

***NorthMet Project Baseline Wetland Type
Evaluation***

***Prepared for
PolyMet Mining Inc.***

April 2011

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1.0 Introduction

The baseline wetland type evaluation was completed as part of the wetland review process for the Environmental Impact Statement (EIS) for the PolyMet Mining Inc. (PolyMet) NorthMet Project. The U.S. Army Corps of Engineers (Corps) determined there was a need to evaluate and classify wetland types in the areas surrounding the Mine Site (Area One) and the Tailings Basin (Area Two) with the potential for indirect hydrologic wetland impacts (see Corps Draft Plan, August 4, 2009, Appendix A).

The purpose of this report is to provide baseline wetland type evaluation data regarding the classification and acreages of wetlands in areas where the Corps has identified that potential indirect wetland impacts may occur. Information presented in this report includes a description of the methodology and a summary of the wetland types in the two evaluation areas.

The baseline wetland type evaluation was deemed final by the Corps at the PolyMet Project Wetland Impact Assessment Group Meeting on March 30, 2011. The information in this report will be used by the Corps during the permitting process to identify possible locations for additional wetland water level monitoring to document potential indirect wetland impacts as a result of the proposed Project.

2.0 Methods

Wetlands were evaluated in two areas: a 23,927-acre area including and surrounding the Mine Site (referred to as Area One) and a 19,397-acre area just north and northwest of the Tailings Basin (referred to as Area Two) (Figure 1). A figure outlining the extent of the two evaluation areas was initially provided in the Corps Draft Plan (Appendix A, Ahlness and Eggers 2009) and discussed at the PolyMet Wetland Workgroup (Workgroup) Meeting on September 10, 2009.

The boundaries for each evaluation area generally follow the St. Louis County section lines and large streams, including portions of the Partridge and Embarrass rivers. The boundary changes from the original Corps Draft Plan (Appendix A, Ahlness and Eggers 2009) connect the two evaluation areas (Figure 1) and include:

- Area One (Figure 2): The north boundary was shifted to the southern extent of property owned/managed by the NorthShore Mining Company. The western boundary was shifted west to the Tailings Basin.
- Area Two (Figure 3): The eastern boundary is located along the eastern edge of Sections 13 (south of the Embarrass River), 24, 25 and 36, Range 14 West, Township 60 North; and Section 1, Sections 10 and 11 (a portion of each section), Range 14 West, Township 59 North.

2.1 Data Sources for Off-Site Review

Wetlands within Area One and Area Two that were previously field verified or delineated during 2004-2010 are identified as “delineated/verified wetlands” on Figures 2 and 3 (Barr 2006a, Barr 2006b, Barr 2007, Barr 2008a, Barr 2008b, Barr 2009; Barr 2010a; Barr 2010b). Wetlands were identified and classified using the Eggers and Reed (1997) community classification system, which classifies the wetlands into 15 different plant communities, which are briefly described in Table 1. All vegetation is identified by common names in this report, with the scientific names provided in Appendix B.

Wetlands within the two areas that had not been previously delineated between 2004 and 2010 by Barr were identified and classified using several sources of information, including:

Table 1 Eggers and Reed (1997) Wetland Community Type Classification System

Wetland Type	Water Depth	Soils	Common Vegetation
Shallow, open water	< 6' deep; permanently inundated	Lacustrine deposits and sediments	Pondweed, duckweed, coontail, water milfoil, water lily
Deep marsh	6" to ≥ 3' deep; permanently to semi-permanently inundated	Lacustrine deposits	Cattail, reed, bulrush, pickerelweed, giant bur-reed, Phragmites, spikerush, wild rice, pondweed, naiad, coontail, watermilfoil, waterweed, duckweed, water lily, spatterdock
Shallow marsh	Saturated soils to ≤ 6" deep; waterlogged early in growing season	Mucky or mineral	Grass, bulrush, spikerush, cattail, bulrush, arrowhead, lake sedge, pickerelweed, smartweed
Sedge meadow	Saturated soils	Muck or peat	Sedge dominant; spike rush, bulrush, nut grass, grass, true rush, forbs
Fresh (wet) meadow	Saturated soils	Mineral or organic	Grass and forbs dominant; redtop, reed grass, manna grass, prairie cordgrass, mint
Wet to wet-mesic prairie	High groundwater table ≤ 12" during portion of growing season	Mineral	Native grass and forbs dominant; prairie cordgrass, big bluestem, aster, culver's root, dock, sunflower
Calcareous fen	Upwelling, calcareous, groundwater discharge	Organic alkaline	Calciphiles dominant; shrubby cinquefoil, sterile sedge, wild timothy, beaked spike rush, Ohio goldenrod, common valerian, lesser fringed gentian
Open bog	Saturated	Organic acid	Continuous sphagnum moss mat present; scattered immature (dbh < 6 in) black spruce or tamarack, ericaceous shrubs, sedges and forbs, such as pitcher plants
Coniferous bog	Saturated	Organic acid	Continuous sphagnum moss mat present; mature (dbh > 6 in) black spruce or tamarack, ericaceous shrubs, sedges and forbs such as pitcher plants
Shrub-carr	Saturated to seasonally flooded	Organic	Woody vegetation < 20 ft high and dbh < 6 in dominated by willows and/or dogwood with various sedges, grasses and forbs
Alder thicket	Saturated to seasonally flooded	Organic or alluvial	Woody vegetation < 20 ft high and dbh < 6 in dominated by speckled alder with various sedges, grasses and forbs
Hardwood swamp	Saturated to ≤ 12" deep during most of growing season	Organic alkaline	Continuous sphagnum moss mat absent; black ash, red maple, yellow birch, silver maple, aspen, American elm, dogwood, alder and various sedges, grasses and forbs
Coniferous swamp	Saturated to ≤ 12" deep during most of growing season	Organic ranging from acid to alkaline	Continuous sphagnum moss mat absent; northern white cedar, tamarack, balsam fir, birch, black ash, alder and various sedges, grasses and forbs
Floodplain forest	Some-what well drained during growing season flood inundation	Alluvial	Maple, ash, birch, cottonwood, elm, willow, jewelweed, nettle
Seasonally flooded basin	Poorly drained; inundated for a few weeks during the growing season	Mineral	Smartweed, beggartick, nut-grass, wild millet, annual species

- Farm Services Administration (FSA) true color aerial photographs from 2003, 2005, 2006, 2008 and 2009.
- FSA color infrared (CIR) aerial photographs from 2008.
- United States Fish and Wildlife Service NWI maps.
- Superior National Forest United States Forest Service (USFS) stand data GIS shapefile obtained from the USFS on September 29, 2009 with data only available for Area One.
- USFS Ecological Landtype soils data (where available).
- Natural Resources Conservation Service soils data for St. Louis County (where available).
- United States Geological Survey topographic maps and digital elevation models.
- Minnesota Department of Natural Resources (MnDNR) 2005 CIR photography stereo pairs with 60 percent overlap.

Additional GIS information available for the analysis included habitat data compiled for the Mine Site and surrounding area (AECOM 2009, ENSR 2004), locations of wetland hydrology monitoring wells (Barr 2011 (in progress), Barr 2010c, Barr 2006c - RS 44), watershed boundaries (MnDNR Data Deli) and streams (MnDNR Data Deli). The figures in Appendices C and D show existing data for habitat surveys, wetland hydrology monitoring well locations, watershed boundaries and stream locations for the Area One and Area Two, respectively.

2.2 Wetland Type Calibration

The MnDNR 2005 CIR photography stereo pairs were viewed through a stereoscope to assist with wetland identification and classification and determination of dominant tree species present within forested wetlands. The initial determination of tree species was completed using information from the field studies conducted in Area One and Area Two between 2004 and 2010 including wetland delineations, habitat surveys and botanical surveys. The site-specific information was used to calibrate (or verify) the tree species signatures observed on the stereo pairs. Field data for the calibration was obtained from sources including:

- Habitat surveys conducted at the Mine Site (ENSR 2004).
- Geomorphology survey conducted in the Partridge River (Barr 2005).
- Biological surveys conducted in the Partridge River (Breneman 2004, Heath 2004).

- Wetland delineation fieldwork conducted at the Mine Site from 2004-2006 (Barr 2006b, Barr 2007) using established methods according to the Routine On-Site Determination Method specified in the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual* (1987 Corps Manual).
- Agency site visit in August 2004 to discuss the site and development plans and review wetlands in the central portion of the site. Agencies present at the meeting included the Corps, MnDNR Land and Minerals, MnDNR Ecological Resources, St. Louis County Soil and Water Conservation District and the U.S. Forest Service.
- Agency site visit in June 2005 to tour the plant areas, Tailings Basin, shops area, railroad areas and wetlands. Discussed the delineation methodology. Agencies present at the meeting included the Corps, MnDNR Environmental Review, U.S. Forest Service, U.S. Fish and Wildlife Service (USFWS) and the U.S. Environmental Protection Agency (USEPA).
- The wetland delineation was approved by the Corps and MnDNR in 2006.
- Fieldwork to delineate wetlands along the Dunka Road from the Mine Site to the Tailings Basin (2007a).
- Field surveys for *Botrychium rugulosum* at the Mine Site in Autumn 2007 (Barr 2007b).
- Fieldwork to delineate wetlands north and east of the Tailings Basin (2008a, 2008b).
- Habitat surveys conducted in areas west, north and east of the Mine Site (AECOM 2008).
- Threatened and endangered species survey conducted in areas adjacent to the Mine Site in 2007-2008 (AECOM 2008, Barr 2008c).
- TB-12 Pipeline Route Analysis for Tailings Basin Alternative (Barr 2009a, Barr 2009b).
- Wetland hydrology monitoring fieldwork conducted from 2005 through 2010 (Barr 2006c, Barr 2010c, Barr 2011 (in progress)).
- Wetland Workgroup site visit in September 2010 to verify wetland types in Area One and Area Two. The Workgroup included members from the Corps, MnDNR, USFWS, USEPA, Fond du Lac Band, Grand Portage Band, Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and Environmental Resource Management (ERM).
- Aerial review by helicopter in October 2010 to review wetland and identify cedar with Area One and Area Two.

- Other field work conducted for PolyMet during 2006-2010 provided verbal comments and observations about general habitat and site characteristics around the Mine Site and Tailings Basin.

Wetlands were classified using the Eggers and Reed classification key (Appendix E) to verify that each wetland met the criteria set forth in the classification key. To supplement the information in the Eggers and Reed classification key, the MnDNR *Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province* (2003) was also reviewed. The information obtained for known wetland polygons was used to evaluate wetlands in the areas where no field verification had been conducted. Using the calibrated areas (known wetland polygons), tree species and dominant wetland types were determined for the remainder of the previously-unevaluated portions of Area One and Area Two (as described in Section 2.3). Wetland polygons were digitized using ArcView 9.3 and the areal extent of each dominant wetland type was determined.

Each wetland polygon was classified by the dominant Eggers and Reed (1997) wetland type and categorized by the dominant tree species (for forested wetlands). While wetlands were digitized and classified by the dominant wetland type and tree species, some polygons, especially the larger wetland complexes, may contain small pockets of other wetland types and tree species.

2.3 Wetland Type Classification Method

The methodology used to evaluate wetlands was developed based on the Eggers and Reed (1997) classification key. Each step in this wetland type evaluation required asking specific questions and providing answers based on using the previously collected field data, aerial photographs (stereo pairs, FSA aerial photography, etc.), and the off-site and on-site information described above. Only areas that were identified as wetland were evaluated for this study. Data points were completed in uplands as part of the routine delineations conducted at the site using the Routine On-Site Determination Method specified in the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual* (U.S. Army Corps 1987). Sources of data included NWI maps, previous delineations and field studies conducted in the areas, review of the stereo pairs, etc.

The aerial photography was reviewed using a stereoscope and GIS to determine if forested wetlands were present in an area. Under the stereoscope, trees have a distinct texture compared with shrubs (alder, willow, dogwood, etc.) and herbaceous (grass, reeds, sedges, etc.) vegetation. Within the areas identified as shrub vegetation, it was not possible to differentiate between alder thickets and shrub-carr communities using the aerial photograph review. Therefore, unless these areas were field

verified, they were classified in this study as “alder thicket/shrub-carr.” Areas with herbaceous vegetation were reviewed for the presence of open water areas. Large open water areas were classified as open water communities and included shallow, open water lakes such as Mud Lake. Smaller open water areas were classified as either shallow marsh or deep marsh communities depending on the aerial extent of the open water area.

Within the areas identified as forested wetlands, it was determined whether the area was dominated by coniferous or deciduous trees. In general, these two groups of trees are relatively easy to distinguish using a stereoscope. The conifers are conical shaped trees with a narrow crown while deciduous trees are generally oval or round shaped with a wide crown. Forested wetland areas with deciduous trees were classified as hardwood swamps.

Within the areas identified as forested wetlands with coniferous trees, the type(s) of tree species present in the area was determined. The dominant tree species observed included black spruce and tamarack; cedar and balsam fir were also present in some areas. There were some stands that were dominated by tamarack, although it was generally either co-dominant with black spruce or was only a minor component along with black spruce. While the black spruce and tamarack were visible by texture and color using the stereoscope, the cedar was less visible. Based on fieldwork, the cedar is generally found as a dominant species or mixed with balsam fir, black ash, black spruce or tamarack.



Because the USFS owns the surface rights for much of Area One, stand data was available that identified the presence of cedar. Using the USFS stand data, habitat data (AECOM 2008) and other field verified data (described previously), the following assumptions were made about the use of cedar data in this report:

- Cedar was considered present at all forested wetland locations within Area One where the USFS stand data indicated that cedar was present
- Cedar was considered present in all areas outside of the USFS stand data where cedar was field verified by foot or helicopter



Often, other species such as black spruce and tamarack or alder are either dominant or co-dominant with cedar in areas where it is present (see Photograph 1). The small size of some of the areas where cedar may be present, coupled with the co-occurrence of other species, makes it very difficult to identify these areas on aerial photographs, with or without the use of a stereoscope. Because of this, in October of 2010, a helicopter was used to fly over the entire Area One and Area Two to identify additional areas of cedar. From a helicopter, differentiating between spruce, tamarack and cedar is relatively straightforward, especially during the fall when tamaracks are starting to change colors. As shown in Photograph 2, the cedar, in the foreground has a greenish/yellowish hue, with wider crowns than the darker green spruce in the background. The yellowish colored trees are tamarack and the white colored trees are deciduous trees that have dropped their leaves.



Within areas identified as forested wetlands dominated by the mature black spruce and/or tamarack, it was determined if the area was a coniferous swamp or bog. Eggers and Reed (1997) defines a coniferous swamp as “northern white cedar and/or tamarack are dominant; continuous sphagnum moss mat absent; usually growing on neutral to alkaline peat/muck soils.” As shown in the Photograph 3, this coniferous swamp is dominated by black spruce and tamarack. The ground cover included grasses and forbs and a discontinuous sphagnum moss mat, as shown in Photograph 4. The organic soils are saturated to the surface in this area. This wetland is located on the eastern edge of a small stand of cedar in Area One.



Within areas identified as forested wetlands dominated by mature coniferous tree species, which were either tamarack or black spruce, it was determined if the area was a coniferous swamp or bog. Eggers and Reed (1997) defines a coniferous bog as “tamarack and/or black spruce are dominant; growing on a continuous sphagnum moss mat and acid, peat soils.” As shown in Photograph 5, this coniferous bog is dominated by black spruce with some tamarack present. Ericaceous shrubs dominated the shrub layer. The ground is covered by a dense mostly continuous sphagnum moss mat as shown in Photograph 6. The sphagnum moss was absent in the open hollows scattered throughout the wetland.



The organic soils are saturated to the surface in this area. This wetland is part of a large coniferous bog in Area One.

Within areas identified as forested wetlands dominated by immature coniferous tree species, which were either tamarack or black spruce, it was determined that the area was an open bog. Eggers and Reed (1997) defines an open bog as “Mature trees are absent or, if present, form open, sparse stands; other woody plants, if present, are shrubs or saplings and pole-size trees (dbh less than 6 inches) less than 20 feet high ... and shrubs are ericaceous and evergreen growing on a sphagnum moss mat layer; peat soils are acidic”. These wetland areas were identified using field data from Hundred Mile Swamp where there are large areas of open bog for calibration of the stereo pair photographs.

2.4 Field Review of Wetlands

Upon completion of the initial off-site wetland determinations, there were locations in the two evaluation areas where the available information was insufficient to determine the presence of wetlands, wetland types or the dominant tree species present. In these locations, field reviews were conducted in late-October and mid-November of 2009 to identify the presence, extent and classification of the wetlands. In addition, field verification of a portion of the off-site wetland determinations was conducted to verify wetland types. In addition, the entire Area One and Area Two were flown with a helicopter in October of 2010 to conduct additional field verification. Upon completion of the field review, wetland polygons were updated using ArcView 9.3; these updates are summarized in a Technical Memorandum for the helicopter review (Barr 2010d), which is provided in Appendix F. Since the Technical Memorandum was written, there were minor changes to the wetland boundaries in Area Two; therefore, the data presented in this report represent the most current wetland data.

3.0 Results

3.1 Area One

Approximately 11,195 acres of wetland have been identified within the 23,927-acre Area One (47 percent of the area). The wetlands are identified on Figure 4 using the Eggers and Reed (1997) community classification system. Table 2 summarizes the acreages and percent of wetland area represented by each Eggers and Reed (1997) wetland community type.

Table 2 Area One - Eggers and Reed (1997) Wetland Types

Eggers and Reed Wetland Community	Total Acres¹	% of Wetland Area
Coniferous bog	4,669	41.7
Coniferous swamp	1,984	17.7
Deep marsh	220	2.0
Hardwood swamp	27	0.2
Open bog	280	2.5
Open water (includes shallow, open water and lakes)	245	2.2
Sedge/wet meadow	46	0.4
Shallow marsh	359	3.2
Shrub swamp (includes alder thicket and shrub-carr)	3,365	30.1
Total acres of wetland	11,195	

¹Total acres have been rounded to the nearest acre.

Coniferous bogs are the most dominant wetland type and represent approximately 42 percent of the wetland area. Shrub swamps, including both alder thickets and shrub-carrs, are the second most dominant wetland type and represent approximately 30 percent of the wetland area. Coniferous swamps are the third most dominant wetland type and represent approximately 18 percent of the wetland area within Area One. The remaining wetland types include: shallow marsh (3.2 percent), open bog (2.5 percent), open water (2.2 percent; includes both shallow, open water and lakes), deep marsh (2.0 percent), sedge and wet meadows (0.4 percent) and hardwood swamps (0.2 percent).

Forested wetland community types include coniferous bog, coniferous swamp and hardwood swamp. The forested wetlands comprise approximately 60 percent of the wetlands within Area One (Table 2). Figure 5 shows the forested wetlands represented by the dominant tree species present in the wetland. Table 3 summarizes the areal extent (acres) of each dominant tree species.

Table 3 Area One – Forested Wetland by Dominant Tree Species

Dominant Tree Species	Total Acres	% of Area
Cedar (with other species)	1,223	18.3
Hardwoods	19	0.3
Spruce	1,060	15.9
Spruce/Tamarack	4,121	61.7
Tamarack	256	3.8
Total acres	6,679	

Approximately 62 percent of the forested wetlands found within Area One are dominated by a combination of black spruce and tamarack (Table 3). Approximately 16 percent of the forested wetlands are dominated by black spruce and about 4 percent of the wetland areas are dominated by tamarack. Northern white cedar is present in approximately 18 percent of the forested wetlands within Area One. Within these areas, cedar typically occurs as a dominant or with other tree species such as spruce, tamarack or black ash. Hardwood swamps represent a minor component (0.3 percent) of the forested wetlands present within Area One. These hardwood swamps are dominated by black ash, quaking aspen and paper birch.

Figure 6 shows the USFS stand data for Area One. The USFS stand data indicates that black spruce and jack pine are the most dominant tree species present within Area One (see Figure 6: “Lowland Conifer A-JPBS-DMRWP” (Jack Pine/Black Spruce and Dry-Mesic Red and White Pine and “Jack Pine-Black Spruce”). The USFS stand data primarily identified the presence of cedar in the northwestern portion of Area One, with a small pocket of cedar also identified in the southeastern corner of Area One (Figure 6).

In addition to the 496 acres within Area One where the USFS documented cedar, this baseline wetland evaluation identified an additional 727 acres within Area One where cedar is present (Figure 5). Cumulatively this represents approximately 18 percent of the entire Area One.

3.2 Area Two

Approximately 8,606 acres of wetland were identified within the 19,397-acre Area Two (44 percent of the area). The wetlands are identified on Figure 7 using the Eggers and Reed (1997) wetland community type classifications. Table 4 summarizes the acreages and percent of wetland area represented by each Eggers and Reed (1997) wetland type.

Table 4 Area Two - Eggers and Reed (1997) Wetland Types

Eggers and Reed Wetland Community	Total Acres¹	% of Wetland Area
Coniferous bog	1,329	15.4
Coniferous swamp	2,225	25.9
Deep marsh	509	5.9
Hardwood swamp	157	1.8
Open bog	353	4.1
Open water (includes shallow, open water and lakes)	286	3.3
Sedge/wet meadow	138	1.6
Shallow marsh	654	7.6
Shrub swamp (includes alder thicket and shrub-carr)	2,955	34.4
Total acres of wetland	8,606	

¹Total acres have been rounded to the nearest acre.

Shrub swamps, including both alder thickets and shrub-carrs, are the most dominant wetland type within Area Two and represent approximately 34 percent of the wetland area. Coniferous swamps are the second most dominant wetland type within Area Two and represent approximately 26 percent of the wetland area (Table 4). Coniferous bogs are the third most dominant wetland type and represent approximately 15 percent of the wetland area. The remaining wetland types include: shallow marsh (7.6 percent), deep marsh (5.9 percent), open water (3.3 percent; includes both shallow, open water and lakes), hardwood swamp (1.8 percent) and sedge and wet meadows (1.6 percent).

Forested wetlands make up approximately 43 percent of the wetland area within Area Two (Table 4). Figure 8 shows wetlands represented by the dominant tree species present in the wetland. Table 5 summarizes the areal extent (acres) of each dominant tree species.

Nearly 65 percent of the forested wetlands present within Area Two are dominated by a combination of black spruce and tamarack (Table 5). Approximately 14 percent of the forest wetlands are dominated by spruce and approximately 4 percent of the forested wetlands are dominated by tamarack. Cedar is present within approximately 13 percent of the wetland area. Within these areas, cedar typically occurs as a dominant or with other tree species such as spruce, tamarack or black ash. Approximately 4 percent of the forested wetlands are dominated by hardwoods such as black ash, quaking aspen and paper birch.

Table 5 Area Two – Forested Wetland by Dominant Tree Species

Dominant Tree Species	Total Acres¹	% of Area
Cedar	473	12.8
Hardwoods	146	3.9
Spruce	508	13.7
Spruce/Tamarack	2,425	65.3
Tamarack	159	4.3
Total acres	3,711	

¹Total acres have been rounded to the nearest acre.

3.3 Wetland Descriptions

Coniferous Bogs and Open Bogs

Coniferous bogs are the dominant wetland type present within Area One and the third most dominant wetland type within Area Two. Open bogs represent a small component of both the Area One wetlands (2.5 percent) and Area Two wetlands (4.1 percent). Coniferous bogs generally have a tree cover greater than 50 percent, which is typically dominated by black spruce and/or tamarack. Forested wetlands that are dominated by dense cover of mature black spruce and tamarack are classified as coniferous bogs in the Eggers and Reed (1997) classification system as described previously. Occasionally, there are areas with balsam fir, jack pine and northern white cedar present within the large coniferous bog complexes (see cedar polygons on Figures 5 and 8). Open bogs do not support a dense tree cover and typically, just a scattering of immature black spruce and/or tamarack are present.

The shrublayer and groundlayer of coniferous bogs and open bogs are similar in composition. The shrublayer is typically dominated by ericaceous shrubs such as leatherleaf, Labrador tea and cranberry. The groundlayer commonly includes a continuous sphagnum moss mat with various sedges and herbaceous vegetation also present. Northern pitcher plants are abundant in the large bog areas that surround Mud Lake.

Soils in the coniferous bogs and open bogs generally consist of fibric peat that is usually saturated to the surface throughout much of the growing season.

Coniferous Swamps

Coniferous swamps within Area One and Area Two are dominated by black spruce and/or tamarack, with balsam fir and northern white cedar present in some areas (Figures 5 and 8 identify areas where cedar is present). Deciduous tree species, such as aspen, birch and on a few occasions, black ash, are

also present in some areas. The shrub layer is typically dominated by alder and willows. The groundlayer commonly includes Canada bluejoint grass, sedges, bunchberry, wild sarsaparilla and starflower. Sphagnum mosses are also present in the groundlayer; however a continuous sphagnum mat is usually absent.

Soils in the coniferous swamps are generally organic and are usually saturated to the surface throughout much of the growing season.

Hardwood Swamps

Hardwood swamps are present but not abundant in Area One and Area Two. The hardwood swamps that are present are dominated by black ash, aspen and birch. Coniferous trees, such as balsam fir, black spruce and northern white cedar are occasionally present in these hardwood swamps (Figures 5 and 8 identify areas where cedar is present). The shrublayer is generally dominated by alder and young trees. The groundlayer species present include Canada bluejoint grass, sedges and ferns. Sphagnum mosses are also present but generally do not form a continuous mat.

Soils in the hardwood swamps can be organic or mineral and are usually saturated throughout much of the growing season.

Shrub Swamps

Shrub swamps, which include both alder thickets and shrub-carrs, represent the most dominant wetland type within Area Two and the second most dominant wetland type within Area One. These shrub swamps are dominated by either alder or willows, with some dogwoods also present. The groundlayer is dominated by Canada bluejoint grass and sedges, with woolgrass, rushes and ferns also present. Sphagnum mosses may be present but do not typically form a continuous mat within these shrub swamps.

Soils in the shrub swamps are usually fibric and hemic peat at the surface underlain by bedrock or mineral soil.

Shallow and Deep Marshes

Although shallow and deep marshes are present within both Area One and Area Two, they represent a relatively small percentage of the wetland area. These wetlands are dominated by cattails, with sedges and Canada bluejoint grass also present.

Soils in the shallow and deep marshes are typically organic at the surface and underlain by mineral soils. The shallow marshes present at the two evaluation areas are typically inundated with up to six inches of water throughout the entire growing season, while the deep marshes present at the sites are inundated with over six inches of water throughout the entire growing season. These wetlands are often associated with disturbances, such as beaver activity.

Sedge Meadows and Wet Meadows

Sedge meadow and wet meadow communities are present within both Area One and Area Two but represent a very small proportion of the total wetland area within each evaluation area. These wetlands are dominated by sedges, Canada bluejoint grass, woolgrass, manna grass and bulrushes.

Soils in the sedge meadow and wet meadow wetlands are typically organic at the surface underlain by mineral soils. These wetlands are generally saturated close to the ground surface or have shallow inundation for prolonged periods during the growing season.

3.4 Summary of Wetland Resources

A total of 443 wetlands covering 11,195 acres were identified in Area One and 351 wetlands covering 8,606 acres were identified in Area Two. Appendix G and Appendix H summarize the wetland resources within Area One and Area Two, respectively. Wetlands across the two areas consist of large wetland complexes, with forested wetlands dominated by black spruce and tamarack representing the most prominent wetland community within each area. Both black spruce and tamarack can persist in the ombrotrophic (deriving its water supply and nutrients from rainfall) conditions of bogs (MnDNR 2003).

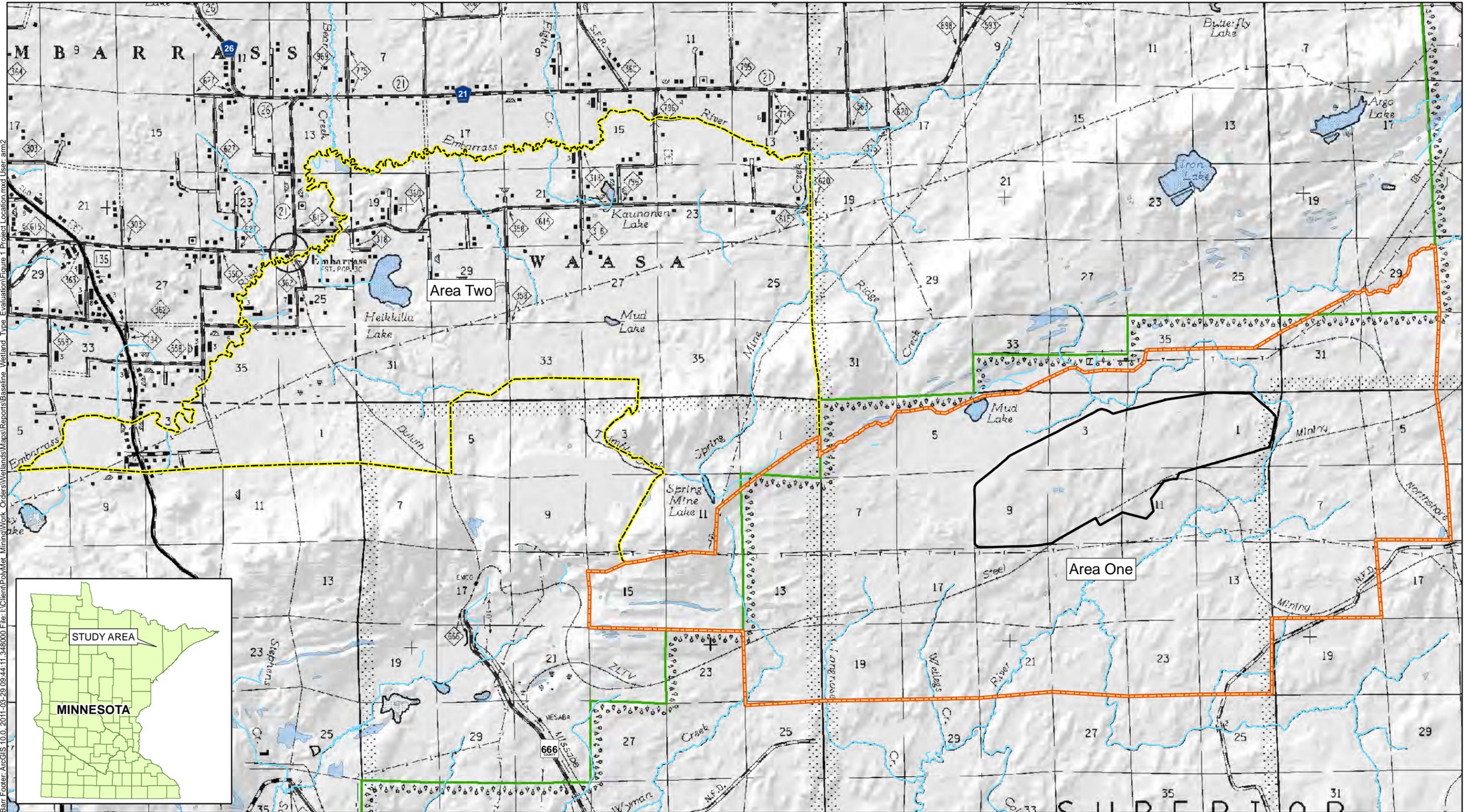
4.0 References

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Figures

Bar Footer: ArcGIS 10.0, 2011-03-29 09:44:11, 348000 File: I:\Client\PolyMet_Mining\Work Orders\Wetlands\Reports\Baseline Wetland Type Evaluation\Figure 1 Project Location.mxd User: arm2



-  Mine Site
-  Area One
-  Area Two
-  National Forest Boundary
-  Lakes
-  Streams

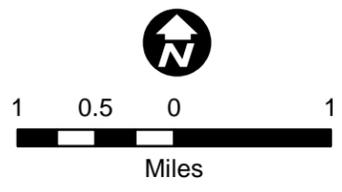
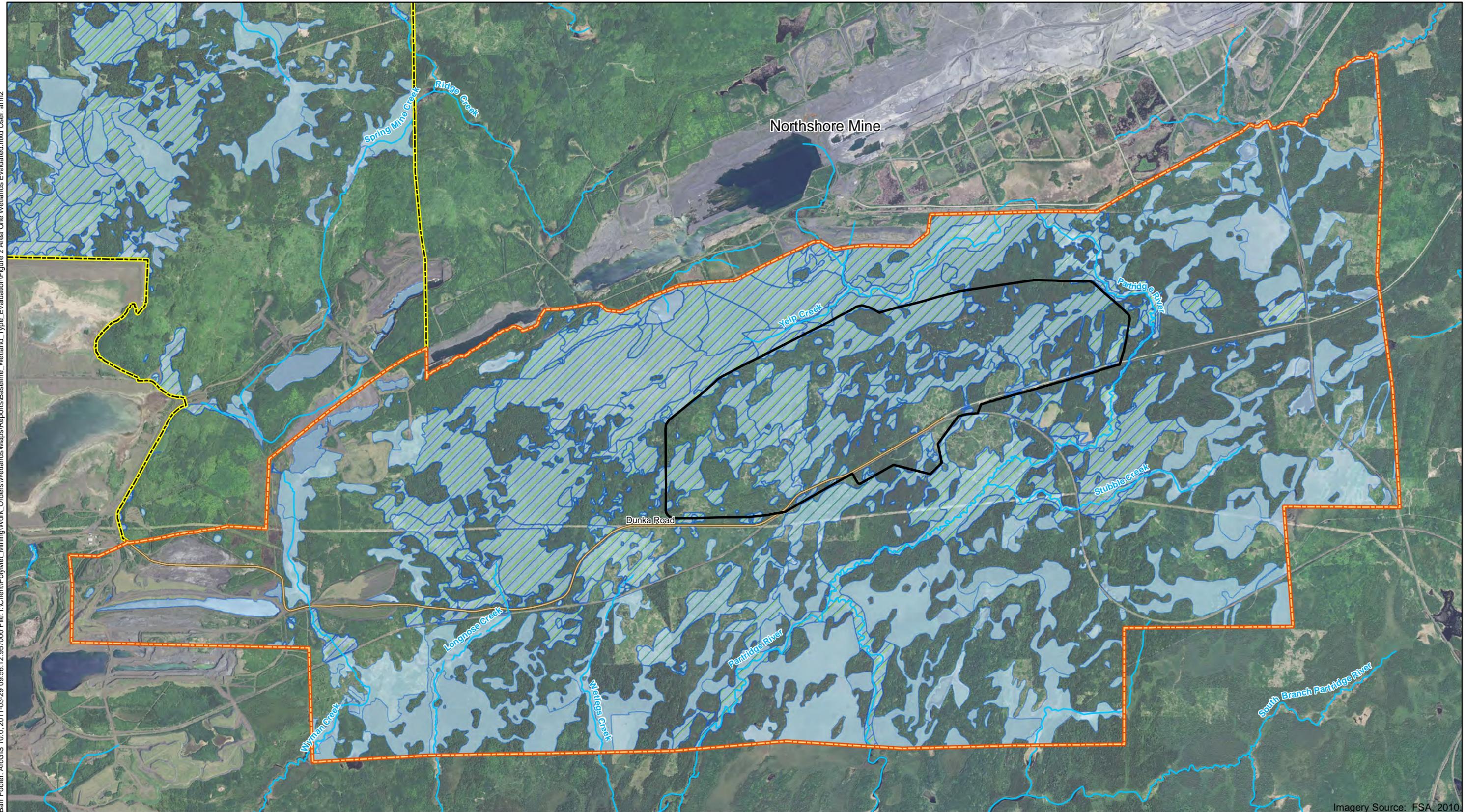


Figure 1
PROJECT LOCATION
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 09:56:12, 957000 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Reports\Baseline_Wetland_Type_Evaluation\Figure 2 Area One Wetlands Evaluated.mxd User: arm2



Imagery Source: FSA, 2010

-  Mine Site
-  Area One
-  Area Two
-  Delineated/Verified Wetlands
-  Wetlands
-  Streams
-  Dunka Road

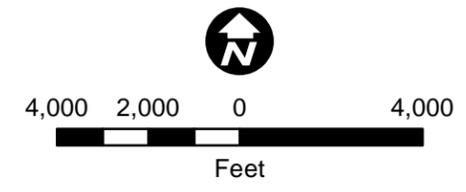
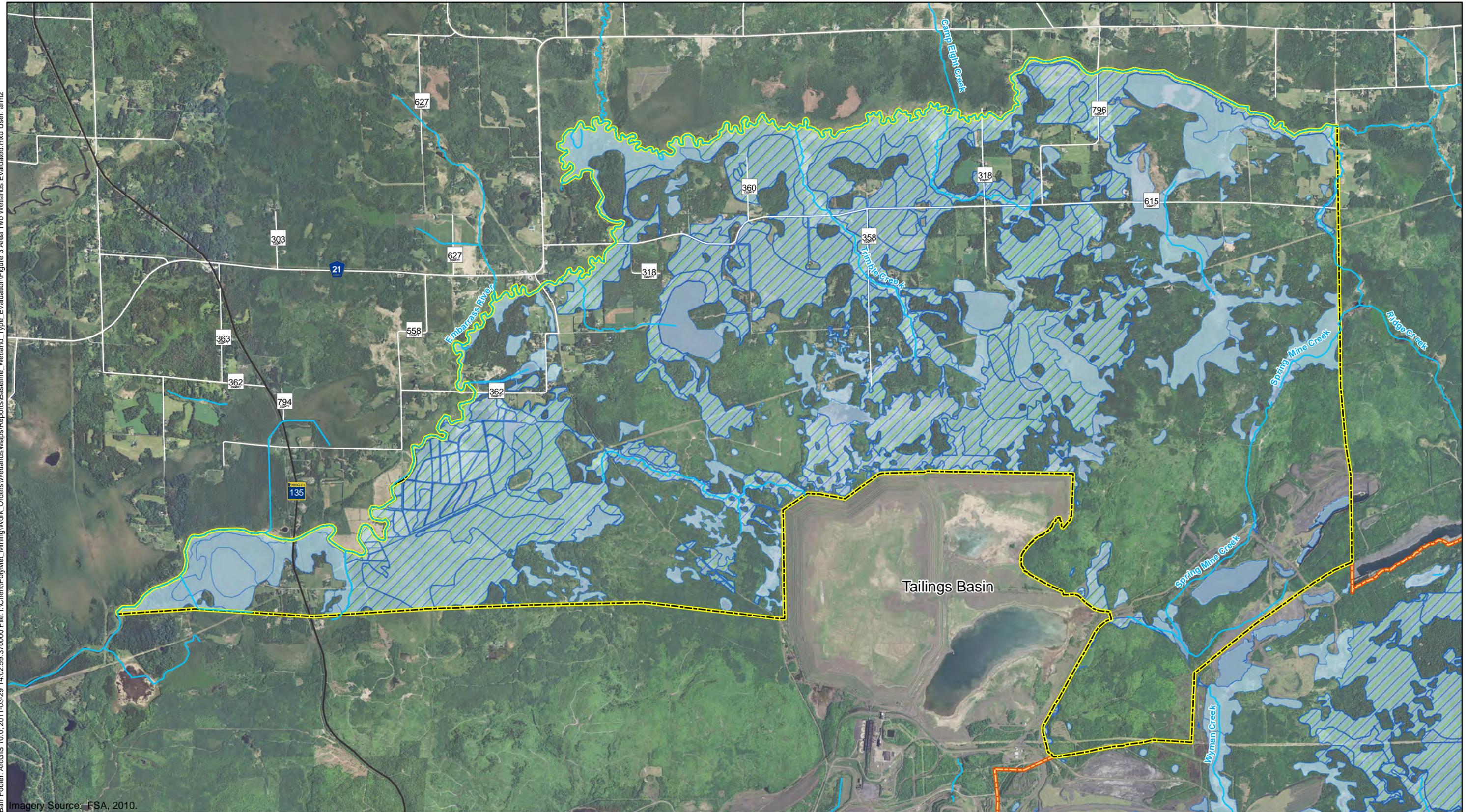


Figure 2
 AREA ONE -
 WETLANDS EVALUATED
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 14:02:59.370000 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Reports\Baseline_Wetland_Type_Evaluation\Figure 3 Area Two Wetlands Evaluated.mxd User: arm2



-  Area Two
-  Area One
-  Delineated/Verified Wetlands
-  Wetlands
-  Streams

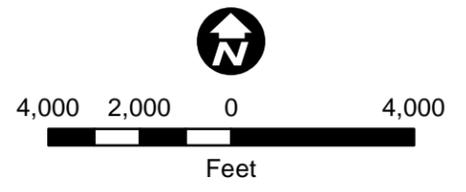
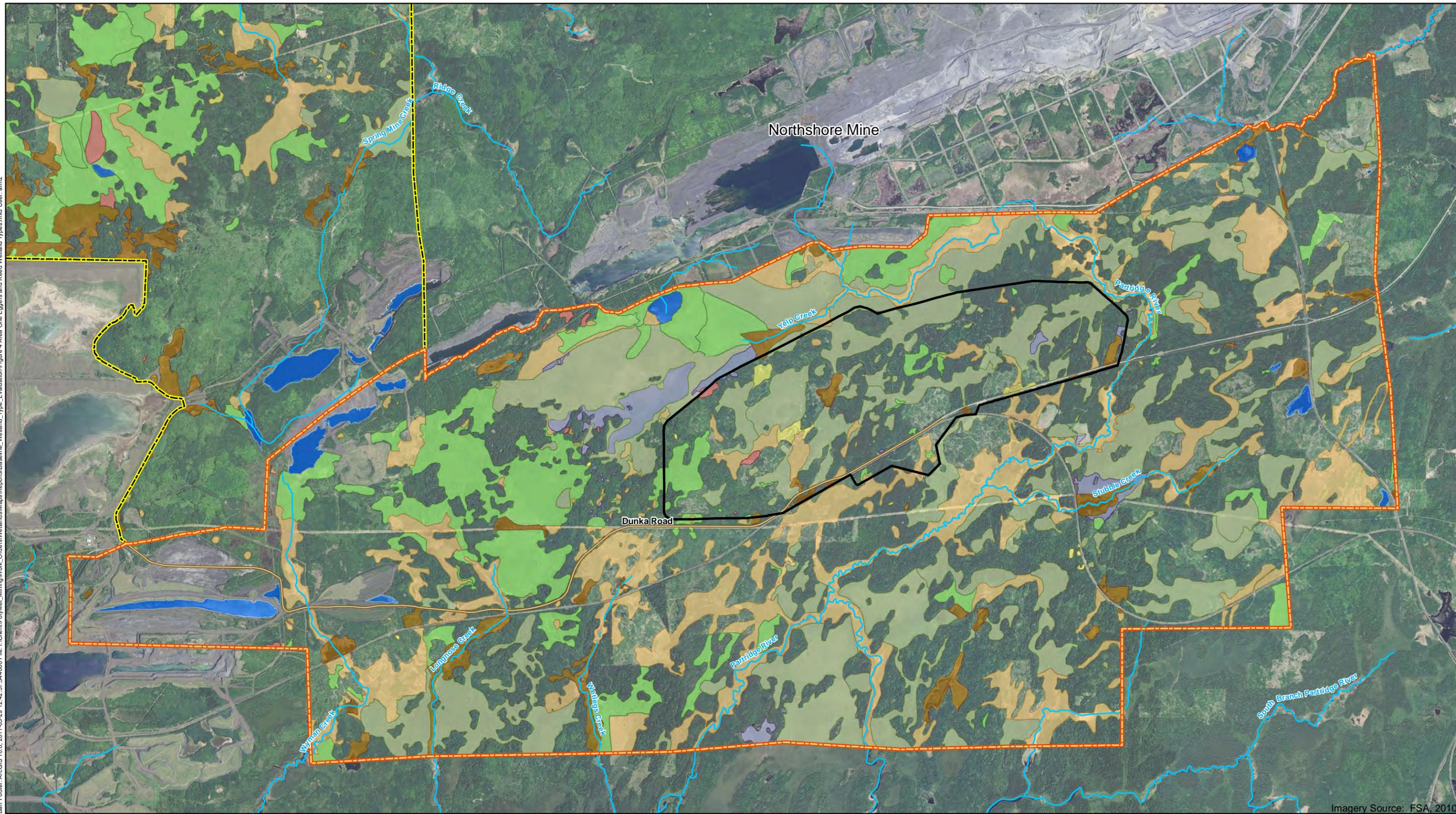


Figure 3
AREA TWO -
WETLANDS EVALUATED
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 12:42:57 344000 File: I:\Client\Polymet_Mining\Work_Orders\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Figure 4 Area One Eggers and Reed Wetland Types.mxd User: smz



Imagery Source: FSA, 2010

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

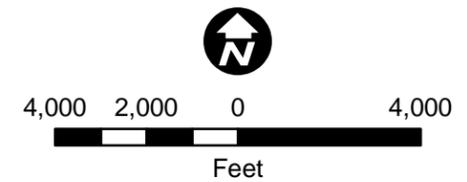
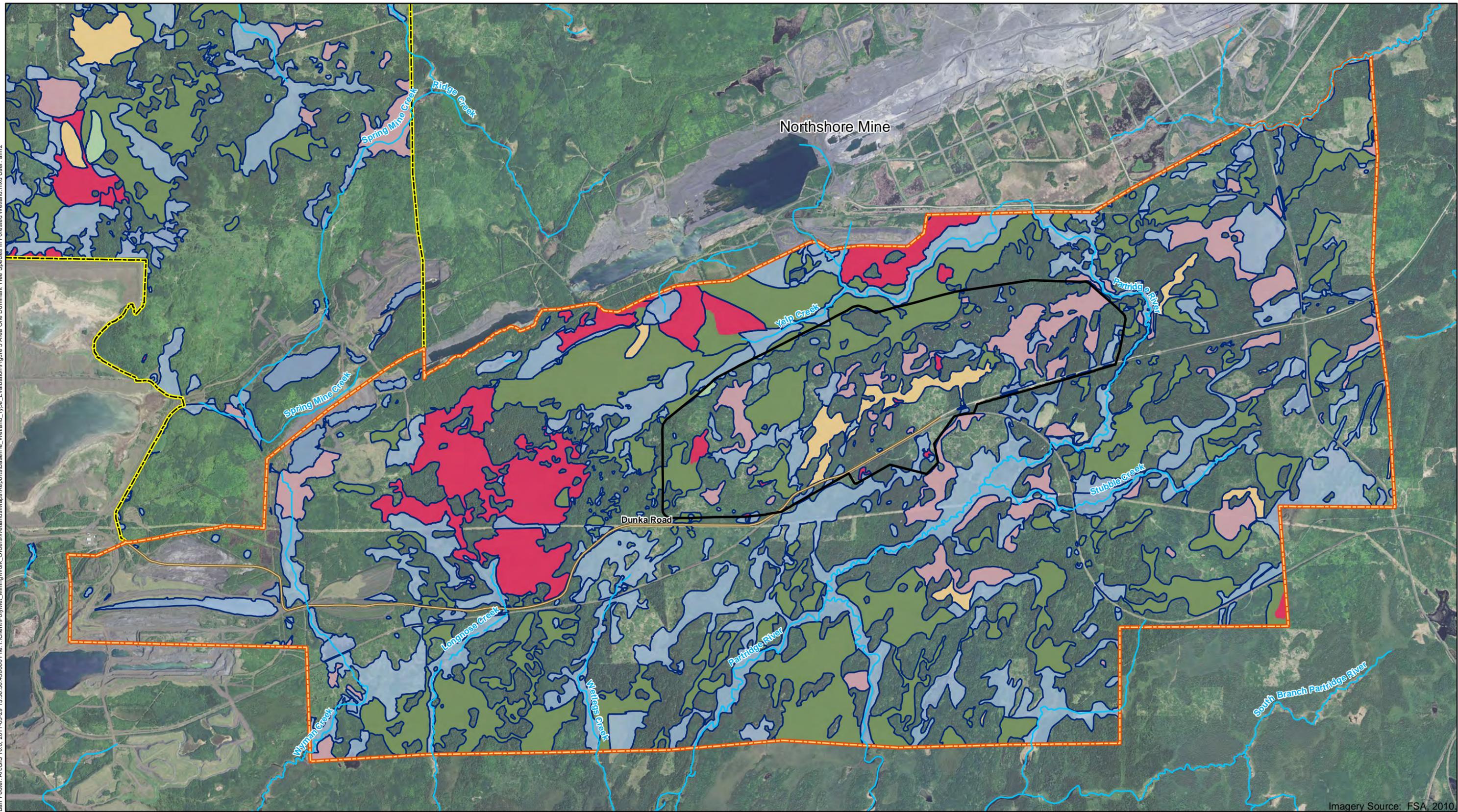


Figure 4
**AREA ONE -
 EGGERS & REED WETLAND TYPES**
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 13:36:50, 438000 File: I:\Client\PolyMet_Mining\Work_Order\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Figure 5 Area One Dominant Tree Species in Forested Wetland.mxd User: srm2



Imagery Source: FSA, 2010

- | | |
|------------|-------------------------------|
| Mine Site | Dominant Tree Species |
| Area One | Cedar (with other species) |
| Area Two | Hardwoods |
| Wetlands | Spruce, tamarack |
| Streams | Spruce |
| Dunka Road | Tamarack |
| | None - Not a forested wetland |

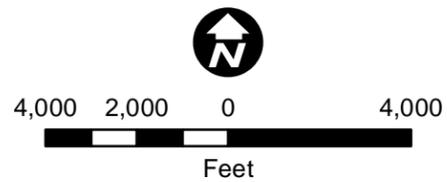
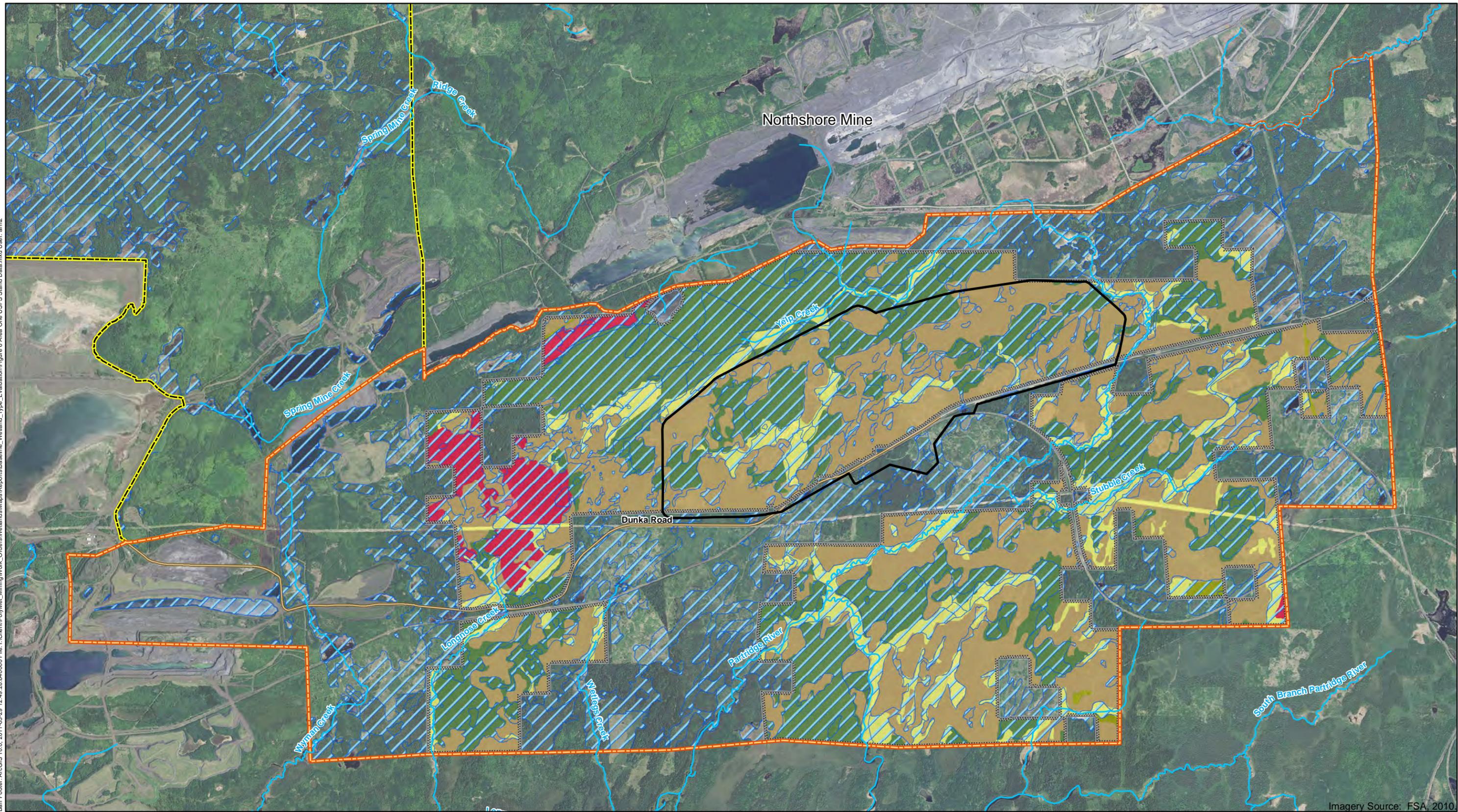


Figure 5
 AREA ONE - DOMINANT TREE SPECIES IN FORESTED WETLANDS
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 12:49:26.640000 File: I:\Client\Polymet_Mining\Work_Order\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Figure 6 Area One USFS Stand Data.mxd User: am2



Imagery Source: FSA, 2010

- | | |
|-----------------------------|------------------------|
| Mine Site | USFS Stand Data |
| Area One | Cedar |
| Area Two | Jack Pine-Black Spruce |
| Boundary of USFS Stand Data | Lowland Conifer |
| Wetlands | Lowland Hardwood |
| Dunka Road | Lowland Non-Forest |
| Streams | Upland Non-Forest |

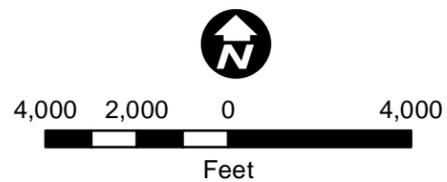
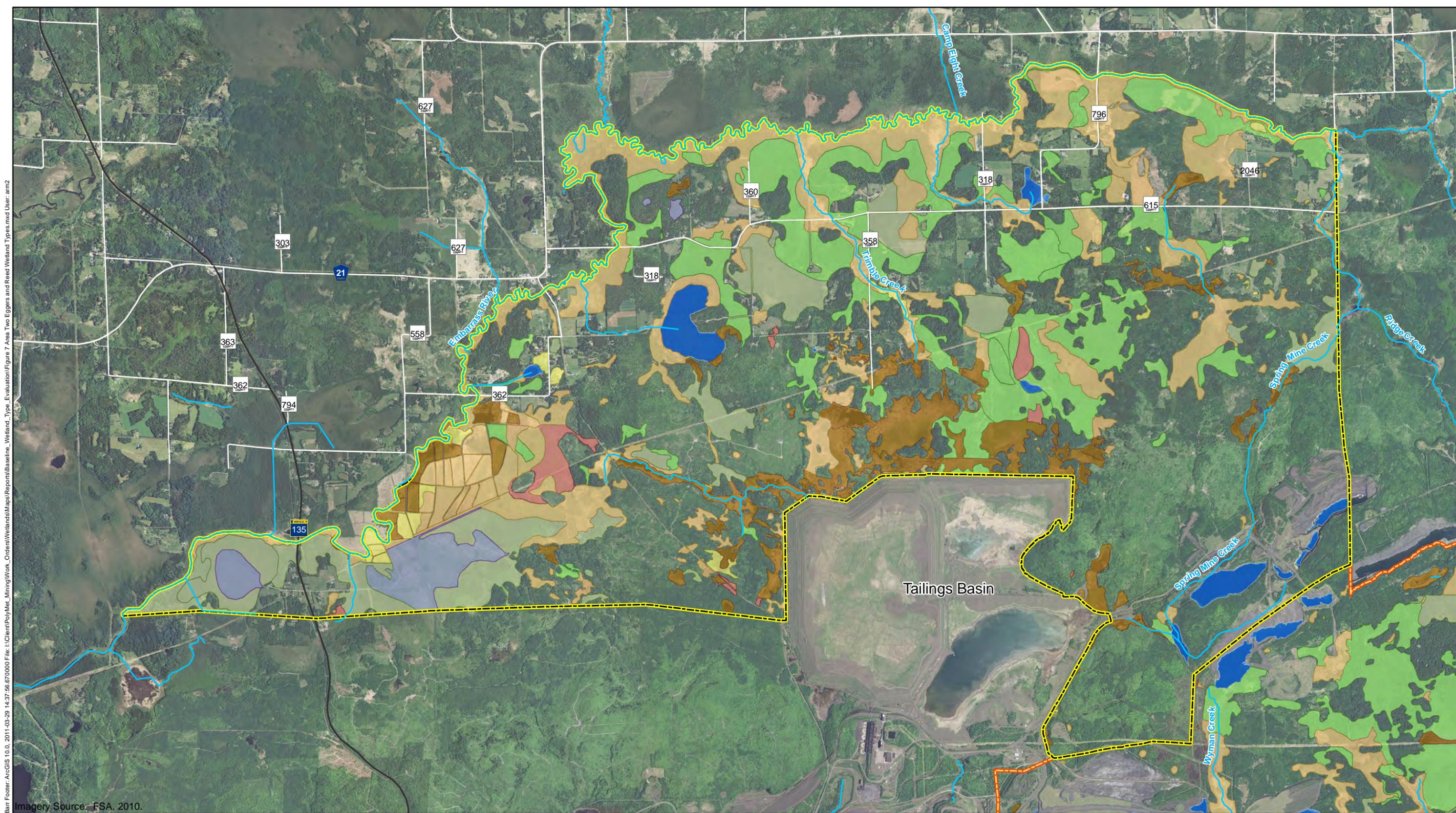


Figure 6
 AREA TWO -
 USFS STAND DATA
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota



Barr Footer: ArcGIS 10.0, 2011-03-29 14:37:56.670000 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Reports\Baseline_Wetland_Type_Evaluation\Figure 7 Area Two Eggers and Reed Wetland Types.mxd User: arm2
 Imagery Source: FSA, 2010.

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

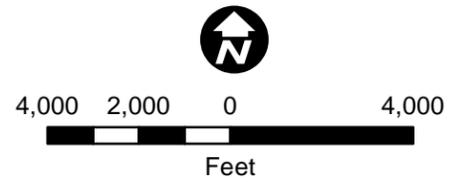
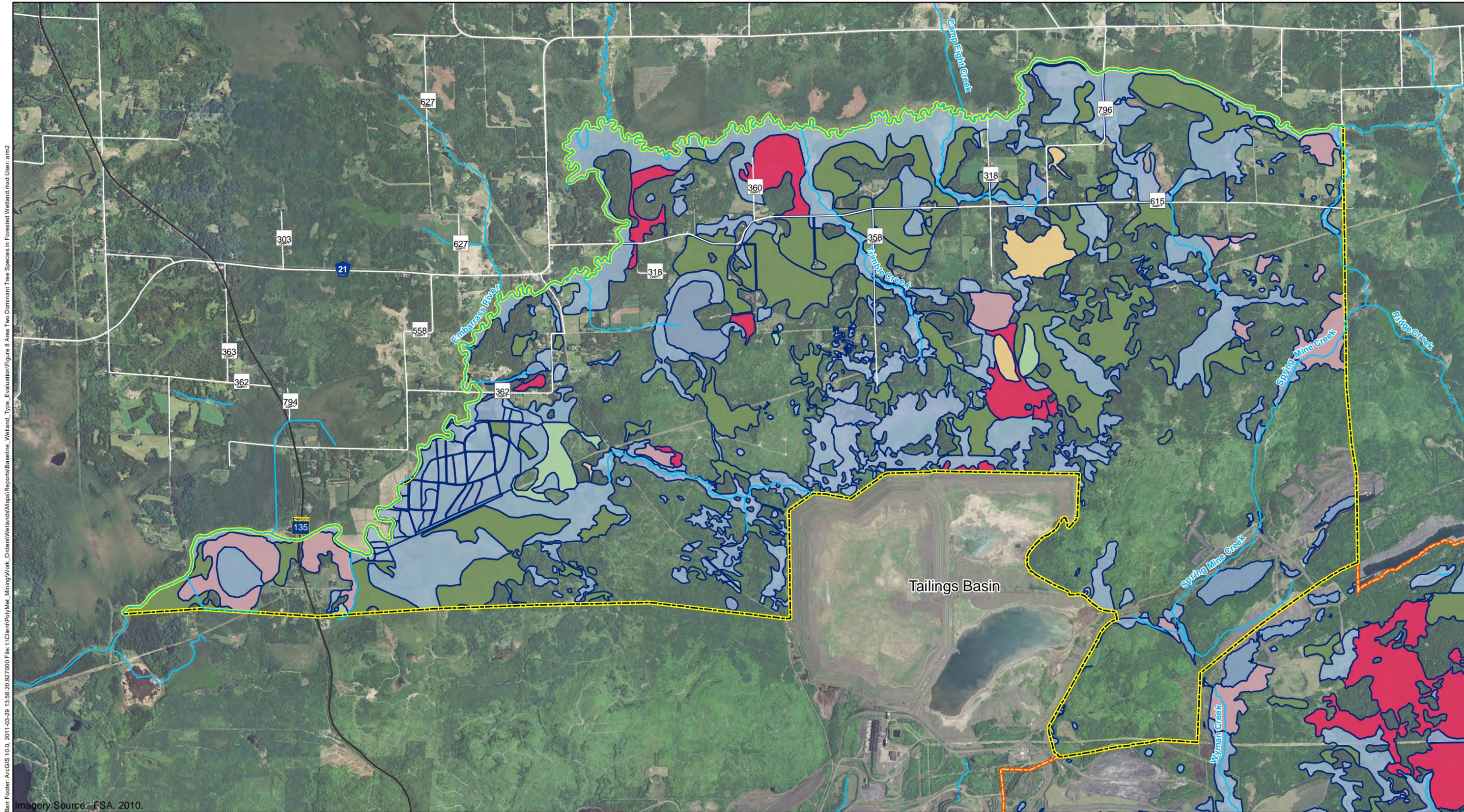


Figure 7
 AREA TWO -
 EGGERS & REED WETLAND TYPES
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 13:58:20.927000 File: I:\Client\Polymet_Mining\Work_Order\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Figure 8 Area Two Dominant Tree Species in Forested Wetland.mxd User: arm2



Imagery Source: FSA, 2010.

- | | |
|----------|-------------------------------|
| Area Two | Dominant Tree Species |
| Area One | Cedar (with other species) |
| Wetlands | Hardwoods |
| Streams | Spruce, tamarack |
| | Spruce |
| | Tamarack |
| | None - Not a forested wetland |

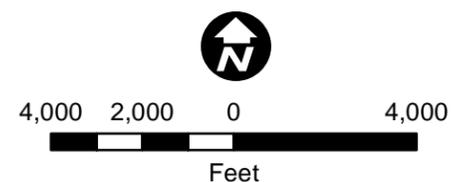


Figure 8
AREA TWO - DOMINANT TREE SPECIES IN FORESTED WETLANDS
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

Appendices

Appendix A

**U.S. Army Corps of Engineers Draft Plan for PolyMet Baseline
Wetland Evaluation, dated August 14, 2009**

DRAFT PLAN
POLYMET PROJECT BASELINE WETLAND TYPE EVALUATION FOR
AREAS OUTSIDE OF THE DELINEATED WETLAND AREAS

Prepared by Jon Ahlness and Steve Eggers, USACE

Background

The U.S. Army Corps of Engineers (Corps) and the Minnesota Department of Natural Resources (MnDNR) are preparing a joint federal-state environmental impact statement (EIS) for the proposed PolyMet project near Hoyt Lakes and Babbitt in northeastern Minnesota. As part of the wetland impact evaluation (for both direct and indirect wetland impacts) for the proposed project, the Corps has determined a need for an evaluation of baseline wetland types for wetlands outside of the mine site and plant site areas where wetland delineations have been conducted and within the areas of potential adverse hydrologic indirect wetland impacts. Indirect wetland impacts could occur as a result of groundwater drawdown in the mine area or groundwater mounding in the tailings basin area.

Purpose

The purpose of the evaluation will be to provide baseline information regarding the types and amounts of wetlands that exist in areas where adverse indirect wetland impacts could occur. The baseline wetland data will be used to prepare a wetland monitoring plan and to determine appropriate compensatory wetland mitigation if project-related adverse indirect wetland impacts were to occur.

Description of Evaluation

The evaluation shall consist of interpretation of available color infrared (CIR) aerial photography to map baseline wetland plant communities to add to the existing knowledge base provided by vegetation cover maps, U.S. Forest Service stand data, National Wetland Inventory (NWI) maps, and topographic maps. Specifics for the evaluation are defined as follows:

1. Interpret stereo pairs (60% overlap) of color infrared (CIR) aerial photography to map wetland plant communities within the areas shown by Figure 1. This should include, at a minimum, the 2005 CIR photography by the MnDNR, Forestry Division. Additional aerial photography can be used as warranted. A contact for the MnDNR CIR photos is Mike Happus of the MnDNR Forest Inventory Office in Grand Rapids, Minnesota. His telephone number is 218-327-4449 x223.
2. Previous vegetation cover mapping by the National Wetland Inventory, and the U.S. Forest Service stand data, and existing topographic maps shall serve as a starting point.

3. Wetland plant communities shall be mapped using the Eggers and Reed (1997) nomenclature. The scale of the mapping should be 1 inch = 1,320 feet or greater detail.
4. An emphasis shall be placed on distinguishing between coniferous swamps dominated by northern white cedar and coniferous bogs dominated by black spruce and/or tamarack.
5. A table identifying individual wetlands with type and area information shall be provided. A table shall also be provided that summarizes the baseline wetland area by wetland type.
6. The areas that shall be evaluated are all or portions of the following sections as shown on the attached map:

Mine area: T. 59N., R. 13W., Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24.

T. 59N., R. 12W., Sections 5, 6, 7, 8, and 18.

T. 60N., R. 13W., Sections 25, 26, 33, 34, 35, and 36.

T. 60N., R. 12W., Sections 29, 30, 31, and 32.

Tailings Basin area: T. 60N., R. 14W., Sections 26, 27, 28, 29, 30, 31, 32, 33, 34, and 35.

T. 60N., R. 15W., Sections 25 and 36.

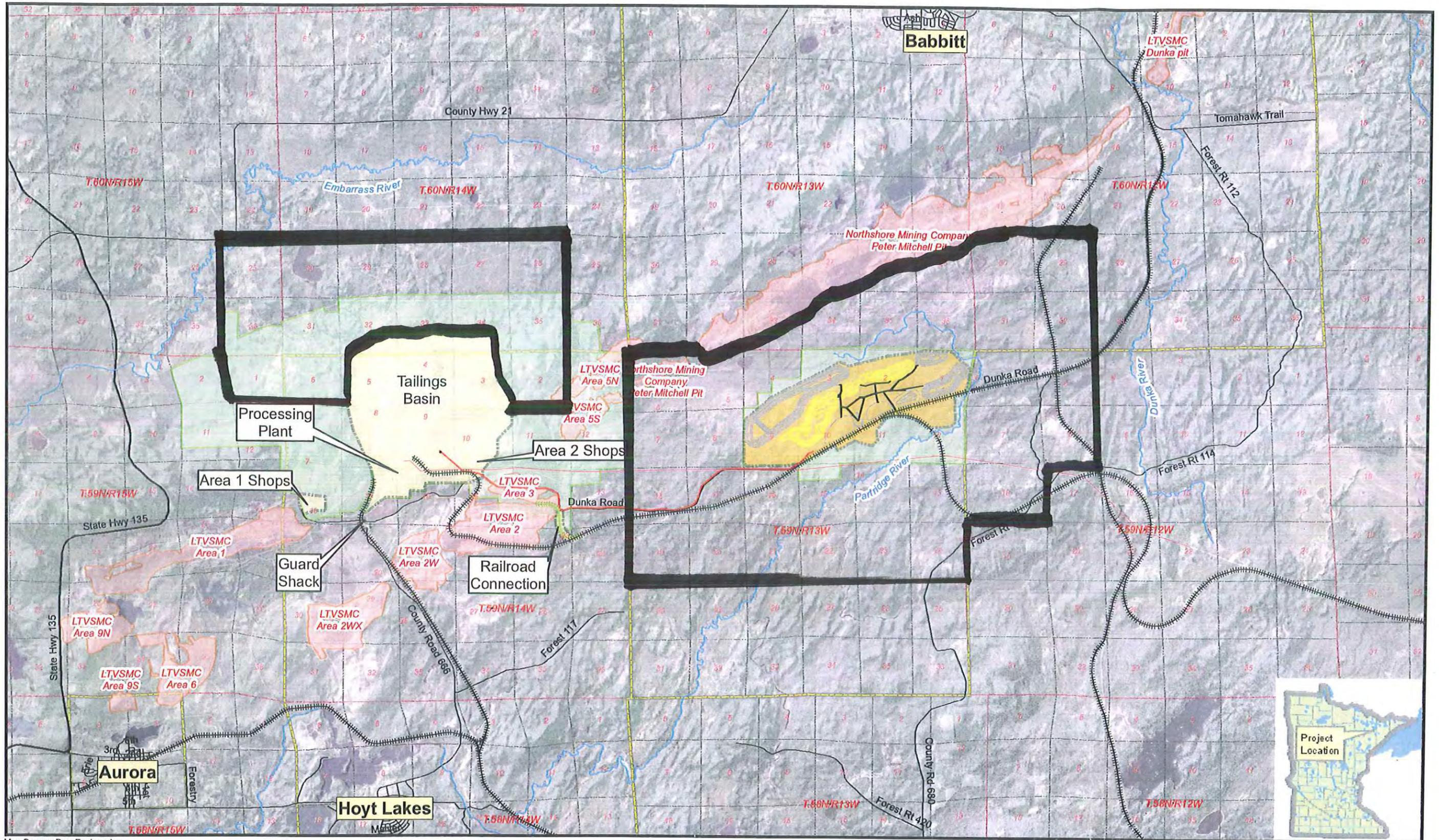
T. 59N., R. 15W., Section 1.

T. 59N., R. 14W., Sections 2, 3, 5, and 6.

The area for evaluation near the proposed mine pit was identified based upon the modeled 0.25-ft groundwater drawdown contour in the glacial aquifer.

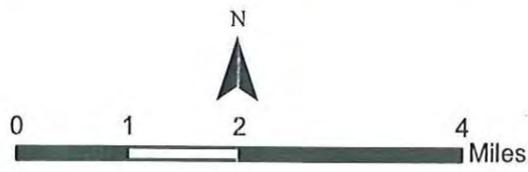
The area for evaluation near the tailings basin area was identified based upon review of historical air photos to identify the indirect wetland impact area that occurred during operation of the existing tailings basin from late 1950s to 2001.

7. PolyMet Mining, Inc. shall conduct the above evaluation and provide a report with the findings for inclusion in the Final EIS.



Map Source: Barr Engineering

- Mine to Plant Pipeline
- 138 KV Transmission Line
- Year 20 NorthMet Pit Contours
- Year 20 Stockpiles
- Railroad
- Railroad Connection
- Project
- Mine Site
- Plant Site
- Taconite Pits (Existing)
- Incorporated Limits of Cities/Villages



DRAFT
Figure 3.1-1
Project Site Map
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota
 December 2008



Appendix B
Scientific Names of Vegetation

Appendix B

Scientific Names of Vegetation

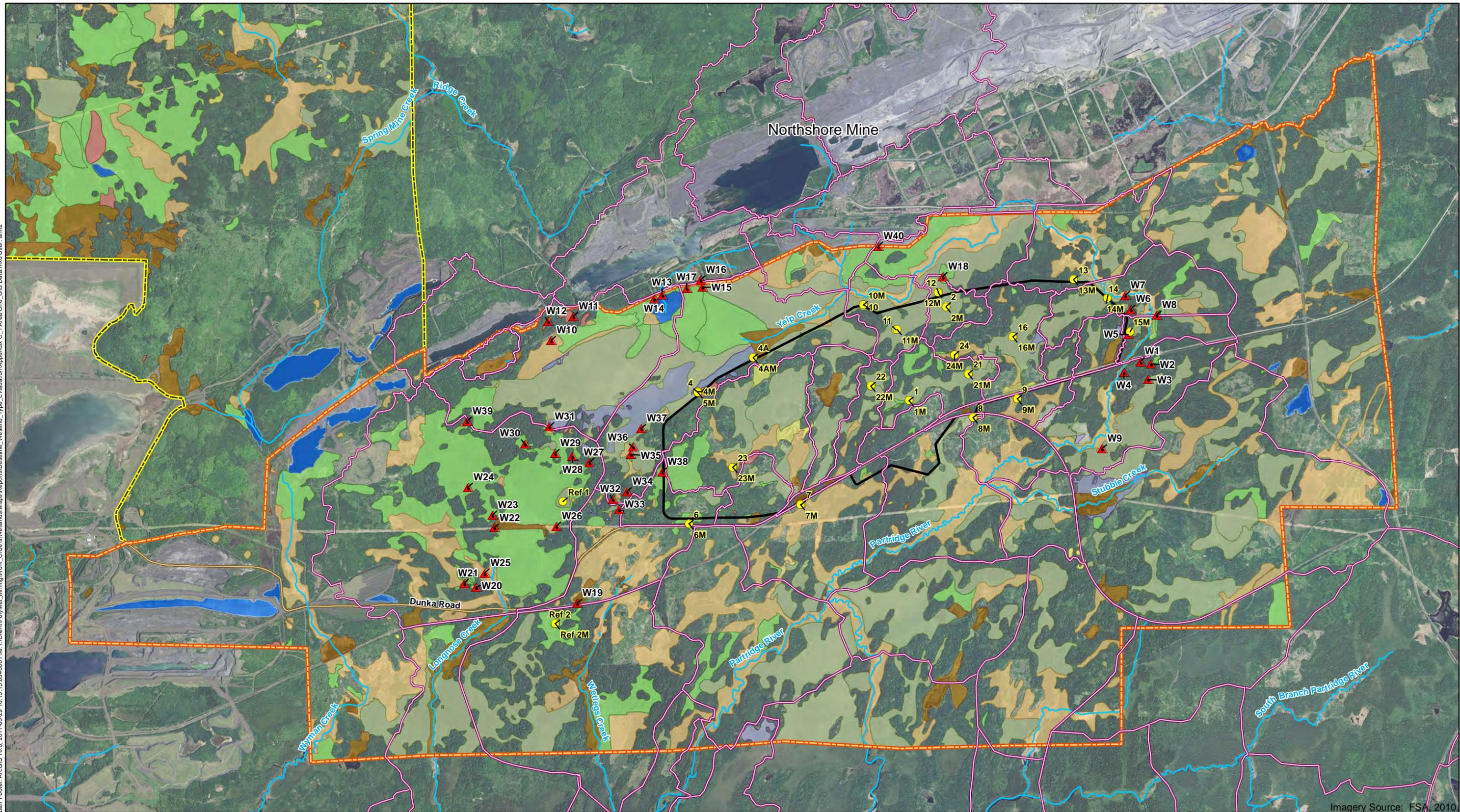
Common Name	Scientific Name
alder	<i>Alnus rugosa</i>
American elm	<i>Ulmus americana</i>
arrowhead	<i>Sagittaria</i> species
aster	<i>Aster</i> species
balsam fir	<i>Abies balsamea</i>
beaked spike rush	<i>Eleocharis rostellata</i>
beggartick	<i>Bidens</i> species
big bluestem	<i>Andropogon gerardii</i>
black ash	<i>Fraxinus nigra</i>
black spruce	<i>Picea mariana</i>
bunchberry	<i>Cornus canadensis</i>
Canada bluejoint	<i>Calamagrostis canadensis</i>
cattail	<i>Thypha</i> species
common valerian	<i>Polemonium reptans</i>
coontail	<i>Ceratophyllum demersum</i>
cottonwood	<i>Populus deltoides</i>
cranberry	<i>Vaccinium</i> species
culver's root	<i>Veronicastrum virginicum</i>
dogwoods	<i>Cornus</i> species
duckweed	<i>Lemna</i> species
giant bur-reed	<i>Sparganium eurycarpum</i>
jack pine	<i>Pinus banksiana</i>
jewelweed	<i>Impatiens capensis</i>
Labrador tea	<i>Ledum groenlandicum</i>
lake sedge	<i>Carex lacustris</i>
leatherleaf	<i>Chamaedaphne calyculata</i>
lesser fringed gentian	<i>Gentianopsis virgata</i>
manna grass	<i>Glyceria</i> species
mint	<i>Lalium</i> species
naiad	<i>Najas</i> species
nettle	<i>Utrica</i> species
northern white cedar	<i>Thuja occidentalis</i>
Ohio goldenrod	<i>Solidago ohioensis</i>
paper birch	<i>Betula papyrifera</i>
reed grass	<i>Phragmites</i>
pickerelweed	<i>Pontederia cordata</i>
pitcher plant	<i>Sarracenia purpurea</i>
pondweed	<i>Elodea</i> species
pondweed	<i>Potamogeton</i> species
prairie cordgrass	<i>Spartina pectinata</i>
quaking aspen	<i>Populus tremuloides</i>
red maple	<i>Acer rubrum</i>
redtop	<i>Agrsotis gigantea</i>
shrubby cinquefoil	<i>Dasiphora fruticosa</i>
spatterdock	<i>Nuphar variegata</i>
spikerush	<i>Eleocharis</i> species
starflower	<i>Trientalis borealis</i>
sterile sedge	<i>Carex sterilis</i>
sunflower	<i>Helianthus</i> species

Common Name	Scientific Name
tamarack	<i>Larix laricina</i>
water lily	<i>Nymphaea</i> species
water milfoil	<i>Myriophyllum</i> species
white pine	<i>Pinus strobus</i>
wild millet	<i>Panicum miliaceum</i>
wild rice	<i>Zizania palustris</i>
wild sarsaparilla	<i>Aralia nudicaulis</i>
wild timothy	<i>Phleum pratense</i>
willows	<i>Salix</i> species
woolgrass	<i>Scirpus cyperinus</i>

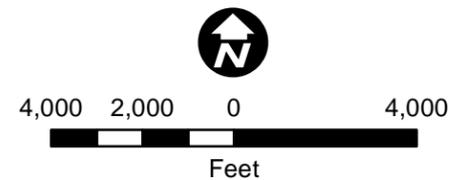
Appendix C

Area One – Summary Figures

Barr Footer: ArcGIS 10.0, 2011-03-29 16:15:15.834000 File: I:\Client\PolyMet_Mining\Work_Order\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Appendix C-1 Area One_GIS Data.mxd User: arm2

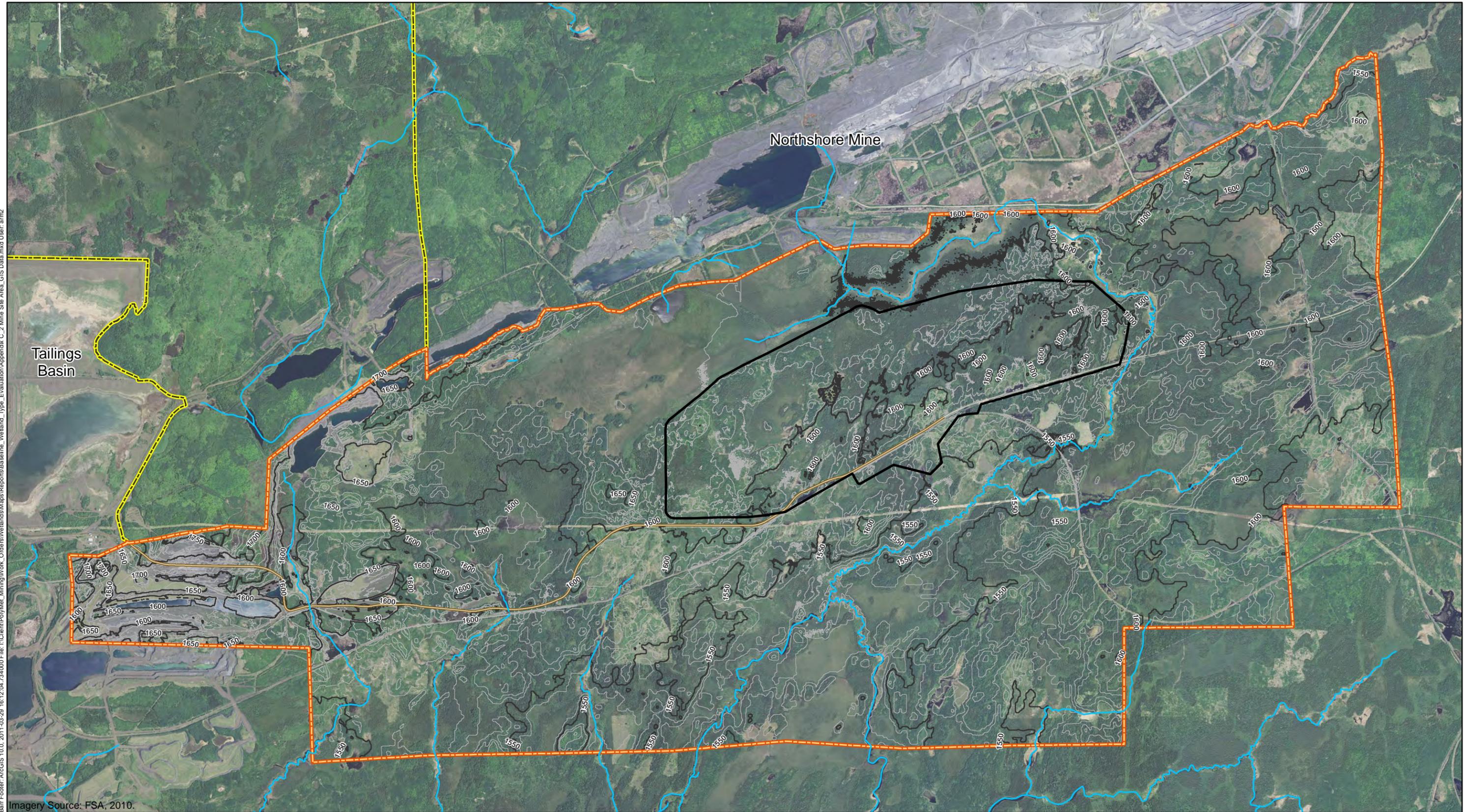


Imagery Source: FSA, 2010



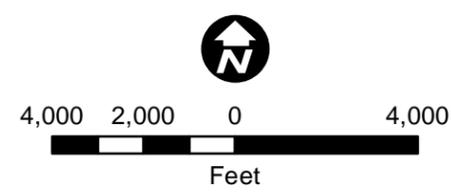
Appendix C-1
 AREA ONE - GIS DATA
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 16:12:04, 7344000 File: I:\Client\Polymet_Mining\Work_Order\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Appendix C-2_Mine_Site_Area_GIS_Data.mxd User: armz



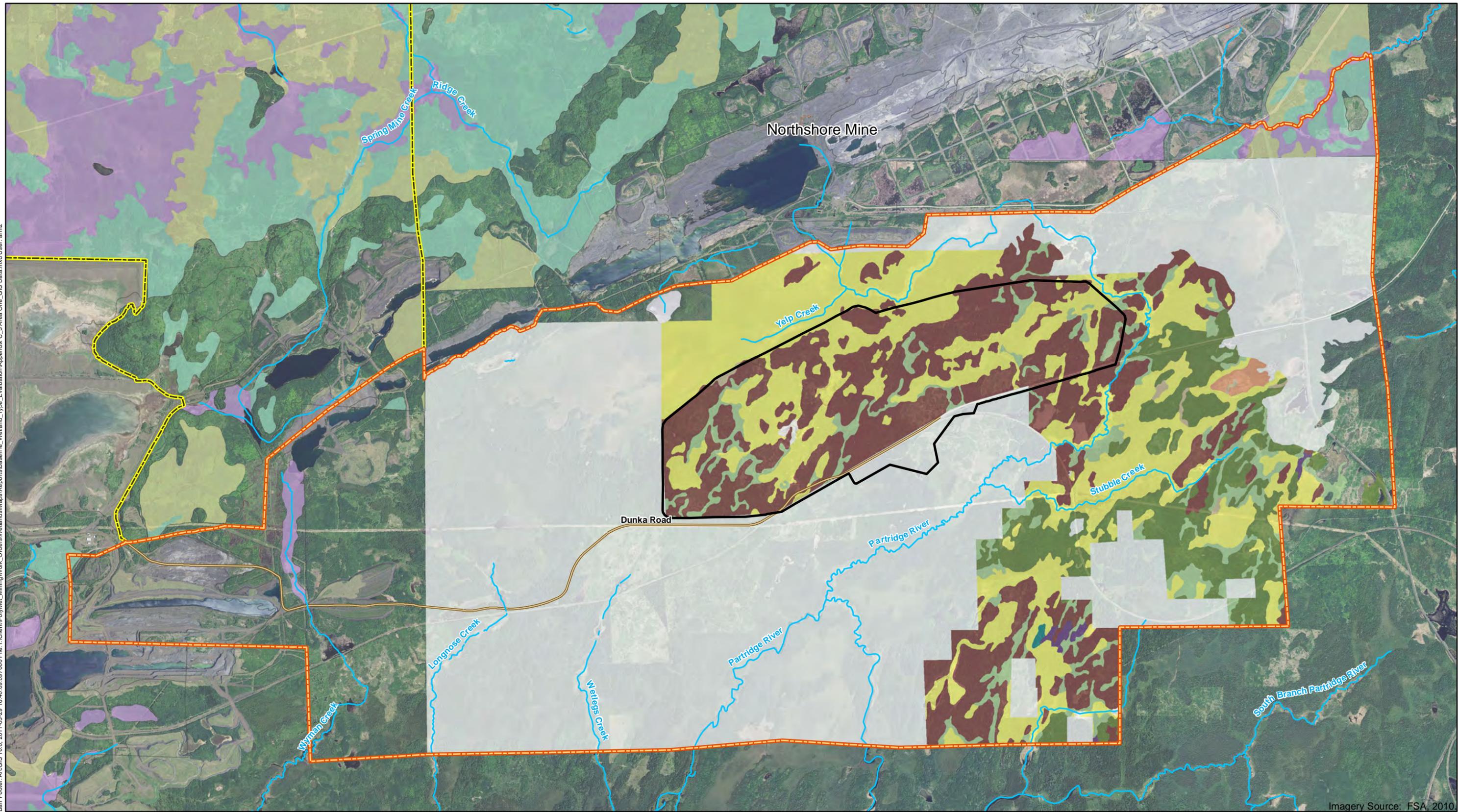
Imagery Source: FSA, 2010.

-  Mine Site
-  Area One
-  Area Two
- Surface Elevation Contours
 -  10 Foot
 -  50 Foot
-  Streams
-  Dunka Road



Appendix C-2
 AREA ONE - GIS DATA
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

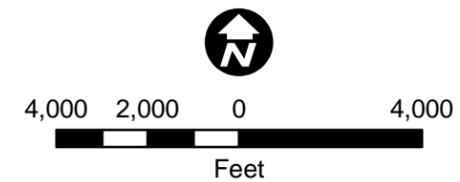
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Imagery Source: FSA, 2010

Mine Site	SSURGO Soils Hydric Rating*	USFS Ecological Landtype (ELT)	ELT 11 - Upland deep Loamy Over Sandy Dry (UDHD)
Area One	All Hydric	ELT 0 - No Data	ELT 13 - Upland Deep Loamy Coarse (UDLDC)
Area Two	Partially Hydric	ELT 1 - Lowland Loamy Moist (LLM)	ELT 14 - Upland Deep Medium Loamy Dry (UDLDM)
Streams	Not Hydric	ELT 2 - Lowland Loamy Wet (LLW)	ELT 16 - Upland Shallow Loamy Dry (USLD)
Dunka Road	Unknown Hydric	ELT 6 - Lowland Organic Acid to Neutral (LPN)	ELT 17 - Upland Very Shallow Droughty (USLXV)

*Natural Resource Conservation Service (NRCS). Soil Survey Geographic (SSURGO) Database



Appendix C-3
 AREA ONE - GIS DATA
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

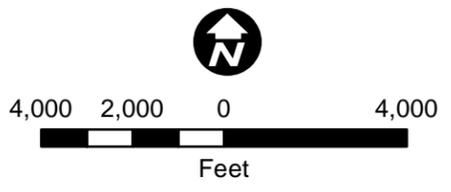
Appendix D
Area Two – Summary Figures



Barr Footer: ArcGIS 10.0, 2011-03-29 16:01:01_999000 File: I:\Client\Polymet_Mining\Work_Order\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Appendix D - 1 Area Two_GIS Data.mxd User: arm2

Imagery Source: FSA, 2010.

- Area Two
- Area One
- Embarrass River Subwatersheds
- ~ Streams



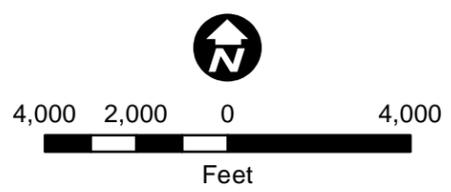
Appendix D-1
 AREA TWO - GIS DATA
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

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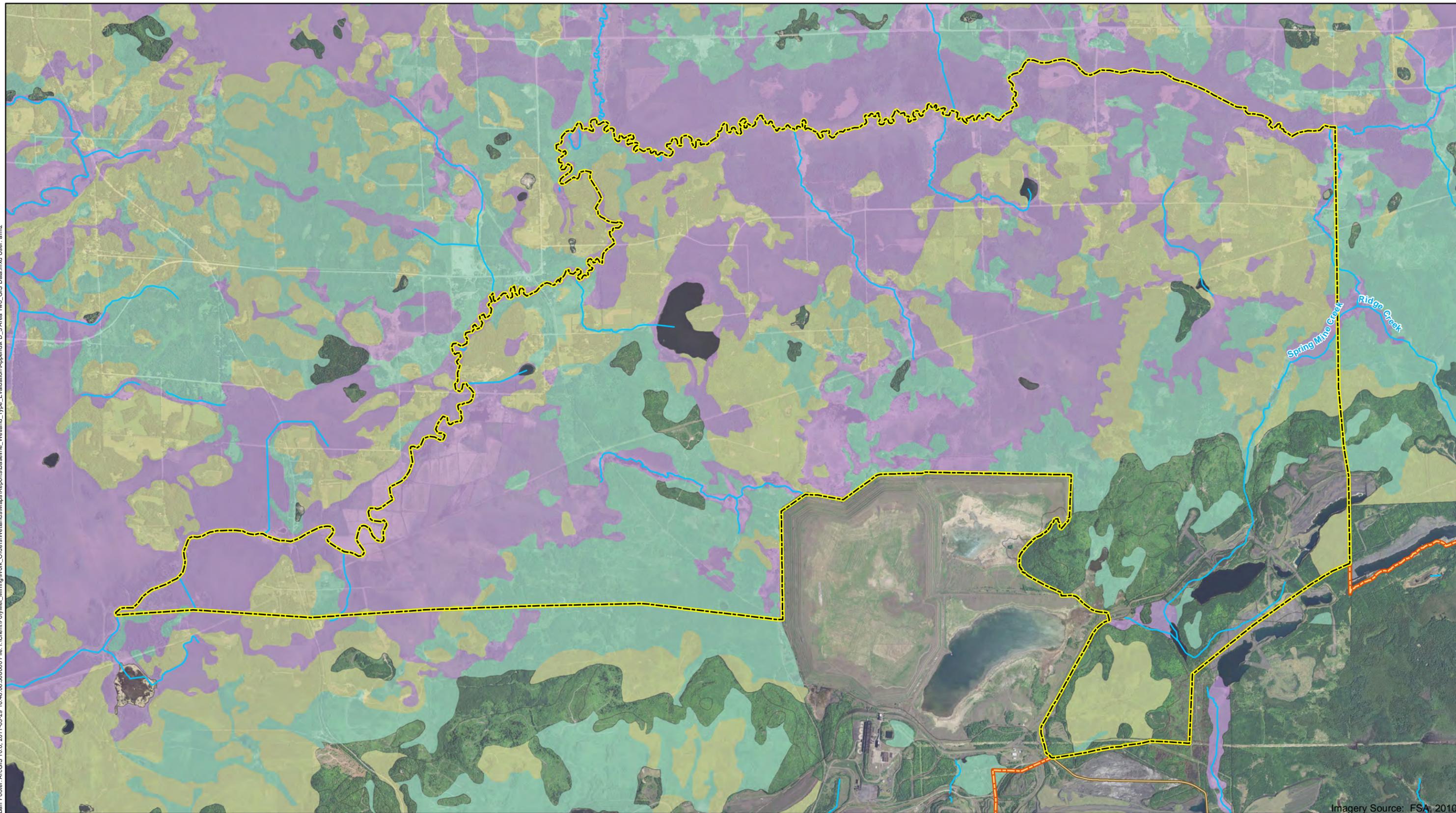
Imagery Source: FSA, 2010.

-  Area Two
-  Area One
- Surface Elevation Contours
 -  10 Foot
 -  50 Foot
-  Streams



Appendix D-2
 AREA TWO - GIS DATA
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.0, 2011-03-29 16:46:06_308000 File: I:\Client\Polymet_Mining\Work_Orders\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Appendix D-3 Area Two_GIS Data.mxd User: arm2



Imagery Source: FSA, 2010

-  Area Two
-  Area One
-  Mine Site
-  Streams
-  Dunka Road

SSURGO Soils Hydric Rating*

-  All Hydric
-  Partially Hydric
-  Not Hydric
-  Unknown Hydric

*Natural Resource Conservation Service (NRCS). Soil Survey Geographic (SSURGO) Database



4,000 2,000 0 4,000



Feet

Appendix D-3
AREA TWO - GIS DATA
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, Minnesota

Appendix E

Eggers & Reed (1997) Wetland Classification Key

Wetland Community Classification Key

Go to upper canopy to key out wetland plant community(-ities) within the evaluation area using the following key¹. Evaluate only each contiguous type that comprises at least 10% of the vegetated wetland area; the exception is a shallow, open water community in which any fringe emergent communities must be evaluated. Be sure to sample shallow, open water areas for submergent vegetation. Enter in page 1 of field data form, MnRAM database second tab, or the manual-use summary table located in the Guidance.

Wetland Community Classification Key

- 1A. Mature trees (dbh of 6 inches or more) are present and form closed stands (more than 17 trees per acre; more than a 50 percent canopy cover) on wet, lowland soils (usually floodplains and ancient lake basins).
 - 2A. Hardwood trees are dominant (>50% areal coverage or basal area of the tree stratum); usually alluvial, peaty/mucky, or poorly drained mineral soils.
 - 3A. Silver maple, American elm, river birch, green ash, black willow, box elder and/or eastern cottonwood are dominant; growing on alluvial soils associated with riverine systems..... **FLOODPLAIN FOREST**
(Type 1); (PFO; 1,6; A)
 - 3B. Black ash, green ash, American elm, eastern cottonwood, black willow, box elder, yellow birch, silver maple, quaking aspen and/or red maple are dominant; northern white cedar may be subdominant; growing on poorly-drained mineral or peat/muck soils, often associated with ancient lake basins..... **HARDWOOD SWAMP**
(Type 7); (PFO;1, 6; A, B, C)
 - 2B. Coniferous trees are dominant (>50% areal coverage or basal area of the tree stratum); soils usually peaty.
 - 4A. Tamarack and/or black spruce are dominant; growing on a continuous sphagnum moss mat and acid, peat soils.....**CONIFEROUS BOG**
(Type 8); (PFO; 2, 4, 6, 7; B)
 - 4B. Northern white cedar and/or tamarack are dominant; continuous sphagnum moss mat absent; usually growing on neutral to alkaline peat/muck soils.....**CONIFEROUS SWAMP**
(Type 7); (PFO;2, 4, 6, 7; B, C)
- 1B. Mature trees are absent or, if present, form open, sparse stands; other woody plants, if present, are shrubs or saplings and pole-size trees (dbh less than 6 inches) less than 20 feet high and growing on wet, lowland, or poorly-drained soils, or in ground-water seepage areas.
 - 5A. Community dominated (>50% areal coverage) by woody shrubs.
 - 6A. Low, woody shrubs usually less than 3 feet high; sphagnum moss mat layer may or

¹ Refer to Pages 19 - 22 of "Wetland Plants and Plant Communities of MN and WI"; (USACOE - St. Paul District; Eggers and Reed).

may not be present.

7A. Shrubs are ericaceous and evergreen growing on a sphagnum moss mat layer; peat soils are acidic.....**OPEN BOG**
(Type 8); (PSS;2, 3, 4, 7; B)

7B. Shrubs are deciduous, mostly shrubby cinquefoil, often growing on sloping sites with a spring-fed supply of internally flowing, calcareous waters; other calciphiles are also dominant; sphagnum moss mat layer absent; muck/poorly-drained mineral soils are alkaline.....**CALCAREOUS FEN**
(Type 2/6), (PEM/PSS;1; B)

6B. Tall, woody deciduous shrubs usually greater than 3 feet high; sphagnum moss mat layer absent: **SHRUB SWAMPS.**

8A. Speckled alder is dominant; usually on acidic soils in and north of the vegetation tension zone (a map of the tension zone is on page 9 of Eggers and Reed [1997]).**ALDER THICKET**
(Type 6); (PSS;1, 6; B, C)

8B. Willows, red-osier dogwood, silky dogwood, meadowsweet and/or steeplebush are dominant on neutral to alkaline poorly drained muck/mineral soils; found north and south of the vegetation tension zone. NOTE: Non-native buckthorns (*Rhamnus cathartica* and *R. frangula*) may occur as dominant shrubs or small trees in disturbed shrub-carrs.**SHRUB-CARR**
(Type 6); (PSS;1, 6; B, C)

5B. Community dominated (>50% areal coverage) by herbaceous plants.

9A. Essentially closed communities, usually with more than 50 percent cover.

10A. Sphagnum moss mat on acid peat soils; leatherleaf, pitcher plants, certain sedges, and other herbaceous species tolerant of low nutrient conditions may be present.**OPEN BOG**
(Type 8); (PSS; 2, 3, 4, 7; B; and PML; 1; B)

10B. Sphagnum moss mat absent; dominant vegetation consists of sedges (Cyperaceae), grasses (Gramineae), cattails, giant bur-reed, arrowheads, forbs and/or calciphiles. Soils are usually neutral to alkaline, poorly-drained mineral soils and mucks.

11A. Over 50 percent of the cover dominance contributed by the sedge family, cattails, giant bur-reed, arrowheads, wild rice, and/or giant reed grass (*Phragmites*).

12A. Herbaceous emergent plants growing on saturated soils to areas covered by standing water up to 6 inches in depth throughout most of the growing season.

13A. Major cover dominance by the sedges (primarily genus *Carex*) typically on saturated soils with, at most, short periods of inundation. Canada blue-joint grass may be a subdominant. Lake sedges (*Carex lacustris*, *C. utriculata*) and slough sedge (*Carex atherodes*) can also be dominants in shallow marshes – see 13B. below.....**SEDGE MEADOW**
(Type 2), (PEM; 1; B)

13B. Major cover dominance by cattails, bulrushes, water plantain, *Phragmites*, arrowheads, slough sedge and/or lake sedges typically on soils that are inundated by up to 6 inches of water depth for a significant portion of most growing seasons.....**SHALLOW MARSH**
(Type 3); (PEM; 1, 2; C)

12B. Herbaceous submergent, floating-leaved, floating and emergent plants growing in areas covered by standing water greater than 6 inches in depth throughout most of the growing season.....**DEEP MARSH**
(Type 4); (PEM; 1, 2; F, G, H; and PAB; 2, 4, 5; F, G; and PUB; F, G; and L2EM2; F, G; and L2AB; 2, 4, 5; F, G)

11B. Over 50 percent of the cover dominance contributed by grasses (except wild rice and *Phragmites*), forbs and/or calciphiles.

14A. Spring-fed supply of internally flowing, calcareous waters, often sloping sites; calciphiles such as sterile sedge, wild timothy, Grass-of-Parnassus and lesser fringed gentian are dominant...**CALCAREOUS FEN**
(Type 2); (PEM; 1; B)

14B. Water source(s) variable; calciphiles not dominant.

15A. Dominated by native prairie grasses (e.g., big bluestem, prairie cordgrass, Canada blue-joint grass) usually with characteristic wet prairie forbs (e.g., Riddell’s goldenrod, gayfeather, mountain mint)...**WET TO WET- MESIC PRAIRIE**
(Type 2); (PEM; 1; A, B)

15B. Dominated by other grass species (e.g., reed canary grass, redtop) and/or generalist forbs (e.g., giant goldenrod, giant sunflower, swamp aster, marsh aster, wild mint).....**FRESH (WET) MEADOW**
(Type 2); (PEM; 1; B)

9B. Essentially open communities, either flats or basins usually with less than 50 percent vegetative cover during the early portion of the growing season, or shallow open water with submergent, floating and/or floating-leaved aquatic vegetation.

- 16A. Areas of shallow, open water (< 6.6 feet in depth) dominated by submergent, floating and/or floating-leaved aquatic vegetation
.....**SHALLOW, OPEN WATER COMMUNITIES**
(Type 5); (PAB; 2, 4, 5; G, H; and PUB; G, H; and L2EM; 2; G, H; and L2AB; 2, 4, 5; G, H)
- 16B. Shallow depressions or flats including vernal pools; standing water may be present for a few weeks each year, but are dry for much of the growing season; often cultivated or dominated by annuals such as smartweeds and wild millet; when not cultivated, perennial vegetation may be present (see Table 4 on page 15).....**SEASONALLY FLOODED BASIN**
(Type 1); (PEM; A)

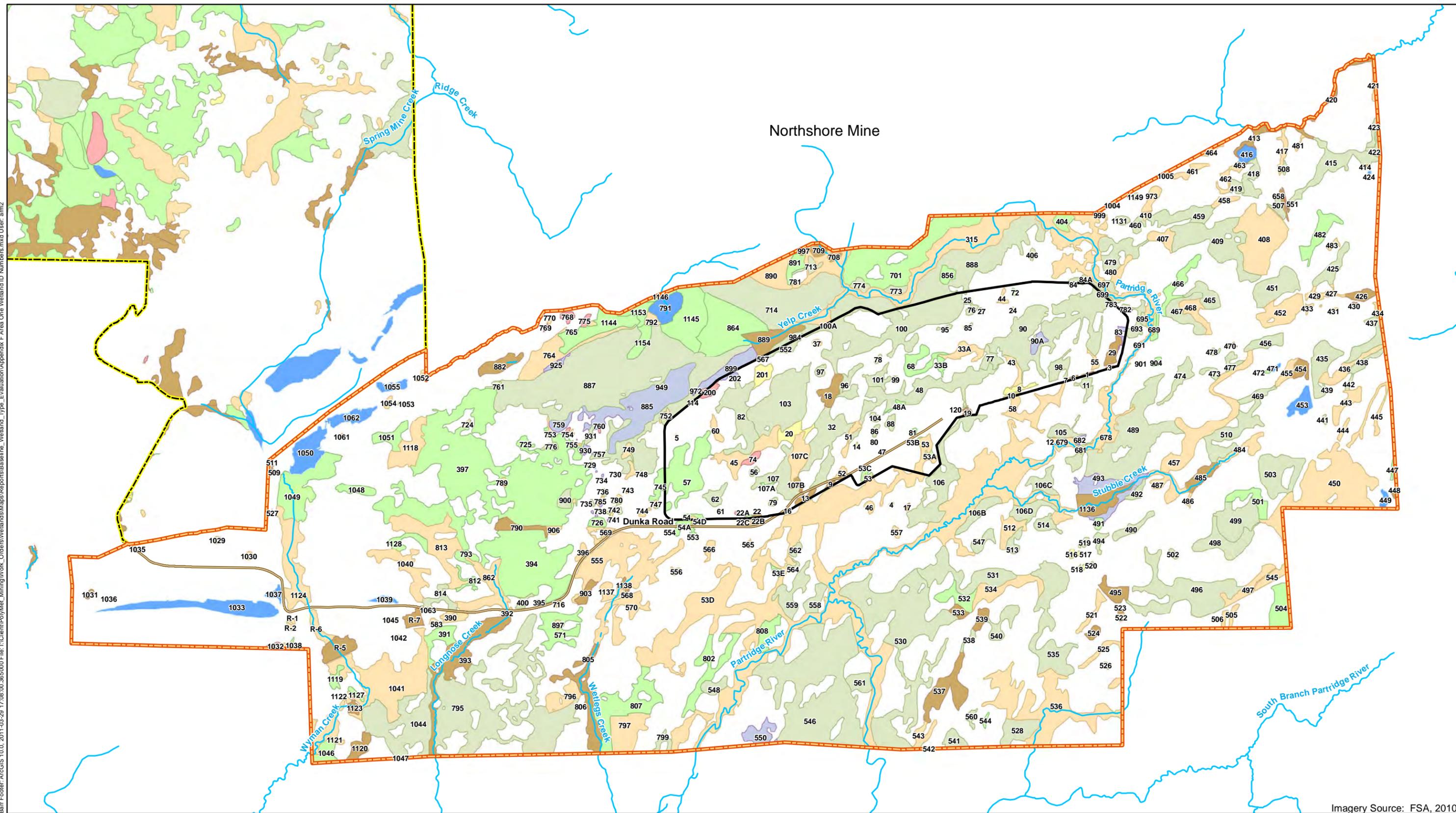
Appendix F

Technical Memorandum, Baseline Type Evaluation

December 21, 2010

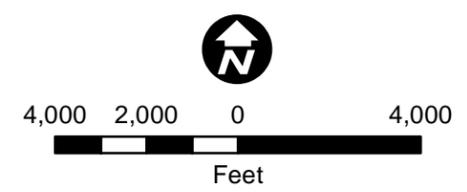
Appendix G
Area One – Wetland Summary

Barr Footer: ArcGIS 10.0, 2011-03-29 17:08:00_365000 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Appendix F Area One Wetland ID Numbers.mxd User: arm2



Imagery Source: FSA, 2010.

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



Appendix G
 AREA ONE -
 WETLAND IDENTIFICATION NUMBERS
 NorthMet Project
 PolyMet Mining Inc.
 Hoyt Lakes, Minnesota

**Appendix Table G1
Wetland Summary - Area One**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1	Shallow marsh	0.4
3	Shallow marsh	0.4
4	Wet meadow	0.5
5	Wet meadow	0.6
6	Shallow marsh	0.6
7	Wet meadow	0.1
8	Sedge meadow	6.8
9	Shallow marsh	1.8
10	Sedge meadow	1.2
11	Coniferous bog	8.9
12	Alder thicket	0.1
13	Deep marsh	5.0
14	Wet meadow	0.3
16	Shallow marsh	0.3
17	Shallow marsh	1.1
18	Shallow marsh	18.9
19	Shallow marsh	1.7
20	Sedge meadow	17.1
22	Shallow marsh	1.4
22A	Coniferous swamp	0.9
22B	Shallow marsh	2.7
22C	Alder thicket/Shrub-carr	2.8
24	Alder thicket	0.8
25	Coniferous bog	1.9
27	Coniferous bog	1.1
29	Shallow marsh	12.0
32	Coniferous bog	73.3
33A	Alder thicket	18.5
33B	Coniferous swamp	4.6
37	Shrub-carr	2.4
43	Alder thicket	8.3
44	Alder thicket	3.3
45	Alder thicket	37.5
46	Shrub-carr	4.0
47	Open bog	0.5
48	Coniferous bog	89.1
48A	Coniferous swamp	2.6
51	Alder thicket	7.5
52	Alder thicket	3.9
53	Alder thicket	18.6
53A	Coniferous swamp	2.3
53B	Coniferous swamp	0.4
53C	Coniferous swamp	2.9
53D	Alder thicket	885.6
53E	Coniferous swamp	1.9
54	Coniferous swamp	4.1
54A	Coniferous swamp	3.2

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
54B	Alder thicket	0.6
54C	Alder thicket	0.7
54D	Coniferous swamp	1.6
55	Alder thicket	3.9
56	Coniferous bog	2.8
57	Coniferous swamp	78.0
58	Alder thicket	34.6
60	Alder thicket	6.7
61	Coniferous swamp	0.5
62	Coniferous bog	12.1
64	Hardwood swamp	0.3
68	Coniferous swamp	23.8
72	Coniferous swamp	1.4
74	Hardwood swamp	6.1
76	Coniferous bog	3.9
77	Coniferous bog	13.0
78	Coniferous bog	1.7
79	Coniferous bog	2.4
80	Coniferous bog	0.3
81	Coniferous swamp	1.7
82	Coniferous bog	62.4
83	Open bog	4.0
84	Coniferous bog	1.3
84A	Coniferous bog	8.2
85	Coniferous bog	1.4
86	Coniferous bog	2.5
88	Coniferous bog	5.6
90	Coniferous bog	176.0
90A	Open bog	7.9
95	Coniferous bog	2.5
96	Coniferous bog	17.3
97	Coniferous bog	4.5
98	Coniferous bog	15.5
99	Coniferous bog	1.4
100	Coniferous bog	176.1
100A	Alder thicket	1.7
101	Coniferous bog	14.2
103	Coniferous bog	118.8
104	Coniferous bog	3.6
105	Coniferous bog	15.5
105A	Coniferous bog	0.1
106	Coniferous bog	83.5
106A	Coniferous bog	0.0001
106B	Coniferous bog	21.3
106C	Coniferous bog	19.9
106D	Coniferous bog	22.8
107	Coniferous bog	40.9

**Appendix Table G1
Wetland Summary - Area One**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
107A	Coniferous swamp	1.7
107B	Shallow marsh	4.5
107C	Alder thicket	27.6
114	Coniferous bog	0.7
120	Shallow marsh	0.6
200	Hardwood swamp	6.4
201	Wet meadow	13.5
202	Open bog	3.1
315	Alder thicket/Shrub-carr	322.7
390	Alder thicket/Shrub-carr	12.6
391	Coniferous swamp	22.3
392	Alder thicket/Shrub-carr	1.2
393	Shallow marsh	84.4
394	Coniferous swamp	194.9
395	Coniferous swamp	1.3
396	Alder thicket/Shrub-carr	5.3
397	Coniferous swamp	589.2
400	Coniferous bog	3.9
404	Coniferous swamp	12.8
406	Coniferous bog	2.4
407	Alder thicket/Shrub-carr	14.6
408	Alder thicket/Shrub-carr	107.7
409	Coniferous bog	98.7
410	Alder thicket/Shrub-carr	2.0
413	Deep marsh	10.9
414	Shallow marsh	1.3
415	Coniferous bog	53.2
416	Shallow, open water	11.9
417	Alder thicket/Shrub-carr	9.8
418	Coniferous bog	19.8
419	Coniferous bog	7.0
420	Deep marsh	17.6
421	Alder thicket/Shrub-carr	5.1
422	Coniferous bog	6.2
423	Coniferous bog	9.1
424	Shallow, open water	0.5
425	Coniferous bog	21.8
426	Deep marsh	11.8
427	Alder thicket/Shrub-carr	2.6
428	Deep marsh	1.0
429	Alder thicket/Shrub-carr	6.7
430	Deep marsh	0.5
431	Alder thicket/Shrub-carr	1.2
432	Alder thicket/Shrub-carr	0.2
433	Alder thicket/Shrub-carr	1.8
434	Alder thicket/Shrub-carr	2.2
435	Coniferous bog	39.3

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
436	Alder thicket/Shrub-carr	23.4
437	Coniferous bog	24.2
438	Coniferous bog	10.9
439	Coniferous bog	1.1
441	Coniferous bog	1.3
442	Coniferous bog	2.6
443	Alder thicket/Shrub-carr	18.0
444	Alder thicket/Shrub-carr	3.5
445	Alder thicket/Shrub-carr	17.0
447	Coniferous swamp	2.6
448	Deep marsh	1.7
449	Shallow, open water	5.5
450	Alder thicket/Shrub-carr	175.5
451	Coniferous bog	47.8
452	Alder thicket/Shrub-carr	40.9
453	Shallow, open water	20.2
454	Deep marsh	11.2
455	Alder thicket/Shrub-carr	10.2
456	Coniferous bog	17.2
457	Alder thicket/Shrub-carr	79.6
458	Alder thicket/Shrub-carr	7.1
459	Coniferous bog	35.0
460	Coniferous bog	6.7
461	Alder thicket/Shrub-carr	9.4
462	Alder thicket/Shrub-carr	8.8
463	Shallow marsh	2.1
464	Alder thicket/Shrub-carr	3.7
465	Coniferous bog	21.8
466	Coniferous swamp	24.9
467	Coniferous bog	29.6
468	Alder thicket/Shrub-carr	19.7
469	Coniferous bog	10.2
470	Shallow marsh	1.3
471	Shallow, open water	2.3
472	Coniferous swamp	1.0
473	Coniferous bog	5.7
474	Coniferous bog	18.4
477	Coniferous bog	8.2
478	Coniferous bog	2.0
479	Coniferous bog	36.9
480	Alder thicket/Shrub-carr	8.9
481	Alder thicket/Shrub-carr	2.0
482	Coniferous swamp	30.1
483	Alder thicket/Shrub-carr	2.8
484	Alder thicket/Shrub-carr	18.3
485	Deep marsh	18.1
486	Alder thicket/Shrub-carr	2.0

**Appendix Table G1
Wetland Summary - Area One**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
487	Alder thicket/Shrub-carr	23.6
489	Coniferous bog	178.7
490	Coniferous bog	13.8
491	Coniferous swamp	4.5
492	Coniferous bog	7.4
493	Open bog	49.6
494	Coniferous bog	6.6
495	Shallow marsh	17.4
496	Coniferous bog	125.9
497	Alder thicket/Shrub-carr	20.6
498	Coniferous bog	46.0
499	Coniferous bog	53.5
501	Coniferous swamp	22.5
502	Coniferous bog	3.1
503	Coniferous bog	56.8
504	Coniferous swamp	36.6
505	Alder thicket/Shrub-carr	4.4
506	Alder thicket/Shrub-carr	3.5
507	Coniferous bog	7.9
508	Coniferous bog	2.1
509	Shrub-carr	0.8
510	Coniferous bog	52.0
511	Shallow marsh	0.2
512	Alder thicket/Shrub-carr	20.3
513	Coniferous bog	10.4
514	Coniferous bog	12.3
515	Sedge/Wet meadow	0.3
516	Sedge/Wet meadow	1.8
517	Sedge/Wet meadow	0.7
518	Sedge/Wet meadow	1.1
519	Coniferous bog	2.2
520	Coniferous bog	1.4
521	Alder thicket/Shrub-carr	11.3
522	Alder thicket/Shrub-carr	2.0
523	Shallow marsh	1.1
524	Shallow marsh	5.9
525	Alder thicket/Shrub-carr	11.0
526	Coniferous bog	1.1
527	Shallow marsh	0.2
528	Coniferous bog	33.0
530	Coniferous bog	276.7
531	Coniferous bog	70.5
532	Coniferous swamp	23.2
533	Deep marsh	7.8
534	Alder thicket/Shrub-carr	34.2
535	Coniferous bog	104.7
536	Alder thicket/Shrub-carr	171.5

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
537	Deep marsh	50.0
538	Coniferous bog	4.0
539	Deep marsh	9.4
540	Coniferous bog	21.4
541	Coniferous bog	15.1
542	Alder thicket/Shrub-carr	0.3
543	Alder thicket/Shrub-carr	13.4
544	Coniferous swamp	1.8
545	Alder thicket/Shrub-carr	12.9
546	Coniferous bog	350.9
547	Coniferous bog	12.3
548	Coniferous bog	13.6
550	Open bog	23.4
551	Shallow marsh	3.6
552	Coniferous bog	8.7
553	Coniferous swamp	2.5
554	Coniferous swamp	2.2
555	Alder thicket/Shrub-carr	131.6
556	Alder thicket/Shrub-carr	1.8
557	Alder thicket/Shrub-carr	2.9
558	Coniferous bog	16.1
559	Coniferous bog	34.1
560	Coniferous bog	5.0
561	Coniferous bog	18.5
562	Coniferous bog	5.3
564	Coniferous bog	3.6
565	Alder thicket/Shrub-carr	1.9
566	Alder thicket/Shrub-carr	5.9
567	Shallow marsh	1.4
568	Deep marsh	0.4
569	Alder thicket/Shrub-carr	9.0
570	Alder thicket/Shrub-carr	48.5
571	Coniferous swamp	44.0
583	Alder thicket/Shrub-carr	0.1
658	Shallow marsh	1.5
678	Alder thicket	58.4
679	Coniferous bog	0.5
681	Coniferous bog	2.1
682	Open bog	2.2
688	Coniferous swamp	2.0
689	Coniferous swamp	4.6
691	Alder thicket	6.2
693	Coniferous bog	12.3
695	Coniferous bog	3.3
697	Coniferous bog	4.5
699	Coniferous bog	2.2
700	Open bog	0.6

**Appendix Table G1
Wetland Summary - Area One**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
701	Coniferous swamp	152.9
708	Shallow marsh	3.9
709	Shallow marsh	8.1
713	Coniferous bog	7.9
714	Coniferous bog	194.6
716	Alder thicket	1.1
724	Alder thicket	1.5
725	Coniferous swamp	8.0
726	Coniferous swamp	6.8
727	Open bog	0.3
728	Open bog	0.2
729	Sedge meadow	0.8
730	Open bog	0.3
731	Shallow, open water	0.1
732	Open bog	0.1
733	Open bog	0.2
734	Open bog	0.3
735	Coniferous bog	0.9
736	Alder thicket	0.6
737	Coniferous bog	0.4
738	Open bog	0.6
739	Open bog	0.3
740	Open bog	0.1
741	Alder thicket	0.6
742	Coniferous bog	3.5
743	Alder thicket	0.6
744	Alder thicket	1.0
745	Coniferous swamp	13.3
746	Alder thicket	0.3
747	Alder thicket	0.9
748	Alder thicket	0.5
749	Alder thicket	9.4
752	Alder thicket	3.6
753	Alder thicket	2.5
754	Hardwood swamp	1.0
755	Alder thicket	0.6
756	Shrub-carr	0.5
757	Open bog	0.3
759	Open bog	10.1
760	Hardwood swamp	0.6
761	Alder thicket	0.8
764	Shrub-carr	57.8
765	Alder thicket	1.2
766	Alder thicket	1.9
768	Hardwood swamp	4.7
769	Hardwood swamp	0.9
770	Alder thicket	0.8

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
773	Coniferous bog	8.1
774	Coniferous bog	8.2
775	Hardwood swamp	3.1
776	Coniferous bog	3.9
777	Open bog	0.04
778	Coniferous swamp	0.5
779	Alder thicket	1.6
780	Coniferous bog	1.4
781	Coniferous bog	0.6
782	Coniferous bog	2.1
783	Coniferous bog	1.9
784	Coniferous bog	1.7
785	Alder thicket	1.3
789	Alder thicket/Shrub-carr	1.9
790	Shallow marsh	16.1
791	Lake	30.6
792	Alder thicket/Shrub-carr	7.1
793	Coniferous swamp	9.7
795	Coniferous bog	332.2
796	Alder thicket/Shrub-carr	26.2
797	Alder thicket/Shrub-carr	51.4
799	Coniferous bog	8.4
802	Coniferous swamp	46.3
805	Deep marsh	7.7
806	Shallow marsh	53.0
807	Coniferous swamp	84.8
808	Coniferous swamp	20.3
812	Coniferous swamp	6.5
813	Alder thicket	81.3
814	Coniferous bog	14.8
856	Coniferous swamp	9.6
862	Alder thicket/Shrub-carr	47.3
864	Coniferous swamp	112.5
882	Deep marsh	22.5
885	Open bog	139.2
887	Coniferous bog	557.8
888	Coniferous bog	192.9
889	Shallow marsh	37.0
890	Alder thicket/Shrub-carr	37.3
891	Coniferous swamp	14.8
897	Alder thicket	2.0
899	Open bog	30.1
900	Coniferous bog	9.6
901	Shrub-carr	0.5
903	Shallow marsh	9.7
904	Coniferous swamp	2.3
906	Alder thicket/Shrub-carr	4.2

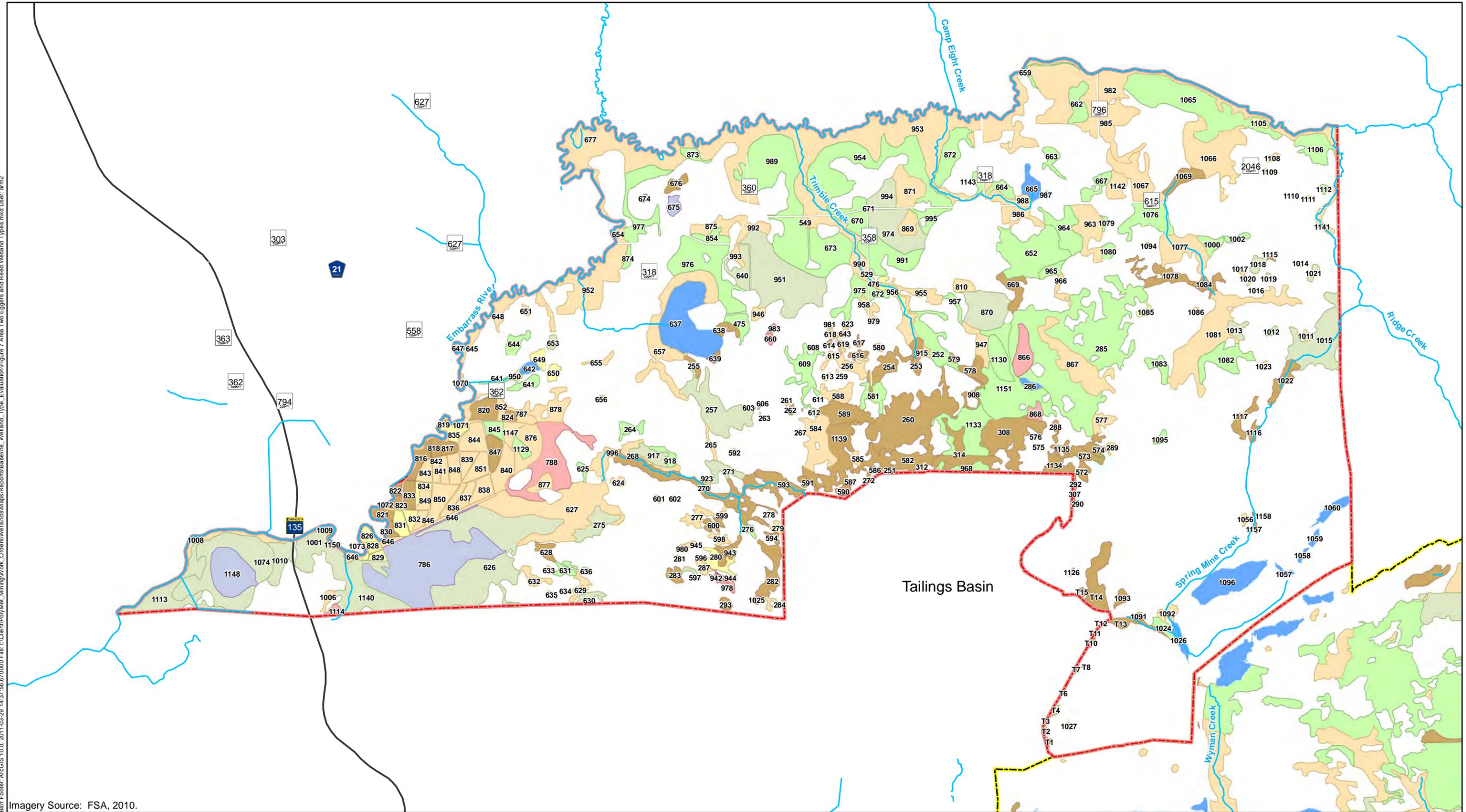
**Appendix Table G1
Wetland Summary - Area One**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
924	Coniferous swamp	0.6
925	Open bog	4.4
930	Open bog	2.2
931	Coniferous bog	4.3
949	Coniferous bog	1.8
972	Hardwood swamp	0.9
973	Alder thicket/Shrub-carr	11.0
984	Coniferous bog	15.1
997	Shallow marsh	1.5
999	Shallow marsh	0.7
1004	Shallow marsh	0.9
1005	Alder thicket/Shrub-carr	1.4
1029	Alder thicket/Shrub-carr	2.0
1030	Alder thicket/Shrub-carr	2.0
1031	Deep marsh	2.1
1032	Hardwood swamp	3.0
1033	Shallow, open water	77.5
1034	Alder thicket/Shrub-carr	0.0
1035	Alder thicket/Shrub-carr	0.5
1036	Shallow, open water	0.4
1037	Shallow, open water	6.6
1038	Coniferous swamp	1.7
1039	Shallow, open water	6.6
1040	Alder thicket/Shrub-carr	43.0
1041	Alder thicket/Shrub-carr	158.2
1042	Sedge/Wet meadow	0.7
1044	Coniferous bog	123.2
1045	Sedge/Wet meadow	0.4
1046	Coniferous swamp	18.4
1047	Alder thicket/Shrub-carr	0.3
1048	Coniferous swamp	13.7
1049	Coniferous swamp	86.3
1050	Shallow, open water	47.1
1051	Coniferous swamp	20.3

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1052	Alder thicket/Shrub-carr	2.1
1053	Sedge/Wet meadow	0.2
1054	Alder thicket/Shrub-carr	3.0
1055	Shallow, open water	11.4
1061	Alder thicket/Shrub-carr	1.0
1062	Shallow, open water	24.2
1063	Shallow marsh	0.001
1118	Alder thicket/Shrub-carr	43.8
1119	Coniferous swamp	7.9
1120	Shallow marsh	16.4
1121	Alder thicket/Shrub-carr	30.0
1122	Alder thicket/Shrub-carr	3.5
1123	Shallow marsh	5.5
1124	Alder thicket/Shrub-carr	74.2
1127	Coniferous swamp	3.8
1128	Coniferous swamp	15.1
1131	Coniferous bog	4.6
1132	Shallow marsh	0.2
1136	Deep marsh	40.5
1137	Alder thicket/Shrub-carr	12.1
1138	Deep marsh	2.2
1144	Coniferous swamp	52.8
1145	Coniferous swamp	80.5
1146	Coniferous swamp	6.2
1149	Coniferous bog	1.8
1153	Coniferous swamp	15.9
1154	Coniferous swamp	17.1
R-1	Alder thicket/Shrub-carr	1.0
R-2	Alder thicket/Shrub-carr	1.7
R-3	Alder thicket/Shrub-carr	0.6
R-5	Shallow marsh	26.7
R-6	Alder thicket/Shrub-carr	14.0
R-7	Shallow marsh	12.2

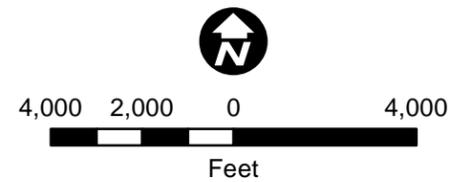
Appendix H
Area Two – Wetland Summary

Barr Footer: ArcGIS 10.0, 2011-03-29 14:37:56.670000 File: I:\Client\Polymet_Mining\Work_Orders\Wetlands\Maps\Reports\Baseline_Wetland_Type_Evaluation\Figure 7 Area Two Eggers and Reed Wetland Types.mxd User: arm2



Imagery Source: FSA, 2010.

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



Appendix H
AREA TWO -
WETLAND IDENTIFICATION NUMBERS
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, Minnesota

**Appendix Table H1
Wetland Summary - Area Two**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
251	Alder thicket/Shrub-carr	1.4
252	Coniferous swamp	45.7
253	Deep marsh	5.9
254	Shallow marsh	36.7
255	Shallow marsh	6.1
256	Alder thicket/Shrub-carr	23.4
257	Coniferous bog	84.7
259	Alder thicket/Shrub-carr	0.3
260	Shallow marsh	149.5
261	Alder thicket/Shrub-carr	0.8
262	Shallow marsh	1.9
263	Alder thicket/Shrub-carr	0.7
264	Coniferous swamp	10.9
265	Alder thicket/Shrub-carr	4.8
267	Alder thicket/Shrub-carr	1.1
268	Alder thicket/Shrub-carr	15.4
270	Shallow marsh	87.2
271	Coniferous bog	18.1
272	Deep marsh	1.1
275	Coniferous bog	30.6
276	Coniferous swamp	5.8
277	Alder thicket/Shrub-carr	14.5
278	Alder thicket/Shrub-carr	1.7
279	Alder thicket/Shrub-carr	3.6
280	Sedge meadow	17.1
281	Alder thicket/Shrub-carr	1.5
282	Shallow marsh	32.5
283	Deep marsh	8.9
284	Alder thicket/Shrub-carr	5.1
285	Coniferous swamp	364.7
286	Shallow, open water	7.4
287	Alder thicket/Shrub-carr	5.9
288	Deep marsh	4.5
289	Alder thicket/Shrub-carr	2.9
290	Coniferous swamp	0.5
292	Deep marsh	1.8
293	Deep marsh	5.7
307	Shallow marsh	0.8
308	Deep marsh	82.7
309	Wet meadow	0.0
312	Alder thicket/Shrub-carr	2.0
314	Shallow marsh	45.8
475	Coniferous swamp	16.7
476	Alder thicket/Shrub-carr	0.8
529	Wet meadow	0.3
549	Alder thicket/Shrub-carr	2.2
572	Deep marsh	7.3

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
573	Shallow marsh	13.9
574	Deep marsh	12.8
575	Alder thicket/Shrub-carr	0.5
576	Sedge/Wet meadow	0.3
577	Alder thicket/Shrub-carr	13.5
578	Deep marsh	17.5
579	Deep marsh	2.1
580	Alder thicket/Shrub-carr	1.7
581	Coniferous swamp	20.6
582	Deep marsh	48.2
584	Alder thicket/Shrub-carr	53.0
585	Alder thicket/Shrub-carr	4.4
586	Deep marsh	1.9
587	Shallow marsh	1.0
588	Alder thicket/Shrub-carr	18.2
589	Deep marsh	40.0
590	Shallow marsh	5.4
591	Deep marsh	5.4
592	Alder thicket/Shrub-carr	1.8
593	Deep marsh	30.4
594	Deep marsh	1.6
596	Alder thicket/Shrub-carr	0.2
597	Coniferous bog	4.4
598	Alder thicket/Shrub-carr	6.3
599	Alder thicket/Shrub-carr	2.8
600	Shallow marsh	8.8
601	Alder thicket/Shrub-carr	1.3
602	Alder thicket/Shrub-carr	0.6
603	Shallow marsh	0.1
604	Shallow marsh	0.1
605	Shallow marsh	0.1
606	Shallow marsh	0.2
607	Alder thicket/Shrub-carr	0.1
608	Shallow, open water	0.4
609	Coniferous swamp	38.8
610	Shallow marsh	0.2
611	Coniferous bog	0.6
612	Coniferous bog	2.2
613	Alder thicket/Shrub-carr	1.6
614	Shallow marsh	1.2
615	Shallow marsh	0.4
616	Deep marsh	6.0
617	Shallow marsh	2.1
618	Alder thicket	1.5
619	Alder thicket/Shrub-carr	0.9
620	Shallow marsh	0.3
621	Alder thicket/Shrub-carr	0.5

**Appendix Table H1
Wetland Summary - Area Two**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
622	Alder thicket/Shrub-carr	0.4
623	Alder thicket/Shrub-carr	0.9
624	Alder thicket/Shrub-carr	4.8
625	Coniferous swamp	3.7
626	Coniferous bog	258.8
627	Alder thicket/Shrub-carr	187.0
628	Deep marsh	10.5
629	Alder thicket/Shrub-carr	10.7
630	Coniferous bog	8.1
631	Coniferous swamp	10.0
632	Alder thicket/Shrub-carr	11.1
633	Alder thicket/Shrub-carr	1.1
634	Alder thicket/Shrub-carr	0.5
635	Alder thicket/Shrub-carr	1.8
636	Coniferous bog	2.3
637	Lake	132.0
638	Shallow marsh	9.4
639	Shallow marsh	4.0
640	Coniferous bog	26.0
641	Coniferous swamp	16.1
642	Shallow, open water	8.3
643	Alder thicket/Shrub-carr	1.6
644	Coniferous swamp	14.3
645	Shallow marsh	1.0
646	Alder thicket/Shrub-carr	23.4
647	Alder thicket/Shrub-carr	6.5
648	Alder thicket	46.0
649	Sedge/Wet meadow	10.6
650	Sedge/Wet meadow	7.9
651	Alder thicket	2.1
652	Coniferous swamp	109.4
653	Coniferous bog	5.2
654	Shrub-carr	15.2
655	Alder thicket/Shrub-carr	5.7
656	Alder thicket/Shrub-carr	1.9
657	Alder thicket/Shrub-carr	99.9
659	Coniferous swamp	6.1
660	Hardwood swamp	2.9
662	Coniferous swamp	26.4
663	Coniferous swamp	13.1
664	Coniferous swamp	13.3
665	Shallow, open water	20.7
667	Coniferous swamp	17.3
669	Shallow marsh	21.4
670	Coniferous swamp	30.1
671	Coniferous bog	0.004
672	Coniferous swamp	9.0

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
673	Coniferous swamp	129.6
674	Open bog	2.3
675	Open bog	9.7
676	Deep marsh	9.5
677	Alder thicket/Shrub-carr	165.6
786	Open bog	266.8
787	Alder thicket/Shrub-carr	16.2
788	Hardwood swamp	98.1
810	Alder thicket/Shrub-carr	11.7
811	Coniferous swamp	0.2
816	Deep marsh	15.5
817	Deep marsh	10.0
818	Deep marsh	7.1
819	Deep marsh	1.0
820	Deep marsh	26.9
821	Shallow marsh	9.2
822	Shallow marsh	4.5
823	Shallow marsh	6.2
824	Shallow marsh	5.7
825	Wet meadow	1.8
826	Wet meadow	8.9
827	Wet meadow	2.8
828	Wet meadow	4.3
829	Wet meadow	6.8
830	Shallow marsh	4.9
831	Wet meadow	13.7
832	Wet meadow	9.4
833	Shallow marsh	15.1
834	Wet meadow	8.3
835	Wet meadow	12.7
836	Shrub-carr	11.5
837	Shrub-carr	13.5
838	Shrub-carr	19.0
839	Shrub-carr	13.1
840	Shrub-carr	31.3
841	Shrub-carr	9.2
842	Shrub-carr	8.3
843	Shrub-carr	12.6
844	Shrub-carr	28.5
845	Coniferous swamp	12.6
846	Shrub-carr	7.6
847	Shallow marsh	17.9
848	Shrub-carr	16.0
849	Shrub-carr	10.9
850	Shrub-carr	29.7
851	Shrub-carr	19.7
852	Shrub-carr	3.7

**Appendix Table H1
Wetland Summary - Area Two**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
854	Coniferous swamp	14.6
866	Hardwood swamp	31.0
867	Alder thicket/Shrub-carr	79.4
868	Hardwood swamp	9.9
869	Alder thicket/Shrub-carr	16.5
870	Coniferous bog	66.7
871	Alder thicket/Shrub-carr	41.1
872	Coniferous swamp	42.3
873	Coniferous swamp	10.0
874	Coniferous swamp	5.8
875	Alder thicket/Shrub-carr	27.0
876	Alder thicket	39.1
877	Alder thicket/Shrub-carr	12.6
878	Alder thicket/Shrub-carr	35.5
908	Shallow marsh	8.7
915	Alder thicket	5.5
917	Coniferous bog	19.9
918	Coniferous swamp	9.4
921	Alder thicket/Shrub-carr	0.4
923	Wet meadow	0.7
942	Deep marsh	3.0
943	Deep marsh	14.0
944	Hardwood swamp	2.6
945	Alder thicket/Shrub-carr	2.3
946	Alder thicket/Shrub-carr	6.9
947	Alder thicket/Shrub-carr	20.4
950	Alder thicket/Shrub-carr	3.1
951	Coniferous bog	165.8
952	Alder thicket/Shrub-carr	108.5
953	Alder thicket/Shrub-carr	614.0
954	Coniferous swamp	175.5
955	Alder thicket/Shrub-carr	39.2
956	Wet meadow	17.4
957	Coniferous swamp	6.9
958	Alder thicket/Shrub-carr	3.6
963	Alder thicket/Shrub-carr	50.5
964	Coniferous swamp	42.9
965	Coniferous swamp	11.2
966	Alder thicket/Shrub-carr	8.1
968	Coniferous swamp	13.8
974	Coniferous bog	69.2
975	Coniferous swamp	26.3
976	Coniferous swamp	99.6
977	Coniferous swamp	53.7
978	Hardwood swamp	2.8
979	Alder thicket/Shrub-carr	5.8
980	Alder thicket/Shrub-carr	2.8

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
981	Alder thicket	0.4
982	Alder thicket/Shrub-carr	103.2
983	Hardwood swamp	1.7
985	Alder thicket/Shrub-carr	55.3
986	Alder thicket/Shrub-carr	22.2
987	Shallow, open water	1.8
988	Alder thicket/Shrub-carr	20.5
989	Coniferous swamp	130.2
990	Alder thicket/Shrub-carr	42.2
991	Coniferous swamp	55.7
992	Alder thicket/Shrub-carr	15.0
993	Alder thicket/Shrub-carr	7.1
994	Coniferous bog	26.8
995	Coniferous swamp	18.3
996	Alder thicket/Shrub-carr	4.1
1000	Coniferous swamp	12.9
1001	Coniferous bog	77.3
1002	Coniferous swamp	5.8
1003	Alder thicket/Shrub-carr	0.5
1006	Alder thicket/Shrub-carr	5.5
1008	Alder thicket/Shrub-carr	28.9
1009	Alder thicket/Shrub-carr	5.7
1010	Coniferous bog	28.9
1011	Alder thicket/Shrub-carr	2.1
1012	Coniferous swamp	2.8
1013	Coniferous bog	10.8
1014	Alder thicket/Shrub-carr	0.2
1015	Coniferous bog	99.3
1016	Sedge/Wet meadow	0.7
1017	Alder thicket/Shrub-carr	1.2
1018	Coniferous bog	9.0
1019	Coniferous bog	2.7
1020	Sedge/Wet meadow	1.3
1021	Coniferous bog	5.1
1022	Deep marsh	20.2
1023	Alder thicket/Shrub-carr	2.4
1024	Coniferous swamp	10.8
1025	Hardwood swamp	1.6
1026	Shallow, open water	12.8
1027	Alder thicket/Shrub-carr	1.0
1056	Alder thicket/Shrub-carr	2.0
1057	Shallow, open water	4.9
1058	Shallow, open water	2.8
1059	Shallow, open water	4.6
1060	Shallow, open water	16.4
1065	Coniferous swamp	162.4
1066	Alder thicket/Shrub-carr	108.3

**Appendix Table H1
Wetland Summary - Area Two**

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1067	Alder thicket/Shrub-carr	57.1
1069	Shallow marsh	19.9
1070	Alder thicket/Shrub-carr	3.8
1071	Alder thicket/Shrub-carr	29.2
1072	Alder thicket/Shrub-carr	8.6
1073	Alder thicket/Shrub-carr	3.8
1074	Coniferous bog	146.2
1076	Coniferous swamp	50.7
1077	Alder thicket/Shrub-carr	51.5
1078	Shallow marsh	29.2
1079	Coniferous swamp	2.6
1080	Coniferous swamp	8.1
1081	Alder thicket/Shrub-carr	144.3
1082	Coniferous swamp	43.4
1083	Coniferous swamp	14.5
1084	Deep marsh	14.0
1085	Sedge/Wet meadow	4.3
1086	Alder thicket/Shrub-carr	1.9
1091	Shallow marsh	1.8
1092	Alder thicket/Shrub-carr	11.1
1093	Shallow marsh	6.5
1094	Sedge/Wet meadow	1.1
1095	Coniferous swamp	4.8
1096	Shallow, open water	73.0
1105	Sedge/Wet meadow	5.4
1106	Coniferous swamp	35.6
1107	Alder thicket/Shrub-carr	0.8
1108	Alder thicket/Shrub-carr	2.5
1109	Alder thicket/Shrub-carr	0.8
1110	Sedge/Wet meadow	0.3
1111	Alder thicket/Shrub-carr	0.6
1112	Coniferous swamp	2.3
1113	Coniferous bog	81.8
1114	Hardwood swamp	5.5
1115	Shallow marsh	1.1

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1116	Deep marsh	6.0
1117	Deep marsh	14.0
1125	Sedge meadow	0.1
1126	Hardwood swamp	0.7
1129	Coniferous swamp	9.8
1130	Coniferous swamp	32.3
1133	Coniferous swamp	70.5
1134	Shallow marsh	16.3
1135	Deep marsh	7.4
1139	Shallow marsh	70.1
1140	Coniferous bog	79.0
1141	Alder thicket/Shrub-carr	9.4
1142	Alder thicket/Shrub-carr	20.3
1143	Coniferous swamp	7.6
1147	Alder thicket/Shrub-carr	13.5
1148	Open bog	74.5
1150	Shallow marsh	3.9
1151	Coniferous swamp	117.3
1157	Deep marsh	1.2
1158	Deep marsh	0.9
T1	Deep marsh	1.9
T2	Deep marsh	0.9
T3	Wet meadow	0.1
T4	Wet meadow	1.0
T5	Wet meadow	0.2
T6	Alder thicket/Shrub-carr	0.1
T7	Shallow marsh	0.9
T8	Wet meadow	0.0
T10	Deep marsh	1.5
T11	Deep marsh	0.9
T12	Shallow marsh	0.4
T13	Deep marsh	13.8
T14	Deep marsh	45.2
T15	Shallow marsh	1.7