



# MINNESOTA STEEL

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March 30, 2006

Dr. Bonita Eliason,  
Minnesota Department of Natural Resources  
Attn: Endangered Species Permits  
500 Lafayette Road, Box 25  
St Paul, MN 55155

**RE: Endangered Species Takings Permit Application for Minnesota Steel Industries**

Dear Dr. Eliason:

As you may be aware, Minnesota Steel Industries is moving ahead with planning, design and permitting activities for its mining and steel production project at the former Butler Taconite operation near Nashwauk in Itasca County. The required Environmental Impact Statement is currently underway with the Department of Natural Resources (MDNR) designated as the responsible governmental unit.

One component of the natural resource permitting process is the project's potential effect on plant species listed as endangered or threatened by the State of Minnesota. Minnesota Steel has coordinated with the MDNR on efforts to locate and quantify listed plant species, and has worked to avoid and/or minimize the project's impacts on listed plant species. The project as previously described in the scoping Environmental Assessment Worksheet (dated July 18, 2005) has been modified and predicted impacts to listed species have been reduced.

With this letter we are applying to the MDNR for a takings permit. You had previously suggested to Daniel Jones, our botanist with Barr Engineering Company, that we prepare an application with a description of the impacts and suggestion for mitigation. Accordingly, the attached plan describes the impacts and proposed mitigation.

We look forward to meeting with you to discuss this application. If you should have any questions or comments, please feel free to contact me at 651/209-7707.

Sincerely,

Debra L. McGovern  
Environmental & Regulatory Affairs Director

Attachment

cc: Howard Hilshorst, Minnesota Steel Executive VP  
Scott Ek, MN DNR Environmental Review  
Jon Ahlness, USACE-St Paul

*The Resource. The Technology. The Future of Steel.*

**Minnesota Steel Industries  
Description of Impacts on Sensitive Plant Species and  
Proposal for Mitigation  
March 30, 2006**

**Nature of Project**

Minnesota Steel Industries proposes to operate a mining and steel-making facility at the Itasca County location shown on the Project Location Map (Figure 1). The project will entail excavation of iron ore, conveyance of the ore to an onsite taconite production plant, and disposal on the site of tailings and other unusable material. The project's potential impacts to listed plant species include:

- removal during grading and site preparation for construction of the mining and steel-making facility;
- removal by excavation for extraction of iron ore;
- removal by conveyance structure and/or haul road construction, and
- burial under mine tailings disposal.

As discussed below, the project design will avoid most of these potential impacts at seven of the eight locations identified by the EAW as being within the project area and containing identified populations of listed plant species. However, impacts related to construction of the crushing area are unavoidable in one location that currently supports a state-endangered species population.

**Summary of Botanical Surveys**

Botanical surveys were conducted on the Minnesota Steel project site in 1999 and in 2005 by qualified botanists following work plans that had been reviewed and approved by MNDNR. The 2005 survey identified two state-endangered plant species and one state-threatened plant species. State-endangered plant species populations were found at two locations and state-threatened plant species populations at four locations. The sensitive plant species found by the 2005 botanical survey are listed below, along with the approximate number of individuals present.

2005 Location Number	Scientific Name	Common Name	MNDNR status	Approximate # of individuals
71504	<i>Platanthera flava</i>	Tubercled rein-orchid	E	40
71607	<i>Botrychium oneidense</i>	Blunt-lobed grapefern	E	40
71501	<i>Botrychium rugulosum</i>	St. Lawrence grapefern	T	6
71602	<i>B. rugulosum</i>	St. Lawrence grapefern	T	12
71603	<i>B. rugulosum</i>	St. Lawrence grapefern	T	5
71606	<i>B. rugulosum</i>	St. Lawrence grapefern	T	50

The 1999 botanical survey found additional populations of state endangered and threatened plant species. Specifically, the 1999 survey identified one state-endangered plant species (*Platanthera flava*) in two locations, and four state-threatened plant species at a total of six locations. The 2005 botanical survey rediscovered one of the *Platanthera flava* locations. However, the remaining 1999 populations were not found by the 2005 survey. There are two reasons why these populations were not found. First, some of the 1999 findings were well outside of the currently proposed project

activities, and were excluded from the 2005 search area. Second, the coordinates from the 1999 findings were visited, but the plants were not seen in 2005. The endangered and threatened plant species located by the 1999 botanical survey are listed below, along with their approximate population sizes.

Scientific Name	Common Name	MNDNR status	Approximate # of individuals	2005 survey status*
<i>Platanthera flava</i>	Tubercled rein-orchid	E	78	Located ~40 individuals
<i>Platanthera flava</i>	Tubercled rein-orchid	E	70	Not found
<i>Botrychium campestre</i>	Prairie moonwort	T	20	Outside project limits
<i>Botrychium campestre</i>	Prairie moonwort	T	3	Outside project limits
<i>Botrychium oneidense</i>	Blunt-lobed grapefern	T	10	Outside project limits
<i>Botrychium pallidum</i>	Pale moonwort	T	4	Not found; located ~40 <i>B. oneidense</i> at same location
<i>Botrychium rugulosum</i>	St. Lawrence grapefern	T	1	Not found; located ~40 <i>B. oneidense</i> at same location
<i>Botrychium rugulosum</i>	St. Lawrence grapefern	T	25	Outside project limits
<i>Botrychium rugulosum</i>	St. Lawrence grapefern	T	60	Outside project limits

\*Outside project limits – the 1999 botanical survey covered an area larger than what is currently proposed. The 2005 survey did not attempt to re-identify 1999 populations outside of the current project limits

Not found – The 2005 survey returned to the coordinates of 1999 populations, but did not find the previously-identified species. In some cases, the 2005 survey identified different listed species at the 1999 coordinates.

To summarize, the 1999 and 2005 botanical surveys identified two state-endangered and three state-threatened plant species at a total of thirteen sites. Eight of these were within the project area as defined in the Environmental Assessment Worksheet. The two botanical surveys are discussed in detail in the Botanical Survey Report prepared by Barr for Minnesota Steel and provided to MNDNR on August 23, 2005.

#### **Avoidance/Minimization**

Minnesota Steel and Barr Engineering Co. have consulted the data obtained in the botanical surveys to consider design modifications that would avoid populations of listed plant species or minimize impacts in those areas. As mentioned previously, a number of potential impacts that were identified in the scoping Environmental Assessment Worksheet have been avoided.

The proposed tailings basin will be reduced in size to avoid encroaching on the Pickerel Creek watershed. This watershed contains sites 71501 and 71504, as well as PFLA Site 1 from the 1999 survey, which include *Botrychium rugulosum* (threatened) and *Platanthera flava* (endangered)

Near the tailings pipeline to the east of Pits 5 and 6, site 71602 includes *Botrychium rugulosum* (threatened). Further south is PFLA site 2, which has a population of *Platanthera flava* (endangered). These sites can be avoided by routing of the pipeline. Also to the east of the pits, sites 71603 and 71606 both contain *Botrychium rugulosum* (threatened) These will be avoided as well. As a result, there will be no impacts resulting from the proposed mining activities at seven of the eight locations identified by the EAW as being within the project area and containing identified populations of listed plant species.

### Location and Species to be Taken

There is only one location where loss of listed species cannot be avoided. Site 71607 (same as Mixed Site from the 1999 survey) contains *Botrychium oneidense* (endangered). A population of approximately 40 *Botrychium oneidense* will be removed. This population is currently located under a mixed aspen-birch-jack pine stand adjacent to a sparsely-vegetated open area of fine older mine tailings and grit. The UTM coordinates for the specific location are 5244440N, 481340E (Zone 15). The location is shown on Figure 2.

The 1999 botanical survey also located two threatened species at site 71607; however, these were not found by the 2005 survey. The threatened species located in 1999 were four individuals of *Botrychium pallidum* and one individual of *Botrychium rugulosum*. It is unclear whether these species are still present in a subterranean dormant state. Many species within the genus *Botrychium* can persist underground for several years, and the overall life expectancy of an individual plant is estimated to be 10-12 years. For the purposes of this taking permit application, it is assumed that these individuals are still present.

Site 71607 is at the site of the proposed primary and secondary crusher and dry cobbing operation. Minnesota Steel has studied the possibility of relocating this facility and concluded that relocation is not feasible. The location of the crusher/cobbing operation is dependent on the following factors:

1. It must be located near the edge of the pits to reduce haul distance
2. It must be centrally located (between the two pits) to reduce haul distance
3. It must be located to the north of the iron formation boundary to avoid covering mineral reserves.
4. It must be a relatively large, open area because of the size of crushing and cobbing operations and the large roadways needed for haul trucks and maintenance equipment.

Preservation by fencing of the small area within the large open crusher/cobber working area does not appear feasible. The project would greatly modify the surrounding soils, vegetation and hydrology and an isolated fenced area could impose a safety risk to trucks and equipment. In a highly industrialized environment with heavy equipment traffic it would be hard to maintain the fenced area intact and dust from traffic would often cover the site. In conclusion, because of the size and configuration of the crushing/cobbing operation, and the relatively small, dense distribution of the listed plant species, the loss of this plant population cannot be avoided or minimized.

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.

### **Proposed Mitigation Measures**

Where there is no feasible alternative to taking a listed species, MN DNR has accepted 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.

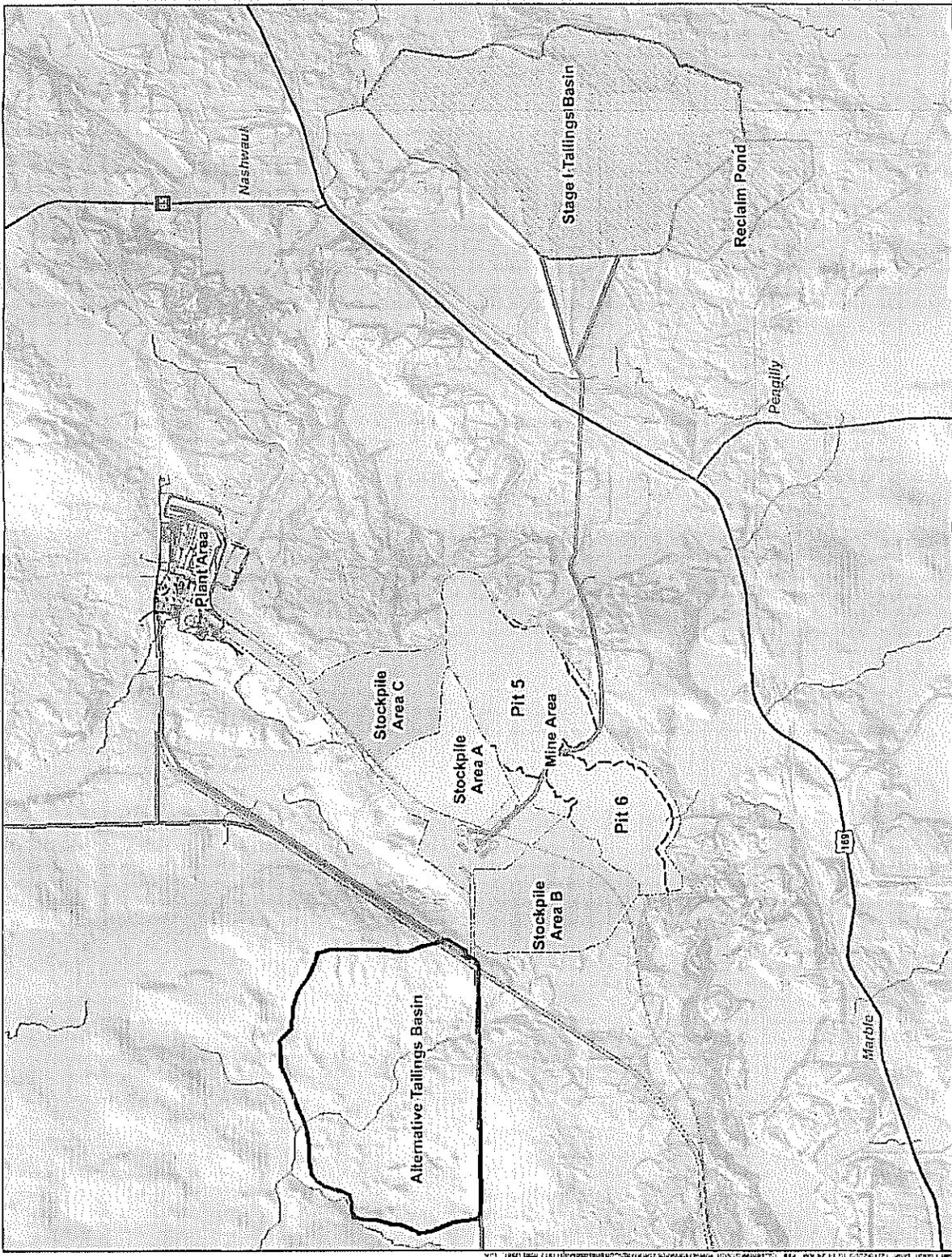
In the case of *Botrychium*, a species whose ecology and life history are not well understood, the first two options do not provide reliable compensation for the population reductions or losses. This is because acquisition of another known population site would not necessarily ensure the sustained viability of that population. Moreover, further field studies to locate new populations are not crucial to the conservation of *Botrychium* at this point in time – extensive populations have been located in recent years.

Minnesota Steel has already funded two separate, comprehensive field surveys to locate and map populations of *Botrychium* and other state-listed plant species on its property. As part of the Environmental Impact Statement, Minnesota Steel will also be funding a cumulative impacts analysis to assess the proposed mining projects impacts on state-listed plant species and other natural resources. As an additional measure to compensate for the project's impacts to state-listed plant species, Minnesota Steel proposes to contribute to the funding of further research into the ecology and distribution of the genus *Botrychium*.

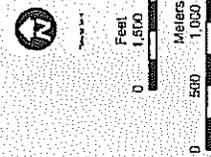
Specifically, Minnesota Steel proposes to contribute to the funding of a research proposal prepared by Dr. Cindy Johnson-Groh of Gustavus Adolphus College. Dr. Johnson-Groh is a nationally recognized expert in the ecology of *Botrychium*, and has conducted field research projects on the genus in Minnesota, Oregon, Colorado, Alaska and other locations.

Representatives of Minnesota Steel spoke by telephone with Dr. Johnson-Groh on December 6, 2005. She said that her proposal is based on studying the disturbance ecology of *Botrychium*. She plans to conduct a large research project that would visit a number of sites (50-100) with varying disturbance histories and conditions (age, length, type of disturbance; physical parameters such as soils, hydrology, etc.; associated vegetation communities). She would like to conduct searches for *Botrychium* at these sites, then correlate the occurrences of *Botrychium* species and communities to the disturbance history and physical conditions.

Minnesota Steel proposes to make a contribution to the Minnesota DNR in the amount of \$3,500 to the fund this research. Based on conversations with Dr. Johnson-Groh, this amount would fund one student assistant for a full summer field season. The proposed funding is roughly proportional to the contribution made for much larger takings of similar species.



- Proposed Rail Alignment\*
  - Road Alignment - Option 1\*
  - Road Alignment - Option 2\*
  - Preferred Gas Alignment\*
  - Project Mine Pits
  - Alternative Tailings Basin
  - Stage 1 TB Reclaim Pond
  - Stage 1 Tailings Basin
  - Stage 1 TB Tailings Line
  - Project Area Outlines
- Project Areas**
- Mine Area
  - Plant Area
  - Stockpile Area A
  - Stockpile Area B
  - Stockpile Area C
- \*Source: SEH  
2003 FSA Aerial Photo



**Figure 1 - Project Location Map**  
 Application for Taking Permit  
 for Sensitive Plant Species  
 Minnesota Steel Industries  
 March 2006

1999 Walton Rare Plant Survey

DNR STATUS

- Endangered
- Endangered & Threatened

2005 Rare Plant Survey

DNR STATUS

- Endangered
- Threatened

Proposed Rail Alignment\*

Road Alignment - Option 1\*

Road Alignment - Option 2\*

Preferred Gas Alignment\*

Project Mine Pits

Alternative Tailings Basin

Stage 1 TB Reclaim Pond

Stage 1 Tailings Basin

Stage 1 TB Tailings Line

Project Area Outlines

Project Areas

Mine Area

Plant Area

Stockpile Area A

Stockpile Area B

Stockpile Area C

\*Source: SEH

2003 FSA Aerial Photo

Feet

0 1,500

Meters

0 500 1,000

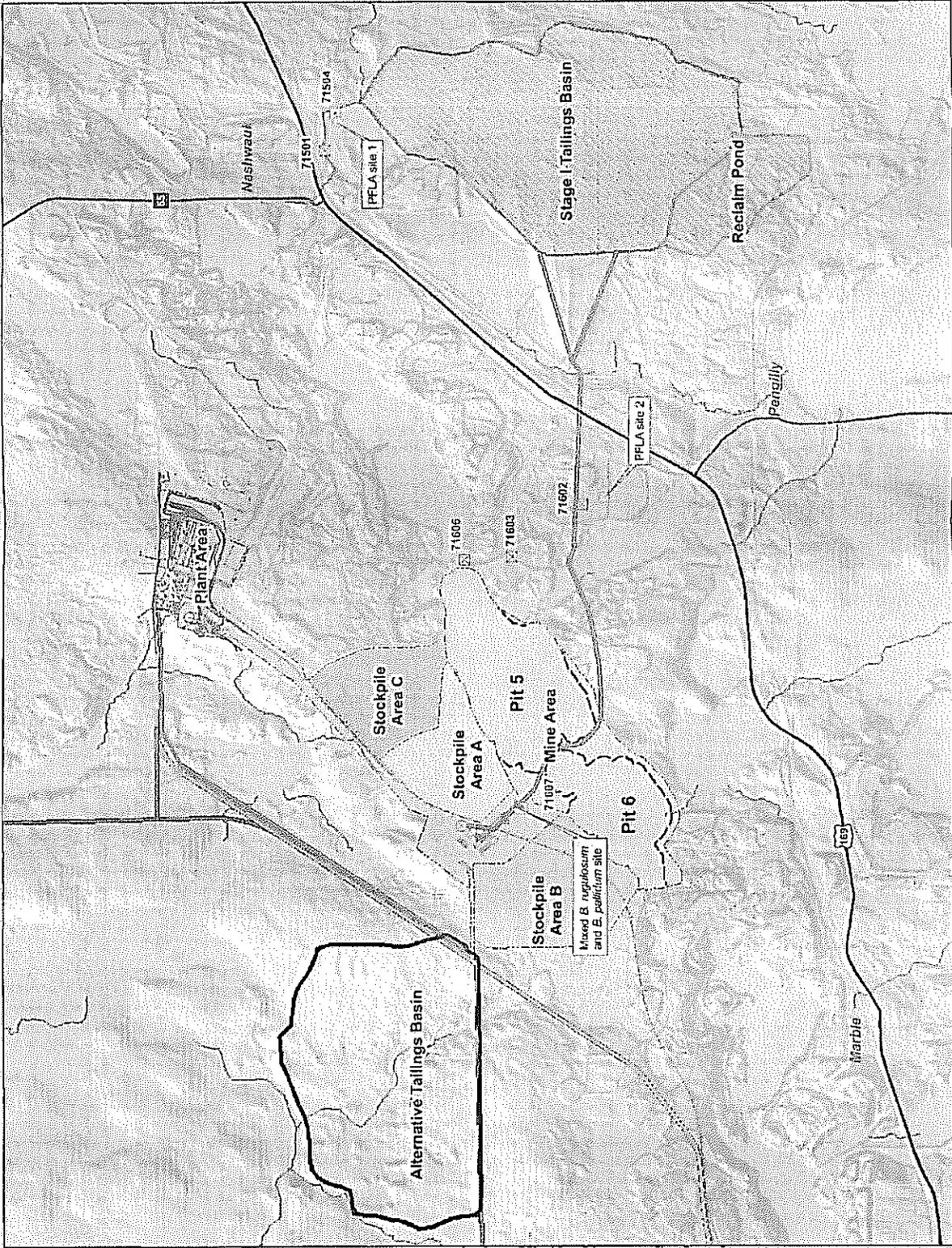


Figure 2 - Locations of Minnesota Endangered & Threatened Plant Species Found in 1999 and 2005 Botanical Surveys

Application for Taking Permit for Sensitive Plant Species

Minnesota Steel Industries

March 2006



September 12, 2006

Dr. Bonita Eliason  
Minnesota Department of Natural Resources  
Division of Ecological Services  
Attn: Endangered Species Permits  
500 Lafayette Road, Box 25  
St. Paul, MN 55155

**Re: Transplanting Plan for *Botrychium* Species on Minnesota Steel Industries Site**

Dr. Eliason:

Attached is a plan for transplanting *Botrychium* species that have been proposed for removal as part of the Minnesota Steel Industries mining and steel production project near Nashwauk in Itasca County. This transplant plan has been researched and prepared as a supplement to the March 30, 2006 Takings Permit Application submitted by Minnesota Steel. In a May 9, 2006 meeting to review the takings permit application, you requested an evaluation of the potential for transplanting the affected *Botrychium* population. The attached plan has been prepared in response to your request.

The transplant plan is based on additional field studies conducted in June of this year to determine the existing habitat conditions and to locate similar conditions elsewhere on the project site, away from proposed mining activities. The plan also reflects information obtained from the Minnesota Department of Natural Resources (MDNR) Natural Heritage Database, as well as literature reviews on *Botrychium* life history and conversations with Dr. Cindy Johnson-Groh, who has expertise on the genus.

As a result, the plan identifies a site that most closely reflects conditions at the existing *Botrychium* site, and proposes an appropriate, effective means of re-locating the plants. Pending your review of the transplant plan and concurrence with its findings, Minnesota Steel proposes to transplant the *Botrychium* population in early spring 2007.

We look forward to hearing your comments on the proposed transplant plan. If you have questions or comments, please contact Debra McGovern at 651/209-7707. Thank you for your continued assistance in the takings permit process.

Debra L. McGovern  
Environmental & Regulatory Affairs Director  
Minnesota Steel Industries

Daniel W. Jones  
Environmental Scientist  
Barr Engineering Co.

Attachment

cc: Howard Hilshorst, Minnesota Steel Executive VP  
Scott Ek, MDNR Environmental Review  
John Ahlness, USACE-St. Paul

# Minnesota Steel *Botrychium* Transplant Strategy

September 2006

## Introduction

At a meeting on May 9, 2006 to discuss the takings permit application and appropriate mitigation, MDNR requested an evaluation of the potential for transplanting the populations of *Botrychium* to a location on the Minnesota Steel site outside of active mining areas.

The existing sites and potential transplant sites were visited to gather information on plant associations, soils, and other factors for evaluating the efficacy of transplanting the existing population. The results of those visits and the resulting transplant strategy are outlined below.

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

There are seventeen species of *Botrychium* in Minnesota (MDNR 2002). This transplant plan focuses on three of these species. They are *Botrychium oneidense*, *B. rugulosum*, which are in the subgenus *Sceptridium* (the grapeferns) and *B. pallidum*, which is in the subgenus *Botrychium* (the moonworts) (Wagner and Wagner 1993). *Botrychium oneidense* and *B. pallidum* are state-endangered species; *B. rugulosum* is a state-threatened species (MDNR 2002).

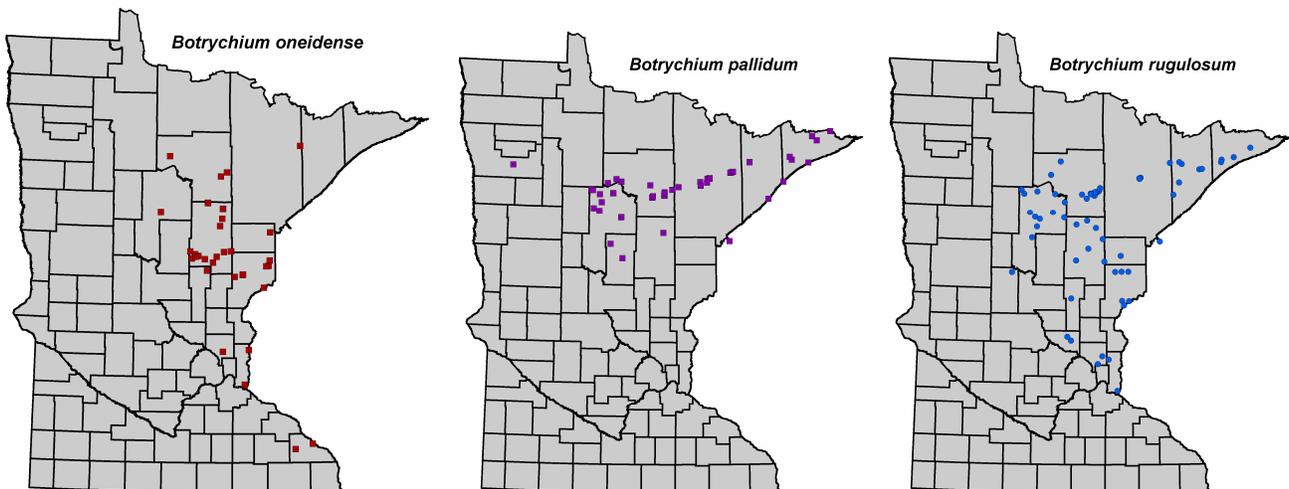
In general, members of the genus *Botrychium* are small plants with a single leaf that is divided into a once- or twice-pinnate sterile frond, called the trophophore, and a fertile segment called the sporophore. The diploid sporophore produces spores above ground, which are released and develop below 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 1956). 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).

There are two additional characteristics of *Botrychium* species that are relevant to the transplant plan. First, *Botrychium* roots are few (~5-30 per plant), relatively short (3-20 cm), and typically horizontal and thus shallow. Second, *Botrychium* species form symbiotic relationships with mycorrhizal fungi to acquire nutrients and supplement the relatively weak photosynthesis conducted by the plants (Johnson-Groh et al 2002, Johnson-Groh and Lee 2002). The relevance of these characteristics will be explained further below.

Barr botanist Daniel Jones submitted a request to the MDNR Natural Heritage Database (NHD, MDNR 2006) to evaluate the statewide and regional presence of the three *Botrychium* species. The NHD has the following numbers of records for the three *Botrychium* species discussed here:

- *Botrychium oneidense* – 37 records in 10 counties;
- *B. pallidum* – 55 records in 8 counties;
- *B. rugulosum* – 68 records in 13 counties.

Most records for these three *Botrychium* species are in Itasca, St. Louis, Cass or Aitkin Counties. The distributions of NHD *Botrychium* records statewide are shown below. Left to right are *B. oneidense*, *B. pallidum* and *B. rugulosum*.



The NHD records include site descriptions and plant associations for each population recorded. This information was used to sort the records into general habitat types, and to then analyze the relative occurrence of each species within those habitat types. Four habitat types were identified from the NHD records for the three *Botrychium* species. These are:

**Forested communities** – Upland forested communities described in the NHD records are generally maple-basswood (*Acer saccharum* – *Tilia americana*) or mixed maple and red oak (*Quercus rubra*) stands, along with other northern hardwoods such as paper birch (*Betula papyrifera*) and aspen (*Populus tremuloides*). Approximately two-thirds of the *B. rugulosum* records that occur in forested habitat are in stands of jack pine or red pine (*Pinus banksiana* and *Pinus resinosa*).

**Wetland edges** – Approximately one-quarter of the records for the three *Botrychium* species are in habitats adjacent to wet areas. Common descriptions are “low area”, “moist black ash woods”, “ashy swale”, or at the edges of ponds and lakes. In each case, the

*Botrychium* individual or population is not actually in standing water or saturated soils, but is at the periphery of a wetland area.

**Ruderal** – This term is used to describe disturbed sites. In the case of the NHD records, it refers to those habitats described as old tailings basins, logging landings, roadsides, gravel pits and railroad or gas pipeline rights-of-way. These areas are typified 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.

**Meadows and open areas** – This habitat type is characterized by open grassy areas with mixed native/non-native forbs and clumps of small birch/poplar/aspen regeneration. It is somewhat similar to the disturbed habitat type, but is generally either further along in terms of succession, or has less of a prior disturbance history. Only *Botrychium rugulosum* records include this habitat type.

The NHD records for each species were grouped by habitat type, and the percent of occurrences in each habitat type was calculated. The percent distribution of records for the three *Botrychium* species in each of these habitat types is shown in Table 1.

**Table 1. Percent Occurrence\* of Three *Botrychium* Species by General Habitat Type**

Species	Percent Occurrence by General Habitat Type			
	Forested	Wet	Ruderal	Meadow
<i>B. oneidense</i>	35	54	11	0
<i>B. pallidum</i>	15	17	68	0
<i>B. rugulosum</i>	32	15	32	21

\*Based on MDNR Natural Heritage Database Records

These results help illustrate the specific habitat preferences of the three *Botrychium* species. *B. oneidense* tends to be found near wet areas and, to a lesser degree, in forested areas. It is infrequently found in disturbed areas. *B. pallidum* shows a distinct preference for disturbed areas, as 36 of the 55 records(68%) are in some type of ruderal area. *B. rugulosum* is more evenly distributed across a variety of habitats.

An additional comprehensive discussion of the local, regional and statewide distribution of the three *Botrychium* species is provided in Section 5.5 of the Draft EIS for the project. This section provides a discussion of the cumulative impacts of regionally proposed mining activities on *Botrychium* species, and discusses past and projected statewide and regional loss of various habitat types, and the potential impact of those losses on *Botrychium* species.

## Existing site

The existing site is a small stand of balsam poplars (*Populus balsamifera*), generally 2"-7" diameter and 25'-40' tall. Canopy cover is approximately 60%. The area surrounding the stand of trees is an old tailings site that now ranges from open areas of grasses and forbs to unvegetated fine tailings. Reed canary grass (*Phalaris arundinacea*), fringed brome (*Bromus inermis*) and other non-native grasses make up the majority of the plant cover underneath the poplars. Shinleaf (*Pyrola elliptica*), wild strawberry (*Fragaria virginica*) and horsetails (*Equisetum* sp.) are also present, as well as small patches of moss-lichen crusts. Bare ground makes up about 10% of the ground cover.

The site is at the edge of two mapped soil units. One is Keewatin silt loam, the other is Slickens (old mine tailings). The soils at the existing site are dense mine tailings with a silty-clay texture and a Munsell value of 2.5YR 3/4 with occasional 2.5/10Y dark grey streaks. A soil sample was collected and was analyzed by Soil Engineering Testing, Inc (SET). Results confirm that the soils are very fine grain size mine tailings. In addition, nearby soil borings taken by American Engineering Testing, Inc. (AET) for the design of the concentrator/crusher site indicate a depth of 28 feet of mine tailings over sandy lean clay. (See SET and AET soils data in Appendix.)

The existing site was monumented using a 24" wooden stake near the center of the plot. The stake is in turn monumented by three reference trees. The distance and azimuth of each reference tree was measured and is recorded on an aluminum tag nailed to the base of the tree. Reflective trail markers and flagging are hung on the reference trees to identify them from a distance. Distances and azimuths to several individual *Botrychium oneidense* plants were recorded from the center stake.

## Search for Potential Transplant Sites

A search was conducted on June 23-24 for areas with site conditions similar to the existing *Botrychium oneidense* site. The search area include the Permit to Mine boundary, excluding wetlands and areas proposed for mining activities.

Seven sites were initially identified during the June 23-24 search. The sites identified provided similar plant association and canopy cover. However, none of the seven sites provided a similar soils match. After conversations that Barr botanist Daniel Jones had with Welby Smith and Bonita Eliason of the MDNR, an additional search was conducted by Barr soils scientists Christie Kearney and Micah Beukema to attempt to locate sites with better soils matches.

This second search was conducted on July 24, 2006, and focused on suitable plant associations in areas mapped as Slickens. Several areas with similar soils were located; however, many are within the Stage I Tailings Basin, and would not be available as transplant sites. Several other areas visited had coarser mine tailings typical of the taconite mining activities conducted on the site in the past.

Locating transplant sites with soils that are highly similar to the existing site has proven to be difficult. One possible reason for this is that the existing site contains tailings from pre-Hanna mining, most likely from hematite mining. The majority of the Minnesota Steel site is on taconite mining areas. As a result, the specific composition of the tailings varies somewhat within the larger area. Most of the tailings-derived soils in the vicinity of the Minnesota Steel project are from previous taconite mining activities.

Nevertheless, one of the potential transplant sites identified provides soils derived from hematite tailings, albeit somewhat coarser. This site supports a plant association similar to the existing site, and therefore has good potential for supporting the existing *Botrychium oneidense* population, as well as the other two species. Like the existing site, it is a young balsam poplar stand on old tailings, with a mixture of native and non-native grasses and forbs, and small patches of bare ground and moss-lichen crusts.

The transplant methods will ensure that at least 10” of topsoil from the existing site existing will be transplanted along with the *Botrychium* populations. This depth will ensure that no roots are damaged, since *Botrychium* roots are short and nearly perfectly horizontal. It will also transport both mycorrhizal associates of the *Botrychium* population and underground propagules, including gemmae and juvenile sporophytes. Mycorrhizal associates are important nutrient and carbohydrate sources, and the propagules serve as a gene bank during unfavorable environmental conditions (Johnson-Groh et al 2002).

## **Proposed Sites and Transplant Methods**

### **Preferred Transplant Site**

The preferred site for transplanting the *Botrychium* population was first identified using soils maps, aerial photos and NWI mapping. It was field-checked during a July 24, 2006 visit, and has been designated Site A. The location is shown on Figure 1.

Site A has soils that are most similar to the existing site of the various alternatives visited. The soils at Site A are mapped as Slickens, and are older tailings not derived from taconite mining activities. Based on the land use history of the area, the tailings at Site A are likely derived from previous hematite mining activities. Site A is also adjacent to a wetland. As discussed earlier, the MDNR Natural Heritage Database records for *Botrychium oneidense* suggest that the species, while an upland obligate, prefers proximity to wetlands.

The existing plant association at Site A is a mixed birch – balsam poplar stand that provides similar canopy cover and some of the same species as those at the existing site. Additional birch and poplar may be live-staked as needed to augment the plant association and canopy cover as part of the site preparation for the transplant.

## Transplant Methods

As an initial step toward devising a transplant plan, Barr botanist Daniel Jones contacted Dr. Cindy Johnson-Groh by phone in June 2006 to discuss the transplant methods and monitoring that she designed for the Enbridge pipeline project. Mr. Jones was also on the Enbridge site with Dr. Johnson-Groh in June 2005, and has been in e-mail contact with her regarding *Botrychium* transplanting and other mitigation strategies since December 2005 (Johnson-Groh 2005).

*Botrychium* populations were transplanted on the Enbridge pipeline project several years ago using a tree spade. Access was not an issue for that project, and the populations were re-located to the edges of the pipeline corridor, relatively close to their original positions.

The Minnesota Steel site presents more challenging access issues, and will require re-locating the populations over a longer distance. The existing *Botrychium* population is relatively easily accessed. However, the transplant location is in an area with moderately difficult access. As a result, the transplant effort will use smaller equipment that can more readily access the transplant sites. A tree spade will not be able to traverse most parts of the Minnesota Steel property.

Minnesota Steel proposes to transplant the *B. oneidense* population in a series of soil sections, cut to a depth of at least ten inches, similar to cutting sod sections. As discussed above, this depth will be suitable to safely re-locate plants, roots, propagules and mycorrhizal associates. A Bobcat or similar skid loader will be used to cut the soil sections and to re-plant them at the transplant sites. Sections will be transported on a large flatbed trailer initially, then on small flatbed trailers that can be towed to the transplant site by ATVs.

The transplant plan would require the following equipment:

- Heavy-duty Pick-up (F250 or F350) with long trailer (must be able to hold Bobcat, sod sections and possibly small ATV trailer.)
- Skid loader with standard bucket (Bobcat)
- Heavy-duty 4x4 or 4x6 ATV with small flatbed trailer
- Second smaller pickup with trailer for ATV
- Spade and fork
- Chainsaw
- Tarps
- 4' rebar lengths, stakes and other equipment for referencing transplant sites.

The transplanting would be accomplished following these steps:

- 1: Drive to the existing site in the heavy truck, trailering the Bobcat. Unload the Bobcat.
2. Use the chainsaw to clear trees around and in transplant area, taking care to fell trees away from the center of the site. Identify specific *Botrychium* sod sections to be removed.

Most of these can be located using distance and bearing data recorded from the center stake in June 2006. In general, as much of the area beneath the stand of trees as can be practically taken will be re-located. This will maximize capture of subterranean propagules and mycorrhizal associates.

3. Remove sod sections ~2' wide by 4' long and at least 10" deep. This should be about a standard bucket size cut at the required depth. Use the spade and/or fork to help free sections. Minimize disturbance (cracking, breaking) to sod sections. Set sod sections onto long trailer near the front. Cover with the tarps to prevent drying. Reload Bobcat. Exit existing site.

4. Take both trucks and equipment to a point as close to the transplant site as is practical. Unload the ATV, the small ATV trailer and the Bobcat. Transfer sod sections to the ATV trailer. Drive the Bobcat and ATV with the trailered sod sections to the transplant site.

5. Identify the most suitable transplant areas. Use the Bobcat to remove existing soil or sod to approximately equal depth as sections. In general, the existing soils at the transplant site should be excavated to a depth slightly more shallow than the depth of the transplanted sections. This will allow for settling that may occur once the transplant sections are in place. Dispose of and spread dirt from the existing sod sections nearby.

6. Transplant the *Botrychium* sod sections. Again, the sections should be set in the ground to a depth slightly above the existing ground level to allow for settling, but should not be set too high. Transplanted sections should be placed as close to each other as possible to create a large area of contiguous sections. Depending on the ATV trailer capacity, the ATV may need to make one or more return trips to the long trailer to get additional sod sections that were cut.

7. Install rebar lengths at the northeast corner of each transplanted section, as well as at other appropriate reference points (larger trees) for the overall site. Map the site, showing the overall site reference location and the locations and orientations of each transplanted section. The intent is to provide easily found references for re-locating the general transplant site and the specific sod sections. Record distance and azimuth from the general site reference to the northeast corner of each transplanted section (e.g., 18' @ 060° to NE corner of section x). If aboveground structures are visible, record approximate number of individuals in each section.

## **Monitoring**

Initial monitoring of the transplant site will occur one month after the transplanting occurs. This visit will serve as an initial check on the condition of the soil sections to evaluate settling and to check the general site conditions. The site will be re-visited twice during the first year.

The transplant site will be then monitored annually for a period of five years after transplanting. The transplant site and specific sections will be re-located. The number of

*Botrychium oneidense* individuals and other *Botrychium* species present will be recorded for each section. It is anticipated that the transplant methods will minimize disturbance, and that mature aboveground plant structures will emerge in the year following transplanting. However, since much of the early *Botrychium* life cycle is spent below ground, it may be several years before the success of the transplant can be fully measured.

At the end of each monitoring period, Minnesota Steel will provide MDNR with a progress report on the transplant site, including a tally of *Botrychium* species and individuals present at each site.

## References

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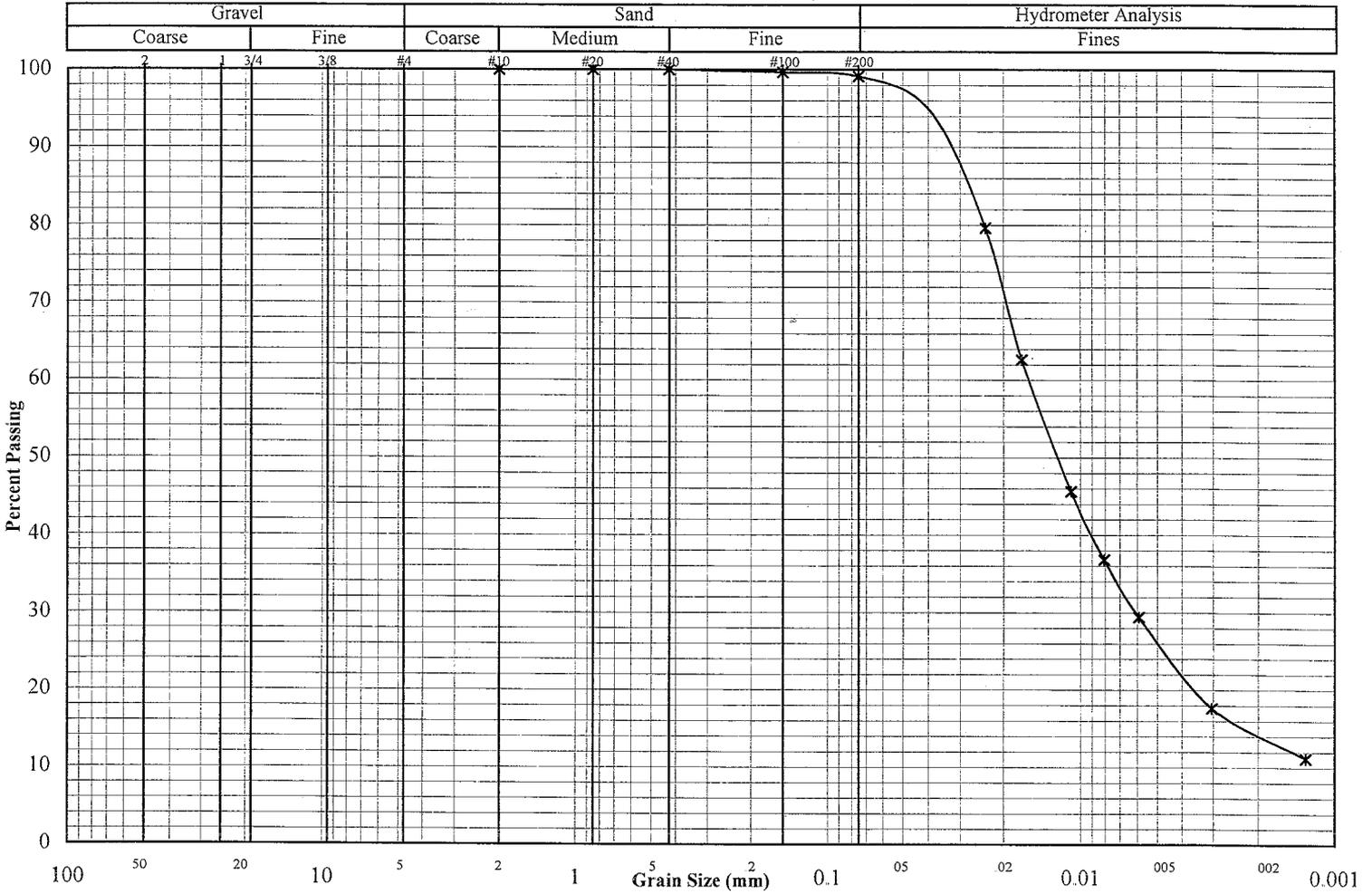
## **Appendix – Soils Data from Existing Site**

# Grain Size Distribution ASTM D422

Job No. : **5745**

Project:	Minnesota Steel - #2331286	Test Date:	7/18/20
Reported To:	Barr Engineering Company	Report Date:	7/20/06

	Location / Boring No	Sample No.	Depth (in)	Sample Type	Soil Classification
*	Botone Site		0-14	Bag	Lean Clay (CL)
●					
◇					



	Other Tests			Percent Passing			Other Parameters		
	*	●	◇	*	●	◇	*	●	◇
Liquid Limit				321.3			D <sub>60</sub>		
Plastic Limit				2"			D <sub>30</sub>		
Plasticity Index				1.5"			D <sub>10</sub>		
Water Content				1"			C <sub>u</sub>		
Dry Density (pcf)				3/4"			C <sub>c</sub>		
Specific Gravity	3.00			3/8"			Remarks:		
Porosity				#4					
Organic Content				#10	100.0				
pH				#20	100.0				
Shrinkage Limit				#40	100.0				
Penetrometer				#100	99.7				
Qu (psf)				#200	99.1				
(* = assumed)									



# SUBSURFACE BORING LOG

AET JOB NO: **07-02371**

LOG OF BORING NO. **06-053 (p. 1 of 2)**

PROJECT: **Plant / Concentrator Site; Nashwauk, MN**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DD	LL	PL	%-#200				
1	FILL, silty sand, laminations of sand and silt, reddish brown and brown (mine tailings)	FILL/MINE TAILINGS													
2			-		SU	-									
3															
4															
5			5	M	SS	20	12								
6															
7															
8															
9															
10															
11															
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13															
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26															
27															
28															

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-60.5'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		1/17/06	09:00	16.5	14.5	16.5	-	13.5	
		1/17/06	12:30	46.5	48.7	48.7	--	46.0	
BORING COMPLETED: 1/17/06									
DR: LA LG: DK Rig: 51									



SUBSURFACE BORING LOG

AET JOB NO: 07-02371

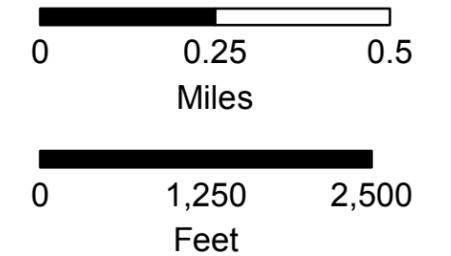
LOG OF BORING NO. 06-053 (p. 2 of 2)

PROJECT: Plant / Concentrator Site; Nashwauk, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DD	LL	PL	%-#200	
30	SANDY LEAN CLAY, a little gravel, gray to brown, stiff to very stiff (CL) <i>(continued)</i>		11	M		18						
31												
32												
33												
34			17	M		24						
35												
36												
37												
38			12	M		24						
39												
40												
41												
42	SILTY SAND, brown, wet, medium dense (SM)	TILL										
43												
44												
45												
46			19			24						
47												
48												
<b>AUGER REFUSAL AT 48.7 FEET</b> Borehole backfilled with bentonite grout.												



- Legend**
- + Proposed transplant site
  - Botrychium oneidense
  - Wetlands
  - Permit to Mine Boundary
  - Project Features



**Figure 1. Proposed Transplant Site A**

Minnesota Steel Industries  
Proposed Transplant Location  
for Takings Permit Application

September 2006