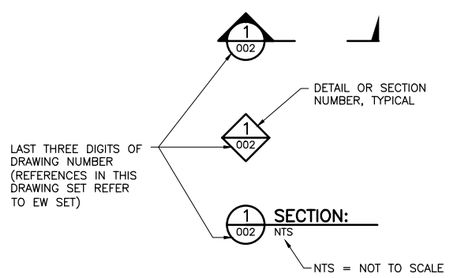
SHEET INDEX

SHEET NO. TITLE

GENERAL DRAWINGS

EW–001 LOCATION MAP AND SITE MAP
EW–002 LEGEND AND SHEET INDEX
EW–003 DUNKA ROAD UPGRADE GENERAL LAYOUT
EW–004 DUNKA ROAD UPGRADE TYPICAL SECTION
EW–005 HAUL ROADS GENERAL LAYOUT – MINE YEAR 11
EW–006 HAUL ROADS TYPICAL SECTIONS AND DETAILS
EW–007 HAUL ROADS TYPICAL SECTIONS AND DETAILS
EW–008 PRE–STRIPPING PIT TYPICAL SECTION
EW–009 OVERBURDEN STORAGE AND LAYDOWN AREA GRADING PLAN
EW–010 HAUL ROAD CLOSURE PLAN MINE YEARS 1–11
EW–011 HAUL ROAD CLOSURE PLAN MINE YEARS 11–20

DRAWING NUMBERING



NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE BASED ON MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
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 PAUL T. SWENSON
SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
LEGEND AND SHEET INDEX

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. EW–002 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_EW–002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:19 AM

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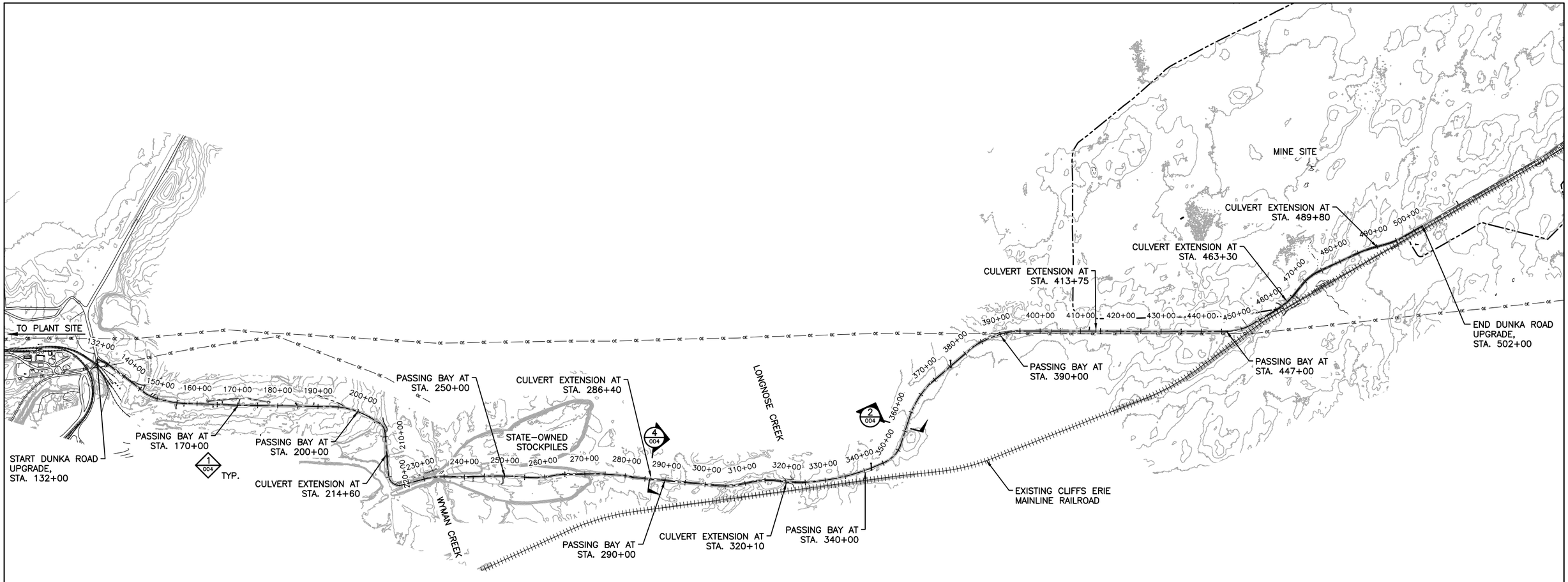

1/— PLAN: DUNKA ROAD UPGRADE

0 1200 2400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
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 PAUL T. SWENSON
SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
DUNKA ROAD UPGRADE
GENERAL LAYOUT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. EW-003
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NAD-03-CS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:00 AM
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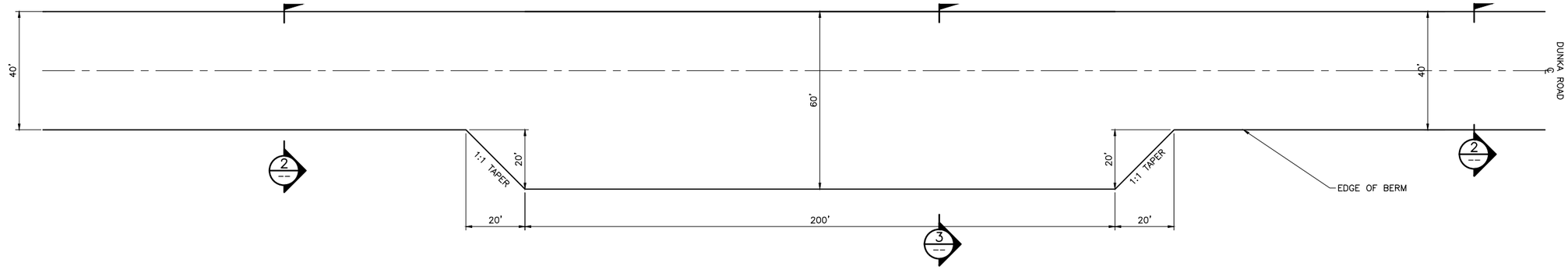


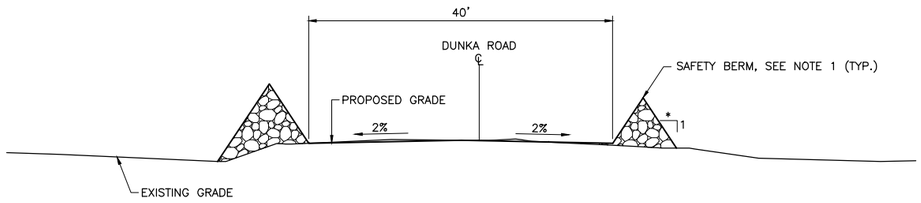
1/003 DETAIL: DUNKA ROAD PASSING BAY

0 20 40

SCALE IN FEET

APPROXIMATE PASSING BAY LOCATIONS

STA 170+00
STA 200+00
STA 250+00
STA 290+00
STA 340+00
STA 390+00
STA 447+00



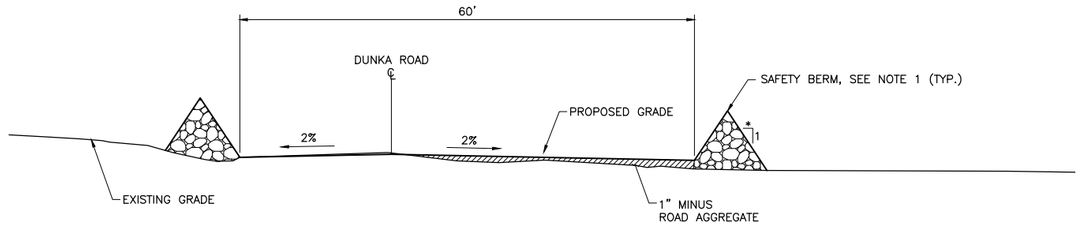
2/003 SECTION: TYPICAL DUNKA ROAD

0 10 20

SCALE IN FEET

NOTES:

1. WHERE BERMS ARE REQUIRED.
2. * = ANGLE OF REPOSE



3/– SECTION: TYPICAL DUNKA ROAD PASSING BAY

0 10 20

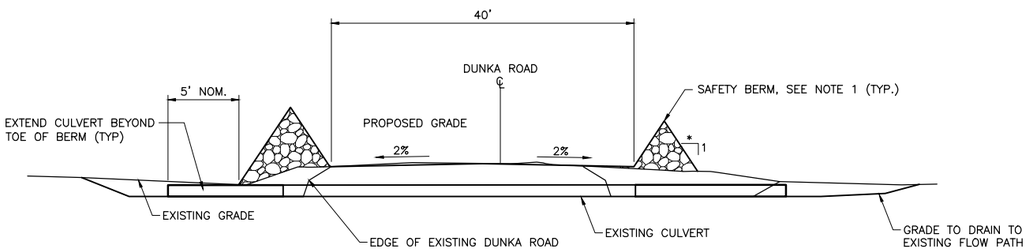
SCALE IN FEET

NOTES:

1. WHERE BERMS ARE REQUIRED.
2. * = ANGLE OF REPOSE

APPROXIMATE CULVERT EXTENSION LOCATIONS

STA 214+60
STA 286+40
STA 320+10
STA 413+75
STA 463+30
STA 489+80



4/003 SECTION: TYPICAL DUNKA ROAD CULVERT EXTENSION

0 10 20

SCALE IN FEET

NOTES:

1. WHERE BERMS ARE REQUIRED.
2. * = ANGLE OF REPOSE

VER NO.	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
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 PAUL T. SWENSON
SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
DUNKA ROAD UPGRADE
TYPICAL SECTION

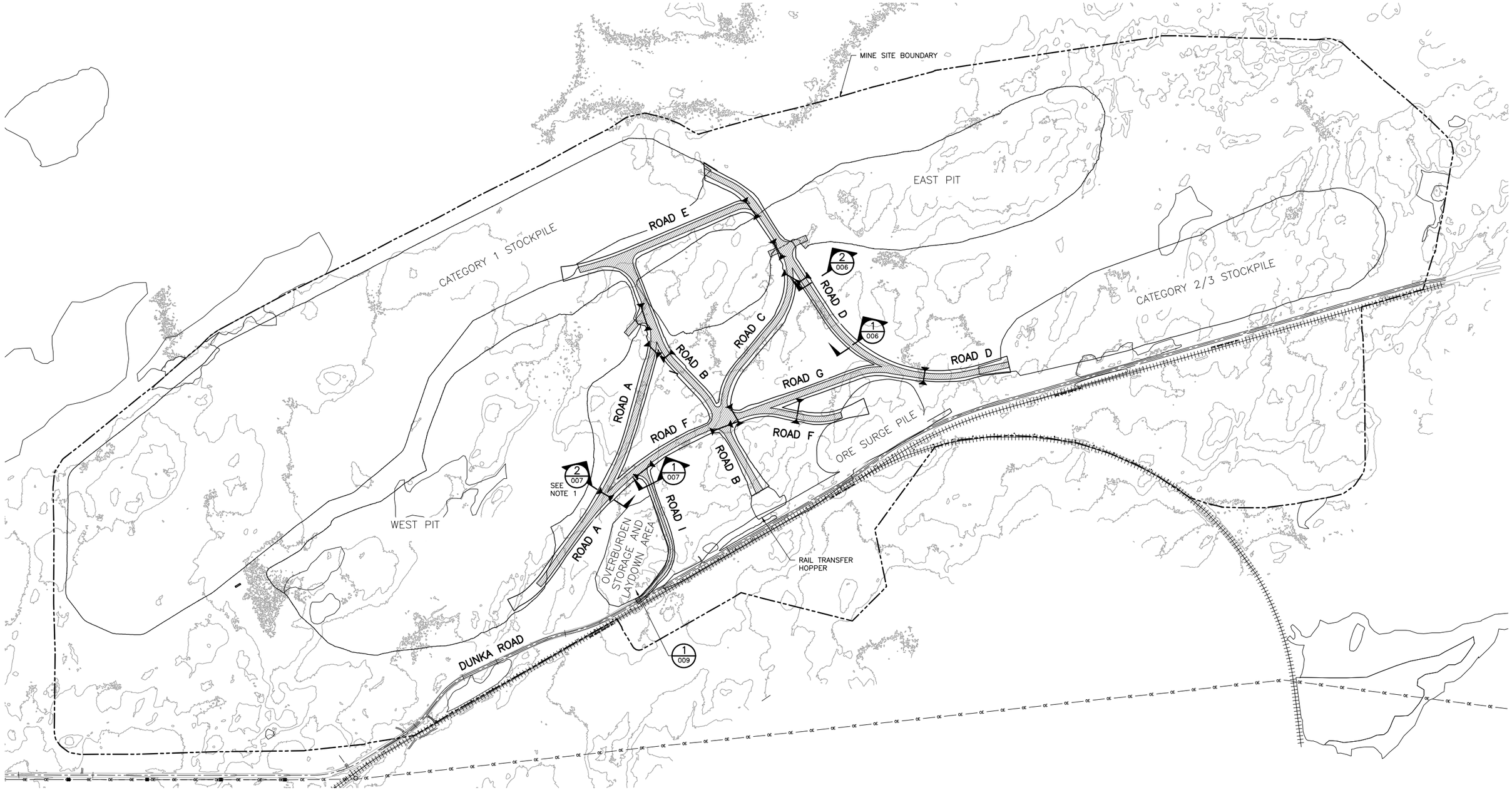
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. EW-004 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-EW-004.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:00 AM
INCHES 1 2



1/- PLAN: HAUL ROADS GENERAL LAYOUT – MINE YEAR 11

0 700 1400
SCALE IN FEET

NOTES

1. CULVERT SECTION SHOWN AS TYPICAL CALLOUT. ALL CULVERTS THAT CROSS THE HAUL ROADS, SHOWN ON THIS DRAWING WILL BE CONSTRUCTED AS SHOWN ON 2/007.

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

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FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
HAUL ROADS GENERAL LAYOUT
MINE YEAR 11

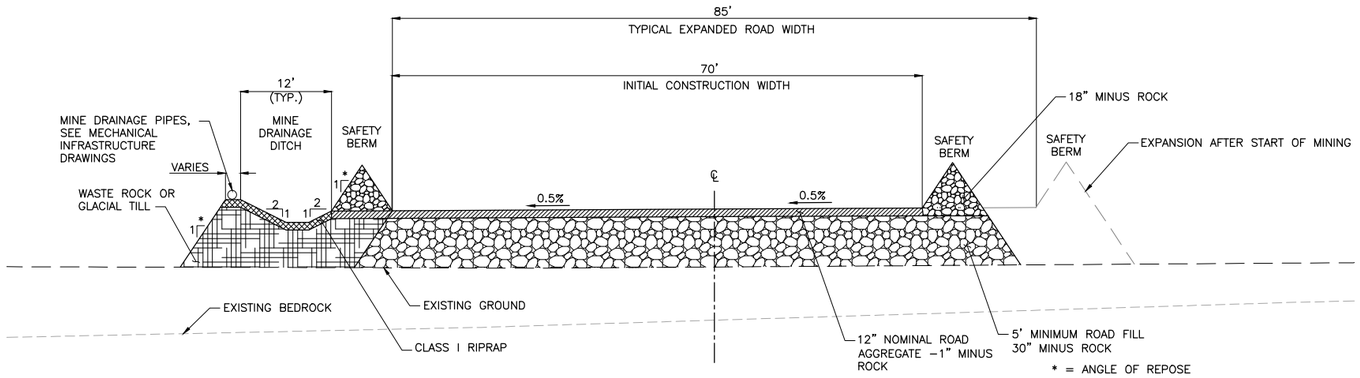
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. EW-005
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-EW-005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:05 AM

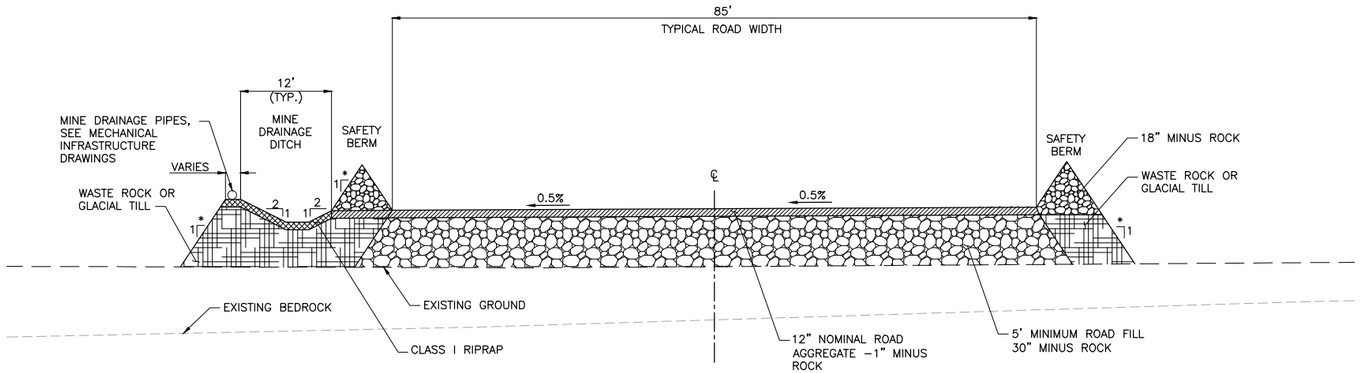


1 / 005 **SECTION: TYPICAL PRE-MINING HAUL ROAD WITH EXPANSION**

SHOWN AT INITIAL CONSTRUCTION WIDTH

0 10 20

SCALE IN FEET



2 / 005 **SECTION: TYPICAL HAUL ROAD AFTER START OF MINING**
(AFTER MINE ROCK EXCAVATION BEGINS)

0 10 20

SCALE IN FEET

NOTES:

1. MINE DRAINAGE DITCH TO BE CONSTRUCTED WHERE NEEDED. DITCH MAY BE LOCATED ON EITHER OR BOTH SIDES OF ROAD.
2. SAFETY BERMS TO BE CONSTRUCTED OF WASTE ROCK OBTAINED FROM STATE-OWNED STOCKPILE (PRIOR TO START OF MINING) OR FROM CATEGORY 1 WASTE ROCK (AFTER START OF MINING).
3. DESIGN GRADE OF DITCHES BASED ON HYDRAULIC DESIGN REQUIREMENTS STARTING AT STORAGE POND ELEVATION.
4. ROAD GRADE ESTABLISHED TO PROVIDE POSITIVE DRAINAGE INTO DITCH WITH NO BACKUP OF WATER ONTO THE ROAD FOR THE 10-YEAR, 24-HOUR STORM.
5. DRAINAGE SYSTEM DESIGNED TO CONTROL/CONTAIN THE 100-YEAR, 24-HOUR STORM.
6. DRAINAGE PATH MUST BE PROVIDED THROUGH BERM BETWEEN ROAD AND DITCH. THIS CAN BE ACCOMPLISHED BY THE FOLLOWING OPTIONS IN APPROPRIATELY SPACED LOCATIONS.
   A. COARSE WASTE ROCK FROM STATE-OWNED STOCKPILE (PRIOR TO START OF MINING) OR FROM CATEGORY 1 WASTE ROCK (AFTER START OF MINING) (NO FINES)
   B. CULVERTS
   C. LARGE BOULDERS FROM PRE-STRIPPING
   D. GAP IN BERM
7. ROAD FILL TO BE CONSTRUCTED OF WASTE ROCK OBTAINED FROM STATE-OWNED STOCKPILE (PRIOR TO START OF MINING) OR FROM CATEGORY 1 WASTE ROCK (AFTER START OF MINING).
8. DISTURBED SOIL AREAS SHALL BE VEGETATED IN ACCORDANCE WITH THE CONSTRUCTION SWPPP.

VER NO	DATE	DESCRIPTION
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ISSUED	VERSION	DATE
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FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON

SIGNATURE

DATE 5/21/15 LICENSE# 20533

DRAWN: KKB

CHECKED: ATS

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
HAUL ROADS
TYPICAL SECTIONS AND DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

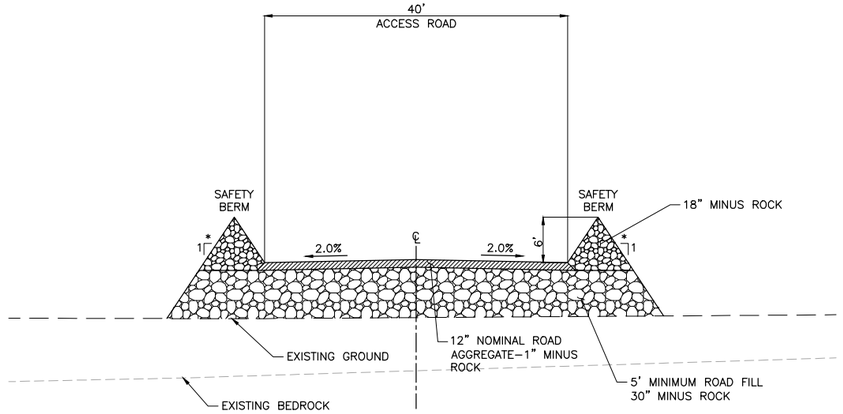
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. EW-006

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NNM-EW-006.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:02 AM

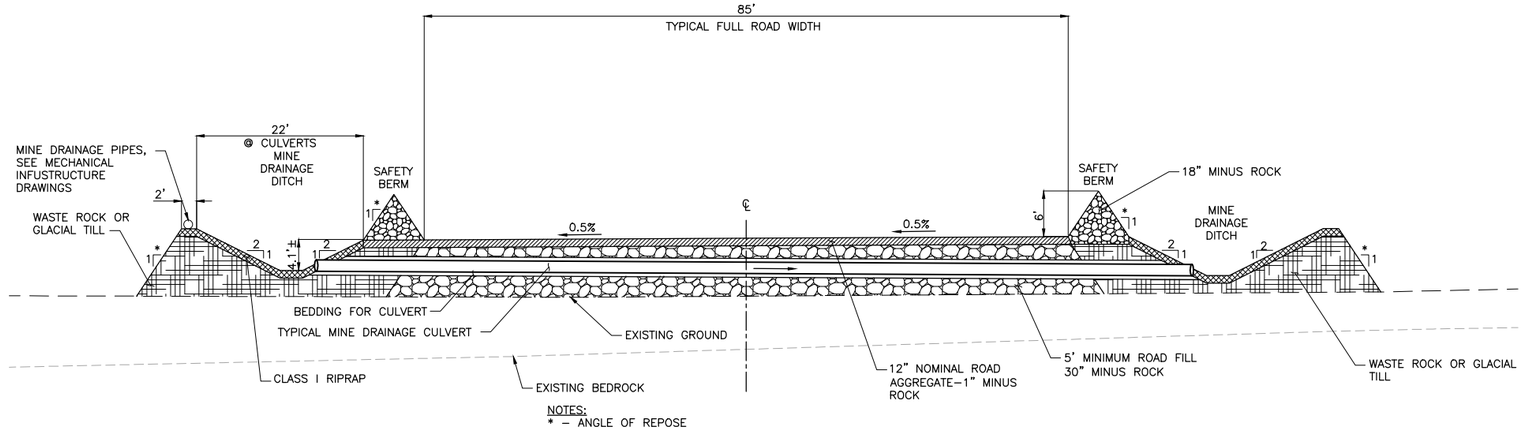
INCHES 1 2



NOTES:
* – ANGLE OF REPOSE

1/005 SECTION: TYPICAL ACCESS ROAD (ROAD I)

0 10 20
SCALE IN FEET



NOTES:
* – ANGLE OF REPOSE

2/005 SECTION: TYPICAL HAUL ROAD WITH MINE DRAINAGE CULVERT CROSSING

0 10 20
SCALE IN FEET

NOTES:

1. CULVERT AND MINE DRAINAGE DITCH ON DOWNSTREAM SIDE OF CULVERTS SHOWN FOR VISUAL PURPOSES ONLY. ACTUAL DESIGN WILL BE A TRANSITION OF ROAD SLOPE AND MINE DRAINAGE DITCH LOCATION.

2. REFER TO MINE SITE MINE DRAINAGE DRAWINGS FOR LOCATIONS.

VER NO.	DATE	DESCRIPTION
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ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION.		

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
HAUL ROADS
TYPICAL SECTIONS AND DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. EW-007
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-EW-007.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:06 AM

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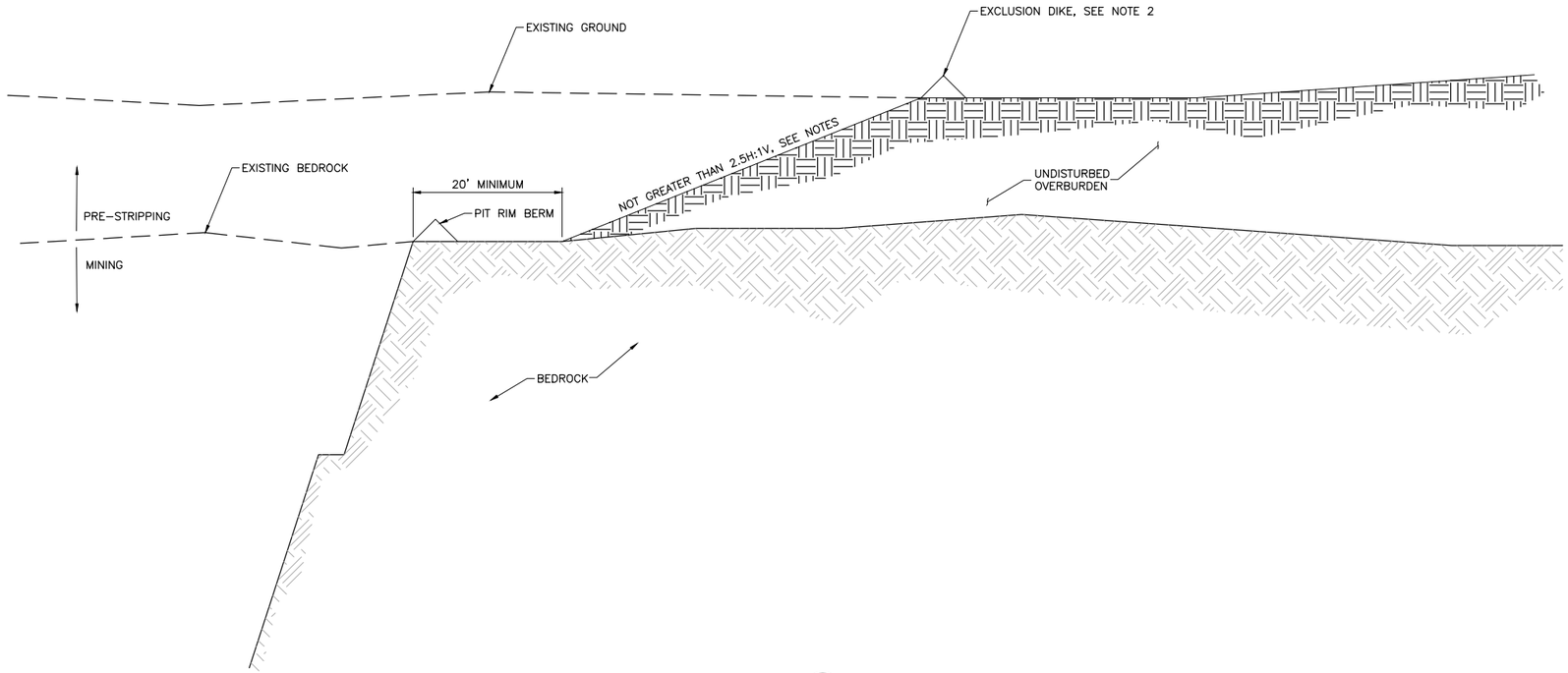

1 SECTION: TYPICAL EDGE OF PIT TO UNDISTURBED GROUND

0 10 20

SCALE IN FEET

NOTES:

1. PROPOSED FINISHED GRADE WITHIN PRE-STRIPPING AREA REFLECTS BEDROCK DATA PROVIDED BY POLYMET.
2. CONSTRUCT EXCLUSION DIKE AROUND PIT PERIMETER TO DIVERT SURFACE RUNOFF AWAY FROM PIT.
3. FINAL PIT SLOPES SHALL ADHERE TO CHAPTER 6132.23 OVERBURDEN PORTION OF PITWALLS OF MINNESOTA DNR STANDARDS.
4. SLOPES IN AREAS WHERE ORGANIC SOILS AND WETLANDS ARE PRESENT MAY BE SLOPED AS NECESSARY TO MAINTAIN A STABLE SLOPE.
5. 20' BENCH SHALL BE ESTABLISHED FROM THE TOE OF THE OVERBURDEN TO THE FUTURE CREST OF ROCK IN ACCORDANCE WITH MINNESOTA DNR SIDEWALL DESIGN STANDARDS.
6. CONTRACTOR SHALL LEAVE TEMPORARY HAUL ROADS WITHIN PRE-STRIPPING LIMITS IN PLACE FOR OWNER'S ACCESS.
7. CONTRACTOR SHALL STOCKPILE OVERBURDEN IN LOCATIONS AND AT QUANTITIES TO BE APPROVED BY OWNER.

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION.		

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PRINTED NAME PAUL T. SWENSON

SIGNATURE

DATE 5/21/15 LICENSE# 20533

DRAWN: KKB

CHECKED: ATS

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK PRE-STRIPPING PIT TYPICAL SECTION

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. EW-008

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-EW-008.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:14 AM

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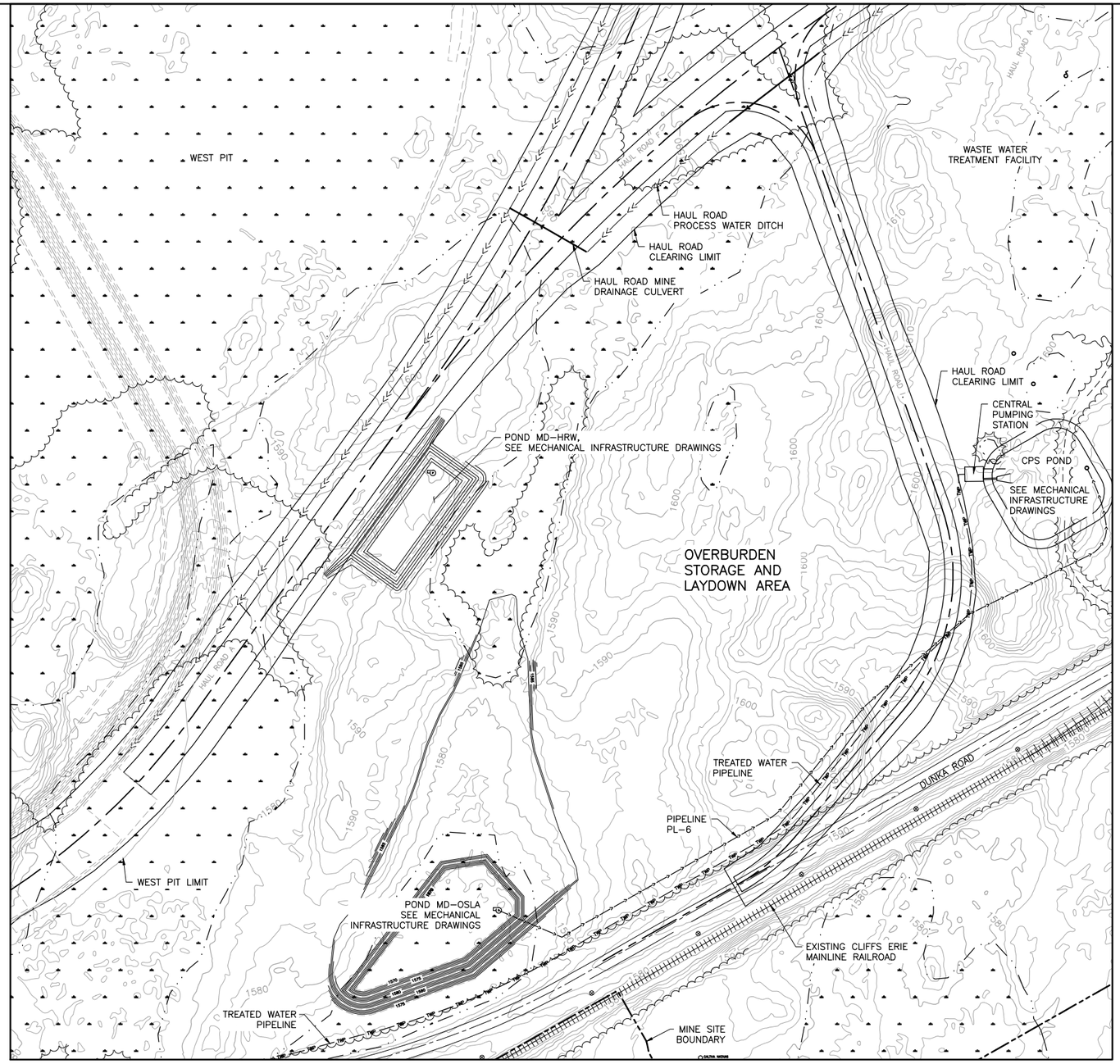

1/005 PLAN: OVERBURDEN STORAGE AND LAYDOWN AREA

0 150 300

SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON

SIGNATURE

DATE 5/21/15 LICENSE# 20533

DRAWN: KKB

CHECKED: ATS

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK OVERBURDEN STORAGE AND LAYDOWN AREA GRADING PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

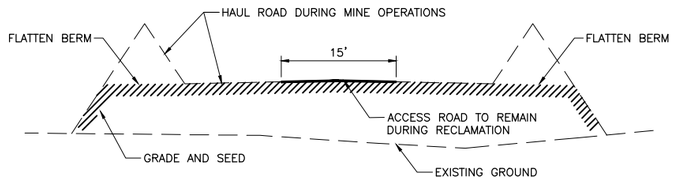
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. EW–009

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_SW–009.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:12 AM

INCHES 1 2



2 SECTION: ACCESS ROAD DURING RECLAMATION

1 PLAN: HAUL ROAD RECLAMATION PLAN A

0 1000 2000
SCALE IN FEET

NOTES:

1. PLAN A SHOWS RECLAMATION PLAN IF MINE IS CLOSED PRIOR TO MINE YEAR 11.
2. ALL FEATURES SHOWN WILL REMAIN DURING RECLAMATION UNLESS OTHERWISE NOTED.
3. RECLAMATION OF THE HAUL ROADS WILL CONSIST OF REMOVING SAFETY BERMS THROUGH GRADING AND SEEDING THE SURFACES.
4. ALL ACTIVE HAUL ROADS TO BE RECLAIMED EXCEPT DESIGNATED LONG–TERM ACCESS ROADS.

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		
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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
HAUL ROAD RECLAMATION PLAN A
MINE YEARS 1–11

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. EW–010 REV

CADD USER: Terri J. Toma FILE: K:\DESIGN\23690C29.10\PERMIT_NMG-05-CS-FIGURE 2.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:13 AM

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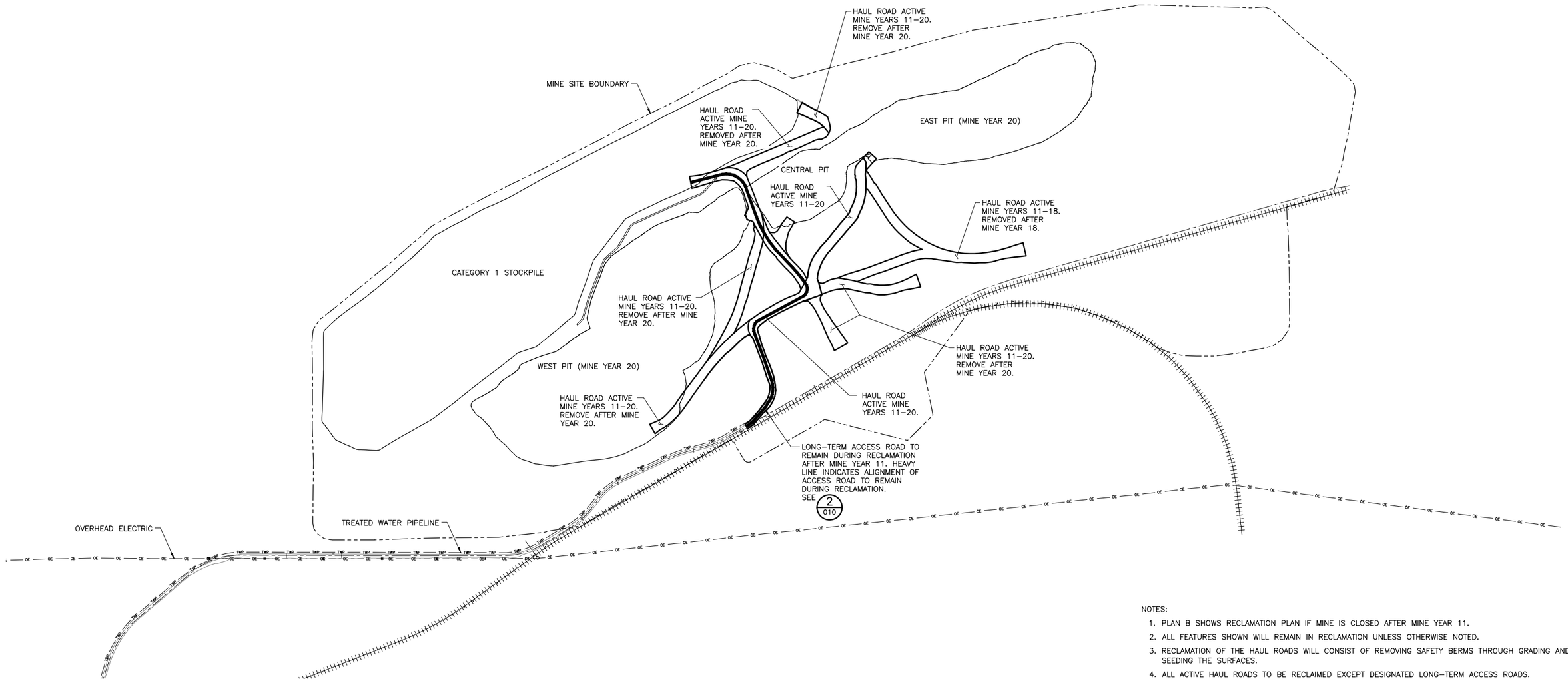

NOTES:

1. PLAN B SHOWS RECLAMATION PLAN IF MINE IS CLOSED AFTER MINE YEAR 11.
2. ALL FEATURES SHOWN WILL REMAIN IN RECLAMATION UNLESS OTHERWISE NOTED.
3. RECLAMATION OF THE HAUL ROADS WILL CONSIST OF REMOVING SAFETY BERMS THROUGH GRADING AND SEEDING THE SURFACES.
4. ALL ACTIVE HAUL ROADS TO BE RECLAIMED EXCEPT DESIGNATED LONG–TERM ACCESS ROADS.

1/– PLAN: HAUL ROAD RECLAMATION PLAN B

0 1000 2000
SCALE IN FEET

N

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

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SIGNATURE
DATE 5/21/15 LICENSE# 20533

DRAWN: KKB
CHECKED: ATS
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE & DUNKA ROAD EARTHWORK
HAUL ROAD RECLAMATION PLAN B
MINE YEARS 11–20

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. EW–011
REV

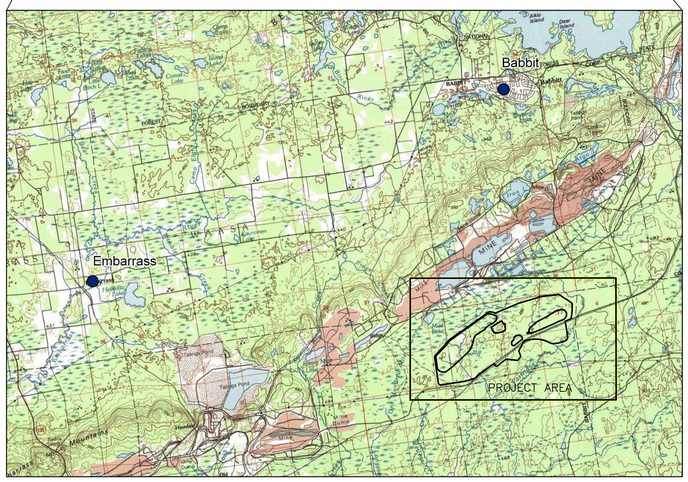
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMG-05--CS-FIGURE 3.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 10:25 AM
INCHES 1 2

Category 1, 2/3, and 4 Stockpiles and Ore Surge Pile

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
CATEGORIES 1, 2/3, AND 4 STOCKPILES AND ORE SURGE PILE DESIGN
HOYT LAKES, MINNESOTA



PROJECT LOCATION MAP



SITE LOCATION

DRAWING LIST		
SHEET NUMBER	REVISION	SHEET TITLE
SKP–001	E	TITLE SHEET AND LOCATION MAP
SKP–002	E	LEGEND, GENERAL NOTES AND SPECIFICATIONS
SKP–003	E	STOCKPILE LAYOUTS – MINE YEAR 1 LIMITS
SKP–004	E	STOCKPILE LAYOUTS – MINE YEAR 2 LIMITS
SKP–005	E	STOCKPILE LAYOUTS – MINE YEAR 11 LIMITS
SKP–006	E	STOCKPILE LAYOUTS – MINE YEAR 21 LIMITS CLOSURE CONFIGURATION
SKP–007	E	EXISTING SITE CONDITIONS
SKP–008	E	SITE LAYOUT AND LOCATION OF FIELD INVESTIGATIONS
SKP–009	E	DEPTH TO BEDROCK ISOPACH MAP
SKP–010	E	CATEGORY 1 STOCKPILE SUBGRADE EXCAVATION PLAN
SKP–011	E	CATEGORY 1 STOCKPILE MINE YEAR 1 CONTINGENCY CLOSURE CONFIGURATION
SKP–012	E	CATEGORY 1 STOCKPILE FINAL GRADES AND SUB–BASIN DELINEATION
SKP–013	E	CATEGORY 1 STOCKPILE DESIGN SECTIONS
SKP–014	E	CATEGORY 2/3 STOCKPILE SUBGRADE EXCAVATION PLAN
SKP–015	E	CATEGORY 2/3 STOCKPILE FOUNDATION GRADING PLAN – MINE YEAR 1 AND MAXIMUM
SKP–016	E	CATEGORY 2/3 STOCKPILE UNDERDRAIN PIPING PLAN – MINE YEAR 1 AND MAXIMUM
SKP–017	E	CATEGORY 2/3 STOCKPILE OVERLINER DRAINAGE PIPING PLAN – MINE YEAR 1 AND MAXIMUM
SKP–018	E	CATEGORY 2/3 STOCKPILE MAXIMUM CAPACITY CONFIGURATION
SKP–019	E	CATEGORY 2/3 STOCKPILE DESIGN SECTIONS
SKP–020	E	CATEGORY 4 STOCKPILE SUBGRADE EXCAVATION PLAN
SKP–021	E	CATEGORY 4 STOCKPILE FOUNDATION GRADING PLAN – MINE YEAR 1 AND MAXIMUM
SKP–022	E	CATEGORY 4 STOCKPILE UNDERDRAIN PIPING PLAN – MINE YEAR 1 AND MAXIMUM
SKP–023	E	CATEGORY 4 STOCKPILE OVERLINER DRAINAGE PIPING PLAN – MINE YEAR 1 AND MAXIMUM
SKP–024	E	CATEGORY 4 STOCKPILE MAXIMUM CAPACITY CONFIGURATION
SKP–025	E	CATEGORY 4 STOCKPILE DESIGN SECTIONS
SKP–026	E	ORE SURGE PILE SUBGRADE EXCAVATION PLAN
SKP–027	E	ORE SURGE PILE FOUNDATION GRADING PLAN
SKP–028	E	ORE SURGE PILE UNDERDRAIN PIPING PLAN
SKP–029	E	ORE SURGE PILE OVERLINER DRAINAGE PIPING PLAN
SKP–030	E	ORE SURGE PILE TYPICAL CONFIGURATION
SKP–031	E	ORE SURGE PILE DESIGN SECTIONS
SKP–032	E	CATEGORY 1 STOCKPILE RECLAMATION AND OPERATIONS SURFACE WATER – MANAGEMENT DETAILS – SHEET 1 OF 2
SKP–033	E	CATEGORY 1 STOCKPILE RECLAMATION AND OPERATIONS SURFACE WATER – MANAGEMENT DETAILS – SHEET 2 OF 2
SKP–034	E	CATEGORY 1 STOCKPILE PHASED COVER DESIGN
SKP–035	E	CONSTRUCTION DETAILS

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	F	5–22–15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE

PRINTED NAME BRENT R. BRONSON

DATE 5/22/15 LICENSE # 46492

DRAWN: MTM

CHECKED:

GOLDER PROJECT NO.: 113–2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TITLE SHEET AND LOCATION MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980–0540
Fax: (303) 985–2080
www.golder.com

DWG. NO. SKP–001

REV

CADD USER: Brewer, Keith FILE: K:_DENVER\113–2209\11322094002.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 11:49 AM
INCHES 1 2

LEGEND

MAJOR FEATURE

EXISTING GROUND TOPOGRAPHY (SEE NOTE 2)

PROPOSED FINISHED GRADE TOPOGRAPHY

SLOPE DIRECTION

CROSS SECTION IDENTIFIER

SHEET WHERE SECTION IS LOCATED

SLOPE

HAUL ROADS

MINE SITE BOUNDARY

PIT BOUNDARY

MINE YEAR 1 ORE, WASTE ROCK STOCKPILE LIMITS

MAXIMUM ORE, WASTE ROCK STOCKPILE LIMITS

GEOMEMBRANE BARRIER LAYER

PREPARED SUBGRADE

SOIL LINER 1

SOIL LINER 2

WASTE ROCK OR ORE

STRUCTURAL FILL

GRANULAR DRAINAGE MATERIAL 1

COMMON FILL 1

DRAIN ROCK

RIPRAP

RANDOM FILL

OVERBURDEN MATERIAL

VERTICAL PERCOLATION LAYER (USCS – ML)

LATERAL DRAINAGE LAYER (USCS – SP OR SM)

GATP-06-7 GOLDER ASSOC. TEST PIT (2006)

SB-05-01 BARR ENGINEERING BOREHOLES (2005)

RS-11 BARR ENGINEERING BOREHOLES (2008)

J003 AMERICAN ENGINEERING TESTING, INC. BOREHOLES (2010)

SHALLOW MARSH

CONIFEROUS SWAMP

HARDWOOD SWAMP

SHRUB SWAMP

CONIFEROUS BOG

OPEN BOG

SEDGE MEADOW

TERTIARY COLLECTION PIPING

4-INCH

PRIMARY AND SECONDARY COLLECTION PIPING

4-INCH

6-INCH

8-INCH

10-INCH

12-INCH

LIST OF ABBREVIATIONS

AMSL	ABOVE MEAN SEA LEVEL
CY	CUBIC YARD
DIA.	DIAMETER
EL.	ELEVATION
ET	EVAPOTRANSPIRATION
FT.	FEET
HDPE	HIGH DENSITY POLYETHYLENE
ID	INSIDE DIAMETER
IN.	INCH
LLDPE	LINEAR LOW DENSITY POLYETHYLENE
LCRS	LEAK COLLECTION AND RECOVERY SYSTEM
MAX.	MAXIMUM
MIN.	MINIMUM
N.T.S.	NOT TO SCALE
OD	OUTSIDE DIAMETER
SY	SQUARE YARD
TYP.	TYPICAL
ROMP	ROCK AND OVERBURDEN MANAGEMENT PLAN
USCS	UNIFIED SOIL CLASSIFICATION SYSTEM
CPEP	PERFORATED CORRUGATED POLYETHYLENE

GENERAL NOTES:

1. THIS DRAWING SET REPRESENTS THE DESIGN FOR PERMITTING FOR CATEGORY 1 STOCKPILE, CATEGORY 2/3 STOCKPILE, CATEGORY 4 STOCKPILE AND ORE SURGE PILE FOR THE POLYMET NORTHMET PROJECT IN HOYT LAKES, MINNESOTA, PREPARED IN SUPPORT OF A PERMIT TO MINE. THE DRAWING SET ONLY INCLUDES INFRASTRUCTURE ASSOCIATED WITH THE MOVEMENT OF ROCK (STOCKPILES, PITS, HAUL ROADS, AND RAIL TRANSFER HOPPER) AND NOT OTHER SUPPORT FACILITIES.
2. BASE TOPOGRAPHY PROVIDED BY BARR ENGINEERING IN AUGUST 2011.
3. GOLDER ASSOCIATES INC. (GOLDER) IS RESPONSIBLE FOR STOCKPILE DESIGNS WITH BATTERY LIMITS DEFINED BY THE PERIMETER/LINER BERMS AND THE UNDERDRAIN SUMPS.
4. AT THE BASIC ENGINEERING LEVEL, LIMITED GEOTECHNICAL DATA EXISTS, PARTICULARLY IN LOWLAND AREAS. ADDITIONAL DATA WILL BE OBTAINED FROM THESE AREAS AFTER THE PERMIT TO MINE IS APPROVED. SUBGRADE EXCAVATION PLANS WERE DEVELOPED USING AVAILABLE INFORMATION, AND WILL BE UPDATED FOR FINAL DESIGN BASED ON RESULTS OF PHASE II GEOTECHNICAL INVESTIGATION.
5. EARTHWORK QUANTITIES BASED ON NEAT LINE (I.E., NET CUT/ FILL SHRINKAGE FACTOR = 1.0).
6. PREPARED SUBGRADE, AS DEFINED ON THE DRAWINGS, INCLUDES CLEARING, GRUBBING, TOPSOIL REMOVAL, REMOVAL OF GEOTECHNICALLY-UNSUITABLE MATERIALS, MOISTURE CONDITIONING, AND SUBGRADE COMPACTION AS DEFINED IN THE SPECIFICATIONS.
7. FOUNDATION PREPARATION ASSUMES THE FOLLOWING GENERAL CONSTRUCTION SEQUENCE: (I) EXCAVATE TO BEDROCK WITHIN LOWLAND AREAS ASSUMING A MAXIMUM DEPTH OF OVER-EXCAVATION OF 20 FEET, OR UNTIL REACHING GEOTECHNICALLY-SUITABLE FOUNDATION SOILS AS DETERMINED BY THE PHASE II GEOTECHNICAL INVESTIGATION. STOCKPILE ORGANIC SOILS AND TILL MATERIAL SEPARATELY FOR FUTURE USE AS RECLAMATION SOILS AND STRUCTURAL FILL; (II) PLACE STRUCTURAL FILL AS REQUIRED TO MEET THE FOUNDATION GRADE REQUIREMENTS WITH GRANULAR SOILS, E.G., CATEGORY 1 WASTE ROCK MATERIAL; (III) ESTABLISH FOUNDATION DRAINAGE AS REQUIRED TO PREVENT EXCESS PORE PRESSURES DURING OPERATION; AND (IV) CONSTRUCT LINER SYSTEM DEPENDENT UPON THE REACTIVITY CATEGORY OF THE STOCKPILE MATERIAL.
8. AREAS WITH UNSUITABLE SOILS (LOWLAND AREAS) ARE ASSUMED TO COINCIDE WITH THE PREVIOUSLY IDENTIFIED WETLAND AREAS. HORIZONTAL AND VERTICAL EXTENTS OF LOWLAND AREAS ARE EXPECTED TO BE REVISED BASED ON RESULTS OF PHASE II GEOTECHNICAL INVESTIGATION.
9. POST-CONSOLIDATION STOCKPILE SETTLEMENTS WERE ESTIMATED BASED ON LIMITED INFORMATION ON THE CONSOLIDATION PROPERTIES OF SUBGRADE MATERIALS. HENCE, FOUNDATION EXCAVATION AND GRADING PLANS ARE ANTICIPATED TO UNDERGO MINOR MODIFICATIONS BASED ON THE RESULTS OF THE PHASE II GEOTECHNICAL INVESTIGATION TO ENSURE SUFFICIENT DRAINAGE.
10. CATEGORY 1 WASTE ROCK STOCKPILE WILL BE RECLAIMED BY PLACEMENT OF A GEOMEMBRANE COVER AT CLOSURE. PRIOR TO CLOSURE, WASTE ROCK CATEGORY 2, 3 AND 4 WILL BE USED TO BACKFILL EAST PIT.
11. LIMITS OF DISTURBANCE (I.E., CLEARING LIMITS) ASSUMED TO BE 40 FEET FROM THE FACILITY LIMITS.

SPECIFICATIONS:

1. FOR EARTHWORKS COMPONENTS OF THE STOCKPILE DESIGN, REFER TO SECTION 2300 OF THE PROJECT SPECIFICATIONS.
2. FOR GEOSYNTHETIC AND PIPING COMPONENTS OF THE STOCKPILE DESIGN, REFER TO SECTION 2272 FOR GEOTEXTILE, 2273 FOR POLYETHYLENE GEOMEMBRANE LINERS, AND SECTION 2610 FOR PIPING.
3. QUALITY ASSURANCE REQUIREMENTS FOR STOCKPILE CONSTRUCTION ARE DEFINED IN THE CONSTRUCTION QUALITY ASSURANCE PLAN.
4. SPECIFICATION SECTION NUMBERING IS PRELIMINARY.

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS

ISSUED	VERSION	DATE
FOR PERMITTING	F	5-22-15
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.

SIGNATURE

PRINTED NAME BRENT R. BRONSON

DATE 5/22/15 LICENSE # 46492

DRAWN: MTM

CHECKED:

GOLDER PROJECT NO.: 113-2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

LEGEND, GENERAL NOTES AND SPECIFICATIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-002

REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\132209H003.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 11:50 AM

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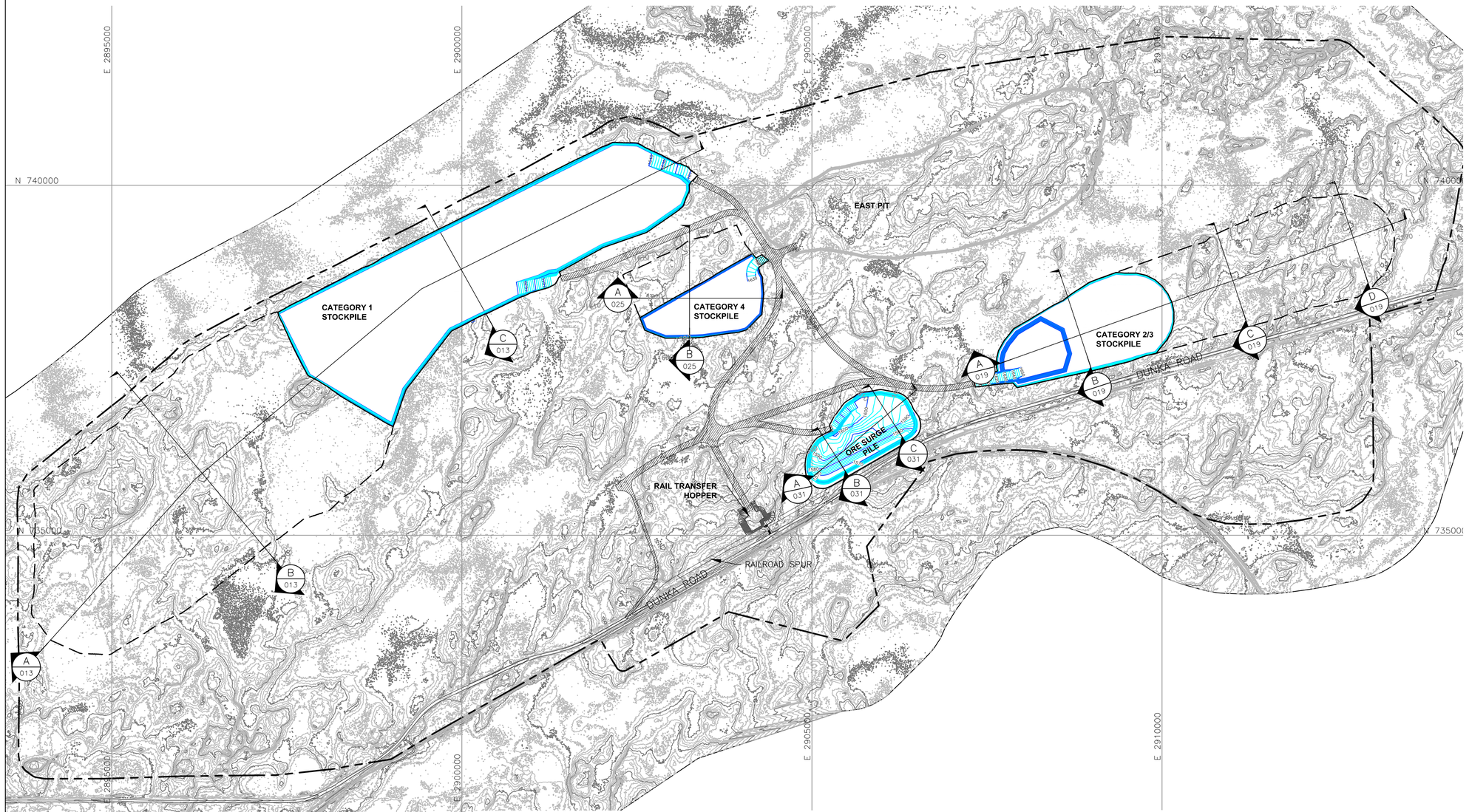

LEGEND

- EXISTING GROUND TOPOGRAPHY (1590 / 1580)
- PROPOSED STOCKPILE LAYOUTS (1590 / 1600)
- HAUL ROADS
- MINE SITE BOUNDARY
- MINE YEAR 1 PIT BOUNDARY (SEE NOTE 1)
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- CROSS SECTION IDENTIFIER (A / 019)
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
4. CATEGORY 2/3 AND CATEGORY 4 STOCKPILES SHOWN BASED ON WASTE ROCK SCHEDULE ONLY, I.E. WITHOUT OVERBURDEN. SEE DRAWINGS 018 AND 024 SHOWING MAXIMUM CAPACITY LAYOUTS FOR THESE STOCKPILES.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 800 1600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
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ISSUE STATUS		
ISSUED	VERSION	DATE
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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED: GG
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

STOCKPILE LAYOUTS – MINE YEAR 1 LIMITS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-003 REV

CADD USER: Brewer, Keith FILE: K:_DENVER\113-2209\113220900H001.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 11:51 AM

INCHES 1 2



LEGEND

- EXISTING GROUND TOPOGRAPHY (1590 / 1580)
- PROPOSED GRADING TOPOGRAPHY (1590 / 1600)
- HAUL ROADS
- MINE SITE BOUNDARY
- PIT BOUNDARIES AT MINE YEAR 2 (SEE NOTE 1)
- MINE YEAR 1 AND 2 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- CROSS SECTION IDENTIFIER (A / 019)
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
4. CATEGORY 2/3 AND CATEGORY 4 STOCKPILES SHOWN BASED ON WASTE ROCK SCHEDULE ONLY, I.E. WITHOUT OVERBURDEN. SEE DRAWINGS 018 AND 024 SHOWING MAXIMUM CAPACITY LAYOUTS FOR THESE STOCKPILES.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 800 1600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
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C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
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E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

STOCKPILE LAYOUTS – MINE YEAR 2 LIMITS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-004
REV

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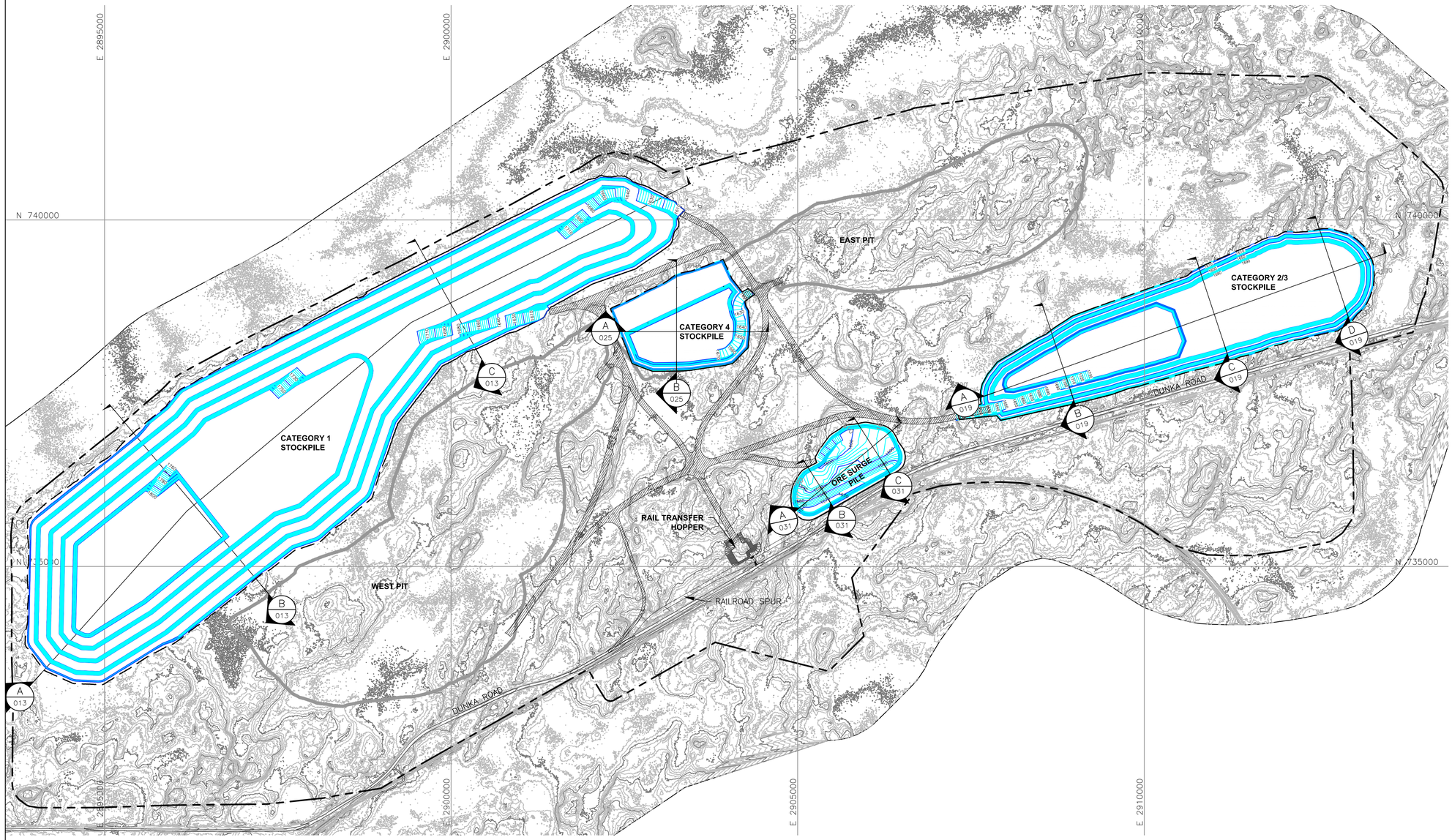

LEGEND

- EXISTING GROUND TOPOGRAPHY (1590 / 1580)
- PROPOSED LAYOUTS (1590 / 1600)
- HAUL ROADS
- MINE SITE BOUNDARY
- PIT BOUNDARIES AT MINE YEAR 11 (SEE NOTE 1)
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- CROSS SECTION IDENTIFIER (A / 025)
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
4. CATEGORY 2/3 AND CATEGORY 4 STOCKPILES SHOWN BASED ON WASTE ROCK SCHEDULE ONLY, I.E. WITHOUT OVERBURDEN. SEE DRAWINGS 018 AND 024 SHOWING MAXIMUM CAPACITY LAYOUTS FOR THESE STOCKPILES.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 800 1600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

STOCKPILE LAYOUTS – MINE YEAR 11 LIMITS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
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DWG. NO. SKP-005 REV

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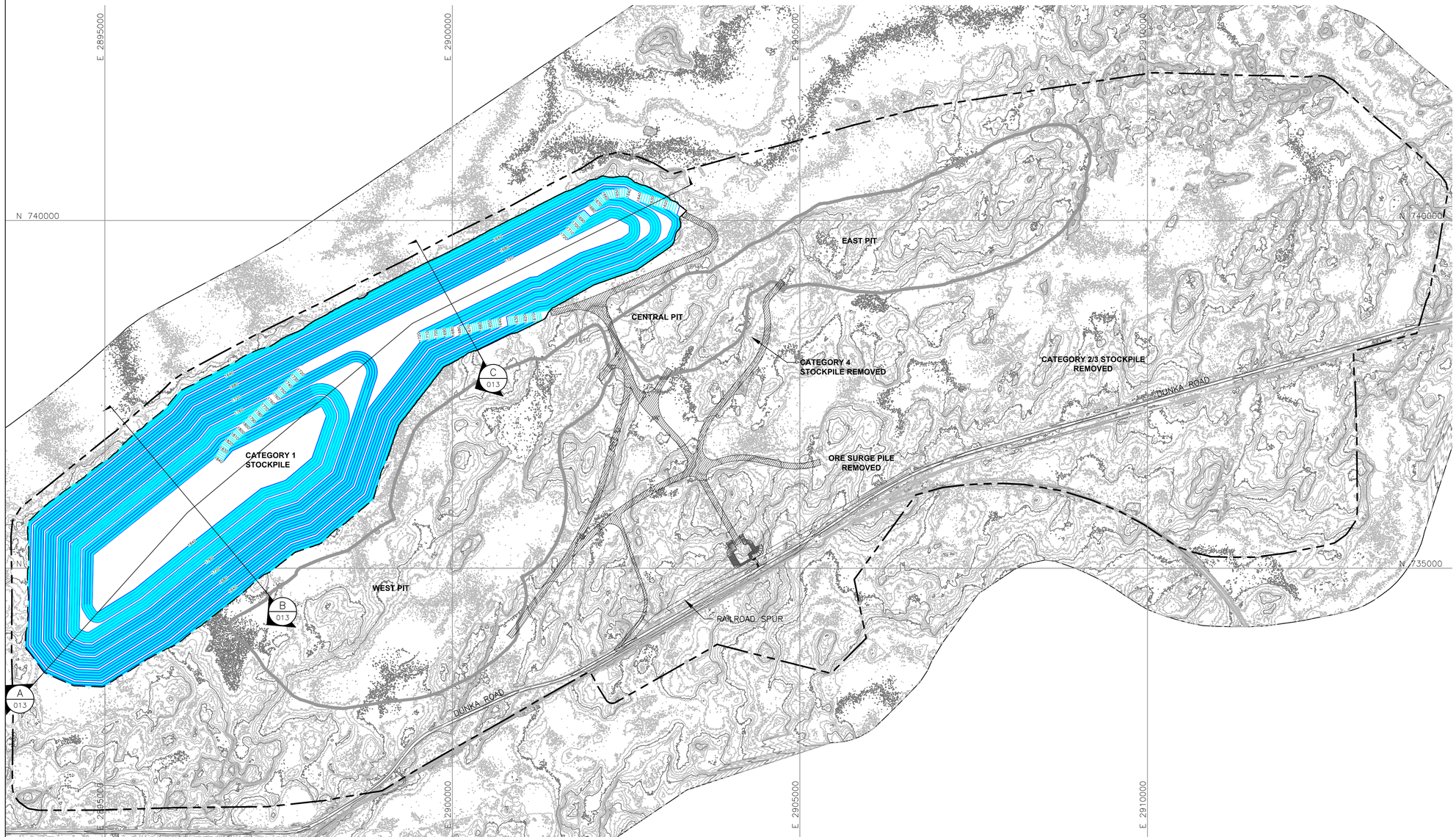

LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED LAYOUT CONTOURS
- HAUL ROADS
- MINE SITE BOUNDARY
- ULTIMATE PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- CROSS SECTION IDENTIFIER (A / 013)
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 800 1600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

STOCKPILE LAYOUTS MINE YEAR 21 LIMITS CLOSURE CONFIGURATION

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-006
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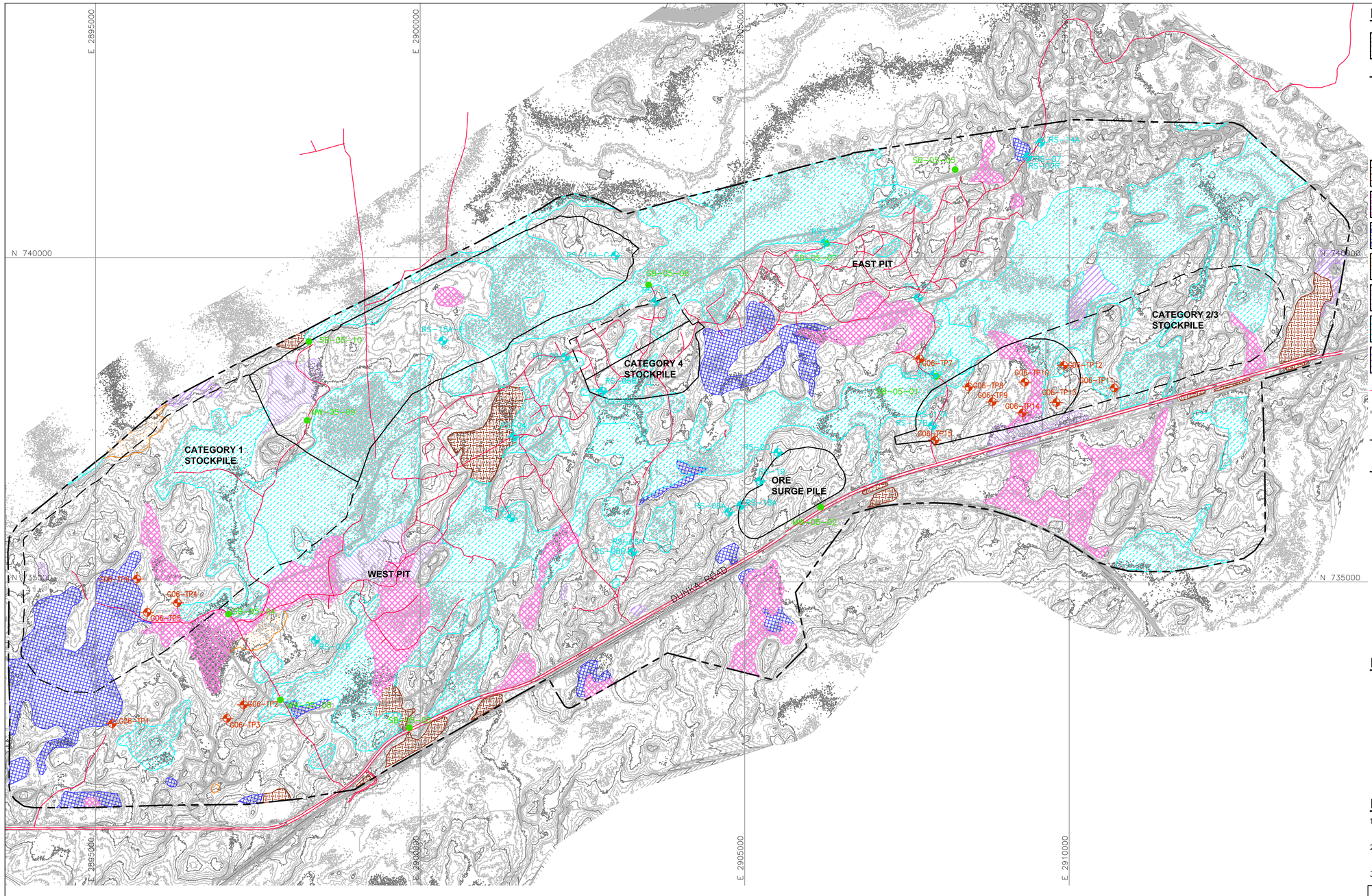

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- MINE SITE BOUNDARY
- G06-TP11 — GOLDER ASSOC. TEST PIT (2006)
- SB-05-01 — BARR ENGINEERING BOREHOLES (2005)
- RS-11 — BARR ENGINEERING BOREHOLES (2008)
- SHALLOW MARSH
- SHRUB SWAMP
- CONIFEROUS SWAMP
- HARDWOOD SWAMP
- SEDGE MEADOW
- CONIFEROUS BOG
- OPEN BOG
- EXISTING TRAIL OR ROAD
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 2)
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 3)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 3)

NOTES

1. WETLAND DELINEATION CHARACTERIZATION PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. OPEN PIT LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
3. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH,
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 800 1600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
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ISSUE STATUS	VERSION	DATE
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FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

EXISTING SITE CONDITIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-007
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\132209h022.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 11:55 AM

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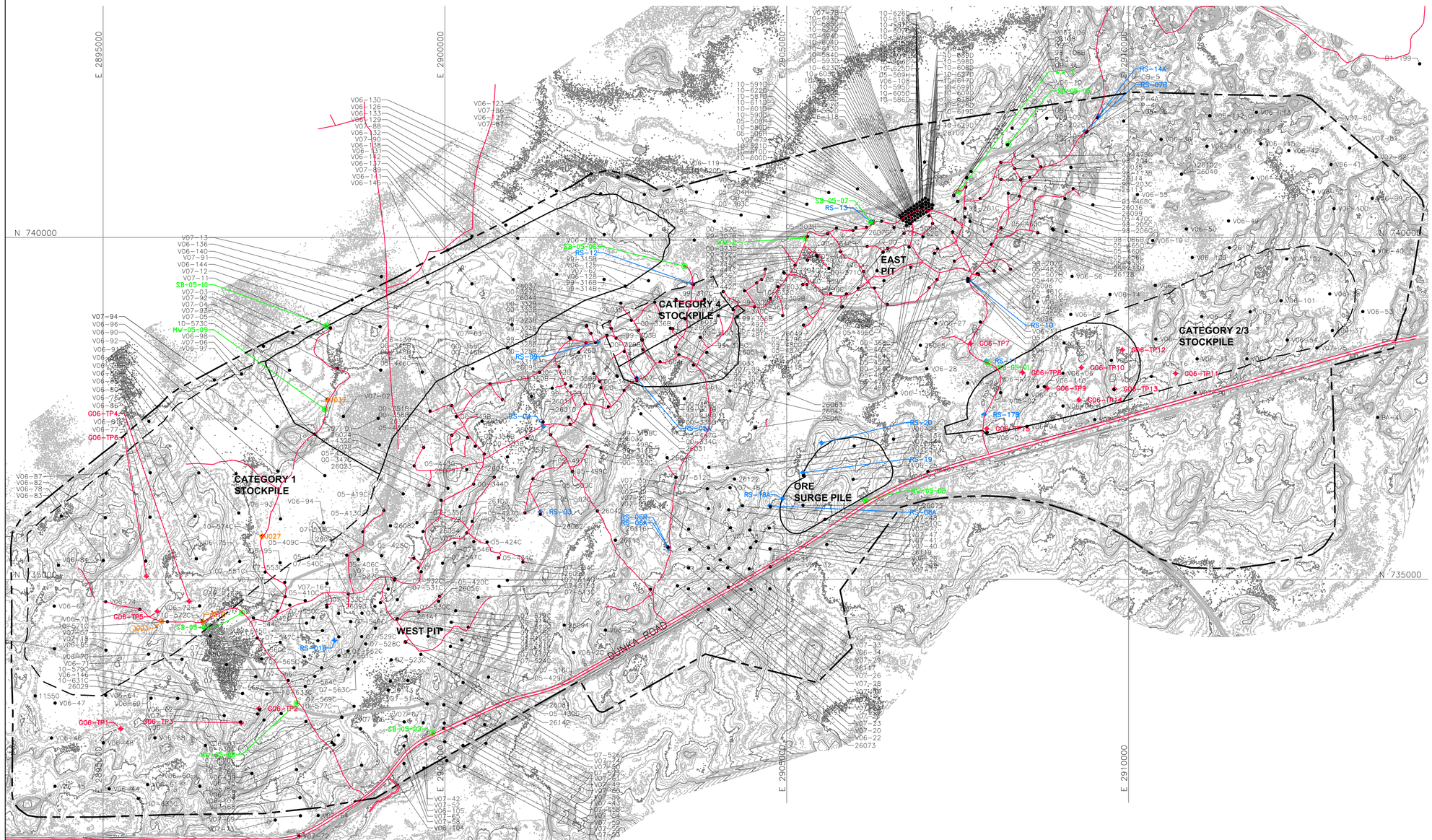

LEGEND

- EXISTING GROUND TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 ORE, AND WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, AND WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- G06-TP11 — GOLDER ASSOC. TEST PIT (2006)
- SB-05-01 — BARR ENGINEERING BOREHOLES (2005)
- RS-07R — BARR ENGINEERING BOREHOLES (2008)
- 05-444PM / 06-58 — BORING OR GEOPHYSICAL SURVEY LOCATION
- J003 — AMERICAN ENGINEERING TESTING, INC. BOREHOLES (2010)

NOTES

1. OPEN PIT LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
4. SEE GEOTECHNICAL DATA PACKAGE VOLUME 3 FOR DETAILS ON TEST PITS, BOREHOLES AND GEOPHYSICAL SURVEYS.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 800 1600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
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.

SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

SITE LAYOUT AND LOCATION OF FIELD INVESTIGATIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-008 REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\13220BHO23.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 11:56 AM
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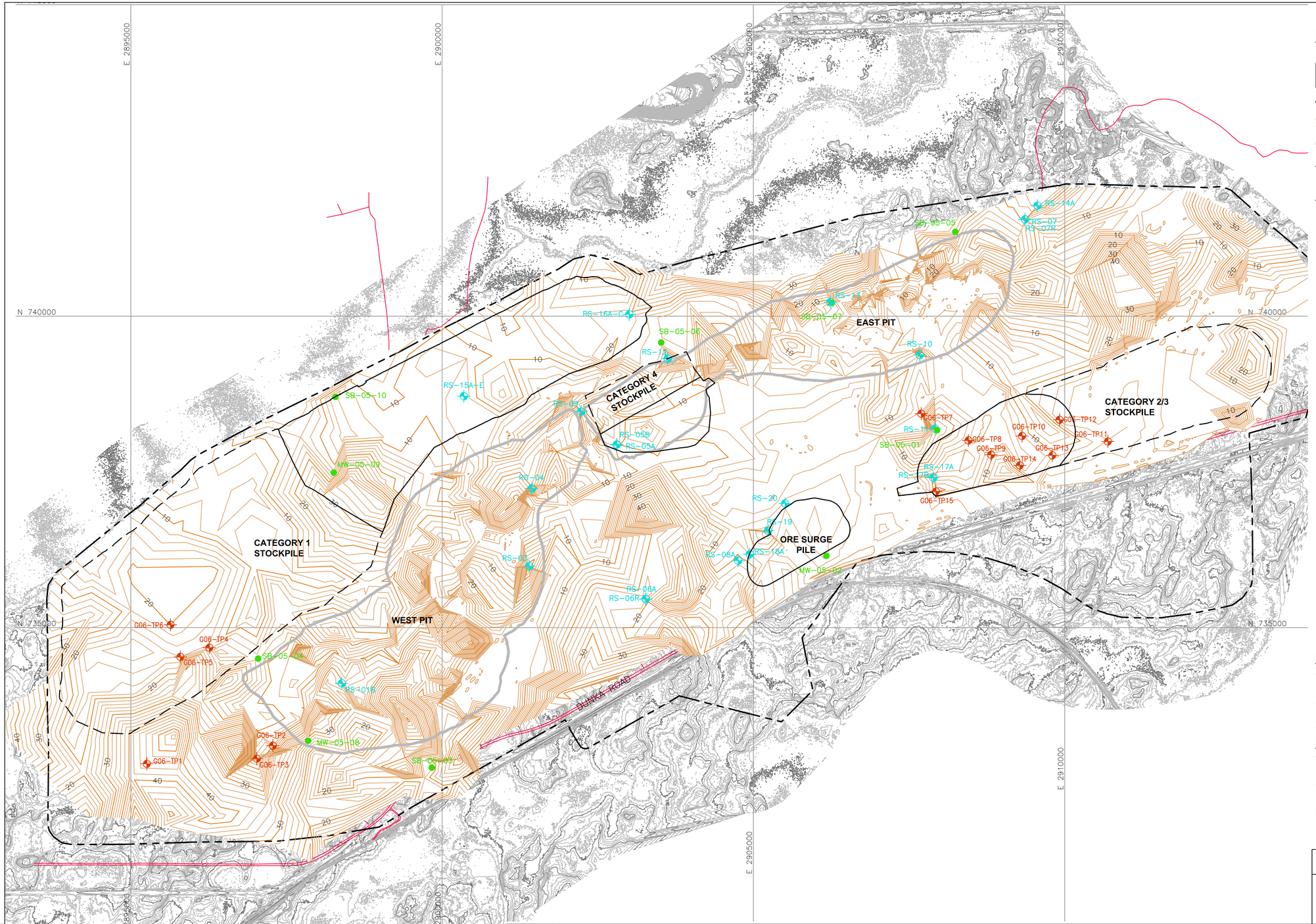

LEGEND

- EXISTING GROUND TOPOGRAPHY
- MINE SITE BOUNDARY
- ESTIMATED DEPTH TO BEDROCK CONTOURS
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- G06-TP11 — GOLDER ASSOC. TEST PIT (2006)
- SB-05-01 — BARR ENGINEERING BOREHOLES (2005)
- RS-11 — BARR ENGINEERING BOREHOLES (2008)

NOTES

1. OPEN PIT BOUNDARIES PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE

PRINTED NAME BRENT R. BRONSON

DATE 5/22/15 LICENSE # 46492

DRAWN: MTM

CHECKED:

GOLDER PROJECT NO.: 113-2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

DEPTH TO BEDROCK ISOPACH MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-009 REV

CADD USER: Brewer, Keith FILE: K:_DENVER\113-2209\11322094024.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 11:57 AM

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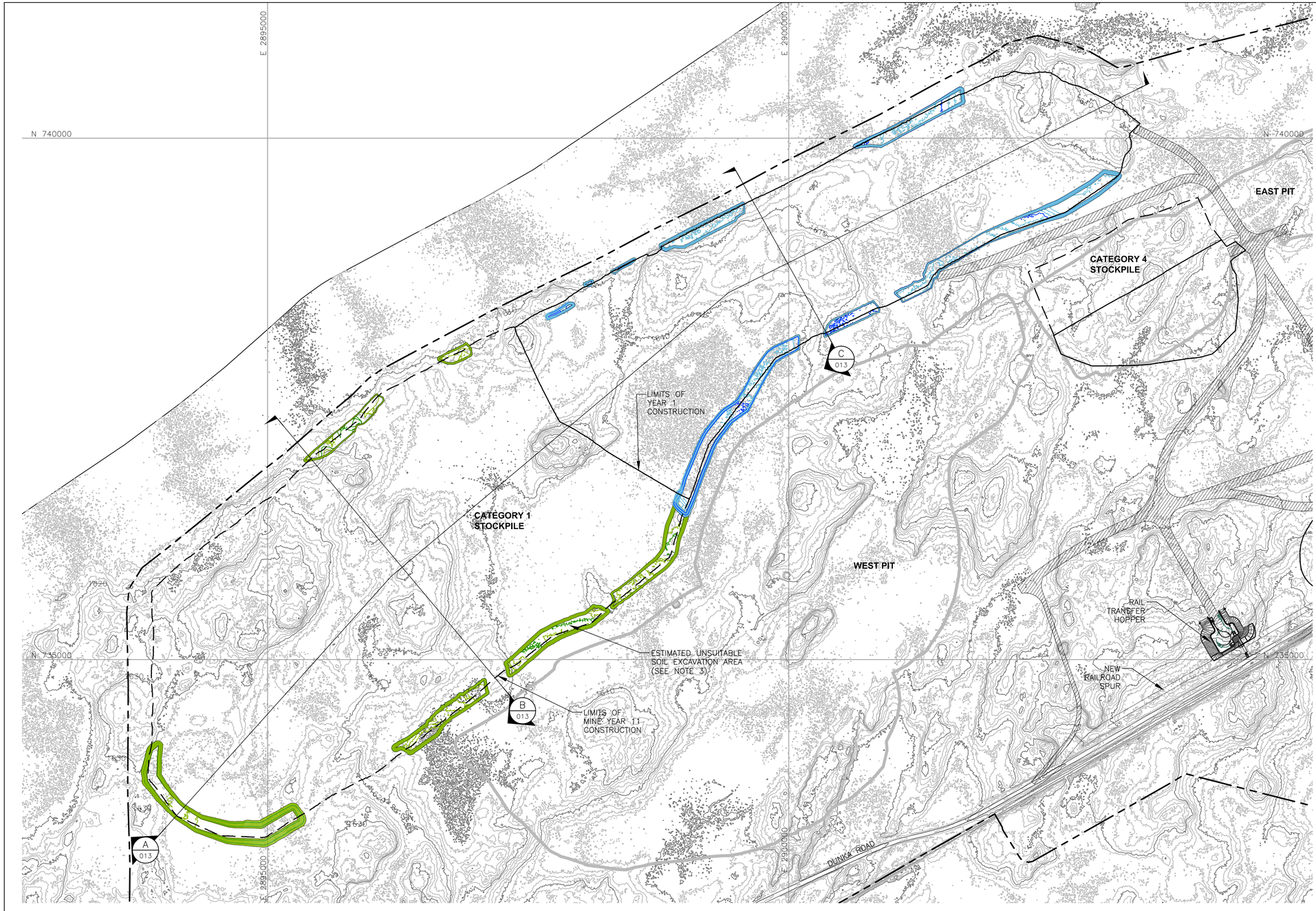

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MINE YEAR 1 EXCAVATION TOPOGRAPHY
- MINE YEAR 11 AND ULTIMATE EXCAVATION TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. UNSUITABLE SOILS TO BE EXCAVATED WITHIN FIRST 100 FEET FROM THE ULTIMATE STOCKPILE BOUNDARIES. GEOTECHNICAL PROPERTIES OF THE FOUNDATION SOILS WILL BE CONFIRMED PRIOR TO FINAL DESIGN.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 500 1000
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
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E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUED	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE
PRINTED NAME: BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE
SUBGRADE EXCAVATION PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-010
REV

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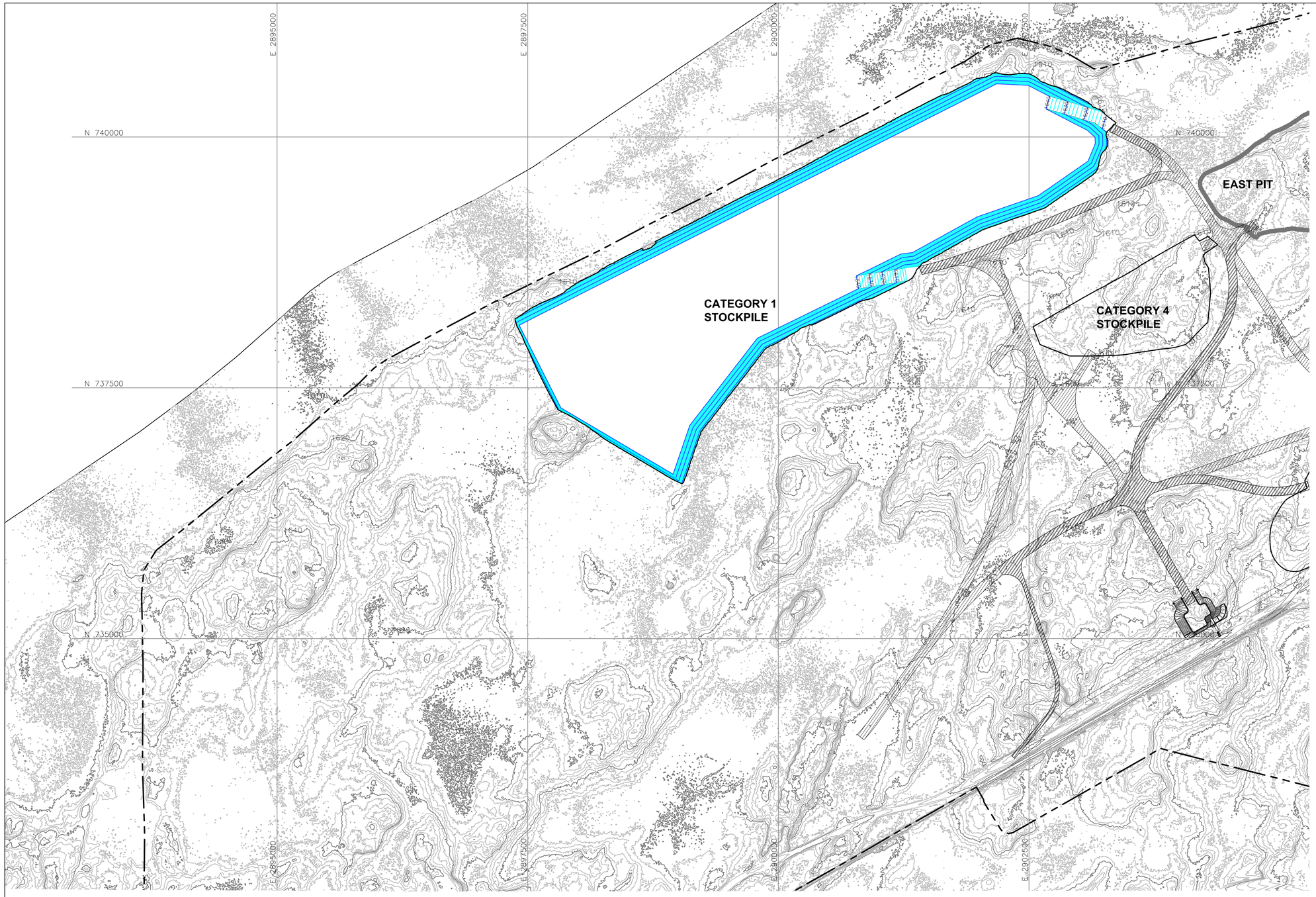

LEGEND

- EXISTING GROUND TOPOGRAPHY (1590 / 1580)
- PROPOSED GRADING TOPOGRAPHY (1590 / 1600)
- HAUL ROADS
- MINE SITE BOUNDARY
- PIT BOUNDARIES AT MINE YEAR 2 (SEE NOTE 1)
- MINE YEAR 1 AND 2 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
4. IF CLOSURE OCCURS AFTER 1 YEAR OF MINING, STOCKPILE DRAINAGE WILL BE AS SHOWN ON DRAWING 012 FOR THIS PORTION OF THE STOCKPILE.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 500 1000
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
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F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED: GG
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE MINE YEAR 1 CONTINGENCY CLOSURE CONFIGURATION

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-011
REV

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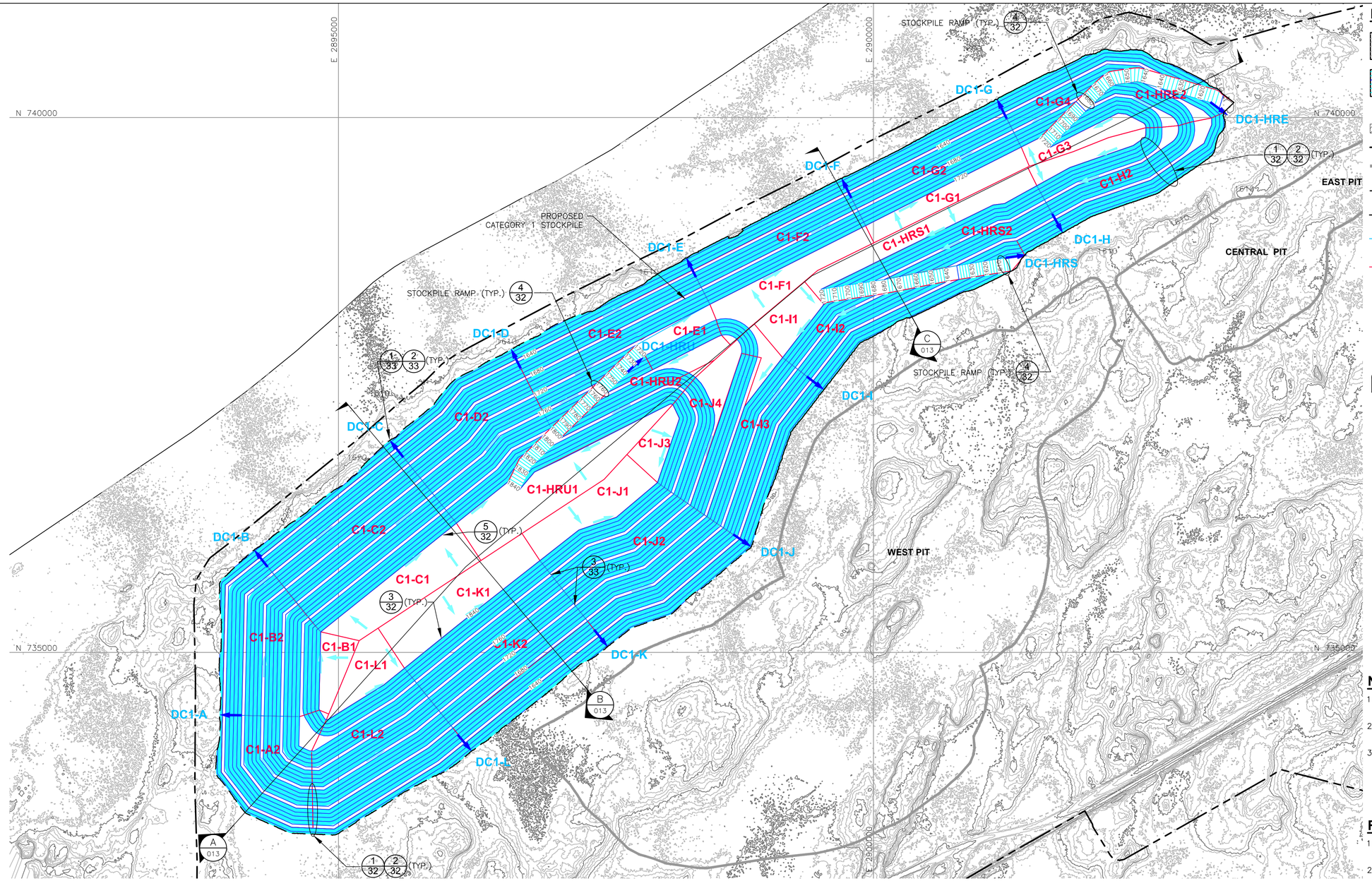

LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED GRADING TOPOGRAPHY
- HAUL ROADS
- MINE SITE BOUNDARY
- PIT BOUNDARIES AT MINE YEAR 2 (SEE NOTE 1)
- MINE YEAR 1 AND 2 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- DOWNCHUTE/DRAINAGE DIRECTION
- WATERSHED DIVIDES
- C1-H1 WATERSHED ID
- DC1-H DOWNCHUTE ID
- GENERAL DRAINAGE DIRECTION
- CROSS SECTION IDENTIFIER (A / 013)
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 500 1000
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
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E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION.		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE
FINAL GRADES AND SUB-BASIN DELINEATION

POLYMET MINING
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-012
REV

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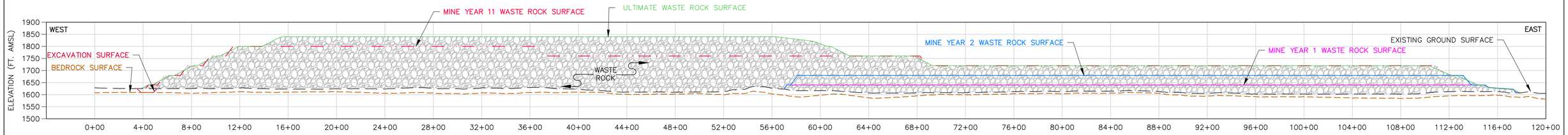

A 013 SECTION

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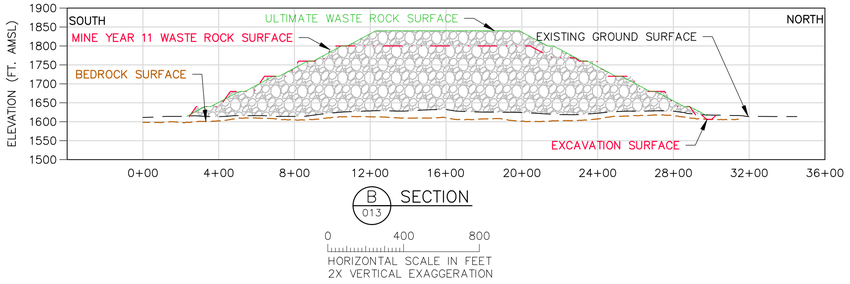
HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



B 013 SECTION

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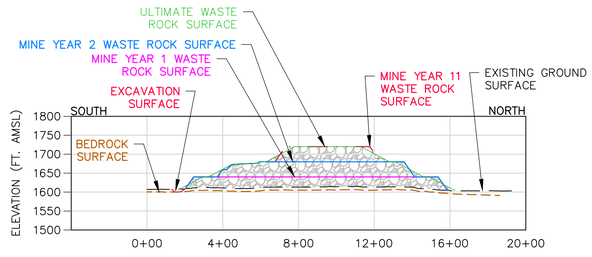
HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



C 013 SECTION

0 400 800

HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION

NOTE

1. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
2. UNSUITABLE SOILS TO BE EXCAVATED WITHIN FIRST 100 FEET FROM THE ULTIMATE STOCKPILE BOUNDARIES. GEOTECHNICAL PROPERTIES OF THE FOUNDATION SOILS WILL BE CONFIRMED PRIOR TO FINAL DESIGN.
3. SEE CROSS SECTION LOCATIONS ON DRAWINGS 3, 4, 5, 6, 10, AND 12.

LEGEND

- MINE YEAR 1 LIMITS
- MINE YEAR 2 LIMITS
- MINE YEAR 11 LIMITS
- MINE YEAR 21, ULTIMATE LIMITS
- EXISTING GROUND SURFACE
- BEDROCK SURFACE
- EXCAVATION SURFACE

VER NO	DATE	DESCRIPTION
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F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

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SIGNATURE

PRINTED NAME BRENT R. BRONSON

DATE 5/22/15 LICENSE # 46492

DRAWN: MTM

CHECKED:

GOLDER PROJECT NO.: 113-2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE DESIGN SECTIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-013

REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\132209d026.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:02 PM

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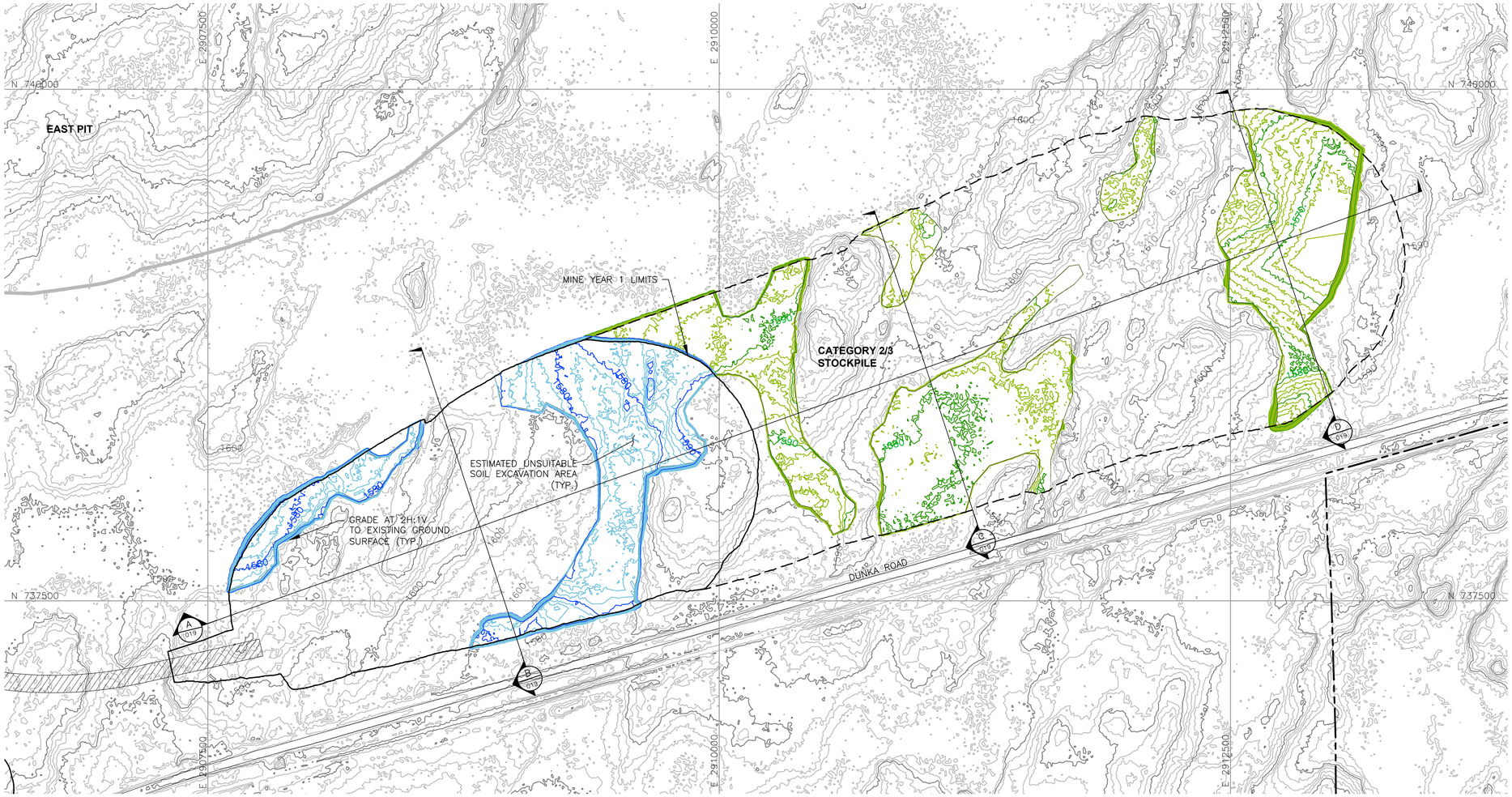

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MINE YEAR 1 EXCAVATION TOPOGRAPHY
- PROPOSED MAXIMUM FOOTPRINT EXCAVATION TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 300 600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	F	5/22/15
FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 2/3 STOCKPILE SUBGRADE EXCAVATION PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-014
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220904.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:03 PM

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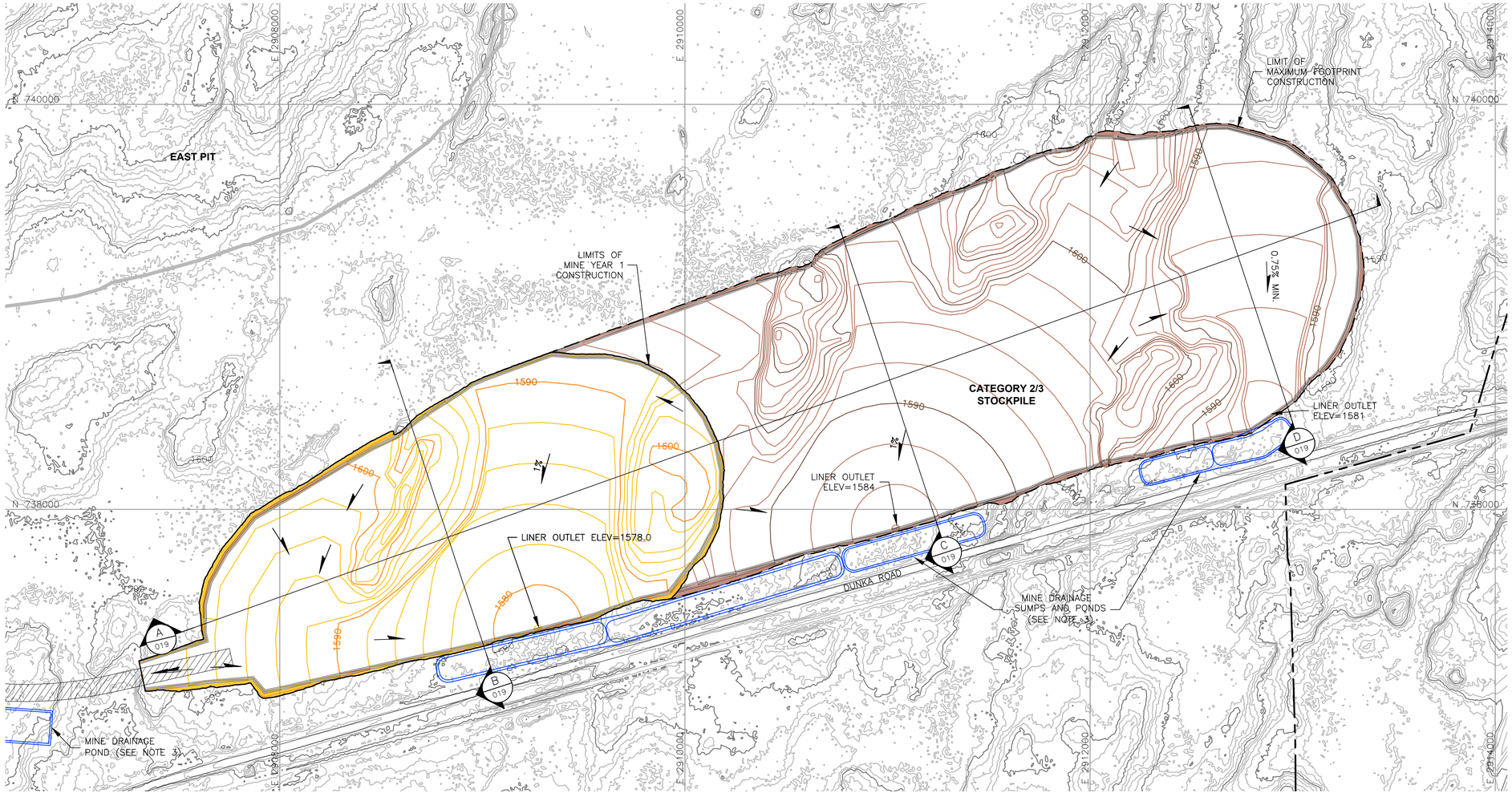

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MINE YEAR 1 GRADING TOPOGRAPHY
- PROPOSED MAXIMUM FOOTPRINT GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- CROSS SECTION IDENTIFIER (A 019)
- SHEET WHERE SECTION IS LOCATED
- SLOPE
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- MINE DRAINAGE SUMP/POND (SEE NOTE 3)

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE MECHANICAL INFRASTRUCTURE PERMIT SUPPORT DRAWINGS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 300 600
SCALE IN FEET

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ISSUE STATUS	VERSION	DATE
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FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 2/3 STOCKPILE
FOUNDATION GRADING PLAN
MINE YEAR 1 AND MAXIMUM

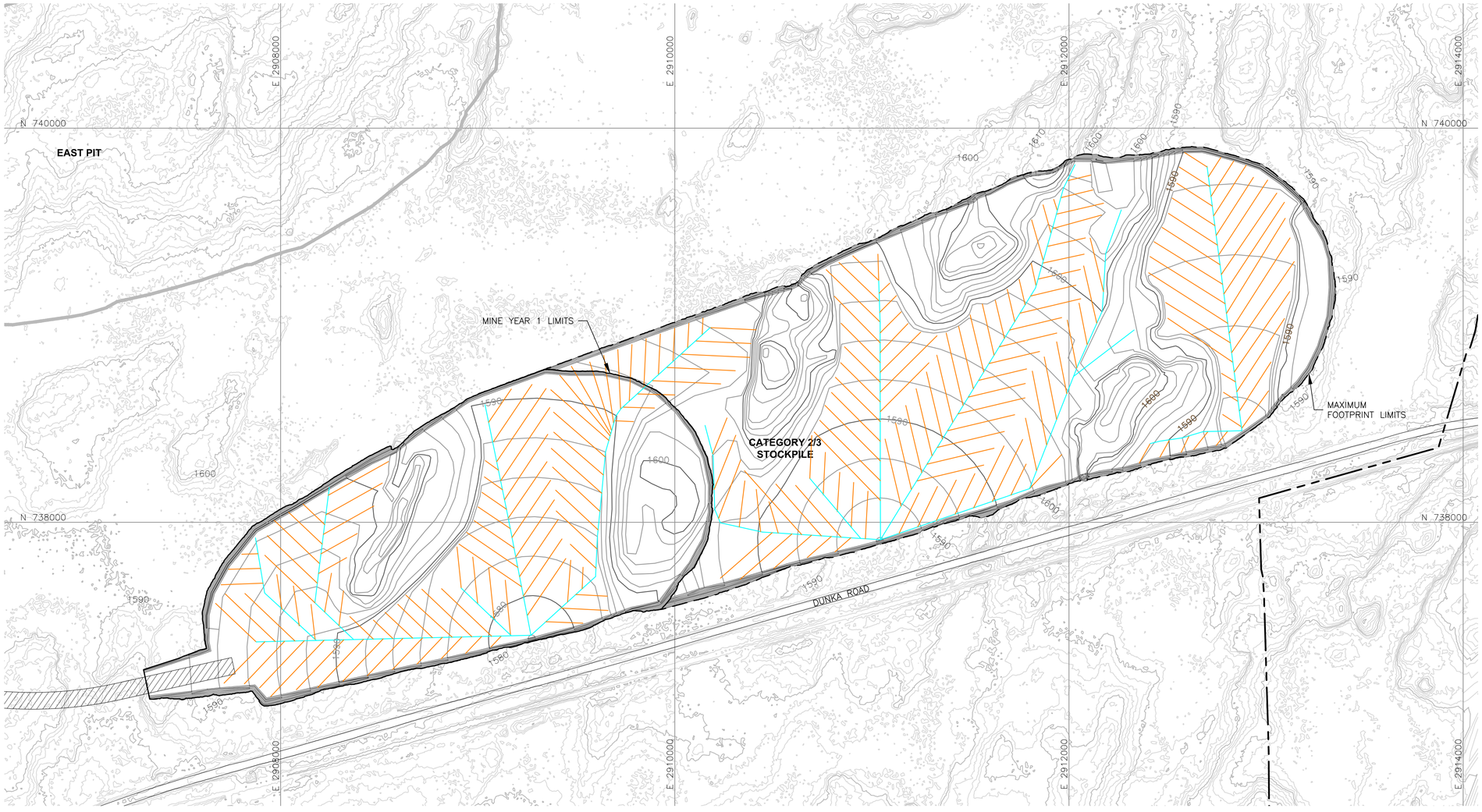
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-015
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\13220HM035.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:04 PM



LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS

TERTIARY COLLECTION PIPING (SEE NOTE 3)
- 4–INCH

SECONDARY COLLECTION PIPING (SEE NOTE 3)
- 6–INCH

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. ACTUAL NUMBER AND LOCATION OF UNDERDRAIN PIPES AND SUMPS WILL NEED TO BE DETERMINED DURING CONSTRUCTION BASED ON ENCOUNTERED FIELD CONDITIONS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 300 600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5–22–15
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.

SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113–2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 2/3 STOCKPILE
UNDERDRAIN PIPING PLAN
MINE YEAR 1 AND MAXIMUM

POLYMET MINING

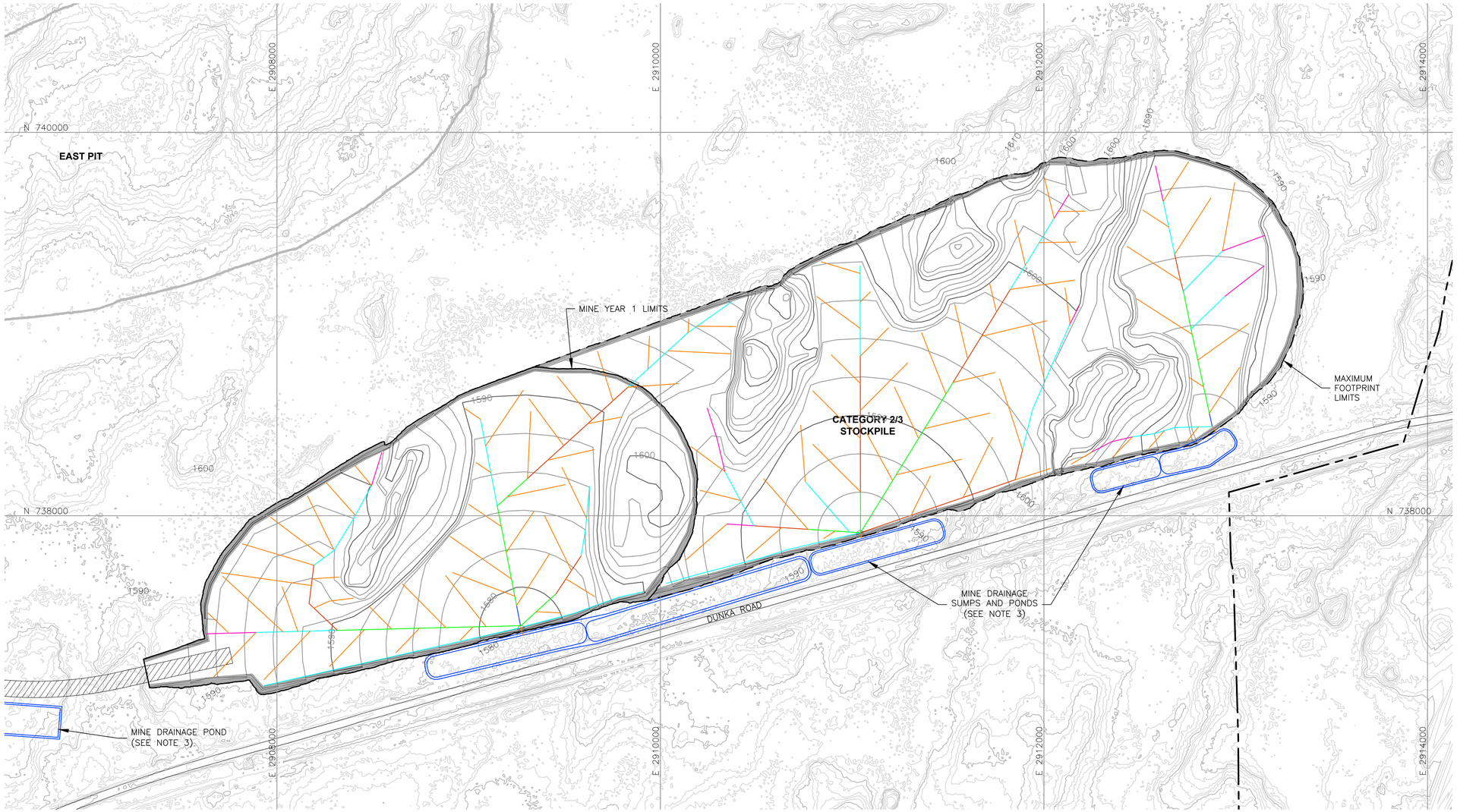
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP–016
REV

CADD USER: Brewer, Keith FILE: K:_DENVER\113-2209\11322090H008.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:05 PM

INCHES 1 2



LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- MINE DRAINAGE SUMP/POND (SEE NOTE 3)

TERTIARY COLLECTION PIPING
- 4–INCH

PRIMARY AND SECONDARY COLLECTION PIPING
- 4–INCH
- 6–INCH
- 8–INCH
- 10–INCH
- 12–INCH

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE MECHANICAL INFRASTRUCTURE PERMIT SUPPORT DRAWINGS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
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D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5–22–15
FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113–2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 2/3 STOCKPILE
OVERLINER DRAINAGE PIPING PLAN
MINE YEAR 1 AND MAXIMUM

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980–0540
Fax: (303) 985–2080
www.golder.com

DWG. NO. SKP–017
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113–2209\113220901O.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:06 PM

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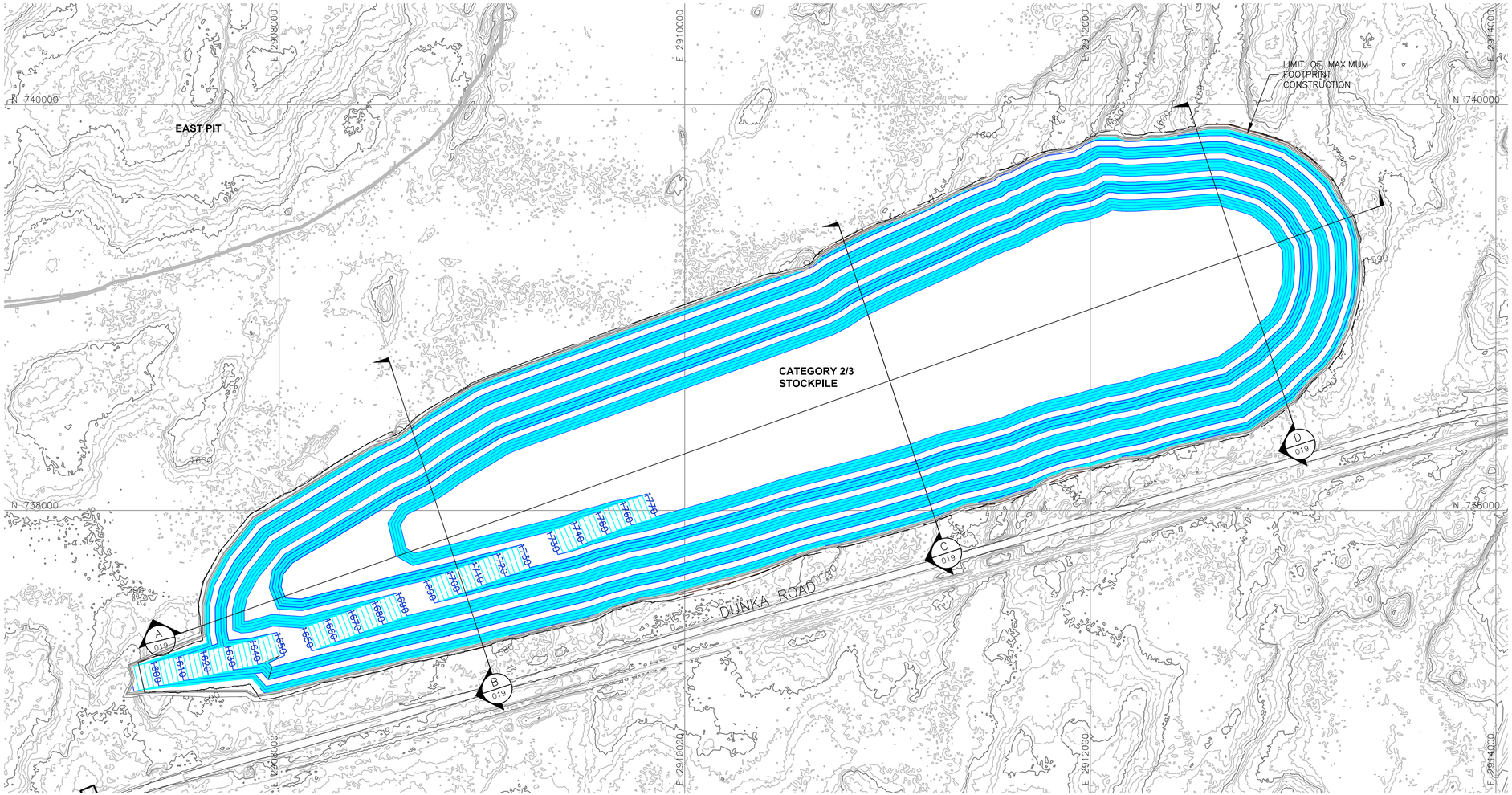

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MAXIMUM GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- PROPOSED HAUL ROAD
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 300 600
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE

PRINTED NAME BRENT R. BRONSON

DATE 5/22/15 LICENSE # 46492

DRAWN: MTM

CHECKED:

GOLDER PROJECT NO.: 113-2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 2/3 STOCKPILE
MAXIMUM CAPACITY CONFIGURATION

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-018

REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220900H004.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:07 PM

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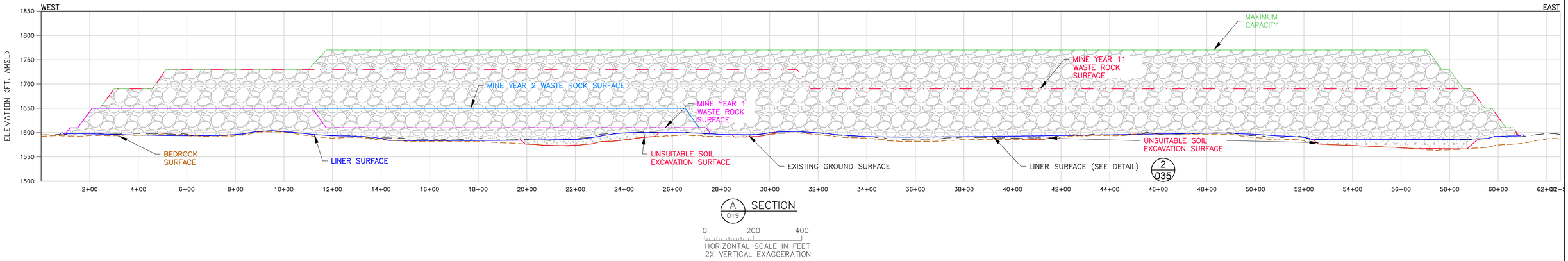
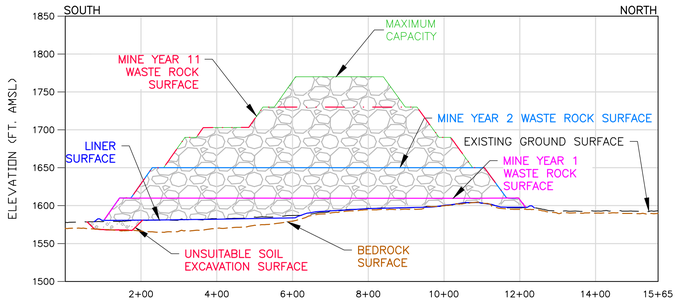


A 019 SECTION

0 200 400

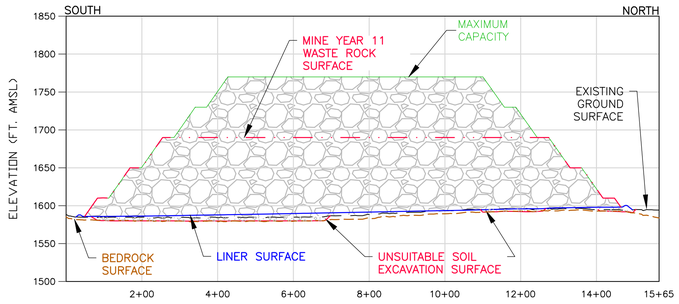
HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



B 019 SECTION

0 200 400

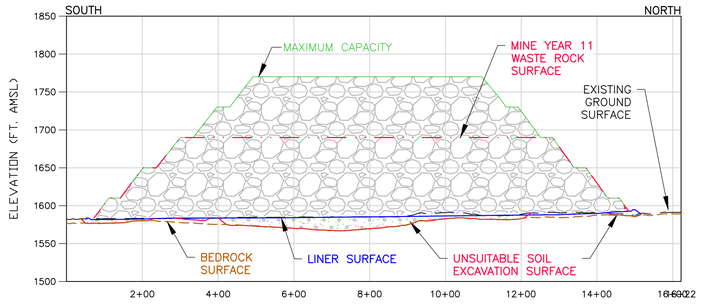
HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



C 019 SECTION

0 200 400

HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



D 019 SECTION

0 200 400

HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION

LEGEND

- MINE YEAR 1 LIMITS
- MINE YEAR 2 LIMITS
- MINE YEAR 11 LIMITS
- MAXIMUM CAPACITY
- LINER SURFACE
- EXISTING GROUND SURFACE
- UNSUITABLE SOIL EXCAVATION SURFACE
- BEDROCK SURFACE

NOTES

1. STOCKPILE INTERBENCH SLOPES AT ANGLE OF REPOSE.
2. THIS DESIGN CONSERVATIVELY ASSUMES THAT ALL LOWLAND/WETLAND SOILS ARE GEOTECHNICALLY UNSUITABLE AND WILL REQUIRE EXCAVATION AND REPLACEMENT WITH STRUCTURAL FILL TO THE DESIGN FOUNDATION BASE GRADE. GEOTECHNICAL PROPERTIES OF THE FOUNDATION SOILS WILL BE CONFIRMED PRIOR TO FINAL DESIGN.
3. MAXIMUM DEPTH OF UNSUITABLE MATERIAL SUBGRADE EXCAVATION LIMITED TO 20 FEET FOR THIS DESIGN. THE ACTUAL DEPTH OF UNSUITABLE SOIL EXCAVATION WILL BE CONFIRMED BY PHASE II GEOTECHNICAL INVESTIGATION.
4. SEE CROSS SECTION LOCATIONS ON DRAWINGS 3, 4, 5, 14, 15 AND 18.

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
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E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE

PRINTED NAME BRENT R. BRONSON

DATE 5/22/15 LICENSE # 46492

DRAWN: MTM

CHECKED:

GOLDER PROJECT NO.: 113-2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 2/3 STOCKPILE DESIGN SECTIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

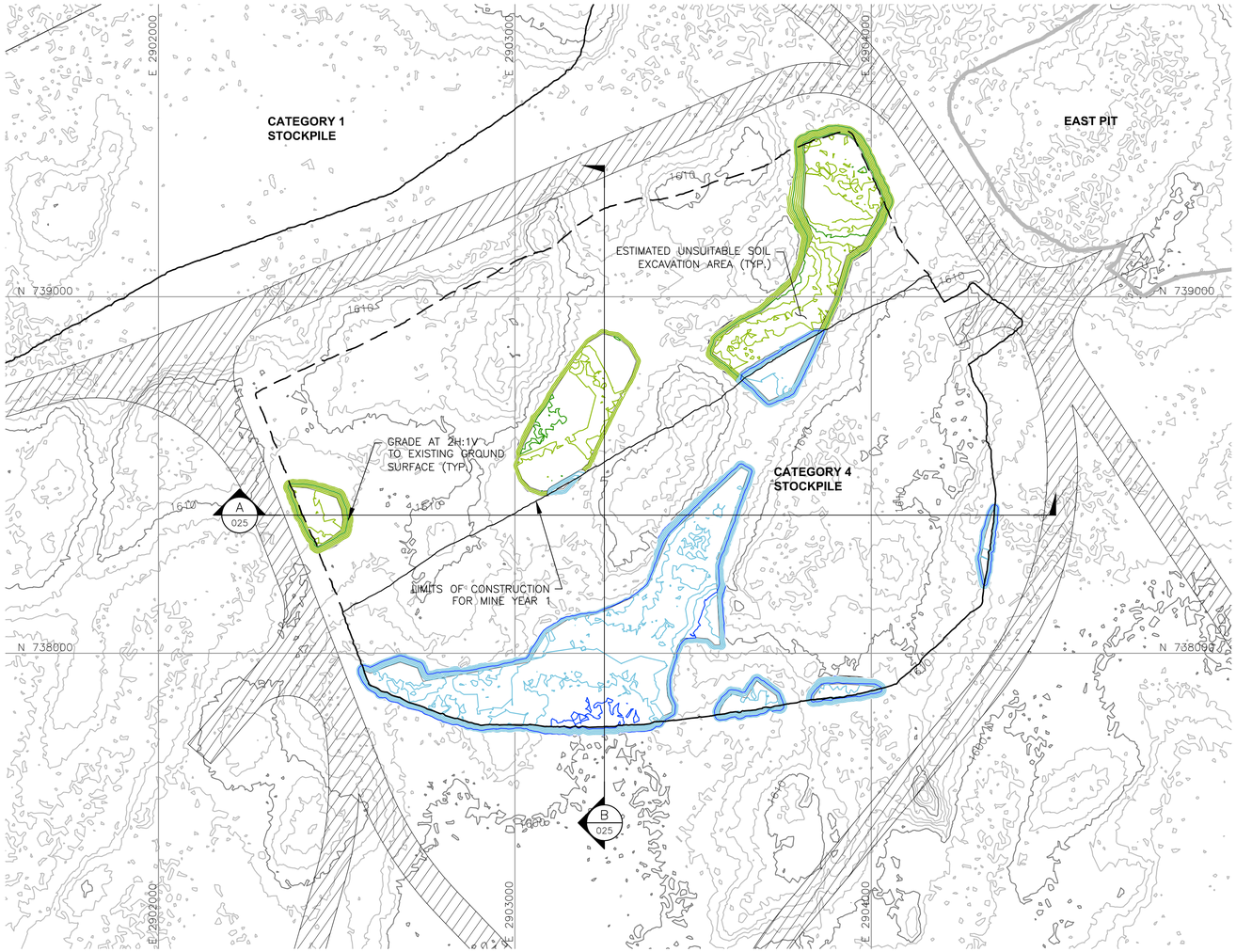
Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-019

REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220SHO11.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:09 PM

INCHES 1 2



LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MINE YEAR 1 EXCAVATION TOPOGRAPHY
- PROPOSED MAXIMUM FOOTPRINT EXCAVATION TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- MINE YEAR 2 PIT BOUNDARIES (SEE NOTE 1)
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 4 STOCKPILE
SUBGRADE EXCAVATION PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-020
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\11322090H012.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:10 PM

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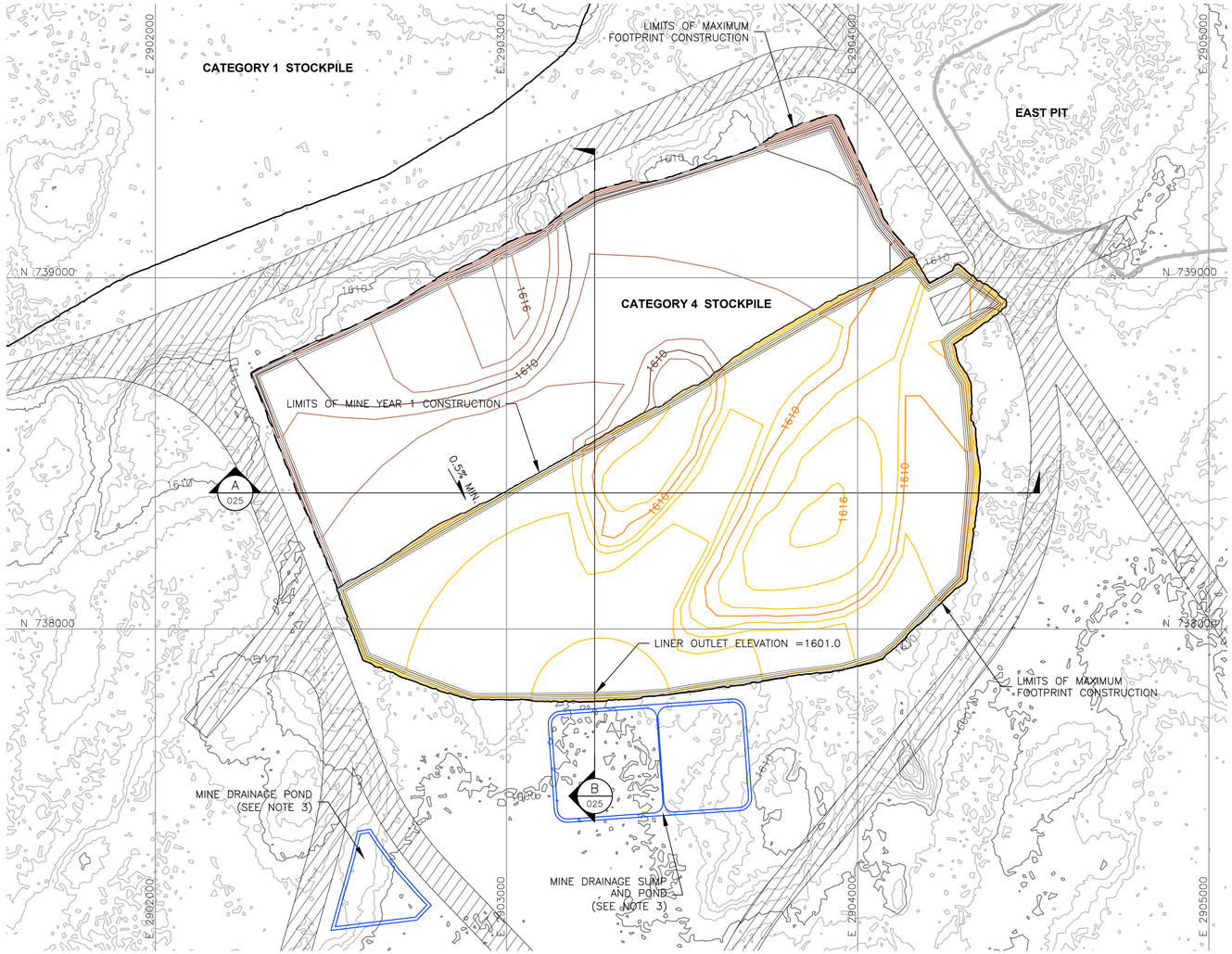

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MINE YEAR 1 GRADING TOPOGRAPHY
- PROPOSED MAXIMUM FOOTPRINT GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED
- SLOPE
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROAD
- MINE YEAR 2 PIT BOUNDARIES (SEE NOTE 1)
- MINE DRAINAGE SUMP/POND (SEE NOTE 3)

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE MECHANICAL INFRASTRUCTURE PERMIT SUPPORT DRAWINGS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUE STATUS	VERSION	DATE
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FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 4 STOCKPILE
FOUNDATION GRADING PLAN
MINE YEAR 1 AND MAXIMUM

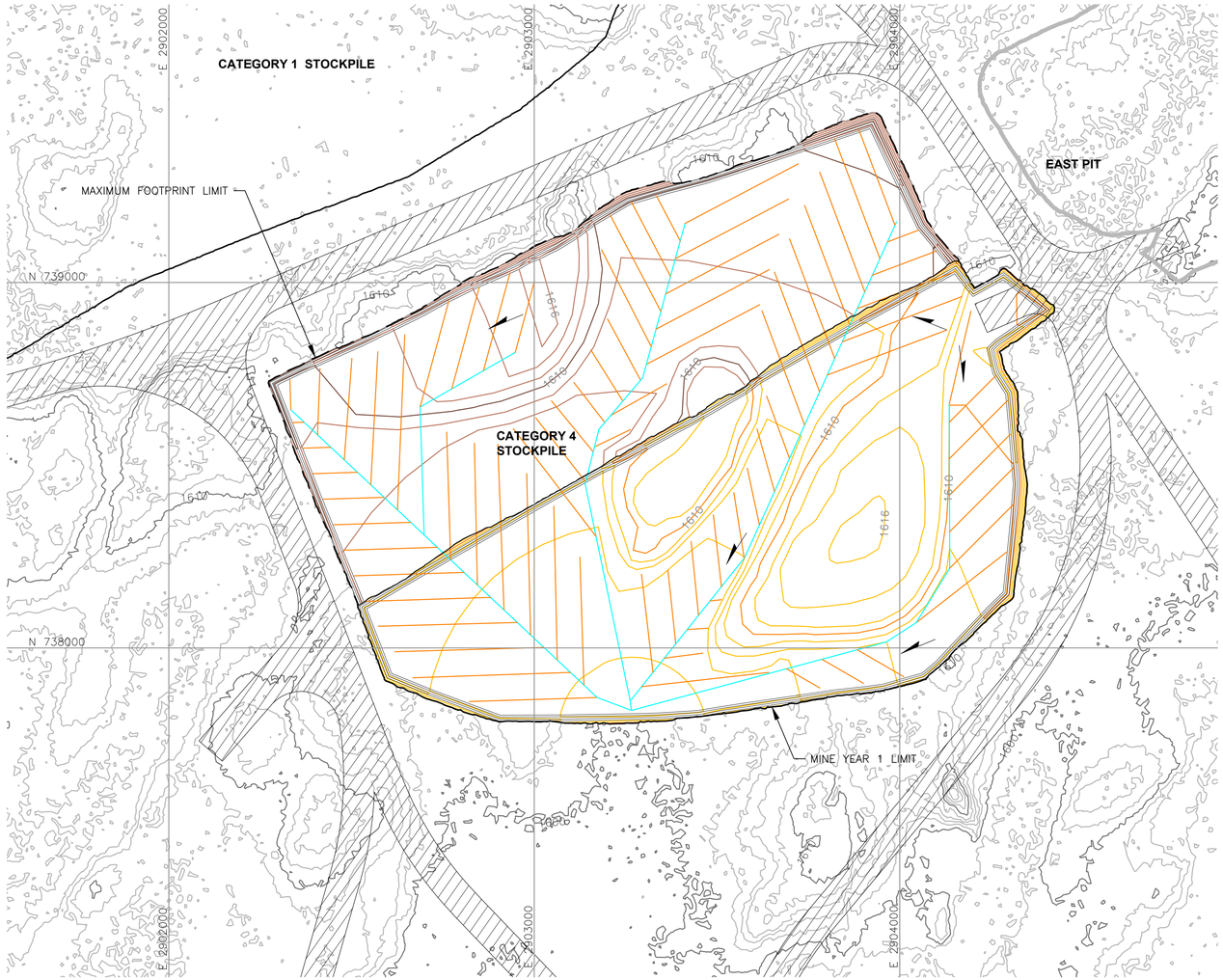
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-021
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\11322OPHO13.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:11 PM



LEGEND

- EXISTING GROUND TOPOGRAPHY (1590, 1580)
- PROPOSED MINE YEAR 1 GRADING TOPOGRAPHY (1590, 1600)
- PROPOSED MAXIMUM FOOTPRINT GRADING TOPOGRAPHY (1590, 1600)
- MINE SITE BOUNDARY
- MINE YEAR 2 PIT BOUNDARIES (SEE NOTE 1)
- SLOPE
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS

TERTIARY COLLECTION PIPING (SEE NOTE 3)
- 4–INCH

SECONDARY COLLECTION PIPING (SEE NOTE 3)
- 6–INCH

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. ACTUAL NUMBER AND LOCATION OF UNDERDRAIN PIPES AND SUMPS WILL NEED TO BE DETERMINED DURING CONSTRUCTION BASED ON ENCOUNTERED FIELD CONDITIONS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
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3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

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ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5–22–15
FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113–2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 4 STOCKPILE
UNDERDRAIN PIPING PLAN
MINE YEAR 1 AND MAXIMUM

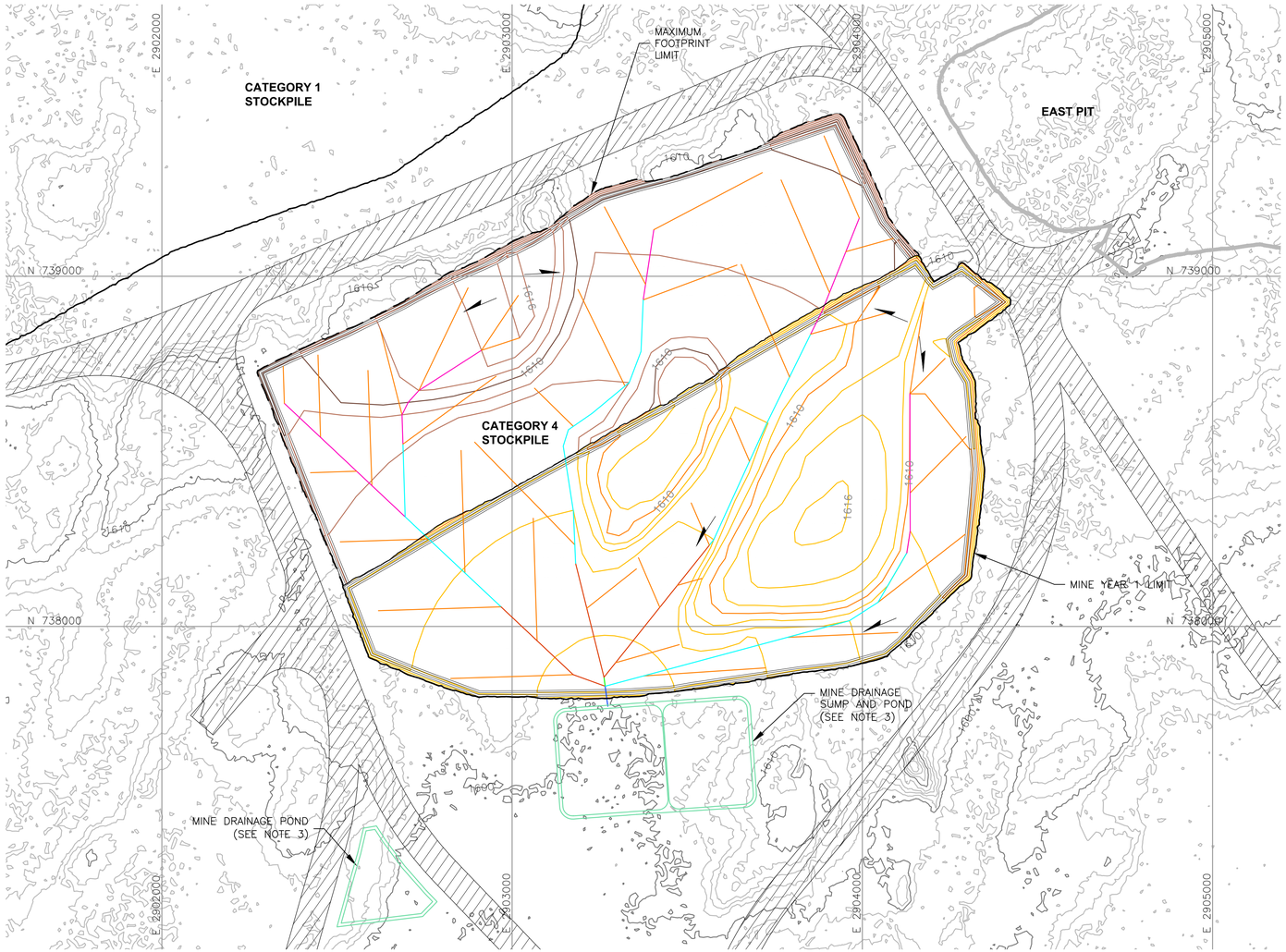
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980–0540
Fax: (303) 985–2080
www.golder.com

DWG. NO. SKP–022
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113209H014.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:12 PM
INCHES 1 2



LEGEND

- EXISTING GROUND TOPOGRAPHY (1590 / 1580)
- PROPOSED MINE YEAR 1 GRADING TOPOGRAPHY (1590 / 1600)
- PROPOSED MAXIMUM FOOTPRINT GRADING TOPOGRAPHY (1590 / 1600)
- MINE SITE BOUNDARY
- MINE YEAR 2 PIT BOUNDARIES (SEE NOTE 1)
- SLOPE
- MINE YEAR 1 WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- MINE DRAINAGE SUMP/POND (SEE NOTE 3)

MINE YEAR 1 – TERTIARY COLLECTION PIPING
- 4–INCH

MINE YEAR 1 – PRIMARY AND SECONDARY COLLECTION PIPING
- 4–INCH
- 6–INCH
- 8–INCH
- 10–INCH
- 12–INCH

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE MECHANICAL INFRASTRUCTURE PERMIT SUPPORT DRAWINGS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5–22–15
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.
SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113–2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 4 STOCKPILE OVERLINER DRAINAGE PIPING PLAN MINE YEAR 1 AND MAXIMUM

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980–0540
Fax: (303) 985–2080
www.golder.com

DWG. NO. SKP–023
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113–2209\11322090H015.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:13 PM

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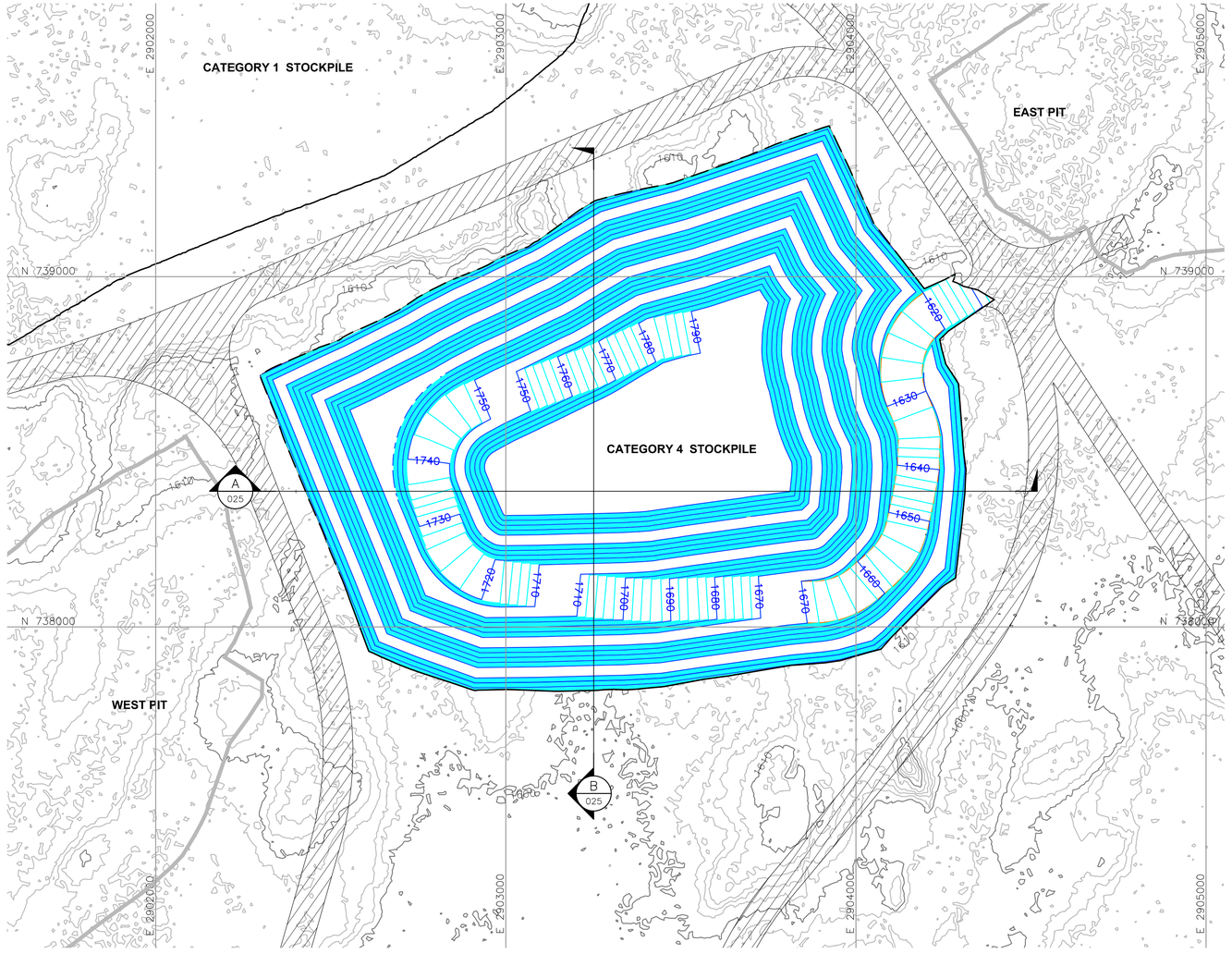

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MAXIMUM GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED
- MINE YEAR 1 WASTE ROCK STOCKPILE LIMIT (SEE NOTE 1)
- MAXIMUM WASTE ROCK STOCKPILE LIMIT
- PROPOSED HAUL ROAD
- MINE YEAR 11 PIT BOUNDARIES (SEE NOTE 1)

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED: GG
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

PLANT DRAWING NUMBER:

CATEGORY 4 STOCKPILE
STOCKPILE MAXIMUM CAPACITY CONFIGURATION

DWG. NO. SKP-024
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220SHO06.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:14 PM

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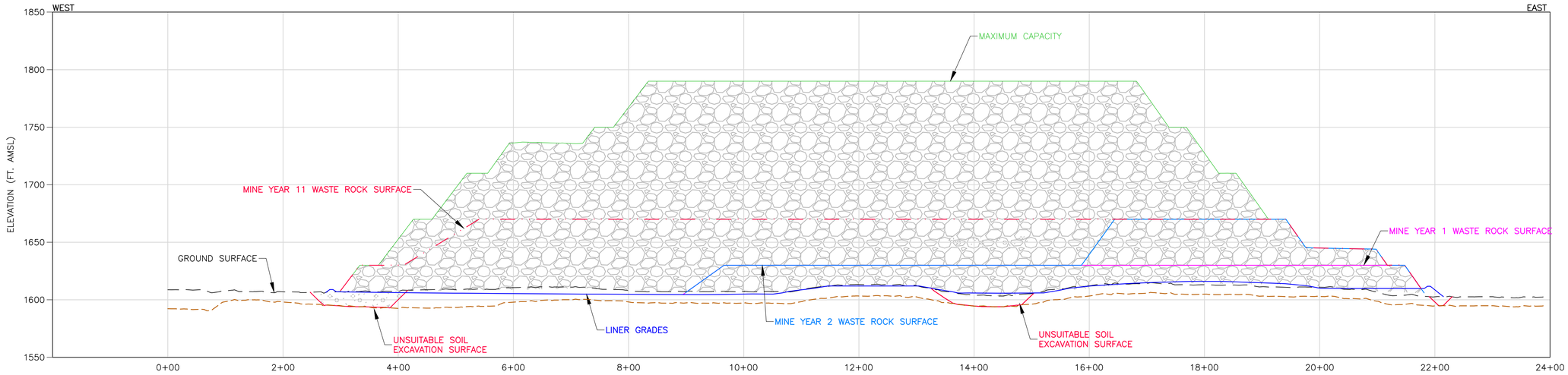
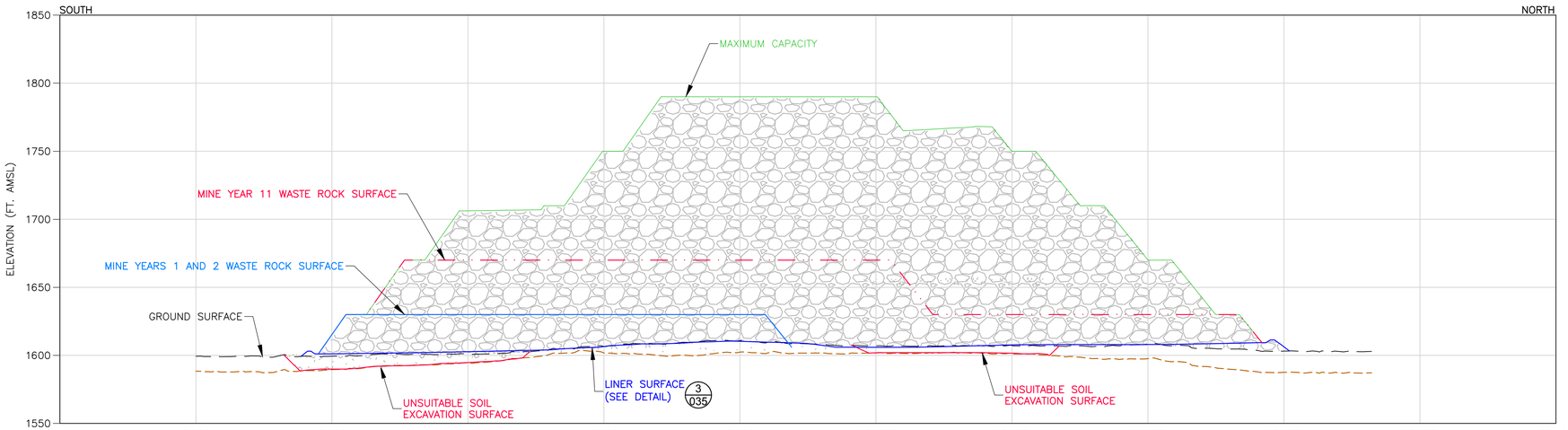


A/025 SECTION

0 100 200
HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



B/025 SECTION

0 100 200
HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION

LEGEND

- MINE YEAR 1 LIMITS
- MINE YEAR 2 LIMITS
- MINE YEAR 11 LIMITS
- MAXIMUM CAPACITY
- LINER SURFACE
- EXISTING GROUND SURFACE
- UNSUITABLE SOIL EXCAVATION SURFACE
- BEDROCK SURFACE

NOTES

1. STOCKPILE INTERBENCH SLOPES AT ANGLE OF REPOSE.
2. THIS DESIGN CONSERVATIVELY ASSUMES THAT ALL LOWLAND/WETLAND SOILS ARE GEOTECHNICALLY UNSUITABLE AND WILL REQUIRE EXCAVATION AND REPLACEMENT WITH STRUCTURAL FILL TO THE DESIGN FOUNDATION BASE GRADE. GEOTECHNICAL PROPERTIES OF THE FOUNDATION SOILS WILL BE CONFIRMED PRIOR TO FINAL DESIGN.
3. MAXIMUM DEPTH OF UNSUITABLE MATERIAL SUBGRADE EXCAVATION LIMITED TO 20 FEET FOR THIS DESIGN. THE ACTUAL DEPTH OF UNSUITABLE SOIL EXCAVATION WILL BE CONFIRMED BY PHASE II GEOTECHNICAL INVESTIGATION.
4. SEE CROSS SECTION LOCATIONS ON DRAWINGS 3, 4, 5, 20, 21 AND 24.

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
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E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

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SIGNATURE B Bronson

PRINTED NAME BRENT R. BRONSON

DATE 5/22/15 LICENSE # 46492

DRAWN: MTM

CHECKED: GG

GOLDER PROJECT NO.: 113-2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 4 STOCKPILE DESIGN SECTIONS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-025

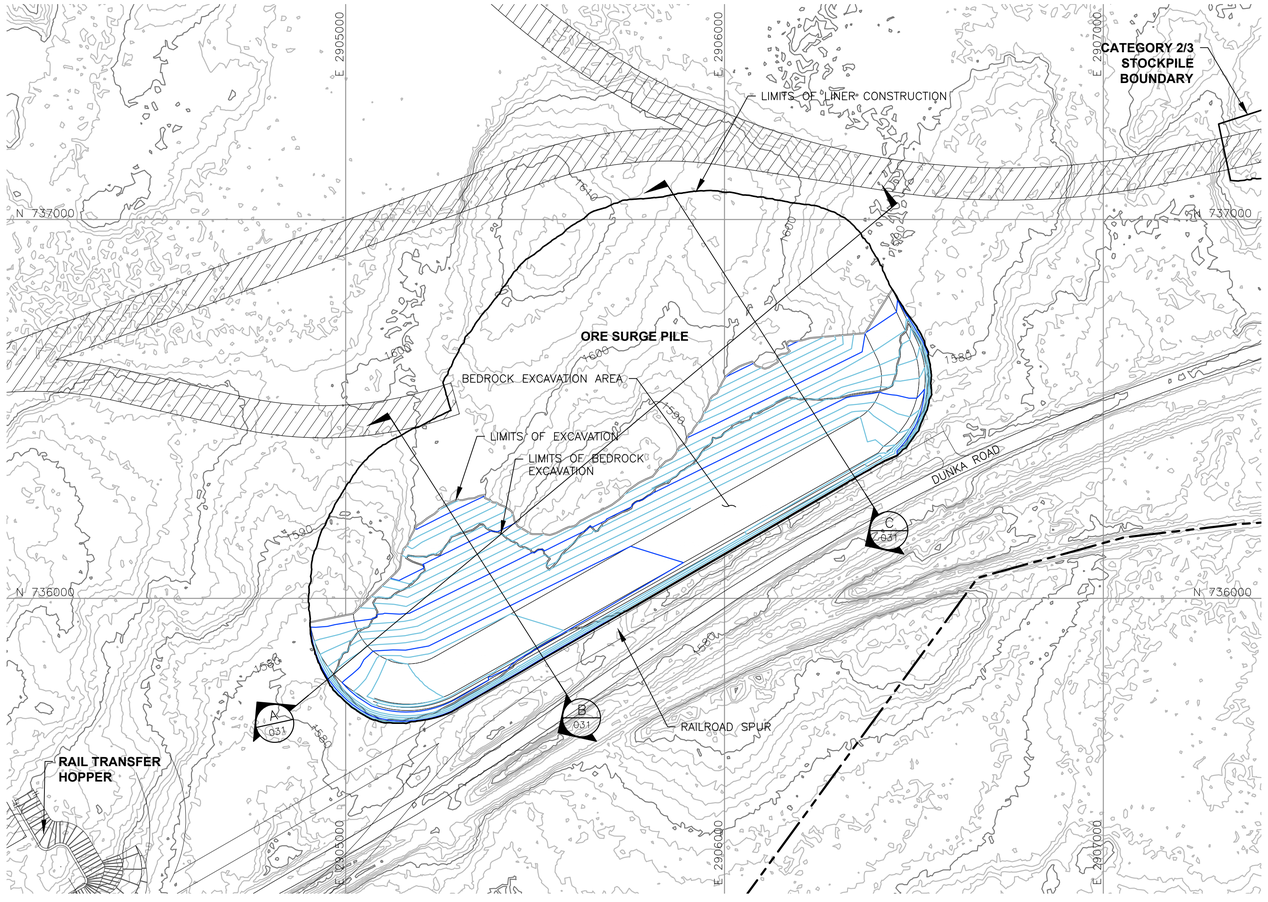
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220SH016.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:15 PM

INCHES 1 2

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MINE YEAR 1 EXCAVATION TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 1 ORE STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED



0 200 400
SCALE IN FEET

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
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E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ORE SURGE PILE SUBGRADE EXCAVATION PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

Golder Associates
GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-026
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220904017.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:16 PM

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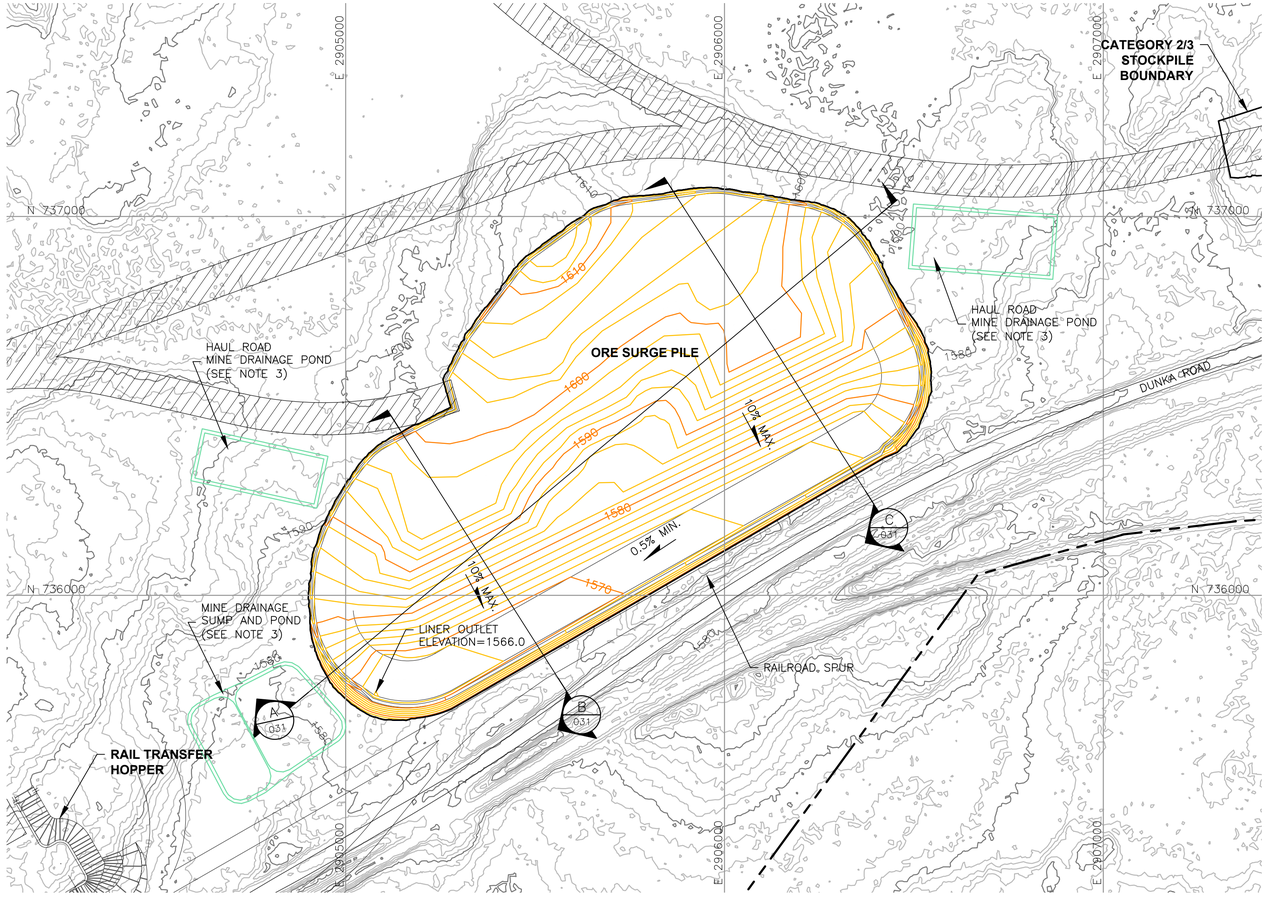

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED MINE YEAR 1 GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- CROSS SECTION IDENTIFIER
- SHEET WHERE SECTION IS LOCATED
- SLOPE
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- MINE DRAINAGE SUMP/POND (SEE NOTE 3)

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE MECHANICAL INFRASTRUCTURE PERMIT SUPPORT DRAWINGS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS MINNESOTA STATE PLANE.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ORE SURGE PILE
FOUNDATION GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-027
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\132209h018.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:17 PM
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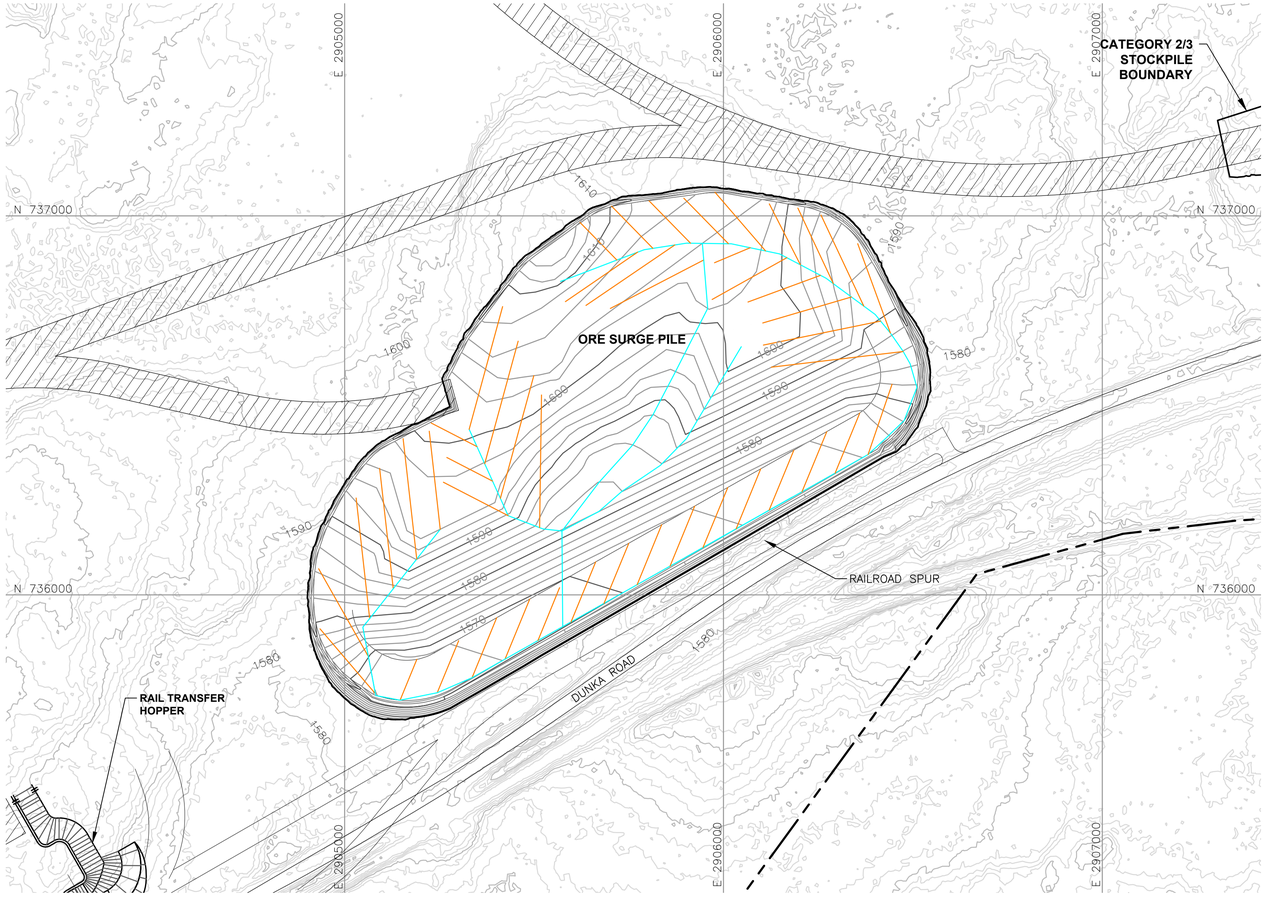

LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS

TERTIARY COLLECTION PIPING (SEE NOTE 3)
- 4–INCH

SECONDARY COLLECTION PIPING (SEE NOTE 3)
- 6–INCH

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. ACTUAL NUMBER OF UNDERDRAIN PIPES AND SUMPS WILL NEED TO BE DETERMINED DURING CONSTRUCTION BASED ON ENCOUNTERED FIELD CONDITIONS.
2. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5–22–15
FOR CONSTRUCTION		

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113–2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

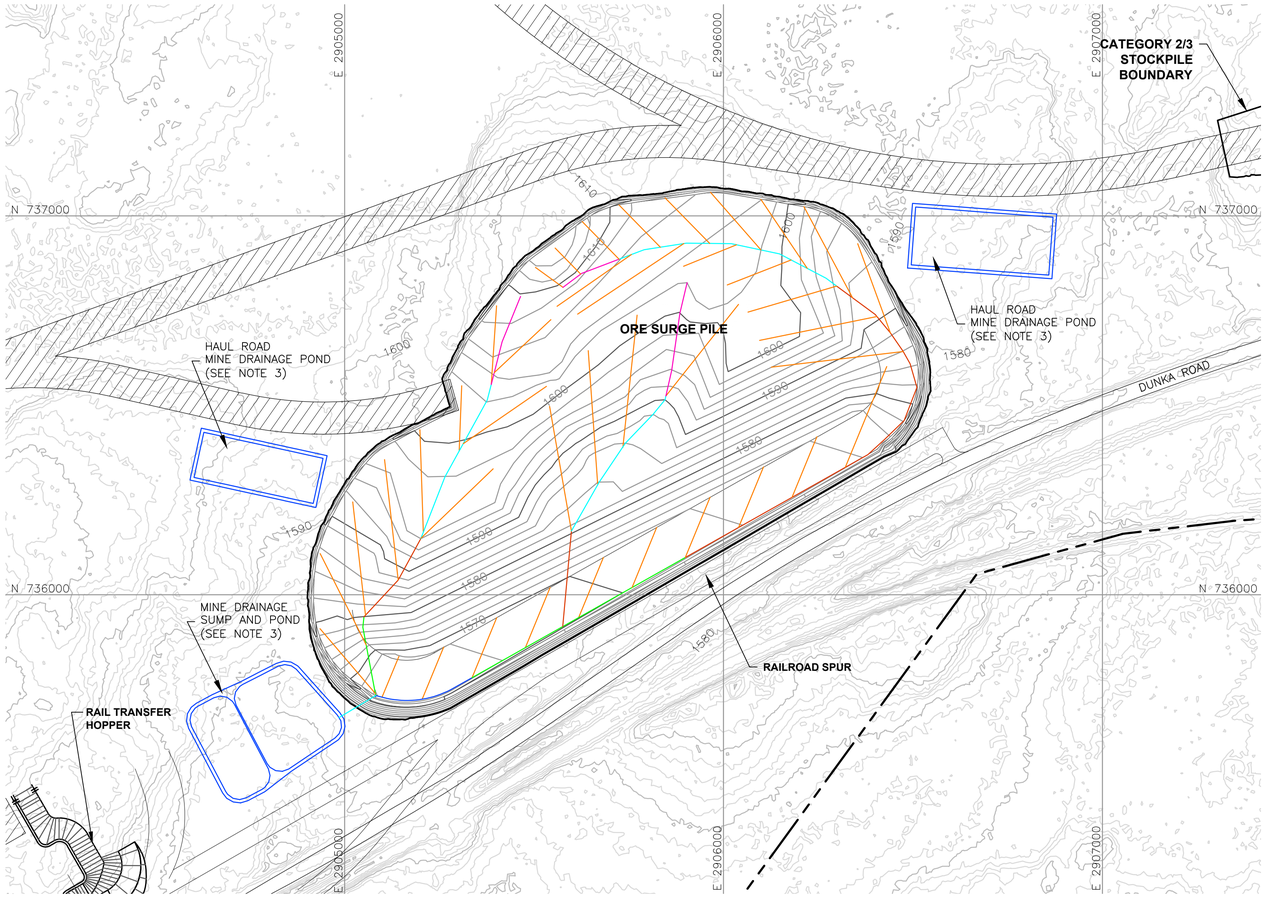
ORE SURGE PILE UNDERDRAIN PIPING PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980–0540
Fax: (303) 985–2080
www.golder.com

DWG. NO. SKP–028
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113–2209\113220HO19.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:18 PM



LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED GRADING TOPOGRAPHY
- MINE SITE BOUNDARY
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- HAUL ROADS
- MINE DRAINAGE SUMP/POND (SEE NOTE 3)

MINE YEAR 1 – TERTIARY COLLECTION PIPING
- 4–INCH

MINE YEAR 1 – PRIMARY AND SECONDARY COLLECTION PIPING
- 4–INCH
- 6–INCH
- 8–INCH
- 10–INCH
- 12–INCH

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE MECHANICAL INFRASTRUCTURE PERMIT SUPPORT DRAWINGS.
4. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
A	12/02/11	ISSUED FOR REVIEW FOR INCLUSION IN ROCK AND OVERBURDEN MANAGEMENT PLAN (ROMP)
B	2/15/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
C	5/29/13	ISSUED FOR REVIEW FOR INCLUSION IN ROMP
D	1/14/14	ISSUED FOR AGENCY REVIEW
E	4/10/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUED	VERSION	DATE
FOR PERMITTING	F	5–22–15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED: GG
GOLDER PROJECT NO.: 113–2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

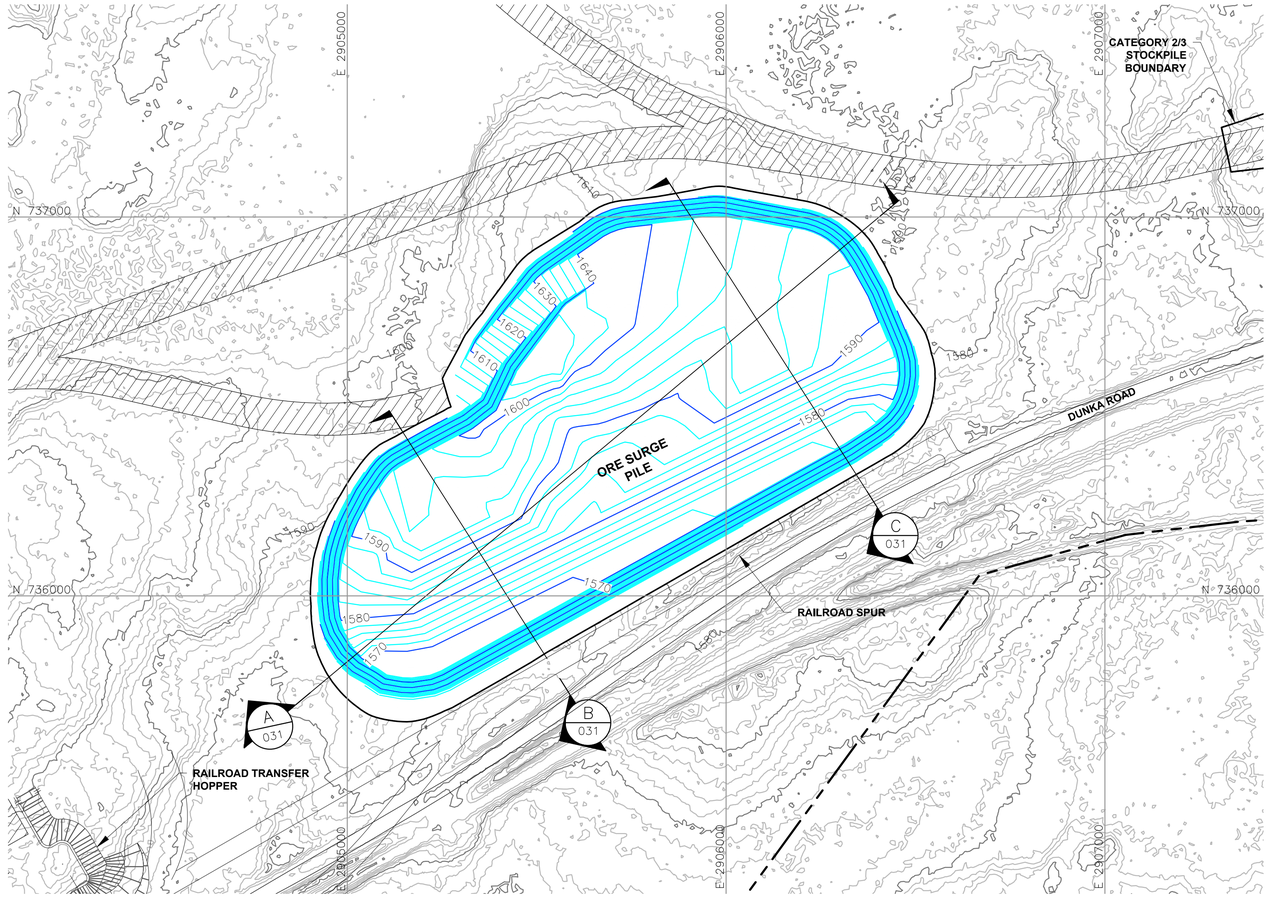
ORE SURGE PILE
OVERLINER DRAINAGE PIPING PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980–0540
Fax: (303) 985–2080
www.golder.com

DWG. NO. SKP–029
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113–2209\13220910H020.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:19 PM



LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED STOCKPILE LAYOUTS
- HAUL ROADS
- MINE SITE BOUNDARY
- MINE YEAR 1 PIT BOUNDARY (SEE NOTE 1)
- MINE YEAR 1 ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- MAXIMUM ORE, WASTE ROCK STOCKPILE OUTLINES (SEE NOTE 2)
- CROSS SECTION IDENTIFIER (A / 031)
- SHEET WHERE SECTION IS LOCATED

NOTES

1. OPEN PIT AND HAUL ROAD LAYOUTS PROVIDED BY BARR ENGINEERING IN OCTOBER 2011.
2. STOCKPILE LAYOUTS PROVIDED BY BARR ENGINEERING IN APRIL 2011 AND MODIFIED BY GOLDER.
3. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY PROVIDED BY BARR ENGINEERING, AUGUST 2011.
2. COORDINATE SYSTEM REFERENCE IS NAD83 MINNESOTA STATE PLANE NORTH.
3. VERTICAL DATUM REFERENCE IS FEET ABOVE MEAN SEA LEVEL (AMSL).

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUE STATUS	VERSION	DATE
FOR PERMITTING	F	5-22-15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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SIGNATURE
PRINTED NAME BRENT R. BRONSON
DATE 5/22/15 LICENSE # 46492

DRAWN: MTM
CHECKED:
GOLDER PROJECT NO.: 113-2209
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

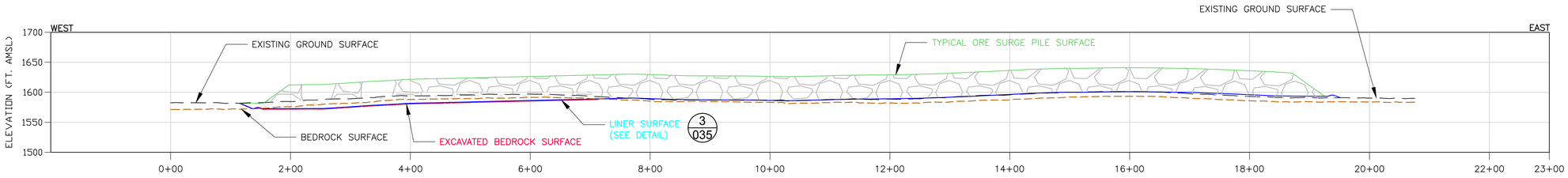
ORE SURGE PILE
TYPICAL CONFIGURATION

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-030
REV

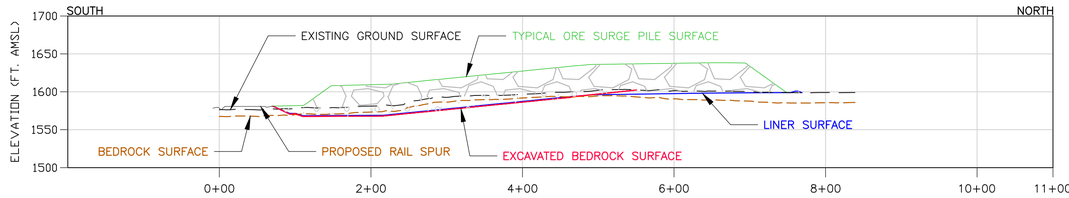
CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\132209k007.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:20 PM



A 031 SECTION

0 100 200

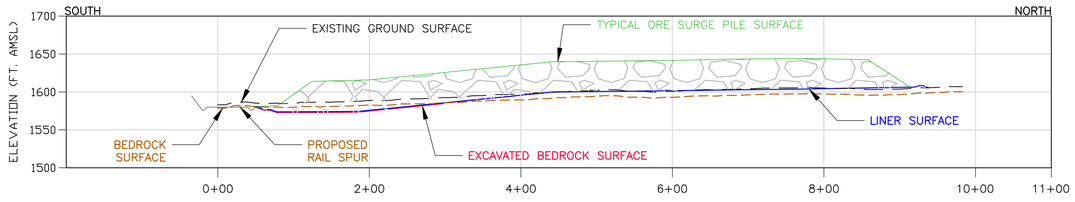
HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



B 031 SECTION

0 100 200

HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION



C 031 SECTION

0 100 200

HORIZONTAL SCALE IN FEET
2X VERTICAL EXAGGERATION

LEGEND

- ORE LIMITS AT TYPICAL CAPACITY
- LINER SURFACE
- EXISTING GROUND SURFACE
- OVERBURDEN SOIL AND BEDROCK EXCAVATION SURFACE
- BEDROCK SURFACE

NOTES

1. STOCKPILE SIDE SLOPES AT ANGLE OF REPOSE.
2. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
3. SEE CROSS SECTION LOCATIONS ON DRAWINGS 3, 4, 5, 26, AND 27

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F	5/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

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GOLDER PROJECT NO.: 113-2209

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

ORE SURGE PILE DESIGN SECTIONS

POLYMET MINING

POLY MET MINING, INC.
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Golder Associates

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
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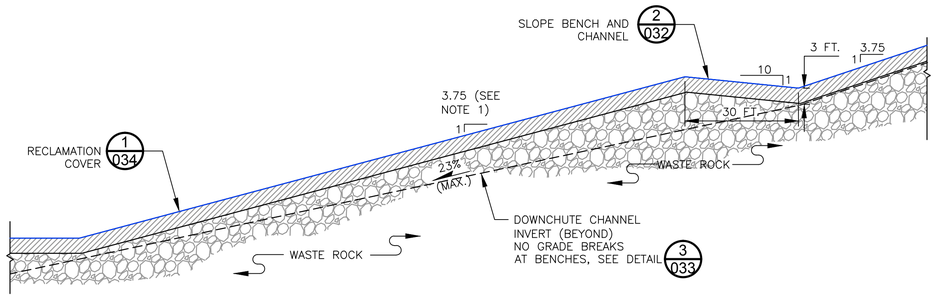
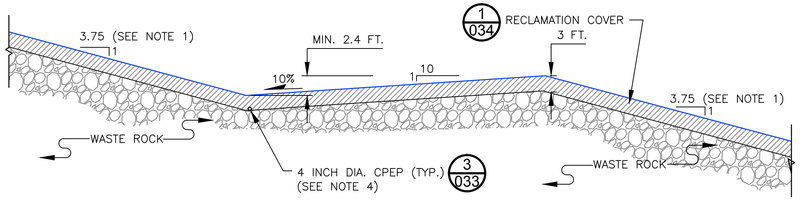
INCHES 1 2



1/032 TYPICAL SLOPE AND DOWNCHUTE GRADING DETAIL

N.T.S.



2/032 TYPICAL SLOPE BENCH AND CHANNEL RECLAMATION DETAIL

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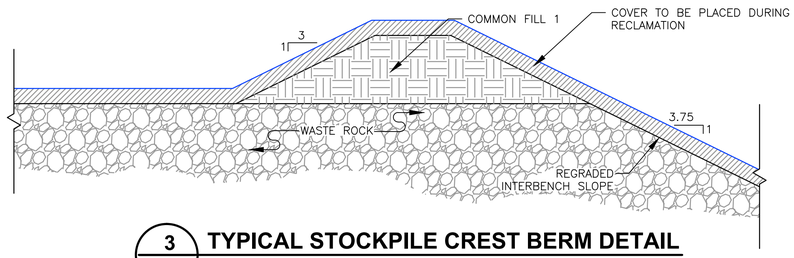
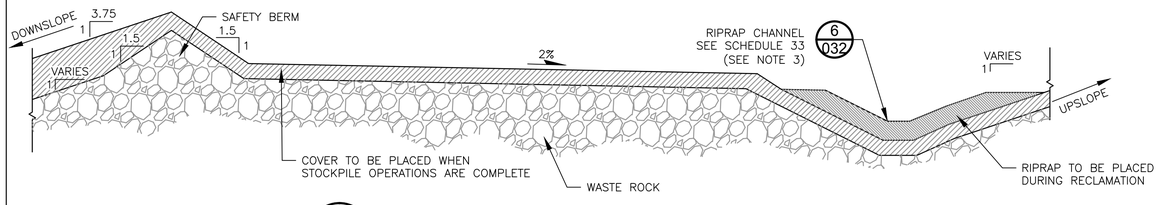


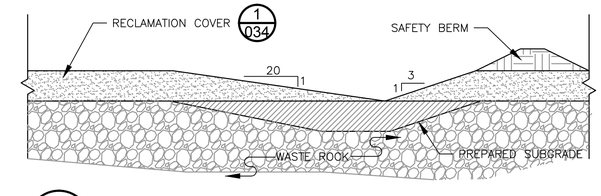
3/032 TYPICAL STOCKPILE CREST BERM DETAIL

N.T.S.



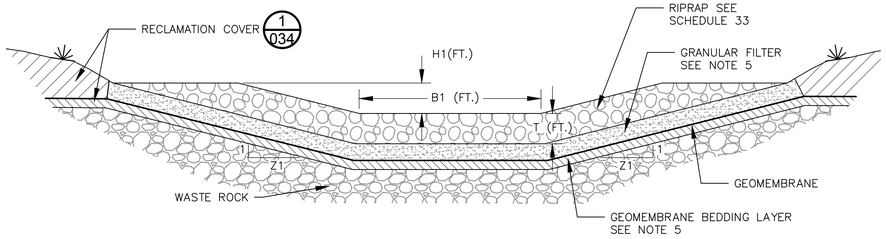
4/032 STOCKPILE RAMP TYPICAL DETAIL

N.T.S.



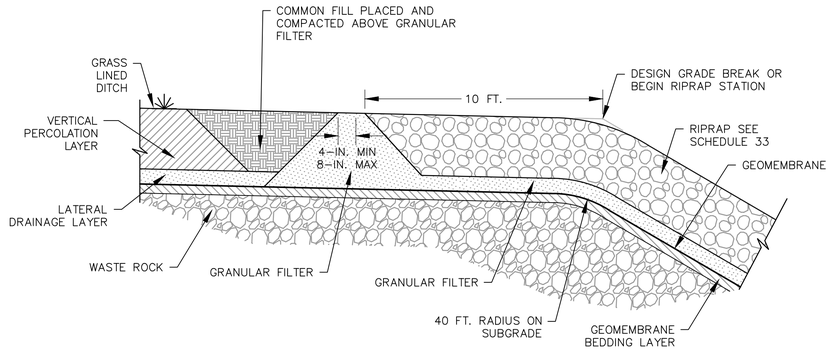
5/032 TYPICAL TOP SURFACE CHANNEL SECTION

N.T.S.



6/032 TYPICAL RIPRAP-LINED CHANNEL AND DOWNCHUTE

N.T.S. (SEE SCHEDULE 33 FOR DIMENSIONS - SKP-033)



7/032 UPSTREAM END OF RIPRAP CHANNEL

N.T.S.

NOTES

1. THE MAXIMUM SLOPE GRADES ARE 3.75H:1V FOR RECLAIMED STOCKPILE AREAS.
2. ASSUME 1.4H:1V INTERBENCH SLOPES FOR ACTIVE AREAS (EQUAL TO NOMINAL ANGLE OF REPOSE FOR WASTE ROCK MATERIAL). REGRADE PRIOR TO PLACEMENT OF RECLAMATION COVER.
3. SEE SCHEDULE 33 ON DRAWING SKP-033.
4. AT BASE OF COVER SYSTEM GRANULAR DRAINAGE LAYER PLACE DRAIN PIPE AT SLOPE-BENCH INTERSECTION. PIPE TO BE CONTINUOUS ALONG BENCHES BETWEEN DOWNCHUTE CHANNELS.
5. RIPRAP-LINED CHANNEL AND DOWNCHUTE DETAILS REPRESENT PRELIMINARY DESIGNS. DETAILED DIMENSIONS AND TECHNICAL SPECIFICATIONS TO BE PROVIDED PRIOR TO CONSTRUCTION, I.E. AS A PART OF FINAL DESIGN.
6. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

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CATEGORY 1 STOCKPILE RECLAMATION AND OPERATIONS SURFACE WATER MANAGEMENT DETAILS – SHEET 1 OF 2

POLYMET MINING

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NORTHMET PROJECT
HOYT LAKES, MINNESOTA

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LAKEWOOD, CO USA 80233
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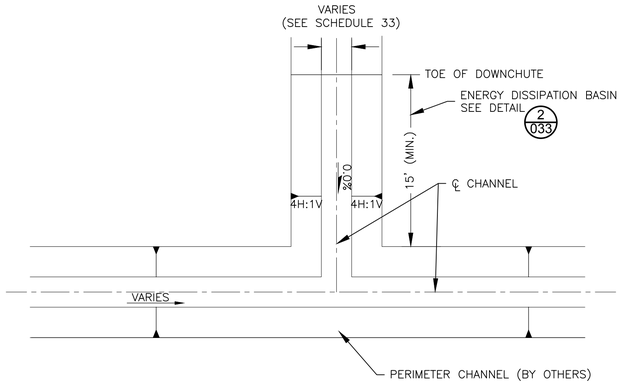
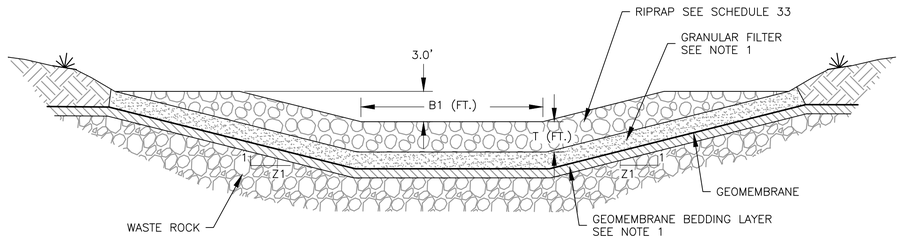
DWG. NO. SKP-032

REV

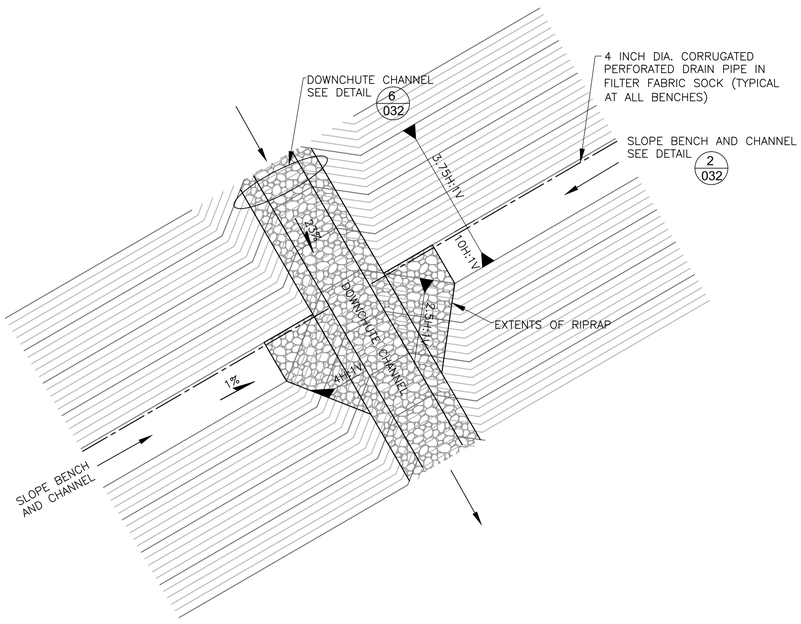
CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220904030.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:21 PM
INCHES 1 2



1/033 DOWNCHUTE CHANNEL CONFLUENCE DETAIL
N.T.S.



2/033 TYPICAL ENERGY DISSIPATION BASIN (SEE SCHEDULE 33 FOR DIMENSIONS)
N.T.S.



3/033 SLOPE BENCH AND CHANNEL TO DOWNCHUTE TRANSITION
N.T.S.

SCHEDULE 33: RIPRAP-LINED CHANNEL DIMENSIONS

CHANNEL ID	BOTTOM WIDTH, B1 (FT)	SIDE SLOPE, Z1 (H:1V)	MIN. DEPTH, H1 (FT)	RIPRAP SIZE, D_{50} (IN)	RIPRAP LAYER THICKNESS, T (FT)	MAX SLOPE, (FT/FT)
DC1-A	20	4	3	12	2	0.23
DC1-B	20	4	3	12	2	0.23
DC1-C	25	4	3	12	2	0.23
DC1-D	20	4	3	12	2	0.23
DC1-E	25	4	3	12	2	0.23
DC1-F	20	4	3	9	1.5	0.23
DC1-G	20	4	3	12	2	0.23
DC1-HRE	8	4	3	9	1.5	0.06
DC1-H	20	4	3	9	1.5	0.23
DC1-HRS	8	4	3	9	1.5	0.06
DC1-HRU	8	4	3	9	1.5	0.07
DC1-I	20	4	3	12	2	0.23
DC1-J	20	4	3	18	3	0.23
DC1-K	25	4	3	12	2	0.23
DC1-L	25	4	3	12	2	0.23

NOTES

1. ENERGY DISSIPATION BASIN DETAIL REPRESENTS PRELIMINARY DESIGN. DETAILED DIMENSIONS AND TECHNICAL SPECIFICATIONS TO BE PROVIDED PRIOR TO CONSTRUCTION, I.E. AS A PART OF FINAL DESIGN.
2. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.

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SCALE: AS SHOWN

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CATEGORY 1 STOCKPILE RECLAMATION AND OPERATIONS SURFACE WATER MANAGEMENT DETAILS – SHEET 2 OF 2

POLYMET MINING

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NORTHMET PROJECT
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Golder Associates
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LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
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DWG. NO. SKP-033
REV

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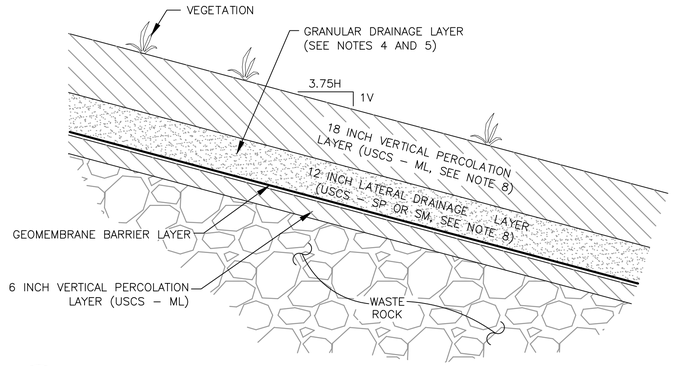
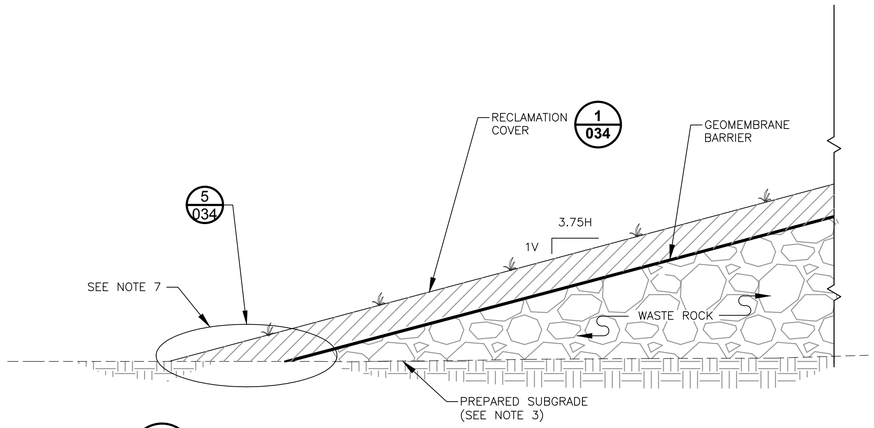


1/034 TYPICAL CATEGORY 1 RECLAMATION COVER DETAIL
N.T.S.



2/034 CATEGORY 1 RECLAMATION COVER DESIGN SECTION
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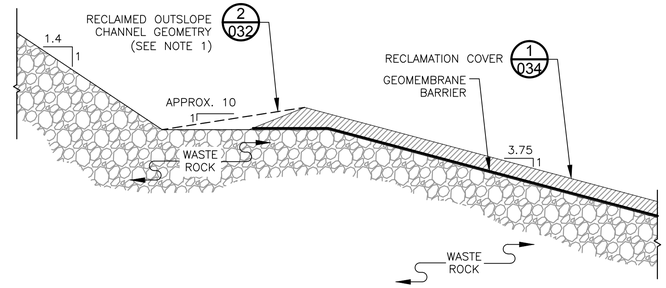
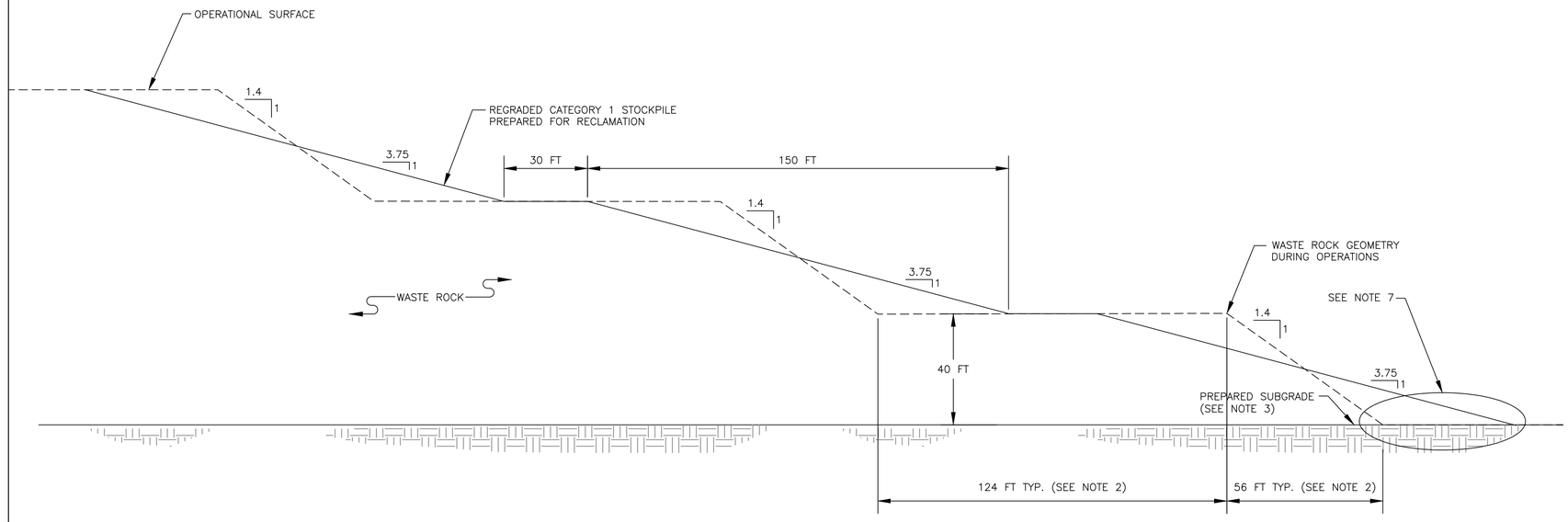
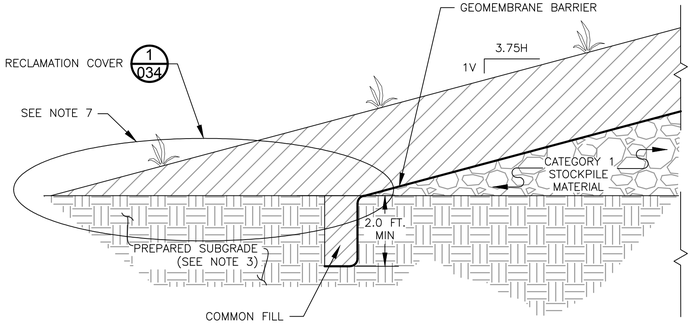


3/034 RECLAMATION TO OPERATIONAL AREA TIE IN DETAIL
N.T.S.



4/034 CATEGORY 1 STOCKPILE TYPICAL GEOMETRY DURING OPERATIONS AND REGRADED FOR RECLAMATION
N.T.S.



5/034 GEOMEMBRANE COVER ANCHOR TRENCH DETAIL
N.T.S.

NOTES

1. TEMPORARY SLOPE BENCH CHANNEL SHOULD BE CONSTRUCTED WITH MINIMUM DEPTH OF 2.4 FT. ON THE BENCHES BY GRADING CHANNEL SIDE SLOPES TO 10H:1V ON 30 FT. WIDE BENCHES.
2. STOCKPILE GEOMETRY DURING OPERATIONS BASED ON ASSUMED WASTE ROCK ANGLE OF REPOSE OF 35.5 DEGREES (1.4H:1V).
3. GEOTECHNICALLY UNSUITABLE SOILS TO BE REMOVED AND REPLACED WITH COMPACTED STRUCTURAL FILL WITHIN 100 FT. OF CATEGORY 1 STOCKPILE PERIMETER LIMITS.
4. ON TOP OF STOCKPILE ON 1% SLOPE AREAS, PLACE 4 INCH DIAMETER PERFORATED CORRUGATED POLYETHYLENE PIPE (CPEP) WITH FILTER FABRIC SOCK AT 75 FOOT SPACING TO FACILITATE DRAINAGE OF GRANULAR DRAINAGE LAYER TO TOP SURFACE CHANNEL. PIPE LOCATION TO BE FIELD FIT.
5. AT STOCKPILE BENCHES, PLACE 4 INCH PERFORATED CPEP DRAIN PIPE WITH FILTER FABRIC SOCK AT BASE OF COVER SYSTEM GRANULAR DRAINAGE LAYER AT SLOPE–BENCH INTERSECTION WITH OUTFLOW DIRECTED TO DOWNCHUTE CHANNELS.
6. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
7. 7EDGE OF LINER TO TIE IN TO CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM.
8. REFER TO UNIFIED SOIL CLASSIFICATION SYSTEM FOR COVER SOIL DESCRIPTION.

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CATEGORY 1 STOCKPILE
PHASED COVER DESIGN

POLYMET MINING

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NORTHMET PROJECT
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Golder Associates
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LAKEWOOD, CO USA 80233
Ph: (303) 980–0540
Fax: (303) 985–2080
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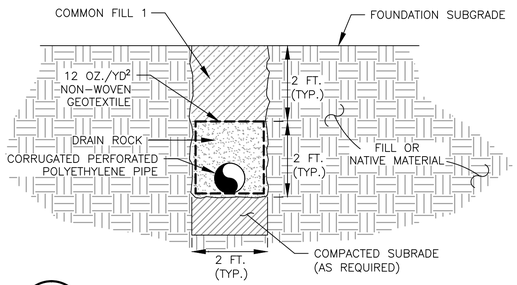
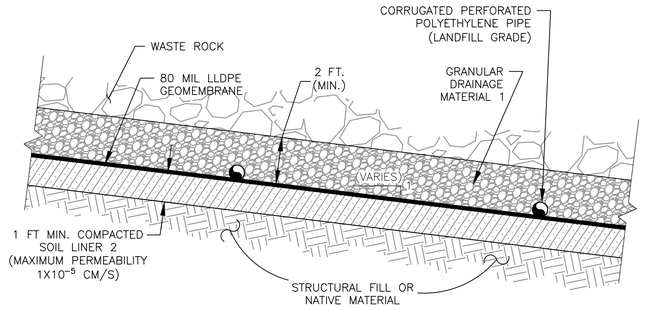


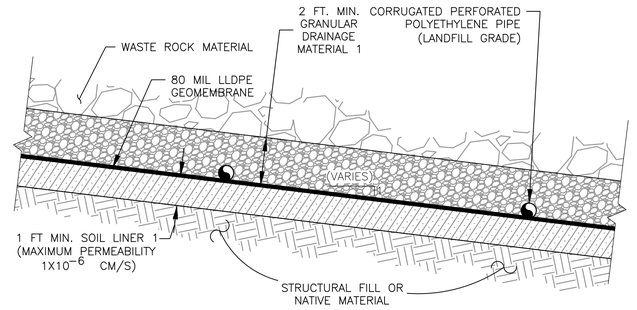
1/035 TYPICAL FOUNDATION UNDERDRAIN

N.T.S.



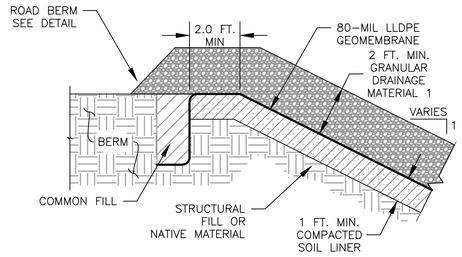
2/035 CATEGORY 2/3 STOCKPILE LINER

N.T.S.



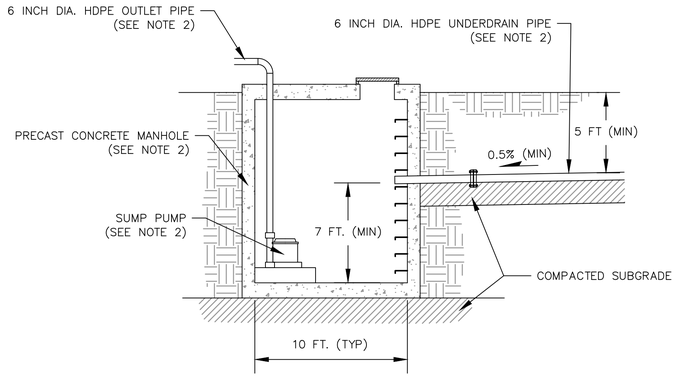
3/035 CATEGORY 4 STOCKPILE AND ORE SURGE PILE LINER

N.T.S.



4/035 GEOMEMBRANE LINER ANCHOR TRENCH DETAIL

N.T.S.



5/035 UNDERDRAIN SUMP MANHOLE

N.T.S.

NOTES

1. SEE GENERAL NOTES AND LEGEND ON DRAWING 002.
2. UNDERDRAIN SUMP MANHOLE DIMENSIONS, SUMP PUMP CAPACITY AND PIPE DIMENSIONS ARE PRELIMINARY AND WILL BE SIZED BASED ON ENCOUNTERED FIELD CONDITIONS.

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HOYT LAKES, MINNESOTA

GOLDER ASSOCIATES INC.
44 UNION BOULEVARD, SUITE 300
LAKEWOOD, CO USA 80233
Ph: (303) 980-0540
Fax: (303) 985-2080
www.golder.com

DWG. NO. SKP-035

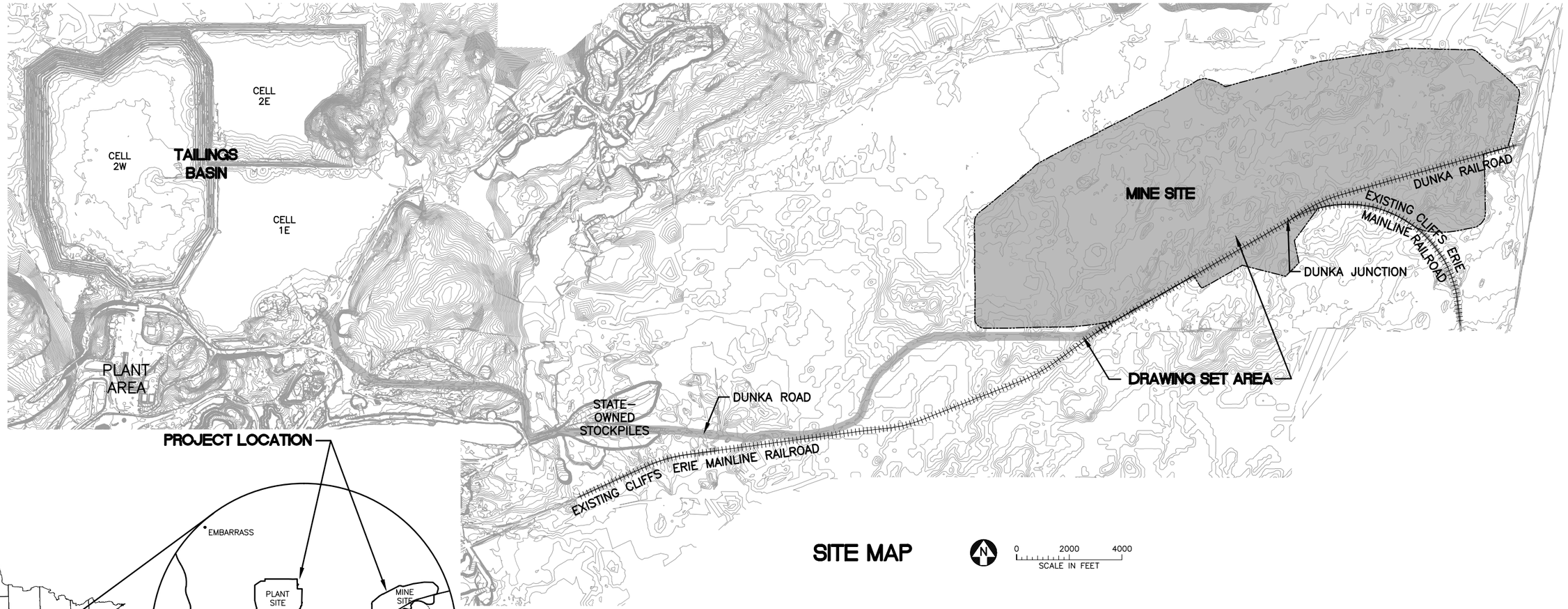
REV

CADD USER: Brewer, Keith FILE: X:_DENVER\113-2209\113220904033.DWG PLOT SCALE: 1:1 PLOT DATE: 5/27/2015 12:21 PM

INCHES 1 2

Mine Site Mechanical Infrastructure

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
MECHANICAL INFRASTRUCTURE
HOYT LAKES, MINNESOTA



SITE MAP

0 2000 4000
SCALE IN FEET

LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO	DATE	DESCRIPTION
1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/18/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MECHANICAL INFRASTRUCTURE GENERAL DWGS
LOCATION MAP AND SITE MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. ME-001
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-50-TS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 12:04 PM

INCHES 1 2

MECHANICAL INFRASTRUCTURE LEGEND

GENERAL

- EXISTING CONTOUR – MAJOR (1000)
- EXISTING CONTOUR – MINOR
- PROPOSED CONTOUR – MAJOR (1000)
- PROPOSED CONTOUR – MINOR
- OTHER FACILITY PROPOSED CONTOUR – MAJOR (1000)
- OTHER FACILITY PROPOSED CONTOUR – MINOR
- PROPOSED RAILROAD
- EXISTING RAILROAD
- PROPOSED ACCESS ROADS
- EXISTING ROAD
- MINE SITE BOUNDARY
- WETLAND BOUNDARY
- HAUL ROAD

TREATED WATER PIPELINE

- EXISTING POWER POLE
- EXISTING TRAIL
- EXISTING UNIMPROVED TRAIL
- R/W — RIGHT OF WAY
- EXISTING STRUCTURES
- TREE LINE
- OE — OE — EXISTING OVERHEAD ELECTRIC
- UE — UE — EXISTING UNDERGROUND ELECTRIC
- TWP — TWP — PROPOSED TREATED WATER PIPELINE
- PROPOSED CULVERT (NON–MINE DRAINAGE)
- PROPOSED MINE DRAINAGE PIPE

CENTRAL PUMPING STATION

- TWP — TWP — PROPOSED TREATED WATER PIPELINE
- PROPOSED CULVERT (NON–MINE DRAINAGE)
- PROPOSED MINE DRAINAGE PIPE

MINE DRAINAGE

- PROPOSED MINE DRAINAGE PIPE
- TOP OF DIKE BENCH
- PROPOSED MINE DRAINAGE CULVERT
- PROPOSED SUMP MANHOLE
- TWP — TWP — PROPOSED TREATED WATER PIPELINE
- PROPOSED HAUL ROAD MINE DRAINAGE DITCH
- PROPOSED STOCKPILE LINER OUTLET PIPE
- PROPOSED MINE DRAINAGE WATERSHED

NOTES

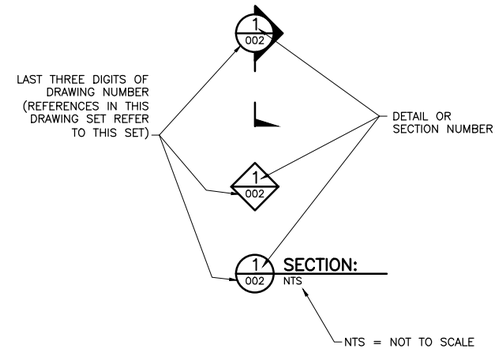
1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.

SHEET INDEX

SHEET NO.	TITLE
MECHANICAL INFRASTRUCTURE GENERAL DRAWINGS	
ME–001	LOCATION MAP AND SITE MAP
ME–002	LEGEND & SHEET INDEX
ME–003	MINE SITE – MINE DRAINAGE FLOW DIAGRAM
ME–004	MINE SITE – SUMP, POND AND PIPE DETAIL TABLES
TREATED WATER PIPELINE DRAWINGS	
TWP–001	GENERAL LAYOUT AND SHEET INDEX
TWP–002	PLAN & PROFILE STATION 113+70 TO 130+00
TWP–003	PLAN & PROFILE STATION 130+00 TO 190+00
TWP–004	PLAN & PROFILE STATION 190+00 TO 250+00
TWP–005	PLAN & PROFILE STATION 250+00 TO 310+00
TWP–006	PLAN & PROFILE STATION 310+00 TO 370+00
TWP–007	PLAN & PROFILE STATION 370+00 TO 430+00
TWP–008	PLAN & PROFILE STATION 430+00 TO 490+00
TWP–009	PLAN & PROFILE STATION 490+00 TO 512+50
TWP–010	PIPELINE INSTALLATION TYPICAL SECTIONS
TWP–011	DETAILS
TWP–012	DETAILS IN CLOSURE
CENTRAL PUMPING STATION (CPS) DRAWINGS	
CPS–001	SITE PLAN
CPS–002	PUMP STATION PLAN
CPS–003	PROCESS FLOW DIAGRAM

SHEET NO.	TITLE
MINE DRAINAGE DRAWINGS	
MD–001	YEAR 1 GENERAL LAYOUT
MD–002	YEAR 11 GENERAL LAYOUT
MD–003	SUMP SOSP & MD–SOSP GRADING PLAN
MD–004	SUMP S4 & MD–S4 GRADING PLAN
MD–005	SUMP S23–1 & MD–S23–1 GRADING PLAN
MD–006	SUMP S23–2 GRADING PLAN
MD–007	SUMP S23–3 & MD–S23–3 GRADING PLAN
MD–008	POND MD–OSLA GRADING PLAN
MD–009	POND MD–RTH GRADING PLAN
MD–010	POND MD–HRE GRADING PLAN
MD–011	POND MD–HRC GRADING PLAN
MD–012	POND MD–HRW GRADING PLAN
MD–013	POND MD–HRN GRADING PLAN
MD–014	SUMP/POND TYPICAL DETAILS
MD–015	PIPE TYPICAL DETAILS
MD–016	CLOSURE PLAN

DRAWING NUMBERING



ABBREVIATIONS

AC–FT	–	ACRE–FEET
AVE	–	AVERAGE
CAT	–	CATEGORY
℄	–	CENTERLINE
CMP	–	CORRUGATED METAL PIPE
CPS	–	CENTRAL PUMPING STATION
DIP	–	DUCTILE IRON PIPE
DV	–	DRAIN VALVE
DWG	–	DRAWING
EL.	–	ELEVATION
GAL	–	GALLONS
GCL	–	GEOSYNTHETIC CLAY LINER
GPM	–	GALLONS PER MINUTE
HDPE	–	HIGH–DENSITY POLYETHYLENE
HRC	–	HAUL ROAD CENTRAL
HRE	–	HAUL ROAD EAST
HRN	–	HAUL ROAD NORTH
HRW	–	HAUL ROAD WEST
INV	–	INVERT
LF	–	LINEAR FEET
MD	–	MINE DRAINAGE
MG	–	MILLION GALLONS
MH	–	MANHOLE
MIL	–	MEASUREMENT OF LINER THICKNESS; A MIL IS A THOUSANDTH OF AN INCH
MIN	–	MINIMUM
MnDOT	–	MINNESOTA DEPARTMENT OF TRANSPORTATION
OSLA	–	OVERBURDEN STORAGE AND LAYDOWN AREA
OSP	–	ORE SURGE PILE
PL	–	PIPELINE
PSI	–	POUNDS PER SQUARE INCH
RTH	–	RAIL TRANSFER HOPPER
SDR	–	STANDARD DIMENSION RATIO
STA	–	STATION
STOCKPILE	–	WASTE ROCK STOCKPILE
TDH	–	TOTAL DESIGN HEAD
TWP	–	TREATED WATER PIPELINE
TYP	–	TYPICAL
V/A	–	VACUUM/AIR RELIEF
WWTF	–	WASTE WATER TREATMENT FACILITY

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SIGNATURE Christie Kearney
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MECHANICAL INFRASTRUCTURE GENERAL DWGS
LEGEND AND SHEET INDEX

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

DWG. NO. ME–002
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-50-TS-002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 12:49 PM

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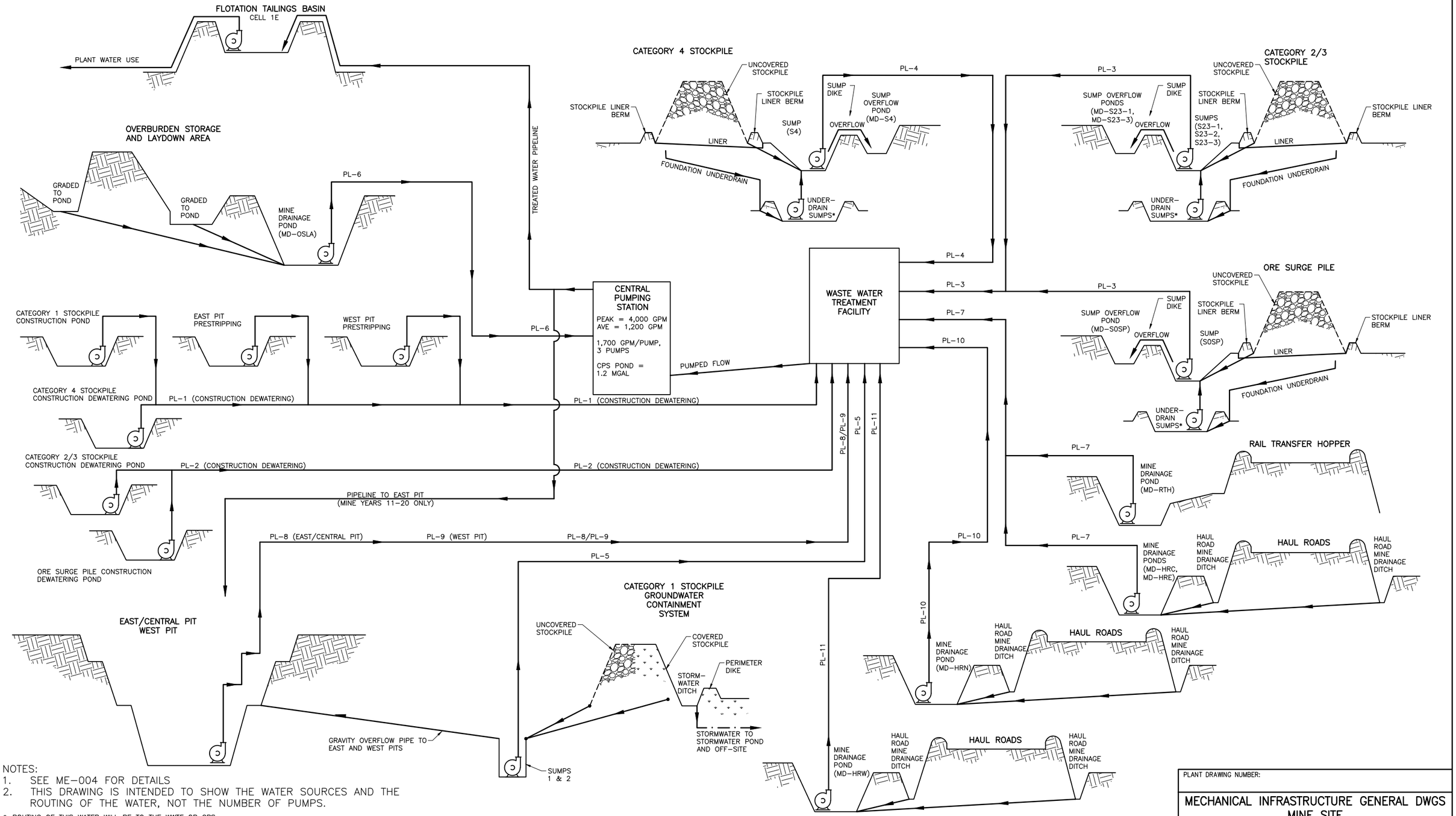

NOTES:
1. SEE ME-004 FOR DETAILS
2. THIS DRAWING IS INTENDED TO SHOW THE WATER SOURCES AND THE ROUTING OF THE WATER, NOT THE NUMBER OF PUMPS.

* ROUTING OF THIS WATER WILL BE TO THE WWTF OR CPS DEPENDING ON WATER QUALITY TESTING RESULTS.

LEGEND

- STORMWATER FLOW
- SITE MINE DRAINAGE FLOW
- COVERED STOCKPILE/GRASS
- UNCOVERED STOCKPILE
- UNCOVERED EARTHWORK
- PUMP

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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MECHANICAL INFRASTRUCTURE GENERAL DWGS
MINE SITE
MINE DRAINAGE FLOW DIAGRAM

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. ME-003 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-50-MF-500.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 12:51 PM
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SUMPS – TEMPORARY

ID	DESCRIPTION	OBJECTIVES	MINE YEARS	DESIGN VOLUME* (GAL)	APPROXIMATE PUMP CAPACITY		LINER TYPE	ACTUAL VOLUME* (GAL)	OVERFLOWS TO	SHOWN ON SHEET #
					GPM	TDH (FT)				
S23–1	CATEGORY 2/3 STOCKPILE SUMP	PROVIDE RUNOFF STORAGE FOR THE 10 YEAR 24 HOUR EVENT	1–19	4,855,000	190	210	MINE DRAINAGE SUMP LINER	4,855,000	MD–S23–1	MD–005
S23–2	CATEGORY 2/3 STOCKPILE SUMP	PROVIDE RUNOFF STORAGE FOR THE 10 YEAR 24 HOUR EVENT	3–17	3,878,000	150	230	MINE DRAINAGE SUMP LINER	3,910,000	MD–S23–1	MD–006
S23–3	CATEGORY 2/3 STOCKPILE SUMP	PROVIDE RUNOFF STORAGE FOR THE 10 YEAR 24 HOUR EVENT	6–16	2,151,000	90	270	MINE DRAINAGE SUMP LINER	2,151,000	MD–S23–3	MD–007
S4	CATEGORY 4 STOCKPILE SUMP	PROVIDE RUNOFF STORAGE FOR THE 10 YEAR 24 HOUR EVENT	1–11	3,291,000	130	50	MINE DRAINAGE SUMP LINER	4,073,000	MD–S4	MD–004
SOSP	ORE SURGE PILE SUMP	PROVIDE RUNOFF STORAGE FOR THE 10 YEAR 24 HOUR EVENT	1–20	2,770,000	80	90	MINE DRAINAGE SUMP LINER	2,835,000	MD–SOSP	MD–003

* DESIGN VOLUME REFLECTS THE VOLUME REQUIRED BASED ON THE DESIGN NEEDS; WHEREAS ACTUAL VOLUME REFLECTS THE VOLUME SHOWN IN THE ATTACHED DRAWING SET. ACTUAL VOLUME DOES NOT INCLUDE ADDITIONAL VOLUME FROM 3 FEET OF FREEBOARD

MINE PIT SUMPS

ID	DESCRIPTION	OBJECTIVES	MINE YEARS	INITIAL SUMP CAPACITY (AC–FT)	MAXIMUM SUMP CAPACITY (AC–FT)	APPROXIMATE PUMP CAPACITY – INITIAL YEAR AND MAXIMUM YEAR		OVERFLOWS TO
						GPM	TDH (FT)	
WP–W	WEST PIT – WEST SUMP	*COLLECTION IN PIT	2–20	6.6	14.0	YEAR 2: 820 YEAR 20: 1,590	YEAR 2: 120 YEAR 20: 740	NONE
WP–E	WEST PIT – EAST SUMP	*COLLECTION IN PIT	10–20	4.7	9.4	YEAR 10: 530 YEAR 20: 1,050	YEAR 10: 110 YEAR 20: 350	NONE
EP	EAST PIT	*COLLECTION IN PIT	1–20	11.6	19.5	YEAR 1: 1,520 YEAR 11: 2,340	YEAR 1: 120 YEAR 11: 750	NONE
CP	CENTRAL PIT	*COLLECTION IN PIT	11–20	3.8	3.8	YEAR 11: 440 YEAR 16: 440	YEAR 1: 60 YEAR 16: 390	NONE

* PIT COLLECTION IS BASED ON 40% OF THE AVERAGE ANNUAL SNOW MELT OCCURRING WITHIN ONE DAY AND THE PUMP CAPACITY DESIGNED TO REMOVE THAT SNOW MELT EVENT WITHIN 3 DAYS

SUMPS – PERMANENT

ID	DESCRIPTION	OBJECTIVES	MINE YEARS	MINIMUM CAPACITY (GAL)	APPROXIMATE PUMP CAPACITY		LINER TYPE	OVERFLOWS TO	SHOWN ON SHEET #
					GPM	TDH (FTI)			
SUMP 1	CATEGORY 1 STOCKPILE SUMP – EAST	COLLECTION FOR GROUNDWATER CONTAINMENT SYSTEM	1–20+	NA – MANHOLE	7,200	50	NA – MANHOLE	EAST PIT	SEE CATEGORY 1 STOCKPILE CONTAINMENT SYSTEM DRAWING SET
SUMP 2	CATEGORY 1 STOCKPILE SUMP – WEST	COLLECTION FOR GROUNDWATER CONTAINMENT SYSTEM	1–20+	NA – MANHOLE	7,200	50	NA – MANHOLE	WEST PIT	

NOTES:

1. ACTUAL PUMP, PIPE, AND POND SIZES WILL BE OPTIMIZED IN FINAL DESIGN
2. STANDARDIZED PUMP SIZE TO BE DETERMINED DURING FINAL DESIGN
3. SOIL LINER 2 IS SHOWN IN DETAIL 2 ON SHEET CPS–002
4. MINE DRAINAGE SUMP LINER IS SHOWN IN DETAIL 1 ON SHEET MD–014
5. MINE DRAINAGE POND LINER IS SHOWN IN DETAIL 2 ON SHEET MD–014
6. ALL PUMP CAPACITY FLOWS AND TDH VALUES HAVE BEEN ROUNDED

MINE DRAINAGE PONDS

ID	DESCRIPTION	OBJECTIVES	MINE YEARS	DESIGN VOLUME* (GAL)	APPROXIMATE PUMP CAPACITY		LINER TYPE	ACTUAL VOLUME* (GAL)	OVERFLOWS TO	SHOWN ON SHEET #
					GPM	TDH (FT)				
CPS	CENTRAL PUMPING STATION POND	STORE WATER FOR CPS CONVEYANCE	1–20+	1,200,000	4,000	450	SOIL LINER 2	1,200,000	NONE	CPS–001
MD–S23–1	CATEGORY 2/3 STOCKPILE SUMP OVERFLOW POND	PROVIDE SUMP OVERFLOW STORAGE UP TO THE 100 YEAR 24 HOUR EVENT	1–19	6,973,000	NA	NA	MINE DRAINAGE POND LINER	7,006,000	NONE	MD–005/ MD–006
MD–S23–3	CATEGORY 2/3 STOCKPILE SUMP OVERFLOW POND	PROVIDE SUMP OVERFLOW STORAGE UP TO THE 100 YEAR 24 HOUR EVENT	6–16	1,727,000	NA	NA	MINE DRAINAGE POND LINER	1,727,000	NONE	MD–007
MD–S4	CATEGORY 4 STOCKPILE SUMP OVERFLOW POND	PROVIDE SUMP OVERFLOW STORAGE UP TO THE 100 YEAR 24 HOUR EVENT	1–11	2,639,000	NA	NA	MINE DRAINAGE POND LINER	3,226,000	NONE	MD–004
MD–SOSP	ORE SURGE PILE SUMP OVERFLOW POND	PROVIDE SUMP OVERFLOW STORAGE UP TO THE 100 YEAR 24 HOUR EVENT	1–20	1,564,000	NA	NA	MINE DRAINAGE POND LINER	1,727,000	NONE	MD–003
MD–HRC	HAUL ROAD RUNOFF POND	PROVIDE FLOOD STORAGE UP TO THE 100 YEAR 24 HOUR EVENT AND REDUCE TSS	1–20	1,988,000	40	80	MINE DRAINAGE POND LINER	2,248,000	NONE	MD–011
MD–HRE	HAUL ROAD RUNOFF POND	PROVIDE FLOOD STORAGE UP TO THE 100 YEAR 24 HOUR EVENT AND REDUCE TSS	1–20	3,487,000	70	110	MINE DRAINAGE POND LINER	3,487,000	NONE	MD–010
MD–HRW	HAUL ROAD RUNOFF POND	PROVIDE FLOOD STORAGE UP TO THE 100 YEAR 24 HOUR EVENT AND REDUCE TSS	2–20	1,206,000	30	70	MINE DRAINAGE POND LINER	1,303,000	NONE	MD–012
MD–HRN	HAUL ROAD RUNOFF POND	PROVIDE FLOOD STORAGE UP TO THE 100 YEAR 24 HOUR EVENT AND REDUCE TSS	2–20	1,434,000	30	110	MINE DRAINAGE POND LINER	1,499,000	NONE	MD–013
MD–RTH	RAIL TRANSFER HOPPER RUNOFF POND	PROVIDE FLOOD STORAGE UP TO THE 100 YEAR 24 HOUR EVENT AND REDUCE TSS	1–20	228,000	200	60	MINE DRAINAGE SUMP LINER	228,000	NONE	MD–009
MD–OSLA	OVERBURDEN STORAGE & LAYDOWN AREA RUNOFF POND	PROVIDE FLOOD STORAGE UP TO THE 25 YEAR 24 HOUR EVENT AND REDUCE TSS	1–20	3,487,000	100	90	NONE	4,725,000	NONE	MD–008
TEMP (VARIOUS)	STOCKPILE CONSTRUCTION RUNOFF PONDS AND PIT STRIPPING	TEMPORARY POND TO COLLECT RUNOFF DURING CONSTRUCTION	VARIES	VARIES	VARIES	VARIES	NONE	VARIES	NONE	NONE

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PIPING

ID	DESCRIPTION	OBJECTIVES	WATER SOURCE	NOMINAL PIPE SIZES* (IN)
TWP	TREATED WATER PIPELINE	TRANSPORT WATER FROM THE CPS TO FLOTATION TAILINGS BASIN	CPS	20
PL–1	PIPELINE NUMBER 1	TRANSPORT CONSTRUCTION WATER TO THE WWTF	TEMP – CAT 1, CAT 4, EAST PIT & WEST PIT	2 TO 8
PL–2	PIPELINE NUMBER 2	TRANSPORT CONSTRUCTION WATER TO THE WWTF	TEMP – CAT 2/3 + OSP	2 TO 8
PL–3	PIPELINE NUMBER 3	TRANSPORT MINE DRAINAGE TO THE WWTF	CAT 2/3 & OSP	3 TO 8
PL–4	PIPELINE NUMBER 4	TRANSPORT MINE DRAINAGE TO THE WWTF	CAT 4	4
PL–5	PIPELINE NUMBER 5	TRANSPORT MINE DRAINAGE TO THE WWTF	CAT 1	28 TO 42
PL–6	PIPELINE NUMBER 6	TRANSPORT MINE DRAINAGE TO THE CPS	OSLA	3
PL–7	PIPELINE NUMBER 7	TRANSPORT MINE DRAINAGE TO THE WWTF	RTH, MD–HRE & MD–HRC	2 TO 6
PL–8	PIPELINE NUMBER 8	TRANSPORT MINE DRAINAGE TO THE WWTF	EAST PIT & CENTRAL PIT	12 TO 20
PL–9	PIPELINE NUMBER 9	TRANSPORT MINE DRAINAGE TO THE WWTF	WEST PIT	10 TO 22
PL–10	PIPELINE NUMBER 10	TRANSPORT MINE DRAINAGE TO THE WWTF	MD–HRN	2
PL–11	PIPELINE NUMBER 11	TRANSPORT MINE DRAINAGE TO THE WWTF	MD–HRW	2

*ALL PIPES ARE SIZED BASED ON THE USE OF HDPE SDR 11 PIPE

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SIGNATURE Christie Kearney
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MECHANICAL INFRASTRUCTURE GENERAL DWGS
MINE SITE
SUMP, POND AND PIPE DETAIL TABLES

POLYMET MINING

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DWG. NO. ME–004
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CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-50-MF-501.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 12:53 PM
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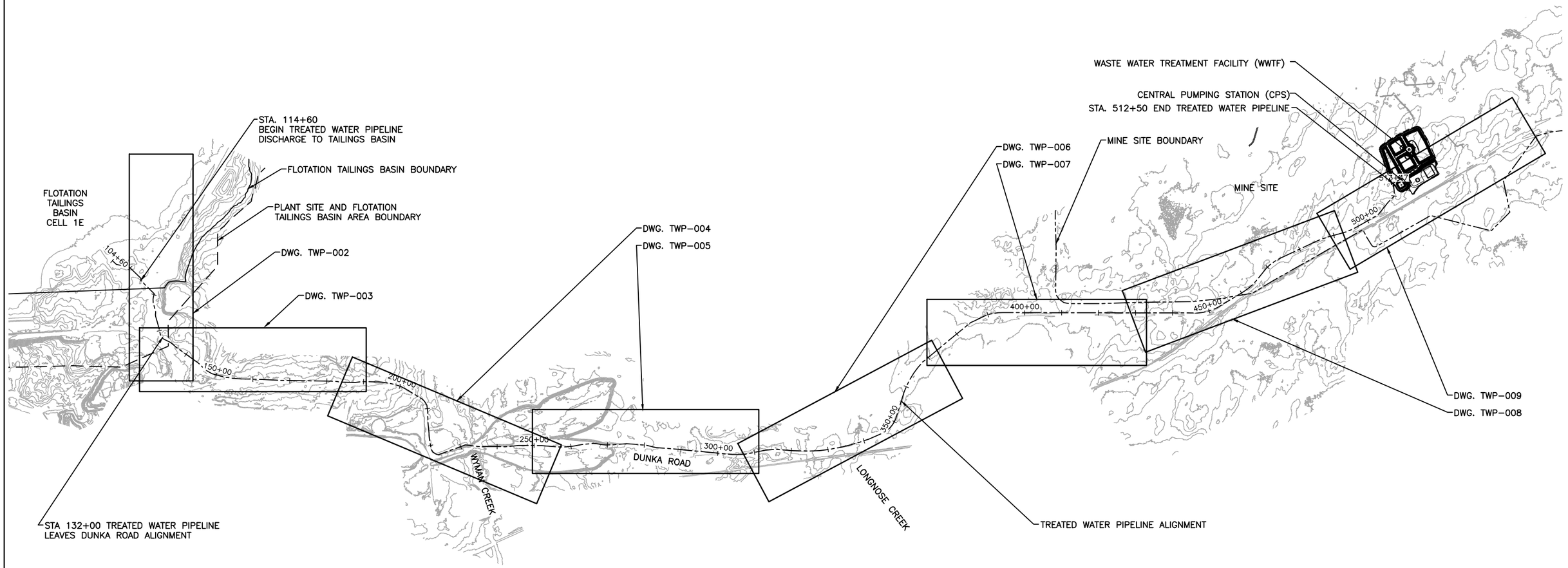

1 PLAN: SHEET INDEX

N

0 1/4 1/2
SCALE IN MILES

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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE
GENERAL LAYOUT AND SHEET INDEX

POLYMET MINING

POLY MET MINING, INC.
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HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-001
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-100.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:01 PM

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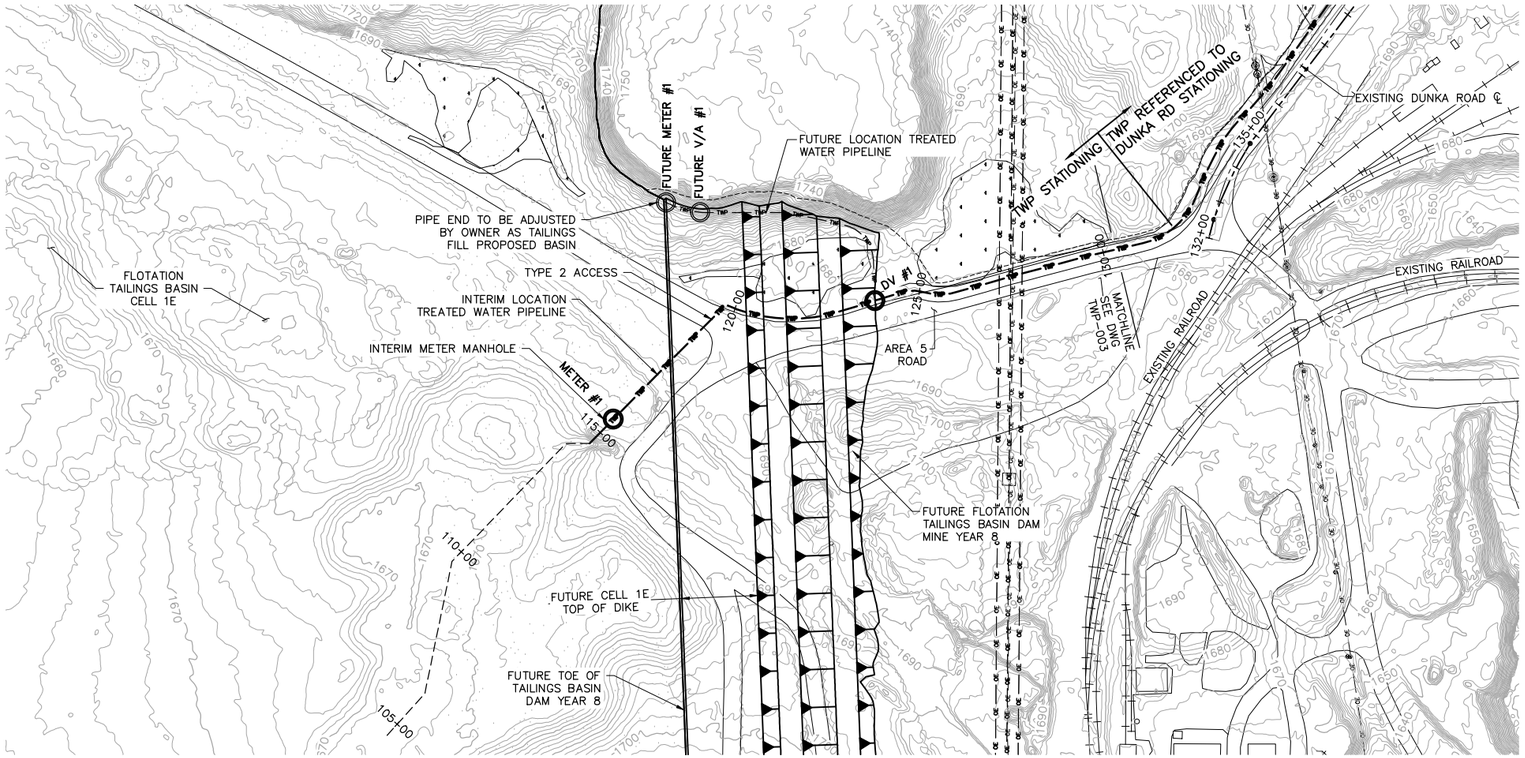

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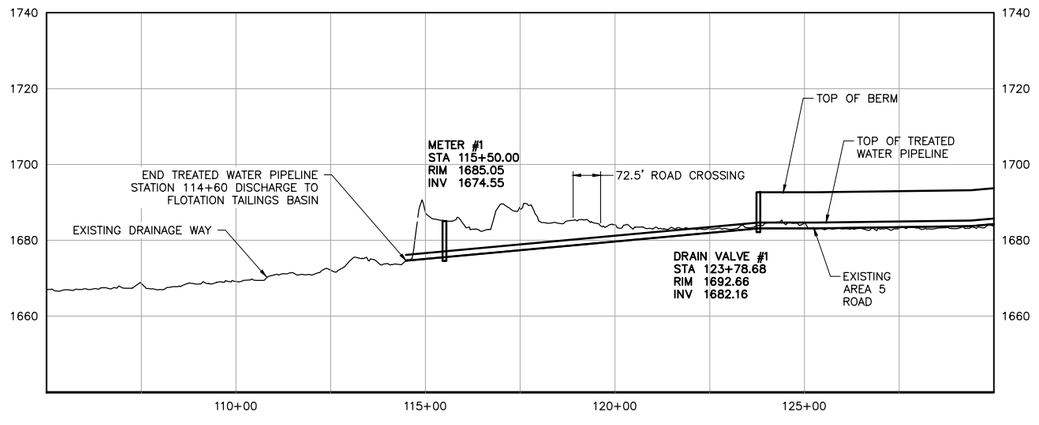
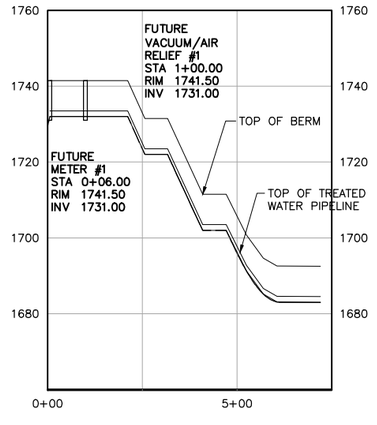


PROFILE: INTERIM

VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET



PROFILE: FUTURE

VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER (1 / TWP-010), NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

VER NO.	DATE	DESCRIPTION
1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/18/15
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 JON M. MINNE

SIGNATURE

DATE 5/18/15 LICENSE# 25080

DRAWN: VJS

CHECKED: JMM3

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE PLAN AND PROFILE STATION 113+70 TO 130+00

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-002 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-103.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:06 PM

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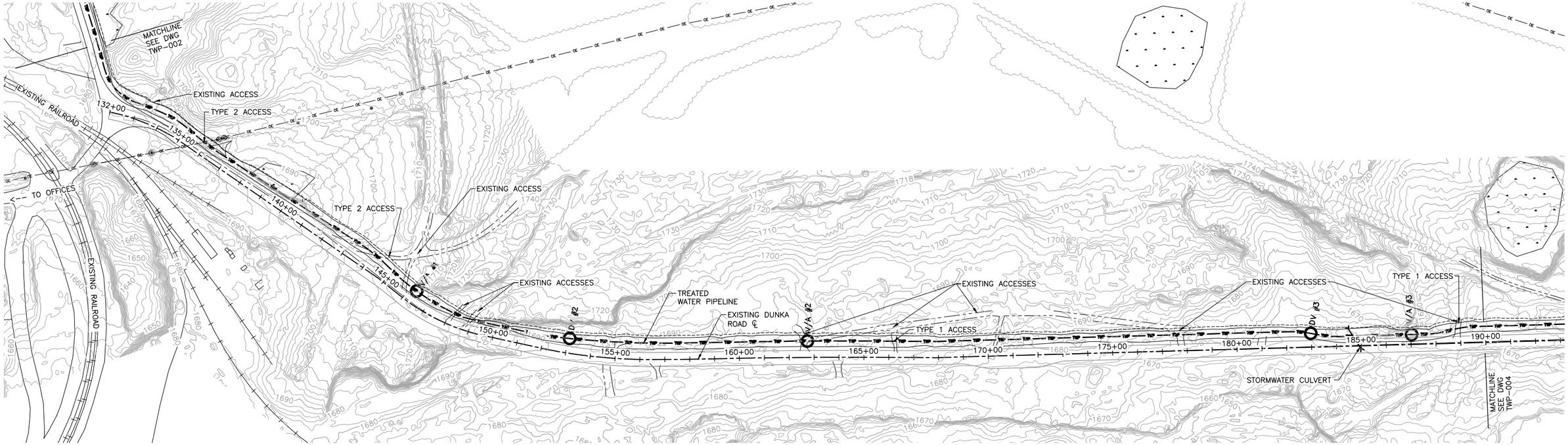
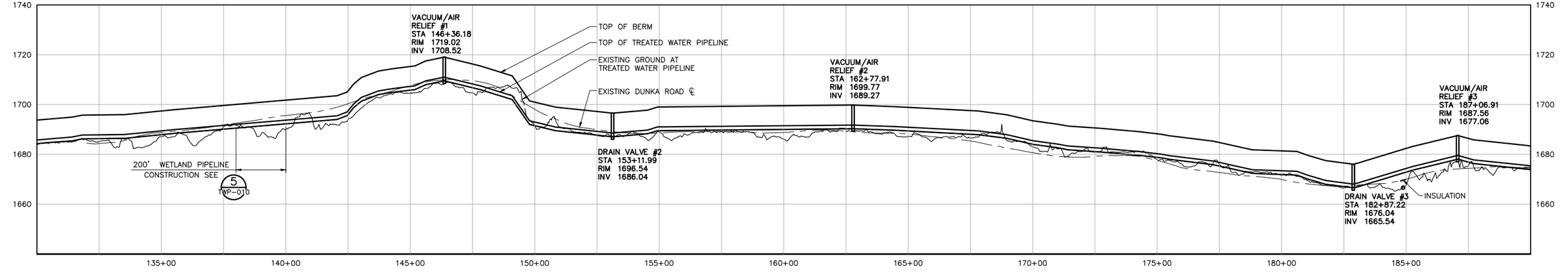


PLAN 0 200 400 SCALE IN FEET



PROFILE

VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER 1 TWP-010, NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE PLAN AND PROFILE STATION 130+00 TO 190+00

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-003 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-104.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:12 PM

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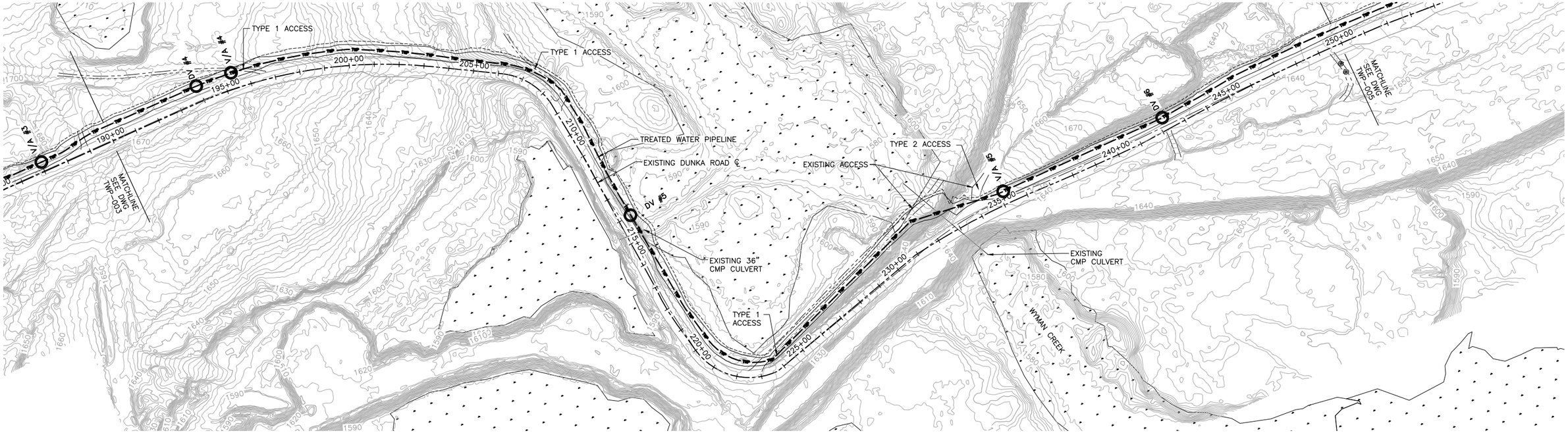
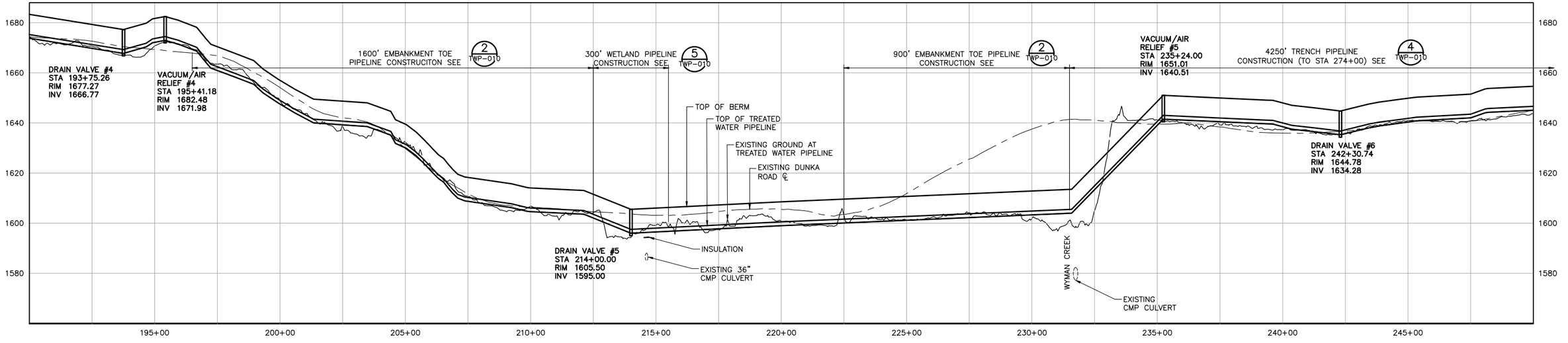


PLAN 0 200 400 SCALE IN FEET



VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET

PROFILE

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER 1 TWP-010 , NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

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FOR CONSTRUCTION		
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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE PLAN AND PROFILE STATION 190+00 TO 250+00

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-004 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-105.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:15 PM

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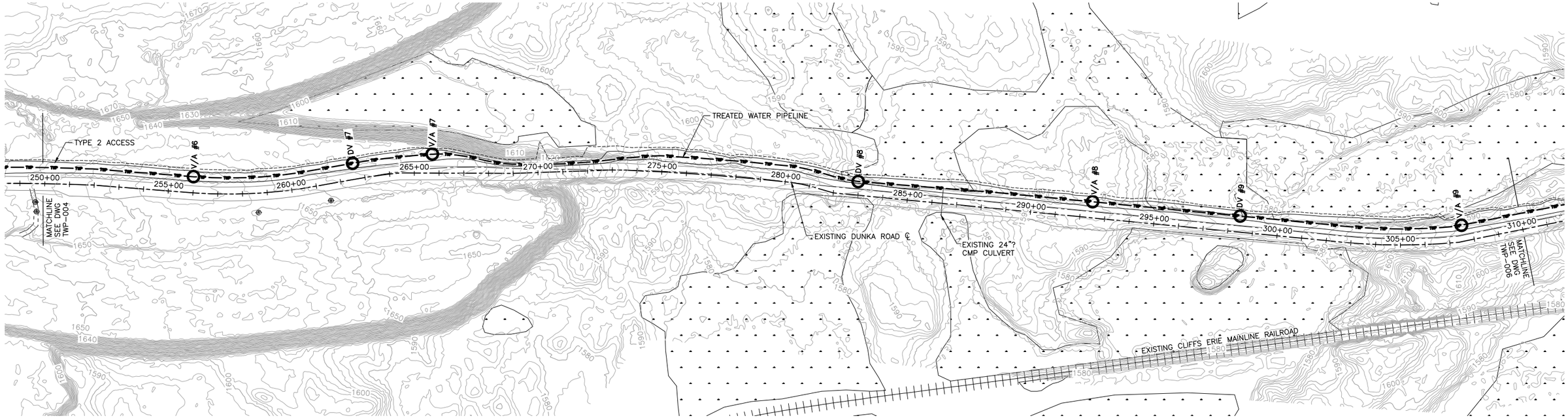

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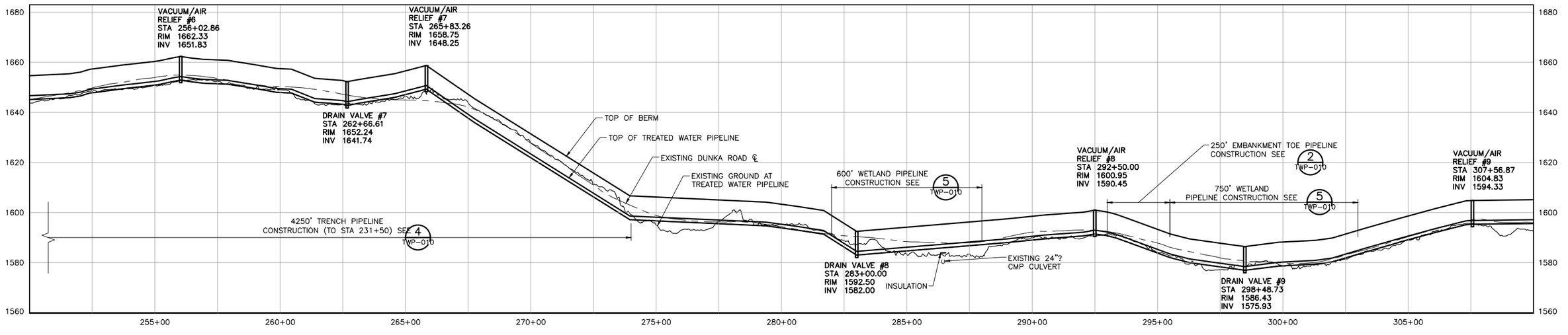

VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER (1) TWP-010, NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE PLAN AND PROFILE STATION 250+00 TO 310+00

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-005 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-106.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:18 PM

INCHES 1 2

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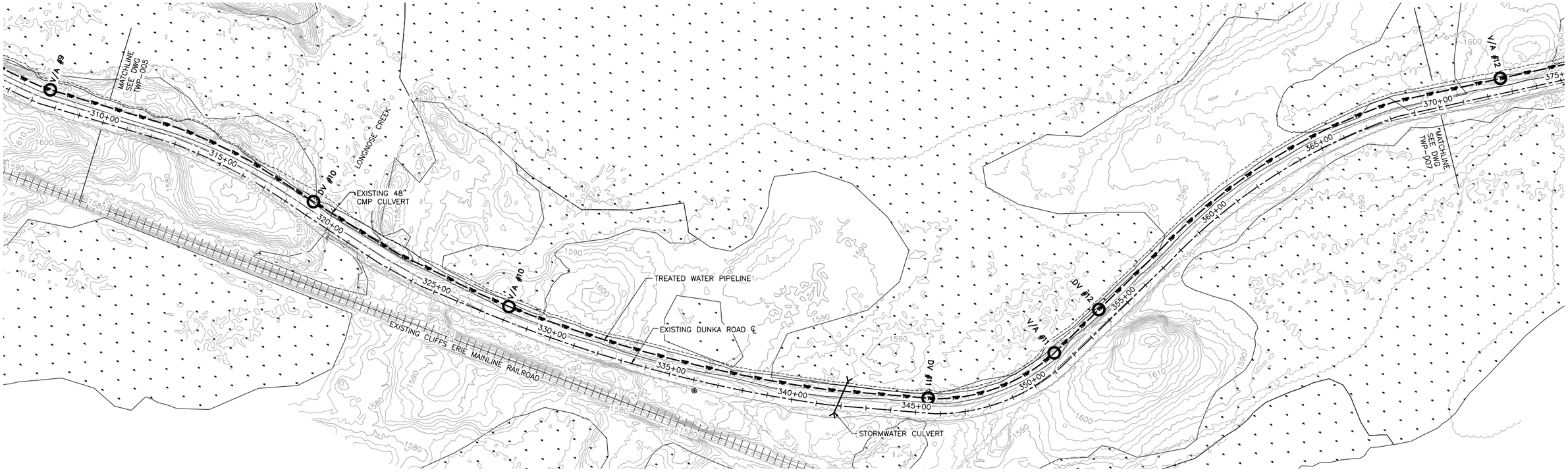

PLAN

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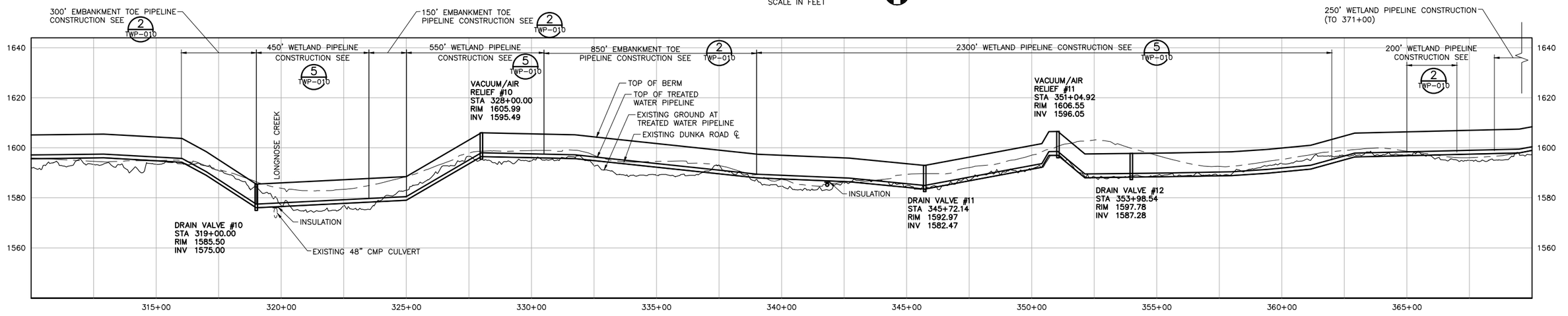
SCALE IN FEET



PROFILE

VERTICAL SCALE: 0 20 40
SCALE IN FEET

HORIZONTAL SCALE: 0 200 400
SCALE IN FEET

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER 1 TWP-010, NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

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FOR CONSTRUCTION		
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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

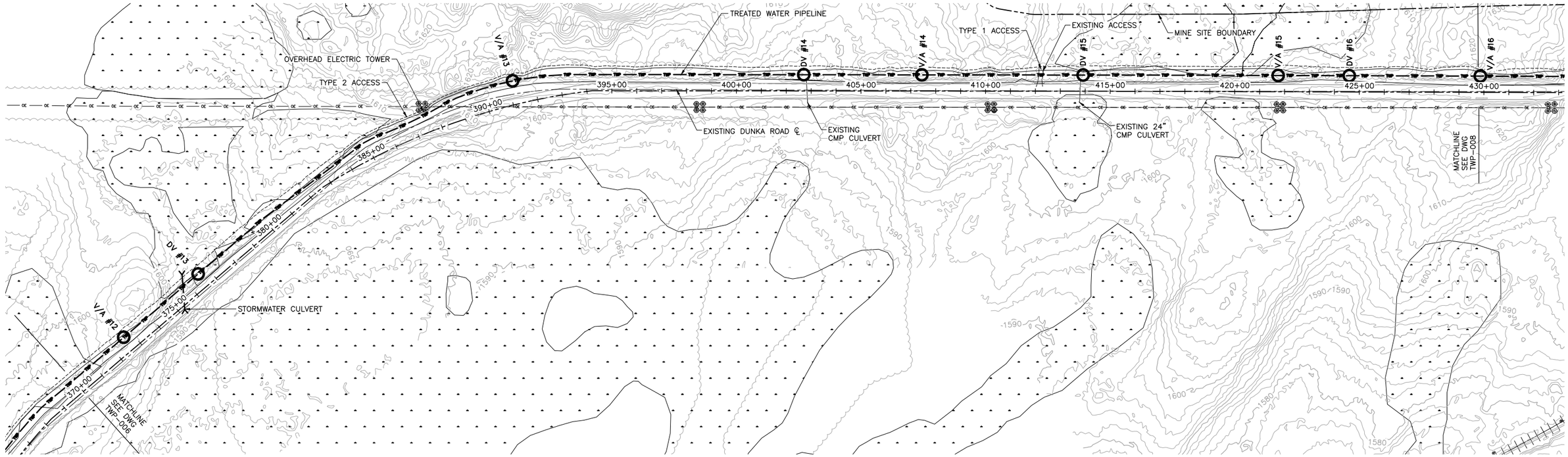
TREATED WATER PIPELINE PLAN AND PROFILE STATION 310+00 TO 370+00

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-006
REV

INCHES 1 2



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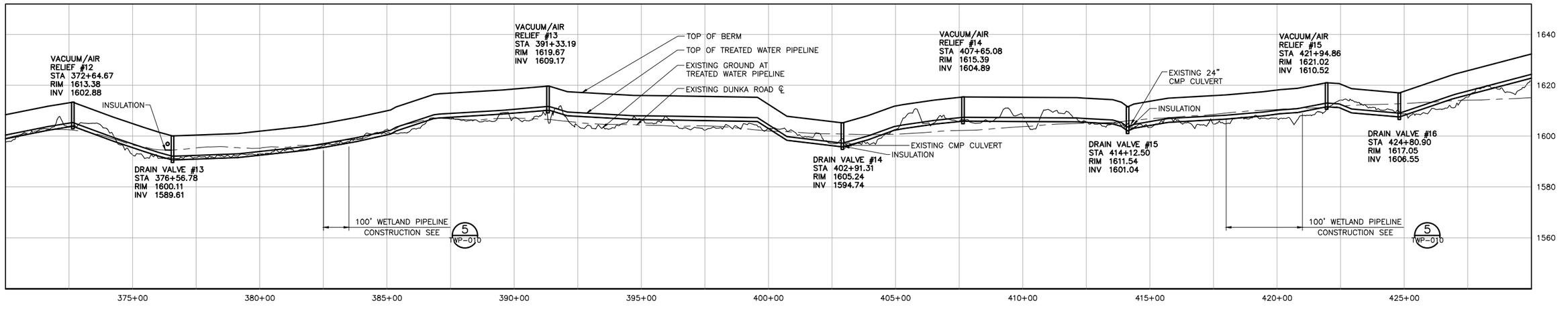

PROFILE

VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER (1 / TWP-010), NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE PLAN AND PROFILE STATION 370+00 TO 430+00

POLYMET MINING

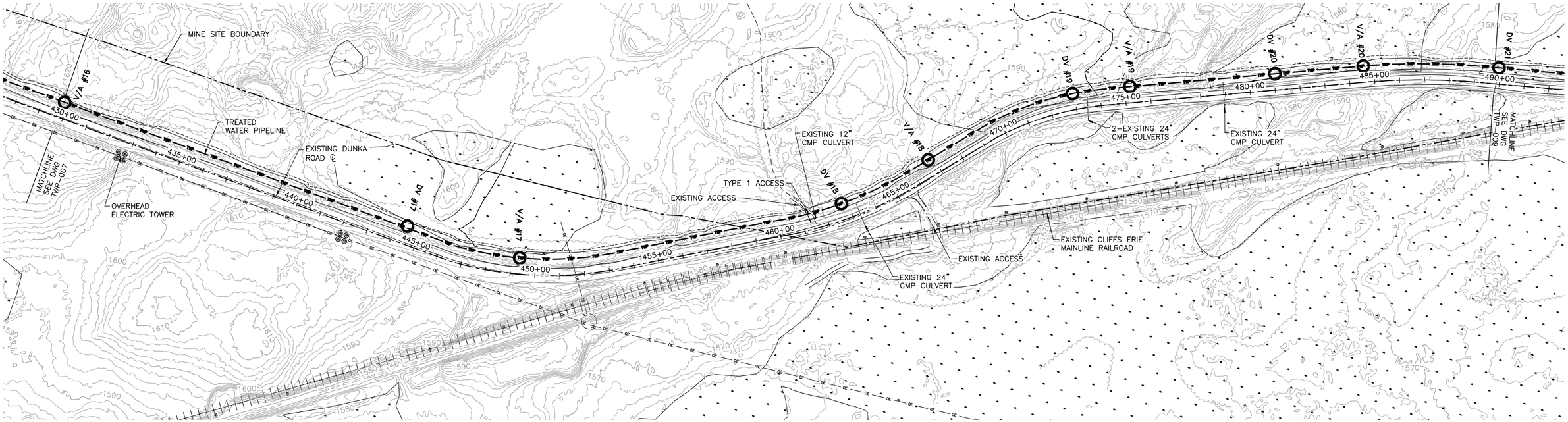
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

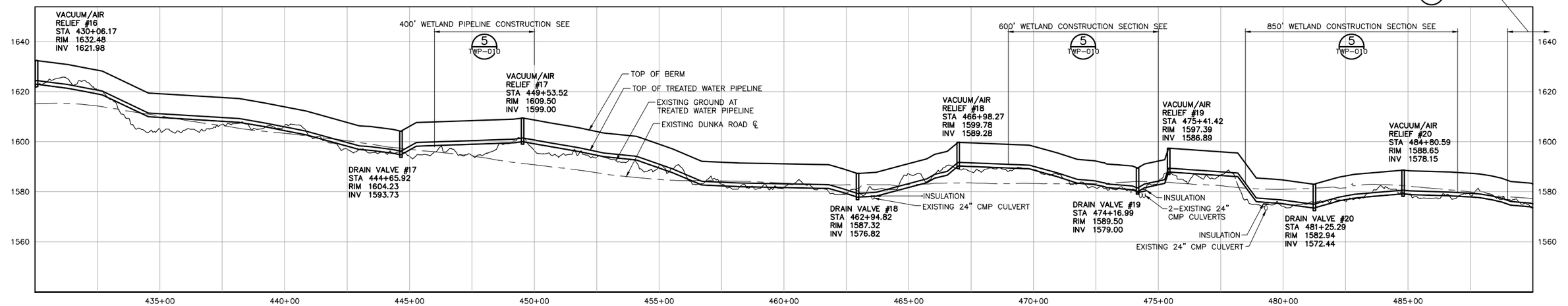
DWG. NO. TWP-007 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-108.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:24 PM

INCHES 1 2



PLAN 0 200 400 SCALE IN FEET



PROFILE

VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER 1 TWP-010 , NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/18/15
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PRINTED NAME JON M. MINNE

SIGNATURE

DATE 5/18/15 LICENSE# 25080

DRAWN: VJS

CHECKED: JMM3

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE PLAN AND PROFILE STATION 430+00 TO 490+00

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-008 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-109.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:27 PM
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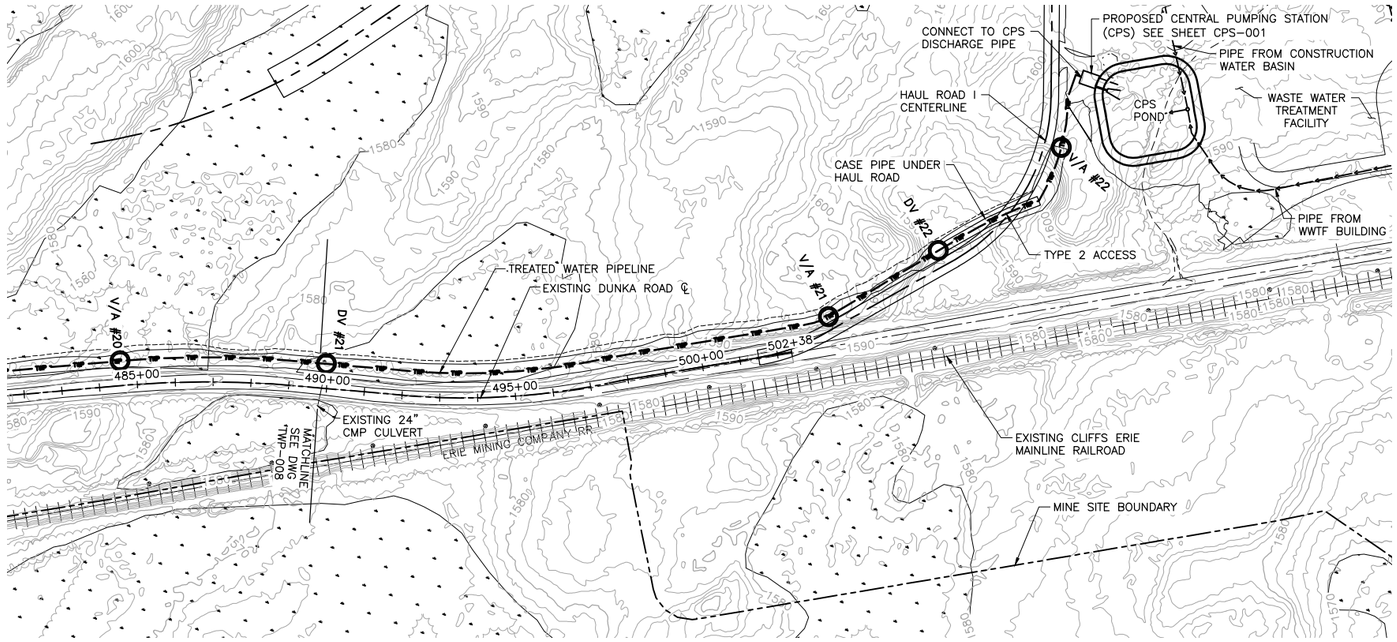

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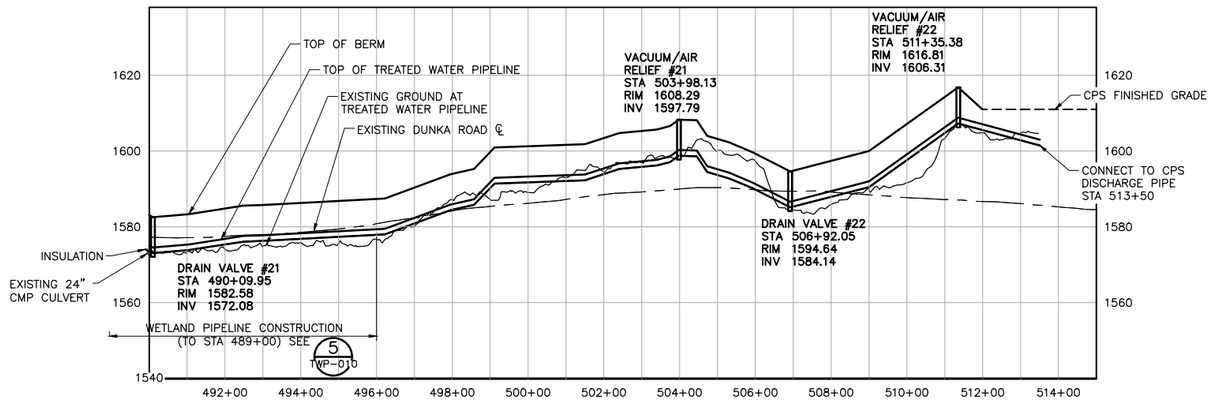

PROFILE

VERTICAL SCALE: 0 20 40 SCALE IN FEET

HORIZONTAL SCALE: 0 200 400 SCALE IN FEET

NOTES:
1. PIPELINE SHALL BE CONSTRUCTED PER 1 TWP-010, NORMAL PIPELINE CONSTRUCTION, UNLESS NOTED OTHERWISE.

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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE PLAN AND PROFILE STATION 490+00 TO 512+50

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-009 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-110.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:30 PM
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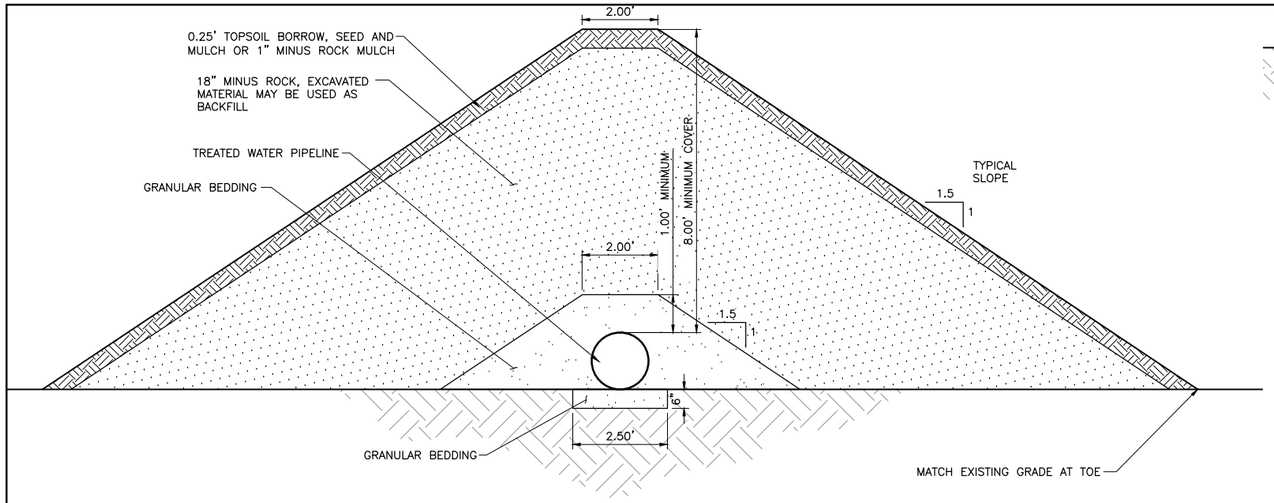
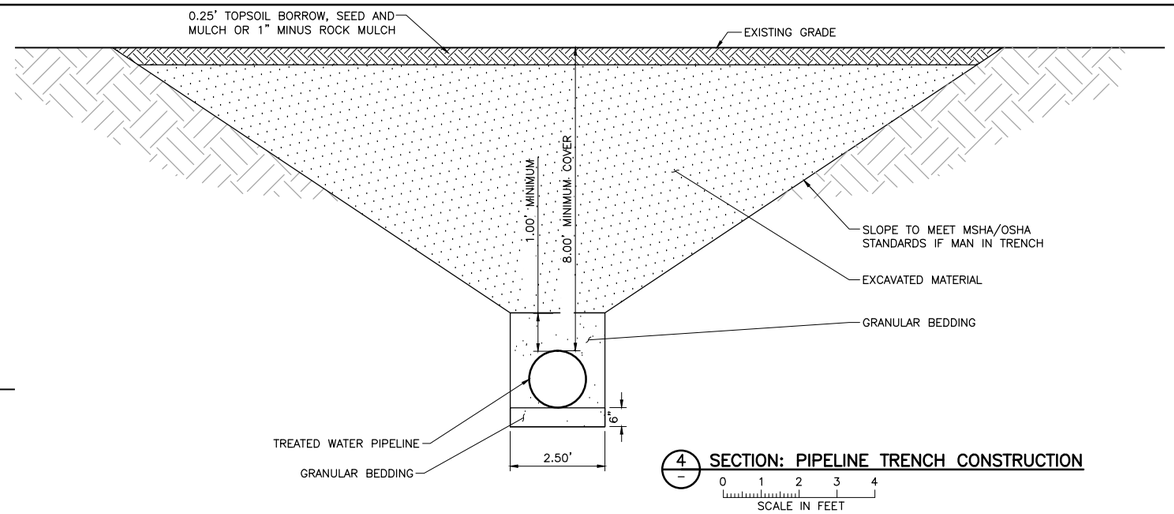


1 SECTION: NORMAL PIPELINE CONSTRUCTION

0 1 2 3 4

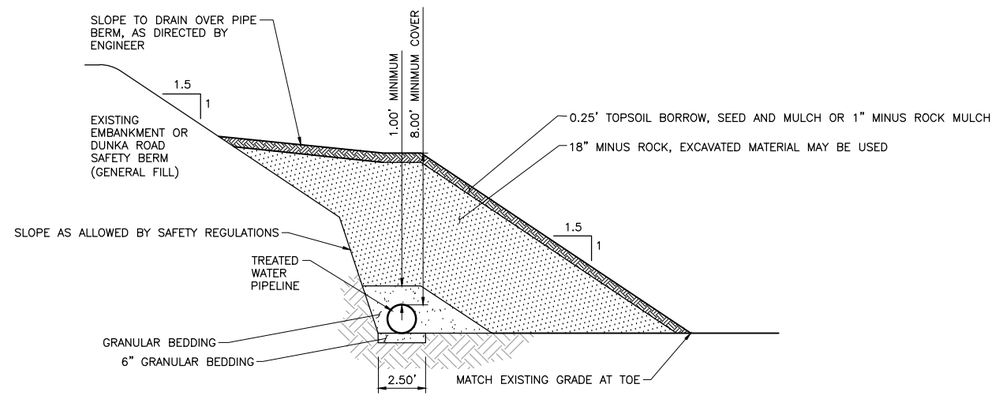
SCALE IN FEET



4 SECTION: PIPELINE TRENCH CONSTRUCTION

0 1 2 3 4

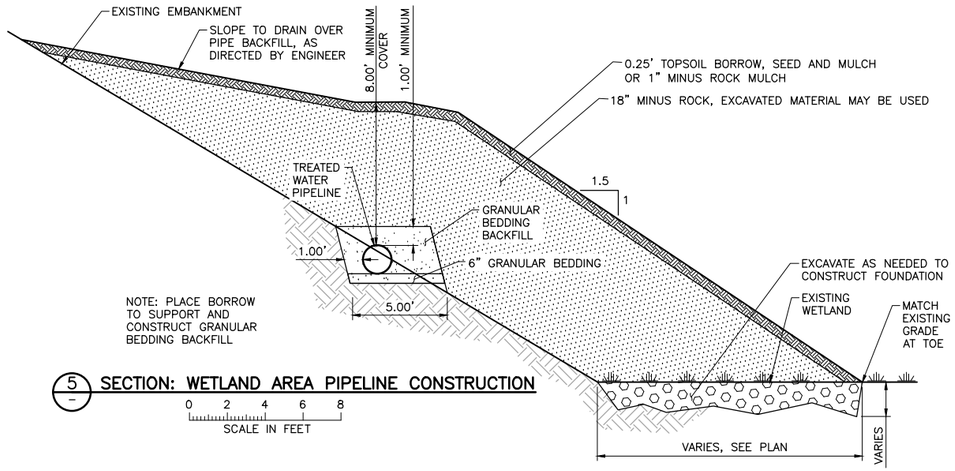
SCALE IN FEET



2 SECTION: EMBANKMENT TOE PIPELINE CONSTRUCTION

0 2 4 6 8

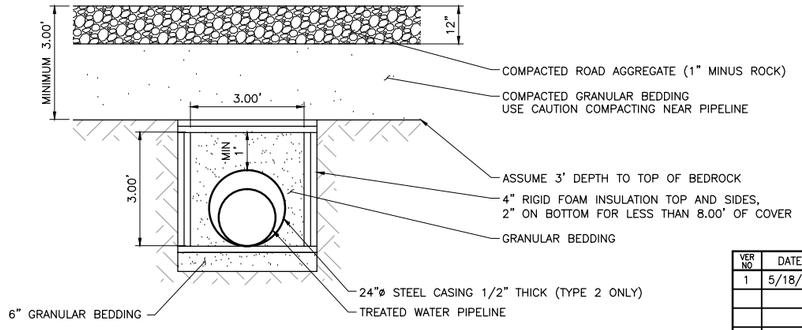
SCALE IN FEET



5 SECTION: WETLAND AREA PIPELINE CONSTRUCTION

0 2 4 6 8

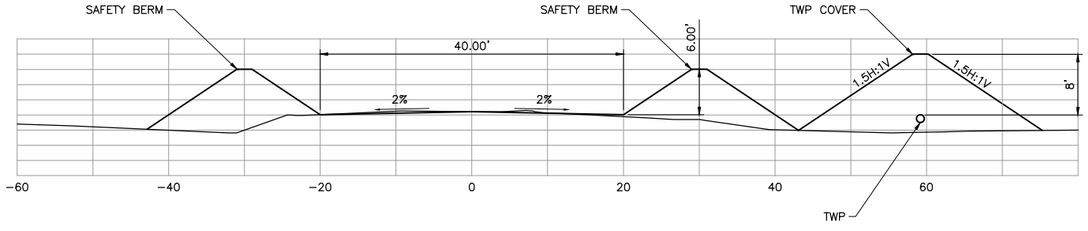
SCALE IN FEET



3 SECTION: ACCESS ROAD CROSSING – TYPE 1 OR 2

0 1 2 3 4

SCALE IN FEET



6 TWP-003 SECTION: DUNKA ROAD/TWP TYPICAL SECTION

0 10 20

SCALE IN FEET

VER NO.	DATE	DESCRIPTION
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FOR CONSTRUCTION		

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PRINTED NAME JON M. MINNE

SIGNATURE

DATE 5/18/15 LICENSE# 25080

DRAWN: VJS

CHECKED: JMM3

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE
PIPELINE INSTALLATION TYPICAL SECTIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-010

REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-303.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:31 PM

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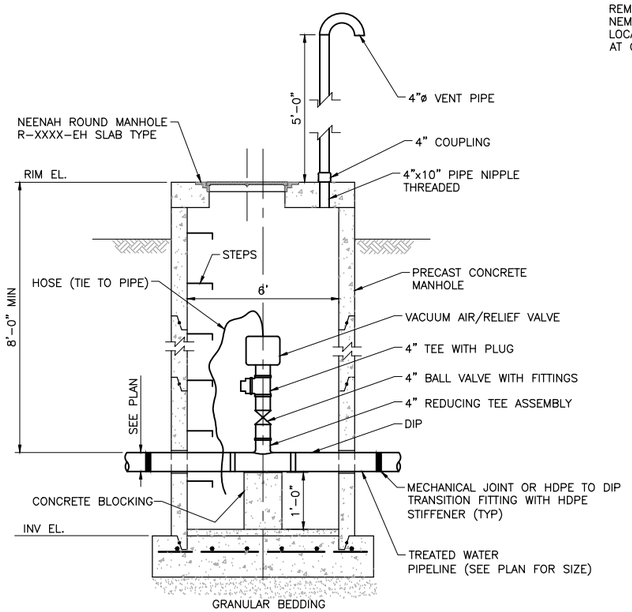
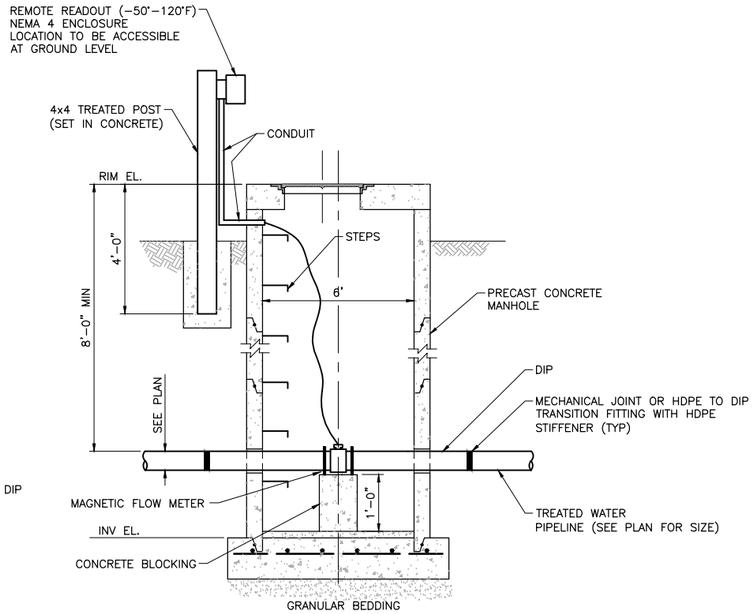
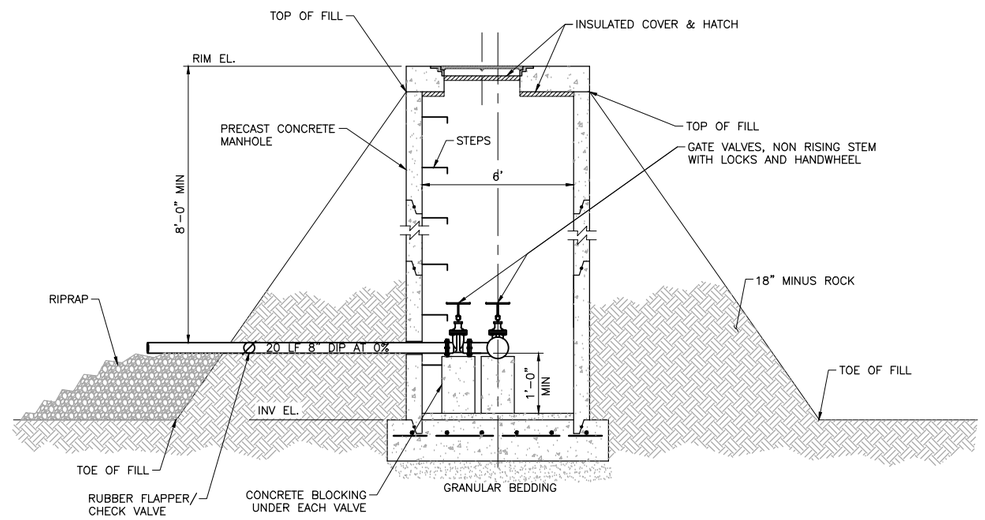


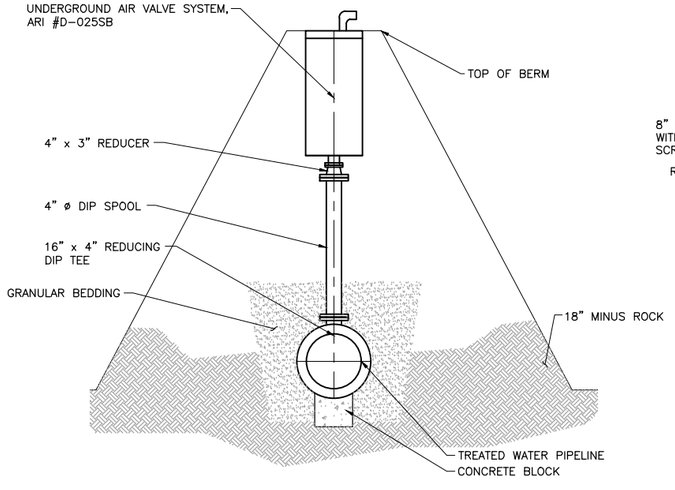
1 – ELEVATION: ALTERNATE VACUUM/AIR RELIEF MANHOLE
NOT TO SCALE



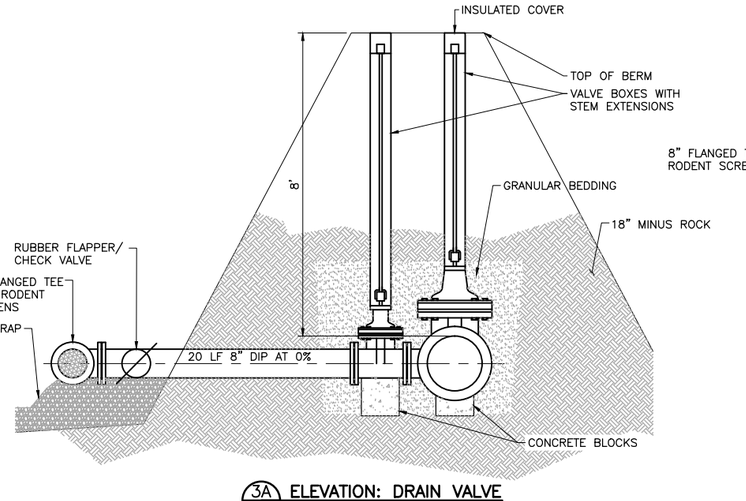
2 – ELEVATION: METER MANHOLE
NOT TO SCALE



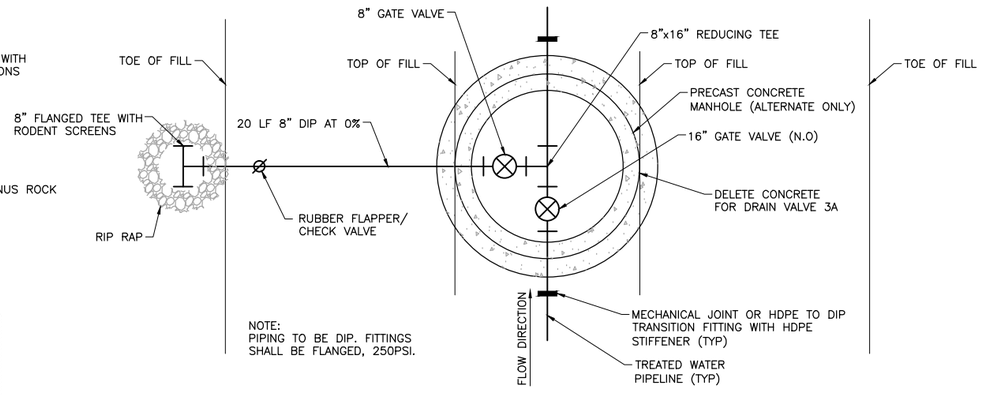
3 – ELEVATION: ALTERNATE DRAIN VALVE MANHOLE
NOT TO SCALE



1A – ELEVATION: VACUUM/AIR RELIEF
NOT TO SCALE



3A – ELEVATION: DRAIN VALVE
NOT TO SCALE



4 – PLAN: DRAIN VALVE
NOT TO SCALE

VER NO	DATE	DESCRIPTION
1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/18/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

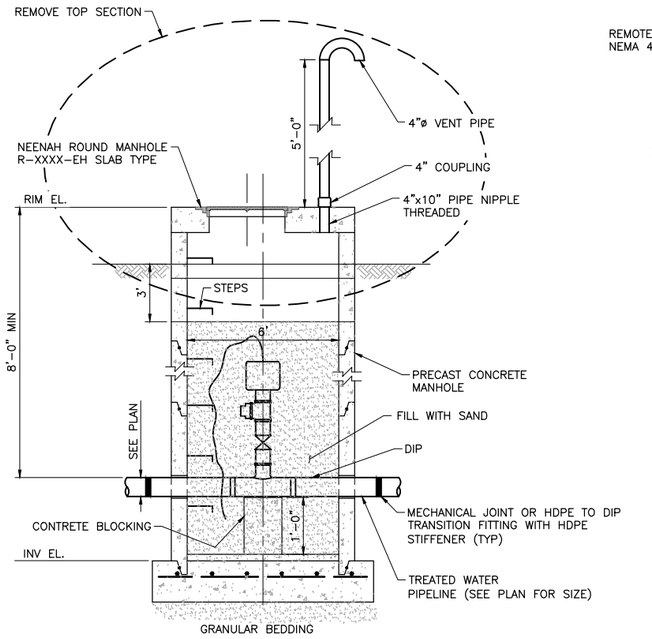
BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

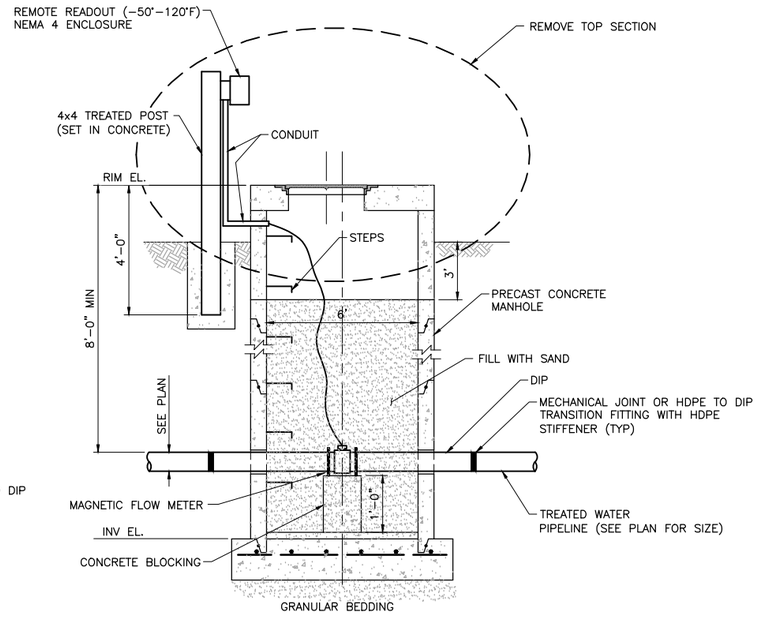
DWG. NO. TWP-011
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-304.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:33 PM

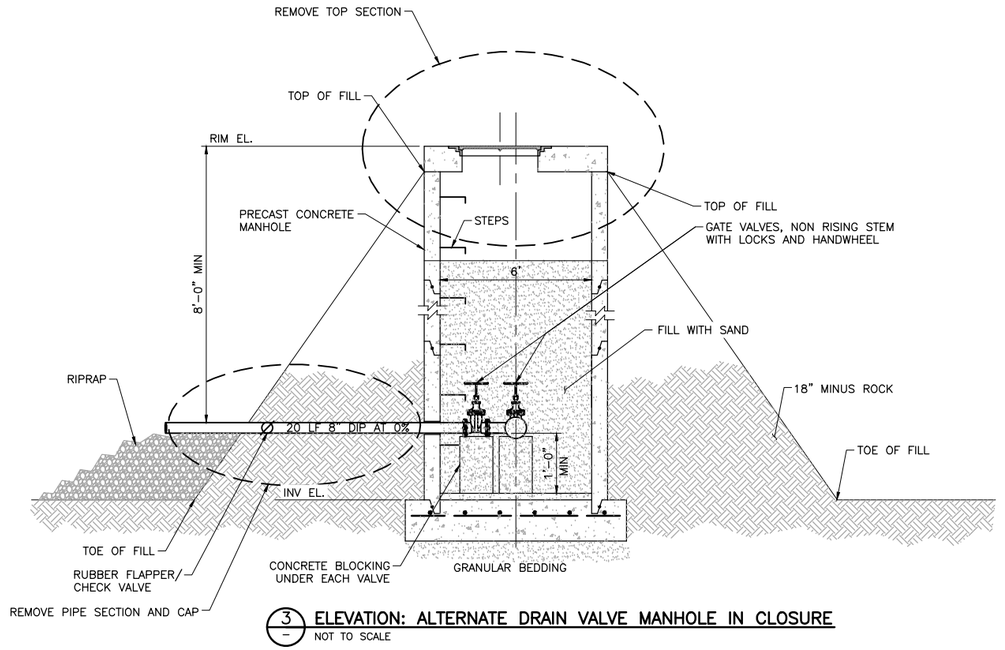
INCHES 1 2



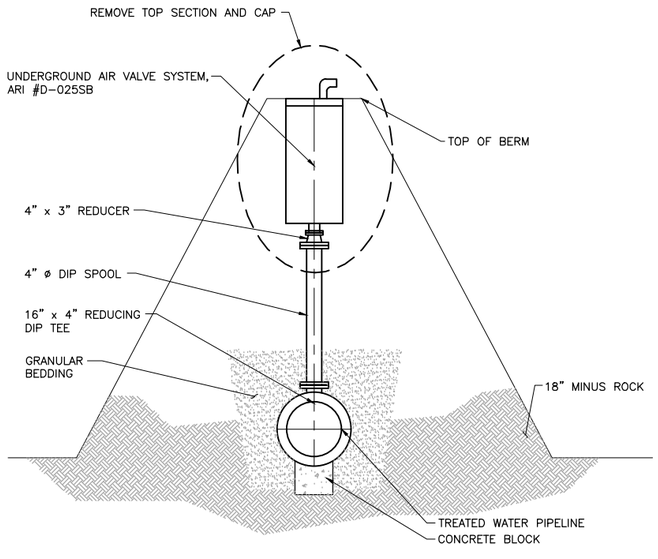
1 – **ELEVATION: ALTERNATE VACUUM/AIR RELIEF MANHOLE IN CLOSURE**
NOT TO SCALE



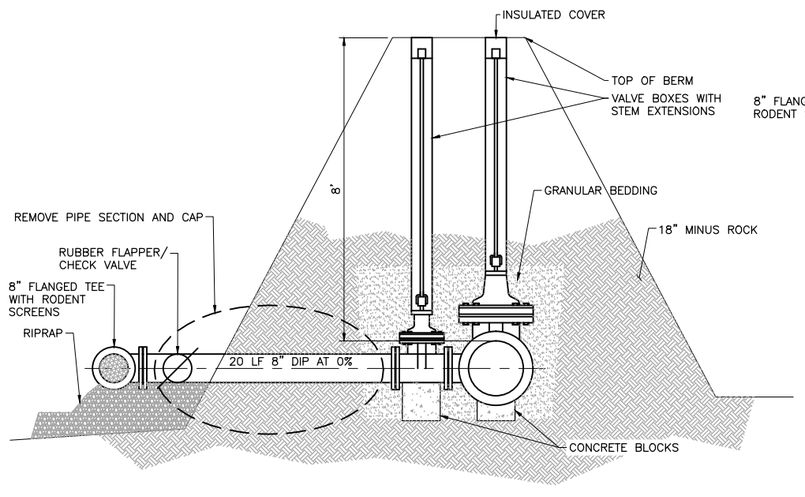
2 – **ELEVATION: METER MANHOLE IN CLOSURE**
NOT TO SCALE



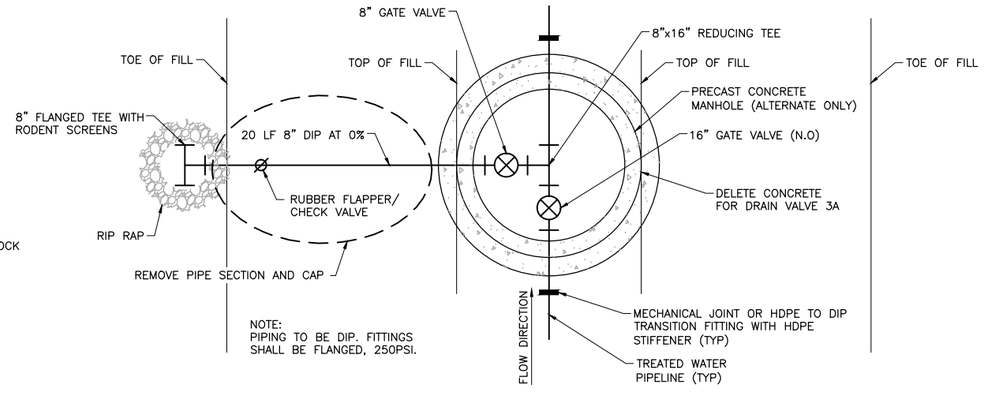
3 – **ELEVATION: ALTERNATE DRAIN VALVE MANHOLE IN CLOSURE**
NOT TO SCALE



1A – **ELEVATION: VACUUM/AIR RELIEF IN CLOSURE**
NOT TO SCALE



3A – **ELEVATION: DRAIN VALVE IN CLOSURE**
NOT TO SCALE



4 – **PLAN: DRAIN VALVE IN CLOSURE**
NOT TO SCALE

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PRINTED NAME JON M. MINNE
SIGNATURE
DATE 5/18/15 LICENSE# 25080

DRAWN: VJS
CHECKED: JMM3
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

TREATED WATER PIPELINE DETAILS IN CLOSURE

POLYMET MINING

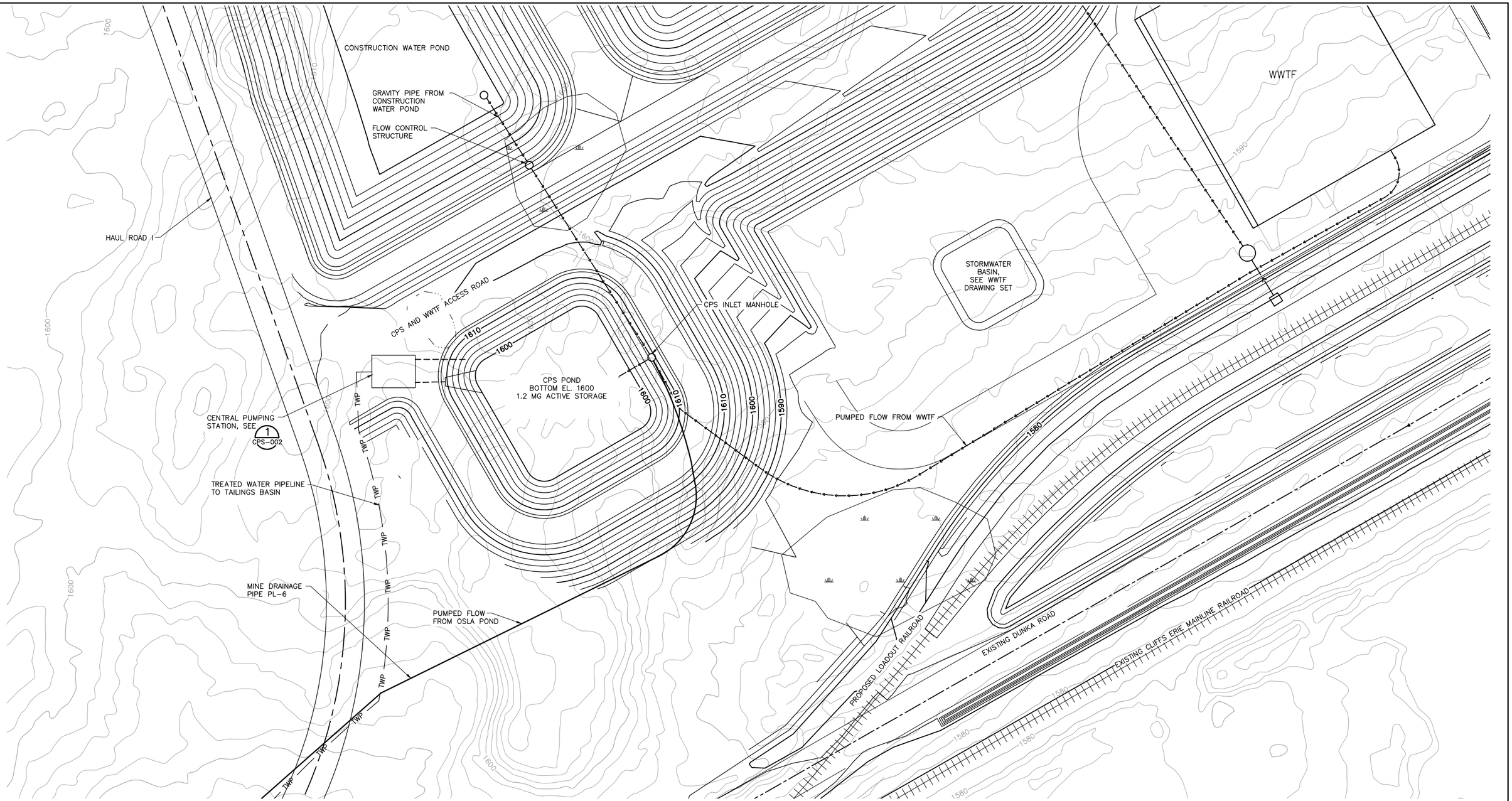
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. TWP-012
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMD-51-CU-305.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:34 PM

INCHES 1 2



1 PLAN: CENTRAL PUMPING STATION

0 50 100

SCALE IN FEET

N

VER NO.	DATE	DESCRIPTION
1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/18/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME ANNE M. PHARES

SIGNATURE Anne M. Phares

DATE 5/18/15 LICENSE# 42022

DRAWN: CSB2

CHECKED: AMP

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CENTRAL PUMPING STATION
SITE PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

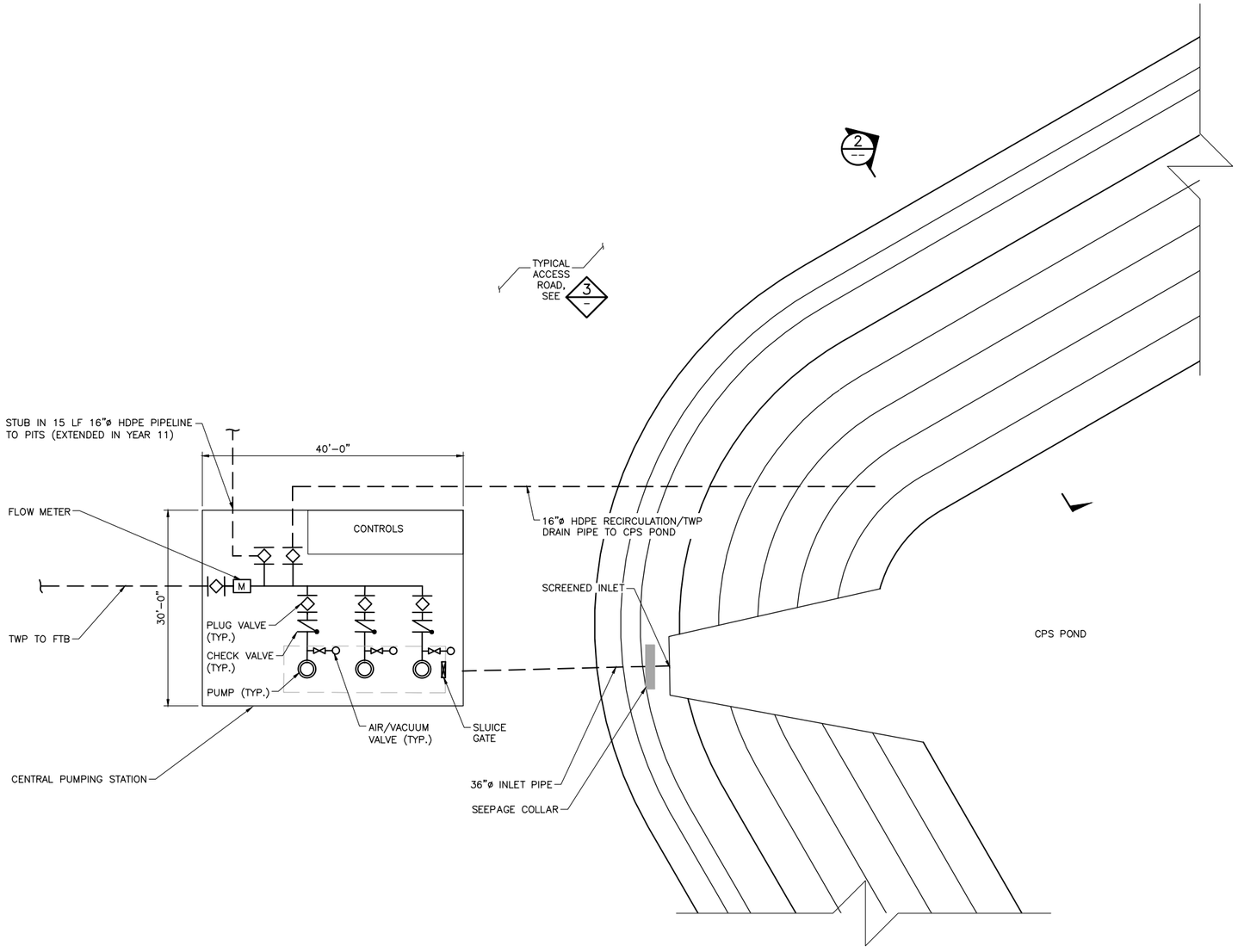
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CPS-001

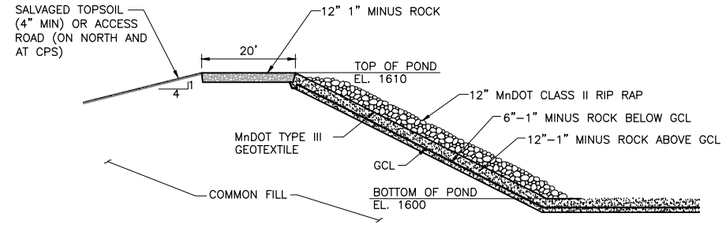
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-52-CS-101.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:37 PM

INCHES 1 2

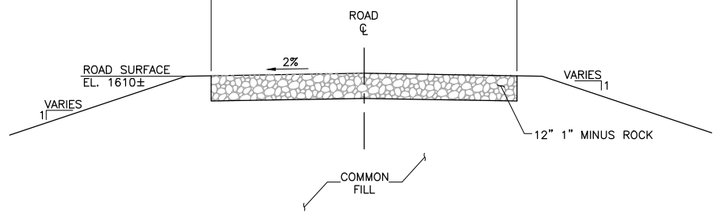


1/CPS-001 **PLAN: CPS AND SITE SCHEMATIC DIAGRAM**



NOTE: PROVIDE SAFETY BERMS AS REQUIRED BY MSHA.

2/— **DETAIL: POND CONSTRUCTION**
NOT TO SCALE



NOTE: PROVIDE 2' SAFETY BERMS AS REQUIRED BY MSHA REGULATIONS.

3/— **DETAIL: TYPICAL ACCESS ROAD**
NOT TO SCALE

NOTES:

1. REFER TO PROJECT SPECIFICATIONS FOR SOIL TYPE INFORMATION.

VER NO	DATE	DESCRIPTION
1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

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FOR PERMITTING	1	5/18/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME ANNE M. PHARES
SIGNATURE Anne M. Phares
DATE 5/18/15 LICENSE# 42022

DRAWN: AMP
CHECKED: AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CENTRAL PUMPING STATION
PUMP STATION PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CPS-002 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-52-FF-100.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:42 PM

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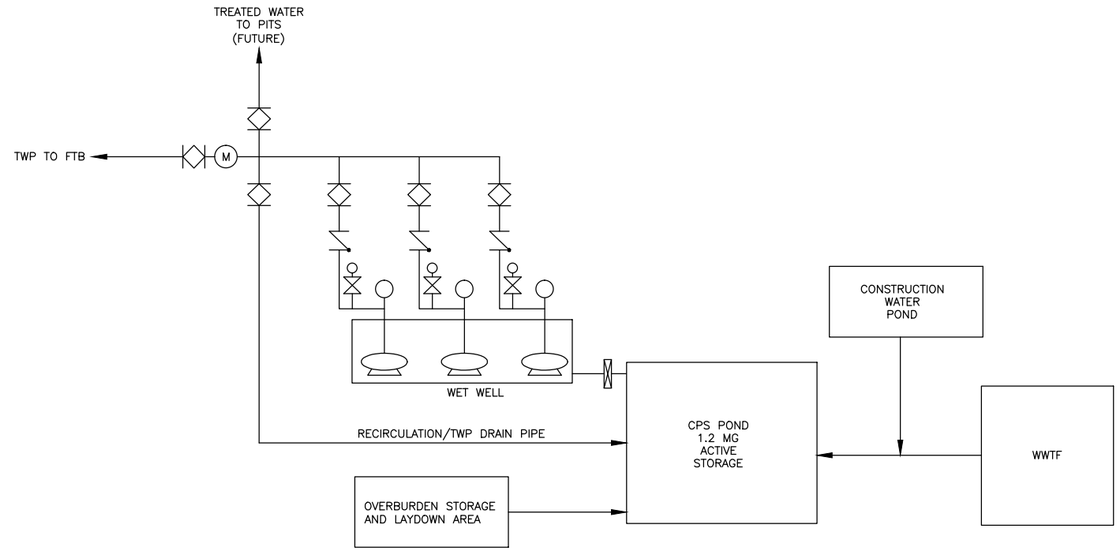

LEGEND

- PIPE
- VERTICAL TURBINE PUMP AND MOTOR
- CHECK VALVE
- (M) MAGNETIC FLOWMETER
- PLUG VALVE
- AIR/VACUUM VALVE
- SLUICE GATE

VER NO.	DATE	DESCRIPTION
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ISSUED	VERSION	DATE
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PRINTED NAME ANNE M. PHARES
SIGNATURE Anne M. Phares
DATE 5/18/15 LICENSE# 42022

DRAWN: CSB2
CHECKED: AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CENTRAL PUMPING STATION PROCESS FLOW DIAGRAM MINE YEARS 1-20

POLYMET MINING

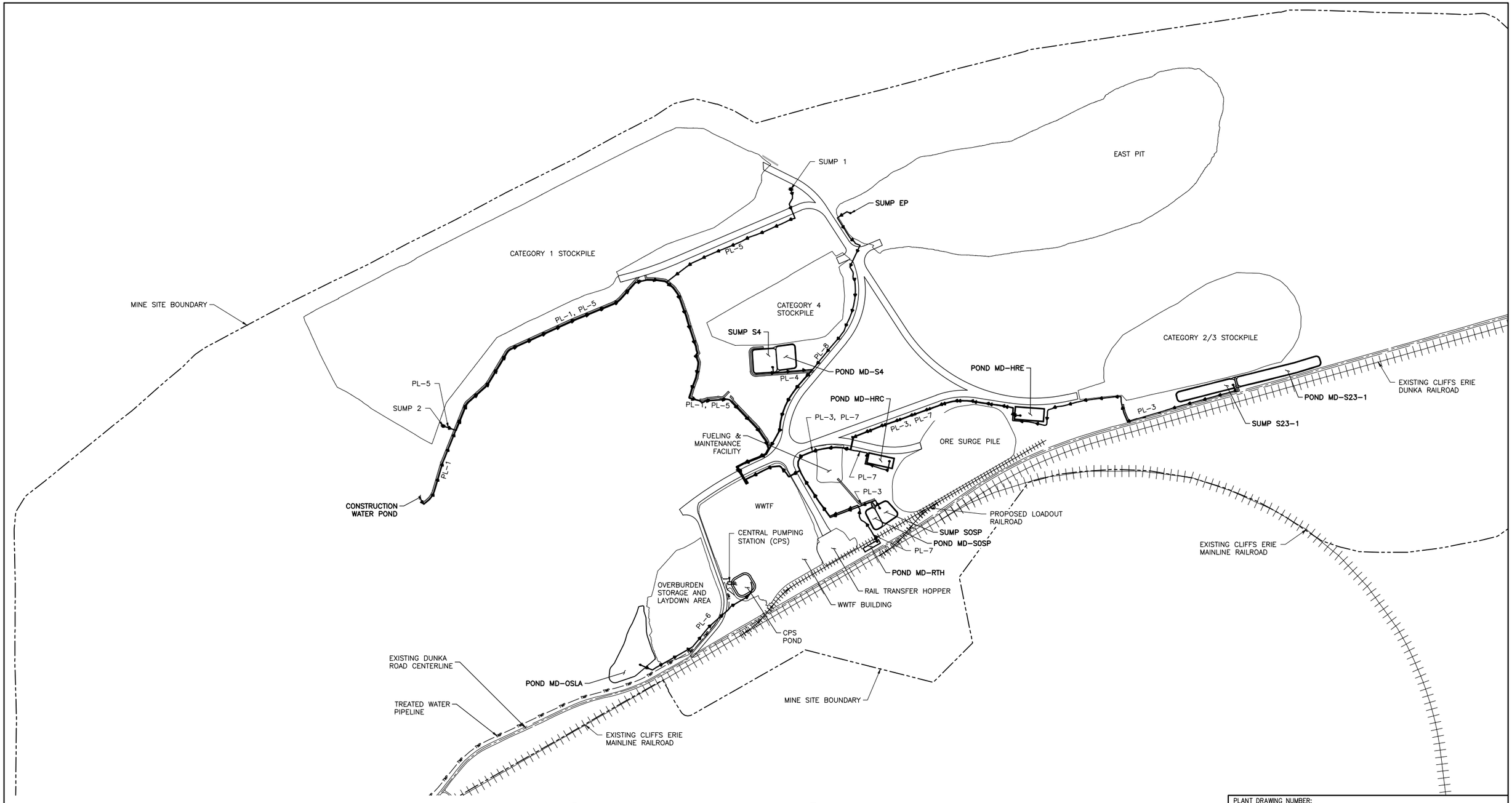
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. CPS-003
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-52-MF-500.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:39 PM

INCHES 1 2



1 PLAN: GENERAL LAYOUT MINE YEAR 1

0 600 1200

SCALE IN FEET

N

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-100-.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:46 PM

INCHES 1 2

VER NO	DATE	DESCRIPTION
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PRINTED NAME CHRISTIE KEARNEY

SIGNATURE Christie Kearney

DATE 5/18/15 LICENSE# 48864

DRAWN: KRM

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE YEAR 1 GENERAL LAYOUT

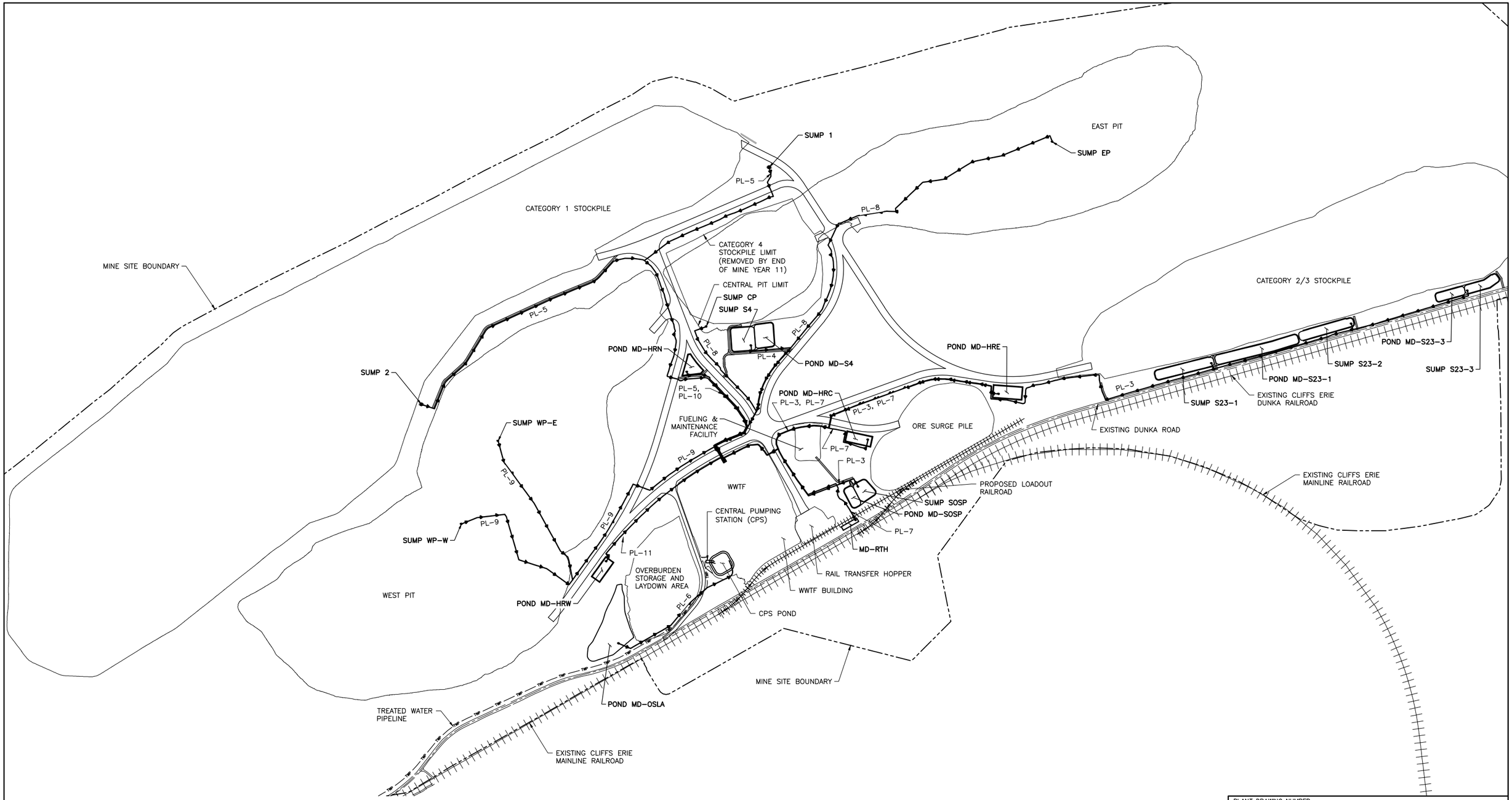
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-001

REV



1 PLAN: GENERAL LAYOUT MINE YEAR 11

0 600 1200

SCALE IN FEET

N

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-101-DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:48 PM

INCHES 1 2

VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
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NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME CHRISTIE KEARNEY

SIGNATURE Christie Kearney

DATE 5/18/15 LICENSE# 48864

DRAWN: KRM

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE MINE YEAR 11 GENERAL LAYOUT

POLYMET MINING

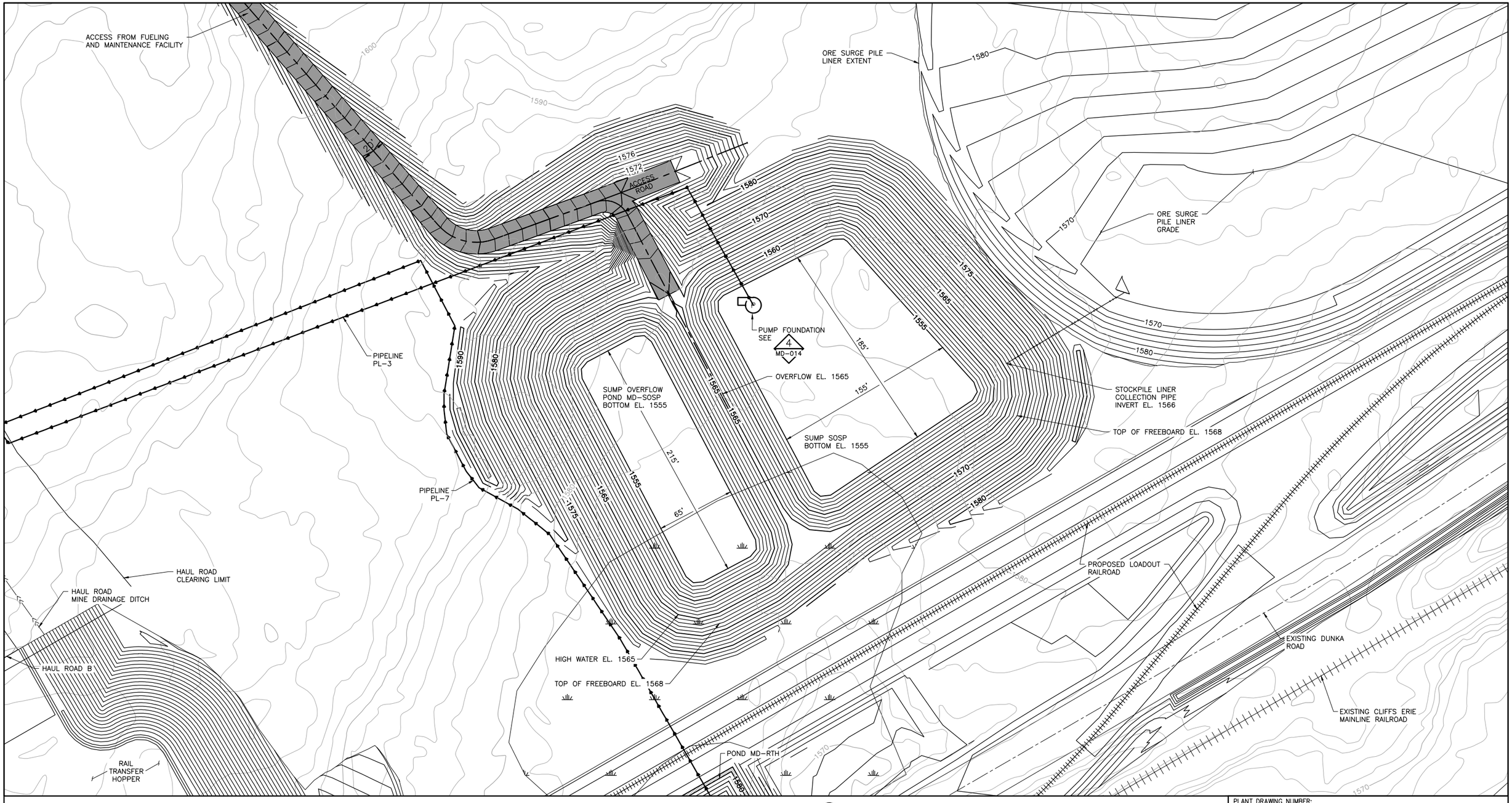
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-002

REV



NOTE:
1. THE SUMP SOSP OVERFLOWS TO THE SUMP OVERFLOW POND MD-SOSP IN EVENTS GREATER THAN THE 10-YEAR 24 HOUR STORM.

1 -- PLAN: SUMP SOSP AND MD-SOSP

0 40 80
SCALE IN FEET

N

VER NO	DATE	DESCRIPTION
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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE
DATE 5/18/15 LICENSE # 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE SUMP DESIGN
SUMP SOSP & MD-SOSP GRADING PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-003
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-125.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:52 PM

CATEGORY 4 STOCKPILE LINER GRADE

STOCKPILE LINER COLLECTION PIPE INVERT EL. 1601

CATEGORY 4 STOCKPILE LINER EXTENT

OVERFLOW EL. 1600

SUMP S4 BOTTOM EL. 1593

SUMP OVERFLOW POND MD-S4 BOTTOM EL. 1593

PUMP FOUNDATION SEE 4 MD-014

PIPELINE PL-8

PIPELINE PL-4

HAUL ROAD MINE DRAINAGE DITCH

HAUL ROAD CLEARING LIMIT

ACCESS ROAD

TOP OF DIKE EL. 1603

HIGH WATER EL. 1600

HAUL ROAD B

HAUL ROAD C

NOTE:
1. THE SUMP S4 OVERFLOWS TO THE SUMP OVERFLOW POND MD-S4 IN EVENTS GREATER THAN THE 10-YEAR 24 HOUR STORM.

1 PLAN: SUMP S4 AND MD-S4

0 40 80
SCALE IN FEET

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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE SUMP DESIGN
SUMP S4 AND MD-S4 GRADING PLAN

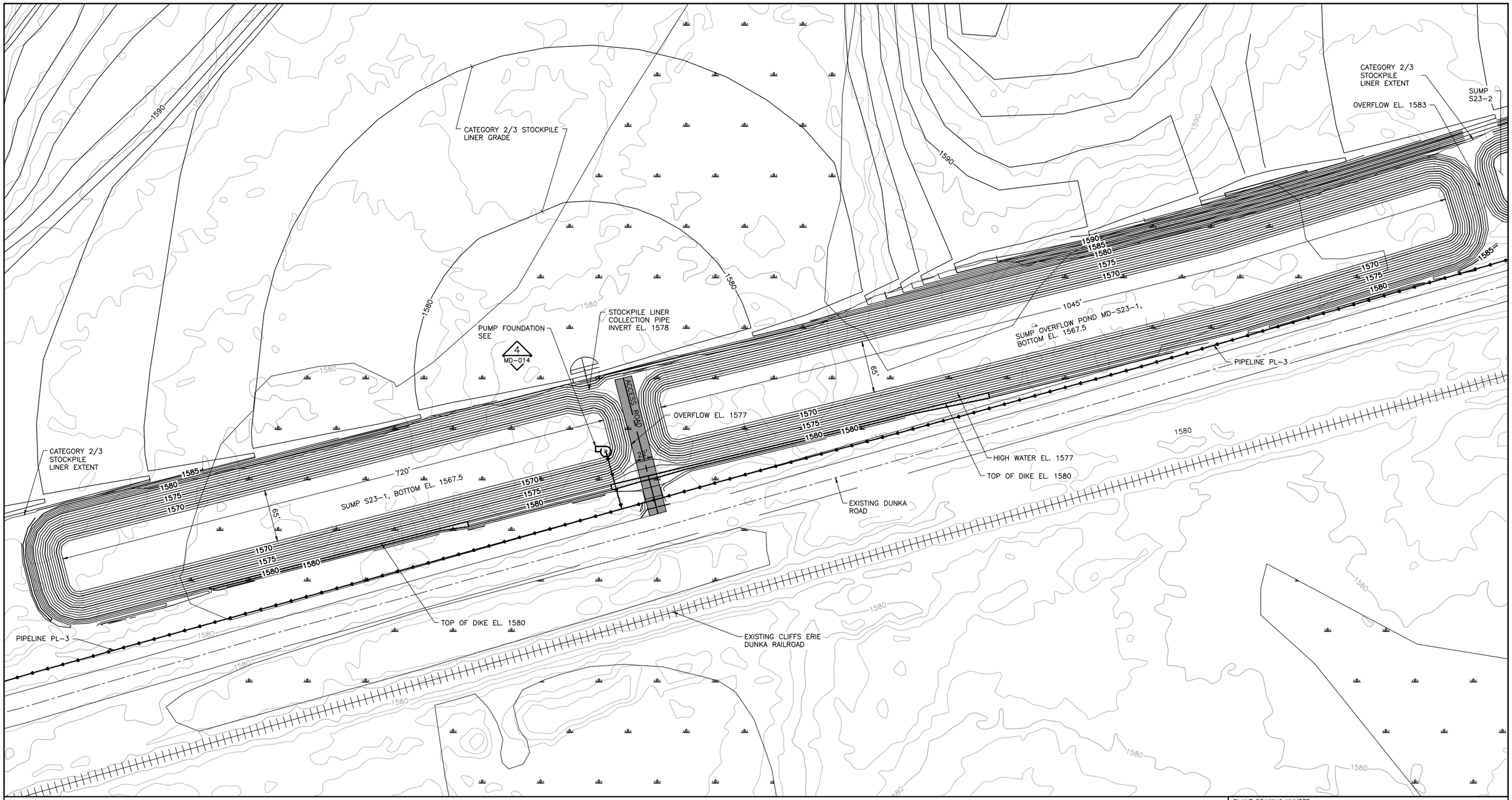
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-004 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-126.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:56 PM

INCHES 1 2



NOTE:
1. THE SUMP S23-1 OVERFLOWS TO THE SUMP OVERFLOW POND MD-S23-1 IN EVENTS GREATER THAN THE 10-YEAR 24 HOUR STORM.

1 -- PLAN: SUMP S23-1 AND MD-S23-1

0 60 120
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE SUMP DESIGN
SUMP S23-1 AND MD-S23-1 GRADING PLAN

POLYMET MINING

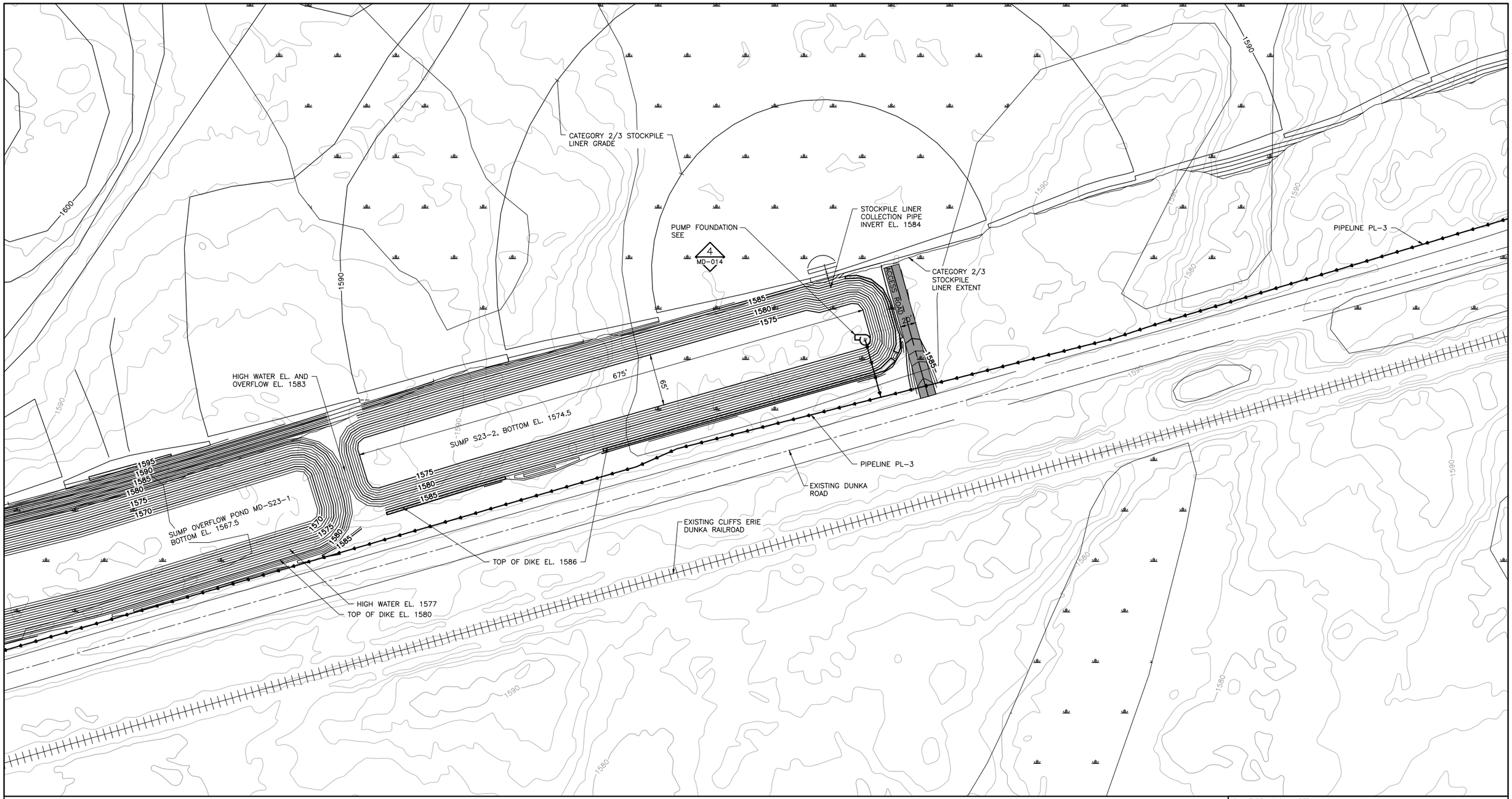
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-005
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-127.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 1:58 PM

INCHES 1 2



NOTE:
1. THE SUMP S23-2 OVERFLOWS TO THE SUMP OVERFLOW POND MD-S23-1 IN EVENTS GREATER THAN THE 10-YEAR 24 HOUR STORM.

1 PLAN: SUMP S23-2

0 60 120

SCALE IN FEET

VER NO	DATE	DESCRIPTION
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FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE Christie Kearney
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE SUMP DESIGN
SUMP S23-2 GRADING PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-006 REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-128.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:00 PM

INCHES 1 2

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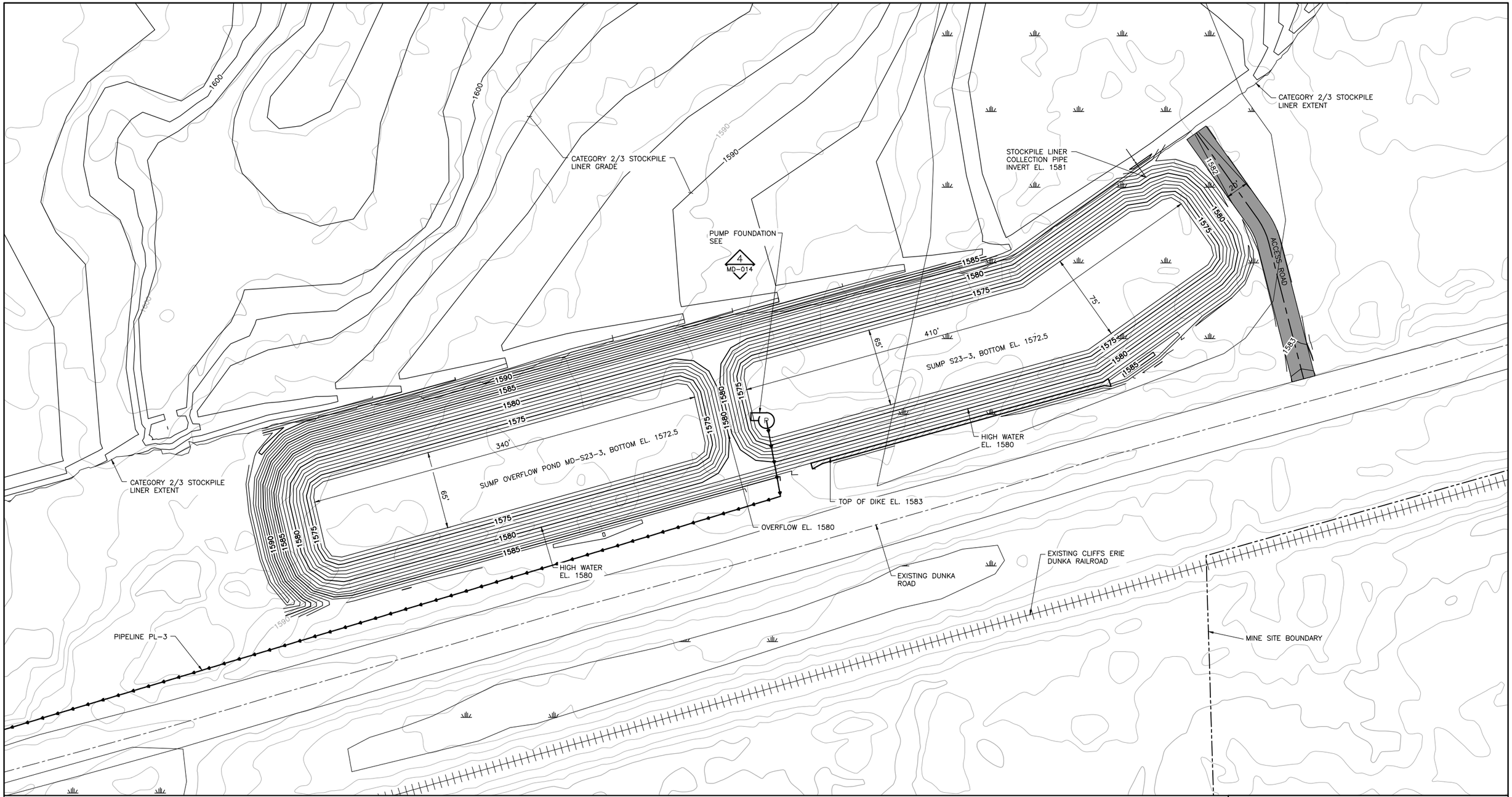

NOTE:
1. THE SUMP S23-3 OVERFLOWS TO THE SUMP OVERFLOW POND MD-S23-3 IN EVENTS GREATER THAN THE 10-YEAR 24 HOUR STORM.

1 PLAN: SUMP S23-3 AND MD-23-3

0 40 80
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/18/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE SUMP DESIGN
SUMP S23-3 AND MD-S23-3 GRADING PLAN

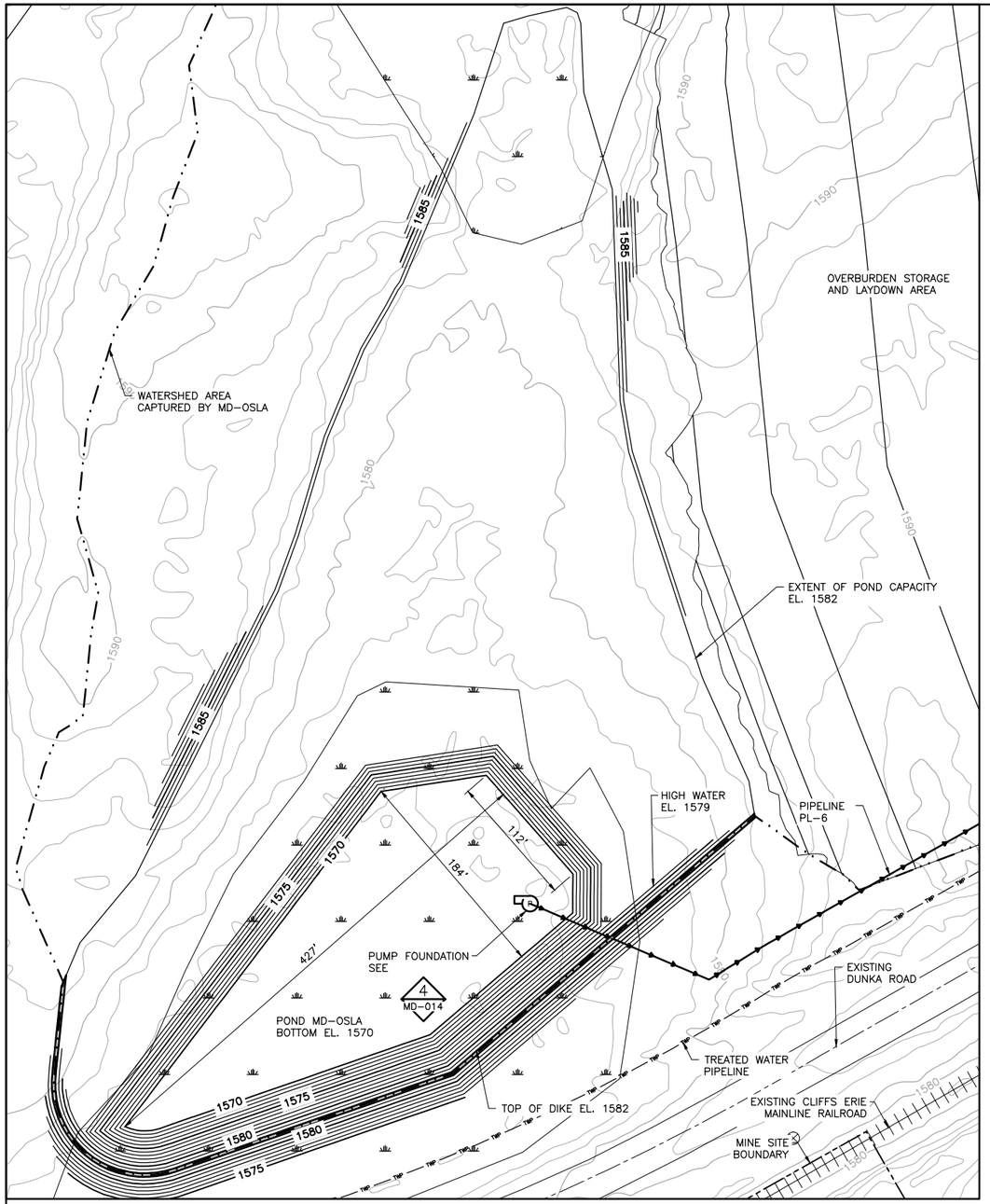
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-007
REV

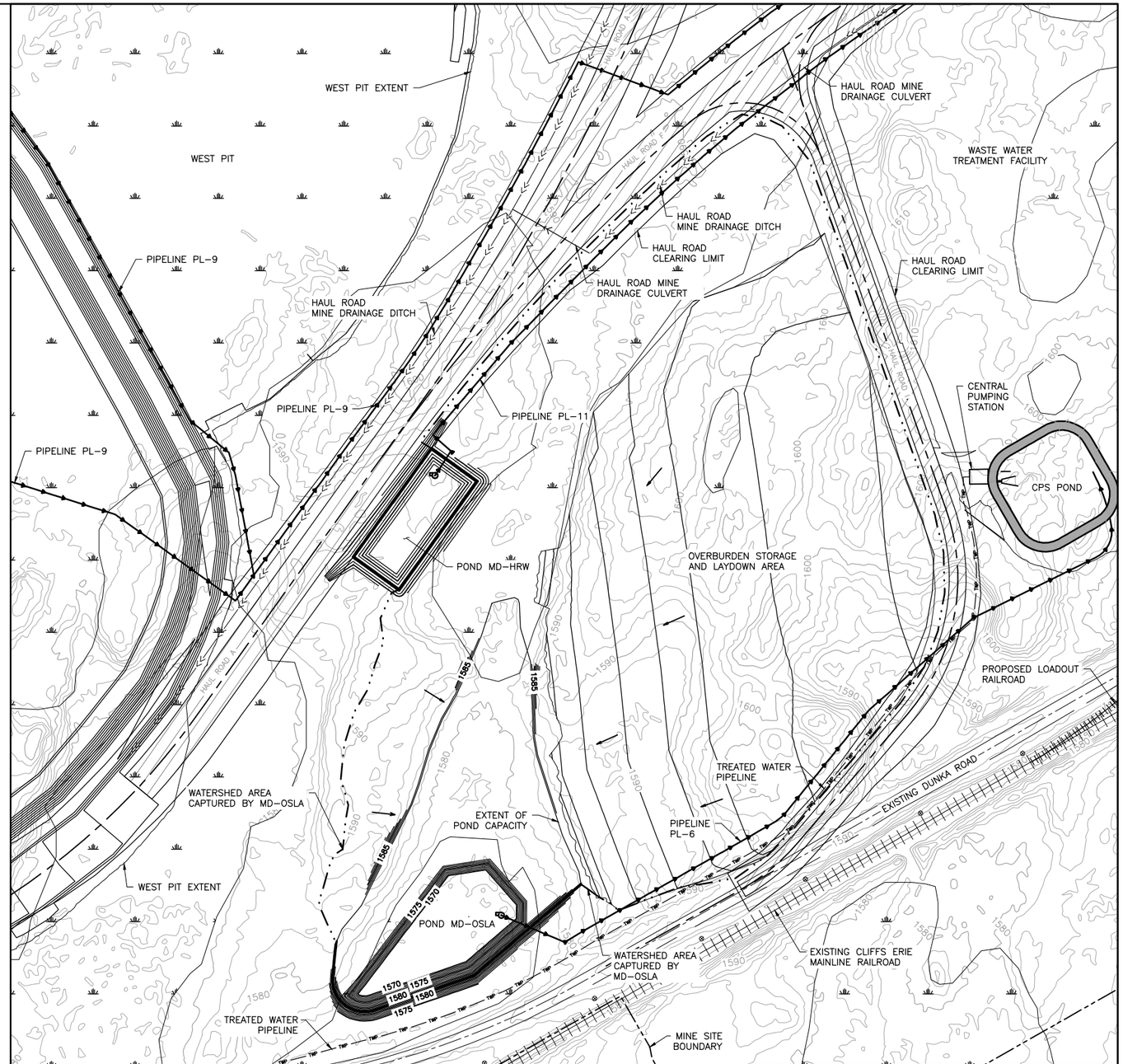
INCHES 1 2



1 PLAN: POND MD-OSLA

0 60 120

SCALE IN FEET



2 PLAN: DRAINAGE AREA FOR MD-OSLA

0 150 300

SCALE IN FEET

NOTE:
1. MINE YEAR 11 CONTOURS ARE SHOWN FOR THE WEST PIT.

VER NO	DATE	DESCRIPTION
1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/18/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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SIGNATURE

DATE 5/18/15 LICENSE# 48864

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE POND DESIGN
POND MD-OSLA GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-008

REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-140.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:06 PM

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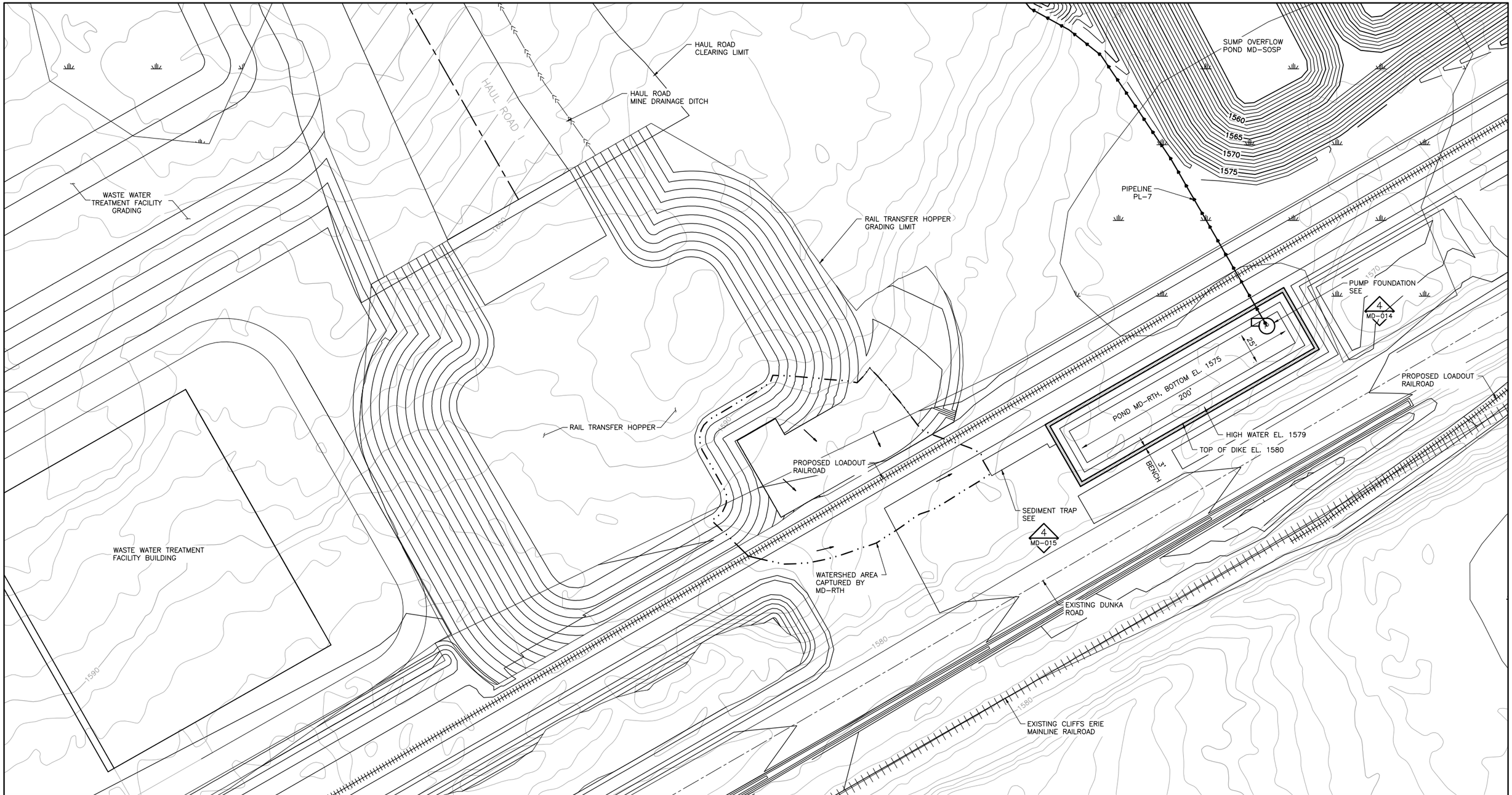

1 PLAN: POND MD-RTH

0 40 80

SCALE IN FEET

N

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-141.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:07 PM

INCHES 1 2

VER NO	DATE	DESCRIPTION
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ISSUED	VERSION	DATE
FOR PERMITTING	1	5/18/15
FOR CONSTRUCTION		

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PRINTED NAME CHRISTIE KEARNEY

SIGNATURE

DATE 5/18/15 LICENSE# 48864

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE POND DESIGN
POND MD-RTH GRADING PLAN

POLYMET MINING

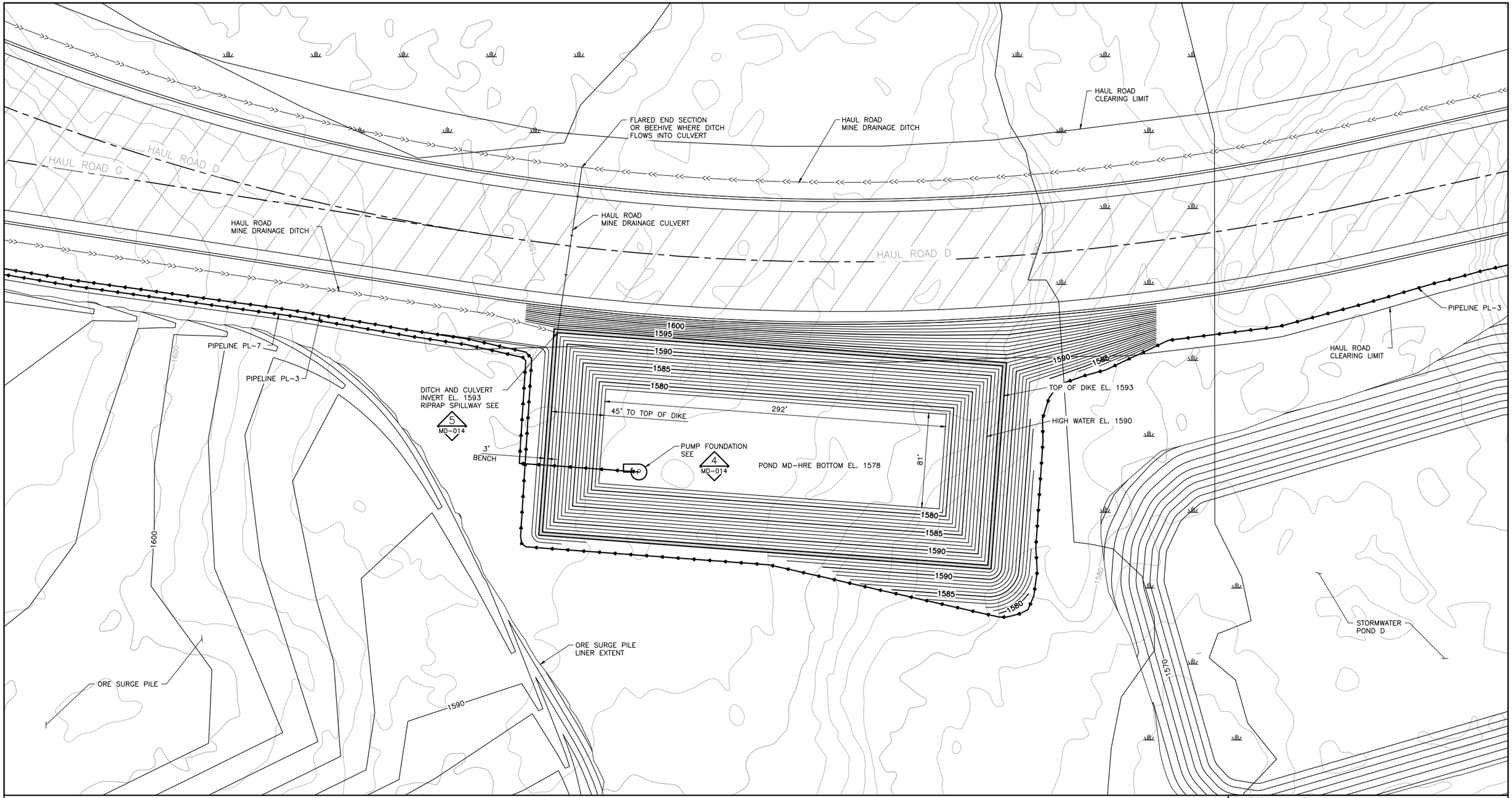
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-009

REV



1 PLAN: POND MD-HRE

0 40 80

SCALE IN FEET

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SIGNATURE

DATE 5/18/15 LICENSE# 48864

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE POND DESIGN
POND MD-HRE GRADING PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-010

REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-142.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:08 PM

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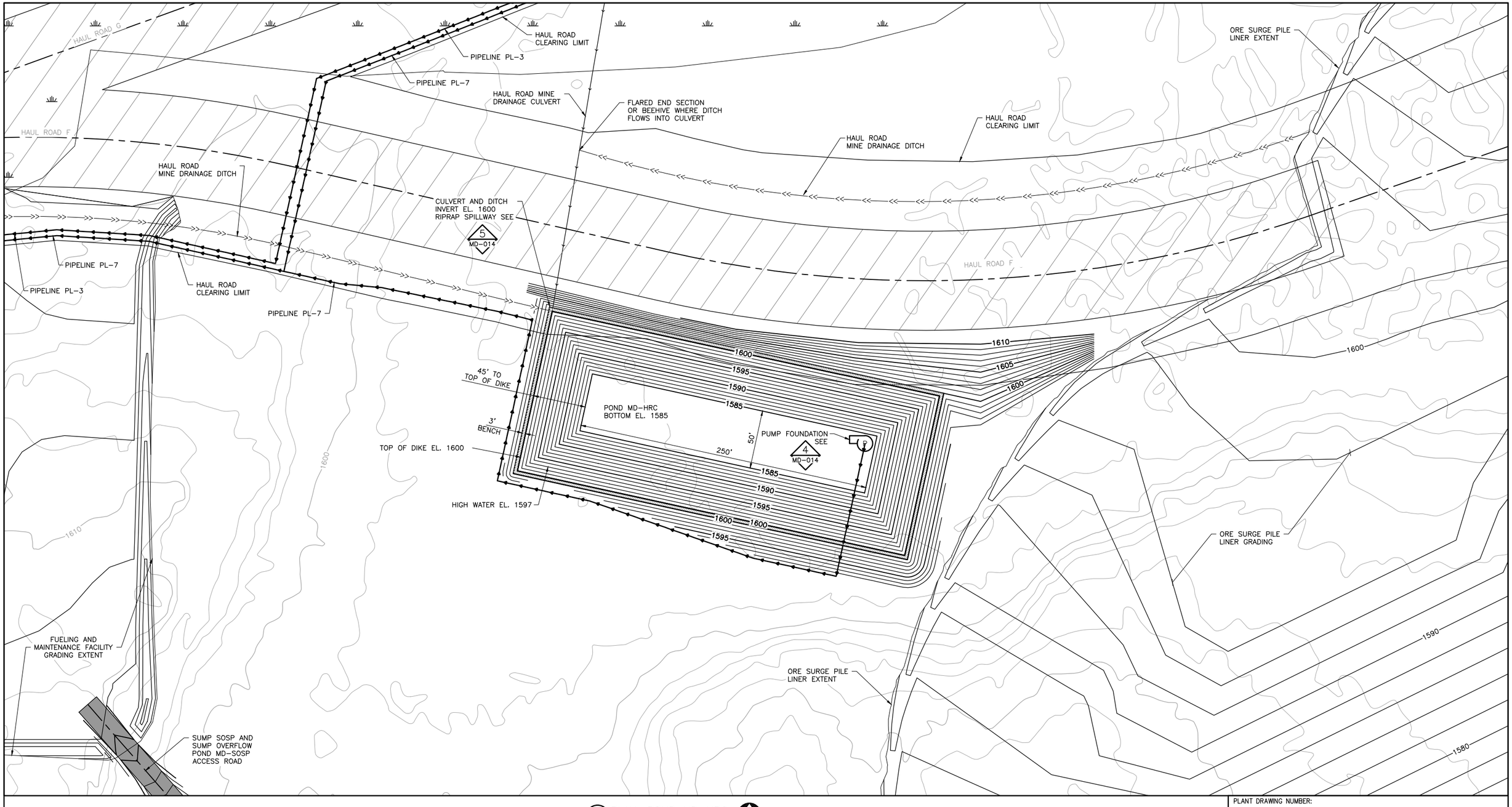

1 PLAN: POND MD-HRC

0 40 80

SCALE IN FEET

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FOR CONSTRUCTION		

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PRINTED NAME CHRISTIE KEARNEY

SIGNATURE Christie Kearney

DATE 5/18/15 LICENSE# 48864

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE POND DESIGN
POND MD-HRC GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

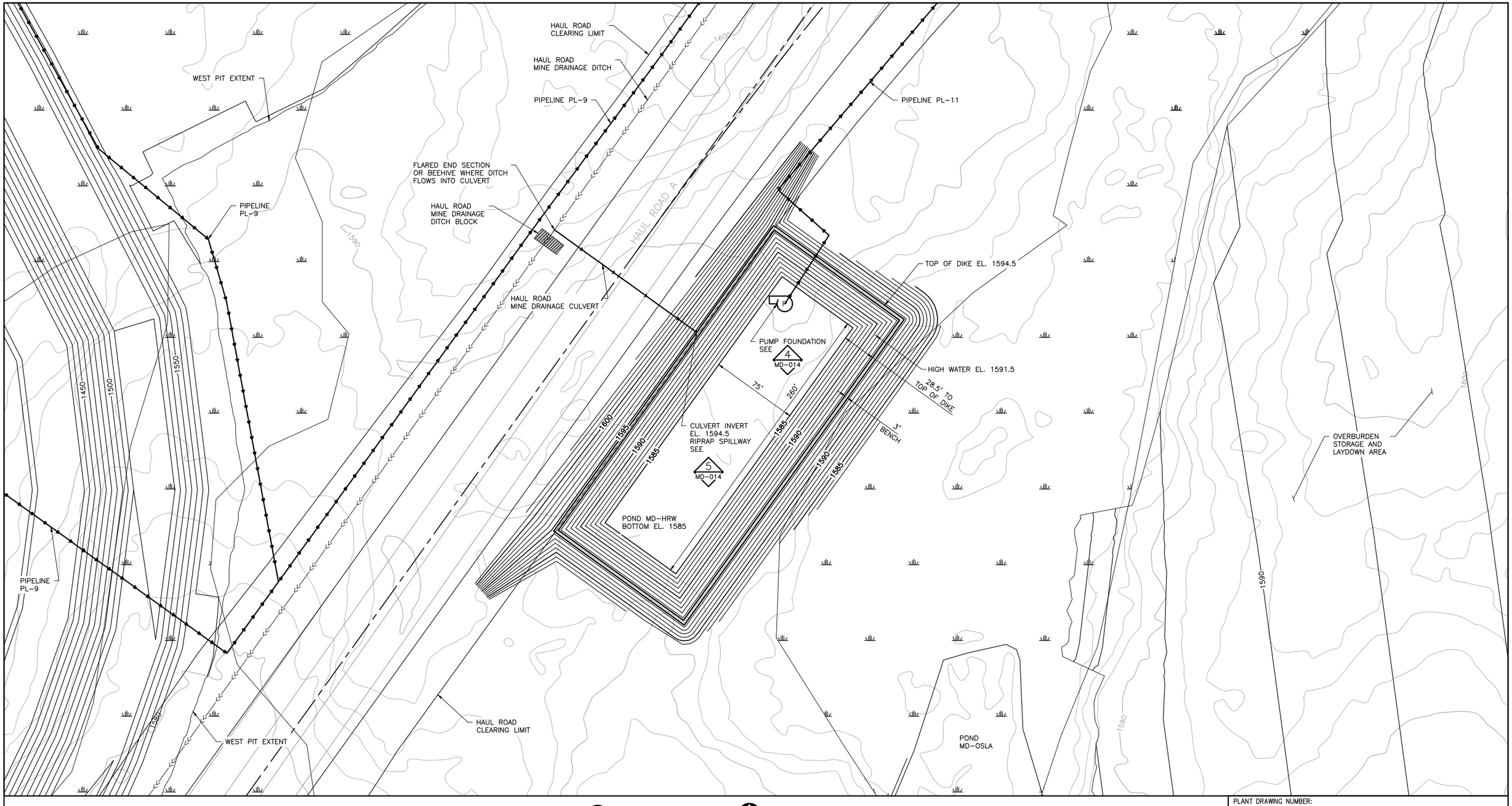
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-011

REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-143.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:18 PM

INCHES 1 2



NOTE:
1. MINE YEAR 11 CONTOURS ARE SHOWN FOR THE WEST PIT.

1 PLAN: POND MD-HRW

0 40 80

SCALE IN FEET

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PRINTED NAME CHRISTIE KEARNEY

SIGNATURE Christie Kearney

DATE 5/18/15 LICENSE# 48864

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE POND DESIGN
POND MD-HRW GRADING DESIGN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-012

REV

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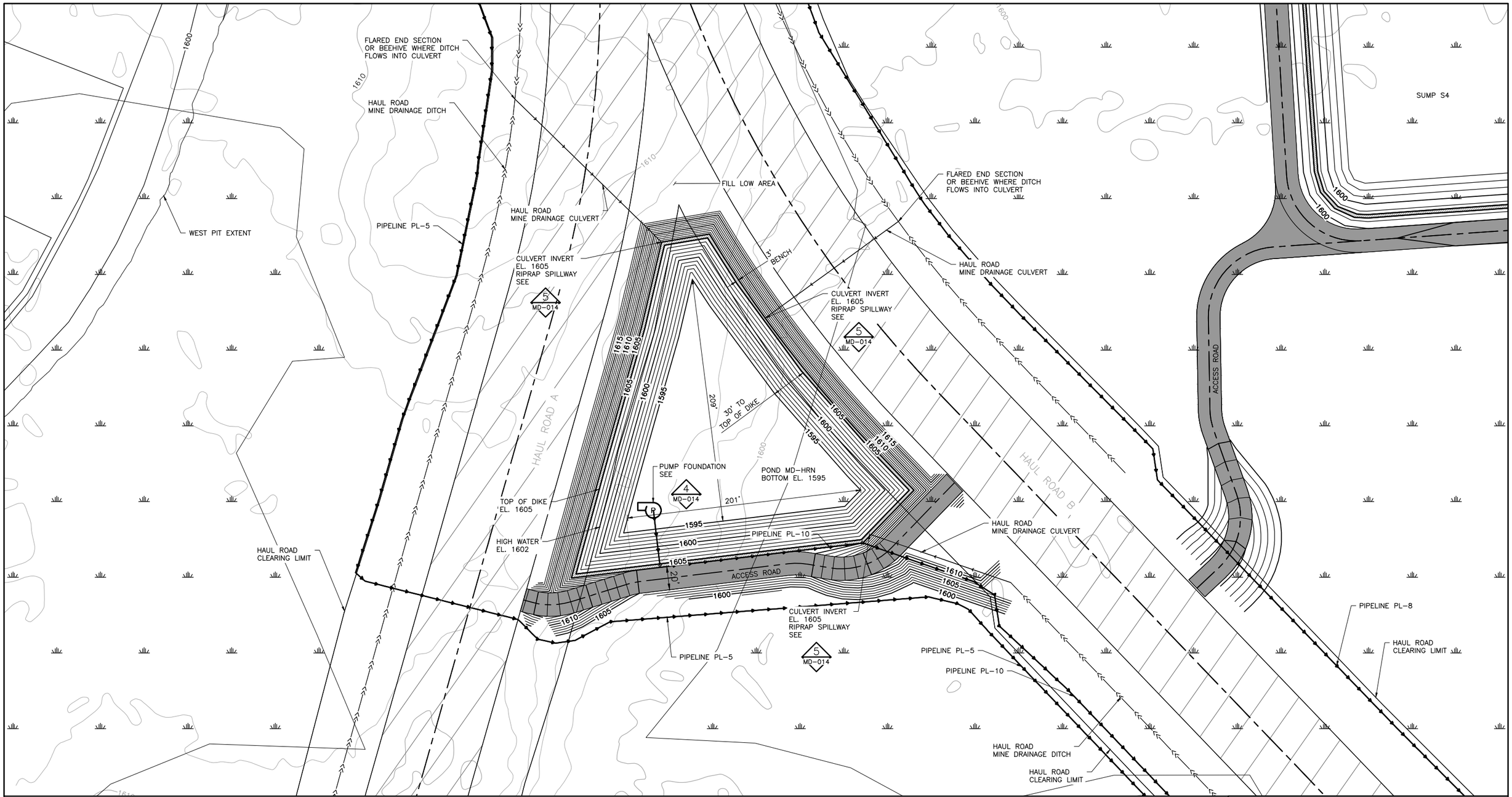

NOTE:
1. MINE YEAR 11 CONTOURS ARE SHOWN FOR THE WEST PIT.

1 PLAN: POND MD-HRN

0 40 80
SCALE IN FEET

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SIGNATURE
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CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
MINE DRAINAGE POND DESIGN
POND MD-HRN GRADING PLAN

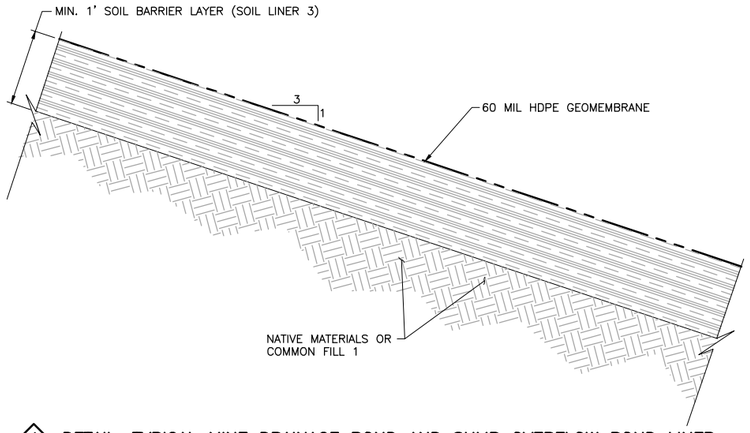
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

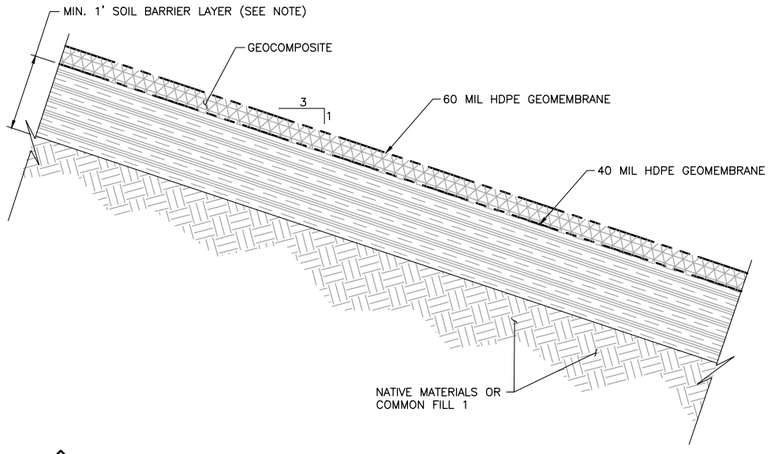
DWG. NO. MD-013
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-145.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:24 PM

INCHES 1 2

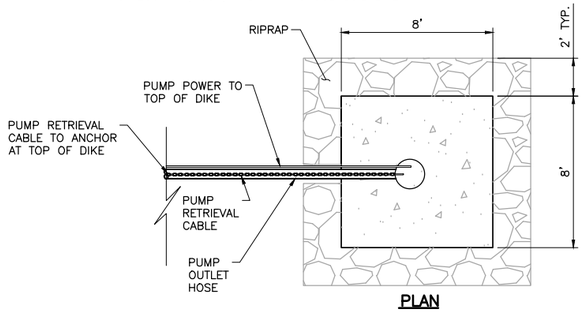


1 – DETAIL: TYPICAL MINE DRAINAGE POND AND SUMP OVERFLOW POND LINER
NOT TO SCALE

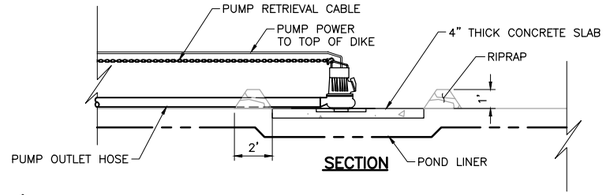


2 – DETAIL: TYPICAL CATEGORY 2/3, 4 AND OSP SUMP AND MD-RTH LINER
NOT TO SCALE

NOTE: SOIL BARRIER LAYER TO MATCH THE ASSOCIATED STOCKPILE: CATEGORY 2/3 TO USE SOIL LINER 2; CATEGORY 4, OSP, AND RTH TO USE SOIL LINER 1

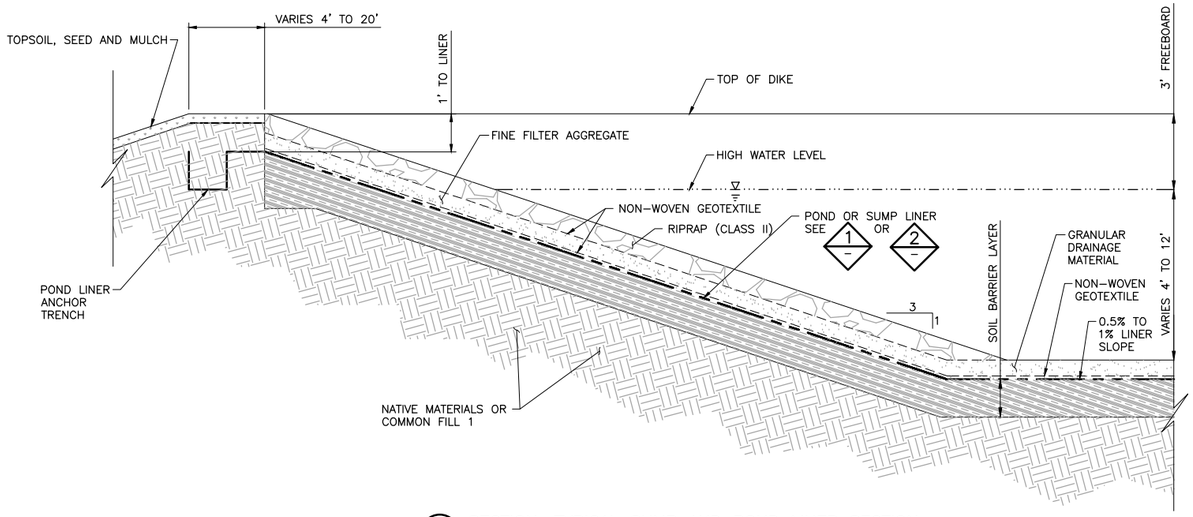


PLAN

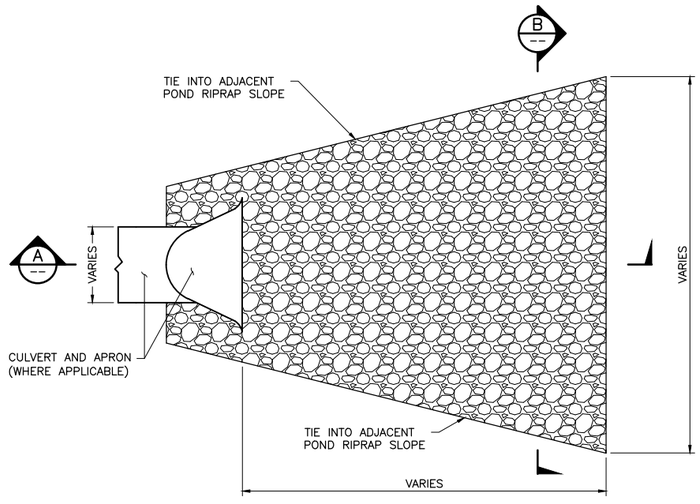


SECTION

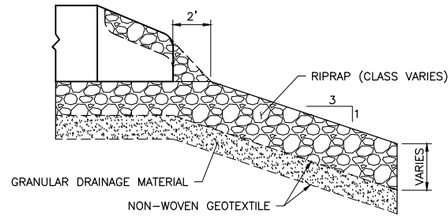
4 – DETAIL: TYPICAL SUMP AND POND PUMP FOUNDATION STRUCTURE
NOT TO SCALE



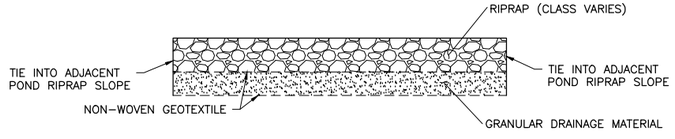
3 – SECTION: TYPICAL SUMP AND POND LINER SECTION
NOT TO SCALE



5 – DETAIL: RIPRAP SLOPE
NOT TO SCALE



A – SECTION: RIPRAP SLOPE
NOT TO SCALE



B – SECTION: RIPRAP SLOPE
NOT TO SCALE

NOTES:
1. RIPRAP GRADATION BASED ON EXPECTED VELOCITIES FROM 100 YEAR 24-HOUR STORM EVENT.
2. CULVERT OUTLETS TO RIPRAP SLOPE.

VER NO.	DATE	DESCRIPTION
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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE
SUMP/POND TYPICAL DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-014
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-55-CS-320.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:38 PM
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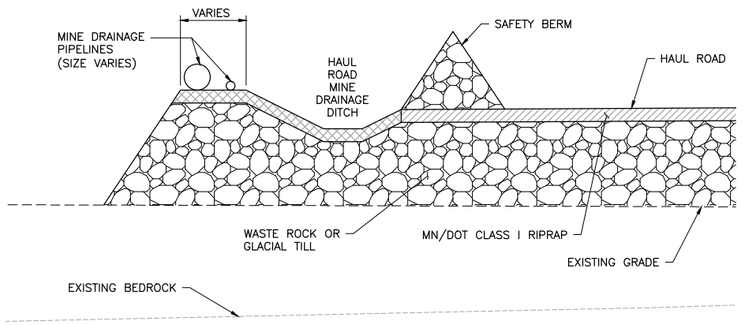
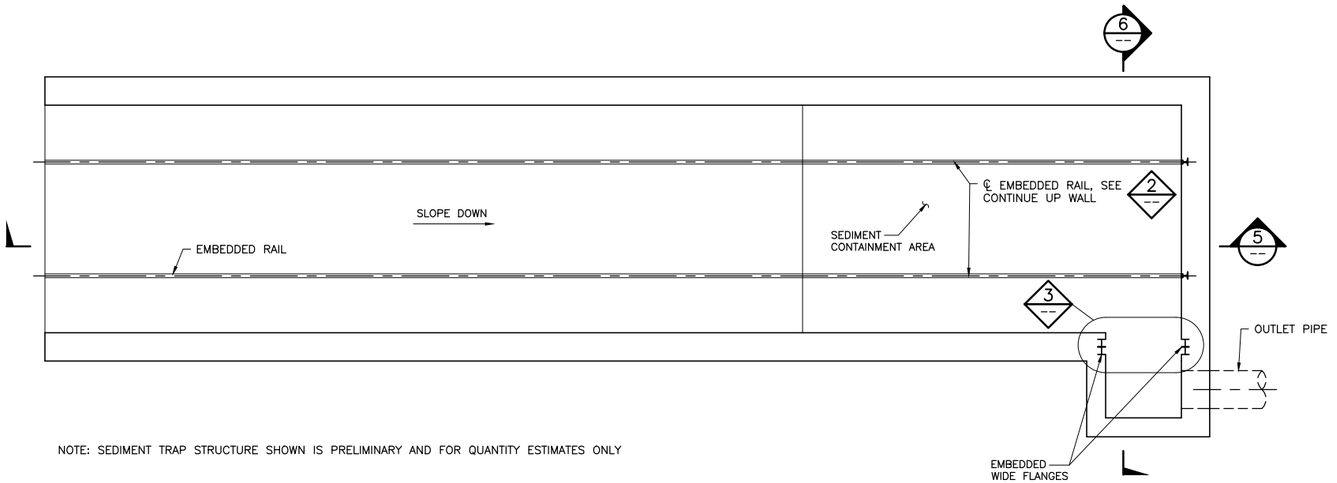


NOTES:

1. HAUL ROAD AND HAUL ROAD MINE DRAINAGE DITCH DESIGN IS SHOWN IN THE EARTHWORK DRAWINGS.
2. MINE DRAINAGE PIPELINES WILL BE SECURED WITH COVER MATERIAL OVER THE PIPES EVERY 100'

1 – SECTION: TYPICAL PIPE LOCATION

NOT TO SCALE

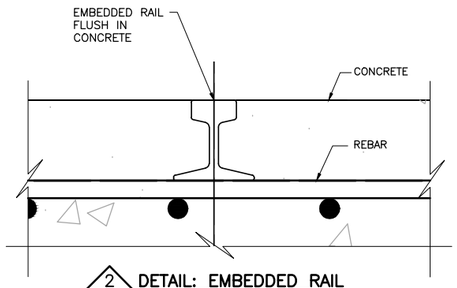


NOTE: SEDIMENT TRAP STRUCTURE SHOWN IS PRELIMINARY AND FOR QUANTITY ESTIMATES ONLY

4 – PLAN: SEDIMENT TRAP

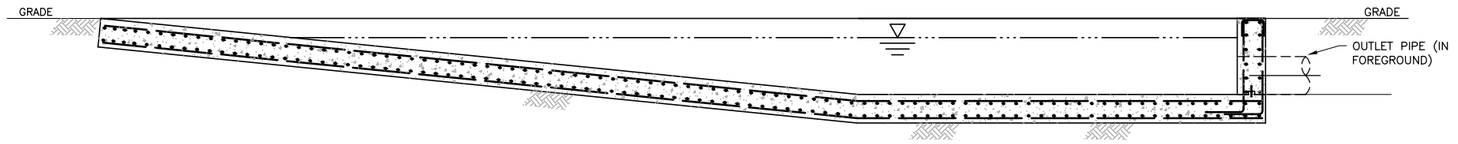
MD-009

0 1 5
SCALE



2 – DETAIL: EMBEDDED RAIL

0 3 6 9 1
SCALE



5 – SECTION: SEDIMENT TRAP

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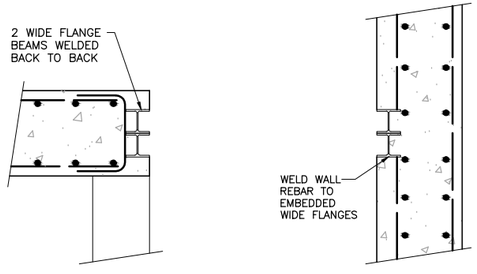
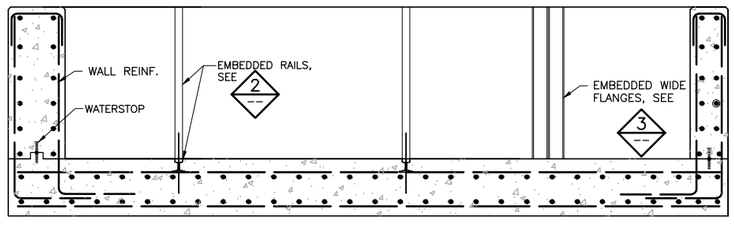
SCALE



3 – DETAIL: EMBEDDED WIDE FLANGES

NOT TO SCALE



6 – SECTION: SEDIMENT TRAP

0 1 2 3 4 5
SCALE

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PRINTED NAME CHRISTIE KEARNEY
SIGNATURE Christie Kearney
DATE 5/18/15 LICENSE# 48864

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE SECTIONS AND DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

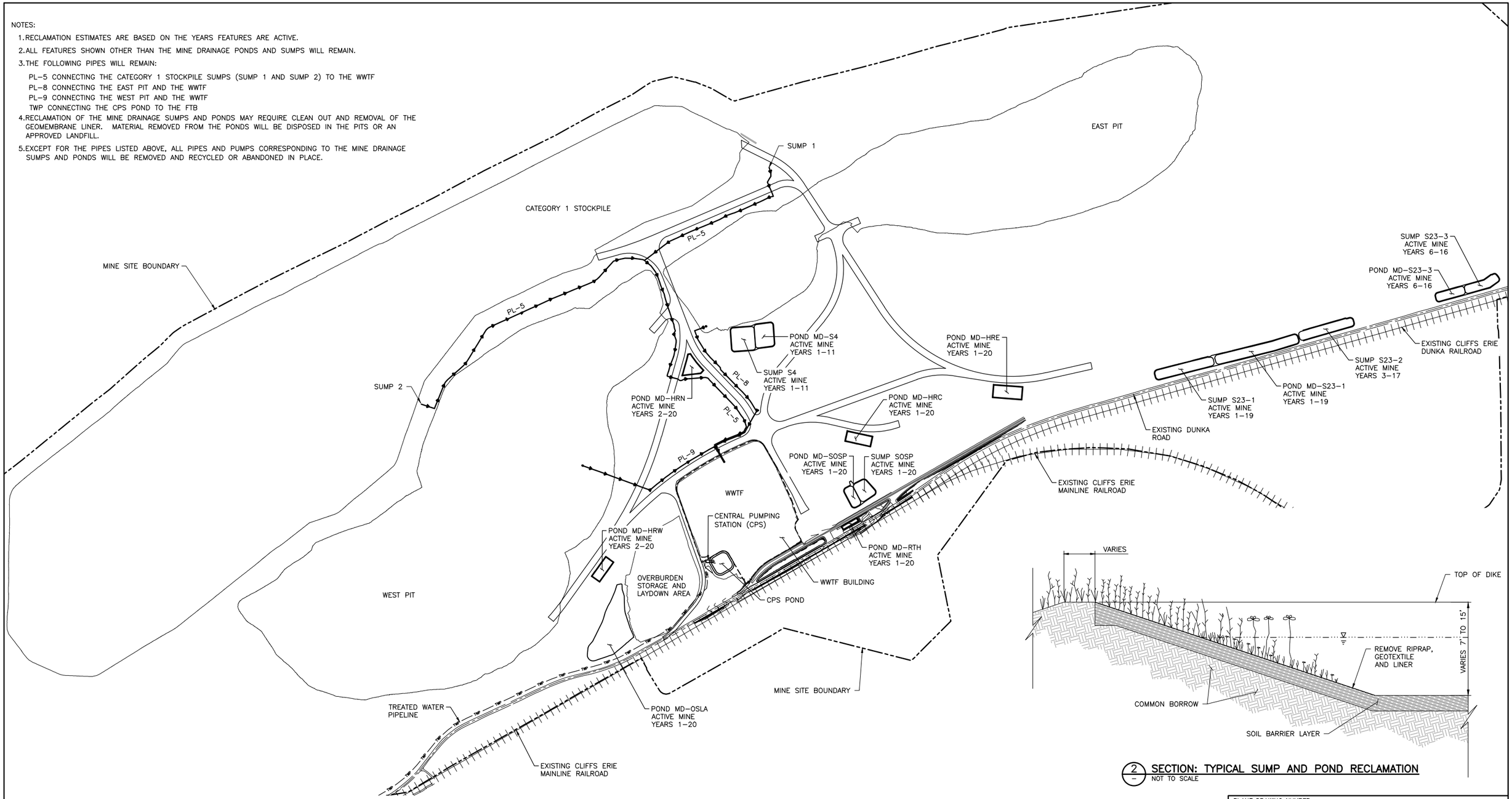
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. MD-015
REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-54-CU-300.DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:33 PM
INCHES 1 2

NOTES:

1. RECLAMATION ESTIMATES ARE BASED ON THE YEARS FEATURES ARE ACTIVE.
2. ALL FEATURES SHOWN OTHER THAN THE MINE DRAINAGE PONDS AND SUMPS WILL REMAIN.
3. THE FOLLOWING PIPES WILL REMAIN:
   - PL–5 CONNECTING THE CATEGORY 1 STOCKPILE SUMPS (SUMP 1 AND SUMP 2) TO THE WWTF
   - PL–8 CONNECTING THE EAST PIT AND THE WWTF
   - PL–9 CONNECTING THE WEST PIT AND THE WWTF
   - TWP CONNECTING THE CPS POND TO THE FTB
4. RECLAMATION OF THE MINE DRAINAGE SUMPS AND PONDS MAY REQUIRE CLEAN OUT AND REMOVAL OF THE GEOMEMBRANE LINER. MATERIAL REMOVED FROM THE PONDS WILL BE DISPOSED IN THE PITS OR AN APPROVED LANDFILL.
5. EXCEPT FOR THE PIPES LISTED ABOVE, ALL PIPES AND PUMPS CORRESPONDING TO THE MINE DRAINAGE SUMPS AND PONDS WILL BE REMOVED AND RECYCLED OR ABANDONED IN PLACE.



1 PLAN: GENERAL LAYOUT RECLAMATION

0 600 1200

SCALE IN FEET

2 SECTION: TYPICAL SUMP AND POND RECLAMATION

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1	5/18/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

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PRINTED NAME CHRISTIE KEARNEY

SIGNATURE

DATE 5/18/15 LICENSE# 48864

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE DRAINAGE INFRASTRUCTURE RECLAMATION PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. MD–016

REV

CADD USER: Veronica Sackett FILE: K:\DESIGN\23690C29.10\PERMIT_NMM–55–CS–102–DWG PLOT SCALE: 1:2 PLOT DATE: 5/18/2015 2:32 PM

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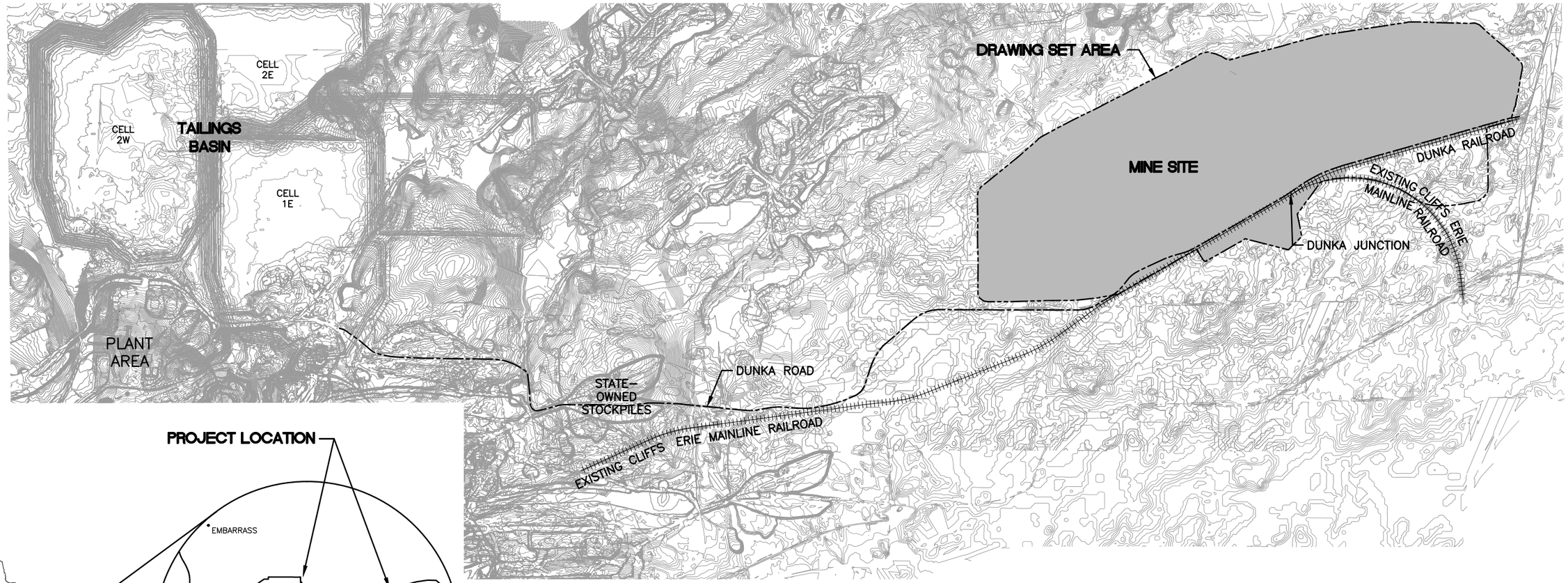
Mine Site Stormwater

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
MINE SITE STORMWATER
HOYT LAKES, MINNESOTA



SITE MAP

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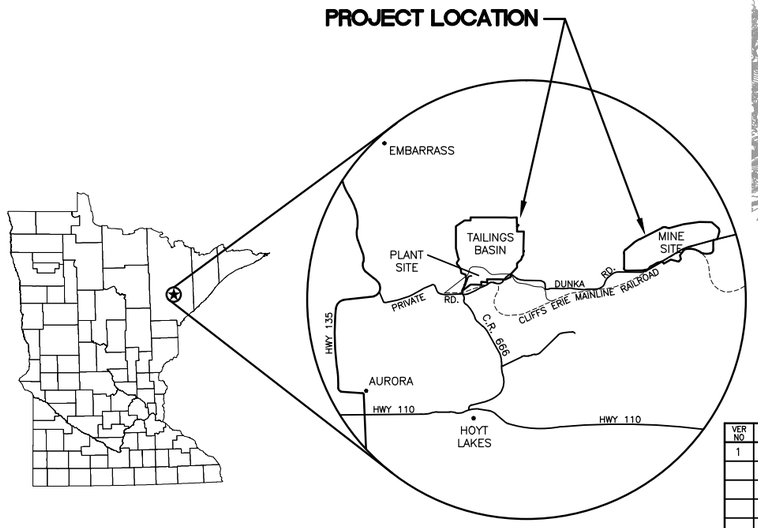

LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO.	DATE	DESCRIPTION
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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
LOCATION MAP AND SITE MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-001
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-00-TS-003.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 4:04 PM

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GENERAL LEGEND

EXISTING

- EXISTING CONTOUR – MAJOR (1000)
- EXISTING POWER POLE
- EXISTING RAILROAD
- WATER EDGE/CREEK CENTER LINE
- EXISTING ROAD
- RIGHT OF WAY (R/W)
- PROPERTY LINE
- MINE SITE BOUNDARY
- EXISTING STRUCTURES
- WETLAND BOUNDARY
- EXISTING OVERHEAD ELECTRIC (OE)
- EXISTING UNDERGROUND ELECTRIC (UE)
- EXISTING CULVERT
- PROPOSED MINE DRAINAGE CULVERT

PROPOSED

- PROPOSED CONTOUR – MAJOR (1000)
- PROPOSED CONTOUR – MINOR
- PROPOSED ACCESS ROADS
- PROPOSED STORMWATER DRAIN
- SURFACE DRAINAGE

SHEET INDEX

SHEET NO.	TITLE
GENERAL DRAWINGS	
SW–001	STORMWATER LOCATION MAP AND SITE MAP
SW–002	STORMWATER LEGEND AND SHEET INDEX
SW–003	STORMWATER SITE DRAINAGE PLAN MINE YEAR 1
SW–004	STORMWATER SITE DRAINAGE PLAN MINE YEAR 11
SW–005	STORMWATER SITE DRAINAGE PLAN MINE YEAR 20
SW–006	STORMWATER SHEET LOCATION MAP
SW–007	STORMWATER TYPICAL DIKES AND DITCHES CROSS SECTIONS
SW–008	STORMWATER SEDIMENTATION POND A GRADING PLAN AND DETAILS
SW–009	STORMWATER SEDIMENTATION POND B GRADING PLAN AND DETAILS
SW–010	STORMWATER SEDIMENTATION POND C–EAST GRADING PLAN AND DETAILS
SW–011	STORMWATER SEDIMENTATION POND C–WEST GRADING PLAN AND DETAILS
SW–012	STORMWATER SEDIMENTATION POND D GRADING PLAN AND DETAILS
SW–013	STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 10+00N – 38+50N
SW–014	STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 38+50N – 66+50N
SW–015	STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 66+50N – 94+00N
SW–016	STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 94+00N – 122+00N
SW–017	STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 122+00N – 144+00N
SW–018	STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 146+00N – 162+00N
SW–019	STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 162+00N – 183+00N
SW–020	STORMWATER SOUTH DIKE AND DITCH PLAN AND PROFILE STATION 10+00S – 22+95S
SW–021	STORMWATER DITCH B PLAN AND PROFILE STATION 0+00B – 17+50B
SW–022	STORMWATER DITCH B PLAN AND PROFILE STATION 17+50B – 35+00B
SW–023	STORMWATER DITCH C(E) PLAN AND PROFILE STATION 0+00C(E) – 19+64C(E)
SW–024	STORMWATER DITCH C(W) PLAN AND PROFILE STATION 0+00C(W) – 18+00C(W)
SW–025	STORMWATER DITCH C(W) PLAN AND PROFILE STATION 18+00C(W) – 34+50C(W)
SW–026	STORMWATER DITCH C(W) PLAN AND PROFILE STATION 35+00C(W) – 55+00C(W)
SW–027	STORMWATER DITCH C(W) PLAN AND PROFILE STATION 55+00C(W) – 75+00C(W)
SW–028	STORMWATER DITCH C(W) PLAN AND PROFILE STATION 75+00C(W) – 94+60C(W)
SW–029	STORMWATER DITCH C(W) PLAN AND PROFILE STATION 95+00C(W) – 124+35C(W)
SW–030	STORMWATER DITCH D PLAN AND PROFILE STATION 0+00D – 27+00D
SW–031	STORMWATER DIKES, DITCHES, AND PONDS CLOSURE PLAN

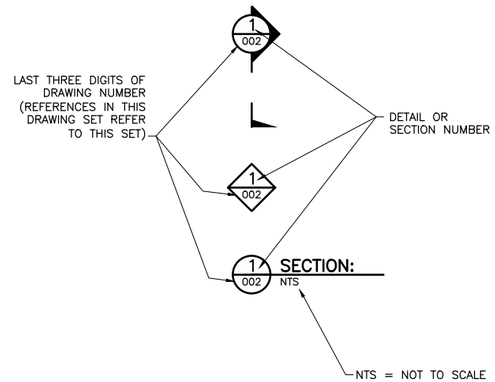
NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE BASED ON MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.
4. CULVERT DIMENSIONS ARE PRELIMINARY. FINAL DIMENSIONS SHALL BE DETERMINED DURING FINAL DESIGN.
5. THE BEDROCK PROFILES SHOWN ON THESE DRAWINGS REPRESENT THE BEST AVAILABLE INFORMATION FOR PLANNING PURPOSES. THE BEDROCK SURFACE FROM WHICH THE PROFILES ARE EXTRACTED IS A THREE–DIMENSIONAL, MODELED SURFACE THAT RESULTED FROM DEDUCTING THE DEPTH TO BEDROCK IDENTIFIED ON LOGS OF BORINGS CONDUCTED AT THE MINE SITE FROM THE LIDAR TOPOGRAPHIC GROUND SURFACE MODEL. THE RESULTING DATA WAS THEN MODELED IN GIS SOFTWARE TO DEVELOP A THREE–DIMENSIONAL BEDROCK SURFACE. THE PROFILES SHOW SIGNIFICANT DETAIL IN LOCAL ELEVATIONS, WHICH MAY OR MAY NOT ACTUALLY EXIST. THE BEDROCK SURFACE PROFILES SHOULD BE TAKEN AS REPRESENTATIVE, BUT NOT NECESSARILY PRECISE.

ABBREVIATIONS

CATEGORY 1 STOCKPILE	–	CATEGORY 1 WASTE ROCK STOCKPILE
CATEGORY 2/3 STOCKPILE	–	CATEGORY 2/3 WASTE ROCK STOCKPILE
CL	–	CENTERLINE
CPS	–	CENTRAL PUMPING STATION
D50	–	THE MEDIAN PARTICLE DIAMETER OF A PARTICLESIZE DISTRIBUTION; THE SIZE AT WHICH 50% OF THE PARTICLES IN THE MATERIAL PARTICLE SIZE DISTRIBUTION CURVE ARE SMALLER
EL	–	ELEVATION
INV	–	INVERT
I, I, III, IV, V	–	ROMAN NUMERALS FOR RIPRAP CLASSIFICATION
kV	–	KILOVOLT
LF	–	LINEAR FEET
MP	–	MINNESOTA POWER
NWL	–	NORMAL WATER LEVEL
RCP	–	REINFORCED CONCRETE PIPE
O.C.	–	ON CENTER
OSLA	–	OVERBURDEN STORAGE AND LAYDOWN AREA
PVI	–	POINT OF VERTICAL
SWPPP	–	STORMWATER POLLUTION PREVENTION PLAN
TWP	–	TREATED WATER PIPELINE
WWTF	–	WASTE WATER TREATMENT FACILITY
(E)	–	EAST
(W)	–	WEST

DRAWING NUMBERING



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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER LEGEND AND SHEET INDEX

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. SW–002 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM–SW–002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 4:05 PM

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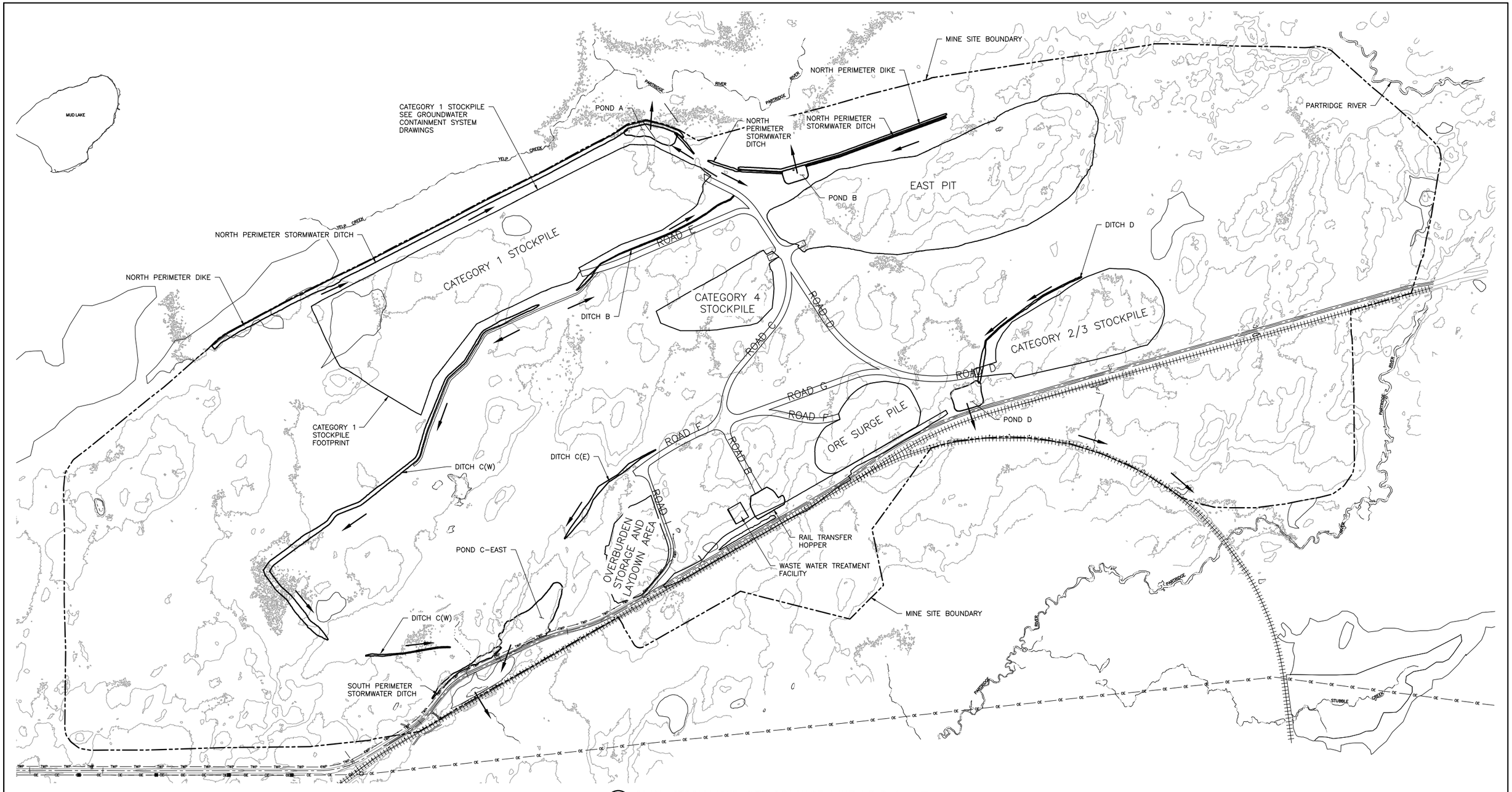

1 PLAN: STORMWATER SITE DRAINAGE MINE YEAR 1

0 700 1400
SCALE IN FEET

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DATE 5/26/15 LICENSE# 20533

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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
SITE DRAINAGE PLAN
MINE YEAR 1

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-003
REV

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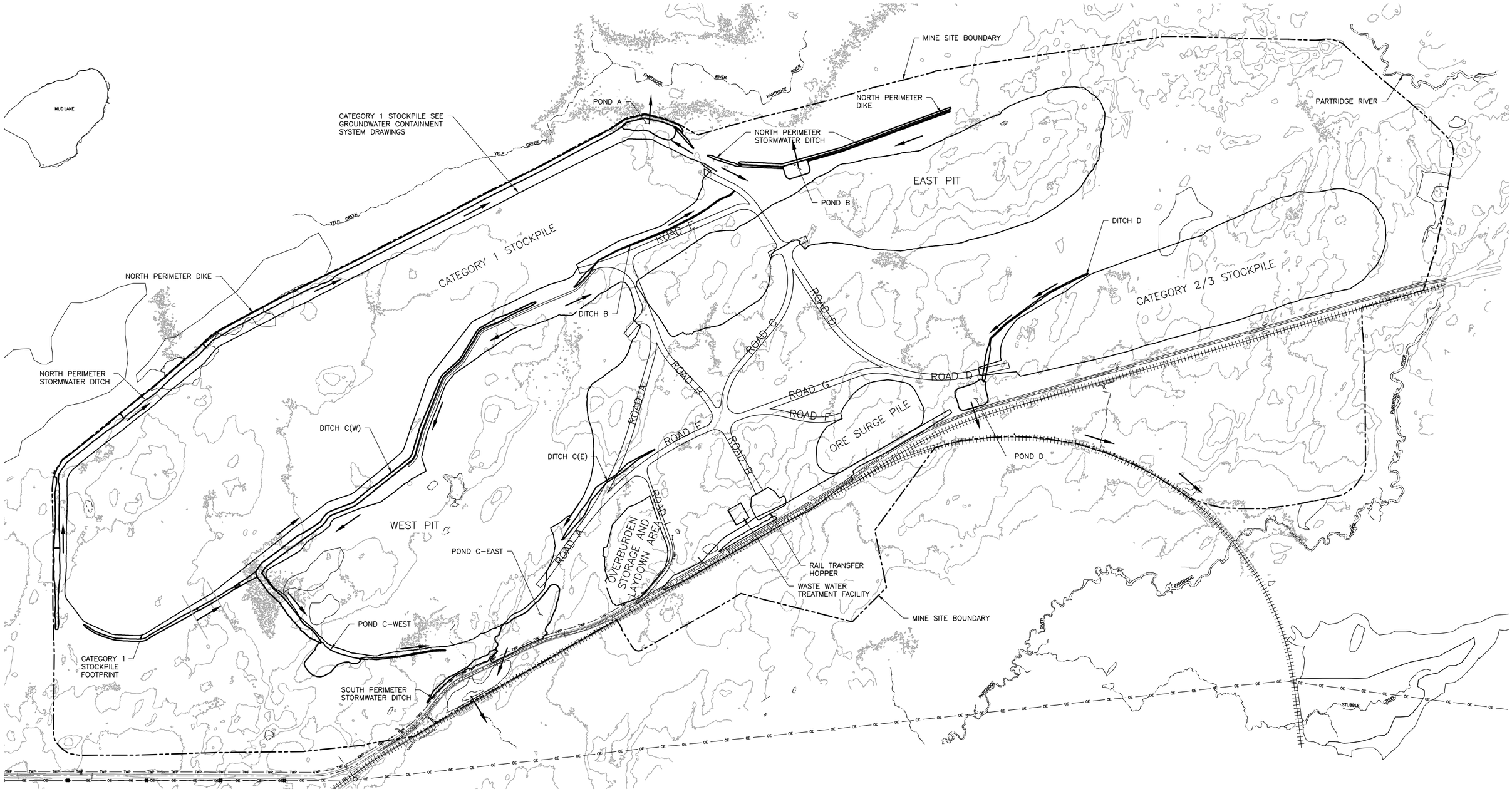

1 PLAN: STORMWATER SITE DRAINAGE MINE YEAR 11

0 700 1400
SCALE IN FEET

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DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
SITE DRAINAGE PLAN
MINE YEAR 11

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-004
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-SW-004.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 8:33 PM

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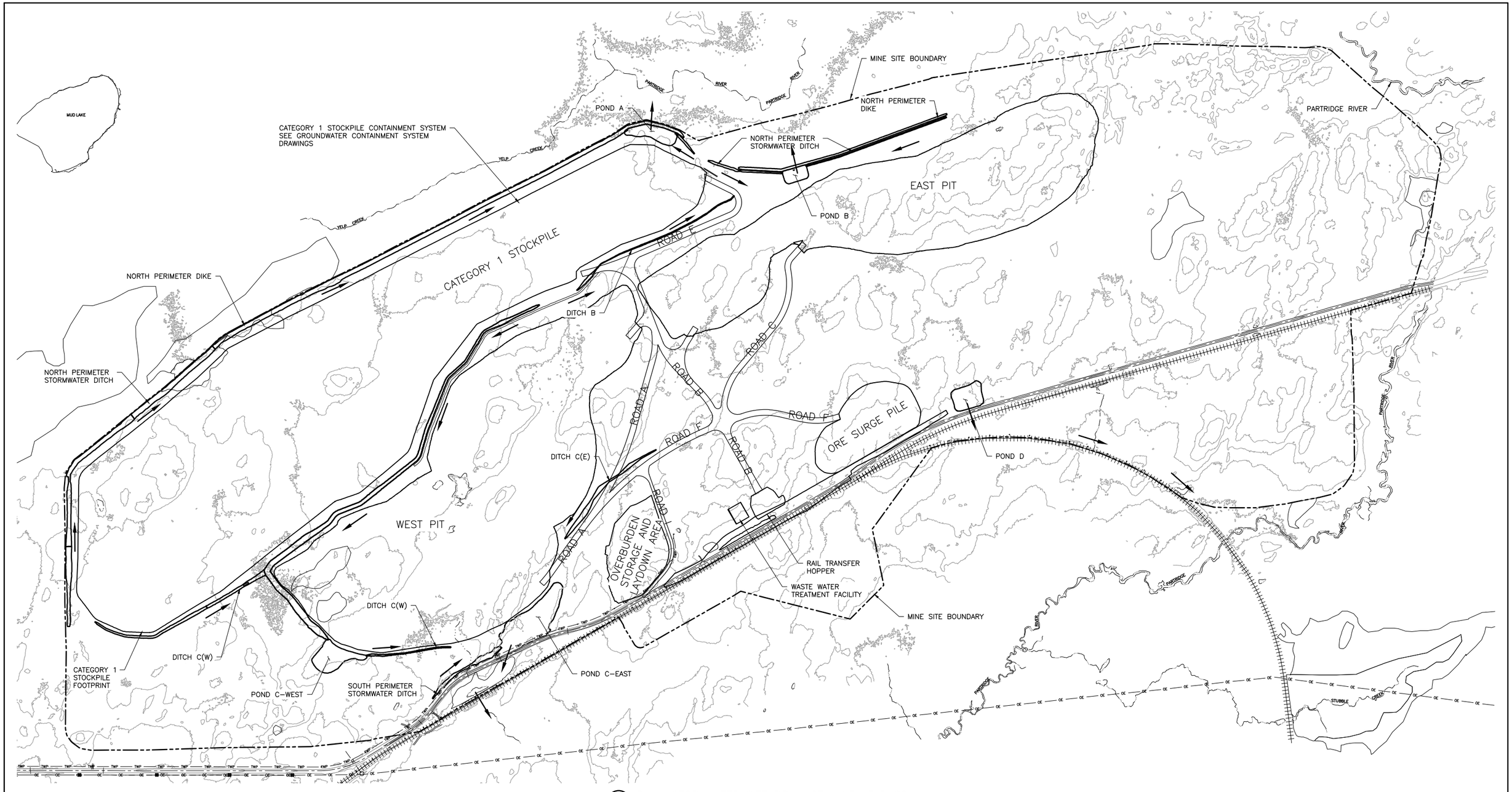

1 PLAN: STORMWATER SITE DRAINAGE MINE YEAR 20

0 700 1400
SCALE IN FEET

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
SITE DRAINAGE PLAN
MINE YEAR 20

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

DWG. NO. SW-005 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-SW-005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 8:49 PM
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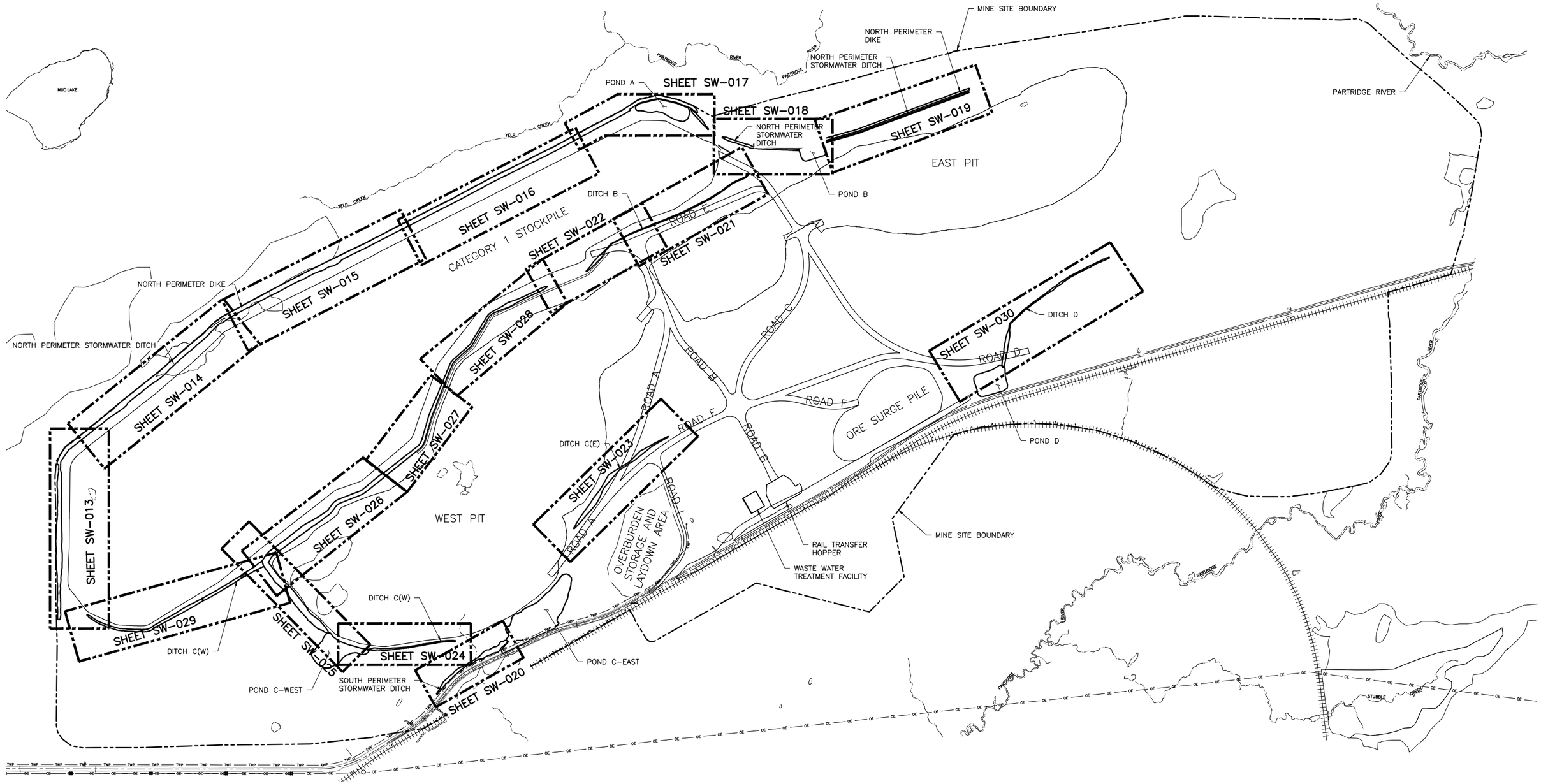

1 PLAN: STORMWATER SHEET LOCATION MAP

0 700 1400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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ISSUED	VERSION	DATE
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SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER SHEET LOCATION MAP

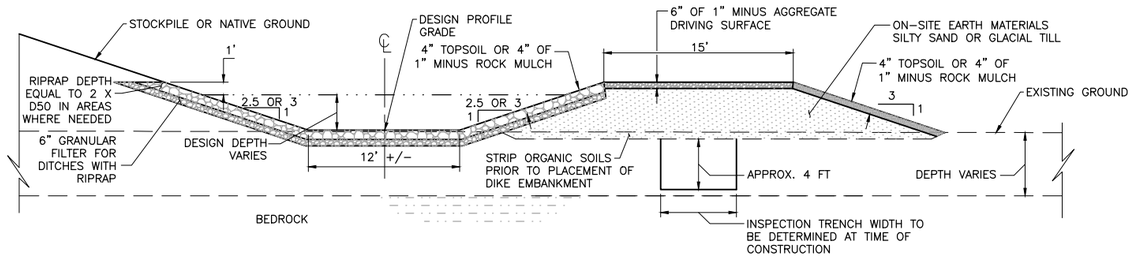
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

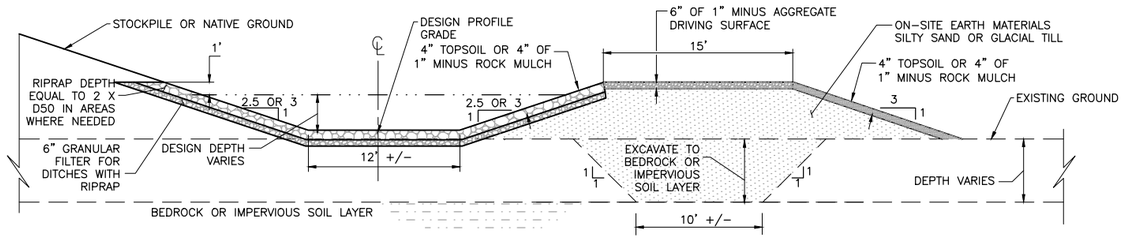
DWG. NO. SW-006 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-SW-006.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 8:55 PM



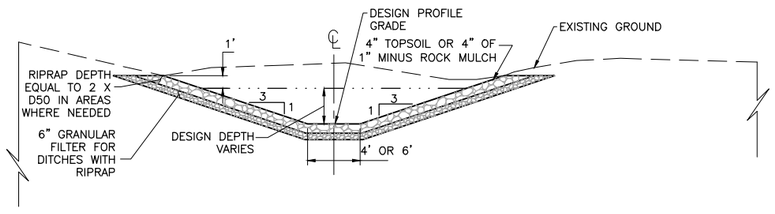
1 – SECTION: TYPICAL PERIMETER DIKE AND DITCH WITHOUT SEEPAGE CUTOFF TRENCH

0 6 12
SCALE IN FEET



2 – SECTION: TYPICAL PERIMETER DIKE AND DITCH WITH SEEPAGE CUTOFF TRENCH

0 6 12
SCALE IN FEET



3 – SECTION: TYPICAL INTERIOR DITCH

0 6 12
SCALE IN FEET

NOTES

1. DITCHES NOT REQUIRING RIPRAP WILL BE CONSTRUCTED WITH NATIVE SOILS AND EITHER 4" TOPSOIL OR 4" OF 1" MINUS ROCK MULCH TO DESIGN PROFILE GRADE.
2. RESTORE ALL DISTURBED AREAS NOT STABILIZED WITH RIPRAP IN ACCORDANCE WITH THE SWPPP.
3. DESIGN DEPTH ESTABLISHED IN FINAL DESIGN OR IN FIELD. TOP OF DIKE TO FLOWLINE OF DITCH SHALL PROVIDE 1 FOOT OF FREEBOARD FROM DESIGN DEPTH.
4. INSPECTION TRENCH TO BE CONSTRUCTED ALONG ENTIRE LENGTH OF PERIMETER DIKES WHERE NON-ORGANIC MATERIALS ARE PRESENT.
5. PERIMETER DITCH AND DIKE ALONG THE NORTH SIDE OF THE CATEGORY 1 STOCKPILE (STATION 10+00 TO 143+53) SHALL HAVE 2.5H:1V SIDE SLOPES. ALL OTHER DITCHES AND DIKES SHALL HAVE SIDE SLOPES OF 3H:1V.

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
TYPICAL DIKES AND DITCHES
CROSS SECTIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-007
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-300.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 8:56 PM
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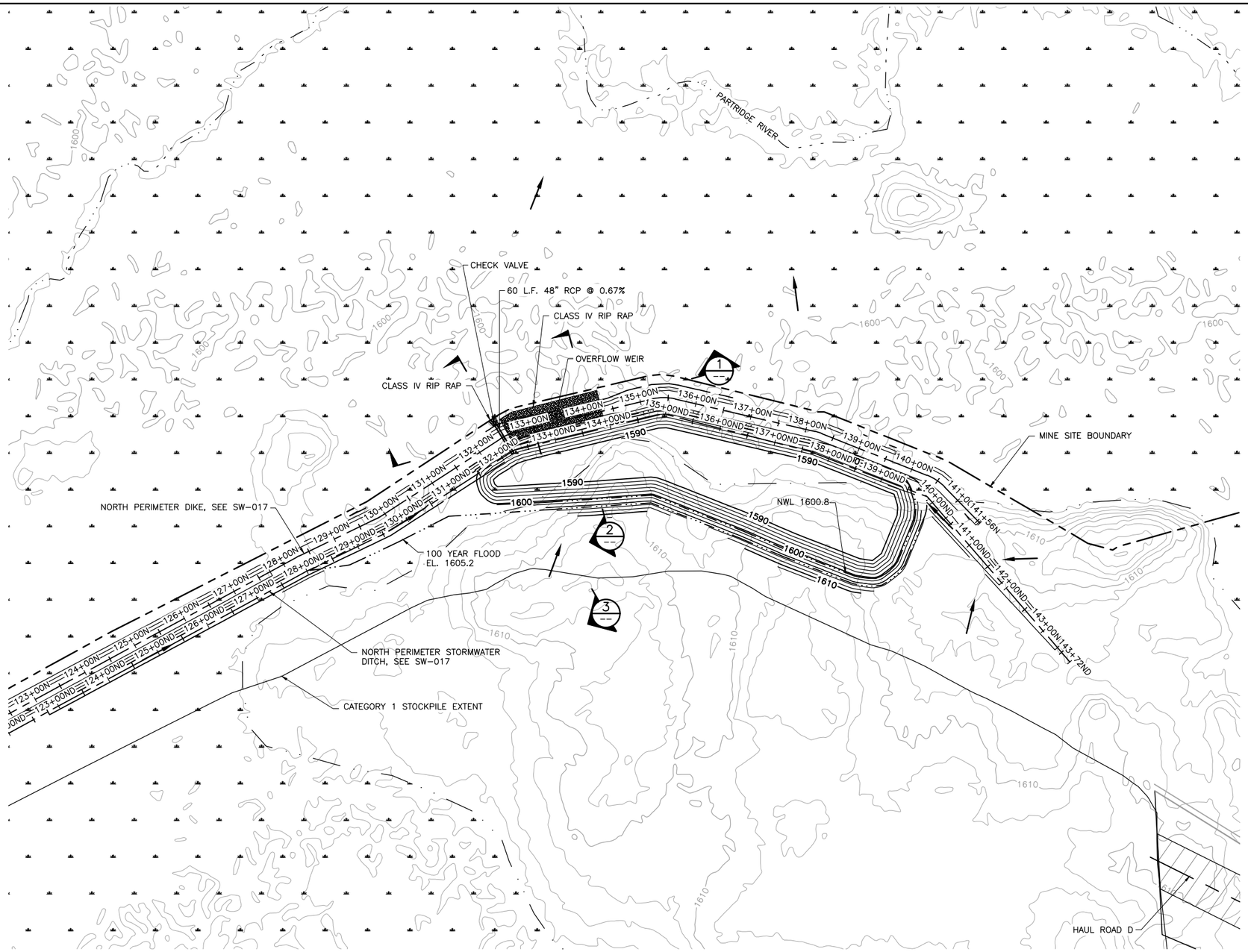
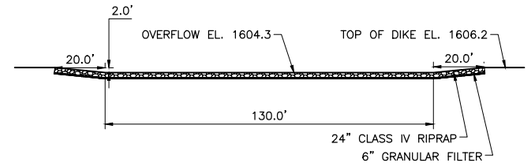


1 PLAN: STORMWATER SEDIMENTATION POND A

0 100 200

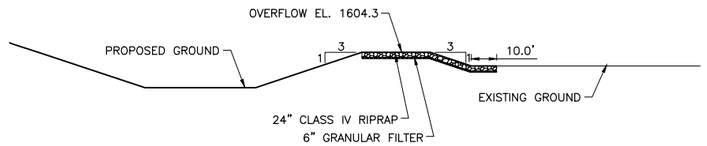
SCALE IN FEET



1 SECTION: OVERFLOW WEIR CREST

0 30 60

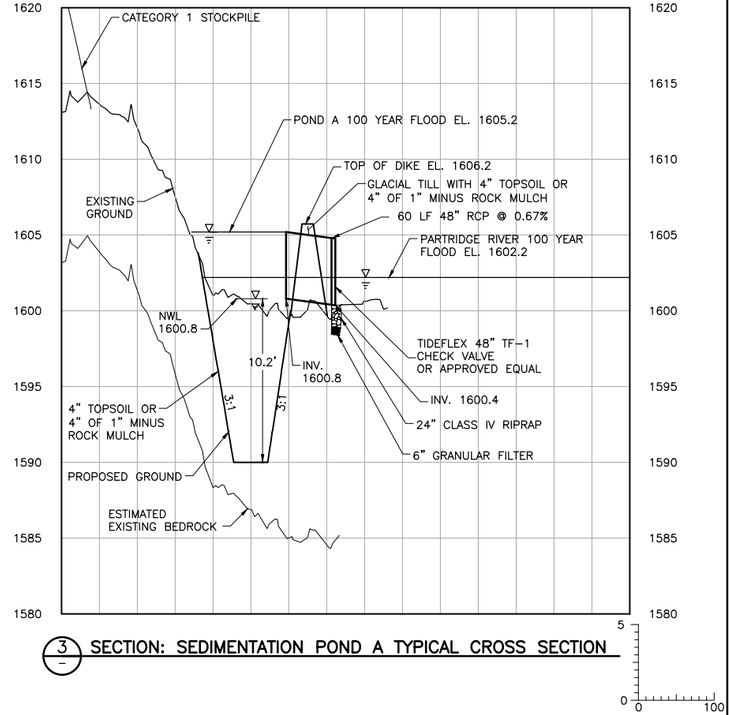
SCALE IN FEET



2 SECTION: OVERFLOW WEIR SPILLWAY

0 30 60

SCALE IN FEET



3 SECTION: SEDIMENTATION POND A TYPICAL CROSS SECTION

0 0 100

SCALE IN FEET

NOTES

1. ALL DISTURBED AREAS WILL BE RESTORED IN ACCORDANCE WITH THE SWPPP.

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PRINTED NAME PAUL T. SWENSON

SIGNATURE

DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS

CHECKED: ATS

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER SEDIMENTATION POND A GRADING PLAN AND 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

DWG. NO. SW-008

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-150.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 2:18 PM
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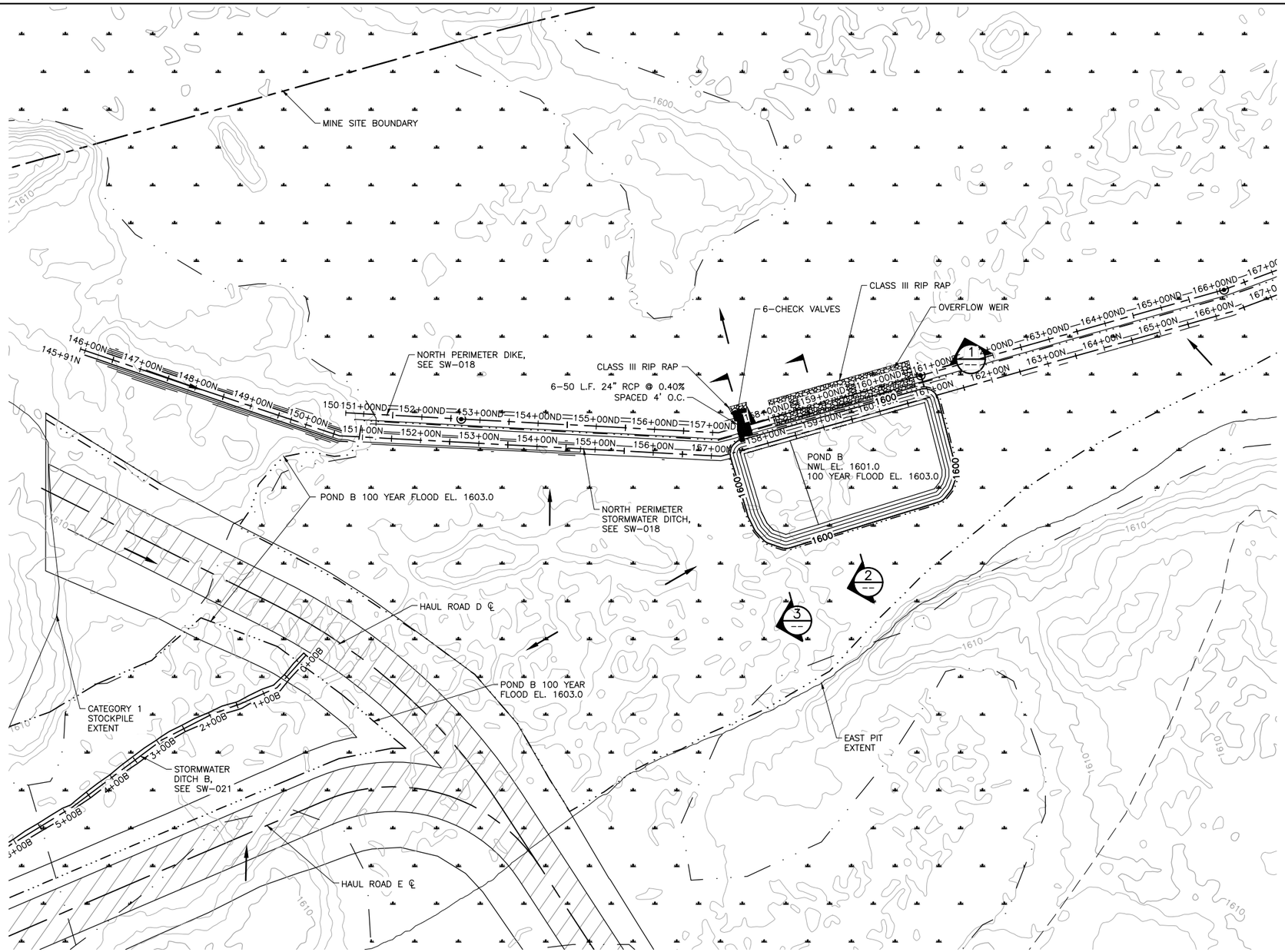
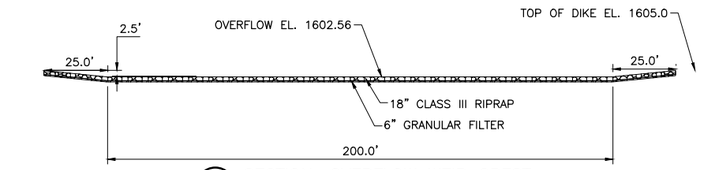
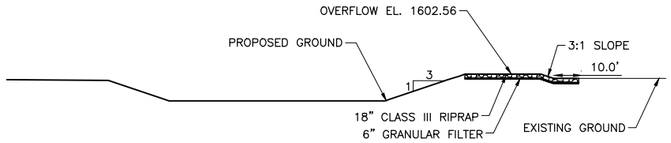


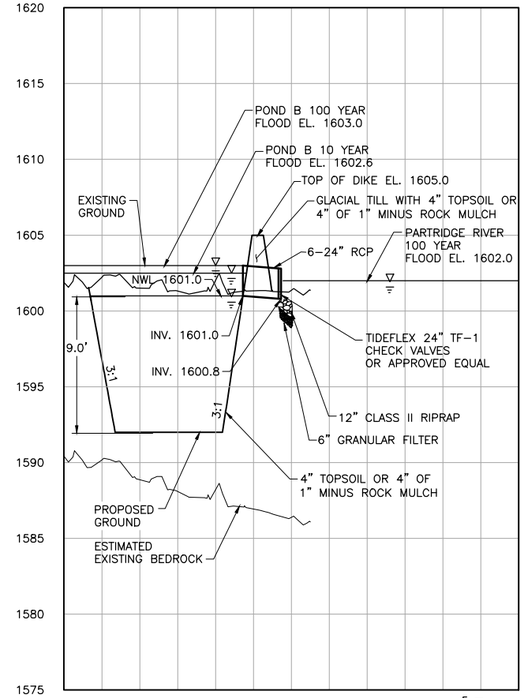
1 PLAN: STORMWATER SEDIMENTATION POND B
0 100 200
SCALE IN FEET



1 SECTION: OVERFLOW WEIR CREST
0 30 60
SCALE IN FEET



2 SECTION: OVERFLOW WEIR SPILLWAY
0 30 60
SCALE IN FEET



3 SECTION: SEDIMENTATION POND B TYPICAL CROSS SECTION
5
0 0 100
SCALE IN FEET

NOTES

1. ALL DISTURBED AREAS WILL BE RESTORED IN ACCORDANCE WITH THE SWPPP.

VER NO.	DATE	DESCRIPTION
1	5/26/15	ISSED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/26/15
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 PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER SEDIMENTATION POND B GRADING PLAN AND DETAILS

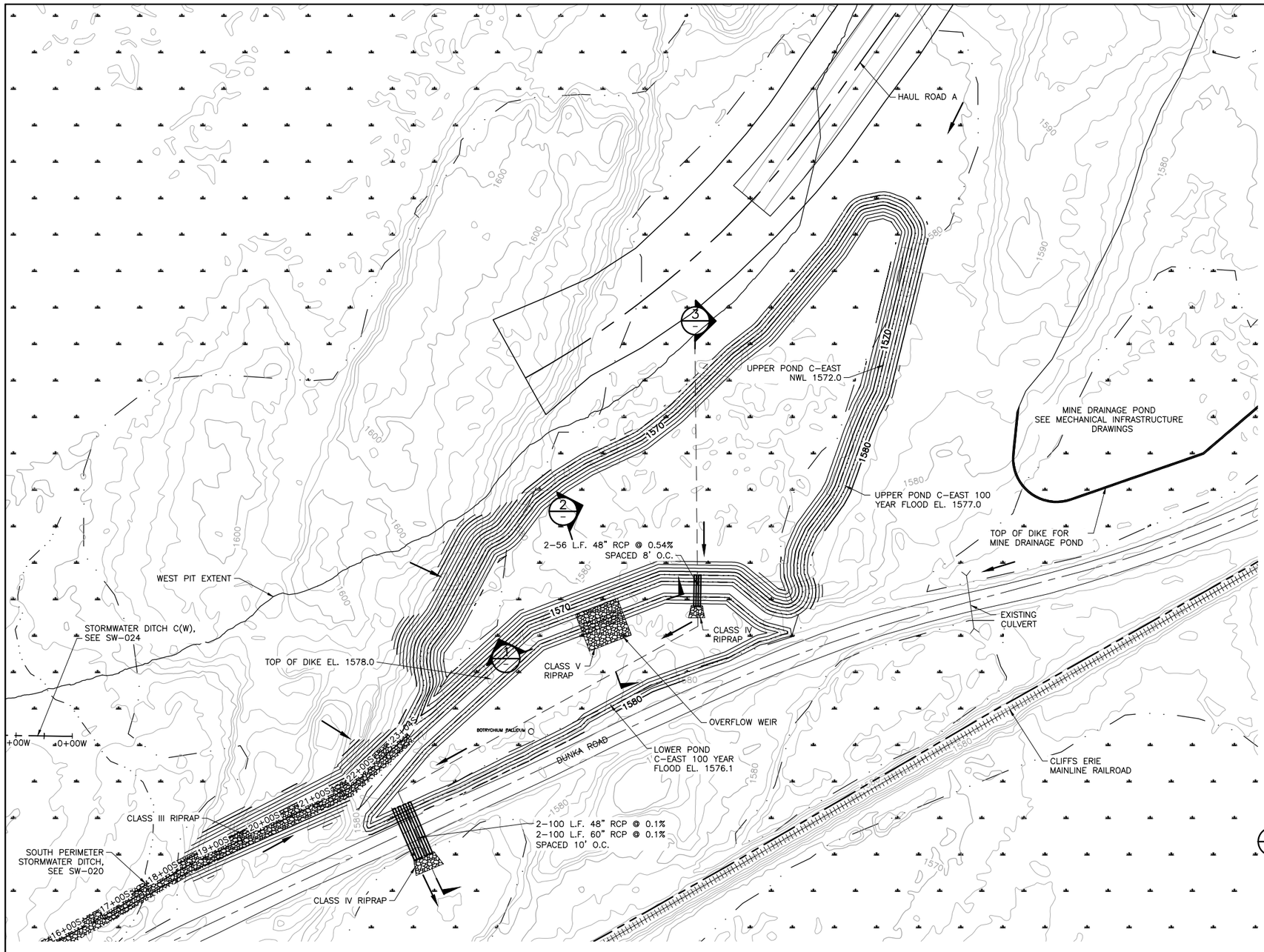
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-009
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-151.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 2:28 PM

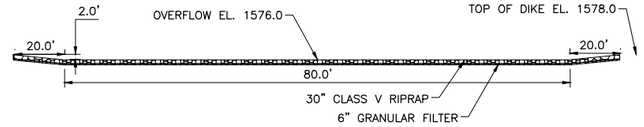
INCHES 1 2



1 PLAN: STORMWATER SEDIMENTATION POND C-EAST

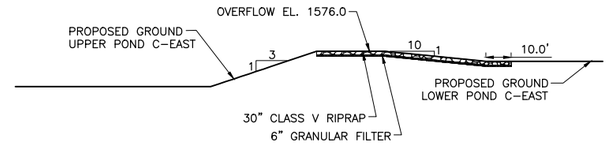
0 100 200

SCALE IN FEET



1 SECTION: OVERFLOW WEIR CREST

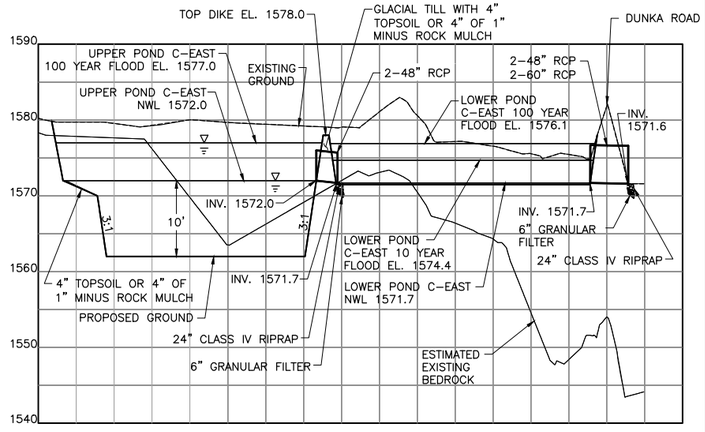
N.T.S.



2 SECTION: UPPER POND OVERFLOW WEIR SPILLWAY

0 30 60

SCALE IN FEET



3 SECTION: UPPER POND SEDIMENTATION POND C-EAST TYPICAL CROSS SECTION

10

0 0 100

SCALE IN FEET

NOTES

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PRINTED NAME PAUL T. SWENSON

SIGNATURE

DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS

CHECKED: ATS

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
SEDIMENTATION POND C-EAST
GRADING PLAN AND DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

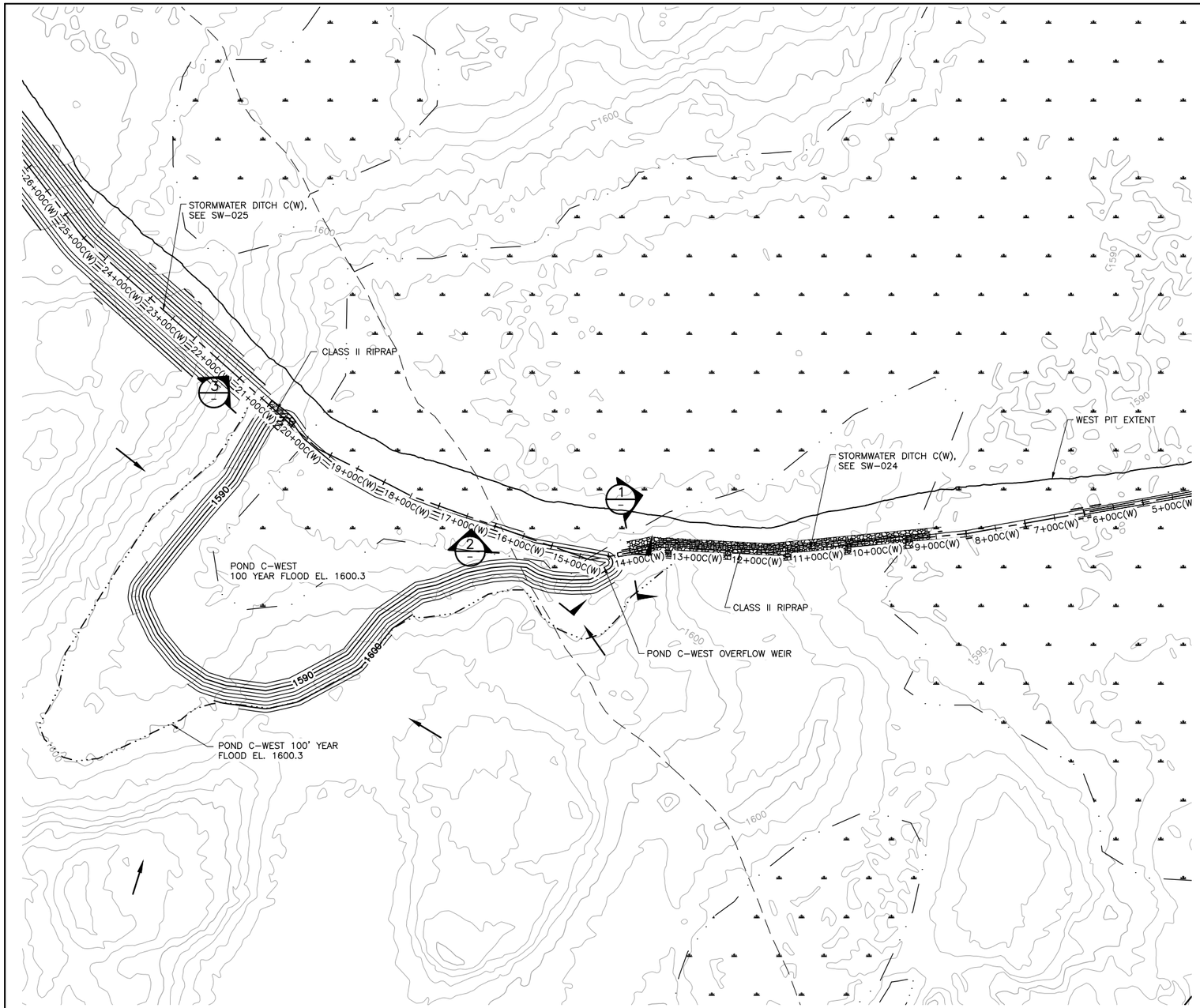
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-010

REV

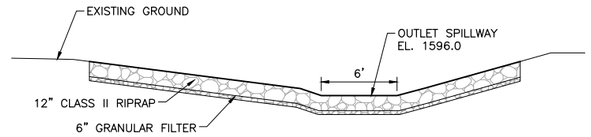
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-152.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 2:37 PM

INCHES 1 2

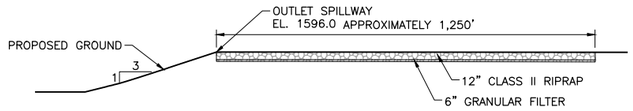


1 PLAN: STORMWATER SEDIMENTATION POND C-WEST

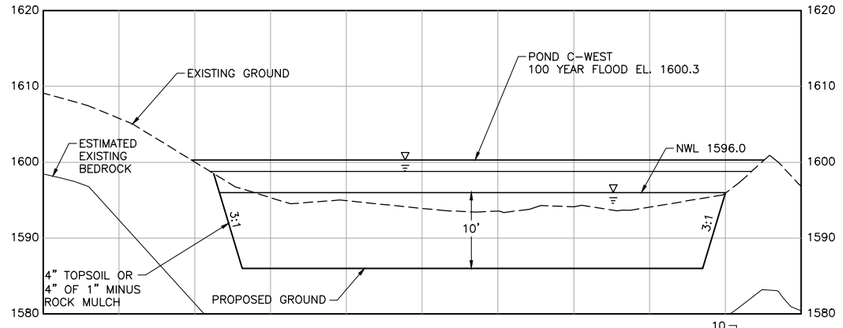
0 100 200
SCALE IN FEET



1 SECTION: OVERFLOW WEIR CREST
N.T.S.



2 SECTION: OVERFLOW WEIR SPILLWAY
N.T.S.



3 SECTION: SEDIMENTATION POND C-WEST TYPICAL CROSS SECTION

NOTES

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER SEDIMENTATION POND C-WEST GRADING PLAN AND DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-011
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-153.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 2:40 PM
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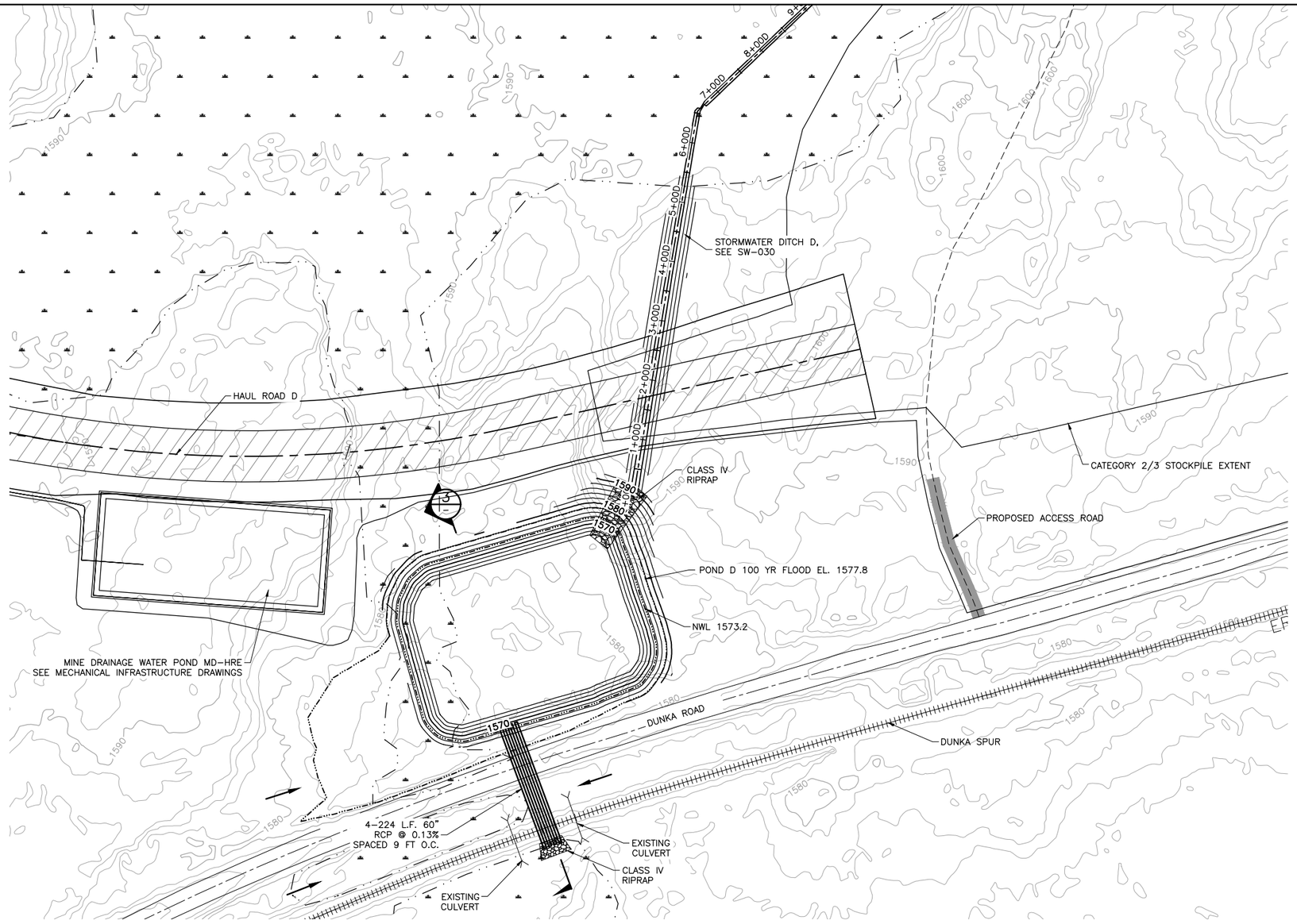
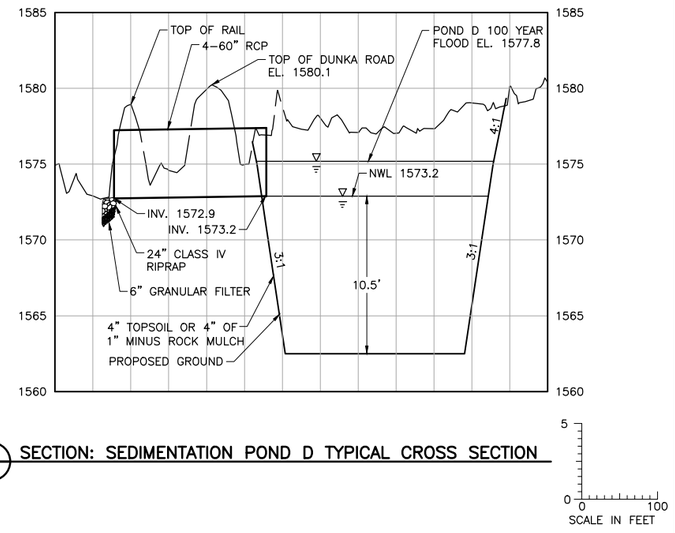


1 PLAN: STORMWATER SEDIMENTATION POND D

0 100 200

SCALE IN FEET



3 SECTION: SEDIMENTATION POND D TYPICAL CROSS SECTION

NOTES

1. ALL DISTURBED AREAS WILL BE RESTORED IN ACCORDANCE WITH THE SWPPP.

VER NO.	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/26/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON

SIGNATURE

DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS

CHECKED: ATS

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER SEDIMENTATION POND D GRADING PLAN AND DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-012

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-154.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 3:57 PM

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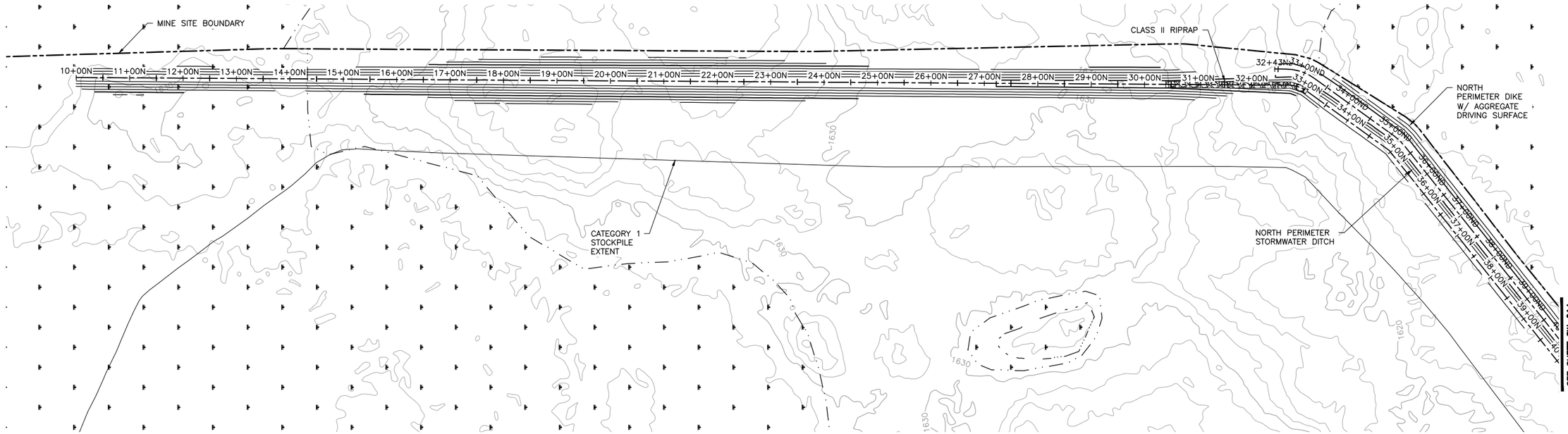
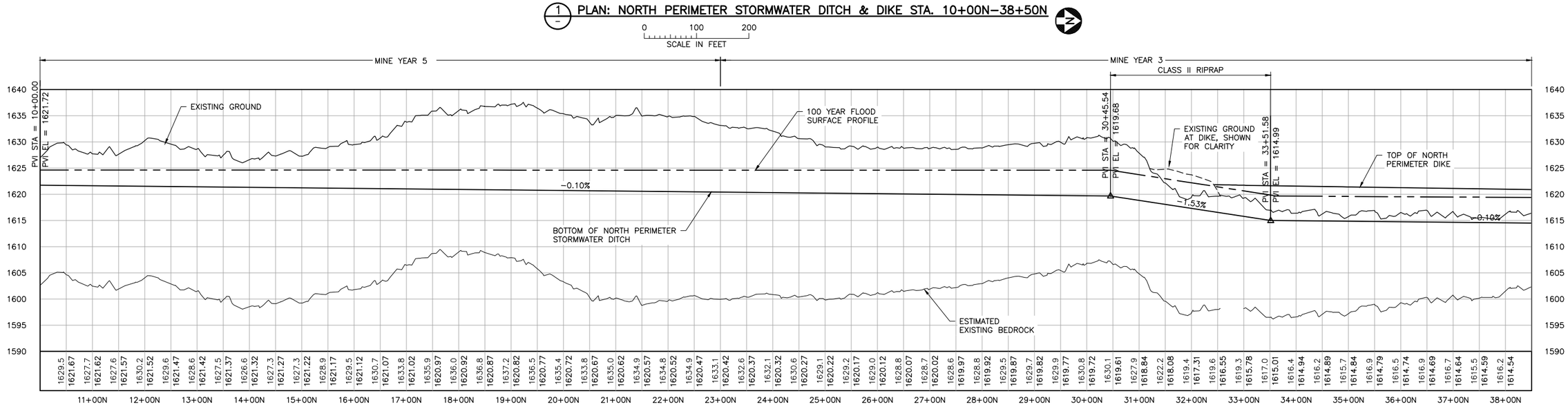


1 — PLAN: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 10+00N–38+50N

0 100 200
SCALE IN FEET



2 — PROFILE: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 10+00N–38+50N

10
0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

VER NO.	DATE	DESCRIPTION
1	5/26/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
NORTH DIKE AND DITCH PLAN AND PROFILE
STATION 10+00N – 38+50N

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-013
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-100.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 2:42 PM
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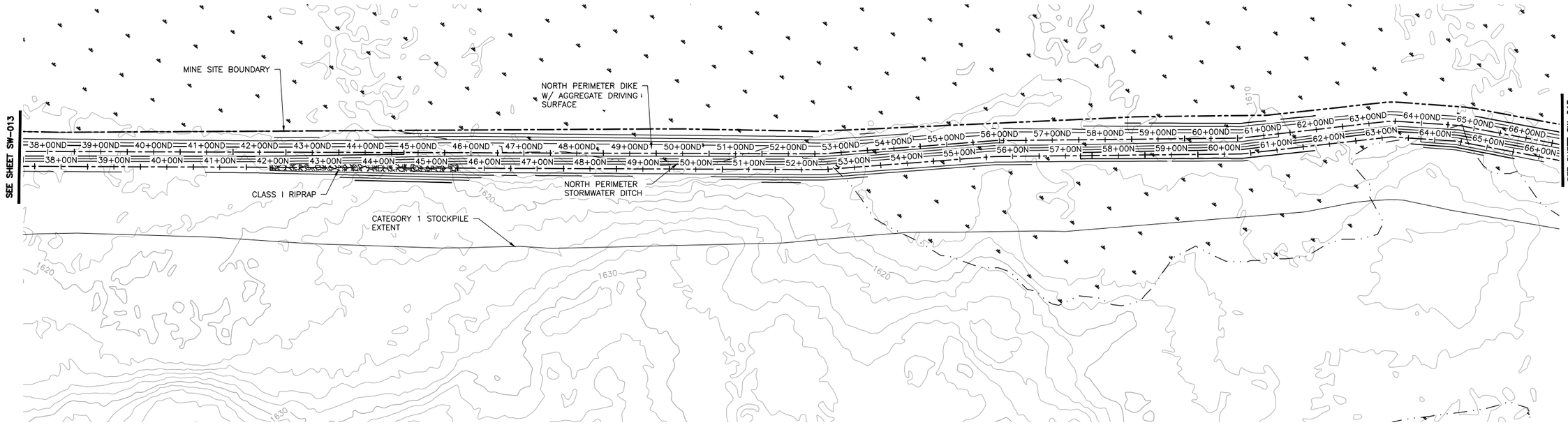
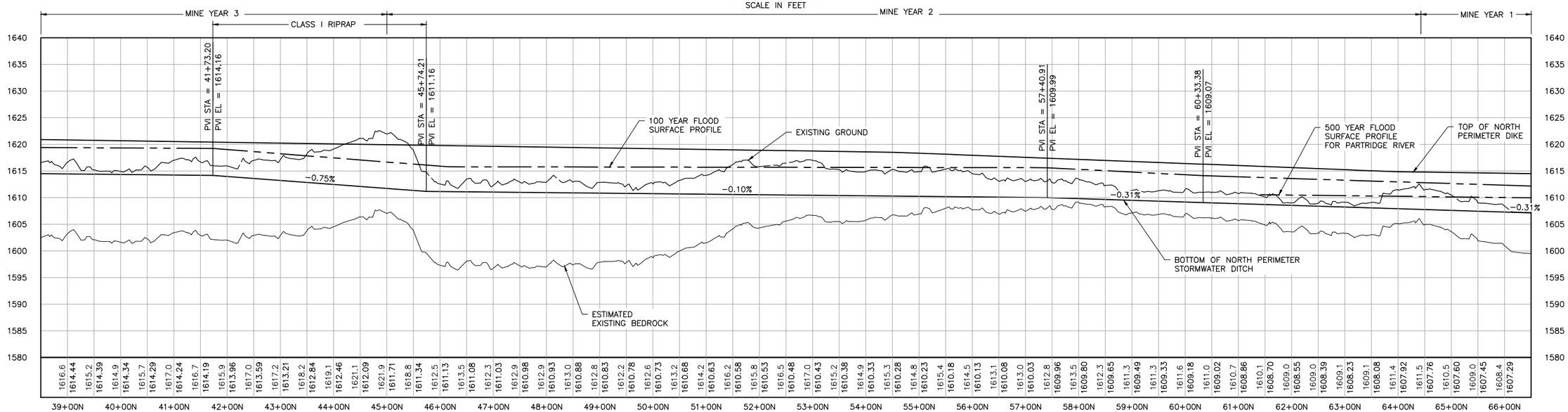


1 PLAN: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 38+50N–66+50N

0 100 200
SCALE IN FEET



2 PROFILE: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 38+50N–66+50N

10
0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

VER NO	DATE	DESCRIPTION
1	5/26/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/26/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 38+50N – 66+50N

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-014
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-101.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 2:45 PM
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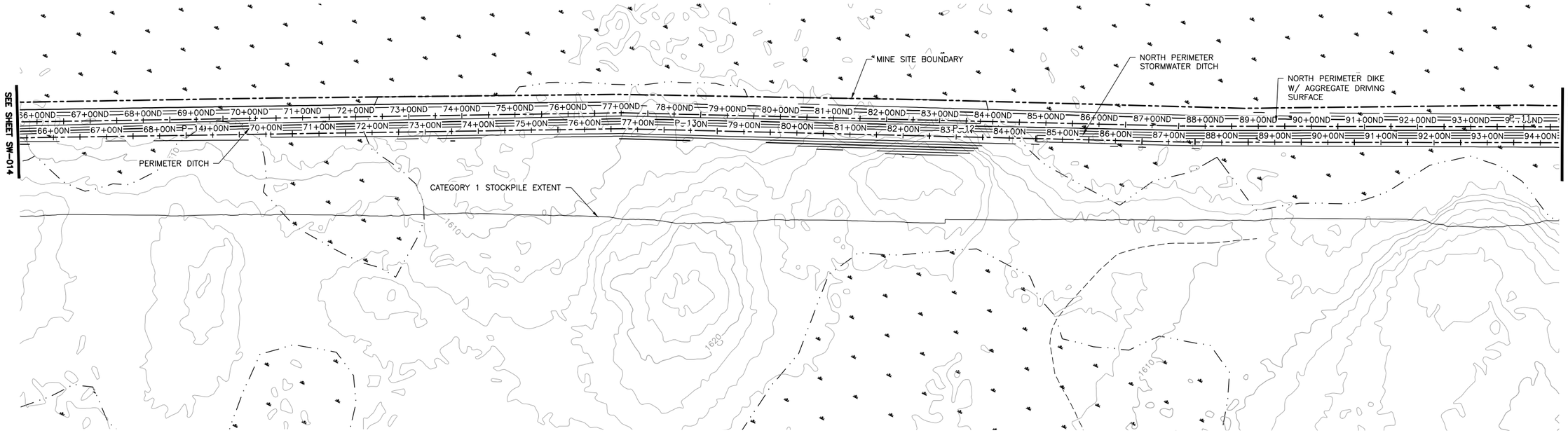
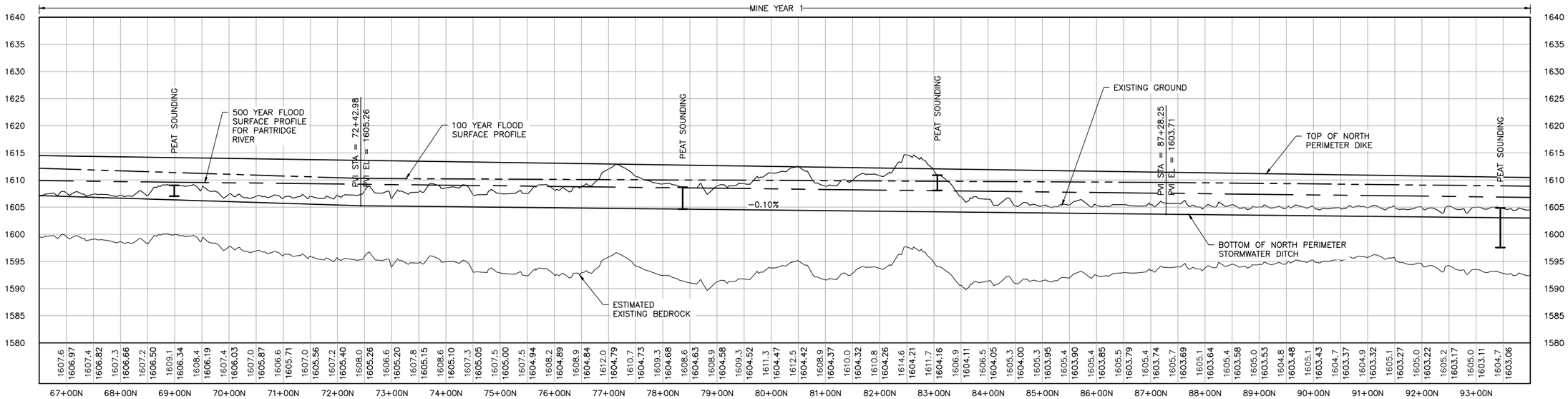


1 — PLAN: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 66+50N–94+00N

0 100 200
SCALE IN FEET



2 — PROFILE: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 66+50N–94+00N

10 0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

VER NO	DATE	DESCRIPTION
1	5/26/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 66+50N – 94+00N

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-015 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-102.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 9:50 PM
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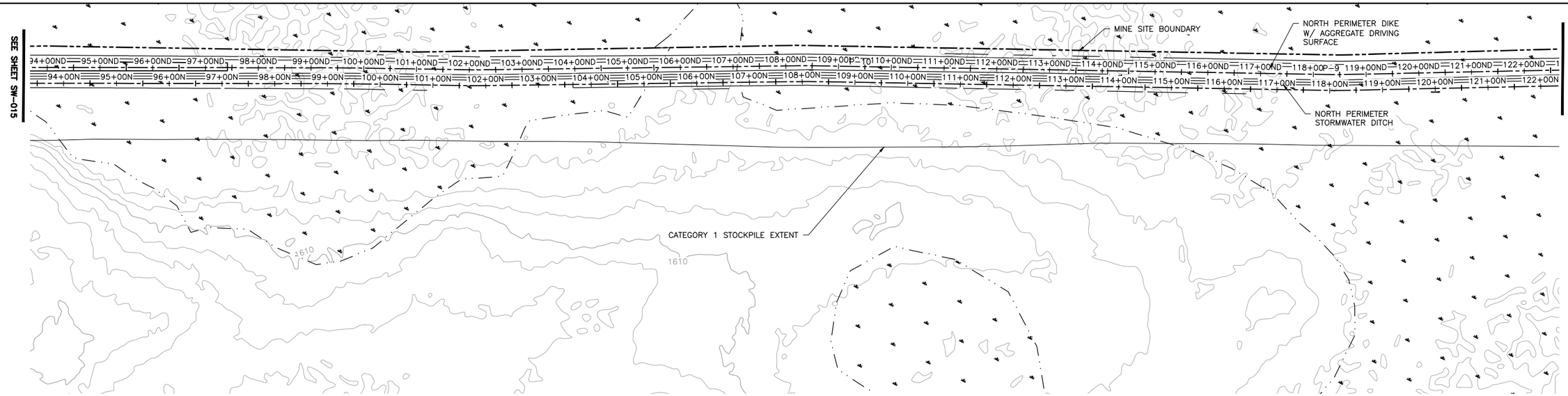
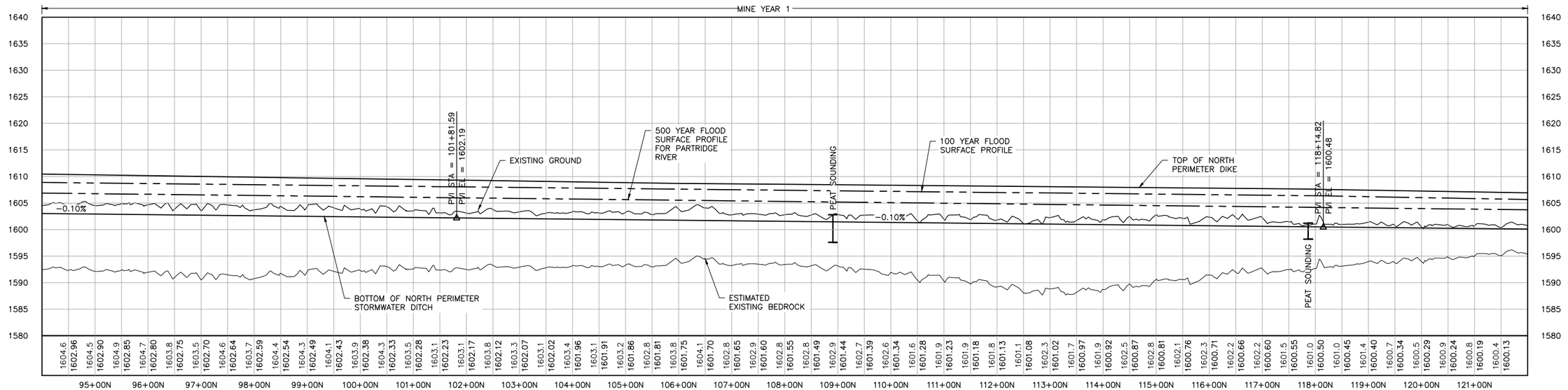


1 — PLAN: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 94+00N–122+00N

0 100 200

SCALE IN FEET



2 — PROFILE: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 94+00N–122+00N

10

0 100

SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

VER NO	DATE	DESCRIPTION
1	5/26/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/26/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON

SIGNATURE

DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS

CHECKED: ATS

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER NORTH DIKE AND DITCH PLAN AND PROFILE STATION 94+00N – 122+00N

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

DWG. NO. SW-016

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-103.DWG PLOT DATE: 5/28/2015 9:49 PM PLOT SCALE: 1:2
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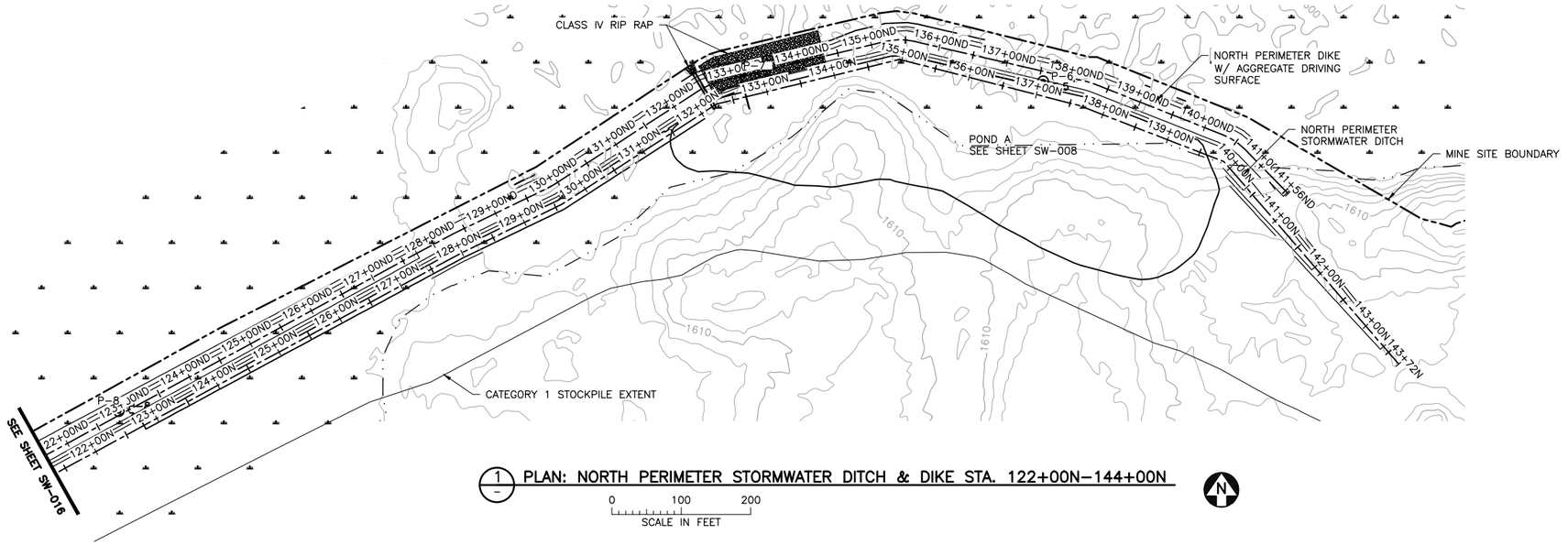
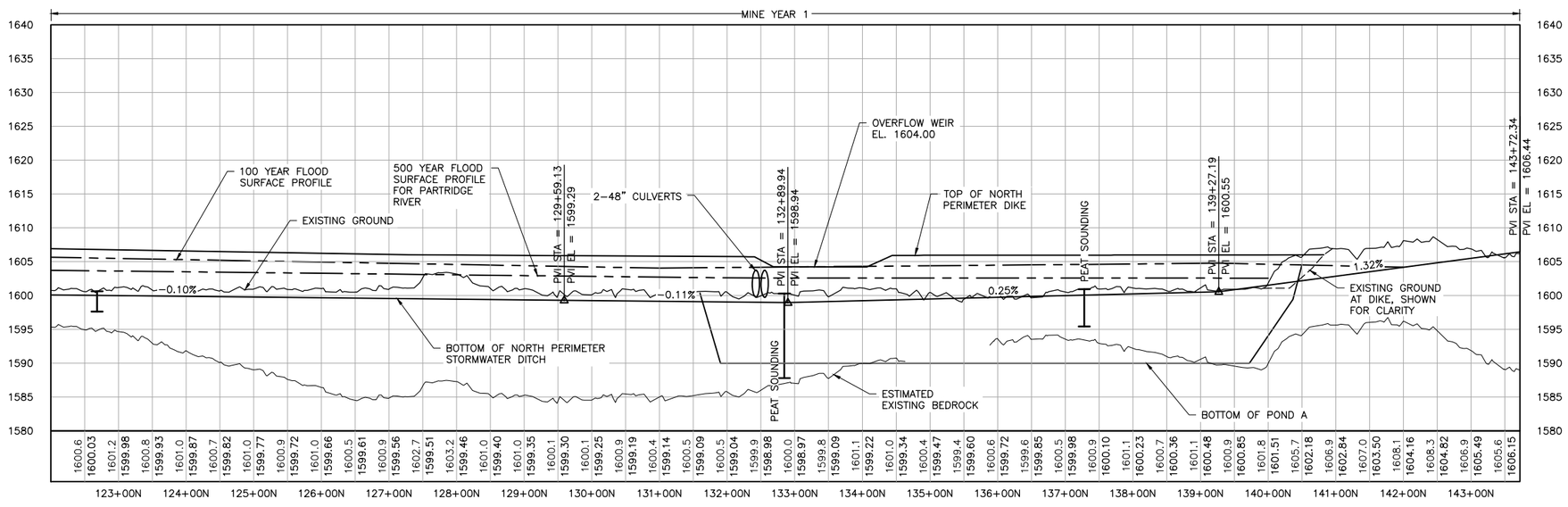


1 PLAN: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 122+00N–144+00N

0 100 200
SCALE IN FEET



2 PROFILE: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 122+00N–144+00N

10 0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.
3. BOTTOM OF DITCH PROFILE LINE SHOWN TO PRESENT HYDRAULIC GRADE REQUIREMENTS, RESULTING "FILL" AREAS SHALL BE LEFT AS IS. DO NOT PLACE FILL TO RAISE GROUND TO DITCH PROFILE LINE.

VER NO.	DATE	DESCRIPTION
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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
NORTH DIKE AND DITCH PLAN AND PROFILE
STATION 122+00N – 144+00N

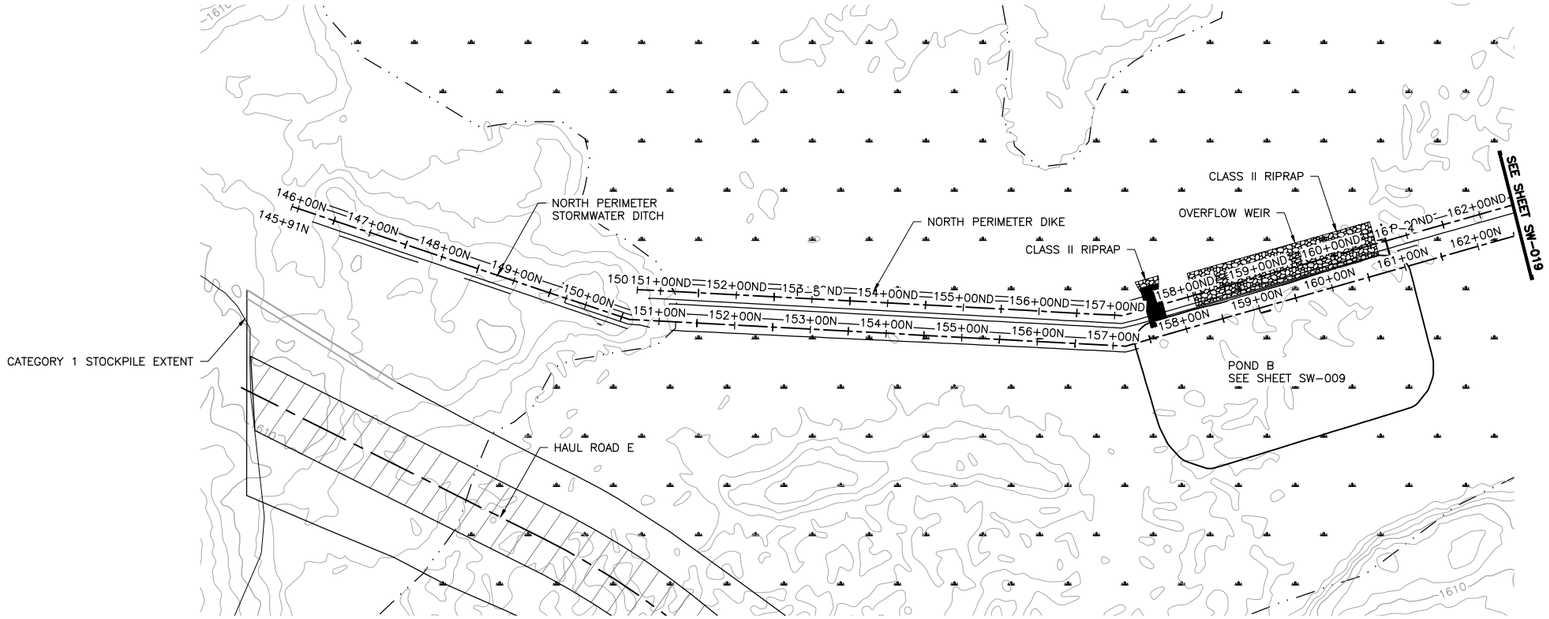
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

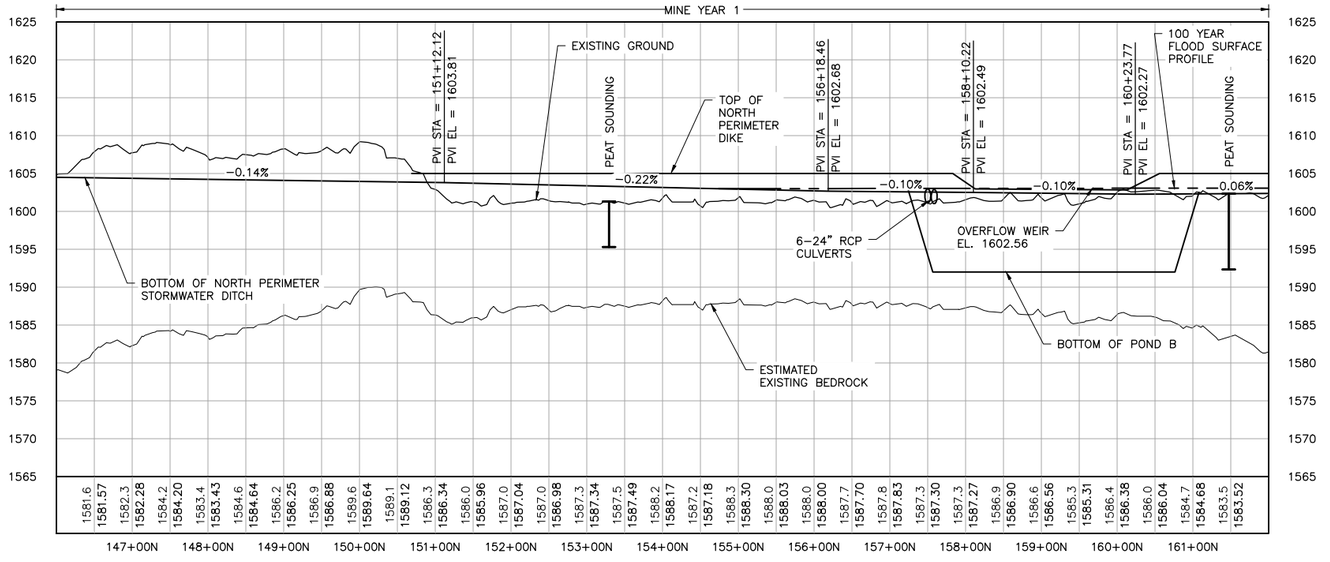
DWG. NO. SW-017
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-104.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 1:58 PM
INCHES 1 2



1 — PLAN: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 146+00N–162+00N

0 100 200
SCALE IN FEET



2 — PROFILE: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 146+00N–162+00N

10
0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.
3. BOTTOM OF DITCH PROFILE LINE SHOWN TO PRESENT HYDRAULIC GRADE REQUIREMENTS, RESULTING "FILL" AREAS SHALL BE LEFT AS IS. DO NOT PLACE FILL TO RAISE GROUND TO DITCH PROFILE LINE.

VER NO	DATE	DESCRIPTION
1	5/26/15	ISSUED FOR INCLUSION IN PERMIT APPLICATION

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/26/15
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 PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
NORTH DIKE AND DITCH PLAN AND PROFILE
STATION 146+00N – 162+00N

POLYMET MINING

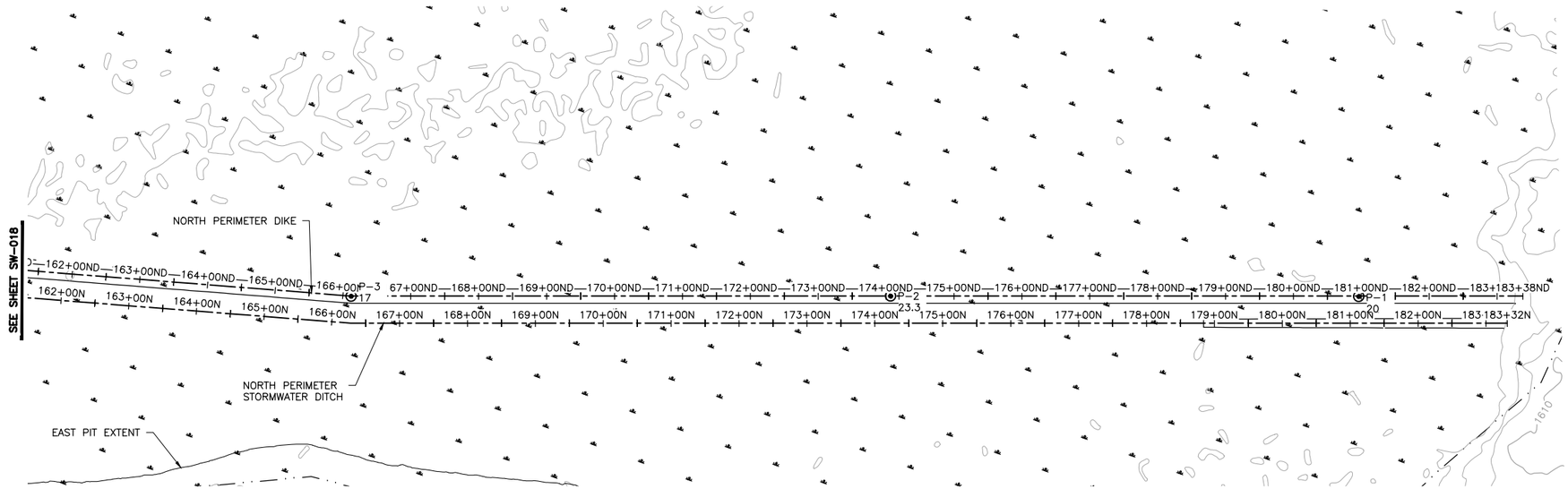
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-018
REV

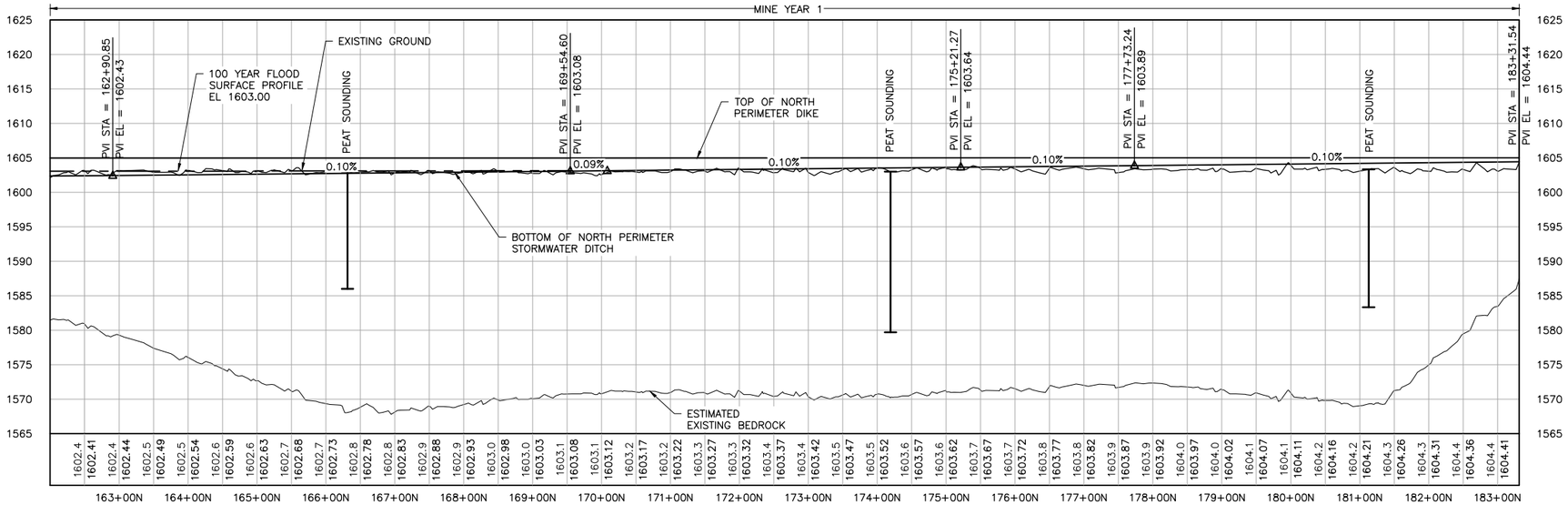
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-105.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 2:49 PM

INCHES 1 2



1 — PLAN: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 162+00N–183+00N

0 100 200
SCALE IN FEET



2 — PROFILE: NORTH PERIMETER STORMWATER DITCH & DIKE STA. 162+00N–183+00N

10
0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.
3. BOTTOM OF DITCH PROFILE LINE SHOWN TO PRESENT HYDRAULIC GRADE REQUIREMENTS, RESULTING "FILL" AREAS SHALL BE LEFT AS IS. DO NOT PLACE FILL TO RAISE GROUND TO DITCH PROFILE LINE.

VER NO.	DATE	DESCRIPTION
1	5/26/15	ISSUED FOR INCLUSION IN PAERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/26/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
NORTH DIKE AND DITCH PLAN AND PROFILE
STATION 162+00N – 183+00N

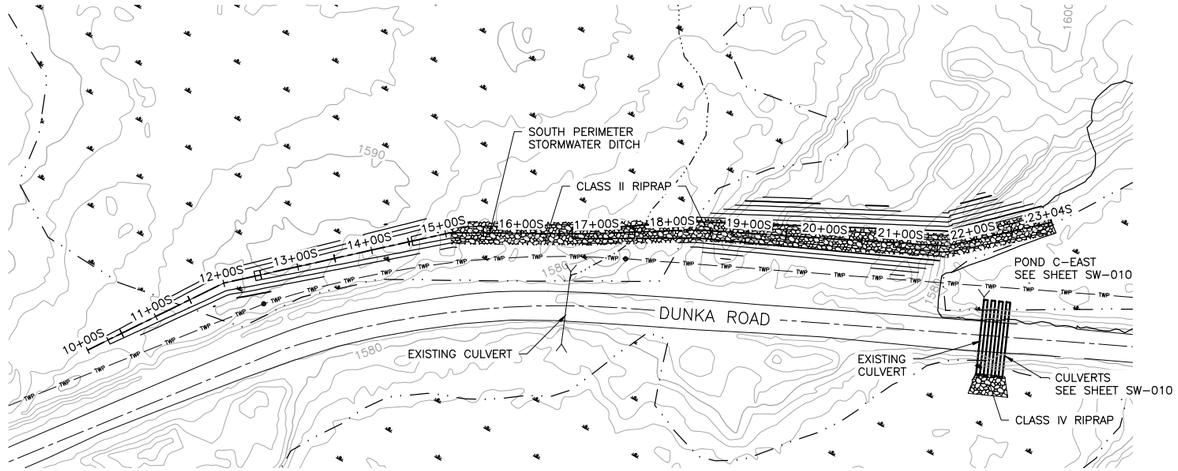
POLYMET MINING
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-019
REV

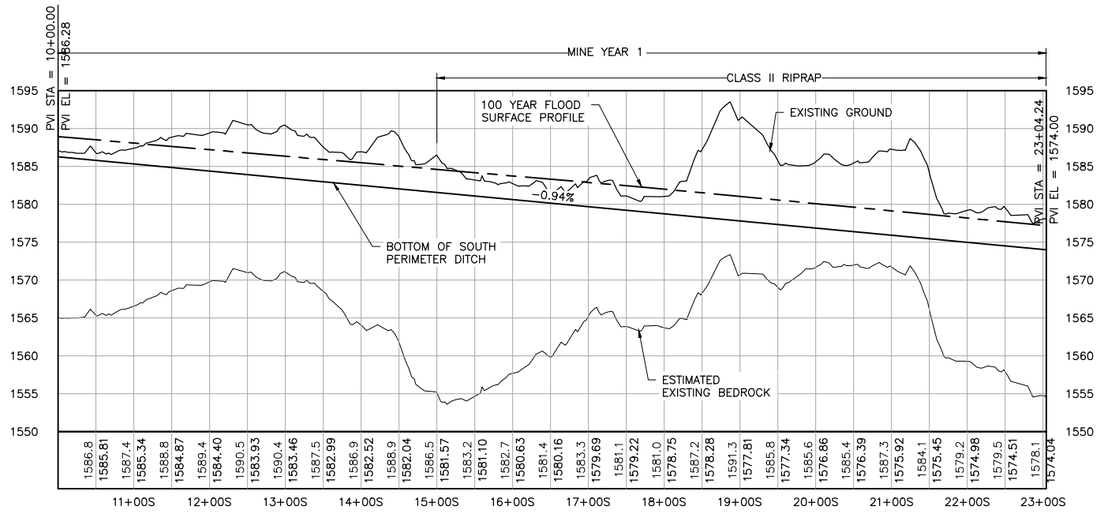
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-106.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 10:14 PM

INCHES 1 2



1 PLAN: SOUTH PERIMETER DITCH STA. 10+00S–22+95S

0 100 200
SCALE IN FEET



2 PROFILE: SOUTH PERIMETER DITCH STA. 10+00S–22+95S

10
0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

VER NO	DATE	DESCRIPTION
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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
SOUTH DIKE AND DITCH PLAN AND PROFILE
STATION 10+00S – 22+95S

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

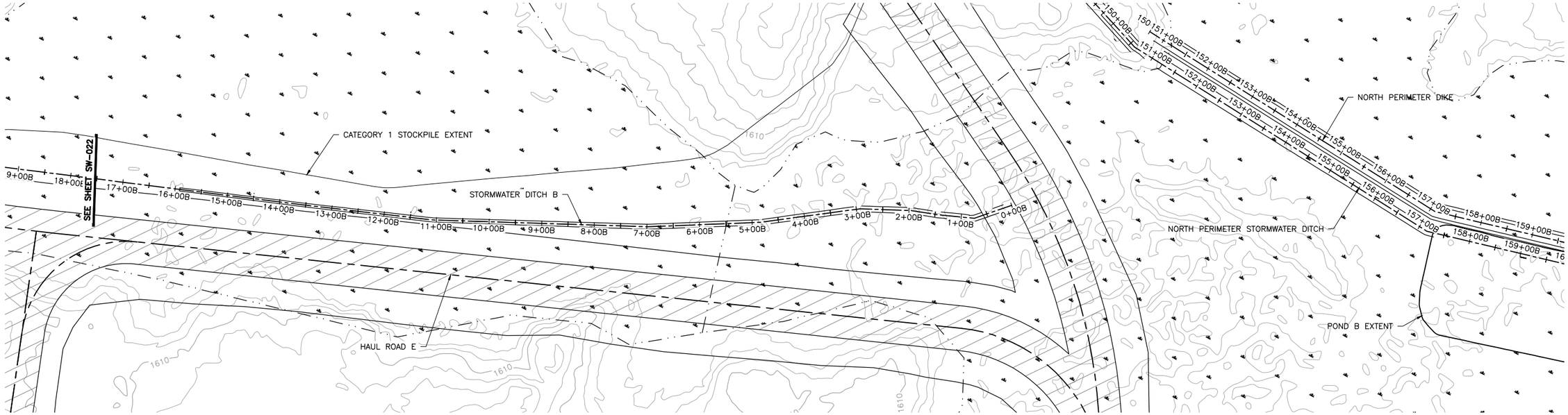
BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-020
REV

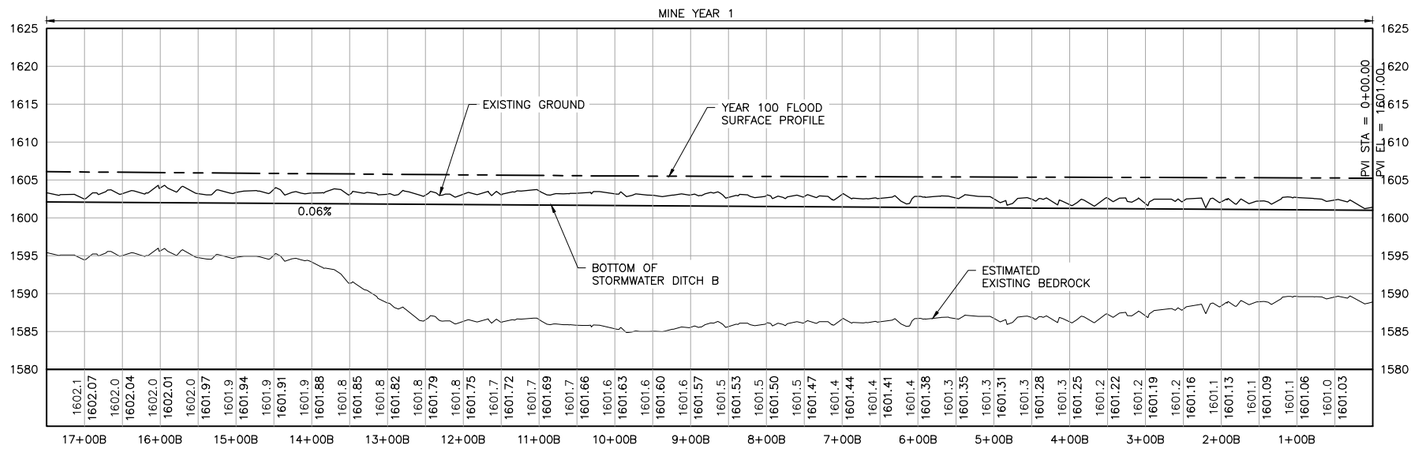
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690229.10\PERMIT_NMM-05-CS-107.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 4:11 PM

INCHES 1 2



1 — PLAN: STORMWATER DITCH B STA. 0+00B–17+50B

0 100 200
SCALE IN FEET



2 — PROFILE: STORMWATER DITCH B STA. 0+00B–17+50B

10
0
0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
DITCH B PLAN AND PROFILE
STATION 0+00B – 17+50B

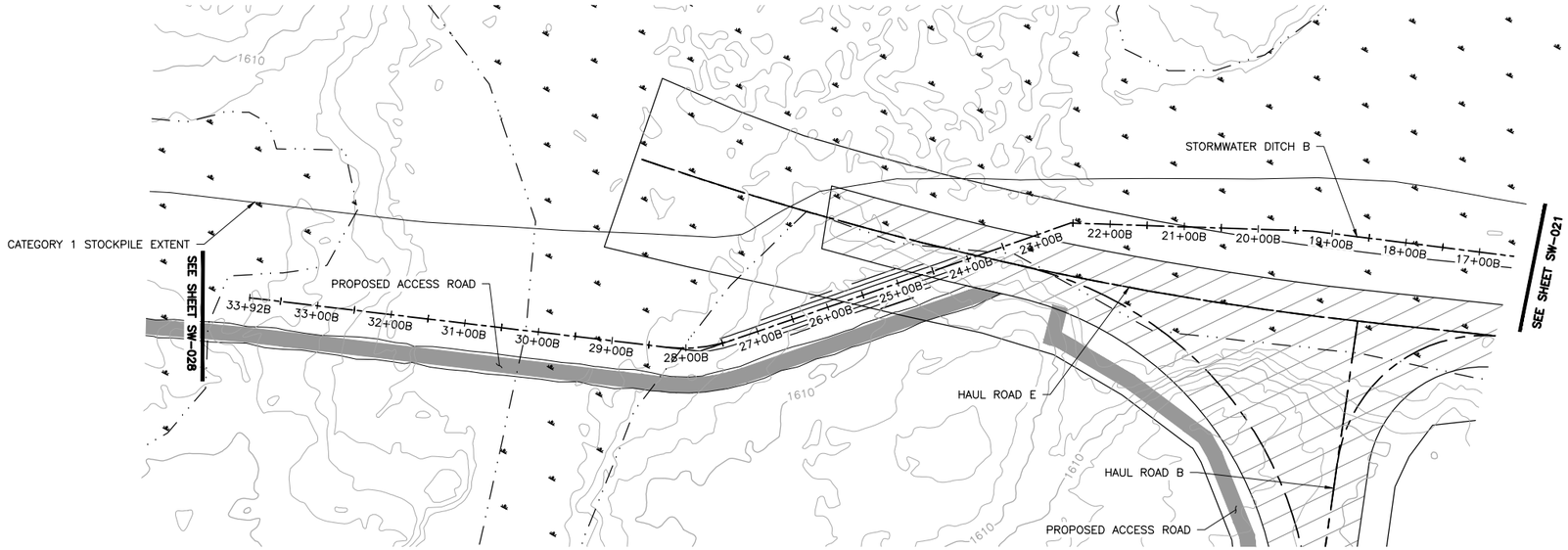
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-021 REV

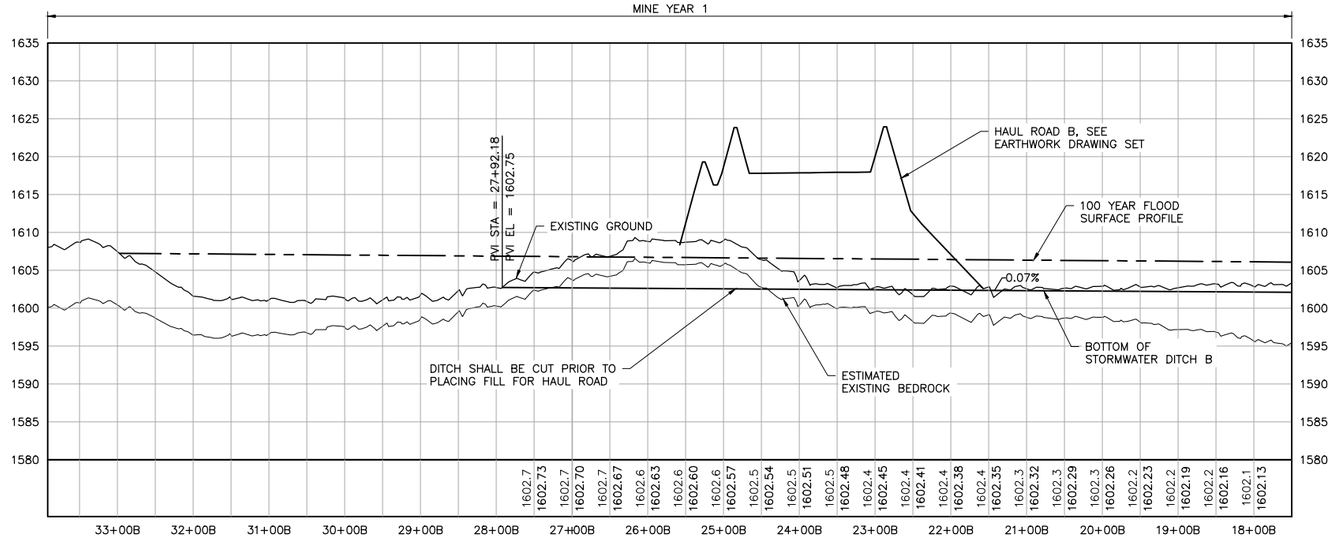
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-109.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 9:58 PM

INCHES 1 2



1 PLAN: STORMWATER DITCH B STA. 17+50B–33+92B

0 100 200
SCALE IN FEET



2 PROFILE: STORMWATER DITCH B STA. 17+50B–33+92B

10
0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.
3. BOTTOM OF DITCH PROFILE LINE SHOWN TO PRESENT HYDRAULIC GRADE REQUIREMENTS, RESULTING "FILL" AREAS SHALL BE LEFT AS IS. DO NOT PLACE FILL TO RAISE GROUND TO DITCH PROFILE LINE.

VER NO	DATE	DESCRIPTION
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ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/26/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
DITCH B PLAN AND PROFILE
STATION 17+50B – 33+92B

POLYMET MINING

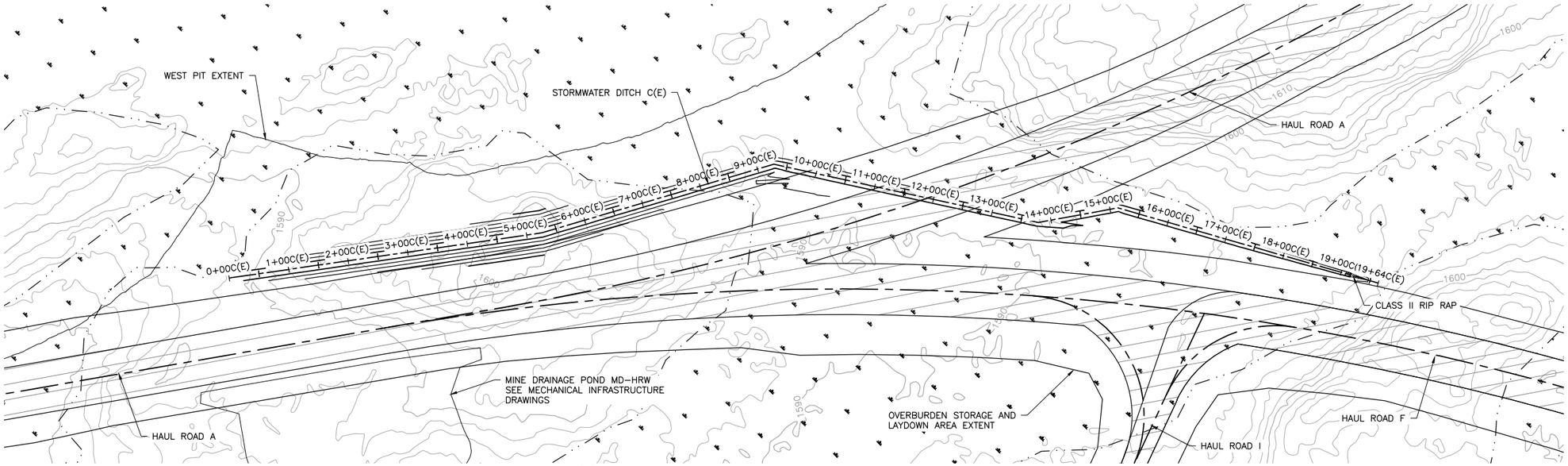
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

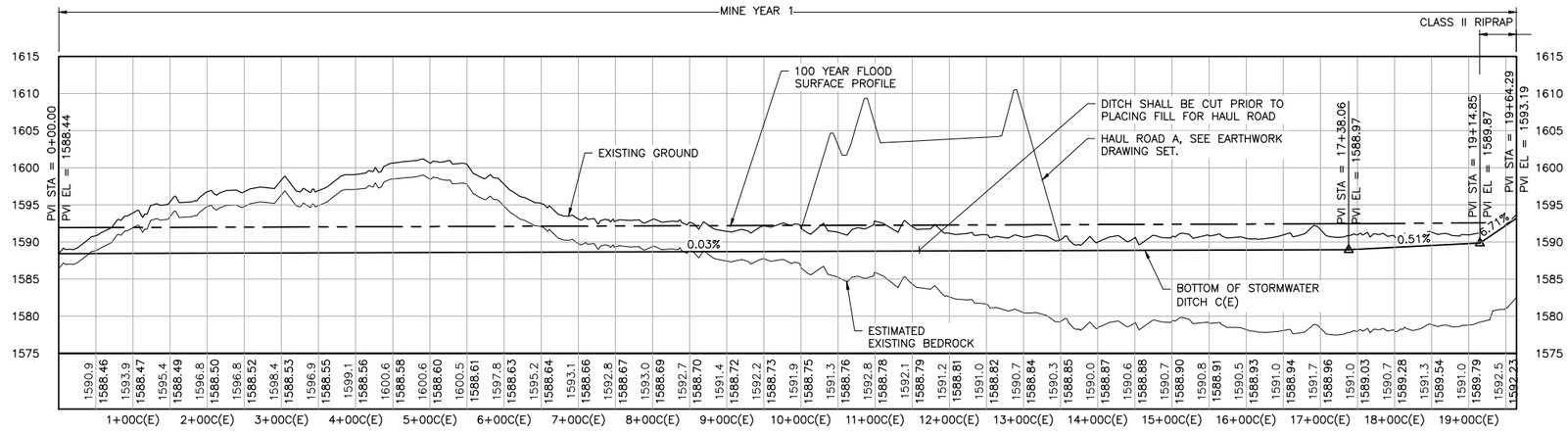
DWG. NO. SW-022 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-110.DWG PLOT DATE: 5/29/2015 4:16 PM PLOT SCALE: 1:2
INCHES 1 2



1 — PLAN: STORMWATER DITCH C(E) STA. 0+00C(E)–19+64C(E)

0 100 200
SCALE IN FEET



2 — PROFILE: STORMWATER DITCH C(E) STA. 0+00C(E)–19+64C(E)

10
0
0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

VER NO.	DATE	DESCRIPTION
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FOR PERMITTING	1	5/26/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER DITCH C(E) PLAN AND PROFILE STATION 0+00C(E) – 19+64C(E)

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-023
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-111.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 3:05 PM
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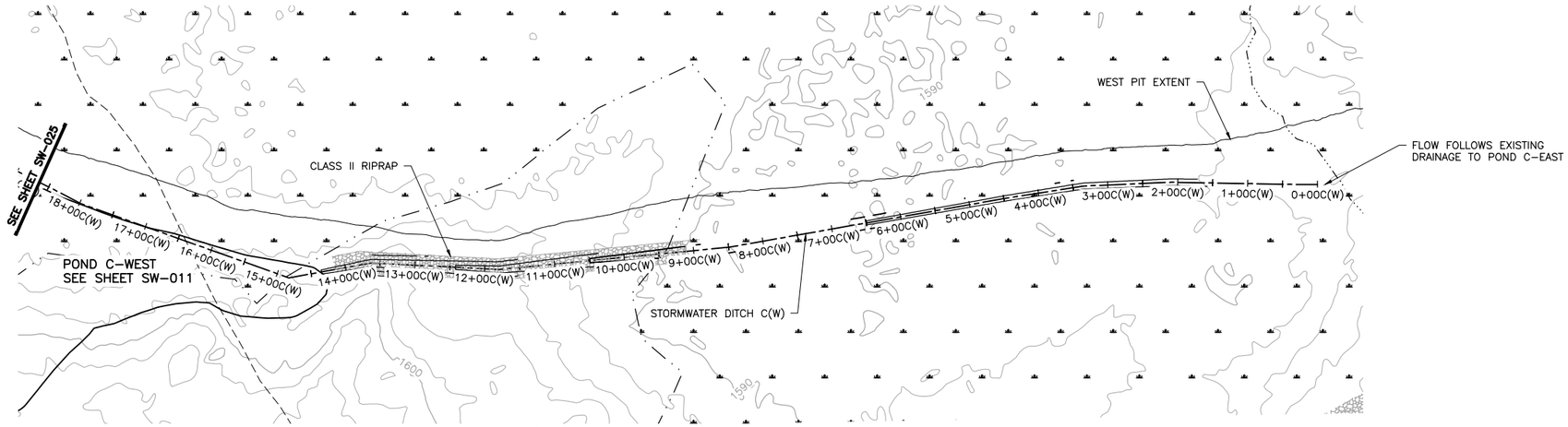
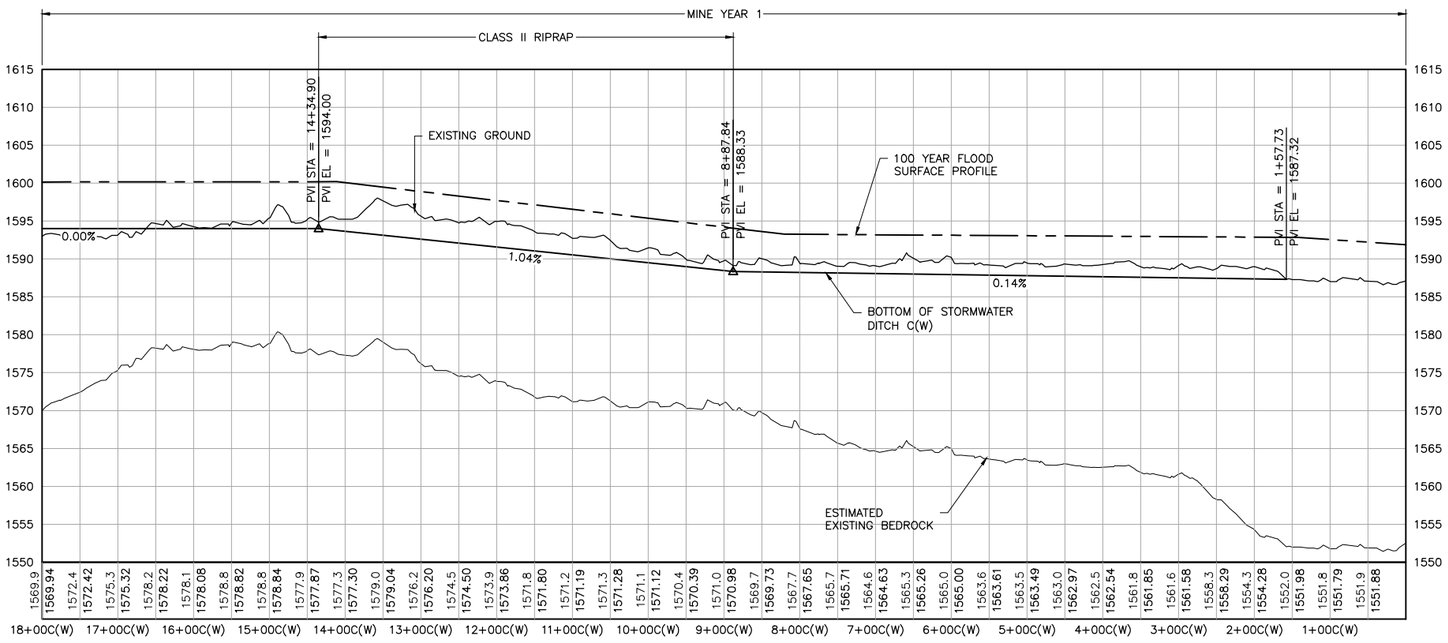


1 — PLAN: STORMWATER DITCH C(W)– STA. 0+00C(W)–18+00C(W)

0 100 200
SCALE IN FEET



2 — PROFILE: STORMWATER DITCH C(W)– STA. 0+00C(W)–18+00C(W)

10
0
0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.
3. BOTTOM OF DITCH PROFILE LINE SHOWN TO PRESENT HYDRAULIC GRADE REQUIREMENTS, RESULTING "FILL" AREAS SHALL BE LEFT AS IS. DO NOT PLACE FILL TO RAISE GROUND TO DITCH PROFILE LINE.

VER NO	DATE	DESCRIPTION
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ISSUE STATUS	VERSION	DATE
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FOR CONSTRUCTION		
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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
DITCH C(W) PLAN AND PROFILE
STATION 0+00C(W) – 18+00C(W)

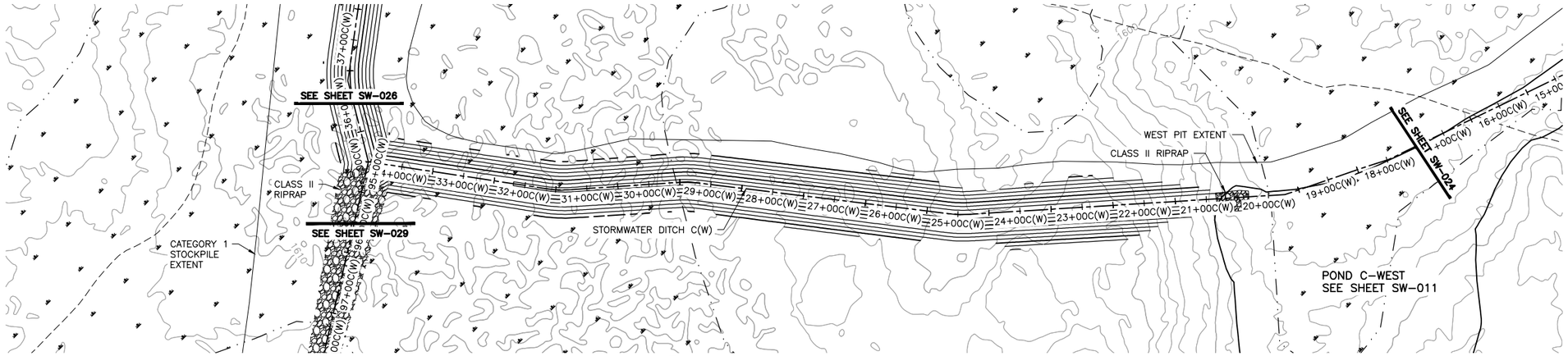
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-024
REV

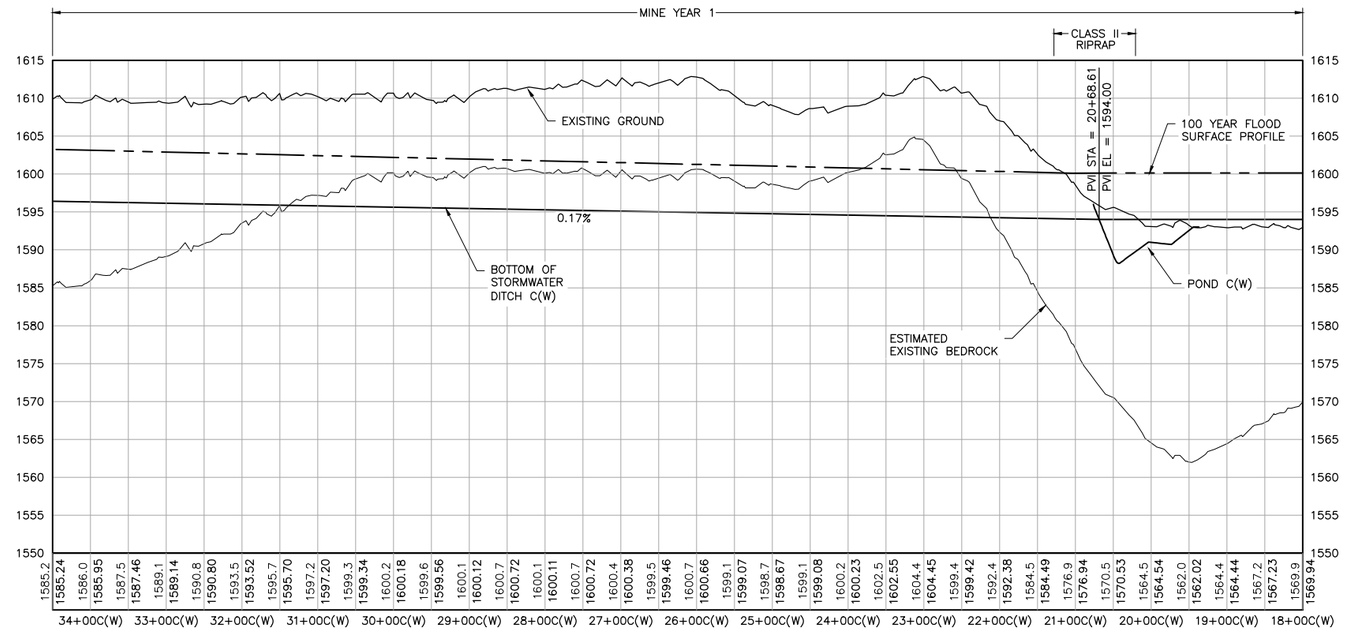
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-112.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 10:01 PM

INCHES 1 2



1 PLAN: STORMWATER DITCH C(W) – STA. 18+00C(W)–34+50C(W)

0 100 200
SCALE IN FEET



2 PROFILE: STORMWATER DITCH C(W) – STA. 18+00C(W)–34+50C(W)

10
0
0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.
3. BOTTOM OF DITCH PROFILE LINE SHOWN TO PRESENT HYDRAULIC GRADE REQUIREMENTS, RESULTING "FILL" AREAS SHALL BE LEFT AS IS. DO NOT PLACE FILL TO RAISE GROUND TO DITCH PROFILE LINE.

VER NO.	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/26/15
FOR CONSTRUCTION		

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER DITCH C(W) PLAN AND PROFILE STATION 18+00C(W) – 34+50C(W)

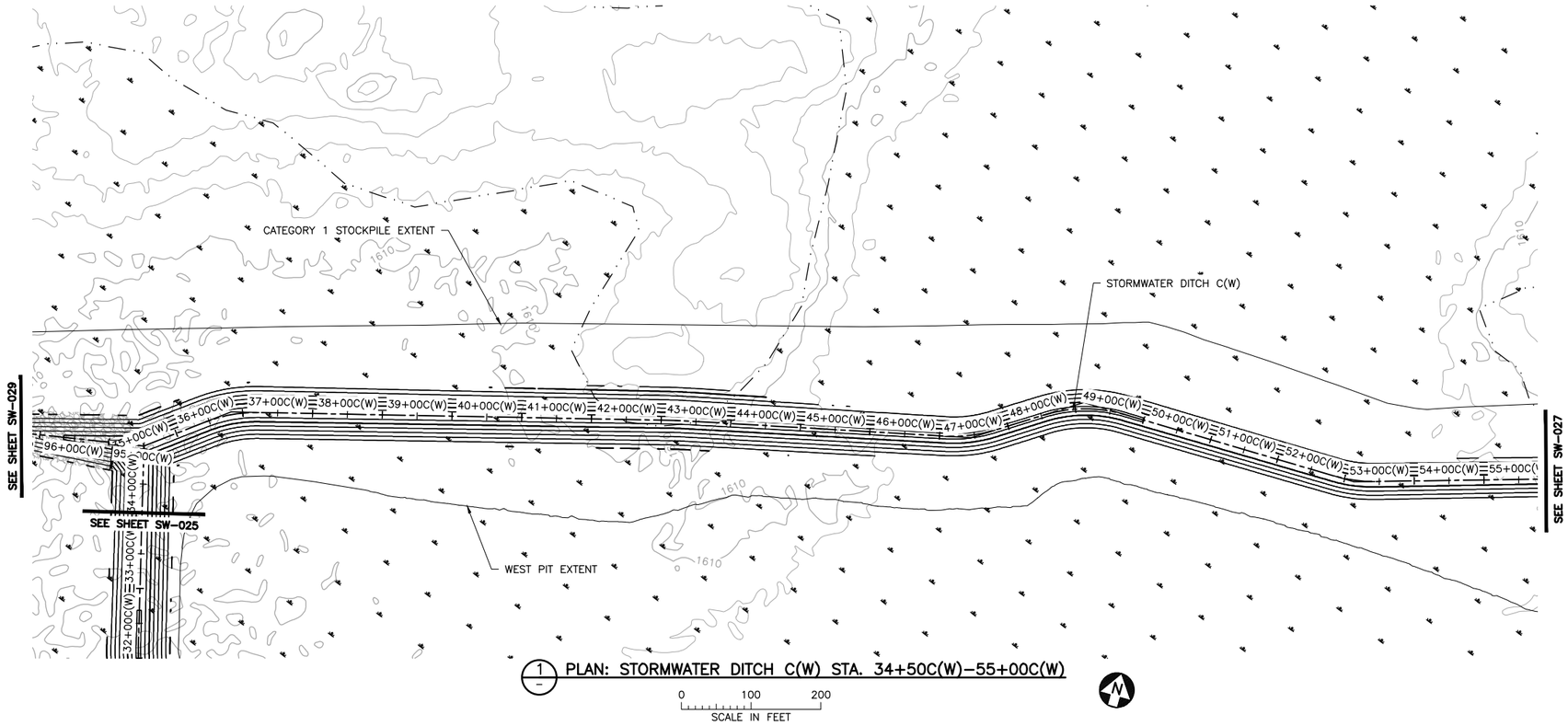
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-025 REV

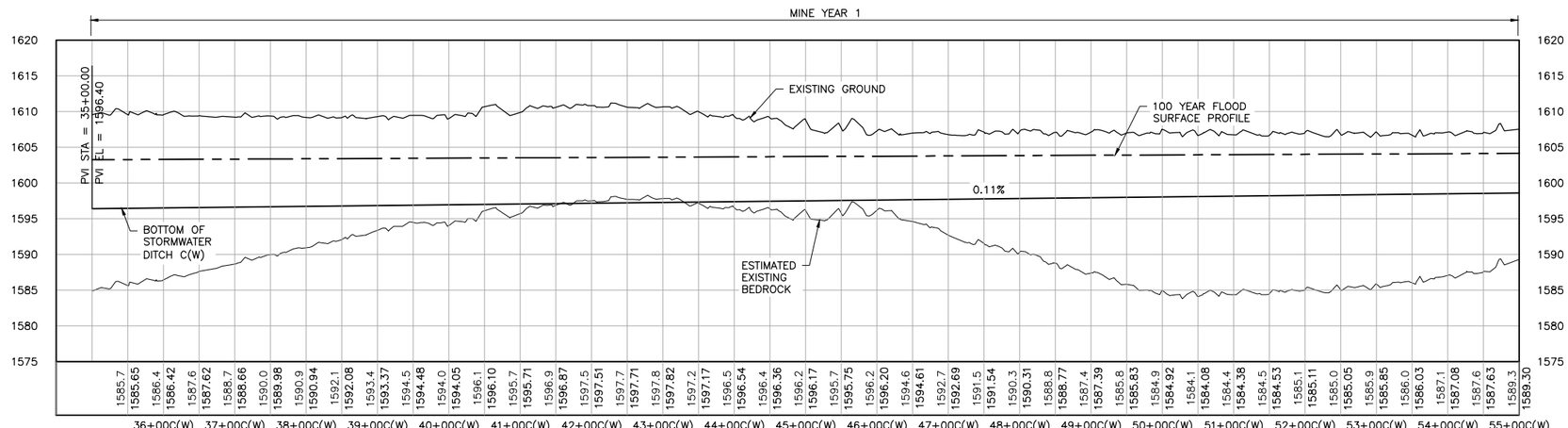
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-113.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 11:20 AM

INCHES 1 2



1 — PLAN: STORMWATER DITCH C(W) STA. 34+50C(W)–55+00C(W)

0 100 200
SCALE IN FEET



2 — PROFILE: STORMWATER DITCH C(W) STA. 34+50C(W)–55+00C(W)

10
0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER DITCH C(W) PLAN AND PROFILE STATION 34+50C(W) – 55+00C(W)

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-026 REV

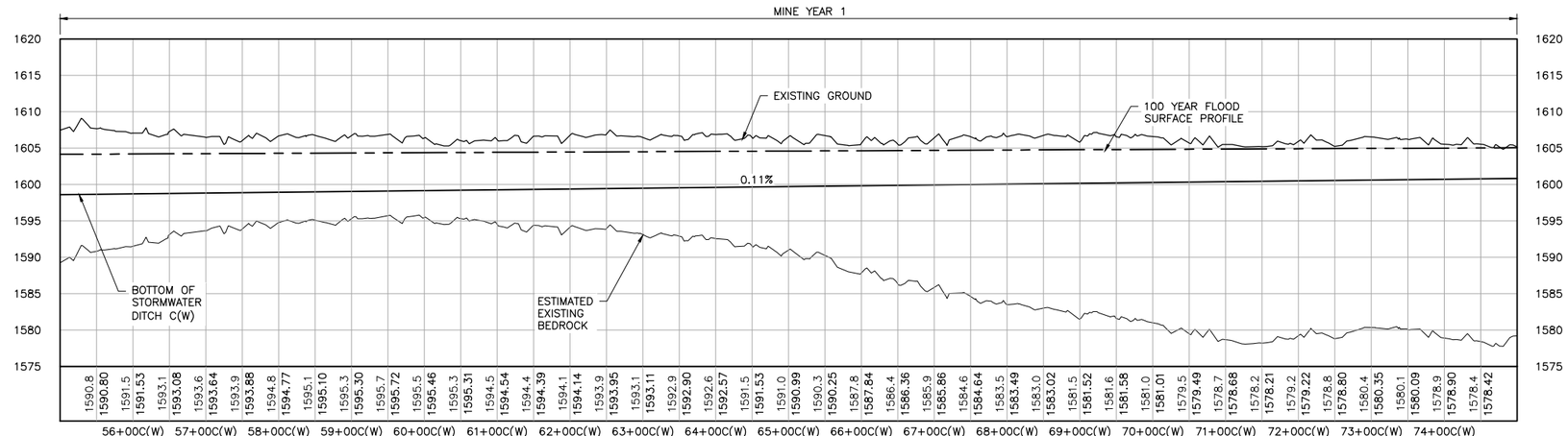
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-117.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 3:07 PM

INCHES 1 2



1 — PLAN: STORMWATER DITCH C(W) STA. 55+00C(W)–75+00C(W)

0 100 200
SCALE IN FEET



2 — PROFILE: STORMWATER DITCH C(W) STA. 55+00C(W)–75+00C(W)

10
0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

VER NO	DATE	DESCRIPTION
1	5/26/15	ISSUED FOR INCLUSION IN PERMET APPLICATION

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/26/15
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 PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
DITCH C(W) PLAN AND PROFILE
STATION 55+00C(W) – 75+00C(W)

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-027 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-115.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 9:59 PM

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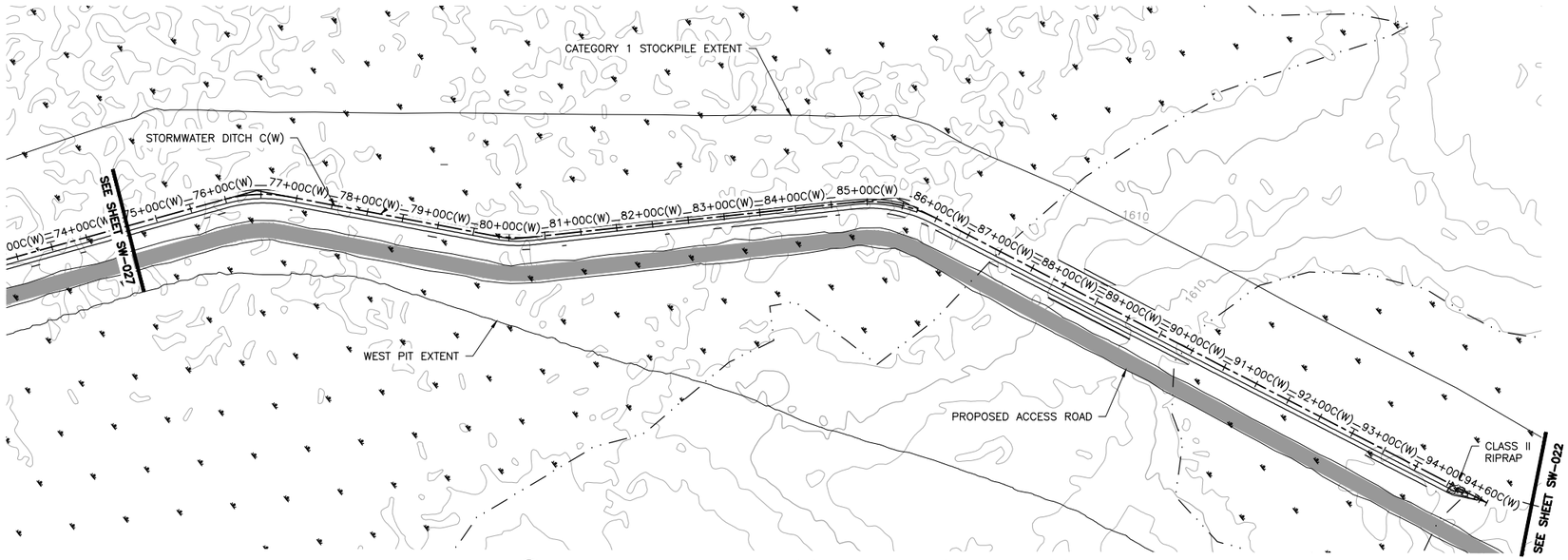

1 — PLAN: STORMWATER DITCH C(W) STA. 75+00C(W)–94+60C(W)

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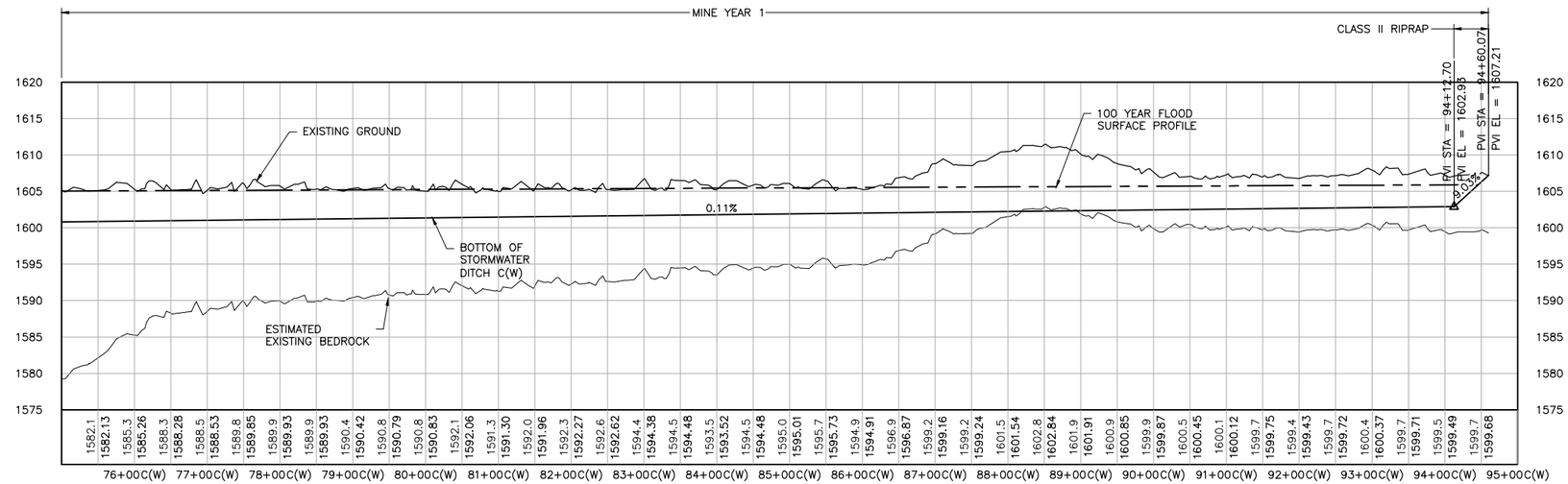
SCALE IN FEET



2 — PROFILE: STORMWATER DITCH C(W) STA. 75+00C(W)–94+60C(W)

10
0 0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

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PRINTED NAME PAUL T. SWENSON
SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER DITCH C(W) PLAN AND PROFILE STATION 75+00C(W) – 94+60C(W)

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-028 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NWM-05-CS-116.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 3:13 PM

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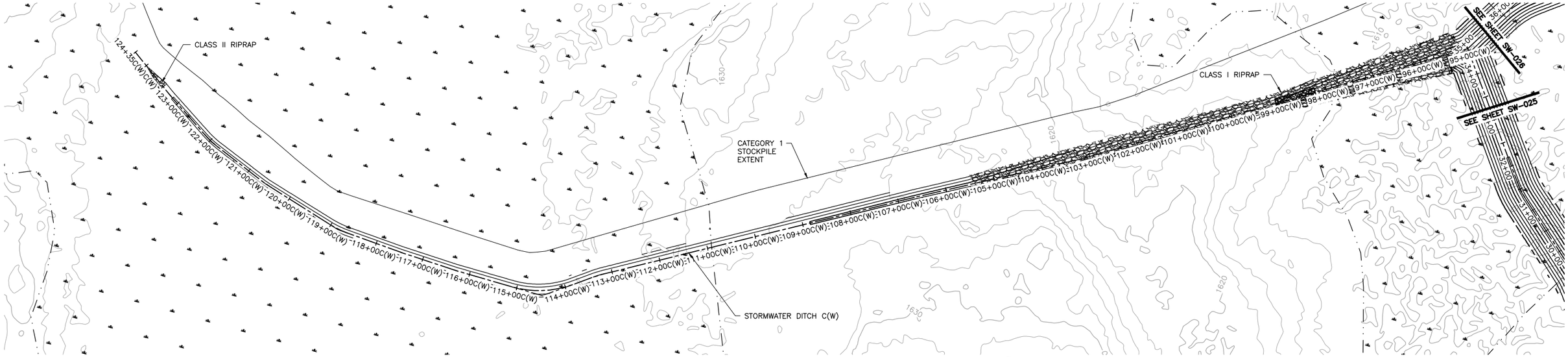
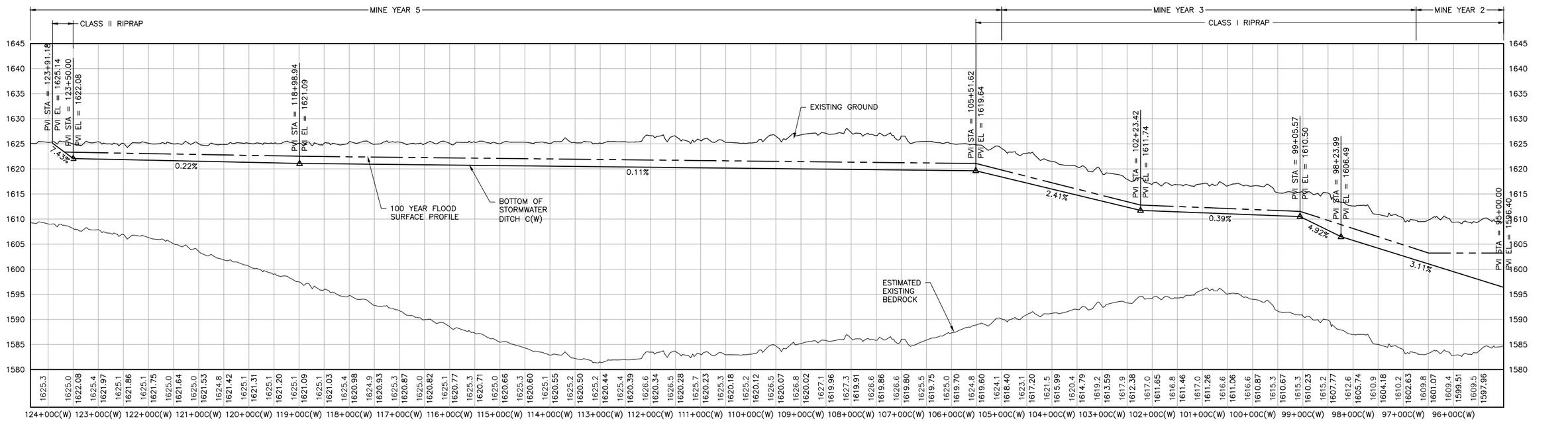


1 — PLAN: STORMWATER DITCH C(W) STA. 95+00C(W)–124+35C(W)

0 100 200
SCALE IN FEET



2 — PROFILE: STORMWATER DITCH STA. 95+00C(W)–124+35C(W)

10
0 100
SCALE IN FEET

NOTES:

1. ALL STATIONS SHOWN ON PROFILE ARE BASED ON DITCH CENTERLINE STATIONS.
2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

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SIGNATURE
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DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER DITCH C(W) PLAN AND PROFILE STATION 95+00C(W) – 124+35C(W)

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-029 REV

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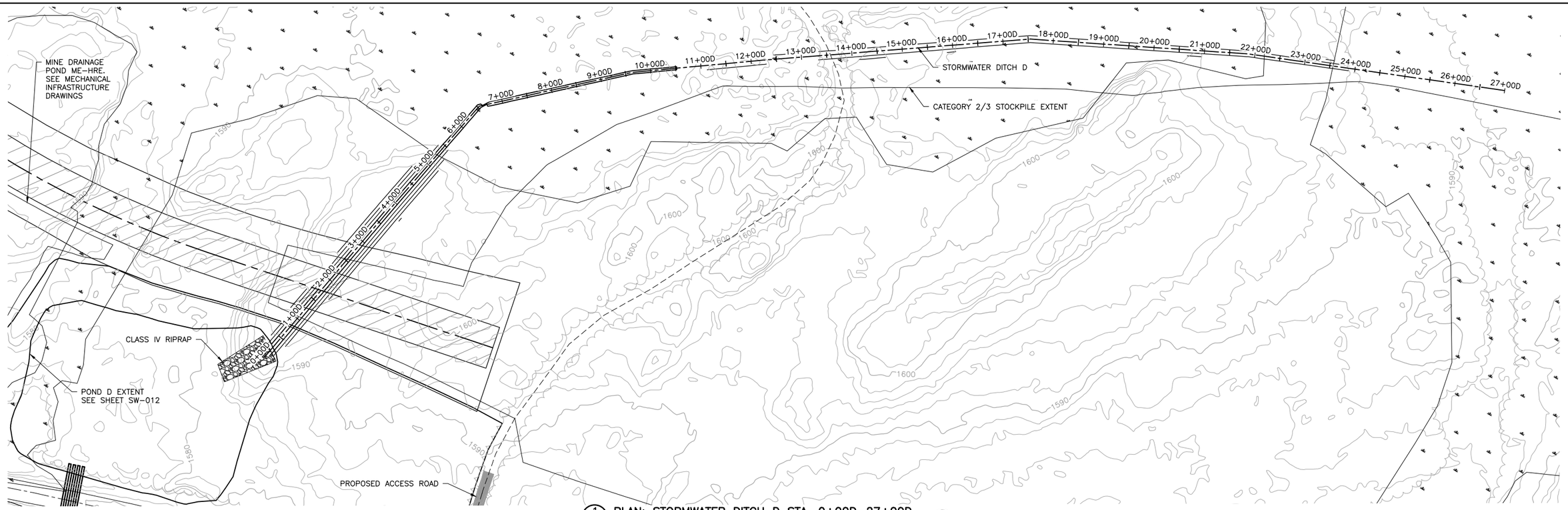
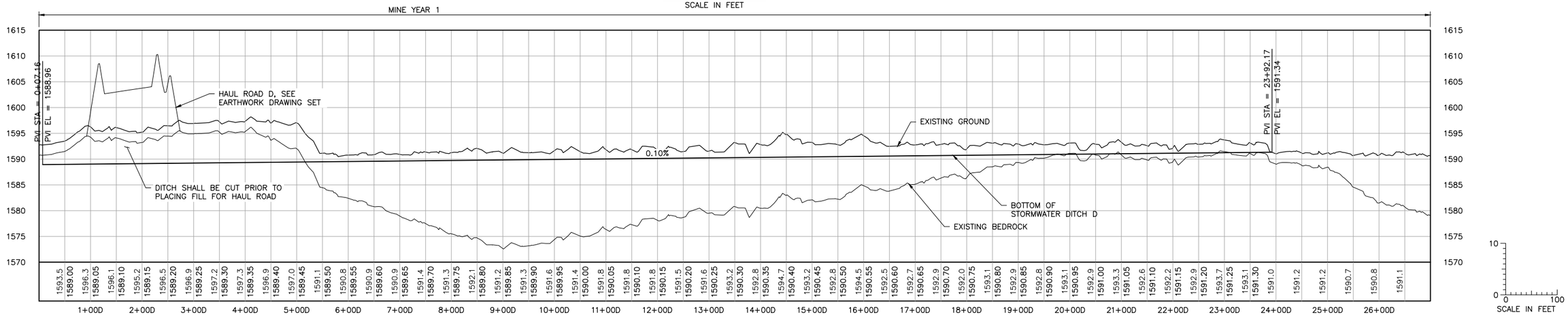


1 — PLAN: STORMWATER DITCH D STA. 0+00D–27+00D



2 — PROFILE: STORMWATER DITCH D STA. 0+00D–27+00D

NOTES:

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2. EXISTING GROUND PROFILE REPRESENTS GRADE AT DITCH CENTERLINE.

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SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER DITCH D PLAN AND PROFILE STATION 0+00D – 27+00D

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

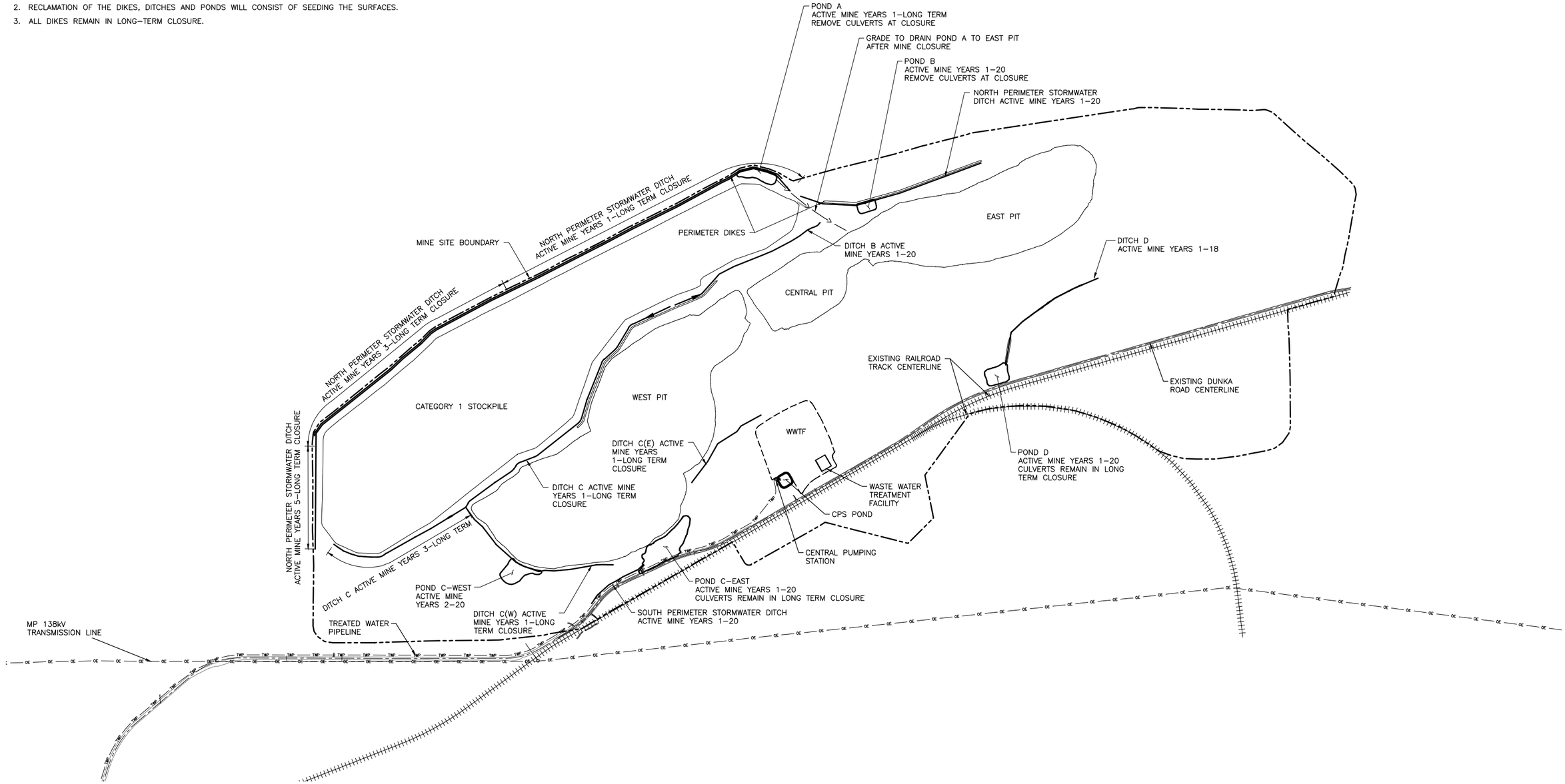
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. SW-030
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-05-CS-118.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 4:00 PM
INCHES 1 2

NOTES:

1. ALL FEATURES SHOWN WILL REMAIN IN LONG–TERM CLOSURE UNLESS OTHERWISE NOTED.
2. RECLAMATION OF THE DIKES, DITCHES AND PONDS WILL CONSIST OF SEEDING THE SURFACES.
3. ALL DIKES REMAIN IN LONG–TERM CLOSURE.



1 PLAN: STORMWATER DIKES, DITCHES, AND PONDS RECLAMATION PLAN

0 1000 2000
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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SIGNATURE
DATE 5/26/15 LICENSE# 20533

DRAWN: KKB/ATS
CHECKED: ATS
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE STORMWATER
DIKES, DITCHES, AND PONDS
RECLAMATION PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

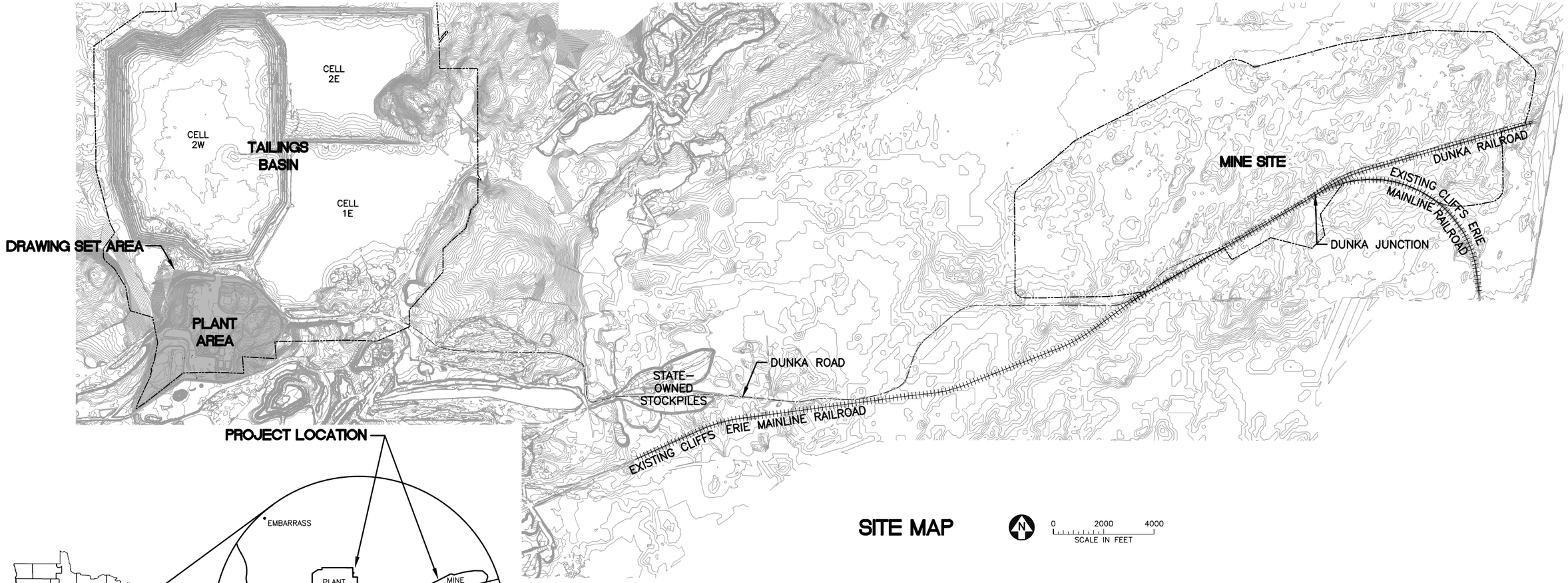
DWG. NO. SW–031 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMG–04–CS–FIGURE 1.DWG PLOT SCALE: 1:2 PLOT DATE: 5/29/2015 11:43 AM

INCHES 1 2

Plant Site Stormwater

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
PLANT SITE STORMWATER
HOYT LAKES, MINNESOTA



SITE MAP

N

0 2000 4000
SCALE IN FEET

LOCATION MAP
NOT TO SCALE

N

VICINITY MAP
NOT TO SCALE

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PRINTED NAME CRISTIAN A. DIAZ
SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GENERAL DWGS
LOCATION MAP AND SITE MAP

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

DWG. NO. PSSW-001
REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 9:36 AM
INCHES 1 2

PLANT SITE STORMWATER LEGEND

EXISTING

- EXISTING CONTOUR – MAJOR 10'
- EXISTING CONTOUR – MINOR 2'
- EXISTING RAILROAD
- WATER EDGE/CREEK CENTER LINE
- EXISTING ROAD
- EXISTING STRUCTURES
- TREE LINE
- EXISTING MANHOLE/CATCH BASIN
- EXISTING CULVERT
- EXISTING FENCE
- WETLAND BOUNDARY

PROPOSED

- PROPOSED CONTOUR – MAJOR 5'
- PROPOSED CONTOUR – MINOR 1'
- PROPOSED CENTERLINE STATIONING (1+00X)
- PROPOSED CULVERT (STORMWATER)
- PROPOSED PIPE
- PROPOSED MANHOLE/CATCH BASIN
- PROPOSED RIPRAP
- PROJECT AREA BOUNDARY
- FLOW PATH

PROPOSED OTHER FACILITY

- PROPOSED STRUCTURES
- PROPOSED RAILROAD

NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.

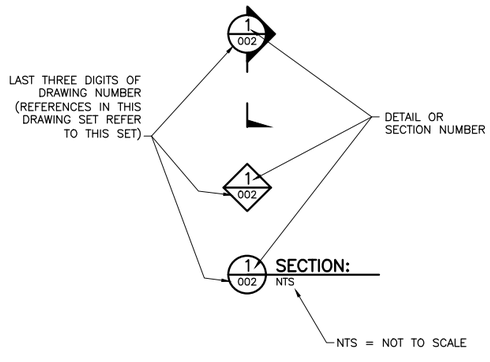
SHEET INDEX

SHEET NO.	TITLE
PLANT SITE STORMWATER DRAWINGS	
PSSW–001	LOCATION MAP & SITE MAP
PSSW–002	LEGEND & SHEET INDEX
PSSW–003	GENERAL LAYOUT & SHEET INDEX MAP
PSSW–004 TO PSSW–015	GRADING PLANS
PSSW–016 TO PSSW–030	GRADING PROFILES
PSSW–031 TO PSSW–033	SECTIONS & DETAILS

ABBREVIATIONS

AC–FT	–	ACRE–FEET
AVE	–	AVERAGE
CB	–	CATCH BASIN
℄	–	CENTERLINE
CMP	–	CORRUGATED METAL PIPE
DS	–	DOWNSTREAM
DV	–	DRAIN VALVE
DWG	–	DRAWING
EL.	–	ELEVATION
FTB	–	FLOTATION TAILINGS BASIN
GAL	–	GALLONS
GPM	–	GALLONS PER MINUTE
HDPE	–	HIGH–DENSITY POLYETHYLENE
INV	–	INVERT
LF	–	LINEAR FEET
MH	–	MANHOLE
MIN	–	MINIMUM
NWL	–	NORMAL WATER LEVEL
PSSW	–	PLANT SITE STORMWATER
SDR	–	STANDARD DIMENSION RATIO
STA	–	STATION
TYP	–	TYPICAL
US	–	UPSTREAM

DRAWING NUMBERING



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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GENERAL DWGS
LEGEND AND SHEET INDEX

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. PSSW–002 REV

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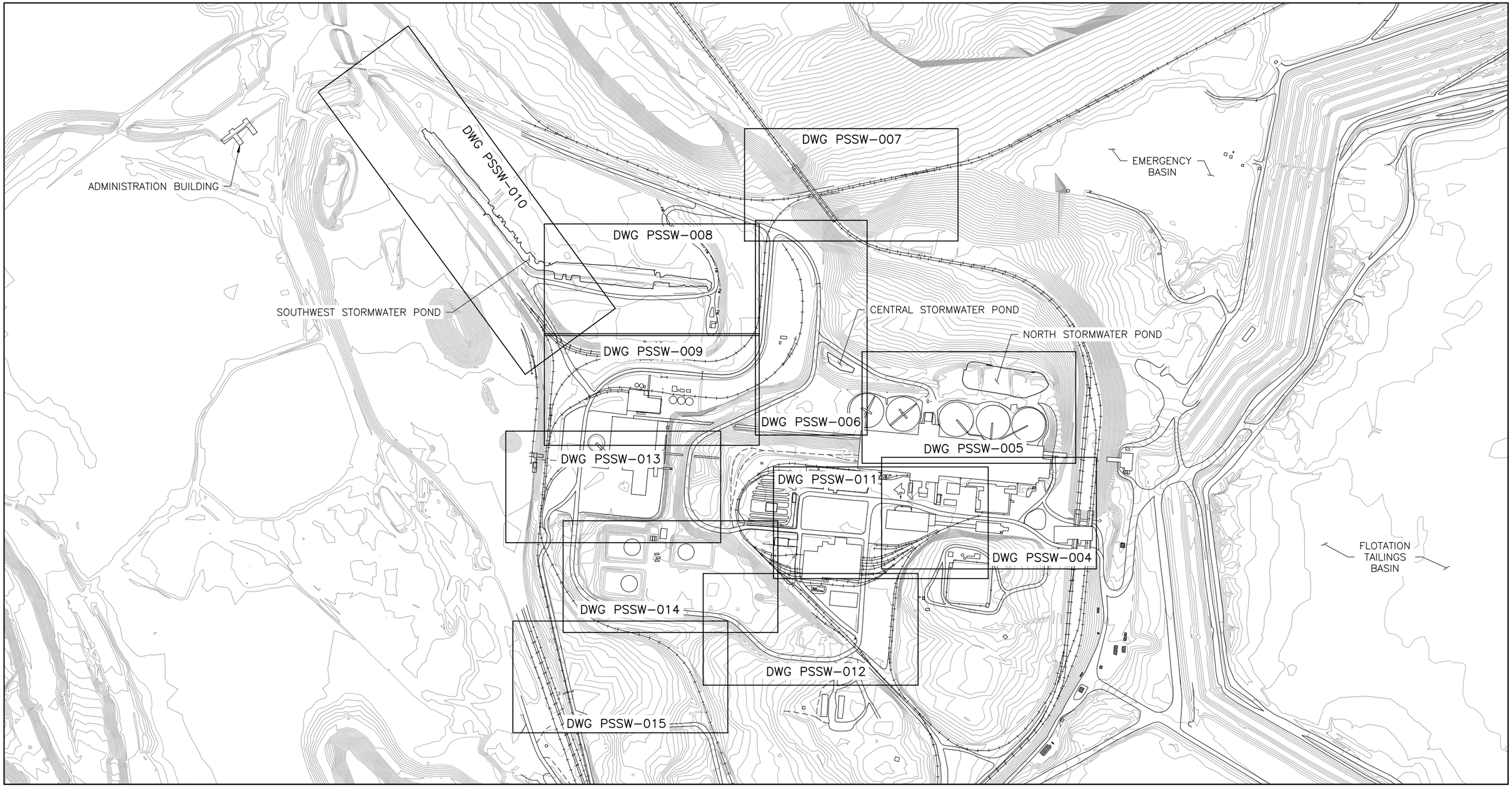

1 PLAN: SHEET INDEX

0 350 700
SCALE IN FEET

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER
GENERAL LAYOUT AND SHEET INDEX MAP

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-003
REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-003.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 9:39 AM

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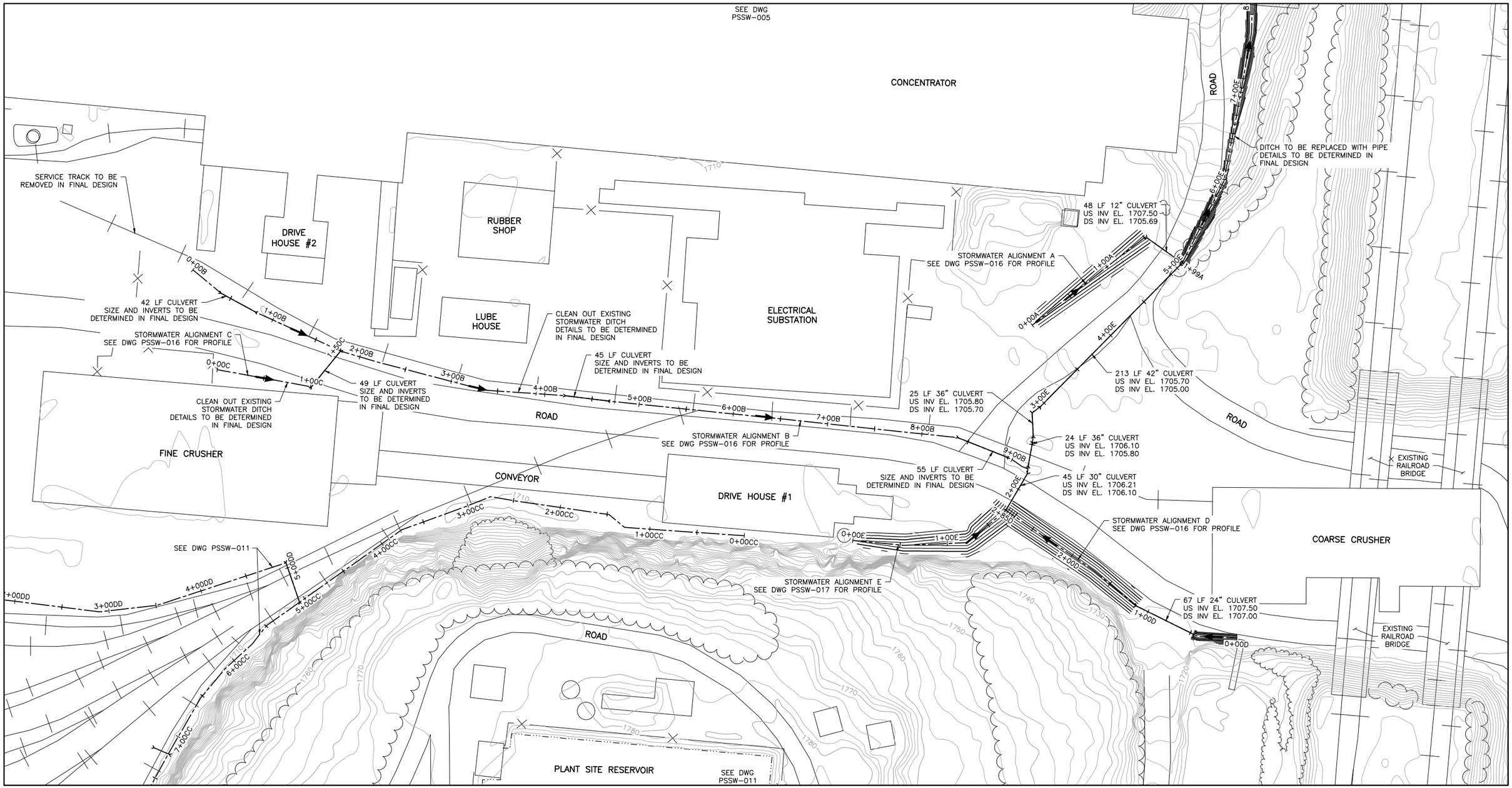

1 PLAN: STORMWATER ALIGNMENTS A-E

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

0 50 100
SCALE IN FEET

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-004 REV

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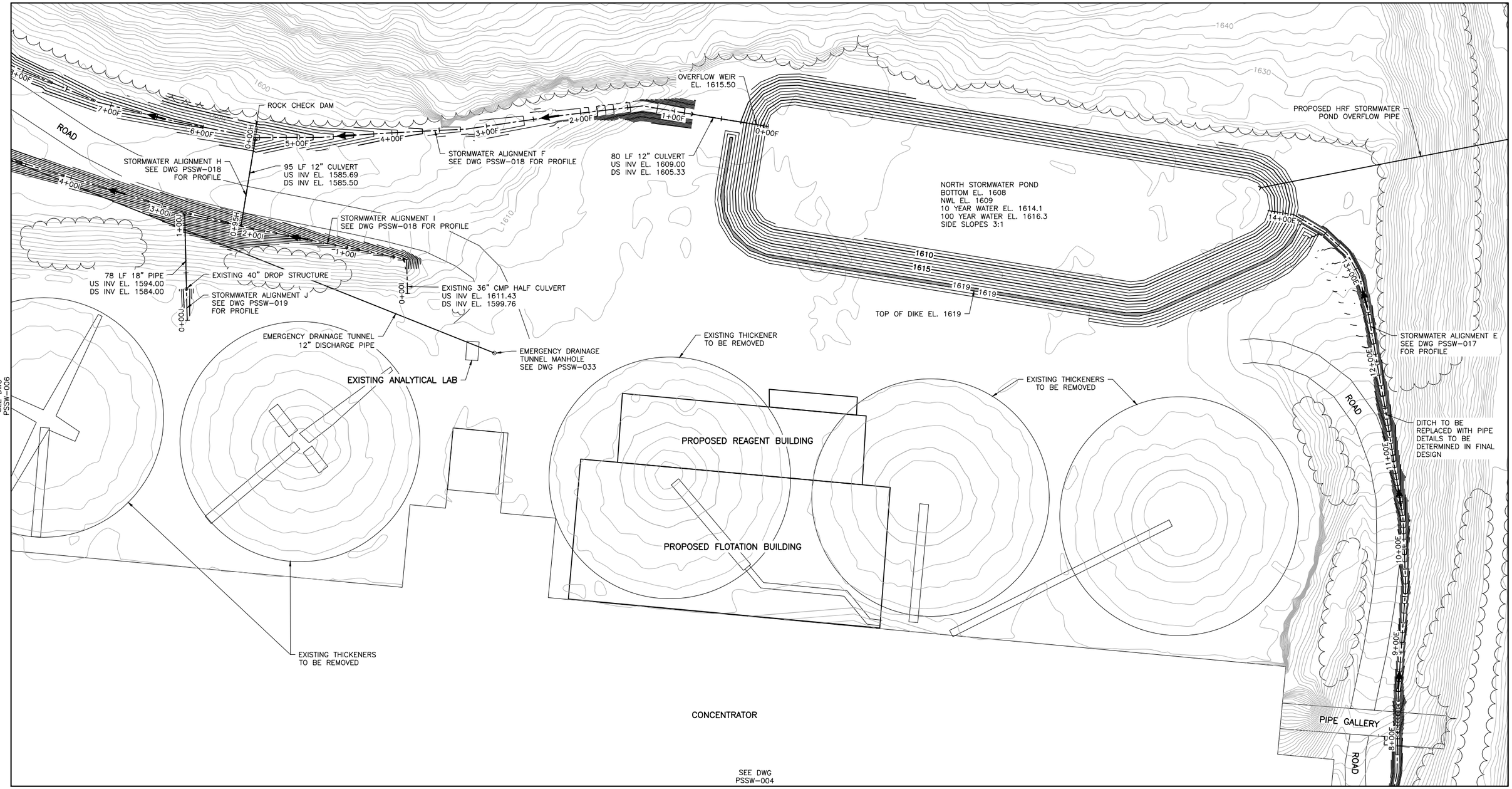

1 PLAN: STORMWATER ALIGNMENTS E, F, H–J

NOTE:

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0 50 100
SCALE IN FEET

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DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

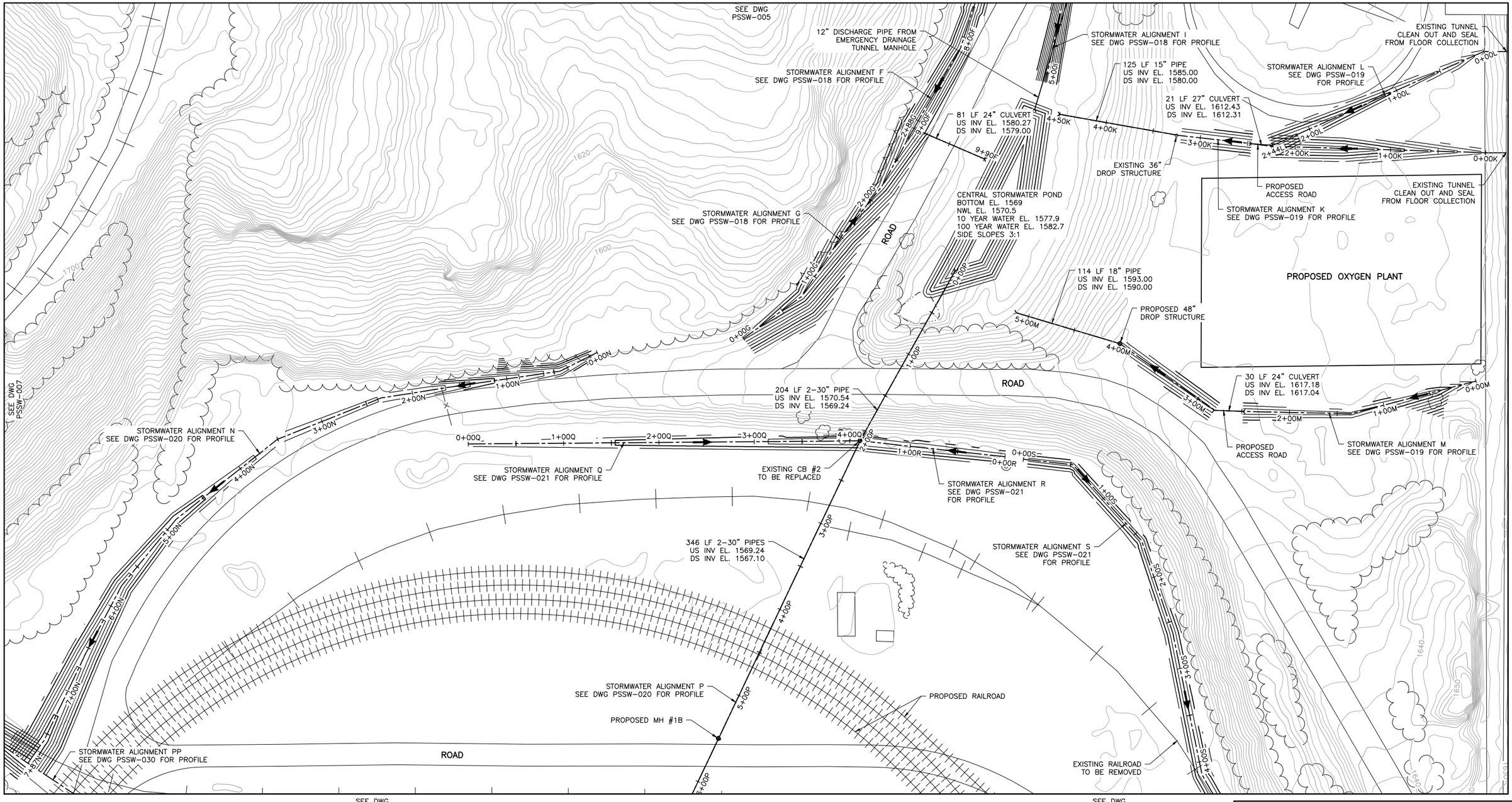
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-005 REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 9:55 AM



1 PLAN: STORMWATER ALIGNMENTS F, G, I, K–N, P–S

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

0 50 100
SCALE IN FEET

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-006
REV

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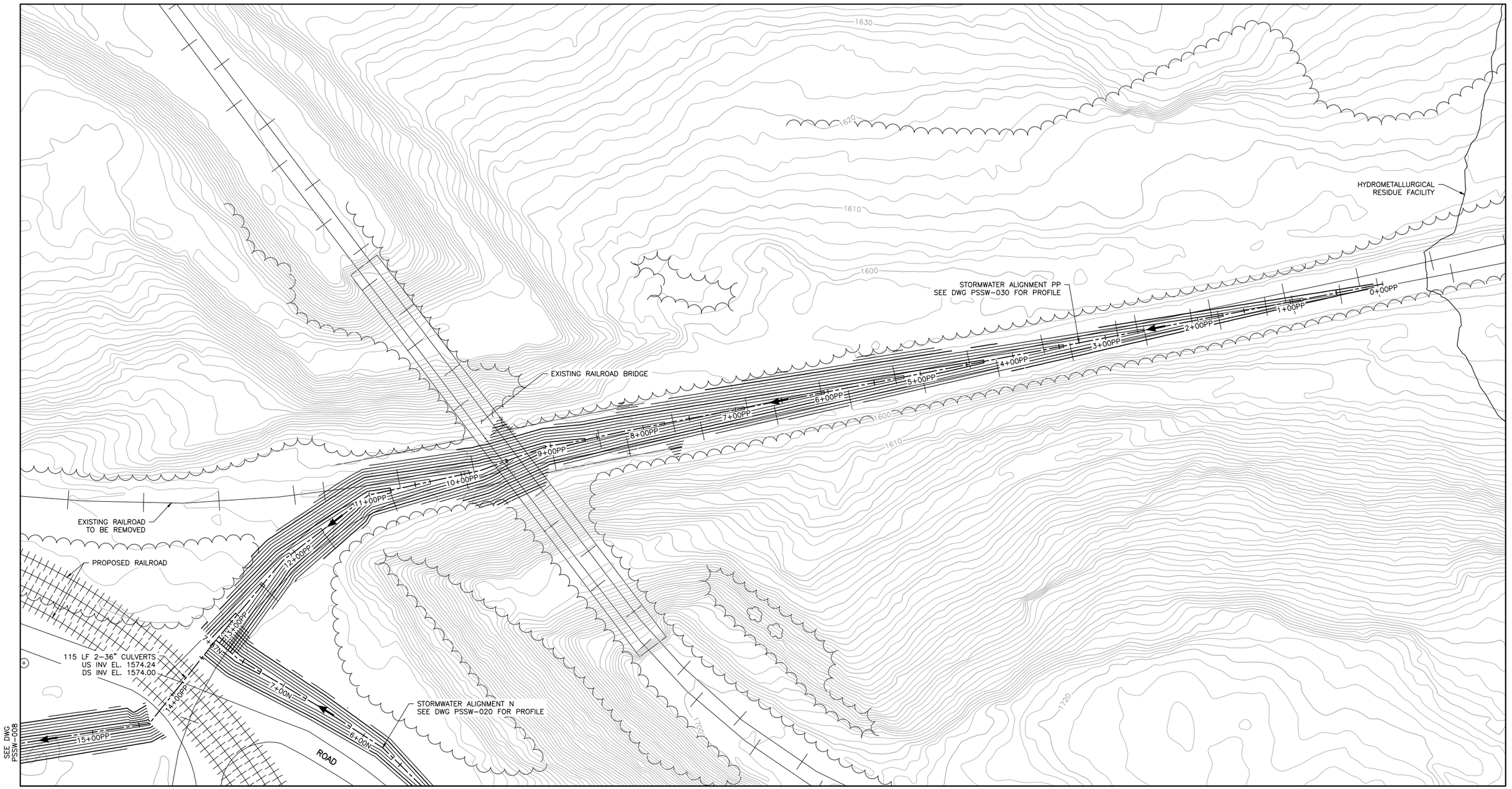

1/- PLAN: STORMWATER ALIGNMENTS N AND PP

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

VER NO	DATE	DESCRIPTION
1	5/15/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/15/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

POLYMET MINING

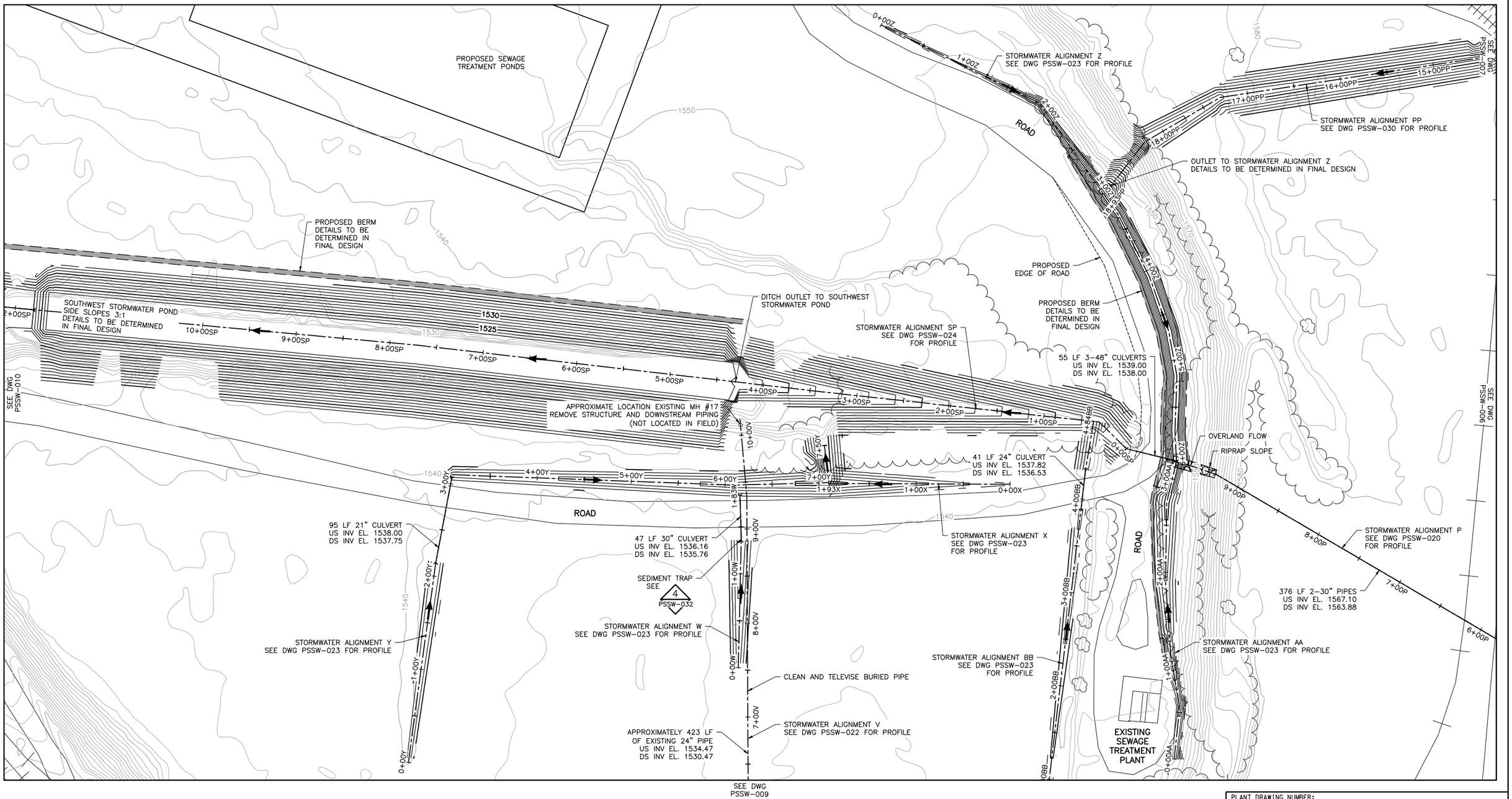
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-007

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-007.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:00 AM
INCHES 1 2



1/- PLAN: STORMWATER ALIGNMENTS V-Z, AA, BB, SP

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

0 50 100
SCALE IN FEET

VER NO	DATE	DESCRIPTION
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FOR CONSTRUCTION		

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

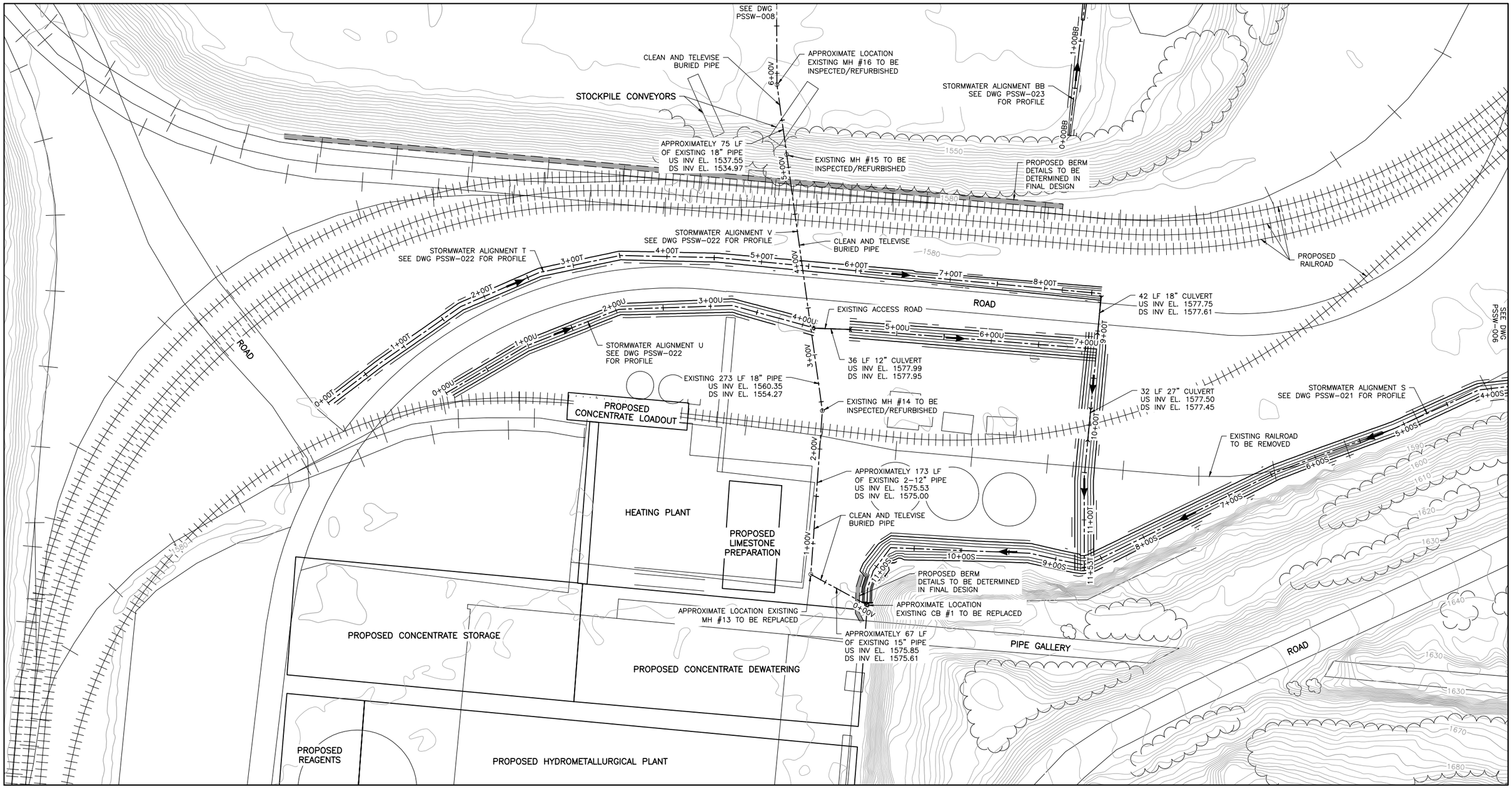
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-008 REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-008.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:13 AM



1 PLAN: STORMWATER ALIGNMENTS S-V, BB

NOTE:

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0 50 100
SCALE IN FEET

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FOR CONSTRUCTION		
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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

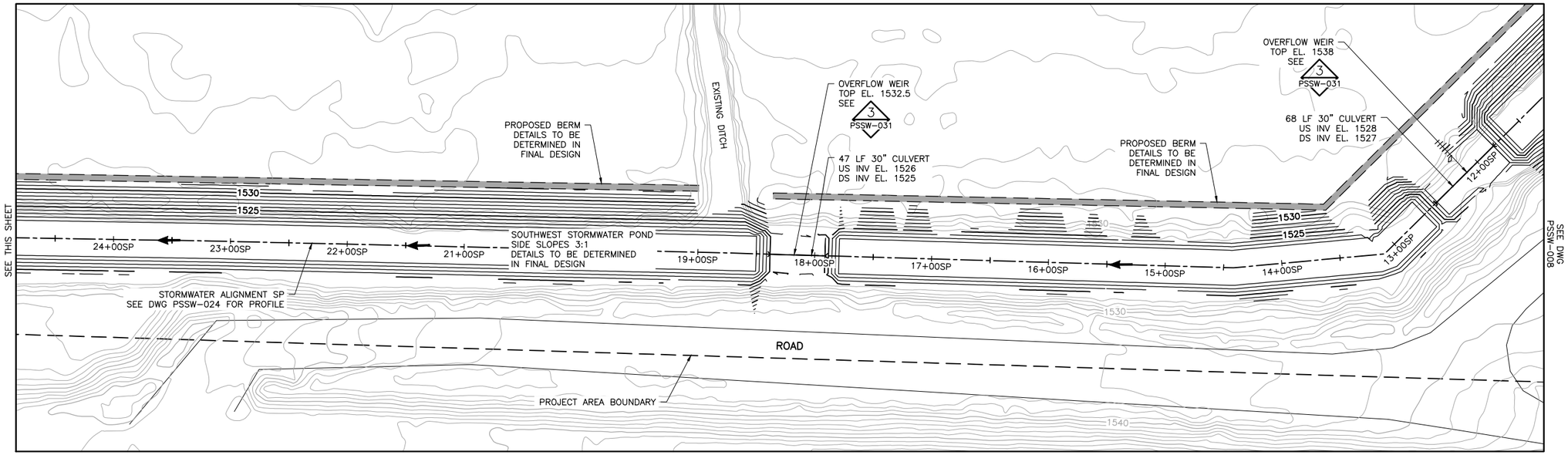
POLYMET MINING

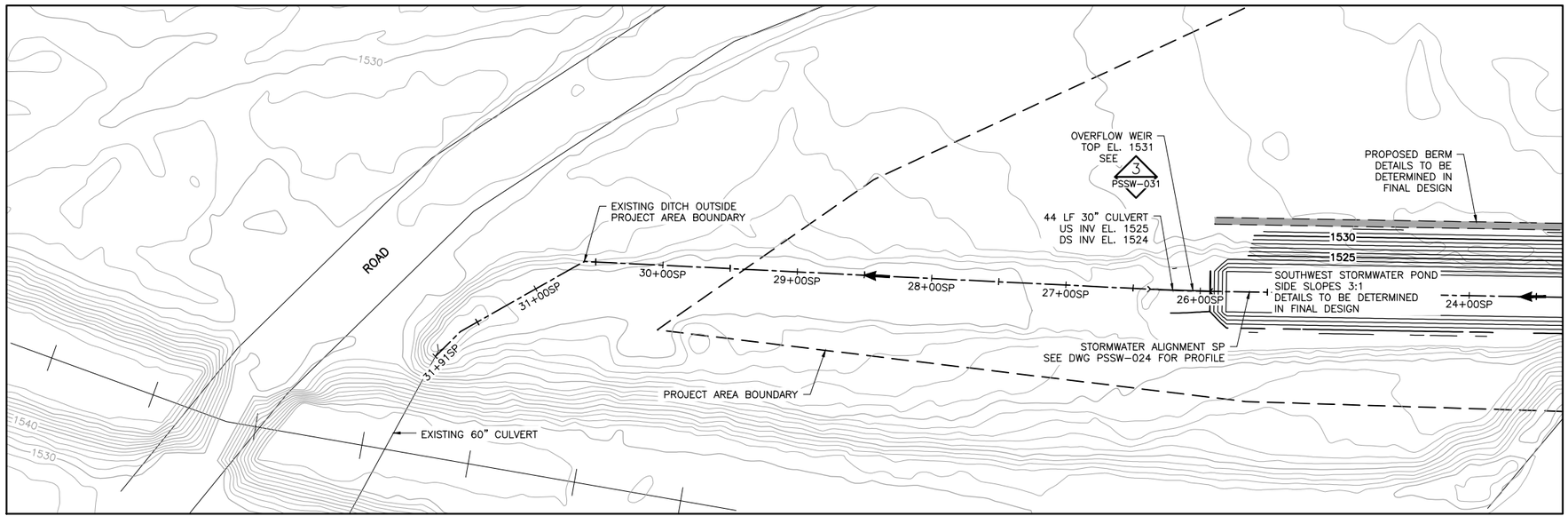
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-009
REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-009.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:15 AM
INCHES 1 2





1 PLAN: STORMWATER ALIGNMENT SP

NOTE:

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0 50 100
SCALE IN FEET

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CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

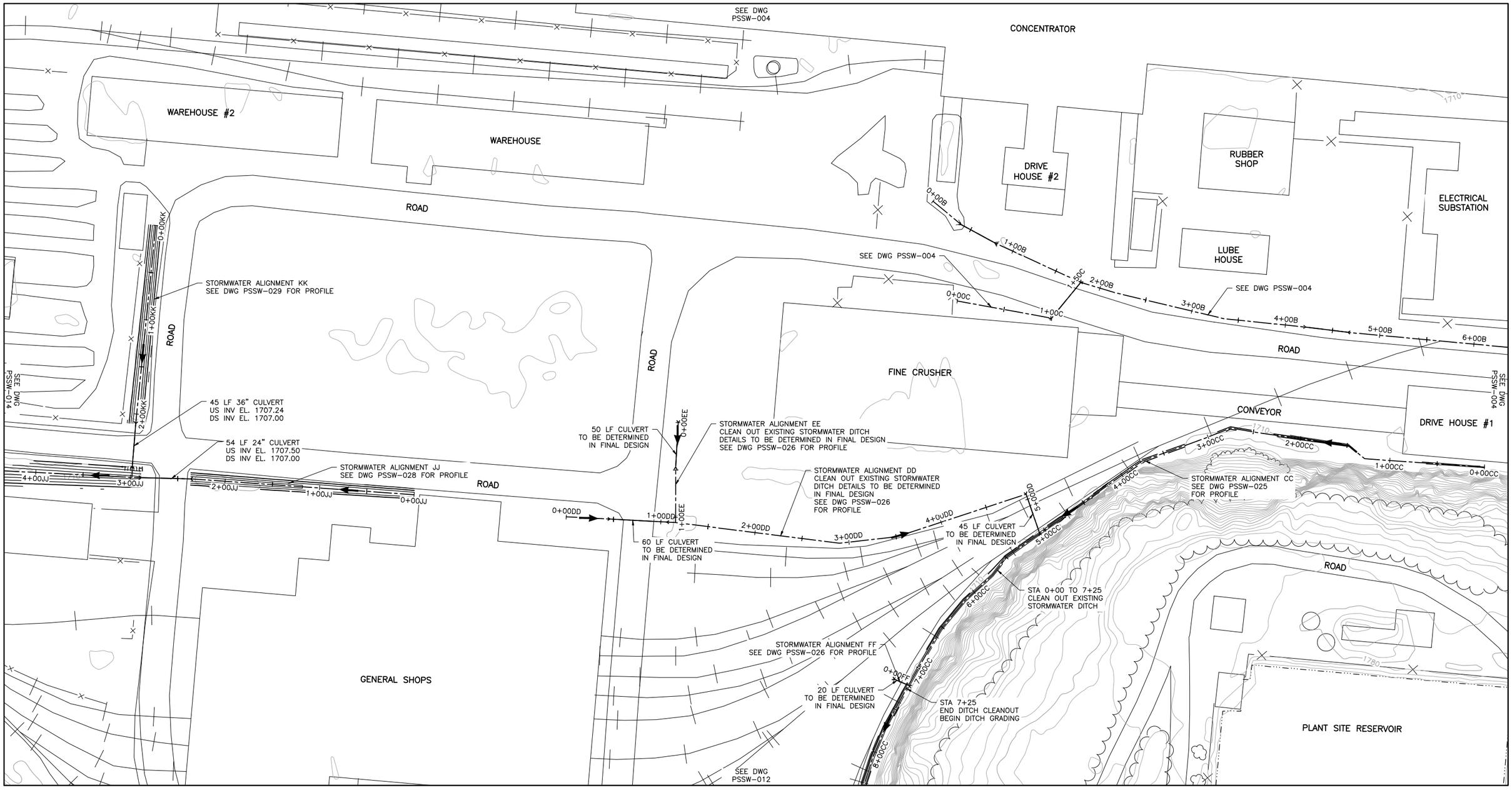
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-010 REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-0110.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:18 AM



1 PLAN: STORMWATER ALIGNMENTS CC, DD, EE, FF, JJ, AND KK

NOTE:

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0 50 100
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SCALE: AS SHOWN

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POLYMET MINING

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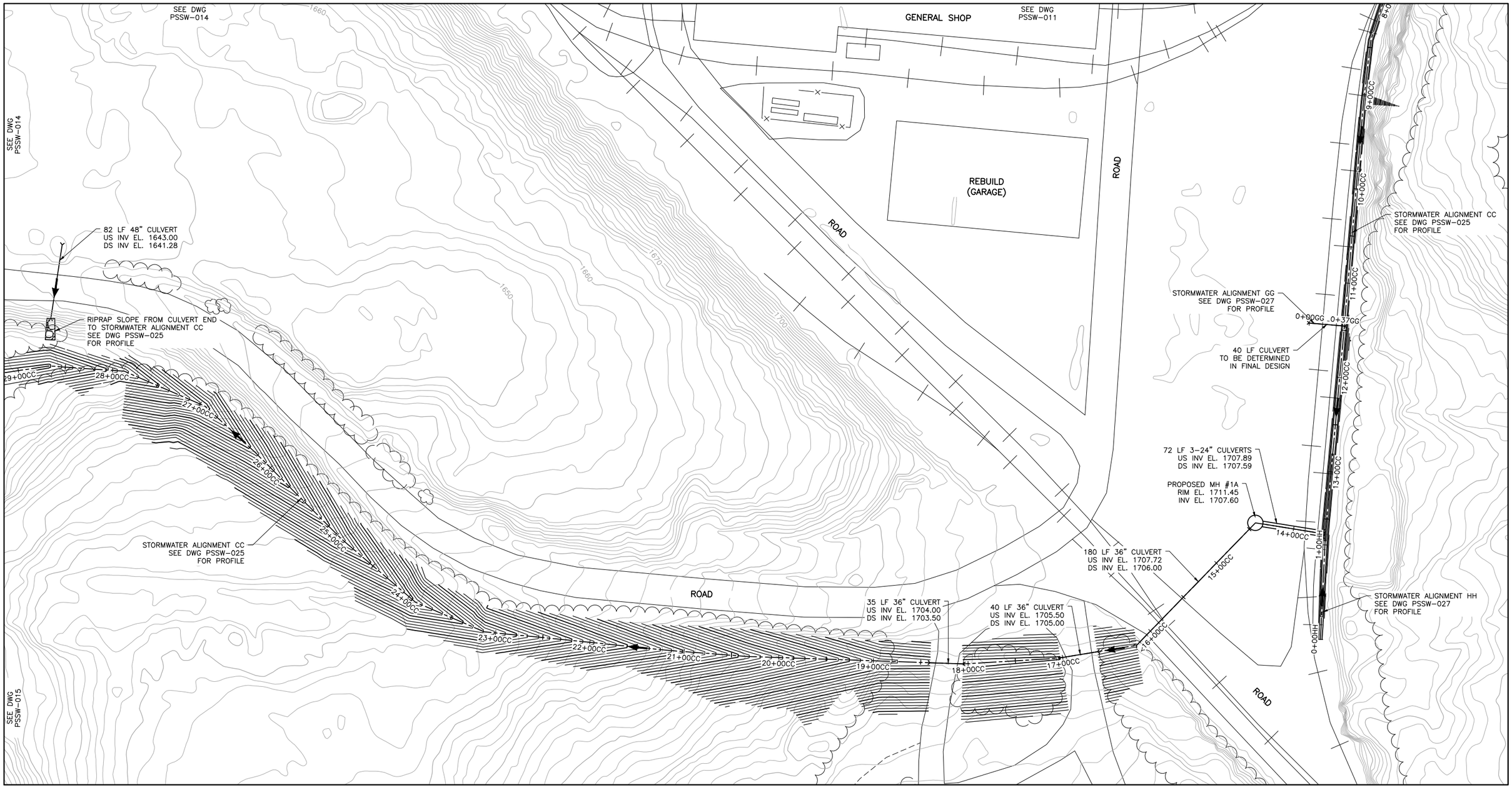
Ph: 1-800-632-2277

DWG. NO. PSSW-011 REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-011.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:20 AM



1 PLAN: STORMWATER ALIGNMENTS CC AND HH

NOTE:

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0 50 100
SCALE IN FEET

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DRAWN: PRT
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

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

DWG. NO. PSSW-012
REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-012.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:22 AM

INCHES 1 2



1 PLAN: STORMWATER ALIGNMENTS JJ, MM, AND NN

NOTE:

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0 50 100
SCALE IN FEET

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DRAWN: PRT
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-013 REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-013.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:24 AM
INCHES 1 2



1 PLAN: STORMWATER ALIGNMENTS CC AND JJ

NOTE:

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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

POLYMET MINING

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NORTHMET PROJECT
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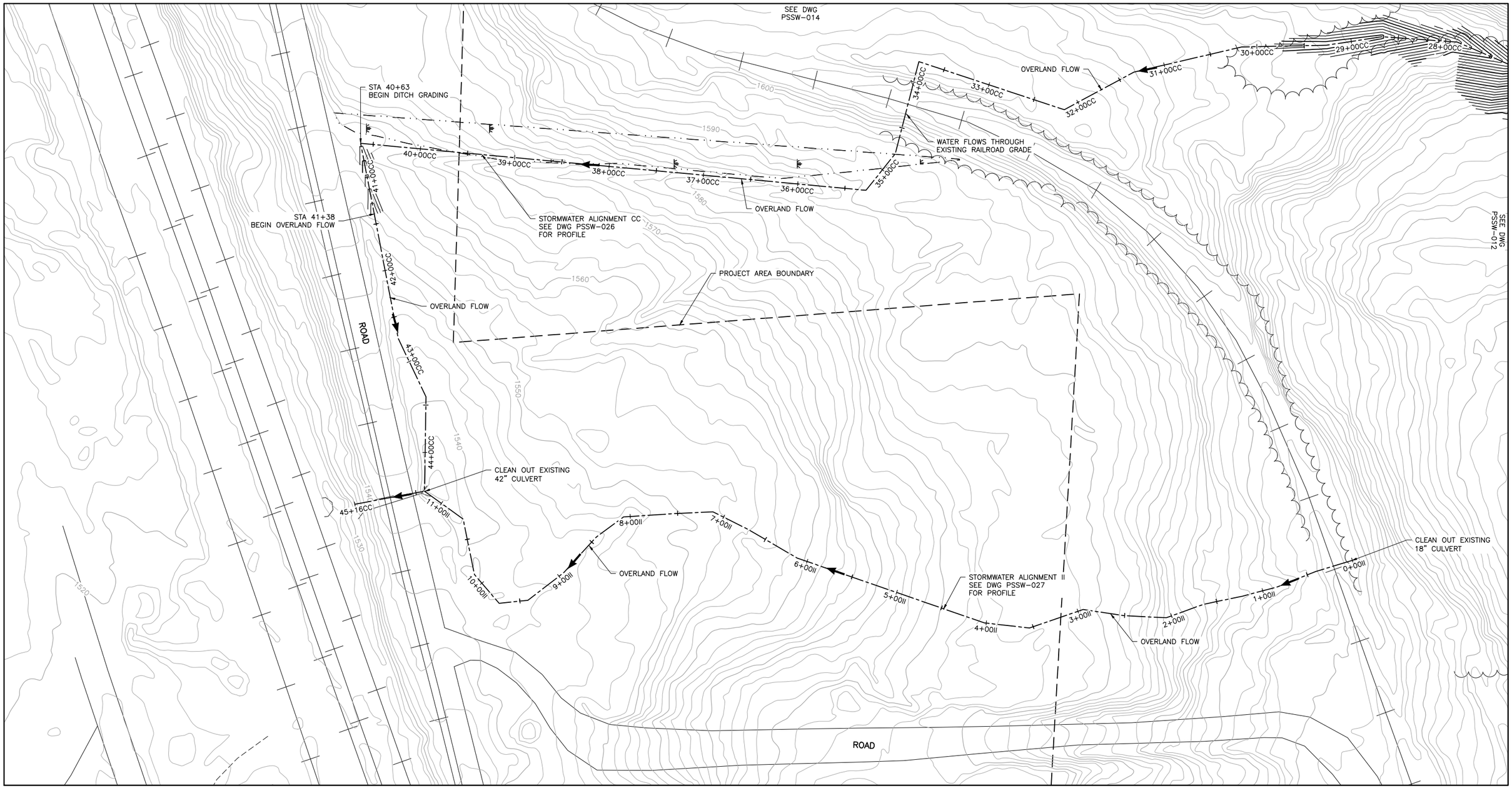
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-014 REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-014.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:26 AM



1 PLAN: STORMWATER ALIGNMENTS CC AND II

NOTE:

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0 50 100
SCALE IN FEET

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: PRT
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PLAN

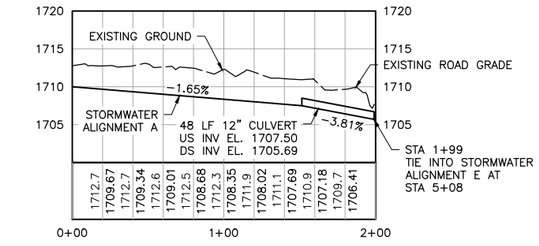
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-015 REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-015.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:45 AM

INCHES 1 2



A PSSW-004 **PROFILE: STORMWATER ALIGNMENT A**

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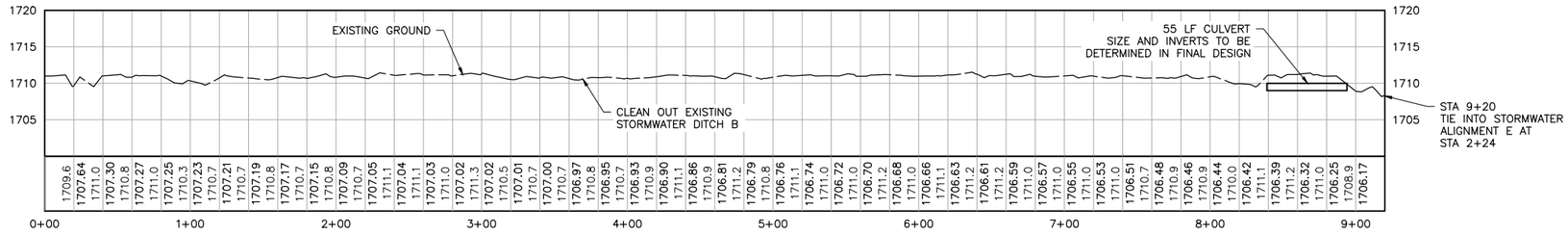
0 10 20 VERTICAL SCALE IN FEET



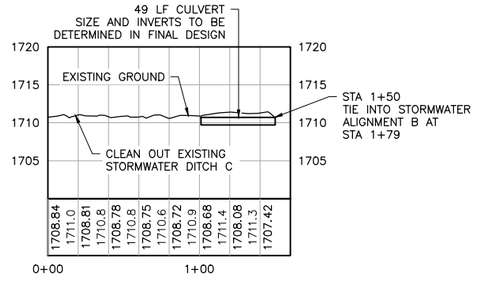
NOTE:

STORMWATER DITCH HAS CONSTRAINTS RESTRICTING CONSTRUCTION. DESIGN OPTIONS HAVE BEEN IDENTIFIED. THIS PROFILE SHOWS CLEAN-OUT OF THE EXISTING DITCH, WHICH DOES NOT HAVE THE CAPACITY AS REQUIRED TO RESTRICT FLOODING.

B PSSW-004 **PROFILE: STORMWATER ALIGNMENT B**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



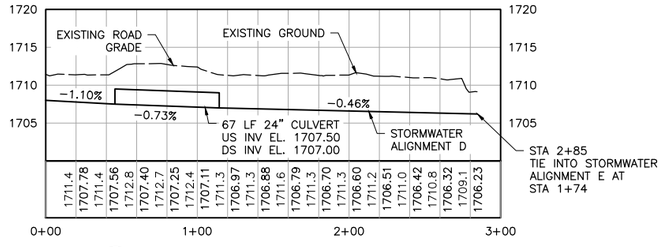
NOTE:

STORMWATER DITCH HAS CONSTRAINTS RESTRICTING CONSTRUCTION. DESIGN OPTIONS HAVE BEEN IDENTIFIED. THIS PROFILE SHOWS CLEAN-OUT OF THE EXISTING DITCH, WHICH DOES NOT HAVE THE CAPACITY AS REQUIRED TO RESTRICT FLOODING.

C PSSW-004 **PROFILE: STORMWATER ALIGNMENT C**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



D PSSW-004 **PROFILE: STORMWATER ALIGNMENT D**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

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SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

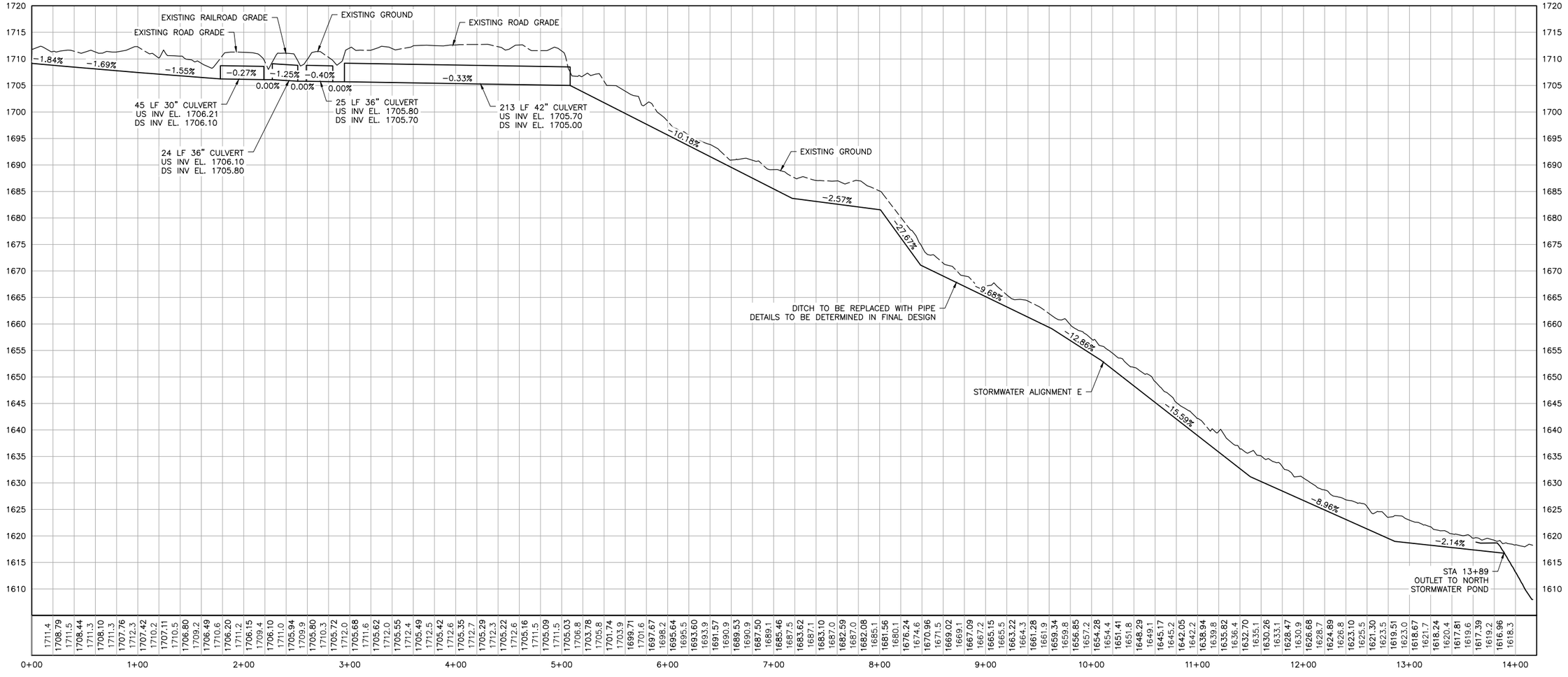
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-016

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-016.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:49 AM

INCHES 1 2



E PROFILE: STORMWATER ALIGNMENT E
PSSW-004,005

HORIZONTAL SCALE IN FEET: 0 50 100
VERTICAL SCALE IN FEET: 0 10 20

NOTE:

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

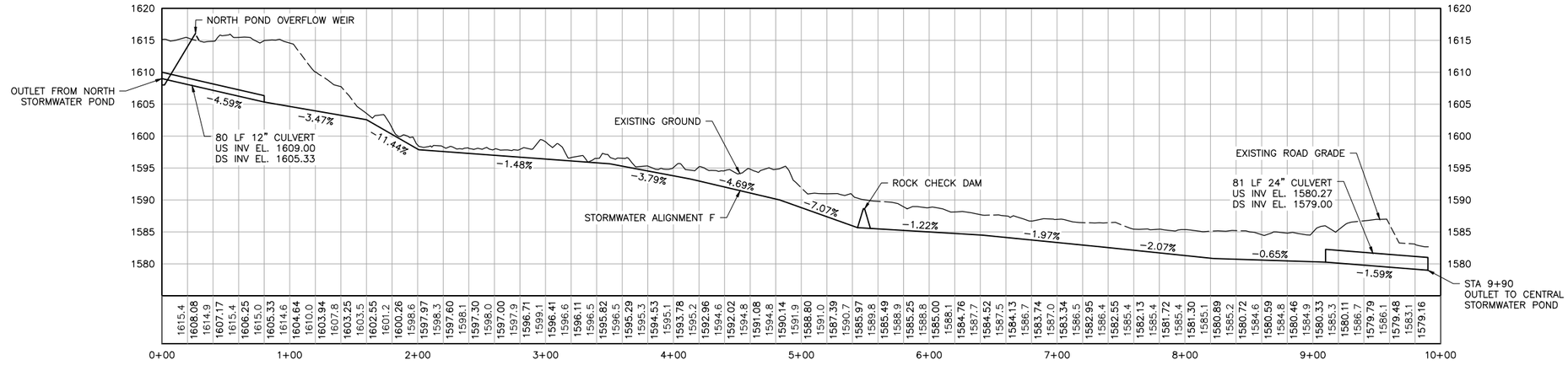
BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-017
REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-017.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 10:58 AM

INCHES 1 2



F PROFILE: STORMWATER ALIGNMENT F

PSSW-005,006

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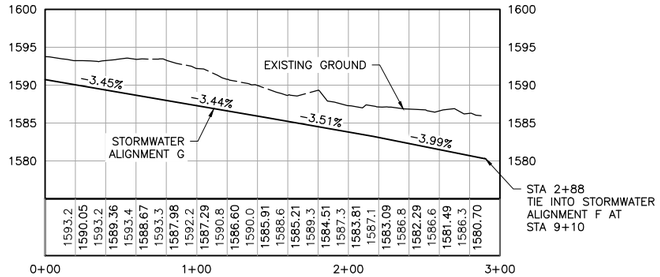
0 10 20 VERTICAL SCALE IN FEET

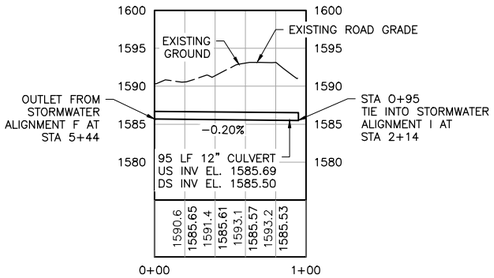


G PROFILE: STORMWATER ALIGNMENT G

PSSW-006

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

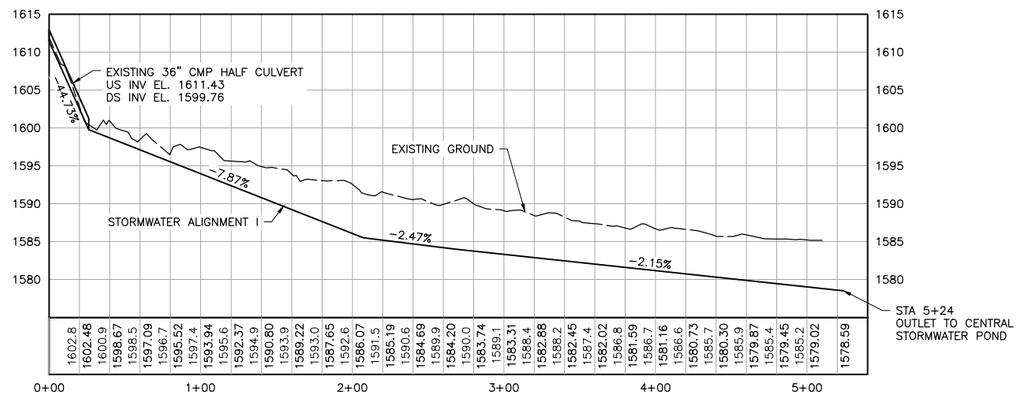


H PROFILE: STORMWATER ALIGNMENT H

PSSW-005

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



I PROFILE: STORMWATER ALIGNMENT I

PSSW-005,006

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

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DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-018

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-018.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:12 AM

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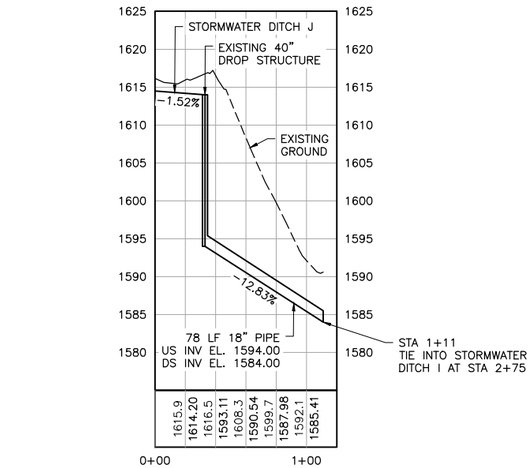
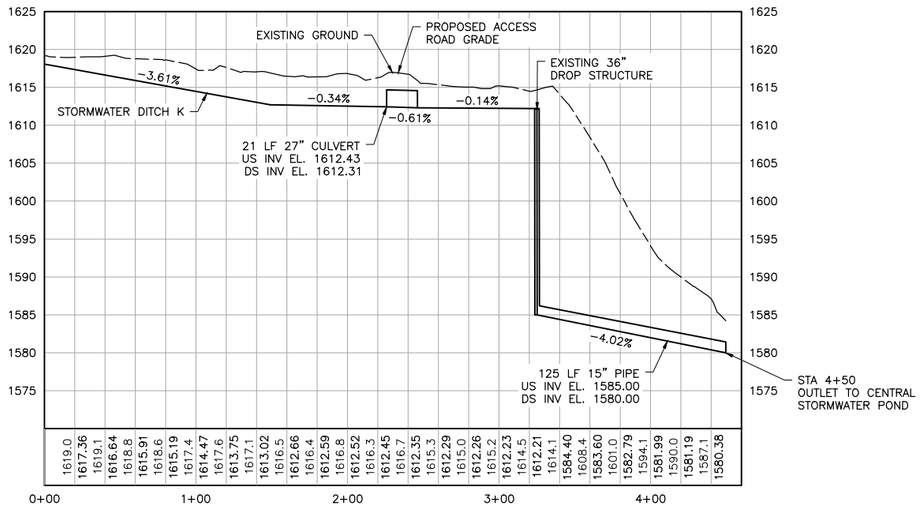


J PSSW-005 **PROFILE: STORMWATER ALIGNMENT J**

HORIZONTAL SCALE IN FEET: 0 50 100

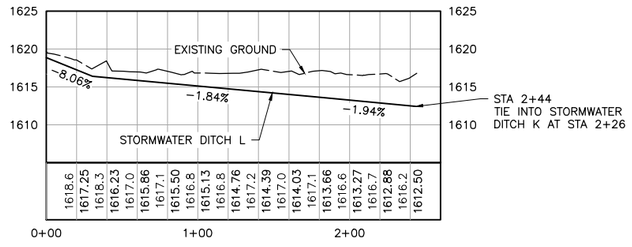
VERTICAL SCALE IN FEET: 0 10 20



K PSSW-006 **PROFILE: STORMWATER ALIGNMENT K**

HORIZONTAL SCALE IN FEET: 0 50 100

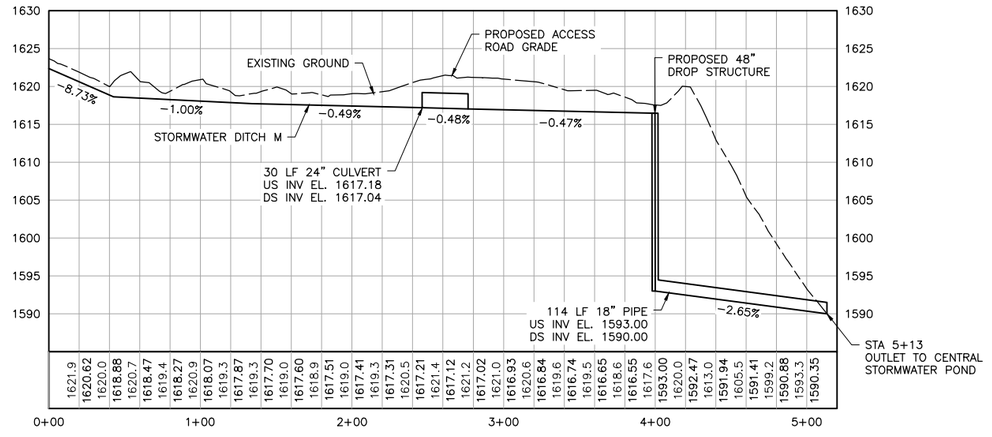
VERTICAL SCALE IN FEET: 0 10 20



L PSSW-006 **PROFILE: STORMWATER ALIGNMENT L**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20



M PSSW-006 **PROFILE: STORMWATER ALIGNMENT M**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

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ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/15/15
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 CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

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NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

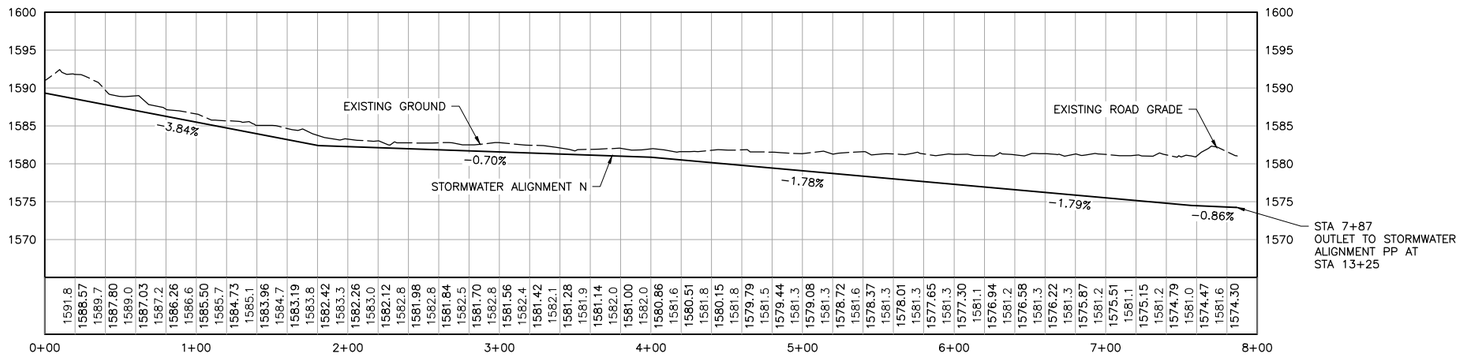
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-019

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-019.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:14 AM

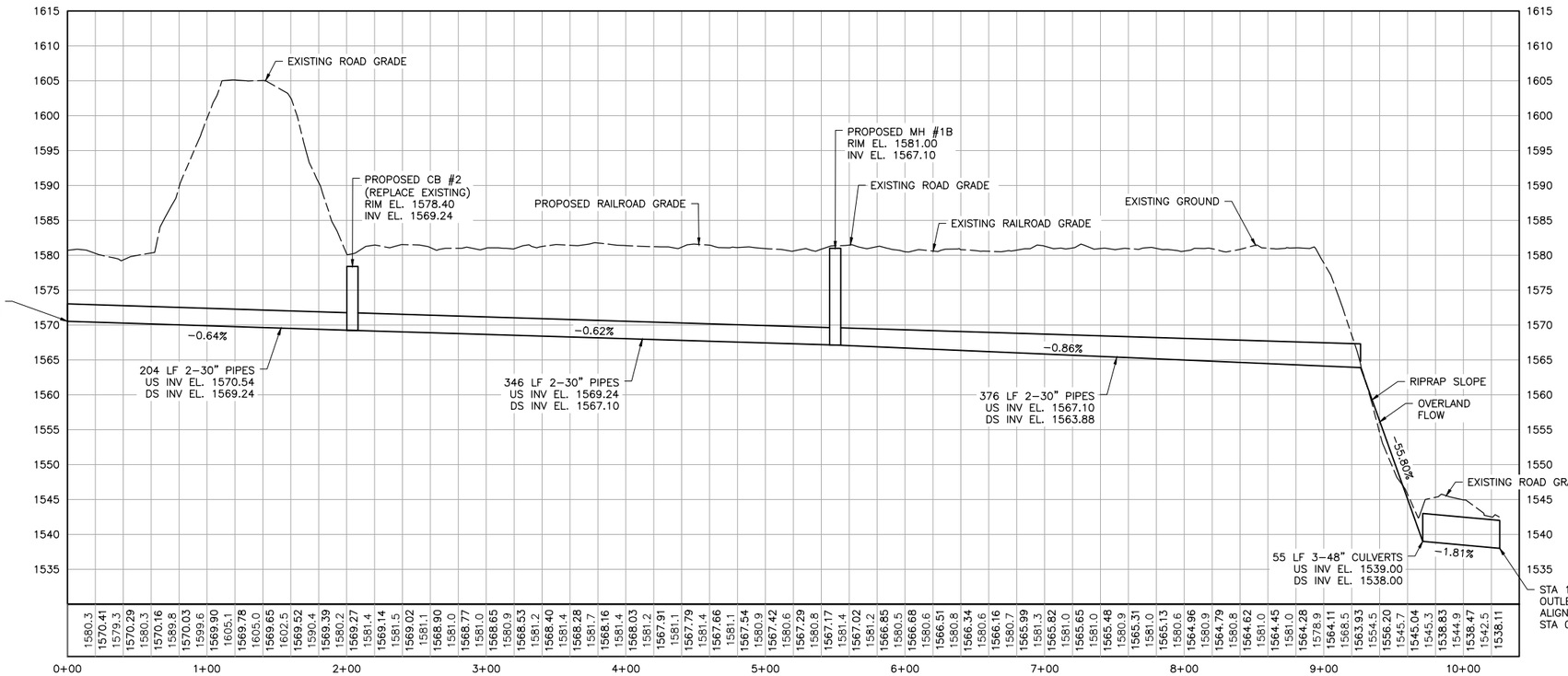
INCHES 1 2



N PSSW-006 **PROFILE: STORMWATER ALIGNMENT N**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20



P PSSW-006,008 **PROFILE: STORMWATER ALIGNMENT P**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/15/15
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SIGNATURE

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DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

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BARR

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MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-020

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-020.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:18 AM

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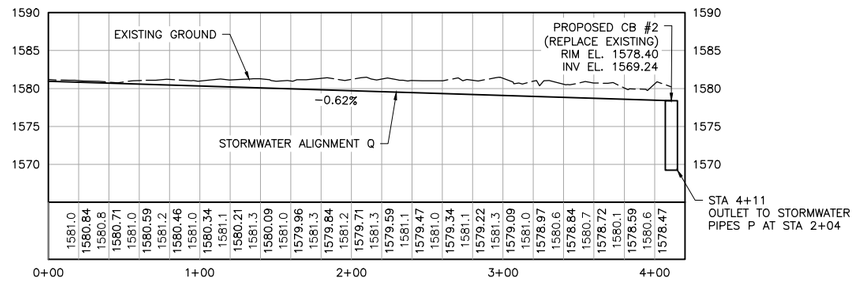
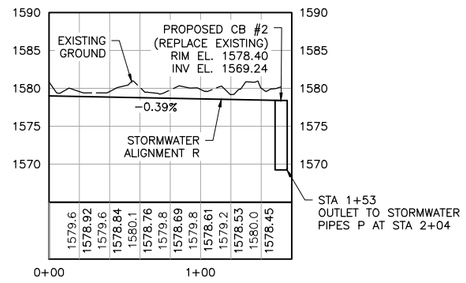


Q PSSW-006 **PROFILE: STORMWATER ALIGNMENT Q**

HORIZONTAL SCALE IN FEET: 0 50 100

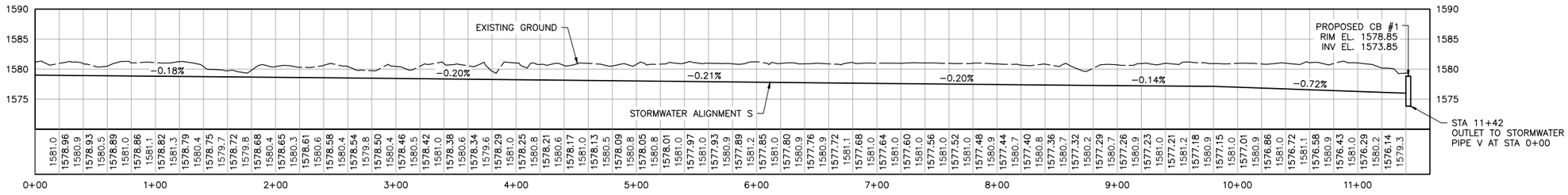
VERTICAL SCALE IN FEET: 0 10 20



R PSSW-006 **PROFILE: STORMWATER ALIGNMENT R**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20



S PSSW-006.009 **PROFILE: STORMWATER ALIGNMENT S**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

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NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

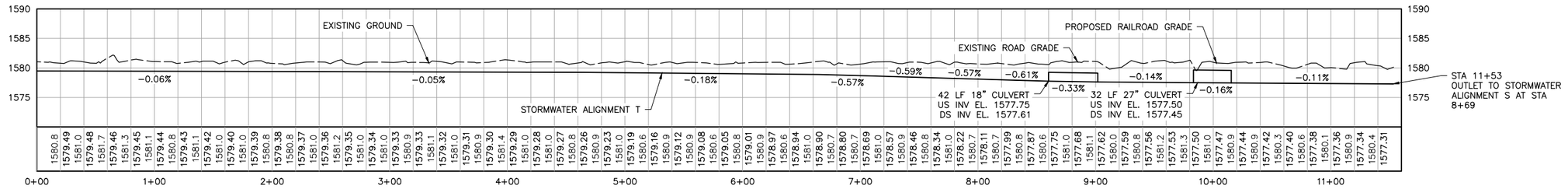
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-021

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-021.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:21 AM

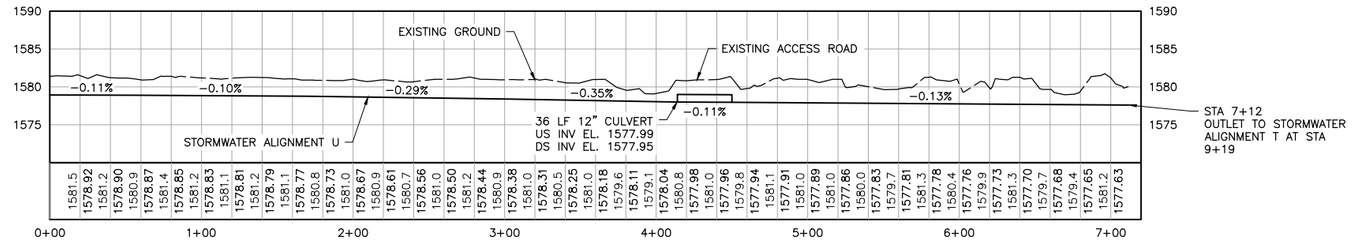
INCHES 1 2



T PSSW-009 **PROFILE: STORMWATER ALIGNMENT T**

0 50 100 HORIZONTAL SCALE IN FEET

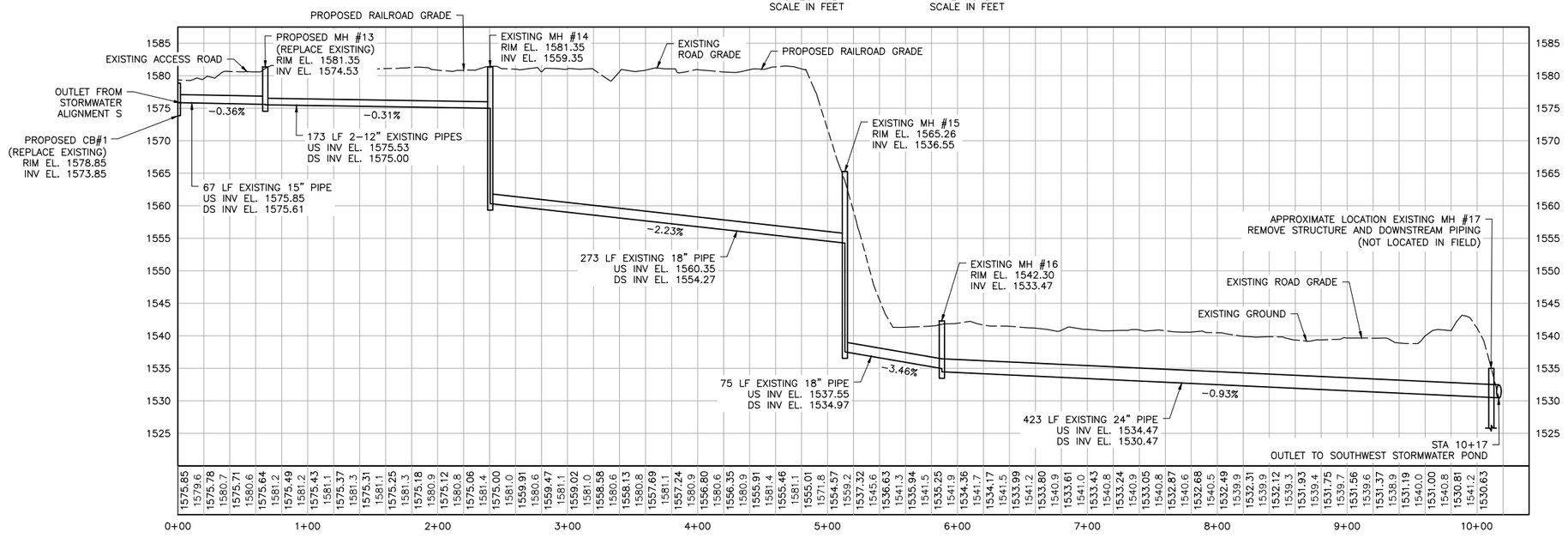
0 10 20 VERTICAL SCALE IN FEET



U PSSW-009 **PROFILE: STORMWATER ALIGNMENT U**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



V PSSW-008,009 **PROFILE: STORMWATER ALIGNMENT V**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

NOTE:

CLEAN AND TELEVISE BURIED PIPE.

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

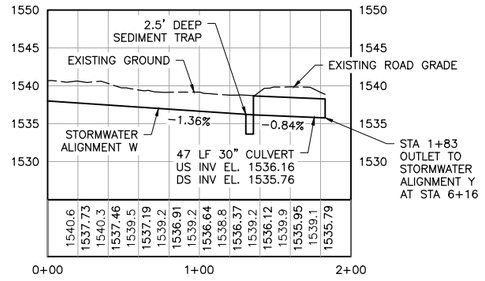
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1−800−632−2277

DWG. NO. PSSW−022

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-022.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:24 AM

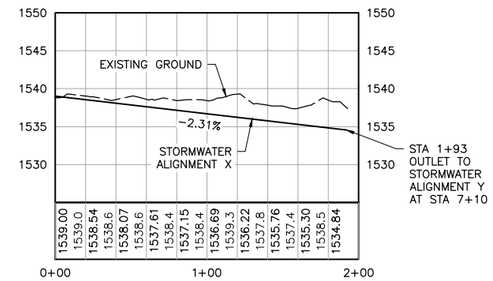
INCHES 1 2



W PSSW-008 **PROFILE: STORMWATER ALIGNMENT W**

0 50 100 HORIZONTAL SCALE IN FEET

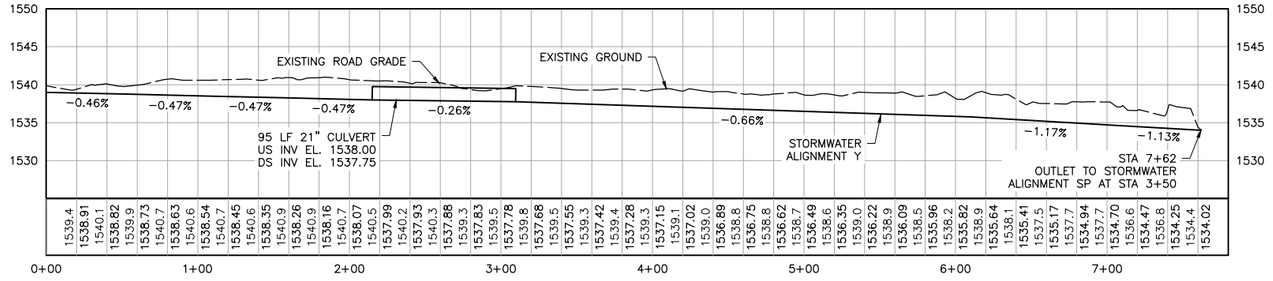
0 10 20 VERTICAL SCALE IN FEET



X PSSW-008 **PROFILE: STORMWATER ALIGNMENT X**

0 50 100 HORIZONTAL SCALE IN FEET

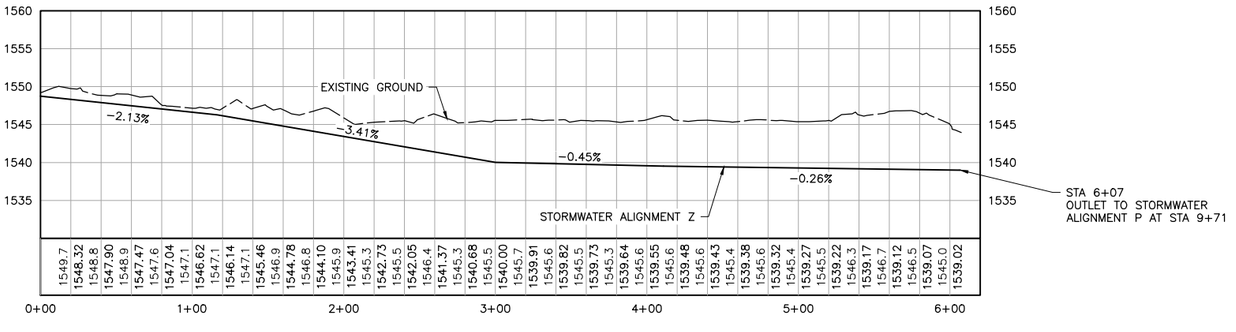
0 10 20 VERTICAL SCALE IN FEET



Y PSSW-008 **PROFILE: STORMWATER ALIGNMENT Y**

0 50 100 HORIZONTAL SCALE IN FEET

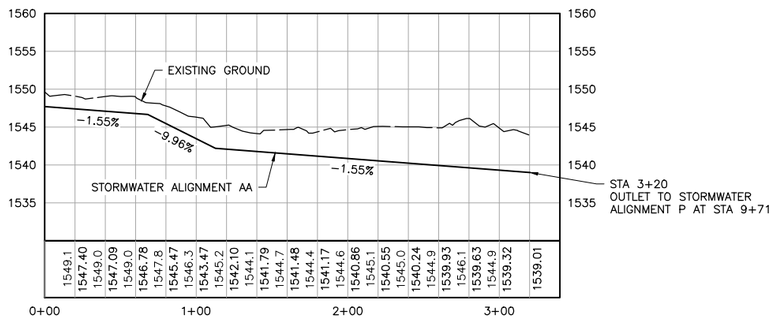
0 10 20 VERTICAL SCALE IN FEET



Z PSSW-008 **PROFILE: STORMWATER ALIGNMENT Z**

0 50 100 HORIZONTAL SCALE IN FEET

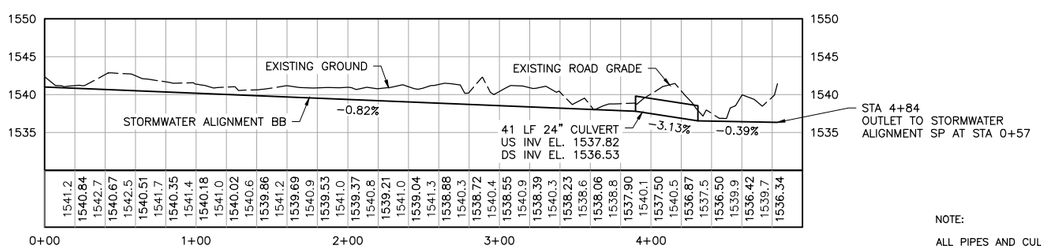
0 10 20 VERTICAL SCALE IN FEET



AA PSSW-008 **PROFILE: STORMWATER ALIGNMENT AA**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



BB PSSW-008,009 **PROFILE: STORMWATER ALIGNMENT BB**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

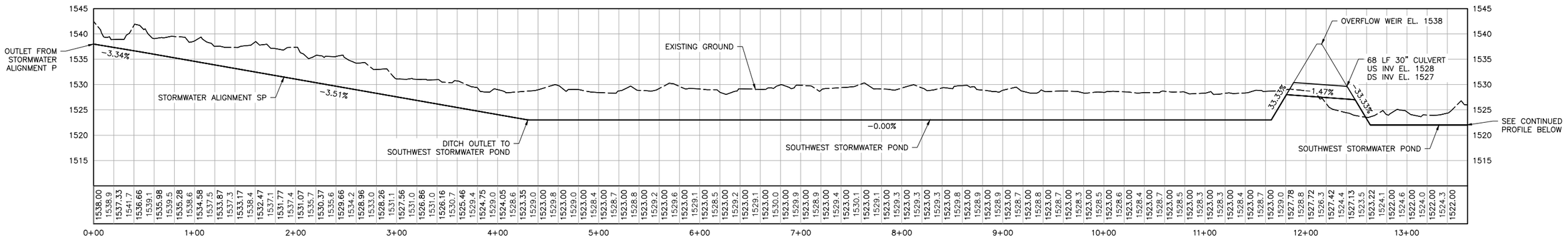
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-023

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-023.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:28 AM

INCHES 1 2



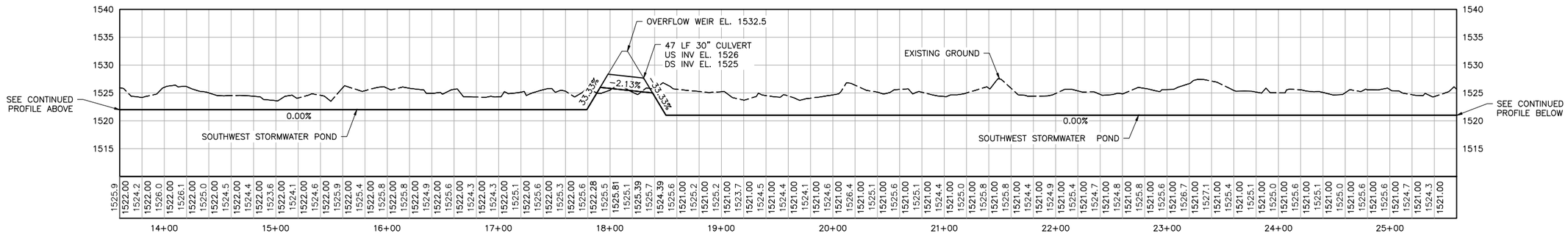
SP PSSW-008,010 **PROFILE: STORMWATER ALIGNMENT SP**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

SOUTHWEST STORMWATER POND TO BE OPTIMIZED IN FINAL DESIGN.



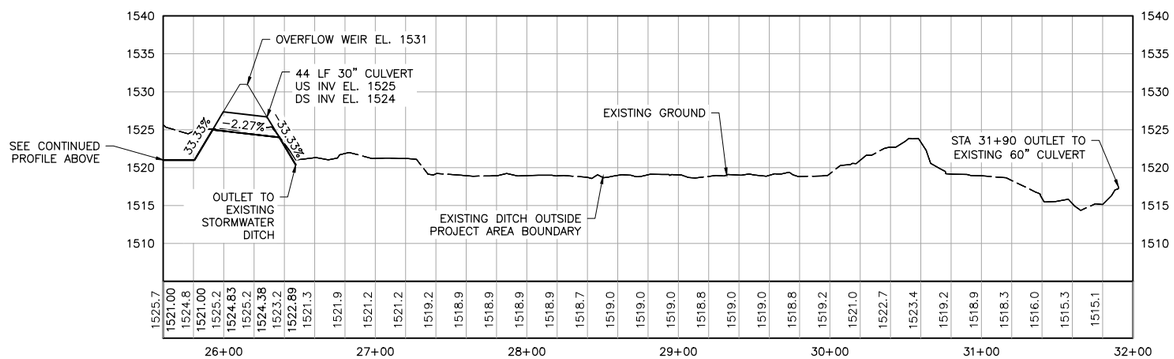
SP PSSW-008,010 **PROFILE: STORMWATER ALIGNMENT SP**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

SOUTHWEST STORMWATER POND TO BE OPTIMIZED IN FINAL DESIGN.



SP PSSW-008,010 **PROFILE: STORMWATER ALIGNMENT SP**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

SOUTHWEST STORMWATER POND TO BE OPTIMIZED IN FINAL DESIGN.

NOTE:

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: VJS

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

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POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

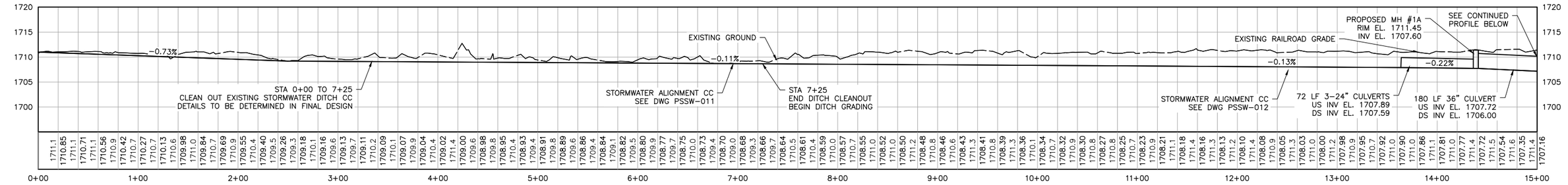
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-024

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-024.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:31 AM

INCHES 1 2



CC PSSW-011 PSSW-012 **PROFILE: STORMWATER ALIGNMENT CC**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20

NOTE:

STORMWATER DITCH HAS CONSTRAINTS RESTRICTING CONSTRUCTION. DESIGN OPTIONS HAVE BEEN IDENTIFIED. THIS PROFILE SHOWS CLEAN-OUT OF THE EXISTING DITCH, WHICH DOES NOT HAVE THE CAPACITY AS REQUIRED TO RESTRICT FLOODING.



CC PSSW-012 **PROFILE: STORMWATER ALIGNMENT CC**

HORIZONTAL SCALE IN FEET: 0 50 100

VERTICAL SCALE IN FEET: 0 10 20

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: PRT

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

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POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

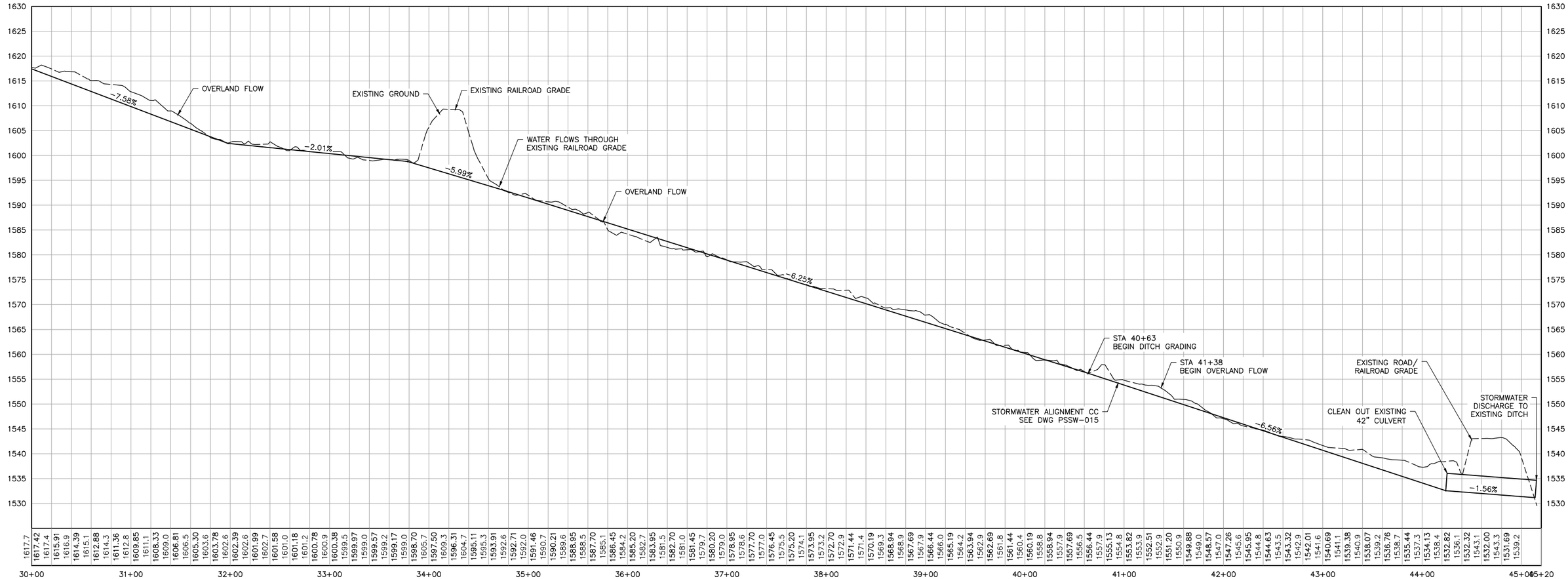
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-025

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-025.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:33 AM

INCHES 1 2

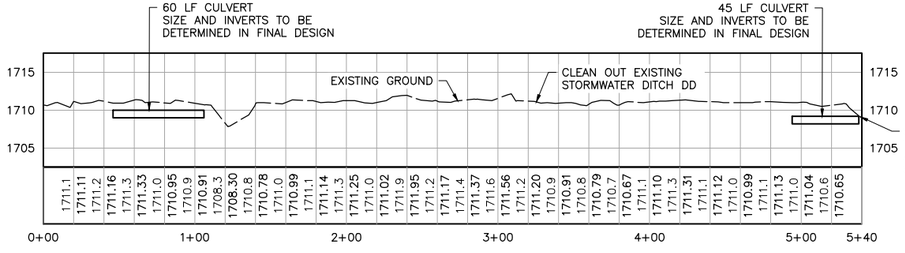


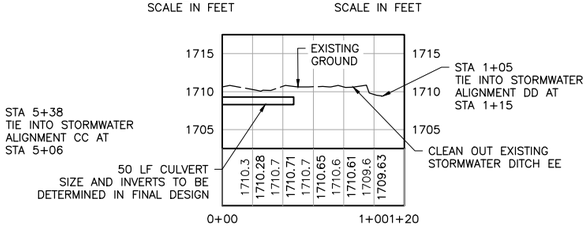
CC PROFILE: STORMWATER ALIGNMENT CC

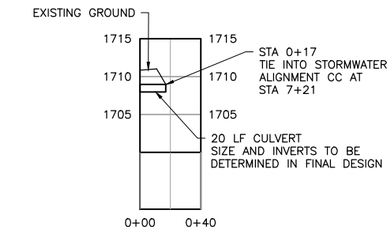
PSSW-015

HORIZONTAL SCALE IN FEET: 0, 50, 100

VERTICAL SCALE IN FEET: 0, 10, 20







DD PROFILE: STORMWATER ALIGNMENT DD

PSSW-011

HORIZONTAL SCALE IN FEET: 0, 50, 100

VERTICAL SCALE IN FEET: 0, 10, 20

NOTE:

STORMWATER DITCH HAS CONSTRAINTS RESTRICTING CONSTRUCTION. DESIGN OPTIONS HAVE BEEN IDENTIFIED. THIS PROFILE SHOWS CLEAN-OUT OF THE EXISTING DITCH, WHICH DOES NOT HAVE THE CAPACITY AS REQUIRED TO RESTRICT FLOODING.

EE PROFILE: STORMWATER ALIGNMENT EE

PSSW-011

HORIZONTAL SCALE IN FEET: 0, 50, 100

VERTICAL SCALE IN FEET: 0, 10, 20

NOTE:

STORMWATER DITCH HAS CONSTRAINTS RESTRICTING CONSTRUCTION. DESIGN OPTIONS HAVE BEEN IDENTIFIED. THIS PROFILE SHOWS CLEAN-OUT OF THE EXISTING DITCH, WHICH DOES NOT HAVE THE CAPACITY AS REQUIRED TO RESTRICT FLOODING.

FF PROFILE: STORMWATER ALIGNMENT FF

PSSW-011

HORIZONTAL SCALE IN FEET: 0, 50, 100

VERTICAL SCALE IN FEET: 0, 10, 20

NOTE:

STORMWATER DITCH HAS CONSTRAINTS RESTRICTING CONSTRUCTION. DESIGN OPTIONS HAVE BEEN IDENTIFIED. THIS PROFILE SHOWS CLEAN-OUT OF THE EXISTING DITCH, WHICH DOES NOT HAVE THE CAPACITY AS REQUIRED TO RESTRICT FLOODING.

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

VER NO	DATE	DESCRIPTION
1	5/15/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/15/15
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 CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: PRT

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

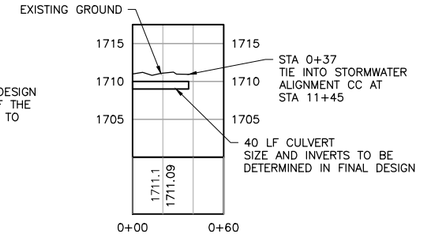
DWG. NO. PSSW-026

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-026.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:36 AM
INCHES 1 2

NOTE:

STORMWATER DITCH HAS CONSTRAINTS RESTRICTING CONSTRUCTION. DESIGN OPTIONS HAVE BEEN IDENTIFIED. THIS PROFILE SHOWS CLEAN-OUT OF THE EXISTING DITCH, WHICH DOES NOT HAVE THE CAPACITY AS REQUIRED TO RESTRICT FLOODING.

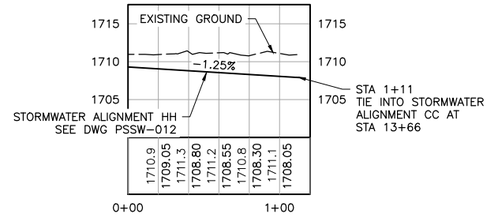


GG PROFILE: STORMWATER ALIGNMENT GG

PSSW-012

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

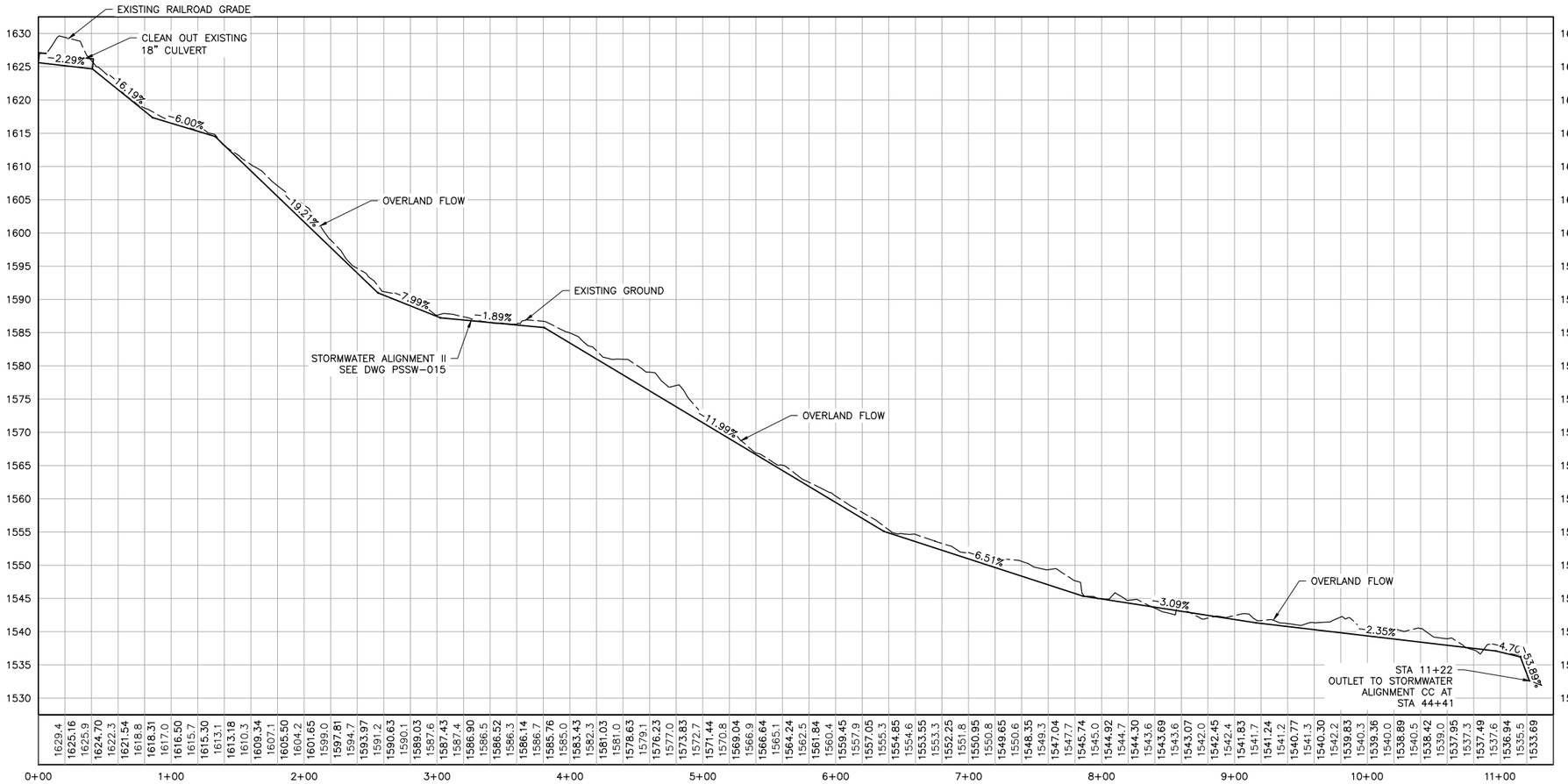


HH PROFILE: STORMWATER ALIGNMENT HH

PSSW-012

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



II PROFILE: STORMWATER ALIGNMENT II

PSSW-015

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

ALL PIPES AND CULVERTS ARE PROPOSED UNLESS INDICATED.

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: PRT

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

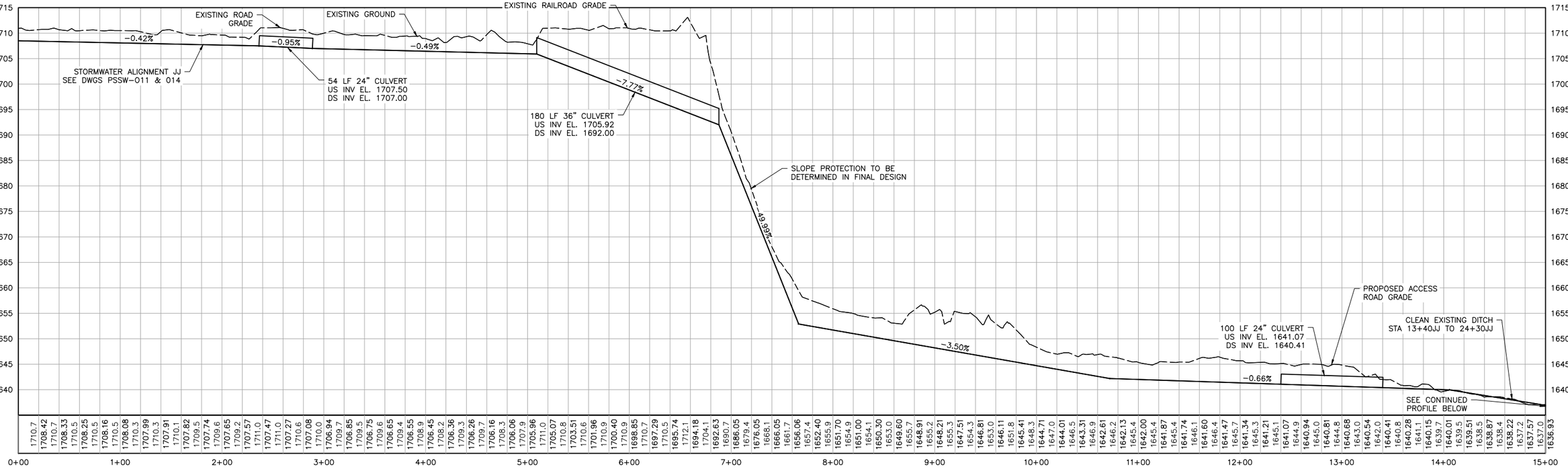
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-027

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-027.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:39 AM

INCHES 1 2

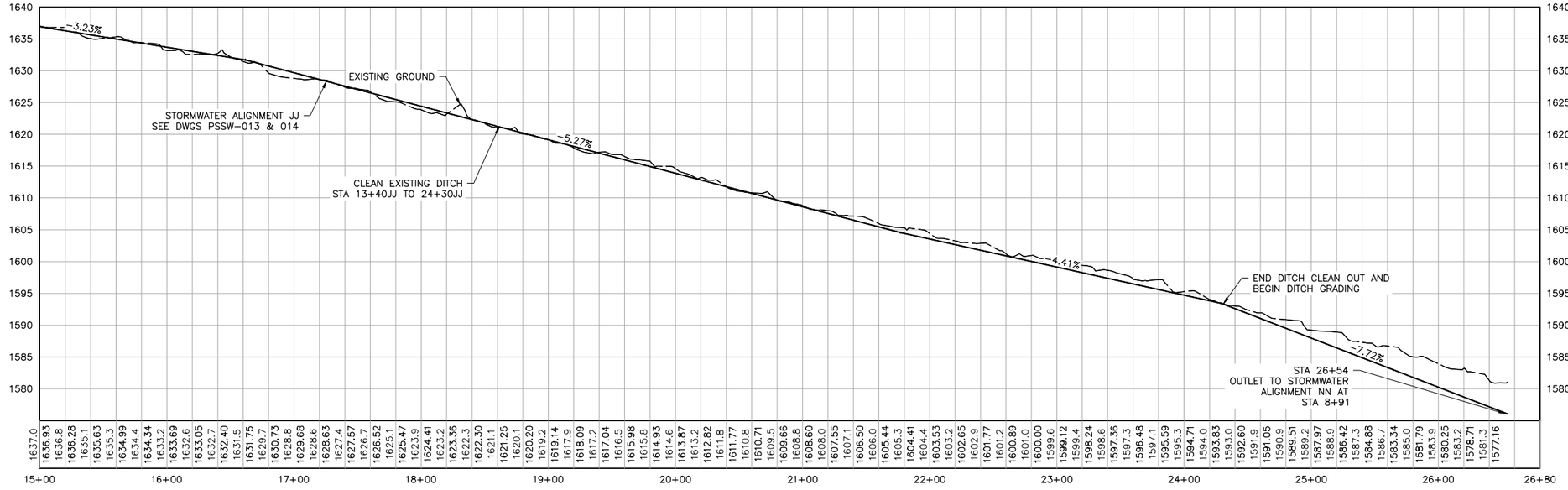


JJ
PSSW-011
PSSW-014

PROFILE: STORMWATER ALIGNMENT JJ

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



JJ
PSSW-013
PSSW-014

PROFILE: STORMWATER ALIGNMENT JJ

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: PRT
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

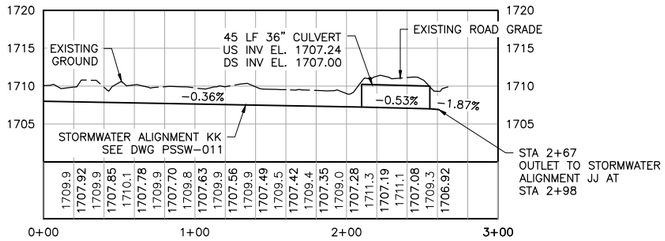
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-028

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-028.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:43 AM

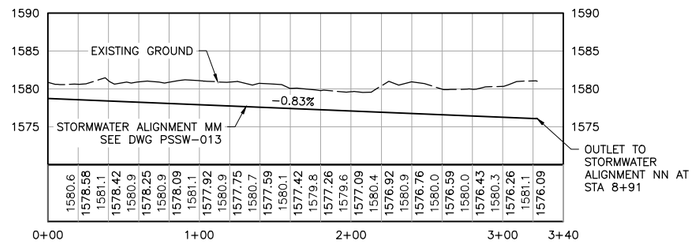
INCHES 1 2



KK PSSW-011 **PROFILE: STORMWATER ALIGNMENT KK**

0 50 100 HORIZONTAL SCALE IN FEET

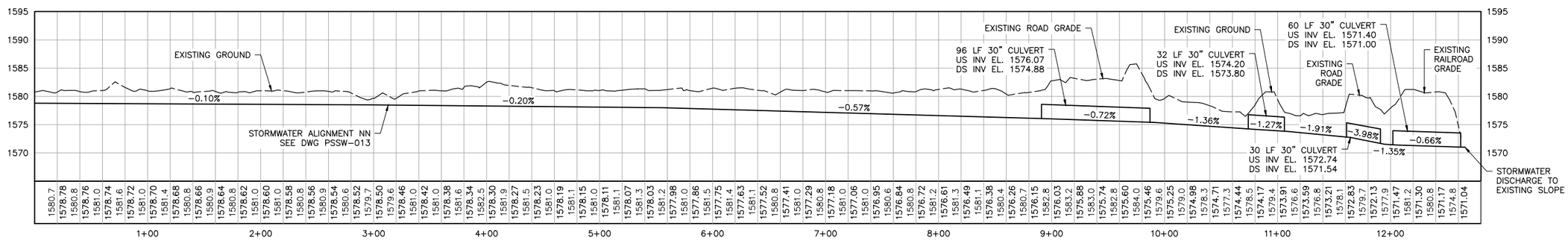
0 10 20 VERTICAL SCALE IN FEET



MM PSSW-013 **PROFILE: STORMWATER ALIGNMENT MM**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



NN PSSW-013 **PROFILE: STORMWATER ALIGNMENT NN**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: PRT

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

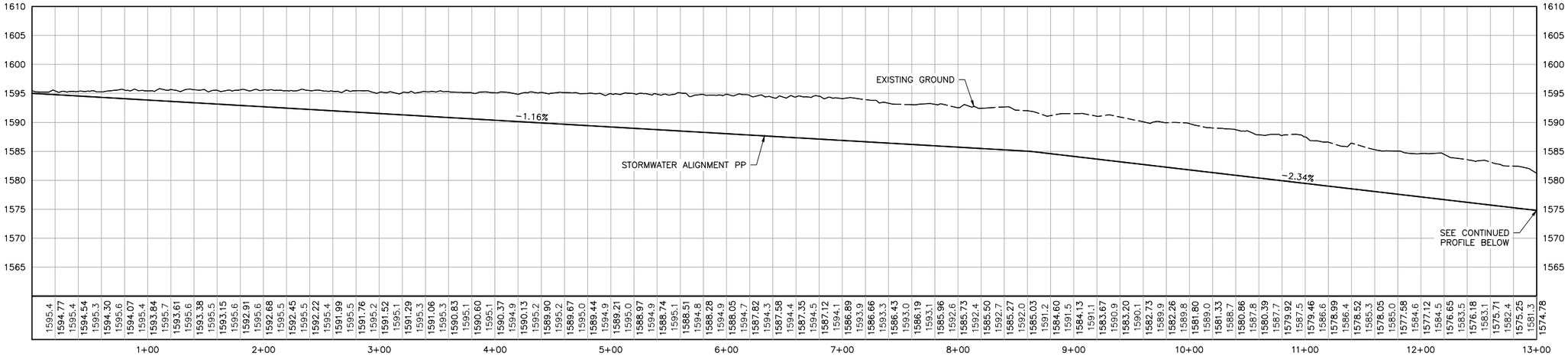
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-029

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-029.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:45 AM

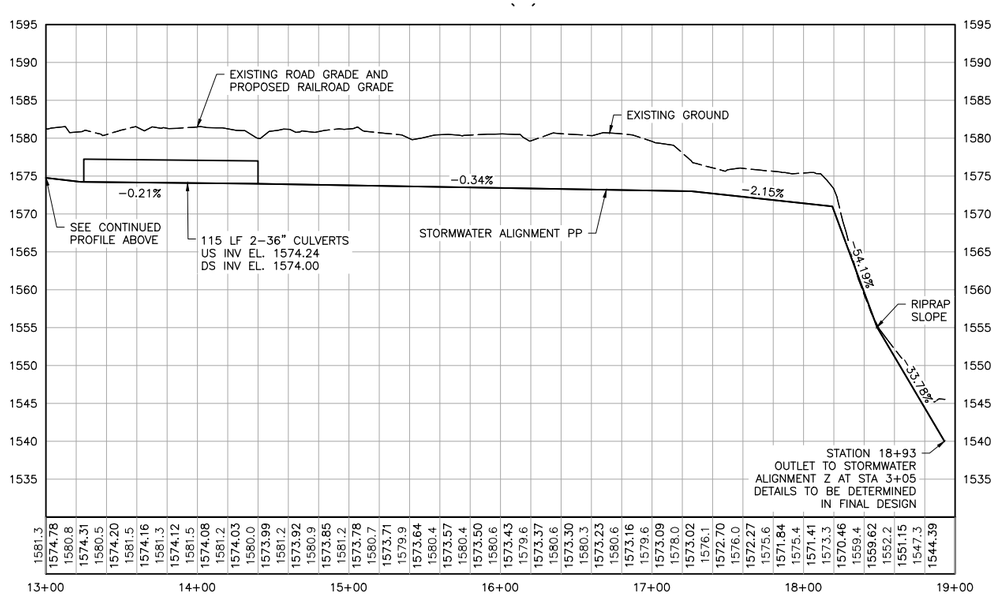
INCHES 1 2



PP PSSW-007 **PROFILE: STORMWATER ALIGNMENT PP**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET



PP PSSW-008 **PROFILE: STORMWATER ALIGNMENT PP**

0 50 100 HORIZONTAL SCALE IN FEET

0 10 20 VERTICAL SCALE IN FEET

NOTE:

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PRINTED NAME CRISTIAN A. DIAZ

SIGNATURE

DATE 5/15/15 LICENSE# 46593

DRAWN: PRT

CHECKED: CMK2

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GRADING PROFILES

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

DWG. NO. PSSW-030

REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-030.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:49 AM

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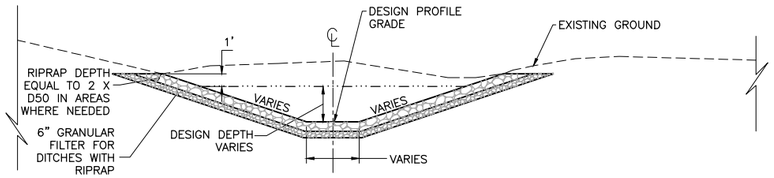
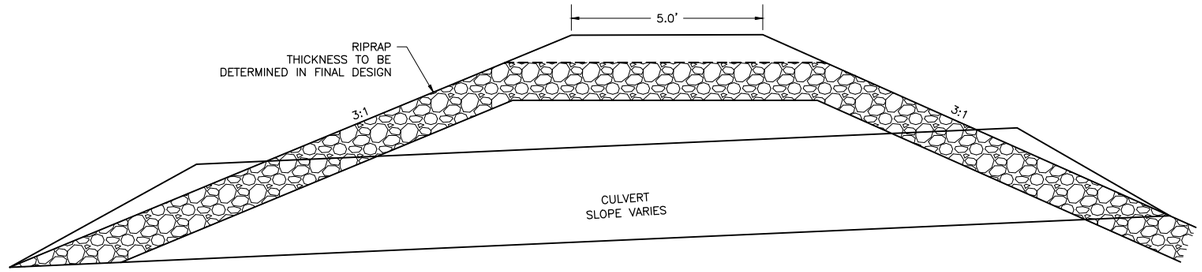


1 SECTION: TYPICAL DITCH

0 6 12
SCALE IN FEET

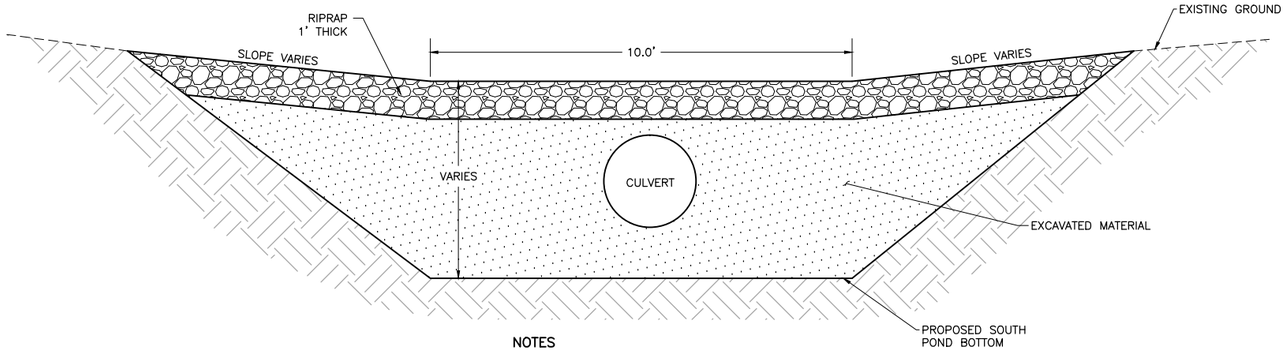
NOTES

1. DITCHES NOT REQUIRING RIPRAP WILL BE CONSTRUCTED WITH NATIVE SOILS AND 4" TOPSOIL TO DESIGN PROFILE GRADE.
2. DITCHES CONSTRUCTED IN BEDROCK WILL NOT REQUIRE RIPRAP OR TOPSOIL.
3. RESTORE ALL DISTURBED AREAS NOT STABILIZED WITH RIPRAP.
4. DITCH CROSS SECTIONS VARY. DETAILS WILL BE TABULATED IN FINAL DESIGN.
5. DITCHES THAT REQUIRE LARGE DIAMETER RIPRAP MAY REQUIRE AN ADDITIONAL LAYER BETWEEN THE RIPRAP AND THE GRANULAR FILTER, TO BE DETERMINED IN FINAL DESIGN.



A SECTION: OVERFLOW WEIR SIDE VIEW

NOT TO SCALE



NOTES

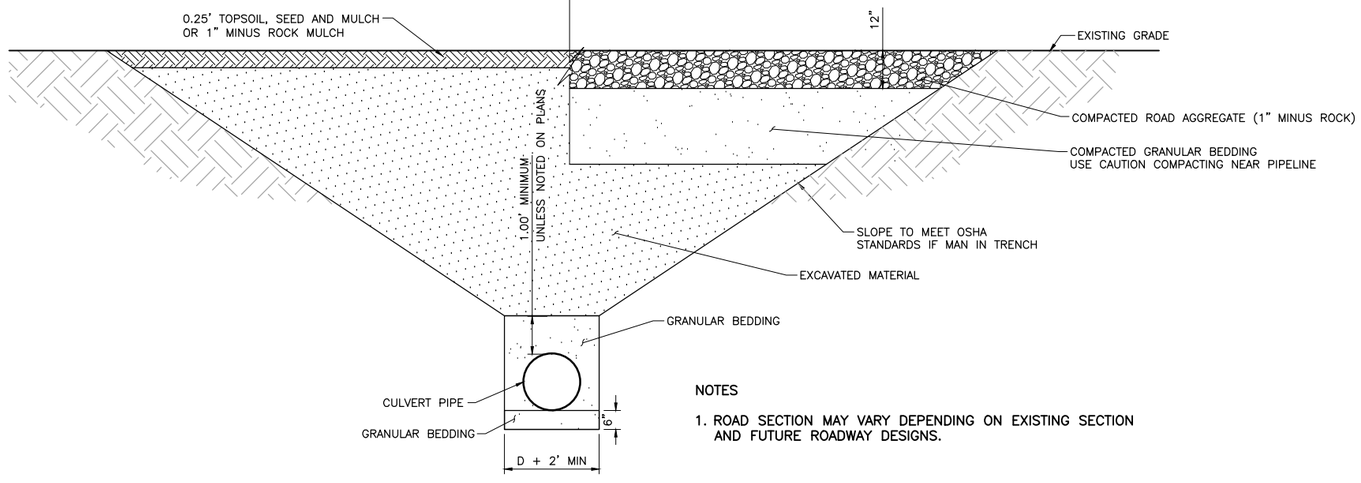
1. WEIR CROSS SECTIONS VARY. DETAILS WILL BE TABULATED IN FINAL DESIGN.

B SECTION: OVERFLOW WEIR CROSS SECTION

NOT TO SCALE

3 DETAIL: SOUTH POND OVERFLOW WEIRS

PSSW-010.024 NOT TO SCALE



NOTES

1. ROAD SECTION MAY VARY DEPENDING ON EXISTING SECTION AND FUTURE ROADWAY DESIGNS.

2 SECTION: PIPELINE AND CULVERT TRENCH CONSTRUCTION

0 1 2 3 4
SCALE IN FEET

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SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER SECTIONS AND DETAILS

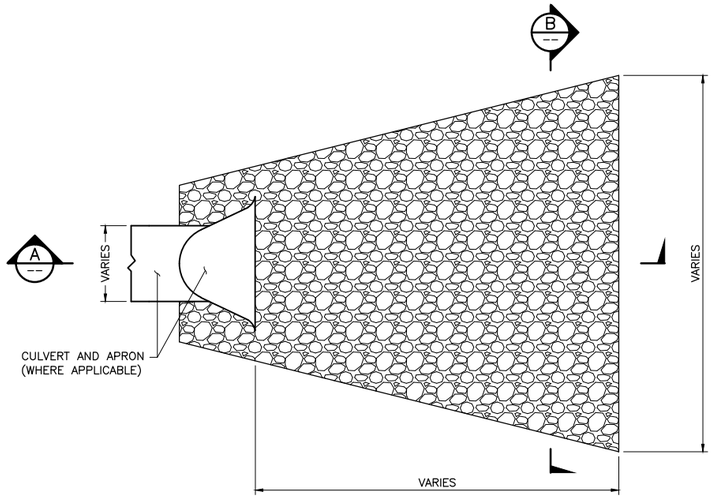
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

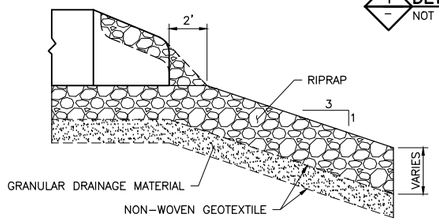
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-031 REV

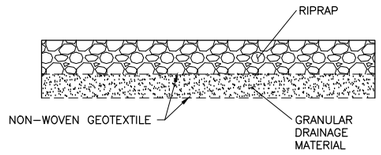
CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-031.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:50 AM
INCHES 1 2



1 DETAIL: RIPRAP SLOPE
NOT TO SCALE



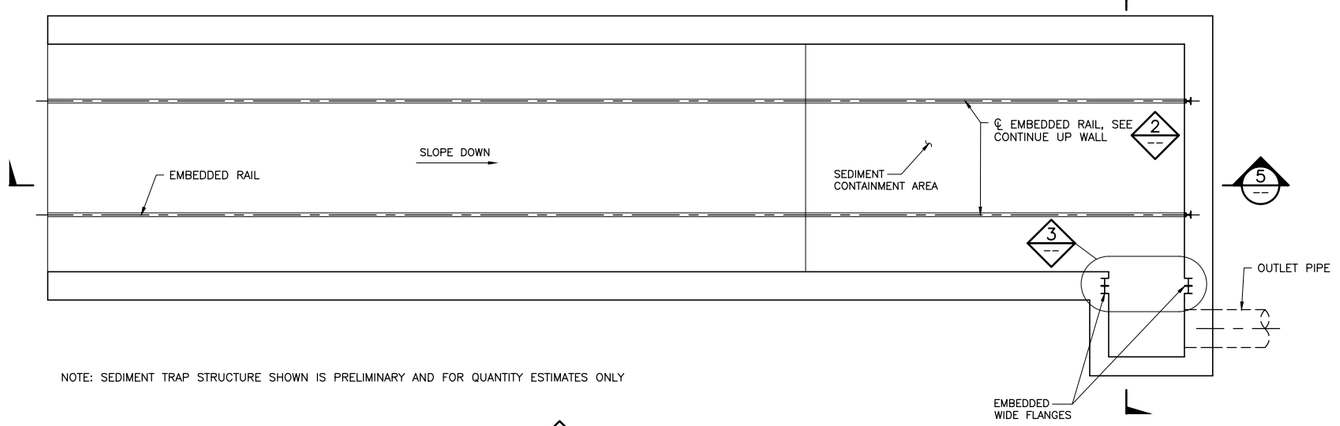
A SECTION: RIPRAP SLOPE
NOT TO SCALE



B SECTION: RIPRAP SLOPE
NOT TO SCALE

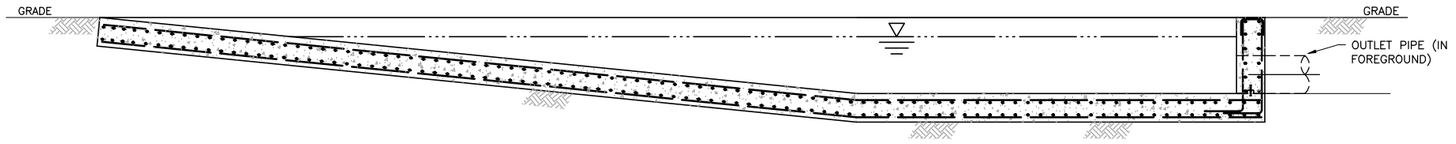
NOTES:

1. RIPRAP GRADATION BASED ON EXPECTED VELOCITIES FROM 10 YEAR 24–HOUR STORM EVENT.
2. RIPRAP DIMENSIONS AND CLASSES VARY. DETAILS WILL BE TABULATED IN FINAL DESIGN.
3. ALL CULVERT UPSTREAM AND DOWNSTREAM ENDS SHALL HAVE FLARED END SECTIONS.

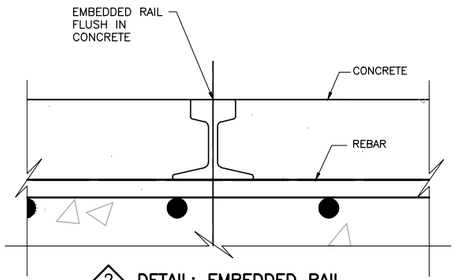


NOTE: SEDIMENT TRAP STRUCTURE SHOWN IS PRELIMINARY AND FOR QUANTITY ESTIMATES ONLY

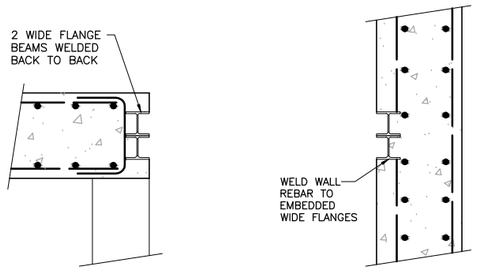
4 PSSW–007 PLAN: SEDIMENT TRAP
NOT TO SCALE



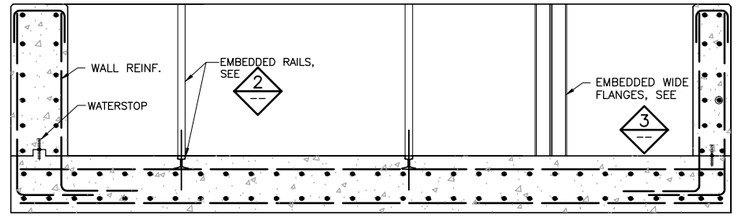
5 SECTION: SEDIMENT TRAP
NOT TO SCALE



2 DETAIL: EMBEDDED RAIL
NOT TO SCALE



3 DETAIL: EMBEDDED WIDE FLANGES
NOT TO SCALE



6 SECTION: SEDIMENT TRAP
NOT TO SCALE

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PRINTED NAME CRISTIAN A. DIAZ
SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: VJS
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER
SECTIONS AND DETAILS

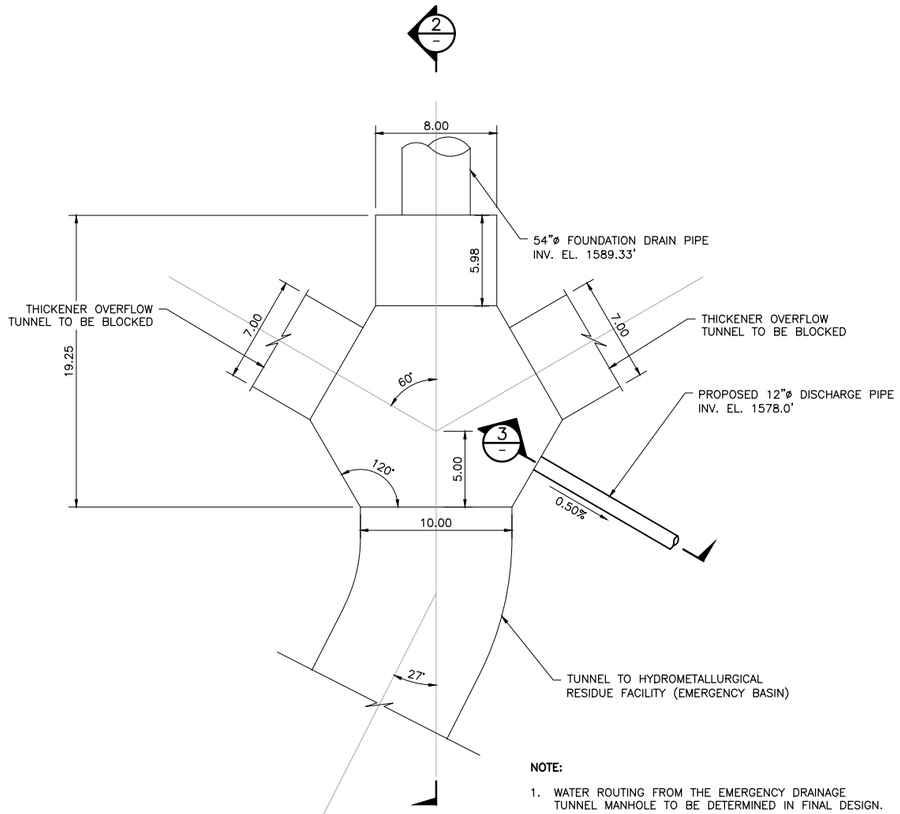
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

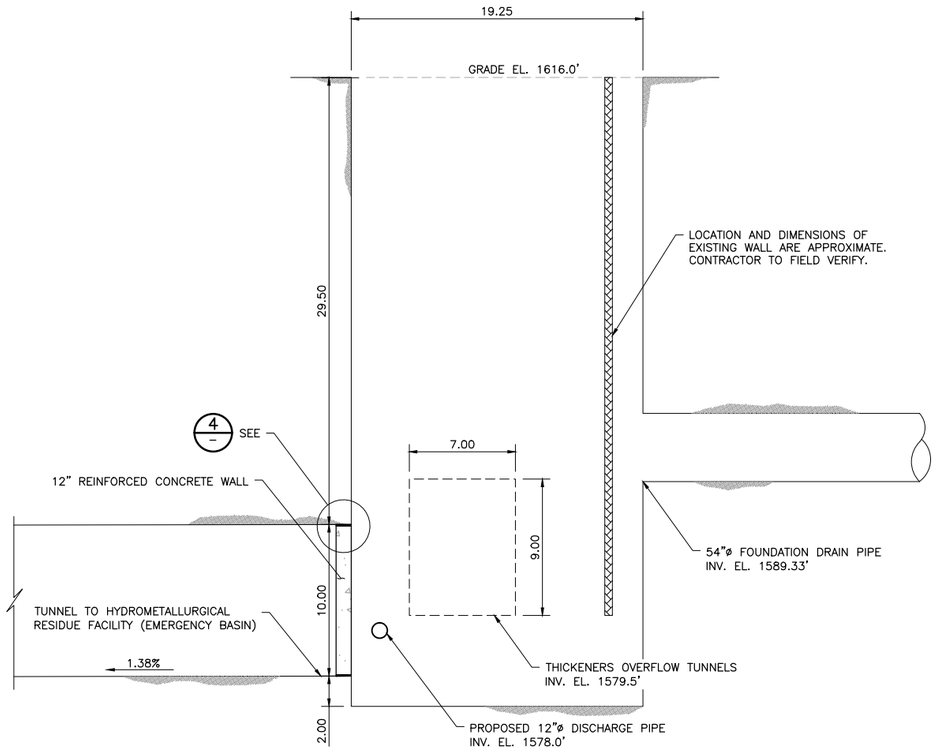
DWG. NO. PSSW–032
REV

CADD USER: Cristian A. Diaz FILE: K:\DESIGN\23690C29.10\PERMIT_NMP-63-CS-032.DWG PLOT SCALE: 1:2 PLOT DATE: 5/15/2015 11:51 AM
INCHES 1 2



NOTE:

1. WATER ROUTING FROM THE EMERGENCY DRAINAGE TUNNEL MANHOLE TO BE DETERMINED IN FINAL DESIGN.

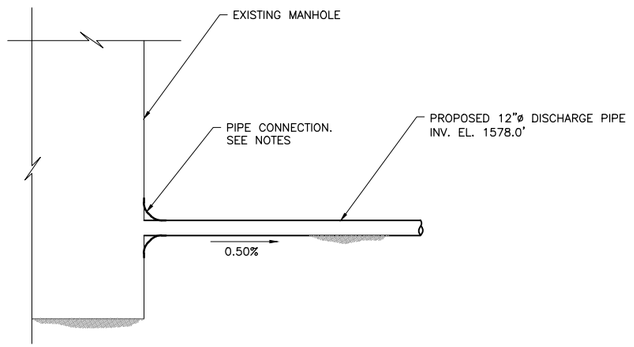


1 PLAN: EXISTING EMERGENCY DRAINAGE TUNNELS AND MANHOLE
PSSW-005

0 5 10
SCALE IN FEET

2 SECTION: EXISTING EMERGENCY DRAINAGE TUNNELS AND MANHOLE
PSSW-005

0 5 10
SCALE IN FEET



3 SECTION: PROPOSED PIPE CONNECTION
PSSW-005

0 5 10
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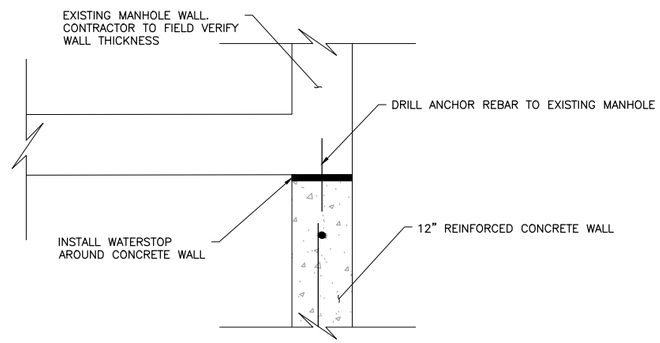

4 SECTION: ANCHOR AND WATER STOP DETAIL (TYP.)
PSSW-005 NOT TO SCALE

NOTES:

1. DIMENSIONS SHOWN ARE BASED ON DRAWINGS TB-651, TB-679 AND TJ-63, APPROVED ON 08/06/54. ACTUAL DIMENSIONS MAY VARY.
2. CORE THROUGH EXISTING MANHOLE TO PROVIDE SPACE FOR PLACEMENT OF NEW PIPE.
3. CONTRACTOR TO PLACE WATERTIGHT CONNECTION BOOT.
4. BACKFILL SHALL BE PLACED WITH CARE OVER PIPE TO AVOID SETTLEMENT AND DISRUPTION TO THE CONNECTION WITH MANHOLE.

VER NO	DATE	DESCRIPTION
1	5/15/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/15/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME CRISTIAN A. DIAZ
SIGNATURE
DATE 5/15/15 LICENSE# 46593

DRAWN: CMB2
CHECKED: CAD
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE STORMWATER GENERAL DWGS EMERGENCY DRAINAGE TUNNEL MANHOLE CONNECTION AND BLOCKAGE DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. PSSW-033 REV

INCHES 1 2
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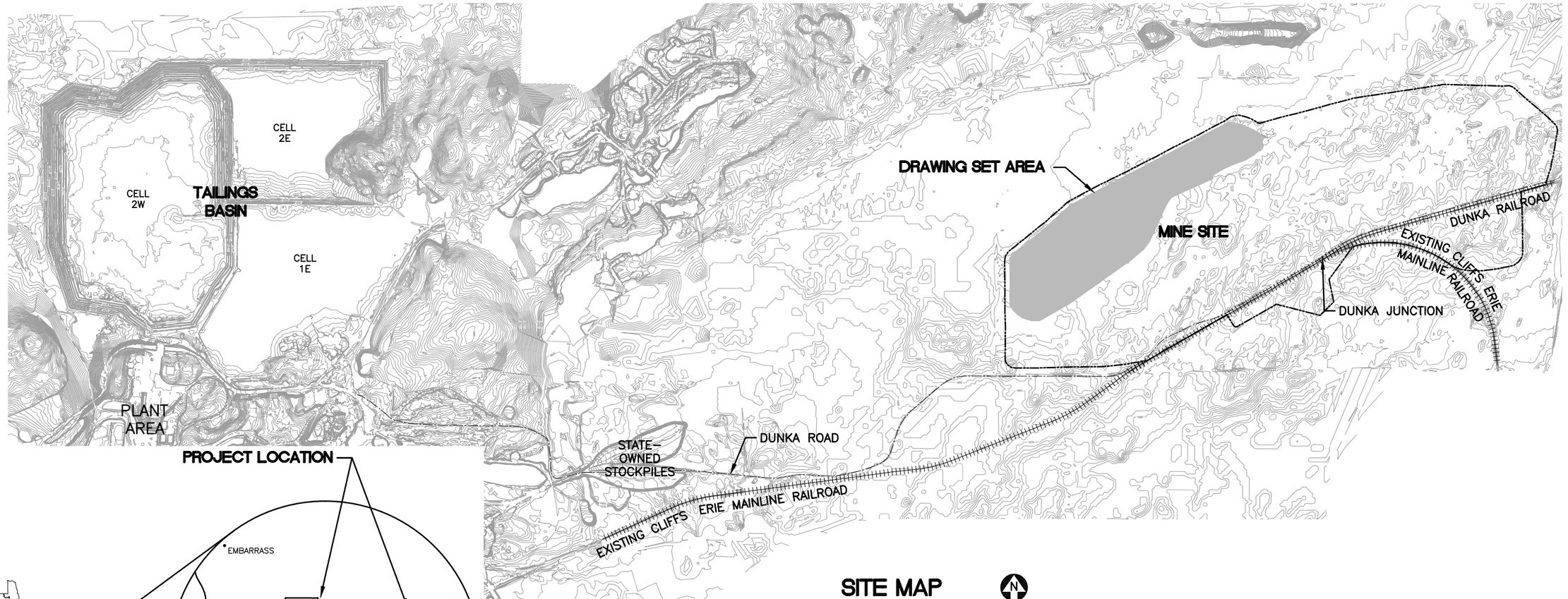
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

Category 1 Stockpile Groundwater Containment System

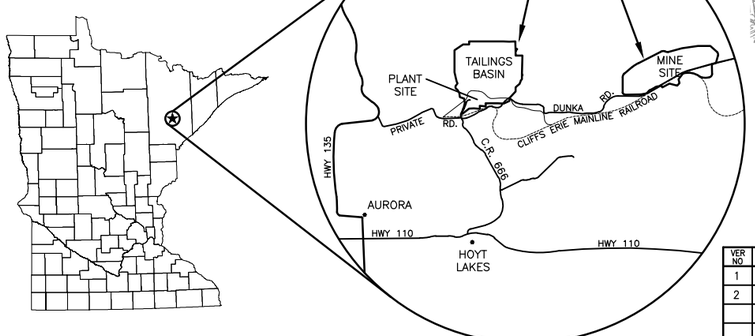
POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM
HOYT LAKES, MINNESOTA



SITE MAP

0 2000 4000
SCALE IN FEET

PROJECT LOCATION



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
2	5/28/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	5/28/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM LOCATION MAP AND SITE MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-001 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-21-CS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:29 PM

INCHES 1 2

GENERAL LEGEND

- 1000 — EXISTING CONTOUR – MAJOR
- EXISTING CONTOUR – MINOR
- MINE SITE BOUNDARY
- OF — PROPOSED SUMP OVERFLOW PIPE
- PROPOSED MINE DRAINAGE PIPE (PUMPED FLOW)
- PROPOSED MINE DRAINAGE PIPE (GRAVITY FLOW)
- PROPOSED SUMP MANHOLE
- PROPOSED ACCESS ROADS
- HAUL ROAD

ABBREVIATIONS

CAT	–	CATEGORY
DWG	–	DRAWING
EL	–	ELEVATION
GCS	–	GROUNDWATER CONTAINMENT SYSTEM
MH	–	MANHOLE
NTS	–	NOT TO SCALE
PVI	–	PROFILE VERTICAL INTERSECTION
STA	–	STATION
WWTF	–	WASTE WATER TREATMENT FACILITY

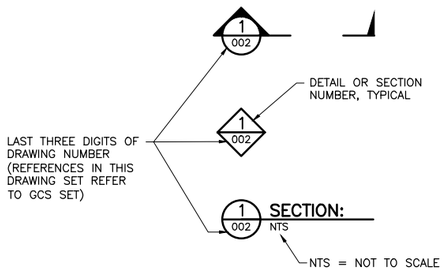
SHEET INDEX

SHEET NO. TITLE

GENERAL DRAWINGS

GCS–001 LOCATION MAP AND SITE MAP
GCS–002 LEGEND AND SHEET INDEX
GCS–003 MINE YEAR 0 LAYOUT
GCS–004 MINE YEAR 2 LAYOUT
GCS–005 MINE YEAR 3 LAYOUT
GCS–006 MINE YEAR 5 LAYOUT
GCS–007 MINE YEAR 6 LAYOUT
GCS–008 MINE YEAR 20 LAYOUT
GCS–009 CLOSURE CONFIGURATION
GCS–010 TYPICAL CROSS SECTIONS
GCS–011 TYPICAL CROSS SECTIONS
GCS–012 NORTH PROFILES
GCS–013 SOUTH PROFILES
GCS–014 DISCHARGE PROFILES

DRAWING NUMBERING



NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.

VER NO.	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
2	5/28/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
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FOR CONSTRUCTION		

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE
GROUNDWATER CONTAINMENT SYSTEM
LEGEND AND SHEET INDEX

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. GCS–002
REV

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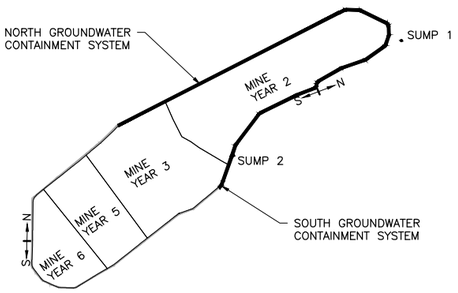

1 PLAN: OVERALL CONFIGURATION
NTS

2 PLAN: GCS – MINE YEAR 0 LAYOUT
0 500 1000
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
2	5/28/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM MINE YEAR 0 LAYOUT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-003
REV

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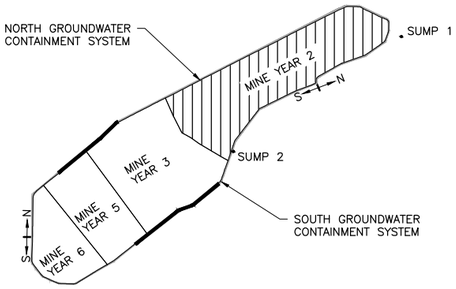

1 / -- PLAN: OVERALL CONFIGURATION
NTS

2 / -- PLAN: GCS – MINE YEAR 2 LAYOUT
0 500 1000
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM MINE YEAR 2 LAYOUT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-004
REV

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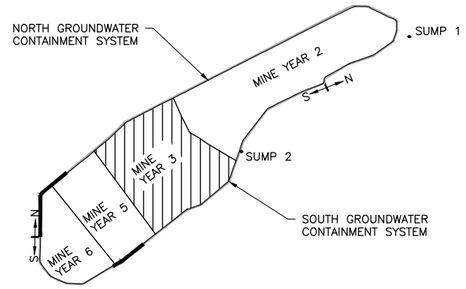

1 / -- PLAN: OVERALL CONFIGURATION
NTS

MH–A
MH–B
FLOW
SUMP OVERFLOW
EAST PIT
PUMP WATER TO WWTF
MINE YEAR 3 CATEGORY 1 STOCKPILE FOOTPRINT
ACCESS ROAD
SUMP OVERFLOW
WASTE WATER TREATMENT FACILITY LOCATION
WEST PIT
1 / 010
EXTEND NORTH GROUNDWATER CONTAINMENT SYSTEM SEE 1 / 012
2 / 010
EXTEND SOUTH GROUNDWATER CONTAINMENT SYSTEM SEE 2 / 013

2 / -- PLAN: GCS – MINE YEAR 3 LAYOUT
0 500 1000
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
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SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM MINE YEAR 3 LAYOUT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. GCS–005
REV

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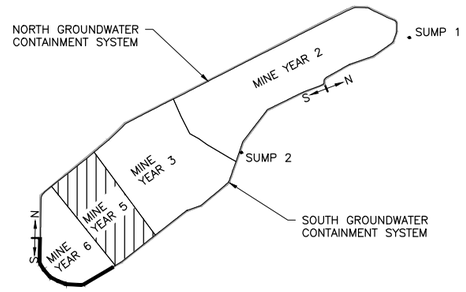

1 PLAN: OVERALL CONFIGURATION
NTS

2 PLAN: GCS – MINE YEAR 5 LAYOUT
0 500 1000
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM MINE YEAR 5 LAYOUT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-006
REV

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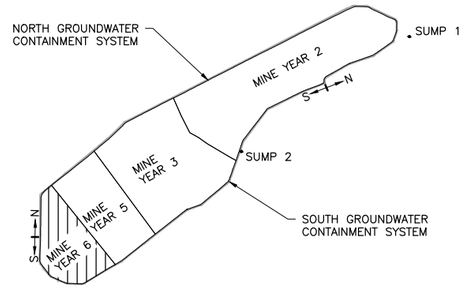

1 PLAN: OVERALL CONFIGURATION
NTS

2 PLAN: GCS – MINE YEAR 6 LAYOUT
0 500 1000
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
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ISSUE STATUS	VERSION	DATE
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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM YEAR 6 LAYOUT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-007
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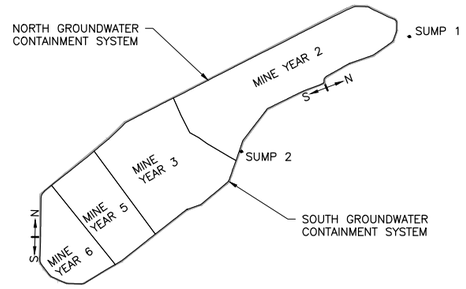

1 PLAN: OVERALL CONFIGURATION
NTS

2 PLAN: GCS – MINE YEAR 20 LAYOUT
0 500 1000
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
2	5/28/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM MINE YEAR 20 LAYOUT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-008
REV

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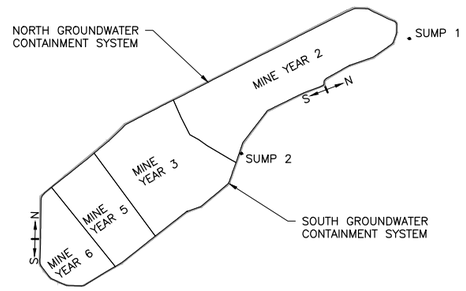

1 / -- PLAN: OVERALL CONFIGURATION
NTS

2 / -- PLAN: CLOSURE CONFIGURATION
0 500 1000
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
2	5/28/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM CLOSURE CONFIGURATION

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-009
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-21-CS-009.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:46 PM
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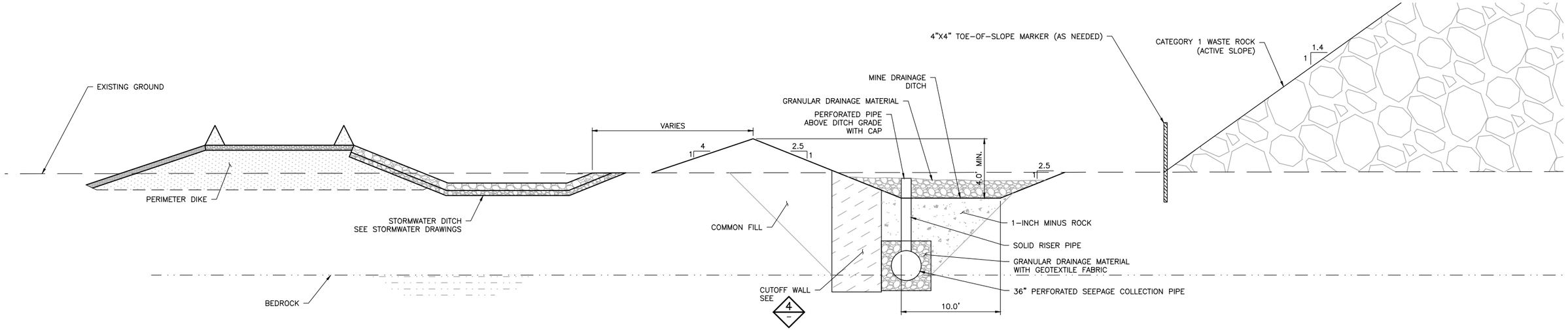

1/– SECTION: NORTH GROUNDWATER CONTAINMENT SYSTEM TYPICAL SECTION – ADJACENT TO ACTIVE STOCKPILE

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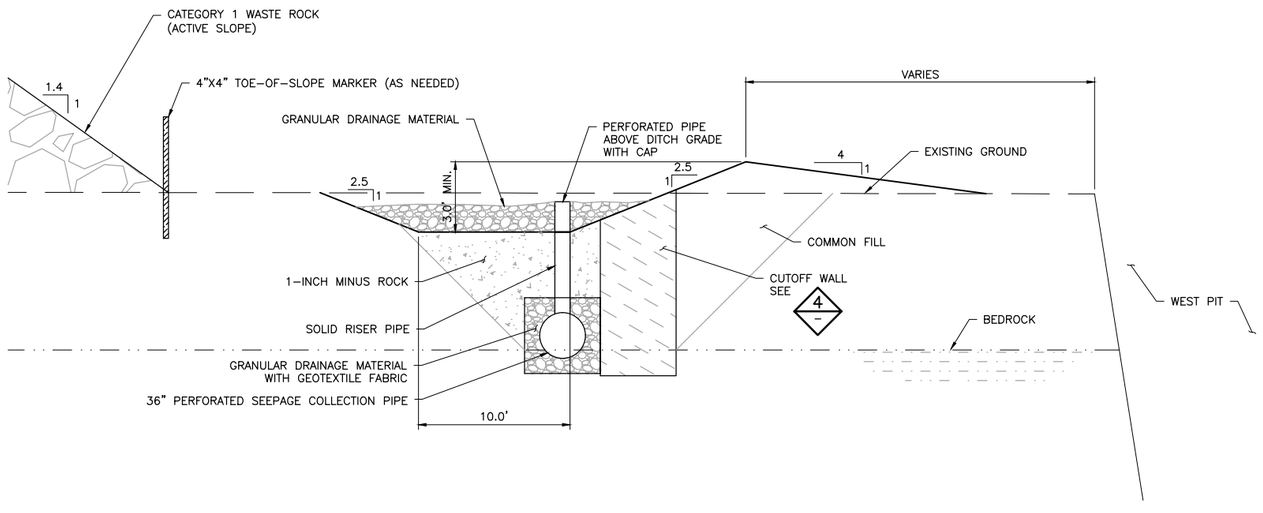
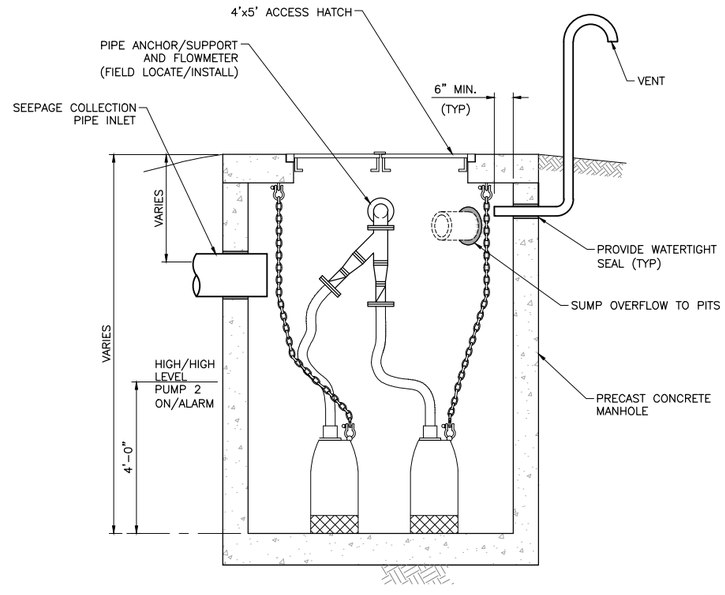
SCALE IN FEET



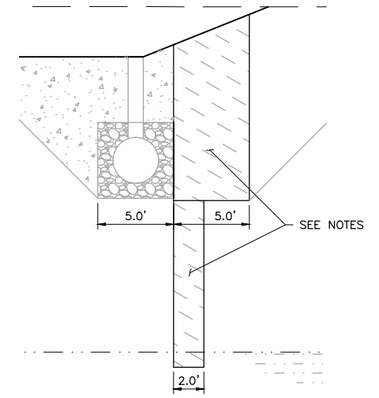
2/– SECTION: SOUTH GROUNDWATER CONTAINMENT SYSTEM TYPICAL SECTION – ADJACENT TO ACTIVE STOCKPILE

0 5 10
SCALE IN FEET



3/– SECTION: TYPICAL SUMP

NTS



4/– SECTION: TYPICAL CUTOFF WALL

0 5 10
SCALE IN FEET

NOTES:

1. CUTOFF WALL WILL BE A HYDRAULIC BARRIER CONSTRUCTED OF COMPACTED SOIL, GEOSYNTHETIC CLAY, OR APPROVED ALTERNATE.

2. USE TRENCHLESS TECHNOLOGY TO CONSTRUCT 2' WIDE TRENCH DOWN TO COMPETENT BEDROCK IN AREAS WHERE COLLECTION PIPE IS LOCATED ABOVE BEDROCK. SEE

VER NO.	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
2	5/28/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	5/28/15
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 THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM TYPICAL CROSS SECTIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. GCS–010
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM–21–CS–010.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:55 PM
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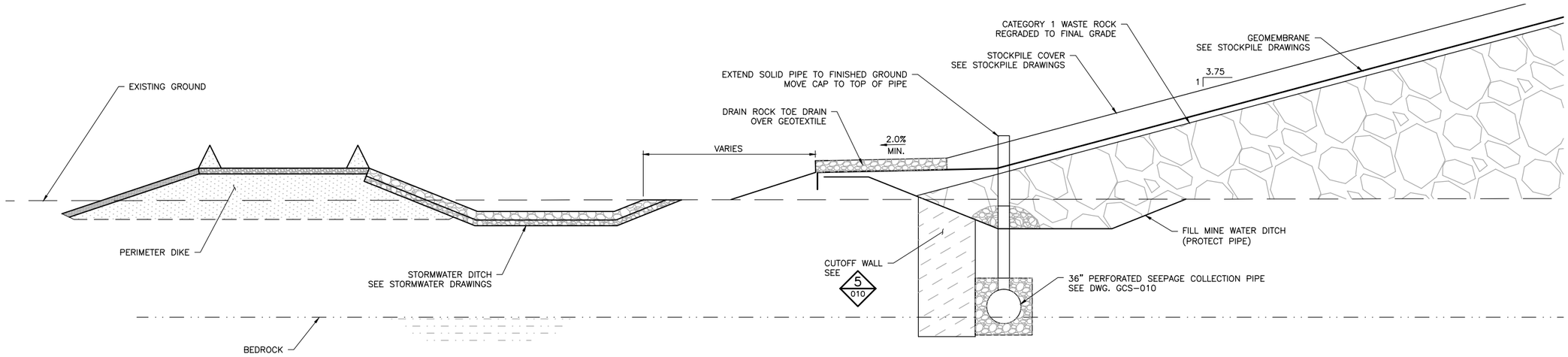

1 – SECTION: CLOSURE NORTH GROUNDWATER CONTAINMENT SYSTEM TYPICAL SECTION – ADJACENT TO RECLAIMED STOCKPILE

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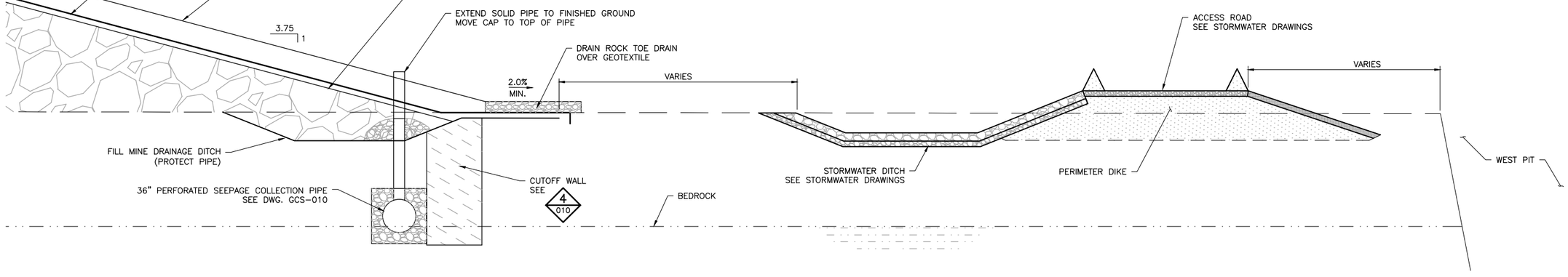
SCALE IN FEET



2 – SECTION: CLOSURE SOUTH AND GROUNDWATER CONTAINMENT SYSTEM TYPICAL SECTION – ADJACENT TO RECLAIMED STOCKPILE

0 5 10
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
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DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM TYPICAL CROSS SECTIONS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-011
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-21-CS-011.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:57 PM
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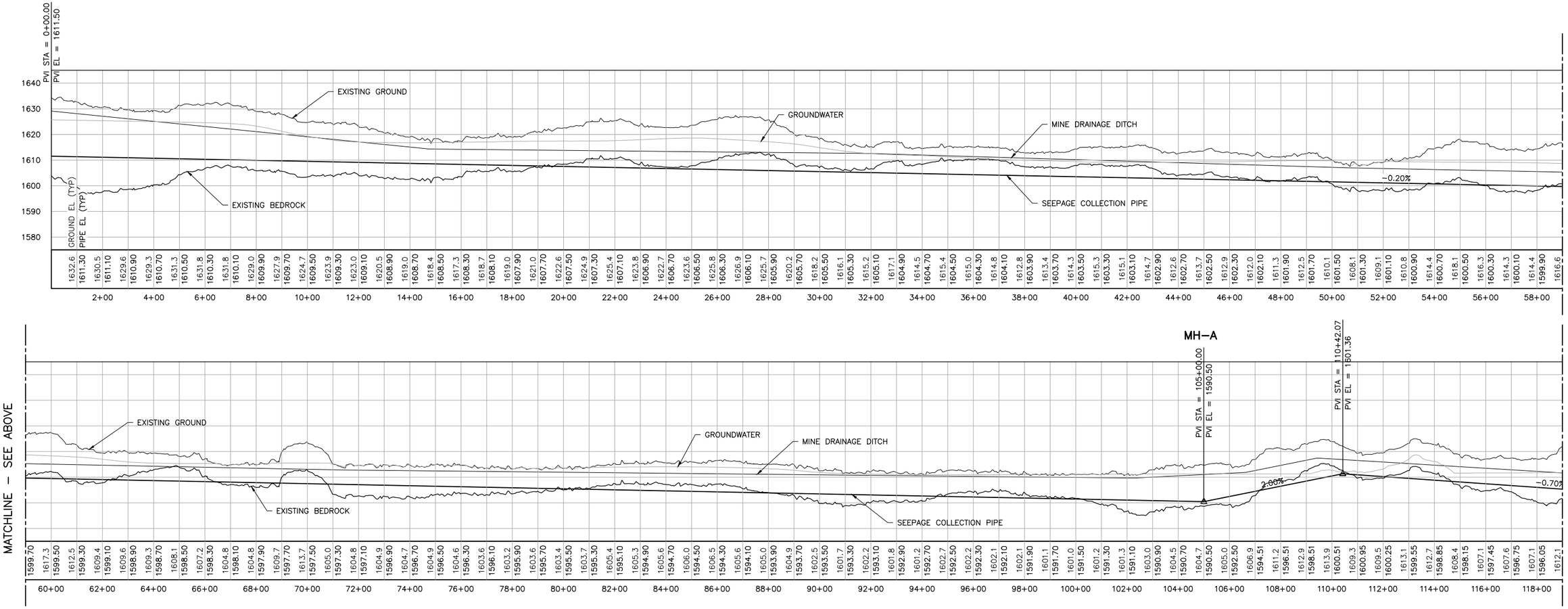

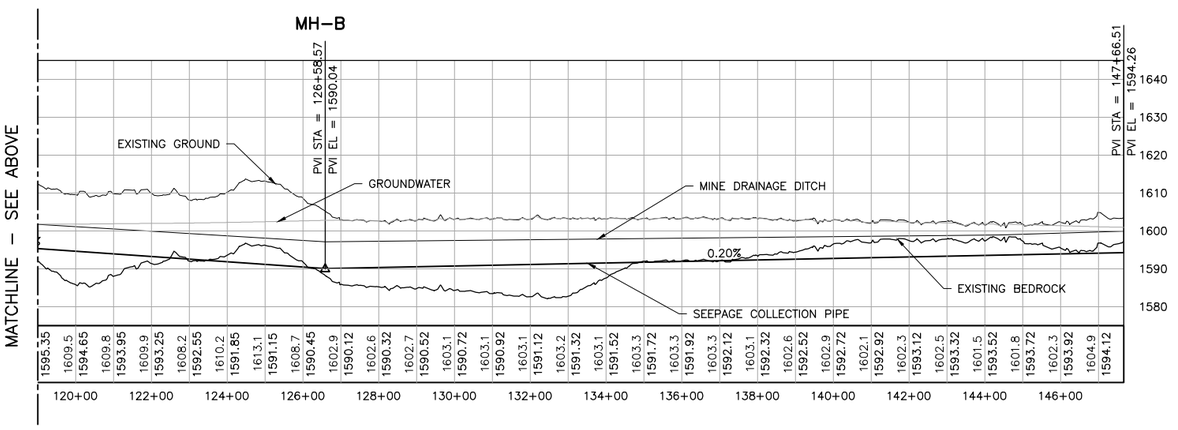

1 PROFILE: NORTH GROUNDWATER CONTAINMENT SYSTEM

NOTE:

ALL GROUNDWATER AND BEDROCK PROFILES SHOWN ARE APPROXIMATE.

VER NO.	DATE	DESCRIPTION
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DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE
GROUNDWATER CONTAINMENT SYSTEM
NORTH PROFILES

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-012
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-21-CS-012.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:57 PM

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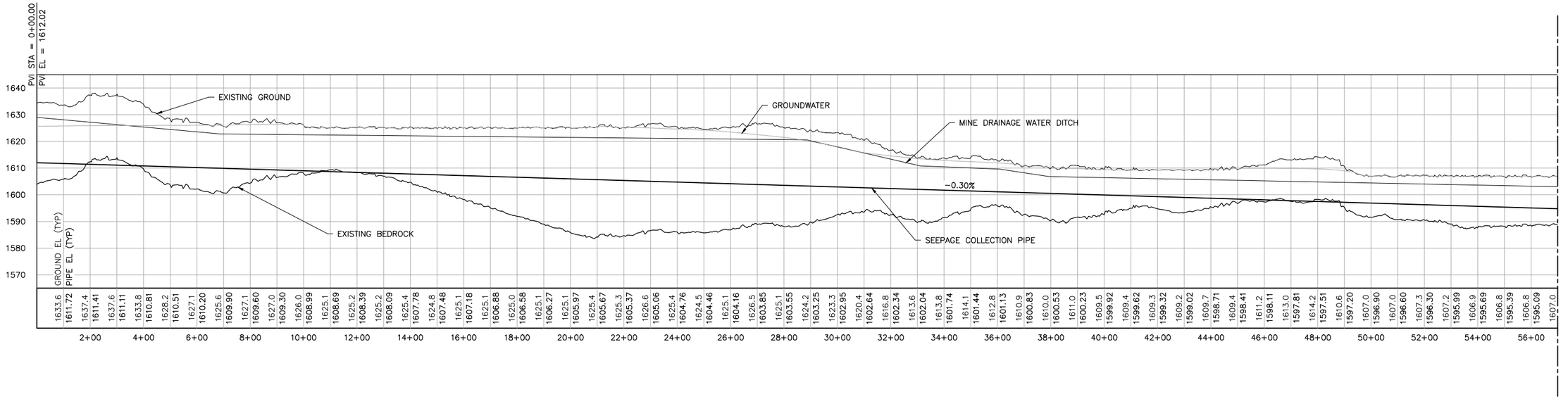

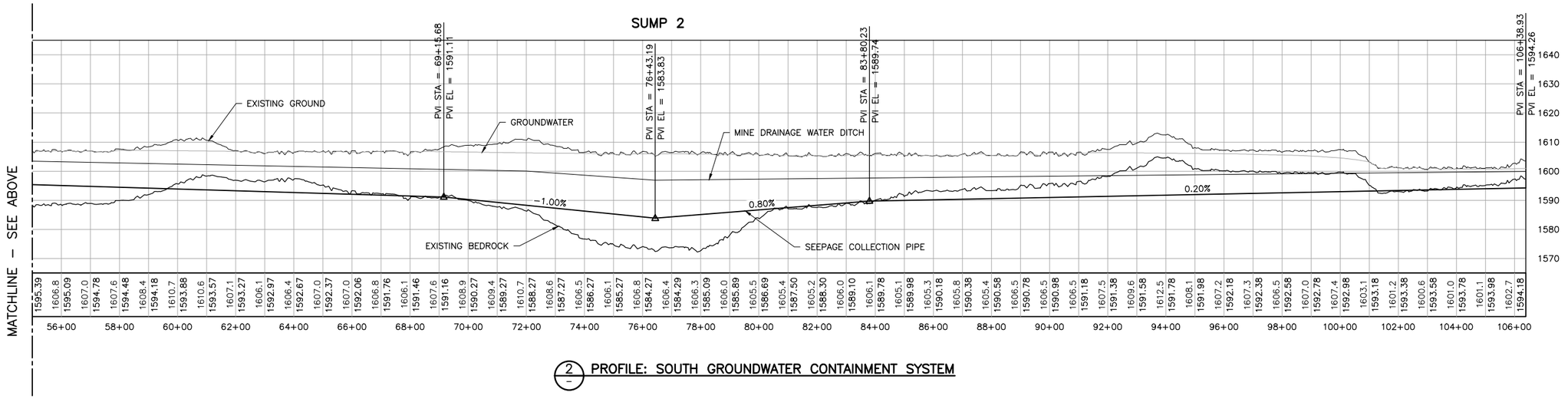

2 PROFILE: SOUTH GROUNDWATER CONTAINMENT SYSTEM

NOTE:

ALL GROUNDWATER AND BEDROCK PROFILES SHOWN ARE APPROXIMATE.

VER NO	DATE	DESCRIPTION
1	10/18/11	ROCK AND OVERBURDEN MANAGEMENT PLAN – VERSIONS 5, 6, 7 – ATTACHMENT C
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DATE 5/28/15 LICENSE# 20951

DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE
GROUNDWATER CONTAINMENT SYSTEM
SOUTH PROFILES

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. GCS-013 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-21-CS-013.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:53 PM

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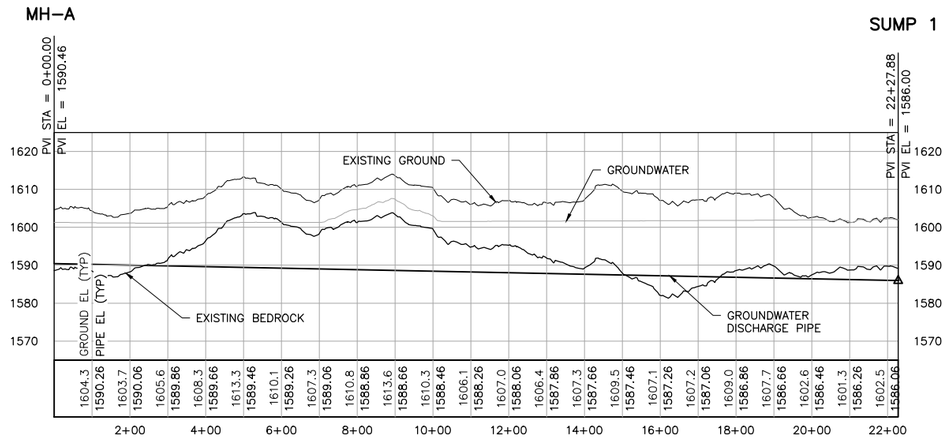
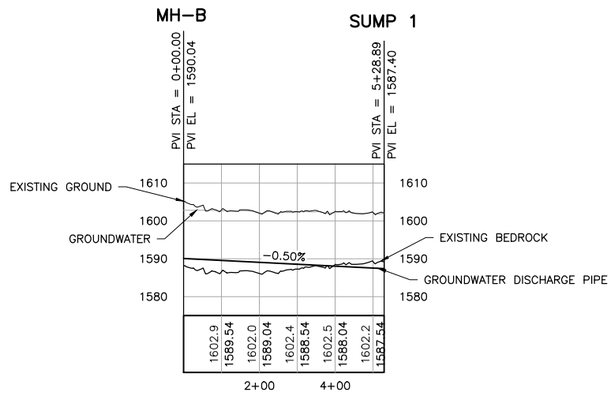


3 – PROFILE: MANHOLE A GROUNDWATER DISCHARGE PIPE TO SUMP 1



4 – PROFILE: MANHOLE B GROUNDWATER DISCHARGE PIPE TO SUMP 1

NOTE:

ALL GROUNDWATER AND BEDROCK PROFILES SHOWN ARE APPROXIMATE.

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DRAWN: CAD
CHECKED: CMK2
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

CATEGORY 1 STOCKPILE GROUNDWATER CONTAINMENT SYSTEM DISCHARGE PROFILES

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

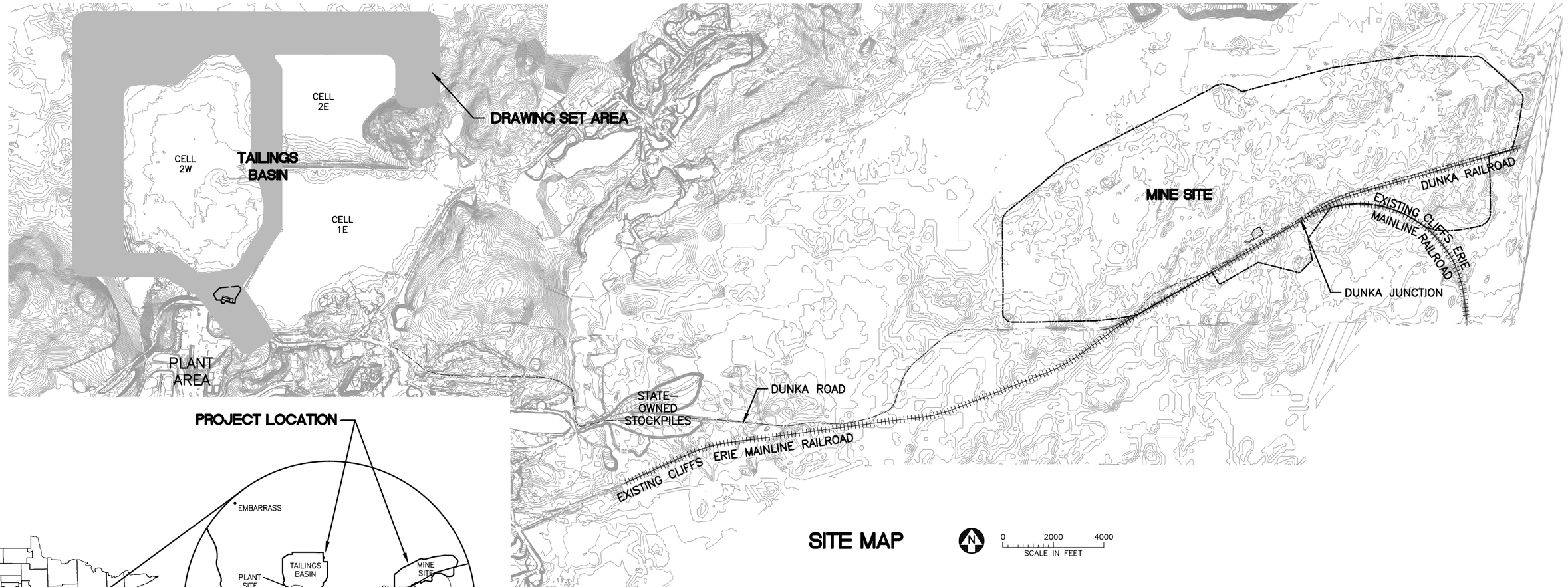
DWG. NO. GCS–014
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM–21–CS–014.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:54 PM

INCHES 1 2

FTB Seepage Containment and Stream Augmentation Systems

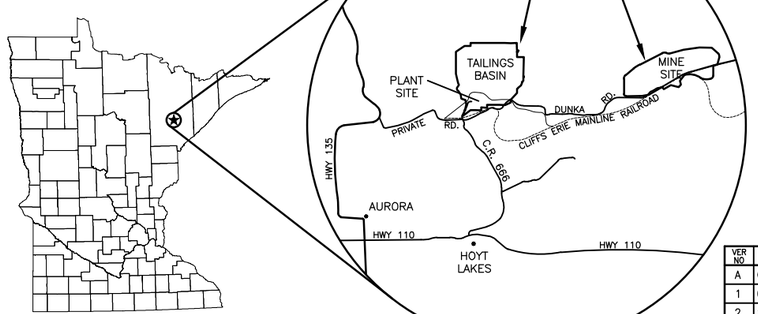
POLY MET MINING, INC. NORTHMET PROJECT
FTB SEEPAGE CONTAINMENT
AND STREAM AUGMENTATION SYSTEMS
HOYT LAKES, MINNESOTA



SITE MAP

0 2000 4000
SCALE IN FEET

PROJECT LOCATION



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO.	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
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3	5/28/15	ISSUED FOR PERMIT TO MINE APPLICATION

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DATE 5/28/15 LICENSE# 20951

DRAWN: BDP
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS LOCATION MAP AND SITE MAP

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-001
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 11:06 AM

INCHES 1 2

GENERAL LEGEND

- EXISTING CONTOUR – MAJOR (1000)
- EXISTING CONTOUR – MINOR
- PROPOSED CONTOUR – MAJOR (1000)
- PROPOSED CONTOUR – MINOR
- EXISTING POWER POLE
- EXISTING RAILROAD
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING UNIMPROVED TRAIL
- EXISTING STRUCTURES
- TREE LINE
- WETLAND BOUNDARY
- EXISTING CULVERT
- EXISTING PIPELINE (P)
- CUTOFF WALL ALIGNMENT
- OVERHEAD ELECTRIC
- SURFACE DRAINAGE
- PROPOSED DEWATERING PIPE
- PROPOSED DISCHARGE PIPELINE
- PROPOSED RETURN PIPELINE
- PROPOSED CULVERT (NON–MINE DRAINAGE)
- PROPOSED SEEPAGE COLLECTION DRAIN
- PROPOSED STORMWATER DRAIN
- PROPOSED MANHOLE
- PROPOSED RIP RAP
- ROTASONIC BORING
- ROTASONIC BORING WITH PIEZOMETER
- SPT BORING
- SPT BORING WITH PACKER
- FLOW METER (M)

ABBREVIATIONS

APPROX.	–	APPROXIMATE
CDSM	–	CEMENT DEEP SOIL MIX
CMP	–	CORRUGATED METAL PIPE
CPEP	–	CORRUGATED POLYETHYLENE PIPE
CY	–	CUBIC YARD
DR	–	DIMENSION RATIO
DWG	–	DRAWING
EL.	–	ELEVATION
ø	–	DIAMETER
FTB	–	FLOTATION TAILINGS BASIN
GCL	–	GEOSYNTHETIC CLAY LINER
HDPE	–	HIGH DENSITY POLYETHYLENE
HRF	–	HYDROMETALLURGICAL RESIDUE FACILITY
LDPE	–	LOW DENSITY POLYETHYLENE
LF	–	LINER FEET
LTVSMC	–	LTV STEEL MINING COMPANY
MCY	–	MILLION CUBIC YARDS
mil	–	one thousandth of an inch
MIN	–	MINIMUM
MSL	–	MEAN SEA LEVEL
NTS	–	NOT TO SCALE
SCH.	–	SCHEDULE
DR	–	DIMENSION RATIO
TYP	–	TYPICAL
N–MH–XX	–	NORTH SECTION MANHOLE
NW–MH–XX	–	NORTHWEST SECTION MANHOLE
W–MH–XX	–	WEST SECTION MANHOLE
N–MH/PS–XX	–	NORTH SECTION MANHOLE/PUMP STATION
NW–MH/PS–XX	–	NORTHWEST SECTION MANHOLE
W–MH/PS–XX	–	WEST SECTION MANHOLE/PUMP STATION

NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.
4. EXISTING TOPOGRAPHIC INFORMATION WAS UPDATED FOR AREAS SOUTH EAST OF COAL ASH LANDFILL AND EAST OF OUTCROP BETWEEN CELLS 1E AND 2E USING CONTOURS FROM DATA COLLECTED IN 1999.

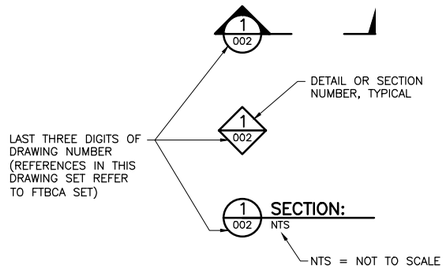
SHEET INDEX

SHEET NO. TITLE

GENERAL DRAWINGS

FTBCA–001	LOCATION MAP AND SITE MAP
FTBCA–002	LEGEND AND SHEET INDEX
FTBCA–003	PLAN SHEET LAYOUT
FTBCA–004	PLAN AND PROFILE– STATION 0+00 TO STATION 30+94
FTBCA–005	PLAN AND PROFILE– STATION 30+94 TO STATION 61+88
FTBCA–006	PLAN AND PROFILE– STATION 61+88 TO STATION 92+82
FTBCA–007	PLAN AND PROFILE– STATION 92+82 TO STATION 123+76
FTBCA–008	PLAN AND PROFILE– STATION 123+76 TO STATION 154+70
FTBCA–009	PLAN AND PROFILE– STATION 154+70 TO STATION 185+64
FTBCA–010	PLAN AND PROFILE– STATION 185+64 TO STATION 216+58
FTBCA–011	PLAN AND PROFILE– STATION 216+58 TO STATION 240+17
FTBCA–012	EAST SECTION PLAN & PROFILE STATION 0+00 TO STATION 25+43
FTBCA–013	DETAILS
FTBCA–014	DETAILS
FTBCA–015	DETAILS

DRAWING NUMBERING



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DRAWN: BDP
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS
LEGEND AND SHEET INDEX

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. FTBCA–002
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT–10–CU–002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 11:09 AM
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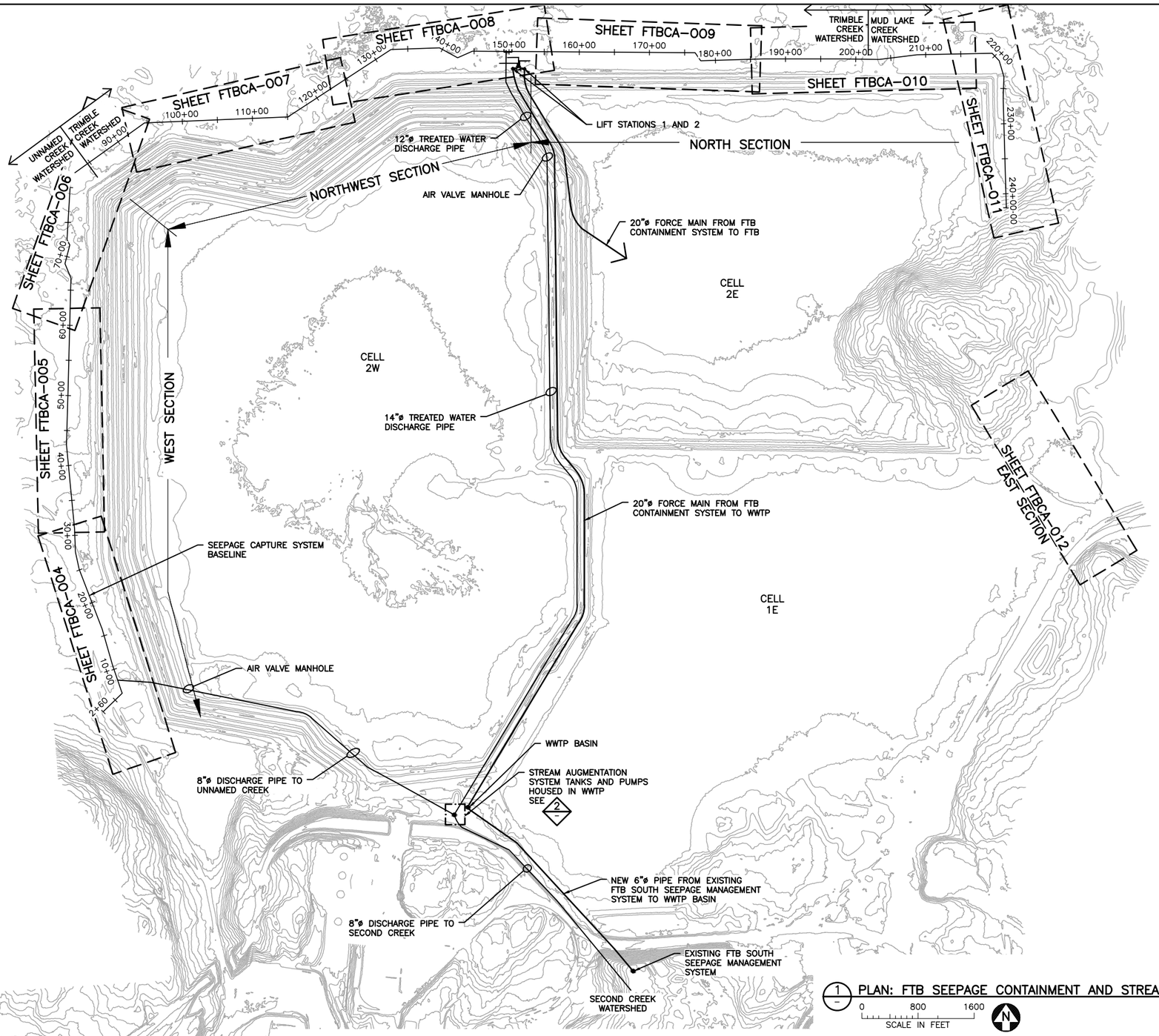

1 PLAN: FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION LAYOUT

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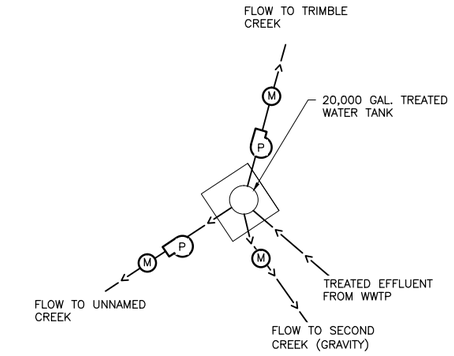
SCALE IN FEET



2 DETAIL: CONCEPTUAL STREAM AUGMENTATION SYSTEM SUPPLY
NOT TO SCALE

NOTES

1. SEEPAGE CAPTURE SYSTEMS INCLUDE THE FTB CONTAINMENT SYSTEM ALONG THE WEST, NORTH AND EAST SIDES OF THE FTB, THE SOUTH SEEPAGE MANAGEMENT SYSTEM ON THE SOUTH SIDE OF THE FTB AND CONVEYANCE TO THE WWTP EQUALIZATION BASIN.
2. STREAM AUGMENTATION SYSTEM INCLUDES TREATED WATER CONVEYANCE AND DISCHARGE TO UNNAMED CREEK, TRIMBLE CREEK, AND SECOND CREEK WATERSHEDS.
3. FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS DESIGN REFERENCE BASELINE SHOWN ON THIS SHEET. SEE SUBSEQUENT SHEETS FOR PROPOSED LAYOUT OF SYSTEMS ALONG BASELINE.

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A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
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SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: BDP
CHECKED: DVS
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN SHEET LAYOUT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-003
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-003.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 11:11 AM
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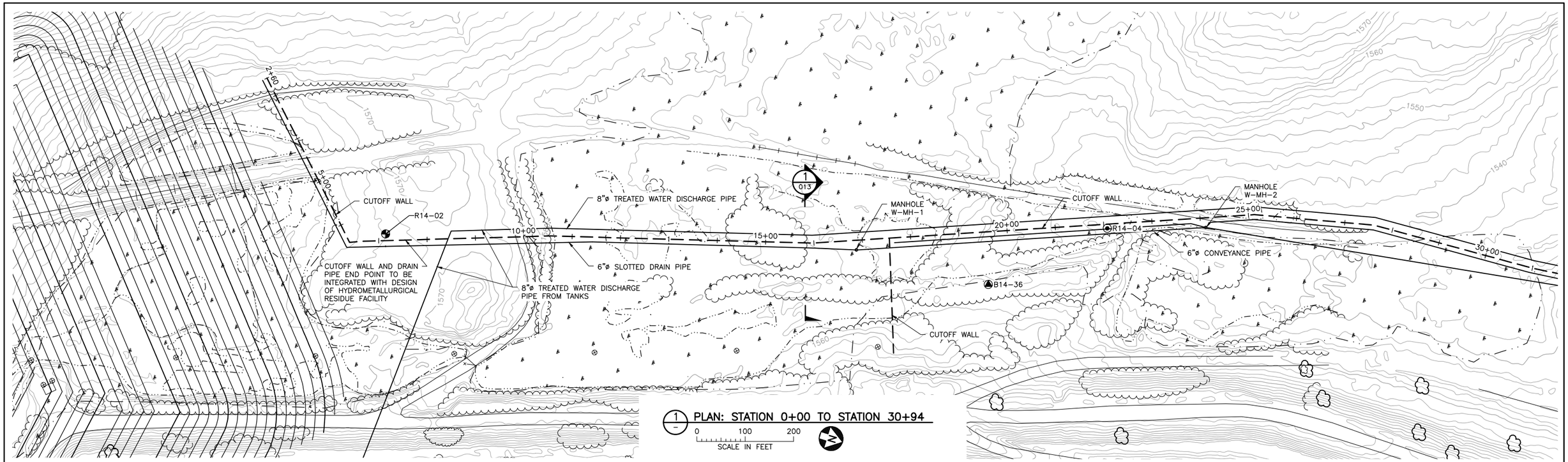
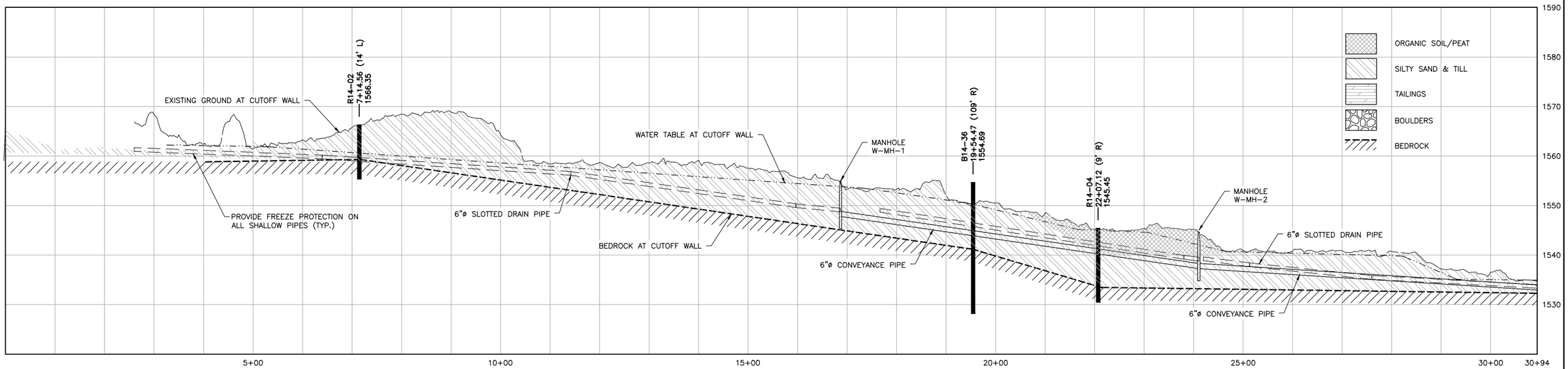


1 PLAN: STATION 0+00 TO STATION 30+94

0 100 200
SCALE IN FEET



2 PROFILE: STATION 0+00 TO STATION 30+94

0 100 200 (SCALE IN FEET HORIZONTAL)
0 10 20 (SCALE IN FEET VERTICAL)

NOTES:

1. HORIZONTAL LOCATION OF FORCE MAIN, SEEPAGE CONVEYANCE PIPES AND STREAM AUGMENTATION PIPES/DISCHARGE POINTS ON THIS SHEET AND SUBSEQUENT SHEETS SHOWN FOR CLARITY. ACTUAL LOCATION TO BE DETERMINED DURING FINAL DESIGN.
2. MANHOLE LOCATIONS ON THIS SHEET AND SUBSEQUENT SHEETS ARE PRELIMINARY.
3. ACCESS ROAD NOT SHOWN ON THIS SHEET AND SUBSEQUENT SHEETS.
4. TREATED WATER DISCHARGE PIPES NOT SHOWN IN PROFILE ON THIS SHEET AND SUBSEQUENT SHEETS.
5. WATER TABLE ELEVATIONS ARE ESTIMATED BASED ON PIEZOMETERS, BORING LOGS, SOIL TYPES AND AERIAL PHOTOGRAPHY.
6. GROUND SURFACE ELEVATIONS ARE BASED ON 2010 LIDAR DATA (NAVD88). BORING ELEVATIONS SHOWN ARE BASED ON 2010 LIDAR DATA (NAVC88) ADJUSTED AFTER GEOTECHNICAL EXPLORATION (03-11-2014 THRU 05-20-2014). STRATIGRAPHY AND WATER TABLES ARE BASED ON THE 2014 FIELD INVESTIGATION LOGS.
7. BORING LOCATION OFFSETS FROM PROPOSED CUTOFF WALL ALIGNMENT ARE SHOWN. SUBSURFACE CONDITIONS ON WALL ALIGNMENT WILL DIFFER FROM THOSE SHOWN.
8. AREAS OF COBBLES AND BOULDERS BETWEEN BORING LOCATIONS AND ADJACENT BORING LOCATIONS SHOULD BE ASSUMED TO EXIST.

VER NO	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
1	09/09/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3 – ATTACHEMENT B
2	12/31/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3,4 – ATTACHEMENT B
3	5/28/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	3	5/28/15
FOR CONSTRUCTION	–	–

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: BJH
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 0+00 TO 30+94

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-004
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-004.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:27 PM

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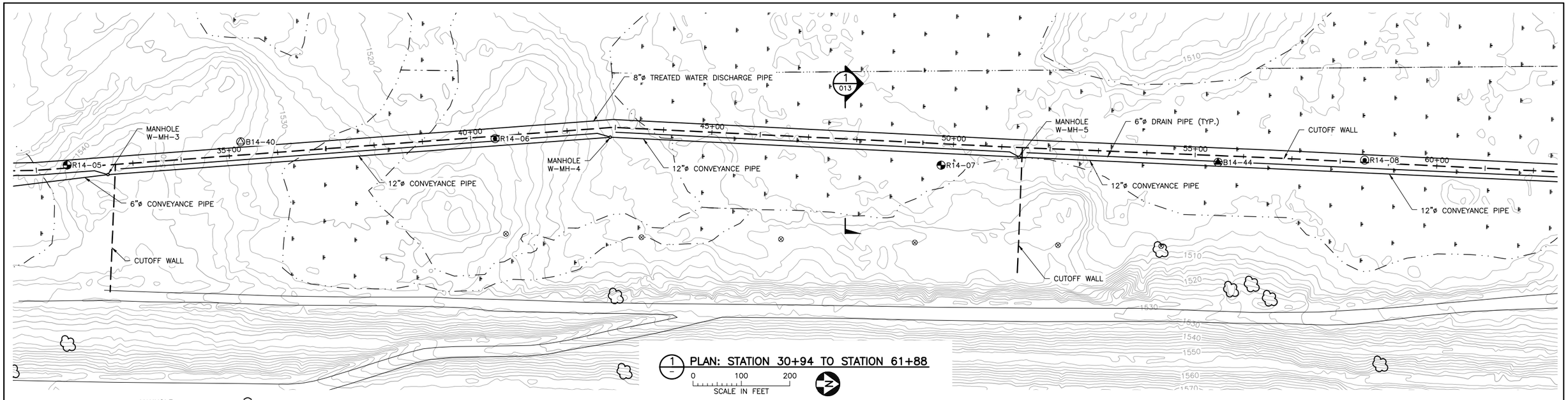
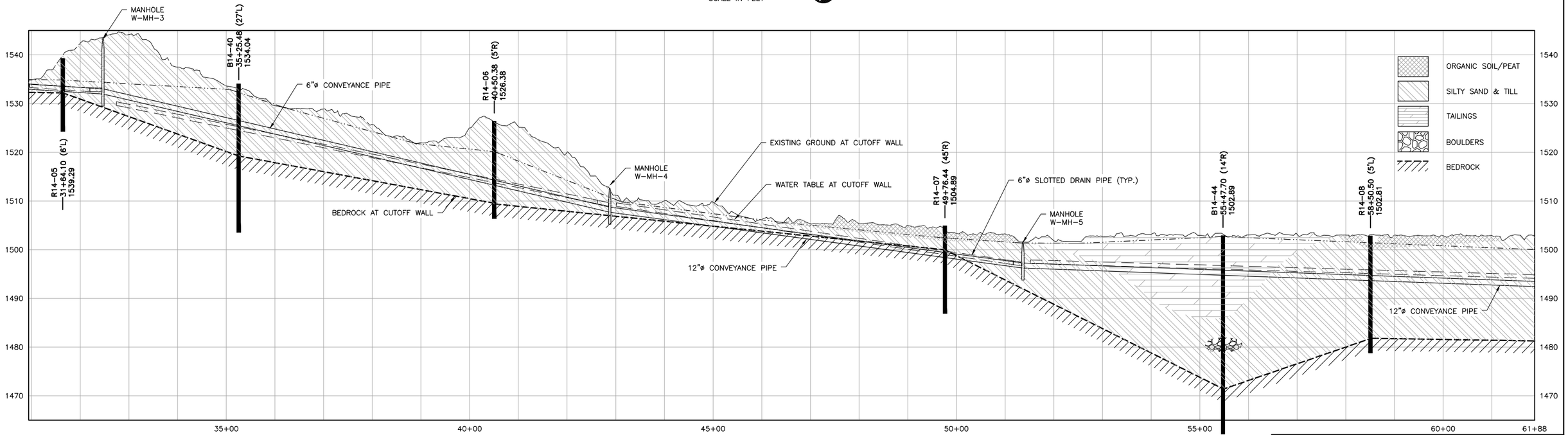


1 PLAN: STATION 30+94 TO STATION 61+88

0 100 200

SCALE IN FEET



2 PROFILE: STATION 30+94 TO STATION 61+88

0 100 200 — SCALE IN FEET HORIZONTAL

0 10 20 — SCALE IN FEET VERTICAL

VER NO	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
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DATE 5/28/15 LICENSE# 20951

DRAWN: BJH

CHECKED: DVS/AMP

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 30+94 TO 61+88

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. FTBCA–005

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT–10–CU–005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:33 PM

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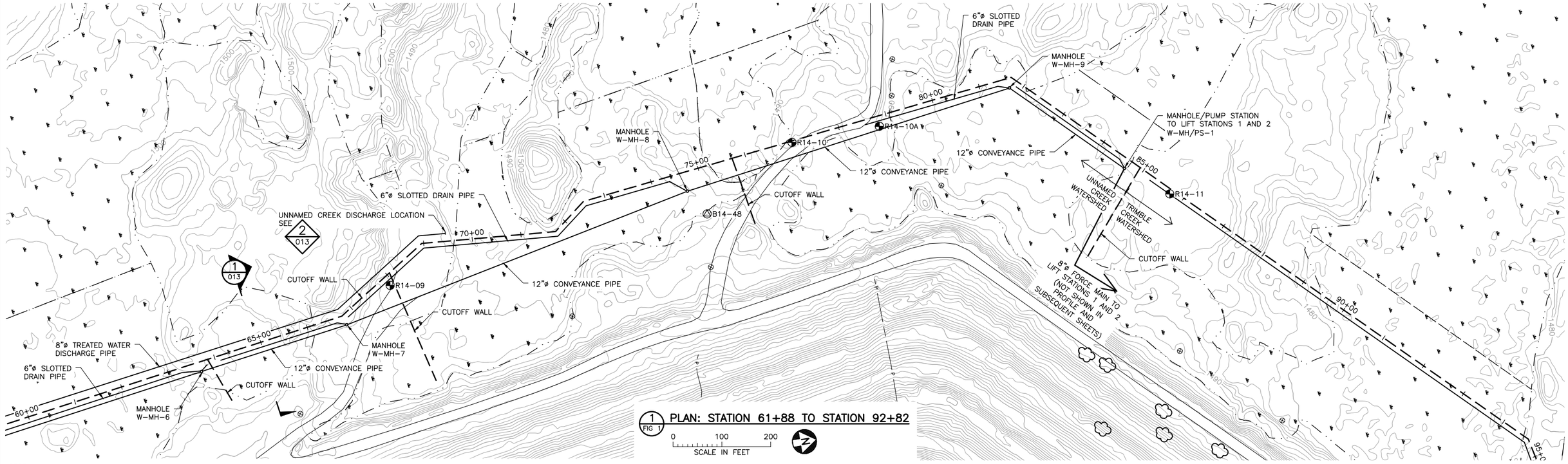
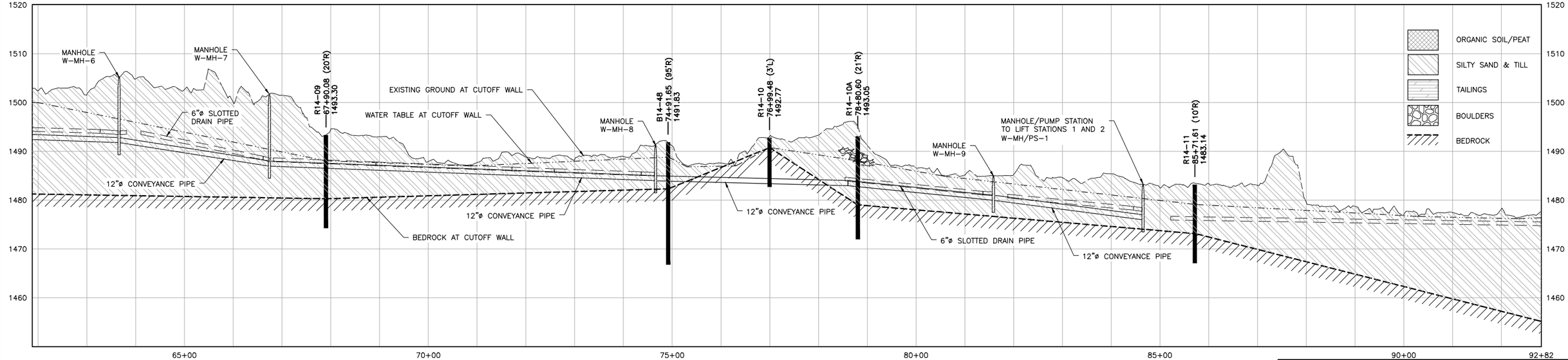


1 FIG 1 **PLAN: STATION 61+88 TO STATION 92+82**

0 100 200 SCALE IN FEET



2 – **PROFILE: STATION 61+88 TO STATION 92+82**

0 100 200 SCALE IN FEET HORIZONTAL

0 10 20 SCALE IN FEET VERTICAL

VER NO	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
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SIGNATURE Thomas J. Radue
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DRAWN: BJH
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 61+88 TO 92+82

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-006 REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-006.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:34 PM
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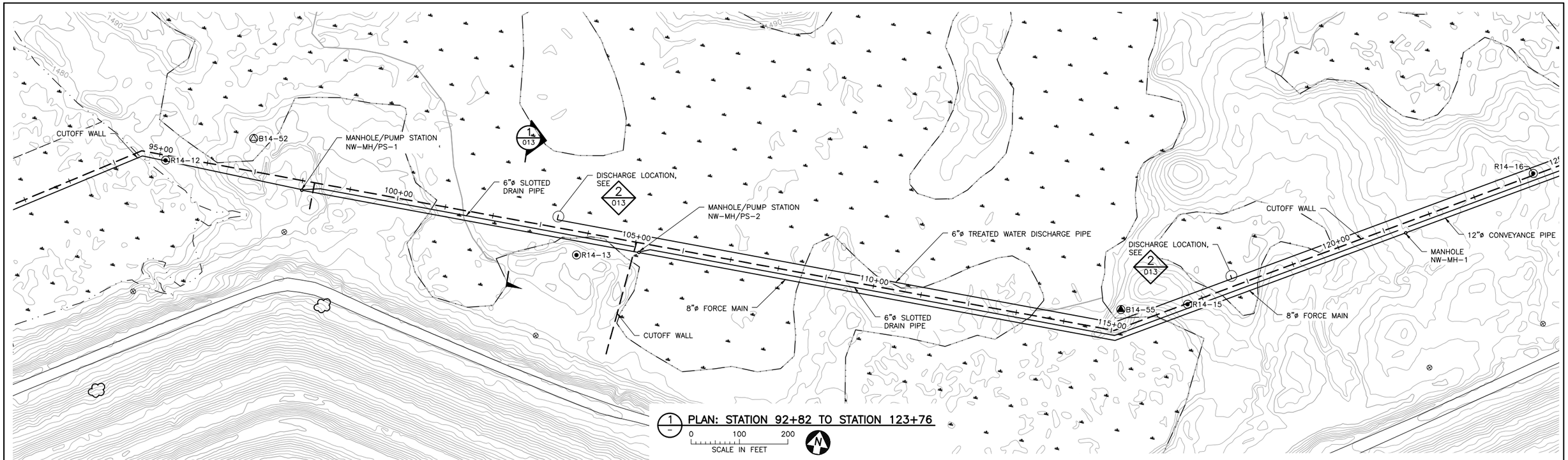
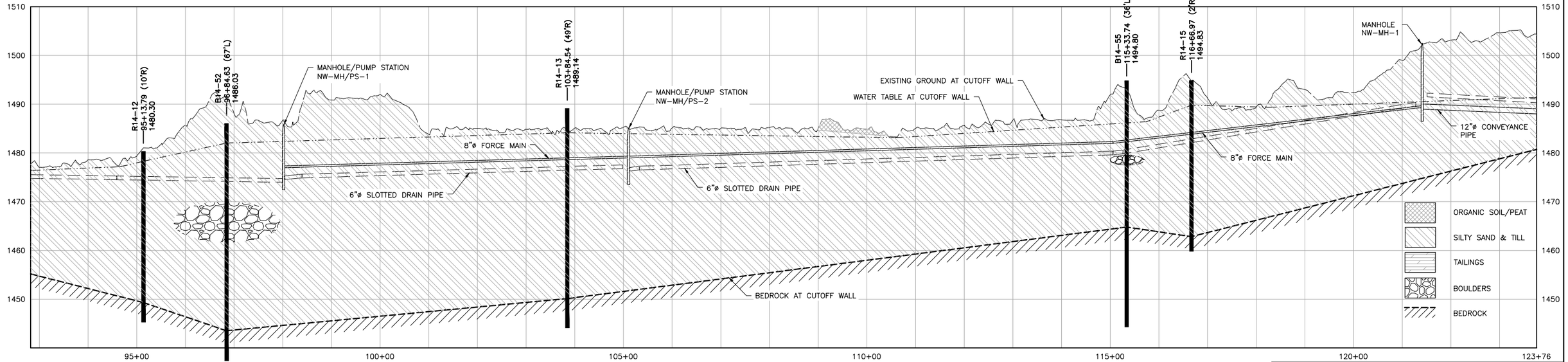


1 PLAN: STATION 92+82 TO STATION 123+76

0 100 200
SCALE IN FEET



2 PROFILE: STATION 92+82 TO STATION 123+76

0 100 200
SCALE IN FEET
HORIZONTAL

0 10 20
SCALE IN FEET
VERTICAL

VER NO	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
1	09/09/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3 – ATTACHEMENT B
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DRAWN: BJH
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 92+82 TO 123+76

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-007
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-007.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:46 PM

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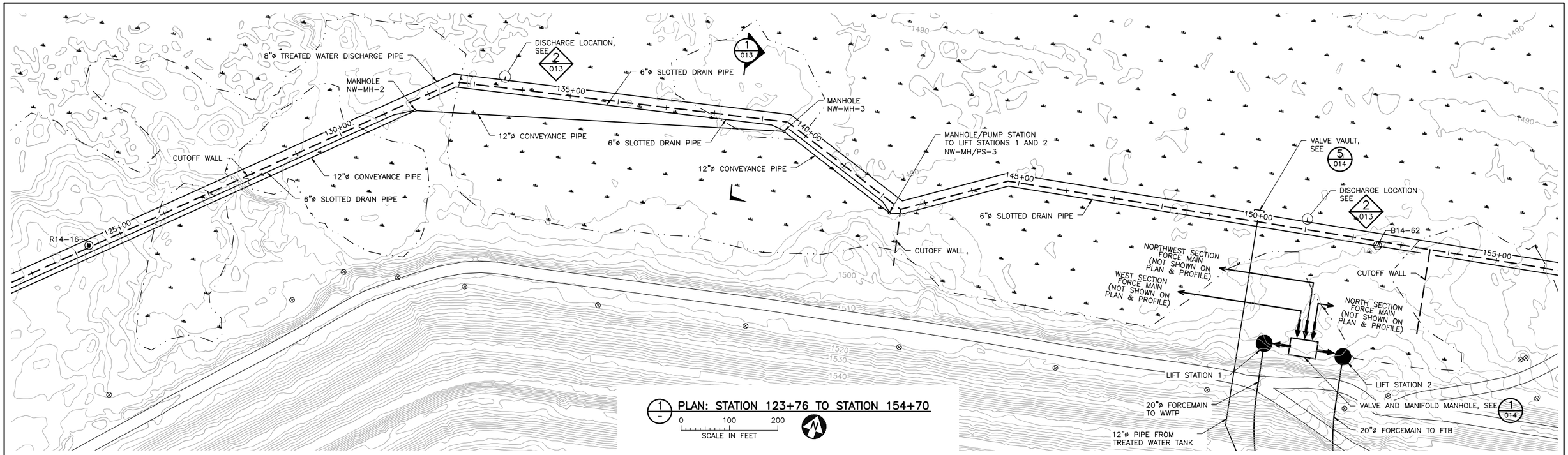
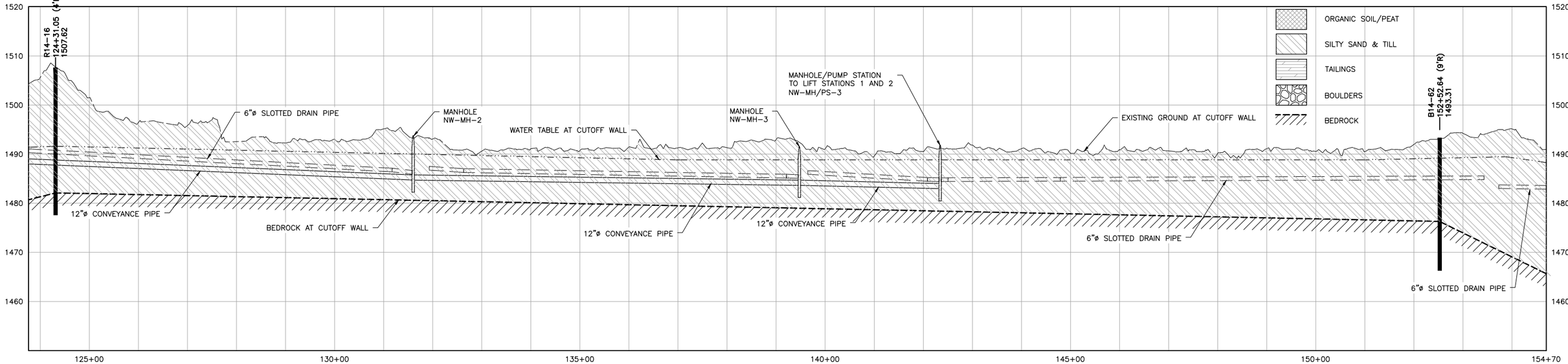


1/– PLAN: STATION 123+76 TO STATION 154+70

0 100 200
SCALE IN FEET



2/– PROFILE: STATION 123+76 TO STATION 154+70

0 100 200 0 10 20
SCALE IN FEET HORIZONTAL
SCALE IN FEET VERTICAL

VER NO.	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
1	09/09/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3 – ATTACHEMENT B
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ISSUED	VERSION	DATE
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DRAWN: BJH
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 123+76 TO 154+70

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-008
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-008.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:42 PM

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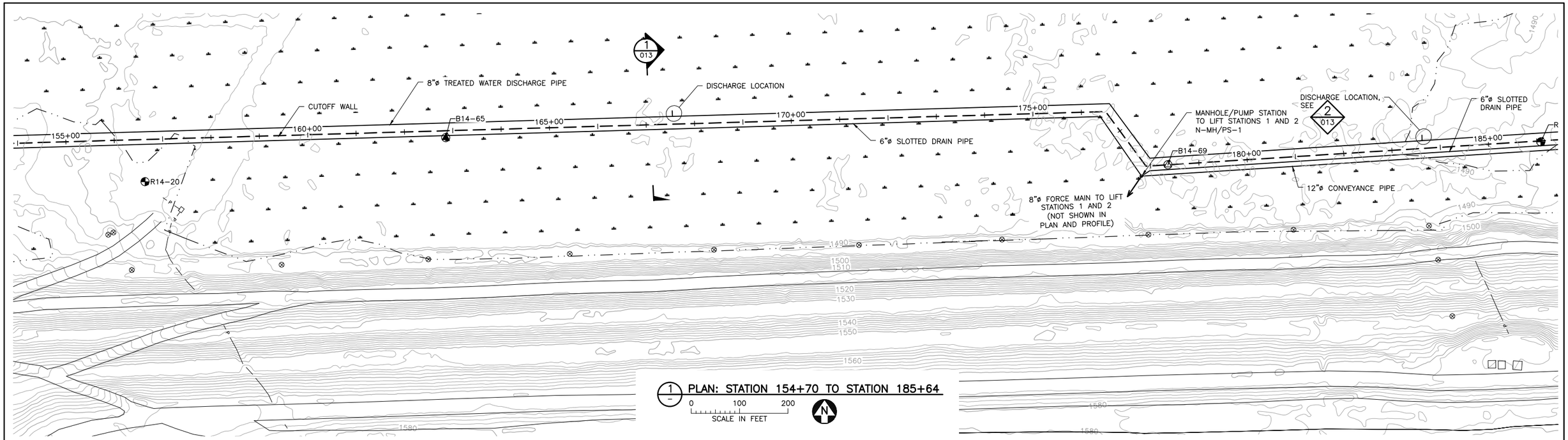
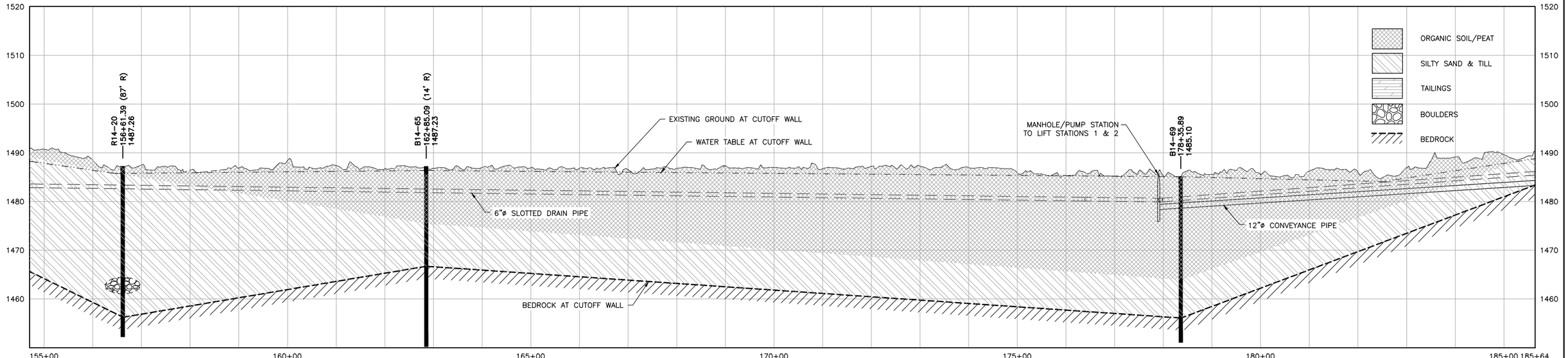


1 – PLAN: STATION 154+70 TO STATION 185+64

0 100 200

SCALE IN FEET



2 – PROFILE: STATION 154+70 TO STATION 185+64

0 100 200 0 10 20

SCALE IN FEET HORIZONTAL

SCALE IN FEET VERTICAL

VER NO	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
1	09/09/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3 – ATTACHEMENT B
2	12/31/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3,4 – ATTACHEMENT B
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ISSUED	VERSION	DATE
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FOR CONSTRUCTION	–	–

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SIGNATURE Thomas J. Radue

DATE 5/28/15 LICENSE# 20951

DRAWN: BJH

CHECKED: DVS/AMP

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 154+70 TO 185+64

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

DWG. NO. FTBCA–009

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT–10–CU–009.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:44 PM

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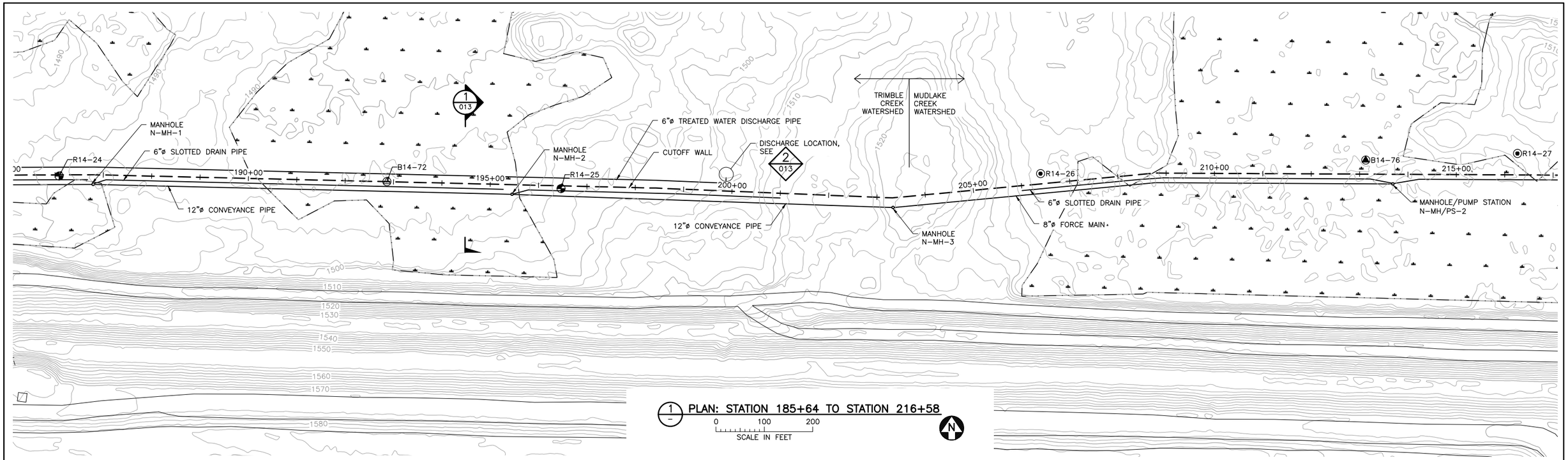
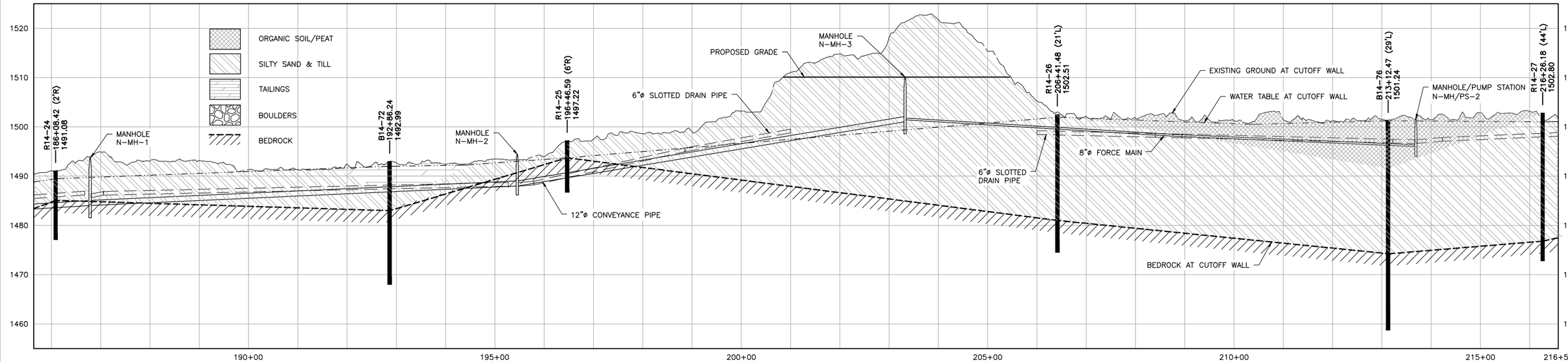


1 PLAN: STATION 185+64 TO STATION 216+58

0 100 200

SCALE IN FEET



2 PROFILE: STATION 185+64 TO STATION 216+58

0 100 200 — SCALE IN FEET HORIZONTAL

0 10 20 — SCALE IN FEET VERTICAL

VER NO.	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
1	09/09/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3 – ATTACHEMENT B
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CHECKED: DVS/AMP

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 185+64 TO 216+58

POLY MET MINING, INC.
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Ph: 1-800-632-2277

DWG. NO. FTBCA-010

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-010.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:52 PM

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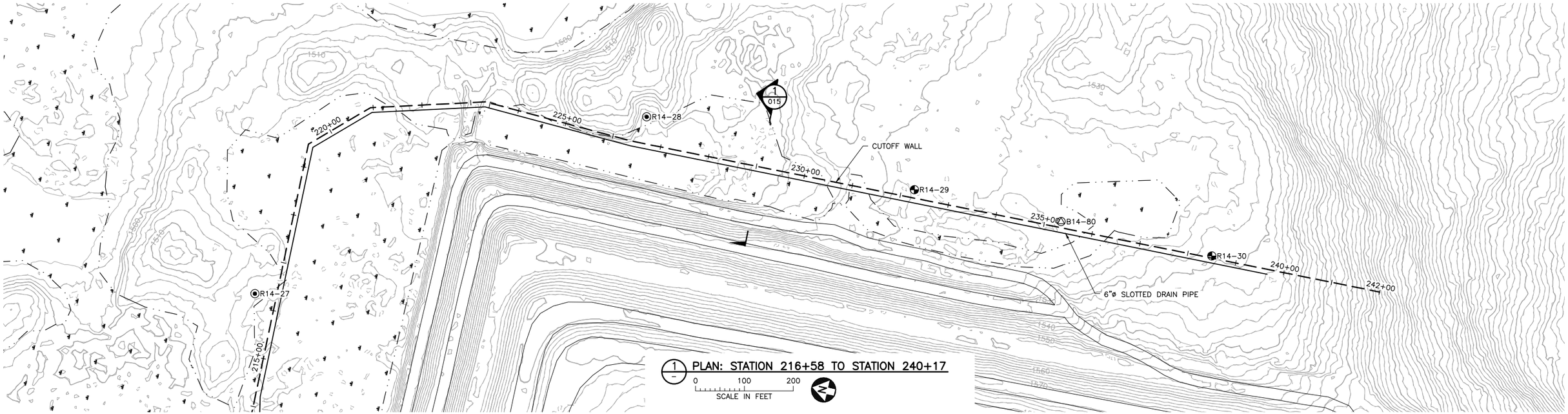
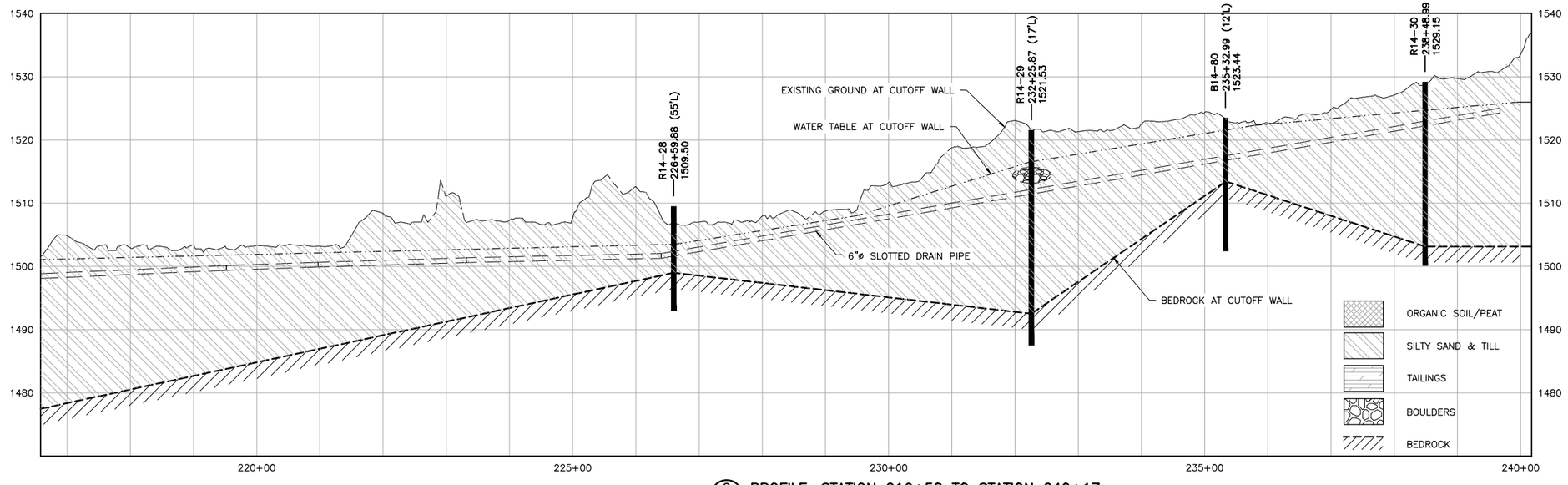


1 — PLAN: STATION 216+58 TO STATION 240+17

0 100 200
SCALE IN FEET



2 — PROFILE: STATION 216+58 TO STATION 240+17

0 100 200
SCALE IN FEET
HORIZONTAL

0 10 20
SCALE IN FEET
VERTICAL

VER NO.	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
1	09/09/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3 – ATTACHEMENT B
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SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: BJH
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS PLAN & PROFILE STATION 216+58 TO 240+17

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-011

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-011.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:57 PM

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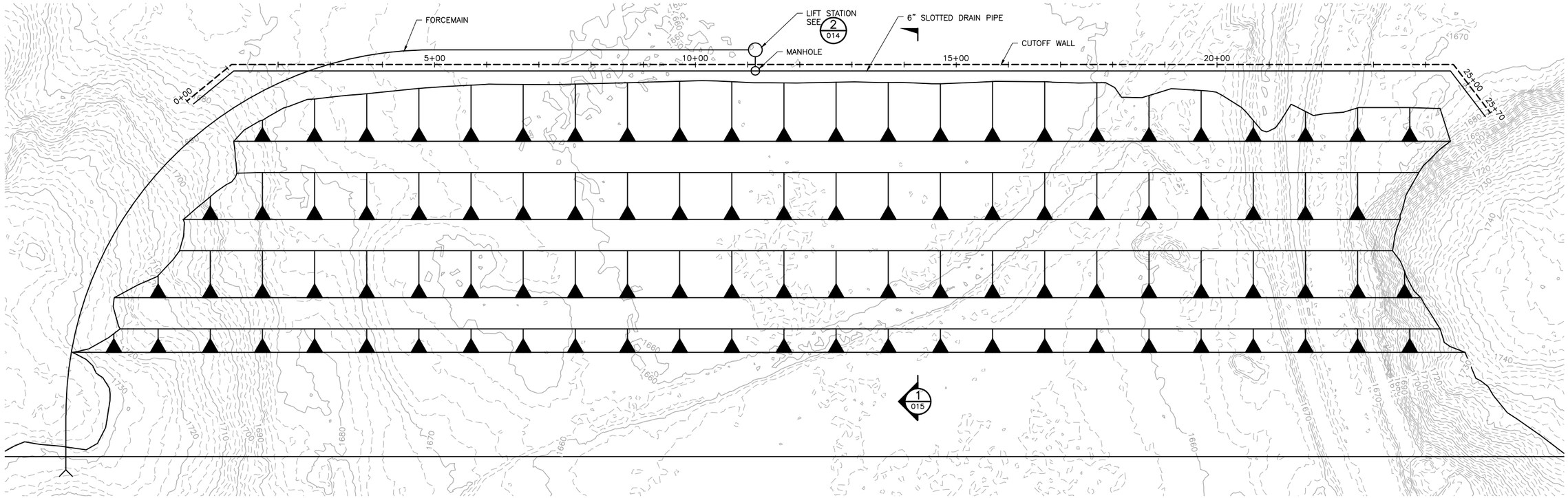
FORCEMAIN
LIFT STATION SEE 2/014
MANHOLE
6" SLOTTED DRAIN PIPE
CUTOFF WALL
0+00
5+00
10+00
15+00
20+00
25+00
25+70
1670
1680
1690
1700
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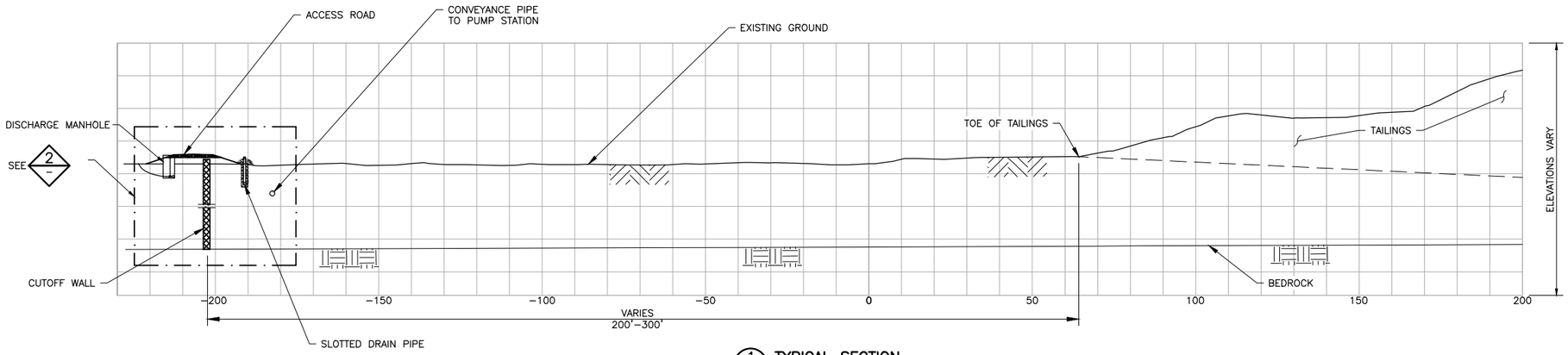
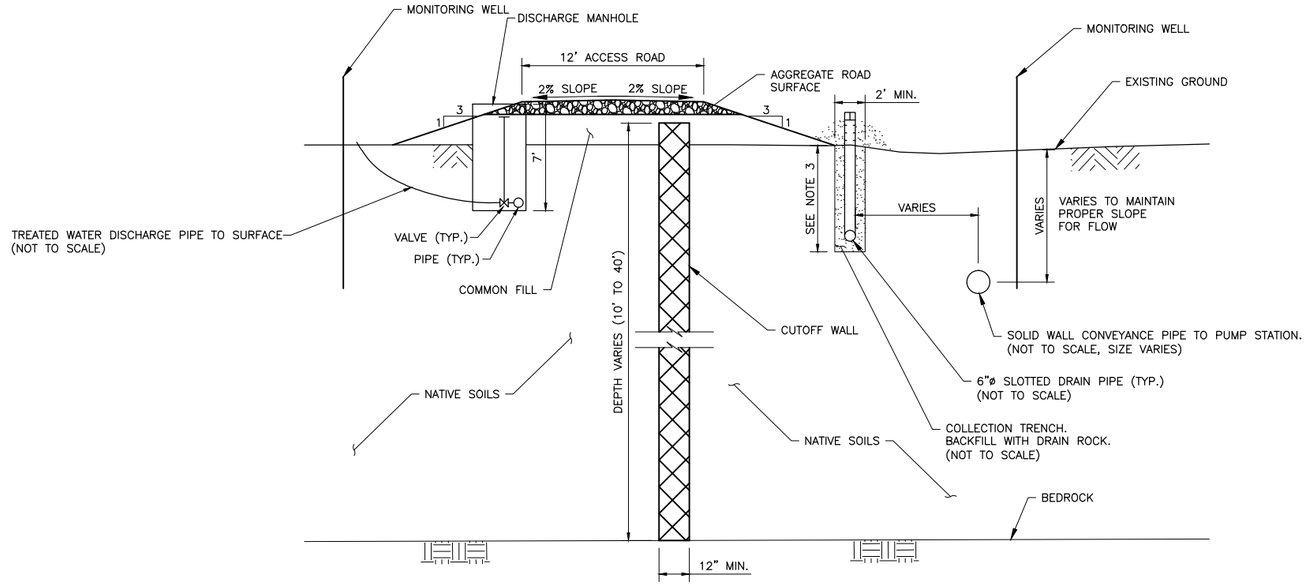


1 TYPICAL SECTION

0 20 40

SCALE IN FEET



2 TYPICAL DETAIL

0 5 10

SCALE IN FEET

NOTES:

1. DIFFUSER TO BE INSTALLED ON DISCHARGE PIPES AS REQUIRED TO PREVENT EROSION.
2. CUTOFF WALL MAXIMUM DESIGN HYDRAULIC CONDUCTIVITY = $1X10^{-6}$CM/SEC
3. 7' TYPICAL BUT MAY BE LESS IN AREAS WITH SHALLOW BEDROCK

VER NO	DATE	DESCRIPTION
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3	5/28/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/28/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME THOMAS J. RADUE

SIGNATURE Thomas J. Radue

DATE 5/28/15 LICENSE# 20951

DRAWN: BDP

CHECKED: DVS/AMP

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-013

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-013.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 12:53 PM

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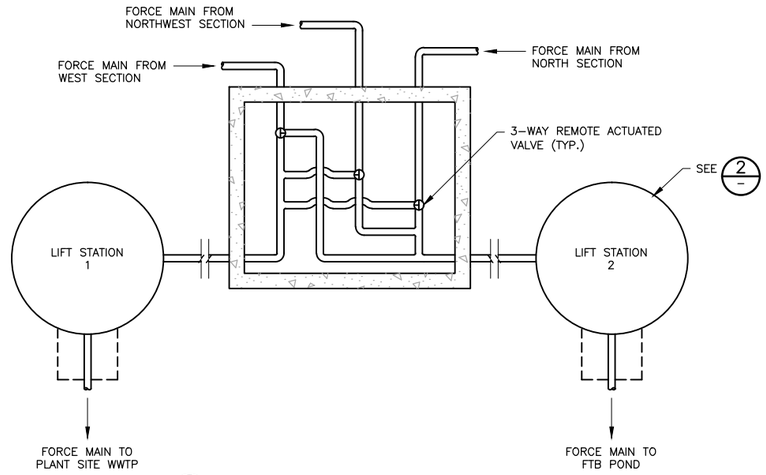
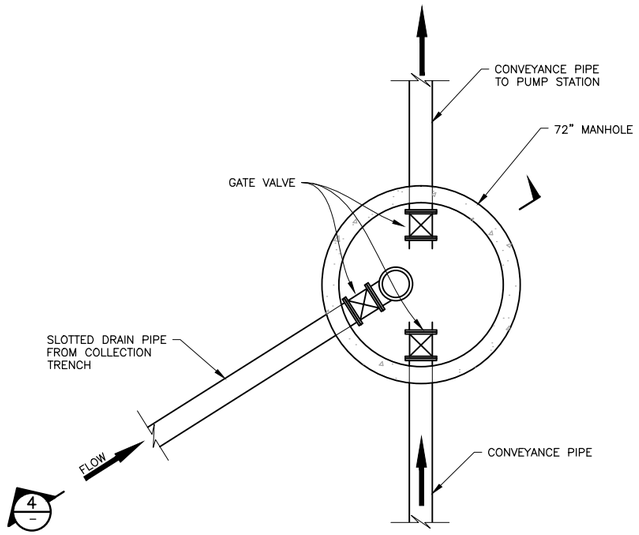
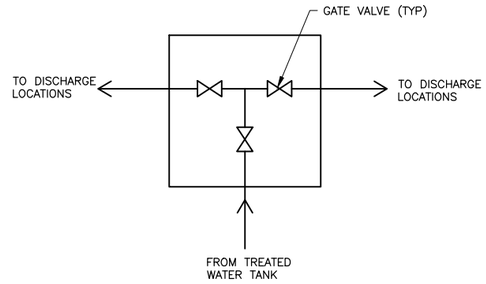


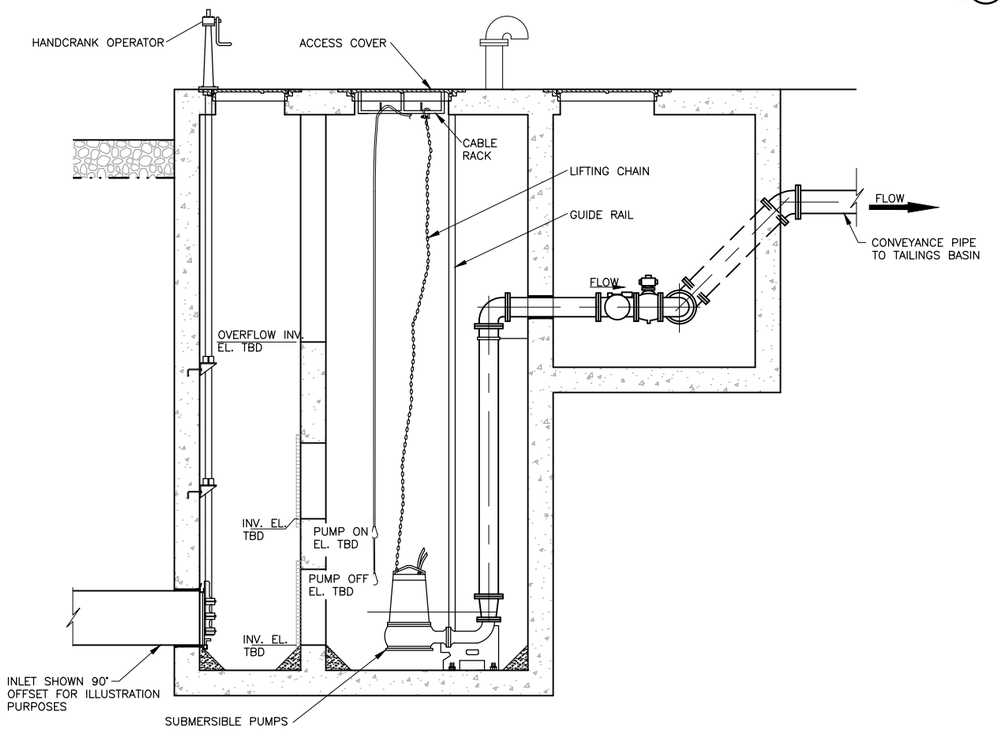
1/008 PLAN: VALVE AND MANIFOLD MANHOLE
NOT TO SCALE



3/- PLAN: MANHOLE (TYP.)
NOT TO SCALE



5/008 PLAN: VALVE VAULT
NOT TO SCALE



2/- SECTION: LIFT STATION (TYP.)
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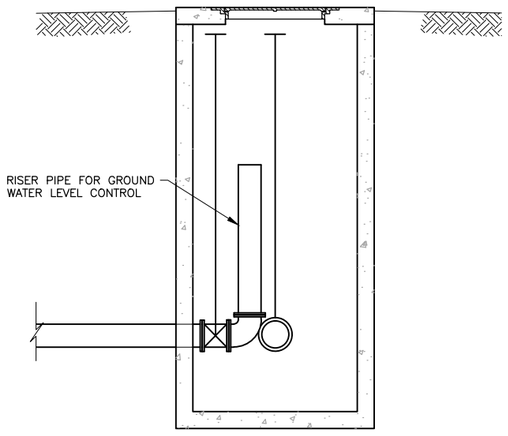

4/- SECTION: MANHOLE (TYP.)
NOT TO SCALE

NOTES:

1. LIFT STATION, MANHOLE AND VAULT CONFIGURATIONS SHOWN ON THIS SHEET ARE INTENDED TO BE REPRESENTATIVE OF TYPICAL FACILITIES NEEDED FOR OPERATION OF THE SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS. THE ACTUAL DESIGN FOR EACH LIFT STATION, PUMP STATION, MANHOLE, AND VAULT WILL BE DEVELOPED DURING DETAILED DESIGN TO REFLECT THE SPECIFIC EQUIPMENT REQUIREMENTS FOR EACH LOCATION.
2. PUMP STATIONS WILL BE SIMILAR TO MANHOLE SHOWN IN 3/- WITH SMALL SUBMERSIBLE PUMP,
3. FLOW METERS WILL BE PROVIDED FOR DISCHARGE FROM ALL LIFT AND PUMP STATIONS AND AT OTHER LOCATIONS AS REQUIRED FOR OPERATIONS.

VER NO	DATE	DESCRIPTION
A	09/28/12	WATER MANAGEMENT PLAN – PLANT– VERSION 2 – ATTACHEMENT B
1	09/09/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3 – ATTACHEMENT B
2	12/31/14	WATER MANAGEMENT PLAN – PLANT– VERSION 3,4 – ATTACHEMENT B
3	5/28/15	ISSUED FOR PERMIT TO MINE APPLICATION

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SIGNATURE Thomas J. Radue
DATE 5/28/15 LICENSE# 20951

DRAWN: BDP
CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-014
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-014.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:02 PM

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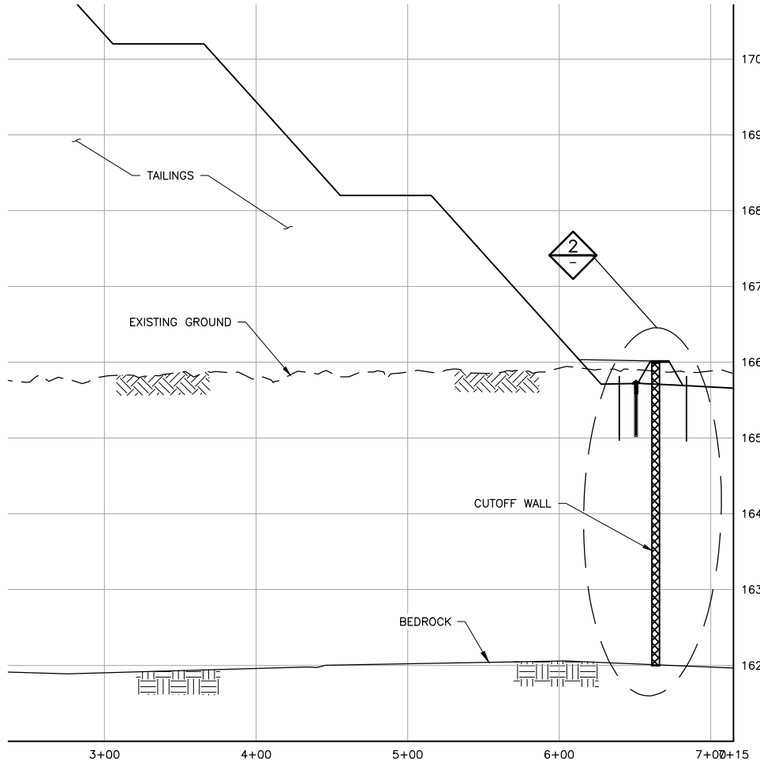
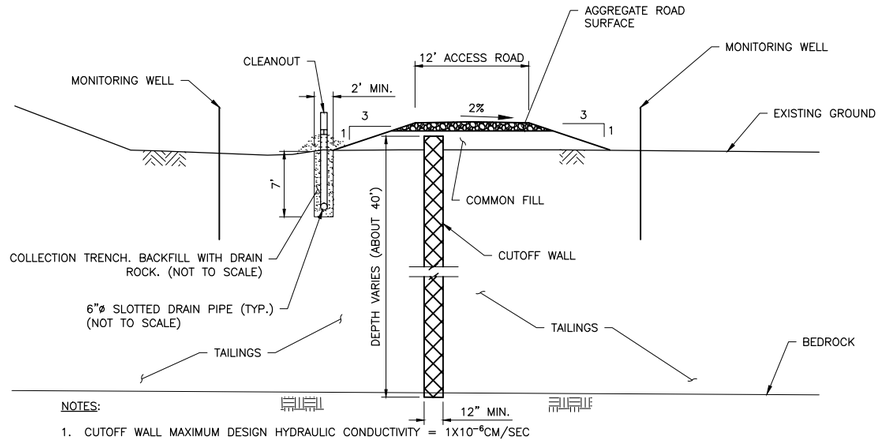


1/11 SECTION: EAST DAM SEEPAGE CONTAINMENT SYSTEM

0 50 100
SCALE IN FEET

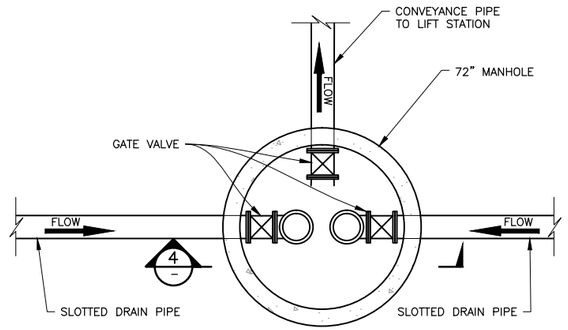


NOTES:

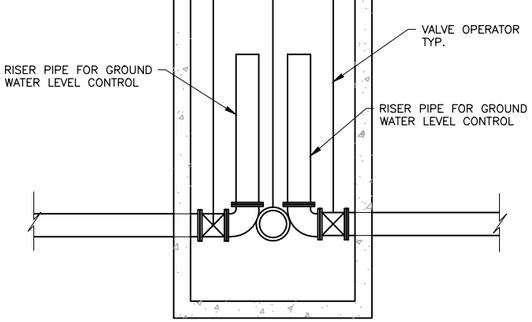
1. CUTOFF WALL MAXIMUM DESIGN HYDRAULIC CONDUCTIVITY = $1X10^{-6}$CM/SEC

2 TYPICAL DETAIL

0 4 8 12 16
SCALE IN FEET



3 PLAN: MANHOLE (TYP.)
NOT TO SCALE



4 SECTION: MANHOLE (TYP.)
NOT TO SCALE

NOTES:

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CHECKED: DVS/AMP
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTBCA-015
REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-10-CU-015.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 1:01 PM
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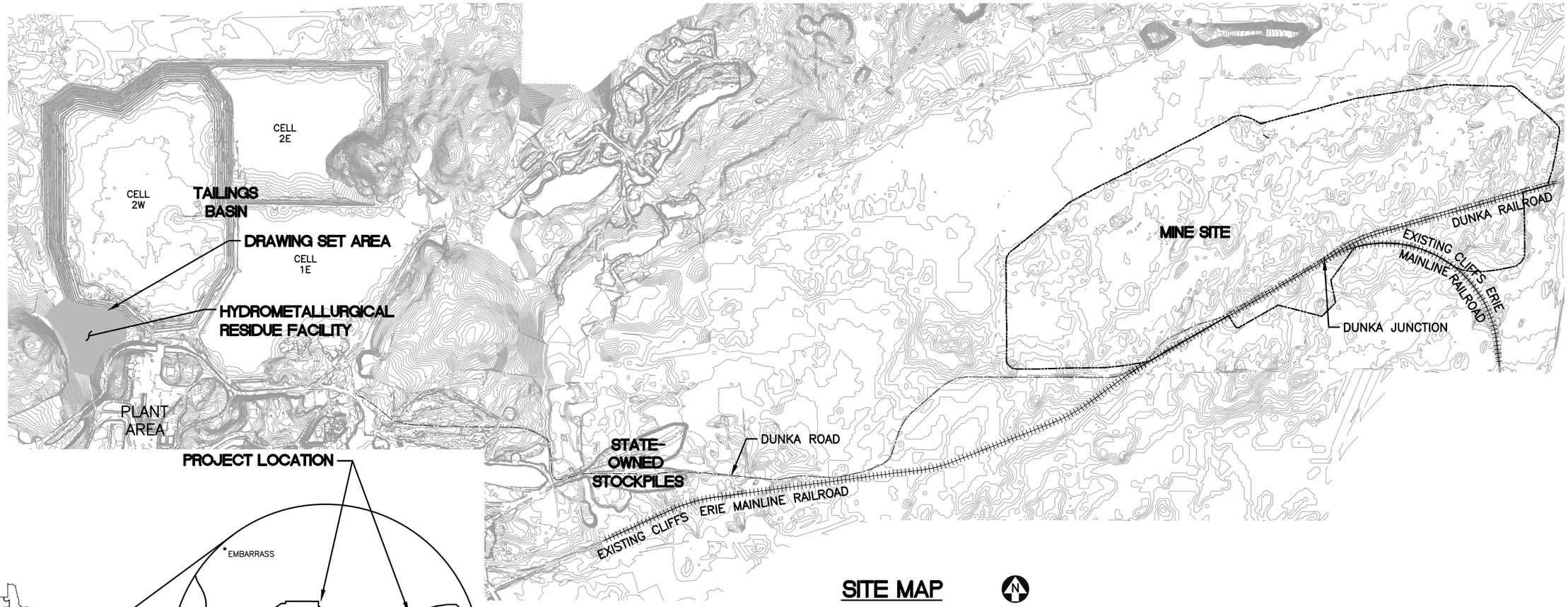
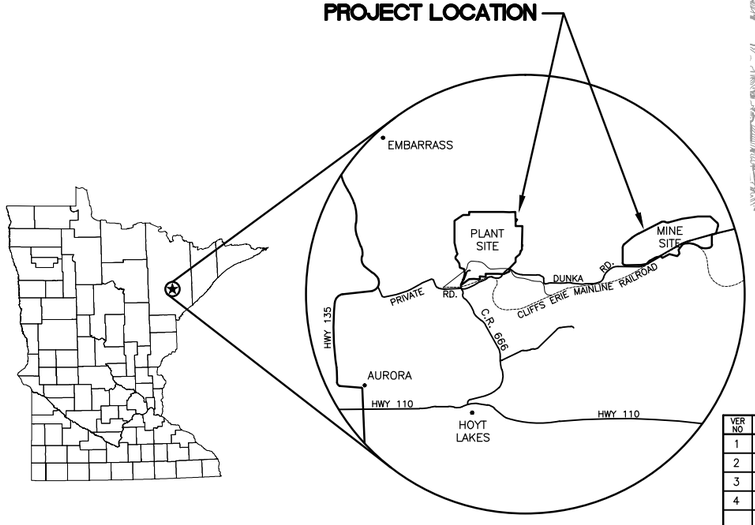
Hydrometallurgical Residue Facility

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT SUPPORT DRAWINGS
HYDROMETALLURGICAL RESIDUE FACILITY
HOYT LAKES, MINNESOTA



SITE MAP

0 2000 4000
SCALE IN FEET



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO	DATE	DESCRIPTION
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DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
LOCATION MAP AND SITE MAP

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-001
REV

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GENERAL LEGEND

- EXISTING CONTOUR – MAJOR
- EXISTING CONTOUR – MINOR
- PROPOSED CONTOUR – MAJOR
- PROPOSED CONTOUR – MINOR
- EXISTING POWER POLE
- EXISTING RAILROAD
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING UNIMPROVED TRAIL
- EXISTING STRUCTURES
- TREE LINE
- WETLAND BOUNDARY
- EXISTING CULVERT
- EXISTING PIPELINE
- OVERHEAD ELECTRIC
- DISCHARGE POINT
- DEWATERING OUTLET POINT
- RETURN PUMP PAD
- DEWATERING PUMP
- SURFACE DRAINAGE
- DRAINAGE COLLECTION STRUCTURE AND PIPE
- DRAINAGE AREA BOUNDARY
- PROPOSED DAMS
- PROPOSED DEWATERING PIPE
- PROPOSED DISCHARGE PIPELINE
- PROPOSED RETURN PIPELINE
- PROPOSED CULVERT (NON-MINE DRAINAGE)
- PROPOSED SEEPAGE COLLECTION DRAIN
- PROPOSED STORMWATER DRAIN
- PROPOSED MANHOLE
- PROPOSED WICK DRAIN LATERAL PIPE
- PROPOSED RIP RAP
- FILL SLOPE
- CUT SLOPE

ABBREVIATIONS

APPROX.	–	APPROXIMATE
CDSM	–	CEMENT DEEP SOIL MIX
CMP	–	CORRUGATED METAL PIPE
CPEP	–	CORRUGATED POLYETHYLENE PIPE
CY	–	CUBIC YARD
DR	–	DIMENSION RATIO
DWG	–	DRAWING
EL.	–	ELEVATION
F	–	DIAMETER
FTB	–	FLOTATION TAILINGS BASIN
GCL	–	GEOSYNTHETIC CLAY LINER
HDPE	–	HIGH DENSITY POLYETHYLENE
HRF	–	HYDROMETALLURGICAL RESIDUE FACILITY
LDPE	–	LOW DENSITY POLYETHYLENE
LF	–	LINER FEET
LTVSMC	–	LTV STEEL MINING COMPANY
MCY	–	MILLION CUBIC YARDS
mil	–	one thousandth of an inch
MIN	–	MINIMUM
MSL	–	MEAN SEA LEVEL
NTS	–	NOT TO SCALE
SCH.	–	SCHEDULE
DR	–	DIMENSION RATIO
TYP.	–	TYPICAL

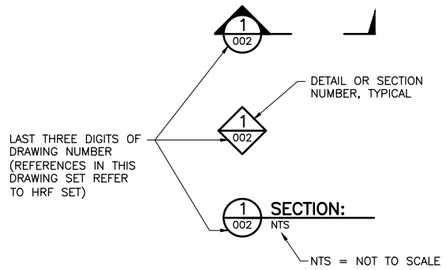
SHEET INDEX

SHEET NO. TITLE

GENERAL DRAWINGS

HRF-001 LOCATION MAP AND SITE MAP
HRF-002 LEGEND AND SHEET INDEX
HRF-003 EXISTING CONDITIONS
HRF-004 RESIDUE FACILITY LAYOUT – MINE YEAR 20
HRF-005 EMERGENCY BASIN EXCAVATIONS AND REMOVALS
HRF-006 SUBGRADE IMPROVEMENT AND SEEPAGE COLLECTION DRAIN LAYOUT
HRF-007 EMERGENCY BASIN PRELOAD
HRF-008 PHASE 1 LAYOUT
HRF-009 PHASE 2 LAYOUT
HRF-010 PHASE 3 LAYOUT
HRF-011 CROSS SECTIONS
HRF-012 CROSS SECTIONS
HRF-013 SUMP AND SIDE WALL RISER PLAN LAYOUT
HRF-014 SUMP AND SIDE WALL RISER SECTIONS
HRF-015 SUMP AND PUMP DETAILS
HRF-016 TYPICAL SECTIONS AND DETAILS
HRF-017 PIPING PLAN AND PROFILE
HRF-018 PIPING DETAILS
HRF-019 RETURN WATER PUMP RAFT
HRF-020 CLOSURE PREPARATION PLAN
HRF-021 TEMPORARY COVER AND FINAL COVER GRADING
HRF-022 FINAL CLOSURE GRADING AND DRAINAGE
HRF-023 CLOSURE SECTIONS AND DETAILS
HRF-024 GEOTECHNICAL INSTRUMENTATION DETAILS

DRAWING NUMBERING



NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.

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DATE 5/19/15 LICENSE# 20951

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BARR PROJECT NO.: 23/69-0C29
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HYDROMETALLURGICAL RESIDUE FACILTY
LEGEND AND SHEET INDEX

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-002 REV

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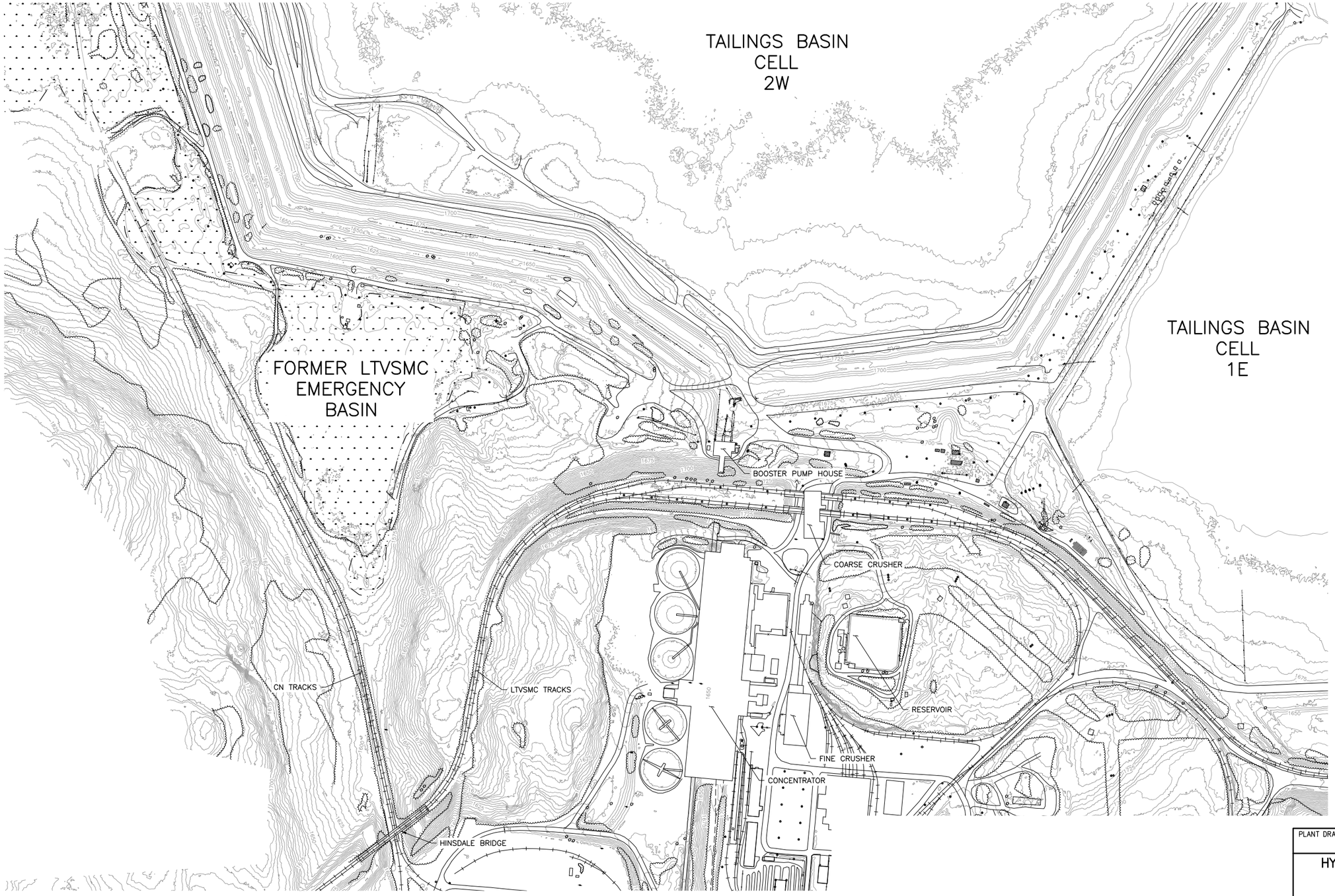

1 PLAN: EXISTING CONDITIONS

0 300 600

SCALE IN FEET

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CHECKED: TJR

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
EXISTING CONDITIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-003

REV

INCHES 1 2

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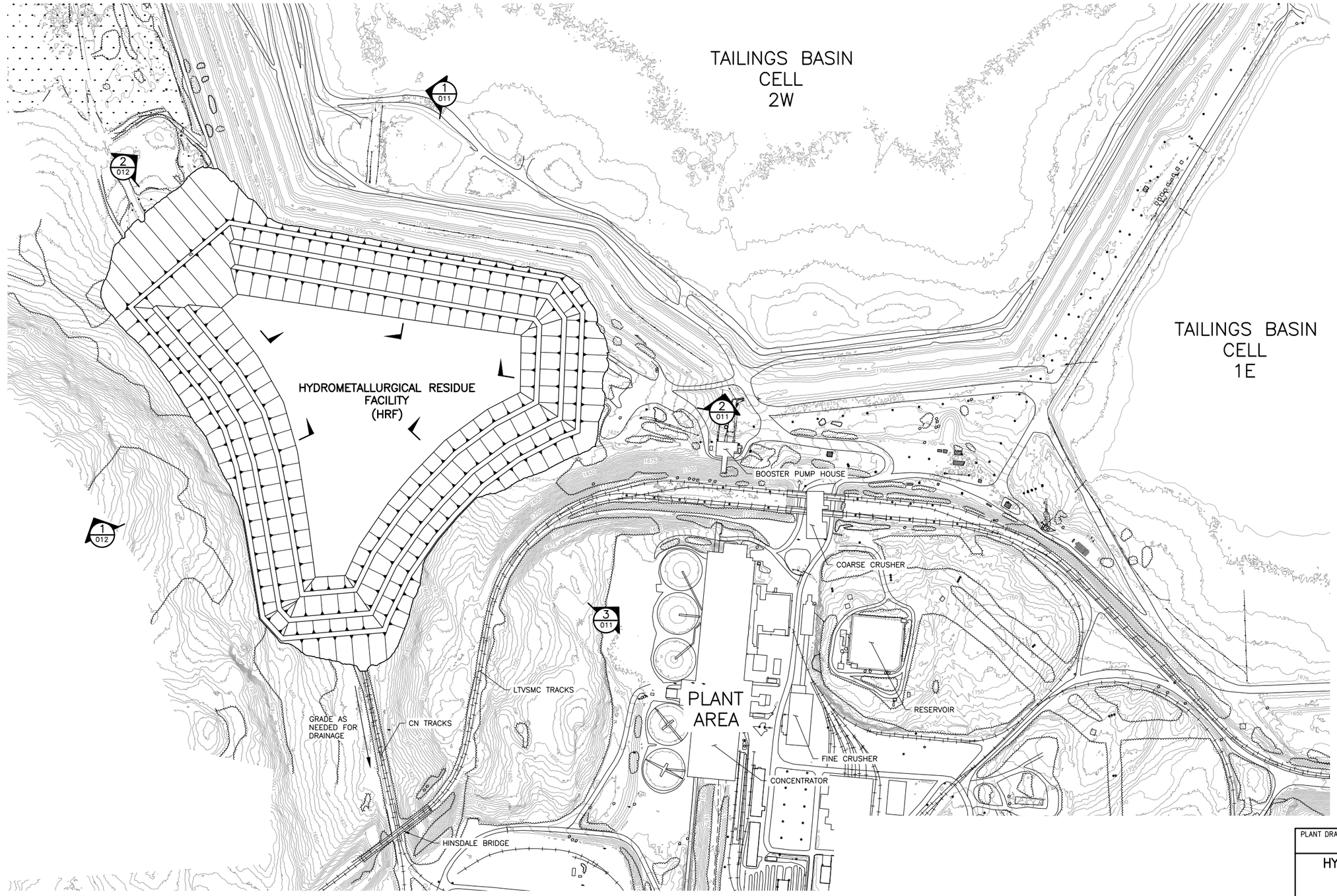

1 / -- PLAN: RESIDUE FACILITY LAYOUT

0 300 600
SCALE IN FEET

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SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
RESIDUE FACILITY LAYOUT
MINE YEAR 20

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-004
REV

INCHES 1 2



NOTES:

1. APPROXIMATE SOIL AND ROCK REMOVAL VOLUME = 329,000 CY

2. DISPOSE OF DEMOLITION DEBRIS IN LTVSMC EXISTING INDUSTRIAL LANDFILL. APPROXIMATE DISTANCE TO LANDFILL IS 3 MILES.

1 PLAN: EMERGENCY BASIN REMOVALS

0 200 400
SCALE IN FEET

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SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY EMERGENCY BASIN EXCAVATIONS AND REMOVALS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-005 REV

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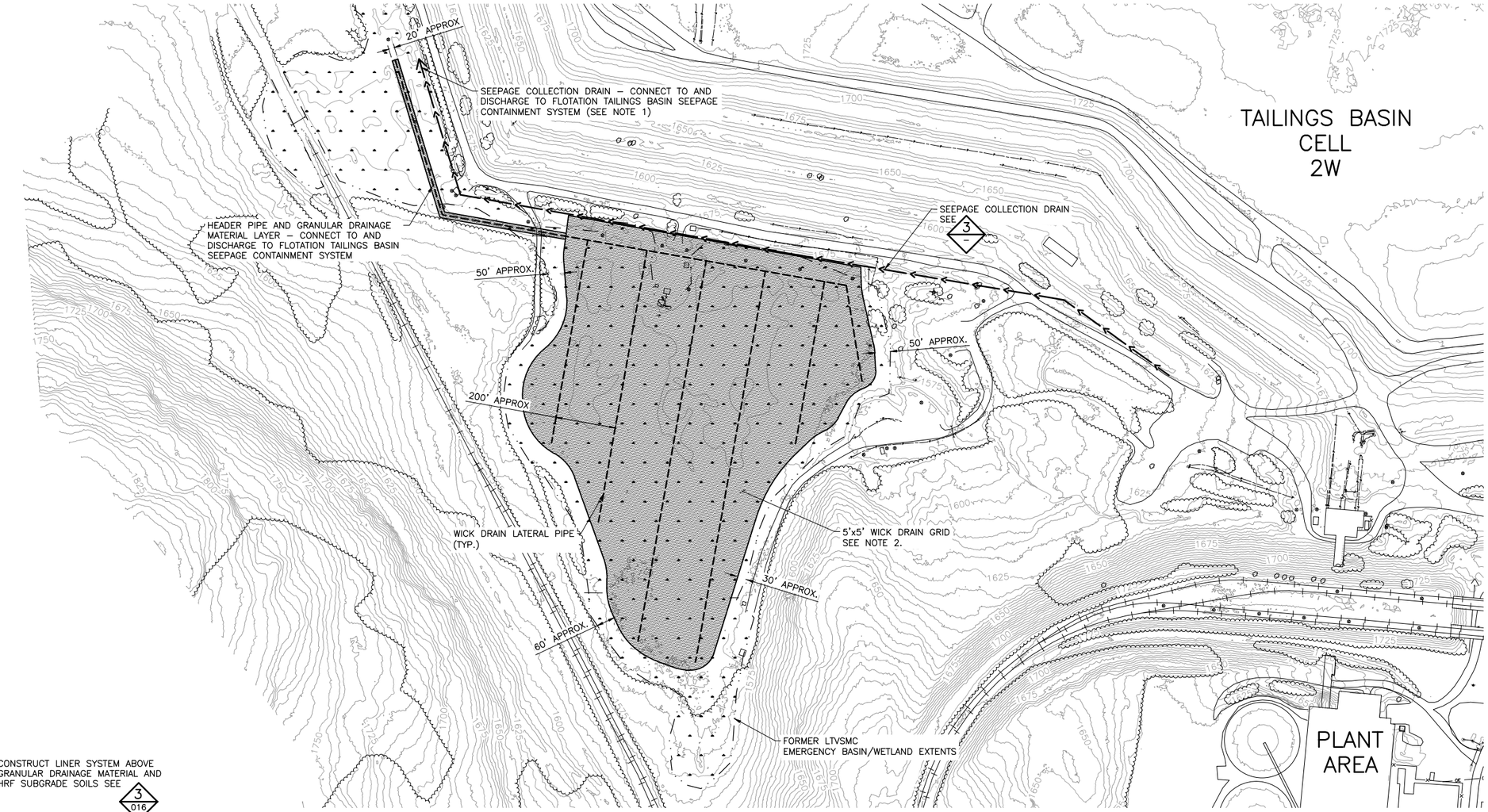
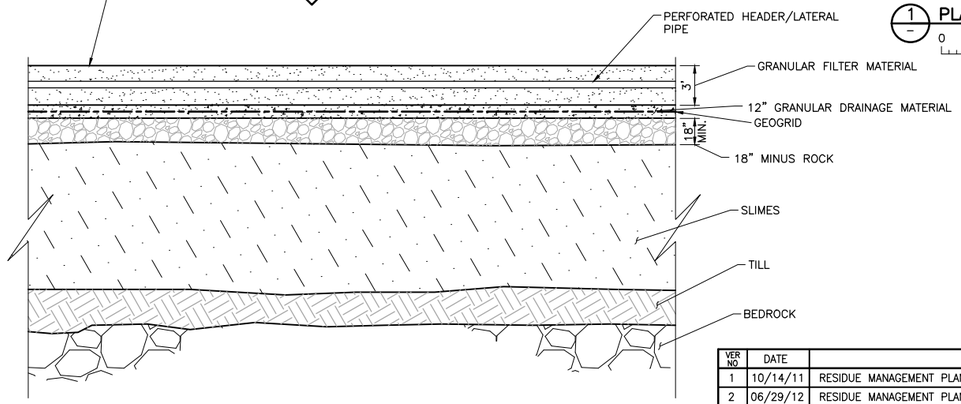


1/– PLAN: SEEPAGE COLLECTION LAYOUT

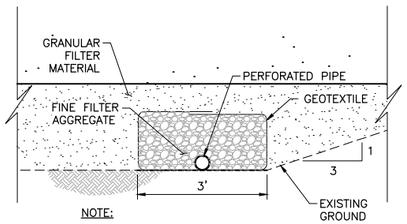
0 200 400

SCALE IN FEET



2/– DETAIL: DRAIN INSTALLATION

NTS



NOTE:

PERFORM MINIMAL TO NO EXCAVATION OF EXISTING SOILS AT TOE OF SLOPE.

3/– DETAIL: SEEPAGE COLLECTION DRAIN

NTS

NOTES:

1. SEE FLOTATION TAILINGS BASIN SEEPAGE CONTAINMENT SYSTEM DRAWINGS FOR CONTAINMENT SYSTEM LOCATION AND DESIGN.
2. WICK DRAINS MAY BE INSTALLED TO IMPROVE THE CONSOLIDATION.

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	4	5/19/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME THOMAS J. RADUE

SIGNATURE Thomas J. Radue

DATE 5/19/15 LICENSE# 20951

DRAWN: CAD

CHECKED: TJR

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY SUBGRADE IMPROVEMENT AND SEEPAGE COLLECTION DRAIN LAYOUT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-006

REV

INCHES 1 2

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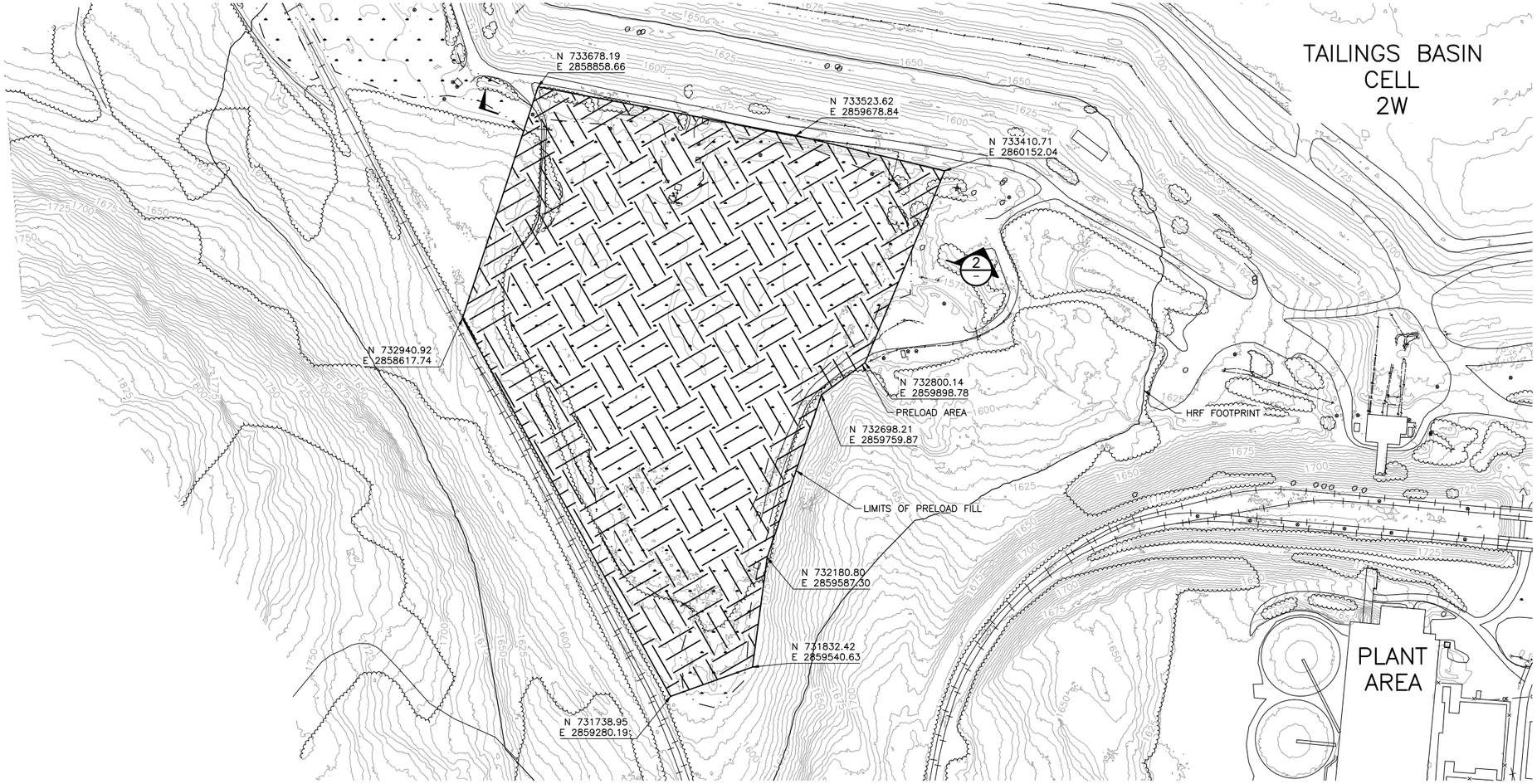
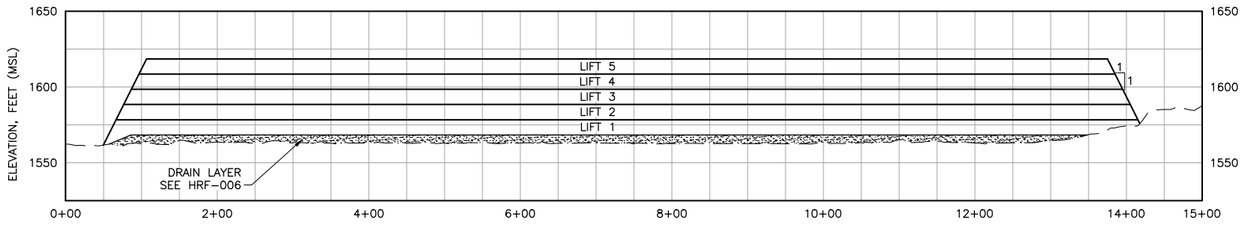


1 — PLAN: PRELOAD LAYOUT

0 200 400

SCALE IN FEET



2 — SECTION: PRELOAD LIFTS

0 100 200

HORIZONTAL SCALE IN FEET

NOTES:

1. PRELOAD AREA USING SOIL AND ROCK REMOVED FOR HRF (SEE DWG. HRF-005).
2. SOIL AND ROCK PRELOAD MATERIAL TO BE REMOVED TO HRF LINER GRADE AND UTILIZED FOR HRF DAM CONSTRUCTION.
3. NUMBER OF PRELOAD LIFTS IS PRELIMINARY.

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	4	5/19/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME THOMAS J. RADUE

SIGNATURE Thomas J. Radue

DATE 5/19/15 LICENSE# 20951

DRAWN: CAD

CHECKED: TJR

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY EMERGENCY BASIN PRELOAD

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-007

REV



NOTES:

1. UPPER LINER SURFACE SHOWN.
2. DRAINAGE COLLECTION GEOCOMPOSITE SHOWN (SHADED AREA).
3. PLACE HRF LINER OVER BASE AND INTERIOR SLOPES OF CELL. SEE DWG. HRF-016.

1 PLAN: LIFT 1 LAYOUT

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	4	5/19/15
FOR CONSTRUCTION		

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
LIFT 1 LAYOUT

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

DWG. NO. HRF-008
REV

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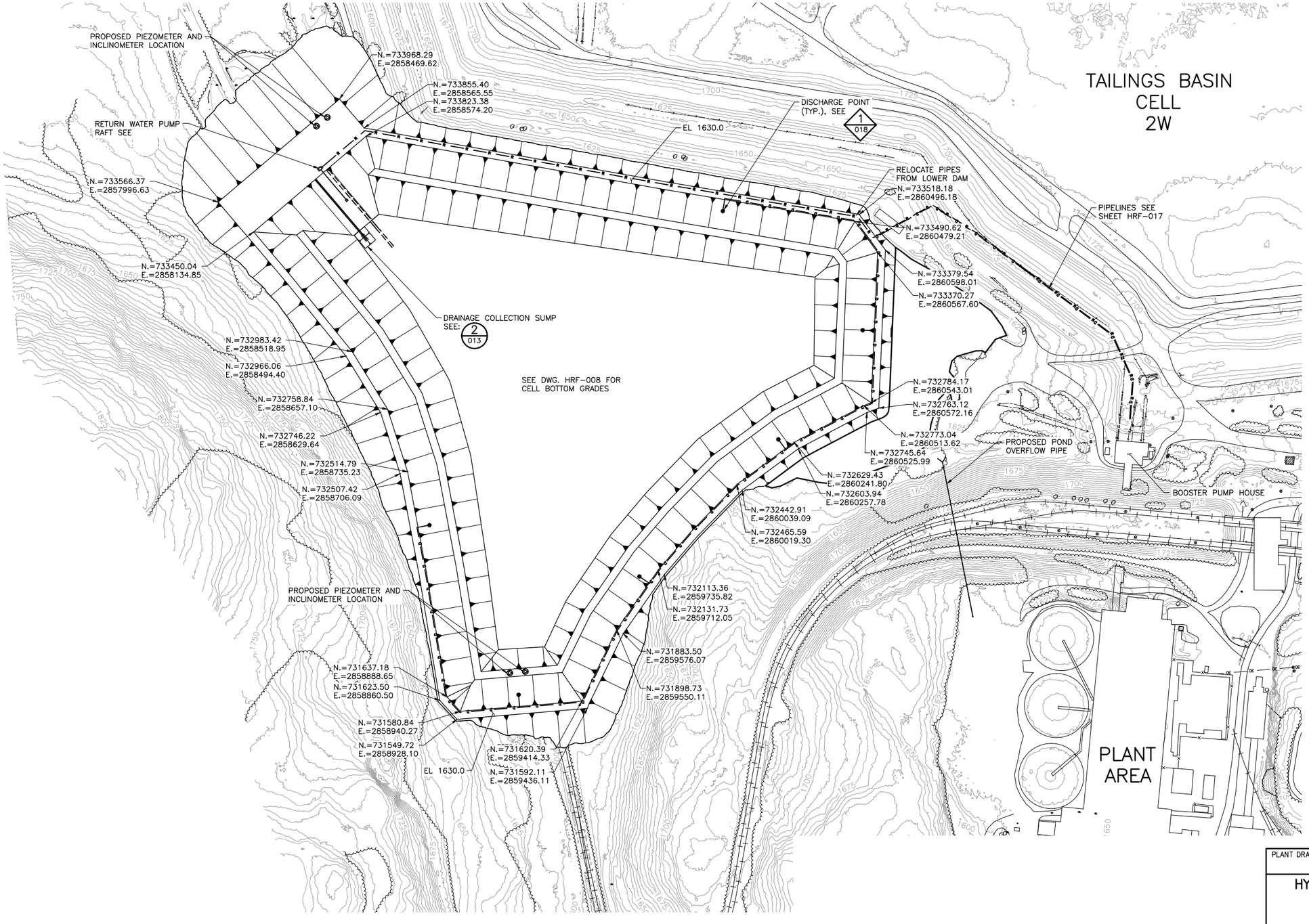

NOTES:

1. LIFT 2 CONSTRUCTION YEAR TO BE BASED ON HRF CAPACITY CONSUMPTION RATE.
2. UPPER LINER SURFACE SHOWN.
3. FOR LEAKAGE DETECTION SUMP SEE 1/013
4. PLACE HRF LINER OVER BASE AND INTERIOR SLOPES OF CELL. SEE DWG. HRF-016.

1/-- PLAN: LIFT 2 LAYOUT

0 200 400

SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

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FOR CONSTRUCTION		

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
LIFT 2 LAYOUT

POLYMET MINING

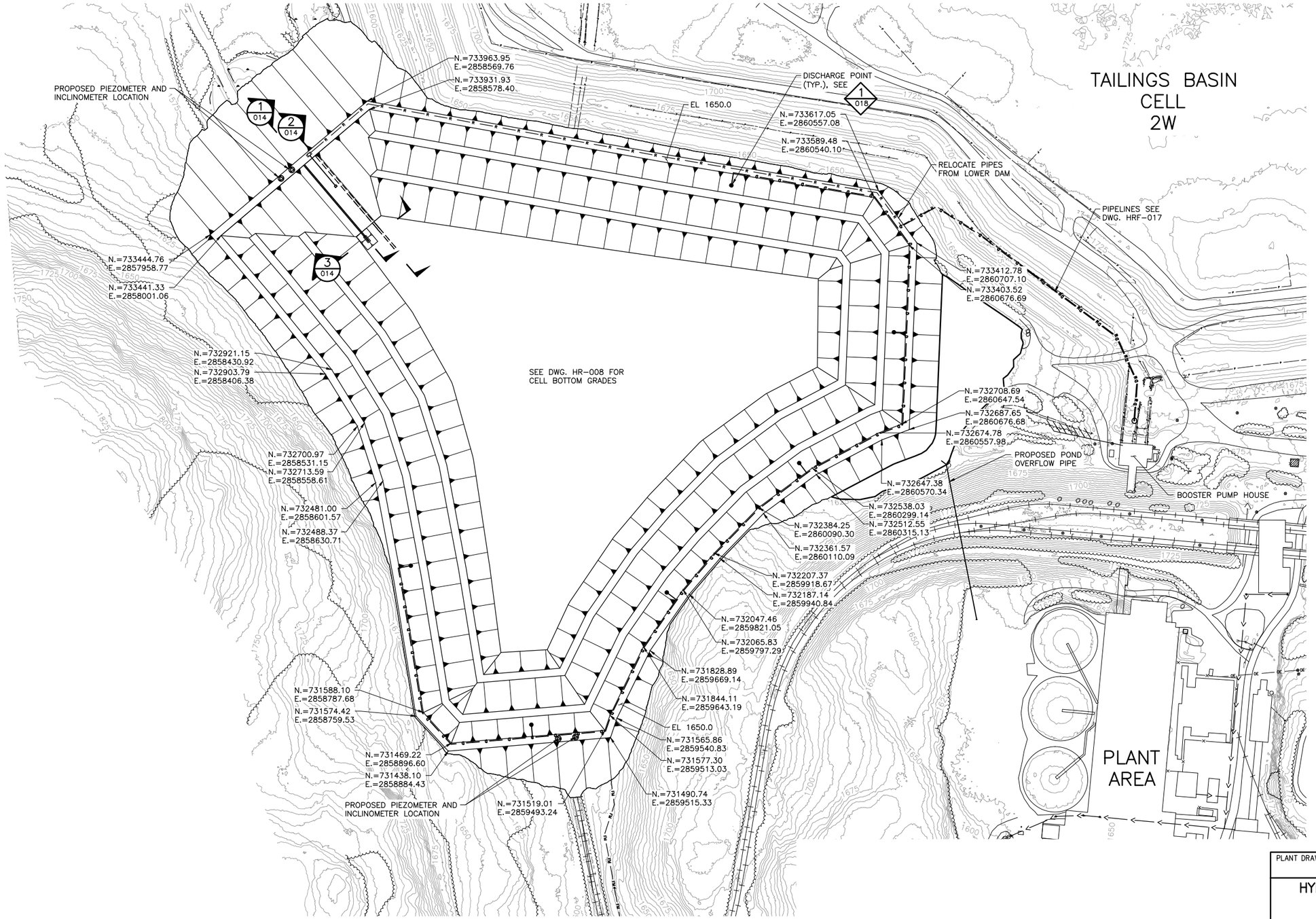
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-009

REV

INCHES 1 2



NOTES:

1. LIFT 3 CONSTRUCTION YEAR TO BE BASED ON HRF CAPACITY CONSUMPTION RATE.
2. UPPER LINER SURFACE SHOWN.
3. PLACE HRF LINER OVER BASE AND INTERIOR SLOPES OF CELL. SEE DWG. HRF-016.

1 PLAN: LIFT 3 LAYOUT

0 200 400
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	4	5/19/15
FOR CONSTRUCTION		

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SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
LIFT 3 LAYOUT

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

DWG. NO. HRF-010
REV

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\89EA0F03-F19E-4CC0-AA24-9A3CC15A1E11\64A9A34A-07CE-4BC0-8C4F-D424B2171E0D\PERMIT_NMT-01-CS-010.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:57 PM

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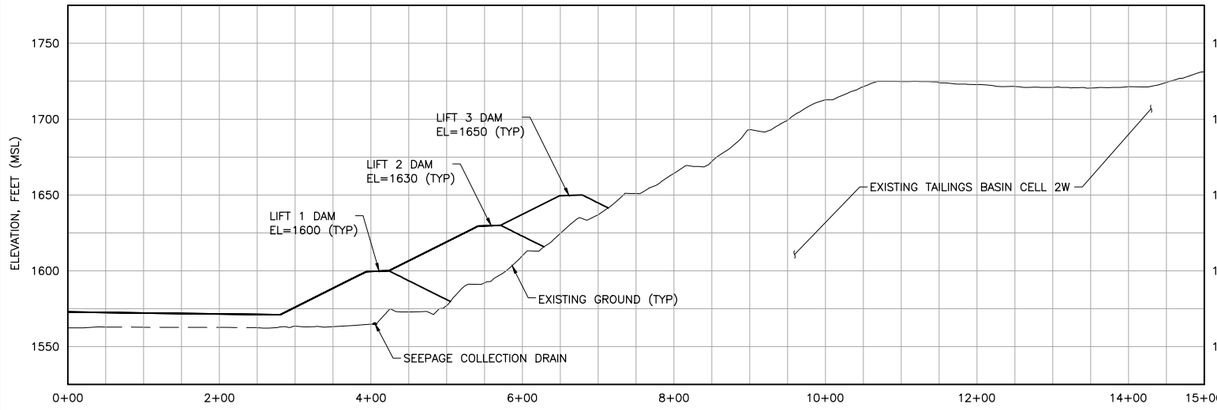
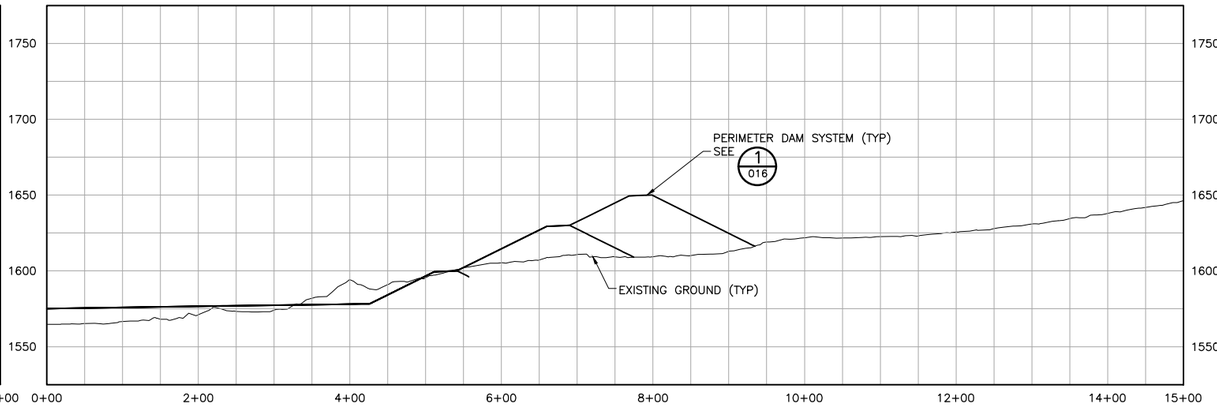


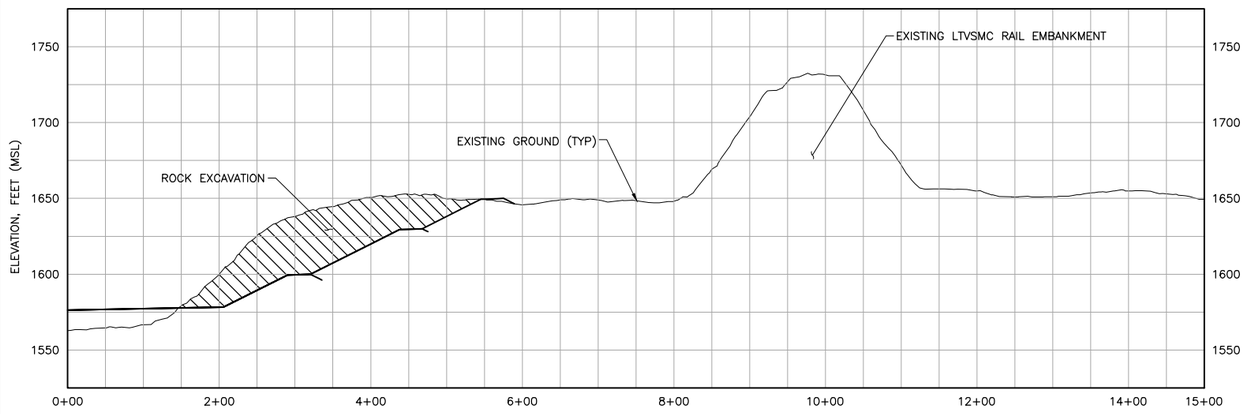
1 – SECTION: HRF NORTH DAM

0 100 200
HORIZONTAL SCALE IN FEET



2 – SECTION: HRF EAST DAM

0 100 200
HORIZONTAL SCALE IN FEET



3 – SECTION: HRF SOUTH EAST DAM

0 100 200
HORIZONTAL SCALE IN FEET

NOTES:

1. SEE DWG. HRF–004 FOR SECTION LOCATIONS.

VER NO.	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
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FOR PERMITTING	4	5/19/15
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SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
CROSS SECTIONS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. HRF–011
REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\BBEA0F03-F19E-4CC0-AA24-9A3CC15A1E11\DA168F0E-B355-4F86-8F6B-28781308E3361\PERMIT_NMT-01-CS-011.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:59 PM

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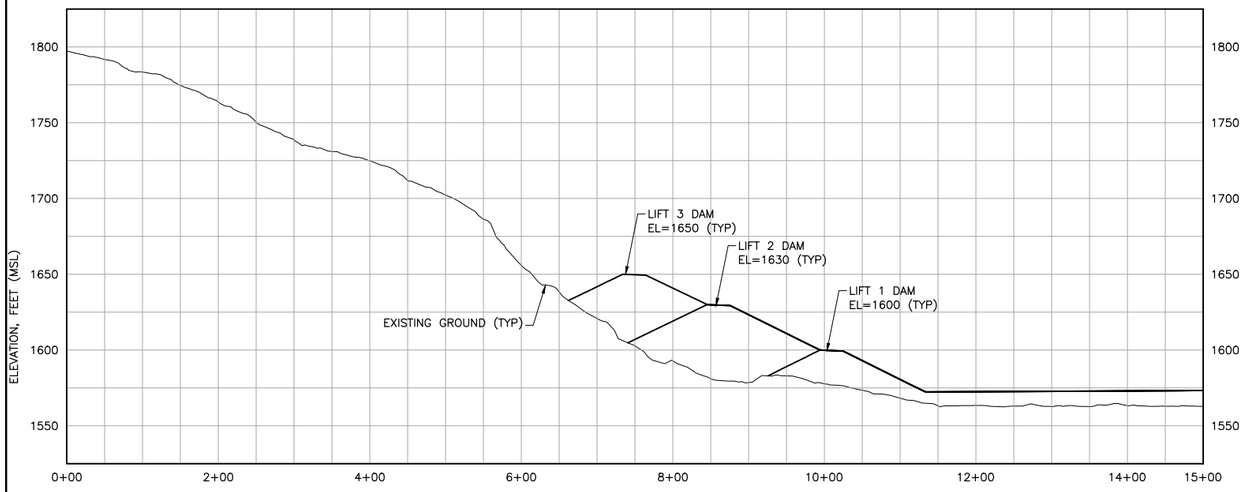
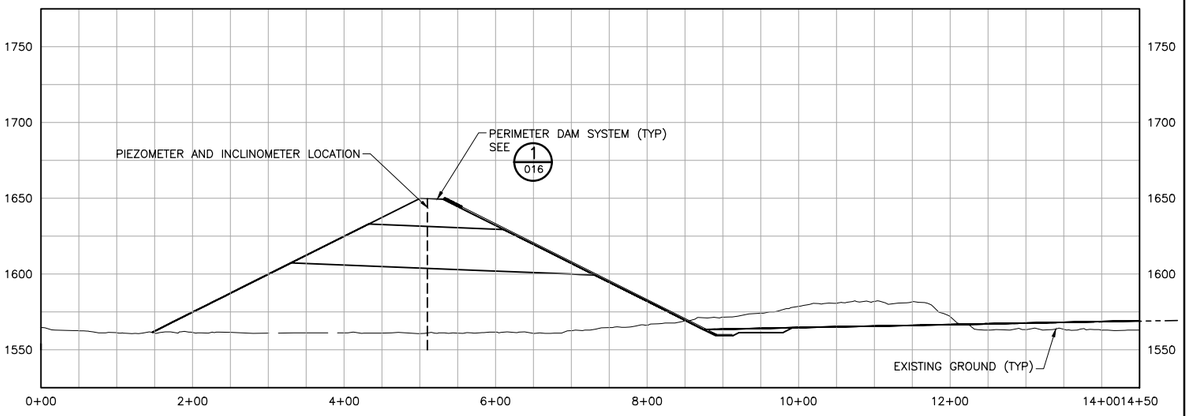


1 – SECTION: HRF SOUTH WEST DAM

0 100 200
SCALE IN FEET
HORIZONTAL



2 – SECTION: HRF NORTH WEST DAM

0 100 200
SCALE IN FEET
HORIZONTAL

NOTES:

1. SEE DWG. HRF–004 FOR SECTION LOCATIONS.

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
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ISSUE STATUS		
ISSUED	VERSION	DATE
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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY CROSS SECTIONS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. HRF–012
REV

INCHES 1 2

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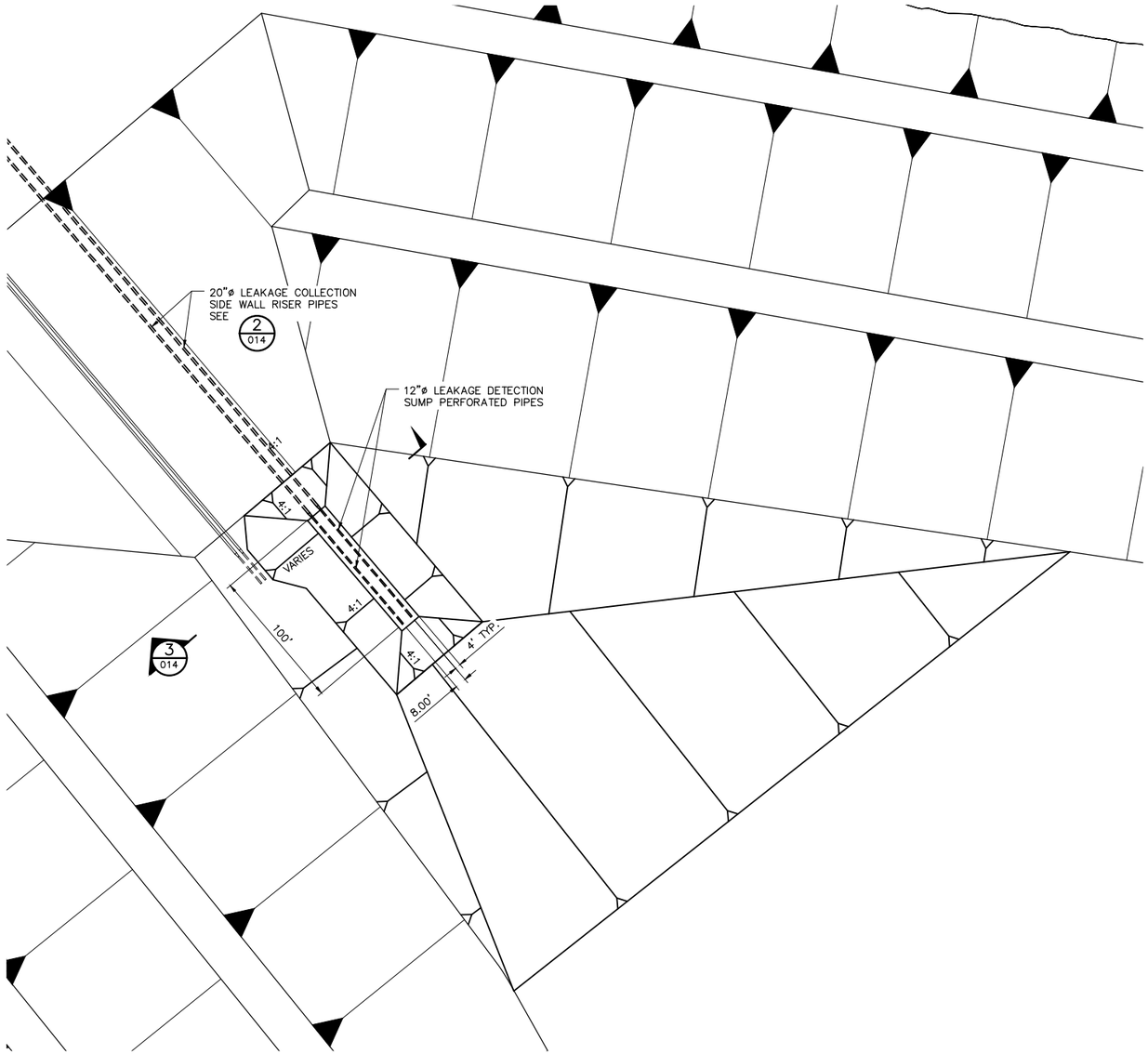
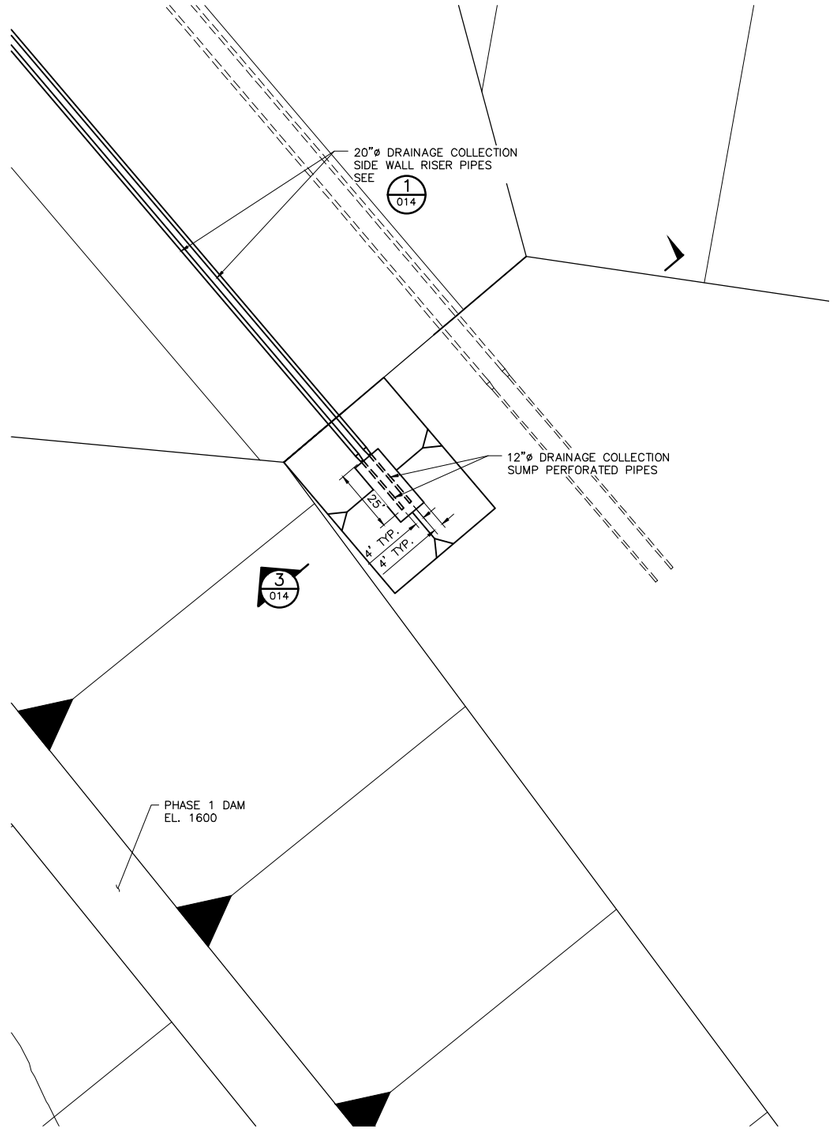


1/-- PLAN: LEAKAGE DETECTION SUMP AND SIDEWALL RISER

0 50 100
SCALE IN FEET



2/-- PLAN: DRAINAGE COLLECTION SUMP AND SIDEWALL RISER

0 30 60
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
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ISSUE STATUS		
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SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY SUMP AND SIDEWALL RISER PLAN LAYOUT

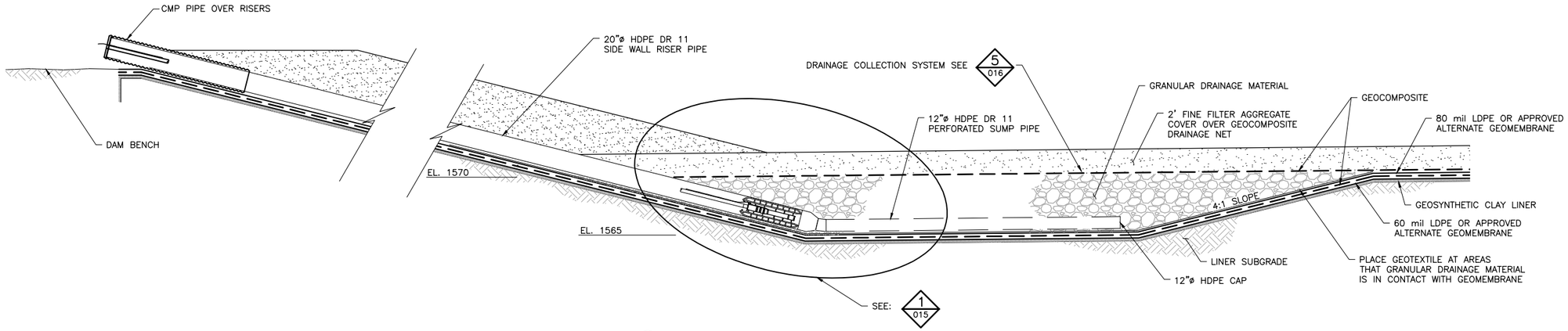
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

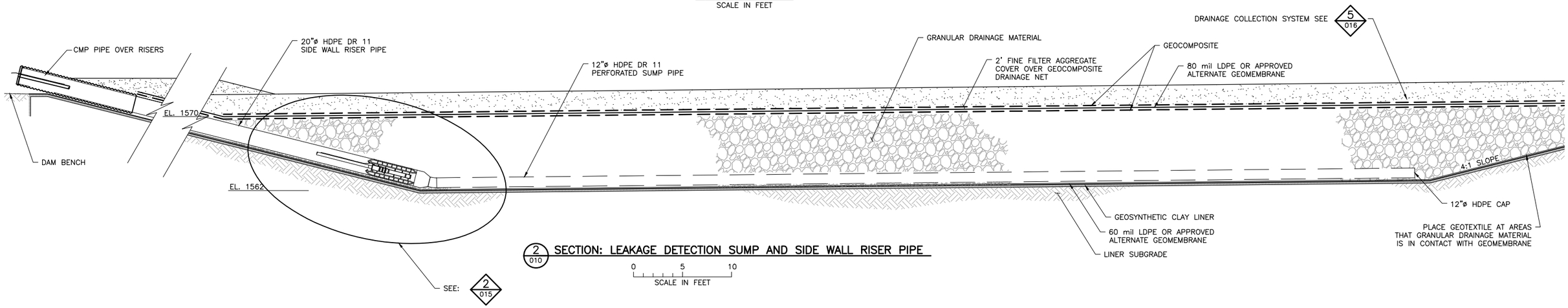
DWG. NO. HRF-013
REV

INCHES 1 2



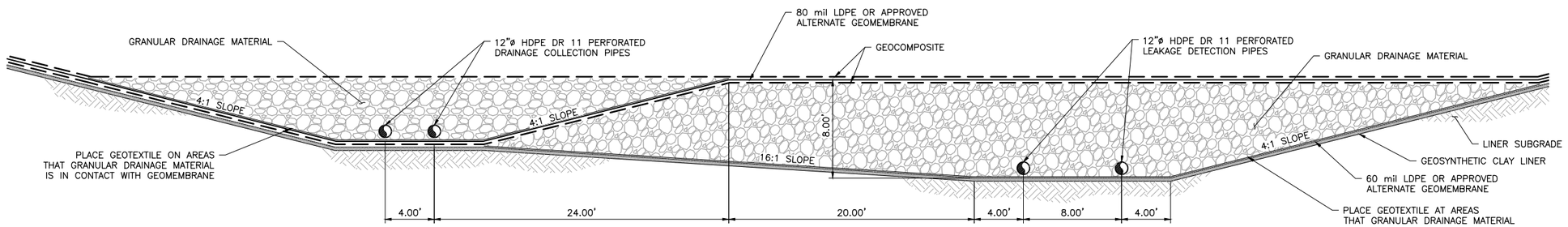
1/010 SECTION: DRAINAGE COLLECTION SUMP AND SIDE WALL RISER PIPE

0 5 10
SCALE IN FEET



2/010 SECTION: LEAKAGE DETECTION SUMP AND SIDE WALL RISER PIPE

0 5 10
SCALE IN FEET



3/010 SECTION: DRAINAGE COLLECTION AND LEAKAGE DETECTION PIPES AND SUMPS

0 5 10
SCALE IN FEET

NOTES:

1. SEE DWG. HRF-010 FOR SECTION LOCATIONS.
2. DIFFERENCE IN GRANULAR DRAINAGE MATERIAL PATTERN SHOWN FOR VISUAL CLARITY PURPOSES ONLY. BOTH LEAKAGE DETECTION AND DRAINAGE COLLECTION AGGREGATES ARE THE SAME.
3. GEOMEMBRANE TYPE AND GEOCOMPOSITE TYPE REQUIRES APPROVAL BY DESIGN ENGINEER.
4. LINER SEPARATION NOT SHOWN TO SCALE FOR CLARITY.

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	4	5/19/15
FOR CONSTRUCTION		

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
SUMP AND SIDEWALL RISER SECTIONS

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

DWG. NO. HRF-014
REV

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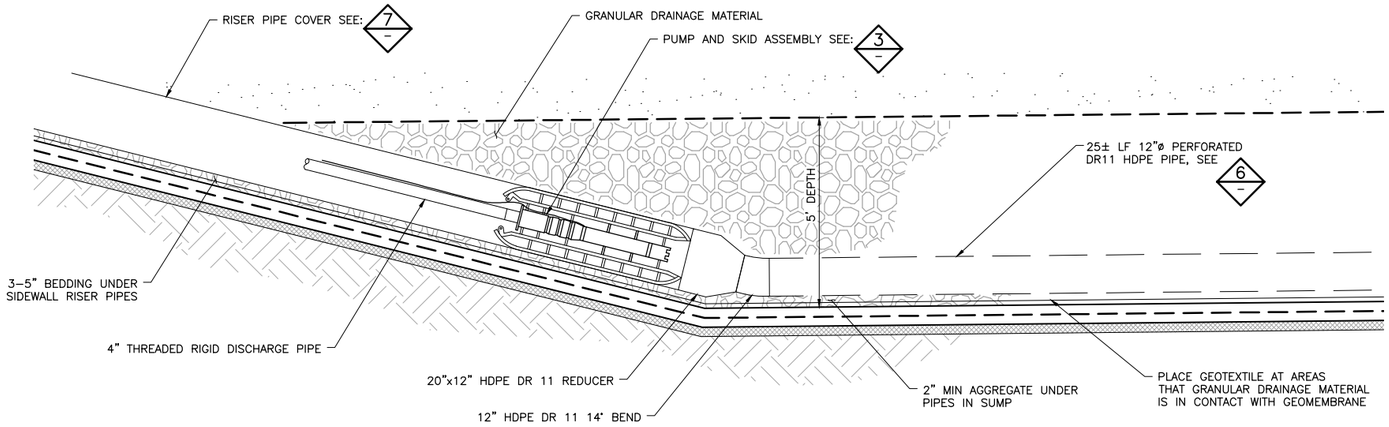
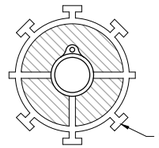


1 / 015 **DETAIL: DRAINAGE COLLECTION SUMP**
NTS



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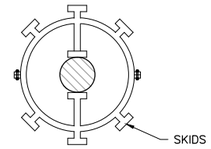
NTS



5 / – **SECTION: PUMP AND SKID SECTION**
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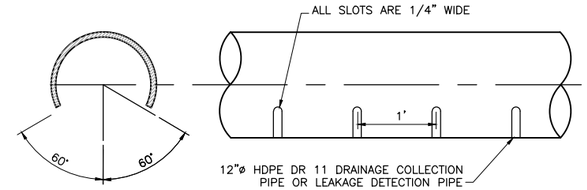
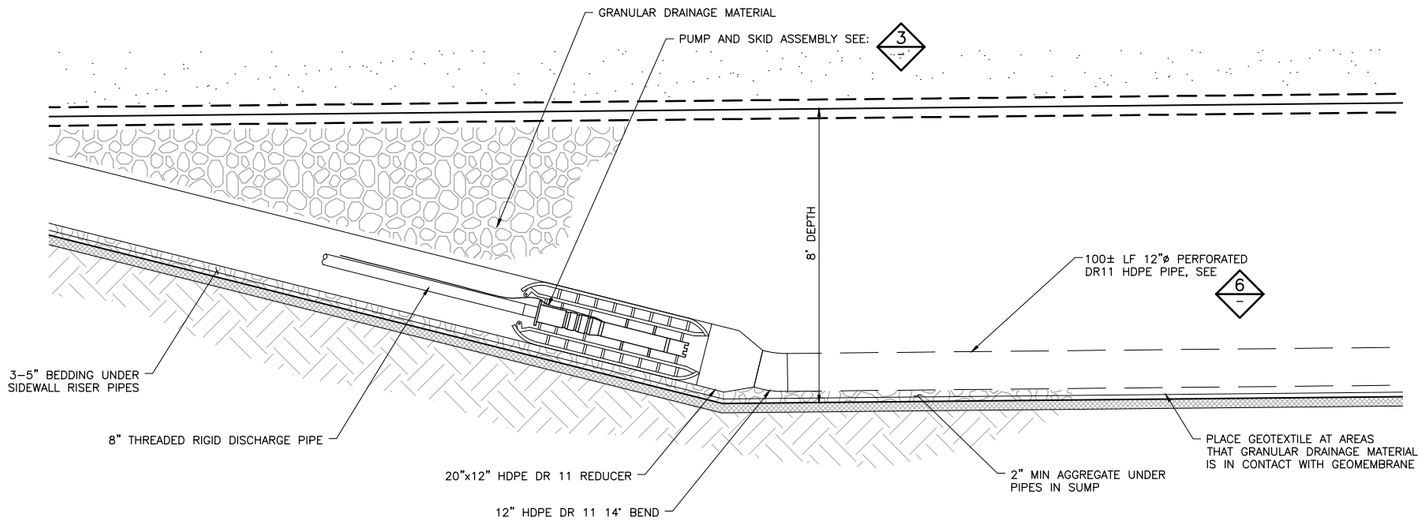
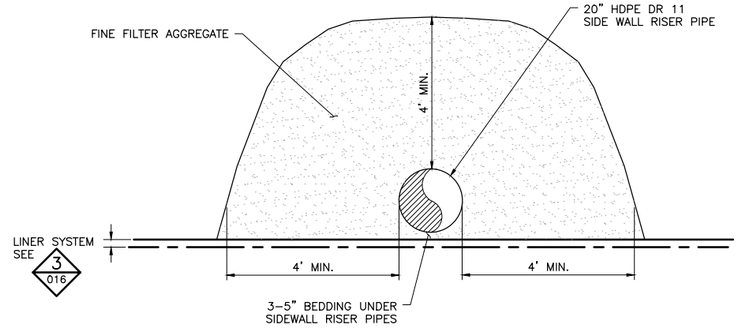


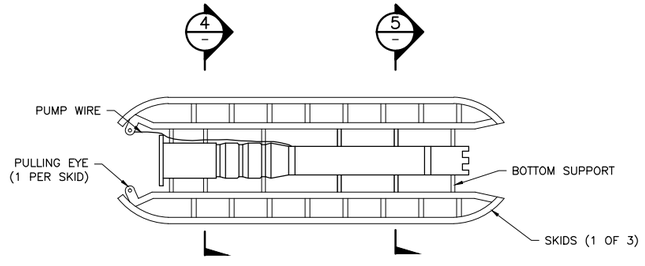
6 / – **DETAIL: DRAINAGE COLLECTION AND LEAKAGE DETECTION PIPE PERFORATION**
NTS



2 / 015 **DETAIL: LEAKAGE DETECTION SUMP**
NTS



7 / – **DETAIL: RISER PIPE COVER**
NTS



3 / – **DETAIL: PUMP AND SKID ASSEMBLY**
NTS

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY SUMP AND PUMP DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-015
REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\B9EA0F03-F19E-4CC0-AA24-9A3CC15A1E11\8B8FE4B-FA49-4BCB-A9C9-D5CA6A5CEF95\PERMIT_NMT-01-CS-015.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 3:03 PM

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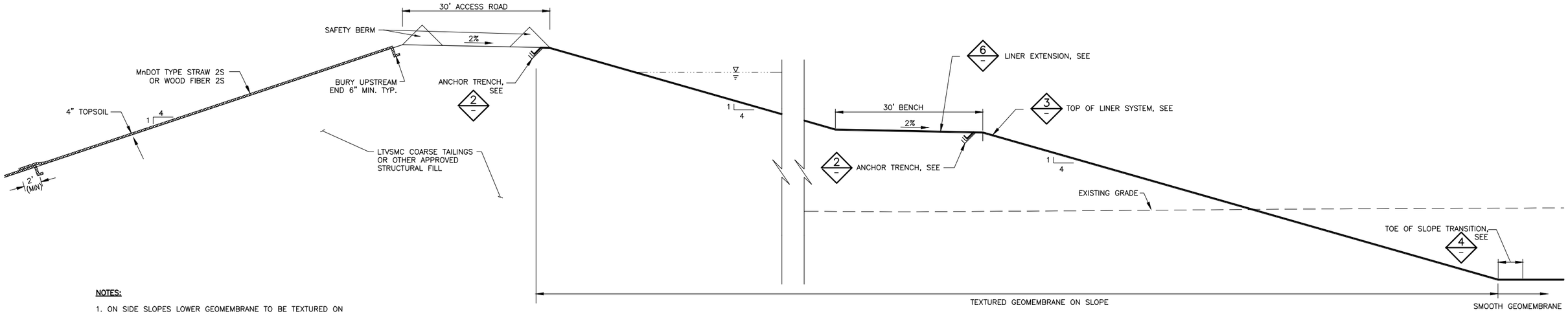
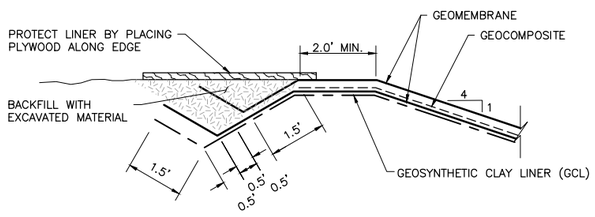


NOTES:

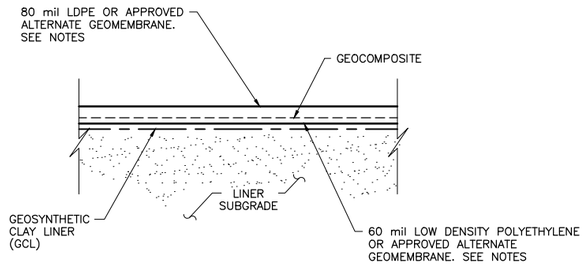
1. ON SIDE SLOPES LOWER GEOMEMBRANE TO BE TEXTURED ON BOTH SIDES. UPPER GEOMEMBRANE TO BE TEXTURED ON BOTTOM SIDE ONLY.

2. GEOMEMBRANE TYPE AND THICKNESS IS PRELIMINARY. TYPE AND THICKNESS MUST BE APPROVED BY DESIGN ENGINEER.

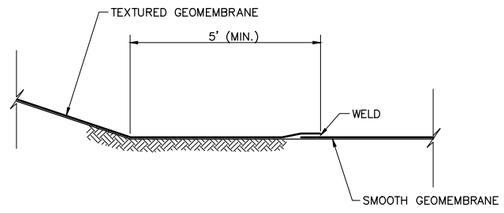
SECTION: PERIMETER DAM TYPICAL CROSS SECTION (1)
NTS



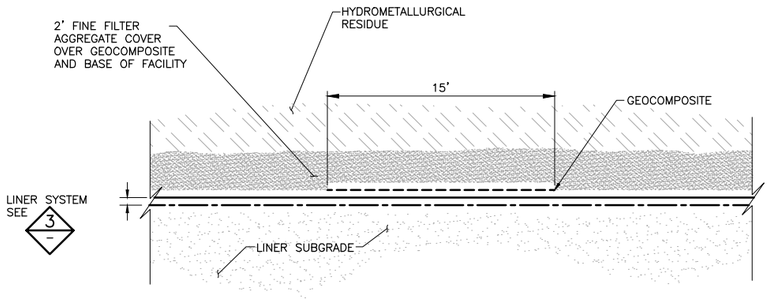
(2) DETAIL: "V" ANCHOR TRENCH GCL/GEOMEMBRANE BARRIER LAYER
NTS

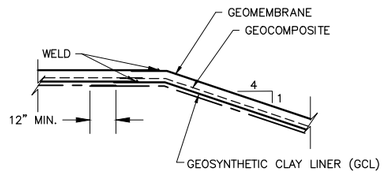


(3) DETAIL: LINER SYSTEM
NTS



(4) DETAIL: TOE OF SLOPE GEOMEMBRANE – TYPE TRANSITION
NTS





(5) DETAIL: DRAINAGE COLLECTION SYSTEM
0 5 10
SCALE IN FEET

(6) DETAIL: LINER SYSTEM EXTENSION
NTS

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

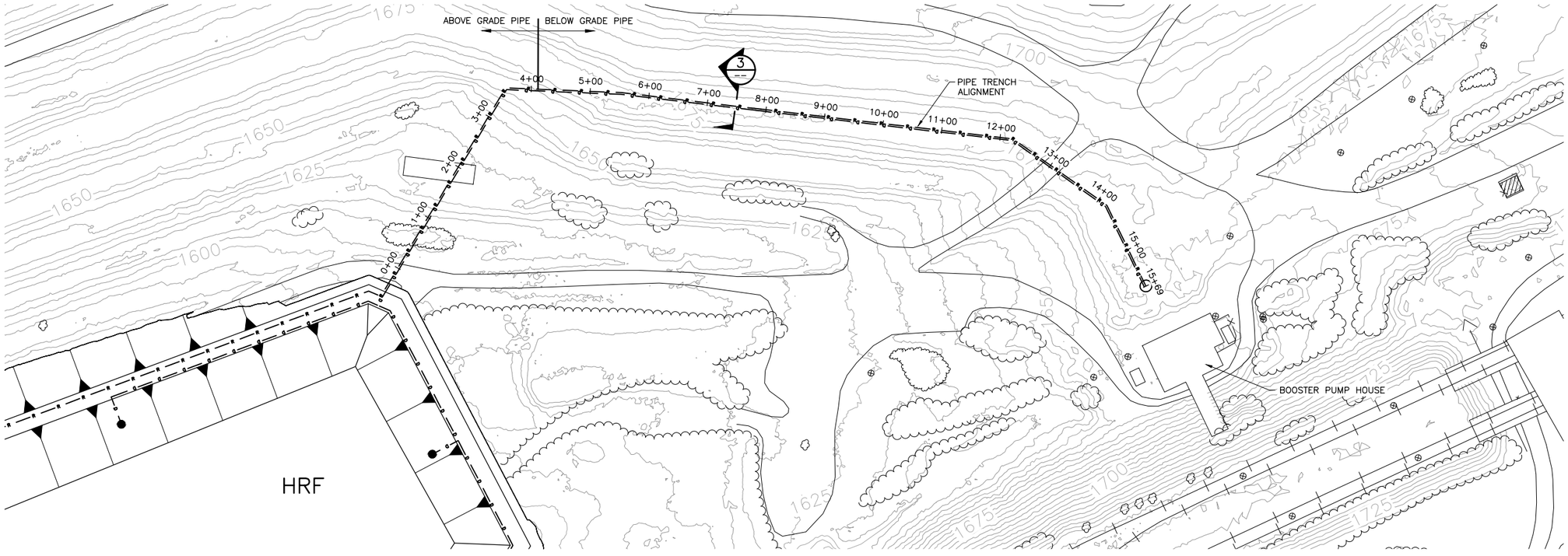
HYDROMETALLURGICAL RESIDUE FACILTY
TYPICAL SECTIONS
AND DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

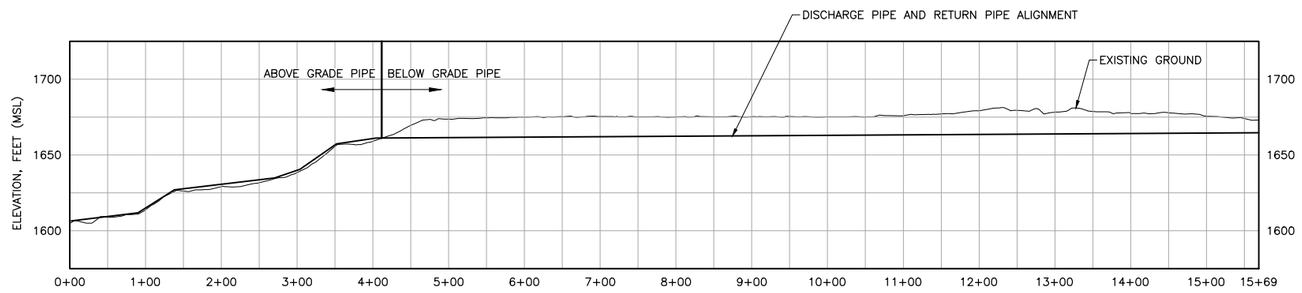
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-016
REV

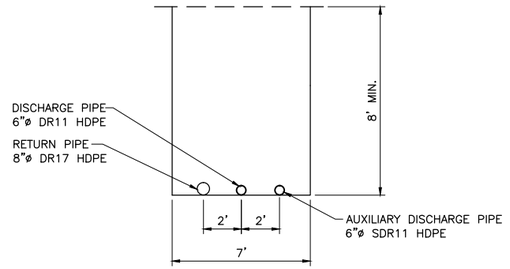
CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\89EA0F03-F19E-4CC0-AA24-9A3CC15A1E11\CEA716DD-1101-4147-A6D2-84470EC19970\PERMIT_MNT-01-CS-016.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 3:04 PM



1 PLAN: PIPING LAYOUT
0 100 200
SCALE IN FEET



2 PROFILE: PIPING LAYOUT
0 100 200
HORIZONTAL SCALE IN FEET



3 SECTION: PIPE TRENCH (TYP.)
0 2 4 6 8
SCALE IN FEET

NOTES:

1. PIPE CLEAN–OUT AND PIG LAUNCHING ACCESS TO BE PROVIDED IN ABOVE–GRADE PORTIONS OF PIPE.
2. PIPING LAYOUT (PLAN AND PROFILE) IS PRELIMINARY.
3. PIPE SIZES ARE PRELIMINARY.

VER NO	DATE	DESCRIPTION
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PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
PIPING
PLAN AND PROFILE

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. HRF–017
REV

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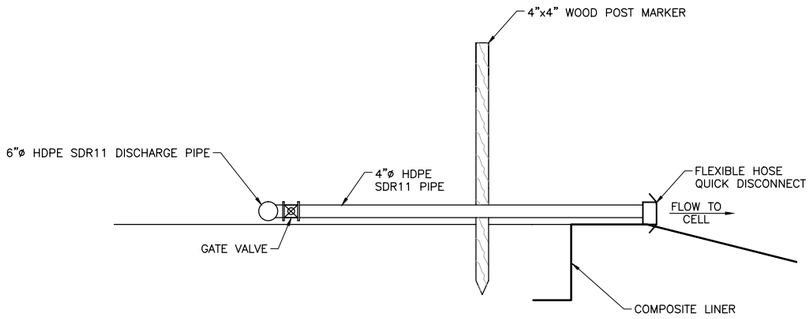

1 DETAIL: TYPICAL RESIDUE DISCHARGE POINT

0 1 2 3 4
SCALE IN FEET

NOTES:

1. PIPE SIZES ARE PRELIMINARY.

VER NO	DATE	DESCRIPTION
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PIPING DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

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4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-018
REV

INCHES 1 2

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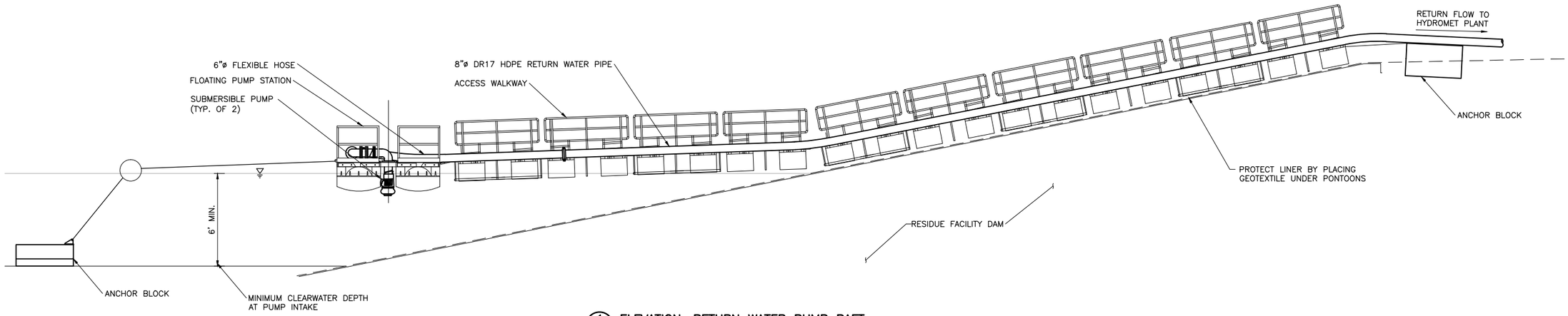
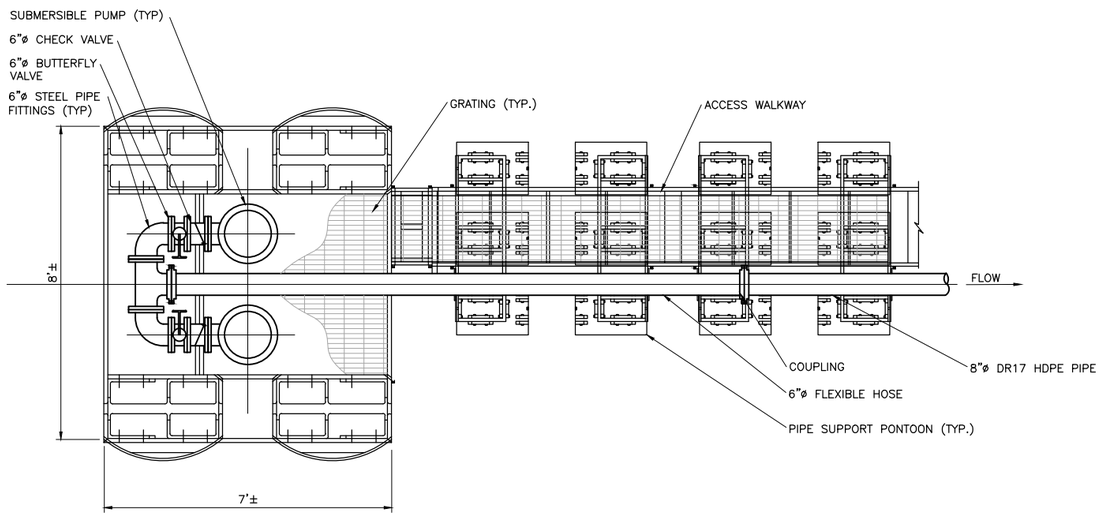


1 – ELEVATION: RETURN WATER PUMP RAFT

0 2 4 6 8
SCALE IN FEET



2 – PLAN: RETURN WATER PUMP RAFT

0 1 2 3 4
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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RETURN WATER PUMP RAFT

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DWG. NO. HRF-019
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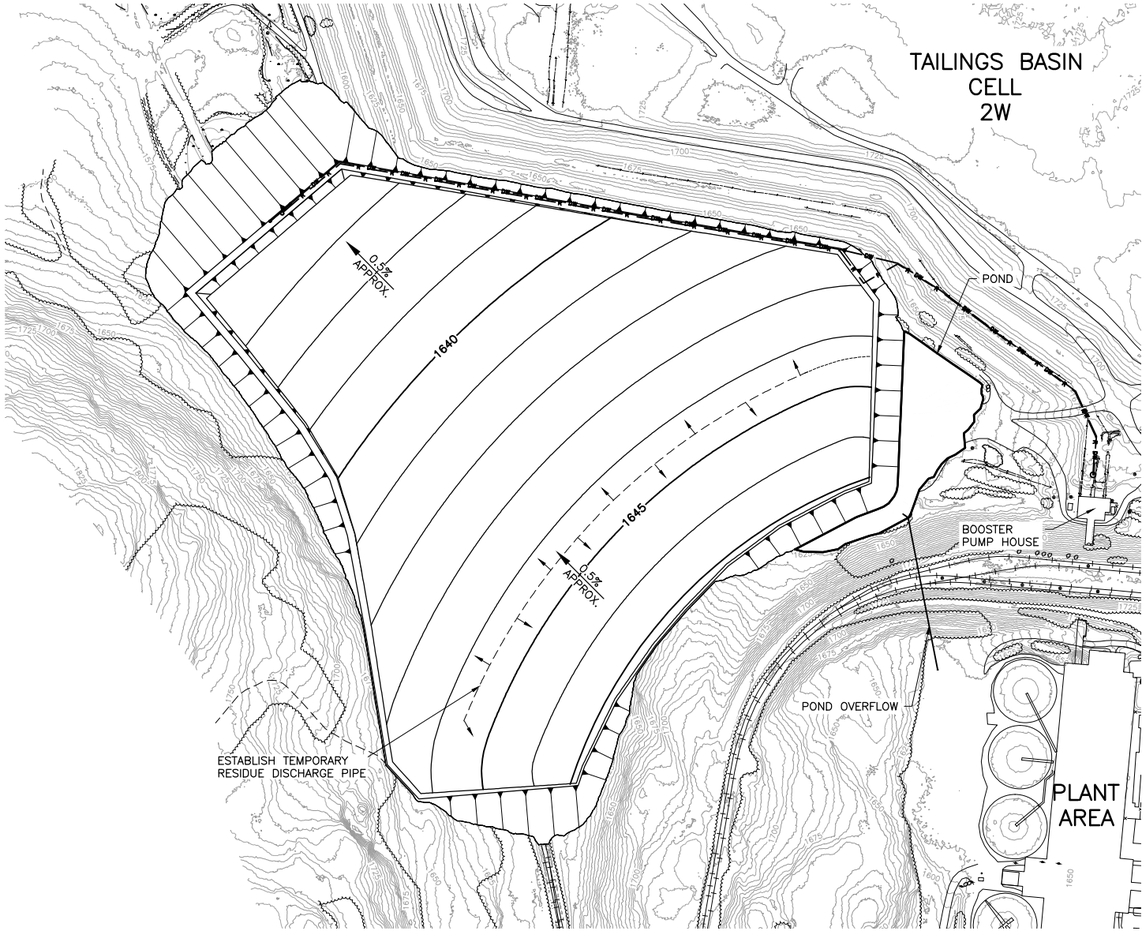
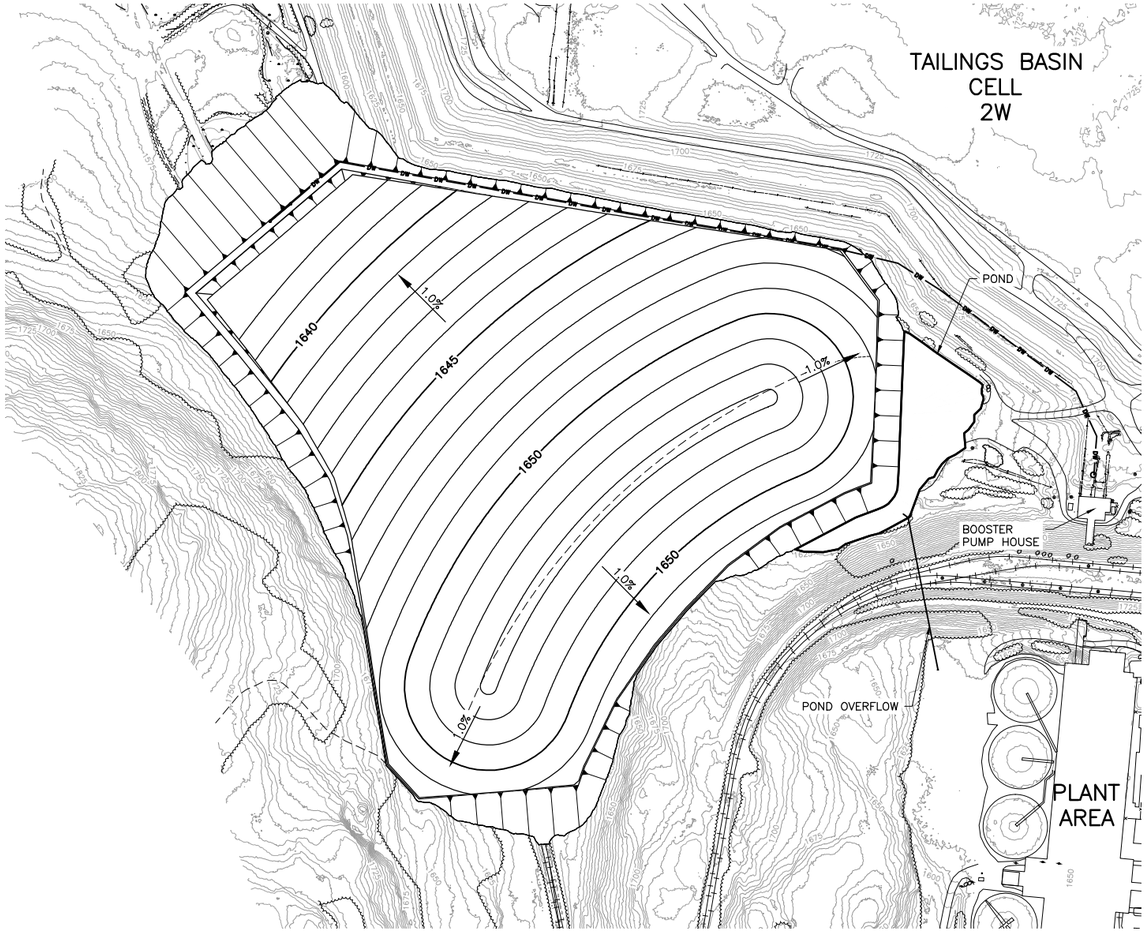
INCHES 1 2



1 — PLAN: START OF MINE YEAR 20 RESIDUE GRADES

0 300 600

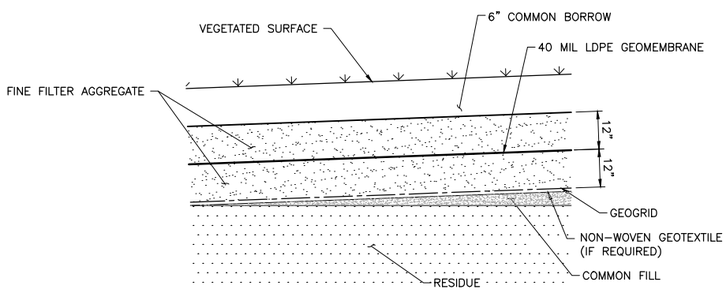
SCALE IN FEET



3 — PLAN: END OF MINE YEAR 20 RESIDUE AND TEMPORARY COVER GRADES

0 300 600

SCALE IN FEET



2 — DETAIL: TEMPORARY COVER SYSTEM

NTS

NOTES:

1. PRIOR TO FINAL CLOSURE PLACE TEMPORARY COVER OVER NEWLY GRADED RESIDUE.
2. ALLOW FOR RESIDUE MATERIAL TO SETTLE PRIOR TO PLACEMENT OF FINAL COVER.
3. COMMON FILL AS NEEDED TO ACHIEVE SLOPES THAT FACILITATE SURFACE WATER RUNOFF.

VER NO	DATE	DESCRIPTION
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BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY CLOSURE PREPARATION PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-020

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CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW IN\89EA0F03-F19E-4CC0-AA24-9A33CC15A1E11\1EE150FF-5A2A-4B62-9D56-3A779972914Z\PERMIT_NMT-01-CS-020.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 3:10 PM

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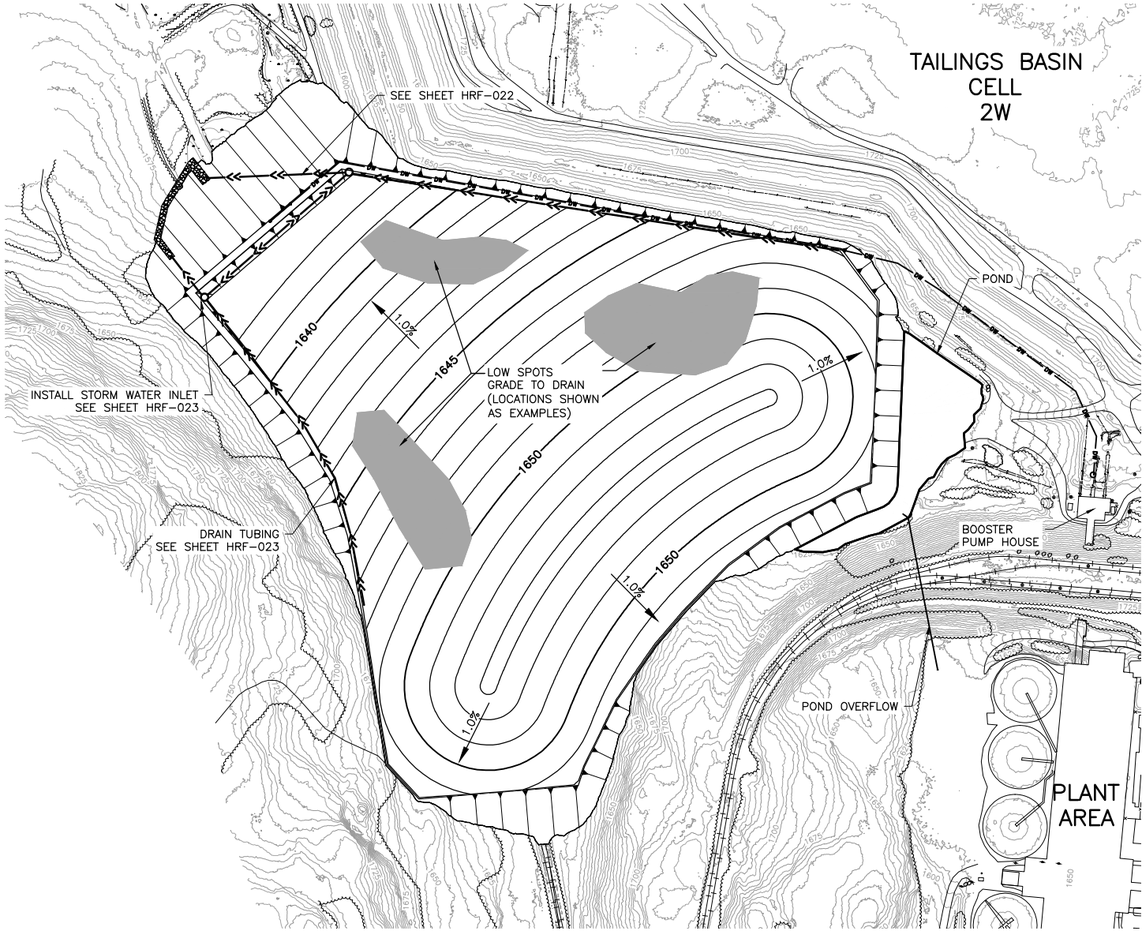
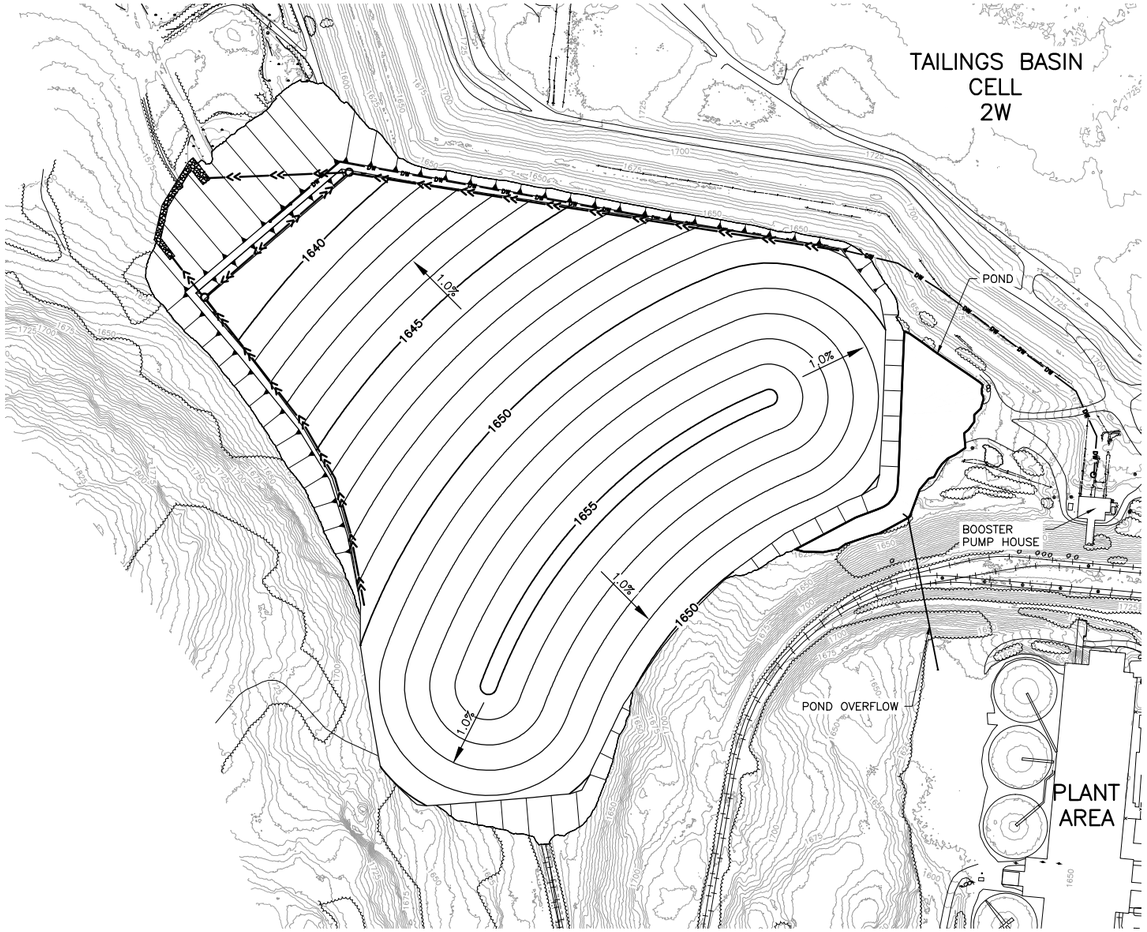


3 PLAN: TEMPORARY COVER REGRADING

0 300 600
SCALE IN FEET



4 PLAN: FINAL COVER GRADES

0 300 600
SCALE IN FEET

NOTES:

1. PRIOR TO FINAL CLOSURE GRADE ANY LOW SPOTS CREATED DURING SETTLEMENT ALLOTMENT TIME.

2. INSTALL DRAIN TUBING AND SURFACE WATER INLETS.

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
3	12/14/12	RESIDUE MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
4	5/19/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	4	5/19/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
TEMPORARY COVER AND
FINAL COVER GRADING

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

DWG. NO. HRF-021

REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\B9EA0F03-F19E-4CC0-AA24-9A3CC15A1E11\5ACF4795-346D-4E1A-A991-FA3527BD1217\PERMIT_NMT-01-CS-021.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 3:12 PM

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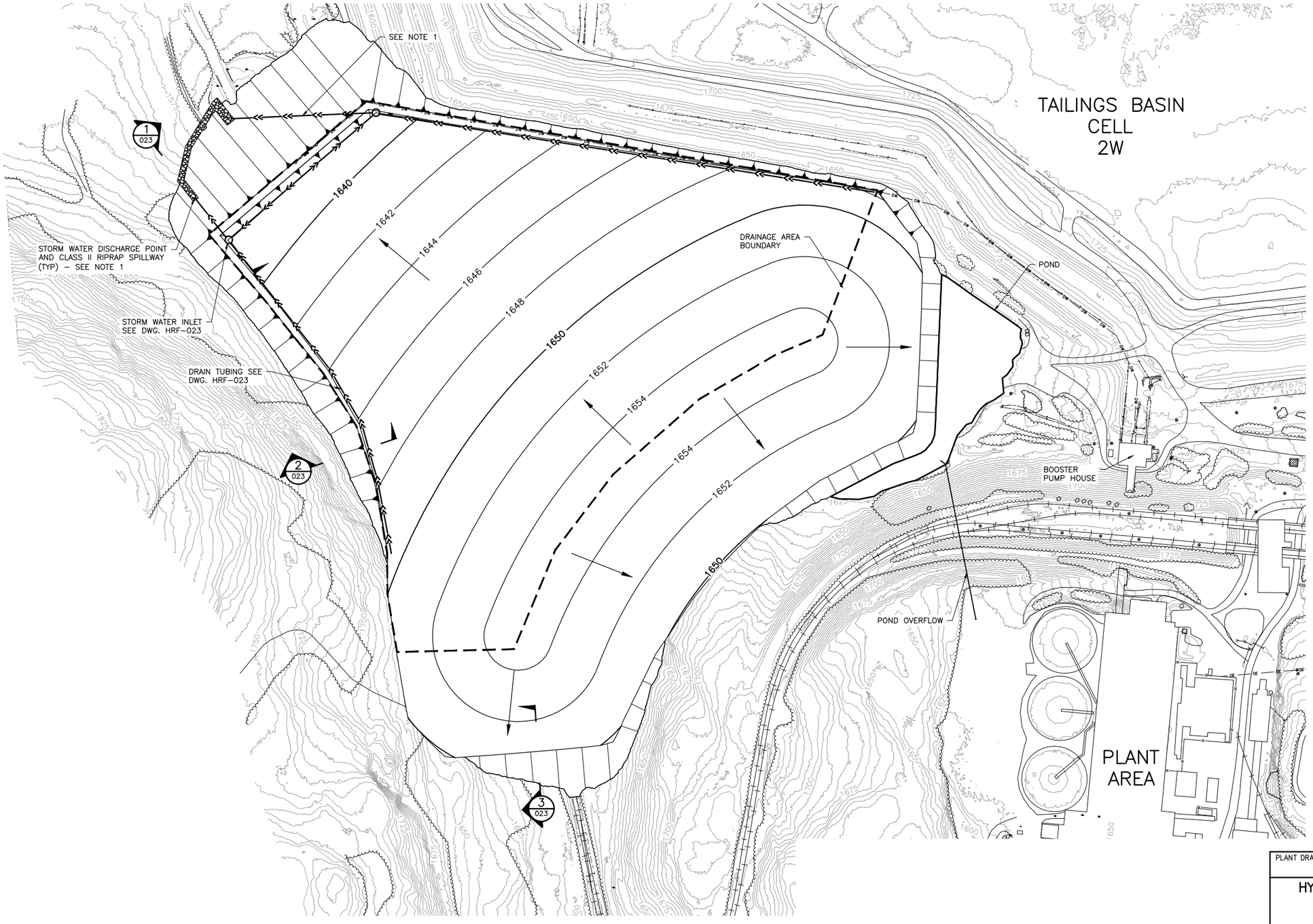

NOTES:

1. FIELD–ALIGN SURFACE WATER DISCHARGE PIPES TO DISCHARGE CLEAN SURFACE RUNOFF TO LOCATION OUTSIDE OF GROUNDWATER CONTAINMENT SYSTEM. SEE FTB SEEPAGE CAPTURE AND STREAM AUGMENTATION SYSTEMS DRAWINGS.

1 — PLAN: FINAL CLOSURE

0 200 400
SCALE IN FEET

N

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
FINAL CLOSURE
GRADING AND DRAINAGE

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. HRF–022
REV

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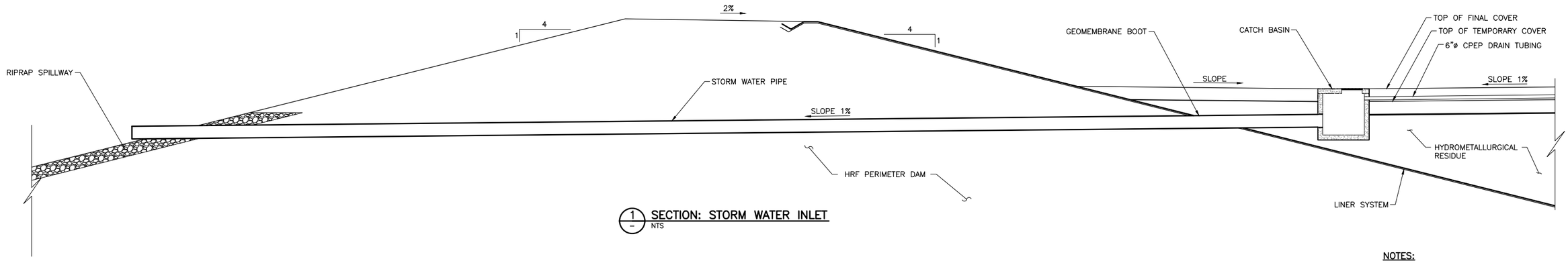
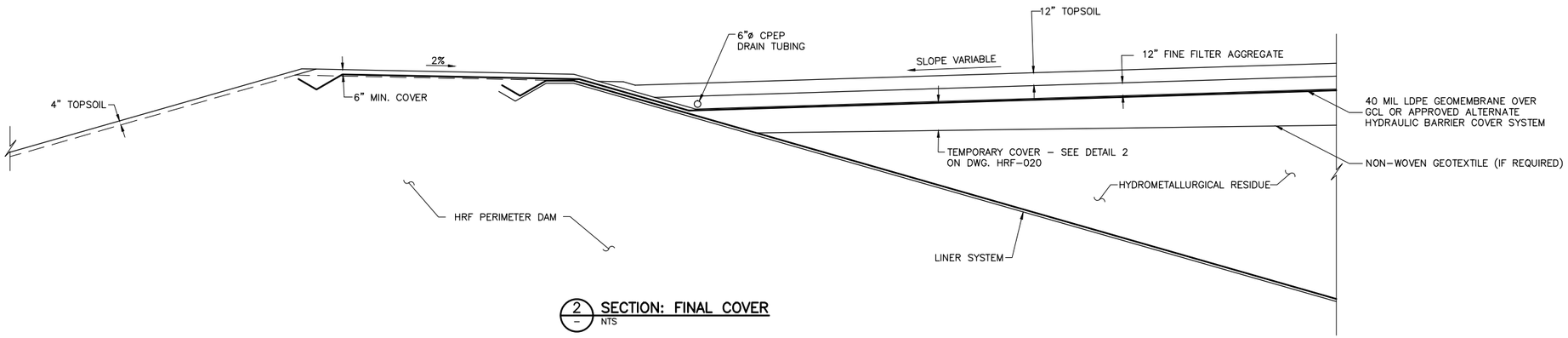


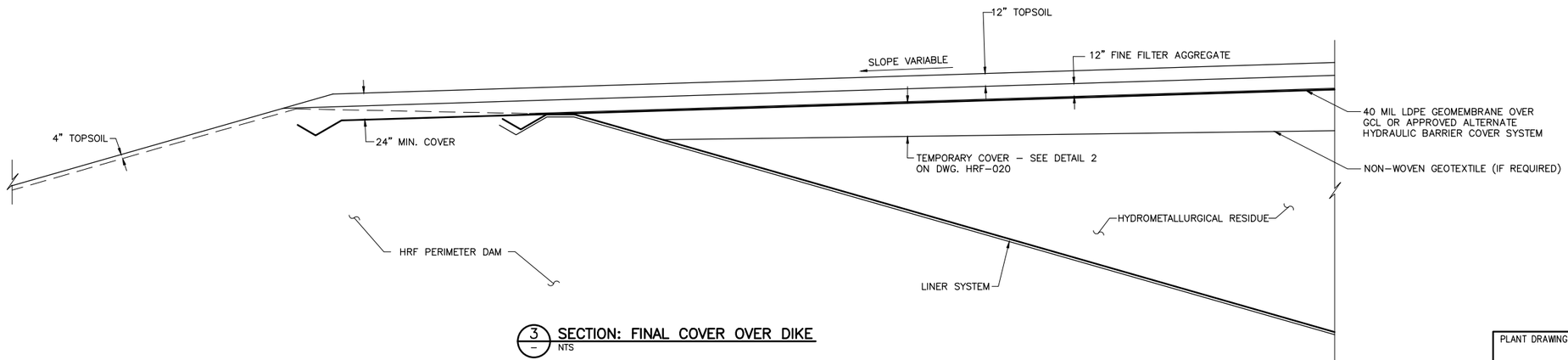
1 – SECTION: STORM WATER INLET
NTS

NOTES:

1. TEMPORARY COVER MATERIALS NOT SHOWN ON THS DRAWING. SEE DETAIL 3 ON DWG. HRF–020.



2 – SECTION: FINAL COVER
NTS



3 – SECTION: FINAL COVER OVER DIKE
NTS

VER NO	DATE	DESCRIPTION
1	10/14/11	RESIDUE MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	06/29/12	RESIDUE MANAGEMENT PLAN – VERSION 1 – RESPONSE TO COMMENTS
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DATE 5/19/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY CLOSURE SECTIONS AND DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. HRF–023
REV

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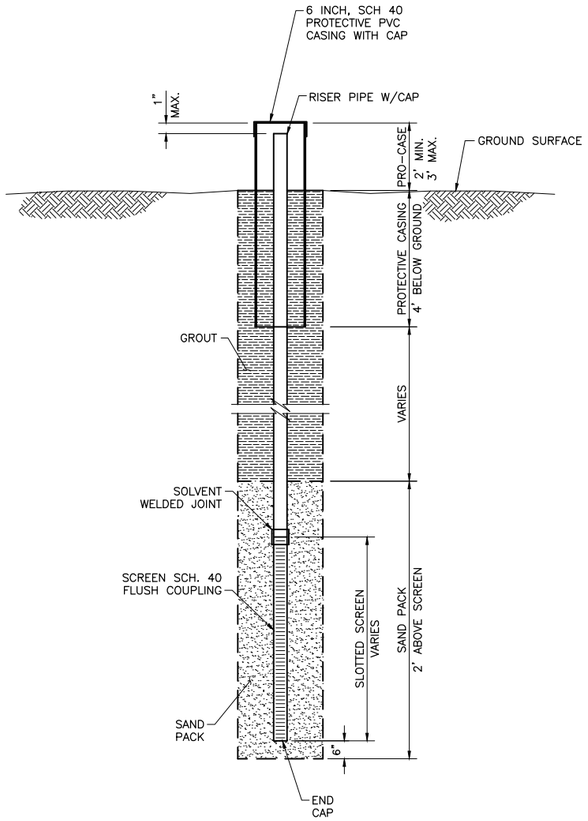
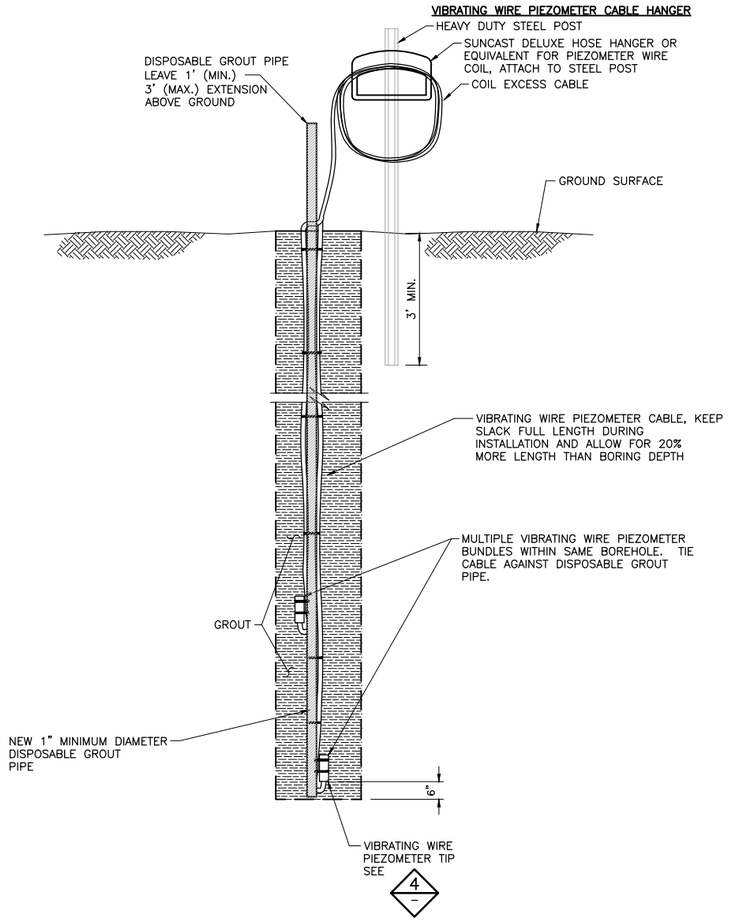
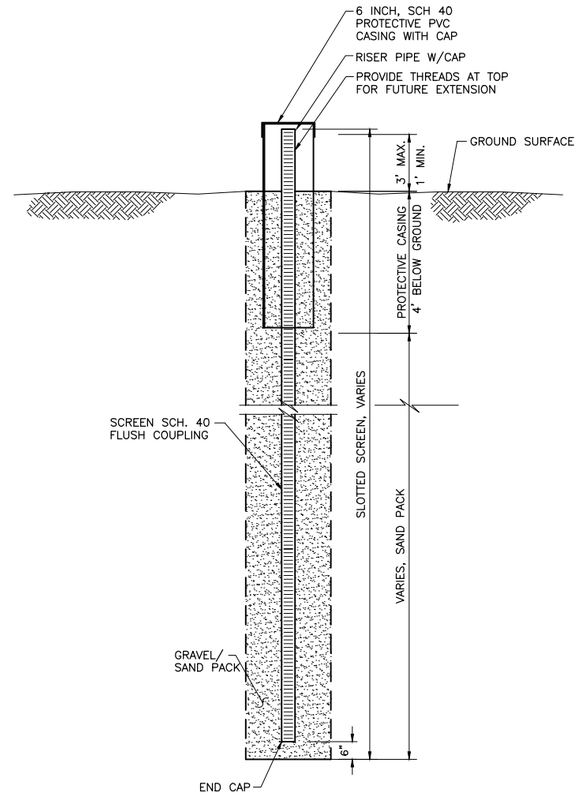


1 DETAIL: TYPICAL (OP) SCREENED PIEZOMETER INSTALLATION
NTS

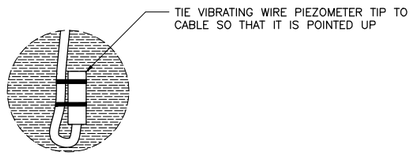


2 DETAIL: TYPICAL (VW) VIBRATING WIRE PIEZOMETER INSTALLATION
NTS



NOTE:
SEE SPECIFICATIONS FOR MONITORING WELLS

3 DETAIL: TYPICAL (MW) FULLY SCREENED PIEZOMETER INSTALLATION
NTS



4 DETAIL: TYPICAL VIBRATING WIRE PIEZOMETER TIP
NTS

VER NO.	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT
2	06/29/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT
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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

HYDROMETALLURGICAL RESIDUE FACILTY
GEOTECHNICAL
INSTRUMENTATION DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

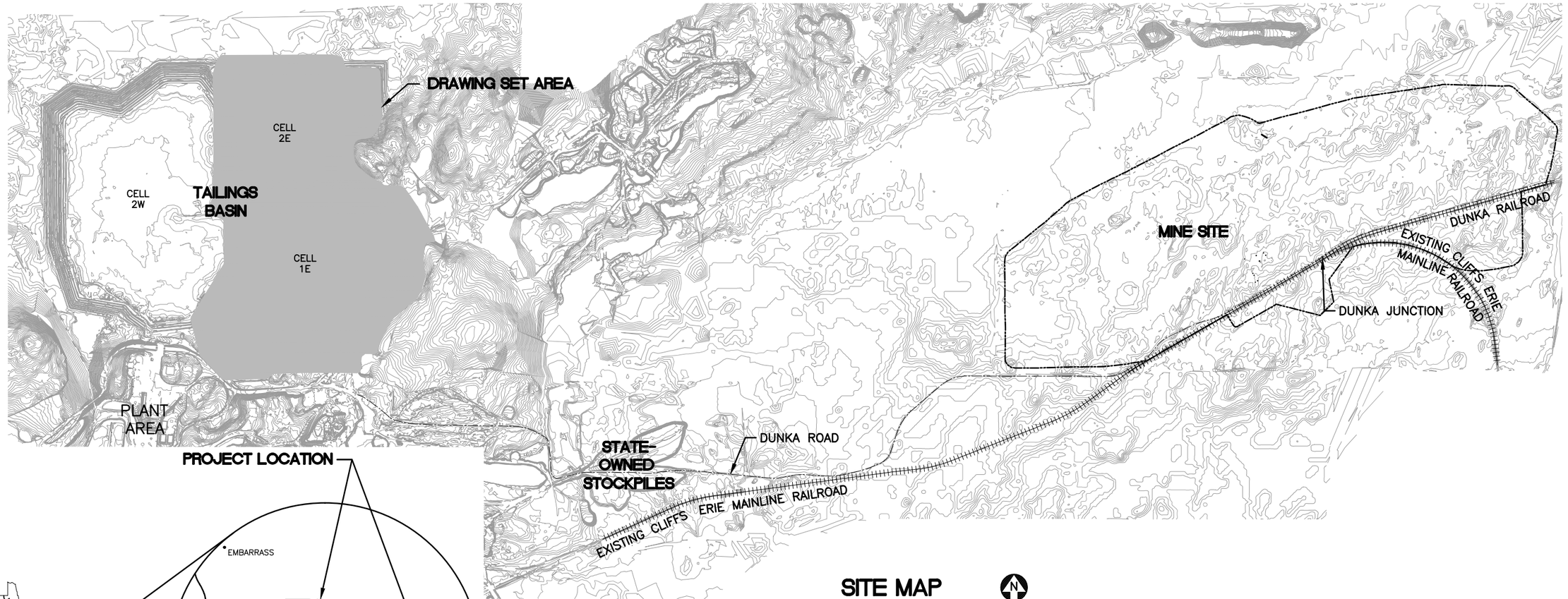
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. HRF-024
REV

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\B9FEA0F03-F19E-4CC0-AA24-9A3CC15A1E11\B9080E36-5FF1-4A0B-8B84-E04C5917F2E63\PERMIT_NMT-01-CS-024.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 3:16 PM

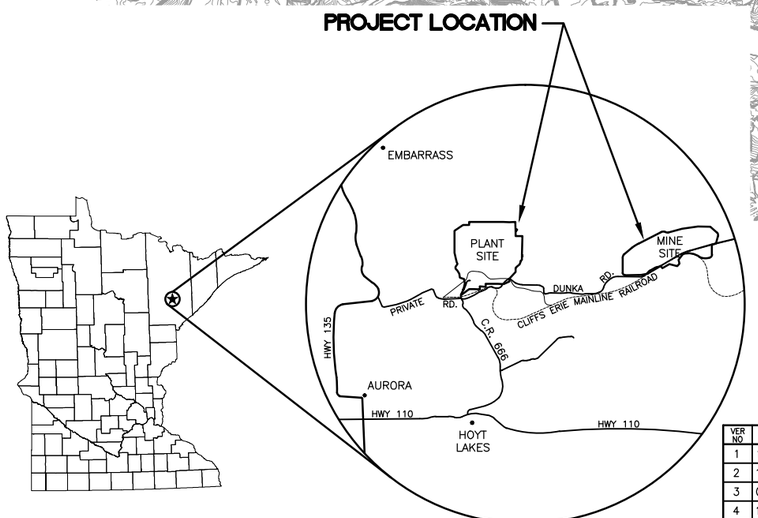
Flotation Tailings Basin

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT SUPPORT DRAWINGS
FLOTATION TAILINGS BASIN
HOYT LAKES, MINNESOTA



SITE MAP

0 2000 4000
SCALE IN FEET



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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4	11/25/14	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 4 – ATTACHMENT A
5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
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DATE 5/20/15 LICENSE# 20951

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CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
LOCATION MAP AND SITE MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTB-001
REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW IN\23187B86-88C2-4AEA-9171-5237B51A3893\0B737F12-FDA4-4270-B550-E3C0690BFC70\PERMIT_NMT-02-CS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:07 PM

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GENERAL LEGEND

- EXISTING CONTOUR – MAJOR
- EXISTING CONTOUR – MINOR
- PROPOSED CONTOUR – MAJOR
- PROPOSED CONTOUR – MINOR
- EXISTING POWER POLE
- EXISTING RAILROAD
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING UNIMPROVED TRAIL
- EXISTING STRUCTURES
- TREE LINE
- WETLAND BOUNDARY
- EXISTING CULVERT
- EXISTING PIPELINE
- OVERHEAD ELECTRIC
- DISCHARGE POINT
- DEWATERING OUTLET POINT
- RETURN PUMP PAD
- DEWATERING PUMP
- SURFACE DRAINAGE
- DRAINAGE COLLECTION STRUCTURE AND PIPE
- DRAINAGE AREA BOUNDARY
- PROPOSED DAMS
- PROPOSED DEWATERING PIPE
- PROPOSED DISCHARGE PIPELINE
- PROPOSED RETURN PIPELINE
- PROPOSED CULVERT (NON–MINE DRAINAGE)
- PROPOSED SEEPAGE COLLECTION DRAIN
- PROPOSED STORMWATER DRAIN
- PROPOSED MANHOLE
- PROPOSED WICK DRAIN LATERAL PIPE
- PROPOSED RIP RAP
- FILL SLOPE
- CUT SLOPE

ABBREVIATIONS

APPROX.	–	APPROXIMATE
CDSM	–	CEMENT DEEP SOIL MIX
CMP	–	CORRUGATED METAL PIPE
CPEP	–	CORRUGATED POLYETHYLENE PIPE
CY	–	CUBIC YARD
DR	–	DIMENSION RATIO
DWG	–	DRAWING
EL.	–	ELEVATION
F	–	DIAMETER
FTB	–	FLOTATION TAILINGS BASIN
GCL	–	GEOSYNTHETIC CLAY LINER
HDPE	–	HIGH DENSITY POLYETHYLENE
HRF	–	HYDROMETALLURGICAL RESIDUE FACILITY
LDPE	–	LOW DENSITY POLYETHYLENE
LF	–	LINER FEET
LTVSMC	–	LTV STEEL MINING COMPANY
MCY	–	MILLION CUBIC YARDS
mil	–	one thousandth of an inch
MIN	–	MINIMUM
MSL	–	MEAN SEA LEVEL
NTS	–	NOT TO SCALE
SCH.	–	SCHEDULE
DR	–	DIMENSION RATIO
TYP.	–	TYPICAL

NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.
4. EXISTING TOPOGRAPHIC INFORMATION WAS UPDATED FOR AREAS SOUTH EAST OF COAL ASH LANDFILL AND EAST OF OUTCROP BETWEEN CELLS 1E AND 2E USING CONTOURS FROM DATA COLLECTED IN 1999.
5. FLOATATION TAILINGS BASIN DESIGN WAS BASED ON CONTOURS FROM DATA COLLECTED IN 1999. PROPOSED DAM LAYOUTS MAY NOT EXACTLY MATCH THE EXISTING TOPOGRAPHY FROM 2010 LIDAR.

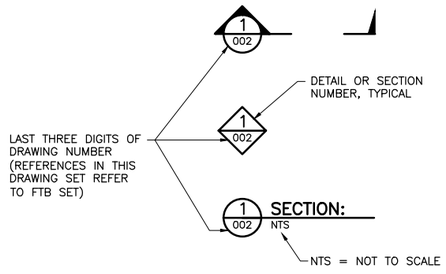
SHEET INDEX

SHEET NO. TITLE

GENERAL DRAWINGS

FTB–001 LOCATION MAP AND SITE MAP
FTB–002 LEGEND AND SHEET INDEX
FTB–003 EXISTING CONDITIONS
FTB–004 LAYOUT MINE YEAR 20
FTB–005 LAYOUT MINE YEAR 1
FTB–006 LAYOUT MINE YEAR 5
FTB–007 LAYOUT MINE YEAR 7
FTB–008 NORTH DAM – MINE YEAR 20 LAYOUT
FTB–009 NORTH DAM – TYPICAL CROSS SECTION
FTB–010 NORTH DAM – STAGED CONSTRUCTION
FTB–011 EAST AND WEST DAMS – MINE YEAR 20 LAYOUT
FTB–012 EAST AND WEST DAMS – TYPICAL CROSS SECTIONS AND DRAINAGE SWALE
FTB–013 SOUTH DAM – MINE YEAR 20 LAYOUT
FTB–014 SOUTH DAM – TYPICAL CROSS SECTION
FTB–015 EMERGENCY OVERFLOW CHANNEL – LAYOUT
FTB–016 EMERGENCY OVERFLOW CHANNEL – SECTIONS
FTB–017 EMERGENCY OVERFLOW CHANNEL – DETAILS
FTB–018 EMERGENCY OVERFLOW CHANNEL – SEQUENCING
FTB–019 PIPING LAYOUT CELL 2E
FTB–020 PIPING LAYOUT CELL 1/2E
FTB–021 DETAILS
FTB–022 TRANSFER PUMP RAFT
FTB–023 TAILINGS DISPOSAL DIFFUSER RAFT
FTB–024 CLOSURE PLAN

DRAWING NUMBERING



VER NO	DATE	DESCRIPTION
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DATE 5/20/15 LICENSE# 20951

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BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
LEGEND AND SHEET INDEX

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. FTB–002
REV

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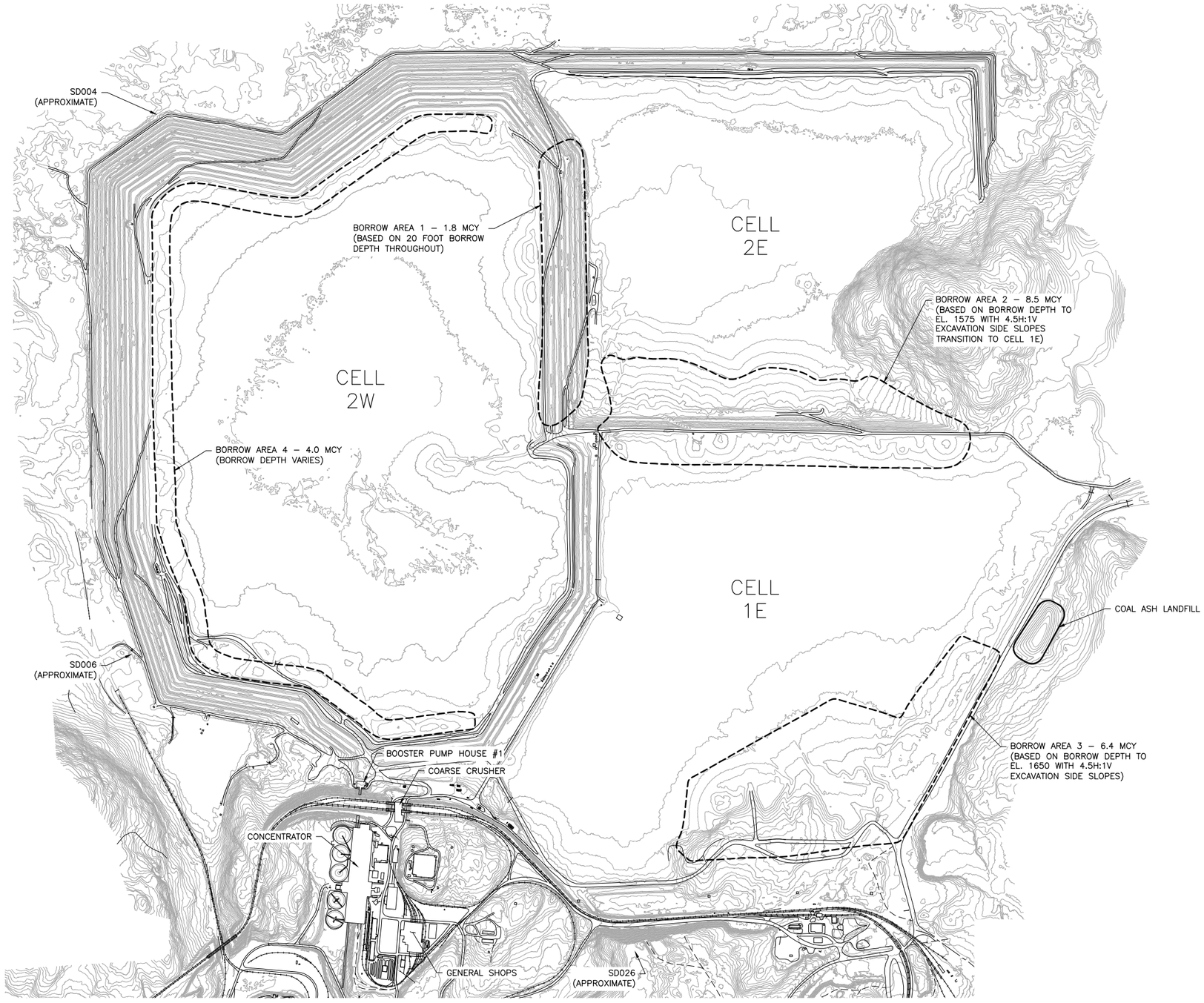

NOTES:

1. CONTOURS DO NOT REFLECT BORROW REMOVAL.
2. BORROW LTVSMC COARSE TAILINGS IN THE NUMERICAL SEQUENCE SHOWN.
3. COAL ASH LANDFILL TO BE RELOCATED TO HYDROMET RESIDUE FACILITY OR ALTERNATE PERMITTED FACILITY PRIOR TO TAILINGS DEPOSITION IN CELL 1E.

1 PLAN: EXISTING CONDITIONS

0 800 1600
SCALE IN FEET

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DATE 5/20/15 LICENSE# 20951

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BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN EXISTING CONDITIONS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTB-003
REV

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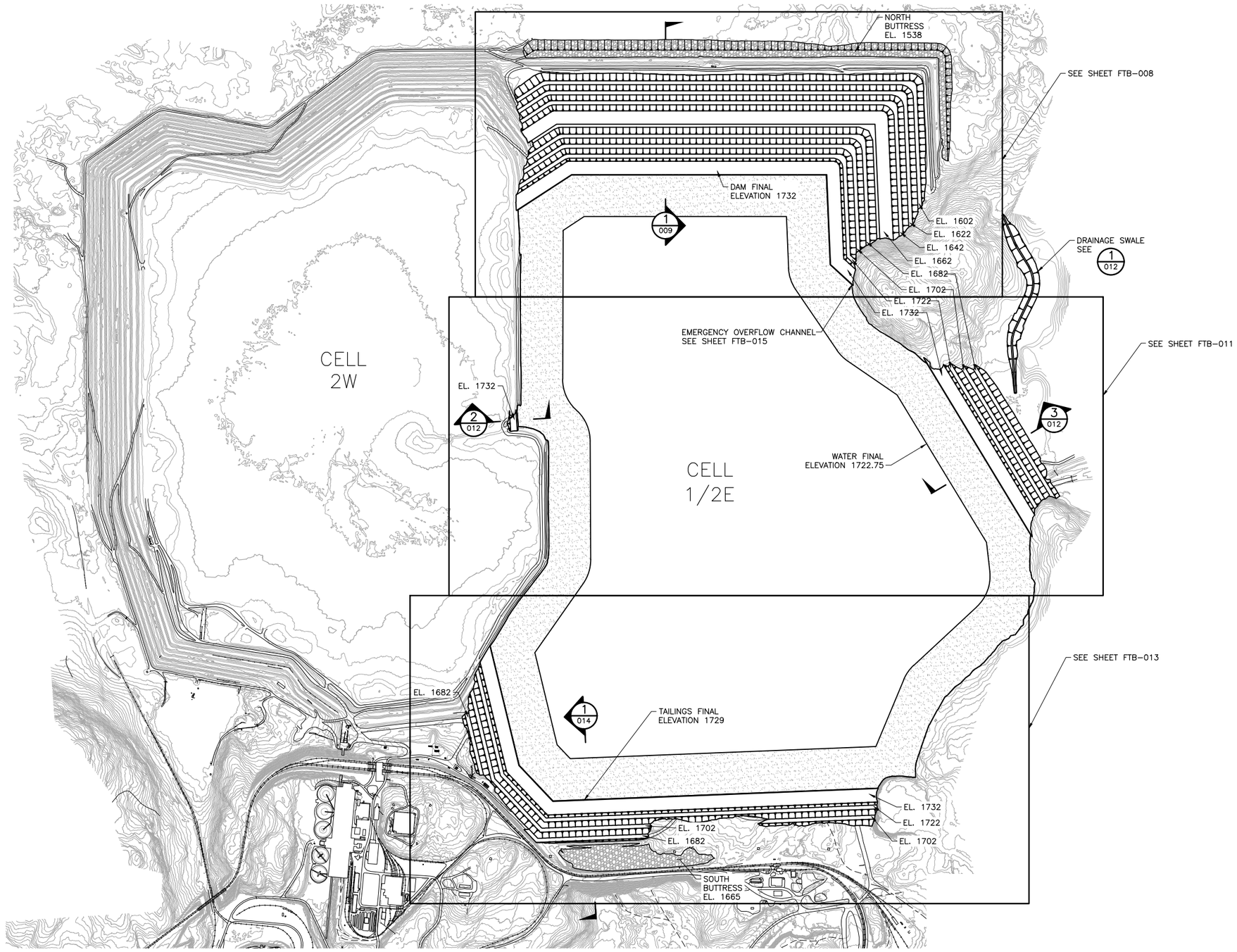

NOTE:

1. CEMENT DEEP SOIL MIX (CDSM) ZONE NOT SHOWN. SEE SHEETS FTB-003 AND FTB-009.
2. LOCATION AND DIMENSIONS OF CDSM SHEAR WALL MAY CHANGE AS DESIGNS ARE FINALIZED.

1 -- PLAN: TAILINGS BASIN LAYOUT MINE YEAR 20

0 800 1600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN LAYOUT MINE YEAR 20

POLYMET MINING

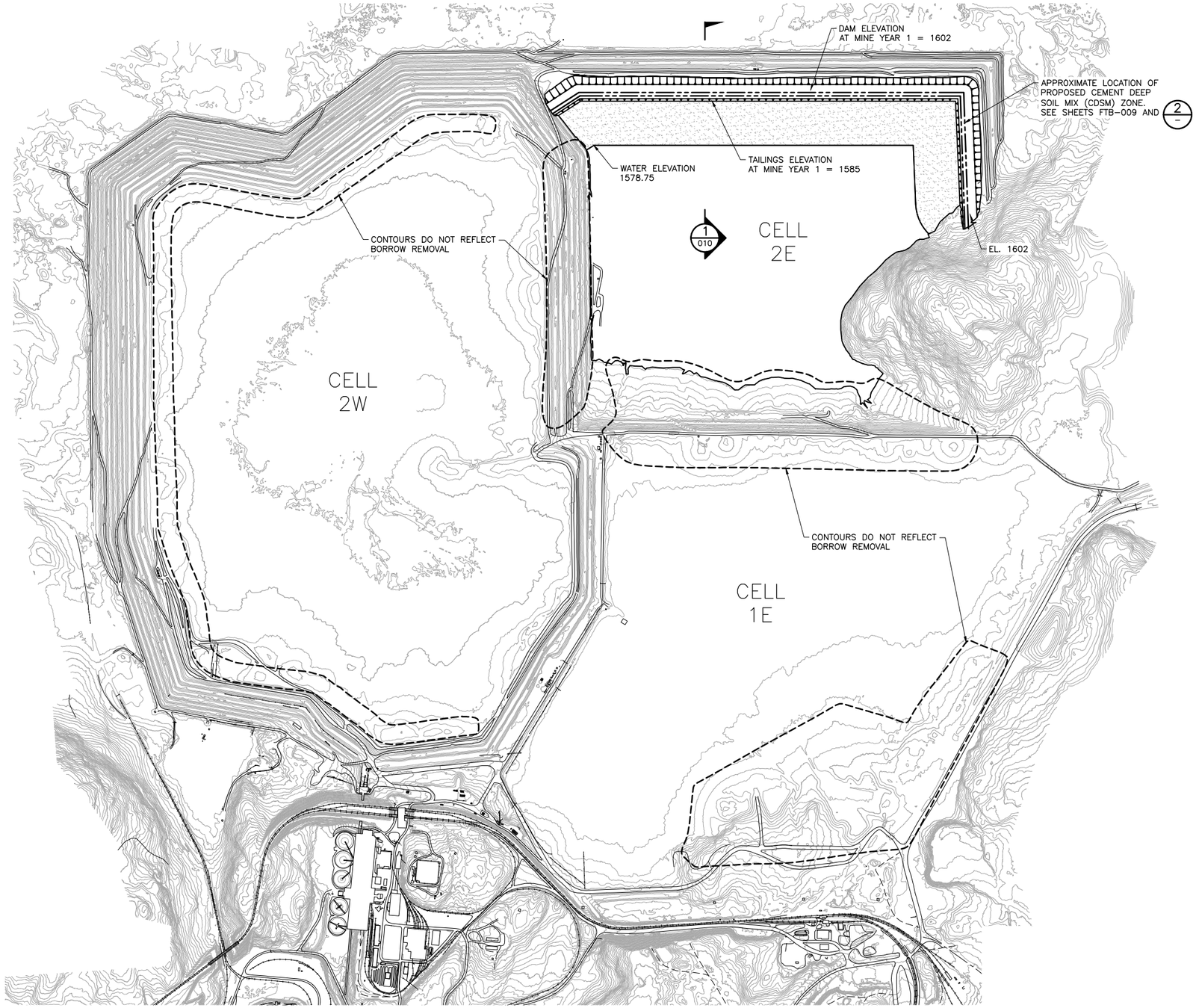
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTB-004 REV

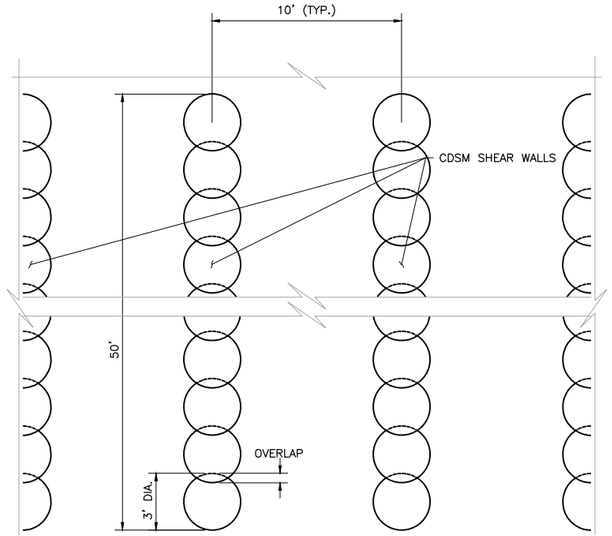
CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-02-CS-004.DWG PLOT SCALE: 1:2 PLOT DATE: 5/28/2015 10:23 AM



1/-- PLAN: TAILINGS BASIN LAYOUT MINE YEAR 1

0 800 1600

SCALE IN FEET



2/-- PLAN: CEMENT DEEP SOIL MIX (CDSM) SHEAR WALLS

0 4 8

SCALE IN FEET

NOTES:

1. SEE SHEET FTB-015 FOR OPERATIONS-PHASE EMERGENCY OVERFLOW CHANNEL.
2. CDSM TO BE CONSTRUCTED PRIOR TO TAILINGS PLACEMENT.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
3	04/12/13	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 3 – ATTACHMENT A
4	11/25/14	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 4 – ATTACHMENT A
5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	6	5/20/15
FOR CONSTRUCTION	–	–

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME THOMAS J. RADUE

SIGNATURE Thomas J. Radue

DATE 5/20/15 LICENSE# 20951

DRAWN: CAD

CHECKED: TJR

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN LAYOUT MINE YEAR 1

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

DWG. NO. FTB-005

REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW IN\23187BB6-88C2-4AEA-9171-5237B51A3893\9CA15052-C4A2-481B-AD15-461E07686FD2\PERMIT_NMT-02-CS-005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:12 PM

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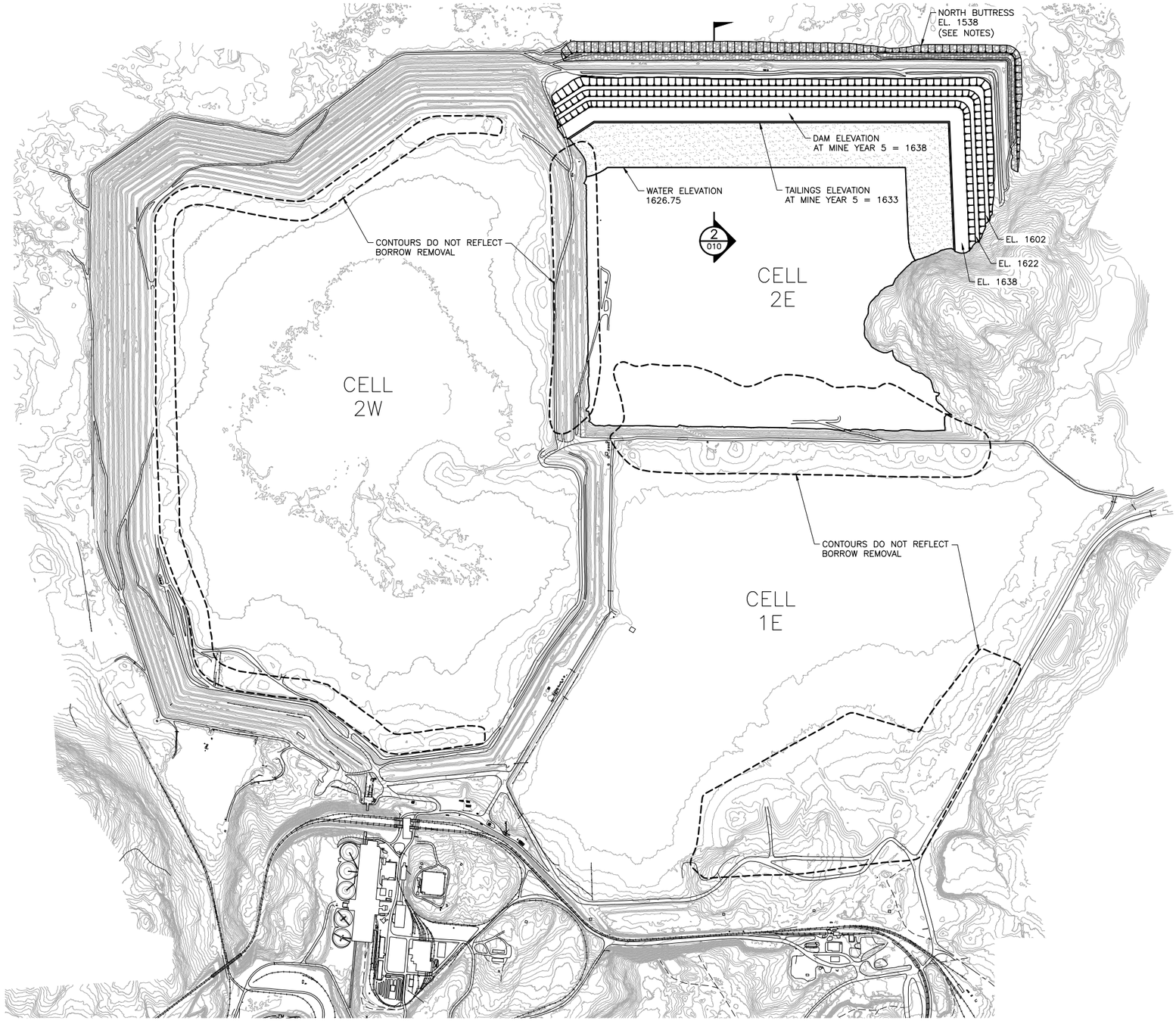

1 PLAN: TAILINGS BASIN LAYOUT MINE YEAR 5

0 800 1600

SCALE IN FEET

NOTES:

1. SEE SHEET FTB-015 FOR OPERATIONS-PHASE EMERGENCY OVERFLOW CHANNEL.
2. CDSM ZONE NOT SHOWN. SEE SHEETS FTB-003 AND FTB-009.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
3	04/12/13	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 3 – ATTACHMENT A
4	11/25/14	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 4 – ATTACHMENT A
5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	6	5/20/15
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SIGNATURE Thomas J. Radue

DATE 5/20/15 LICENSE# 20951

DRAWN: CAD

CHECKED: TJR

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN LAYOUT MINE YEAR 5

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

DWG. NO. FTB-006

REV

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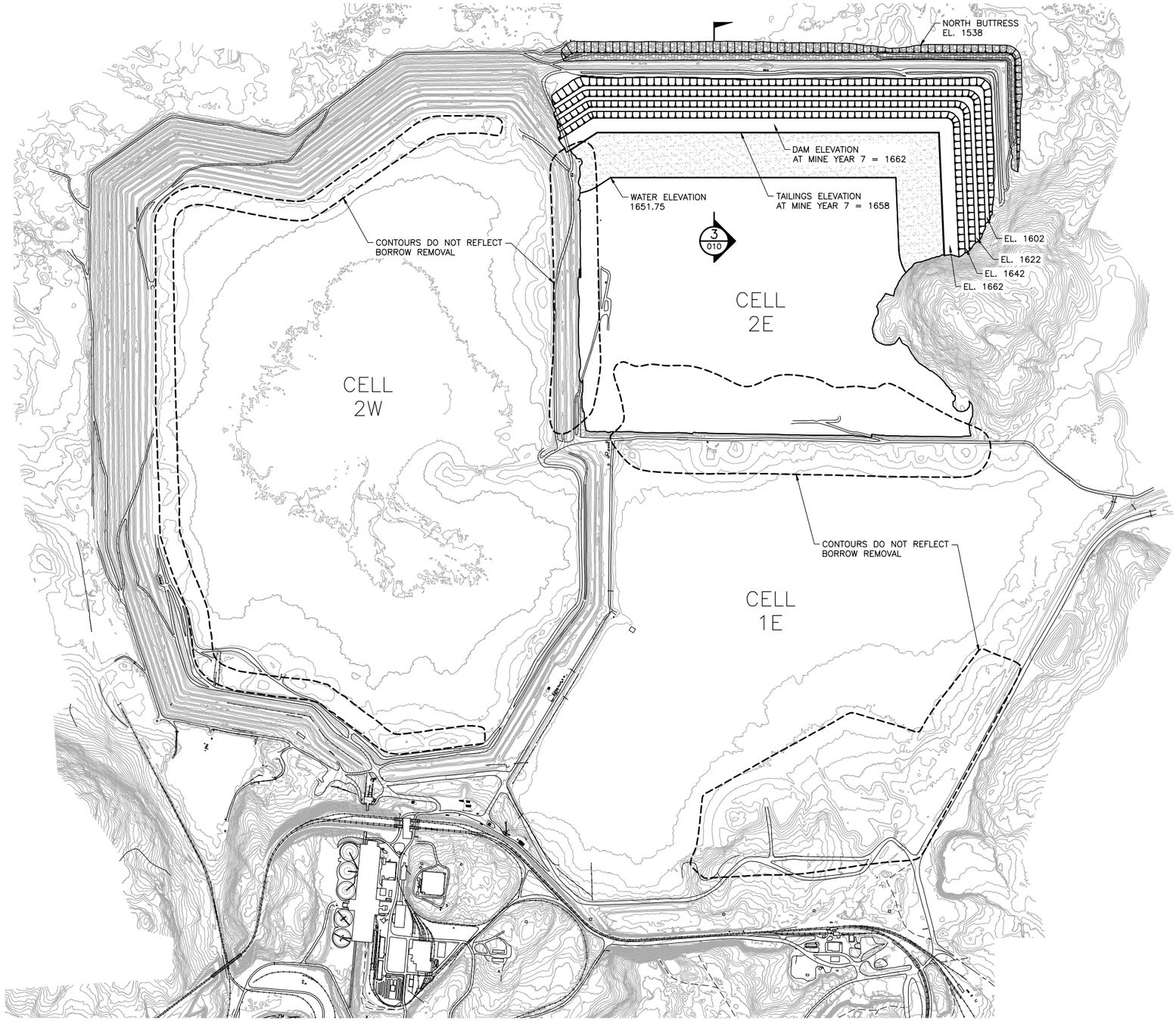

1 PLAN: TAILINGS BASIN LAYOUT MINE YEAR 7

0 800 1600
SCALE IN FEET

NOTES:

1. LAST YEAR BEFORE COMBINING CELLS 2E AND 1E FOR TAILINGS.
2. SEE SHEET FTB-015 FOR OPERATIONS-PHASE EMERGENCY OVERFLOW CHANNEL.
3. CDSM ZONE NOT SHOWN. SEE SHEETS FTB-003 AND FTB-009.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
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5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
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FOR CONSTRUCTION	–	–

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN LAYOUT MINE YEAR 7

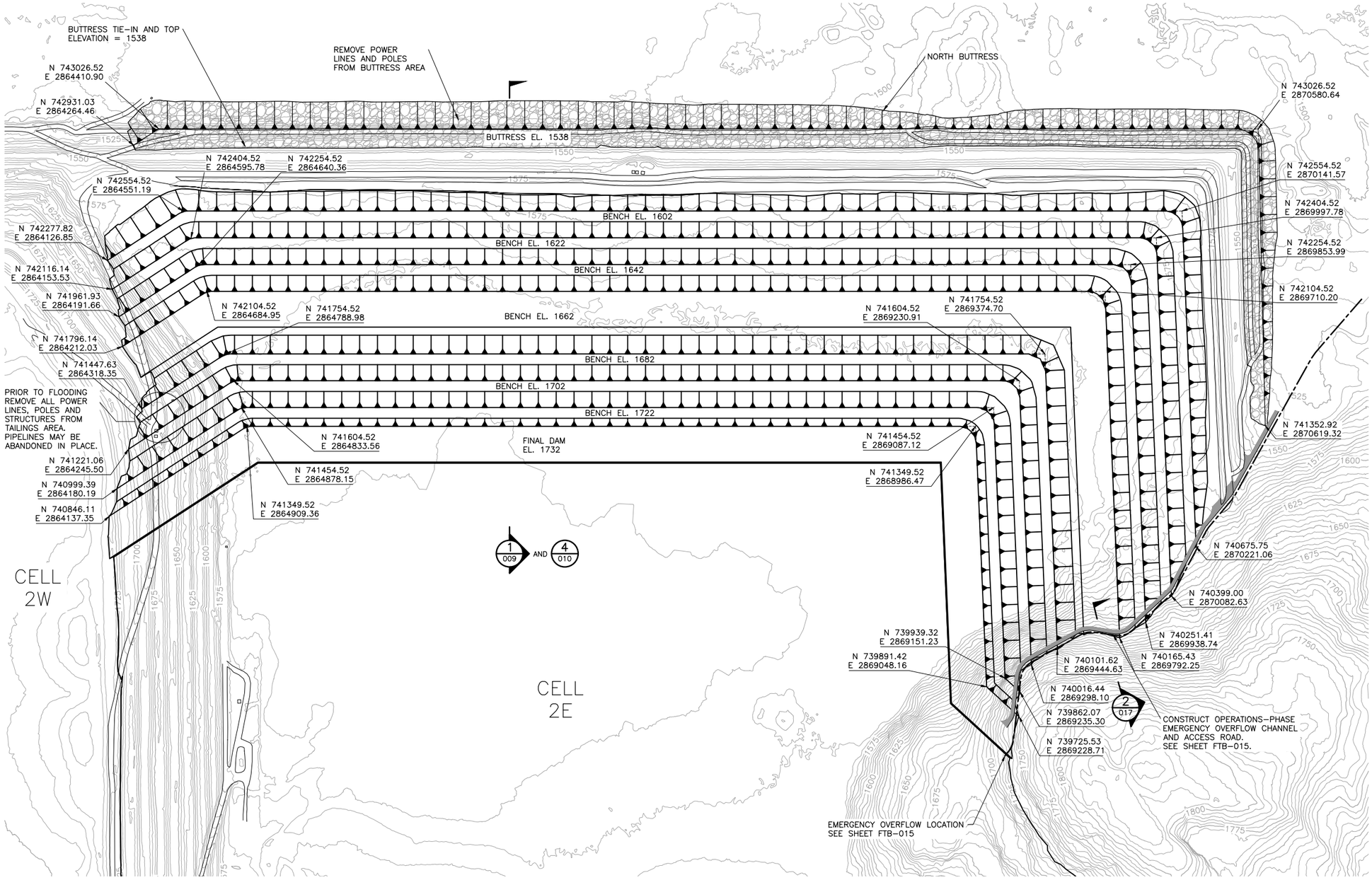
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTB-007 REV

INCHES 1 2



NOTES:

1. DAM ACCESS ROAD LOCATION IS APPROXIMATE. FIELD LOCATE TO PROVIDE PREFERRED SLOPE AND DRAINAGE.
2. EXTEND ACCESS ROAD TO AREA 5 STOCKPILES AND TO PLANT (NOT SHOWN).
3. CDSM ZONE NOT SHOWN. SEE SHEETS FTB–003 AND FTB–009.

1 PLAN: NORTH DAM LAYOUT

0 300 600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
NORTH DAM
MINE YEAR 20 LAYOUT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. FTB–008 REV

CADD USER: Adeptuser FILE: \\PMEDINA\EDINA PW\EDINA PW IN\23187BB6-8BC2-44EA-9171-5237B51A3893\0C4AC241-5545-454B-A96D-471D527CEC2D\PERMIT_NMT-02-CS-008.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:16 PM

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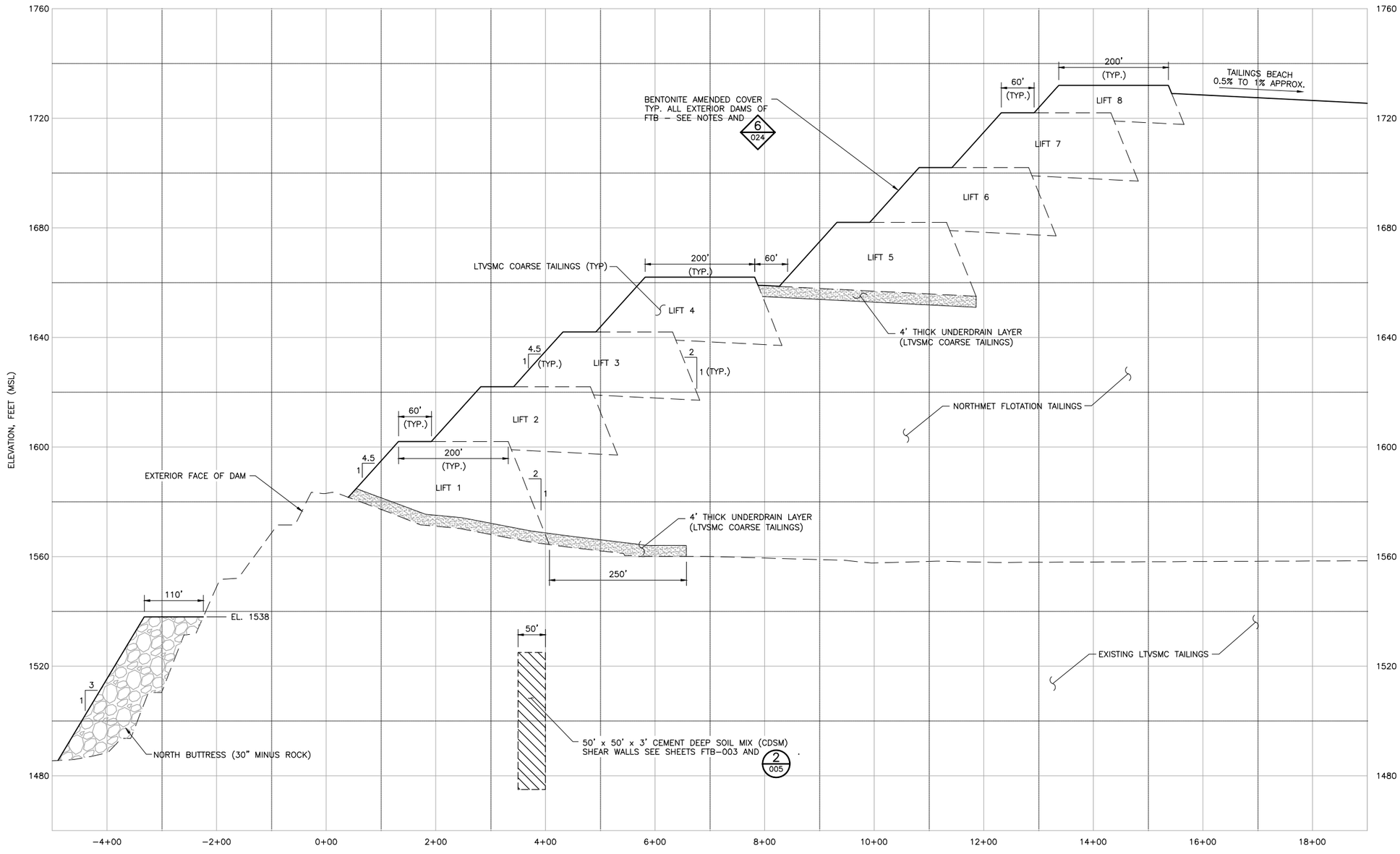

1 – ELEVATION: NORTH DAM TYPICAL CROSS SECTION

0 100 200

HORZ. SCALE IN FEET

NOTES:

1. DAMS AND BUTTRESS DIMENSIONS MAY CHANGE WITH EVALUATION OF FUTURE DAM STABILITY PERFORMANCE DATA.

2. LOCATION AND DIMENSIONS OF CDSM SHEAR WALLS MAY CHANGE AS DESIGNS ARE FINALIZED.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
3	04/12/13	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 3 – ATTACHMENT A
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PRINTED NAME THOMAS J. RADUE

SIGNATURE Thomas J. Radue

DATE 5/20/15 LICENSE# 20951

DRAWN: CAD

CHECKED: TJR

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN NORTH DAM TYPICAL CROSS SECTION

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. FTB–009

REV

CADD USER: Adeptuser FILE: \\PMEDINA\EDINA PW\EDINA PW IN\23187BB6-8BC2-4AEA-9171-52378B51A3893\E0784570-5CED-4287-A152-9C5C8CC2FEBF\PERMIT_NMT-02-CS-009.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:17 PM

INCHES 1 2

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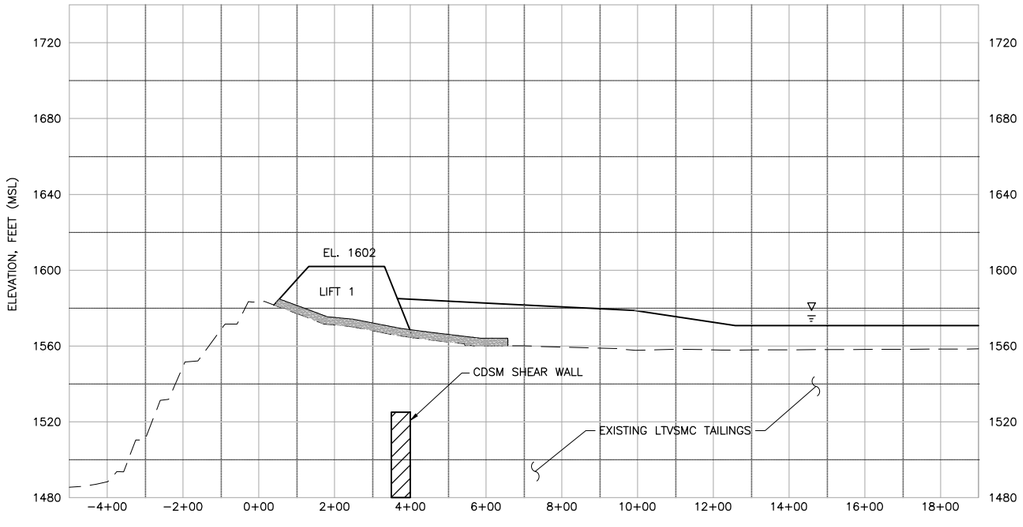
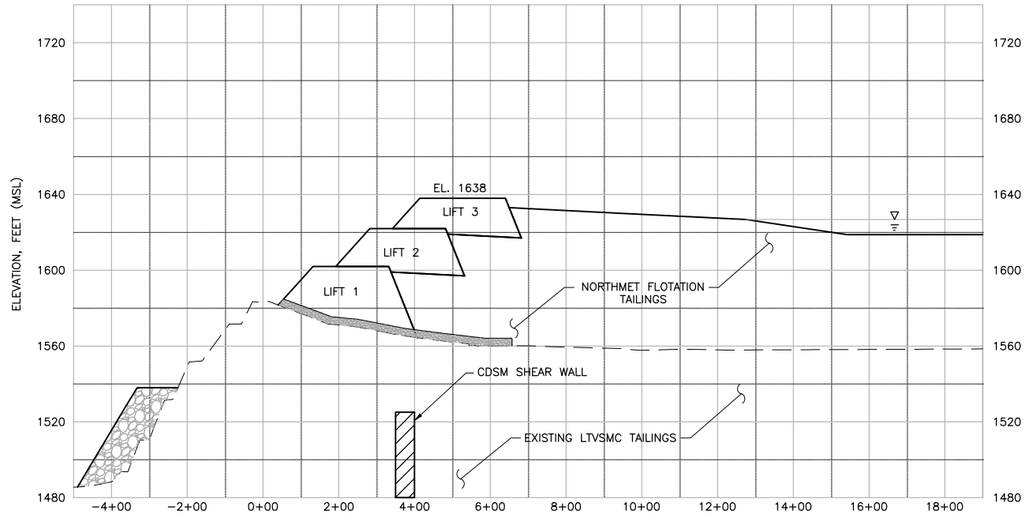


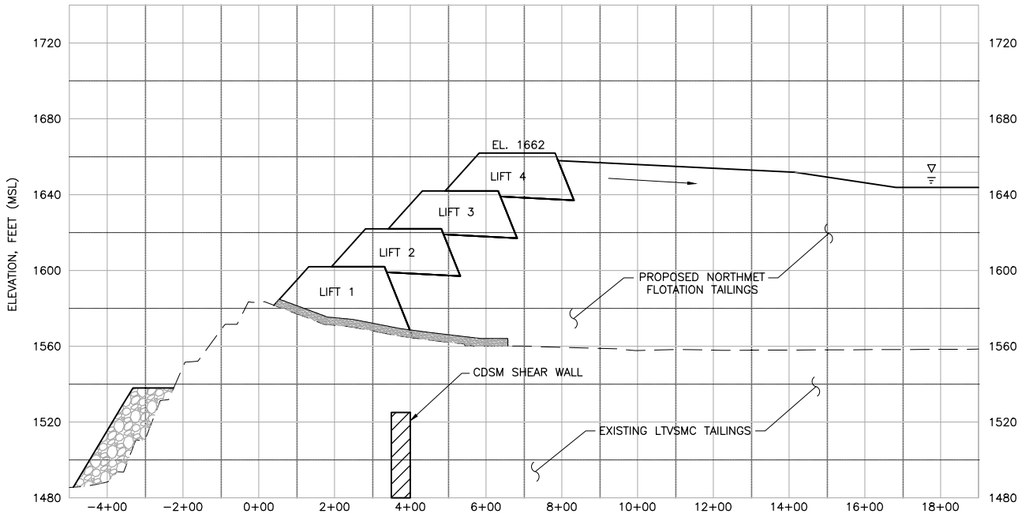
1 — ELEVATION: TYPICAL CROSS SECTION 1 – MINE YEAR 1

0 200 400
HORZ. SCALE IN FEET



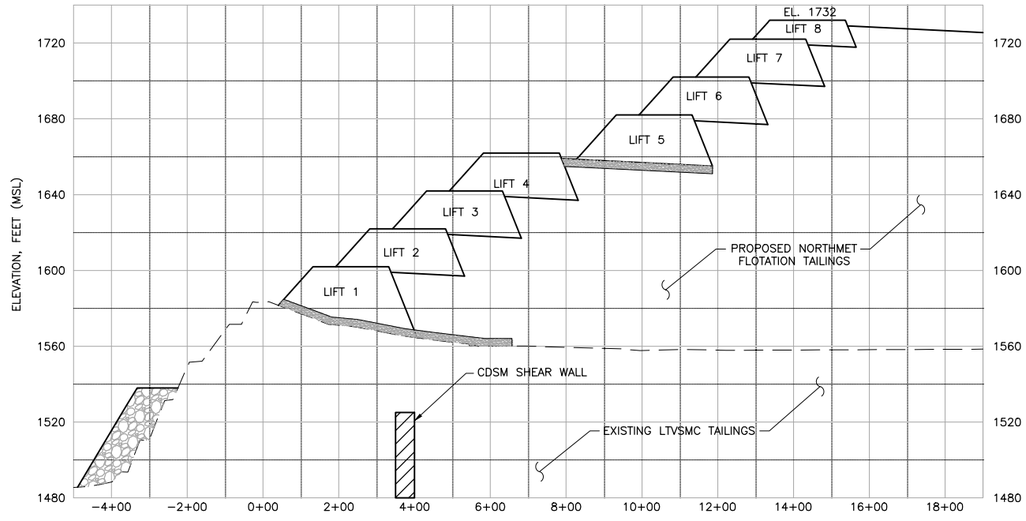
2 — ELEVATION: TYPICAL CROSS SECTION 1 – MINE YEAR 5

0 200 400
HORZ. SCALE IN FEET



3 — ELEVATION: TYPICAL CROSS SECTION 1 – MINE YEAR 7

0 200 400
HORZ. SCALE IN FEET



4 — ELEVATION: TYPICAL CROSS SECTION 1 – MINE YEAR 20

0 200 400
HORZ. SCALE IN FEET

NOTE:

1. DAM AND BUTTRESS DIMENSIONS MAY CHANGE WITH EVALUATION OF FUTURE DAM STABILITY PERFORMANCE DATA.

2. PLACE BENTONITE AMENDED SOIL COVER ON OUTSIDE FACE OF NEW DAMS.

VER NO.	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
3	04/12/13	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 3 – ATTACHMENT A
4	11/25/14	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 4 – ATTACHMENT A
5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	6	5/20/15
FOR CONSTRUCTION	–	–

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
NORTH DAM
STAGED CONSTRUCTION

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTB-010
REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\23187B86-8BC2-4AEA-9171-5237B51A3B93\01E70E48-0FBD-4AE2-A141-49C1D448ABC3\PERMIT_NMT-02-CS-011.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:19 PM

CELL 2E

CELL 1E

N 737605.18
E 2864034.46

2/012

N 737299.05
E 2864055.46

FINAL DAM ELEVATION = 1732

PRIOR TO FLOODING REMOVE ALL POWER LINES, POLES AND STRUCTURES FROM TAILINGS AREA. PIPELINES MAY BE ABANDONED IN PLACE.

PUMP TO REMAIN IN OPERATION

CLOSURE OVERFLOW SEE 3/021

DRAINAGE SWALE SEE 1/012

N 738313.79
E 2870660.40

N 738300.82
E 2870545.47

N 738278.76
E 2870857.04

N 738297.00
E 2871021.39

3/012

BENCH EL. 1682

BENCH EL. 1702

BENCH EL. 1722

FINAL DAM EL. 1732

N 736294.00
E 2872235.58

N 736283.39
E 2872066.60

N 736176.83
E 2871955.79

N 736044.81
E 2871913.03

CONSTRUCT DAM ACCESS ROAD, SEE 2/021

1/--- PLAN: EAST AND WEST DAM LAYOUTS

0 300 600
SCALE IN FEET

VER NO.	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

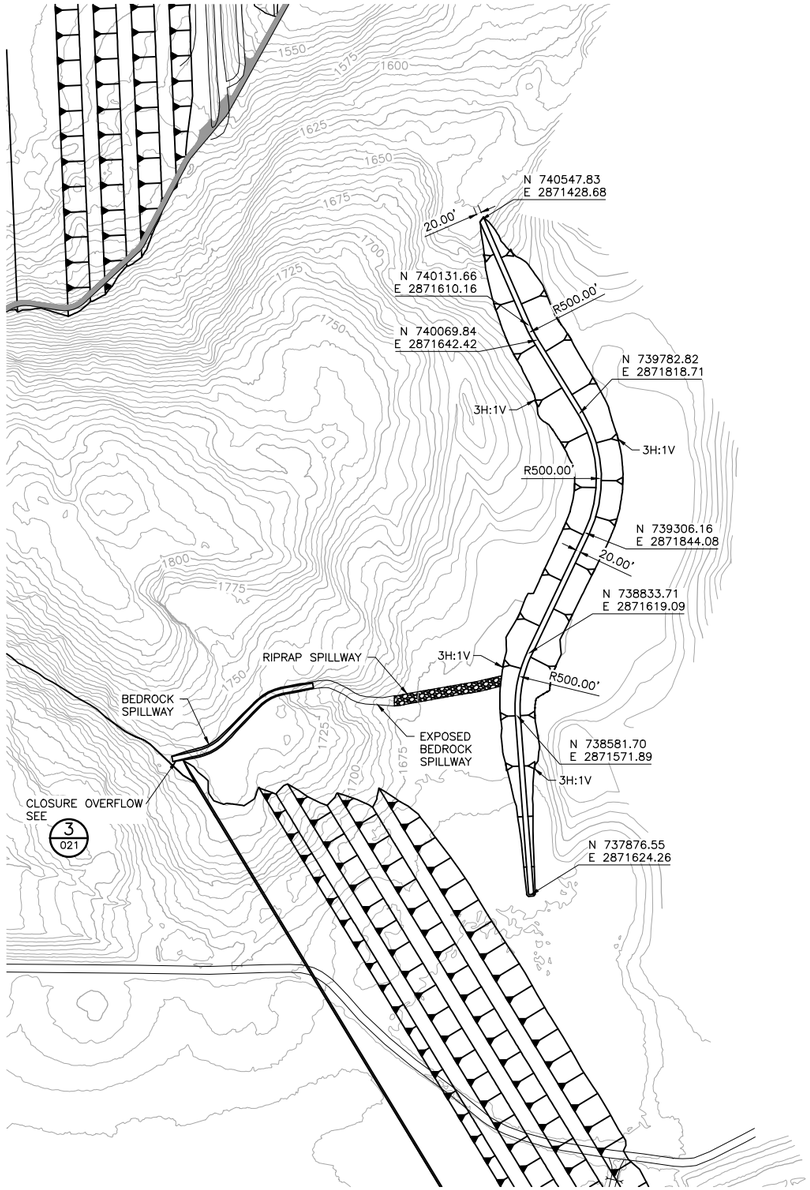
FLOTATION TAILINGS BASIN EAST AND WEST DAMS MINE YEAR 20 LAYOUT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

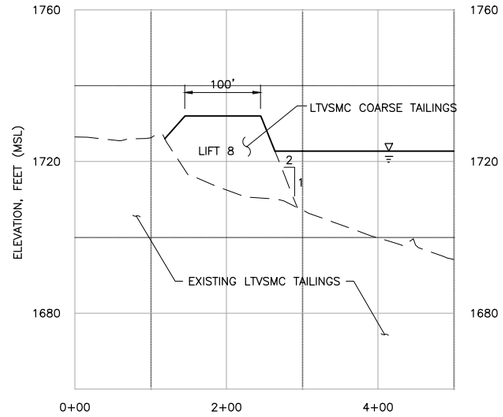
DWG. NO. FTB-011
REV

INCHES 1 2



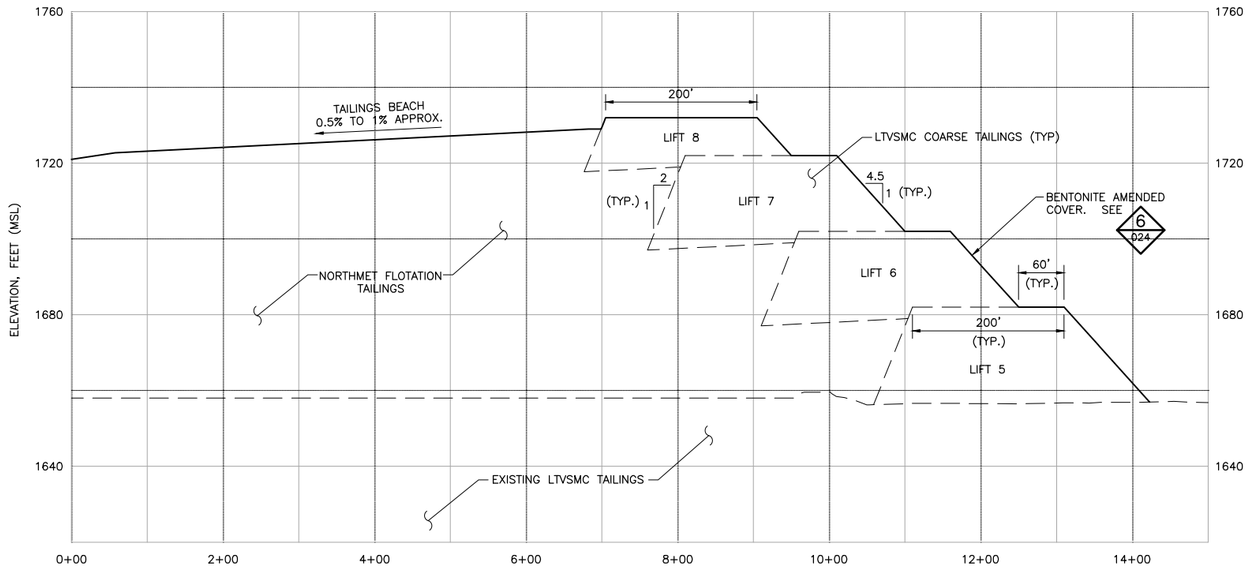
1 PLAN: DRAINAGE SWALE LAYOUT

0 300 600
SCALE IN FEET



2/011 ELEVATION: WEST DAM TYPICAL CROSS SECTION

0 100 200
HORZ. SCALE IN FEET



3/011 ELEVATION: EAST DAM TYPICAL CROSS SECTION

0 100 200
HORZ. SCALE IN FEET

NOTES:

1. CLOSURE OVERFLOW IS FOR EMERGENCY OVERFLOW ONLY UNTIL POND WATER QUALITY MEETS DISCHARGE WATER QUALITY REQUIREMENTS.

2. DAM DIMENSIONS MAY CHANGE WITH EVALUATION OF FUTURE DAM STABILITY PERFORMANCE DATA.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
EAST AND WEST DAMS TYPICAL CROSS SECTIONS AND DRAINAGE SWALE

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

DWG. NO. FTB-012
REV

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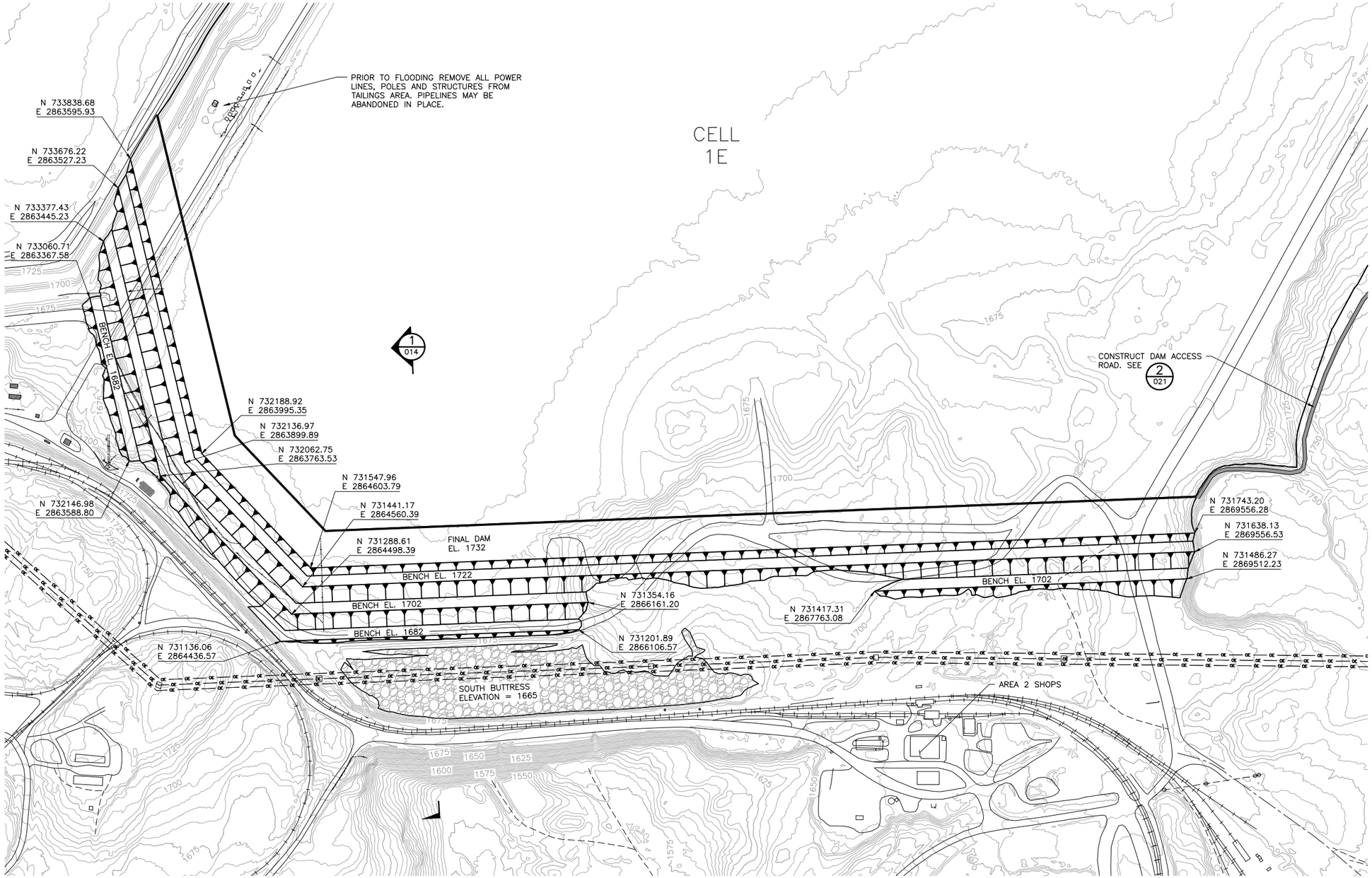

1 PLAN: SOUTH DAM LAYOUT

0 300 600
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
3	04/12/13	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 3 – ATTACHMENT A
4	11/25/14	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 4 – ATTACHMENT A
5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	6	5/20/15
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 THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
SOUTH DAM
YEAR 20 LAYOUT

POLYMET MINING

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NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

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DWG. NO. FTB-013
REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\23187BB6-8BC2-4AEA-9171-5237B51A3893\32DD1CBE-ECD1-42BD-A128-CAEE1A102165\PERMIT_NMT-02-CS-013.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:27 PM

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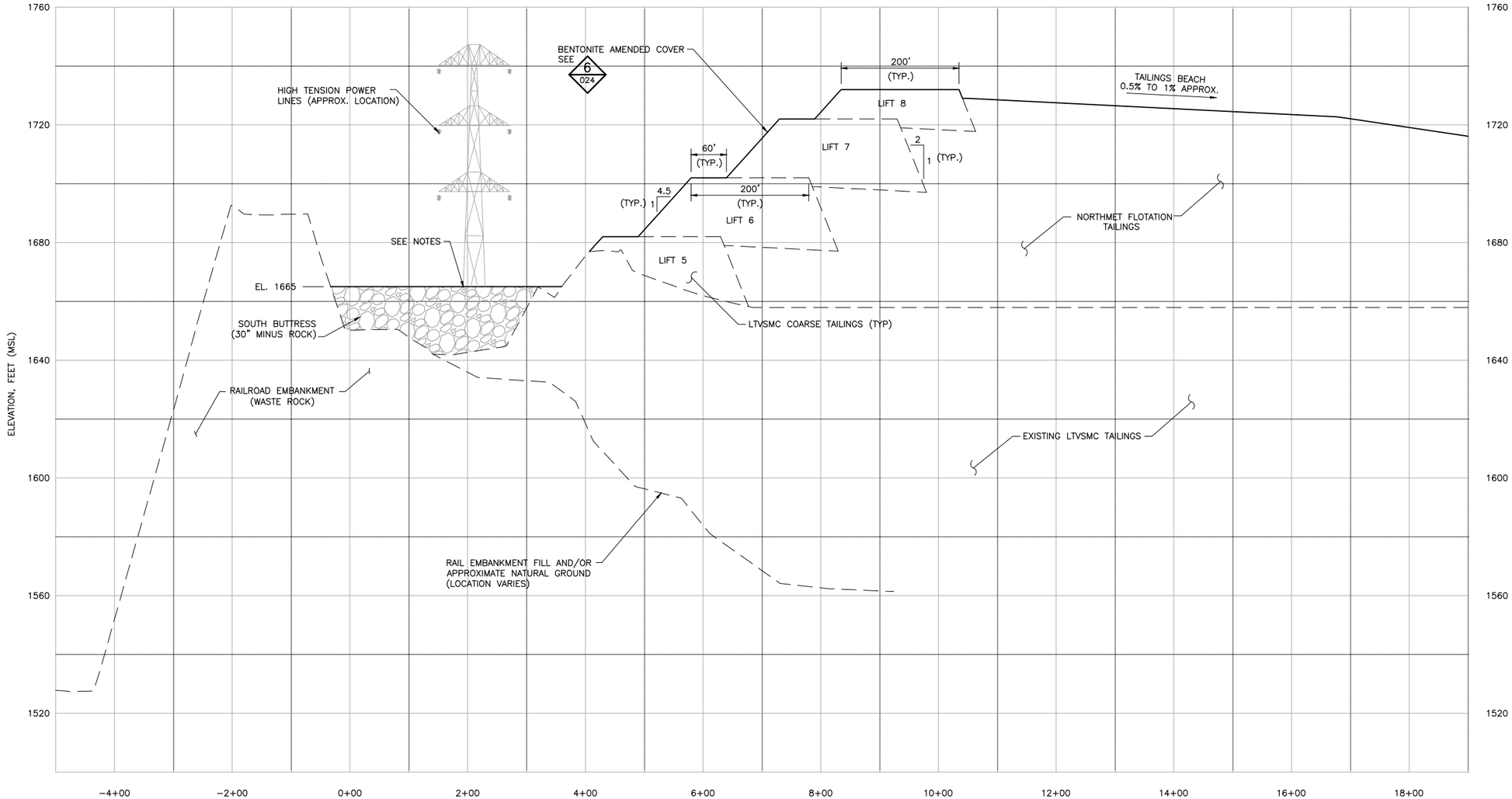

1 ELEVATION: SOUTH DAM TYPICAL CROSS SECTION

0 100 200

HORZ. SCALE IN FEET

NOTES:

1. DAM DIMENSIONS MAY CHANGE WITH EVALUATION OF FUTURE PERFORMANCE DATA.

2. HIGH TENSION POWER LINES SHOWN FOR REFERENCE. TOWER FOUNDATIONS ARE LOCATED OUTSIDE OF THE AREA COVERED BY THE BUTTRESS.

VER NO	DATE	DESCRIPTION
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PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN SOUTH DAM TYPICAL CROSS SECTIONS

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REV

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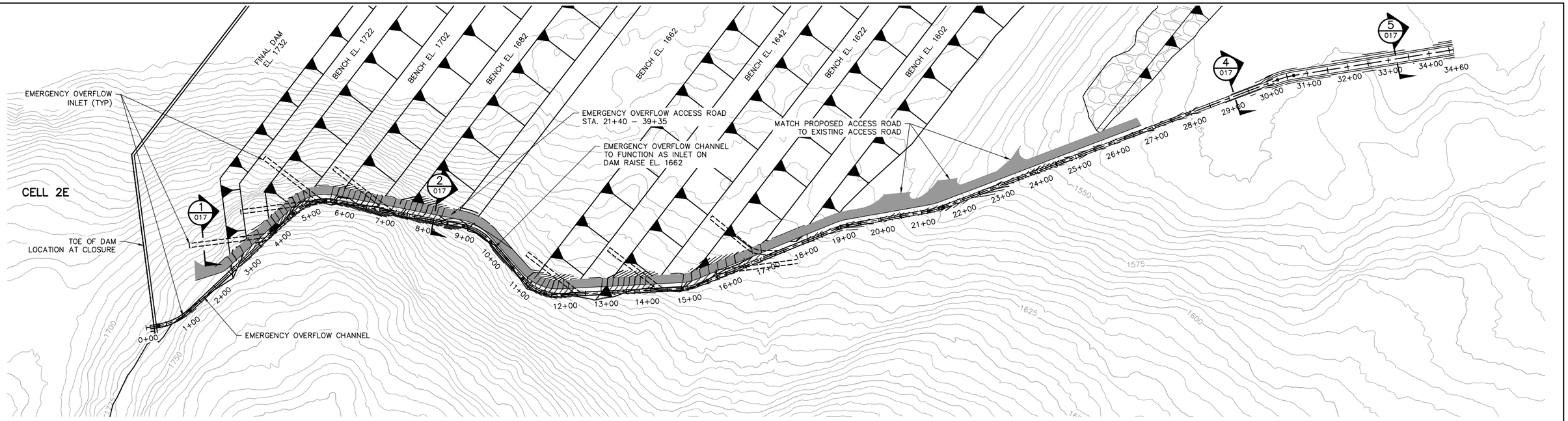
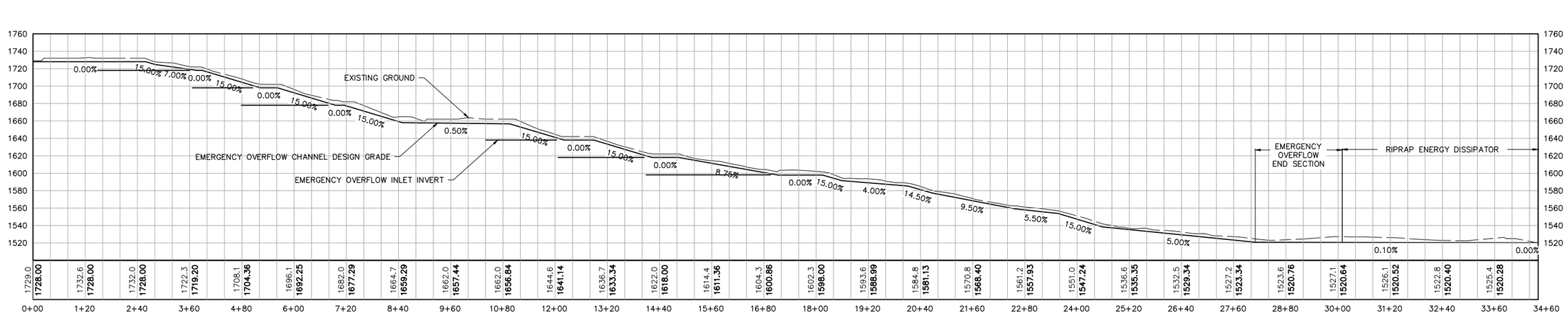


1 – PLAN: EMERGENCY OVERFLOW CHANNEL (OPERATIONS–PHASE)

0 120 240

SCALE IN FEET



2 – PROFILE: EMERGENCY OVERFLOW CHANNEL (OPERATIONS–PHASE)

0 120 240

HORIZONTAL SCALE IN FEET

0 60 120

VERTICAL SCALE IN FEET

VER NO	DATE	DESCRIPTION
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BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

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FLOTATION TAILINGS BASIN EMERGENCY OVERFLOW CHANNEL LAYOUT

POLYMET MINING

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DWG. NO. FTB–015

REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\23187B86-8BC2-4AEA-9171-5237B51A3593\A4BF3209-38E5-49B2-B1E2-75C3648F845E\PERMIT_NMT-02-CS-0115.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:30 PM

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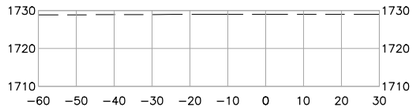

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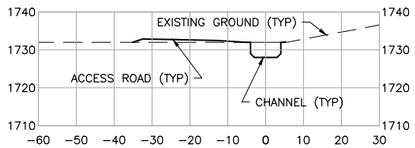

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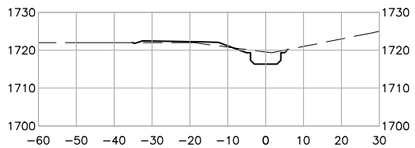

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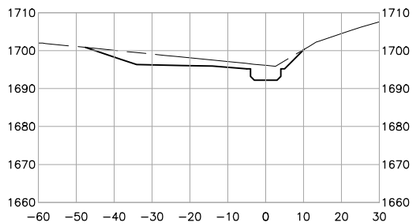

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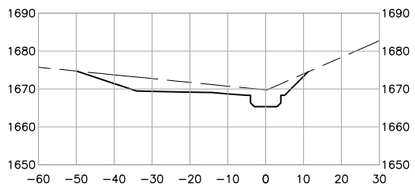

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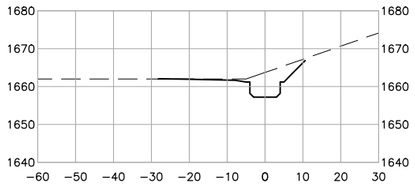

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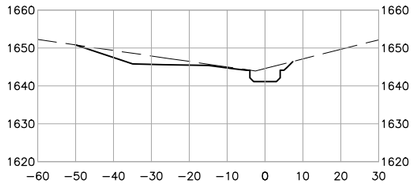

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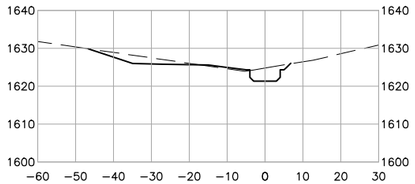

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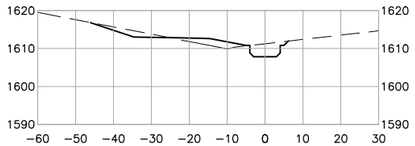

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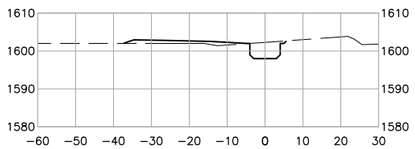

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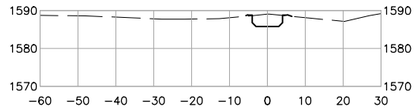

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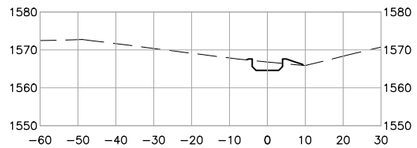

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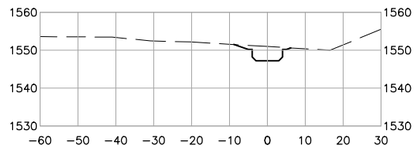

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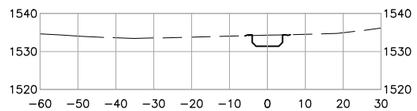

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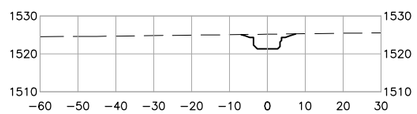

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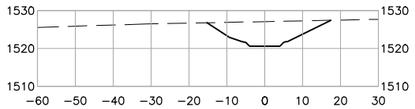

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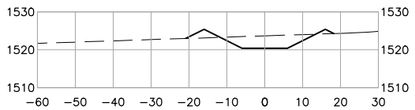

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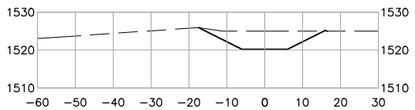
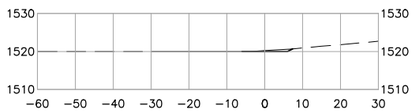


EMERGENCY OVERFLOW STA 34+60



1 SECTIONS: EMERGENCY OVERFLOW CHANNEL

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SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN EMERGENCY OVERFLOW CHANNEL SECTIONS

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BARR ENGINEERING COMPANY
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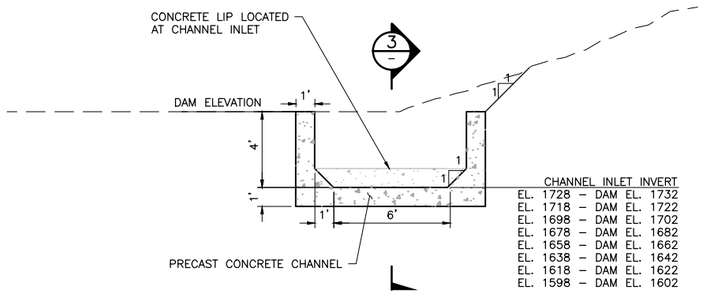
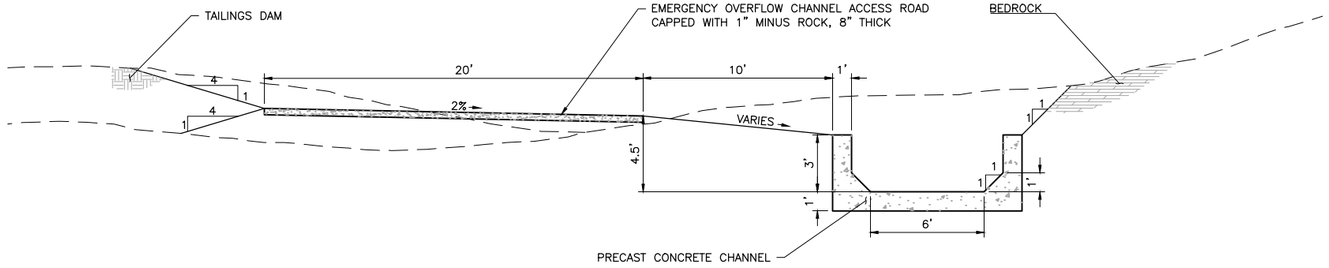
Ph: 1-800-632-2277

DWG. NO. FTB-016
REV

INCHES 1 2

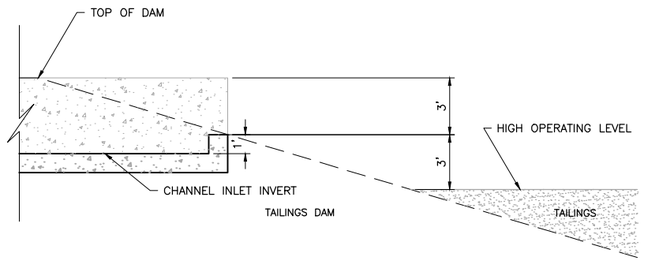


1/015 **SECTION: TYPICAL EMERGENCY OVERFLOW CHANNEL INLET**
NTS

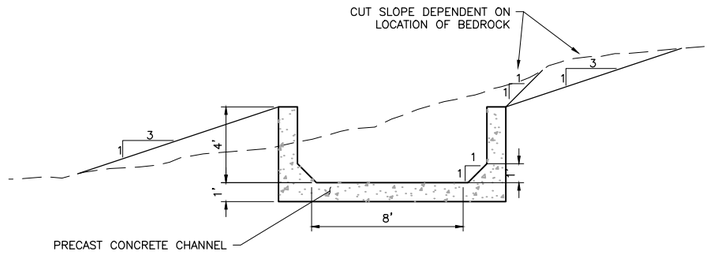


2/015 **SECTION: EMERGENCY OVERFLOW CHANNEL**
NTS

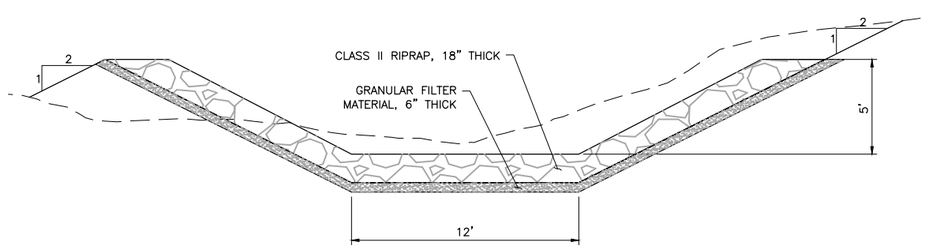
NOTE:
INCREASE EMERGENCY OVERFLOW CHANNEL DEPTH TO 4' WHEN CHANNEL SLOPE IS 0%



3/– **DETAIL: EMERGENCY OVERFLOW CHANNEL INLET**
NTS



4/015 **SECTION: EMERGENCY OVERFLOW CHANNEL END SECTION – STA. 28+10 – 30+10**
NTS



5/015 **SECTION: RIPRAP OVERFLOW CHANNEL ENERGY DISSIPATOR – STA. 30+10 – 34+60**
NTS

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FLOTATION TAILINGS BASIN EMERGENCY OVERFLOW CHANNEL DETAILS

POLYMET MINING

POLY MET MINING, INC.
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HOYT LAKES, MINNESOTA

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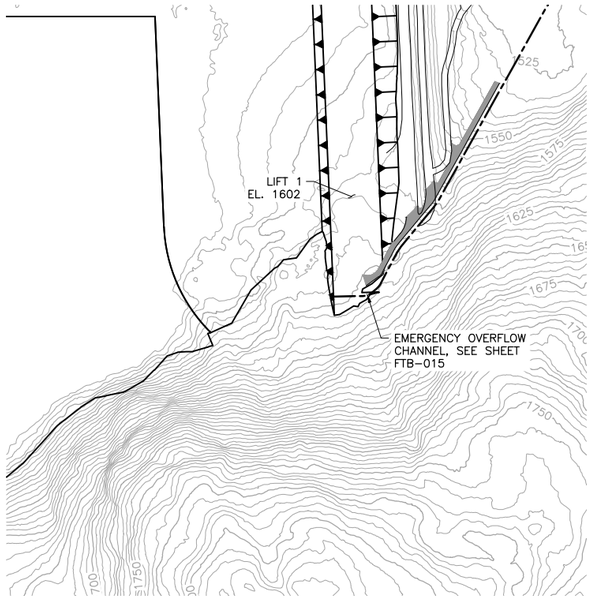
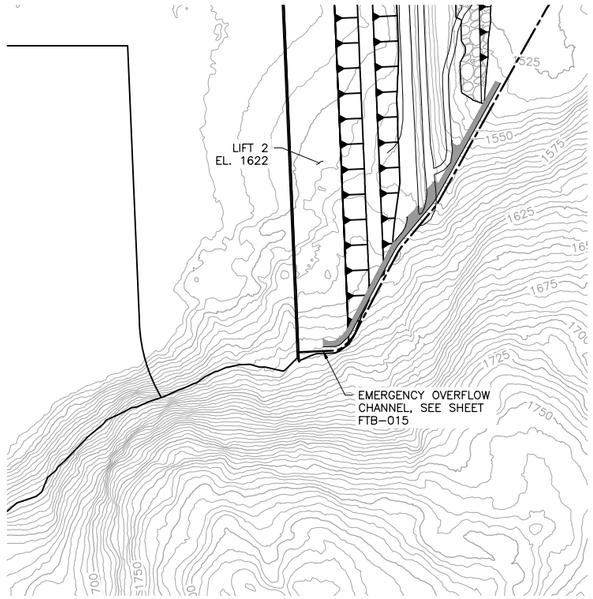
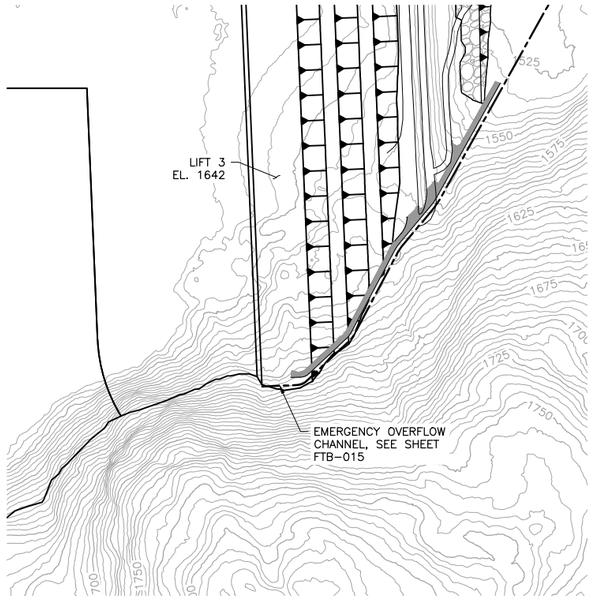
INCHES 1 2



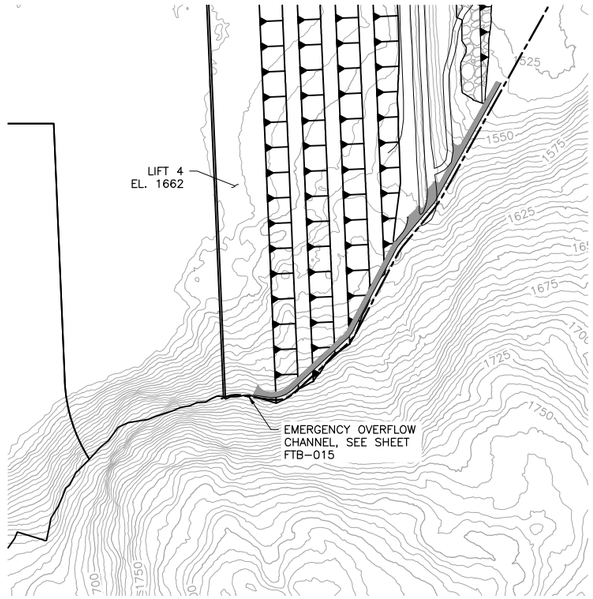
1 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 1



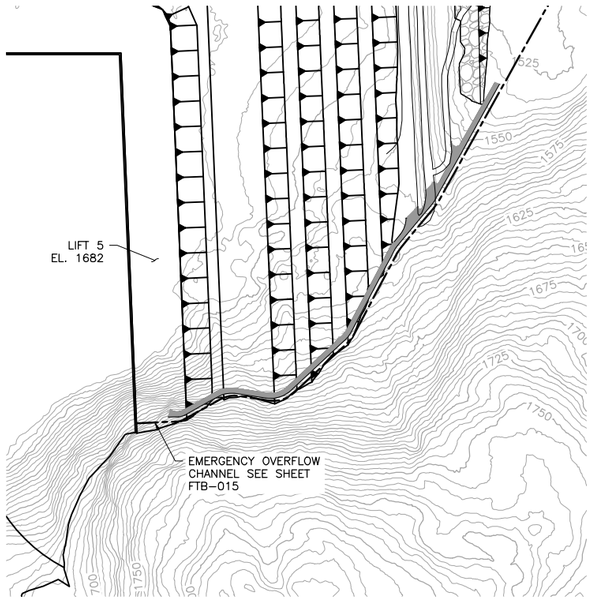
2 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 2



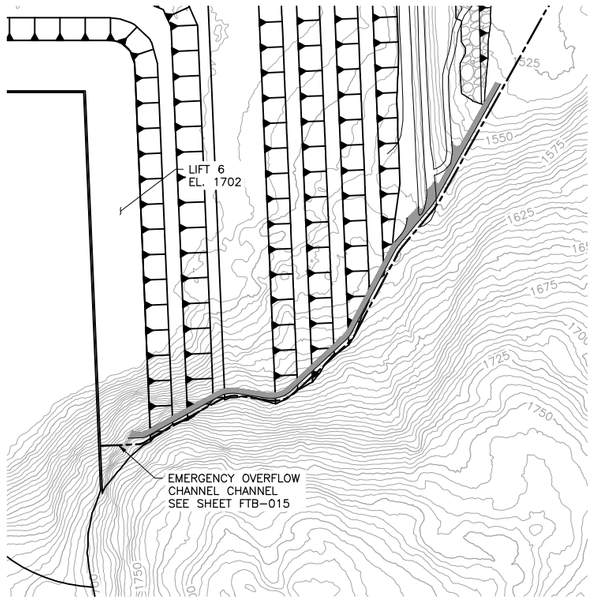
3 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 3



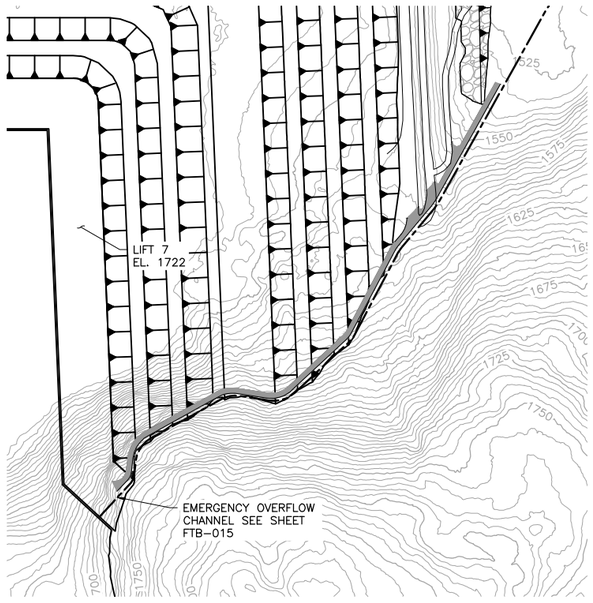
4 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 4



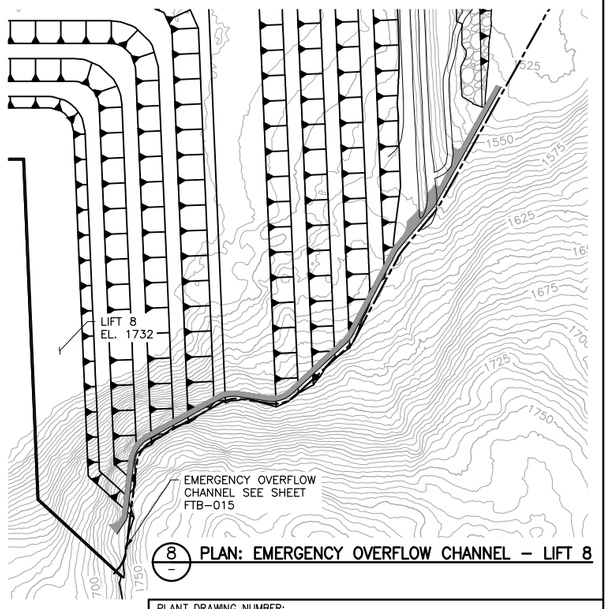
5 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 5



6 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 6



7 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 7



8 PLAN: EMERGENCY OVERFLOW CHANNEL – LIFT 8

N

0 300 600
SCALE IN FEET

NOTES:

1. EMERGENCY OVERFLOW CHANNEL PLAN VIEW NOT SHOWN, SEE SHEET FTB-015 FOR REFERENCE.

VER NO	DATE	DESCRIPTION
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5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	6	5/20/15
FOR CONSTRUCTION	–	–

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
EMERGENCY OVERFLOW CHANNEL
SEQUENCING

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

DWG. NO. FTB-018
REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\23187BB6-BBC2-4AEA-9171-5237B51A3893\144786AB-B5E0-4F91-BAC3-F95582D2B1EF\PERMIT_NMT-02-CS-018.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:35 PM

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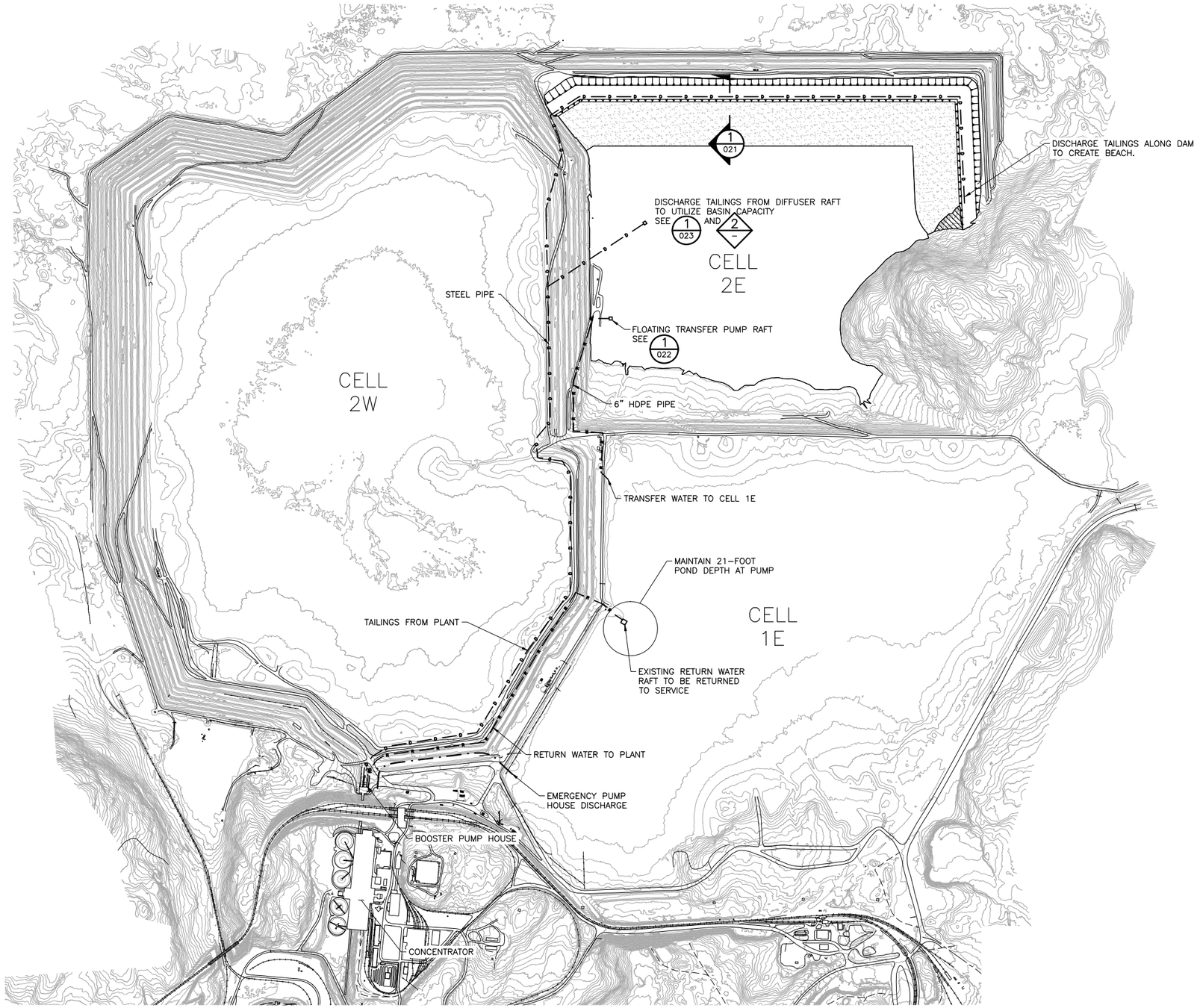

1 PLAN: PIPING LAYOUT CELL 2E

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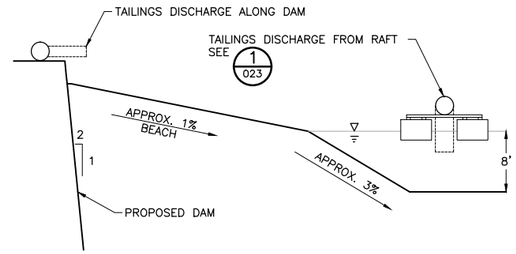
SCALE IN FEET



2 DETAIL: TAILINGS DISCHARGE ALONG DAM
NTS

NOTES:

1. CONTOURS DO NOT REFLECT BORROW REMOVAL.
2. PIPELINE LOCATIONS ARE PRELIMINARY.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
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6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	6	5/20/15
FOR CONSTRUCTION	–	–
NOT APPROVED FOR CONSTRUCTION		

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PRINTED NAME THOMAS J. RADUE
SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
PIPING LAYOUT CELL 2E

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

DWG. NO. FTB-019
REV

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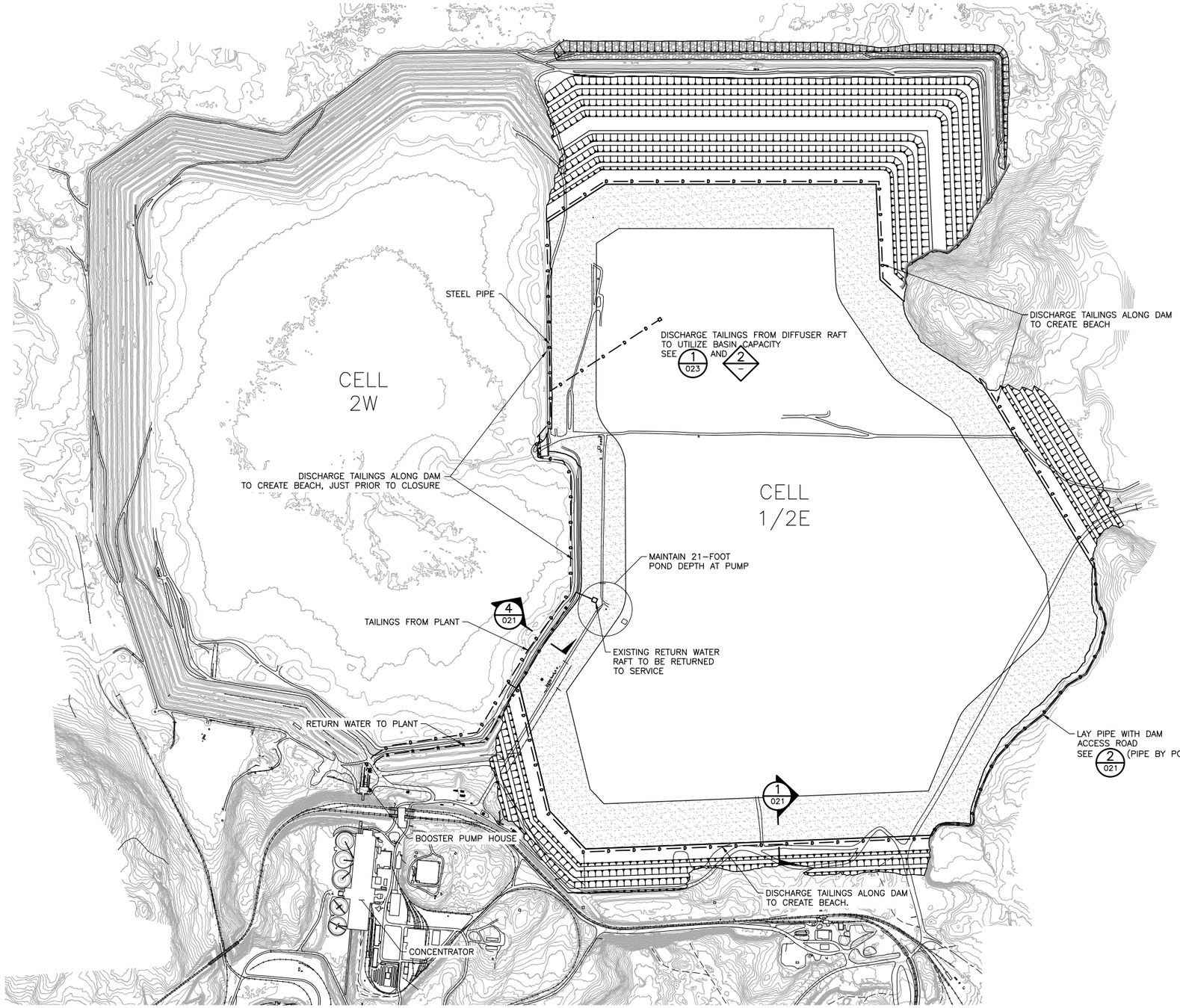
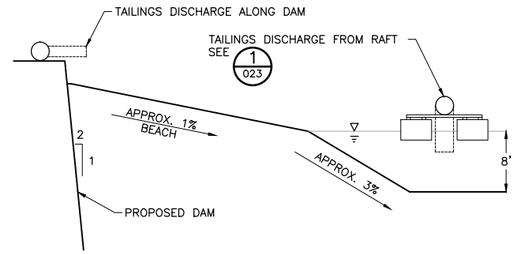


1/– PLAN: PIPING LAYOUT CELL 1/2E

0 800 1600
SCALE IN FEET



2/– DETAIL: TAILINGS DISCHARGE ALONG DAM
NTS

NOTES:

1. PIPELINE LOCATIONS ARE PRELIMINARY.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN PIPING LAYOUT CELL 1/2E

POLYMET MINING

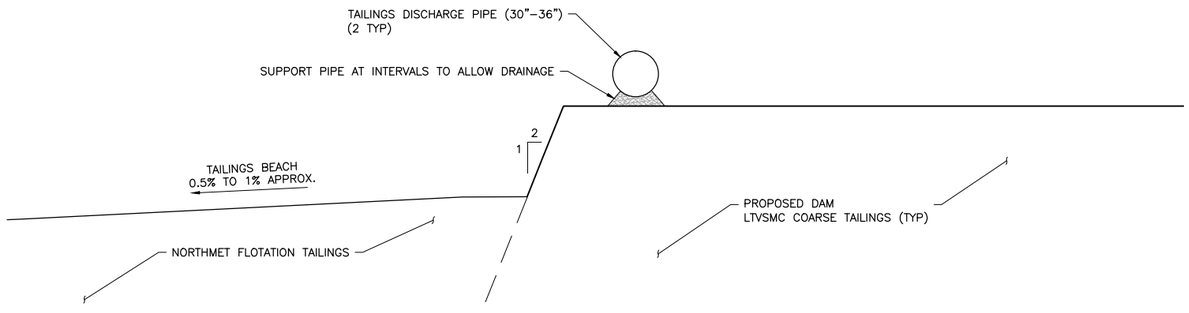
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

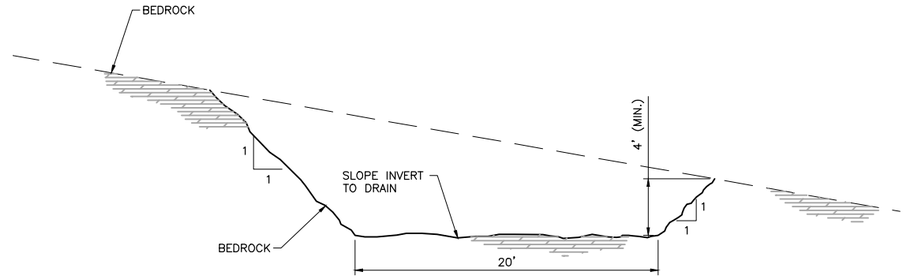
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. FTB–020
REV

INCHES 1 2



1 / 019 SECTION: TYPICAL PIPE LAYOUT
NTS



3 / 011 SECTION: CLOSURE EMERGENCY OVERFLOW
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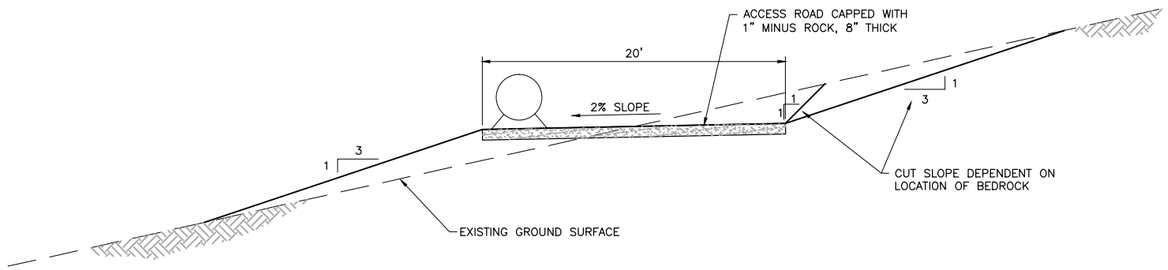
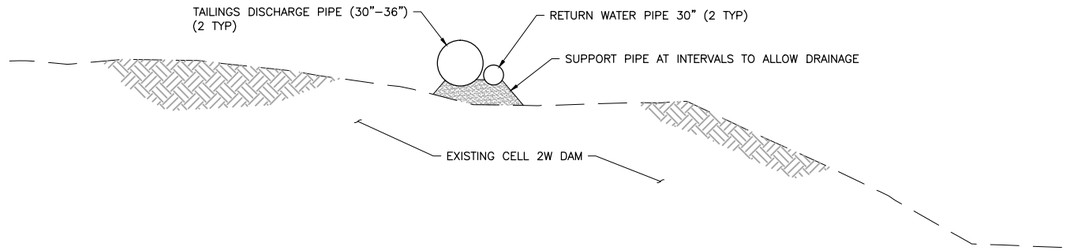


2 / 011,013,020 SECTION: DAM ACCESS ROAD
5 10
SCALE IN FEET



4 / 020 SECTION: TYPICAL RETURN PIPE LAYOUT
NTS

NOTES:

1. EMERGENCY OVERFLOW SIZING AND CONFIGURATION IS PRELIMINARY.
2. PIPELINE INFORMATION IS PRELIMINARY.
3. CONSTRUCT CLOSURE EMERGENCY OVERFLOW AT CLOSURE. OPERATIONS–PHASE EMERGENCY OVERFLOW TO BE MAINTAINED OR REMOVED AT OWNER'S DETERMINATION.
4. ALL PIPE SIZES SHOWN ARE PRELIMINARY.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. FTB–021
REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW IN\23187BB6-88C2-44EA-9171-5237B51A3893\60E159C1-EF6F-404A-BEFB-AB8857C9A469\PERMIT_NMT-02-CS-021.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:39 PM

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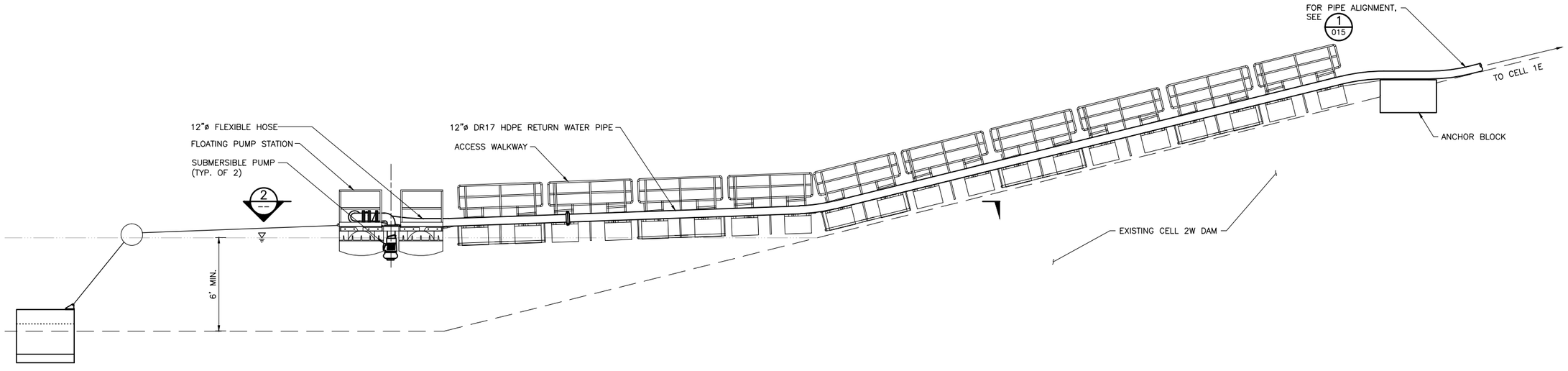

1/– ELEVATION: TRANSFER PUMP RAFT

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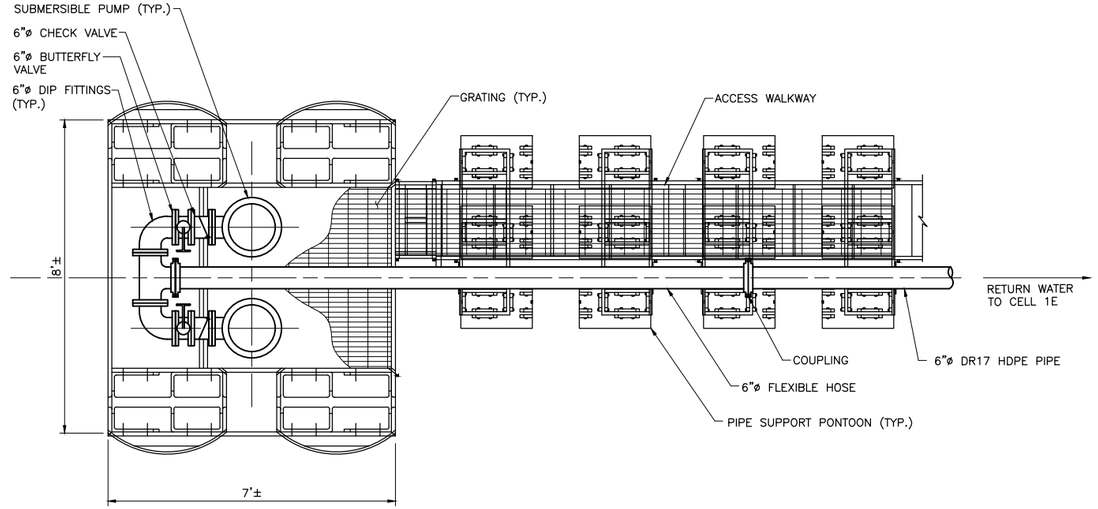
SCALE IN FEET



2/– PLAN: TRANSFER PUMP RAFT

0 2 4
SCALE IN FEET

NOTES:

1. ALL PIPE SIZES SHOWN ARE PRELIMINARY.

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
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DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN TRANSFER PUMP VENT

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTB-022 REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW W\23187B86-8BC2-46EA-9171-5237B51A3893\2CB24140-5EDC-409E-BFDB-061971C1CCEF\PERMIT_NMT-02-CS-022.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:40 PM

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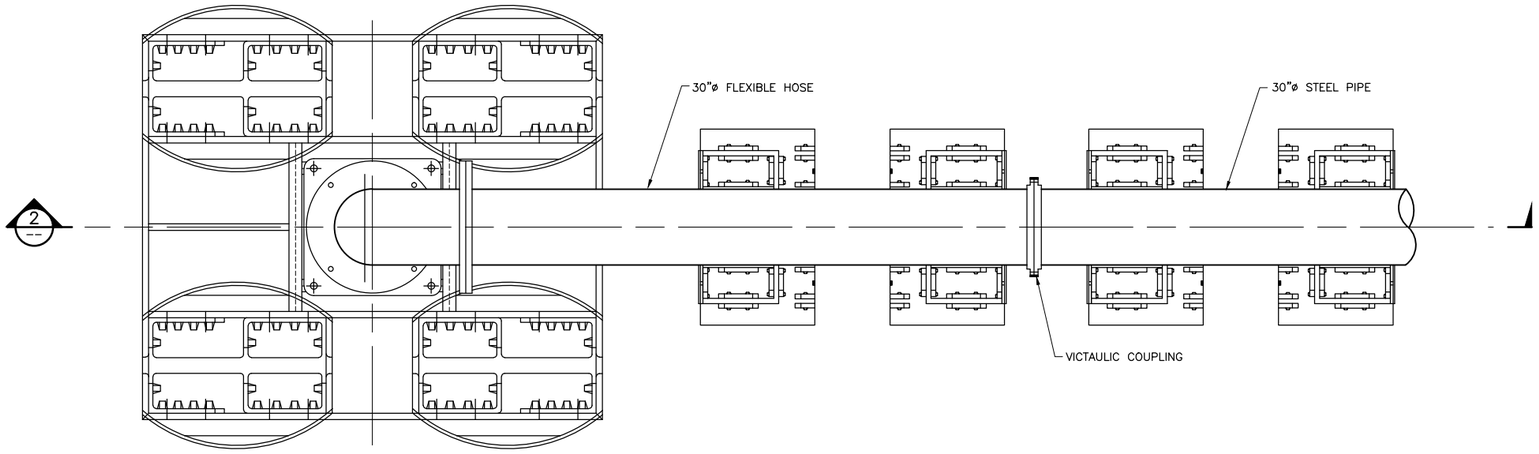
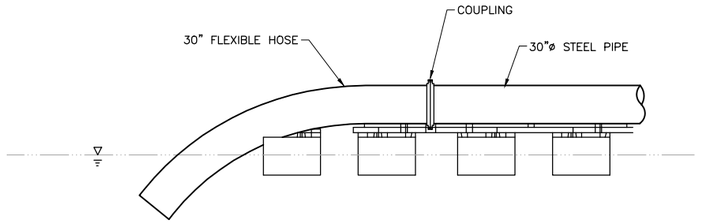
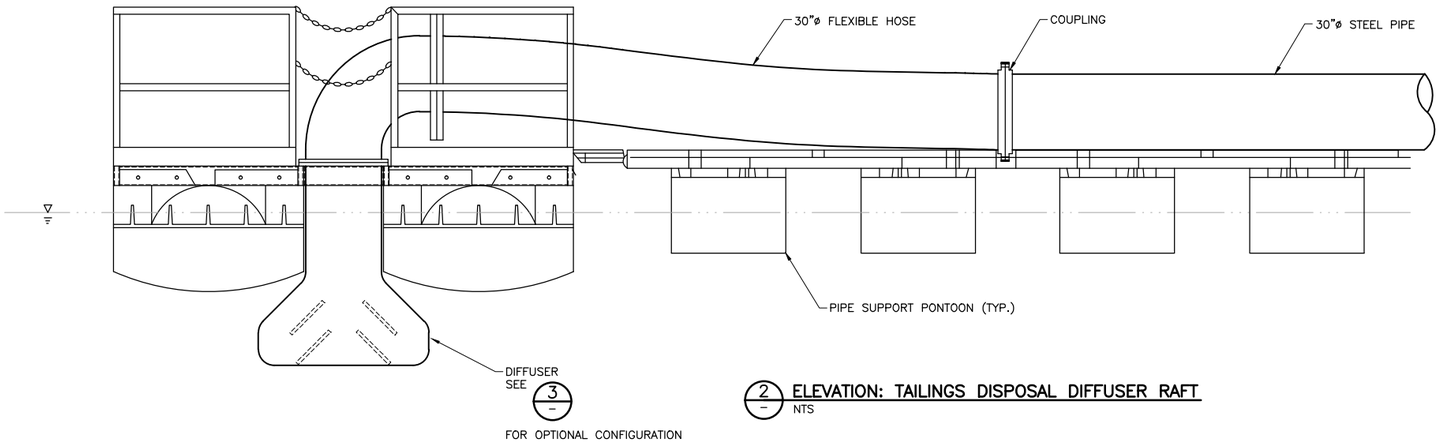


1 PLAN: TAILINGS DISPOSAL DIFFUSER RAFT
NTS



3 ELEVATION: PIPE OPEN END OPTION
NTS



2 ELEVATION: TAILINGS DISPOSAL DIFFUSER RAFT
NTS

NOTES:

1. ALL PIPE SIZES SHOWN ARE PRELIMINARY.

VER NO.	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
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SIGNATURE Thomas J. Radue
DATE 5/20/15 LICENSE# 20951

DRAWN: CAD
CHECKED: TJR
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN
TAILINGS DISPOSAL DIFFUSER RAFT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. FTB-023
REV

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\23187886-8BC2-44EA-9171-5237B51A3893\3A9FBEC1-3C9B-410A-B7AE-1AD10EF39175\FERMIT_INMT-02-CS-023.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:41 PM

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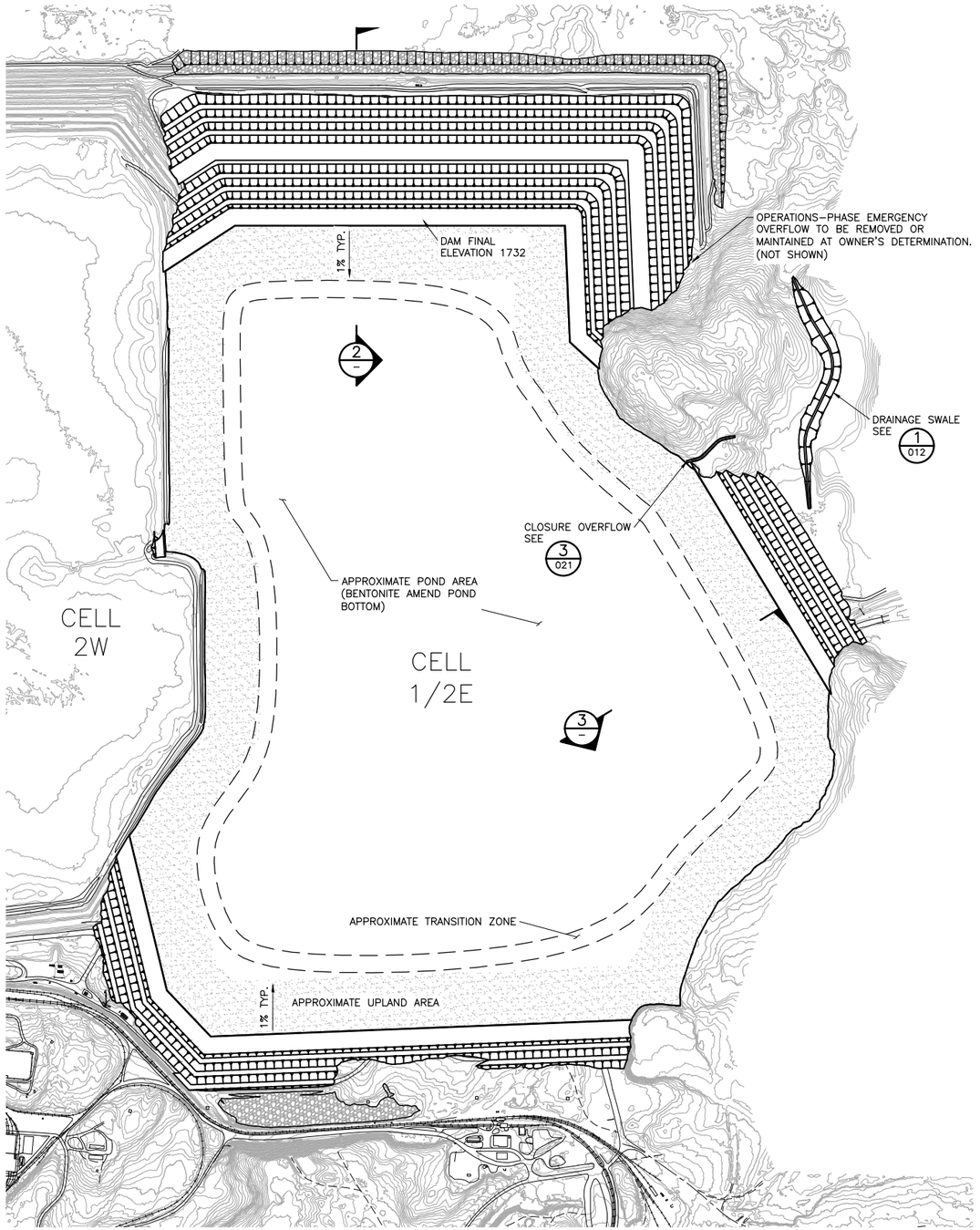

1/– PLAN: PROPOSED CLOSURE PLAN

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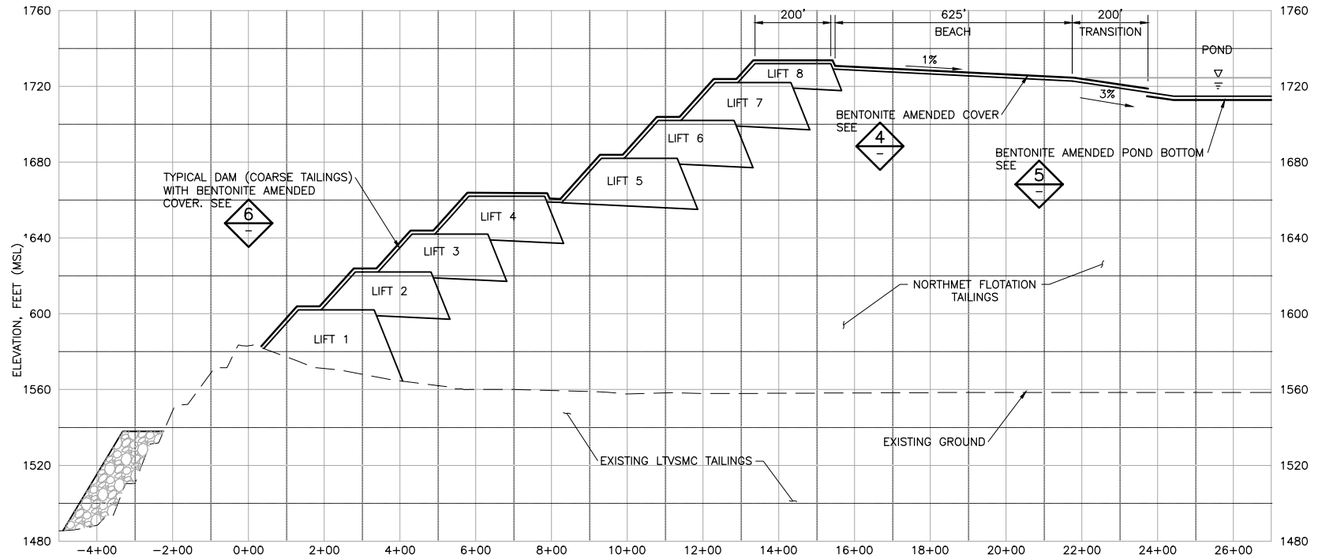
SCALE IN FEET



2/– SECTION: CELL 2E TAILINGS BASIN CLOSURE TYPICAL SECTION

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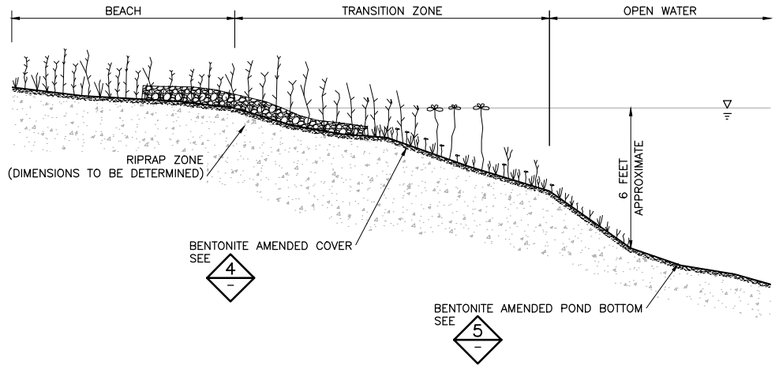
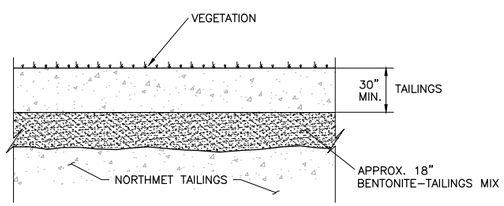
HORIZONTAL SCALE IN FEET



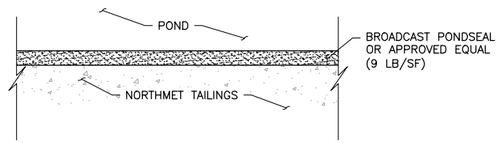
3/– SECTION: SCHEMATIC TAILINGS BASIN CLOSURE SURFACE

NTS



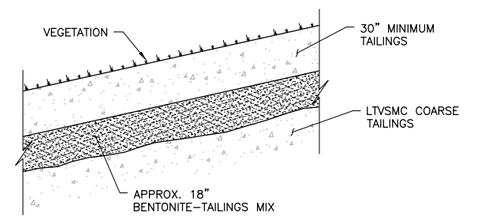
4/– DETAIL: BENTONITE AMENDED COVER

NTS



5/– DETAIL: BENTONITE AMENDED POND BOTTOM

NTS



6/– DETAIL: DAM SLOPE BENTONITE AMENDED COVER

NTS

VER NO	DATE	DESCRIPTION
1	10/14/11	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 1 – ATTACHMENT A
2	12/07/12	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 2 – ATTACHMENT A
3	04/12/13	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 3 – ATTACHMENT A
4	11/25/14	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 4 – ATTACHMENT A
5	03/03/15	FLOTATION TAILINGS MANAGEMENT PLAN – VERSION 5 – ATTACHMENT A
6	5/20/15	ISSUED FOR PERMIT TO MINE APPLICATION

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	6	5/20/15
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 THOMAS J. RADUE

SIGNATURE Thomas J. Radue

DATE 5/20/15 LICENSE# 20951

DRAWN: CAD

CHECKED: TJR

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

FLOTATION TAILINGS BASIN CLOSURE PLAN

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

DWG. NO. FTB-024

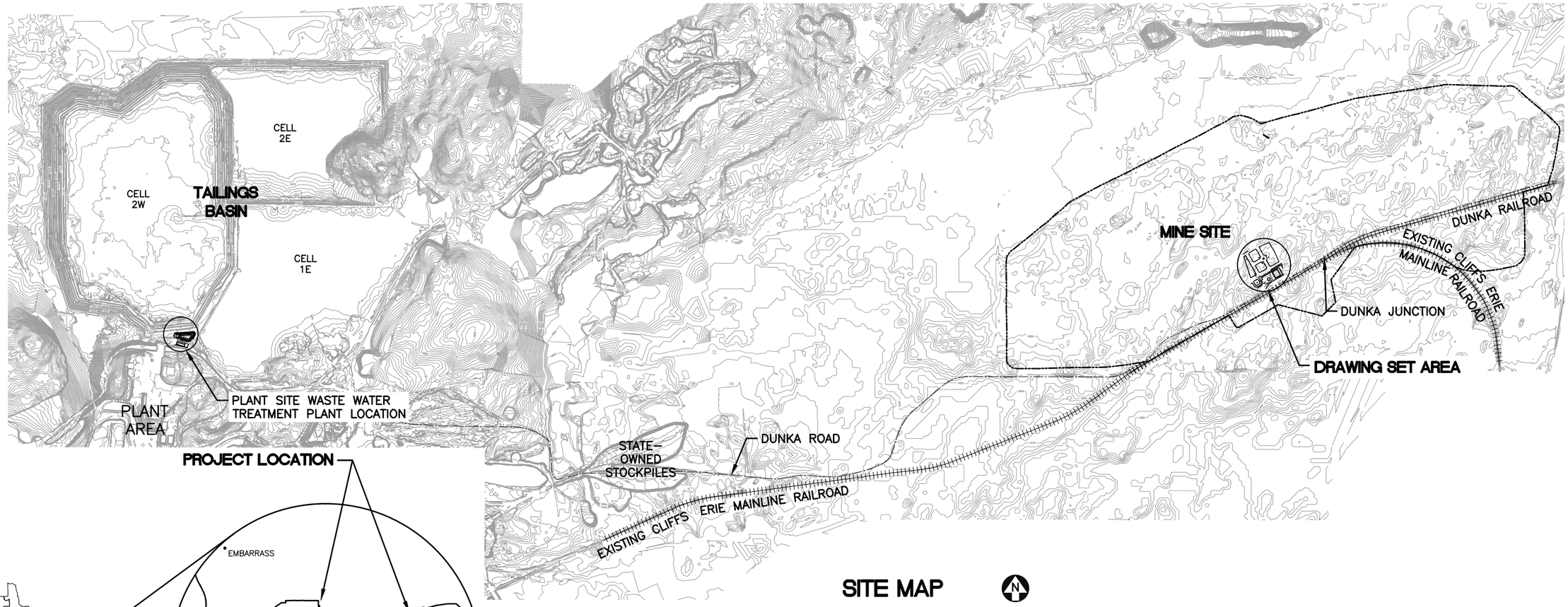
REV

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\23187B86-88C2-4AEA-9171-5237B51A3893\V8B8B4C3D-0FCB-406A-B408-5EDEA40B6032\PERMIT_NMT-02-CS-024.DWG PLOT SCALE: 1:2 PLOT DATE: 5/26/2015 2:42 PM

INCHES 1 2

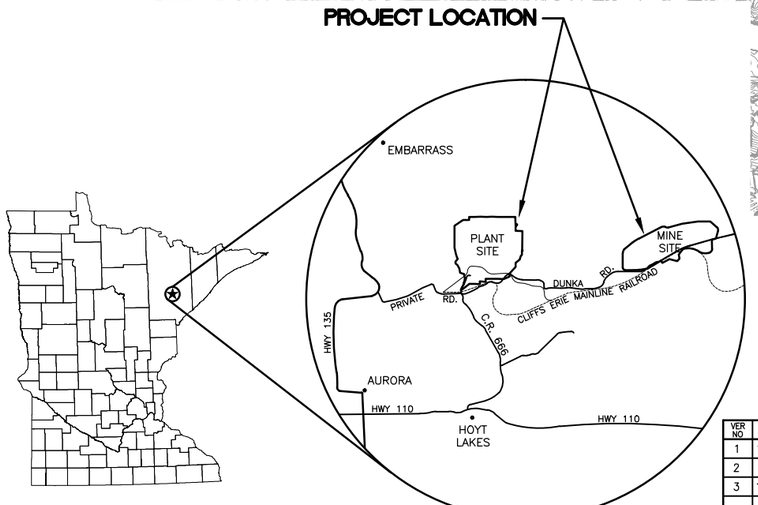
Wastewater Treatment Facility

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
MINE SITE WASTE WATER TREATMENT FACILITY
HOYT LAKES, MINNESOTA



SITE MAP

0 2000 4000
SCALE IN FEET



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO.	DATE	DESCRIPTION
1	10/18/11	WATER MANAGEMENT PLAN SUBMITTAL
2	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
3	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	3	12/22/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME JEFF S. UBL
SIGNATURE _____
DATE 12/22/15 LICENSE# 19646

DRAWN: CMB2
CHECKED: JSU
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
LOCATION MAP AND SITE MAP

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-001
REV

CADD USER: Veronica Wourms FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-43-TS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 12:53 PM
INCHES 1 2

DRAWING INDEX

DRAWING NO.	TITLE
GENERAL DRAWINGS	
TITLE SHEET	
WWTF–001	LOCATION MAP AND SITE MAP
WWTF–002	LEGEND, ABBREVIATIONS, AND DRAWING INDEX
CIVIL – SITEWORK	
WWTF–003	EXISTING SITE PLAN
WWTF–004	SITE GRADING PLAN AND CONSTRUCTION LIMITS
WWTF–005	YARD PIPING PLAN
WWTF–006	BASINS LINER PLAN
WWTF–007	BASINS – INLET AND OUTLET SECTIONS
WWTF–008	BASINS – SECTION AND DETAILS
WWTF–009	YARD PIPING SECTIONS AND DETAILS
WWTF–010	NOT USED
WWTF–011	NOT USED
CIVIL – UTILITIES	
WWTF–012	SPLITTER STRUCTURE – UPPER LEVEL PLAN
WWTF–013	SPLITTER STRUCTURE – LOWER LEVEL PLAN
WWTF–014	SPLITTER STRUCTURE – SECTION
MECHANICAL – MISCELLANEOUS	
WWTF–015	MECHANICAL SYMBOLS AND LEGEND
MECHANICAL – FLOWSHEETS, P&ID'S, ETC.	
WWTF–016	HYDRAULIC PROFILE
WWTF–017	HYDRAULIC PROFILE – RESIDUALS
WWTF–018	PROCESS FLOW DIAGRAM OVERVIEW
WWTF–019	PROCESS FLOW DIAGRAM – EQUALIZATION BASINS
WWTF–020	PROCESS FLOW DIAGRAM – CHEMICAL PRECIPITATION OVERVIEW
WWTF–021	PROCESS FLOW DIAGRAM – HDS METALS REMOVAL
WWTF–022	PROCESS FLOW DIAGRAM – SULFATE REMOVAL
WWTF–023	PROCESS FLOW DIAGRAM – RECARBONATION
WWTF–024	PROCESS FLOW DIAGRAM – GREENSAND FILTERS AND PRIMARY MEMBRANES
WWTF–025	PROCESS FLOW DIAGRAM – SECONDARY MEMBRANES
WWTF–026	PROCESS FLOW DIAGRAM – SOLIDS HANDLING
WWTF–027	PROCESS FLOW DIAGRAM – LIME SYSTEM
WWTF–028	PROCESS FLOW DIAGRAM – CARBON DIOXIDE SYSTEM
WWTF–029	PROCESS FLOW DIAGRAM – CHEMICAL SYSTEMS
WWTF–030	PROCESS FLOW DIAGRAM – PLANT WATER SYSTEM
MECHANICAL LAYOUTS	
WWTF–031	OVERALL GENERAL ARRANGEMENT
WWTF–032	GENERAL ARRANGEMENT – MEDIA FILTER AND PRIMARY MEMBRANE AREA
WWTF–033	GENERAL ARRANGEMENT – SECONDARY MEMBRANE AREA
WWTF–034	GENERAL ARRANGEMENT – CHEMICAL PRECIPITATION AREA
WWTF–035	GENERAL ARRANGEMENT – SOLIDS HANDLING AREA
WWTF–036	GENERAL ARRANGEMENT – CHEMICAL STORAGE AREA

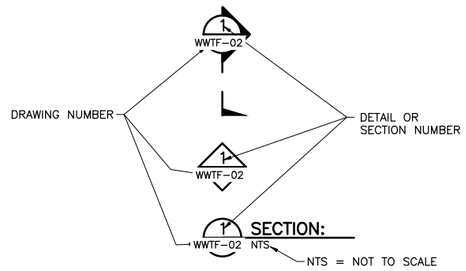
GENERAL LEGEND

- 1000 — EXISTING CONTOUR – MAJOR
- EXISTING CONTOUR – MINOR
- 1000 — PROPOSED CONTOUR – MAJOR
- PROPOSED CONTOUR – MINOR
- EXISTING POWER POLE
- U — UNIDENTIFIED
- EXISTING RAILROAD
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING UNIMPROVED TRAIL
- EXISTING STRUCTURES
- TREE LINE
- WETLAND BOUNDARY
- EXISTING CULVERT
- P — EXISTING PIPELINE
- MnDOT CATEGORY 4 EROSION CONTROL BLANKET
- INLET PROTECTION AND DITCH CHECKS
- MnDOT TYPE 4 MULCH
- PROPOSED CULVERT (NON–MINE DRAINAGE)
- PROPOSED MANHOLE
- PROPOSED RIPRAP
- PROPOSED SILT FENCE
- PROPOSED PIPELINE
- CONSTRUCTION LIMITS
- PROPOSED STRUCTURES
- PROPOSED STRUCTURE EXPANSION
- PROPOSED ROAD
- SURFACE DRAINAGE
- TWP — TWP ALIGNMENT
- PROPOSED RAIL ROAD

GENERAL ABBREVIATIONS

TWP – TREATED WATER PIPELINE
CPS – CENTRAL PUMPING STATION
WWTP – WASTE WATER TREATMENT PLANT
WWTF – WASTE WATER TREATMENT FACILITY
CATEGORY 1 STOCKPILE – CATEGORY 1 WASTE ROCK STOCKPILE
OSLA – OVERBURDEN STORAGE AND LAYDOWN AREA
CIP – CAST IN PLACE ~OR~ CLEAN IN PLACE
CMU– CONCRETE MASONRY UNIT
PEP – POLYETHYLENE PIPE
ø – DIAMETER
MIN – MINIMUM
GAL. – GALLON
APPROX. – APPROXIMATE
DWG – DRAWING
EL – ELEVATION
NTS – NOT TO SCALE
TYP – TYPICAL
MnDOT – MINNESOTA DEPARTMENT OF TRANSPORTATION
HDPE – HIGH DENSITY POLYETHYLENE
RCP – REINFORCED CONCRETE PIPE
GCL – GEOSYNTHETIC CLAY LINER
DIP – DUCTILE IRON PIPE
FFE – FINISHED FLOOR ELEVATION
MIL – MILLIMETER
RTH – RAIL TRANSFER HOPPER
EQ – EQUALIZATION

DRAWING NUMBERING



NOTES

1. COORDINATE SYSTEM IS MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.
4. ALL EXISTING SUBSURFACE UTILITY INFORMATION SHOWN ON DRAWINGS SHALL BE CONSIDERED QUALITY LEVEL D (QL–D) AS DEFINED BY THE STANDARD GUIDELINES FOR THE COLLECTION DEPICTION OF EXISTING SUBSURFACE UTILITY DATA (ASCE, 2003) UNLESS OTHERWISE SPECIFIED.

VER NO	DATE	DESCRIPTION
1	10/18/11	WATER MANAGEMENT PLAN SUBMITTAL
2	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
3	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	3	12/22/15
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 JEFF S. UBL
SIGNATURE
DATE 12/22/15 LICENSE# 19646

DRAWN: CMB2
CHECKED: JSU
BARR PROJECT NO.: 23/69–0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
LEGEND, ABBREVIATIONS, AND DRAWING INDEX

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. WWTF–002
REV

CADD USER: Adeptuser FILE: \\PWHB\HBBINC PW\HBB PW IN\1777A3EB–7110–4D79–9A82–0040B1123F1E\6E127169–4970–4C08–A473–C3ADE94ABE0E\PERMIT_NMM–43–TS–002.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:53 AM
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CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\01F71EC3-7AA7-4BDF-81F6-B8A1E4F4528A\C2C12009-F18B-4099-BD68-DCD4FCFCE57A\PERMIT_NMM-43-CS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 10:06 AM

EXISTING CLIFFS ERIE MAINLINE RAILROAD

EXISTING DUNKA ROAD ℄

EXISTING TREE LINE

CONSTRUCTION LIMITS

EXISTING CULVERT

EXISTING WETLAND (TYP.)

1 PLAN: EXISTING CONDITIONS

0 100 200
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME JEFF S. UBL

SIGNATURE

DATE 5/21/15 LICENSE# 19646

DRAWN: CMB2

CHECKED: JSU

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
EXISTING SITE PLAN

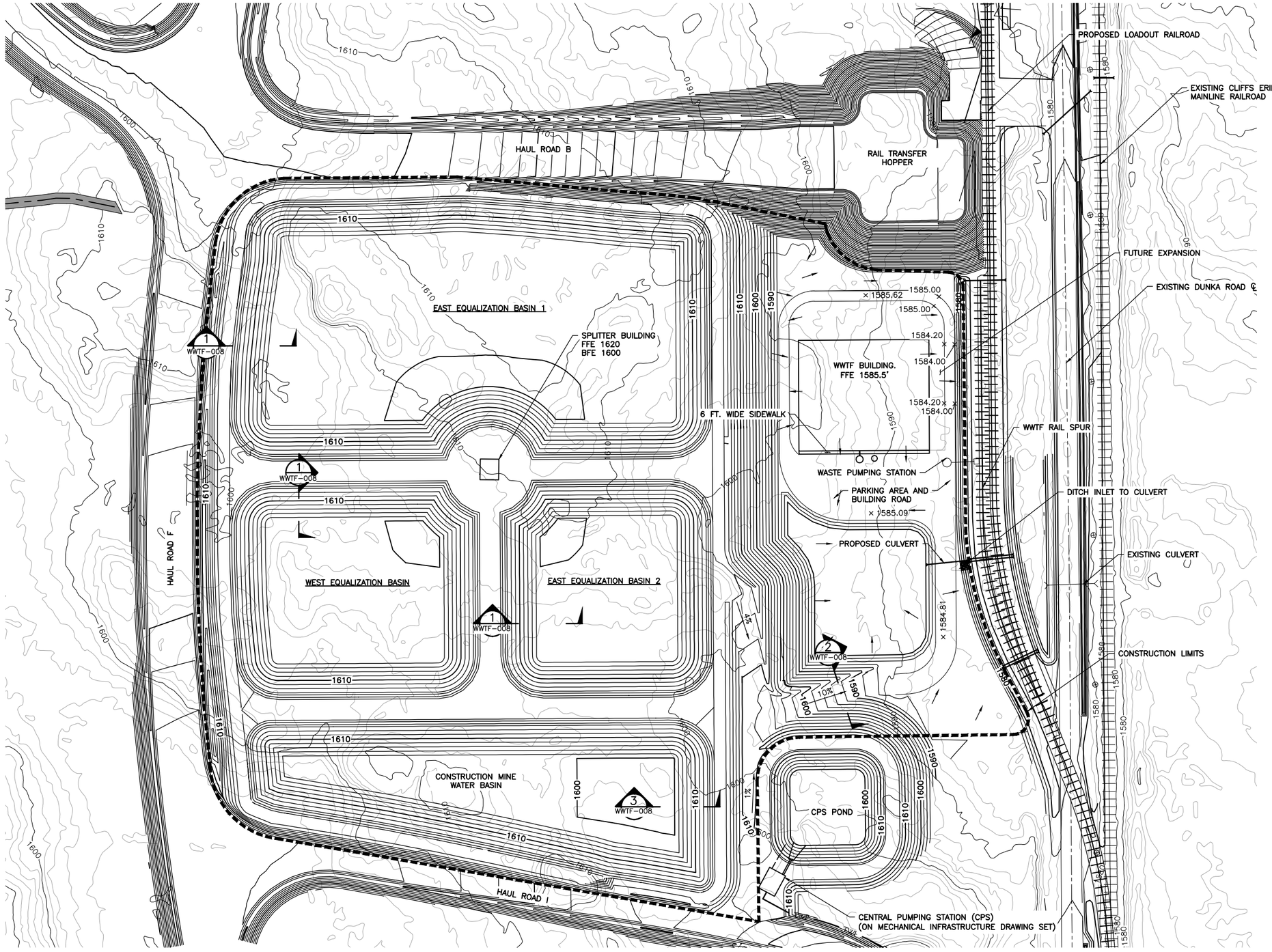
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-003

REV

CADD USER: Amanda Sachi FILE: K:\DESIGN\23690C29.10\PERMIT_NWM-43-CS-002.DWG PLOT SCALE: 1:2 PLOT DATE: 2/3/2016 4:08 PM



NOTE:

PROPOSED FEATURES SHOWN OUTSIDE OF CONSTRUCTION LIMITS ARE SHOWN ON OTHER DRAWING SETS.

1 — PLAN: EQUALIZATION BASINS AND ACCESS ROADS

0 100 200
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	10/18/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
4	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
5	2/2/16	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	5	2/2/16
FOR CONSTRUCTION		

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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 2/2/16 LICENSE# 19646

DRAWN: CMB2
CHECKED: JSU
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF SITE GRADING PLAN AND CONSTRUCTION LIMITS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-004
REV

INCHES 1 2

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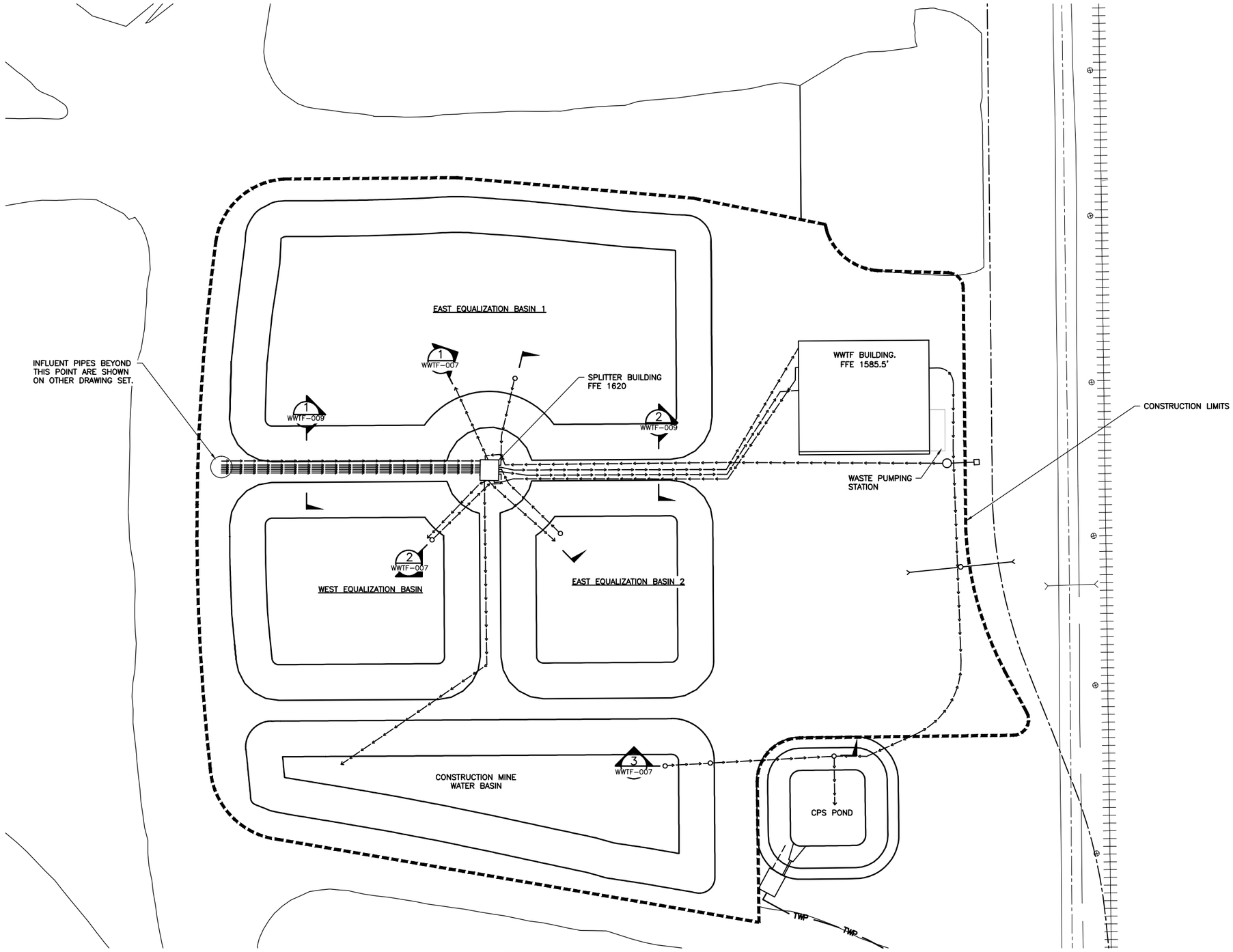

1 PLAN: OVERALL PIPING PLAN

0 100 200
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 12/22/15 LICENSE# 19646

DRAWN: CMB2
CHECKED: JSU
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
YARD PIPING PLAN

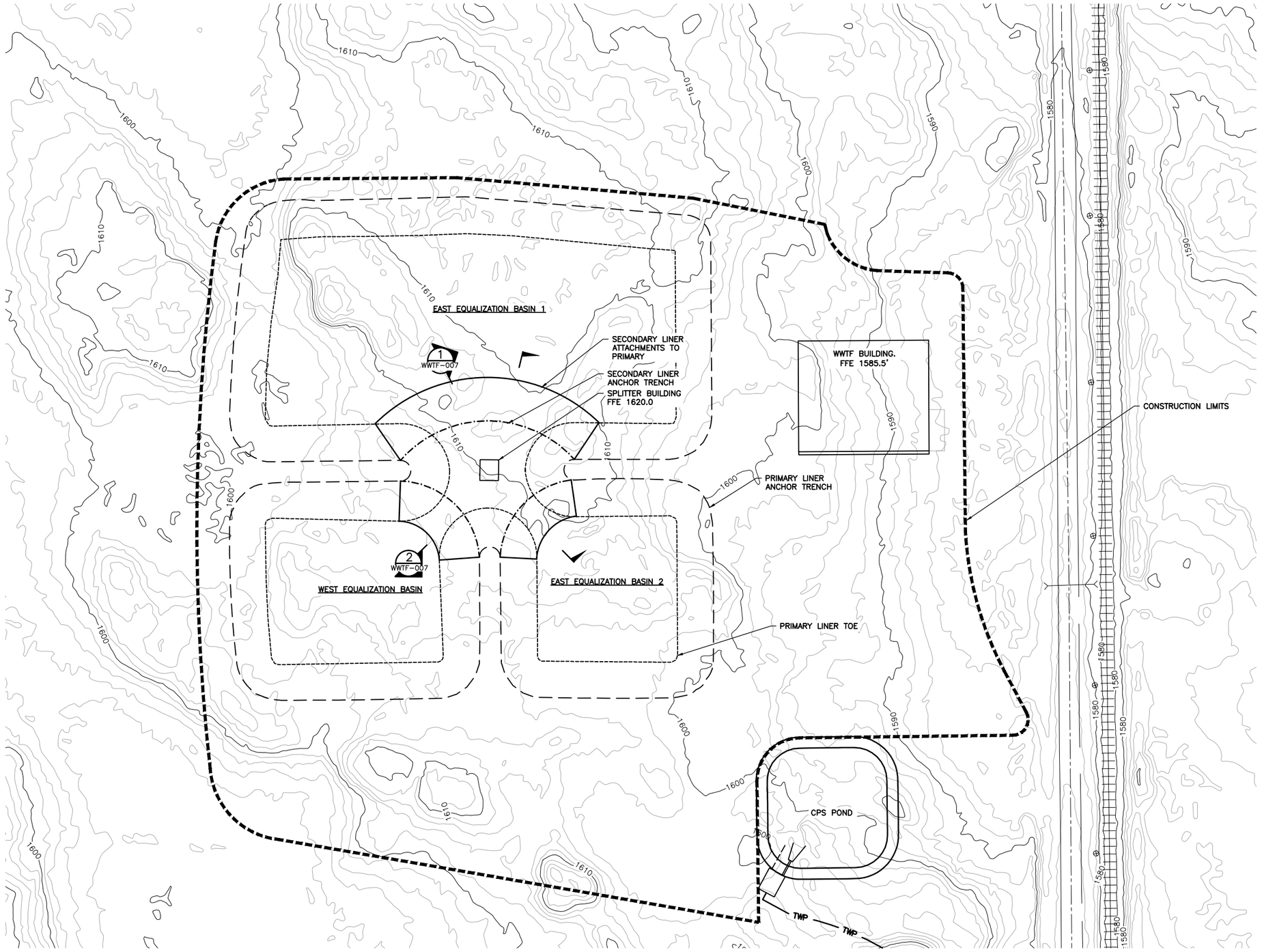
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-005
REV

INCHES 1 2



1 PLAN: OVERALL LINER PLAN

0 100 200
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	12/22/15
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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 12/22/15 LICENSE# 19646

DRAWN: CMB2
CHECKED: JSU
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
BASINS LINER PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-006
REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMM-43-CS-004.DWG PLOT SCALE: 1:2 PLOT DATE: 12/21/2015 2:19 PM

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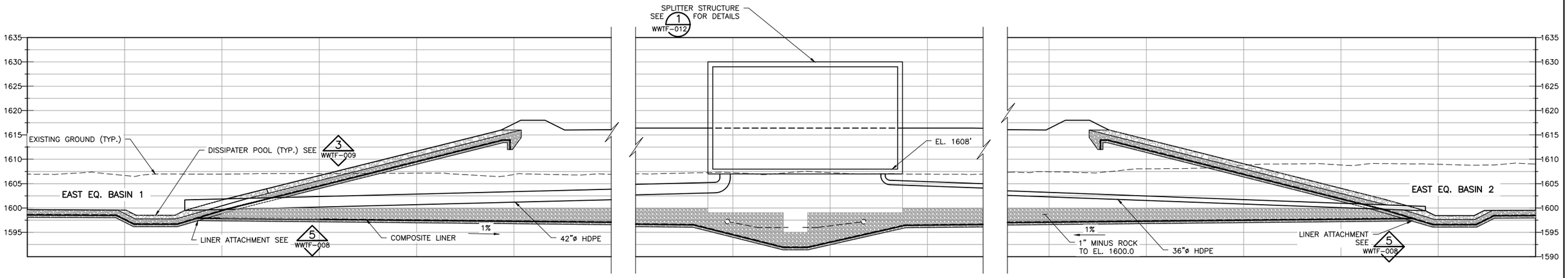
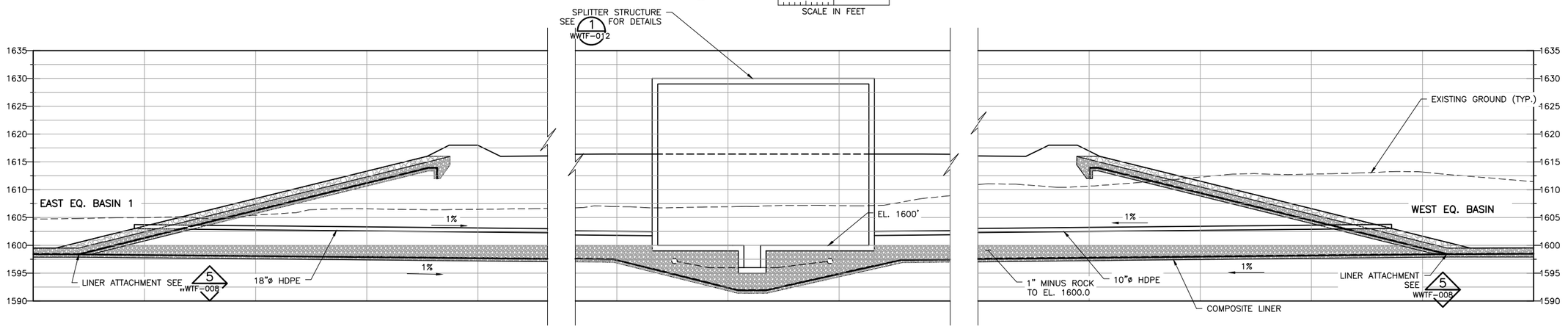


1 SECTION: BASINS INLET STRUCTURES
WWTF-005, WWTF-006

0 10 20
SCALE IN FEET



2 SECTION: BASINS OUTLET STRUCTURES
WWTF-005, WWTF-006

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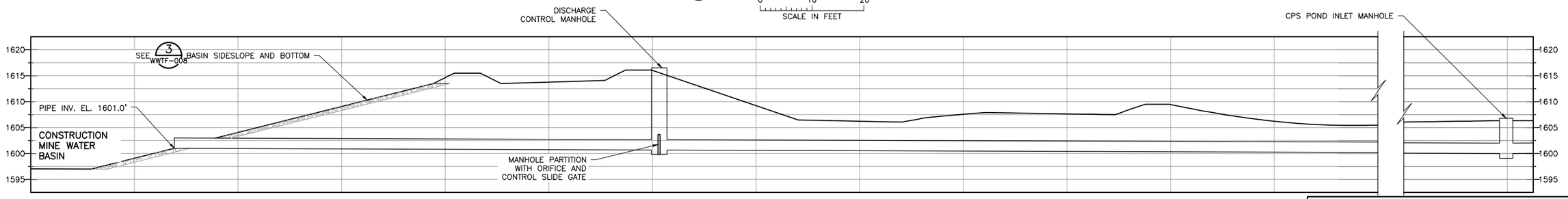

3 SECTION: CONSTRUCTION MINE WATER BASIN TO CPS
WWTF-005

0 10 20
SCALE IN FEET

NOTE:

PIPE DIAMETERS AR PRELIMINARY

VER NO.	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 12/22/15 LICENSE# 19646

DRAWN: CMB2
CHECKED: JSU
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
BASINS INLET AND OUTLET SECTIONS

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

DWG. NO. WWTF-007

REV

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\177A3EB-7110-4D79-9482-0040B1123F1E\AEB154DD-BB9A-4382-A5AB-1C15DDD73D15\PERMIT_NMM-43-CS-005.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:18 AM

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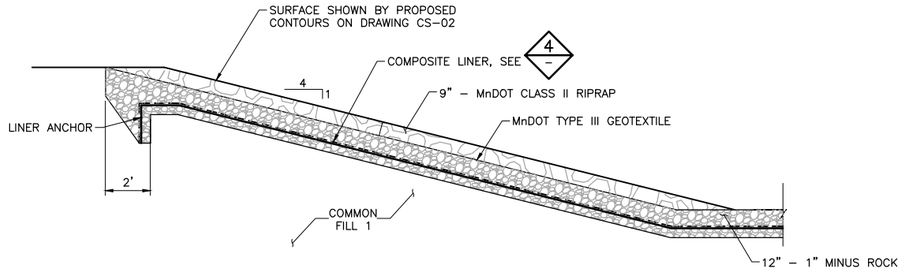
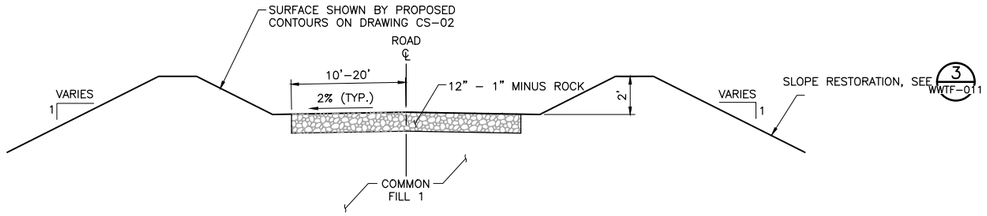


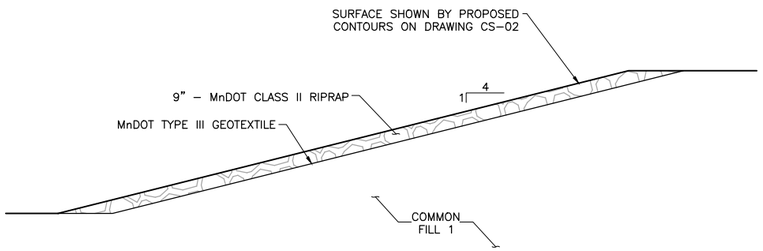
1 WWTF-004 **SECTION: LINED BASIN SIDESLOPE AND BOTTOM (TYP.)**

0 4 8
SCALE IN FEET

NOTE:
SEE DETAIL 5/- FOR SIDESLOPE LINER NEAR SPLITTER BUILDING

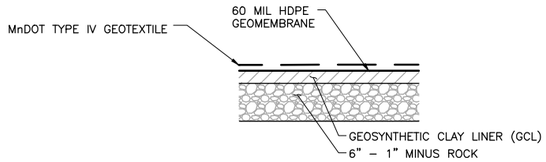


2 WWTF-004 **SECTION: ACCESS/SERVICE ROAD (TYP.)**
NOT TO SCALE

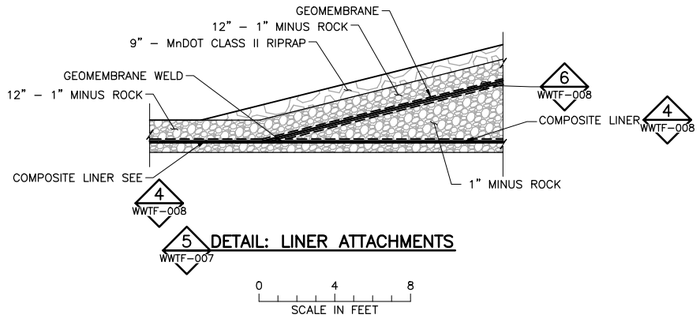


3 WWTF-004 **SECTION: CONSTRUCTION MINE WATER BASIN SIDESLOPE AND BOTTOM (TYP.)**

0 4 8
SCALE IN FEET



4/- **DETAIL: COMPOSITE LINER**
NOT TO SCALE



5 WWTF-007 **DETAIL: LINER ATTACHMENTS**

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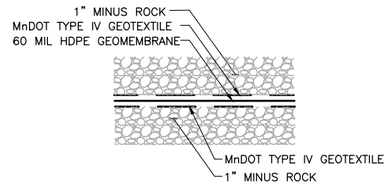

6/- **DETAIL: COMPOSITE LINER**
NOT TO SCALE

VER NO	DATE	DESCRIPTION
1	10/18/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
4	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	4	12/22/15
FOR CONSTRUCTION		

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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 12/22/15 LICENSE# 19646

DRAWN: CMB2
CHECKED: JSU
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
BASINS – SECTIONS AND DETAILS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-008 REV

CADD USER: Adepluser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4079-9482-0040B1123F1E\225A5709-C7D-4D7B-9210-C0DB032A9323\PERMIT_NMM-43-CS-006.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:19 AM
INCHES 1 2

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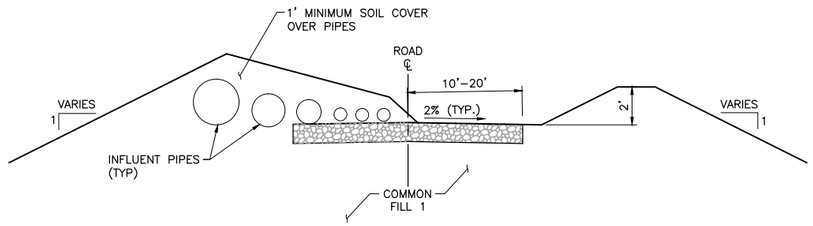
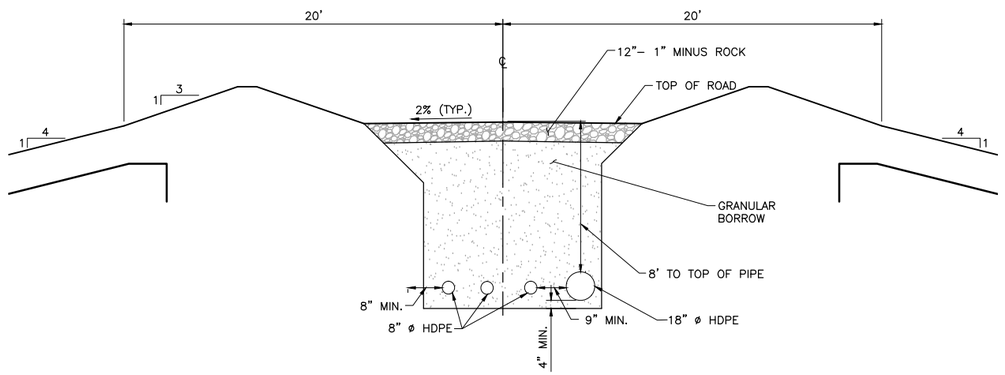


1 SECTION: INFLUENT PIPES TO SPLITTER BUILDING
WWTF–005 NOT TO SCALE



2 SECTION: PIPE TRENCH (TYP.)
WWTF–005

0 4 8
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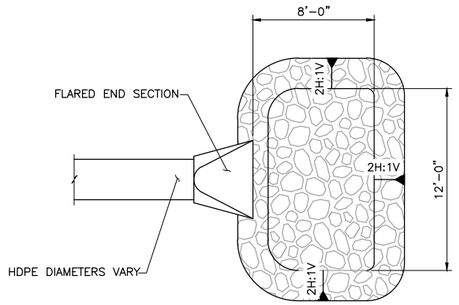

3 DETAIL: DISSIPATER POOL
WWTF–007

0 5 10
SCALE IN FEET

NOTE:

PIPE DIAMETERS AR PRELIMINARY

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME JEFF S. UBL

SIGNATURE

DATE 5/21/15 LICENSE# 19646

DRAWN: CMB2

CHECKED: JSU

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
YARD PIPING SECTIONS AND DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. WWTF–009

REV

INCHES 1 2

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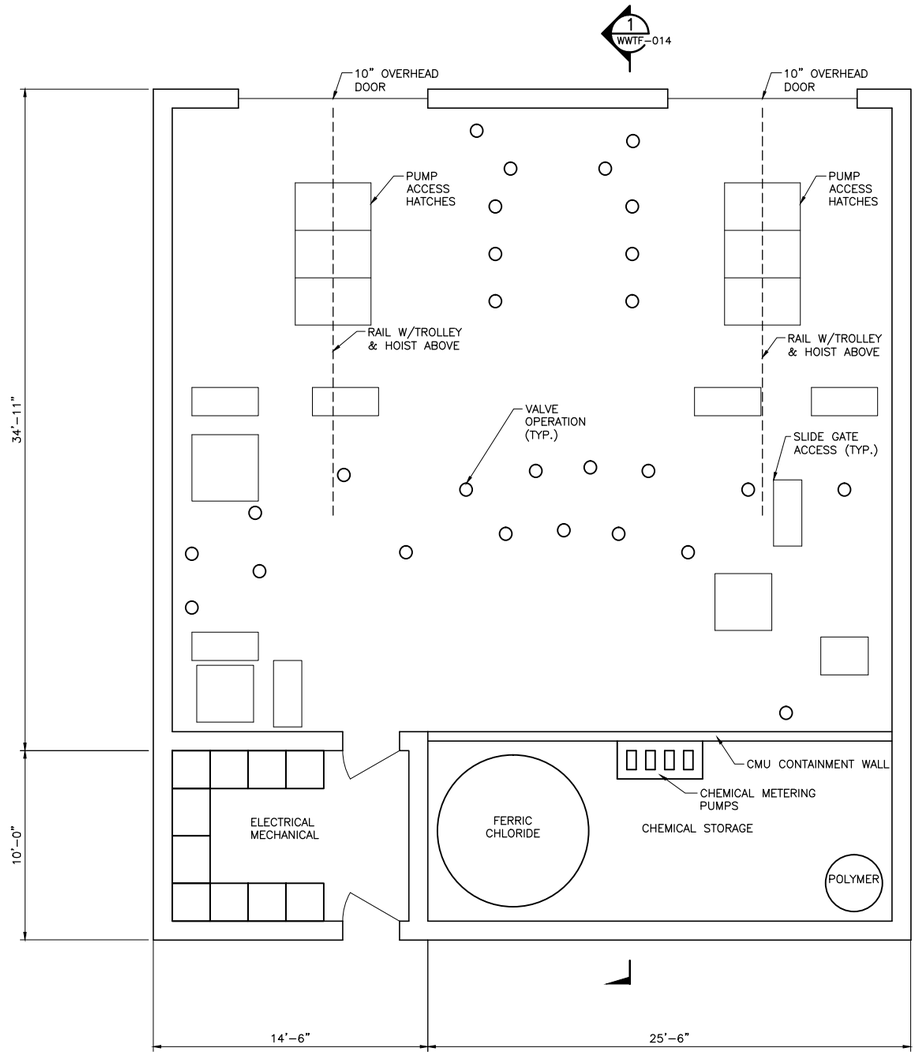

1 PLAN: MAIN LEVEL PLAN

0 1 5
SCALE

VER NO	DATE	DESCRIPTION
1	9/24/13	DEFINITIVE ESTIMATE
2	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE# 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
SPLITTER STRUCTURE
UPPER LEVEL PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-012

REV

INCHES 1 2

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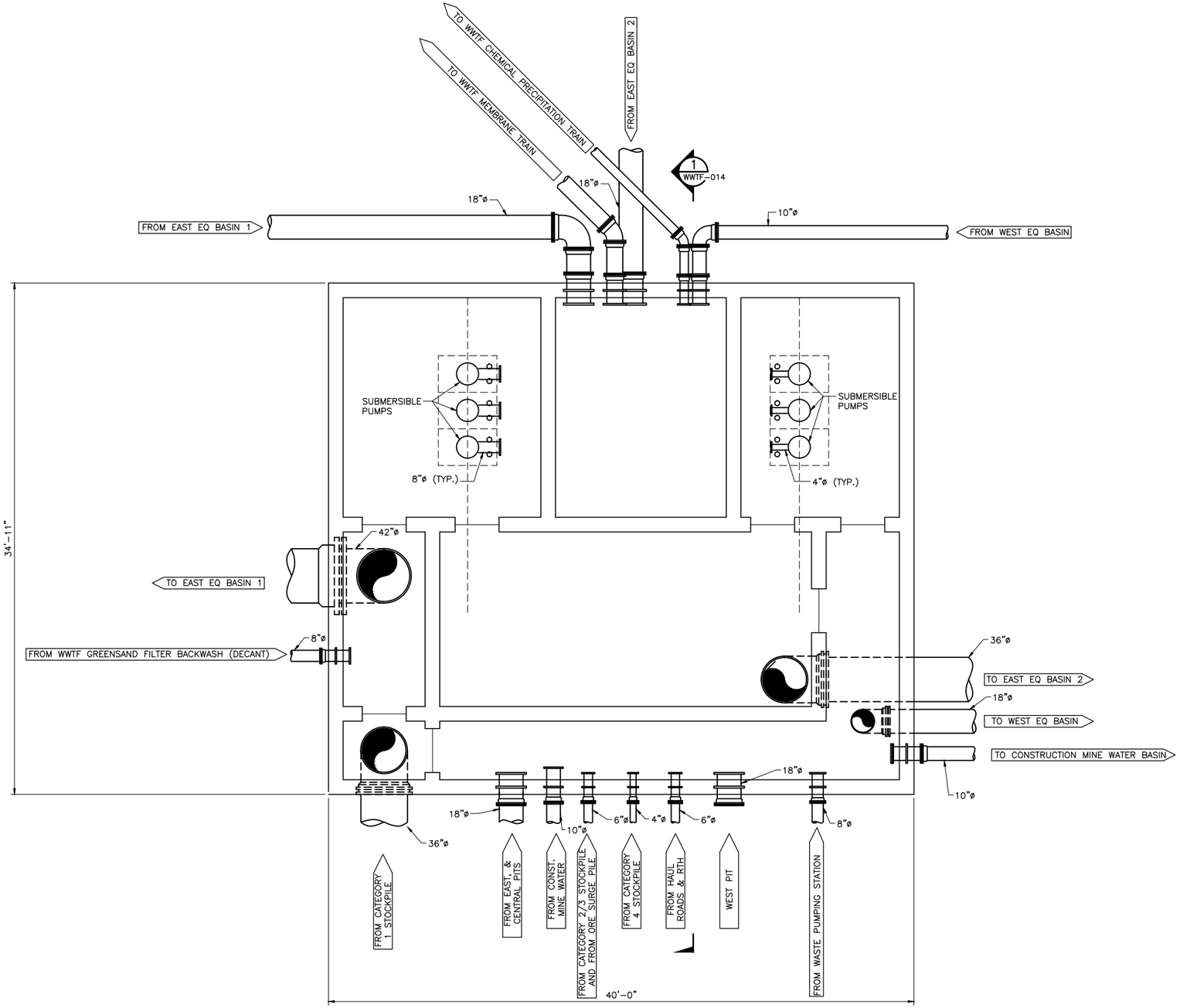

2 PLAN: LOWER LEVEL PLAN

0 1 5
SCALE

NOTE:

PIPE DIAMETERES ARE PRELIMINARY

VER NO	DATE	DESCRIPTION
1	9/24/13	DEFINITIVE ESTIMATE
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3	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	3	12/22/15
FOR CONSTRUCTION		

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 12/22/15 LICENSE# 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
SPLITTER STRUCTURE
LOWER LEVEL PLAN

POLYMET MINING

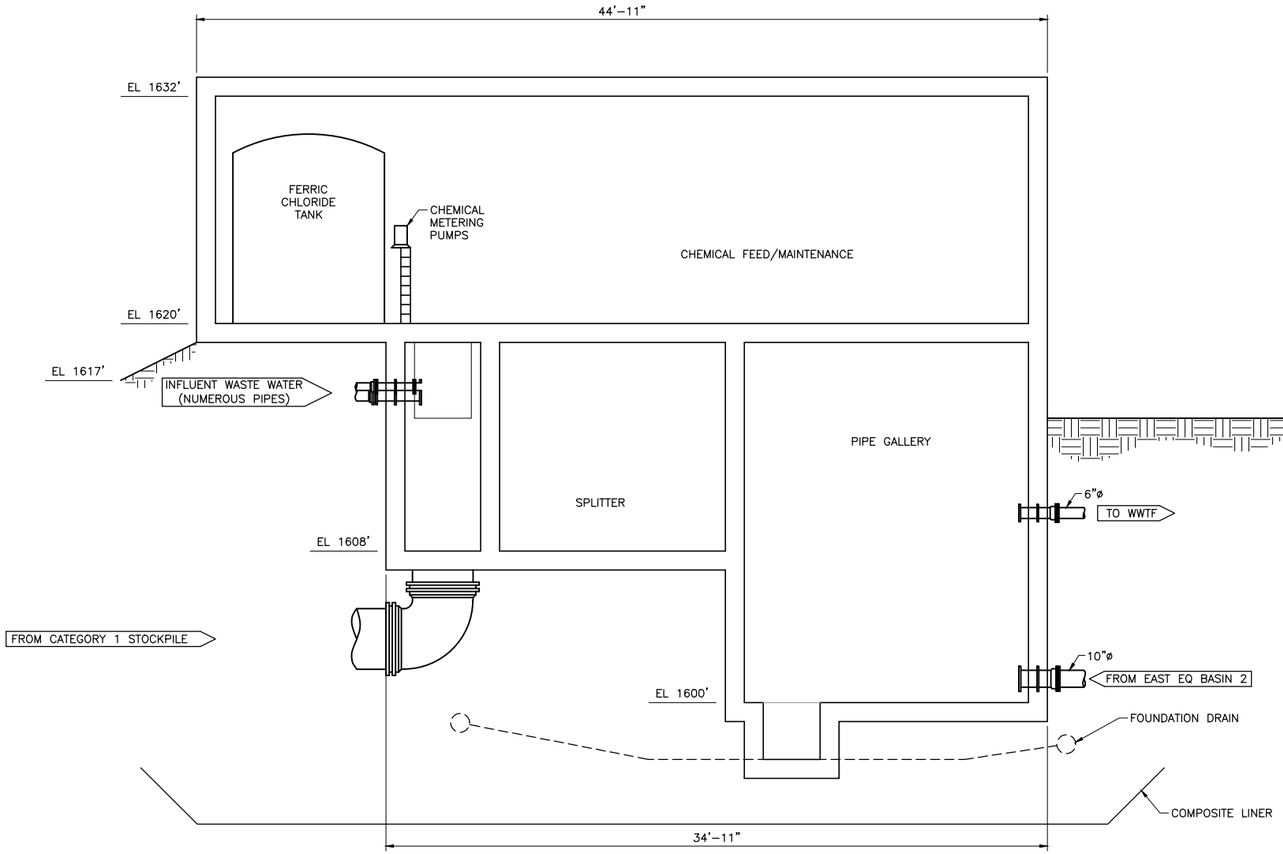
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-013

REV

INCHES 1 2



1 SECTION:
WWTF-012
WWTF-013

0 1 5
SCALE

NOTE:

PIPE DIAMETERES ARE PRELIMINARY

VER NO	DATE	DESCRIPTION
1	9/24/13	DEFINITIVE ESTIMATE
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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 5/21/15 LICENSE# 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
SPLITTER STRUCTURE
SECTION

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

DWG. NO. WWTF-014

REV

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4D79-9A82-004DB1123F1E\2EAF4240-F18E-4A33-9A49-A3777A9C4841\PERMIT_NMM-43-CU-003.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:26 AM

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VALVE SYMBOLS

- IPS EXPANSION JOINT COUPLING
- FLOW METER
- GATE OR GENERIC VALVE
- BUTTERFLY VALVE
- GLOBE VALVE
- BALL VALVE
- PLUG VALVE
- CHECK VALVE
- BALL CHECK VALVE
- BUTTERFLY CHECK VALVE
- SOLENOID OPERATED VALVE
- PNEUMATIC OPERATED VALVE
- MOTOR OPERATED VALVE
- AIR RELEASE VALVE
- PNEUMATIC OPERATED BACKFLOW PREVENTER
- PRESSURE RELIEF VALVE
- CALIBRATION CYLINDER
- SLUICE GATE

PIPING SYMBOLS

- QUICK CONNECT COUPLING
- HOSE COUPLING
- FLEXIBLE HOSE
- AIR SUPPLY
- CONNECTION TO PROCESS
- SLIDE GATE/SLUICE GATE
- SCREW CONVEYOR
- Y-STRAINER
- FLEXIBLE CONNECTION

MECHANICAL PIPING

- FLANGED JOINT
- MECANICAL JOINT
- LIQUID LEVEL
- PULSATION DAMPENER

TYPICAL EQUIPMENT

- FILTER PRESS
- SCREW FEED
- CENTRIFUGAL PUMP
- MIXER
- STATIC MIXER
- HOSE PUMP
- BLOWER
- CLARIFIER
- CHEMICAL METERING PUMP
- CARTRIDGE FILTER OR BASKET STRAINER
- TRUCK
- DIAPHRAGM PUMP
- FORK LIFT
- RAIL CAR

MECHANICAL ABBREVIATIONS

PIPING MATERIALS

BSP	BLACK STEEL PIPE	GALV	GALVANIZED STEEL PIPE
CI	CAST IRON PIPE	HDPE	HIGH DENSITY POLYETHYLENE
		PIP	POLYETHYLENE PIPE
CMP	CORRUGATED METAL PIPE	PVC	POLYVINYL CHLORIDE PIPE
CS	CARBON STEEL	RCP	REINFORCED CONCRETE PIPE
CU	COPPER PIPE	RED	REDUCER
DIP	DUCTILE IRON PIPE	SST,SS	STAINLESS STEEL PIPE
FRP	FIBERGLASS REINFORCED PLASTIC		

PROCESS FLOW STREAM

AIR	COMPRESSED AIR	NPW	NON-POTABLE-WATER
BYP	BYPASS	OVF	OVERFLOW
CW	COLD WATER	PA	PLANT AIR
DR	DRAIN	PW	PLANT WATER
EFF	EFFLUENT	REC	RECYCLE
FE	FINAL EFFLUENT	SC	SCUM
FM	FORCEMAIN	SE	SECONDARY EFFLUENT
FW	FLUSHING WATER	SN	SUPERNATANT, SUBNATANT
GS	GRIT SLURRY	SW	STORM WATER
HC	HOSE CONNECTION	TD	TANK DRAIN
INF	PROCESS BASIN INFLUENT	VT	VENT

VALVE AND FITTING NOMENCLATURE

BCV	BALL CHECK VALVE		
BFV	BUTTERFLY VALVE		
BPRV	BACK PRESSURE REGULATING VALVE	PE	PLAIN END
BV	BALL VALVE	POJ	PUSH ON JOINT
COMP JT	COMPRESSION JOINT	PRV	PRESSURE RELIEF VALVE
CPLG	COUPLING	PV	PLUG VALVE
CV	CHECK VALVE (AIR CUSHION)	PVRV	PRESSURE VACUUM RELIEF VALVE
DO	DISSOLVED OXYGEN PROBE	RJ	RESTRAINED JOINT
EXP JT	EXPANSION JOINT	SJ	SOLDERED JOINT
FAC	FLANGED ADAPTER COUPLING	SOLV	SOLENOID VALVE
FH	FIRE HYDRANT	THD	THREADED
FS	FLOOR STAND	TUBV	TRUE IRON BALL VALVE
GOV	GLOBE VALVE	UN	UNION
GV	GATE VALVE	VB	VALVE BOX
MJ	MECHANICAL JOINT	VC	VICTAULIC COUPLING (SHOULDERED ENDS)
MV	MUD VALVE	WAP	WALL PIPE
P	PUMP	WJ	WELDED JOINT
PBAV	PLASTIC BALL VALVE	WP	WELDED PIPE
		WSV	WALL SLEEVE

PROCESS ABBREVIATIONS

HDS	HIGH DENSITY SLUDGE
CIP	CLEAN IN PLACE
CPS	CENTRAL PUMPING STATION

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE# 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
MECHANICAL SYMBOLS AND LEGEND

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

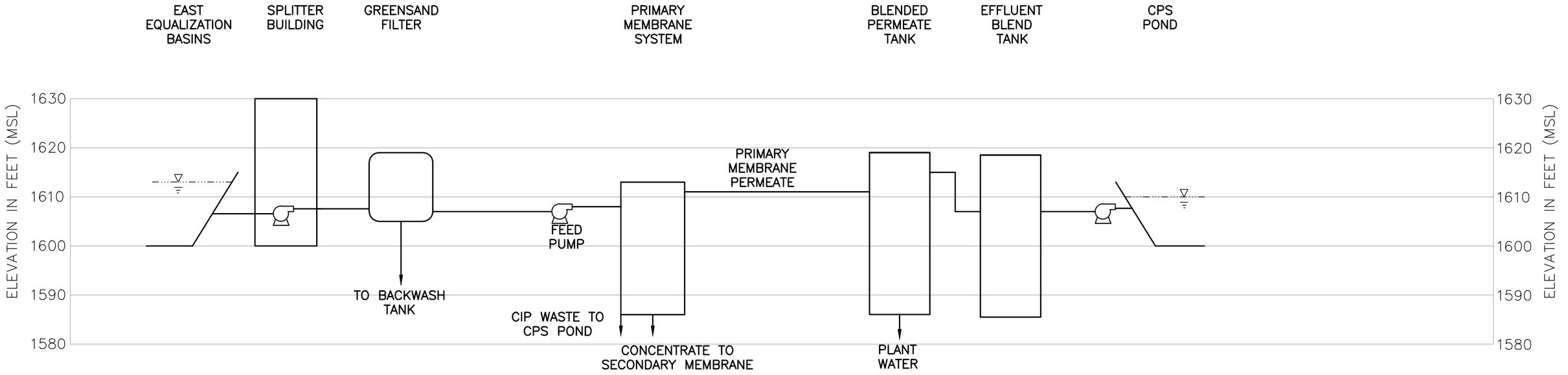
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-015

REV

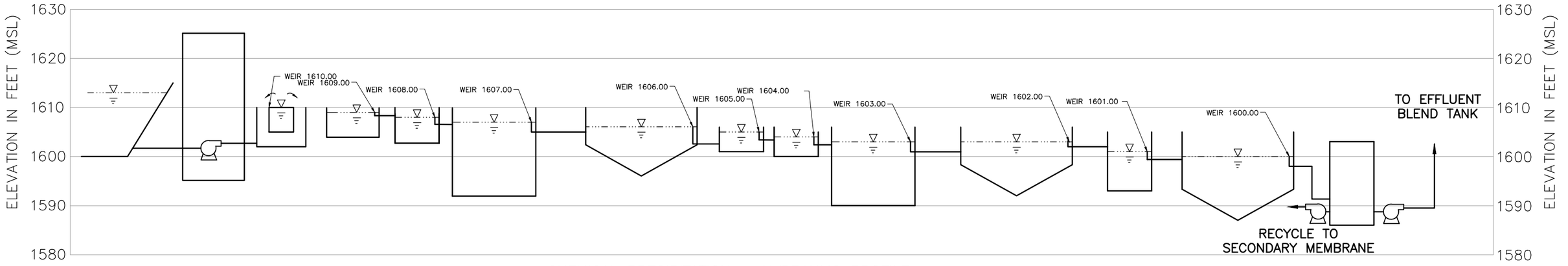
INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4079-9A82-0040B1123F1E\E80CF0C6-6BFA-4001-B345-A4083FDAC25C\PERMIT_NMM-43-MF-001.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:28 AM



FILTRATION – HYDRAULIC PROFILE
(NO HORIZONTAL SCALE)

WEST EQUALIZATION BASIN | SPLITTER BUILDING | INFLUENT SPLITTER BOX | FERRIC SULFATE MIX TANK | LIME MIX TANK | HDS METALS REMOVAL REACTOR TANK | HDS METALS REMOVAL CLARIFIER | HCL MIX TANK | LIME MIX TANK | SULFATE REMOVAL REACTOR TANK | SULFATE REMOVAL CLARIFIER | CO2 MIX TANK | RECARBONATION | CHEMICAL PRECIPITATION EFFLUENT TANK



CHEMICAL PRECIPITATION – HYDRAULIC PROFILE
(NO HORIZONTAL SCALE)

VER NO	DATE	DESCRIPTION
1	10/18/11	WATER MANAGEMENT PLAN SUBMITTAL
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FOR PERMITTING	2	5/21/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION.		

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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 5/21/15 LICENSE# 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
HYDRAULIC PROFILE

POLYMET MINING

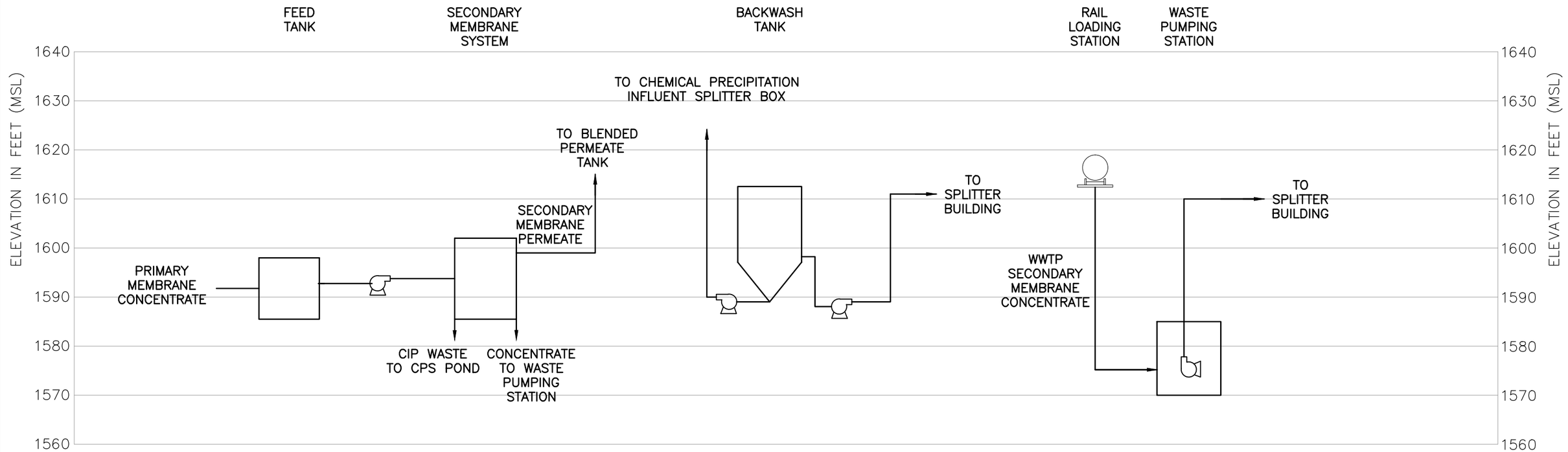
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-016
REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\VHIBBING PW\VHIBB PW IN\1777A3EB-7110-4079-9A82-0040B1123F1E\F3E35034-18BD-4709-AC5E-3B2125A5B558\PERMIT_NMM-43-MF-002.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:29 AM



RESIDUALS – HYDRAULIC PROFILE
(NO HORIZONTAL SCALE)

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/21/15
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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 5/21/15 LICENSE# 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
HYDRAULIC PROFILE
RESIDUALS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-017
REV

INCHES 1 2

CADD USER: Adepfuser FILE: \\PWHIB\HIBBING PW\HBB PW IN\1777A3EB-7110-4079-9482-0040B1123F1E\4107A326-0C6F-4E48-8BD1-5E2737F733F41\PERMIT_NMM-43-MF-003.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:30 AM

MINE SITE

CATEGORY 1 STOCKPILE
EAST PIT
CENTRAL PIT
CONSTRUCTION MINE WATER
CATEGORY 2/3 STOCKPILE
ORE SURGE PILE
CATEGORY 4 STOCKPILE
WEST PIT
RAIL TRANSFER HOPPER
HAUL ROAD EAST
HAUL ROAD WEST
HAUL ROAD NORTH
HAUL ROAD SOUTH

WWTF

FERRIC CHLORIDE
POLYMER
SPLITTER BUILDING
EAST EQUALIZATION BASIN 1
EAST EQUALIZATION BASIN 2
WEST EQUALIZATION BASIN
SECONDARY MEMBRANE CONCENTRATE (INTERMITTENT BATCH OPERATION)
GREENSAND FILTER BACKWASH (PRECIPITATE)
GREENSAND FILTER BACKWASH (DECANT)
BACKWASH TANK
GREENSAND FILTER
GREENSAND FILTER BACKWASH (PRECIPITATE)
SECONDARY MEMBRANE CIP WASTE
CARBON DIOXIDE, ANTISCALANT(S)
CHEMICAL PRECIPITATION EFFLUENT RECYCLE
SECONDARY MEMBRANE
SECONDARY MEMBRANE FEED TANK
SECONDARY MEMBRANE PERMEATE
PRIMARY MEMBRANE
PRIMARY MEMBRANE PERMEATE
PRIMARY MEMBRANE CIP WASTE
CARBON DIOXIDE, ANTISCALANT(S)
PRIMARY MEMBRANE CONCENTRATE
BLENDED PERMEATE TANK
EFFLUENT BLEND TANK
LIME
FERRIC SULFATE (STANDBY)
METALS REMOVAL
LIME
HYDROCHLORIC ACID (STANDBY)
SULFATE REMOVAL
CARBON DIOXIDE
RECARBONATION
CARBON DIOXIDE
CHEMICAL PRECIPITATION EFFLUENT TANK
SLUDGE STORAGE
SLUDGE FILTER PRESS
DEWATERED SLUDGE TO HYDROMETALLURGICAL PROCESS OR OFFSITE DISPOSAL
WASTE PUMPING STATION
CONCENTRATE FROM WWTP
FILTER PRESS FILTRATE
OVERBURDEN STORAGE AND LAY DOWN AREA
CONSTRUCTION WATER BASIN
CPS POND
FTB POND AT PLANT SITE

VER NO.	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
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ISSUE STATUS		
ISSUED	VERSION	DATE
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PRINTED NAME TODD D. DEJOURNETT
SIGNATURE
DATE 12/22/15 LICENSE# 47085

DRAWN: MDS
CHECKED: TDD
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF PROCESS FLOW DIAGRAM OVERVIEW

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-018
REV

INCHES 1 2

CADD USER: Adepiuser FILE: \\PWHIB\HIBBING PW\HBB PW IN\1777A3EB-7110-4079-9482-004DB1123F1E\E9C40DA7-0601-40FD-8168-40FD-8168-7AE033DFC01F\PERMIT_NMM-43-MF-004.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:32 AM

EAST EQUALIZATION BASIN 1

EAST EQUALIZATION BASIN 2

WEST EQUALIZATION BASIN

CONSTRUCTION MINE WATER BASIN

CPS POND

WASTE PUMPING STATION

SPLITTER BUILDING

CATEGORY 1 STOCKPILE

EAST AND CENTRAL PITS

CONSTRUCTION MINE WATER SOURCES

CATEGORY 2/3 STOCKPILE AND ORE SURGE PILE

CATEGORY 4 STOCKPILE

WEST PIT

HAUL ROADS AND RAIL TRANSFER HOPPER

FERRIC CHLORIDE

POLYMER

OVERBURDEN STORAGE AND LAY DOWN AREA

GREENSAND FILTER BACKWASH (DECANT) SHEET WWTF-024

GREENSAND FILTER BACKWASH (PRECIPITATE) SHEET WWTF-024

BUILDING DRAIN SHEET WWTF-025

FILTER PRESS FILTRATE SHEET WWTF-026

WWTF SECONDARY MEMBRANE CONCENTRATE SHEET WWTF-025

GREENSAND FILTER SHEET WWTF-024

RAIL LOAD-OUT PLANT SITE WWTP (ON PLANT SITE WASTE WATER TREATMENT PLANT DRAWING SET)

CHEMICAL PRECIPITATION SHEET WWTF-020 AND WWTF-021

EFFLUENT BLEND TANK SHEET WWTF-023

FTB POND

VER NO.	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
4	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	4	12/22/15
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 BRYAN T. OAKLEY

SIGNATURE

DATE 12/22/15 LICENSE# 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF PROCESS FLOW DIAGRAM EQUALIZATION BASINS

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-019

REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4079-9A82-004DB1123F1E\20E6B46B-F45D-48ED-8003-FAD35B410281\PERMIT_NMM-43-MF-005.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:33 AM

HDS METALS REMOVAL

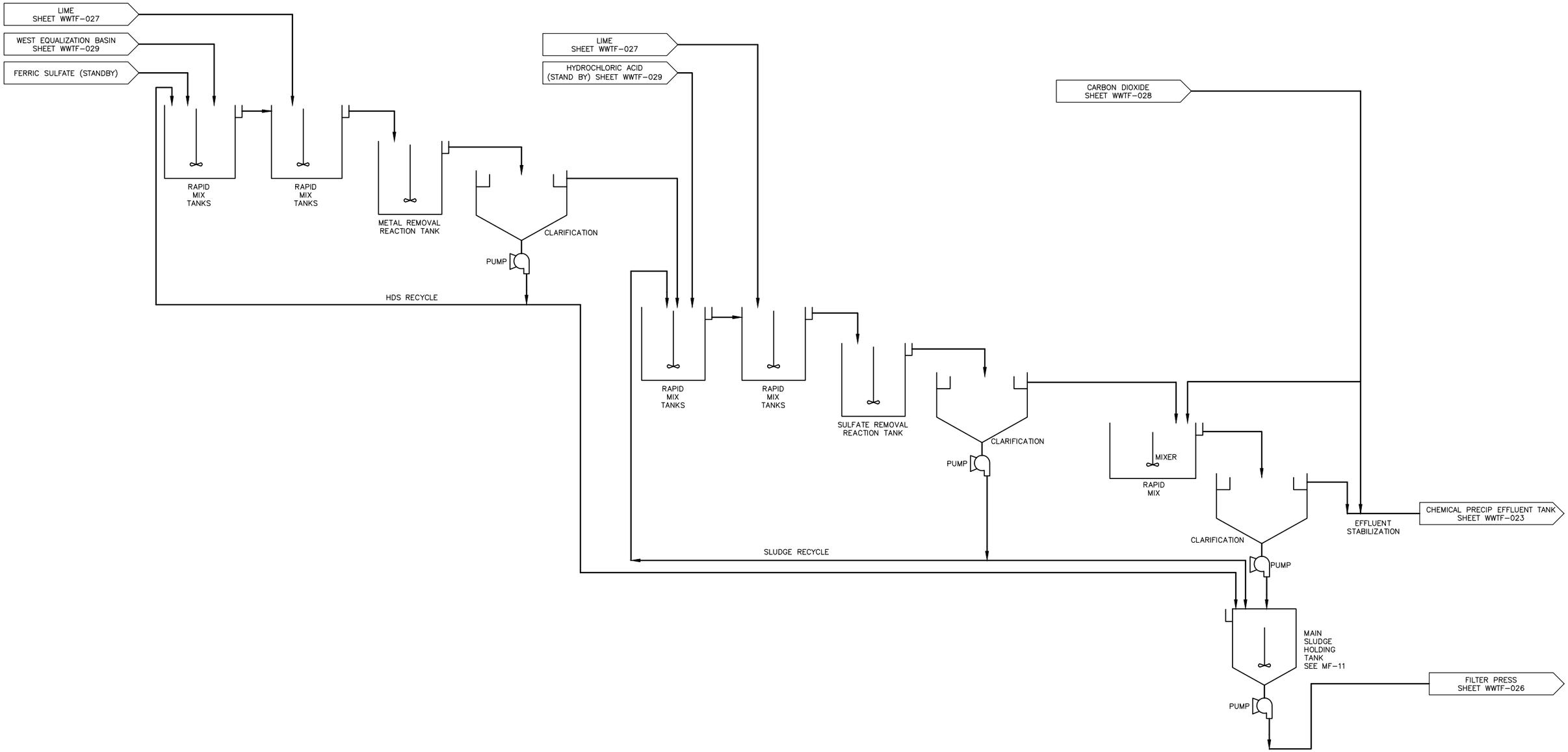
SEE MF-06 HDS METALS REMOVAL PROCESS FLOW DIAGRAM FOR DETAILS.

SULFATE REMOVAL

SEE MF-07 SULFATE REMOVAL PROCESS FLOW DIAGRAM FOR DETAILS.

RECARBONATION

SEE MF-08 RECARBONATION PROCESS FLOW DIAGRAM FOR DETAILS.



NOTE:
TREATMENT LAYOUT IS TYPICAL FOR TWO TRAINS.

VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT
SIGNATURE
DATE 5/21/15 LICENSE# 47085

DRAWN: MDS
CHECKED: TDD
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
CHEMICAL PRECIPITATION OVERVIEW

POLYMET MINING

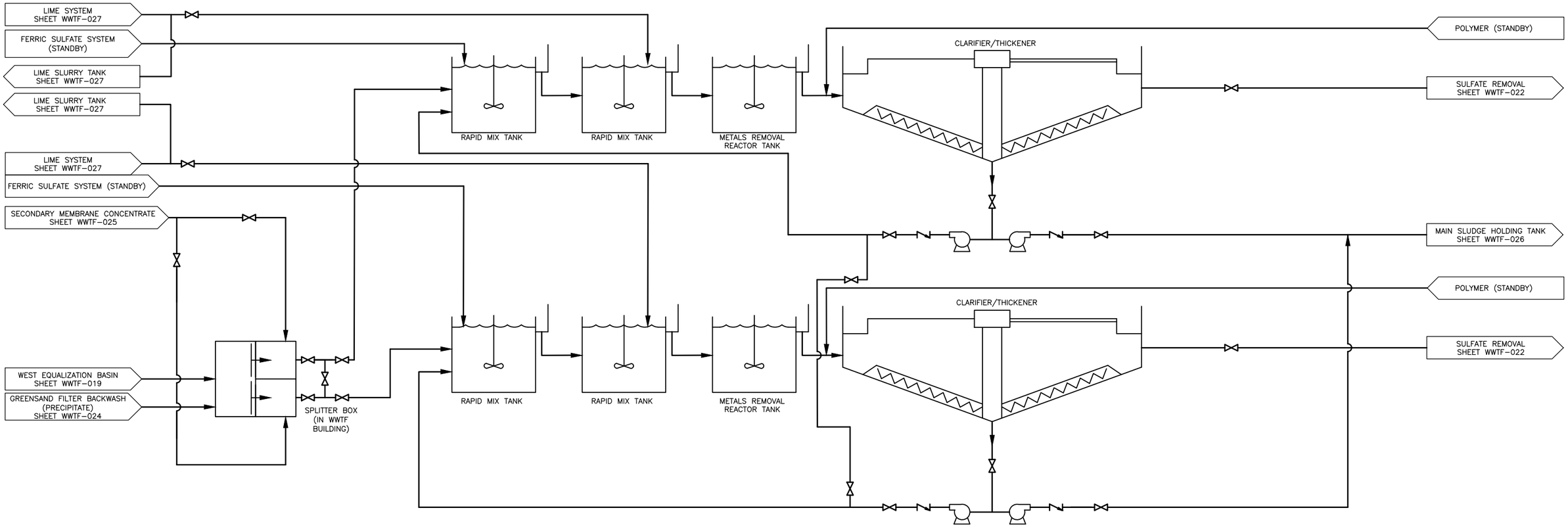
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-020
REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4D79-9A62-0040B1123F1E\F3046DEF-DFAB-446A-9A72-1EF240FEE023\PERMIT_NMM-43-MF-006.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:34 AM



VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT
SIGNATURE
DATE 5/21/15 LICENSE# 47085

DRAWN: MDS
CHECKED: TDD
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
HDS METALS REMOVAL

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

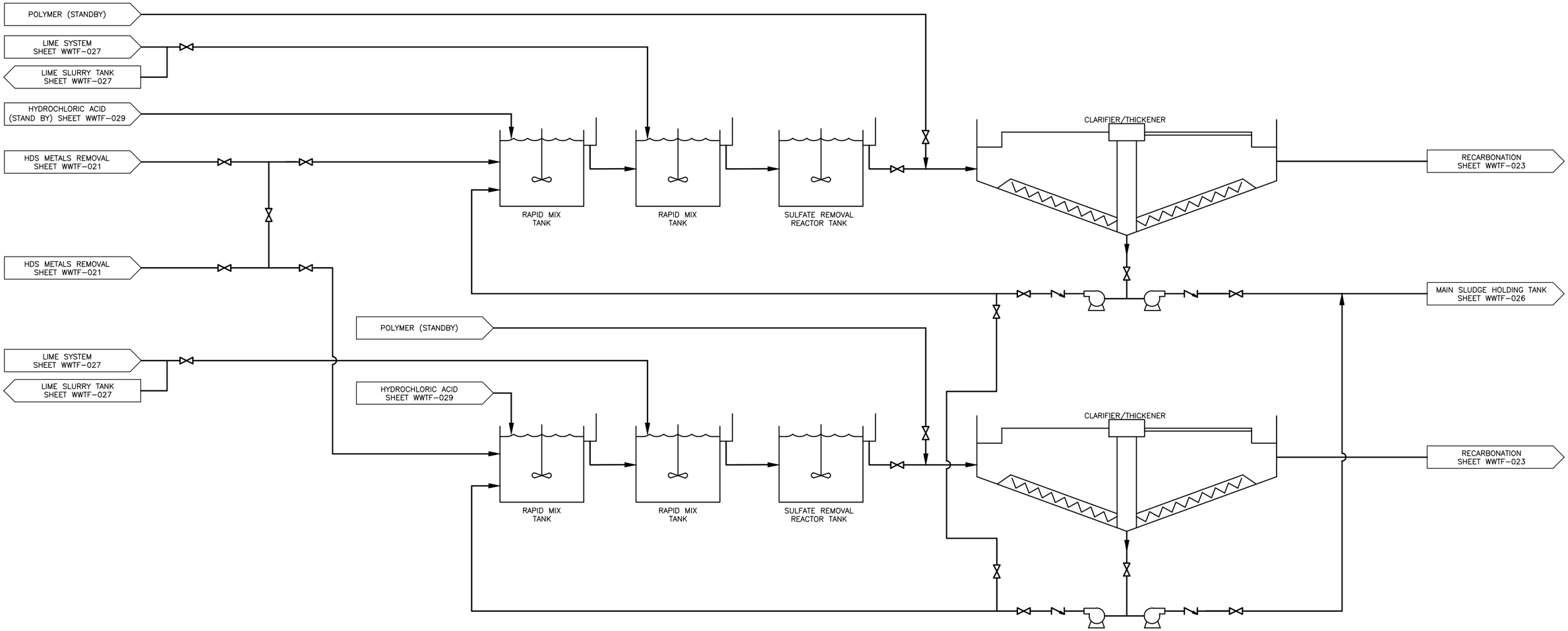
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-021

REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\177A3EB-7110-4D79-9A82-0040B1123F1E\F572577-F5E4-4C00-BD18-DC71CFAF0414\PERMIT_NMM-43-MF-007.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:35 AM



VER NO.	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
SULFATE REMOVAL

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

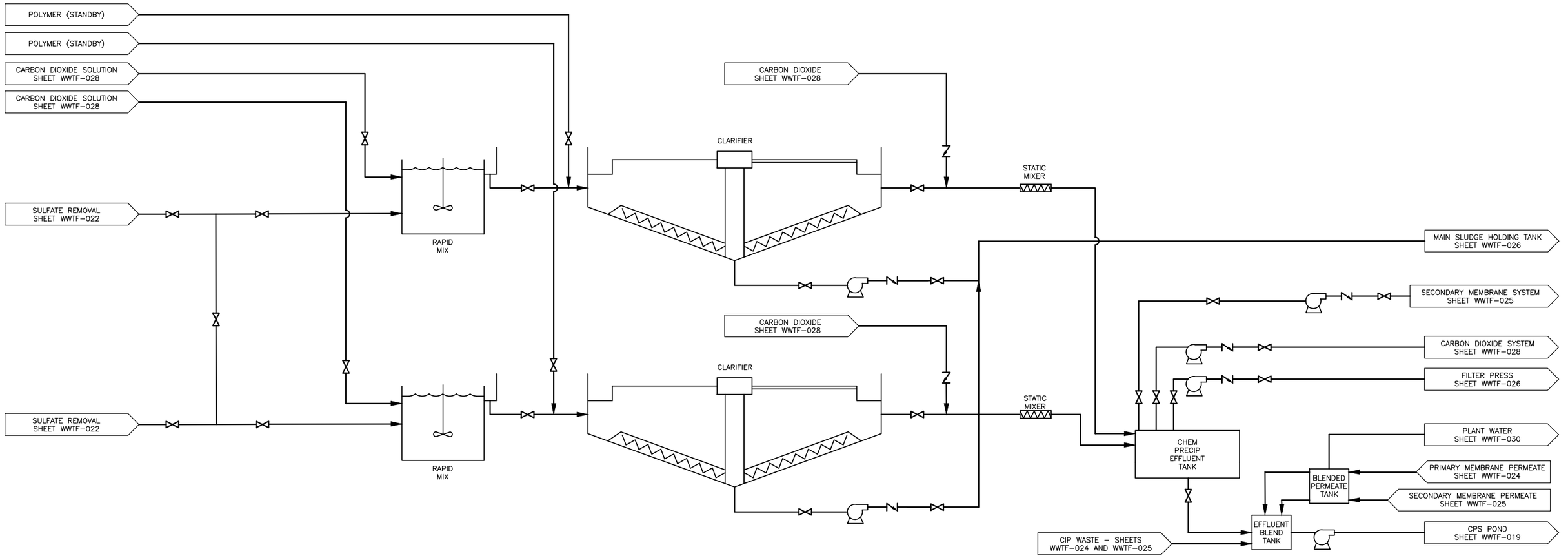
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-022

REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4D79-9A82-0040B1123F1E\56B80F2F-4CBB-4C4A-AC44-219C015CF7E7\PERMIT_NMM-43-MF-008.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:38 AM



VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
RECARBONATION

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

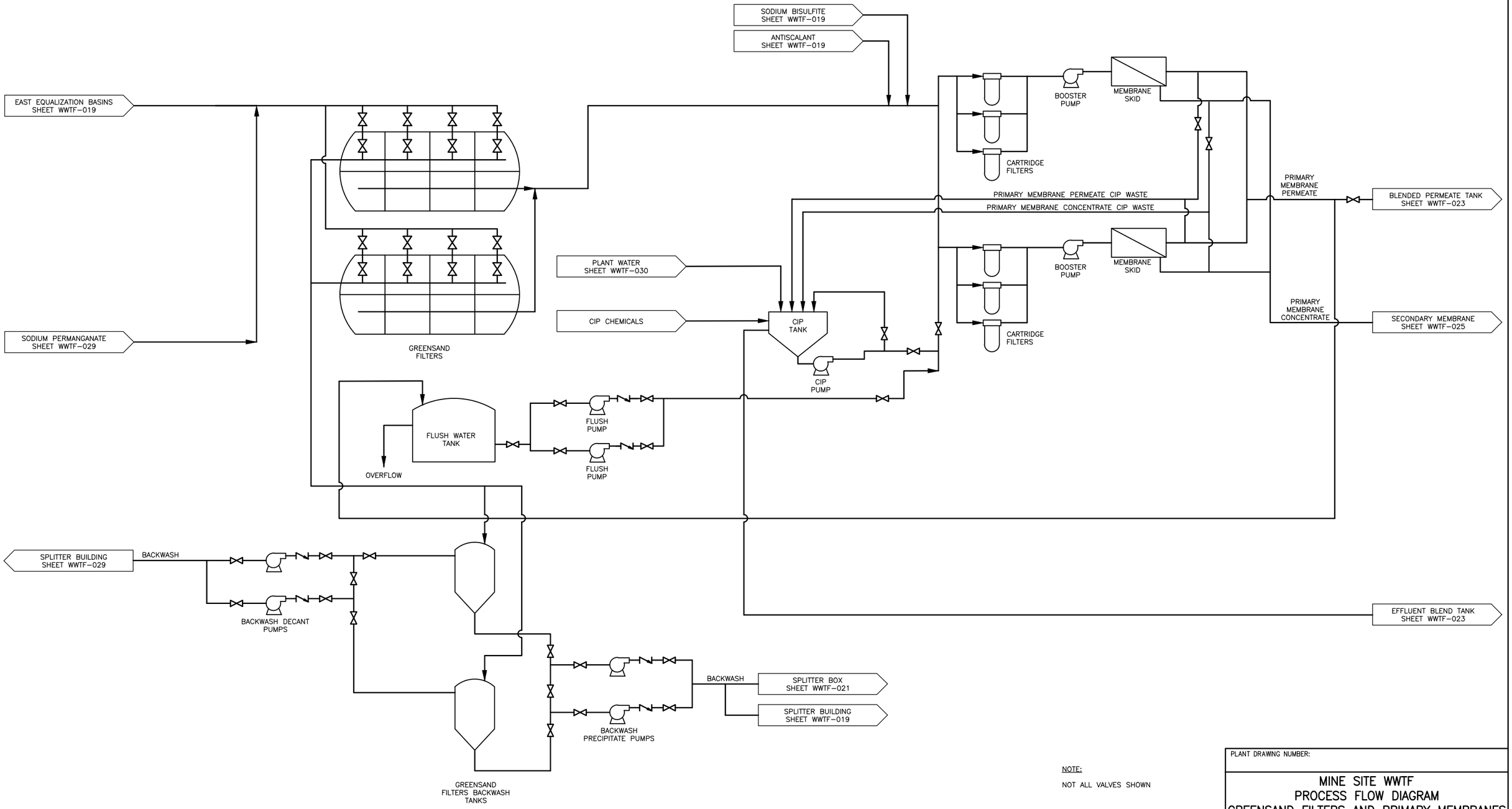
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-023

REV

INCHES 1 2

CADD USER: Adepluser FILE: \\PWHBG\HBBING PW\HBB PW IN\777A3EB-7110-4079-9A82-004DB1123F1E\9EEAE08B-467C-4486-81B3-FFE567D3B786\PERMIT_NMM-43-MF-009.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:37 AM



NOTE:

NOT ALL VALVES SHOWN

VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
GREENSAND FILTERS AND PRIMARY MEMBRANES

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

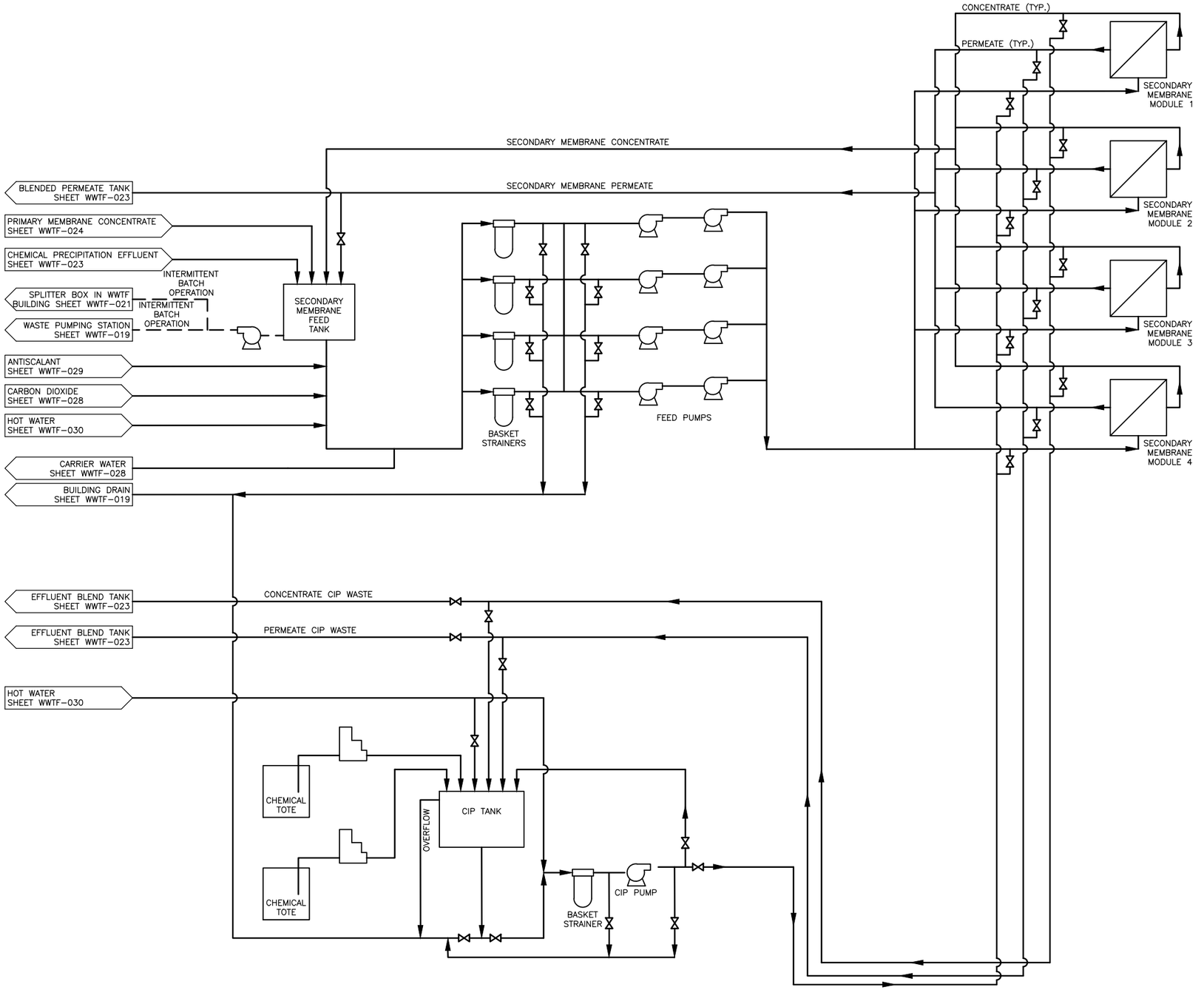
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-024

REV

INCHES 1 2

CADD USER: Adepluser FILE: \\PWHBG\HBBING PW\HBB PW IN\1777A3EB-7110-4079-9A82-004DB1123F1E\78571F59-8F47-4CEE-8715-36F7101449C6\PERMIT_NMM-43-MF-010.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:38 AM



NOTE:

1. LAYOUT IS TYPICAL FOR TWO TREATMENT TRAINS
2. NOT ALL VALVES SHOWN

VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/05
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 TODD D. DEJOURNETT
SIGNATURE
DATE 5/21/15 LICENSE# 47085

DRAWN: MDS
CHECKED: TDD
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
SECONDARY MEMBRANES

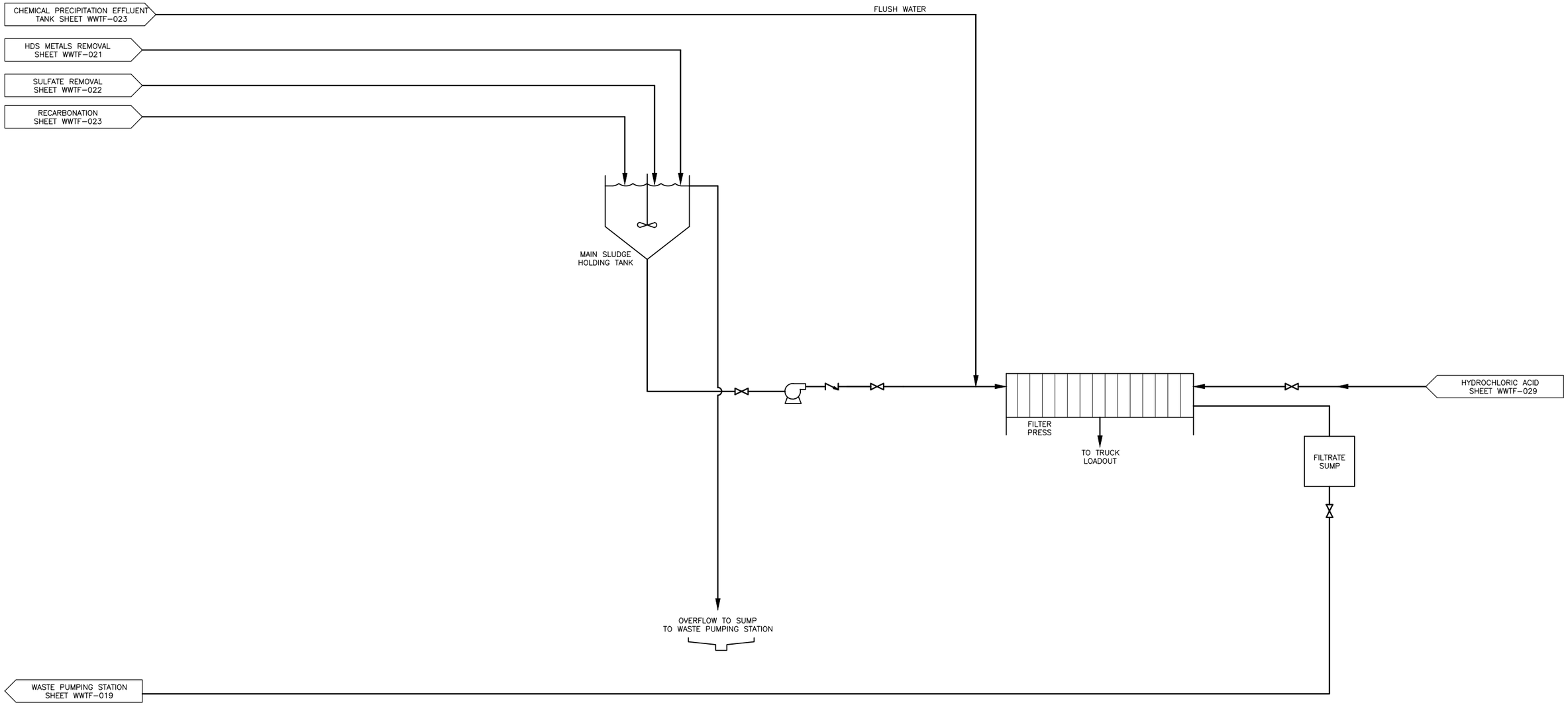
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-025
REV

INCHES 1 2

CADD USER: Adepluser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4079-9A82-0040B1123F1E\7F48FB7C-617D-4A13-9A26-238412BF8936\PERMIT_NMM-43-MF-011.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:39 AM



VER NO.	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
SOLIDS HANDLING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

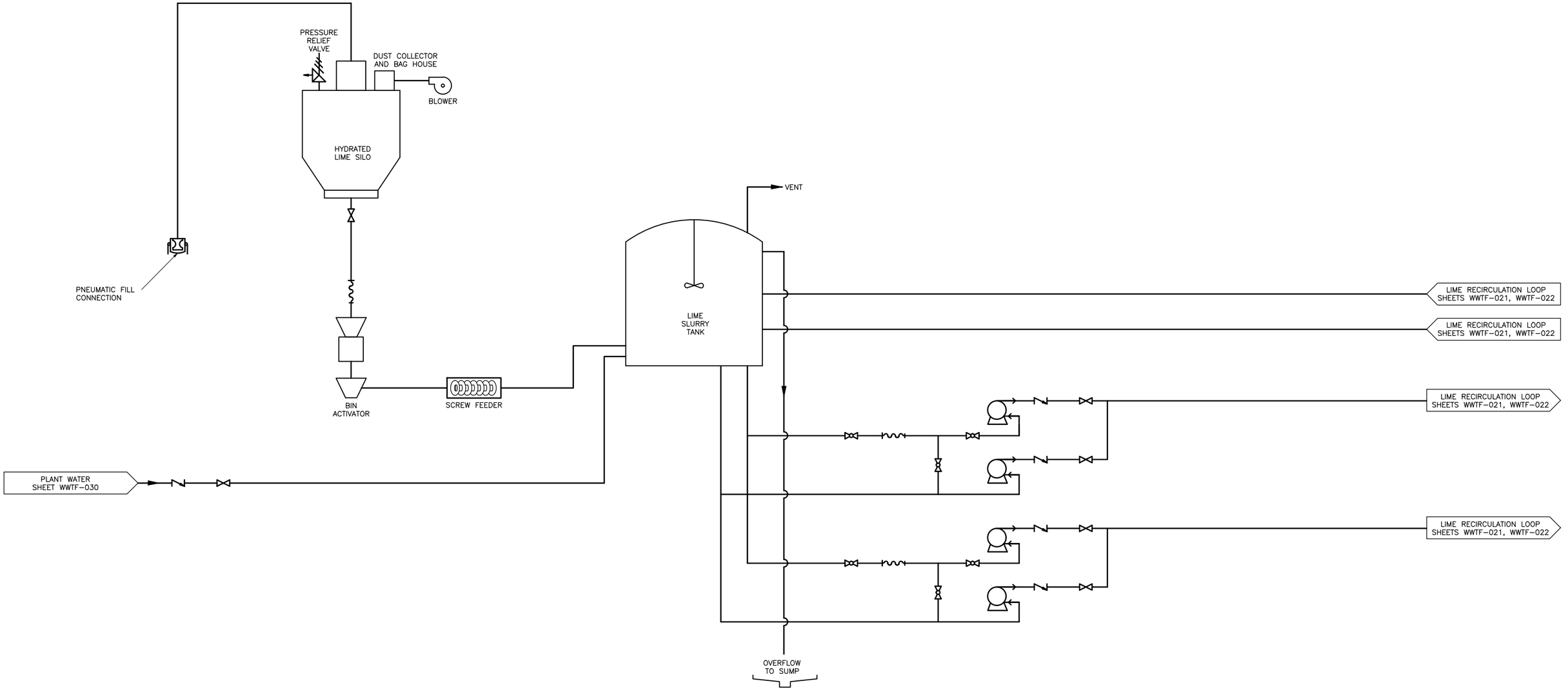
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-026

REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHB\HBBING PW\HBB PW IN\1777A3EB-7110-4D79-9A82-004DB1123F1E\6FF58099-0728-4901-A730-4425E2905196\PERMIT_NMM-43-MF-012.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:40 AM



VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
LIME SYSTEM

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

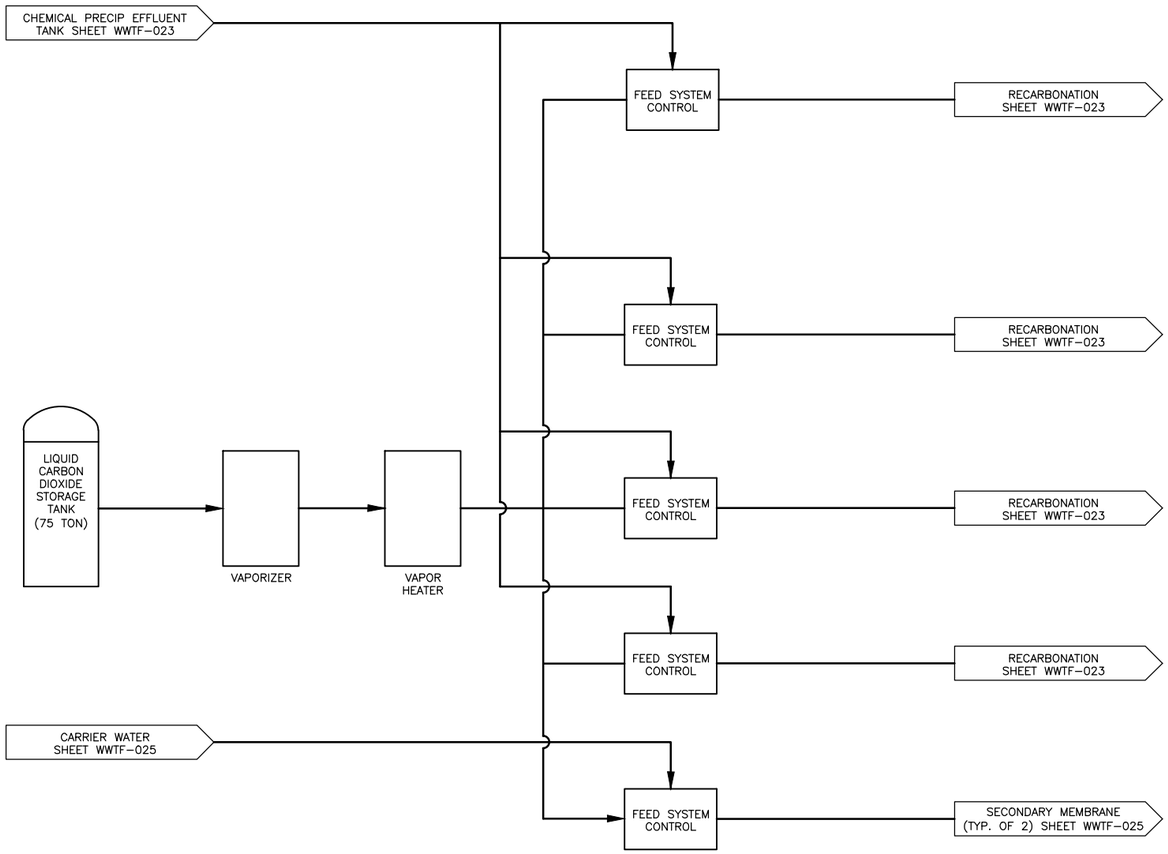
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-027

REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4079-9482-004DB1123F1E\A7850A03-02A0-4E53-9767-2CAC29ADEEB1\PERMIT_NMM-43-MF-013.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:41 AM



VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
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FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
CARBON DIOXIDE SYSTEM

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

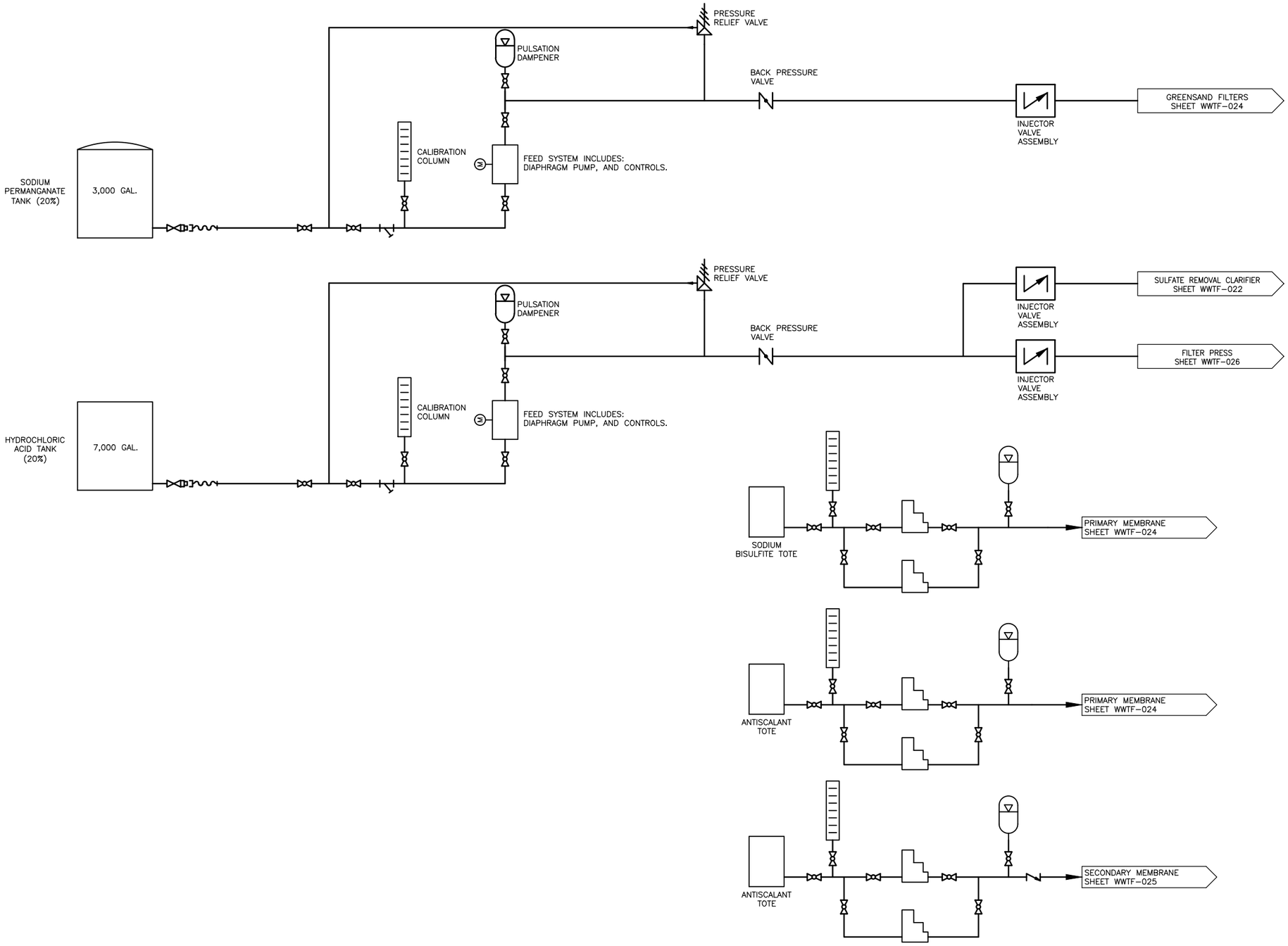
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-028

REV

INCHES 1 2

CADD USER: Adepluser FILE: \\PWHBG\HBBING PW\HBB PW IN\1777A3EB-7110-4079-9A82-004DB1123F1E\A298CEB4-37BC-46FF-8F9D-3EE250B0F5D7\PERMIT_NMM-43-MF-014.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:42 AM



VER NO	DATE	DESCRIPTION
1	10/17/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	3	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
PROCESS FLOW DIAGRAM
CHEMICAL SYSTEMS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

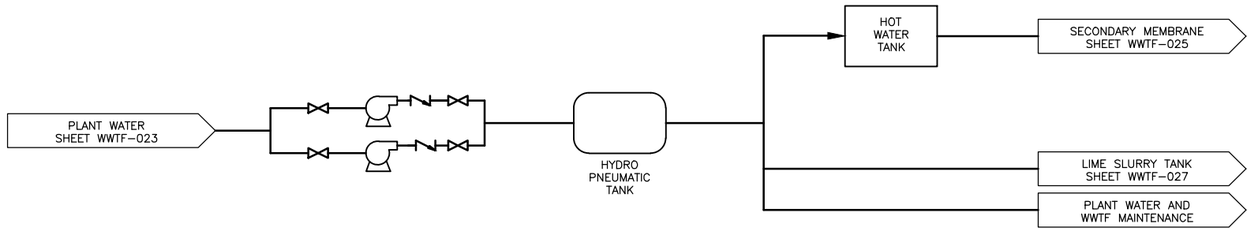
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. WWTF–029

REV

INCHES 1 2

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HBB PW IN\1777A3EB-7110-4079-9482-0040B1123F1E\21A20A73-06E9-4B59-93BF-8E079E980731\PERMIT_NMM-43-MF-015.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:43 AM



VER NO	DATE	DESCRIPTION
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FOR CONSTRUCTION		

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

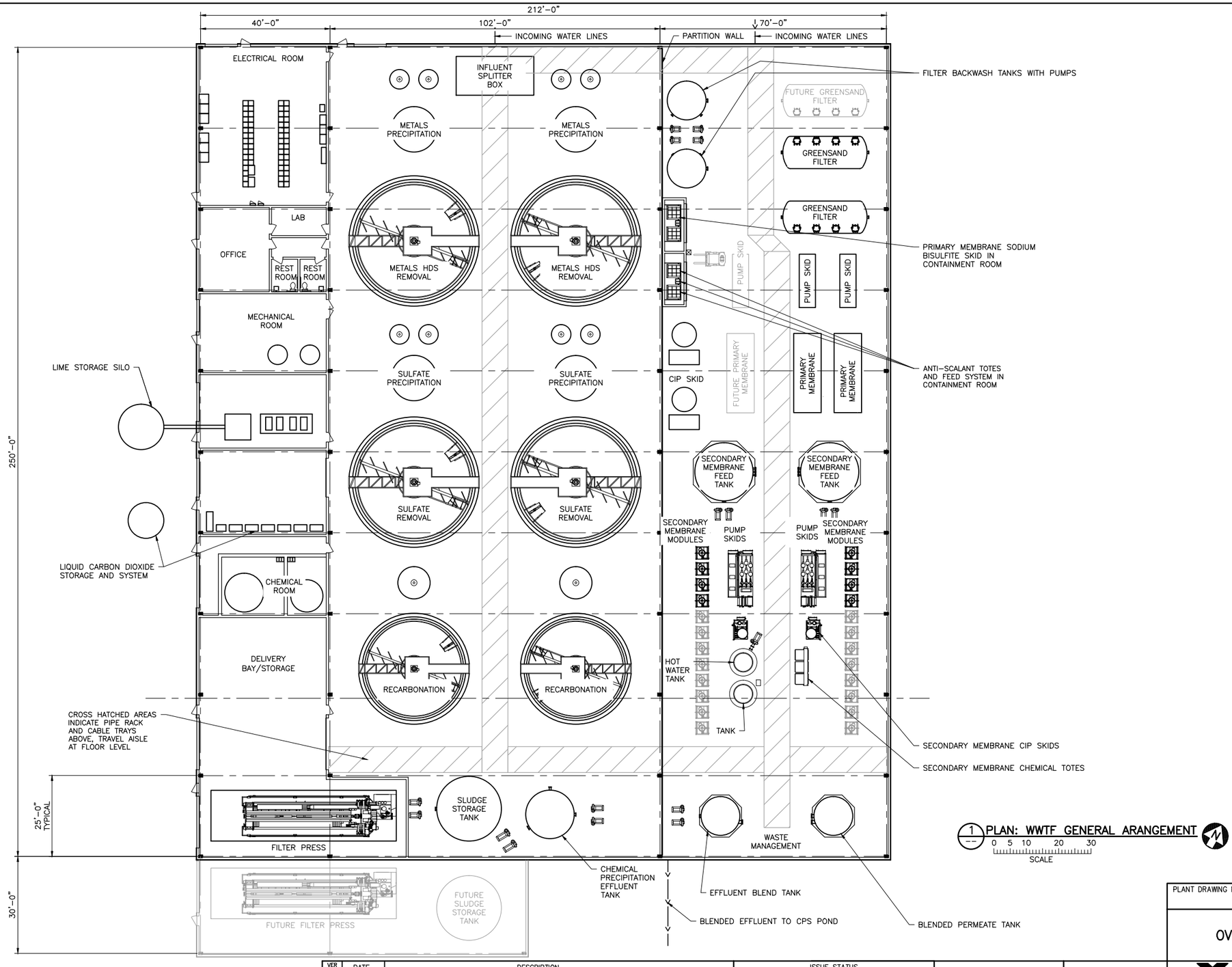
MINE SITE WWTF
PROCESS FLOW DIAGRAM
PLANT WATER SYSTEM

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-030

REV



NOTES:

1. FUTURE BUILD OUT SHOWN GRAYED OUT.

1 PLAN: WWTF GENERAL ARRANGEMENT
SCALE 0 5 10 20 30

VER NO	DATE	DESCRIPTION
1	10/18/11	WATER MANAGEMENT PLAN SUBMITTAL
2	9/24/13	DEFINITIVE ESTIMATE
3	5/21/15	PERMIT APPLICATION SUBMITTAL
4	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	4	12/22/15
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 BRYAN T. OAKLEY
SIGNATURE
DATE 12/22/15 LICENSE #24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
OVERALL GENERAL ARRANGEMENT

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-031
REV

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\1777A3EB-7110-4D79-9A82-0040B1123F1E\0654A8A1-99C6-4B55-89F6-E2D13A09326E\PERMIT_NMM-43-ML-001.DWG PLOT SCALE: 1:2 PLOT DATE: 12/22/2015 9:45 AM

INCHES 1 2

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TO SPLITTER BOX

FLUSHING PUMP SKID

FLUSHING TANK

CIP PUMP SKID

CIP TANK

ANTI-SCALANT TOTES AND FEED SYSTEM IN CONTAINMENT ROOM

SODIUM BISULFITE TOTES AND FEED SYSTEM IN CONTAINMENT ROOM

FILTER BACKWASH TANK 12'ø x 20' HIGH 15,000 GAL.

FILTER BACKWASH TANK 12'ø x 20' HIGH 15,000 GAL.

TO SPLITTER BUILDING

FROM SPLITTER BUILDING

SECONDARY MEMBRANE FEED TANK 18'ø x 24' HIGH 40,000 GAL.

FUTURE PRIMARY MEMBRANE

FUTURE PUMP SKID

PRIMARY MEMBRANE

PUMP SKID

GREENSAND FILTER

GREENSAND FILTER

FUTURE GREENSAND FILTER

SECONDARY MEMBRANE FEED TANK 18'ø x 24' HIGH 40,000 GAL.

PRIMARY MEMBRANE

PUMP SKID

1 -- PLAN: WWTF AREA

0 1 5 10

SCALE

VER NO	DATE	DESCRIPTION
1	5/21/15	PERMIT APPLICATION SUBMITTAL
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 12/22/15 LICENSE # 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
GENERAL ARRANGEMENT – MEDIA FILTER AND PRIMARY MEMBRANE AREA

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-032

REV

INCHES 1 2

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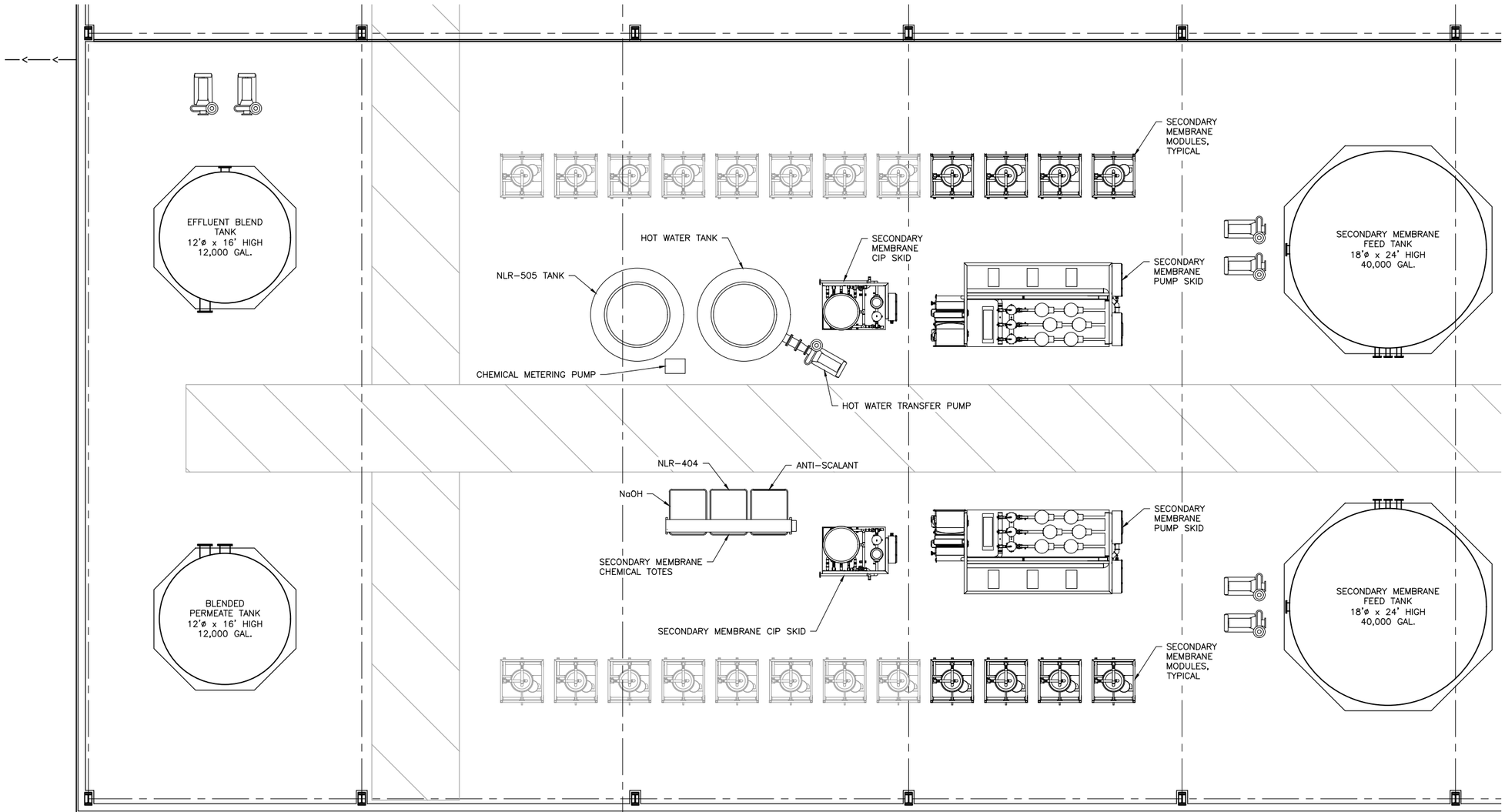

1 -- PLAN: WWTF AREA

0 1 5 10
SCALE

VER NO	DATE	DESCRIPTION
1	5/21/15	PERMIT APPLICATION SUBMITTAL
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 12/22/15 LICENSE # 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
GENERAL ARRANGEMENT
SECONDARY MEMBRANE AREA

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-033
REV

INCHES 1 2

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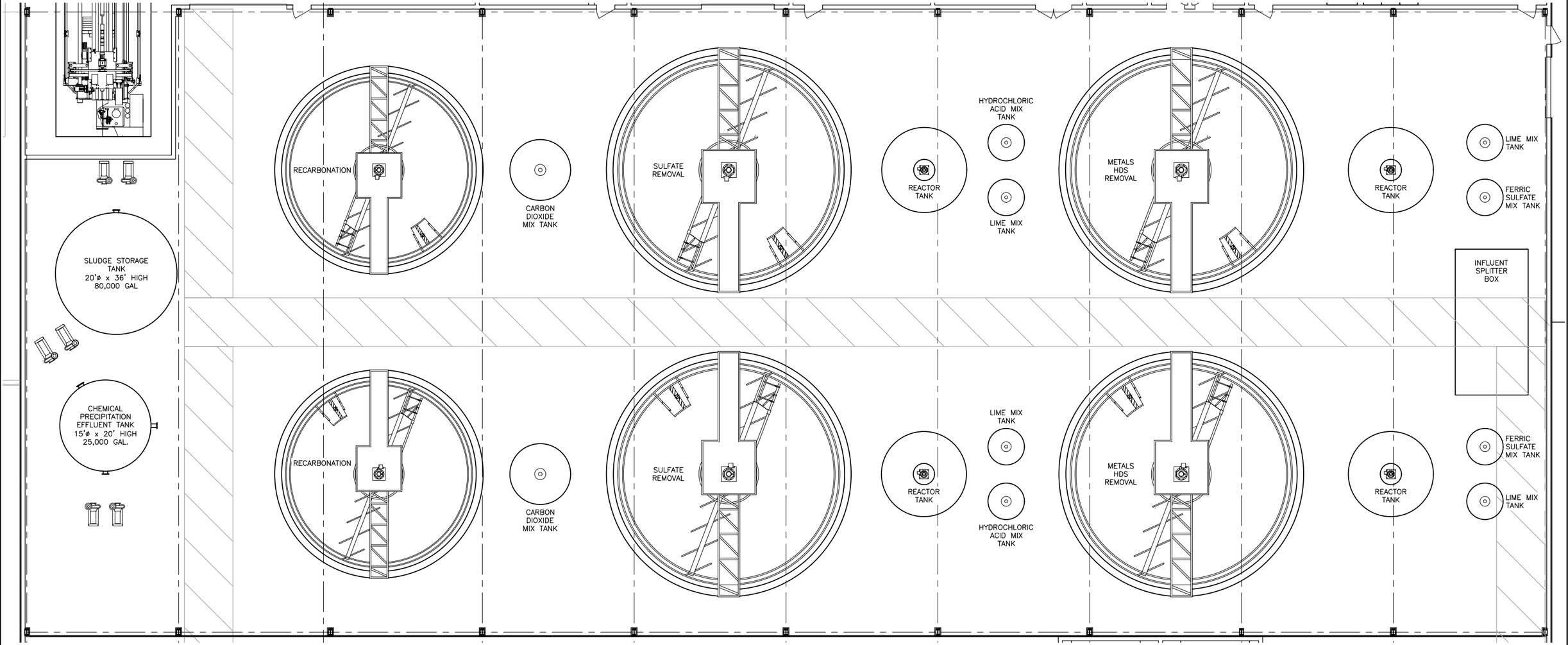

1 PLAN: WWTF AREA
SCALE 0 1 5 10

VER NO	DATE	DESCRIPTION
1	5/21/15	PERMIT APPLICATION SUBMITTAL
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 12/22/15 LICENSE # 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
GENERAL ARRANGEMENT
CHEMICAL PRECIPITATION AREA

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-034
REV

INCHES 1 2

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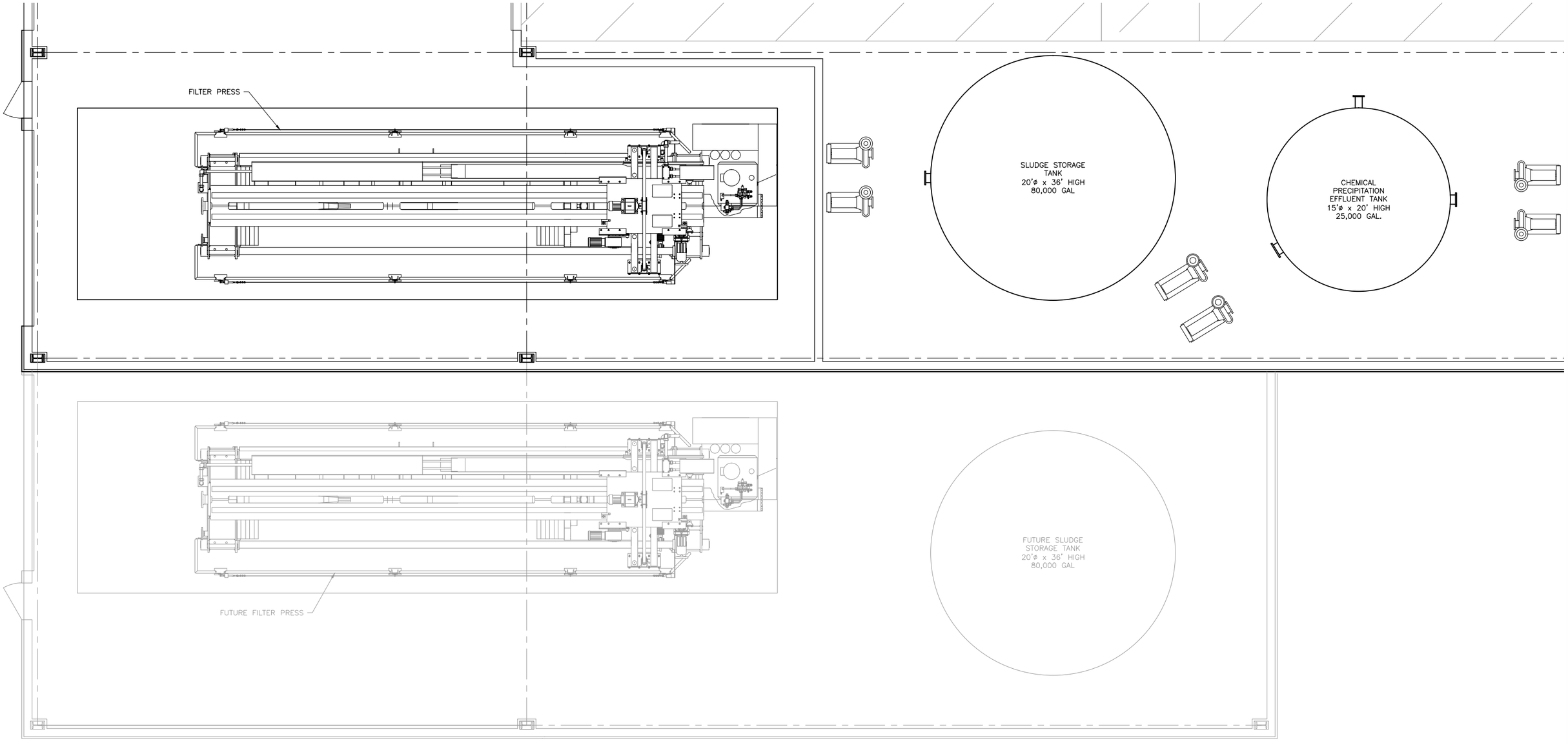

NOTES:

1. FUTURE BUILD OUT SHOWN GRAYED OUT.
2. FILTER PRESS WILL BE LOCATED ON A MEZZANINE ABOVE THE TANK LAYOUT AREA.

1 PLAN: WWTF AREA
0 1 5
SCALE

VER NO	DATE	DESCRIPTION
1	5/21/15	PERMIT APPLICATION SUBMITTAL
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION

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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 12/22/15 LICENSE # 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
GENERAL ARRANGEMENT
SOLIDS HANDLING AREA

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-035
REV

INCHES 1 2

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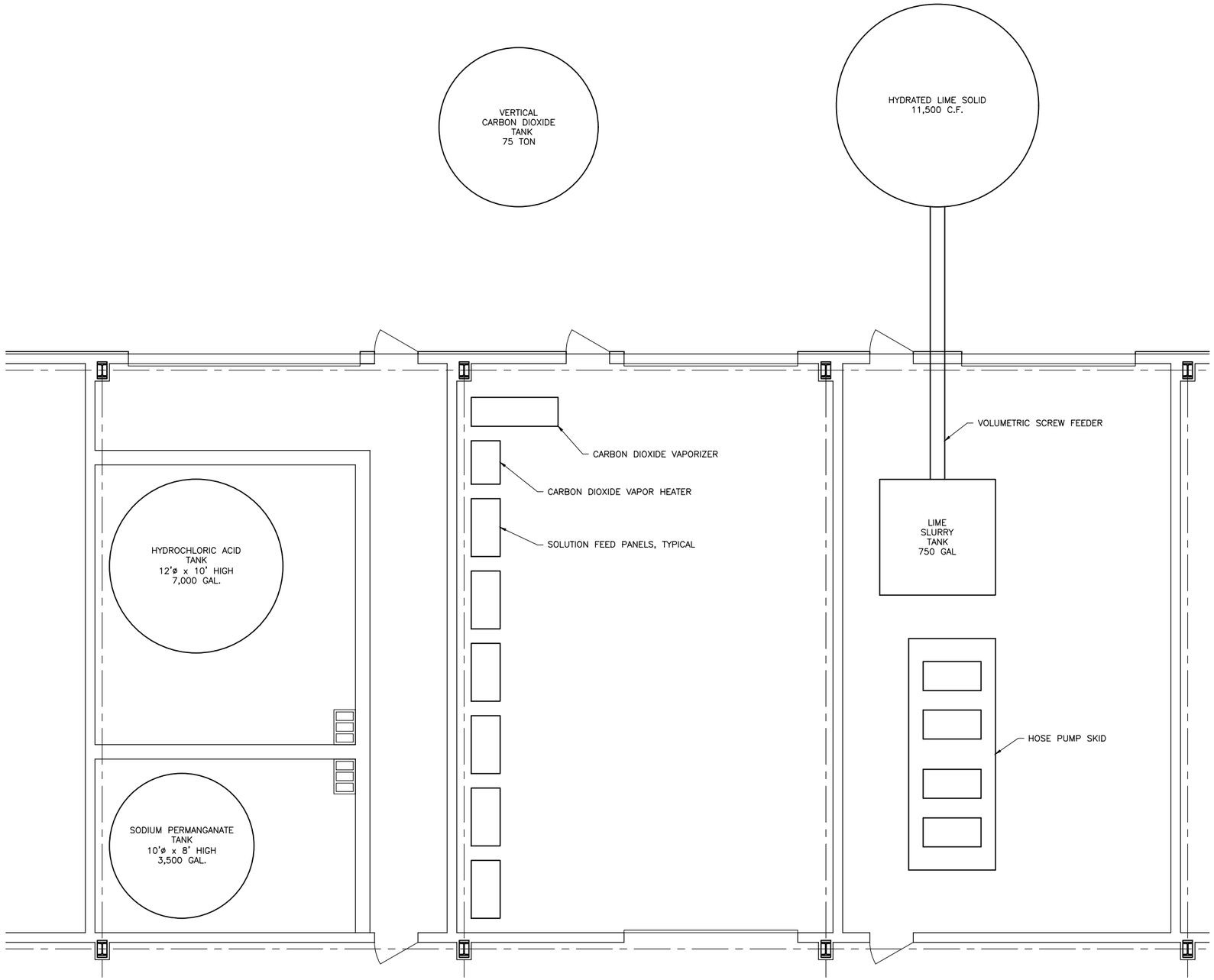

1 PLAN: WWTF AREA
SCALE 0 1 5

VER NO	DATE	DESCRIPTION
1	5/21/15	PERMIT APPLICATION SUBMITTAL
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		

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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 12/22/15 LICENSE # 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

MINE SITE WWTF
GENERAL ARRANGEMENT
CHEMICAL STORAGE AREA

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR

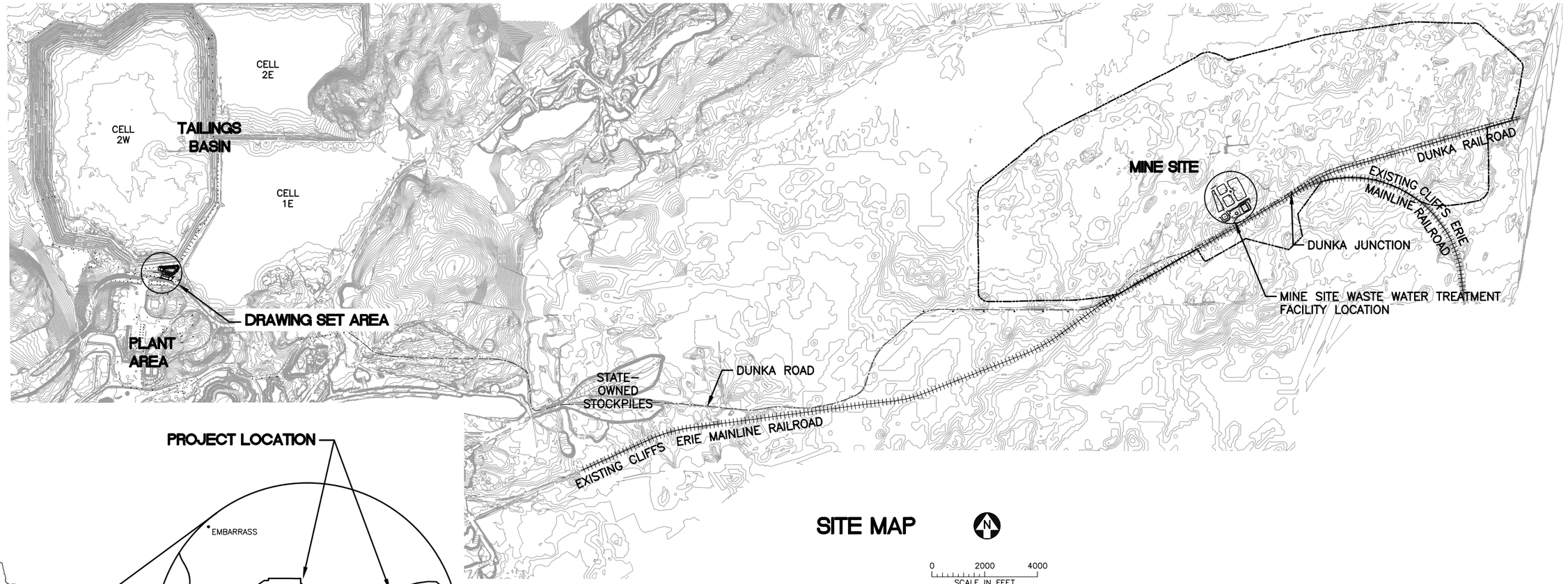
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTF-036
REV

INCHES 1 2

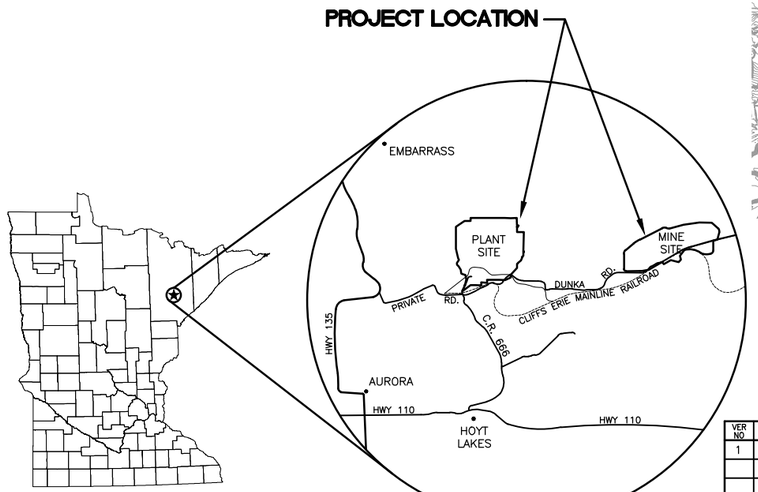
Wastewater Treatment Plant

POLY MET MINING, INC. NORTHMET PROJECT
PERMIT APPLICATION SUPPORT DRAWINGS
PLANT SITE WASTE WATER TREATMENT PLANT
HOYT LAKES, MINNESOTA



SITE MAP

0 2000 4000
SCALE IN FEET



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 5/21/15 LICENSE# 19646

DRAWN: MDS
CHECKED: JSU
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
LOCATION MAP AND SITE MAP

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-001
REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-TS-01.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:13 PM
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DRAWING INDEX

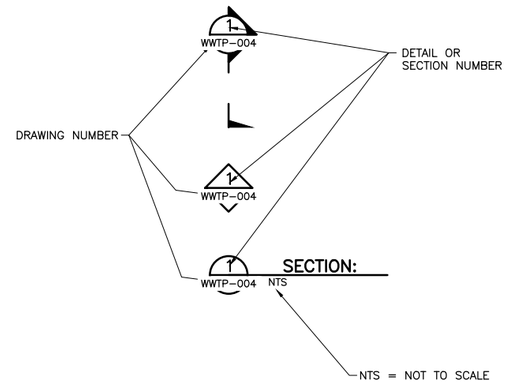
DRAWING NO.	TITLE
	TITLE SHEET
WWTP-001	LOCATION MAP AND SITE MAP
WWTP-002	LEGEND, ABBREVIATIONS, AND DRAWING INDEX
	CIVIL –SITE WORK
WWTP-003	EXISTING SITE PLAN AND DEMOLITION
WWTP-004	SITE GRADING PLAN AND CONSTRUCTION LIMITS
WWTP-005	YARD PIPING PLAN
WWTP-006	PRETREATMENT BASIN SECTIONS AND DETAILS
WWTP-007	PRETREATMENT BASIN OUTLET PLAN
WWTP-008	PRETREATMENT BASIN OUTLET SECTION
WWTP-009	NOT USED
WWTP-010	NOT USED
	MECHANICAL – MISCELLANEOUS
WWTP-011	MECHANICAL SYMBOLS AND LEGEND
	MECHANICAL – FLOW SHEETS, P&IDs, ETC.
WWTP-012	HYDRAULIC PROFILE
WWTP-013	PROCESS FLOW DIAGRAM – OVERVIEW
WWTP-014	PROCESS FLOW DIAGRAM – PRETREATMENT, AND GREENSAND FILTERS
WWTP-015	PROCESS FLOW DIAGRAM – PRIMARY MEMBRANES
WWTP-016	PROCESS FLOW DIAGRAM – SECONDARY MEMBRANES
WWTP-017	PROCESS FLOW DIAGRAM – PERMEATE STABILIZATION AND STREAM AUGMENTATION
WWTP-018	PROCESS FLOW DIAGRAM – LIQUID CHEMICAL STORAGE AND FEED
WWTP-019	PROCESS FLOW DIAGRAM – WASTE LOAD-OUT
WWTP-020	PROCESS FLOW DIAGRAM – CARBON DIOXIDE SYSTEM
WWTP-021	PROCESS FLOW DIAGRAM – PLANT WATER SYSTEM
	MECHANICAL – LAYOUTS
WWTP-022	OVERALL GENERAL ARRANGEMENT
WWTP-023	GENERAL ARRANGEMENT – MEDIA FILTER AND PRIMARY MEMBRANE AREA
WWTP-024	GENERAL ARRANGEMENT – SECONDARY MEMBRANE AND LOAD-OUT AREA
WWTP-025	GENERAL ARRANGEMENT – PERMEATE STABILIZATION AREA

GENERAL LEGEND

- EXISTING CONTOUR – MAJOR (1000)
- EXISTING CONTOUR – MINOR
- PROPOSED CONTOUR – MAJOR (1000)
- PROPOSED CONTOUR – MINOR
- EXISTING POWER POLE
- UNIDENTIFIED (U)
- EXISTING RAILROAD
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING UNIMPROVED TRAIL
- EXISTING STRUCTURES
- TREE LINE
- WETLAND BOUNDARY
- EXISTING CULVERT
- EXISTING PIPELINE (P)
- MnDOT CATEGORY 4 EROSION CONTROL BLANKET
- INLET PROTECTION AND DITCH CHECKS
- MnDOT TYPE 4 MULCH
- PROPOSED CULVERT (NON-MINE DRAINAGE)
- PROPOSED MANHOLE
- PROPOSED RIPRAP
- PROPOSED SILT FENCE
- PROPOSED PIPELINE
- CONSTRUCTION LIMITS
- PROPOSED STRUCTURES
- PROPOSED STRUCTURE EXPANSION
- PROPOSED ROAD
- SURFACE DRAINAGE
- TWP ALIGNMENT

GENERAL ABBREVIATIONS

TWP – TREATED WATER PIPELINE
CPS – CENTRAL PUMPING STATION
WWTP – WASTE WATER TREATMENT PLANT
WWTF – WASTE WATER TREATMENT FACILITY
CATEGORY 1 STOCKPILE – CATEGORY 1 WASTE ROCK STOCKPILE
OSLA – OVERBURDEN STORAGE AND LAYDOWN AREA
CIP – CAST IN PLACE ~OR~ CLEAN IN PLACE
CMU– CONCRETE MASONRY UNIT
PEP – POLYETHYLENE PIPE
ø – DIAMETER
MIN – MINIMUM
GAL. – GALLON
APPROX. – APPROXIMATE
DWG – DRAWING
EL – ELEVATION
NTS – NOT TO SCALE
TYP – TYPICAL
MnDOT – MINNESOTA DEPARTMENT OF TRANSPORTATION
HDPE – HIGH DENSITY POLYETHYLENE
RCP – REINFORCED CONCRETE PIPE
GCL – GEOSYNTHETIC CLAY LINER
DIP – DUCTILE IRON PIPE
FFE – FINISHED FLOOR ELEVATION
MIL – MILLIMETER
RTH – RAIL TRANSFER HOPPER
EQ – EQUALIZATION



NOTES:

1. COORDINATE SYSTEM IS BASED ON MINNESOTA STATE PLANE NORTH ZONE, NAD83.
2. ELEVATIONS ARE BASED ON MEAN SEA LEVEL (MSL), NAVD88.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THE DRAWINGS WAS PREPARED BY AEROMETRIC, INC. FROM LIDAR DATA COLLECTED ON MARCH 17, 2010.
4. ALL EXISTING SUBSURFACE UTILITY INFORMATION SHOWN ON DRAWINGS SHALL BE CONSIDERED QUALITY LEVEL D (QL-D) AS DEFINED BY THE STANDARD GUIDELINES FOR THE COLLECTION DEPICTION OF EXISTING SUBSURFACE UTILITY DATA (ASCE, 2003) UNLESS OTHERWISE SPECIFIED.

VER NO.	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
2	12/22/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	2	12/22/15
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION.		

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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 12/22/15 LICENSE# 19646

DRAWN: GWG
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
LEGEND, ABREVIATIONS, AND DRAWING INDEX

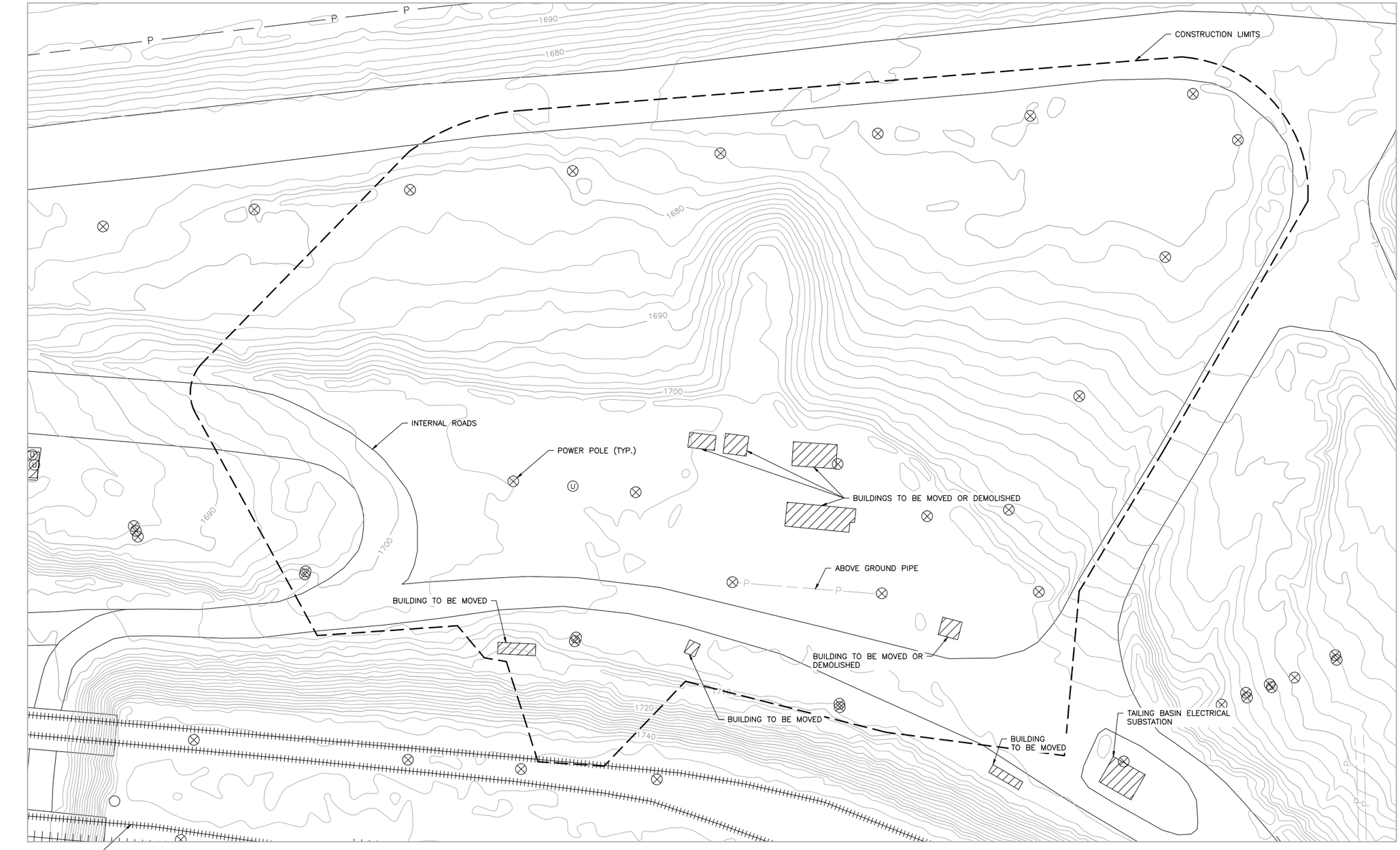
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-002
REV

INCHES 1 2



1 – PLAN: EXISITNG SITE PLAN

0 50 100

SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE B. Oakley

DATE 5/21/15 LICENSE# 24480

DRAWN:

CHECKED:

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
EXISTING SITE PLAN
AND DEMOLITION

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

DWG. NO. WWTP-003

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-CS-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:29 PM

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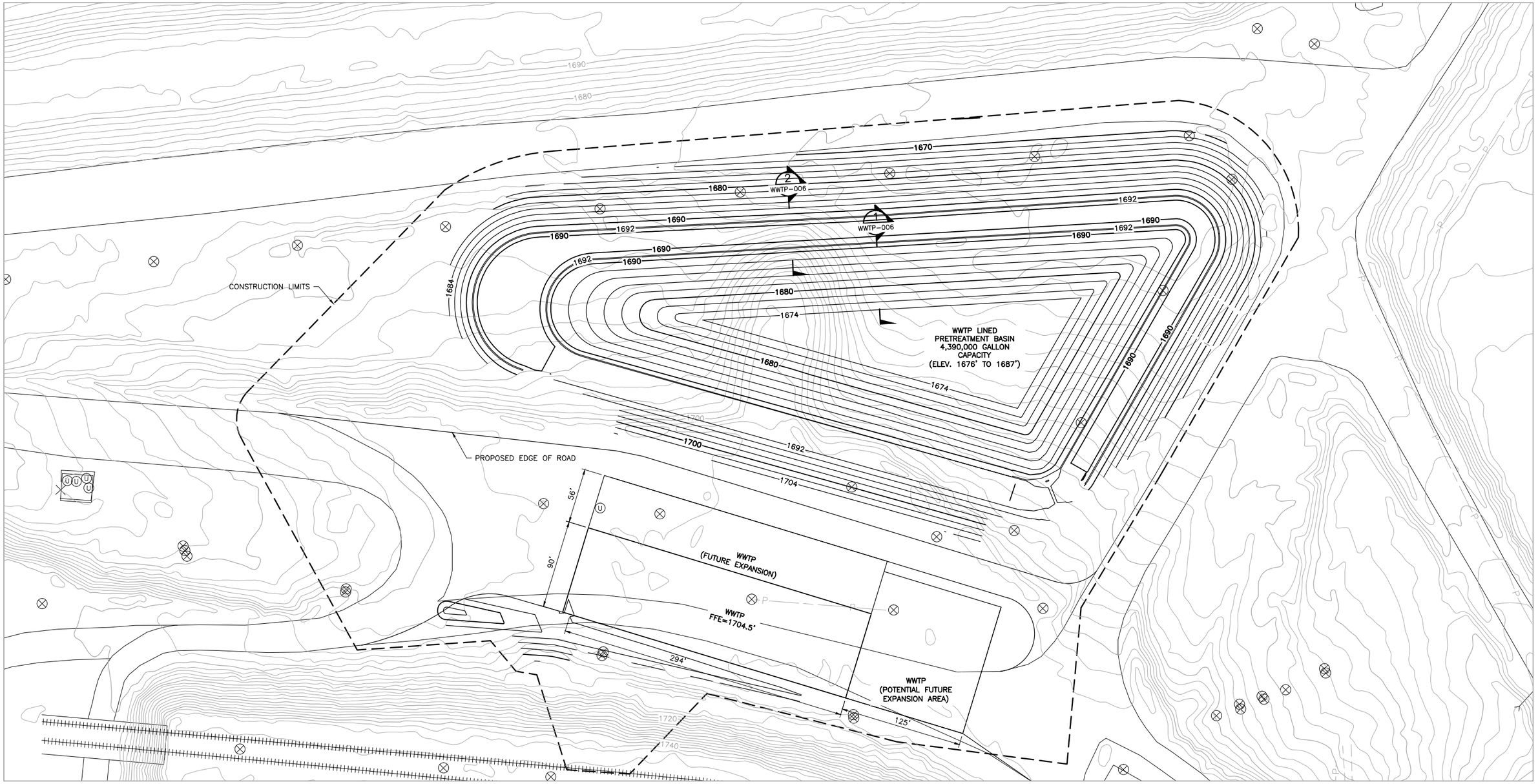

1 PLAN: SITE GRADING

0 50 100

SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE# 24480

DRAWN:

CHECKED:

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
SITE GRADING PLAN
AND CONSTRUCTION LIMITS

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

DWG. NO. WWTP-004

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-CS-002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/27/2015 3:11 PM

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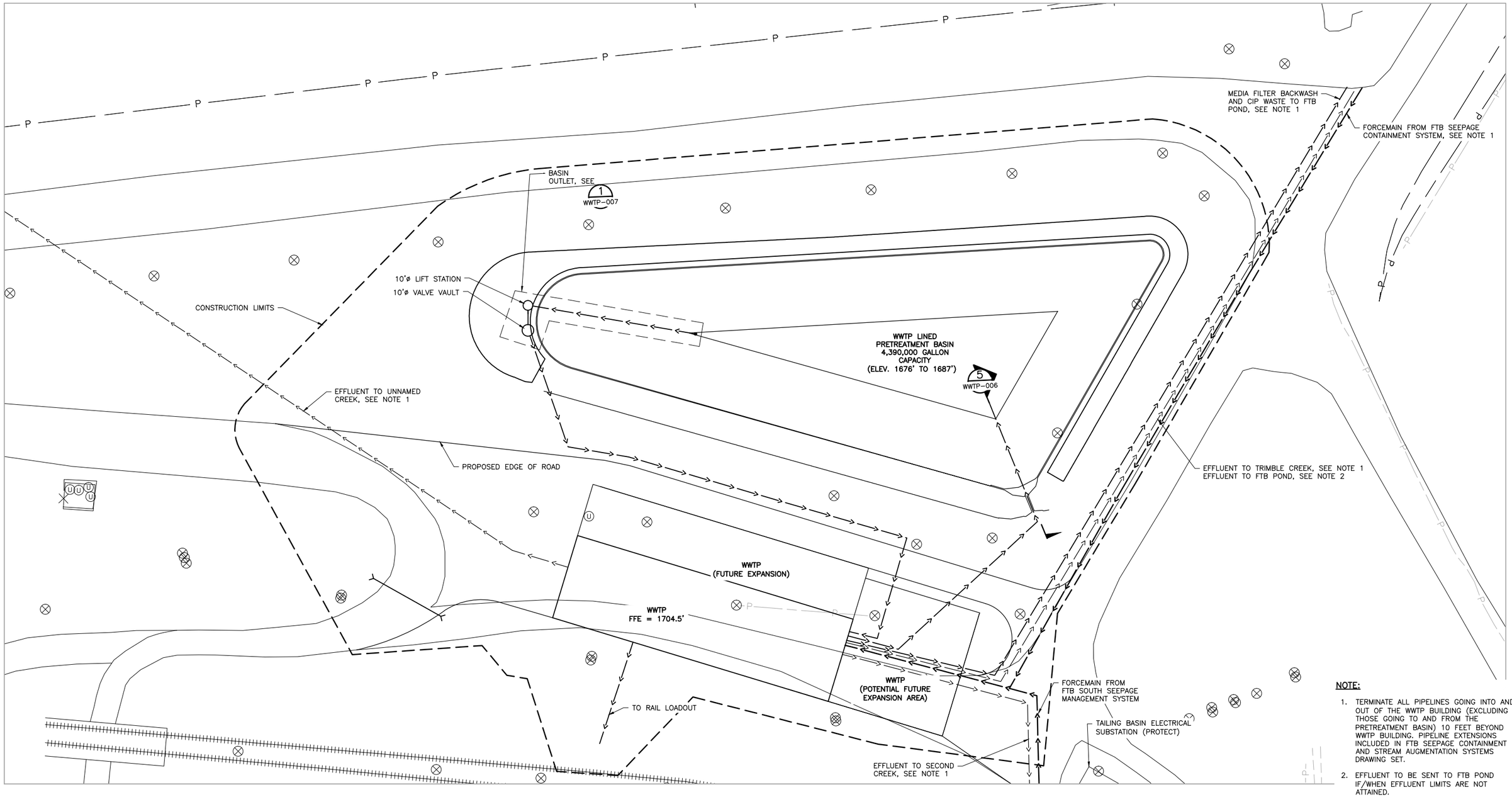

NOTE:

1. TERMINATE ALL PIPELINES GOING INTO AND OUT OF THE WWTP BUILDING (EXCLUDING THOSE GOING TO AND FROM THE PRETREATMENT BASIN) 10 FEET BEYOND WWTP BUILDING. PIPELINE EXTENSIONS INCLUDED IN FTB SEEPAGE CONTAINMENT AND STREAM AUGMENTATION SYSTEMS DRAWING SET.
2. EFFLUENT TO BE SENT TO FTB POND IF/WHEN EFFLUENT LIMITS ARE NOT ATTAINED.

1 PLAN: YARD PIPING

0 50 100
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS
2	1/27/16	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	1/27/16
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 BRYAN T. OAKLEY
SIGNATURE
DATE 1/27/16 LICENSE# 24480

DRAWN:
CHECKED:
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
YARD PIPING PLAN

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-005
REV

CADD USER: Joseph A. Mlashius FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-CS-003.DWG PLOT SCALE: 1:2 PLOT DATE: 1/27/2016 2:01 PM

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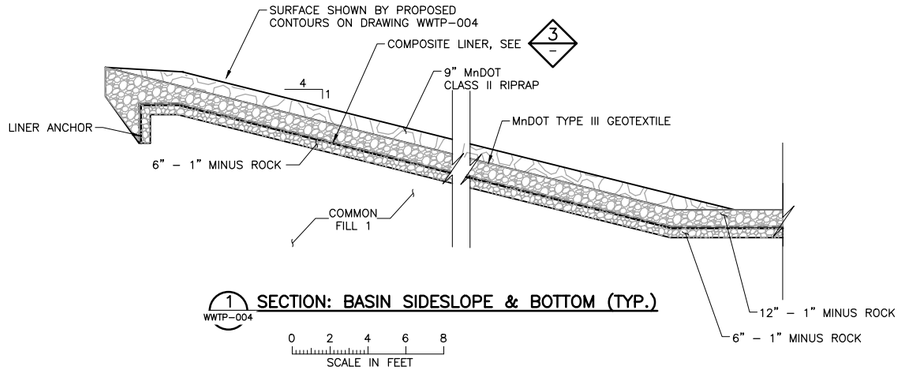
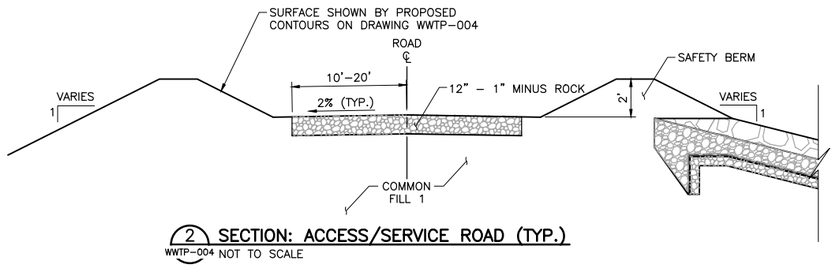
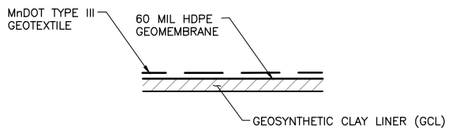


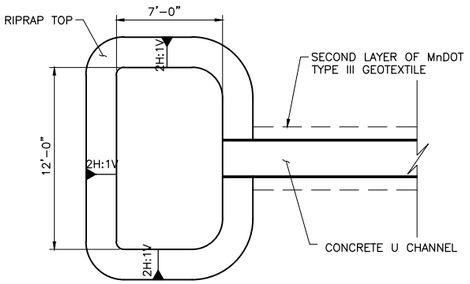
1 WWTP-004 **SECTION: BASIN SIDESLOPE & BOTTOM (TYP.)**



2 WWTP-004 **SECTION: ACCESS/SERVICE ROAD (TYP.)** NOT TO SCALE



3 – **DETAIL: COMPOSITE LINER** NOT TO SCALE



4 – **DETAIL: DISSIPATER POOL**
0 5 10
SCALE IN FEET

5 WWTP-005 **SECTION: BASIN INLET STRUCTURE**
0 2 4 6 8
SCALE IN FEET

NOTE:

1. PIPE SIZES ARE PRELIMINARY

VER NO	DATE	DESCRIPTION
1	9/24/13	DEFINITIVE ESTIMATE
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ISSUE STATUS	VERSION	DATE
FOR PERMITTING	2	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME JEFF S. UBL
SIGNATURE
DATE 5/21/15 LICENSE# 19646

DRAWN:
CHECKED:
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PRETREATMENT BASIN
SECTIONS AND DETAILS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-006 REV

CADD USER: Adeptuser FILE: \\PWHB\HBBNG PW\HBB PW IN\C7F93C2-25B9-4EC3-BBF6-9B8A0E68B0A6\3B443FFD-9DCF-4B5C-9DAF-15A1F53B094A\PERMIT_NMT-45-CS-004.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 10:20 AM

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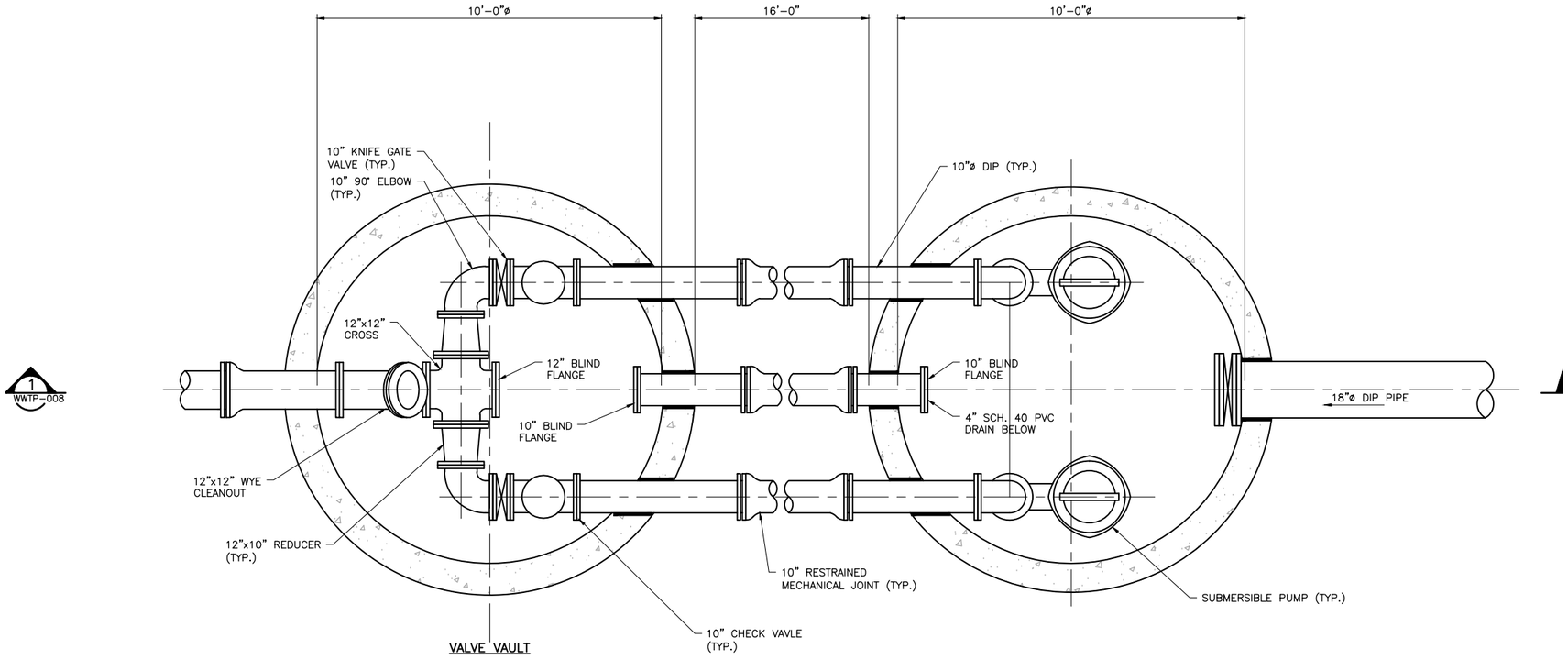

1 WWTP-008

1 WWTP-005 PLAN: PRETREATMENT BASIN OUTLET LIFT STATION

0 2 4
SCALE IN FEET

NOTE:

1. PIPE SIZES ARE PRELIMINARY

VER NO.	DATE	DESCRIPTION
1	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
FOR CONSTRUCTION		

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE# 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PRETREATMENT BASIN OUTLET PLAN

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

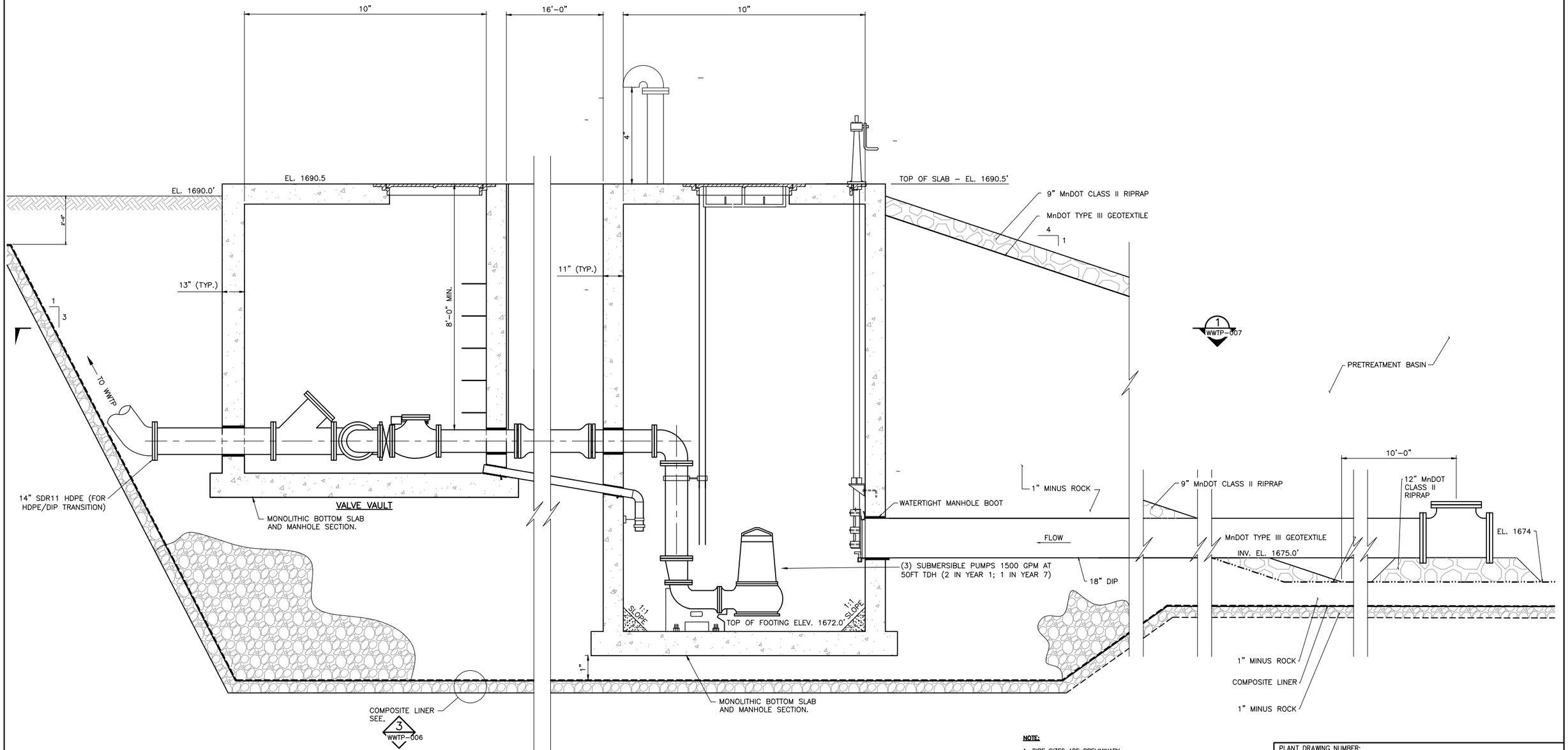
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-007

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-CS-005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:40 PM

INCHES 1 2



NOTE:

1. PIPE SIZES ARE PRELIMINARY

1 WWTP-007 SECTION: PRETREATMENT BASIN OUTLET LIFT STATION

0 1 2 3 4
SCALE IN FEET

VER NO	DATE	DESCRIPTION
1	9/24/13	DEFINITIVE ESTIMATE
2	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	2	5/21/15
FOR CONSTRUCTION		

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SIGNATURE
DATE 5/21/15 LICENSE# 24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PRETREATMENT BASIN OUTLET SECTION

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

DWG. NO. WWTP-008 REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-CS-006.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:42 PM

INCHES 0 1 2

VALVE SYMBOLS

- IPS EXPANSION JOINT COUPLING
- FLOW METER
- GATE OR GENERIC VALVE
- BUTTERFLY VALVE
- GLOBE VALVE
- BALL VALVE
- PLUG VALVE
- CHECK VALVE
- BALL CHECK VALVE
- BUTTERFLY CHECK VALVE
- SOLENOID OPERATED VALVE
- PNEUMATIC OPERATED VALVE
- MOTOR OPERATED VALVE
- AIR RELEASE VALVE
- PNEUMATIC OPERATED BACKFLOW PREVENTER
- PRESSURE RELIEF VALVE
- CALIBRATION CYLINDER

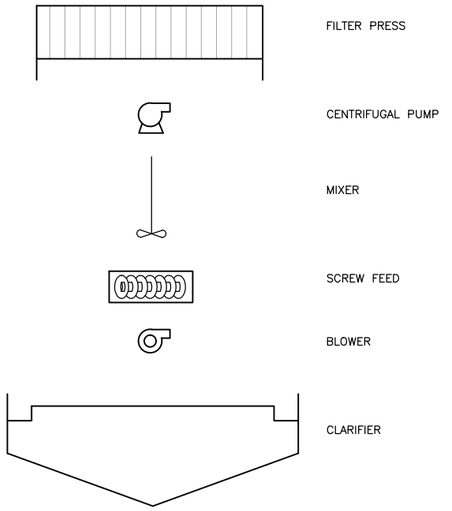
PIPING SYMBOLS

- QUICK CONNECT COUPLING
- HOSE COUPLING
- FLEXIBLE HOSE
- A/S — AIR SUPPLY
- CONNECTION TO PROCESS
- SLIDE GATE/SLUICE GATE
- TRUCK
- SCREW CONVEYOR
- Y-STAINER
- FLEXBLE CONNECTION

MECHANICAL PIPING

- FLANGED JOINT
- MECHANICAL JOINT
- LIQUID LEVEL
- PULSATION DAMPENER

TYPICAL EQUIPMENT



- FILTER PRESS
- CENTRIFUGAL PUMP
- MIXER
- SCREW FEED
- BLOWER
- CLARIFIER
- FLOW METERING PUMP
- CARTRIDGE FILTER OR BASKET STRAINER
- FORK LIFT

MECHANICAL ABBREVIATIONS

PIPING MATERIALS

BSP	BLACK STEEL PIPE	GALV	GALVANIZED STEEL PIPE
CI	CAST IRON PIPE	HDPE	HIGH DENSITY POLYETHYLENE
		PVC	POLYVINYL CHLORIDE PIPE
CMP	CORRUGATED METAL PIPE	RCP	REINFORCED CONCRETE PIPE
CS	CARBON STEEL	RED	REDUCER
CU	COPPER PIPE	SS	STAINLESS STEEL PIPE
DIP	DUCTILE IRON PIPE		
FRP	FIBERGLASS REINFORCED PLASTIC		

PROCESS FLOW STREAM

AIR	COMPRESSED AIR	NPW	NON-POTABLE-WATER
BYP	BYPASS	OVF	OVERFLOW
CW	COLD WATER	PA	PLANT AIR
DR	DRAIN	PW	PLANT WATER
EFF	EFFLUENT	REC	RECYCLE
FE	FINAL EFFLUENT	SC	SCUM
FM	FORCEMAIN	SE	SECONDARY EFFLUENT
FW	FLUSHING WATER	SN	SUPERNATANT, SUBNATANT
GS	GRIT SLURRY	SW	STORM WATER
HC	HOSE CONNECTION	TD	TANK DRAIN
INF	PROCESS BASIN INFLUENT	VT	VENT

VALVE AND FITTING NOMENCLATURE

BCV	BALL CHECK VALVE		
BFV	BUTTERFLY VALVE		
BPRV	BACK PRESSURE REGULATING VALVE	PE	PLAIN END
BV	BALL VALVE	POJ	PUSH ON JOINT
COMP JT	COMPRESSION JOINT	PRV	PRESSURE RELIEF VALVE
CPLG	COUPLING	PV	PLUG VALVE
CV	CHECK VALVE (AIR CUSHION)	PVRV	PRESSURE VACUUM RELIEF VALVE
DO	DISSOLVED OXYGEN PROBE	RJ	RESTRAINED JOINT
EXP JT	EXPANSION JOINT	SJ	SOLDERED JOINT
FAC	FLANGED ADAPTER COUPLING	SOLV	SOLENOID VALVE
FH	FIRE HYDRANT	THD	THREADED
FS	FLOOR STAND	TUBV	TRUE IRON BALL VALVE
GOV	GLOBE VALVE	UN	UNION
GV	GATE VALVE	VB	VALVE BOX
MJ	MECHANICAL JOINT	VC	VICTAULIC COUPLING (SHOULDERED ENDS)
MV	MUD VALVE	WAP	WALL PIPE
P	PUMP	WJ	WELDED JOINT
PBAV	PLASTIC BALL VALVE	WP	WELDED PIPE
		WSV	WALL SLEEVE

PROCESS ABBREVIATIONS

HDS	HIGH DENSITY SLUDGE
CIP	CLEAN IN PLACE
CPS	CENTRAL PUMPING STATION
RO	REVERSE OSMOSIS

NOTE: REFER TO TS-02 FOR GENERAL ABBREVIATIONS.

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE# 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
MECHANICAL SYMBOLS AND LEGEND

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-011

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-M-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:47 PM

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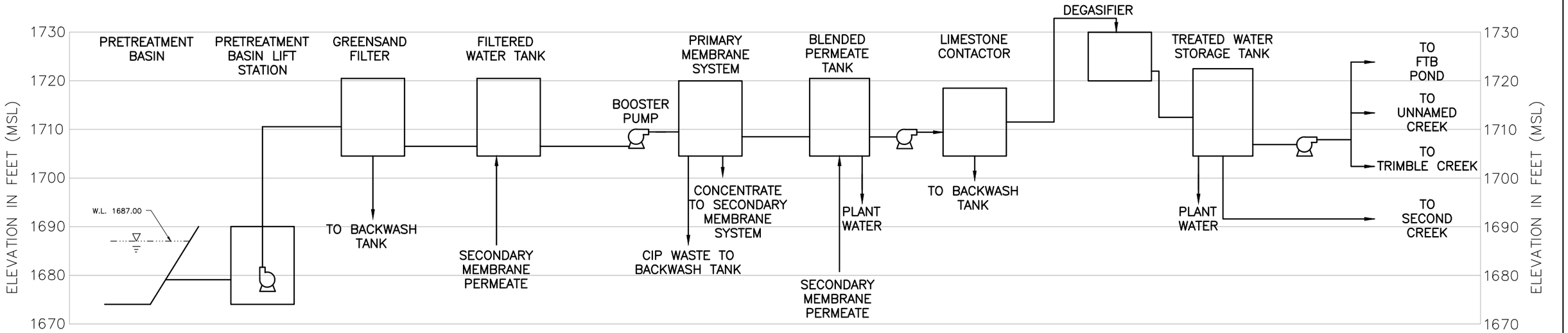
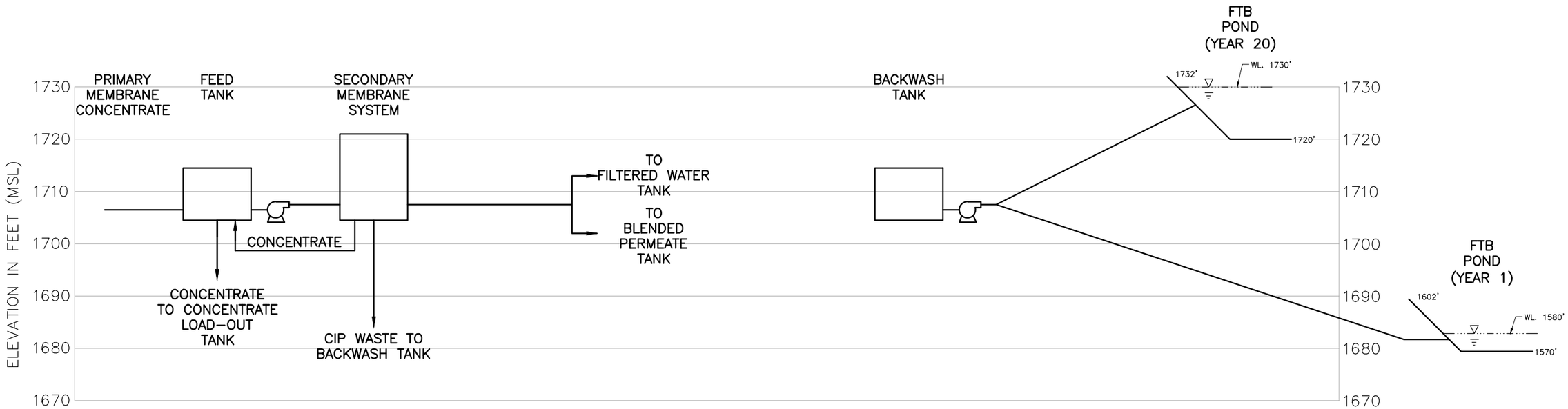


PRIMARY MEMBRANE SYSTEM – HYDRAULIC PROFILE



RESIDUALS – HYDRAULIC PROFILE

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE# 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
HYDRAULIC PROFILE

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

DWG. NO. WWTP–012

REV

CADD USER: Terri J. Toms FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-MF-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/27/2015 3:13 PM

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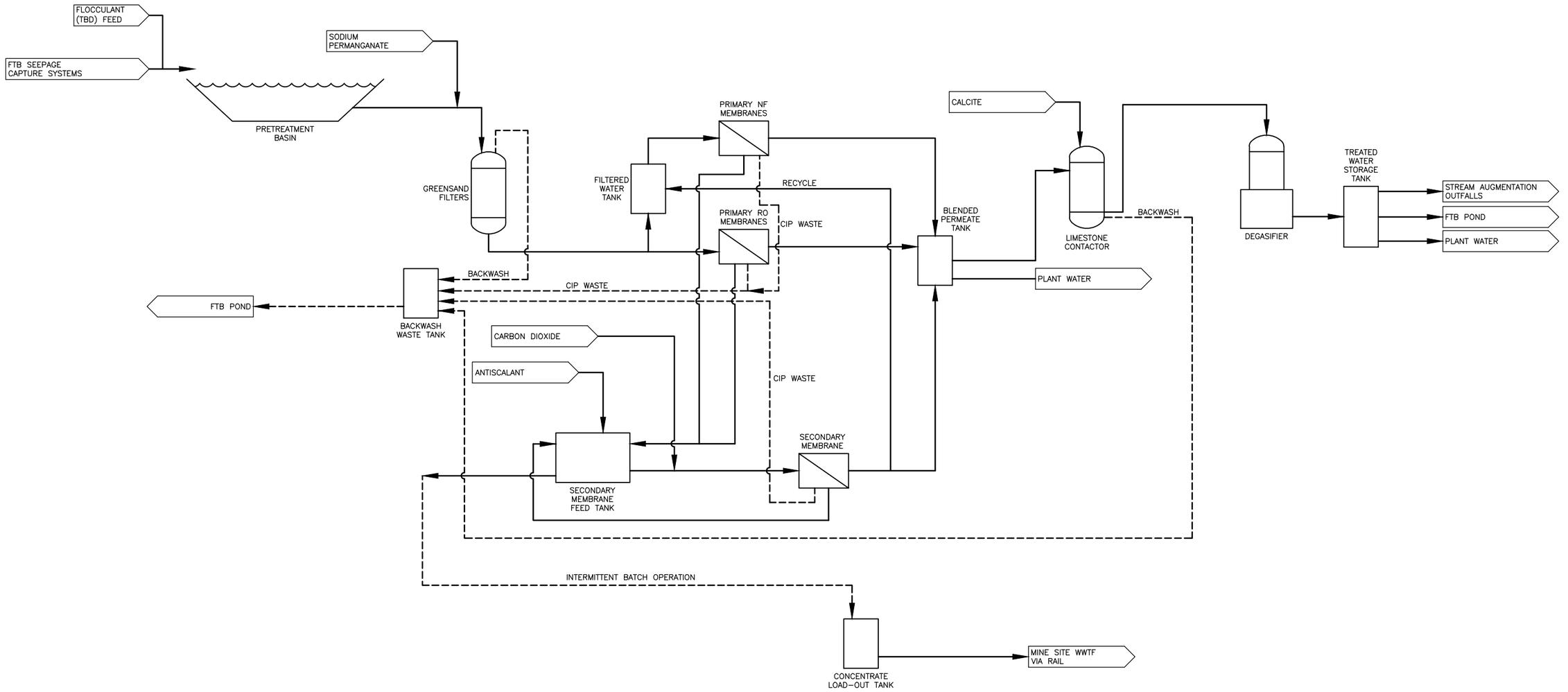

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP PROCESS FLOW DIAGRAM OVERVIEW

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-013

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-MF-002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:51 PM

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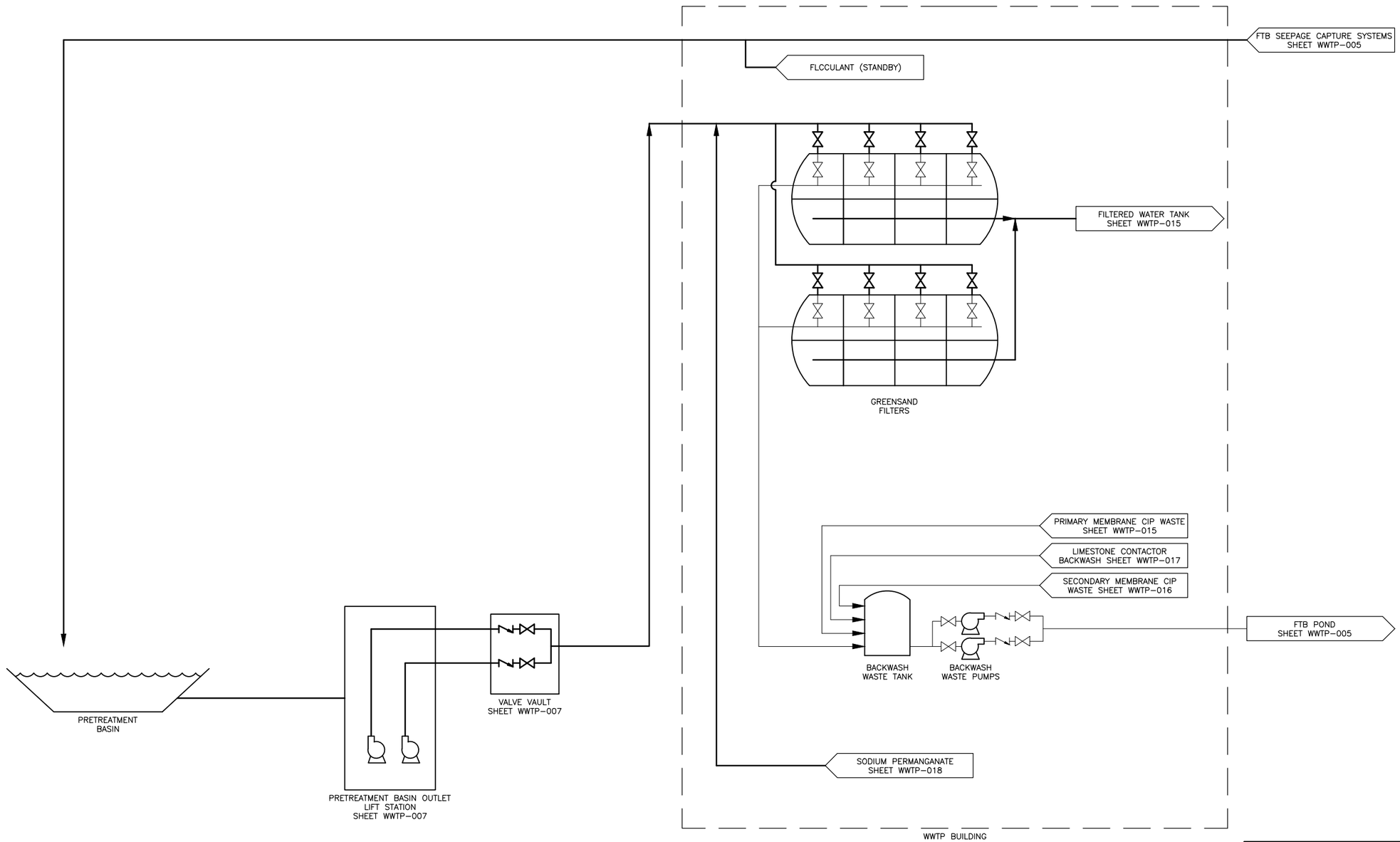

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-MF-003.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:58 PM

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VER NO	DATE	DESCRIPTION
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ISSUE STATUS		
ISSUED	VERSION	DATE
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PRINTED NAME TODD D. DEJOURNETT
SIGNATURE
DATE 5/21/15 LICENSE# 47085

DRAWN: MDS
CHECKED: TDD
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

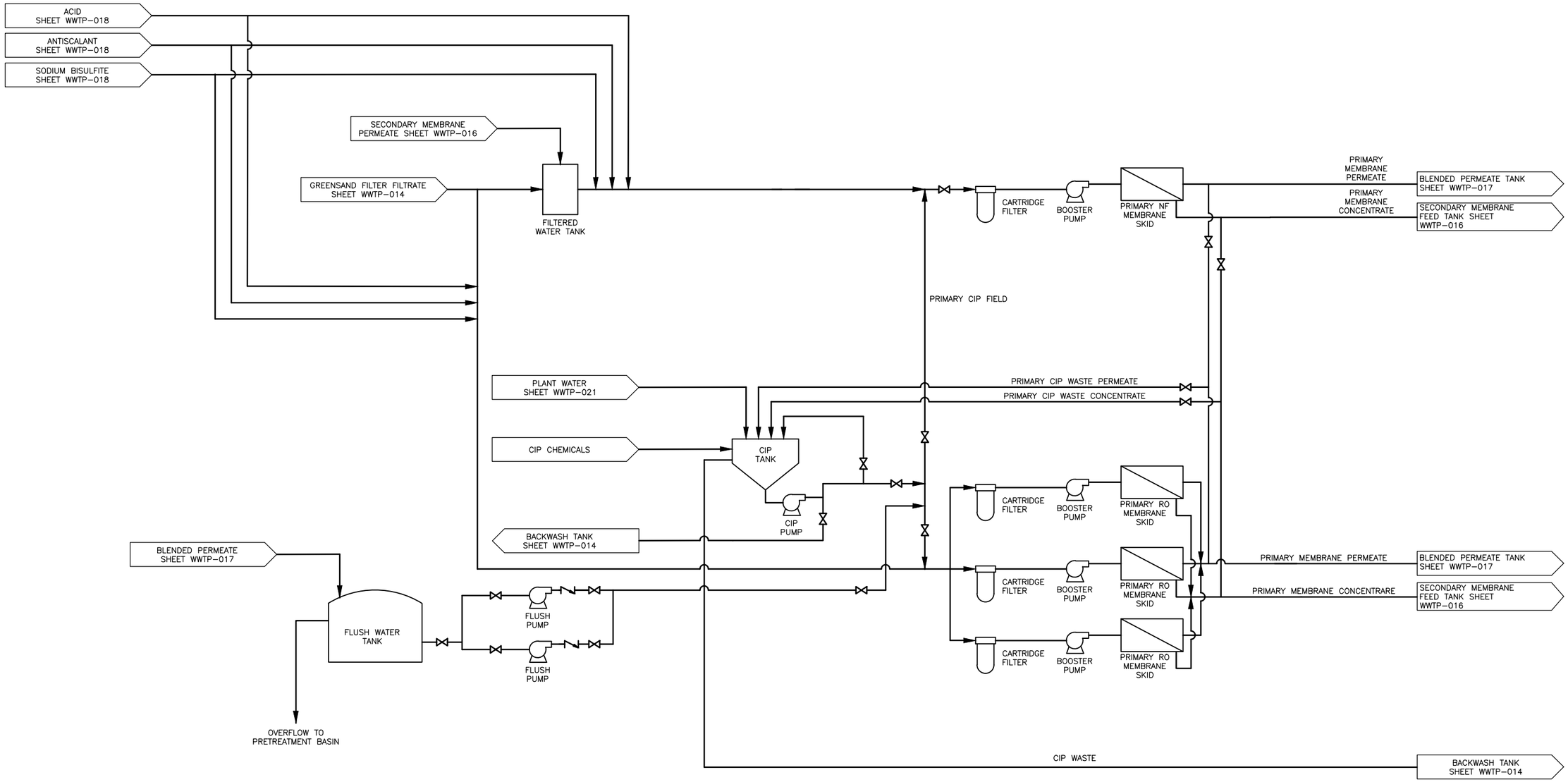
PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
PRETREATMENT AND GREENSAND FILTERS

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-014
REV



NOTE:

NOT ALL VALVES ARE SHOWN

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ISSUED	VERSION	DATE
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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69–0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
PRIMARY MEMBRANES

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1–800–632–2277

DWG. NO. WWTP–015

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-MF-004.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 12:59 PM

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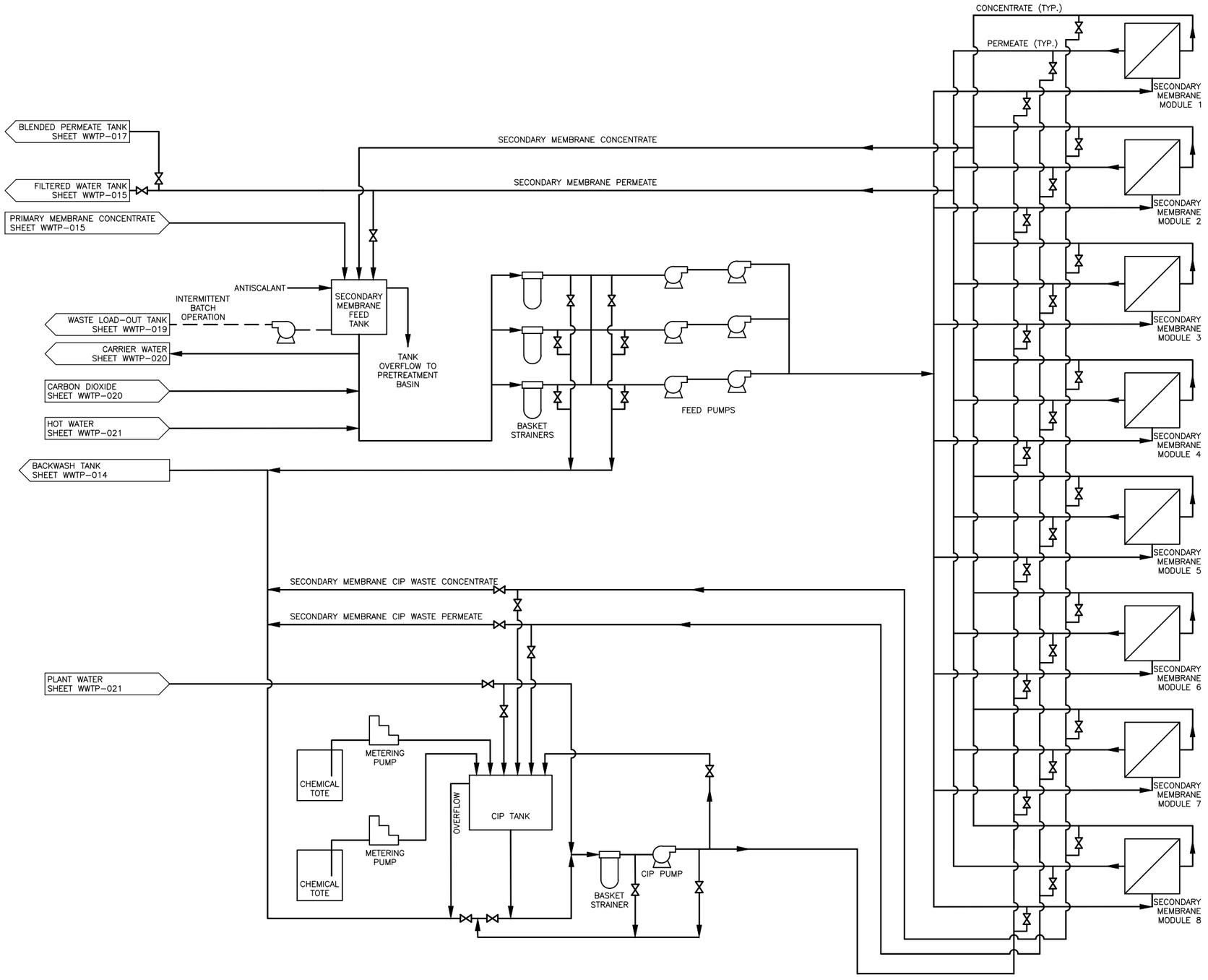

NOTE:

1. LAYOUT IS TYPICAL FOR 2 TRAINS
2. NOT ALL VALVES ARE SHOWN

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SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
SECONDARY MEMBRANES

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-016

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-MF-005.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 1:01 PM

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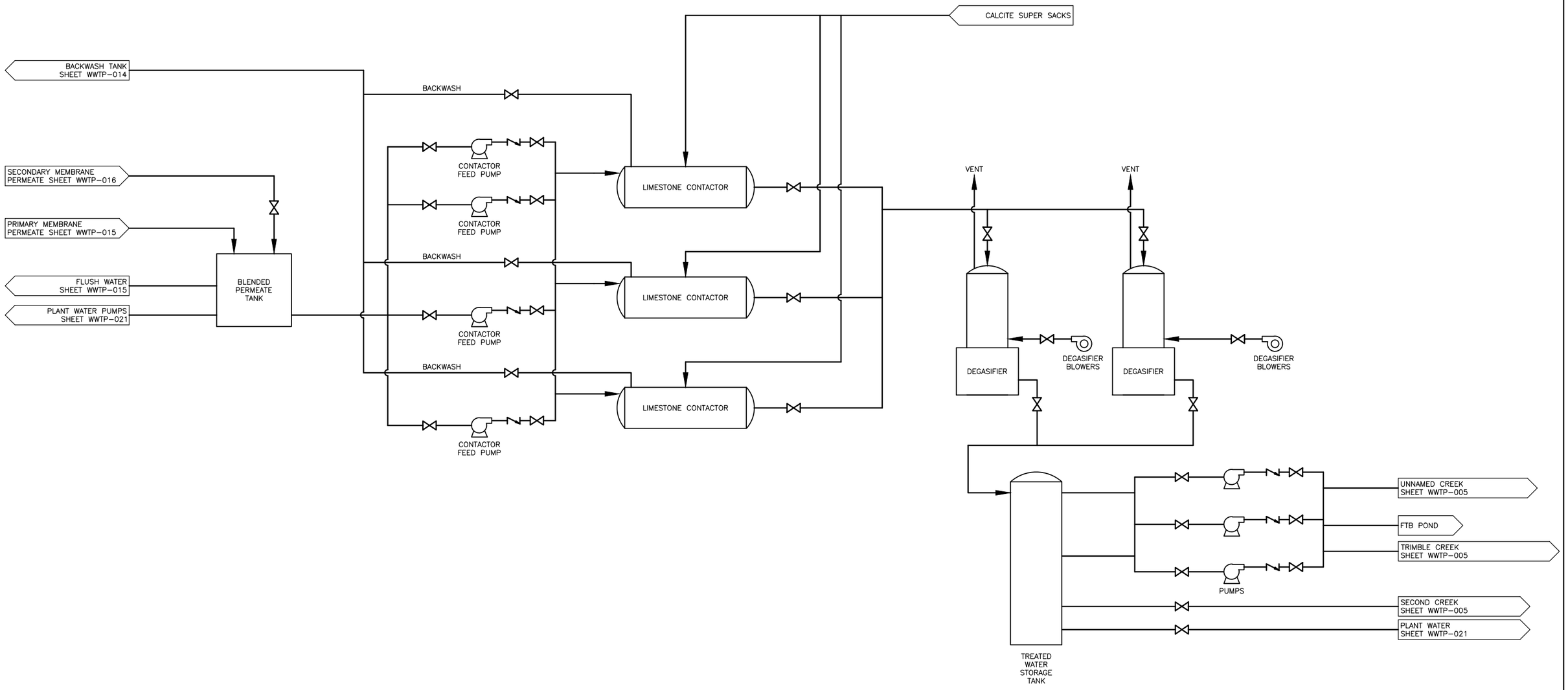

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INCHES 1 2

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2	5/21/15	ISSUED FOR INCLUSION IN PERMIT APPLICATIONS

ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	2	5/21/15
FOR CONSTRUCTION		

NOT APPROVED FOR CONSTRUCTION.

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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
PERMEATE STABIL. AND STREAM AUGMENT.

POLYMET MINING

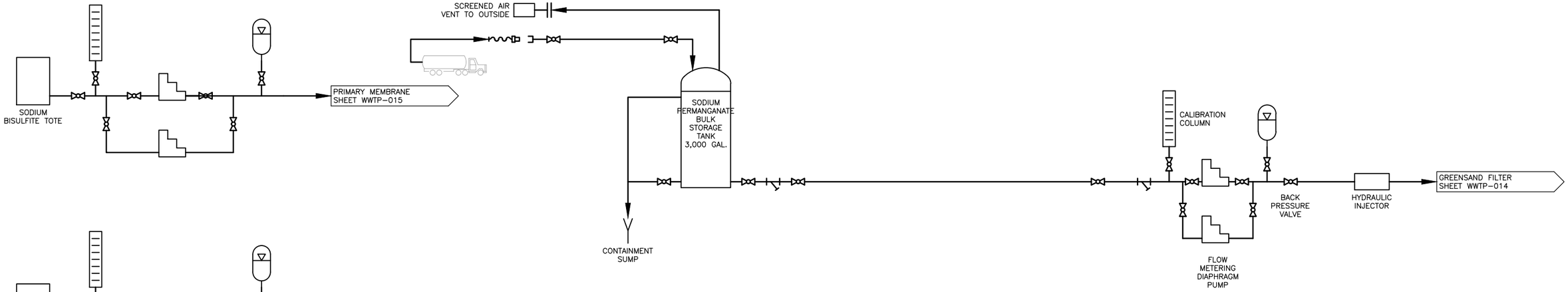
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-017

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-MF-007.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 1:04 PM



VER NO	DATE	DESCRIPTION
1	9/24/13	DEFINITIVE ESTIMATE
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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
LIQUID CHEMICAL STORAGE AND FEED

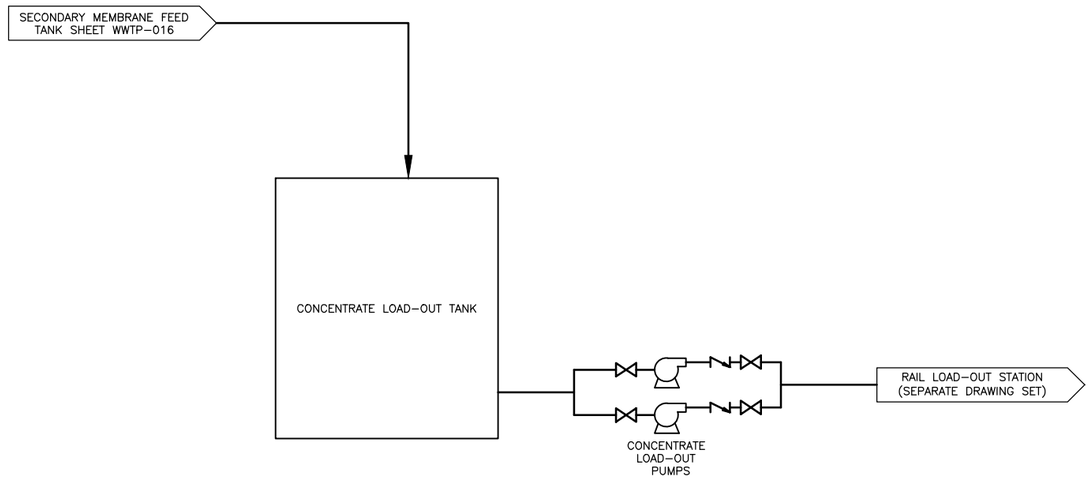
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-018

REV

INCHES 1 2



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VER NO.	DATE	DESCRIPTION
1	9/24/13	DEFINITIVE ESTIMATE
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ISSUE STATUS		
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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
WASTE LOAD-OUT

POLYMET MINING

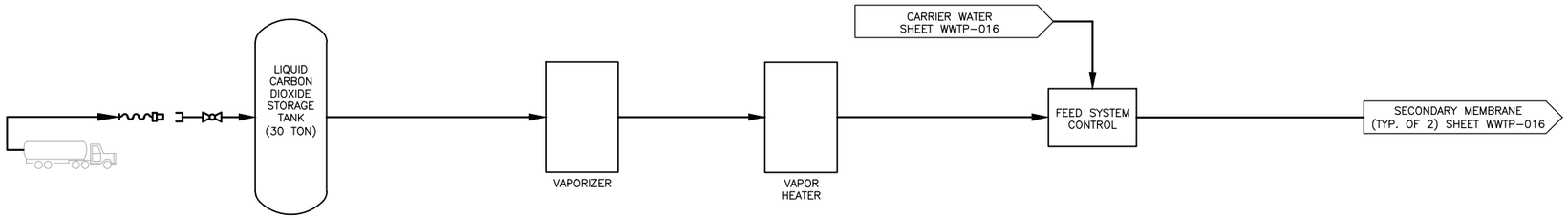
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-019

REV

INCHES 1 2



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SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
CARBON DIOXIDE SYSTEM

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-020

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-MF-009.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 1:07 PM

INCHES 1 2

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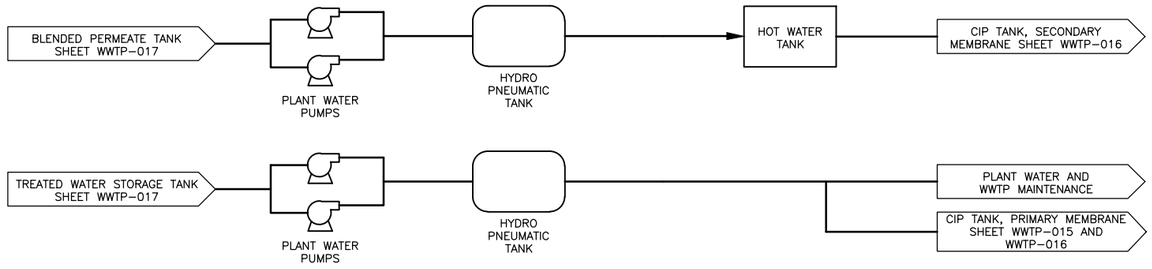

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ISSUE STATUS		
ISSUED	VERSION	DATE
FOR PERMITTING	1	5/21/15
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PRINTED NAME TODD D. DEJOURNETT

SIGNATURE

DATE 5/21/15 LICENSE# 47085

DRAWN: MDS

CHECKED: TDD

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
PROCESS FLOW DIAGRAM
PLANT WATER SYSTEM

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

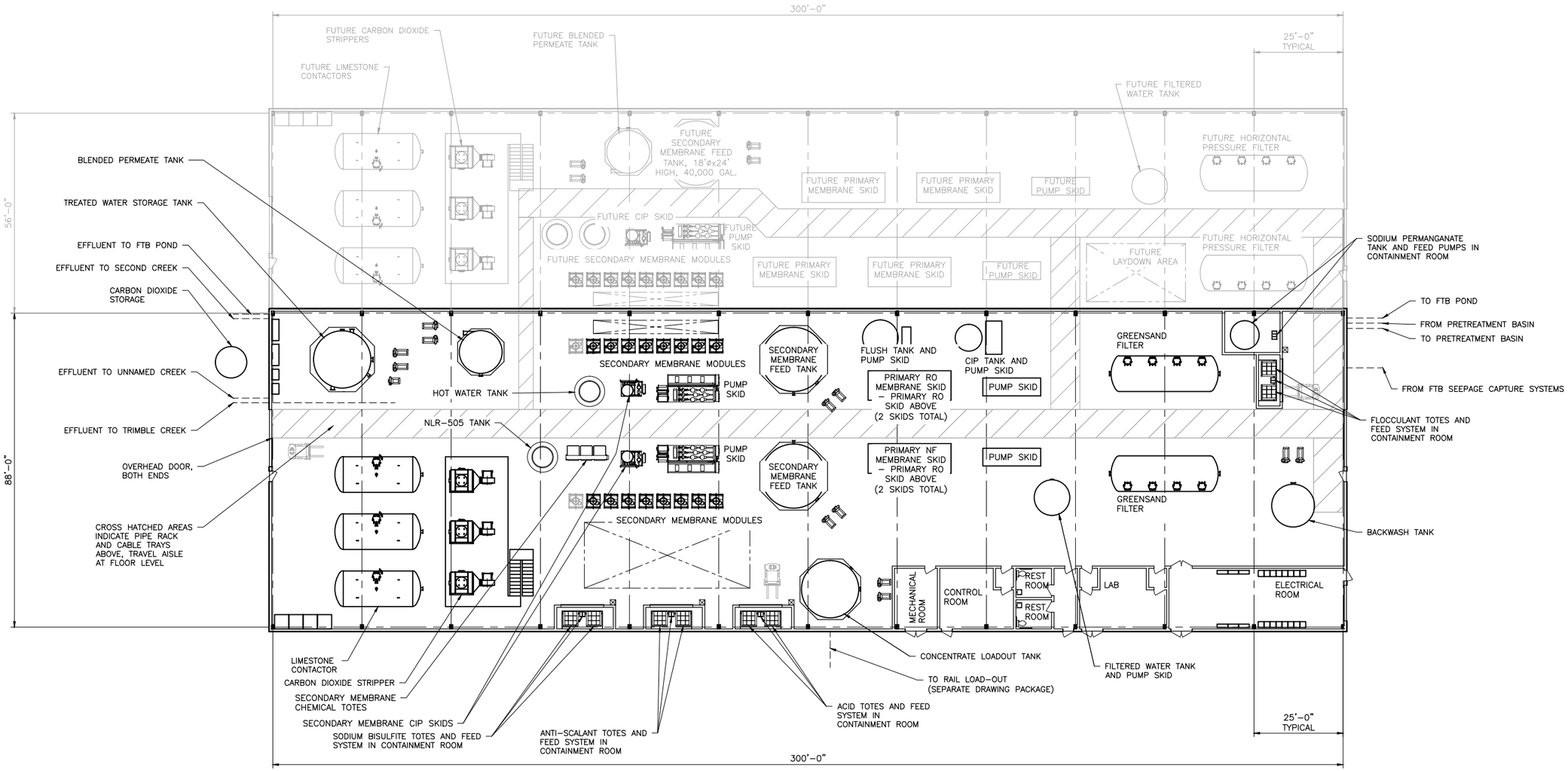
DWG. NO. WWTP-021

REV

INCHES 1 2

NOTES:

1. FUTURE BUILD OUT SHOWN GRAY.



1 PLAN: WWTP GENERAL ARANGEMENT

0 5 10 20 30
SCALE

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-ML-001.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 1:10 PM

INCHES 1 2

VER NO.	DATE	DESCRIPTION
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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE #24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
OVERALL GENERAL ARRANGEMENT

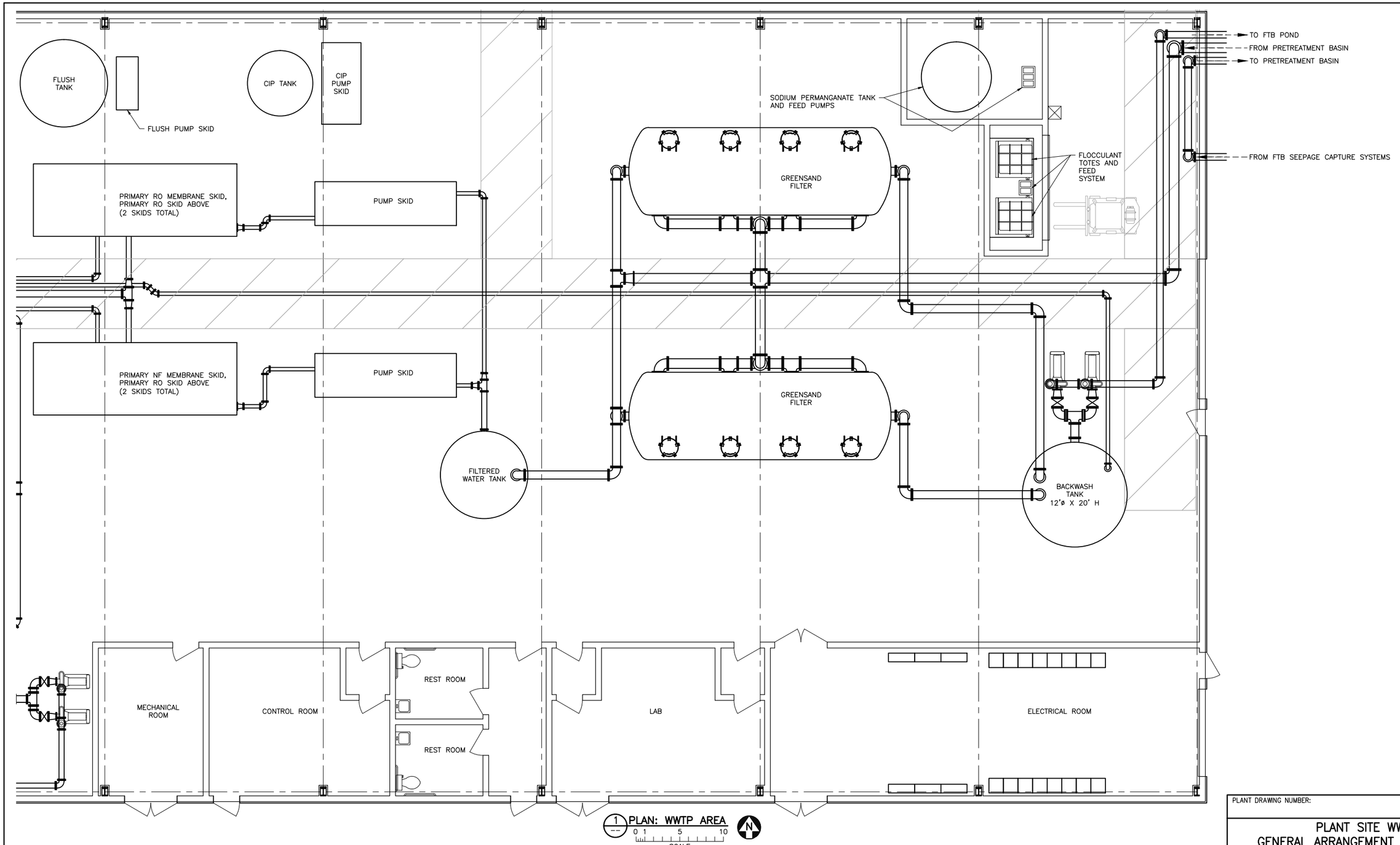
POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-022

REV



1 PLAN: WWTP AREA
SCALE 0 1 5 10

VER NO	DATE	DESCRIPTION
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PRINTED NAME BRYAN T. OAKLEY
SIGNATURE
DATE 5/21/15 LICENSE #24480

DRAWN: MDS
CHECKED: BTO
BARR PROJECT NO.: 23/69-0C29
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
GENERAL ARRANGEMENT MEDIA FILTER AND PRIMARY MEMBRANE AREA

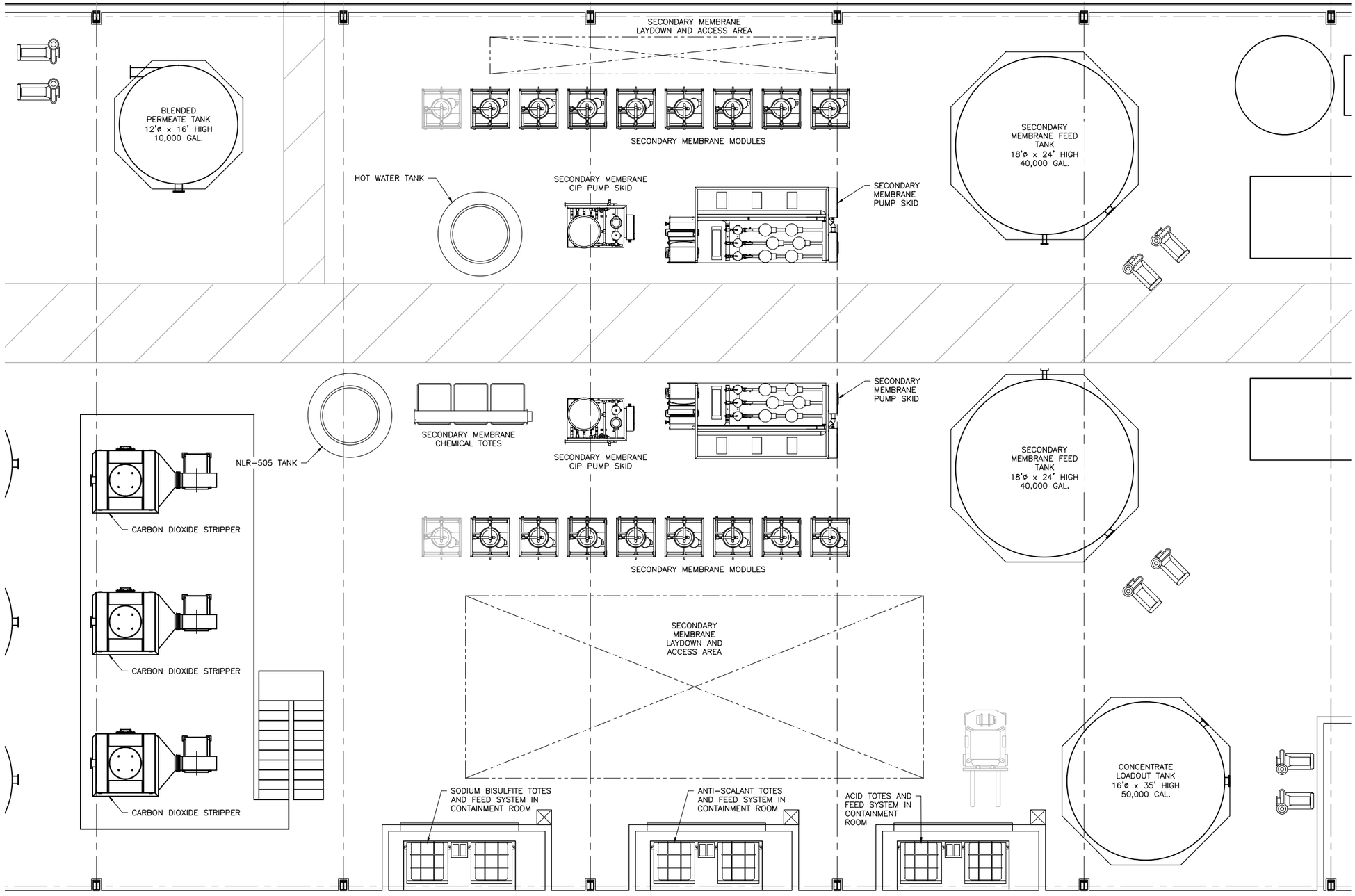
POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-023
REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-ML-002.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 1:12 PM

INCHES 1 2



1 -- PLAN: WWTP AREA

0 1 5 10

SCALE

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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE # 24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
GENERAL ARRANGEMENT
SECONDARY MEMBRANE AND LOAD-OUT AREA

POLYMET MINING

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

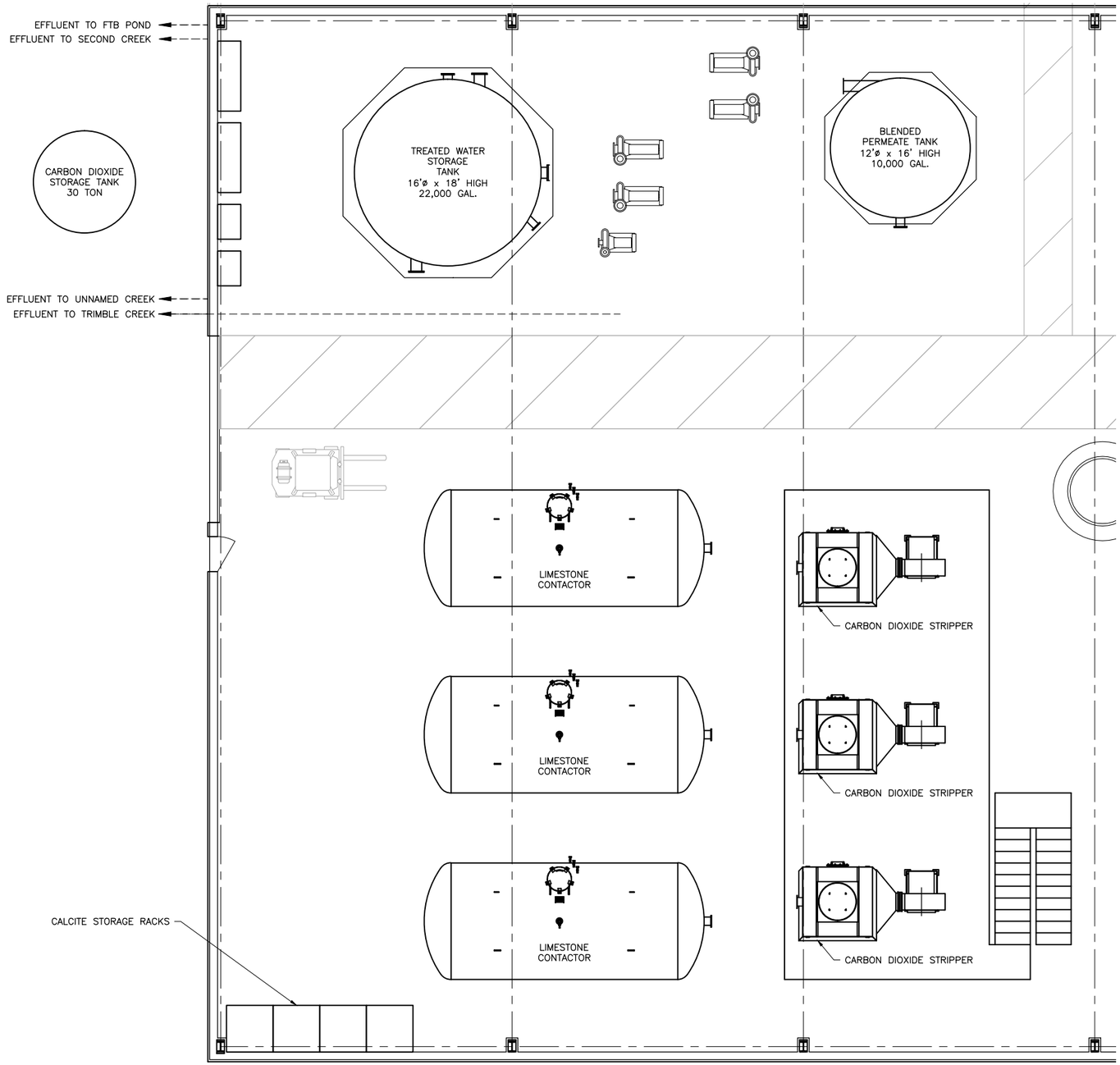
BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-024

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-ML-003.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 1:13 PM

INCHES 1 2



1 PLAN: PERMEATE STABILIZATION

SCALE 0 1 5 10

NOTES:

1. CARBON DIOXIDE STRIPPERS WILL BE ON A MEZZANINE LEVEL

VER NO	DATE	DESCRIPTION
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PRINTED NAME BRYAN T. OAKLEY

SIGNATURE

DATE 5/21/15 LICENSE #24480

DRAWN: MDS

CHECKED: BTO

BARR PROJECT NO.: 23/69-0C29

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

PLANT SITE WWTP
GENERAL ARRANGEMENT
PERMEATE STABILIZATION AREA

POLY MET MINING, INC.
NORTHMET PROJECT
HOYT LAKES, MINNESOTA

BARR ENGINEERING COMPANY
4700 WEST 77TH STREET
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTP-025

REV

CADD USER: Mark D. Schroer FILE: K:\DESIGN\23690C29.10\PERMIT_NMT-45-ML-004.DWG PLOT SCALE: 1:2 PLOT DATE: 5/21/2015 1:15 PM

INCHES 1 2