



# Takings Permit Application

## *NorthMet Project*

Prepared for  
Poly Met Mining, Inc.

September 2018

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## 1.0 Project

Poly Met Mining, Inc. (PolyMet) proposes to construct the NorthMet Project (Project), located near Hoyt Lakes Minnesota (Large Figure 1). The Project is located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, and 6 miles south of Babbitt, Minnesota. The Project areas include 7,600 acres.

The NorthMet Project Mine Site is near the western end of a belt of copper-nickel deposits on the northwestern contact of the Duluth Complex. The Mine Site is in relative proximity to a number of existing mines including the Peter Mitchell open pit taconite mine, which is located approximately 2 miles north of the Mine Site. The Plant Site, which is the former LTVSMC taconite plant property, is located approximately 8 miles west of the Mine Site. The Mine Site and Plant Site are connected by the existing Dunka Road. Access to the Project area is located approximately 5 miles northeast of Hoyt Lakes at the intersection of Country Road 666 and Dunka Road. Specifically, the Project is located in Sections 5 and 6, Township 58 North, Range 14 West; Sections 1, 2, 3, 4, 9, 10, 11, 12, 16, 17, and 18, Township 59 North, Range 13 West; Sections 2, 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 20, 23, 24, 29, and 32, Township 59 North, Range 14 West; and Sections 32, 33, and 34, Township 60 North, Range 14 West, in St. Louis County, Minnesota.

The purpose and need for the Project is described in Section 1.2 of the Final Environmental Impact Statement: NorthMet Mining Project and Land Exchange (final FEIS; Minnesota Department of Natural Resources (DNR) et al. 2015) and Section 4.0 of the Wetland Replacement Plan (). A detailed description of the activities that will be conducted at the project location is provided in Section 3.0 of the final EIS (DNR et al. 2015) and Section 5.0 of the Wetland Replacement Plan (PolyMet 2017). The main Project components include the Mine Site and the Plant Site, which includes the tailings basin and plant processing facilities (Large Figure 2). The Mine Site and the Plant Site will be connected by the Transportation and Utility Corridors. An additional pipeline corridor (Colby Lake Pipeline Corridor) will supply water to the Plant Site when needed. The area of land that encompasses these Project components is referred to as the Mining Area (Large Figure 2). Large Figure 3 in the *Sensitive Plant Species Survey Work Plan* (Appendix A) identifies the areas of construction/disturbance that will occur in the Mining Area.

State-endangered *Caltha natans* (floating marsh marigold), state-endangered *Botrychium ascendens* (upswept moonwort), and state-endangered *Botrychium spathulatum* (spatulate moonwort) were observed during the 2018 sensitive plant species survey, results of which are described in the *Sensitive Plant Species Survey Report* (Appendix B). The sensitive plant species are located within areas of construction/disturbance that will occur in the Mining Area. Since these impacts are unavoidable, PolyMet is submitting this application for a takings permit.

This takings permit application includes: a summary of botanical survey work conducted in the vicinity of the Project areas; a discussion of the life history, distribution, and habitat of the plant species to be taken; avoidance and minimization; a review of the locations of species to be taken; and the proposed mitigation measures. Appendix A includes the *Sensitive Plant Species Survey Work Plan*, which was submitted to the



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DNR on May 24, 2018. Appendix B includes the *Sensitive Plant Species Survey Report*, which was submitted to the DNR on August 21, 2018. Appendix C includes contact information for the project.

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## 2.0 Summary of Botanical Surveys

PolyMet conducted several sensitive plant species surveys in the vicinity of the Mining Area in order to identify whether any vascular plant species listed by the state of Minnesota as endangered or threatened were present. The areas where the surveys were conducted from 1999 through 2018 are shown on Large Figure 4 and Large Figure 5 in Appendix A. These surveys included:

- Foth & Van Dyke Associates, Inc. conducted a sensitive plant species survey in Sections 2, 3, and 10 of Township 59N and Range 13W in 1999, prior to on-site mineral exploration by PolyMet (Foth & Van Dyke Associates, Inc. 1999). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013a).
- Cindy Johnson-Groh conducted a sensitive plant species survey in Sections 2, 3, 10, 11, and 16 of Township 59N and Range 13W in July 2004 to assess the presence of *Botrychium* species in the vicinity of the Project (Johnson-Groh 2004). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013a).
- Deborah Pomroy conducted a sensitive plant species survey in Sections 3, 4, 9, and 10 of Township 59N and Range 13W in spring 2004 (Pomroy and Barnes 2004). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013a).
- Gary Walton conducted a sensitive plant species survey in Sections 1, 2, 11, and 12 of Township 59N and Range 13W in spring 2004 (Walton 2004). This survey documented one state-endangered plant species, *Caltha natans* (floating marsh marigold). *Caltha natans* was documented in five locations in the Mine Site (Sections 1 and 10 of Township 59N, Range 13W) and in eight locations adjacent to the Mine Site (Sections 1, 11, and 12 of Township 59N, Range 13W) (Table 1). *Caltha natans* was only documented in one location where there will be Project disturbance/construction within the Mine Site (Section 1 of Township 59N and Range 13W). This population was located in an older, medium-size, excavated pond, adjacent to Dunka Road.
- Daniel Jones conducted a sensitive plant species survey for *Botrychium* species in Sections 1, 2, 3, 9, 10, and 11 of Township 59N and Range 13W along the internal road network at the Mine Site; and in Sections 1, 9, 10, and 11 of Township 59N and Range 13W along Dunka Road adjacent to the Mine Site (Barr 2007). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013a).
- Daniel Jones conducted a sensitive plant species survey in Sections 16, 17, and 18 of Township 59N and Range 13W and Sections 13, 14, and 15 of Township 59N and Range 14W along Dunka

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Road and the proposed pipeline alignment from the west end of the Mine Site to the Plant Site in June and July 2008 (Barr 2012). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013a).

- Midwest Natural Resources Inc. conducted a sensitive plant species survey in Sections 3, 4, 5, and 9 of Township 59N and Range 13W in 2008 (Barr 2011). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013a).
- Daniel Jones conducted a sensitive plant species survey in Sections 3-10, 14, 15, and 17 in Township 59, Range 14 and Sections 32-34 in Township 60, Range 14W within the Plant Site in 2017 (Barr 2017). The initial survey results identified one state-endangered plant species, *Botrychium ascendens* (upswept moonwort), and one state-threatened plant species, *Botrychium lunaria* (common moonwort). Both *Botrychium* species were documented at the Plant Site (Section 33 of Township 60N, Range 14W). However, the DNR State Botanist determined that the *Botrychium ascendens* was *Botrychium pallidum* (special concern), and that the *Botrychium lunaria* identification could not be conclusively verified. The survey also identified *Botrychium ascendens* in the processing area (Section 9 of Township 59N, Range 14W). However, the DNR State Botanist determined that the identification could not be conclusively verified. As a result of the survey and the DNR verifications, there is no verified presence of endangered or threatened plant species at the Plant Site per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013a).
- Daniel Jones of Salix Environmental LLC and Dan Engle of Barr conducted sensitive plant species surveys for *Caltha natans* and state-endangered or threatened *Botrychium* species in June 2018 (Appendix B). PolyMet originally submitted an application for a Permit to Take Endangered or Threatened Species on November 28, 2017. This application was required because a *Caltha natans* population was observed within an area of construction/disturbance in the Mine Site by Gary Walton in 2004 (Section 1 of Township 59N, Range 13W). This population was located in an older, medium-size, excavated pond, adjacent to Dunka Road. The DNR issued comments regarding PolyMet's 2017 application for a Permit to Take Endangered or Threatened Species on April 18, 2018, (DNR 2018a). The DNR comments stated that because the Project footprint has been modified several times since the Project was first proposed, surveys for *Caltha natans* and state-endangered or threatened *Botrychium* species should be conducted within additional areas in June 2018 (DNR 2018a).
  - The areas that were surveyed for *Caltha natans* and state-endangered or threatened *Botrychium* species are shown on Large Figure 5 in Appendix A. Surveys for *Caltha natans* were conducted in Sections 1 and 10 of Township 59N and Range 13W, where it was previously documented in 2004 and where Project construction/disturbance will occur. In addition, surveys for *Caltha natans* were conducted within Section 3 of Township 59N and Range 14W in areas not previously surveyed, where suitable habitat exists, and where

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Project construction will occur. In 2018, state-endangered *Caltha natans* was documented in two locations in the same older, medium-size, excavated pond, adjacent to Dunka Road where Gary Walton previously documented *Caltha natans* in 2004 (Large Figure 3 in Appendix B); both of these locations are located in areas of construction/disturbance in the Mining Area (Large Figure 3 in Appendix A). Gary Walton's 2004 documented records in the older, medium-size, excavated pond, adjacent to Dunka Road were searched for but not found during the 2018 survey (Appendix B).

- Surveys for state endangered or threatened *Botrychium* were conducted in Section 9 of Township 59N and Range 14W and Section 33 of Township 60N and Range 14W, where state endangered or threatened *Botrychium* species were documented in 2017, but the identifications were inconclusive. In addition, surveys for state-endangered or threatened *Botrychium* were conducted within Sections 16, 23, and 24 of Township 59N and Range 14W in areas not previously surveyed, where suitable habitat exists, and where Project construction will occur. State endangered *Botrychium ascendens* (upswept moonwort) was documented in one location in near the old LTVSMC Plant Site (Large Figure 3 in Appendix B); this population is located in areas of construction/disturbance (Large Figure 3 in Appendix A). In addition, state-endangered *Botrychium spathulatum* (spatulate moonwort) was identified near the upper slope of the lowest lift of the north edge of the Tailings Basin (Large Figure 3 in Appendix B). Additional information on this sensitive plant species survey is available in Appendix B.

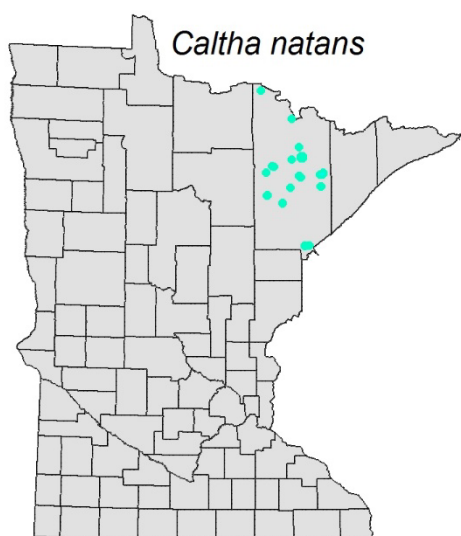
### 3.0 Life History, Distribution and Habitat of *Caltha natans* in Minnesota

*Caltha natans* is a distinctive plant that bears only superficial resemblance to the more familiar *Caltha palustris* (common marsh marigold), which is larger and has yellow flowers (DNR 2018b). *Caltha natans* has small, white flowers about 1 centimeter (0.4 inches) in diameter. Leaves are simple, thin, and subentire. The leaves and petioles commonly float in shallow water, but when water recedes the entire plant may be stranded in mud. Unlike the other species of *Caltha* in North America, *Caltha natans* is relatively invariable morphologically and has not been divided into segregated taxa. It is a perennial herb and is insect-pollinated.

*Caltha natans* occurs in shallow (often 6-7.6 decimeters (2-2.5 feet)), slow-moving water in streams, creeks, pools, ditches, sheltered lake margins, swamps, and beaver ponds. It typically roots in mud, silt, or clay, and it spreads when stems root at the nodes. Some sites may support only a few scattered individuals but other sites may have a dense mat consisting of many plants. In Minnesota, *Caltha natans* is associated with *Glyceria* spp. (manna grass), *Carex* spp. (sedges), *Potamogeton* spp. (pondweed), and *Utricularia* spp. (bladderwort), with an overstory of *Fraxinus nigra* (black ash) or *Salix* spp. (willow).

The statewide and regional presence of *Caltha natans* was evaluated using the DNR Natural Heritage Information System (NHIS) database. The NHIS database indicates that there are 16 element occurrences (EOs) of *Caltha natans*, all of which are located in St. Louis County. The 2018 survey identified a *Caltha natans* population within one of the previously recorded EOs. The statewide distribution of NHIS database EOs for *Caltha natans* is shown on Figure 1.

Figure 1 *Caltha natans* Element Occurrences in NHIS



Population information for *Caltha natans* is summarized in Table 1. Analysis of the available population information for the EOs does not generate a definitive overall number of individual *Caltha natans* plants statewide. There are several reasons why an overall statewide count of known *Caltha natans* plants cannot be determined, including:

- No population count provided;
- Variation in population counts between multiple visits over one or more years;
- Non-numeric population descriptions, e.g., "dozens but not hundreds", "more than 50", etc.
- Population counts based on number of leaves observed; there is not a one-to-one correlation between leaves and plants;
- Population based on area, e.g., "120 square feet"

With no reliable estimate of the number of individual *Caltha natans* plants statewide, the Project impact to *Caltha natans* is best estimated in terms of the number of EOs affected, and the portion of known locations affected within an EO with multiple locations.

**Table 1** Summary of *Caltha natans* Element Occurrences from NHIS database

| Element Occurrence ID | Number of locations/points associated with EO | Population Information <sup>1</sup>  |
|-----------------------|---|--|
| 3904                  | 1   | No population information provided.  |
| 3905                  | 1   | No population information provided.  |
| 3906                  | 1   | No population information provided.  |
| 3907                  | 1   | 1993: 6 plants, 10-15 plants. 1995: 2-3 plants.  |
| 3909                  | 2   | 2005: dozens but not hundreds in 5x1 meter area. 2015: a population of 6 plants.   |
| 13985                 | 1   | 1996: 360 leaves counted in eight patches; also found 4 small sterile plants upstream. 2007: plant was found again in 2 patches.                     |
| 15332                 | 8   | 1,000s of plants.  |
| 19794                 | 1   | A population was found in an area of 120 square feet.  |
| 20373                 | 1   | No population information provided.  |
| 20375                 | 1   | 1994: The specimen was observed. 1995: Walton observed the plant and 2 of 3 patches were damaged from flooding. The third patch did have some fruit. |
| 26339                 | 1   | 1997: 50 floating leaves were observed at this site. 1999: over 1,200 floating leaves were observed.   |
| 32103                 | 14 <sup>2</sup>                               | 2004: plants observed at 13 sites in small patches and populations. 2018: 7 plants observed at 1 site.   |

| Element Occurrence ID | Number of locations/points associated with EO | Population Information <sup>1</sup>  |
|-----------------------|---|--|
| 37025                 | 5   | Population cluster is about 80 cm x 50 cm with approximately 100 leaves on three branching individuals. There were also small patches occur scattered along narrow beaver canals and wet draws. At least 10 separate clusters of individuals observed. |
| 37026                 | 1   | 6 locations had populations.   |
| 37563                 | 2   | More than 50 plants.   |
| 37899                 | 1   | 50 plants.   |

<sup>1</sup>This information was obtained from the "gendesc" and "eo\_data" fields in the NHIS database.

<sup>2</sup>This number includes the location found at the NorthMet Site in 2018.

Spatial distribution of the 16 *Caltha natans* EOs is confined to St. Louis County, albeit across the full north-south and east-west lengths of this largest county in Minnesota. The potentially impacted *Caltha natans* EO is comprised of 13 different sites originally identified across a broad area at the east end of the Mine Site by Gary Walton, plus the one site identified during the 2018 survey, for a total of 14 sites in the EO. Only one of these 14 sites would be impacted by the Project, therefore, the majority of the EO would not be impacted by the Project.

The NHIS database EOs for *Caltha natans* includes site descriptions and plant associations for each population recorded. Two habitat types were identified from the NHIS database EOs for *Caltha natans*. These include:

- Mudflats, shallow channels, small pools, and areas of beaver altered hydrology – the most commonly associated habitat types in the NHIS database for *Caltha natans* are mudflats, shallow pools, and channels, frequently associated with beaver activity and growing along the edges of these water features.
- Drainage ditch – a few records describe the habitat as part of a roadside drainage ditch with high water conditions.

Based on the EO records, a large majority (90+ percent) of the *Caltha natans* present in the state occurs in mud flats, small ponds, and areas of beaver altered hydrology. This habitat type is consistent with the location of the *Caltha natans* found at the NorthMet site, which is an older, medium-size, excavated pond that receives drainage from a roadside ditch.

Eight of the sixteen previously recorded EOs for *Caltha natans* listed in the NHIS records are located on public land. Ownership of the other eight EOs is listed as "unknown" according to the NHIS records. The U.S. Forest Service (USFS) owns six of the eight known EO public sites, with the U.S. National Park Service and DNR Forestry owning the other two EO public sites. As of June 28, 2018 when the USFS and PolyMet

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completed the administrative process for the land exchange (PolyMet, 2018), one of the six EOs that the USFS owns (EO ID 32103 in Table 1), which contains the Gary Walton *Caltha natans* records from 2004, is now located on a combination of public and private land, rather than just public land.

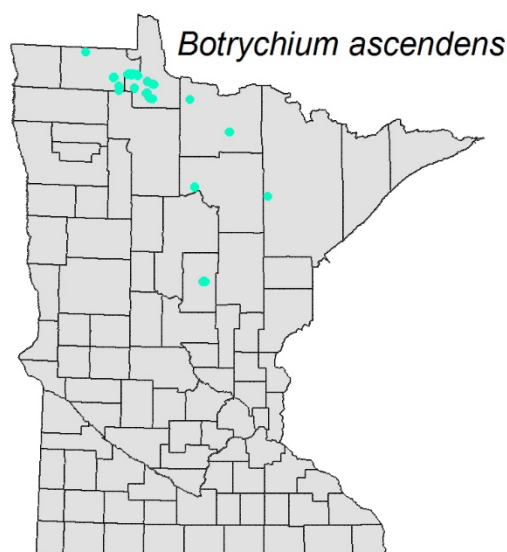


## 4.0 Life History, Distribution and Habitat of *Botrychium ascendens* in Minnesota

There are 20 species of *Botrychium* currently found in Minnesota (DNR 2013b). Members of the genus *Botrychium* are small plants with a single leaf that is divided into a once- or twice-pinnate sterile frond, called the trophophore, and a fertile segment called the sporophore. The diploid sporophore produces spores above ground, which are released and develop below ground into haploid gametophytes, with separate male and female gamete-producing structures. Gametes unite to give rise to young sporophytic plantlets, which develop into the above-ground plant, completing the life cycle (Cobb et al. 2005). Juvenile sporophytes can exist underground for several years before emerging. Moreover, some *Botrychium* species produce underground asexual reproductive structures called gemmae (Farrar and Johnson-Groh 1990). As a result, significant episodes of *Botrychium* life history are spent underground (Johnson-Groh et al. 2002).

The statewide and regional presence of *Botrychium ascendens* was evaluated using the DNR NHIS database. The NHIS database indicates that there are 26 EOs of *Botrychium ascendens*, which are located in six counties including Crow Wing, Itasca, Koochiching, Lake of the Woods, Roseau, and St. Louis. Most of the EOs for *Botrychium ascendens* are located in Lake of the Woods and Roseau counties. It is assumed the *Botrychium ascendens* found in the 2018 survey is a new EO, therefore, the total number of EOs in the state would be 27. The statewide distribution of NHIS database EOs for *Botrychium ascendens* is shown on Figure 2. Population information for *Botrychium ascendens* is summarized in Table 2.

Figure 2 *Botrychium ascendens* Element Occurrences in NHIS



Spatial distribution of the EOs covers the north-central part of the state, and crosses into two of the state's four ecological provinces (Laurentian Mixed Forest Province and Tallgrass Aspen Parklands Province; DNR 2018c). The NHIS database does not consistently provide population numbers for the NHIS

records within a given EO as identified in Table 2, for some of the same reasons discussed in Section 3.0. Therefore, the Project impact to *Botrychium ascendens* is best estimated in terms of the number of EOs affected.

Based on the presence of 27 EOs for *Botrychium ascendens*, removal of one EO would result in a 3.7 percent reduction in *Botrychium ascendens* EOs. In addition, based on the broad spatial distribution of the EOs, and the species' preference for disturbed habitats, additional *Botrychium ascendens* sites are likely to be present in the state.

**Table 2          Summary of *Botrychium ascendens* Element Occurrences from NHIS database**

| Element Occurrence ID | Number of locations/points associated with EO | Population Information <sup>1</sup>                                     |
|-----------------------|---|---|
| 33081                 | 1   | No population information provided.                                     |
| 33084                 | 1   | No population information provided.                                     |
| 34959                 | 1   | 5 plants.   |
| 34960                 | 1   | 7 plants.   |
| 36641                 | 1   | 1 plant.  |
| 37052                 | 1   | 100s of plants.   |
| 37127                 | 1   | 100s of plants in one location; 20 plants in each of 2 other locations. |
| 37128                 | 1   | 100 plants.   |
| 37129                 | 1   | 4 plants.   |
| 37130                 | 1   | 1 plant.  |
| 37131                 | 1   | 56 plants.  |
| 37132                 | 1   | 2012: 4 plants. 2013: 3 plants.   |
| 37133                 | 1   | 2012: 6 plants. 2013: 100 plants.                                       |
| 37134                 | 1   | 2 plants.   |
| 37135                 | 1   | 1 plant.  |
| 37356                 | 1   | 15 plants.  |
| 37357                 | 1   | 85 plants.  |
| 37358                 | 1   | 6 plants.   |

| Element Occurrence ID | Number of locations/points associated with EO | Population Information <sup>1</sup> |
|-----------------------|---|-------------------------------------|
| 37359                 | 1   | 2 plants.                           |
| 37360                 | 1   | 2 plants.                           |
| 37361                 | 1   | 20 plants.                          |
| 37362                 | 1   | 30 plants.                          |
| 37847                 | 1   | 5 plants.                           |
| 37848                 | 1   | 11 plants.                          |
| 37849                 | 1   | 1 plant.                            |
| 38269                 | 1   | 2 plants.                           |
| NEW EO <sup>2</sup>   | 1   | 33 plants.                          |

<sup>1</sup>This information was obtained from the "gendesc" and "eo\_data" fields in the NHIS database.

<sup>2</sup>This is the new population found at the NorthMet Site in 2018.

The NHIS database EOs include site descriptions and plant associations for each population recorded. The primary habitat type described in the NHIS database EOs for *Botrychium ascendens* is disturbed sites including old fields, old homesteads, roadsides, and tailings areas. Nearly all of the EO records that include habitat descriptions meet this habitat type. These disturbed areas are typified by primarily early-successional weedy invasive species or very sparse growth of mixed native/non-native species with small regenerating aspen or birch seedlings and extensive lichen-moss coverage. This is consistent with the habitat for the *Botrychium ascendens* found at the NorthMet site.

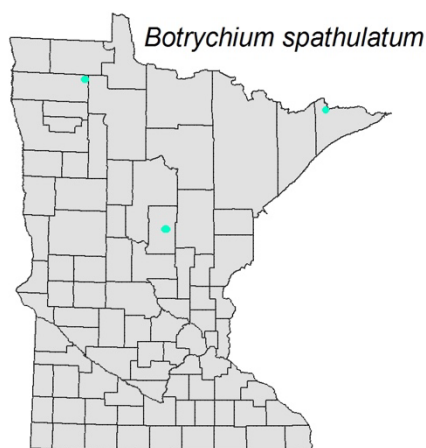
Twenty-two of the 26 previously recorded EOs for *Botrychium ascendens* listed in the NHIS records are located on public lands. Ownership of the other four EOs is listed as "unknown", "private organization", or "Native institution" according to the NHIS records. The majority of the public land is owned by the DNR Forestry or Wildlife, as State Forest or Consolidated Conservation Lands. The new EO from the 2018 survey is located on private land.

## 5.0 Life History, Distribution and Habitat of *Botrychium spathulatum* in Minnesota

As noted in the Section 4.0, there are 20 species of *Botrychium* found in Minnesota (DNR 2013b). A description of the general life cycle of species in the genus *Botrychium*, which includes *Botrychium spathulatum*, is provided above in Section 4.0.

The statewide and regional presence of *Botrychium spathulatum* was evaluated using the DNR NHIS database. The NHIS database indicates that there are five EOs of *Botrychium spathulatum*, which are located in three counties including Crow Wing, Marshall, and Cook. Three of the five EOs for *Botrychium spathulatum* are located in Crow Wing County. It is assumed the *Botrychium spathulatum* found in the 2018 survey is a new EO, therefore, the total number of EOs in the state would be 6. The statewide distribution of NHIS database EOs for *Botrychium spathulatum* is shown on Figure 3. Population information for *Botrychium spathulatum* is summarized in Table 3.

**Figure 3** *Botrychium spathulatum* Element Occurrences in NHIS



Spatial distribution of the EOs for *Botrychium spathulatum* in the state is unusually broad but sparse, and crosses into two of the state's four ecological provinces (Laurentian Mixed Forest Province and Tallgrass Aspen Parklands Province; DNR 2018c). The five EOs extend from the upper Arrowhead, across the state to the edge of the Tallgrass Aspen Parklands province, and south to the center of the state. The NHIS database does not consistently provide population numbers for the NHIS records within a given EO as identified in Table 3, for some of the same reasons discussed in Section 3.0. Therefore, the Project impact to *Botrychium spathulatum* is best estimated in terms of the number of EOs affected.

Based on the presence of five previously recorded EOs for *Botrychium spathulatum*, and the addition of a sixth EO, removal of one EO would result in a 16.5 percent reduction in *Botrychium spathulatum* EOs. In addition, based on the broad spatial distribution of the EOs, and the species' preference for disturbed habitats, additional *Botrychium spathulatum* sites are likely to be present in the state.

**Table 3**      **Summary of *Botrychium spathulatum* Element Occurrences from NHIS database**

| Element Occurrence ID | Number of locations/points associated with EO | Population Information <sup>1</sup> |
|-----------------------|---|-------------------------------------|
| 33083                 | 1   | No population information provided. |
| 38251                 | 1   | At least 6 plants.                  |
| 34967                 | 1   | 2008: 5 plants. 2012: 1 individual. |
| 39576                 | 1   | The plant was observed.             |
| 39575                 | 1   | The plant was observed.             |
| NEW EO <sup>2</sup>   | 1   | 6 plants.                           |

<sup>1</sup>This information was obtained from the "gendesc" and "eo\_data" fields in the NHIS database.

<sup>2</sup>This is the new population found at the NorthMet Site in 2018.

The NHIS database EOs for *Botrychium spathulatum* include site descriptions and plant associations for each population recorded. One primary habitat type, disturbed, was identified from the NHIS database EOs for *Botrychium spathulatum*. In the case of the NHIS records for *Botrychium spathulatum*, it refers primarily to old tailings basins, roadsides, and transmission rights-of-way. These areas are typically characterized by primarily weedy invasive species or very sparse growth of mixed native/non-native species with small regenerating aspen or birch seedlings and extensive lichen-moss coverage.

Four of the five previously recorded EOs for *Botrychium spathulatum* are located on public lands. The fifth EO also appears to be on public land (Crow Wing State Forest), but is listed in the NHIS records as owned by a "private organization". Owners of the other four EO sites include the DNR Wildlife, DNR Parks & Recreation, Thief Lake Wildlife Management Area (WMA), and the U.S. Forest Service. The new EO from the 2018 survey is located on private land.

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## 6.0 Consideration of Alternatives, Avoidance, and Minimization

Minnesota Statute 84.0895 (Protection of Threatened and Endangered Species) and Minnesota Rule 6212.1800 to 6212.2300 (Threatened and Endangered Species Regulations) regulate the taking of endangered or threatened species in Minnesota. The statute and rules permit the DNR to issue permits to applicants authorizing the take of such species under specified conditions. DNR guidance (DNR 2018d) requires that, before any permit is issued, “alternatives to the project that have been considered and rejected, including a no action alternative, and why they were rejected,” and that the applicant provides “a summary of efforts that are planned to avoid and/or minimize the take of endangered or threatened species”.

As discussed in detail below, PolyMet and Barr have consulted the data obtained from the sensitive plant species surveys conducted in the Project area to evaluate the possibility of altering the Project design to avoid or minimize impacts to listed species. Due to the scale of the Project, and the distribution of listed species located within the Project limits, there are no feasible design modifications that would avoid or minimize effects on the listed plant species.

The following sections provide information on how alternatives, including the No Action alternative, were developed and evaluated and the sequencing of steps taken by PolyMet to consider modifying the project to avoid adverse impacts, and incorporating measures to minimize adverse impacts.

### 6.1 Alternatives Analysis

For a comprehensive analysis of the full range of alternatives explored and evaluated during the Environmental Review Process, see Section 3.0 of the final FEIS (DNR et al. 2015). Section 3.0 of the final EIS includes the Proposed Action and Alternatives, describes the Proposed Action for the Project, including the Land Exchange Proposed Action, and alternatives including the No Action Alternative, Land Exchange Alternative B, as well as alternatives considered but eliminated from detailed consideration in the EIS.

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

### 6.2 Avoidance and Minimization

Regulations and guidelines associated with the DNR Endangered and Threatened Species Permit require that project proponents describe the reasonable and practicable avoidance and minimization efforts that have been and will be implemented as part of the Project.

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Geology dictates the location and dimension of the mine pits. The polymetallic ore bodies of the NorthMet deposit can be developed only where the mineral resource exists in economically minable quantities. Extensive exploration programs have been conducted to define the resource, which has allowed a refinement of the pit locations. These studies indicate that the ore reserves identified as the East Pit, Central Pit, and West Pit are the areas where polymetallic ore quality and the distribution and amount of waste rock make mining economically feasible. See Section 3.0 in the final FEIS (DNR et al. 2015) for additional information.

Although avoidance of impacts to Endangered and Threatened Species is infeasible, the project will employ numerous methods to minimize impacts. Alternatives to minimize impacts are described in Sections 6.4, 6.5, and 6.6 of the Wetland Replacement Plan (PolyMet 2017). In addition, these minimization efforts were also described in the *Final Environmental Impact Statement: NorthMet Mining Project and Land Exchange* (final FEIS; DNR et al. 2015). Minimization alternatives use the following general strategies:

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

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## 7.0 Location and Species to be Taken

The location of the *Caltha natans*, *Botrychium ascendens*, and *Botrychium spathulatum* populations to be taken is shown on Large Figure 3 in Appendix B.

The impacts to these three vascular plant species, as described in Sections 3.0, 4.0 and 5.0, would be direct and permanent to the specific plants identified in the 2018 endangered, threatened or special concern survey. As no additional individuals of these species were identified in the vicinity of the Project's 2018 survey area, there would be no indirect or temporary impacts to other individuals or populations within the EOs of the three affected species.

No other state-listed plant species will be taken by the Project. A description of the mitigation plan to compensate for this unavoidable loss is presented in the following section.



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## 8.0 Proposed Mitigation Measures

Where there is no feasible alternative to taking a listed species, the DNR has permitted taking of species based on compensatory mitigation to reduce the impact of the loss of the population. Compensatory mitigation strategies have included:

- funding of the state acquisition of another site where the species occurs
- funding additional survey work to locate other sites
- funding research to develop better understanding of the species

For the two *Botrychium* species, funding of the state acquisition of another site where the species occurs is not feasible. This is because over 80 percent of the known sites for these two species are already located on public land. Half of the known *Caltha natans* sites are also located on publicly-owned lands.

As part of the NorthMet Mining Project and Land Exchange EIS – Record of Decision (DNR 2016), item 167 requested that PolyMet should explore a mitigation measure for vegetation that included “Purchase of an unprotected site with a population of *Caltha natans* should be assessed as mitigation, since the statewide population is lower than the other ETSC species affected”. In response to this request, PolyMet considered the purchase of an unprotected *Caltha natans* site elsewhere. However, the challenge to acquiring such a site is the limited distribution of *Caltha natans* in the state. There are 16 EOs of the species statewide, all in St. Louis County. The limited availability of suitable sites makes a purchase option by PolyMet unfeasible.

Moreover, in the case of *Botrychium*, the option to fund surveys to locate additional sites does not provide reliable compensation for the population reductions or losses. Further field studies to locate new populations cannot be relied upon to locate new sites, due to the small, cryptic nature of *Botrychium* as a genus. In addition, the life cycle of *Botrychium* species includes extensive periods underground, with no visible surface features. This characteristic of the genus confounds the findings of field surveys designed to establish the presence or absence of *Botrychium* species by reducing their level of certainty. As a result, the more preferable mitigation strategy for *Botrychium*, at this point in time, is to fund research on the life cycle, population ecology and community ecology of known *Botrychium* locations.

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## 9.0 Summary

Two populations of *Caltha natans* (7 plants), one population of *Botrychium ascendens* (33 plants), and one population of *Botrychium spathulatum* (6 plants) occur in a part of the Project area that will be disturbed. Removal of these populations is unavoidable, direct and permanent, due to the scale and design of the proposed Project. There would be no additional indirect or temporary impacts to any other individuals or populations of any of the three affected species. PolyMet will work with the DNR to agree upon acceptable mitigation measures for the loss of these plants.

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## 10.0 References

- Barr Engineering Co. (Barr). 2007. Results of Autumn 2007 Field Surveys for *Botrychium rugulosum* at PolyMet Mine Site Technical Memorandum to Rich Baker, DNR. November 7, 2007.
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- . 2011. Summaries of Sensitive Species Surveys Conducted by MNRI and Additional Sensitive Species Locations from the DNR NHIS Database.
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- . 2013b. Minnesota Department of Natural Resources Plant Checklist – November 2013. Division of Ecological and Water Resources.
- . 2016. NorthMet Mining Project and Land Exchange EIS – Record of Decision. March 3, 2016.
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[https://www.dnr.state.mn.us/nhnrp/endangered\\_permits.html](https://www.dnr.state.mn.us/nhnrp/endangered_permits.html)

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.

Poly Met Mining, Inc. 2017. Wetland Replacement Plan. December 2017.

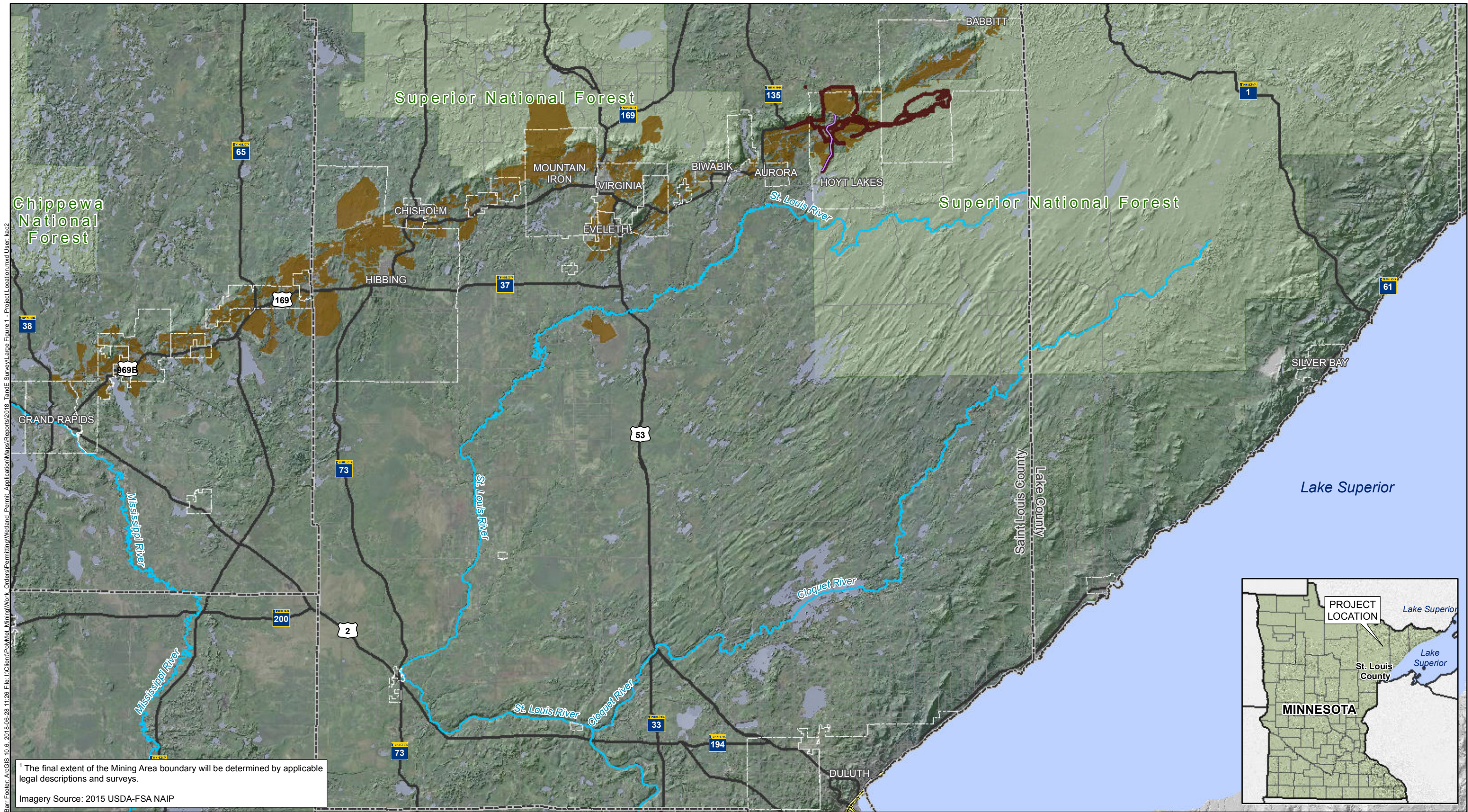
—. 2018. News Release: PolyMet completes 6700-acre land exchange with U.S. Forest Service. June 28, 2018.

Pomroy, Deborah and Raymond Barnes. 2004. 2004 Rare Plant Survey at the PolyMet Mine Site Located in T59N R13W.

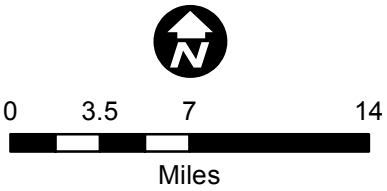
Walton, Gary. 2004. Data Summary: Rare Plant Survey.

## Large Figures





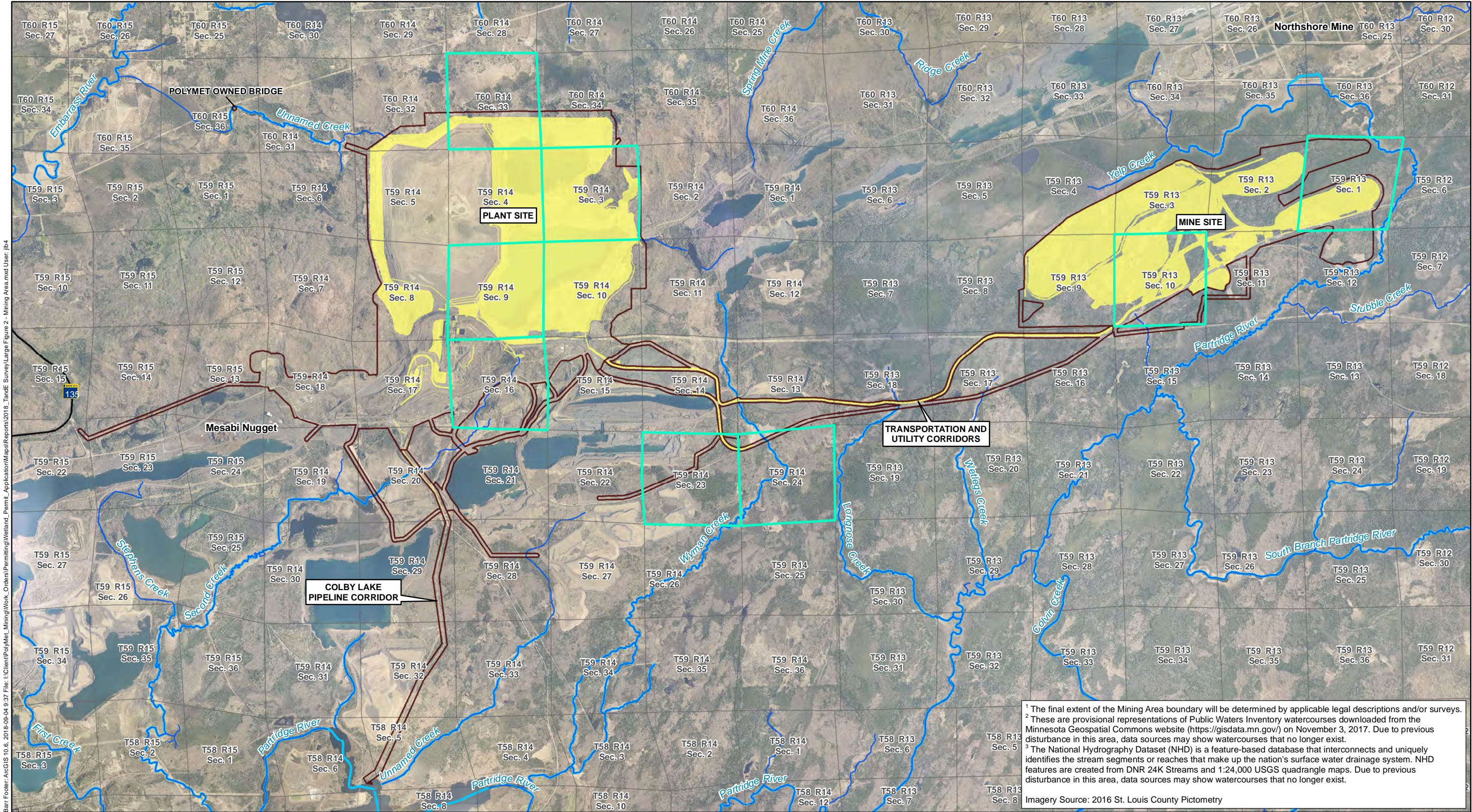
- Mining Area<sup>1</sup>
- Mesabi Iron Range
- National Forest Boundary
- County Boundaries
- City Boundaries
- Major River
- Lakes



PROJECT LOCATION  
NorthMet Project  
Poly Met Mining, Inc.

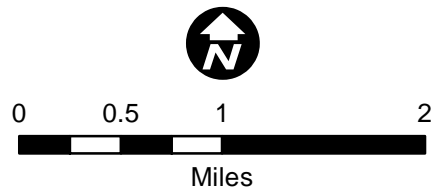
Large Figure 1  
Takings Permit Application





Barr Footer: ArcGIS 10.6, 2018-09-04 9:37 File: I:\Client\PolyMet\_Mining\Work\_Orders\Permitting\Wetland\_Permit\_Application\Map\LargeFigure2\_MiningArea.mxd User: jlb4

- Mining Area<sup>1</sup>
- Construction/Disturbance Areas
- Survey Areas
- Section Lines
- Public Waters Inventory (PWI) Watercourses<sup>2</sup>
- National Hydrography Dataset (NHD) Rivers & Streams<sup>3</sup>



MINING AREA  
NorthMet Project  
Poly Met Mining, Inc.

Large Figure 2  
Takings Permit Application

<sup>1</sup> The final extent of the Mining Area boundary will be determined by applicable legal descriptions and/or surveys.  
<sup>2</sup> These are provisional representations of Public Waters Inventory watercourses downloaded from the Minnesota Geospatial Commons website (<https://gisdata.mn.gov/>) on November 3, 2017. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
<sup>3</sup> The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from DNR 24K Streams and 1:24,000 USGS quadrangle maps. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
Imagery Source: 2016 St. Louis County Pictometry



## Appendices



## Appendix A

### Sensitive Plant Species Survey Work Plan

## Technical Memorandum

**To:** Lisa Joyal – DNR Ecological Services  
**From:** Cheryl Feigum; Daniel Jones, Salix Environmental LLC  
**Subject:** Work Plan – Sensitive Plant Species Survey  
**Date:** May 24, 2018  
**Project:** 23690862.11  
**c:** Brad Moore and Kevin Pylka, Poly Met Mining, Inc.

The purpose of this technical memorandum is to describe the work plan that Barr Engineering Company (Barr) is proposing for conducting a sensitive plant species survey for Poly Met Mining, Inc. (PolyMet) in support of permitting requirements for the NorthMet Mine and Ore Processing Facilities Project (Project). Prior to initiating this survey, Barr is providing the Minnesota Department of Natural Resources (DNR) with this work plan, to ensure that the survey and report are based on DNR-approved methods.

The Project is located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, and 6 miles south of Babbitt, Minnesota (Large Figure 1). The main Project components include the Mine Site and the Plant Site, which includes the tailings basin and plant processing facilities (Large Figure 2). The Mine Site and the Plant Site will be connected by the Transportation and Utility Corridors. An additional pipeline corridor (Colby Lake Pipeline Corridor) will supply water to the Plant Site when needed. The area of land that encompasses these Project components is referred to as the Mining Area (Large Figure 2). Large Figure 3 identifies the areas of construction/disturbance that will occur in the Mining Area.

The Mining Area is located within the Laurentian Uplands and the Nashwauk Uplands subsections of the Laurentian Mixed Forest province (DNR 2018a) and contains a combination of habitats, from highly disturbed former mining and industrial areas to less-disturbed wetlands and mixed hardwood-conifer forested uplands.

### 1.0 Previous Sensitive Plant Species Surveys

PolyMet conducted several sensitive plant species surveys in the vicinity of the Mining Area in order to identify whether any vascular plant species listed by the state of Minnesota as endangered or threatened were present. These surveys are summarized below and the areas where the surveys were conducted are shown on Large Figure 4.

- Foth & Van Dyke Associates, Inc. conducted a sensitive plant species survey in Sections 2, 3, and 10 of Township 59N and Range 13W in 1999, prior to on-site mineral exploration by PolyMet (Foth & Van Dyke Associates, Inc. 1999). No state endangered or threatened vascular plant

species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).

- Cindy Johnson-Groh conducted a sensitive plant species survey in Sections 2, 3, 10, 11, and 16 of Township 59N and Range 13W in July 2004 to assess the presence of *Botrychium* species in the vicinity of the Project (Johnson-Groh 2004). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Deborah Pomroy conducted a sensitive plant species survey in Sections 3, 4, 9, and 10 of Township 59N and Range 13W in spring 2004 (Pomroy and Barnes 2004). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Gary Walton conducted a sensitive plant species survey in Sections 1, 2, 11, and 12 of Township 59N and Range 13W in spring 2004 (Walton 2004). This survey documented one state-endangered plant species, *Caltha natans* (floating marsh marigold). *Caltha natans* was documented in five locations in the Mine Site (Sections 1 and 10 of Township 59N, Range 13W) and in eight locations adjacent to the Mine Site (Sections 1, 11, and 12 of Township 59N, Range 13W) (Table 1). *Caltha natans* was only documented in one location where there will be Project disturbance/construction (Category 2/3 Waste Rock Stockpile) within the Mine Site (Section 1 of Township 59N and Range 13W). Therefore, adverse impacts to this *Caltha natans* population is expected from the Project.
- Daniel Jones conducted a sensitive plant species survey for *Botrychium* species in Sections 1, 2, 3, 9, 10, and 11 of Township 59N and Range 13W along the internal road network at the Mine Site; and in Sections 1, 9, 10, and 11 of Township 59N and Range 13W along Dunka Road adjacent to the Mine Site (Barr 2007). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Daniel Jones conducted a sensitive plant species survey in Sections 16, 17, and 18 of Township 59N and Range 13W and Sections 13, 14, and 15 of Township 59N and Range 14W along Dunka Road and the proposed pipeline alignment from the west end of the Mine Site to the Plant Site in June and July 2008 (Barr 2012). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Midwest Natural Resources Inc. conducted a sensitive plant species survey in Sections 3, 4, 5, and 9 of Township 59N and Range 13W in 2008 (Barr 2011). No state endangered or threatened

vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).

- Daniel Jones conducted a sensitive plant species survey in Sections 3-10, 14, 15, and 17 in Township 59, Range 14 and Sections 32-34 in Township 60, Range 14W within the Plant Site in 2017 (Barr 2017). The initial survey results identified one state-endangered plant species, *Botrychium ascendens* (upswept moonwort), and one state-threatened plant species, *Botrychium lunaria* (common moonwort). Both *Botrychium* species were documented at the Plant Site (Section 33 of Township 60N, Range 14W). However, the DNR State Botanist determined that the *Botrychium ascendens* was *Botrychium pallidum* (special concern), and that the *Botrychium lunaria* identification could not be conclusively verified. The survey also identified *Botrychium ascendens* in the processing area (Section 9 of Township 59N, Range 14W). However, the DNR State Botanist determined that the identification could not be conclusively verified. As a result of the survey and the DNR verifications, there is no verified presence of endangered or threatened plant species at the Plant Site per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).

## 2.0 Proposed Work Plan

Barr submitted an application on behalf of PolyMet on November 28, 2017, for a Permit to Take Endangered or Threatened Species associated with the *Caltha natans* population identified in 2004 by Gary Walton in the south end of the Category 2/3 Waste Rock Stockpile (Section 1 of Township 59N, Range 13W; Large Figure 5). On April 18, 2018, the DNR issued comments regarding PolyMet's 2018 application for a Permit to Take Endangered or Threatened Species (DNR 2018b). The DNR comments stated that because the Project footprint has been modified several times since the Project was first proposed, surveys for *Caltha natans* and *Botrychium* species should be conducted in June 2018 (DNR 2018b).

The proposed work plan for conducting these sensitive plant species surveys for *Caltha natans* and *Botrychium* species is summarized below and follows the DNR's 2015 *Guidance on Documenting and Collecting Rare Plants* (DNR 2015), 2016 *Rare Species Survey Process* (DNR 2016a), 2016 *Rare Species Survey Proposals and Reports* (DNR 2016b), and the Endangered and Threatened Species permit website (DNR 2018c).

### 2.1 Pre-field Research and Preparation

The sensitive plant species survey will only include *Caltha natans* and state endangered or threatened *Botrychium* species. The state endangered and threatened *Botrychium* species likely to be found in St. Louis County are summarized in Table 1.

**Table 1. State Endangered and Threatened *Botrychium* Species Likely to be found in St. Louis County, MN**

| Scientific Name               | Common Name              | Minnesota Status | Habitat  |
|-------------------------------|--------------------------|------------------|--|
| <i>Botrychium ascendens</i>   | Upswept moonwort         | Endangered       | Disturbed areas; road sides                                    |
| <i>Botrychium lanceolatum</i> | Narrow triangle moonwort | Threatened       | Moist rich maple-basswood forest                               |
| <i>Botrychium lineare</i>     | Slender moonwort         | Endangered       | Gravel roadsides, meadows, seeps, terraces of limestone cliffs |
| <i>Botrychium lunaria</i>     | Common moonwort          | Threatened       | Disturbed areas; gravel banks                                  |
| <i>Botrychium mormo</i>       | Goblin fern              | Threatened       | Rich mesic maple-basswood forest                               |
| <i>Botrychium oneidense</i>   | Blunt-lobed grapefern    | Threatened       | Mesic hardwood forest, low areas                               |

Based on the habitat information obtained for the state endangered and threatened *Botrychium* species, the survey will focus on *Botrychium ascendens*, *Botrychium lineare*, and *Botrychium lunaria*, as suitable habitat for these species is present within the Mining Area (in disturbed areas and along roadsides). Since the hardwood forest habitat suitable for *Botrychium lanceolatum*, *Botrychium mormo*, and *Botrychium oneidense* species is not likely to be present in the Mining Area, these species are not likely to be found in the Mining Area, and therefore would not be part of the survey effort.

### 2.1.1 Proposed 2018 Survey Area for *Caltha natans*

Re-surveys for *Caltha natans* will be conducted within the Mining Area where both of the following conditions are met: 1) *Caltha natans* was previously documented in 2004 (Large Figure 4); and 2) Project construction/disturbance will occur (Large Figure 4). Areas to be re-surveyed for *Caltha natans* are located in Sections 1 and 10 of Township 59N and Range 13W (Large Figure 5).

Surveys for *Caltha natans* will be also be conducted within the Mining Area where all three of the following conditions are met: 1) areas that were not previously surveyed (Large Figure 4); 2) areas where suitable habitat exists (shallow (2 to 2.5 feet deep), slow-moving water in streams, creeks, pools, ditches, sheltered lake margins, swamps, and beaver ponds); and 3) Project construction/disturbance will occur (Large Figure 4). Additional areas to be surveyed for *Caltha natans* are located in Section 3 of Township 59N and Range 14W (Large Figure 5).

### 2.1.2 Proposed 2018 Survey Area for *Botrychium*

Re-surveys for state endangered or threatened *Botrychium* species will be conducted within the Mining Area where both of the following conditions are met: 1) state endangered or threatened *Botrychium* species were documented in 2017, but the identifications were inconclusive (Large Figure 4); and 2) Project construction/disturbance will occur (Large Figure 4). Areas to be re-surveyed for state endangered

or threatened *Botrychium* species are located in Section 9 of Township 59N and Range 14W and Section 33 of Township 60N and Range 14W (Large Figure 5).

Surveys for state endangered or threatened *Botrychium* will also be conducted within the Mining Area where all three of the following conditions are met: 1) areas that were not previously surveyed (Large Figure 4); 2) where suitable habitat exists (disturbed areas/roadsides); and 3) Project construction/disturbance will occur (Large Figure 4). Additional areas to be surveyed for state endangered or threatened *Botrychium* are located in Sections 16, 23, and 24 of Township 59N and Range 14W (Large Figure 5).

## **2.2 Survey Information**

The survey areas for *Caltha natans* and state endangered or threatened *Botrychium* species are described in Sections 2.1.1 and 2.1.2, respectively, and shown on Large Figure 5. The approximate timeframe for the survey will be between late-June and mid-July 2018, depending on phenology. Rationale for the survey timeframe will be provided in the report (see Section 2.3).

### **2.2.1 Botanists**

The sensitive plant species survey will be led by Barr subcontractor, Daniel Jones of Salix Environmental LLC. Daniel Jones is listed on the DNR's "General List of Botanical Consultants for hire" document, and is on the DNR's list of qualified *Botrychium* surveyors. Daniel Jones will be assisted by Dan Engel, who is not a DNR-certified botanist, however he has been completing vegetation surveys in northern Minnesota since 2004 and has assisted Daniel Jones with sensitive plant species surveys since 2011.

### **2.2.2 Field Work**

At the beginning of the sensitive plant species survey, the botanists will make an initial reconnaissance of the survey areas to identify vegetative cover and best habitat conditions for listed species. They will then conduct a more comprehensive botanical survey, utilizing intuitive meander search patterns to search for *Caltha natans* and state endangered and threatened *Botrychium* species and to evaluate the site's potential for supporting these listed species. This type of search pattern is essentially a meandering traverse, focusing on the specific habitats and plant associations of listed species. Over the course of the survey, the botanical team will compile lists of vascular plant species observed. This is not intended to be a complete floristic study of the site; rather, it will provide additional background information on vascular plant species in the Project area.

### **2.2.3 Sampling and Recording Procedures**

The methods proposed follow DNR's 2015 *Guidance on Documenting and Collecting Rare Plants* (DNR 2018) during sensitive plant species surveys. If any sensitive plant species are located during the survey, they will be documented using the following procedures:

- 1) The location(s) of sensitive plant species will be flagged using bright fluorescent tape.

- 2) A handheld GPS unit will be used to obtain UTM coordinates of the site. Standard quarter-quarter section legal descriptions will also be recorded.
- 3) At least two digital photographs of the sensitive plant species will be taken.
- 4) Habitat, associated species, population size, phenology, and other pertinent data will be recorded.
- 5) Collection of sensitive plant species samples will follow the DNR's 2015 *Guidance on Documenting and Collecting Rare Plants* (DNR 2015), as it pertains to *Caltha natans* and *Botrychium* species. This guidance includes the following methods for field collections:
  - a. No more than one individual of a particular species will be collected per 40 acres of habitat.
  - b. A new voucher will be collected if the DNR's Rare Features Database indicates that it has been more than 30 years since the last voucher was collected from the population.
  - c. Collections will only be made when distinguishing characters are present.
  - d. Full-plant collections (roots and above-ground portions) will be made only from populations with more than 100 individuals.
  - e. In populations of less than 100, only the distinguishing portion of the plant will be collected, and a close-up photograph will be taken.
  - f. For *Botrychium* species, an above-ground portion of the plant will be collected regardless of population size or state status of the species.
  - g. For aquatic species, only the portion of the stem with leaves and fruits or flowers will be collected. No roots will be collected.

Identification of plant species will follow taxonomic keys and references that are the currently acknowledged standards in field botany. All specimens collected will be pressed as early after collection as is practicable, and dried following standard accepted practices for drying and preserving vascular plant specimens. The botanists will prepare herbarium labels for each specimen, and submit all collected specimens to DNR within 3 months of collection for verification by the DNR State Botanist.

In addition, the botanists conducting the survey will follow the DNR's recommendation for the identification of state endangered and threatened *Botrychium* species, as outlined in the DNR's April 18, 2018 comments regarding PolyMet's 2018 application for a Permit to Take Endangered or Threatened Species (DNR 2018b). The DNR stated the following:

"Since the identification of *Botrychium* species can be challenging, we recommend that surveyors plan to be in daily contact with DNR staff to agree on procedures for resolving any uncertainty that may

arise during the survey. These procedures may include collecting more vouchers than would usually be required, providing a DNR representative to accompany the surveyor in the field, and/or seeking additional expertise on specimen identification (DNR 2018b)."

## 2.3 Reporting Procedures

Barr will prepare a report with the results of the survey for *Caltha natans* and state endangered or threatened *Botrychium* species. The report will be submitted to the DNR for review and approval (DNR 2018b). For all specimens collected, Barr will also provide a DNR Rare Features Report Form, a completed DNR Observation Database Excel file, GIS shapefiles of species locations, and photographs of collected specimens and their habitats.

## 2.4 References

- Barr Engineering Co. (Barr). 2007. Results of Autumn 2007 Field Surveys for *Botrychium rugulosum* at PolyMet Mine Site Technical Memorandum to Rich Baker, MDNR. November 7, 2007.
- . 2012. Results of Sensitive Plant Species Surveys along Dunka Road and Pipeline Route. Revised February 3, 2012.
- . 2011. Summaries of Sensitive Species Surveys Conducted by MNRI and Additional Sensitive Species Locations from the MNDNR NHIS Database.
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- Foth & Van Dyke Associates, Inc. 1999. Supplemental Site Specific Resource Information. PolyMet Mining Corporation NorthMet 1999 Exploration Project. Report Prepared for PolyMet Mining. 1999.
- Johnson-Groh, Cindy. 2004. *Botrychium* (Moonwort) Rare Plant Surveys for PolyMet Project July 2004.
- Minnesota Department of Natural Resources (DNR). 2013. Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species [Online] 2018. [http://files.dnr.state.mn.us/natural\\_resources/ets/endlist.pdf](http://files.dnr.state.mn.us/natural_resources/ets/endlist.pdf).
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- . 2018a. Ecological Classification System. [Online] 2018. <http://www.dnr.state.mn.us/ecs/index.html>.
- . 2018b. 20180418 Response to NorthMet Taking Permit Application. April 18, 2018.



**To:** Lisa Joyal – DNR Ecological Services  
**From:** Cheryl Feigum; Daniel Jones, Salix Environmental LLC  
**Subject:** Work Plan – Sensitive Plant Species Survey  
**Date:** May 24, 2018  
**Page:** 8

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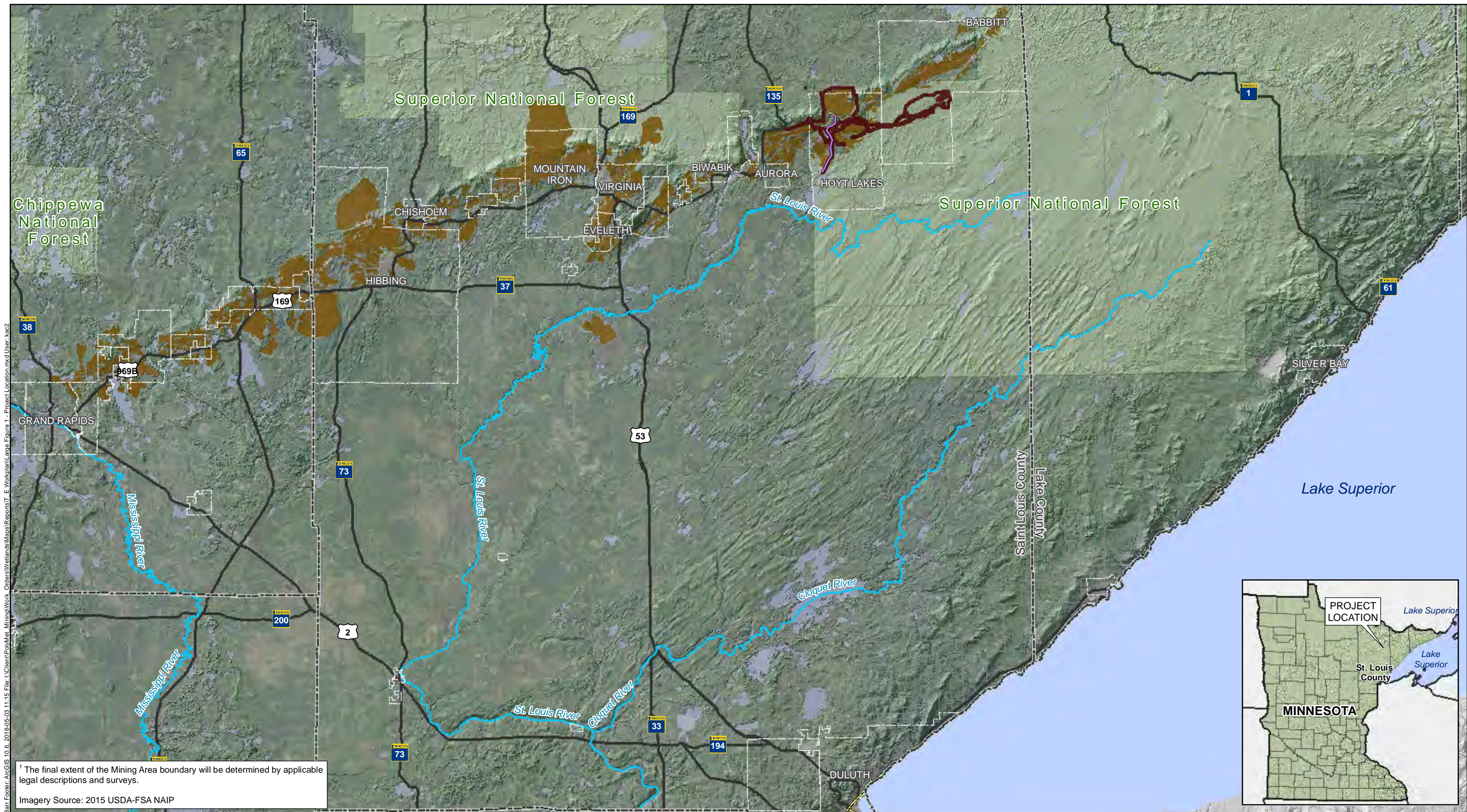
—. 2018c. Endangered and Threatened Species Permit Website. [Online] 2018.  
[http://www.dnr.state.mn.us/nhnrp/endangered\\_permits.html](http://www.dnr.state.mn.us/nhnrp/endangered_permits.html).

Pomroy, Deborah and Raymond Barnes. 2004. 2004 Rare Plant Survey at the PolyMet Mine Site Located in T59N R13W.

Walton, Gary. 2004. Data Summary: Rare Plant Survey.

## Large Figures

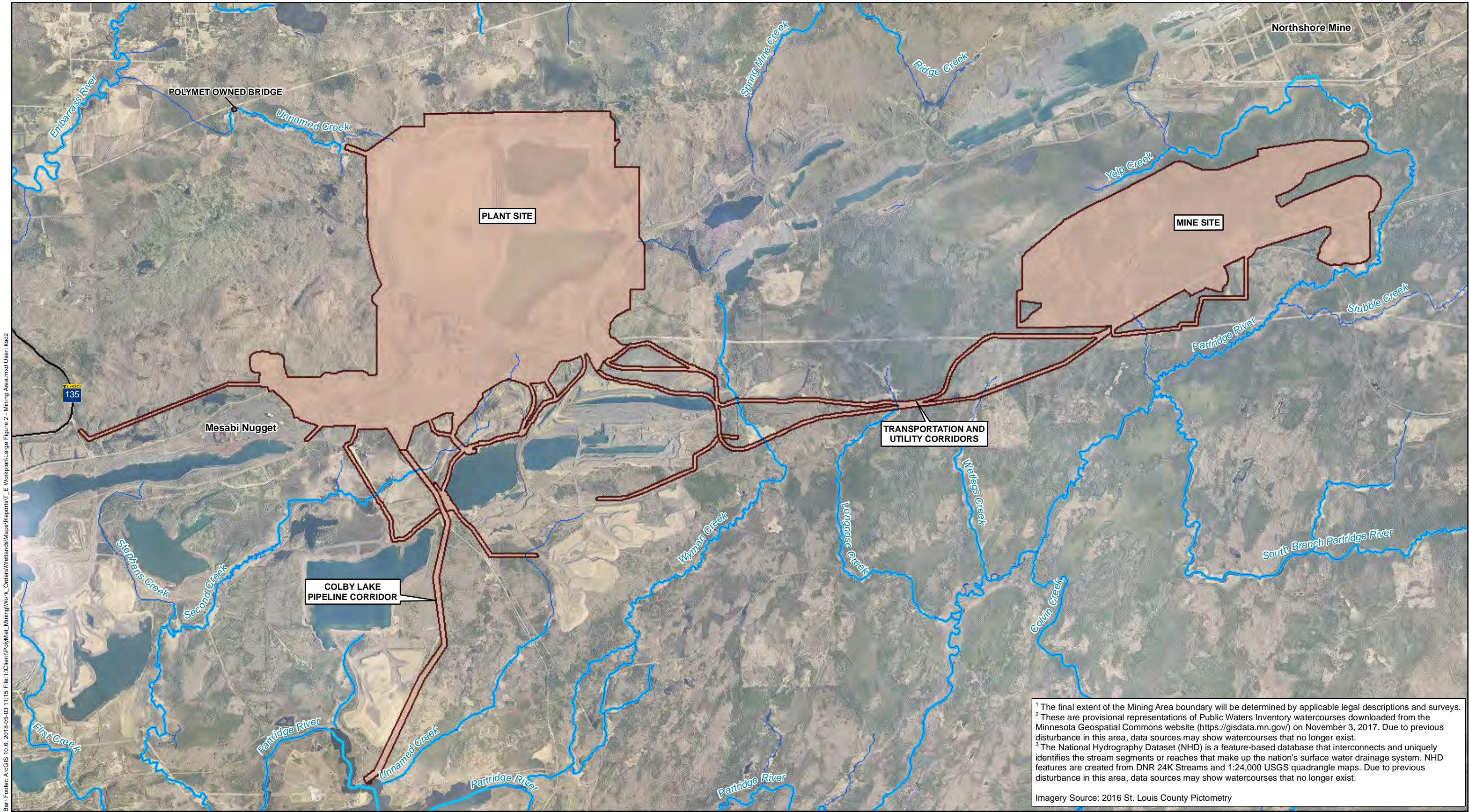




|   |               |   |
|---|---------------|---|
| <ul style="list-style-type: none"> <li> Mining Area<sup>1</sup></li> <li> Mesabi Iron Range</li> <li> National Forest Boundary</li> <li> County Boundaries</li> <li> City Boundaries</li> <li> Major River</li> <li> Lakes</li> </ul> | <br><br>Miles | <p><b>PROJECT LOCATION</b><br/> NorthMet Project<br/> Poly Met Mining, Inc.</p> |
| <p>Large Figure 1<br/> Sensitive Plant Species Survey Work Plan</p>   |               |   |



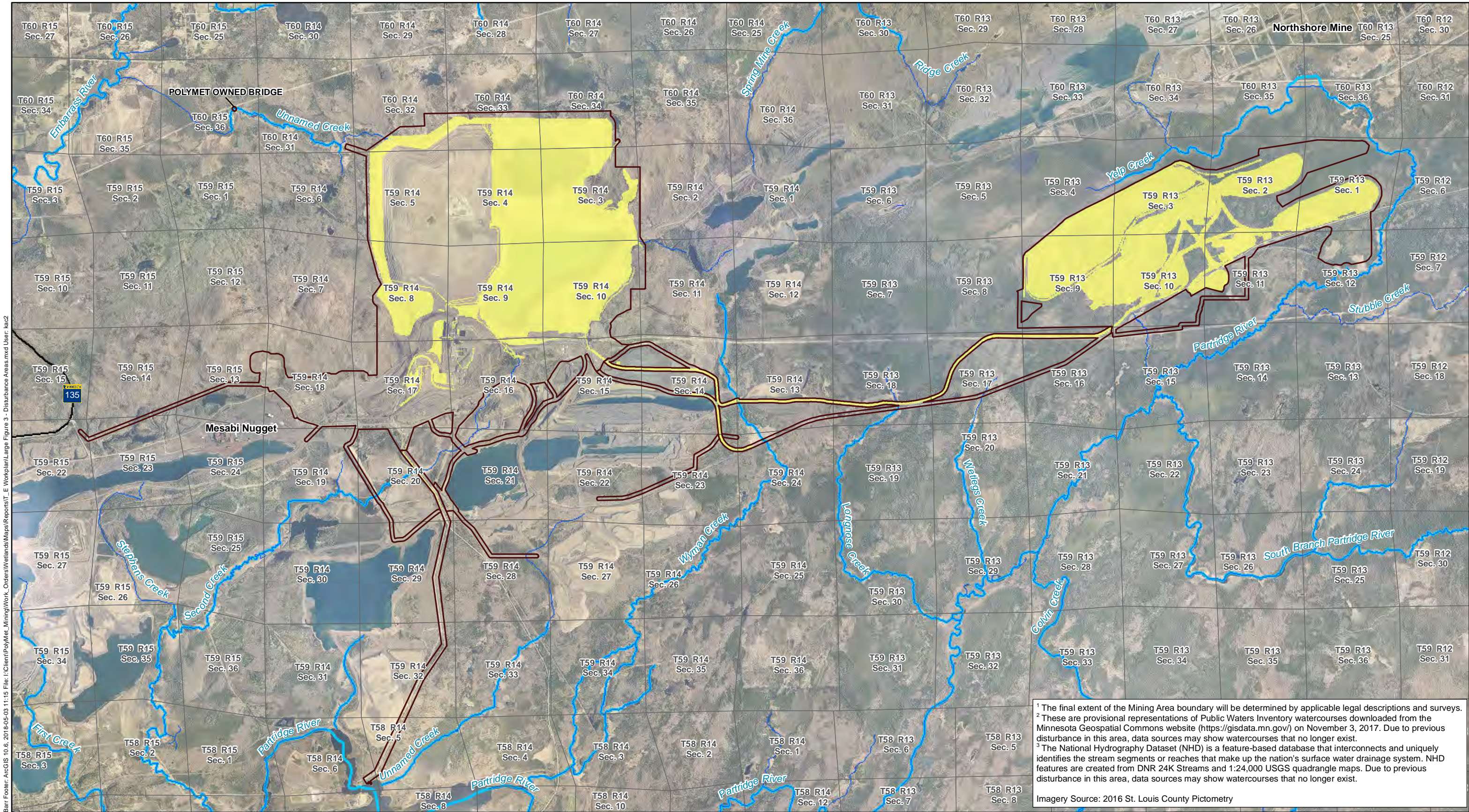
Barr Footer: ArcGIS 10.6, 2018-05-03 11:15 File: L:\Client\Polymet\_Mining\Work\_Orders\Wetlands\Maps\Reports\T\_E\_Workplan\Large Figure 2 - Mining Area.mxd User: leac2



**MINING AREA**  
**NorthMet Project**  
**Poly Met Mining, Inc.**

Large Figure 2  
Sensitive Plant Species Survey Work Plan





Barr Footer: ArcGIS 10.6, 2018-05-03 11:15 File: L:\Client\Polymet\_Mining\Work\_Orders\Wetlands\Maps\Reports\T\_E\_Workplan\Large Figure 3 - Disturbance Areas.mxd User: ka2

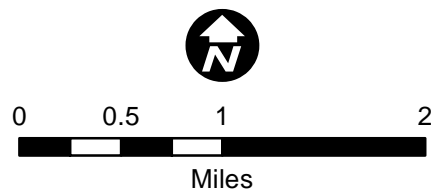
Mining Area<sup>1</sup>

Construction/Disturbance Areas

Section Lines

Public Waters Inventory (PWI) Watercourses<sup>2</sup>

National Hydrography Dataset (NHD) Rivers & Streams<sup>3</sup>

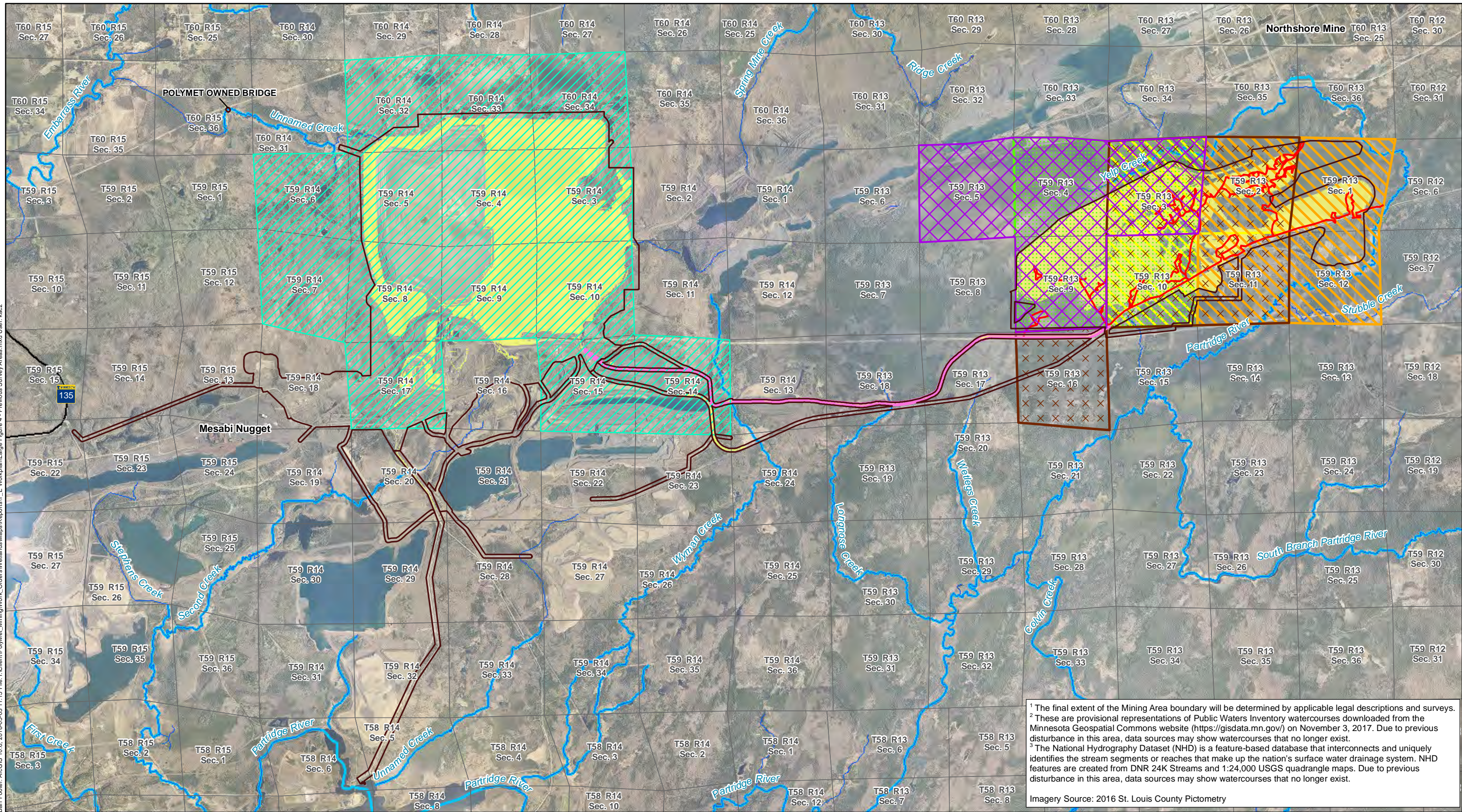


**DISTURBANCE AREAS**  
**NorthMet Project**  
**Poly Met Mining, Inc.**

Large Figure 3  
Sensitive Plant Species Survey Work Plan



Barr Footer: ArcGIS 10.6, 2018-05-03 11:15 File: L:\Client\Polymet Mining\Work Orders\Wetlands\Maps\Reports\T\_E\Workplan\Large Figure 4 - Previous Survey Areas.mxd User: kac2



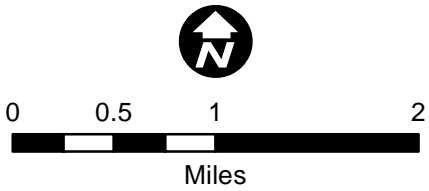
<sup>1</sup> The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys.  
<sup>2</sup> These are provisional representations of Public Waters Inventory watercourses downloaded from the Minnesota Geospatial Commons website (<https://gisdata.mn.gov/>) on November 3, 2017. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
<sup>3</sup> The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from DNR 24K Streams and 1:24,000 USGS quadrangle maps. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
Imagery Source: 2016 St. Louis County Pictometry

Mining Area<sup>1</sup>  
Construction/Disturbance Areas  
Section Lines

Public Waters Inventory (PWI) Watercourses<sup>2</sup>  
National Hydrography Dataset (NHD)  
Rivers & Streams<sup>3</sup>

Previous Botanical Surveys  
Foth & Van Dyke and Associates, Inc. (1999)  
Deborah Pomroy (Spring 2004)  
Gary Walton (Spring 2004)  
Cindy Johnson-Groh (July 2004)

Daniel Jones (2007)  
Daniel Jones (June/July 2008)  
Midwest Natural Resources Inc. (2008)  
Daniel Jones (2017)

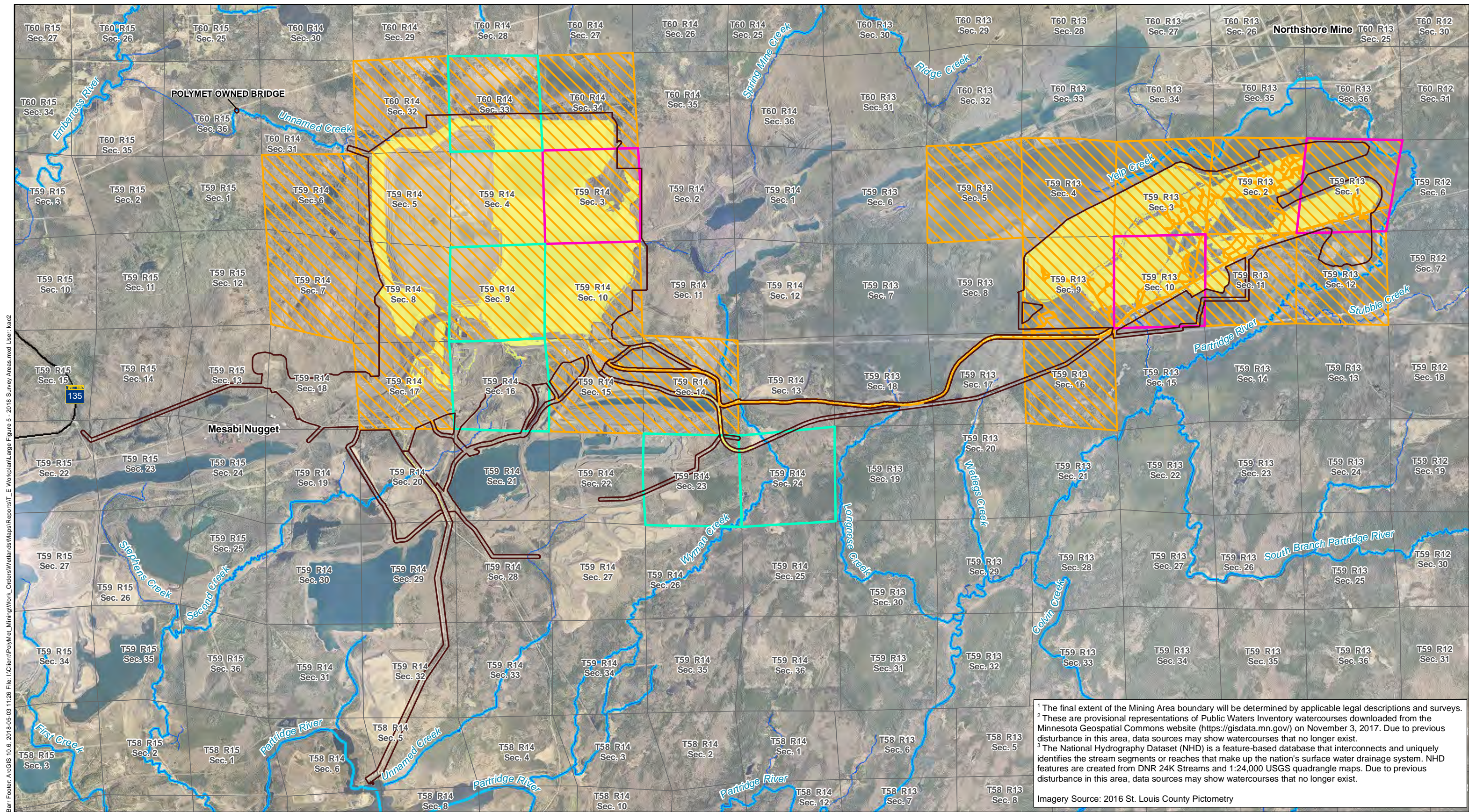


PREVIOUS SURVEY AREAS  
NorthMet Project  
Poly Met Mining, Inc.

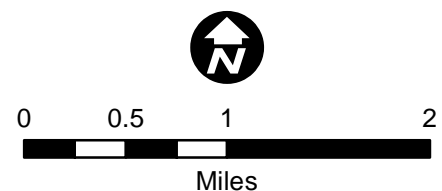
Large Figure 4  
Sensitive Plant Species Survey Work Plan



Barr Footer: ArcGIS 10.6, 2018-05-03 11:26 File: L:\Client\Polymet Mining\Work Orders\Wetlands\Maps\Reports\T\_E\Workplan\Large Figure 5 - 2018 Survey Areas.mxd User: kar2



- Mining Area<sup>1</sup>
- Construction/Disturbance Areas
- Section Lines
- Public Waters Inventory (PWI) Watercourses<sup>2</sup>
- National Hydrography Dataset (NHD) Rivers & Streams<sup>3</sup>
- Previous Botanical Surveys
- Botrychium* Survey Area
- Caltha natans* Survey Area



<sup>1</sup> The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys.  
<sup>2</sup> These are provisional representations of Public Waters Inventory watercourses downloaded from the Minnesota Geospatial Commons website (<https://gisdata.mn.gov/>) on November 3, 2017. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
<sup>3</sup> The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from DNR 24K Streams and 1:24,000 USGS quadrangle maps. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
Imagery Source: 2016 St. Louis County Pictometry

2018 SURVEY AREAS  
NorthMet Project  
Poly Met Mining, Inc.

Large Figure 5  
Sensitive Plant Species Survey Work Plan



## Appendix B

### Sensitive Plant Species Survey Report (August 2018)





# Sensitive Plant Species Survey Report

## *NorthMet Project*

Prepared for  
Poly Met Mining, Inc.

September 2018

# Sensitive Plant Species Survey Report

September 2018

## Contents

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| Appendix B | DNR Rare Feature Reporting Forms   |
| Appendix C | Representative Photographs from June 2018 Sensitive Plant Species Survey |

CD (on back cover) includes:

- Representative Photographs of Sensitive Species within the Survey Area
- DNR Observation Database Spreadsheet
- GIS Shapefile
- Electronic Version of Sensitive Plant Species Report (PDF)

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## 1.0 Executive Summary

Poly Met Mining, Inc. (PolyMet) is proposing to construct the NorthMet Project (Project), located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, and 6 miles south of Babbitt, Minnesota (Large Figure 1). The main Project components include the Mine Site and the Plant Site, which includes the tailings basin and plant processing facilities (Large Figure 2). The Mine Site and the Plant Site will be connected by the Transportation and Utility Corridors. An additional pipeline corridor (Colby Lake Pipeline Corridor) will supply water to the Plant Site when needed. The area of land that encompasses these Project components is referred to as the Mining Area (Large Figure 2). Large Figure 2 identifies the areas of construction/disturbance that will occur in the Mining Area.

Botanists Daniel Jones from Salix Environmental LLC (Salix) and Dan Engel from Barr Engineering Company (Barr) conducted a sensitive plant species survey for state-endangered *Caltha natans* (floating marsh marigold) and state-endangered or threatened *Botrychium* (moonwort) species on June 14, 15, 18, 19, and 20, 2018. The survey areas within the Mining Area are shown on Large Figure 2.

No federally-listed plant species were observed within the survey areas. State-endangered *Caltha natans*, state-endangered *Botrychium ascendens* (upswept moonwort), state-endangered *Botrychium spathulatum* (spatulate moonwort), state-special concern *Botrychium simplex* (least moonwort), and state-special concern *Botrychium campestre* (prairie moonwort) were located within the survey areas (Large Figure 3). Minnesota's endangered species law (Minnesota Statute 84.0895) and associated rules (Minnesota Rules, part 6212.1800) require a permit for the removal of state-endangered and state-threatened species (a "take permit"), but not for state-special concern species; therefore, a take permit would be required from the Minnesota Department of Natural Resources (DNR) for the *Caltha natans*, *Botrychium ascendens*, and *Botrychium spathulatum*, which are located in areas of construction/disturbance.

This report includes a discussion of methods and results from the June 2018 sensitive plant species survey. The Sensitive Plant Species Survey work plan, which was submitted to the DNR on May 24, 2018, is provided in Appendix A. Detailed information on each sensitive plant species location is provided on the DNR Rare Feature Reporting Forms in Appendix B. Representative photographs are provided in Appendix C. An attached CD (on the back cover of this report) includes an electronic version of this report, along with the DNR Observation Database spreadsheet and GIS file. All collected field specimens were submitted to the DNR on July 6, 2018. A flash drive was delivered to the DNR on July 24, 2018 with over 100 high-resolution digital photos of all collected specimens and a photograph log, which represented all the high-resolution photographs that were taken during the field work in June 2018.

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## 2.0 Project Background

The Mining Area is located within the Laurentian Uplands and the Nashwauk Uplands subsections of the Laurentian Mixed Forest province (DNR 2018a) and contains a combination of habitats, from highly disturbed former mining and industrial areas to minimally disturbed or undisturbed wetlands and mixed hardwood-conifer forested uplands.

PolyMet conducted several endangered, threatened, and special concern (ETSC) species surveys in the vicinity of the Mining Area between 1999 and 2017 in order to identify whether any vascular plant species listed by the state of Minnesota as endangered or threatened were present. These surveys are summarized in the *Sensitive Plant Species Survey Work Plan* submitted to the DNR on May 24, 2018 (Appendix A).

PolyMet originally submitted an application for a Permit to Take Endangered or Threatened Species on November 28, 2017. This application was required because a *Caltha natans* population was observed within an area of construction/disturbance by Gary Walton in 2004 (Section 1 of Township 59N, Range 13W; Large Figure 2). The DNR issued comments regarding PolyMet's 2017 application for a Permit to Take Endangered or Threatened Species on April 18, 2018, (DNR 2018b). The DNR comments stated that because the Project footprint has been modified several times since the Project was first proposed, surveys for *Caltha natans* and state-endangered or threatened *Botrychium* species should be conducted within additional areas in June 2018 (DNR 2018b).

The survey areas for *Caltha natans* and state-endangered or threatened *Botrychium* species are shown on Large Figure 3. Surveys for *Caltha natans* were conducted in Sections 1 and 10 of Township 59N and Range 13W, where it was previously documented in 2004 and where Project construction/disturbance will occur. In addition, surveys for *Caltha natans* were conducted within Section 3 of Township 59N and Range 14W in areas not previously surveyed, where suitable habitat exists, and where Project construction will occur.

Surveys for state-endangered or threatened *Botrychium* species were conducted in Section 9 of Township 59N and Range 14W and Section 33 of Township 60N and Range 14W, where state-endangered or threatened *Botrychium* species were documented in 2017, but the identifications were inconclusive. In addition, surveys for state endangered or threatened *Botrychium* were conducted within Sections 16, 23, and 24 of Township 59N and Range 14W in areas not previously surveyed, where suitable habitat exists, and where Project construction will occur.

In addition to the ETSC surveys that were conducted between 1999 and 2018 (Appendix A), PolyMet has also conducted other biological field surveys with relevant botanical components that were led or staffed by qualified botanists, several of whom hold DNR special permits to handle endangered or threatened plant species. These surveys include the following:

- A cultural landscape survey (CLS) conducted in 2010 to help satisfy the Section 106 compliance certification for the Project's U.S. Army Corps of Engineers (USACE) Section 404 permitting. The

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botanical component of the CLS included installation of approximately 50 DNR-style relevés by Barr botanical and biological staff, including several relevés installed jointly by Barr botanists and an independent botanist hired by three tribal bands of the Great Lakes Ojibwe. The CLS documented the distribution and abundance of vascular plants within the Project area and surrounding region.

- A baseline vegetation monitoring relevé installation program initiated in 2015. The purpose of the baseline vegetation monitoring program is to collect relevé-level vegetation data adjacent to the series of groundwater monitoring wells that have been installed throughout and near the Project area. The baseline data will be used in the future to detect vegetation community changes potentially influenced by groundwater level variations. Three field crews installed over 60 relevés; each crew was led by a qualified Barr botanist holding a valid MNDNR special permits to handle endangered or threatened plant species.
- A focused survey was conducted by Barr botanists and Wildlands Ecological Services former Minnesota Biological Survey (MBS) biologist Scott Zager in 2012. The purpose of the survey was to conduct detailed vegetation studies of the bogs and bog-like areas on the Project site as requested by the USACE for the Section 404 permitting.
- Finally, there have been wetland delineation efforts and refinements of those efforts since 2004. These wetland delineations included, as a required component of the USACE delineation methodology, a thorough accounting of the plant species present and their abundance.

Taken together as a complete body of botanical work, the specific ETSC surveys conducted between 1999 and 2018, along with the additional detailed field botanical studies listed above, enable PolyMet to state unequivocally that the vascular plant species composition of the Project area has been thoroughly documented by qualified professional botanists dating back nearly 20 years. If any of the field botanists had located an ETSC plant species during the course of one of the non-ETSC botanical surveys listed above, the finding would have been reported to the DNR.

Most if not all of the Project area has experienced some degree of human disturbance in the recent past. Sources of disturbance include logging and iron-ore mining. The mining activities have resulted in construction of a tailings basin and a processing plant facility with its ancillary buildings and network of haul roads and other internal roads. A high-voltage transmission line and a railroad run roughly east-west through most of the Project area. In addition, exploratory drilling and further logging have contributed to the disturbance history of the Project area. As a result, much of the Project area offers little in the way of suitable habitat to most ETSC plant species. However, the available ETSC plant habitat on the Project site also includes disturbed roadsides and graded areas that supported the former Plant operations. These types of habitats are favored by early-successional species such as those in the genus *Botrychium*.

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## 3.0 Methods

Following discussions with the DNR, Barr submitted a final *Sensitive Plant Species Survey Work Plan* to the DNR on May 24, 2018 (Appendix A). The methodology used for the sensitive plant species survey is summarized in the May 24, 2018 work plan (Appendix A).

The sensitive plant species survey was conducted on June 14, 15, 18, 19, and 20, 2018 by Daniel Jones (Salix) and Dan Engel (Barr). Daniel Jones has a current special collection permit for taking and possessing endangered or threatened species (DNR Special Permit 23224; issued June 14, 2018), is listed on the DNR's *General List of Botanical Consultants for Hire*, and is on the DNR's list of qualified *Botrychium* surveyors.

The locations of sensitive plant species observed during the sensitive plant survey were recorded using a Global Positioning System (GPS) unit to obtain geographic coordinates. Coordinates were recorded in the Universal Transverse Mercator system (Zone 15 North, meters) using the NAD83 datum. Digital photographs of the sensitive plant species were taken, and samples were collected following the DNR's *Guidance on Documenting and Collecting Rare Plants* (DNR 2018c). *Botrychium* species identified in the field were collected and submitted to DNR State Botanist Welby Smith, per the conditions of the special collection permit.

*Botrychium* species found during the sensitive plant survey were identified primarily using *Systematics of Moonworts: Botrychium Subgenus Botrychium* (Farrar 2006). A secondary source for identifying *Botrychium* was "Ophioglossaceae C. Agardh" in *Flora of North America (FNA), Volume 2: Pteridophytes and Gymnosperms* (Wagner and Wagner 1993) and *Systematics of Moonworts; Botrychium subgenus Botrychium* (Farrar 2006). *Caltha natans* identification was verified based on *Manual of Vascular Plants of Northeastern United States and Canada*, 2nd ed., Gleason and Cronquist 1991 (Gleason and Cronquist 1991).

Daniel Jones and Dan Engel made preliminary identifications of specimens of potential ETSC plant species collected in the study area. These specimens were placed in a Pacific Papers professional plant press with proper paper, blotters and ventilators. Specimens were placed in the press in as timely a manner as possible, allowing for time to examine the specimen to make an identification prior to pressing the plants. On average, collected specimens were placed into the press within 5 minutes of being removed from the soil. For each collected specimen, a series of digital photographs were taken to further aid in the species identification.

A selection of the digital photos from the June 14-15, 2018 fieldwork (Specimens S01-S06) was e-mailed to DNR State Botanist Welby Smith on June 17, 2018, as a status update on the sensitive plant species survey and to provide him with specimens for review.

Daniel Jones dried the initial set of specimens in a forced-air heat plant dryer on June 16, 2018. Drying time was approximately 2 hours. Dried specimens were then transferred, pressed within their newsprint between pieces of corrugated ventilator board, to a cool, dry location. The second set of specimens was

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collected on June 18-20, 2018 and was similarly dried and stored. The entire set of specimens was delivered to DNR State Botanist Welby Smith on July 6, 2018.



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## 4.0 Results

During the sensitive plant species survey, two locations of state-endangered *Caltha natans* were documented within the Mine Site in Section 1 of Township 59 and Range 13 (Large Figure 3). The two locations are likely parts of one larger discreet population, considering their proximity to each other and the fact that they occur in the same water body. Both locations were located within a ponded marsh and associated ditch with water depths ranging from 3 feet in the center (estimate) and 11 inches near shore. The pond is not a natural basin, and was likely excavated more than 20 years ago to assist with drainage along Dunka Road. The pond is immediately adjacent to the north edge of Dunka Road, near the security gate that separates PolyMet property from Northshore Mining property. The pond is mostly open water, with sedge and bulrush islands. Near-shore soils are saturated, with a muck substrate beginning not far from the edge of the pond.

Four *Botrychium* species were observed within the survey areas. The botanists documented state-endangered *Botrychium ascendens* (upswept moonwort), state-endangered *Botrychium spathulatum* (spatulate moonwort), state-special concern *Botrychium simplex* (least moonwort), and state-special concern *Botrychium campestre* (prairie moonwort). Subsequent review by DNR State Botanist Welby Smith and his outside consultant Malcolm MacFarland determined that at least one specimen that was identified in the field as *Botrychium minganense* is actually the state-endangered *Botrychium spathulatum*. Malcolm MacFarland also determined that two other specimens identified in the field as *Botrychium minganense* were *Botrychium ascendens*. The soils in the survey areas where these *Botrychium* species were documented consist primarily of fine sandy gravel road fill and/or tailings grit; the extent of bare soil in these areas varied from approximately 5% to 20%. Overall, these disturbed, human-influenced site conditions typically provide habitat for select *Botrychium* species, including those identified in the survey areas:

- One population of *Botrychium ascendens* was documented within the open grass/forb habitat near the Process Plant Area in Section 9 of Township 59 and Range 14 (Large Figure 3).
- One population of *Botrychium spathulatum* was documented along the lower slopes of the disturbed northern edge of the proposed FTB Seepage Containment System in Section 33 of Township 60 and Range 14.
- Two populations of *Botrychium simplex* were documented in open grass/forb communities, one on an old dirt road adjacent to a railroad in the Transportation and Utility Corridors (in Section 24 of Township 59 and Range 14) and another in the southern part of the Plant Site in Section 16 of Township 59 and Range 14 (Large Figure 3).
- One population of *Botrychium campestre* was documented in the open grass/forb community on the side of a gravel road just off of Dunka Road in Section 14 of Township 59 and Range 14 (Large Figure 3).

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As discussed in Section 3.0, specimens of sensitive plant species collected at each location were pressed and dried. Each specimen was documented with a herbarium label and submitted to DNR State Botanist Welby Smith for verification of the sensitive species identification.

Table 1 summarizes the species documented during the 2018 sensitive plant species survey, their state status, the UTM coordinates, the number or estimated number of individual plants located, and the habitat characteristics where the sensitive plant species were found. For each location of the sensitive plant species listed in Table 1, a DNR Rare Feature Reporting Form was prepared; these forms are compiled in Appendix B. A DNR Observation Database spreadsheet, similar to Table 1, was submitted electronically along with this report.

Documentation for this report includes the *Sensitive Plant Species Survey Work Plan* (May 24, 2018; Appendix A), Rare Feature Reporting Forms (Appendix B), representative photographs taken of sensitive species within the survey area (Appendix C), DNR Observation Database spreadsheet (on CD), GIS file (on CD), and an electronic version of this report (on CD).

Table 1 Summary of Findings from the June 2018 Sensitive Plant Species Survey

| Record ID            | MNDNR Identification          |                    |                          | UTM Easting | UTM Northing | Approximate Number of Individuals | Specimen Collected; Specimen #                                     | Habitat Remarks   |
|----------------------|-------------------------------|--------------------|--------------------------|-------------|--------------|-----------------------------------|--|---|
|                      | Scientific Name               | Common Name        | MN Status <sup>(1)</sup> |             |              |                                   |  |   |
| PM-20180614-DJE-P001 | <i>Botrychium ascendens</i>   | Upswept moonwort   | E                        |             |              | 33                                | Yes; PM-20180614-DWJ-S01; PM-20180614-DWJ-S02; PM-20180614-DWJ-S03 | Among <i>Bromus inermis</i> , <i>Poa compressa</i> , <i>Hieracium auranticum</i> , <i>Carex aurea</i> , with a few <i>Populus balsamifera</i> seedlings.  |
| PM-20180614-DJE-P003 | <i>Botrychium spathulatum</i> | Spatulate Moonwort | E                        |             |              | 6                                 | Yes; PM-20180620-DWJ-S08   | Among <i>Galium</i> species, <i>Astragalus canadensis</i> , <i>Lotus corniculatus</i> , <i>Hieracium auranticum</i> , with a few <i>Populus tremuloides</i> , <i>Betula papyrifera</i> , and <i>Salix discolor</i> also present.  |
| PM-20180615-DJE-P004 | <i>Botrychium simplex</i>     | Least moonwort     | SC                       |             |              | 10                                | Yes; PM-20180615-DWJ-S04   | Among <i>Bromus inermis</i> , <i>Hieracium caespitosum</i> , <i>Phalaris arundinacea</i> , <i>Solidago canadensis</i> , <i>Melilotus officinale</i> .   |
| PM-20180615-DJE-P005 | <i>Botrychium campestre</i>   | Prairie moonwort   | SC                       |             |              | 15                                | Yes; PM-20180615-DWJ-S05   | Among <i>Hieracium caespitosum</i> , <i>Danthonia</i> species, <i>Trifolium repens</i> , <i>Melilotus officinale</i> , with a few <i>Populus balsamifera</i> , <i>Betula papyrifera</i> , and <i>Salix discolor</i> also present. |
| PM-20180615-DJE-P006 | <i>Botrychium simplex</i>     | Least moonwort     | SC                       |             |              | 1                                 | Yes; PM-20180615-DWJ-S06   | Among <i>Poa compressa</i> , <i>Trifolium repens</i> , <i>Achillea millefolium</i> , with a few <i>Alnus viridus</i> .  |

| Record ID            | MNDNR Identification |                         |                          | UTM Easting | UTM Northing | Approximate Number of Individuals | Specimen Collected; Specimen # | Habitat Remarks          |
|----------------------|----------------------|-------------------------|--------------------------|-------------|--------------|-----------------------------------|--------------------------------|--------------------------|
|                      | Scientific Name      | Common Name             | MN Status <sup>(1)</sup> |             |              |                                   |                                |                          |
| PM-20180618-DJE-P007 | <i>Caltha natans</i> | Floating marsh marigold | E                        |             |              | 5                                 | Yes; PM-20180618-DWJ-S07       | Edge of deep marsh/ditch |
| PM-20180618-DJE-P008 | <i>Caltha natans</i> | Floating marsh marigold | E                        |             |              | 2                                 | No                             | Edge of deep marsh/ditch |

Note: This table summarizes data provided to DNR for the Natural History Information System (NHIS) database. The DNR Observation Database spreadsheet was submitted electronically on the CD provided with this report.

(1) Minnesota status: E - endangered; T - threatened; SC - special concern

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## 5.0 Conclusions

Minnesota's endangered species law (Minnesota Statute 84.0895) and associated rules (Minnesota Rules, part 6212.1800) require a permit for the removal of state-endangered and state-threatened species (a "take permit"), but not for state-special concern species; therefore, a take permit from DNR is required for the *Caltha natans*, *Botrychium ascendens*, and *Botrychium spathulatum* that are located in areas of Project construction/disturbance.

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## 6.0 References

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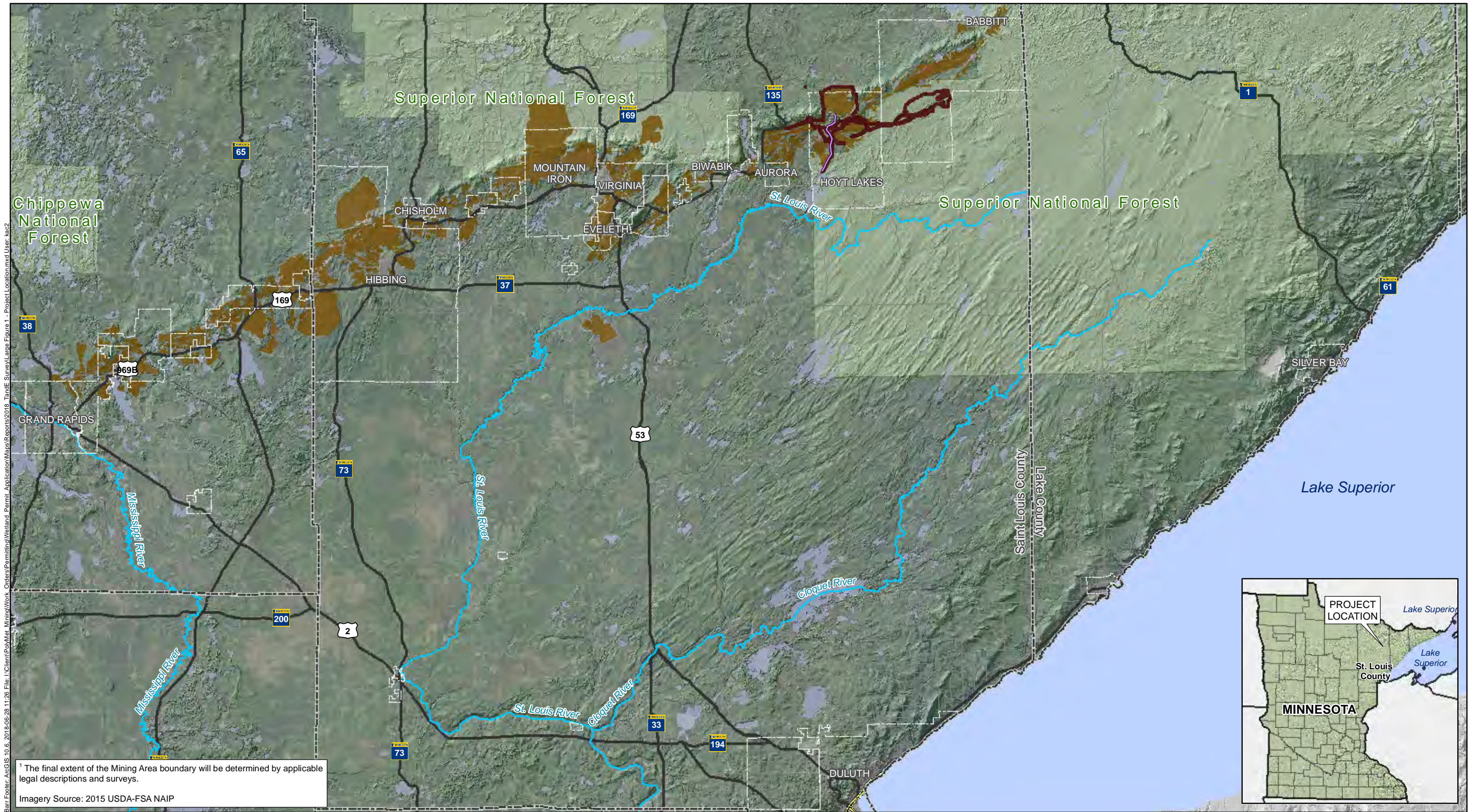
—. 2018b. 20180418 Response to NorthMet Taking Permit Application. April 18, 2018.

—. 2018c. Guidance on Documenting and Collecting Rare Plants.

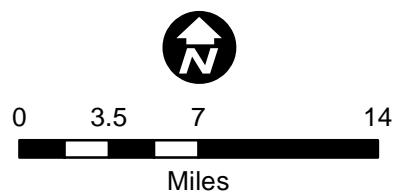
Wagner, W.H., Jr. and F.S. Wagner. 1993. Flora of North America, Volume 2: Pteridophytes and Gymnosperms. New York: Oxford University Press.

## Large Figures





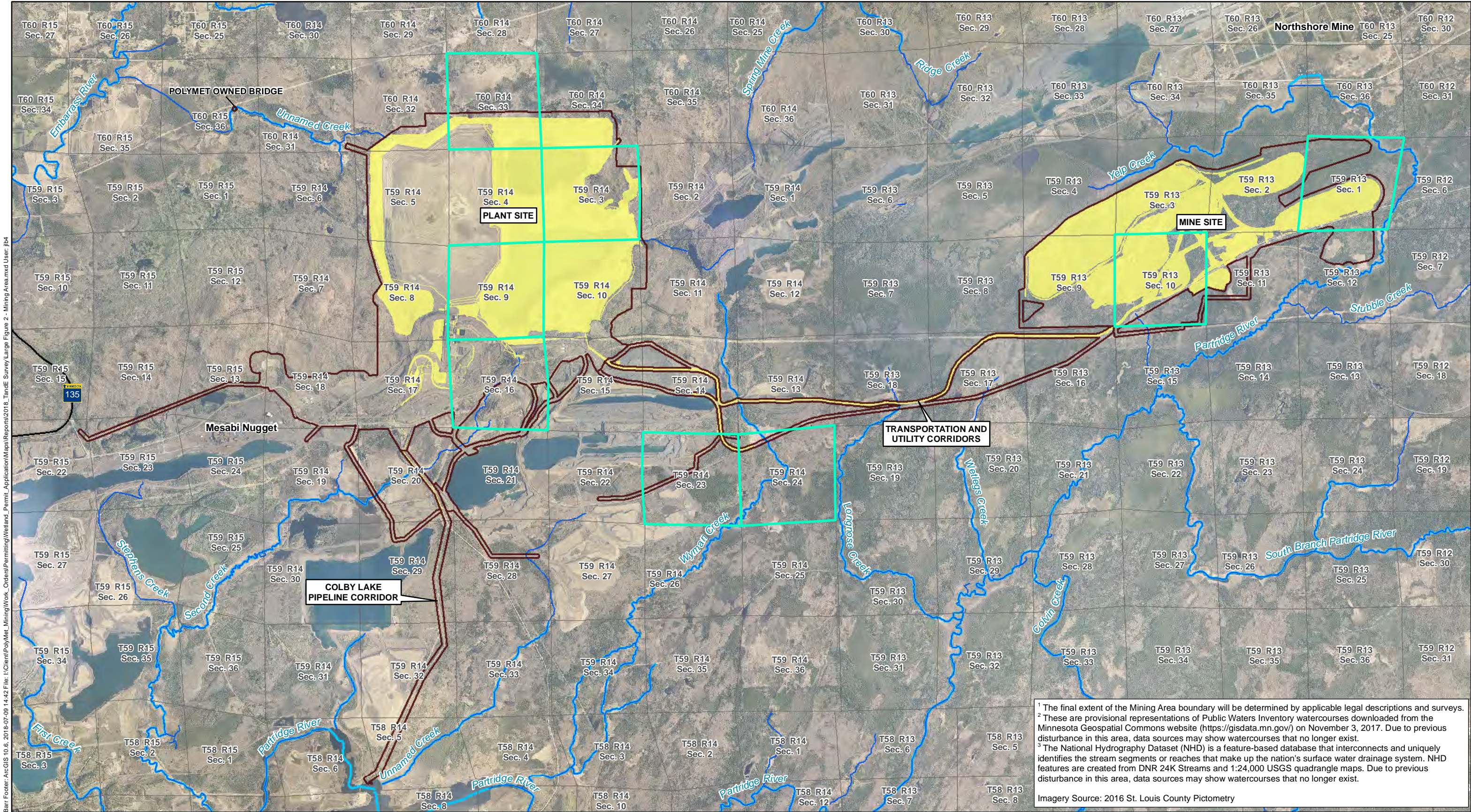
- Mining Area<sup>1</sup>
- Mesabi Iron Range
- National Forest Boundary
- County Boundaries
- City Boundaries
- Major River
- Lakes



PROJECT LOCATION  
NorthMet Project  
Poly Met Mining, Inc.

Large Figure 1  
Sensitive Plant Species Survey Report

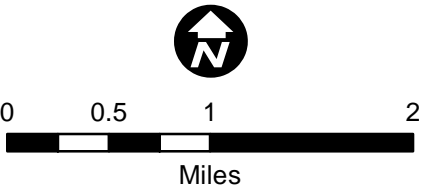




Barr Footer: ArcGIS 10.6, 2018-07-09 14:42 File: I:\Client\PolyMet\_Mining\Work\_Orders\Permitting\Wetland\_Permits\_Application\Maps\Large Figure 2 - Mining Area.mxd User: jlb4

<sup>1</sup> The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys.  
<sup>2</sup> These are provisional representations of Public Waters Inventory watercourses downloaded from the Minnesota Geospatial Commons website (<https://gisdata.mn.gov/>) on November 3, 2017. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
<sup>3</sup> The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from DNR 24K Streams and 1:24,000 USGS quadrangle maps. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
Imagery Source: 2016 St. Louis County Pictometry

- Mining Area<sup>1</sup>
- Construction/Disturbance Areas
- Survey Areas
- Section Lines
- Public Waters Inventory (PWI) Watercourses<sup>2</sup>
- National Hydrography Dataset (NHD) Rivers & Streams<sup>3</sup>



MINING AREA  
NorthMet Project  
Poly Met Mining, Inc.

Large Figure 2  
Sensitive Plant Species Survey Report



**Large Figure 3 Sensitive Plant Species Locations**

Page was redacted to protect sensitive plant location data.

## Appendices

## Appendix A

### Sensitive Plant Species Survey Work Plan

## Technical Memorandum

**To:** Lisa Joyal – DNR Ecological Services  
**From:** Cheryl Feigum; Daniel Jones, Salix Environmental LLC  
**Subject:** Work Plan – Sensitive Plant Species Survey  
**Date:** May 24, 2018  
**Project:** 23690862.11  
**c:** Brad Moore and Kevin Pylka, Poly Met Mining, Inc.

The purpose of this technical memorandum is to describe the work plan that Barr Engineering Company (Barr) is proposing for conducting a sensitive plant species survey for Poly Met Mining, Inc. (PolyMet) in support of permitting requirements for the NorthMet Mine and Ore Processing Facilities Project (Project). Prior to initiating this survey, Barr is providing the Minnesota Department of Natural Resources (DNR) with this work plan, to ensure that the survey and report are based on DNR-approved methods.

The Project is located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, and 6 miles south of Babbitt, Minnesota (Large Figure 1). The main Project components include the Mine Site and the Plant Site, which includes the tailings basin and plant processing facilities (Large Figure 2). The Mine Site and the Plant Site will be connected by the Transportation and Utility Corridors. An additional pipeline corridor (Colby Lake Pipeline Corridor) will supply water to the Plant Site when needed. The area of land that encompasses these Project components is referred to as the Mining Area (Large Figure 2). Large Figure 3 identifies the areas of construction/disturbance that will occur in the Mining Area.

The Mining Area is located within the Laurentian Uplands and the Nashwauk Uplands subsections of the Laurentian Mixed Forest province (DNR 2018a) and contains a combination of habitats, from highly disturbed former mining and industrial areas to less-disturbed wetlands and mixed hardwood-conifer forested uplands.

### 1.0 Previous Sensitive Plant Species Surveys

PolyMet conducted several sensitive plant species surveys in the vicinity of the Mining Area in order to identify whether any vascular plant species listed by the state of Minnesota as endangered or threatened were present. These surveys are summarized below and the areas where the surveys were conducted are shown on Large Figure 4.

- Foth & Van Dyke Associates, Inc. conducted a sensitive plant species survey in Sections 2, 3, and 10 of Township 59N and Range 13W in 1999, prior to on-site mineral exploration by PolyMet (Foth & Van Dyke Associates, Inc. 1999). No state endangered or threatened vascular plant

species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).

- Cindy Johnson-Groh conducted a sensitive plant species survey in Sections 2, 3, 10, 11, and 16 of Township 59N and Range 13W in July 2004 to assess the presence of *Botrychium* species in the vicinity of the Project (Johnson-Groh 2004). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Deborah Pomroy conducted a sensitive plant species survey in Sections 3, 4, 9, and 10 of Township 59N and Range 13W in spring 2004 (Pomroy and Barnes 2004). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Gary Walton conducted a sensitive plant species survey in Sections 1, 2, 11, and 12 of Township 59N and Range 13W in spring 2004 (Walton 2004). This survey documented one state-endangered plant species, *Caltha natans* (floating marsh marigold). *Caltha natans* was documented in five locations in the Mine Site (Sections 1 and 10 of Township 59N, Range 13W) and in eight locations adjacent to the Mine Site (Sections 1, 11, and 12 of Township 59N, Range 13W) (Table 1). *Caltha natans* was only documented in one location where there will be Project disturbance/construction (Category 2/3 Waste Rock Stockpile) within the Mine Site (Section 1 of Township 59N and Range 13W). Therefore, adverse impacts to this *Caltha natans* population is expected from the Project.
- Daniel Jones conducted a sensitive plant species survey for *Botrychium* species in Sections 1, 2, 3, 9, 10, and 11 of Township 59N and Range 13W along the internal road network at the Mine Site; and in Sections 1, 9, 10, and 11 of Township 59N and Range 13W along Dunka Road adjacent to the Mine Site (Barr 2007). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Daniel Jones conducted a sensitive plant species survey in Sections 16, 17, and 18 of Township 59N and Range 13W and Sections 13, 14, and 15 of Township 59N and Range 14W along Dunka Road and the proposed pipeline alignment from the west end of the Mine Site to the Plant Site in June and July 2008 (Barr 2012). No state endangered or threatened vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).
- Midwest Natural Resources Inc. conducted a sensitive plant species survey in Sections 3, 4, 5, and 9 of Township 59N and Range 13W in 2008 (Barr 2011). No state endangered or threatened

vascular plant species were identified during this survey per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).

- Daniel Jones conducted a sensitive plant species survey in Sections 3-10, 14, 15, and 17 in Township 59, Range 14 and Sections 32-34 in Township 60, Range 14W within the Plant Site in 2017 (Barr 2017). The initial survey results identified one state-endangered plant species, *Botrychium ascendens* (upswept moonwort), and one state-threatened plant species, *Botrychium lunaria* (common moonwort). Both *Botrychium* species were documented at the Plant Site (Section 33 of Township 60N, Range 14W). However, the DNR State Botanist determined that the *Botrychium ascendens* was *Botrychium pallidum* (special concern), and that the *Botrychium lunaria* identification could not be conclusively verified. The survey also identified *Botrychium ascendens* in the processing area (Section 9 of Township 59N, Range 14W). However, the DNR State Botanist determined that the identification could not be conclusively verified. As a result of the survey and the DNR verifications, there is no verified presence of endangered or threatened plant species at the Plant Site per Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species (DNR 2013).

## 2.0 Proposed Work Plan

Barr submitted an application on behalf of PolyMet on November 28, 2017, for a Permit to Take Endangered or Threatened Species associated with the *Caltha natans* population identified in 2004 by Gary Walton in the south end of the Category 2/3 Waste Rock Stockpile (Section 1 of Township 59N, Range 13W; Large Figure 5). On April 18, 2018, the DNR issued comments regarding PolyMet's 2018 application for a Permit to Take Endangered or Threatened Species (DNR 2018b). The DNR comments stated that because the Project footprint has been modified several times since the Project was first proposed, surveys for *Caltha natans* and *Botrychium* species should be conducted in June 2018 (DNR 2018b).

The proposed work plan for conducting these sensitive plant species surveys for *Caltha natans* and *Botrychium* species is summarized below and follows the DNR's 2015 *Guidance on Documenting and Collecting Rare Plants* (DNR 2015), 2016 *Rare Species Survey Process* (DNR 2016a), 2016 *Rare Species Survey Proposals and Reports* (DNR 2016b), and the Endangered and Threatened Species permit website (DNR 2018c).

### 2.1 Pre-field Research and Preparation

The sensitive plant species survey will only include *Caltha natans* and state endangered or threatened *Botrychium* species. The state endangered and threatened *Botrychium* species likely to be found in St. Louis County are summarized in Table 1.

**Table 1. State Endangered and Threatened *Botrychium* Species Likely to be found in St. Louis County, MN**

| Scientific Name               | Common Name              | Minnesota Status | Habitat  |
|-------------------------------|--------------------------|------------------|--|
| <i>Botrychium ascendens</i>   | Upswept moonwort         | Endangered       | Disturbed areas; road sides                                    |
| <i>Botrychium lanceolatum</i> | Narrow triangle moonwort | Threatened       | Moist rich maple-basswood forest                               |
| <i>Botrychium lineare</i>     | Slender moonwort         | Endangered       | Gravel roadsides, meadows, seeps, terraces of limestone cliffs |
| <i>Botrychium lunaria</i>     | Common moonwort          | Threatened       | Disturbed areas; gravel banks                                  |
| <i>Botrychium mormo</i>       | Goblin fern              | Threatened       | Rich mesic maple-basswood forest                               |
| <i>Botrychium oneidense</i>   | Blunt-lobed grapefern    | Threatened       | Mesic hardwood forest, low areas                               |

Based on the habitat information obtained for the state endangered and threatened *Botrychium* species, the survey will focus on *Botrychium ascendens*, *Botrychium lineare*, and *Botrychium lunaria*, as suitable habitat for these species is present within the Mining Area (in disturbed areas and along roadsides). Since the hardwood forest habitat suitable for *Botrychium lanceolatum*, *Botrychium mormo*, and *Botrychium oneidense* species is not likely to be present in the Mining Area, these species are not likely to be found in the Mining Area, and therefore would not be part of the survey effort.

### 2.1.1 Proposed 2018 Survey Area for *Caltha natans*

Re-surveys for *Caltha natans* will be conducted within the Mining Area where both of the following conditions are met: 1) *Caltha natans* was previously documented in 2004 (Large Figure 4); and 2) Project construction/disturbance will occur (Large Figure 4). Areas to be re-surveyed for *Caltha natans* are located in Sections 1 and 10 of Township 59N and Range 13W (Large Figure 5).

Surveys for *Caltha natans* will be also be conducted within the Mining Area where all three of the following conditions are met: 1) areas that were not previously surveyed (Large Figure 4); 2) areas where suitable habitat exists (shallow (2 to 2.5 feet deep), slow-moving water in streams, creeks, pools, ditches, sheltered lake margins, swamps, and beaver ponds); and 3) Project construction/disturbance will occur (Large Figure 4). Additional areas to be surveyed for *Caltha natans* are located in Section 3 of Township 59N and Range 14W (Large Figure 5).

### 2.1.2 Proposed 2018 Survey Area for *Botrychium*

Re-surveys for state endangered or threatened *Botrychium* species will be conducted within the Mining Area where both of the following conditions are met: 1) state endangered or threatened *Botrychium* species were documented in 2017, but the identifications were inconclusive (Large Figure 4); and 2) Project construction/disturbance will occur (Large Figure 4). Areas to be re-surveyed for state endangered



or threatened *Botrychium* species are located in Section 9 of Township 59N and Range 14W and Section 33 of Township 60N and Range 14W (Large Figure 5).

Surveys for state endangered or threatened *Botrychium* will also be conducted within the Mining Area where all three of the following conditions are met: 1) areas that were not previously surveyed (Large Figure 4); 2) where suitable habitat exists (disturbed areas/roadsides); and 3) Project construction/disturbance will occur (Large Figure 4). Additional areas to be surveyed for state endangered or threatened *Botrychium* are located in Sections 16, 23, and 24 of Township 59N and Range 14W (Large Figure 5).

## **2.2 Survey Information**

The survey areas for *Caltha natans* and state endangered or threatened *Botrychium* species are described in Sections 2.1.1 and 2.1.2, respectively, and shown on Large Figure 5. The approximate timeframe for the survey will be between late-June and mid-July 2018, depending on phenology. Rationale for the survey timeframe will be provided in the report (see Section 2.3).

### **2.2.1 Botanists**

The sensitive plant species survey will be led by Barr subcontractor, Daniel Jones of Salix Environmental LLC. Daniel Jones is listed on the DNR's "General List of Botanical Consultants for hire" document, and is on the DNR's list of qualified *Botrychium* surveyors. Daniel Jones will be assisted by Dan Engel, who is not a DNR-certified botanist, however he has been completing vegetation surveys in northern Minnesota since 2004 and has assisted Daniel Jones with sensitive plant species surveys since 2011.

### **2.2.2 Field Work**

At the beginning of the sensitive plant species survey, the botanists will make an initial reconnaissance of the survey areas to identify vegetative cover and best habitat conditions for listed species. They will then conduct a more comprehensive botanical survey, utilizing intuitive meander search patterns to search for *Caltha natans* and state endangered and threatened *Botrychium* species and to evaluate the site's potential for supporting these listed species. This type of search pattern is essentially a meandering traverse, focusing on the specific habitats and plant associations of listed species. Over the course of the survey, the botanical team will compile lists of vascular plant species observed. This is not intended to be a complete floristic study of the site; rather, it will provide additional background information on vascular plant species in the Project area.

### **2.2.3 Sampling and Recording Procedures**

The methods proposed follow DNR's 2015 *Guidance on Documenting and Collecting Rare Plants* (DNR 2018) during sensitive plant species surveys. If any sensitive plant species are located during the survey, they will be documented using the following procedures:

- 1) The location(s) of sensitive plant species will be flagged using bright fluorescent tape.

- 2) A handheld GPS unit will be used to obtain UTM coordinates of the site. Standard quarter-quarter section legal descriptions will also be recorded.
- 3) At least two digital photographs of the sensitive plant species will be taken.
- 4) Habitat, associated species, population size, phenology, and other pertinent data will be recorded.
- 5) Collection of sensitive plant species samples will follow the DNR's 2015 *Guidance on Documenting and Collecting Rare Plants* (DNR 2015), as it pertains to *Caltha natans* and *Botrychium* species. This guidance includes the following methods for field collections:
  - a. No more than one individual of a particular species will be collected per 40 acres of habitat.
  - b. A new voucher will be collected if the DNR's Rare Features Database indicates that it has been more than 30 years since the last voucher was collected from the population.
  - c. Collections will only be made when distinguishing characters are present.
  - d. Full-plant collections (roots and above-ground portions) will be made only from populations with more than 100 individuals.
  - e. In populations of less than 100, only the distinguishing portion of the plant will be collected, and a close-up photograph will be taken.
  - f. For *Botrychium* species, an above-ground portion of the plant will be collected regardless of population size or state status of the species.
  - g. For aquatic species, only the portion of the stem with leaves and fruits or flowers will be collected. No roots will be collected.

Identification of plant species will follow taxonomic keys and references that are the currently acknowledged standards in field botany. All specimens collected will be pressed as early after collection as is practicable, and dried following standard accepted practices for drying and preserving vascular plant specimens. The botanists will prepare herbarium labels for each specimen, and submit all collected specimens to DNR within 3 months of collection for verification by the DNR State Botanist.

In addition, the botanists conducting the survey will follow the DNR's recommendation for the identification of state endangered and threatened *Botrychium* species, as outlined in the DNR's April 18, 2018 comments regarding PolyMet's 2018 application for a Permit to Take Endangered or Threatened Species (DNR 2018b). The DNR stated the following:

"Since the identification of *Botrychium* species can be challenging, we recommend that surveyors plan to be in daily contact with DNR staff to agree on procedures for resolving any uncertainty that may

arise during the survey. These procedures may include collecting more vouchers than would usually be required, providing a DNR representative to accompany the surveyor in the field, and/or seeking additional expertise on specimen identification (DNR 2018b)."

## 2.3 Reporting Procedures

Barr will prepare a report with the results of the survey for *Caltha natans* and state endangered or threatened *Botrychium* species. The report will be submitted to the DNR for review and approval (DNR 2018b). For all specimens collected, Barr will also provide a DNR Rare Features Report Form, a completed DNR Observation Database Excel file, GIS shapefiles of species locations, and photographs of collected specimens and their habitats.

## 2.4 References

- Barr Engineering Co. (Barr). 2007. Results of Autumn 2007 Field Surveys for *Botrychium rugulosum* at PolyMet Mine Site Technical Memorandum to Rich Baker, MDNR. November 7, 2007.
- . 2012. Results of Sensitive Plant Species Surveys along Dunka Road and Pipeline Route. Revised February 3, 2012.
- . 2011. Summaries of Sensitive Species Surveys Conducted by MNRI and Additional Sensitive Species Locations from the MNDNR NHIS Database.
- . 2017. Sensitive Plant Species Survey Report: PolyMet Plant Site. October 5, 2017.
- Foth & Van Dyke Associates, Inc. 1999. Supplemental Site Specific Resource Information. PolyMet Mining Corporation NorthMet 1999 Exploration Project. Report Prepared for PolyMet Mining. 1999.
- Johnson-Groh, Cindy. 2004. *Botrychium* (Moonwort) Rare Plant Surveys for PolyMet Project July 2004.
- Minnesota Department of Natural Resources (DNR). 2013. Minnesota's 2013 List of Endangered, Threatened, and Special Concern Species [Online] 2018. [http://files.dnr.state.mn.us/natural\\_resources/ets/endlist.pdf](http://files.dnr.state.mn.us/natural_resources/ets/endlist.pdf).
- . 2018. Guidance on Documenting and Collecting Rare Plants.
- . 2016a. Rare Species Survey Process.
- . 2016b. Rare Species Survey Proposals and Reports.
- . 2018a. Ecological Classification System. [Online] 2018. <http://www.dnr.state.mn.us/ecs/index.html>.
- . 2018b. 20180418 Response to NorthMet Taking Permit Application. April 18, 2018.

**To:** Lisa Joyal – DNR Ecological Services  
**From:** Cheryl Feigum; Daniel Jones, Salix Environmental LLC  
**Subject:** Work Plan – Sensitive Plant Species Survey  
**Date:** May 24, 2018  
**Page:** 8

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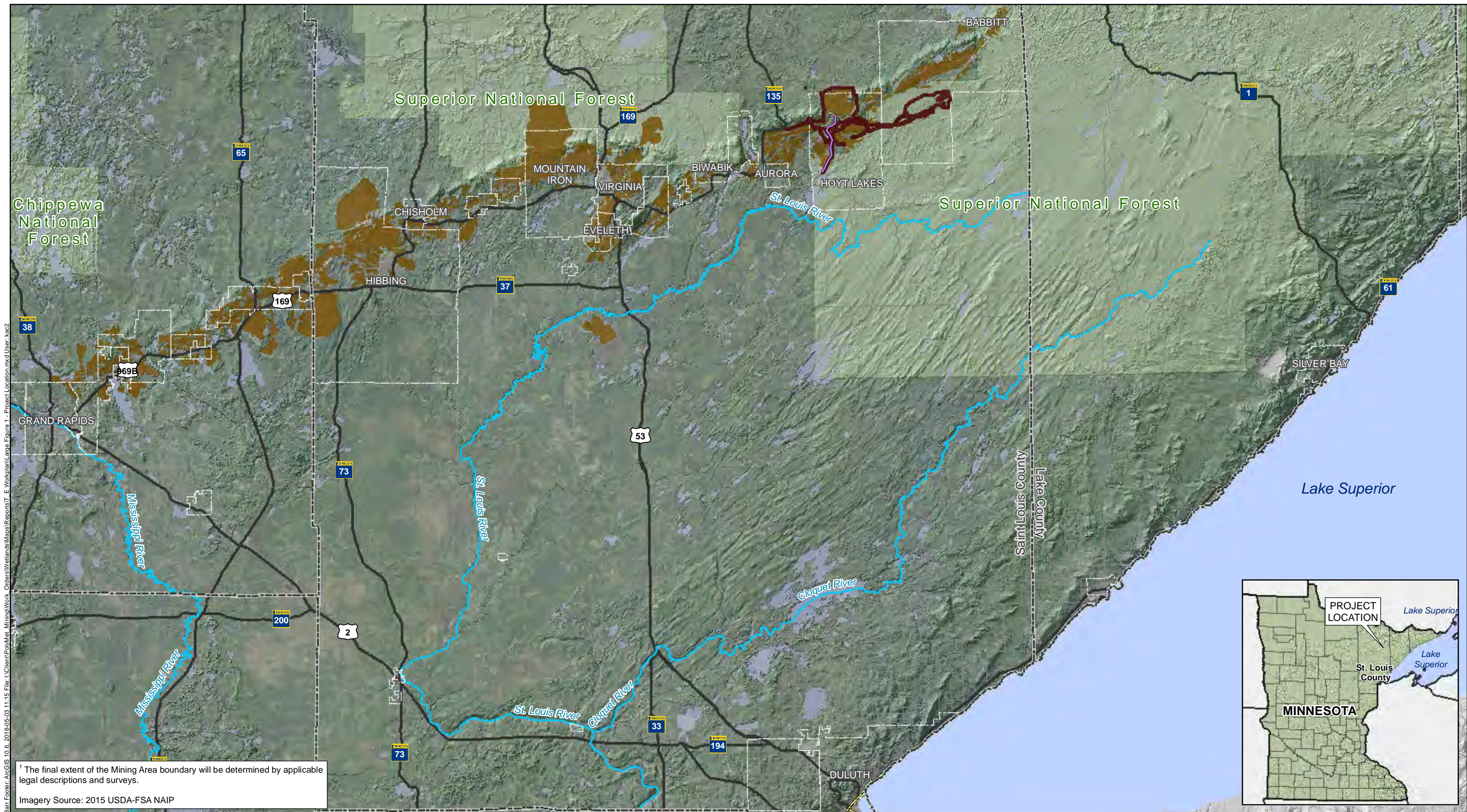
—. 2018c. Endangered and Threatened Species Permit Website. [Online] 2018.  
[http://www.dnr.state.mn.us/nhnrp/endangered\\_permits.html](http://www.dnr.state.mn.us/nhnrp/endangered_permits.html).

Pomroy, Deborah and Raymond Barnes. 2004. 2004 Rare Plant Survey at the PolyMet Mine Site Located in T59N R13W.

Walton, Gary. 2004. Data Summary: Rare Plant Survey.

## Large Figures





|                          |             |
|--------------------------|-------------|
| Mining Area <sup>1</sup> | Major River |
| Mesabi Iron Range        | Lakes       |
| National Forest Boundary |             |
| County Boundaries        |             |
| City Boundaries          |             |

Miles

**PROJECT LOCATION**

NorthMet Project

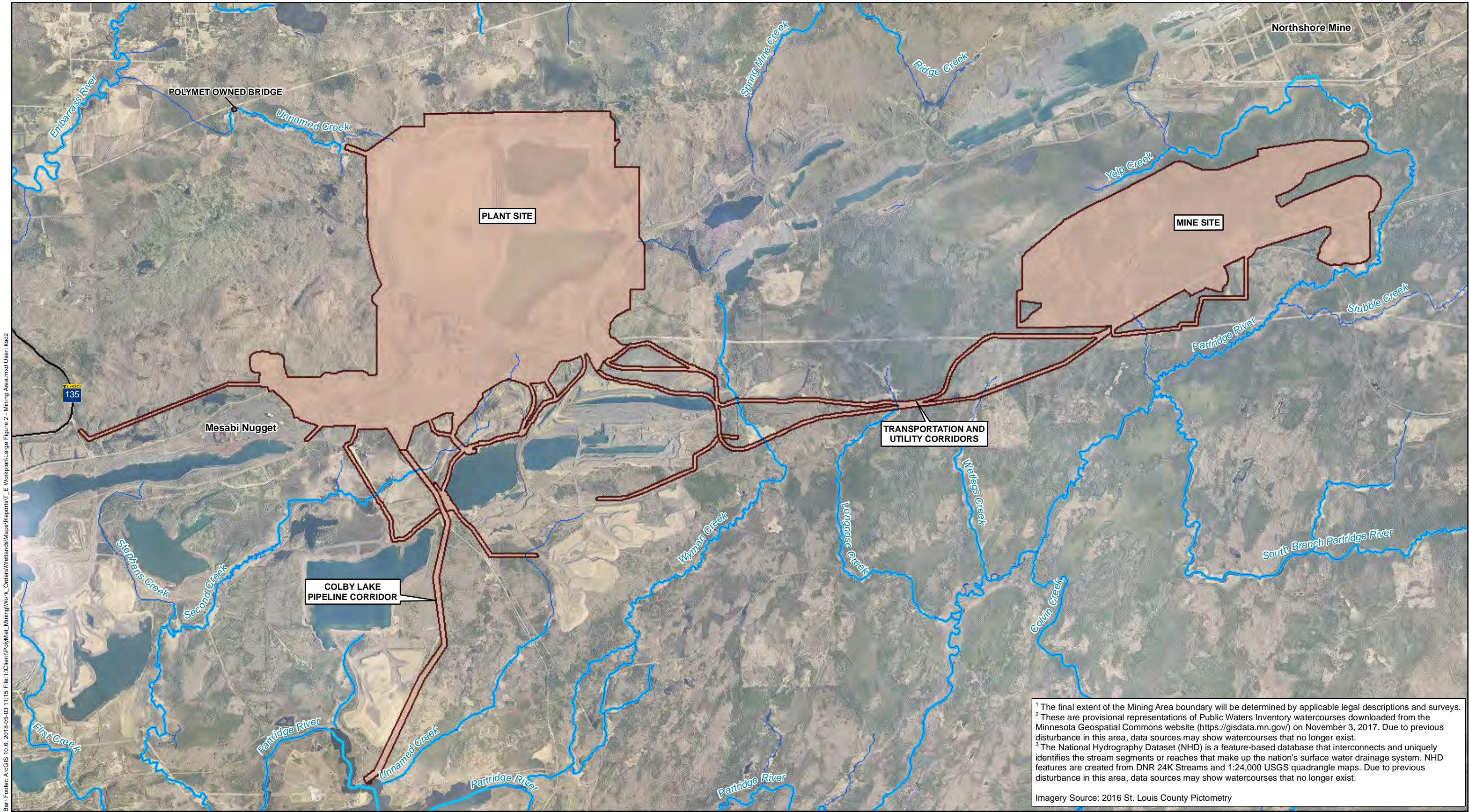
Poly Met Mining, Inc.

Large Figure 1

Sensitive Plant Species Survey Work Plan

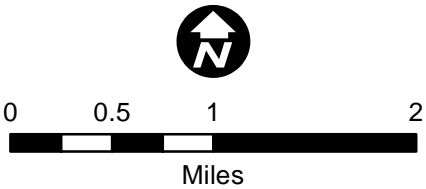


Barr Footer: ArcGIS 10.6, 2018-05-03 11:15 File: L:\Client\Polymet\_Mining\Work\_Orders\Wetlands\Maps\Reports\T\_E\_Workplan\Large Figure 2 - Mining Area.mxd User: leac2



<sup>1</sup> The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys.  
<sup>2</sup> These are provisional representations of Public Waters Inventory watercourses downloaded from the Minnesota Geospatial Commons website (<https://gisdata.mn.gov/>) on November 3, 2017. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
<sup>3</sup> The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from DNR 24K Streams and 1:24,000 USGS quadrangle maps. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
Imagery Source: 2016 St. Louis County Pictometry

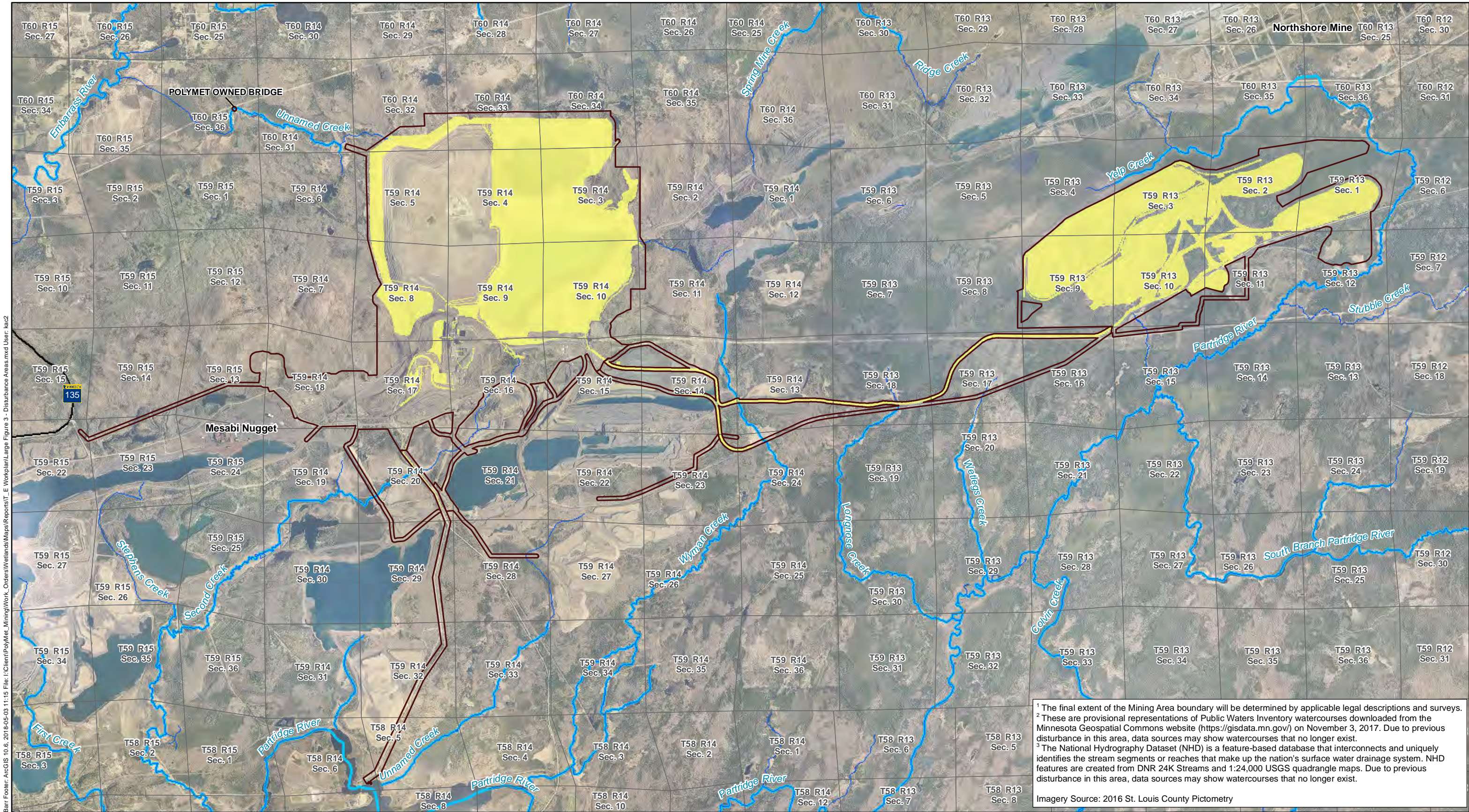
- Mining Area<sup>1</sup>
- Public Waters Inventory (PWI) Watercourses<sup>2</sup>
- National Hydrography Dataset (NHD) Rivers & Streams<sup>3</sup>



MINING AREA  
NorthMet Project  
Poly Met Mining, Inc.

Large Figure 2  
Sensitive Plant Species Survey Work Plan





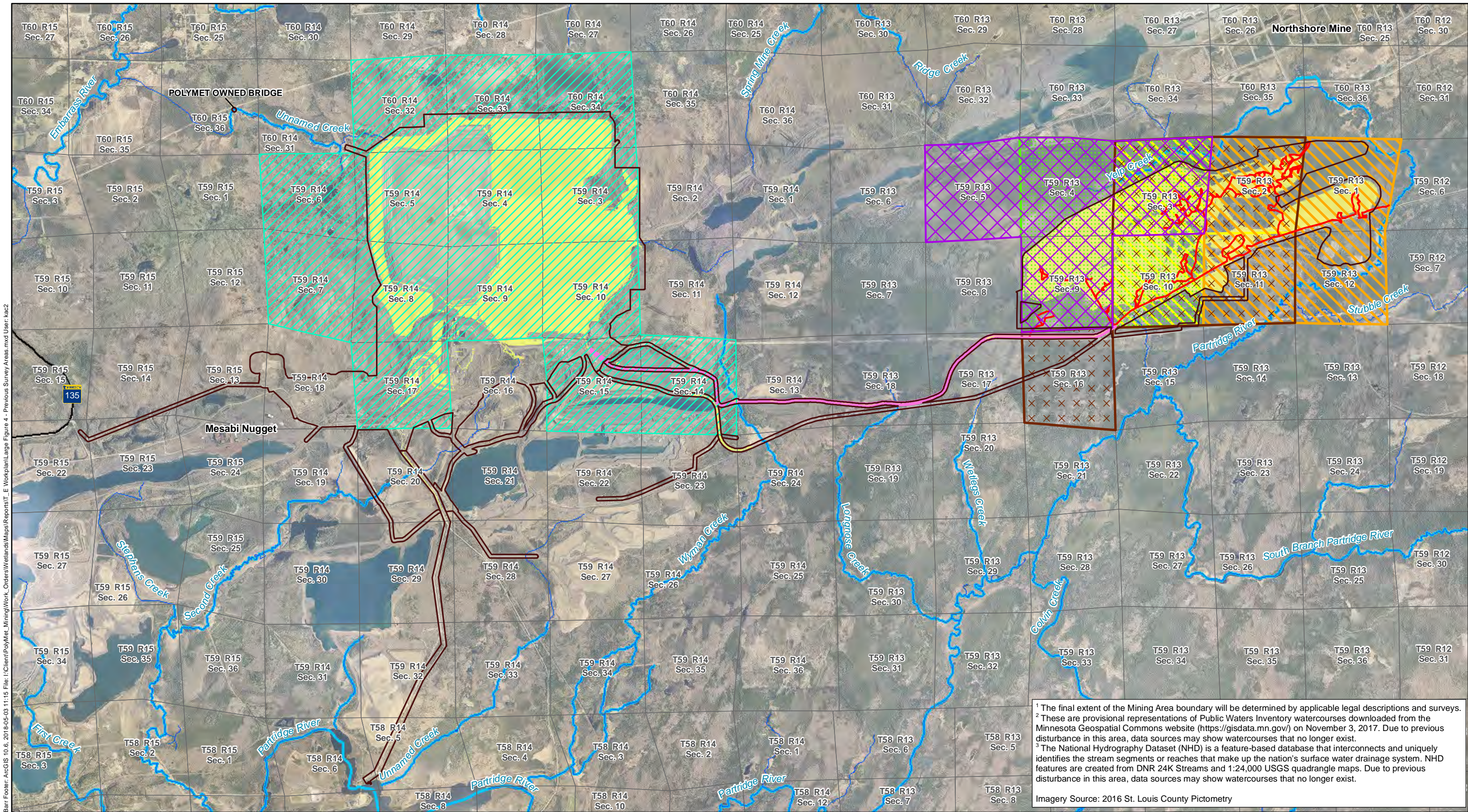
Barr Footer: ArcGIS 10.6, 2018-05-03 11:15 File: L:\Client\Polymet\_Mining\Work\_Orders\Wetlands\Maps\Reports\T\_E\_Workplan\Large Figure 3 - Disturbance Areas.mxd User: kar2

**DISTURBANCE AREAS**  
**NorthMet Project**  
**Poly Met Mining, Inc.**

Large Figure 3  
Sensitive Plant Species Survey Work Plan

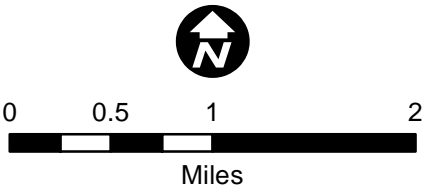


Barr Footer: ArcGIS 10.6, 2018-05-03 11:15 File: L:\Client\PolyMet\_Mining\Work\_Orders\Wetlands\Maps\Reports\T\_E\_Workplan\Large Figure 4 - Previous Survey Areas.mxd User: kac2



<sup>1</sup> The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys.  
<sup>2</sup> These are provisional representations of Public Waters Inventory watercourses downloaded from the Minnesota Geospatial Commons website (<https://gisdata.mn.gov/>) on November 3, 2017. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
<sup>3</sup> The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from DNR 24K Streams and 1:24,000 USGS quadrangle maps. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
Imagery Source: 2016 St. Louis County Pictometry

- |  |   |   |
|--|---|---|
| <div><div></div> Mining Area<sup>1</sup></div> <div><div></div> Construction/Disturbance Areas</div> <div><div></div> Section Lines</div> <div><div></div> Public Waters Inventory (PWI) Watercourses<sup>2</sup></div> <div><div></div> National Hydrography Dataset (NHD) Rivers &amp; Streams<sup>3</sup></div> | <div>Previous Botanical Surveys</div> <div><div></div> Foth &amp; Van Dyke and Associates, Inc. (1999)</div> <div><div></div> Deborah Pomroy (Spring 2004)</div> <div><div></div> Gary Walton (Spring 2004)</div> <div><div></div> Cindy Johnson-Groh (July 2004)</div> | <div><div></div> Daniel Jones (2007)</div> <div><div></div> Daniel Jones (June/July 2008)</div> <div><div></div> Midwest Natural Resources Inc. (2008)</div> <div><div></div> Daniel Jones (2017)</div> |
|--|---|---|

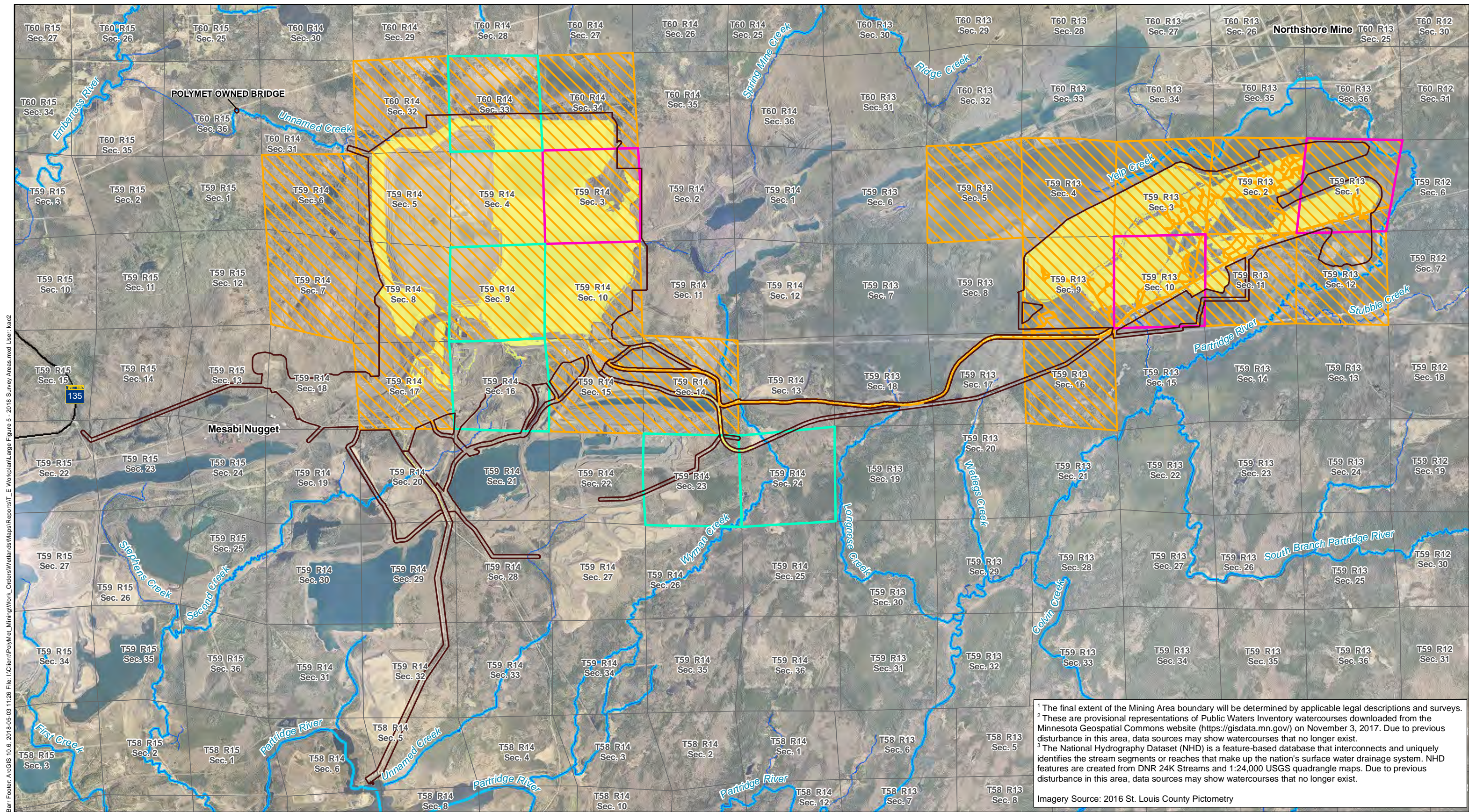


PREVIOUS SURVEY AREAS  
NorthMet Project  
Poly Met Mining, Inc.

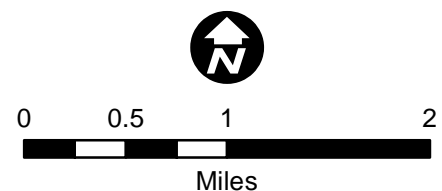
Large Figure 4  
Sensitive Plant Species Survey Work Plan



Barr Footer: ArcGIS 10.6, 2018-05-03 11:26 File: L:\Client\Polymet Mining\Work Orders\Wetlands\Maps\Reports\T\_E\Workplan\Large Figure 5 - 2018 Survey Areas.mxd User: kar2



- Mining Area<sup>1</sup>
- Construction/Disturbance Areas
- Section Lines
- Public Waters Inventory (PWI) Watercourses<sup>2</sup>
- National Hydrography Dataset (NHD) Rivers & Streams<sup>3</sup>
- Previous Botanical Surveys
- Botrychium* Survey Area
- Caltha natans* Survey Area



<sup>1</sup> The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys.  
<sup>2</sup> These are provisional representations of Public Waters Inventory watercourses downloaded from the Minnesota Geospatial Commons website (<https://gisdata.mn.gov/>) on November 3, 2017. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
<sup>3</sup> The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from DNR 24K Streams and 1:24,000 USGS quadrangle maps. Due to previous disturbance in this area, data sources may show watercourses that no longer exist.  
Imagery Source: 2016 St. Louis County Pictometry

2018 SURVEY AREAS  
NorthMet Project  
Poly Met Mining, Inc.

Large Figure 5  
Sensitive Plant Species Survey Work Plan



## Appendix B

### DNR Rare Feature Reporting Forms

Minnesota Natural Heritage Information System  
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium ascendens  
Common Name: Upswept moonwort  
Date: June 14, 2018 Time: 11:40  
Observer(s): Daniel W. Jones (Salix Env.), Dan Engel (Barr Eng.)  
Barr Record ID: PM-20180614-DJE-P001

**LOCATION**

State: Minnesota County: St. Louis  
Quad Name(s): Isaac Lake

Twp: 59 Rng: 14 Sec: 09 [REDACTED]  
Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_  
Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_  
Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

or

UTM: Northing [REDACTED] Easting [REDACTED] Zone 15N (Zone 15 preferred!)  
(NAD83) or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. Longitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. (provide degrees, minutes, and seconds)  
Source: \_\_\_\_\_

**Map:** A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

Directions/comments/description of location: Barr specimen#s PM-20180614-DWJ-S01, PM-20180614-DWJ-S02, PM-20180614-DWJ-S03 . This species was found in disturbed, graded soils north of the former LTV Steel Mining Company (SMC) plant, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the main road from the guard house up to and through the former plant site. Total population is 33 stems.

\*OPT\* **SEARCH EFFORT** time actively searching \_\_\_\_\_ min. acres searched 0.1 # of observers 2

\*OPT\* **BIOLOGY** If the species was searched for but not found, check here: \_\_\_\_\_ Revisit needed? Y (N) When? \_\_\_\_\_

Population size: 33 (stems) or clonal stands (circle one) (counted) or estimated? (circle one)

Circle the description which most accurately fits the occurrence. If you circle more than one description in each line, on the line below the description indicate the percentage of the population in each stage.

Leaves: dormant budding new leaf (full leaf) leaf fall  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100 + \_\_\_\_\_ = 100%  
Flowers & Fruit: dormant budding early flower full flower early fruit (mature fruit) dispersing seed  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100 + \_\_\_\_\_

Age structure: seedlings immature 1<sup>st</sup> yr.(biennials) (mature)  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100

Vigor: feeble (normal) (vigorous)  
\_\_\_\_\_ 70 30

Evidence of reproduction?: (Yes) No If yes; Type: (sexual) asexual both (circle one)

Evidence: sporophores present with mature spores

Comments (e.g., note symbiosis, parasitism, disease, plant density or patchiness): \_\_\_\_\_

FOR DATABASE PERSONNEL USE ONLY  
El.Code: \_\_\_\_\_ Occ#: \_\_\_\_\_  
Single Source EO / Multi-Source EO  
Search effort: \_\_\_\_\_ min./(A/person)  
Data security? Yes No  
Mapped \_\_\_\_\_ QC1 \_\_\_\_\_  
Entered \_\_\_\_\_ QC2 \_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*OPT\* **HABITAT**

Topography:

crest  
upper slope  
mid-slope  
lower slope  
bottom

Moisture:

hydric  
wet-mesic  
mesic  
dry-mesic  
xeric

(circle all that apply)

Light:

open  
partial  
filtered  
shade

Aspect:

N NE  
E SE  
S SW  
W NW  
flat

Slope:

0 % or °  
Measured or estimated?  
(circle one)

Elevation:

\_\_\_\_\_m or \_\_\_\_\_ft.

Plant community: Among *Bromus inermis*, *Poa compressa*, *Hieracium aurantiacum*, *Carex aurea*, with a few *Populus balsamifera* seedlings

Soil/substrate type: Tailings aggregate.

Comments: Typical of most *Botrychium* habitat observed at old mining sites, on a flat graded area.

\*OPT\* **CONSERVATION**

List disturbances, if any: On flat graded area, most recently used as laydown area for old slurry pipe sections.

List threats, if any: Potentially removed by redevelopment of former LTV plant site for PolyMet purposes.

**IDENTIFICATION**

Specimen collected? (Yes) No If yes, Collector: Daniel W. Jones Date of Collection: 06/14/2018

Collectors Address & Phone: c/o Salix Environmental LLC; 208 Linden Street South, Northfield, MN 55057; (507) 581-2517

Repository: \_\_\_\_\_ Accession #: U Minn Herbarium Collection #: \_\_\_\_\_

*Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.*

Photograph taken? (Yes) No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): Systematics of Moonworts:

*Botrychium* Subgenus *Botrychium*, Donald Farrar June 2006; *Flora of North America*, vol. 2, *Ophioglossaceae*, Wagner Jr. and Wagner, add'l *Botrychium* notes from Donald Farrar.

Comments: Initial field ID by D. Jones was *Botrychium minganense*. Collected specimens submitted to Welby Smith, whose outside consultant Malcolm MacFarland determined that the specimen was *B. ascendens*.

FOR DATABASE PERSONNEL USE ONLY

Verified by: \_\_\_\_\_ Date sent to Herbarium \_\_\_\_\_ Date collector notified of outcome: \_\_\_\_\_

\*OPT\* **SUMMARY** (circle one in each column)

Condition:

A – habitat pristine  
B  
C  
(D) – habitat degraded

Quality:

A – stand large, productive, vigorous  
B  
(C)  
D – stand small, feeble

Viability:

A – quality likely to remain constant  
B  
C  
(D) – quality certain to deteriorate

Defensability:

A – protectable  
B  
C  
(D) – not protectable

Rank: A B C or (D) (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat potentially in footprint of large-scale earthwork.

\*OPT\* = **OPTIONAL** Section (i.e., you are not required to fill in these sections to submit a record)

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to [sharron.nelson@dnr.state.mn.us](mailto:sharron.nelson@dnr.state.mn.us) - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Minnesota Natural Heritage Information System  
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium spathulatum  
Common Name: Common moonwort  
Date: June 14, June 20, 2018 Time: NA  
Observer(s): Daniel W. Jones (Salix Env.), Dan Engel (Barr Eng.)  
Barr Record ID: PM-20180614-DJE-P003

**LOCATION**

State: Minnesota County: St. Louis

Quad Name(s): \_\_\_\_\_

Twp: 60 Rng: 14 Sec: 33 [REDACTED]

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

or

UTM: Northing [REDACTED] Easting [REDACTED] Zone 15N (Zone 15 preferred!)

NAD83 or NAD27? (circle one) (NAD83 preferred!)

Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. Longitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. (provide degrees, minutes, and seconds)  
Source: \_\_\_\_\_

**Map:** A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

Directions/comments/description of location: Barr specimen #PM-20180614-DWJ-S08. This species was found along the northern edge of the former LTV Steel Mining Company (SMC) tailings basin, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the lower access road located on the western and northwestern edge of the LTVSMC tailings basin.

\*OPT\* **SEARCH EFFORT** time actively searching \_\_\_\_\_ min. acres searched 0.1 # of observers 2

\*OPT\* **BIOLOGY** If the species was searched for but not found, check here: \_\_\_\_\_ Revisit needed? Y N When? \_\_\_\_\_

Population size: 6 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. If you circle more than one description in each line, on the line below the description indicate the percentage of the population in each stage.

Leaves: dormant budding new leaf full leaf leaf fall  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100 + \_\_\_\_\_ = 100%

Flowers & Fruit: dormant budding early flower full flower early fruit mature fruit dispersing seed  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100 + \_\_\_\_\_

Age structure: seedlings immature 1<sup>st</sup> yr. (biennials) mature  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100

Vigor: feeble normal vigorous  
\_\_\_\_\_ + 100 + \_\_\_\_\_

Evidence of reproduction?: Yes No If yes; Type: sexual asexual both (circle one)

Evidence: sporophores present with mature spores

Comments (e.g., note symbiosis, parasitism, disease, plant density or patchiness): \_\_\_\_\_

FOR DATABASE PERSONNEL USE ONLY  
El. Code: \_\_\_\_\_ Occ#: \_\_\_\_\_  
Single Source EO / Multi-Source EO  
Search effort: \_\_\_\_\_ min. / (A/person)  
Data security? Yes No  
Mapped \_\_\_\_\_ QC1 \_\_\_\_\_  
Entered \_\_\_\_\_ QC2 \_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*OPT\* **HABITAT**

Topography:

crest  
upper slope  
mid-slope  
lower slope  
bottom

Moisture:

hydric  
wet-mesic  
mesic  
dry-mesic  
xeric

(circle all that apply)

Light:

open  
partial  
filtered  
shade

Aspect:

N NE  
E SE  
S SW  
W NW  
flat

Slope:

30 % or \_\_\_\_\_ °  
Measured or estimated?  
(circle one)

Elevation:

\_\_\_\_\_ m or \_\_\_\_\_ ft.

Plant community: Artificial open grass and legume-dominated forb reclamation area; *Galium boreale*, *Astragalus canadensis*, *Lotus corniculatus*, *Hieracium aurantiacum*, with a few *Populus tremuloides*, *Betula papyrifera*, and *Salix discolor* also present.

Soil/substrate type: Tailings aggregate used for tailings dam construction.

Comments: At mid-upper slope of lowest lift of tailings basin. Typical of most *Botrychium* habitat observed at old mining sites, but on steeper slopes than usual.

\*OPT\* **CONSERVATION**

List disturbances, if any: On slope of LTVSMC tailings basin berm. Berm has been seeded with a reclamation mix of grasses and leguminous species, dominated by *Astragalus canadensis* and *Lotus corniculata*. Occasional small groups of *Populus tremuloides* also present on the lower slopes.

List threats, if any: The northeastern edge of the LTVSMC tailings basin berm will be re-graded and amended to raise its elevation. As a result, the plant location will be removed.

**IDENTIFICATION**

Specimen collected? (Yes) No If yes, Collector: Daniel W. Jones Date of Collection: 06/14/2018

Collectors Address & Phone: c/o Salix Environmental LLC; 208 Linden Street South, Northfield, MN 55057; (507) 581-2517

Repository: \_\_\_\_\_ Accession #: U Minn Herbarium Collection #: \_\_\_\_\_

*Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.*

Photograph taken? (Yes) No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): Systematics of Moonworts: *Botrychium* Subgenus *Botrychium*, Donald Farrar June 2006; *Flora of North America*, vol. 2, *Ophioglossaceae*.

Comments: Initial 6/14/18 field ID by D. Jones was inconclusive. Return visit on 6/20/18 led to *B. minganense*. Collected specimens were submitted to Welby Smith, whose outside consultant Malcolm McFarland ultimately identified the specimen as *B. spathulatum*.

FOR DATABASE PERSONNEL USE ONLY

Verified by: \_\_\_\_\_ Date sent to Herbarium \_\_\_\_\_ Date collector notified of outcome: \_\_\_\_\_

\*OPT\* **SUMMARY** (circle one in each column)

Condition:

A – habitat pristine

B

C

D – habitat degraded

Quality:

A – stand large, productive, vigorous

B

C

D – stand small, feeble

Viability:

A – quality likely to remain constant

B

C

D – quality certain to deteriorate

Defensability:

A – protectable

B

C

D – not protectable

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat in footprint of proposed large-scale earthwork.

\*OPT\* = **OPTIONAL** Section (i.e., you are not required to fill in these sections to submit a record)

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to [sharron.nelson@dnr.state.mn.us](mailto:sharron.nelson@dnr.state.mn.us) - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Minnesota Natural Heritage Information System  
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium simplex  
Common Name: Least moonwort  
Date: June 15, 2018 Time: NA  
Observer(s): Daniel W. Jones (Salix Env.), Dan Engel (Barr Eng.)  
Barr Record ID: PM-20180615-DJE-P004

**LOCATION**

State: Minnesota County: St. Louis

Quad Name(s): \_\_\_\_\_  
\_\_\_\_\_

Twp: 59 Rng: 14 Sec: 14 [REDACTED]

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

or

UTM: Northing [REDACTED] Easting [REDACTED] Zone 15N (Zone 15 preferred!)  
NAD83 or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. Longitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. (provide degrees, minutes, and seconds)  
Source: \_\_\_\_\_

**Map:** A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

**Directions/comments/description of location:** Barr specimen #PM-20180615-DWJ-S04. This species was located in a broad, open field, in a formerly disturbed area associated with the former LTVSMC plant site, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the internal road network of the former LTVSMC plant site.

\*OPT\* **SEARCH EFFORT** time actively searching \_\_\_\_\_ min. acres searched 0.01 # of observers 2

\*OPT\* **BIOLOGY** If the species was searched for but not found, check here: \_\_\_\_\_ Revisit needed? Y N When? \_\_\_\_\_

**Population size:** 10 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. **If you circle more than one description** in each line, on the line below the description indicate the percentage of the population in each stage.

**Leaves:** dormant budding new leaf full leaf leaf fall  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100 + \_\_\_\_\_ = 100%

**Flowers & Fruit:** dormant budding early flower full flower early fruit mature fruit dispersing seed  
\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ 100 \_\_\_\_\_

**Age structure:** seedlings immature 1<sup>st</sup> yr.(biennials) mature  
\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ 100

**Vigor:** feeble normal vigorous  
\_\_\_\_\_ 100 \_\_\_\_\_

**Evidence of reproduction?:** Yes No If yes; Type: sexual asexual both (circle one)

Evidence: sporophores present with mature spores

**Comments** (e.g., note symbiosis, parasitism, disease, plant density or patchiness): \_\_\_\_\_

FOR DATABASE PERSONNEL USE ONLY  
El.Code: \_\_\_\_\_ Occ#: \_\_\_\_\_  
Single Source EO / Multi-Source EO  
Search effort: \_\_\_\_\_ min./(A/person)  
Data security? Yes No  
Mapped \_\_\_\_\_ QC1 \_\_\_\_\_  
Entered \_\_\_\_\_ QC2 \_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



\*OPT\* **HABITAT**

Topography:

crest  
upper slope  
mid-slope  
lower slope  
bottom

Moisture:

hydric  
wet-mesic  
mesic  
dry-mesic  
xeric  
(circle all that apply)

Light:

open  
partial  
filtered  
shade

Aspect:

N NE  
E SE  
S SW  
W NW  
flat

Slope:

0-1 % or °  
Measured or estimated?  
(circle one)

Elevation:

\_\_\_\_\_m or \_\_\_\_\_ft.

Plant community: Among *Bromus inermis*, *Hieracium caespitosum*, *Phalaris arundinacea*, *Solidago Canadensis*, *Melilotus officinale*.

Soil/substrate type: Tailings aggregate.

Comments: Typical of most *Botrychium* habitat observed at old mining sites.

\*OPT\* **CONSERVATION**

List disturbances, if any: On a flat open field within the former LTVSMC plant site. Adjacent to steep road embankments.

List threats, if any: The site has clearly been graded in the past, and may be re-graded as part of the planned renovation of the former LTV plant. As a result, the plant location may be removed.

**IDENTIFICATION**

Specimen collected? Yes No If yes, Collector: Daniel W. Jones Date of Collection: 06/15/2018

Collectors Address & Phone: c/o Salix Environmental LLC; 208 Linden Street South, Northfield, MN 55057; (507) 581-2517

Repository: \_\_\_\_\_ Accession #: U Minn Herbarium Collection #: \_\_\_\_\_

*Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.*

Photograph taken? Yes No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): Systematics of Moonworts: Botrychium Subgenus Botrychium, Donald Farrar June 2006; Flora of North America, vol. 2, Ophioglossaceae, Wagner Jr. and Wagner, add'l Botrychium notes from Donald Farrar.

Comments: Initial field ID by D. Jones was *Botrychium simplex*. Collected specimens were submitted to Welby Smith, whose outside consultant Malcolm McFarland verified the ID.

FOR DATABASE PERSONNEL USE ONLY

Verified by: \_\_\_\_\_ Date sent to Herbarium \_\_\_\_\_ Date collector notified of outcome: \_\_\_\_\_

\*OPT\* **SUMMARY** (circle one in each column)

Condition:

A – habitat pristine  
B  
C  
D – habitat degraded

Quality:

A – stand large, productive, vigorous  
B  
C  
D – stand small, feeble

Viability:

A – quality likely to remain constant  
B  
C  
D – quality certain to deteriorate

Defensability:

A – protectable  
B  
C  
D – not protectable

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat.

\*OPT\* = **OPTIONAL Section** (i.e., you are not required to fill in these sections to submit a record)

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155  
Form may also be emailed to [sharon.nelson@dnr.state.mn.us](mailto:sharon.nelson@dnr.state.mn.us) - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Minnesota Natural Heritage Information System  
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium campestre  
Common Name: Prairie moonwort  
Date: June 15, 2018 Time: NA  
Observer(s): Daniel W. Jones (Salix Env.), Dan Engel (Barr Eng.)  
Barr Record ID: PM-20180615-DJE-P005

**LOCATION**

State: Minnesota County: St. Louis

Quad Name(s): \_\_\_\_\_  
\_\_\_\_\_

Twp: 59 Rng: 14 Sec: 23 [REDACTED]

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

or

UTM: Northing [REDACTED] Easting [REDACTED] Zone 15N (Zone 15 preferred!)

NAD83 or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. Longitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. (provide degrees, minutes, and seconds)  
Source: \_\_\_\_\_

**Map:** A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

**Directions/comments/description of location:** Barr specimen #PM-20180615-DWJ-S05. This species was located adjacent to an old gravel two-track road, near a formerly disturbed area associated with the former LTVSMC plant site, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the internal road network of the former LTVSMC plant site.

\*OPT\* **SEARCH EFFORT** time actively searching \_\_\_\_\_ min. acres searched 0.01 # of observers 2

\*OPT\* **BIOLOGY** If the species was searched for but not found, check here: \_\_\_\_\_ Revisit needed? Y N When? \_\_\_\_\_

**Population size:** 15 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. **If you circle more than one description** in each line, on the line below the description indicate the percentage of the population in each stage.

**Leaves:** dormant budding new leaf full leaf leaf fall  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100 + \_\_\_\_\_ = 100%  
**Flowers & Fruit:** dormant budding early flower full flower early fruit mature fruit dispersing seed  
\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ 100 \_\_\_\_\_

**Age structure:** seedlings immature 1<sup>st</sup> yr.(biennials) mature  
\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ 100

**Vigor:** feeble normal vigorous  
\_\_\_\_\_ 100 \_\_\_\_\_

**Evidence of reproduction?:** Yes No If yes; Type: sexual asexual both (circle one)

Evidence: sporophores present with mature spores

**Comments** (e.g., note symbiosis, parasitism, disease, plant density or patchiness): \_\_\_\_\_

FOR DATABASE PERSONNEL USE ONLY  
El.Code: \_\_\_\_\_ Occ#: \_\_\_\_\_  
Single Source EO / Multi-Source EO  
Search effort: \_\_\_\_\_ min./(A/person)  
Data security? Yes No  
Mapped \_\_\_\_\_ QC1 \_\_\_\_\_  
Entered \_\_\_\_\_ QC2 \_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*OPT\* **HABITAT**

Topography:

crest  
upper slope  
mid-slope  
lower slope  
bottom

Moisture:

hydric  
wet-mesic  
mesic  
dry-mesic  
xeric  
(circle all that apply)

Light:

open  
partial  
filtered  
shade

Aspect:

N NE  
E SE  
S SW  
W NW  
flat

Slope:

0-1 % or °  
Measured or estimated?  
(circle one)

Elevation:

\_\_\_\_\_m or \_\_\_\_\_ft.

Plant community: Among *Hieracium caespitosum*, *Danthonia* species, *Trifolium repens*, *Melilotus officinale*, with a few *Populus balsamifera*, *Betula papyrifera*, and *Salix discolor* also present.

Soil/substrate type: Gravel and Tailings aggregate.

Comments: Typical of most *Botrychium* habitat observed at old mining sites.

\*OPT\* **CONSERVATION**

List disturbances, if any: On a flat open field within the former LTVSMC plant site. Adjacent to steep road embankments.

List threats, if any: The site has clearly been graded in the past, and may be re-graded as part of the planned renovation of the former LTV plant. As a result, the plant location may be removed.

**IDENTIFICATION**

Specimen collected? (Yes) No If yes, Collector: Daniel W. Jones Date of Collection: 06/15/2018

Collectors Address & Phone: c/o Salix Environmental LLC; 208 Linden Street South, Northfield, MN 55057; (507) 581-2517

Repository: \_\_\_\_\_ Accession #: U Minn Herbarium Collection #: \_\_\_\_\_

*Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.*

Photograph taken? (Yes) No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): Systematics of Moonworts:

Botrychium Subgenus Botrychium, Donald Farrar June 2006; Flora of North America, vol. 2, Ophioglossaceae, Wagner Jr. and Wagner, add'l Botrychium notes from Donald Farrar.

Comments: Initial field ID by D. Jones was *Botrychium simplex*. Collected specimens were submitted to Welby Smith, whose outside consultant Malcolm McFarland verified the ID.

FOR DATABASE PERSONNEL USE ONLY

Verified by: \_\_\_\_\_ Date sent to Herbarium \_\_\_\_\_ Date collector notified of outcome: \_\_\_\_\_

\*OPT\* **SUMMARY** (circle one in each column)

Condition:

A – habitat pristine  
B  
C  
D – habitat degraded

Quality:

A – stand large, productive, vigorous  
B  
C  
D – stand small, feeble

Viability:

A – quality likely to remain constant  
B  
C  
D – quality certain to deteriorate

Defensability:

A – protectable  
B  
C  
D – not protectable

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat.

\*OPT\* = **OPTIONAL Section (i.e., you are not required to fill in these sections to submit a record)**

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

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Minnesota Natural Heritage Information System  
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium simplex  
Common Name: Least moonwort  
Date: June 15, 2018 Time: NA  
Observer(s): Daniel W. Jones (Salix Env.), Dan Engel (Barr Eng.)  
Barr Record ID: PM-20180615-DJE-P006

**LOCATION**

State: Minnesota County: St. Louis

Quad Name(s): \_\_\_\_\_  
\_\_\_\_\_

Twp: 59 Rng: 14 Sec: 23 [REDACTED]

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

or

UTM: Northing [REDACTED] Easting [REDACTED] Zone 15N (Zone 15 preferred!)

NAD83 or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. Longitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. (provide degrees, minutes, and seconds)  
Source: \_\_\_\_\_

**Map:** A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

**Directions/comments/description of location:** Barr specimen #PM-20180615-DWJ-S06 This plant was found along an overgrown trail, in a formerly disturbed area associated with the former LTVSMC plant site, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the internal road network of the former LTVSMC plant site.

\*OPT\* **SEARCH EFFORT** time actively searching \_\_\_\_\_ min. acres searched 0.01 # of observers 2

\*OPT\* **BIOLOGY** If the species was searched for but not found, check here: \_\_\_\_\_ Revisit needed? Y N When? \_\_\_\_\_

**Population size:** 1 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. **If you circle more than one description** in each line, on the line below the description indicate the percentage of the population in each stage.

**Leaves:** dormant budding new leaf full leaf leaf fall  
\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + 100 + \_\_\_\_\_ = 100%  
**Flowers & Fruit:** dormant budding early flower full flower early fruit mature fruit dispersing seed  
\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ 100 \_\_\_\_\_

**Age structure:** seedlings immature 1<sup>st</sup> yr.(biennials) mature  
\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ 100

**Vigor:** feeble normal vigorous  
\_\_\_\_\_ 100 \_\_\_\_\_

**Evidence of reproduction?:** Yes No If yes; Type: sexual asexual both (circle one)

Evidence: sporophores present with mature spores

**Comments** (e.g., note symbiosis, parasitism, disease, plant density or patchiness): \_\_\_\_\_

FOR DATABASE PERSONNEL USE ONLY  
El.Code: \_\_\_\_\_ Occ#: \_\_\_\_\_  
Single Source EO / Multi-Source EO  
Search effort: \_\_\_\_\_ min./(A/person)  
Data security? Yes No  
Mapped \_\_\_\_\_ QC1 \_\_\_\_\_  
Entered \_\_\_\_\_ QC2 \_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*OPT\* **HABITAT**

|   |  |  |   |   |
|---|--|--|---|---|
| <u>Topography:</u><br>crest<br>upper slope<br>mid-slope<br>lower slope<br><u>bottom</u> | <u>Moisture:</u><br>hydric<br>wet-mesic<br><u>mesic</u><br>dry-mesic<br>xeric<br>(circle all that apply) | <u>Light:</u><br><u>open</u><br>partial<br>filtered<br>shade | <u>Aspect:</u><br>N NE<br>E SE<br>S SW<br>W NW<br><u>flat</u> | <u>Slope:</u><br>0-1 % or _____ °<br>Measured or <u>estimated?</u><br>(circle one)<br><br><u>Elevation:</u><br>_____ m or _____ ft. |
|---|--|--|---|---|

Plant community: Among *Poa compressa*, *Trifolium repens*, *Achillea millefolium*, with a few *Alnus sp.*

Soil/substrate type: Gravel and Tailings aggregate.

Comments: Typical of most *Botrychium* habitat observed at old mining sites.

\*OPT\* **CONSERVATION**

List disturbances, if any: On a flat open field within the former LTVSMC plant site. Adjacent to steep road embankments.

List threats, if any: The site has clearly been graded in the past, and may be re-graded as part of the planned renovation of the former LTV plant. As a result, the plant location may be removed.

**IDENTIFICATION**

Specimen collected? (Yes) No If yes, Collector: Daniel W. Jones Date of Collection: 06/15/2018

Collectors Address & Phone: c/o Salix Environmental LLC; 208 Linden Street South, Northfield, MN 55057; (507) 581-2517

Repository: \_\_\_\_\_ Accession #: U Minn Herbarium Collection #: \_\_\_\_\_

*Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.*

Photograph taken? (Yes) No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): Systematics of Moonworts:

*Botrychium* Subgenus *Botrychium*, Donald Farrar June 2006; *Flora of North America*, vol. 2, *Ophioglossaceae*, Wagner Jr. and Wagner, add'l *Botrychium* notes from Donald Farrar.

Comments: Initial field ID by D. Jones was *Botrychium simplex*. Collected specimens were submitted to Welby Smith, whose outside consultant Malcolm McFarland verified the ID.

FOR DATABASE PERSONNEL USE ONLY

Verified by: \_\_\_\_\_ Date sent to Herbarium \_\_\_\_\_ Date collector notified of outcome: \_\_\_\_\_

\*OPT\* **SUMMARY** (circle one in each column)

|   |   |   |  |
|---|---|---|--|
| <u>Condition:</u><br>A – habitat pristine<br><u>B</u><br><u>C</u><br>D – habitat degraded | <u>Quality:</u><br>A – stand large, productive, vigorous<br><u>B</u><br><u>C</u><br>D – stand small, feeble | <u>Viability:</u><br>A – quality likely to remain constant<br><u>B</u><br><u>C</u><br><u>D</u> – quality certain to deteriorate | <u>Defensability:</u><br>A – protectable<br><u>B</u><br><u>C</u><br><u>D</u> – not protectable |
|---|---|---|--|

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat.

\*OPT\* = **OPTIONAL Section (i.e., you are not required to fill in these sections to submit a record)**

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to [sharron.nelson@dnr.state.mn.us](mailto:sharron.nelson@dnr.state.mn.us) - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.



Minnesota Natural Heritage Information System  
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Caltha natans  
Common Name: Floating marsh marigold  
Date: June 18, 2018 Time: NA  
Observer(s): Daniel W. Jones (Salix Env.), Dan Engel (Barr Eng.)  
Barr Record ID: PM-20180615-DJE-P007

**LOCATION**

State: Minnesota County: St. Louis

Quad Name(s): \_\_\_\_\_  
\_\_\_\_\_

Twp: 59 Rng: 13 Sec: 1

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

or

UTM: Northing \_\_\_\_\_ Easting \_\_\_\_\_ Zone 15N (Zone 15 preferred!)

NAD83 or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_ (provide degrees, minutes, and seconds)  
deg. min. sec. deg. min. sec. Source: \_\_\_\_\_

**Map:** A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

**Directions/comments/description of location:** Barr specimen #PM-20180615-DWJ-S07. This species was located at the edge of a pond, likely excavated 20+ years ago, near edge of Dunka Road (former mining road). Pond is mostly open water, varying depths, with sedge/bulrush islands. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the internal road network of the former LTVSMC plant site.

\*OPT\* **SEARCH EFFORT** time actively searching \_\_\_\_\_ min. acres searched 0.01 # of observers 2

\*OPT\* **BIOLOGY** If the species was searched for but not found, check here: \_\_\_\_\_ Revisit needed? Y N When? \_\_\_\_\_

**Population size:** 5 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. **If you circle more than one description** in each line, on the line below the description indicate the percentage of the population in each stage.

|                             |           |          |                                |                    |             |                                     |
|-----------------------------|-----------|----------|--------------------------------|--------------------|-------------|-------------------------------------|
| <b>Leaves:</b>              | dormant   | budding  | new leaf                       | <u>full leaf</u>   | leaf fall   |                                     |
|                             | _____     | _____    | _____                          | <u>100</u>         | _____       | =100%                               |
| <b>Flowers &amp; Fruit:</b> | dormant   | budding  | early flower                   | <u>full flower</u> | early fruit | <u>mature fruit</u> dispersing seed |
|                             | _____     | _____    | _____                          | <u>50</u>          | _____       | <u>50</u>                           |
| <b>Age structure:</b>       | seedlings | immature | 1 <sup>st</sup> yr.(biennials) | <u>mature</u>      |             |                                     |
|                             | _____     | _____    | _____                          | <u>100</u>         |             |                                     |

**Vigor:** feeble normal vigorous  
\_\_\_\_\_ 100 \_\_\_\_\_

**Evidence of reproduction?:** Yes No If yes; Type: sexual asexual both (circle one)

Evidence: open flowers and mature seed pods

**Comments** (e.g., note symbiosis, parasitism, disease, plant density or patchiness): \_\_\_\_\_

FOR DATABASE PERSONNEL USE ONLY  
El.Code: \_\_\_\_\_ Occ#: \_\_\_\_\_  
Single Source EO / Multi-Source EO  
Search effort: \_\_\_\_\_ min./(A/person)  
Data security? Yes No  
Mapped \_\_\_\_\_ QC1 \_\_\_\_\_  
Entered \_\_\_\_\_ QC2 \_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*OPT\* **HABITAT**

Topography:

crest  
upper slope  
mid-slope  
lower slope  
bottom

Moisture:

hydric  
wet-mesic  
mesic  
dry-mesic  
xeric  
(circle all that apply)

Light:

open  
partial  
filtered  
shade

Aspect:

N NE  
E SE  
S SW  
W NW  
flat

Slope:

0-1 % or °  
Measured or estimated?  
(circle one)

Elevation:

\_\_\_\_\_m or \_\_\_\_\_ft.

Plant community: Deep marsh/ditch; estimated 2'-3' at center, ~10"-12" at edges where plants are growing.

Soil/substrate type: saturated soils/muck

Comments:

\*OPT\* **CONSERVATION**

List disturbances, if any: The pond where this plant is found was excavated years ago; spoils piles are adjacent to the pond.

The pond is immediately adjacent to Dunka Road and a security gate.

**IDENTIFICATION**

Specimen collected? Yes No If yes, Collector: Daniel W. Jones Date of Collection: 06/15/2018

Collectors Address & Phone: c/o Salix Environmental LLC; 208 Linden Street South, Northfield, MN 55057; (507) 581-2517

Repository: \_\_\_\_\_ Accession #: U Minn Herbarium Collection #: \_\_\_\_\_

*Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.*

Photograph taken? Yes No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): none; consulted DNR rare species guide and other aquatic references.

Comments: Initial field ID by D. Jones was *Caltha natans*. Collected specimens were submitted to Welby Smith, who verified the ID.

FOR DATABASE PERSONNEL USE ONLY

Verified by: \_\_\_\_\_ Date sent to Herbarium \_\_\_\_\_ Date collector notified of outcome: \_\_\_\_\_

\*OPT\* **SUMMARY** (circle one in each column)

Condition:

A – habitat pristine  
B  
C  
D – habitat degraded

Quality:

A – stand large, productive, vigorous  
B  
C  
D – stand small, feeble

Viability:

A – quality likely to remain constant  
B  
C  
D – quality certain to deteriorate

Defensability:

A – protectable  
B  
C  
D – not protectable

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed aquatic habitat.

\*OPT\* = **OPTIONAL Section** (i.e., you are not required to fill in these sections to submit a record)

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to [sharron.nelson@dnr.state.mn.us](mailto:sharron.nelson@dnr.state.mn.us) - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Minnesota Natural Heritage Information System  
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Caltha natans  
Common Name: Floating marsh marigold  
Date: June 18, 2018 Time: NA  
Observer(s): Daniel W. Jones (Salix Env.), Dan Engel (Barr Eng.)  
Barr Record ID: PM-20180615-DJE-P008

**LOCATION**

State: Minnesota County: St. Louis

Quad Name(s): \_\_\_\_\_  
\_\_\_\_\_

Twp: 59 Rng: 13 Sec: 1 [REDACTED]

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

Twp: \_\_\_\_\_ Rng: \_\_\_\_\_ Sec: \_\_\_\_\_

or

UTM: Northing [REDACTED] Easting [REDACTED] Zone 15N (Zone 15 preferred!)

NAD83 or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. Longitude: \_\_\_\_\_ deg. \_\_\_\_\_ min. \_\_\_\_\_ sec. (provide degrees, minutes, and seconds)  
Source: \_\_\_\_\_

**Map:** A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

**Directions/comments/description of location:** No specimen collected. This species was located at the edge of a pond, likely excavated 20+ years ago, near edge of Dunka Road (former mining road). Pond is mostly open water, varying depths, with sedge/bulrush islands. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the internal road network of the former LTVSMC plant site.

\*OPT\* **SEARCH EFFORT** time actively searching \_\_\_\_\_ min. acres searched 0.01 # of observers 2

\*OPT\* **BIOLOGY** If the species was searched for but not found, check here: \_\_\_\_\_ Revisit needed? Y N When? \_\_\_\_\_

**Population size:** 2 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. **If you circle more than one description** in each line, on the line below the description indicate the percentage of the population in each stage.

|                             |           |          |                                |                    |             |                                     |
|-----------------------------|-----------|----------|--------------------------------|--------------------|-------------|-------------------------------------|
| <b>Leaves:</b>              | dormant   | budding  | new leaf                       | <u>full leaf</u>   | leaf fall   |                                     |
|                             | _____     | _____    | _____                          | <u>100</u>         | _____       | =100%                               |
| <b>Flowers &amp; Fruit:</b> | dormant   | budding  | early flower                   | <u>full flower</u> | early fruit | <u>mature fruit</u> dispersing seed |
|                             | _____     | _____    | _____                          | <u>50</u>          | _____       | <u>50</u>                           |
| <b>Age structure:</b>       | seedlings | immature | 1 <sup>st</sup> yr.(biennials) | <u>mature</u>      |             |                                     |
|                             | _____     | _____    | _____                          | <u>100</u>         |             |                                     |

**Vigor:** feeble normal vigorous  
\_\_\_\_\_ 100 \_\_\_\_\_

**Evidence of reproduction?:** Yes No If yes; Type: sexual asexual both (circle one)

Evidence: open flowers and mature seed pods

**Comments** (e.g., note symbiosis, parasitism, disease, plant density or patchiness): \_\_\_\_\_

FOR DATABASE PERSONNEL USE ONLY

El.Code: \_\_\_\_\_ Occ#: \_\_\_\_\_

Single Source EO / Multi-Source EO

Search effort: \_\_\_\_\_ min./(A/person)

Data security? Yes No

Mapped \_\_\_\_\_ QC1 \_\_\_\_\_

Entered \_\_\_\_\_ QC2 \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*OPT\* **HABITAT**

Topography:

crest  
upper slope  
mid-slope  
lower slope  
bottom

Moisture:

hydric  
wet-mesic  
mesic  
dry-mesic  
xeric  
(circle all that apply)

Light:

open  
partial  
filtered  
shade

Aspect:

N NE  
E SE  
S SW  
W NW  
flat

Slope:

0-1 % or °  
Measured or estimated?  
(circle one)

Elevation:

\_\_\_\_\_m or \_\_\_\_\_ft.

Plant community: Deep marsh/ditch; estimated 2'-3' at center, ~10"-12" at edges where plants are growing.

Soil/substrate type: saturated soils/muck

Comments:

\*OPT\* **CONSERVATION**

List disturbances, if any: The pond where this plant is found was excavated years ago; spoils piles are adjacent to the pond.

The pond is immediately adjacent to Dunka Road and a security gate.

**IDENTIFICATION**

Specimen collected? Yes No If yes, Collector: \_\_\_\_\_ Date of Collection: \_\_\_\_\_

Collectors Address & Phone: \_\_\_\_\_

Repository: \_\_\_\_\_ Accession #: U Minn Herbarium Collection #: \_\_\_\_\_

*Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.*

Photograph taken? Yes No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): none; consulted DNR rare species guide and other aquatic references.

Comments: Field ID by D. Jones was *Caltha natans*. No specimen was collected due to proximity to PM-20180618-DWJ-S07. Should be considered same population.

FOR DATABASE PERSONNEL USE ONLY

Verified by: \_\_\_\_\_ Date sent to Herbarium \_\_\_\_\_ Date collector notified of outcome: \_\_\_\_\_

\*OPT\* **SUMMARY** (circle one in each column)

Condition:

A – habitat pristine  
B  
C  
D – habitat degraded

Quality:

A – stand large, productive, vigorous  
B  
C  
D – stand small, feeble

Viability:

A – quality likely to remain constant  
B  
C  
D – quality certain to deteriorate

Defensability:

A – protectable  
B  
C  
D – not protectable

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed aquatic habitat.

\*OPT\* = **OPTIONAL Section** (i.e., you are not required to fill in these sections to submit a record)

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to [sharon.nelson@dnr.state.mn.us](mailto:sharon.nelson@dnr.state.mn.us) - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

## Appendix C

### Representative Photographs from June 2018 Sensitive Plant Species Survey

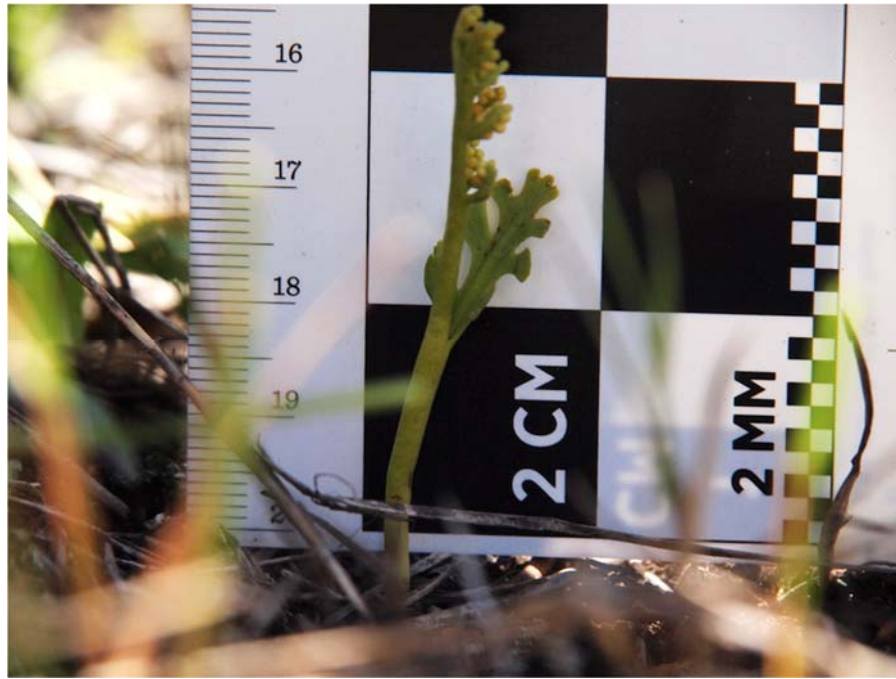




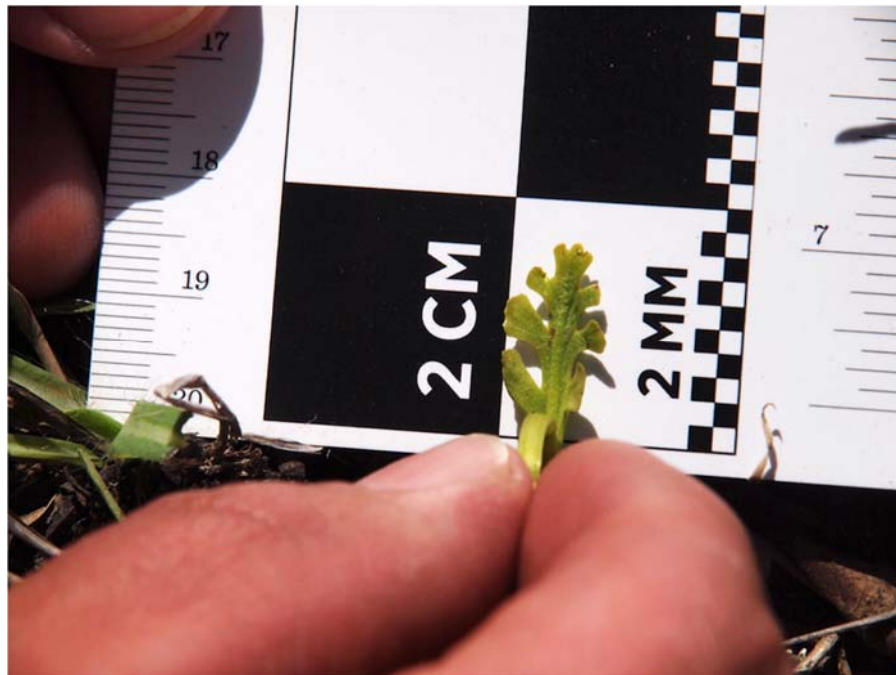
Photograph 1. *Botrychium ascendens*  
Report ID: PM-20180614-DJE-P001  
Specimen #: PM-20180614-DWJ-S01



Photograph 2. *Botrychium ascendens* (detail)  
Report ID: PM-20180614-DJE-P001  
Specimen #: PM-20180614-DWJ-S01



Photograph 3. *Botrychium ascendens*  
Report ID: PM-20180614-DJE-P001  
Specimen #: PM-20180614-DWJ-S02



Photograph 4. *Botrychium ascendens*  
Report ID: PM-20180614-DJE-P001  
Specimen #: PM-20180614-DWJ-S02



Photograph 5. *Botrychium ascendens*  
Report ID: PM-20180614-DJE-P001  
Specimen #: PM-20180614-DWJ-S03



Photograph 6. *Botrychium ascendens*  
(detail) Report ID: PM-20180614-DJE-P001  
Specimen #: PM-20180614-DWJ-S03





Photograph 7. *Botrychium spathulatum*  
 Report ID: PM-20180614-DJE-P003  
 Specimen #: PM-20180620-DWJ-S08



Photograph 8. *Botrychium spathulatum* (detail)  
 Report ID: PM-20180614-DJE-P003  
 Specimen #: PM-20180620-DWJ-S08



Photograph 9. *Botrychium simplex*  
Report ID: PM-20180615-DJE-P004  
Specimen #: PM-20180615-DWJ-S04



Photograph 10. *Botrychium simplex* (detail)  
Report ID: PM-20180615-DJE-P004  
Specimen #: PM-20180615-DWJ-S04





Photograph 11. *Botrychium campestre*  
Report ID: PM-20180615-DJE-P005  
Specimen #: PM-20180615-DWJ-S05



Photograph 12. *Botrychium campestre* (detail)  
Report ID: PM-20180615-DJE-P005  
Specimen #: PM-20180615-DWJ-S05



Photograph 13. *Botrychium simplex*  
Report ID: PM-20180615-DJE-P006  
Specimen #: PM-20180615-DWJ-S06



Photograph 14. *Caltha natans*  
Report ID: PM-20180618-DJE-P007  
Specimen #: PM-20180618-DWJ-S07

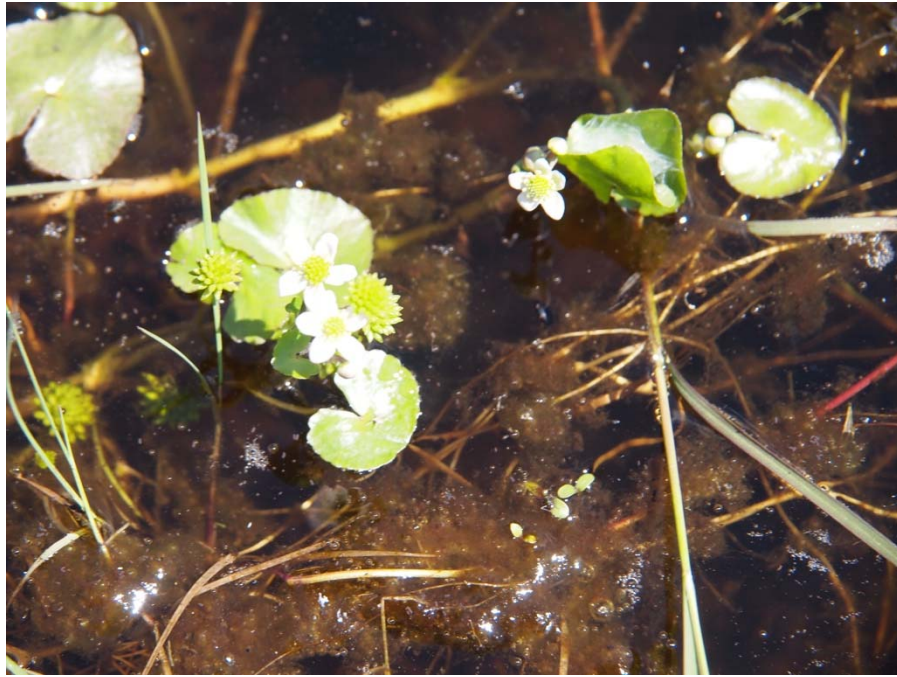


Photograph 15. *Caltha natans* (detail)  
Report ID: PM-20180618-DJE-P007  
Specimen #: PM-20180618-DWJ-S07



Photograph 16. *Caltha natans*  
Report ID: PM-20180618-DJE-P008  
Specimen #: not collected





Photograph 17. *Caltha natans* (detail)  
Report ID: PM-20180618-DJE-P008  
Specimen #: not collected

## Appendix C

### Project Contact Information

1. Name, street address, phone number and email of the person/s submitting the application.

Kevin Pylka  
Poly Met Mining, Inc.  
6500 County Road 666  
Hoyt Lakes, MN 55750  
218-471-2162  
[kpylka@polymetminning.com](mailto:kpylka@polymetminning.com)

2. Name, title, affiliation, and street address of the person to which a permit would be issued. This person must be authorized to serve as a contractual representative of the entity to which the permit will be issued.

Christie Kearney, P.E.  
Environmental Site Director  
Poly Met Mining, Inc.  
218-471-2163  
[ckearney@polymetminning.com](mailto:ckearney@polymetminning.com)

Mailing Address:  
6500 County Road 666  
Hoyt Lakes, MN 55750



## CD on Back Cover

Information on CD was redacted to protect sensitive plant location data.