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Technical Memorandum

To: Ann Foss, Minnesota Pollution Control Agency; Jess Richards, Minnesota Department of Natural Resources; Kenton Spading, U.S. Army Corps of Engineers
Prepared for: Poly Met Mining, Inc.
From: Don E. Richard, PhD, P.E.
Subject: Proposed Waste Water Treatment System (WWTS) Relocations (Version 2)
Date: April 5, 2017
c: Jennifer Saran, Christie Kearney, PolyMet

1.0 Introduction

Poly Met Mining, Inc. (PolyMet) is proposing to modify the footprint of the waste water treatment system (WWTS) for its NorthMet Project (Project), by combining the Mine Site Waste Water Treatment Facility (WWTF) and the Plant Site Waste Water Treatment Plant (WWTP) into a single building located at the Plant Site, at the location of the former WWTP. The WWTS building would be approximately 33% larger than the former WWTP (81,000 square feet instead of 61,000 square feet), and it would contain all the treatment processes formerly housed in the two separate buildings. These changes would have environmental effects that are either the same as those evaluated in the Final Environmental Impact Statement (FEIS) (Reference (1)) or result in some relatively small, but nonetheless important, reductions in environmental effects.

The location for the WWTS, at the location of the former WWTP, is shown on Large Figure 1. At the Mine Site, the WWTF would be eliminated and the equalization basins would be relocated to the south of Dunka Road as shown on Large Figure 2. To transport mine water to the Plant Site for treatment, the single Treated Water Pipeline would be replaced by a three pipeline system. The three Mine to Plant Pipelines would deliver three types of mine water (high concentration mine water, low concentration mine water, and construction mine water) to their respective destinations at the Plant Site (additional details below). Piping relocations necessary to accommodate these changes are shown on Large Figure 1, Large Figure 2, and Large Figure 3. These changes will not increase the proposed corridor width along the Transportation and Utility Corridor or the wetland impacts along the Transportation and Utility Corridor.

There would be a number of benefits from these relocations. PolyMet planned to transport WWTS byproducts and waste streams back and forth between the Plant Site and the Mine Site. With all WWTS operations under one roof, this transport would no longer be necessary. This increased efficiency would require less energy and truck traffic, and eliminate the need to haul WWTS-related material via trains. The one-roof configuration would also allow more efficient use of the treatment units and reduce capital outlays for the Project. The water quality and rate of the treated discharge to the environment and to the FTB Pond would be the same as were evaluated for the FEIS. In addition, the removal of the WWTF and

relocation of the Equalization Basin Area will result in 7.9 fewer acres of wetland impacts, including 7.8 acres of direct impact and 0.1 acres of indirect impact (fragmentation).

The following sections describe the proposed WWTS relocations (Section 2), compare the environmental effects of the proposed WWTS relocations with those evaluated in the FEIS (Section 3), and summarize potential ripple effects across the various permitting efforts that are in progress (Section 4).

2.0 WWTS Relocations

The WWTS relocations would modify the physical location and structure of the treatment buildings and collection ponds. Overall, the WWTS would still have the same treatment units and would continue to meet the stated treatment objectives for the system as described in the FEIS, the NPDES/SDS permit application and the Permit to Mine application, while increasing treatment efficiency and reducing environmental effects.

The WWTS evaluated in the FEIS (as described in the WWTS Design and Operation Report (Reference (2)) was developed as an integrated system for managing the quality of water discharged from the Project to the surrounding environment. The design to house waste water treatment in separate facilities housed at both the Mine Site and the Plant Site was based primarily on the iterative nature of the Project development. Waste water treatment for the Project was originally proposed just at the Mine Site, as described in the Draft Environment Impact Statement, to treat mine water prior to sending it to the Tailings Basin. As the Project evaluation progressed, a separate Waste Water Treatment Plant (WWTP) was added to treat water at the Plant Site prior to the discharge, which was needed to supplement streamflow downstream of the Tailings Basin, as described in the Supplemental Draft Environmental Impact Statement. The modifications to the WWTS proposed in this memorandum would integrate the two operations into a single building at the Plant Site (at the location of the WWTP).

2.1 Physical Modifications

The WWTS relocations would consist of the following physical modifications:

- All of the same treatment processes described in the Design and Operation Report (Reference (2)) would be combined into a single treatment building, which would be located at the Plant Site in the same location that was proposed for the WWTP. Large Figure 4 and Large Figure 5 show the general arrangement of the "under-one-roof" WWTS.

- The Waste Water Treatment Facility (WWTF) would be eliminated from the Mine Site and the Central Pumping Station and the mine water equalization basins would be relocated to a new location south of Dunka Road. Large Figure 2 shows the location of the Equalization Basin Area, and Large Figure 3 shows the proposed layout of the equalization basins. The Low and High Concentration Equalization Basins would have the same storage capacity and have the same liner design as the previous design provided in the Waste Water Treatment System: Design and

Operation Report (Reference (2)), therefore leakage rates from the equalization basins would be the same. The Construction Mine Water Basin is smaller than originally proposed, in order to fit in the available Equalization Basin Area footprint, however it will still provide the necessary volume required to manage this water between the construction areas and the FTB by optimizing the pump sizing associated with the construction mine water.[1]

- The pumps and equipment in the former Splitter Structure Building would be integrated into an expanded Central Pumping Station (CPS) near the relocated equalization basins.

- The Treated Water Pipeline would be replaced with three separate pipelines to convey water between the Mine Site and the Plant Site within the same pipeline corridor. The two pipelines carrying mine water from the Mine Site equalization basins would be extended to the Plant Site WWTS building, and the pipeline carrying construction mine water would be routed to the FTB, consistent with what was presented in the FEIS. These pipelines would have flow meters at both ends of each pipe for leak detection. A cross-section of the proposed Mine to Plant Pipelines is included on Large Figure 3.

    - When treated water is needed during operations to manage water levels in the East Pit, it would be pumped from the WWTS via the Construction Mine Water Pipeline. When East Pit backfill begins in Mine Year 11, runoff from the Overburden and Laydown Area (OSLA), which reports to the Construction Mine Water Basin, would be routed directly to the East Pit, making the Construction Mine Water Pipeline available to transport treated water from the WWTS to the Mine Site. These two operating scenarios will not occur simultaneously. No construction mine water will need to be managed after Mine Year 11 as all of the mine feature construction will be completed. East Pit water level management will need to start in Mine Year 12, after the Category 4 waste rock is disposed of in the pit. At that time, the Construction Mine Water Pipeline would be available to use for sending water from the WWTS to the East Pit because no more construction mine water will be generated. For the FEIS evaluation, the water used to manage water levels in the East Pit included both OSLA runoff and treated water from the WWTF, so this operation remains consistent with that analysis. The Construction Mine Water Pipeline would be sized to accommodate flows of treated water needed to manage East Pit water levels as well as construction mine water, recognizing that these would be two separate operating scenarios for this pipeline. In addition, the Construction Mine Water Pipeline would be extended to the WWTS prior to Mine Year 12 to deliver treated

[1] The previous Construction Mine Water Basin was designed based on the size of the available area and the construction phase of the Project rather than the design requirements during operations. The basin has been designed to manage groundwater inflows to construction areas (the largest source of water that will be sent to the pond) plus 4.8 inches per month of stormwater runoff during the operations phase. Construction mine water during the construction phase will be managed through a combination of this pond and the equalization basins..

water back to the Mine Site in Mine Year 12. This extension would follow the same route as the other two proposed Mine to Plant Pipelines.

- Likewise, during reclamation and closure (during West Pit flooding and East Pit flushing), the Construction Mine Water Pipeline would be used to return treated water from the WWTS to the East Pit, and the Construction Mine Water Pipeline would be sized to also accommodate flows of treated water needed for East Pit flushing during this period.

- This piping configuration and water management in connection with the WWTS will not change quantities or rates of treated water being conveyed to the Mine Site relative to the conveyances reviewed in the FEIS.

- The rail spur needed for WWTP concentrate management at the Mine Site would be eliminated.

The modifications would necessitate limited changes in terminology with regard to the components of the WWTS, as summarized in Table 1.

Table 1 WWTS Terminology Changes

Current name	Proposed name	Notes
Waste Water Treatment Plant (WWTP) and Waste Water Treatment Facility (WWTF)	Waste Water Treatment System (WWTS)	The two sets of treatment trains that were previously at two locations would now be housed under one roof at the Plant Site.
Treated Water Pipeline	As a whole: • Mine to Plant Pipelines (MPP) Three individual pipes: • Construction Mine Water Pipeline • Low Concentration Mine Water Pipeline • High Concentration Mine Water Pipeline	These pipelines would also be used to pump water from the Plant Site to the Mine Site for East Pit filling and to flood the West Pit.
Construction Mine Water Basin	Construction Mine Water Basin	
West Equalization Basin	High Concentration Equalization Basin (HCEQ Basin)	
East Equalization Basin 1	Low Concentration Equalization Basin 1 (LCEQ Basin 1)	
East Equalization Basin 2	Low Concentration Equalization Basin 2 (LCEQ Basin 2)	
WWTP effluent (discharged to receiving waters)	WWTS discharge	
WWTF effluent (sent to the FTB via the CPS)	Treated mine water (WWTS stream pumped to the FTB)	Formerly "treated mine water", which included WWTF effluent, OSLA runoff, and construction mine water. With reconfiguration, that mixture no longer exists, and the "treated mine water" would consist of effluent from the chemical precipitation and membrane filtration portion of the WWTS.
Treated mine water	Treated mine water	"Treated mine water" formerly included WWTF effluent, OSLA runoff, and construction mine water. With reconfiguration, that mixture no longer exists, but these flows still report to the FTB.
Central Pumping Station	Central Pumping Station	The Central Pumping Station would be combined with the Splitter Structure.
--	Equalization Basin Area	New term describing pond area south of Dunka Road
Splitter Structure	--	This structure would be integrated into the Central Pumping Station.
CPS Pond		This pond no longer exists.

2.2 Internal Treatment Plant Flow and Process Modifications

The new operation within the single WWTS building would contain all of the same treatment units and the same operating configuration as proposed in the previous two-building system. Large Figure 4 and Large Figure 5 show the general layout for the combined WWTS building, and Large Figure 6 shows the process flow diagram for the WWTS. The primary membrane operations within the single WWTS building would remain independent for the treatment of mine water and the treatment of FTB seepage capture systems water, as was the case with the two-building system. Treated mine water would continue to be routed to the FTB Pond for further removal of mercury. Treated FTB seepage would be discharged to the environment in the same quantity and quality and from the same locations. The secondary membrane operations would treat the same volume of water, and the secondary membrane concentrate would continue to be routed to the chemical precipitation treatment train.

Because the WWTS treatment process would be the same, and in particular the quantity and quality of treated water discharged to the environment would not change, the modeling included in the existing NPDES/SDS and Permit to Mine applications is not affected. Accordingly, the model results remain valid and need not be revised in connection with the WWTS relocations.

2.3 Comparison of FEIS and WWTS Relocations

Large Figure 7 through Large Figure 10 compare the flows evaluated for the FEIS with the flows for the WWTS during operations, reclamation, closure, and postclosure maintenance.

During operations (Large Figure 7 and Large Figure 8), mine water would be sent to the Plant Site via the Mine to Plant Pipelines located within the Transportation and Utility Corridor, along the alignment planned for the Treated Water Pipeline. The construction mine water would go to the FTB Pond, as it previously had in the FEIS (i.e., previously combined with the treated mine water at the CPS Pond, which was then routed through the Treated Water Pipeline to the FTB Pond). The high concentration mine water would report to chemical precipitation treatment units at the WWTS, and the low concentration mine water would report to membrane filtration treatment units at the WWTS, as was the case in the FEIS configuration of the WWTF. Treated mine water from the membrane separation and chemical precipitation treatment units at the WWTS would be routed to the FTB Pond. When East Pit backfilling begins in approximately Mine Year 11, treated mine water would be routed back to the Mine Site through the Construction Mine Water Pipeline. Treated mine water and OSLA runoff would both be used in water level management during East Pit backfill, with that operation proceeding at the same rate of backfill and water level management as evaluated for the FEIS and with the same type of water as was evaluated for the FEIS. Accordingly, the WWTS relocations would result in no change in management of water from the FTB seepage capture systems as compared to the prior configuration: some water would be returned to the FTB Pond, and some water would be sent to the WWTS for treatment and then discharged under the terms of an NPDES/SDS Permit and the Water Appropriation permits. The quantity, quality, and location

of discharge to the environment would be unchanged from what was evaluated in the FEIS and NPDES/SDS permit application, Water Appropriation permit application, and the Permit to Mine application.

During reclamation and closure (Large Figure 9), mine water would be sent to the WWTS for treatment and treated water would be returned to the Mine Site to flush the East Pit and to accelerate flooding of the West Pit, at the same rate as evaluated for the FEIS. As during operations, the WWTS relocations would result in no change from the prior configuration in the management of water from the FTB seepage capture systems during reclamation and closure, and the quantity, quality, and location of discharge to the environment would be unchanged from what was evaluated in the FEIS and Permit to Mine applications. At the beginning of the reclamation phase three of the four EQ basins and one of the Mine to Plant pipelines would be reclaimed. One EQ basin and two Mine to Plant pipelines would remain in use. The basin and one pipeline would be used to send mine water from the East Pit and the Category 1 Waste Rock Stockpile to the WWTS. The second pipeline would be used to send treated water back to the Mine Site for flushing the East Pit and flooding the West Pit.

During postclosure maintenance (Large Figure 10), while mechanical water treatment continues, mine water would be sent to the WWTS for treatment and returned to the Mine Site for discharge to the environment at the same rates and quantities as evaluated for the FEIS. One EQ basin and two Mine to Plant pipelines would remain in use during this phase. The basin and one pipeline would be used to send mine water from the West Pit and the Category 1 Waste Rock Stockpile to the WWTS. The second pipeline would be used to send treated water back to the Mine Site for discharge. As with previous phases, the WWTS relocations would result in no change in management of water from the FTB seepage capture systems and the quantity, quality, and location of discharge to the environment would be unchanged from what was evaluated in the FEIS and Permit to Mine application.

The WWTS relocations would result in no changes to the planned transition to non-mechanical (passive) treatment, which will need to be demonstrated prior to implementation, as described in the FEIS and Permit to Mine application.

Safety inspections and emergency response procedures for the relocated Equalization Basin Area would be the same as those laid out in the WWTS Design and Operation Report (Section 4.4.1 of Reference (2)). As planned for in the previous location, the equalization basins will have water level control systems to automatically shut off incoming flow before the basins reach full capacity. In addition, a high-water-level alarm will alert the operators so that overfilling does not occur. The control room at the WWTS will have water level monitoring of the equalization basins, and the Equalization Basin Area will be visually inspected at least once per shift.

2.4 Operating Efficiencies

The WWTS relocations would result in the following operating efficiencies:

- Waste water treatment plant concentrate would not need to be shipped via trains between the two treatment buildings, reducing the total railcar usage and associated emissions and safety concerns for the Project, and eliminating the need for a rail spur at the Mine Site.
- Chemicals used in the precipitation process would not need to be trucked or hauled by rail to the Mine Site.
- The hauling distance of solids generated from the chemical precipitation process to the HRF, once operational, would be significantly reduced, because the chemical precipitation process would be located at the Plant Site instead of the Mine Site.
- Heating requirements and associated utility costs and maintenance needs for a single building would be reduced in comparison to two buildings.
- Infrastructure costs and operations and maintenance requirements at the Mine Site would be reduced by eliminating the WWTF building, integrating the Splitter building into the Central Pumping System (CPS) building, and eliminating the CPS Pond from the Project.
- Staffing, potable water and sewage operations, instrumentation, monitoring, and control systems would be streamlined by being in a single location.

As discussed in Section 3, these operational efficiencies would have environmental effects that are either the same as those evaluated in the FEIS or result in some relatively small, but nonetheless important, reductions in environmental effects.

In addition to these immediate operational efficiencies, having all of the water treatment process equipment at a single location provides additional redundancy between process units and allows the potential for greater operating flexibility and improvement through adaptive management during the operations phase of the Project.

3.0 Environmental Outcomes

PolyMet evaluated whether the WWTS relocations would change the environmental effects that were evaluated in the FEIS and permit applications. The water quality and rate of the treated discharge to the environment would be the same as were evaluated for the FEIS. Air quality impacts would be unchanged, or potentially slightly decreased, due to the improved efficiency of the proposed modifications. Wetland impacts would slightly decrease, and no additional cultural resource impacts would be expected. More detailed results are discussed below.

3.1 Surface Water and Groundwater Quality

WWTS discharge quantity, quality, and location of discharge to the environment would be unchanged during operations, reclamation, closure, and postclosure maintenance, as described in Section 2.2. There would be no change in the type, amount, or rate of water supplied to the Mine Site in the pertinent timeframes to accelerate mine pit flooding, so waste rock in the East Pit would be submerged at the same rate evaluated for the FEIS and the West Pit flooding would also be consistent with the FEIS. There would be no change with regard to compliance with applicable effluent limits and new source performance standards in 40 CFR part 440, as described in Section 5 of Volume III of the NPDES/SDS permit application. Therefore, water quality effects in receiving and downstream waters would be the same as were evaluated for the FEIS and in the Project permit applications. Other potential effects on surface and groundwater quality due to the WWTS relocation could include:

- The addition of two new Mine to Plant pipelines (for a total of three) could theoretically increase the potential for leakage or a pipeline rupture. However, the pipelines will be located along travel corridors for ease of inspection and equipped with a leak detection system through the use of flow meters to monitor the flow into and out of the pipelines. Additionally, these pipelines are designed for local climatic conditions by being covered in a minimum of eight feet of material for protection against frost and protection against direct impact to the pipelines.

- Relocation of the equalization basins would slightly shorten the time for any liner leakage to groundwater to reach the property boundary. This would be a minor effect, because minimal leakage is expected from the highly efficient equalization basin composite liner system. Initial breakthrough of groundwater flow from equalization basin leakage to the Partridge River was estimated for the FEIS to be at approximately Mine Year 80 (Table 5.2.2-22 of Reference (1)). The reduction in flow path length by approximately 10% would proportionally shorten the breakthrough time to approximately Mine Year 72. This change will not result in any estimated non-compliance by the Project with applicable water quality standards. The evaluation of compliance with groundwater quality standards will remain unchanged. In particular, there will be no changes relative to the monitoring well design included in the FEIS with respect to locations of: performance monitoring wells immediately downstream of the basins, indicator wells between the basins and the compliance point, and compliance wells at the groundwater compliance point upgradient of the Partridge River excepted as noted in bullet below; therefore this system continues to allow sufficient time to identify a potential change in groundwater quality and initiate contingency mitigation.

- Relocation of the equalization basins would force abandonment of one existing surficial aquifer monitoring well (MW-5) that was proposed for continued monitoring in the NPDES/SDS permit application. The potential need for a replacement surficial aquifer well in this area would be discussed with the MPCA for NPDES/SDS permitting. No other changes to monitoring locations would be needed.

- The impervious surface area at the Mine Site would be decreased by 11.1 acres, which would reduce the stormwater volumes associated with the Project and thus reduce the amount of watershed reduction from the Partridge River. Runoff from the WWTF was planned to be routed to a stormwater basin within the treatment area footprint, then routed south offsite.
  Large Figure 2 shows the culverts that will route stormwater offsite under both plans. At the Plant Site the amount of impervious area will slightly increase, from 1.4 acres to 1.9 acres.

3.2 Air Quality

The primary air effects from the WWTS relocations have been evaluated. PolyMet expects an overall reduction in actual air emissions because of the WWTS relocations. The following provides an overview of the primary changes associated with the WWTS relocations that relate to air quality effects:

- The WWTF building would be removed from the air dispersion model configuration.
- The WWTS footprint would be larger than the WWTP footprint (relevant for air dispersion modeling).
- The increased heating demand for the larger footprint of the WWTS is accommodated with the current safety factor that was provided for heating calculations of the previous WWTP building, so there would be no change in the potential air emissions at the Plant Site as a result of heating.
- A lime silo and mix tank would be located at the WWTS at the Plant Site with a maximum daily throughput equal to one-half the rate at the previous WWTF. The throughput rate at the WWTF accounted for both the waste water treatment related lime demand and other lime demands at the Mine Site, but in the modified design these two activities would be split between the Plant Site WWTS and the Mine Site. Total potential Project emissions from lime storage and handling will remain unchanged.
- Reduction in actual truck traffic between the Mine Site and Plant Site – resulting in lower air emissions for the Project.
- The emergency power requirements at the WWTS can be met by the WWTP generator in the current emission inventory, as critical power demand is only indirectly related to building size. Emergency power demand is driven by the size of pumps and other energy intensive equipment that must continue to operate during a power failure.

PolyMet proposes to retain the following sources in the air emissions inventory:

- The lime storage and handling equipment at the WWTF (identified as EU 147, SV 50 and EU 148 in the air permit application) was sized to accommodate the WWTF lime demand along with other neutralization needs at the Mine Site. A lime silo and mix tank would remain in the Mine Site emission inventory, with a maximum daily throughput equal to one-half the previous rate, to

account for potential future lime demand if powdered lime would be preferred or required for other Mine Site neutralization needs. The lime storage and handling will be included in the initial air permit for the Project. The date of commencement of construction for this equipment will be dependent on the specific demand that indicates the need for powdered lime at the Mine Site and the Project timeline associated with this demand. All applicable provisions of the air permit and state and federal air quality regulations will be followed when the equipment is installed.

- Truck traffic between the Plant and Mine sites previously associated with waste water treatment would remain unchanged in the emissions inventory, which accounts for variation in operation over the mine life.

The lime storage and handling equipment proposed for relocation to the Plant Site has controlled potential $PM_{2.5}$ emissions of about 0.6 tons per year compared to the current controlled potential $PM_{2.5}$ emissions at the Plant Site of 194.3 tons per year. The WWTS is also located away from the "effective fenceline" (i.e., nearest point to the emission sources where ambient air impacts are evaluated) and is unlikely to influence the stacks located in the Crusher/Concentrator and Hydrometallurgical Plant. Therefore, effects on the Plant Site modeling due to the WWTS changes would be minimal.

Truck traffic associated with hauling of WWTF filtered sludge from the WWTF to the Plant Site for disposal (either offsite, in the HRF once constructed, or into the autoclave for processing once constructed) would be eliminated as a result of this modification. Lime might still be needed at the Mine Site. One option for delivering lime to the Mine Site would be hauling slurry by truck from the Plant Site. The current Plant Site and Mine Site emission inventories have 18, 40-ton trucks per day hauling lime and sludge between the Mine Site and the Plant Site. This number of trips would allow sufficient lime movement to accommodate potential lime needs at the Mine Site and would remain in the emission inventory for future design flexibility over the 20-year mine life.

The relocated ponds at the Mine Site would have minimal effect on air permitting because the new location is within the proposed "effective fenceline" outside of which ambient air impacts are to be evaluated, and there would be no emission-generating activity associated with the ponds. Potential PM_{10} monitoring locations as discussed with MPCA as part of a planned revision to the draft Special Purpose Monitoring Plan would need to be reevaluated considering the location of the ponds, but submittal of an updated plan was already intended based on additional modeling to be completed in connection with the Project's air permit application.

The emissions inventory for the air permit application would need to be updated to reflect the relocation of some sources as described above and changes to the building configurations. WWTS chemical usage with the potential to generate emissions (e.g., dust from handling) would be included in the Plant Site emission inventory. Work on a Class II modeling supplement and AERA verification runs is already underway to address a request from MPCA and an error in a portion of the AERMOD air dispersion

modeling system issued by USEPA. The emission inventory, updated to accommodate the WWTS modification discussed in this memo, would be used in the additional modeling to be conducted. The proposed changes are minor in the context of the Class I modeling, so updated Class I modeling is not proposed.

3.3 Wetlands

The WWTS relocations would result in no changes to wetland impacts at the Plant Site, as shown on Large Figure 11 or along the Transportation and Utility Corridors.

With the WWTS relocations at the Mine Site, wetland impacts would decrease by 7.9 acres, including 7.8 acres of direct impact and 0.1 acres of indirect impact (fragmentation)[2]. Wetland impacts would be reduced by 0.3 acres in open bog (Wetland 47; direct impact[3]), by 0.4 acres in coniferous swamp (Wetland 48A; direct impact), and by 7.6 acres (7.5 acres of direct impact and 0.1 acre of indirect (fragment impact)) in coniferous bog (Wetlands 80, 86, 88, and 104). Based on the factors for potential indirect wetland impacts, as identified in the Wetland Data Package (Reference (3)), these wetlands would have a Rating of either 1 or 2 (one or two factors potentially indirectly impacting a wetland). The bog wetlands have a rating of 1 and the coniferous swamp has a rating of 2. Based on these ratings, no changes are planned for the Monitoring Plan for Potential Indirect Wetland Impacts (Reference (4)).

Large Figure 12 compares the wetland area impacts for the WWTS relocations to those that were included in the FEIS, Section 404 permit application, Permit to Mine application, and WCA permit application. The NorthMet Project Wetland Replacement Plan and Wetland Permit Application include the mitigation proposed for the 7.9 acres of wetland impact for the FEIS/permit application location. The wetland impacts planned in the FEIS and permit applications would include open bog, coniferous swamp, and coniferous bog. Mitigation requirements were dependent on the acreage of each type of wetland impacted. This reduction in required mitigation would be accounted for as appropriate under the applicable regulatory processes governing federal and state wetland and water permits.

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[2] Large Table 2 of the Wetland Replacement Plan v1 (Oct 2016) identifies a total of 758.2 acres of direct impact for the Mine Site. The proposed WWTS relocations would decrease the direct wetland impacts by 7.8 acres. The total direct wetland impact for the Mine Site with the proposed WWTS relocations would be 750.4 acres. Large Table 2 of the Wetland Replacement Plan v1 (Oct 2016) identifies a total of 26.4 acres of indirect (fragmented) wetland impact for the Mine Site. The proposed WWTS relocations would decrease the indirect (fragmented) wetland impacts by 0.1 acres. The total direct wetland impact for the Mine Site with the proposed WWTS relocations would be 26.3 acres.

[3] Wetland 47 is classified as an open bog, which means its hydrology is supported by precipitation and not dependent on the size of the watershed. Therefore, the remaining portion of Wetland 47 would not be considered as fragmented. Factors that may cause potential indirect impacts to Wetland 47 include metals (this factor applies to all wetlands in this revised area, see response to Comment 0019) which would result in a Rating of 1 (one factor potentially indirectly impacting the wetland).

The wetlands that are located within the area of the original WWTF location were considered to be either directly impacted or indirectly impacted (identified as impacted by fragmentation) as part of the wetland impacts analysis for the FEIS and permit applications.

Within the proposed Equalization Basin Area, there are no wetlands[4]. This upland area is forested as is the area of the original location of the WWTF. These areas are approximately the same acreage, so there should not be any modification needed to the Biological Opinion, which required the USACE to consult with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq*.

3.4 Cultural Resources

Cultural resources surveys have already been conducted within the Equalization Basin Area. The eastern half of the Equalization Basin Area was surveyed in 1990 for the U.S. Forest Service Stubble Creek Timber Sale. The entire Equalization Basin Area was surveyed as part of a 2004 survey conducted by The 106 Group, which resulted in a "no effect" report (Reference (5)). All but the southern edge of the Equalization Basin Area was surveyed in 2006 and 2008 by Soils Consulting (Reference (6); Reference (7)). Therefore, this area has been surveyed for cultural resources by three different cultural resource teams between 1990 and 2008. Additionally, the Project has completed its NHPA Section 106 review process, resulting in a Memorandum of Agreement to resolve adverse effects on eligible historic properties in the Project area. As a result of these studies and coordination, no additional cultural resources work is needed within this area.

4.0 Permitting Effects

It is envisioned that updates to the air permit application, NPDES/SDS permit application, the consolidated Water Appropriation Permits application, and the Permit to Mine application would need to be provided to the MPCA and the DNR to accurately reflect the WWTS relocations. Based on the environmental effects of the WWTS relocations described in Section 3, descriptions of environmental effects would not need updating. Rather, the changes would principally affect application terminology

[4] There are wetlands to the south of the proposed WWTS pond relocations. These wetlands have already been identified with a factor rated low to high likelihood of hydrologic impacts (which may be due to changes in watershed). Large Figure 23 in the Wetland Data Package v11 (Apr 2015) identifies these wetlands with Ratings ranging from 1 to 4. There are currently multiple wetland hydrology monitoring wells located in these wetlands; therefore, no changes are planned for the Monitoring Plan for Potential Indirect Wetland Impacts v1 (Feb 2016).

and descriptions, along with associated supporting information, such as figures and permit application support drawings.

4.1 NPDES/SDS Permit Application Updates

The items that would need to be updated in the NPDES/SDS permit application include:

- Descriptions and figures of the WWTS, including a review of the constructability of the ponds at the new location
- Proposed Monitoring Plan (due to the closure of a groundwater well)
- Permit Application Support Drawings for the WWTS (replacing the drawing sets for the WWTF and WWTP)
- Permit application forms (e.g., Municipal and Industrial Pond Attachments)
- Waste water treatment chemical additives information, to reflect that most usage would be at the Plant Site.

4.2 Permit to Mine Application Updates

The portions of the Permit to Mine application that would need to be updated include:

- Description of the WWTS system layout
- Mine Site engineering drawings for mine water piping to the new location of the Construction Mine Water Basin and equalization basins
- Mine Site, Transportation and Utility Corridors, and Plant Site drawings for the Mine to Plant Pipelines from the equalization basins to the WWTS and the Construction Mine Water Basin to the FTB Pond
- Financial assurance calculations, to reflect the proposed WWTS relocations

4.3 Water Appropriation Permits Application Updates

The portions of the consolidated Water Appropriation Permit application that would need to be updated include:

- Dewatering appropriation quantities associated with construction of the WWTS equalization basins and the Construction Mine Water Basin
- Description of the WWTS system layout

- Permit Application Support Drawings for the WWTS (replacing the drawing sets for the WWTF and WWTP)

4.4 Air Quality Permit Application Updates

In addition to the changes described in Section 3.2 to the emission inventory and model inputs, the proposed changes to the WWTS would require updates to the facility description portion of the air permit application, including equipment lists, process flow diagrams, and site layout figures. The PolyMet air permitting team would work with MPCA staff to determine the most efficient way to accomplish the changes. For example, relocated emission units could either be renamed or assigned new ID numbers, whichever was more efficient for data entry into the MPCA's TEMPO system.

4.5 Wetland Permit Updates

The Section 401 water quality certification, the Section 404 permit application, and the Wetland Conservation Act approval would be affected by this Project change. PolyMet will work with these permitting teams to address any needed changes associated with each process.

5.0 References

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

2. **Barr Engineering Co.** Waste Water Treatment Systems: Design and Operation Report - NorthMet Project v1. July 2016.

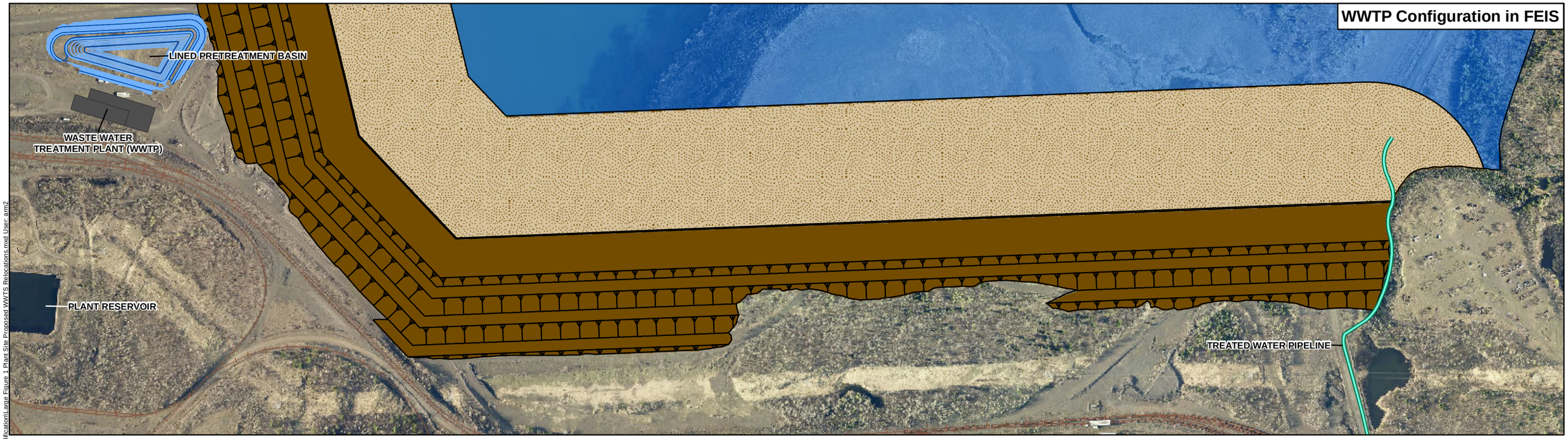
3. **Poly Met Mining Inc.** NorthMet Project Wetland Data Package (v11). April 2015.

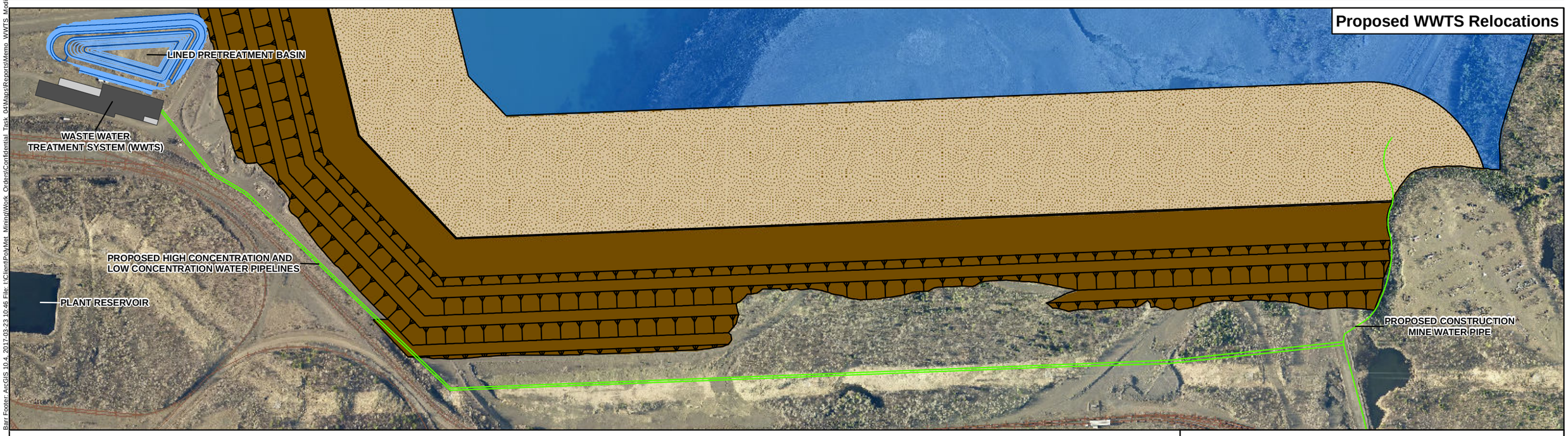
4. —. Monitoring Plan for Potential Indirect Wetland Impacts (v1). February 2016.

5. **The 106 Group.** Cultural Resources Assessment for the Environmental Impact Statement Scopiong Document, PolyMet Mining Corporation NorthMet Project, Hoyt Lakes, St. Louis County, Minnesota. Report prepared for Barr Engineering Company. 2004.

6. **Soils Consulting.** Phase I Archaeological Survey, NorthMet Mine Impact Area. 2006.

7. —. Phase I Archaeological Survey of Dunka Road Expansion and Substation – and – Phase II Archaeological Evaluation of NorthMet Archaeological Site. 2008.





Flotation Tailings Basin
Dam
Beach
Pond

Treated Water Pipeline

Proposed Mine to Plant Pipelines
(Alignment shown for illustrative purposes, not to scale)

Railroad

N

0 250 500 1,000

Feet

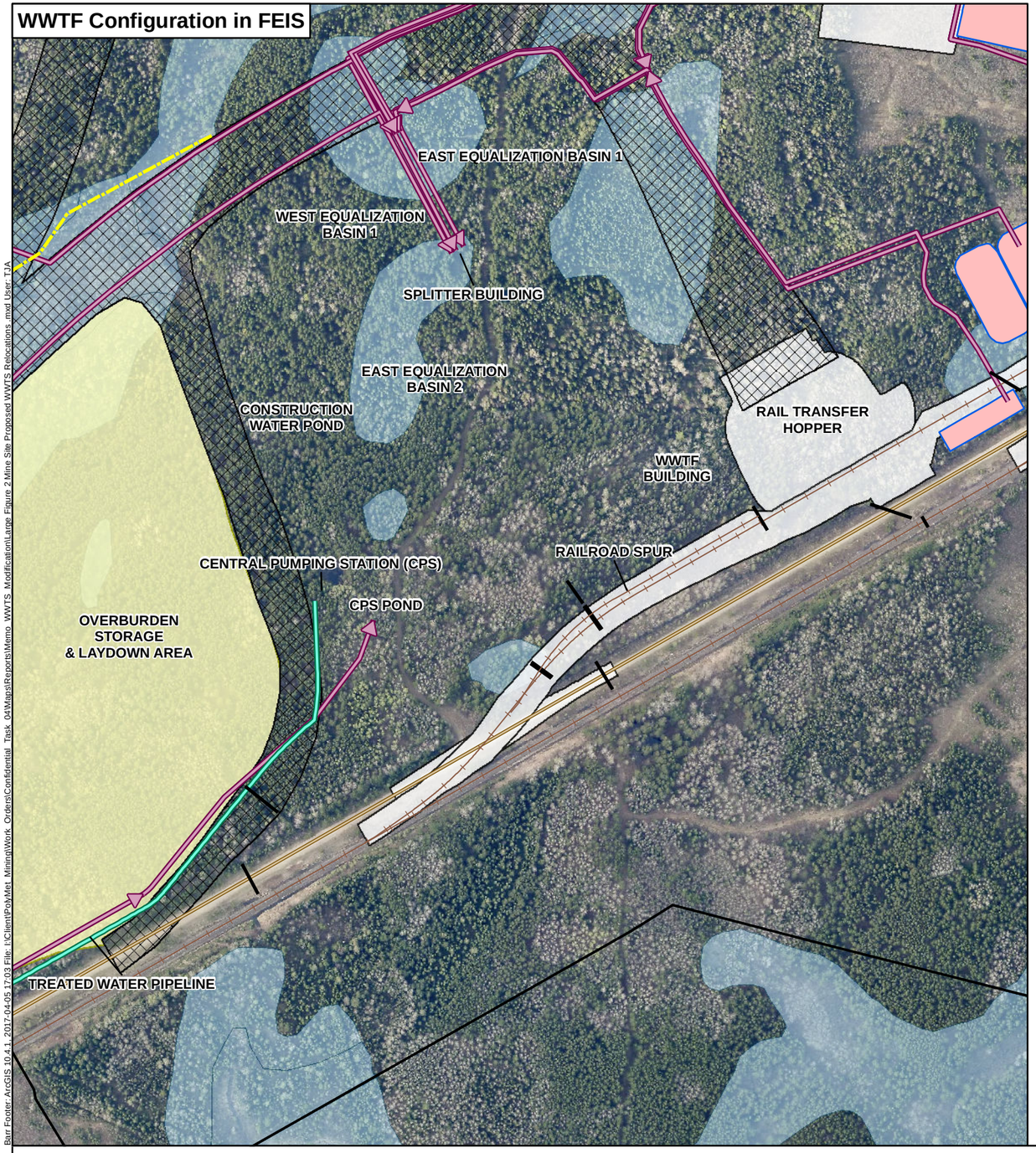
BARR

PLANT SITE: PROPOSED WWTS RELOCATIONS
NorthMet Project
Poly Met Mining Inc.

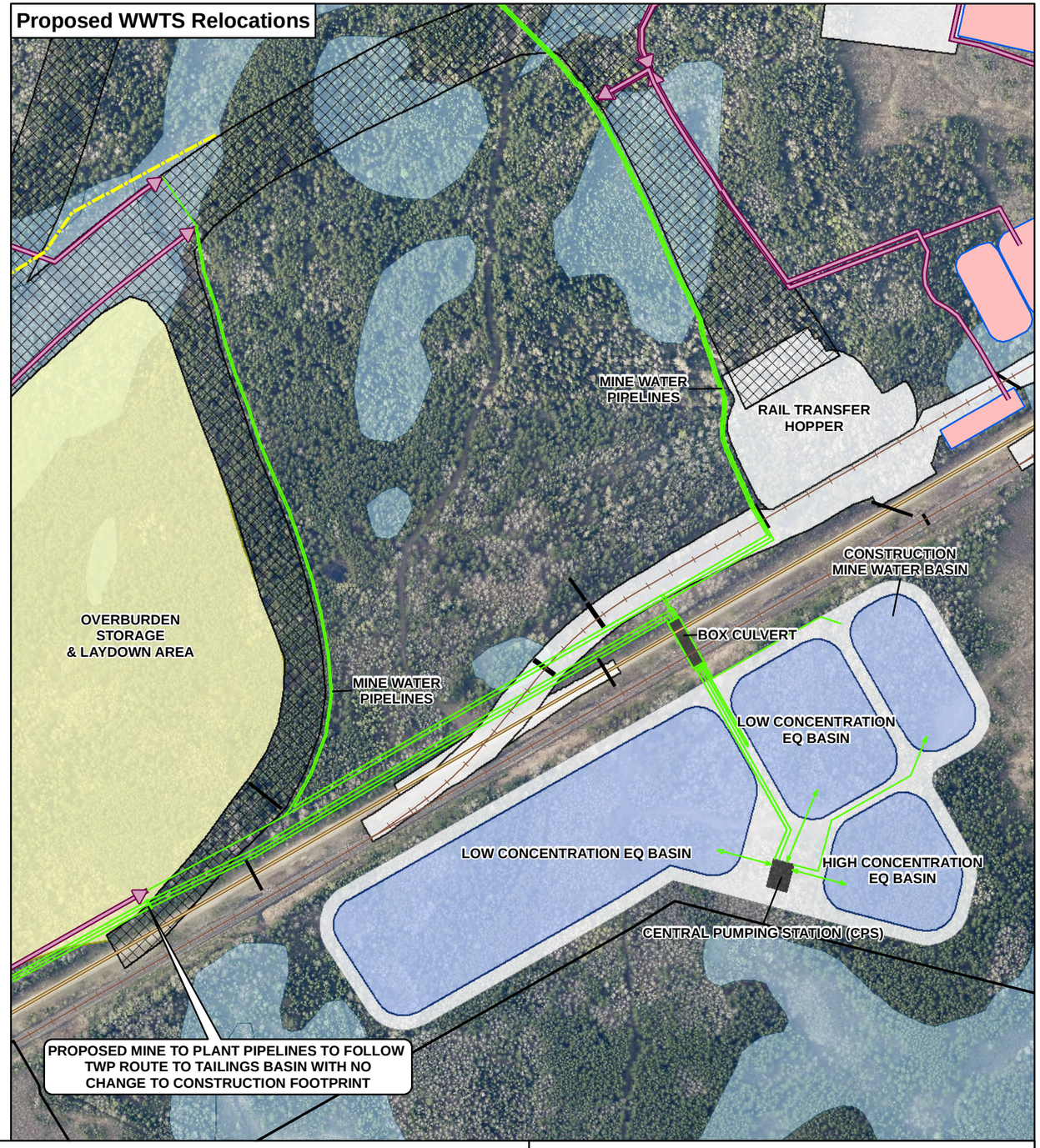
Large Figure 1
Proposed Waste Water Treatment System (WWTS) Relocations

Barr Footer: ArcGIS 10.4, 2017-03-23 10:46 File: I:\Client\PolyMet Mining\Work Orders\Confidential Task 04\Maps\Reports\Memo_WWTS_ModificationsLarge Figure 1 Plant Site Proposed WWTS Relocations.mxd User: amz

WWTF Configuration in FEIS



Proposed WWTS Relocations



- EIS Project Areas
- Active Stockpile
- Haul Roads
- Railroad
- Mine Water Ponds and Sumps
- Stormwater Ditches
- Treated Water Pipeline
- Proposed Mine Water Pipe Modifications (Alignment shown for illustrative purposes, not to scale)
- Culverts
- Waste Wate Treatment Equalization Basins
- Splitter/Pump Building
- Wetlands

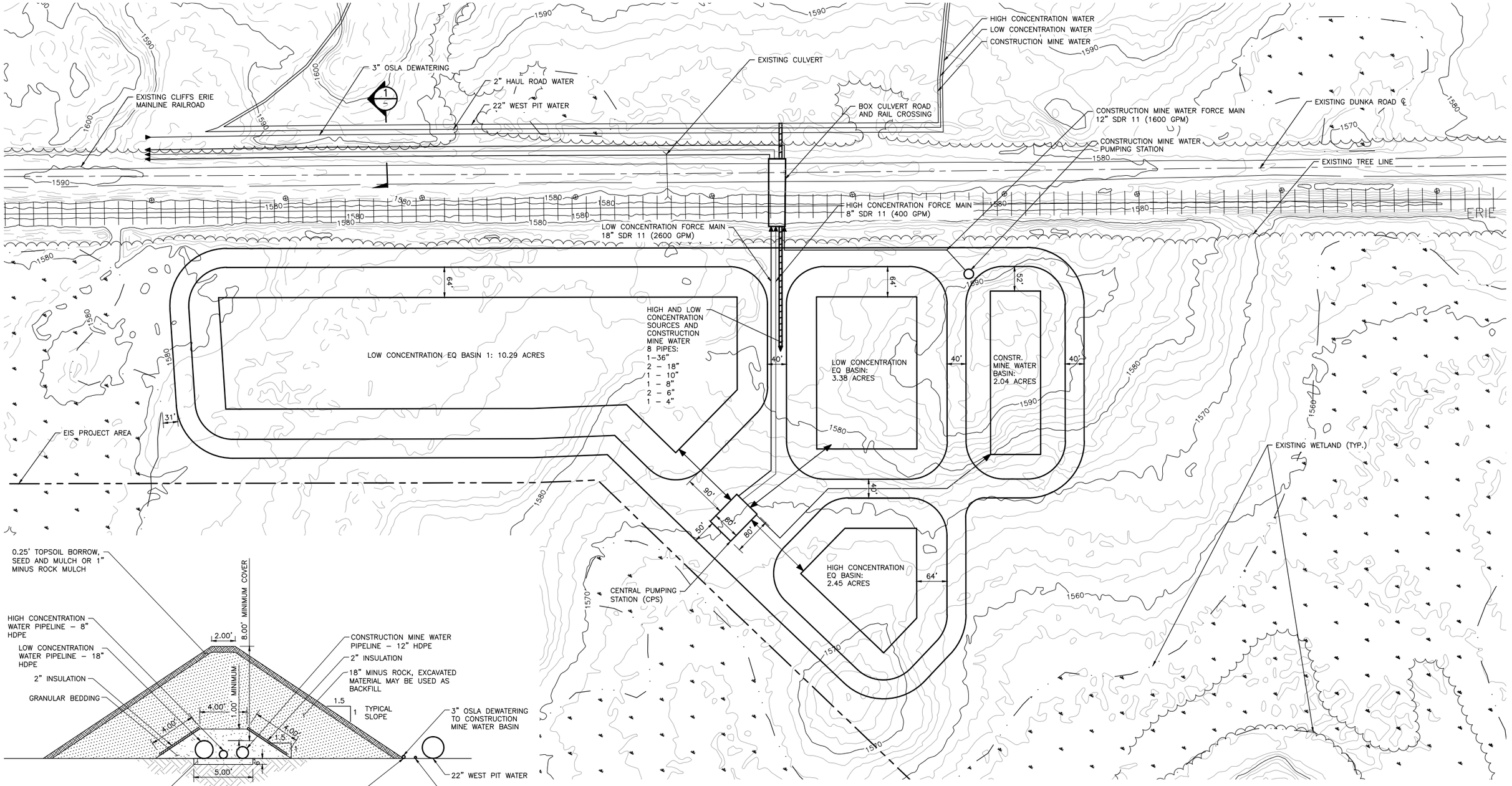
0 175 350 700
Feet

BARR

MINE SITE: PROPOSED WWTS RELOCATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 2
Proposed Waste Water Treatment System (WWTS) Relocations

Barr Foster; ArcGIS 10.4.1, 2017-04-05 17:03; File: I:\Client\PolyMet_Mining\Work_Orders\Confidential_Task_04\Maps\Reports\Memo_WWTS_ModificationLarge_Figure_2 Mine Site Proposed WWTS Relocations.mxd User: TJA



1 SECTION: TYPICAL PIPELINE CONSTRUCTION

0 2 4 6 8
SCALE IN FEET

1 PLAN: EXISTING CONDITIONS

N

0 100 200
SCALE IN FEET

VER NO	DATE	DESCRIPTION	ISSUE STATUS	VERSION	DATE
			FOR PERMITTING		
			FOR CONSTRUCTION		

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINTED NAME _____

SIGNATURE _____

DATE _____ LICENSE# _____

DRAWN: STD

CHECKED:

BARR PROJECT NO.: 23/69-862.04

SCALE: AS SHOWN

PLANT DRAWING NUMBER: LARGE FIGURE 3

MINE SITE
EQ BASIN/MINE WATER PIPING PLAN

POLYMET MINING

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

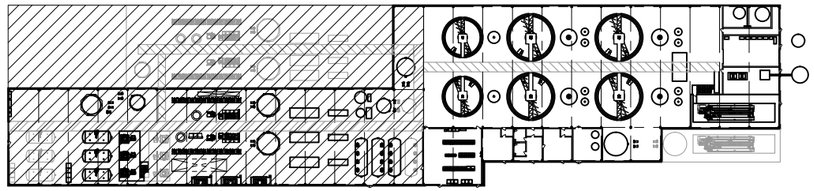
BARR ENGINEERING COMPANY
4300 MARKETPOINTE DRIVE
MINNEAPOLIS, MN.
Ph: 1-800-632-2277

DWG. NO. WWTS-01

REV C

CADD USER: Veronica Wourms FILE: K:\DESIGN\23690C29.10\23690862.04_PRELIM_WWTF_LAYOUT2.DWG PLOT SCALE: 1:2 PLOT DATE: 3/23/2017 11:14 AM

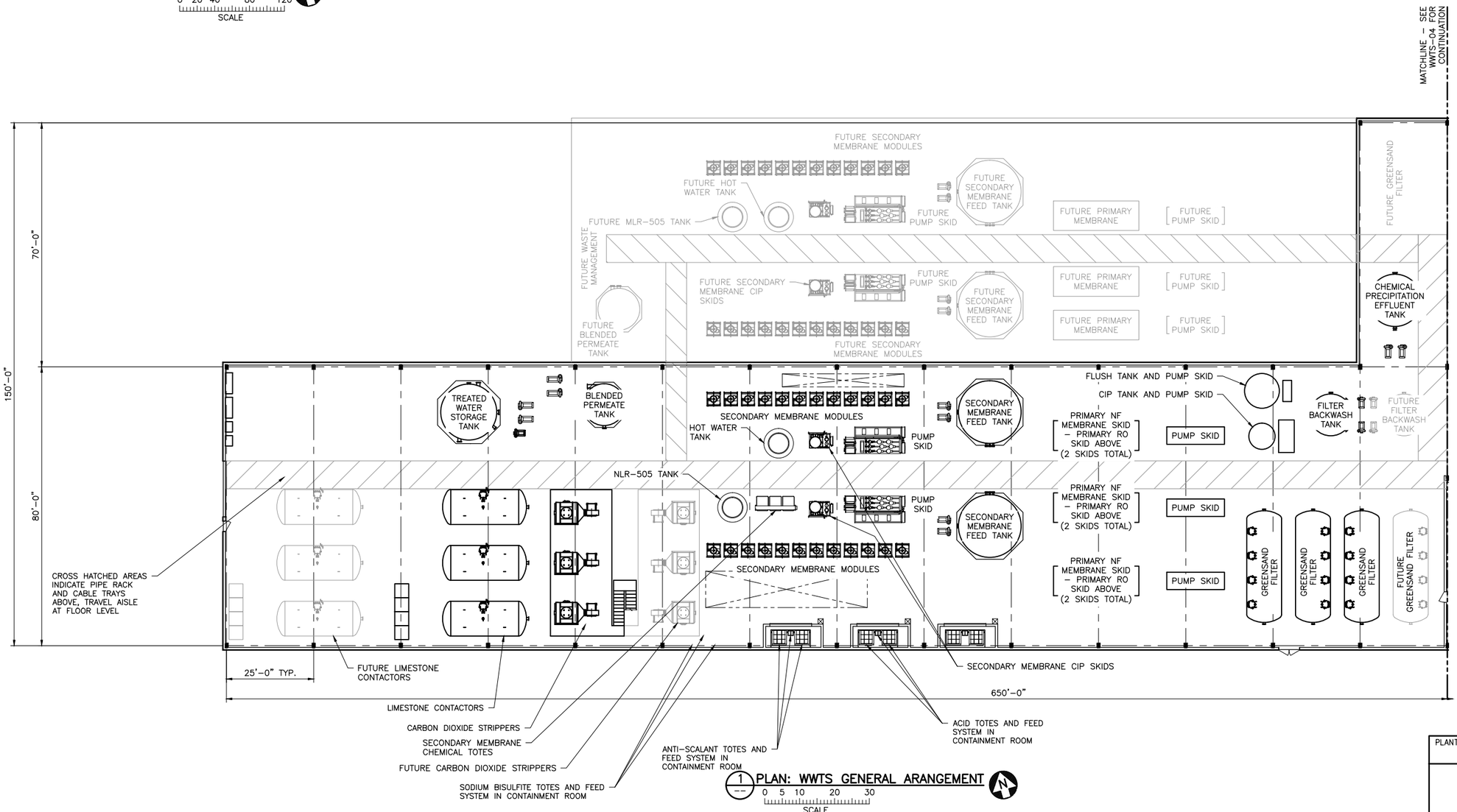
INCHES 1 2



KEY PLAN: WWTS
0 20 40 80 120
SCALE

NOTES:

1. FUTURE BUILD OUT SHOWN GRAYED OUT.



1 PLAN: WWTS GENERAL ARANGEMENT
0 5 10 20 30
SCALE

VER NO.	DATE	DESCRIPTION	ISSUE STATUS	VERSION	DATE
			ISSUED		
			FOR PERMITTING		
			FOR CONSTRUCTION		
			NOT APPROVED FOR CONSTRUCTION		

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DATE _____ LICENSE # _____

DRAWN: DAK
CHECKED: BTO
BARR PROJECT NO.: 23/69-0862.04
SCALE: AS SHOWN

PLANT DRAWING NUMBER:

COMBINED WWTS
OVERALL GENERAL ARRANGEMENT
Large Figure 4

POLYMET MINING

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

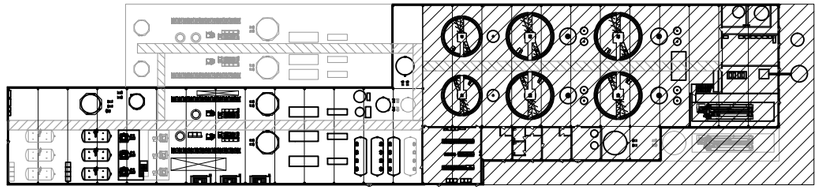
BARR ENGINEERING COMPANY
4300 MARKETPOINTE DRIVE
Suite 200
MINNEAPOLIS, MN 55435
Ph: 1-800-632-2277

DWG. NO. WWTS-03
REV

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NOTES:

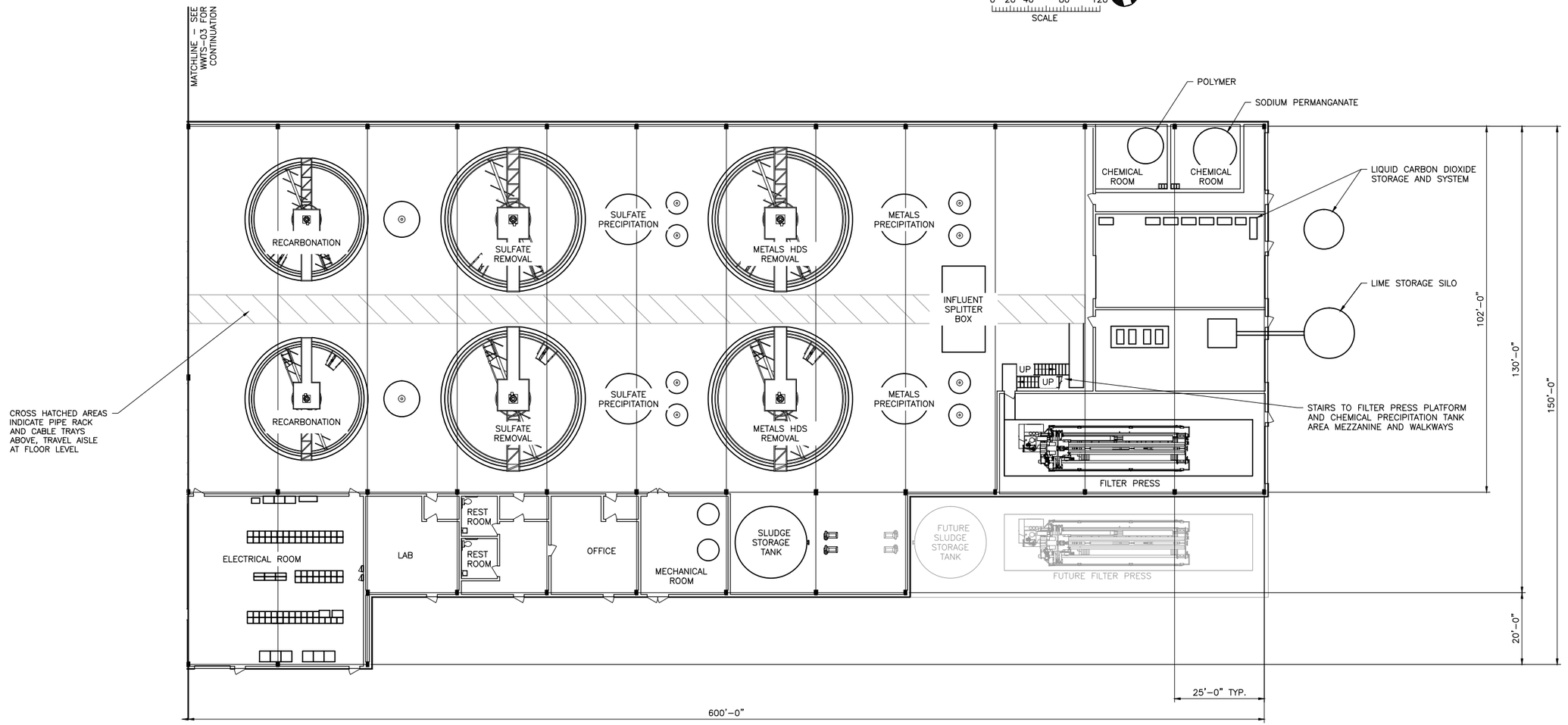
1. FUTURE BUILD OUT SHOWN GRAYED OUT.



KEY PLAN: WWTS

0 20 40 80 120

SCALE



1 PLAN: WWTS GENERAL ARANGEMENT

0 5 10 20 30

SCALE

VER NO	DATE	DESCRIPTION

ISSUE STATUS	VERSION	DATE
FOR PERMITTING		
FOR CONSTRUCTION		
NOT APPROVED FOR CONSTRUCTION		

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SIGNATURE _____

DATE _____ LICENSE # _____

DRAWN: DAK

CHECKED: BTO

BARR PROJECT NO.: 23/69-0862.04

SCALE: AS SHOWN

PLANT DRAWING NUMBER:

COMBINED WWTS
OVERALL GENERAL ARRANGEMENT
Large Figure 5

POLYMET MINING

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

BARR ENGINEERING COMPANY
4300 MARKETPOINTE DRIVE
Suite 200
MINNEAPOLIS, MN 55435
Ph: 1–800–632–2277

DWG. NO. WWTS–04

REV

CADD USER: Dean Kemmer FILE: M:\ADEPTWORK\DAK\236908620 4_WWTS-04.DWG PLOT SCALE: 1:2 PLOT DATE: 2/22/2017 11:12 AM

INCHES 1 2

Mpls\23 MN\69\2369C08 NorthMet WWTF\WorkFiles\Figures-Diagrams\Flow Sheets\Source Files\WWTS P50 Flows_Mine Year 1_v2.vsd

Waste Water Treatment System

Category 2/3 Stockpile & Sump (Liner)
Ore Surge Pile & Sump (Liner)
Category 4 Stockpile & Sump (Liner)
40
20
20
Splitter Structure
High Concentration EQ Basin
80
High Concentration Pipeline
80
Category 1 Stockpile (Containment System)
140
50
Rail Transfer Hopper
Haul Roads
210
East Pit
Low Concentration EQ Basin
410
Low Concentration Pipeline
410
Construction Mine Water Basin
10
Overburden Storage & Laydown Area
20
Construction Mine Water Pipeline
Net Precipitation and Runoff
2,080
Sewage Treatment System
20
Other (see Note 7)
650
Beneficiation Plant
1,750
Plant Reservoir
Colby Lake
11,420
13,770
20
1,170
Pond
Flotation Tailings Basin
Seepage Capture Systems
1,900
Iron Solids Pretreatment
Ferric Sulfate
Lime
230
Metals Removal
230
HCl
Lime
Sulfate Removal
230
CO_2
pH Adjustment, Calcium Removal
CO_2
230
Filtered sludge to HRF or off-site disposal
50
Secondary Membrane Concentrate
10
Secondary Membrane CIP Waste
Acid, Antiscalant(s)
170
Chemical Precipitation Effluent Recycle
Secondary Membrane
10
Water for CIP
50
200
Secondary Membrane Permeate
$NaMnO_4$
Antiscalant(s)
Primary Membrane
420
Greensand Filter
400
310
Primary Membrane Permeate
80
Primary Membrane Concentrate
< 5
Primary Membrane CIP Waste
570
10
Backwash Precipitate
10
Backwash Decant
Backwash Tank
20
Backwash
20
Secondary Membrane CIP Waste
80
Secondary Membrane Concentrate
< 5
Primary Membrane CIP Waste
450
Primary Membrane Concentrate
20
Water for CIP
Secondary Membrane
Acid, Antiscalant(s)
460
Secondary Membrane Permeate
$NaMnO_4$
Antiscalant(s)
Greensand Filter
1,800
1,790
Primary Membrane (RO)
1,340
Primary Membrane Permeate
100
Backwash
Primary Membrane (NF)
20
360
Primary Membrane Permeate
< 5
Primary Membrane CIP Waste
100
Primary Membrane Concentrate
Calcite
Limestone Contactor
Degassifier
1,710
169 SD002 (Unnamed Creek Wetlands)
169 SD003 (Unnamed Creek Wetlands)
169 SD004 (Trimble Creek Wetlands)
169 SD005 (Trimble Creek Wetlands)
169 SD006 (Trimble Creek Wetlands)
169 SD007 (Trimble Creek Wetlands)
169 SD008 (Trimble Creek Wetlands)
169 SD009 (Trimble Creek Wetlands)
169 SD010 (Trimble Creek Wetlands)
185 SD011 (Second Creek)

Legend	
XX →	P50 Annual average flow (rounded to 10 gpm)
XX →	P50 Annual average membrane concentrate flow (rounded to 10 gpm)
XX →	Intermittent flows for filter cleaning (rounded to 10 gpm)

Notes:

(1) This figure shows the Waste Water Treatment System flow configuration at the beginning of operations. Mine Year 1 is expected to be the year of minimal discharge and minimal loading from the WWTS.

(2) This figure shows average flows from sources of intake water, operations contributing wastewater to the effluent, and treatment units within the WWTS. It does not include flows that do not contribute to the effluent, such as water entrained within tailings and water in sludge from chemical precipitation units. Total flows may not equal the sum of their contributing parts because flows that do not contribute to the effluent are not shown and flows are rounded to the nearest 10 gpm.

(3) Flows are based on the GoldSim water model (Water Modeling Data Package – Mine Site v14 and Water Modeling Data Package – Plant Site v11).

(4) Consistent with the FEIS, average flows outside the WWTS are the annual average of the monthly mean flow rates.

(5) WWTS internal flows were estimated using the FEIS GoldPhreeqc model (Waste Water Treatment System Design and Operation Report v1). For this diagram, the GoldPhreeqc model influent values to the WWTS were the annual average of the monthly median values from the GoldSim model Mine Site and Plant Site flows.

(6) To be consistent with the values reported in the NPDES/SDS permit application on EPA Form 2D, flow rates to the surface water discharge outfalls were not rounded to 10 gpm.

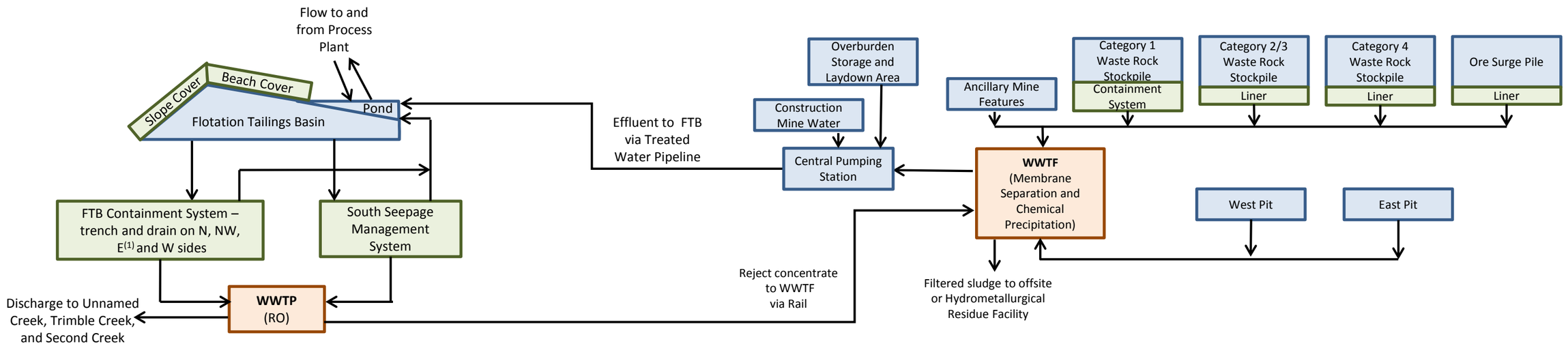
(7) Other inflows to the Beneficiation Plant include water in the raw ore, reagents, and gland seals of slurry pumps.

WATER TREATMENT AVERAGE FLOWS
OVERALL FLOW SHEET – MINE YEAR 1
NorthMet Project
Poly Met Mining Inc.

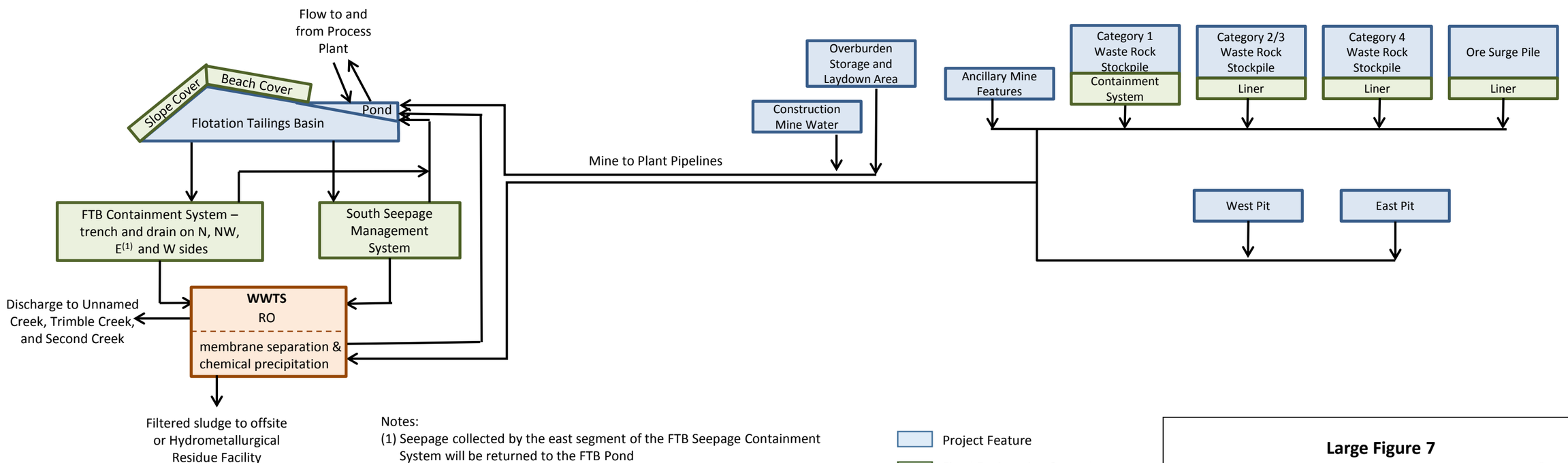
Large FIgure 6
Proposed Waste Water Treatment System (WWTS) Relocations

Operations: Mine Years 1 to 11

Configuration with WWTP and WWTF Evaluated for FEIS



Proposed WWTS Relocations



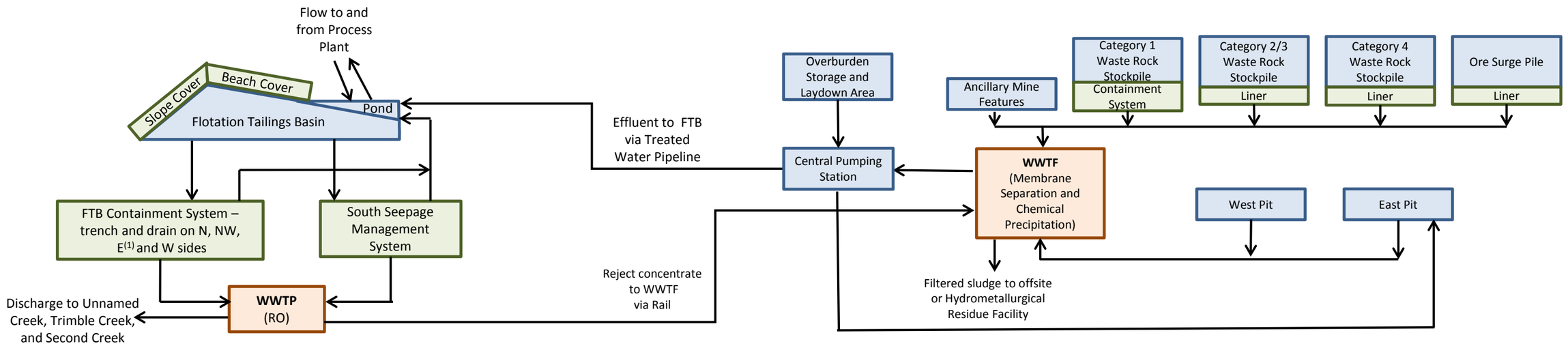
Notes:
(1) Seepage collected by the east segment of the FTB Seepage Containment System will be returned to the FTB Pond

Project Feature
Fixed Engineering Control
Adaptive Engineering Control

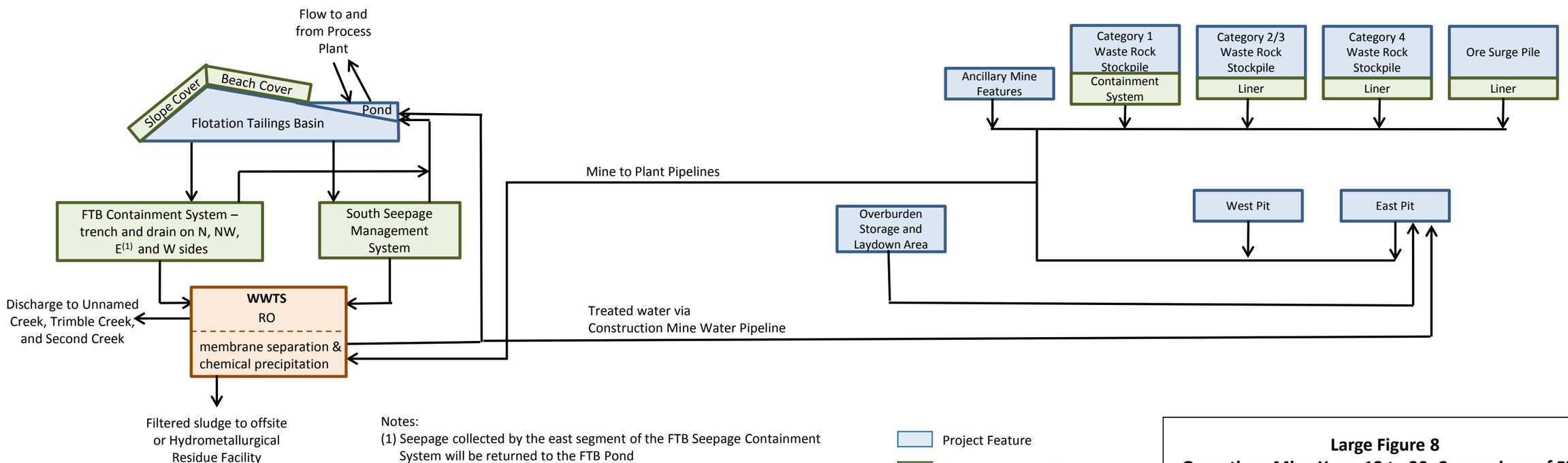
Large Figure 7
Operations Mine Years 1 to 11: Comparison of FEIS Flows and Proposed Flows with WWTS Relocations

Operations: Mine Years 12 to 20 (East Pit Backfilling)

Configuration with WWTP and WWTF Evaluated for FEIS



Proposed WWTS Relocations

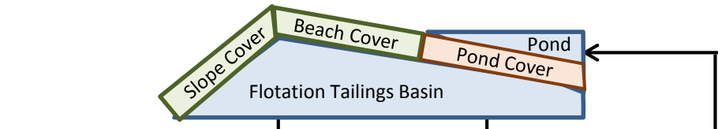


Notes:
(1) Seepage collected by the east segment of the FTB Seepage Containment System will be returned to the FTB Pond

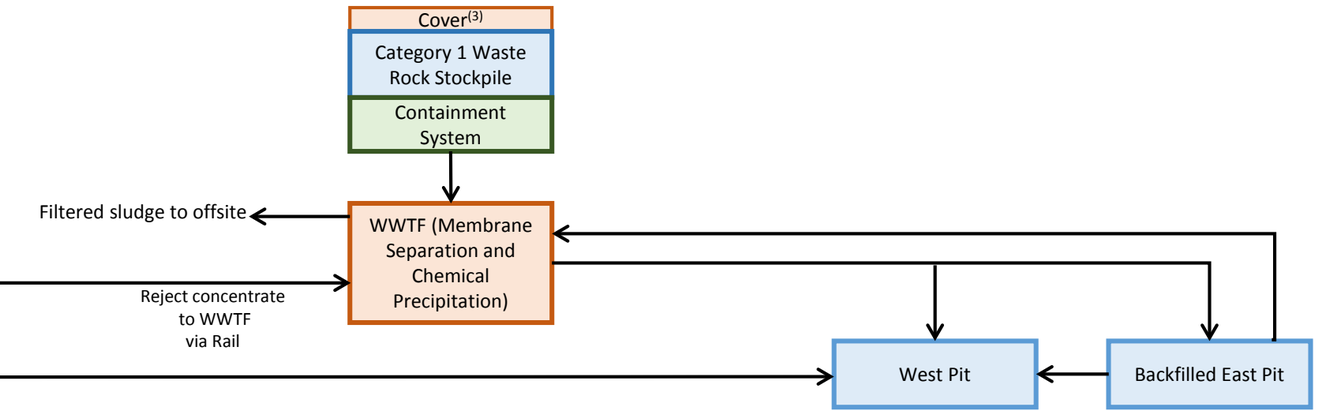
Project Feature
Fixed Engineering Control
Adaptive Engineering Control

Large Figure 8
Operations Mine Years 12 to 20: Comparison of FEIS Flows and Proposed Flows with WWTS Relocations

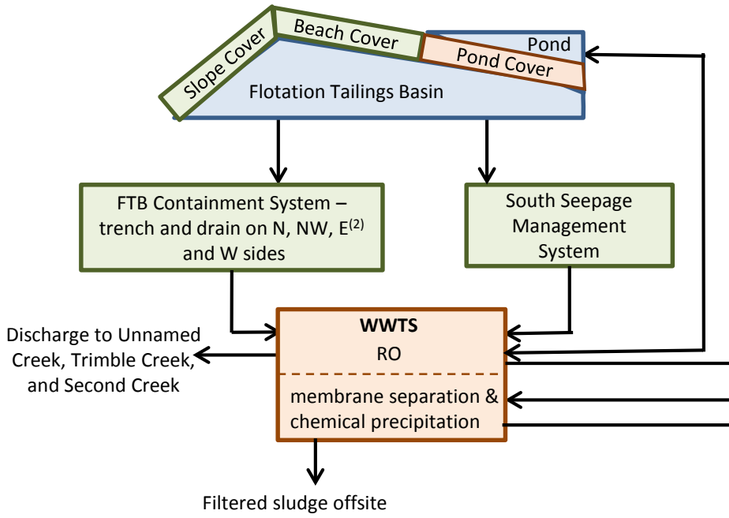
Reclamation[1]



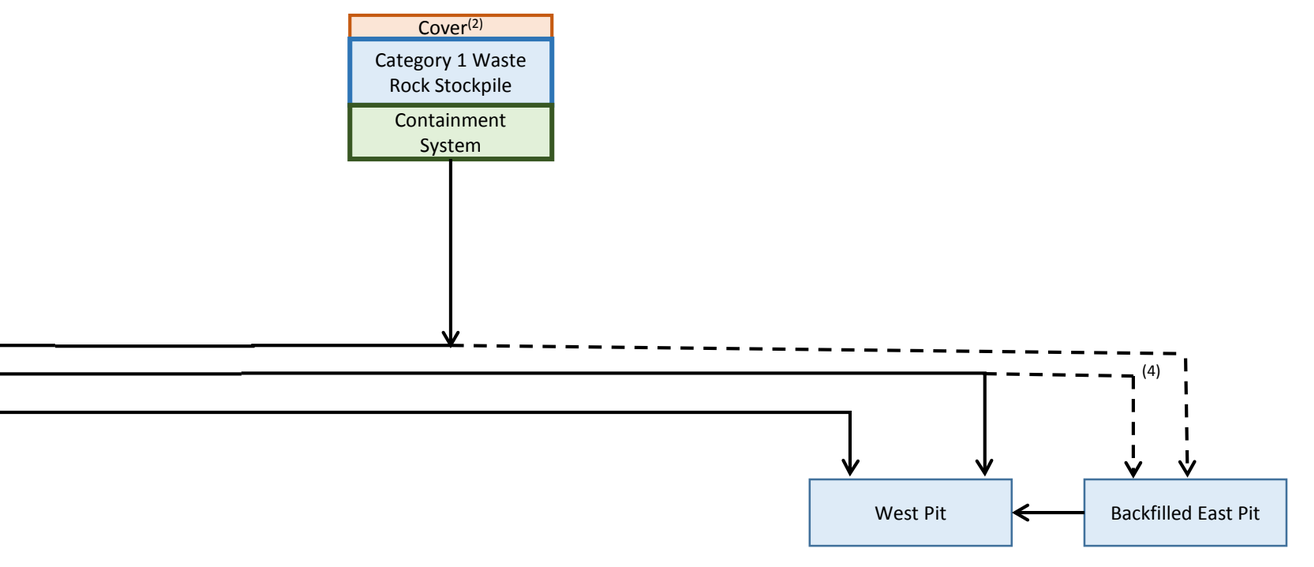
Configuration with WWTP and WWTF Evaluated for FEIS



Reclamation and Closure[1]



Proposed WWTS Relocations



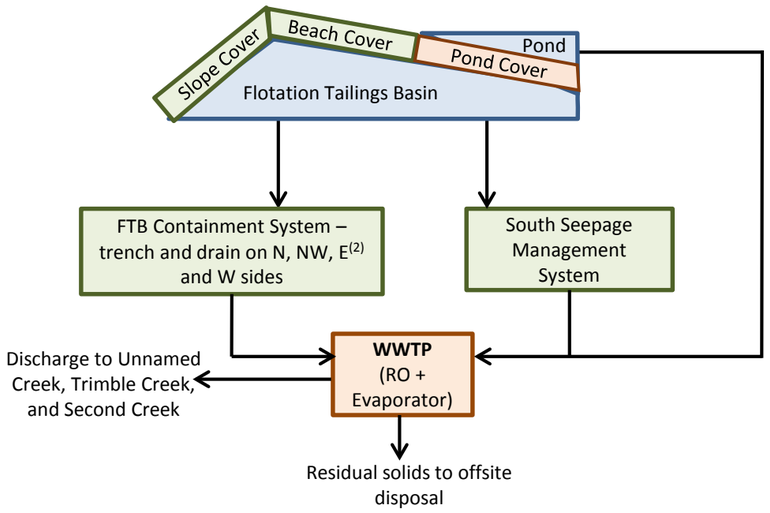
Notes:

(1) The Project phase referred to as "reclamation" in the FEIS encompasses the phases referred to as "reclamation" and "closure" in the Permit to Mine
(2) Seepage collected by the east segment of the FTB Seepage Containment System will be returned to the FTB Pond
(3) Category 1 Waste Rock Stockpile covering begins in Year 14 and is completed by Year 21
(4) After East Pit flushing is completed (at the end of reclamation) these flows will be discontinued

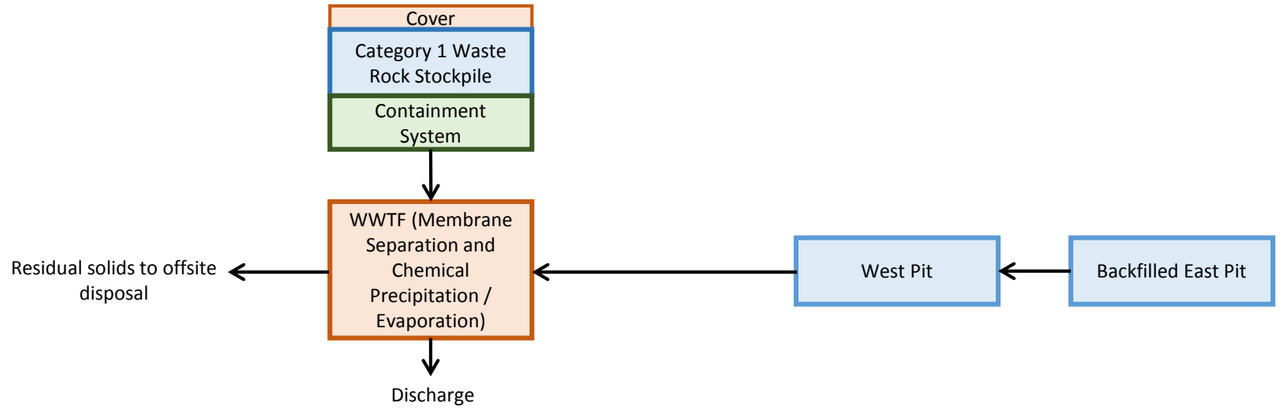
Project Feature
Fixed Engineering Control
Adaptive Engineering Control

Large Figure 9
Reclamation and Closure: Comparison of FEIS Flows and Proposed Flows with WWTS Relocations

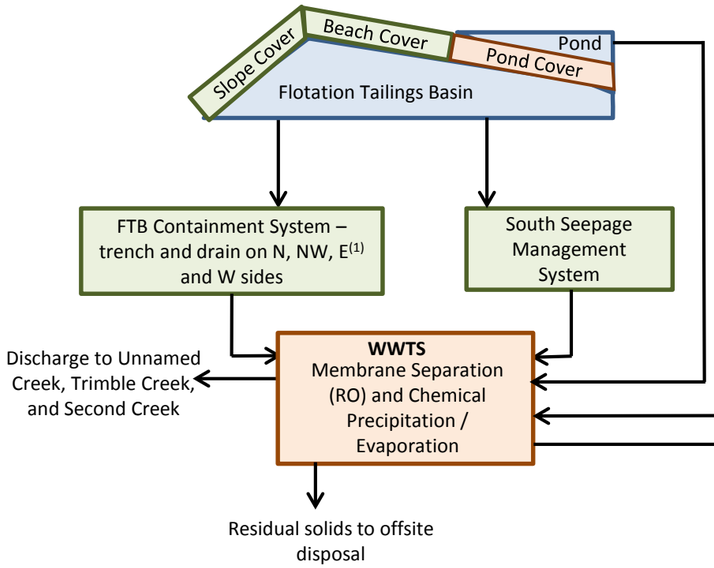
Long-Term Closure[1]



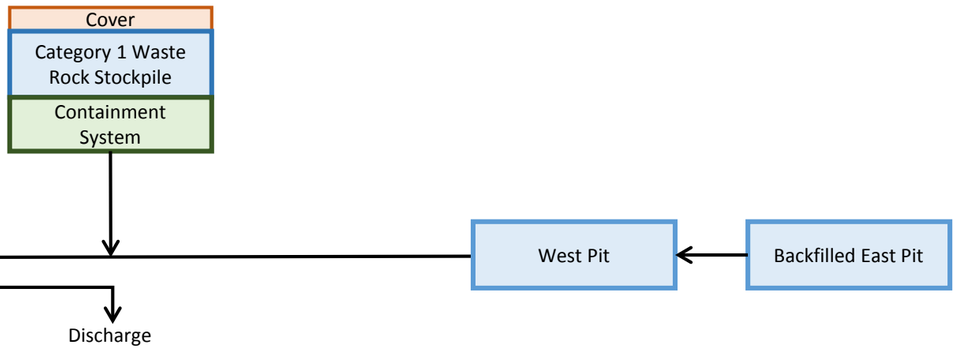
Configuration with WWTP and WWTF Evaluated for FEIS



Postclosure Maintenance[1]



Proposed WWTS Relocations

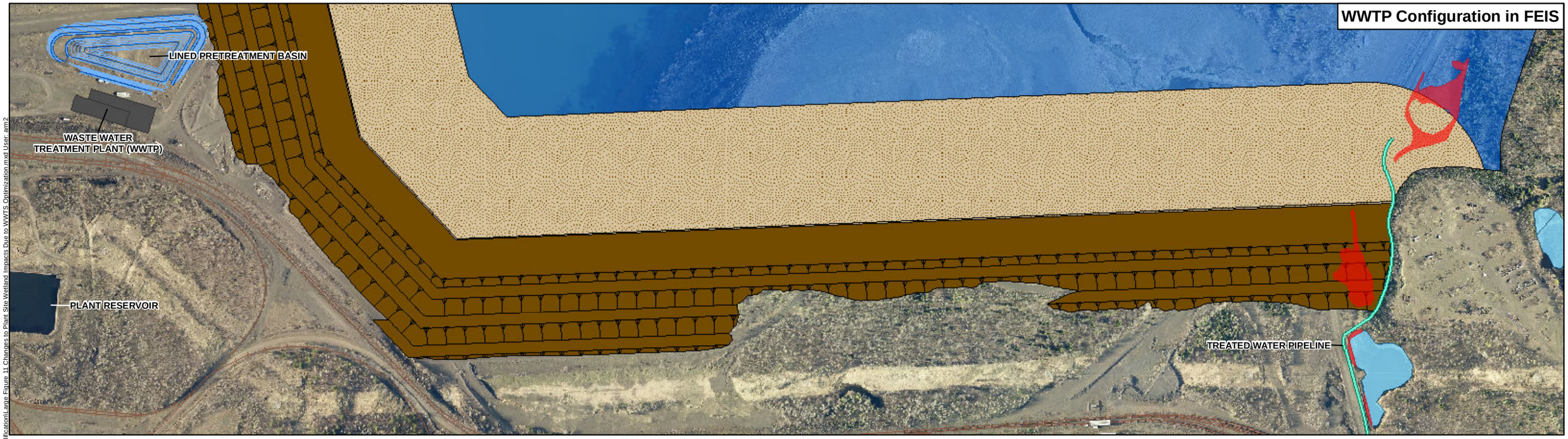


Notes:
(1) The Project phase referred to as "long-term closure" in the FEIS is referred to as "postclosure maintenance" in the Permit to Mine
(2) Seepage collected by the east segment of the FTB Seepage Containment System will be returned to the FTB Pond

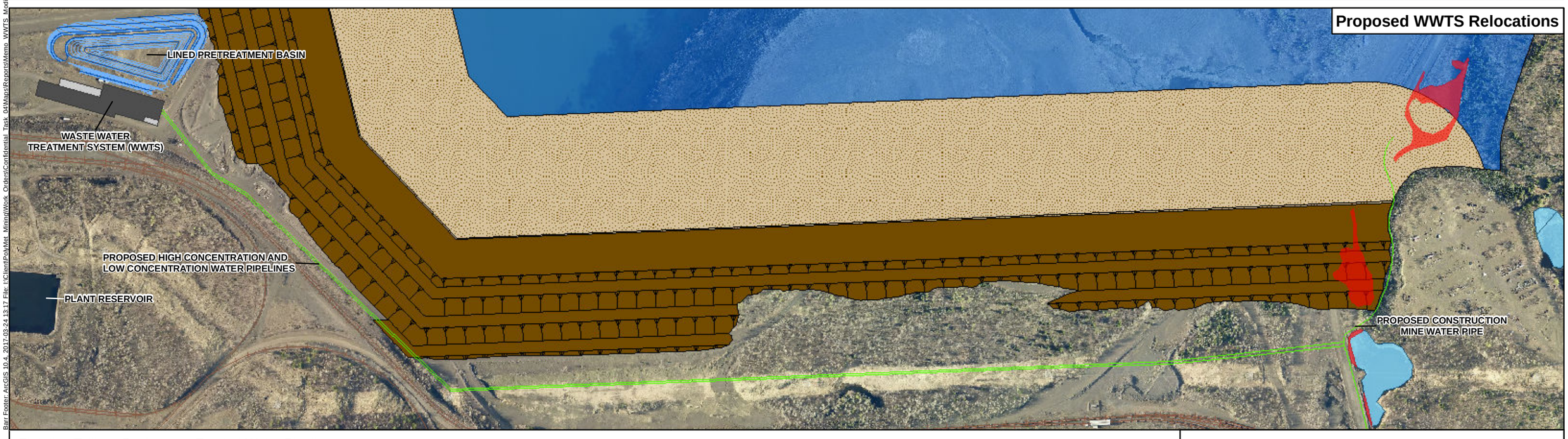
Project Feature
Fixed Engineering Control
Adaptive Engineering Control

Large Figure 10
Postclosure Maintenance: Comparison of FEIS Flows and Proposed Flows with WWTS Relocations

WWTP Configuration in FEIS



Proposed WWTS Relocations



Flotation Tailings Basin
Dam
Beach
Pond

Treated Water Pipeline
Proposed Mine to Plant Pipelines
(Alignment shown for illustrative purposes, not to scale)
Railroad

Potential Direct Wetland Impacts
Direct Wetland Impacts
No Direct Impact

N

0 250 500 1,000
Feet

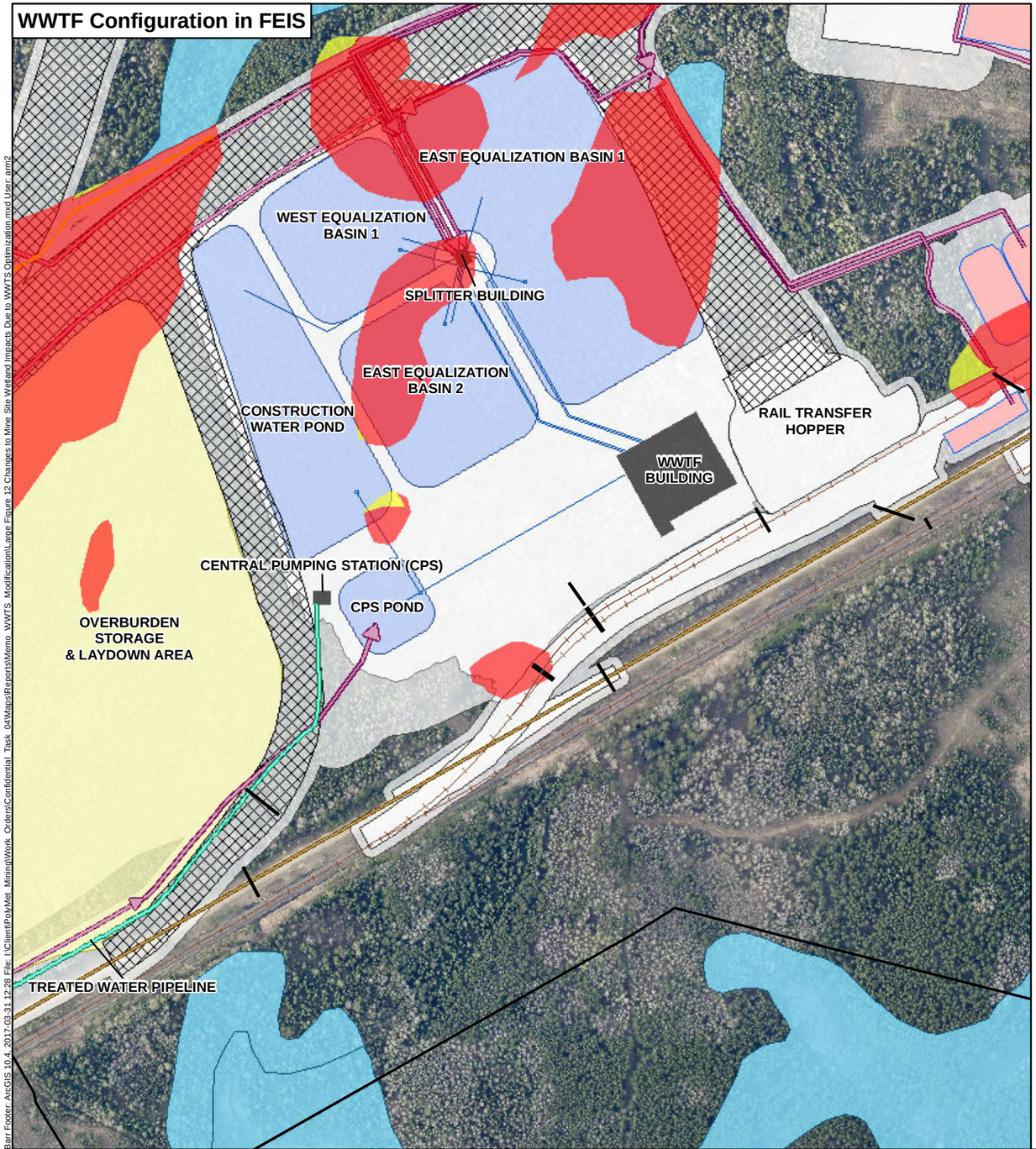
BARR

CHANGES TO PLANT SITE WETLAND IMPACTS
DUE TO WWTS RELOCATIONS
NorthMet Project
Poly Met Mining Inc.

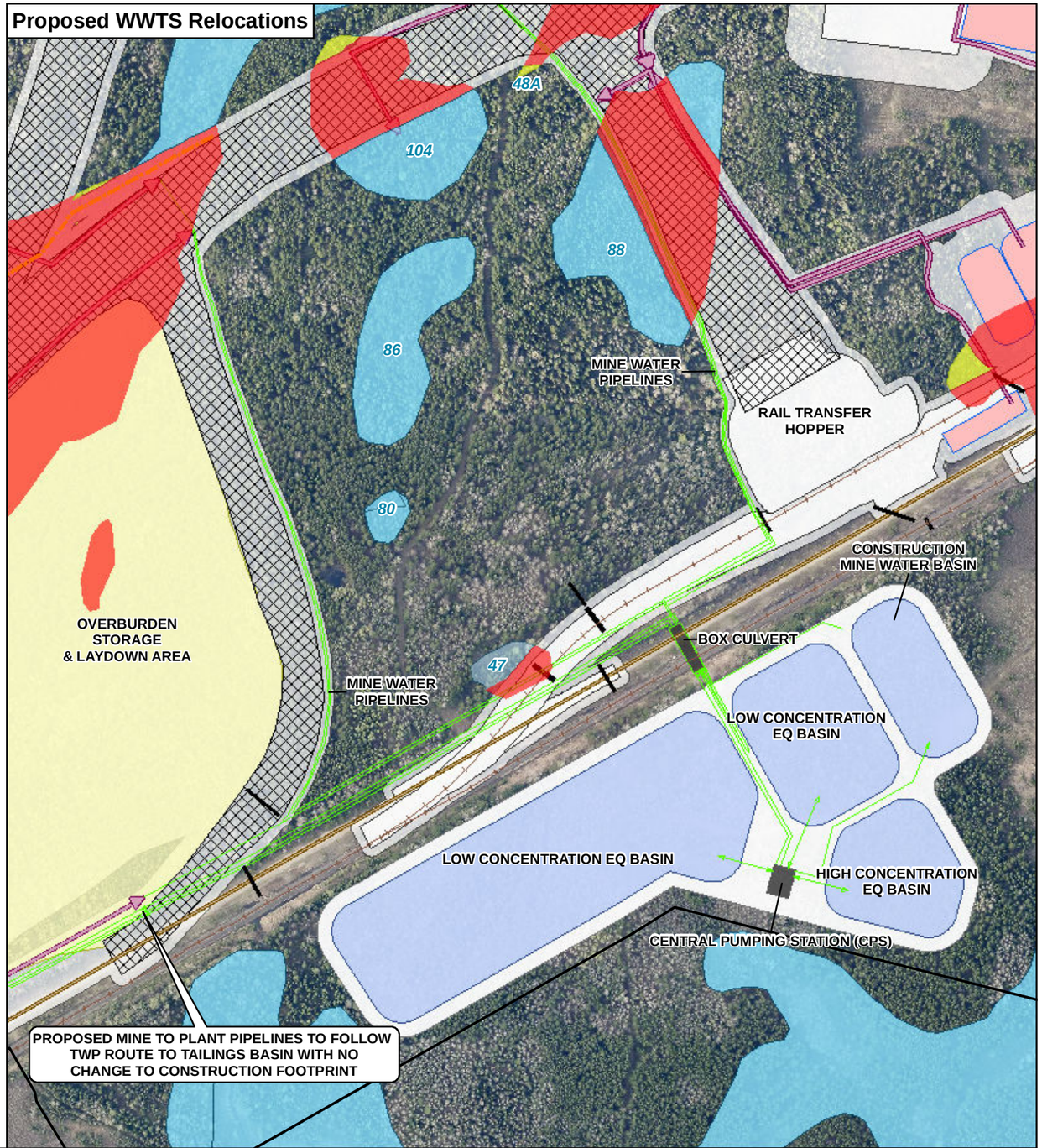
Large Figure 11
Proposed Waste Water Treatment System (WWTS) Relocations

Barr Foster, ArcGIS 10.4, 2017-03-24 13:17, File: I:\Client\PolyMet_Mining\Work_Orders\Confidential_Task_04\Maps\Reports\Memo_WWTS_Modification\Large Figure 11 Changes to Plant Site Wetland Impacts Due to WWTS Optimization.mxd User: amn2

WWTF Configuration in FEIS



Proposed WWTS Relocations



- EIS Project Areas
- Areas Disturbed by Proposed Project Features
- Mine Pit
- Active Stockpile
- Haul Roads
- Railroad
- Mine Water Pipe
- Mine Water Ponds and Sumps
- Stormwater Ditches
- Treated Water Pipeline
- Proposed Mine Water Pipe Modifications (Alignment shown for illustrative purposes, not to scale)
- Culverts

Potential Direct Wetland Impacts

- Direct Impact
- Fragmented Wetland
- No Direct Impact

0 175 350 700
Feet

BARR

CHANGES TO MINE SITE WETLAND IMPACTS
DUE TO WWTS RELOCATIONS
NorthMet Project
Poly Met Mining Inc.

Large Figure 12
Proposed Waste Water Treatment System (WWTS) Relocations

Barr Footer: ArcGIS 10.4, 2017-03-31 12:28 File: I:\Client\PolyMet_Mining\Work_Orders\Confidential_Task_04\Maps\Reports\Memo_WWTS_Modification\Large Figure 12 Changes to Mine Site Wetland Impacts Due to WWTS Optimization.mxd User: amr2