

**DRAFT**

**Visual Assessment Technical Memorandum**

Zavoral Property Mine and Reclamation Project

**AECOM**

August 19, 2011

**TABLE OF CONTENTS**

**EXECUTIVE SUMMARY**..... ES-1

**1.0 PROJECT BACKGROUND**..... 1

    1.1 Alternative 1: Applicant’s Preferred Alternative – 5 to 10-Year Operation..... 1

        1.1.1 Zavoral Site Activities ..... 1

        1.1.2 Scandia Mine Activities ..... 3

    1.2 Alternative 2: No-Build Alternative..... 3

    1.3 Alternative 3: Reduced Time Period - Up to 5-Year Operation ..... 3

**2.0 VISUAL ASSESSMENT GOALS** ..... 4

**3.0 VISUAL ASSESSMENT** ..... 4

    3.1 Existing Environment ..... 5

    3.2 Scenic Resource Management (or Special Designations) ..... 5

    3.3 Review of Tiller Visual Analysis Information ..... 8

    3.4 Identification of Sensitive Viewing Areas..... 9

        3.4.1 Impact Analysis ..... 10

            3.4.1.1 Analysis Methods..... 10

            3.4.1.2 Significance Criteria..... 17

            3.4.1.3 Alternative 1: Up to 10-Year Operation ..... 17

            3.4.1.4 Alternative 2: No-Build Alternative ..... 22

            3.4.1.5 Alternative 3: Up to 5-Year Operation..... 22

        3.4.2 Potential Mitigation Measures..... 22

**4.0 REFERENCES** ..... 23

**LIST OF FIGURES**

Figure 1. Visual Resource Analysis..... 2

Figure 2a. Existing Condition. .... 11

Figure 2b. Simulation..... 12

Figure 3a. Existing Condition ..... 13

Figure 3b. Simulation..... 14

Figure 4a. Existing Condition ..... 15

Figure 4b. Simulation..... 16

Figure 5. Plan View Model of Phase 2 Mining and Reclamation..... 20

**LIST OF TABLES**

Table 1 – Contrast of Proposed Project Activities with the Existing Landscape ..... 17

## Executive Summary

The Tiller Corporation, Inc. (Tiller) proposes to operate a sand and gravel mine on the site of a dormant, unreclaimed gravel mine in the City of Scandia, Washington County, Minnesota. The 114-acre site (Zavoral Site or Site) is located along St. Croix Trail North (State Trunk Highway [TH] 95) near its intersection with TH 97. Tiller proposes to mine and reclaim 64 acres of the 114-acre Site, predominately on portions of the Site that were previously disturbed by mining. An 8-acre area that has not been previously mined is included in the proposed mining area. Tiller is also proposing to restore approximately 4 acres of the previously mined area located within the St. Croix National Scenic Riverway and USA Scenic Easement Area (Figure 1).

The Site is within the jurisdiction of the City of Scandia and partially within the designated riverway. The protection of scenic resources within these jurisdictions is guided by the City of Scandia Comprehensive Plan, and the Cooperative Management Plan (CMP) and Environmental Impact Statement (EIS) for the Lower St. Croix National Scenic Riverway. The Washington County Comprehensive Plan also describes a scenic easement that is partially within the Site.

This technical memorandum presents the evaluations completed for Task 17 – Visual Resources for the Project. It identifies potential environmental impacts related to the Project alternatives and identifies measures that could avoid, minimize, or mitigate for these potential impacts. This work was conducted as part of the EIS process to be completed under Minn. R. 4410. The following alternatives are included in the EIS analysis.

- Alternative 1 – Tiller’s Preferred Alternative. Mining and reclamation would occur over a 5 to 10-year period.
- Alternative 2 – No Build Alternative.
- Alternative 3 – Reduced Timeframe. Mining and reclamation would occur over an up to 5-year period.

The following goals are included under Task 17 – Visual Resources:

- Review Tiller’s visual impact analysis information for the Zavoral Site (Appendix A) for accuracy.
- Model site-specific conditions for the Zavoral Site.
- Accurately represent views of the Zavoral Site from key view areas through drawings, photographs, or other imaging methods for ease in understanding by reviewing agencies and the public. Complete a written analysis describing the visual impacts of the Zavoral Site.
- Identify the strategies to avoid, minimize, or mitigate visual impacts at the Zavoral Site to key viewing areas.

- Identify visual impacts that would result from aggregate mined at the Zavoral Site being used at the Scandia Mine.

The following are key findings of the visual assessment:

- Proposed short- and long-term mining activities would introduce new elements into the landscape, and create new contrasts with the existing landscape form, line, color, and texture.
- The Tiller visual impact analysis (revised June 2011) concluded that the proposed Project would not be visible from the St. Croix River or from Wisconsin, and that the greatest potential for visual impact is to the traveling motorist in Minnesota. This analysis was reviewed by AECOM and determined to accurately reflect the existing and proposed Project conditions.
- AECOM selected 3 sensitive viewpoints from which the proposed Project would be most visible and prepared photographic simulations from those viewpoints in leaf-off conditions. These photographic simulations are included as Figures 2 through 4 in the memorandum.
- AECOM prepared a computer-generated representation of Phase 2 Mining and Reclamation showing what the Project would look like during the period when the highest level of disturbance at the Site would occur (Figure 5).
- Views from sensitive viewpoints in proximity to the Site were evaluated. Views into the Site would be limited because the interior would be excavated and mined to a lower elevation than adjacent properties, and stands of trees (in both leaf-on and leaf-off conditions) screen views. Installation of additional screening berms and tree plantings would help screen Project activities from sensitive viewpoints.

Additional mitigation measures identified as part of the AECOM visual assessment that would further reduce negative visual are:

- Establish a maximum stockpile height limit of approximately 880 feet mean sea level (msl). Stockpiles limited to this elevation would be effectively screened by proposed and existing berms. Locating stockpiles on the west side of the Site should be minimized, as the upper slopes of stockpiles would have a greater potential to be within the viewsheds of sensitive viewpoints.
- Limit non-daylight lighting to what is required for safety and security. All such lighting should consist of shielded, downward directed lighting.
- Fully implement and monitor reclamation activities to verify that reclamation is occurring as planned and to meet pre-determined criteria established by the City to confirm the success of reclamation.
- Monitor the proposed transplanting of native white pine trees to verify maintenance and watering and to assess survival rates. If survival rates do not fall within a pre-determined range established by the City, replacement trees should be provided by Tiller.

## **1.0 Project Background**

Tiller proposes to operate a sand and gravel mine on the site of a dormant, unreclaimed gravel mine in the City of Scandia, Washington County, Minnesota. The 114-acre site (Zavoral Site or Site) is located along St. Croix Trail North (State Trunk Highway [TH] 95) near its intersection with TH 97. Tiller proposes to mine and reclaim 64 acres of the 114-acre Site, predominately on portions of the Site that were previously disturbed by mining. An 8-acre area that has not been previously mined is included in the proposed mining area. Tiller is also proposing to restore approximately 4 acres of the previously mined area located within the St. Croix Riverway and USA Scenic Easement Area (Figure 1).

The St. Croix River was designated as a National Scenic Riverway in 1962 in recognition of its outstandingly remarkable scenic, recreational, and geologic values. The St. Croix River District includes all lands within the riverway boundary, as published in the *Federal Register*, between the dam at St. Croix Falls/Taylors Falls and the confluence of the Mississippi River.

The Site is within the jurisdiction of the City of Scandia and partially within the designated riverway. The protection of scenic resources within these jurisdictions is guided by the City of Scandia Comprehensive Plan, and the CMP and EIS for the Lower St. Croix National Scenic Riverway. The Washington County Comprehensive Plan also describes a scenic easement that is partially within the Site. The proposed Project and alternatives would comply with the scenic resource goals and policies of all affected jurisdictions.

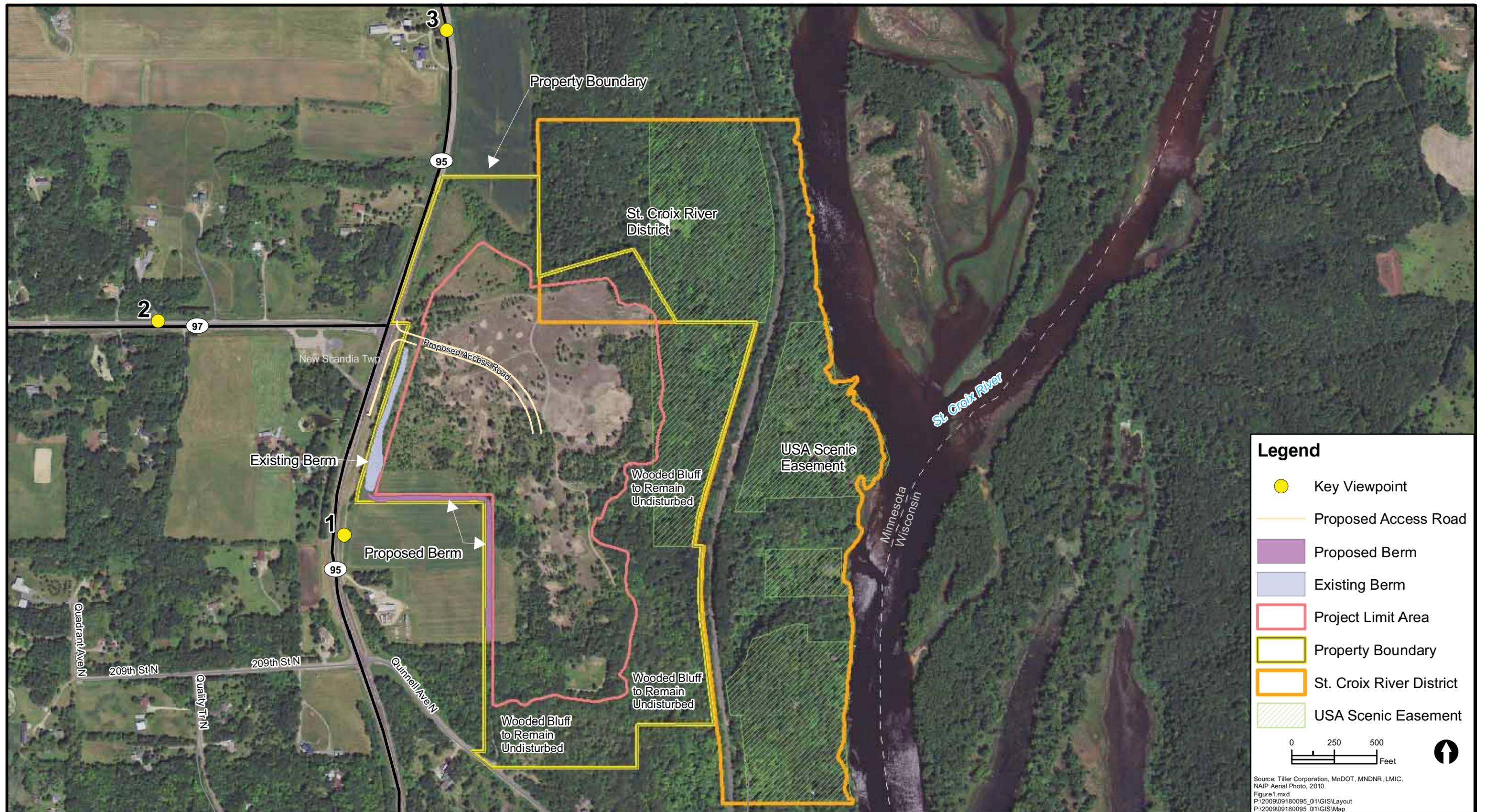
This technical memorandum presents the evaluations completed for Task 17 – Visual Resources for the proposed Project. It identifies potential environmental impacts related to the Project alternatives and identifies measures that could avoid, minimize, or mitigate for these potential impacts. This work was conducted as part of the EIS process to be completed under Minn. R. 4410. The following alternatives are included in the EIS analysis.

### **1.1 Alternative 1: Applicant’s Preferred Alternative – 5 to 10-Year Operation**

#### **1.1.1 Zavoral Site Activities**

The mining and reclamation would be conducted in phases, with a Project duration of up to 10 years under this alternative. Proposed site preparation, mining, and reclamation phasing are included in Appendix B.

In general, reclamation of the Site would proceed in increments as areas of mining are completed. The reclamation plan proposes that perimeter areas be sloped and interior areas backfilled and graded to reclamation grades. Topsoil or other organic material would be applied to these areas and vegetation established to reduce erosion. The Environmental Assessment Worksheet (EAW),



Prepared By:



Prepared For:

CITY OF SCANDIA  
 ZAVORAL MINING AND RECLAMATION  
 EIS PROJECT  
 WASHINGTON COUNTY, MINNESOTA

Visual Resource Analysis  
 Figure 1

August 2011

09180095\_01

prepared earlier for the Project, proposed that the previously mined area within the St. Croix Riverway be restored during the final phase of mining operations at the Site. Tiller's letter to the City (April 7, 2009) proposed revising the reclamation and phasing plan to include reclamation of the area within the St. Croix Riverway and scenic easement areas during the first years of operation. This technical memorandum, therefore, evaluates the Project scenario that includes reclamation of the St. Croix Riverway and scenic easement areas during the first 5 years of mining operations on the Site.

### **1.1.2 Scandia Mine Activities**

Raw aggregate material mined at the Site would primarily be transported to the Scandia Mine. The Scandia Mine currently uses or processes aggregate material from the Scandia Mine and materials that are transported to the Scandia Mine from various locations, most recently Chisago, Minnesota, and Polk counties, Wisconsin. Tiller has indicated that the materials transported from the Zavoral Site would replace materials hauled to the Scandia Mine from Chisago County and Polk County. The following activities would occur at the Scandia Mine:

- Aggregate material brought in from the Zavoral Site (add-rock) would be blended with aggregate material mined at the Scandia Mine for use in the production of hot mix asphalt.
- A portion of the aggregate material transported to the Scandia Mine may be processed as needed through a series of crushers, screens, conveyors, wash decks, and classifiers to produce commercial grade construction aggregates.
- The finished construction aggregate products would be stockpiled at the Scandia Mine until they are hauled off-site by trucks to various construction sites.

The Scandia Mine operates under a Conditional Use Permit (CUP) and an Annual Operating Permit (AOP) approved by the City of Scandia. The processing activities listed above are included in the activities authorized by these permits. No changes in operations at the Scandia Mine are expected.

## **1.2 Alternative 2: No-Build Alternative**

The No-Build alternative is based on the existing use continuing at the Site. It would remain as an unreclaimed open space. Allowable future uses of the Zavoral Site are agricultural and rural residential.

## **1.3 Alternative 3: Reduced Time Period - Up to 5-Year Operation**

This alternative focuses on the impacts of the proposed activities if the overall time frame for mining at the Zavoral Site is up to 5 years rather than up to 10 years, as proposed in Tiller's Preferred Alternative. This would result in more mining occurring for more weeks each year and more material being mined per year.

Tiller is proposing the following activities at the Zavoral Site with either of the "build alternatives" (Alternatives 1 and 3):

- Clearing and grubbing the Site of vegetation, as necessary.
- Removing overburden from areas to be mined, and stockpiling the material on the Site for potential future use in reclamation.
- Excavating raw aggregate materials.
- Using water from the existing well for dust suppression.
- Storing fuel and related materials, such as oil, anti-freeze, grease, and hydraulic fluid, on the Site.
- Reclaiming the Site through grading, placing topsoil or other organic material, and seeding.

Mining operations would typically be conducted on a seasonal basis from April through mid-November; however, it could occur year-round

Mined aggregate material (pit-run and/or add-rock) would primarily be hauled to Tiller's Scandia Mine near Manning Avenue and 225th Street for use in material produced at that Site.

## 2.0 Visual Assessment Goals

The following tasks and goals are included in this visual assessment:

- Review Tiller's visual impact analysis information submitted for the Zavoral Site (Appendix A) for accuracy.
- Model site-specific conditions for the Zavoral Site.
- Accurately represent views of the Zavoral Site from key view areas through drawings, photographs, or other imaging methods for ease in understanding by reviewing agencies and the public. Complete a written analysis describing the visual impacts of the Zavoral Site
- Identify the strategies to avoid, minimize, or mitigate visual impacts at the Zavoral Site to key viewing areas.
- Identify visual impacts that would result from aggregate mined at the Zavoral Site being used at the Scandia Mine.

## 3.0 Visual Assessment

Scenic landscapes contribute to the quality of life for local communities and can provide economic benefits to communities when they provide high quality, scenic settings for residences and outdoor recreation experiences. Activities in the vicinity of the proposed Project were reviewed to identify potential impacts on the quality of views from nearby areas, such as residences, roadways, a bike path, and the St. Croix Riverway.

Visual resources of the area include existing natural features, such as vegetation, water features, landforms and geology, as well as human-made elements. The visual resource analysis area includes the Zavoral Site and all areas outside of the Site that would provide views of Project activities.

### **3.1 Existing Environment**

This section describes the visual setting, including user sensitivity, scenic quality and integrity of the landscape, and visibility of the Site from sensitive viewing areas.

Landscape character creates a “sense of place” and describes the image of an area that is valued by residents and visitors to the area. The regional landscape of east-central Minnesota, west of the St. Croix River, is characterized by rolling hills interspersed with depressions of small lakes and wetlands, extensively covered by urban and suburban development, as well as pasture and some crops and woodland (EPA 2007). The St. Croix River flows through a broad floodplain covered with forests and braided channels, bordered by heavily wooded bluffs. The Minnesota side of the river includes low density residential areas. The Wisconsin side is natural in character with few signs of development. The overall landscape setting of the Site possesses considerable scenic qualities based on the diversity of landforms, vegetation pattern, and surface water. Characteristic rural residential uses in a scenic setting of dense tree stands interspersed with agricultural uses adjacent to the St. Croix River are shown in the aerial view in Figure 1.

The existing Zavoral Site is an unreclaimed gravel mine characterized by irregular landforms and several stockpiles remaining from past mining activities. Neighboring properties include agricultural and residential land uses. Land cover on undeveloped areas consists of fields, open space, and wooded areas. Past mining at the Site has modified the interior terrain to an elevation that is lower than adjacent properties, which limits visibility into the Site. The scenic integrity, which indicates the degree of intactness and wholeness of the natural character of the landscape, is relatively low because of the presence of past mining disturbance and developed residential land uses on adjacent private land parcels. The scenic integrity of the adjacent St. Croix River corridor is high, as there is little evidence of discordant human activities along the river.

A portion of the Site lies within the St. Croix River Riverway and St. Croix River District, which includes all lands within the riverway boundary (Figure 1). Historically, mining activities occurred on approximately 4 acres that are within the areas now designated St. Croix River District along the west boundary of the riverway.

### **3.2 Scenic Resource Management (or Special Designations)**

As stated, the CMP and EIS for the Lower St. Croix National Scenic Riverway were adopted by the National Park Service (NPS) in 2002. The CMP provides direction to:

- Preserve and protect the riverway’s ecological integrity, unimpounded condition, natural and scenic resources, and significant historic resources.
- Accommodate a diverse range of recreational opportunities that do not detract from the exceptional natural, historic, scenic, and aesthetic resources.

- Provide an environment that allows the opportunity for peace and solitude.
- Provide an opportunity for the education and study of the geologic, historic, ecological, and aesthetic values to further enhance stewardship of the river.

As described in the Washington County Comprehensive Plan, the Minnesota Department of Natural Resources (MnDNR) and NPS acquired scenic easements along the St. Croix River. Scenic easements are agreements between a landowner and a government agency to protect and preserve views of scenic river districts or byways. These easements typically consist of a thin corridor along the St. Croix River shore or adjacent bluff tops. A small area of wooded bluff within the Site is within a USA scenic easement, shown on Figure 1. The scenic easement is also within the St. Croix River District and the designated Scenic River corridor.

The Washington County Comprehensive Plan provides policies and associated implementation strategies to protect scenic values in the county (Washington County 2010). Policies and strategies that apply to the Site and proposed activities within the Site are summarized below:

Policy 6-4: Protect shoreland areas in order to maintain natural habitat and water quality.

#### Implementation Strategies

- Manage and regulate land uses in the Lower St. Croix Wild and Scenic River corridor in order to protect their scenic, natural, historic, cultural, and recreational aspects in accordance with the Lower St Croix Cooperative Management Plan.

The Lower St. Croix River Bluffland and Shoreland Management Ordinance provide protection strategies that include measures to protect scenic resources (Washington County Planning Commission 1976). These include guidelines for minimum area, setbacks, and other requirements of each district within the riverway; standards and criteria for allowable uses within the riverway:

#### Section 5. Uses within the St. Croix Riverway

501. Purpose. The purpose of establishing standards and criteria for uses in the St Croix Riverway shall be to protect and preserve existing natural, scenic, and recreational values, to maintain proper relationships between various land use types, and to prohibit new residential, commercial, or industrial uses that are inconsistent with the National Wild and Scenic Rivers Act, and the Federal and State Lower St Croix River Acts.

#### 807. Factors to Be Considered.

807.01. When considering a proposal or zoning amendment within the St. Croix River District, the governing body shall address the following items in making its decisions:

- (1) Preserving the scenic and recreational resources of the St. Croix Riverway, especially in regard to the view from and use of the river.

The Site is located within the municipal boundaries of the City of Scandia. The City of Scandia Comprehensive Plan vision narrative describes the desired long-range outcome of Scandia's future development, investment, and protection efforts; and provides goals, policies, and implementation strategies that connect to the vision (City of Scandia 2009). Land use (LU) goals, policies, and strategies that address visual resources and are applicable to the proposed Project include:

- LU Goal 1: Maintain the City's unique rural and small-town character and its natural landscape while accommodating a reasonable amount of new development that contributes to, rather than detracts from, that character.
  - LU Policy 1.3: Establish standards that protect Scandia's scenic views by minimizing the visual impact of new development.
    - LU Implementation Strategy 1.3.2: Require landscaping along major collector roads to minimize visual impact of new development.
  - LU Policy 1.4: Emphasize sensitivity to community character in new development and redevelopment, whether that character is expressed by historic buildings, agricultural views and activities, natural resource, scenic views, dark skies, a quiet setting, or other elements that are important to the City's residents.

Scandia Ordinance No. 103 provides regulations for the protection of scenic resources during mining operations.

7.1 Operating Conditions. The following operating conditions and standards must be met for all mining operations.

Screening, Where deemed necessary by the City, extracting and processing operations shall be screened or located in such a manner as to minimize the impacts on surrounding properties. To minimize noise, dust, odors, erosion and visual impacts on surrounding properties, a continuous screen shall be installed and maintained, either along the street or along the perimeter of the visible portion of the area being operated.

The following shall serve as the minimum performance standards for screening and may be varied as determined by the City:

(A) The screen shall have a total height of not less than six feet and shall consist of one or more of the following types:

(1) Walls. A wall shall consist of concrete, stone, brick, tile, or similar type of solid masonry material a minimum of four inches thick.

(2) Berms. A berm shall be constructed of earthen materials, and it shall be seeded and mulched as shown on the landscape plan. Plans for berms must be provided that avoid impacts, especially surface water, onto neighboring properties. If berms are constructed of topsoil, they must remain until final reclamation. Berms must have a minimum slope of 3:1 and have a silt fence at the base closest to the public road or neighboring property. The silt

fence shall be maintained until vegetation is established, at which time it shall be removed. No haul roads, either temporary or permanent, material stockpiles or other mining-related activities shall occur on the berm.

(3) Fences, Solid. A solid fence shall be constructed of wood and shall form a continuous screen.

(4) Fences, Open. An open weave or mesh-type fence, when not used in combination with a berm, shall be combined with plant materials to form a continuous screen.

(5) Planting. Plant materials, when used as a screen, shall consist of dense evergreen plants or a majority of dense evergreen plant materials combined with deciduous plants provided a continuous screen is established. They shall be of a kind or used in such a manner so as to provide a continuous screen within 24 months after commencement of operations in the area to be screened. Plant materials shall not be limited to a maximum height. The Screening Plan shall be prepared by a licensed landscape architect. Required screening shall be installed prior to commencement of operations.

The City may require that (1), (2), or (3) above shall be installed if, 24 months after commencement of operations in the area to be screened, plant materials have not formed an opaque screen, or if an opaque screen is not maintained.

There are no other state, federal, or local guidelines or regulatory authority for the protection of visual resources on private lands outside of the St. Croix River District and scenic easement. The Scenic Management Objectives described above were included in this visual analysis.

### **3.3 Review of Tiller Visual Analysis Information**

The visual analysis prepared for this report uses information from the Tiller Visual Analysis (updated June 2011, Appendix A), which evaluated the potential visual impacts of the proposed project using two methods: a Photo Visual Impact Analysis and a Computer Aided Visual Impact Analysis. Both methods identified that sensitive viewing receptors could have the potential to be impacted by the proposed Project. The existing conditions photographs used in this memorandum were taken from the Tiller Visual Analysis.

Tiller's Photo Visual Impact Analysis uses photographs taken from potentially sensitive receptors to assess the visibility of the Site. Views of the Site and adjacent properties were photographed and the locations recorded using a GPS during leaf-on and leaf-off conditions to develop a visual impact baseline for traveling motorists, a local bike trail, neighboring residences in Minnesota and Wisconsin, and from the St. Croix River. The photographs were taken at locations surrounding the Site that were most likely to offer a view of the interior of the Project. The locations were determined based on topography, tree coverage, and location.

The Computer Aided Visual Impact Analysis was developed using ArcGIS® 3D Analyst™ 10 to determine the viewshed or area that can be seen from a set of observation points. The model is

based on the expected visual conditions of the proposed Project area and adjacent and surrounding properties. Three viewshed analyses were prepared by Tiller that identified the visibility of the Site from three sensitive viewing areas: 1) roadways along the Minnesota side of the riverway, 2) the St. Croix River, and 3) the Wisconsin bluffs. The key viewpoints were selected to represent sensitive viewing areas that provide the largest potential area of unimpeded views of the Site interior, as well as locations that represent areas where viewers would have a concern for the scenic quality of the landscape. The Tiller viewshed analyses concluded that the proposed Project would not be visible from the St. Croix River or from Wisconsin, and that the greatest potential for visual impact is to the traveling motorist in Minnesota.

This analysis was reviewed by AECOM and determined to accurately reflect existing and proposed Project conditions.

### **3.4 Identification of Sensitive Viewing Areas**

Residents, recreationists on the bike path and St. Croix Riverway, and other visitors viewing the landscapes along the riverway would be sensitive to modifications to the landscape that could impact the visual quality of their view.

The Site has the potential to be viewed from or near sensitive viewpoints on TH 95 (St. Croix Trail North) along the west side of the Site, TH 97, a bike path along TH 95, residences accessed from the highway, and from within the St. Croix Scenic Riverway, including high bluffs along the Wisconsin side of the riverway. Viewshed analyses identified the visibility of the Site from these areas. Very little of the Site under current conditions is visible from sensitive viewpoints at any location because past mining activities have lowered the Site terrain to elevations lower than the river bluff to the west and the rolling terrain to the east. Visibility of the Site is also strongly influenced by screening of the Site from tree stands during both seasonal leaf-on and leaf-off conditions. The Tiller visual impact information (Appendix A) includes photographs of the existing Site landscape as seen from surrounding sensitive viewpoints.

The upper portions of some existing stockpiles, with an estimated maximum height of 907 feet msl, are either not visible or only partially visible during leaf-off conditions as viewed from sensitive receptors within an approximate 1/4-mile distance. Because of the filtering effect of the screening trees during the off-leaf season, the form, line, and color contrasts of the stockpiles become diffused with distance and difficult to discern by most viewers.

The Project would not be visible from the St. Croix Riverway or from the Wisconsin bluffs on the east side of the river. No part of the Project Site is visible from the river, which is located at a lower elevation than the Site. Bluffs vegetated with stands of trees (with an estimated height of 60 feet) along the east side of the Site block all views of the Site from any location on the river. The vegetated bluffs also block views from the bluffs on the Wisconsin side of the river. Any potentially visible portions of the Site unimpeded by tree stands (view corridors across open spaces) are indistinct due to distance from any location along the Wisconsin bluff line. In general, views of the Site interior from Wisconsin are either not present or very difficult to discern through the filtering of distance and vegetation. There are few sensitive viewing areas that provide unimpeded views of the Site during either seasonal leaf-on or leaf-off conditions.

The Site is visible to a limited extent from sensitive viewpoints along roadways and the bike path in Minnesota. As seen from TH 95, south of the highway junction with Quinnell Avenue and north of 220<sup>th</sup> Street, the Site is screened by stands of trees during both leaf-on and leaf-off conditions. Partially open viewshed corridors and relatively sparse tree stands do occur on TH 97 and a relatively short segment of TH 95 north of the Site. Three key viewpoints were selected to represent sensitive viewing areas that provide the most potential for unimpeded views of the Site interior, as well as locations that represent areas where viewers would have a concern for the scenic quality of the landscape.

**Key Viewpoint 1:** This viewpoint is located on the bike path along the east side of TH 95 within ¼ mile of the southwest boundary of the Site, as shown in Figure 1. The photograph in Figure 2a represents existing conditions at the Site. It shows that most of the Site is screened by trees even during the seasonal leaf-off condition, with the exception of the top of a stockpile.

**Key Viewpoint 2:** This viewpoint is located on TH 97 about ¼ mile west of the Site, as shown in Figure 1. The photograph in Figure 3a was taken during leaf-off conditions on TH 97, approximately ¼ mile west of the Site. Trees screen most of the Site. White pines along the east side of the Site are visible; however, the ground surface is not visible because of an elevation difference of about 70 feet. The interior of the proposed Project is at a lower elevation due to past mining activity. The screening berm that remains from previous mining activity is also visible along the right hand side of the photograph across from TH 95.

**Key Viewpoint 3:** This viewpoint is located on TH 95 approximately ¼ mile north-northwest of the Site, as shown in Figure 1. The photograph in Figure 4a shows the Site during leaf-off conditions. The interior of the Site is not visible. The northern portion of the Site, including a small area of disturbance from past mining activities, is within the viewshed of the viewpoint; however, any disturbed areas are difficult to discern from the surrounding undisturbed landscape because of the partial screening of trees and other vegetation.

### **3.4.1 Impact Analysis**

This section provides an assessment of the direct and indirect short- and long-term potential impacts to visual resources from the proposed Project under the two “build alternatives.”

#### **3.4.1.1 Analysis Methods**

Short-term visual impacts associated with site preparation activities and long-term impacts from mining and reclamation were assessed by analyzing the contrast between the proposed Project and the existing landscape, as seen from the three sensitive viewing areas. Contrasts were evaluated using photographic simulations of the proposed Project prepared for key viewpoints. The viewshed analysis depicts the portions of the Site that would be visible from within the sensitive viewing areas.



**Figure 2a. Existing Condition. Key Viewpoint 1 is on a bike trail located north of Quinnell Avenue North between TH 95 and the proposed Project. It overlooks an agricultural field adjacent to the proposed Project.**



Figure 2b. Simulation: Proposed berms between Key Viewpoint 1 and the tree stands would screen visible activities during leaf-off conditions, including site preparation work, excavation, loading, hauling, grading, and removal of stockpiles, on the western side of the Project area.



**Figure 3a. Existing Condition: Key Viewpoint 2 is on eastbound TH 97, approximately ¼ mile west of the proposed Project. The trees screen most of the proposed Project area during leaf-off conditions.**



**Figure 3b. Simulation:** The proposed Project access entrance as seen from Key Viewpoint 2 would be within the line of sight for motorists traveling eastbound on TH 97. The berm screens views of the site interior, although some operations activities may be partially visible, such as the truck shown partially blocked by the berm in the right side of the simulation.



**Figure 4a. Existing Condition:** The view from Key Viewpoint 3 is to the south-southeast from TH 95, located  $\frac{1}{4}$  mile north of the proposed Project.



**Figure 4b. Simulation: Visibility of Phase 1 Mining and Phase 2 Reclamation from Key Viewpoint 3 during leaf-off conditions will be limited due to screening from trees, a vegetated berm, and lowering of interior elevation.**

The contrast evaluation assesses changes to the visual quality of a landscape from the introduction of the proposed Project into the existing landscape. The degree of contrast was evaluated according to the criteria shown in Table 1. The contrast of proposed Project facilities is compared with the significance criteria to determine whether the proposed Project would result in a significant impact to the visual resources of the visual analysis area.

**Table 1 – Contrast of Proposed Project Activities with the Existing Landscape**

<b>Degree of Contrast</b>	<b>Criteria</b>
None	The proposed action is not visible or perceived.
Weak	The proposed action can be seen but does not attract attention.
Moderate	The proposed action begins to attract attention and begins to dominate the characteristic landscape.
Strong	The proposed action demands attention, would not be overlooked, and is dominant in the landscape.

Source: Bureau of Land Management 1986

**3.4.1.2 Significance Criteria**

The following were used in determining significance criteria.

- Effects on existing scenic integrity and scenic attractiveness resulting from the proposed Project.
- Level of Project visibility from sensitive viewing areas, such as the St. Croix National Scenic River, TH 95 and TH 97 on the Minnesota side of the St. Croix River, and the bluff line on the Wisconsin side of the St. Croix River.
- Compliance with the Scenic Management Objectives of the Lower St Croix CMP, the City of Scandia Comprehensive Management Plan and Ordinance No. 103, and the regulation of scenic resources identified in other state, federal, and local regulations and planning documents.

**3.4.1.3 Alternative 1: Up to 10-Year Operation**

Direct effects to visual resources would occur as a result of the disturbance of the landscape by Project activities. Direct effects can be short or long term. Indirect effects caused by the proposed Project can occur later in time or farther removed in distance, and could involve indirect changes in local economic tourism and recreation sectors that are dependent on the scenic setting of the St. Croix River.

Short-term direct effects to the visual character of the analysis area would result from site preparation activities and early reclamation activities. Site preparation activities include realignment of the Site access and construction of a turning lane, internal main haul road construction, construction of screening berms, and tree removal. The majority of the visual impact of the proposed Project would result from short-term site preparation activities.

Long-term direct effects result from the mining and reclamation operational phases of the proposed Project. No significant buildings or structures are proposed for construction on the Site. The proposed activities and equipment associated with the proposed Project would introduce new elements into the landscape and create new contrasts with the existing landscape form, line, color, and texture over the operating life of up to 10 years for the proposed Project.

Existing vegetation and the existing screening berms would be preserved along TH 95 and along the southwest perimeter of the Site. In addition, new berms would be constructed. The combination of the new berms, existing berms, and existing vegetation would screen most views of proposed mining and reclamation activities from nearby vehicular, bicycle, and pedestrian traffic in the area.

Construction of the new berms would occur as the Site is being mined. In addition, native white pine trees would be transplanted at selected locations within the Site to provide additional screening.

The majority of mining and reclamation would take place on previously mined areas; therefore, the proposed Project would require very little additional overburden removal. Stockpiles present at the Site would be removed under Phases 1 and 3 of the proposed Project (Appendix B). Phased reclamation activity would take place concurrently with mining activity and require the placement of overburden materials, including topsoil reclamation.

In general, long-term effects of mining and reclamation activities would be not be visible, or would be partially visible from sensitive viewpoints. This is because the interior Site terrain would be further excavated to a lower elevation than adjacent properties, which would limit visibility into the Site. In addition, views of the Site are blocked by tree stands in both leaf-on and leaf-off conditions as viewed from TH 95, TH 97, the bike path, and nearby residences.

### ***Non-Daylight Lighting***

Mine facilities would be lit at night or under low light conditions (early morning, evening, and during adverse weather conditions) for maintenance activities and safety. No night-time shifts are proposed for the Project. Non-daylight lighting is generally visible for long distances, and would potentially be visible through gaps in screening vegetation as viewed from roads and residences to the north, west, and south of the Site, and from bluffs on the Wisconsin side of the St. Croix River. However, the amount of light projected outside the Site would be minimized with the installation of downward directed lighting to illuminate only the area within the Site. The downward directed lighting would be visible to viewers within the Minnesota and Wisconsin sensitive viewing areas as well as the key viewpoints, but would likely not attract attention as the downward lighting would be screened to some extent by topography, vegetation, and the existing and proposed berms. Visual contrasts from non-daylight lighting would be weak.

### *Sensitive Viewing Areas*

Impacts on the three key viewpoints that AECOM identified as having the highest potential for views of the proposed Project are described below.

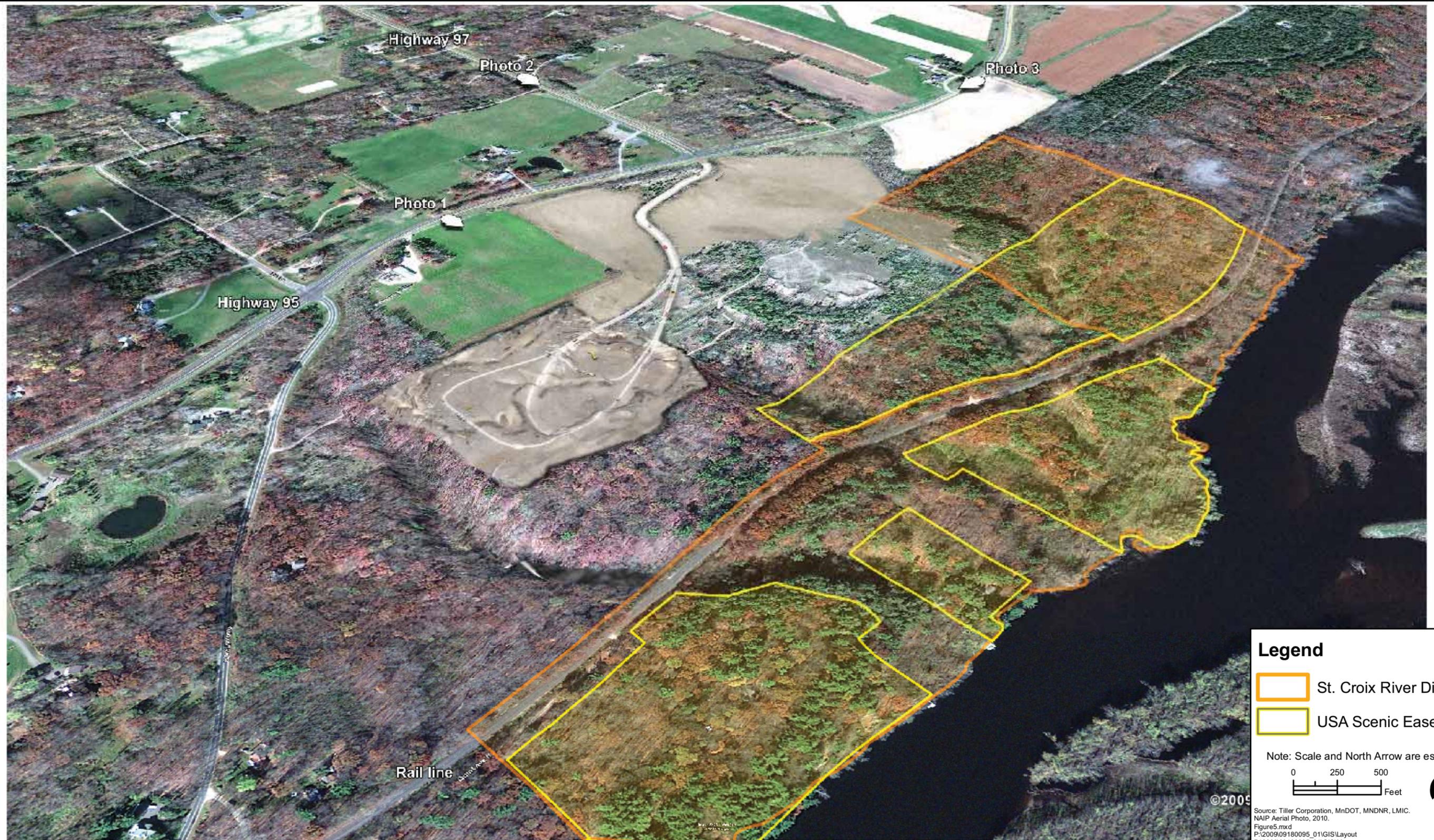
**Key Viewpoint 1:** This photographic simulation (Figure 2b) provides a view of Phase 2 mining and reclamation activities (Appendix B, Sheet C2) that would be visible to the public using the bike path for about 6 to 12 weeks. Phase 2 (Appendix B and Figure 5) was selected because it represents the most area disturbed by Project activities that could be visible, especially when occurring on the western portions of the Site. Visible activities would include excavation, loading, hauling, grading, and removal of stockpiles. The potential for impacts to the viewshed would decrease as mining reduces the elevation internally within the Site. Most of the activities would be screened by proposed and existing berms, and would be only partially visible over limited periods of time; therefore, the overall contrast of the operational phases with the surrounding landscape would be weak.

**Key Viewpoint 2:** This photographic simulation (Figure 3b) provides a view of Phase 2 mining and reclamation activities (Appendix B, Sheet C2). A short segment of the access road (junction with the highway shown in Figure 3b) would be visible over the life of the Project, but would repeat the lines, colors, and textures of existing roadways visible from the viewpoint resulting in a weak contrast to the existing landscape. The overall contrast of mining and reclamation equipment associated with operational phases would be weak because most of the activities would be screened by proposed and existing berms, and would be partially and intermittently visible over limited periods of time.

**Key Viewpoint 3:** This photographic simulation (Figure 4b) provides a view of Phase 1 Mining and Phase 2 Reclamation (Appendix B, Sheets C1-C2). The existing stockpiles would be removed as part of Phase 3 Mining (Appendix B, Sheet C3). The proposed Project would not be visible during leaf-on conditions. The northern portion of the Site is within the viewshed of this viewpoint. Northern areas of the Site and several existing stockpiles may be visible during leaf-off conditions. As shown in Figure 4b, the overall contrast of the operational phases would be nonexistent to weak because most of the activities would be screened by proposed and existing berms, and would be only partially visible over limited periods of time.

As shown in the photographic simulations (Figures 2, 3, and 4) for the three key viewpoints, effects on existing scenic integrity and scenic attractiveness would be negligible. There would be no change in the scenic integrity of the Site as viewed from the key viewpoints, as portions of the existing Site have already been modified by past mining activities.

**Visibility:** In summary, there would be little change in the scenic attractiveness of the overall landscape viewed from any sensitive viewpoint or area, because overall contrasts of proposed long-term Project activities with the existing landscape would be weak due to complete or partial screening of proposed activities by existing landforms and vegetation or by proposed berms. Once mining and reclamation phases are complete, the Site would be restored to a natural landscape appearance, which could enhance the natural scenic attractiveness of the Site.



Prepared By:

**AECOM**



Prepared For:

CITY OF SCANDIA  
 ZAVORAL MINING AND RECLAMATION  
 EIS PROJECT  
 WASHINGTON COUNTY, MINNESOTA

**Plan View Model of Phase 2  
 Mining and Reclamation**

**Figure 5**

August 2011

09180095\_01

The first phase of reclamation would be in the northeastern portion of the proposed Project. This previously mined area is located within the St. Croix River District and USA Scenic Easement Areas, and would not be part of any mining activity associated with the proposed Project. Once the existing stockpiles have been removed and the final grading within the Phase 1 reclamation area has been completed, reclamation of this area would begin. The prescribed planting of this area would include a coniferous tree community intermixed with appropriate native prairie seed in openings.

The reclaimed Site condition would be accomplished by grading to achieve a gently rolling landscape that harmonizes with surrounding landforms characterized by gently sloping fields and steeper sloping bluff areas. Proposed reclamation areas would include low-lying areas or depressions located throughout the proposed mining limits, which would develop some ecological diversity and create visual interest. The 64-acre area would be covered by areas of native-dominated dry prairie, mesic prairie, and coniferous woodland that transition to and harmonize with existing, adjacent native plant communities.

The proposed Project would not be visible from most viewpoints in the three sensitive viewing areas, which include residential areas, recreation areas, and highways. Figure 5 presents a computer-generated representation of Phase 2 of the proposed Project. This phase represents the highest level of disturbance at the Zavoral Site. The proposed Project would not be visible to boaters and other recreationists on the St. Croix River or from the bluff line in Wisconsin. The contrast rating analysis concluded that contrasts of the proposed Project with the surrounding landscape would be weak (the proposed Project can be seen but does not attract attention), because most activities would be screened from view from key viewpoints and within the Minnesota sensitive viewing area.

### ***Compatibility with Visual Land Use Goals***

The proposed Project would be compatible with the scenic objectives of the Lower St. Croix CMP, because there would be no effect to the riverway's scenic resources, adverse effects to the scenic setting of recreational opportunities, or effects to opportunities to enhance stewardship of the river. It is not anticipated that changes in the visual resources would affect the local economy.

The proposed Project would be compatible with the City of Scandia visual land use goals, policies, and strategies that address visual resources (LU Goal 1, City of Scandia Comprehensive Plan) and with Ordinance No. 103, which provides standards for screening of mining operations. The rural character and natural landscape would be preserved by proposed berm screening and tree plantings. Existing adverse impacts, such as stockpiles, would be removed and the phased reclamation activities would enhance the natural character of viewsheds, which include the Project Site during operations. Once the operating and reclamation phases are complete, the natural character of the Site would be restored to a condition that conforms to the natural landscape, even to a greater extent than current Site conditions. Existing agricultural landscapes within sensitive viewsheds that contribute to the community character would be preserved, and effects to dark skies would be minimized to the greatest possible extent through downward directed lighting.

#### **3.4.1.4 Alternative 2: No-Build Alternative**

Under the No-Build alternative, there would be no impacts to visual resources as the proposed Project would not be developed. The area would remain unreclaimed. Future agricultural or rural residential land use would need to comply with city comprehensive plan and zoning.

#### **3.4.1.5 Alternative 3: Up to 5-Year Operation**

Alternative 3 would be conducted using the same operational plan (including mining and reclamation phases) and layout. The primary difference is that mining and reclamation would take place up to 10 years with Alternative 1 and up to 5 years under Alternative 3. This would result in more mining occurring for more weeks each year and more material being mined per year.

The visual impacts under Alternative 3 would be identical to those described for Alternative 1, but would occur over a shorter period of time. The overall contrasts from the alternative would be none (facilities not visible) to weak (facilities are visible, but do not attract attention). As described for Alternative 1, no significant impacts, as determined by the significance criteria, were identified from any phase of the proposed Project.

### **3.4.2 Potential Mitigation Measures**

The visual impacts from site preparation, operating phases, and reclamation are anticipated to be negligible because mitigation measures included in the Zavoral Mine Plan provide screening elements such as berms and plantings, as well as ongoing reclamation strategies that mitigate impacts to key viewing areas to the degree practicable. Additional mitigation would ensure that the proposed screening and reclamation strategies are successfully implemented.

- Establishing a maximum stockpile height limit of approximately 880 feet msl. Stockpiles limited to this elevation would be effectively screened by proposed and existing berms. Locating stockpiles on the west side of the Site should be minimized, as the upper slopes of stockpiles would have a greater potential to be within the viewsheds of sensitive viewpoints.
- Limit non-daylight lighting to what is required for safety and security. All such lighting should consist of shielded, downward directed lighting.
- Fully implement and monitor reclamation and activities to verify that reclamation is occurring as planned and to meet pre-determined criteria established by the City to confirm the success of reclamation.
- Monitor the proposed transplanting of native white pine trees to verify maintenance and watering and to assess survival rates. If survival rates do not fall within a pre-determined range established by the City, replacement trees should be provided by Tiller.

## 4.0 References

- Bureau of Land Management (BLM). 1986. Visual Resource Contrast Rating. BLM Manual Handbook 8431. US Department of Interior, Bureau of Land Management.
- City of Scandia. 2009. City of Scandia Comprehensive Plan. Adopted by the City Council March 17, 2009.
- Environmental Protection Agency (EPA). 2007. Minnesota Level III and IV Ecoregions. [ftp://ftp.epa.gov/wed/ecoregions/mn/mn\\_eco\\_desc.pdf](ftp://ftp.epa.gov/wed/ecoregions/mn/mn_eco_desc.pdf). Reviewed July 19, 2011.
- National Park Service (NPS). 2002. Cooperative Management Plan (CMP) and Environmental Impact Statement for the Lower St. Croix National Scenic Riverway.
- U.S. Dept. of Agriculture, Forest Service (USFS). 1995. Landscape aesthetics: a handbook for scenery management. U.S.D.A. Agriculture Handbook No. 701.
- Washington County. 2010. 2030 Comprehensive Plan, A Policy Guide to 2030.
- Washington County Planning Commission. 1976. Lower St. Croix River Bluffland and Shoreland Management Ordinance as adopted by the Washington County Planning Commission.

## Appendix A: Tiller Visual Assessment



## **E11.1 Revised Photo Visual Impact Analysis**

### **E11.1.1 Introduction**

The current visual conditions of the proposed Project and adjacent properties were photographed and recorded using a global positioning system (GPS) during leaf-on and leaf-off conditions to develop a visual impact baseline for traveling motorists, a local bike trail, neighboring residences in Minnesota and Wisconsin and from the St. Croix River (Figure 1). The analysis also helps determine sensitive observation areas that may have the potential to be impacted by the proposed Project so that mitigation measures can be developed as may be necessary. Activities which may be visible include Site Preparation work, excavation, loading, hauling, grading and removal of stockpiles. These activities will only occur for a limited period of time during any given year of operation.

The existing site is primarily an un-reclaimed gravel mine that is characterized by irregular landforms and several remaining stockpiles. Neighboring properties are characterized by agricultural and residential land uses. Land cover consists of fields, open space and wooded areas. Past mining has left the land at a reduced elevation compared to the adjacent properties which currently limits visibility into the proposed Project area. The proposed Project will result in further lowering of the interior elevation by approximately 15 feet and reconfiguration of the topography. Other than the proposed access entrance and proposed screening berms the current elevations within the proposed Project limits reflect the greatest elevations the site will experience throughout the life of the Project.

### **E11.1.2 Methods**

Leaf-off conditions were photographed April 2009, November 2010, January 2011 and April 2011. Leaf-on conditions were photographed in August and September 2009. The range in photograph dates is a result of accessibility to photograph locations, feedback from the public and comments from the City and its consultant. The GPS locations of the photographs were recorded using Trimble® SCS900 Site Controller Software. In locations where the Trimble® software was not applicable, a combination of topography data and aerial photography was used to identify photograph locations; this technique was utilized for leaf-off photographs in Wisconsin and leaf-off photographs on the Bike Trail.

The photographs were taken at locations surrounding the proposed Project that were most likely to offer a view of the interior of the Project. The locations were determined based on topography, tree coverage and location. A wide range of photograph locations were selected to ensure thorough coverage of the proposed Project for the Photo Visual Impact Analysis (Figure 1). The majority of photograph locations have a corresponding leaf-on and leaf-off photograph. The exact photograph locations were difficult to recreate on the St. Croix River due to the river current, but the locations are as close as practical. In Wisconsin, the leaf-on locations were chosen due to the open viewing corridor over the agricultural fields; no potential for distant visibility is offered in the forested areas. During leaf-off conditions the photograph locations in Wisconsin were selected due east of the proposed Project to determine potential visual impacts to the forested areas that offer no visibility during leaf-on conditions. Photographs taken from the bike trail that travels along Highway 95 were only taken during leaf-off in order to determine the greatest potential for visual impacts.



### **E11.1.3 Results**

Photographs were taken at selected locations to provide a comparison of the view during leaf-off and leaf-on conditions of the proposed Project (Figure 1).

#### **Location 1 – Highway 97 (Photographs 1 and 2)**

Photographs 1 and 2 were taken on Highway 97, approximately 0.8 miles west of the proposed Project. For both the leaf-on and leaf-off conditions, the proposed Project will be blocked by trees and rolling topography.

#### **Location 2 – Highway 97 (Photographs 3 and 4)**

Photographs 3 and 4 were taken on Highway 97, approximately 0.5 miles west of the proposed Project. For the leaf-on conditions, the visibility of the proposed Project will be blocked by trees and vegetation. During leaf-off conditions tree screening at the perimeter of the property and the reduced elevation of the interior of the proposed Project area prevent any substantial views into the proposed Project area.

Construction of the proposed Project access entrance has the potential to be viewed from this location. The current access is skewed slightly to the north of Highway 97. The new access will be realigned so it is directly in line with Highway 97. The new access will be within the line of sight for motorists traveling eastbound on Highway 97. This activity will be short term (3-4 weeks) during Site Preparation work. The construction of the new access will require the removal of a minor amount of trees within the eastbound Highway 97 viewshed, which will result in the potential to view activity during construction. This will be a temporary viewshed impact not unlike any other road construction project in the area. The new Project access has been designed to accommodate mitigation measures to screen the entrance area. Upon completion of the construction of the new access road alignment, the new access road will turn sharply upon entering the Project area and a screening berm and landscaping will screen the view into the Project area from motorists eastbound on Highway 97. The top of the berm will reach an elevation of 923 feet above mean sea level (MSL). The elevation on the back side of the berm will rapidly drop off to the base of the proposed Project which will vary between 840 feet and 864 feet above MSL throughout the life of the mining operation. The berm will therefore effectively screen the active phases of the Project as motorists eastbound on Highway 97 approach the site. The bluffs on the Wisconsin side of the river will be visible in the horizon beyond the new screening berm.

#### **Location 3 – Highway 97 (Photograph 5)**

Photograph 5 was taken during leaf-off conditions on Highway 97, approximately 0.25 miles west of the proposed Project. The trees screen most of the proposed Project area. At this location, the white pines on the east side of the Project Limit Area are visible, but the ground surface is not visible due to the elevation change of 70 feet. The interior of the proposed Project is at a reduced elevation due to past mining activity. The screening berm that remains from previous mining activity is also visible along the right hand side of the photograph across from Highway 95.

Construction of the proposed Project access entrance has the potential to be viewed from this location. The new access will be realigned so it is directly in line with Highway 97. The new access will be within the line of sight for motorists traveling eastbound on Highway 97. This activity will be short term (3-4 weeks) during Site Preparation work, not unlike any other road construction project in the area.



#### **Location 4 – 220<sup>th</sup> St N (Photographs 6 and 7)**

Photographs 6 and 7 were taken on 220<sup>th</sup> Street North, located north of the proposed Project approximately 0.6 miles. The proposed Project is not visible from this location due to rolling topography and screening from trees, located both along the northern perimeter of the property boundary and midway between 220<sup>th</sup> Street North and the property boundary.

#### **Location 5 – Quarry Ave N (Photographs 8 and 9)**

Photographs 8 and 9 were taken on Quarry Avenue North, located approximately 0.4 miles north of the proposed Project. The proposed Project is not visible from Quarry Ave. North during leaf-on conditions due to rolling topography and screening from trees and vegetation. During leaf-off conditions most of the proposed Project will be screened by trees and rolling topography. Some activity may be visible on the very northern limits of the property, which includes Phase 1 Mining and Phase 2 Reclamation (C1-C2), but visibility will be limited due to screening from trees and further lowering of interior elevation.

#### **Location 6 – Highway 95 (Photographs 10 and 11)**

Photographs 10 and 11 were taken on Highway 95, located approximately 0.25 miles north-northwest of the proposed Project. During leaf-on conditions the proposed Project is not visible due to vegetation. During leaf-off conditions some activity may be visible on the very northern limits of the property, which includes Phase 1 Mining and Phase 2 Reclamation (C1-C2), but visibility will be limited due to screening from trees and further lowering of interior elevation.

#### **Location 7 – Highway 97 and Highway 95 Intersection (Photographs 12 and 13)**

Photographs 12 and 13 were taken just east of the intersection of Highway 97 and Highway 95, facing east towards the proposed Project. During leaf-on conditions the proposed Project is not visible due to vegetation and tree coverage. During leaf-off conditions, the top of a remaining stockpile (center of photo) and the canopies of the white pines are visible on the eastern edge of the Project limit area. During leaf-off conditions, activity that involves the removal of the remaining stockpile has the potential to be visible. This activity will be temporary (less than 2 weeks) during Phase 3 Mining (C3). The existing berm that remains from previous mining activity limits visibility into the proposed Project area. Another factor that limits visibility is a difference in elevation of approximately 50 feet between the photograph locations and the interior of the proposed Project area. The interior of the site is at a reduced elevation due to past mining activity and will be further reduced as part of the Project.

Construction of the proposed Project access entrance has the potential to be viewed from this location. The new access will be realigned so it is directly in line with Highway 97. The new access will be within the line of sight for motorists at the intersection of Highway 97 and Highway 95. This activity will be short term (3-4 weeks) during Site Preparation work, not unlike any other road construction project in the area.

#### **Location 8 – Highway 95 (Photographs 14 and 15)**

Photographs 14 and 15 were taken on Highway 95, located west of the proposed Project about 0.1 miles. Both leaf-on and leaf-off conditions essentially provide the same viewshed across an agricultural field that has a viewing corridor into the Project area. There is some visibility of a remaining stockpile in the southwestern fringes of the proposed Project area during leaf-off. The trees that are visible in the distance beyond the agricultural field are within Phase 1 and will be removed as part of the proposed Project. This will open up the view of the Project to motorists northbound on Highway 95. A screening berm is proposed to be constructed along the outside perimeter of the proposed Project limits. The screening berm will continue from the existing berm along Highway 95, wrapping around the southwest corner of Phase 1 heading east-west



and then continuing south along the west property line of Phase 2. The potential for viewing activity at the proposed Project will be highest during the construction of the berm and the potential removal of the berm, during Phase 1 Mining and Phase 4 Reclamation respectively. The potential exists that occasional mining activity may be visible during the four mining phases from this location due to a gradual slope in elevation toward the direction of the proposed Project area and minimal coverage from trees and vegetation. The proposed berm will help decrease visual impacts at this location.

**Location 9 – Quinnell Ave N (Photographs 16 and 17)**

Photographs 16 and 17 were taken on Quinnell Avenue North, located west of the southwest corner of the proposed Project approximately 0.1 miles. The proposed Project is not visible from this location due to screening from trees and vegetation.

**Location 10 – St. Croix River (Photographs 18 through 26)**

Photographs 18 through 26 were taken on the St. Croix River during leaf-on and leaf-off conditions. The photographs reveal that a combination of the dramatic elevation change and mature tree and vegetation coverage prevent any visibility of the proposed Project from the river.

**Location 11 – Wisconsin (Photographs 27 through 31)**

Photographs 27 through 31 were taken at various locations along the Wisconsin bluff line approximately 1-1.5 miles from the proposed Project “as the crow flies”. All five of the images demonstrate that the density of tree and vegetation coverage, the elevation changes, topography and the sheer distance from the proposed Project prevent the possibility of viewing the interior of the proposed Project.

**Location 12 – Bike Trail (Photographs 32 through 37)**

Photographs 32 through 37 were taken during leaf-off at a number of locations along the bike trail located between Highway 95 and the proposed Project. The bike trail extends from the existing Zavoral site entrance at the intersection of Highways 95 and 97 and terminates just south of the Zavoral property at Quinnell Avenue North. The bike trail does not experience high traffic (as indicated in photograph 32), but it does provide useful consideration for the analysis due to the proximity of the Project.

The segment of the bike trail adjacent to the proposed Project is just under 0.5 miles long, and is considered to be part of the Scandia/Marine Neighborhood Loop. The City of Scandia produced a Trails Planning Map that illustrates existing and proposed bike routes within the City limits. The proposed trailhead for the bike route described as the Scandia/Marine Loop is located near the intersection of Highway 95 and Highway 97. The bike route begins by heading south along Highway 95 for approximately four miles into the City of Marine. From the City of Marine, the trail begins to make the return loop west and north on County Road 4, where a number of trails may be taken back to the proposed trailhead.

Although the bike trail adjacent to the Project is considered as part of the Comprehensive Trail Plan in the City of Scandia, the Washington County Bike Trail System does not include the bike trail as part of the countywide bike trail system. The County Bike Trail Administration produced a map that illustrates bike routes in Washington County. The bike route described as Bike Loop 1 begins at Square Lake Park and travels west and north along paved shoulders of County Roads to Highway 97. From Highway 97, the route travels east through Scandia along paved shoulders, then proceeds south on Highway 95 along paved shoulders to the off-road trail through William O’Brian State Park. The route resumes on Highway 95 in Marine on the St.



Croix and ultimately returns to Square Lake Park. Regardless of the status of the adjacent bike trail, it does offer an additional vantage point that further defines the current viewshed.

As indicated, six photographs were taken along the bike trail starting at the intersection of Highway 95 and Highway 97, then south towards Quinnell Avenue North. Photograph 32 illustrates the condition of the bike trail. Photograph 33 is the view facing towards the existing site access. A new site access is proposed that would realign the site access with Highway 97. The construction of the proposed site access will be a temporary activity (3-4 weeks) during Site Preparation. Photographs 34 and 35 are located south of the intersection and facing the existing berm that screens the site. The existing view at the location of photograph 34 offers limited if any visibility into the site, which is not expected to change since the existing berms will remain throughout the life of the proposed Project. The location of photograph 35 may have a greater potential for visual impacts during Phase 1 Mining and Reclamation due to the higher vantage point and the greater proximity to the location for proposed berms. The proposed berms would be constructed during Site Preparations as a 3-4 week activity. The potential to view activity during Phase 1 Mining and Reclamation would likely be limited to the western-most perimeter of the proposed Project and the potential would decrease as mining reduces the elevation internally within the site. Photographs 36 and 37 are located just north of Quinnell Avenue North and provide a view overlooking the agricultural field adjacent to the proposed Project. From this location, Phase 1 and Phase 2 Mining and Reclamation have the potential to impact this particular viewshed when mining and reclamation activities occur on the western fringes of the proposed Project limits. Activities which may be visible include Site Preparation work, excavation, loading, hauling, grading and removal of stockpiles. These activities will only occur for a limited period of time during any given year of operation. The potential for impacts to the viewshed will decrease as mining reduces the elevation internally within the site.



**Photo 1: Leaf-on**



**Photo 2: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 1 – Highway 97</b>
-------------------------------------	--------------------------------



**Photo 3: Leaf-on**



**Photo 4: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 2 – Highway 97</b>
-------------------------------------	--------------------------------



**Photo 5: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 3 – Highway 97</b>
-------------------------------------	--------------------------------

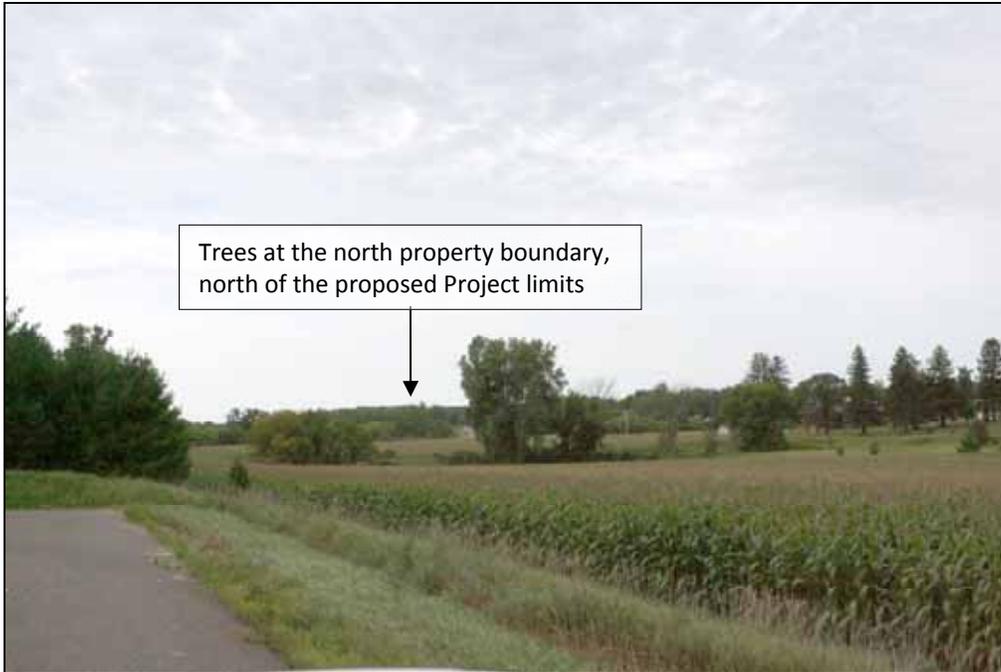


**Photo 6: Leaf-on**



**Photo 7: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 4 – 220<sup>th</sup> Street North</b>
-------------------------------------	---



**Photo 8: Leaf-on**



**Photo 9: Leaf-off**



**Photo 10: Leaf-on**



**Photo 11: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 6 – Highway 95</b>
-------------------------------------	--------------------------------



**Photo 12: Leaf-on**



**Photo 13: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 7 – East Side of Highway 97 and Highway 95 Intersection</b>
-------------------------------------	---



**Photo 14: Leaf-on**



**Photo 15: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 8- Highway 95</b>
-------------------------------------	-------------------------------



**Photo 16: Leaf-on**



**Photo 17: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 9- Quinnell Avenue North</b>
-------------------------------------	--



**Photo 18: Leaf-on**



**Photo 19: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 10– St. Croix River</b>
-------------------------------------	-------------------------------------



**Photo 20: Leaf-on**



**Photo 21: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 10– St. Croix River</b>
-------------------------------------	-------------------------------------



**Photo 22: Leaf-on**



**Photo 23: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 10– St. Croix River</b>
-------------------------------------	-------------------------------------



**Photo 24: Leaf-on**



**Photo 25: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 10– St. Croix River</b>
-------------------------------------	-------------------------------------



**Photo 26: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 10– St. Croix River</b>
-------------------------------------	-------------------------------------



**Photo 27: Leaf-on**



**Photo 28: Leaf-on**

<b>Photo Visual Impact Analysis</b>	<b>Location 11- Wisconsin</b>
-------------------------------------	-------------------------------



**Photo 29: Leaf-off**



**Photo 30: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 11- Wisconsin</b>
-------------------------------------	-------------------------------



**Photo 31: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 11- Wisconsin</b>
-------------------------------------	-------------------------------



**Photo 32: View of the bike trail facing south.**



**Photo 33: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 12– Bike trail</b>
-------------------------------------	--------------------------------



**Photo 34: Leaf-off**



**Photo 35: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 12– Bike trail</b>
-------------------------------------	--------------------------------



**Photo 36: Leaf-off**



**Photo 37: Leaf-off**

<b>Photo Visual Impact Analysis</b>	<b>Location 12– Bike trail</b>
-------------------------------------	--------------------------------



## E11.2 Computer Aided Visual Impact Analysis

### E11.2.1 Introduction

A Computer Aided Visual Impact Analysis was conducted to determine the potential for impacts on the local viewshed for motorists, residents, and visitors to the area. The Computer Aided Visual Impact Analysis was developed from a computer model that determines the viewshed, or area that can be seen from a set of observer points. The model is based on the expected visual conditions of the proposed Project area and adjacent and surrounding properties. The analysis helps determine sensitive observation areas that may have the potential to be impacted by the proposed Project so that mitigation measures can be developed as may be necessary.

Activities which may be visible include Site Preparation work, excavation, loading, hauling, grading and removal of stockpiles. These activities will only occur for a limited period of time during any given year of operation.

The existing site is primarily an un-reclaimed gravel mine that is characterized by irregular landforms and several remaining stockpiles. Neighboring properties are agricultural and residential with wooded areas. The past mining has left the land at a reduced elevation compared to the adjacent properties which currently reduces visibility into the proposed Project area. The proposed Project will result in further lowering of the elevation by approximately 15 feet and reconfiguration of the topography. In general, the current elevations within the proposed Project limits reflect the greatest elevations the site will experience throughout the life of the Project.

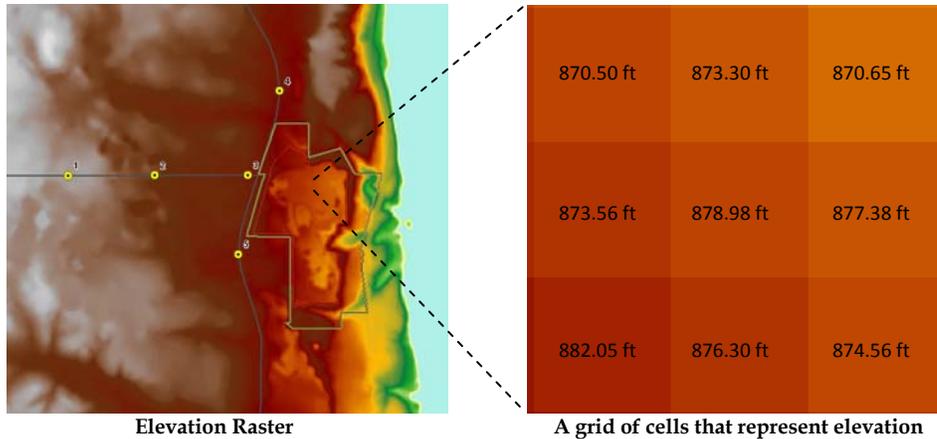
Three viewshed models were developed to determine the degree of visibility into the proposed Project area from sets of selected observer points in Minnesota, the St. Croix River and Wisconsin (Figure 2). The observer points were selected to determine potential visual impacts to each of the following:

- A traveling motorist in Minnesota; observer points were chosen along Highways 95 and 97.
- A recreational user on the St. Croix River; observer points were evenly positioned along the main channel of the St. Croix River near the proposed Project.
- A resident of, or visitor to the Wisconsin bluff line; observer points were chosen at higher elevation points along the bluff where a sight line into the Project area was more likely.

### E11.2.2 Methods

All three viewshed models were developed using ArcGIS® 3D Analyst™ 10. To develop the viewshed all necessary data was compiled and processed in order to depict the viewshed accurately.

First, a representation of the topography at the proposed Project and surrounding areas was generated in the form of an elevation raster (illustration below). A raster consists of a matrix of cells (or pixels) organized into rows and columns (or grid) where each cell contains a value representing a measurement at the center of the cell, such as elevation. The elevation raster is a three-dimensional surface that can be processed by the visual analysis tools in 3D Analyst™.



The data that represents the topography at the proposed Project and surrounding areas and used to generate the elevation raster are shown on Figure 2 and include:

- **10 ft Contours** outside the Property Boundary (source: Mapmart).
- **2 ft and 10 ft Washington County Contours** inside the Property Boundary (source: Washington County).
- **60 ft Tree Canopy Height** added to the elevation of the two sets of contours at select locations (source: Mapmart and Washington County modified by Tiller Corporation).
- **Proposed and Existing Berms**, which includes the proposed new access entrance (source: Sunde Engineering, PLLC).

The elevation raster was generated from the topography data using an interpolation technique specifically designed to work with contour inputs. The basic function of interpolation is to determine cell values in a raster based on known values and characteristics of the input data. The interpolation method uses an iterative finite difference technique based on the widely accepted algorithm developed by Michael Hutchinson (1988, 1989)<sup>1</sup>.

Second, five points were selected per viewshed to represent observer locations. The points were chosen in locations where a potential viewing corridor would be most likely: at higher elevations, at locations with minimal tree coverage that could obstruct the view and at locations close to the proposed Project (Figure 2).

Third, three viewshed models were generated by ArcGIS 3D Analyst™ 10, using the Observer Points tool. The Observer Points tool uses the elevation raster and the five selected observer points as inputs to generate a new raster that represents the viewshed. The viewshed raster stores information about which observer points are visible from each raster cell, which can be used to identify and symbolize the raster cells that are visible from a specific observer point. For

<sup>1</sup> Hutchinson, M.F. 1988. Calculation of hydrologically sound digital elevation models. Paper presented at Third International Symposium on Spatial Data Handling at Sydney, Australia.

Hutchinson, M.F. 1989. A new procedure for gridding elevation and stream line data with automatic removal of spurious pits. *Journal of Hydrology* 106: 211-232.



example, every raster cell that is visible from Observer 1 is shaded pink (Figure 3). Each observer point is assigned a unique color which is used to show the region that is visible to that particular observer. An additional color is used to indicate areas that can be seen by multiple observers (2+ Observer Points). A raster cell that is not shaded on the map is not visible to any observer point.

The viewshed is modeled based on a calculated visibility for each cell in the raster. The visibility of a cell is determined by comparing the altitude angle to the cell center with the altitude angle to the local horizon. The local horizon is computed by considering the intervening terrain between the observation point and the current cell center. Essentially, where cells of higher elevation value are between the observation point and the current cell, the view is blocked. If the view is blocked then the current cell is determined to not be part of the viewshed. If it is not blocked then it is included in the viewshed.

The viewshed models were created using the following settings:

- No observation constraints.
- Azimuth set to a full 360-degree view.
- No vertical limitations.
- Radius (three-dimensional line of sight) distance set to infinity.
- Output resolution (the dimension of each cell, or area covered on the ground by each cell) set to 20 feet x 20 feet to match the resolution of the elevation raster.
- 4-foot offset was added to the elevation value at each of the observer points.

The 4-foot value is a conservative number to account for the height of a driver's eye. (The Mn/DOT Road Design Manual uses a standard of 3.5 feet.) A driver's eye height is not a concern for most of the observer point locations; however, the 4-foot offset provides a greater vantage point and generates a more conservative model. Without an offset, the observer points would be at ground elevation, which would decrease the size of the viewshed.

### **E11.2.3 Assumptions**

First, tree canopy height was added to the appropriate elevation contours within reasonable proximity to the proposed Project to reflect the existing and expected visual obstacle which trees provide (Figure 2). A 60-foot canopy height was used to simulate the existing type of tree coverage which is dominated by mature white pine and mixed hardwoods. This is a conservative estimate since most of the trees east of the proposed Project are greater than 60 feet in height. The tree canopy height was only added to elevation contours in Minnesota between the proposed Project limit and the St. Croix River, and only to elevation contours that exist in dense tree coverage that reflect the mature part of the forest.

No tree canopy height modifications were made to elevation contours in Wisconsin, elevation contours for the existing and proposed berms, elevation contours west of the property line, or elevation contours within the proposed Project limits (Figure 2). By limiting the extent of tree canopy height modifications, the view from the observer points is modeled as having an open



corridor free of trees and vegetation. This is a conservative approach to the analysis and produces an expanded viewshed that more closely examines the worst-case potential for visual impacts of the proposed Project. This does not reflect the true nature of the current and expected visual conditions. In reality, trees provide a substantial amount of screening at most of the described locations. As mentioned earlier, tree canopy height is only modeled for portions of the forest between the proposed Project limit and the St. Croix River that present significant visual screening (Figure 2).

Second, observer points were placed in areas having the following characteristics:

- Higher elevation than the proposed Project area.

Due to the recessed elevation in the proposed Project area, there is a greater potential for visibility into the proposed Project area from higher elevations.

- Minimal tree coverage.

Although trees were only modeled for the area between the proposed Project limit and the St. Croix River, placement of observer points was based on where a viewing corridor might exist in reality.

- Close proximity to the proposed Project area, including the St. Croix River and neighboring residences.

#### **E11.2.4 Results**

The three viewshed models that were generated are illustrated on Figures 3-5. Each figure includes an aerial photograph of the site, the limits of the proposed Project, the location of the five observation points used in the model, and the resulting visible viewshed from the five observation points. The viewshed, or area visible from the observation points, is shaded. Areas that are not shaded are not visible from the observation point in any direction.

#### **Model 1 – Traveling Motorist, MN (Figure 3)**

The results of the first model, as shown on Figure 3, indicate that the interior of the proposed Project limit represents a very small fraction of the overall viewshed. The viewshed represented by motorists on Highway 97 does not include the proposed Project as a significant component. For Observers 1, 2 and 3 the visual impact associated with the proposed Project includes: the existing berm that runs parallel to Highway 95, the proposed new access and the tree canopy on the eastern edge of the proposed Project limit. The limited visual impact of the proposed Project is due to undulating topography, reduced elevation within the proposed Project and sufficient screening from the existing berm.

The viewshed model indicates that visibility into the proposed Project area is primarily limited to motorists traveling on Highway 95. Observers 4 and 5 represent the traveling motorist on Highway 95. From these two observer points, a small fraction of the interior of the proposed Project can be seen. From Observer 4, the northern reaches of the proposed Project and several existing stockpiles are indicated to be part of the viewshed. The visible area in the northern reaches of the proposed Project encompasses approximately 3.80 acres. This visible area is included as part of Phase 1 Mining and Phase 2 Reclamation (C1-C2). The existing stockpiles will be removed as part of Phase 3 Mining (C3). From Observer 5, the eastern portion of the agricultural field that occurs within the proposed Project area and several existing stockpiles are indicated to be part of the viewshed. The eastern portion of the agricultural field



will be mined as part of Phase 2 Mining (C2). Screening from the proposed berm and reduced elevation within the proposed Project as mining progresses will reduce visual impacts. The existing stockpiles will be removed as part of Phase 3 Mining (C3).

Tree canopy height was not added to elevation contours west of the project limit area, therefore vegetation and tree screening do not present any visual limitations in this model. Refer back to Figure 2 for the extent of tree canopy modifications to elevation contour lines.

### **Model 2 – St. Croix River (Figure 4)**

The results of the second model, as shown on Figure 4, indicate that the proposed Project is not visible from the St. Croix River. A combination of the dramatic elevation change and mature forest prevent the possibility of viewing the proposed Project from the St. Croix River.

### **Model 3 – Wisconsin (Figure 5)**

The results of the third model, as shown on Figure 5, indicate that there is very limited potential for visibility into the Project limit area. Most of the viewshed near the Project limit area is reflective of visible tree canopy. The west central portion of the proposed Project is visible to Observer 3 and visible at places to 2+ Observer Points (Observers 1, 2, 3, and/or 5). This area contains the proposed and existing berms and a portion of the field adjacent to the berms. Throughout the life of the project, elevations within the Project limit area will decrease, further reducing visual impacts to residents and visitors on the Wisconsin bluff line.

Tree canopy height was not added to elevation contours in Wisconsin. Therefore the visual limitations caused by vegetation and tree screening have been reduced, which results in an expanded viewshed. Refer back to Figure 2 for the extent of tree canopy modifications to elevation contour lines.

## **Summary**

The proposed Project is well screened; a very limited number of potential viewing corridors exist. This conclusion is supported by both the Photo and Computer Aided Visual Impact Analyses.

Reasons for limited visibility into the proposed Project area include:

- Local topography.
- Mature forest surrounding much of the proposed Project area.
- Proposed and existing berms.
- Decreased elevation within the proposed Project area due to past mining activities.

With the exception of the new entrance alignment, tree coverage and vegetation that exist outside of the proposed mining limits are expected to remain for screening and therefore no new viewing corridors to the site are anticipated to open. It is not expected that the current viewing corridors will change much throughout the life of the Project. Mining activities within the proposed Project will further reduce elevation which will also decrease the potential for visibility into the proposed Project area.



The greatest potential for visual impact is to the traveling motorist in Minnesota. This conclusion is supported by both the Photo and Computer Aided Visual Impact Analyses (Figure 3). Mining activities that have the greatest potential for visual impact include the construction of the proposed Project access entrance (which will occur for a 3-4 week period during Site Preparation) and construction of proposed screening berms (which will occur during Phase 1 Mining as a temporary activity). Mining and reclamation activities that occur at or near the western perimeter of the proposed Project limits have the potential to be visible for motorists traveling within close proximity of the proposed Project. Results from both analyses suggest that the visual impact will be minimal based on the small fraction of the viewshed modeled within the proposed Project limit area and the degree of tree screening in both leaf-on and leaf-off conditions illustrated in photo locations 1-9.

According to both analyses, the proposed Project will not be visible from the St. Croix River. A combination of the dramatic elevation change and mature forest prevent the possibility of viewing the proposed Project from the St. Croix River.

In addition, both analyses support the conclusion that the proposed Project will not be visible from Wisconsin. The Photo Visual Impact Analysis clearly demonstrates that high tree density from tall canopy trees prevents an open viewing corridor to the proposed Project area. The Computer Aided Visual Impact Analysis suggests that the west central portion of the proposed Project is visible to Observer 3 and visible at places to 2+ Observer Points (Observers 1, 2, 3 and/or 5). The visible area within the Project contains the proposed and existing berms and a portion of the field adjacent to the berms. Since the model does not include tree canopy height near the observer points, the viewshed is expanded to resemble worst-case. The Photo Visual Impact Analysis supports the conclusion that visibility into the proposed Project area from Wisconsin is unlikely.

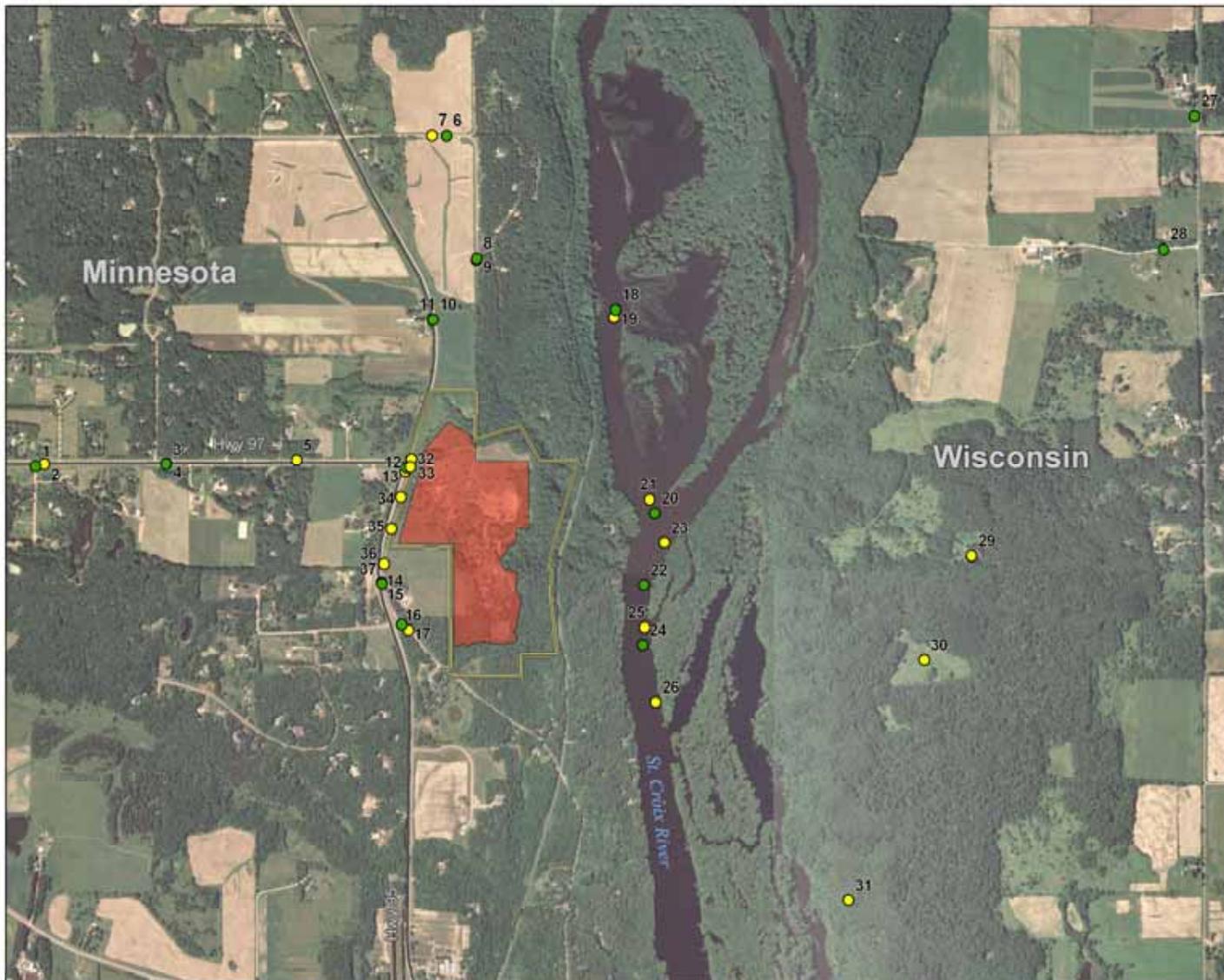


### Zavoral Mining and Reclamation Project Figure 1

#### Zavoral Viewshed Analysis

- Leaf On Photo Points
- Leaf Off Photo Points
- Project Limit Area
- Property Boundary
- State Highways

2005 NAIP Aerial Photo



**TILLER**  
CORPORATION

P.O. Box 1480 Maple Grove, MN 55311-0480  
Phone: (763) 425-4191 Fax: (763) 425-7151

# Zavoral Mining and Reclamation Project

## Figure 2

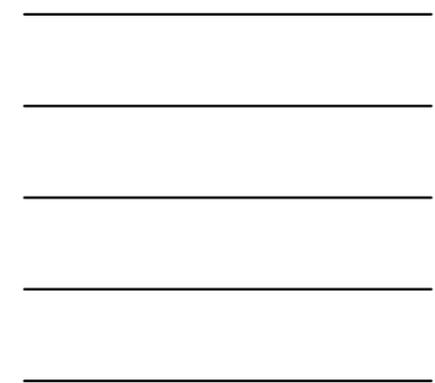
### Zavoral Viewshed Analysis

-  Observer Point Locations
  -  Project Limit Area
  -  Property Boundary
  -  State Highways
- Topography
-  2 ft and 10 ft Contours
  -  Contours+60ft Tree Canopy Height
  -  Proposed and Existing Berms
- 2005 NAIP Aerial Photo
- 0 0.15 0.3 Miles



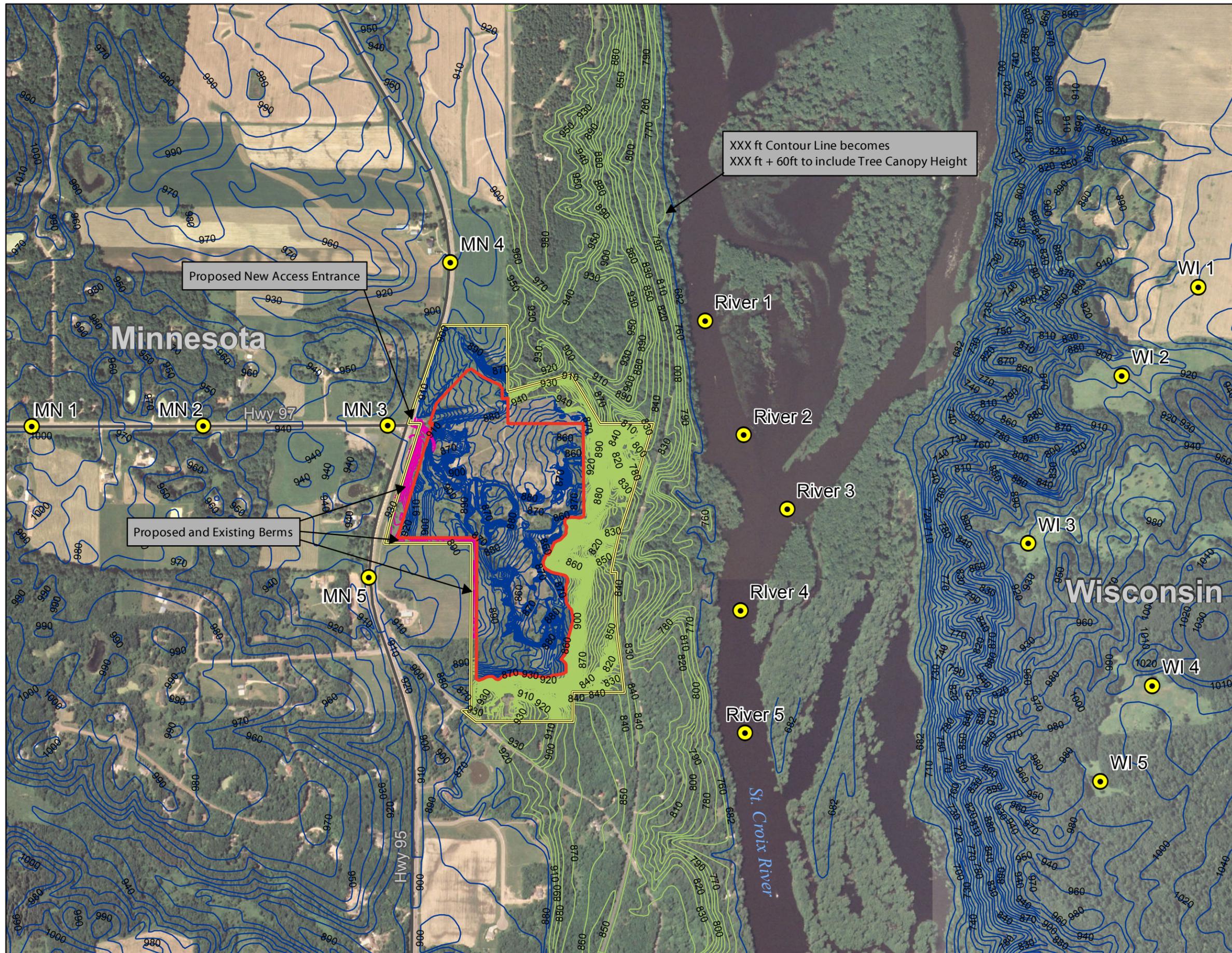
Topography within the property boundary includes 2ft and 10ft contours (Washington County). Topography outside the property boundary includes 10ft contours (Mapmart).

Contour elevation labels reflect the modified elevations used in the model to account for tree canopy height.




**TILLER**  
CORPORATION

P.O. Box 1480 Maple Grove, MN 55311-6480  
Phone: (763) 425-4191 Fax: (763) 425-7153



XXX ft Contour Line becomes  
XXX ft + 60ft to include Tree Canopy Height

Proposed New Access Entrance

Proposed and Existing Berms

Minnesota

Wisconsin

St. Croix River

# Zavoral Mining and Reclamation Project

## Figure 3

### Zavoral Viewshed Analysis

 Observer Points, MN

Visible Areas From Observer Points

Traveling Motorist, MN

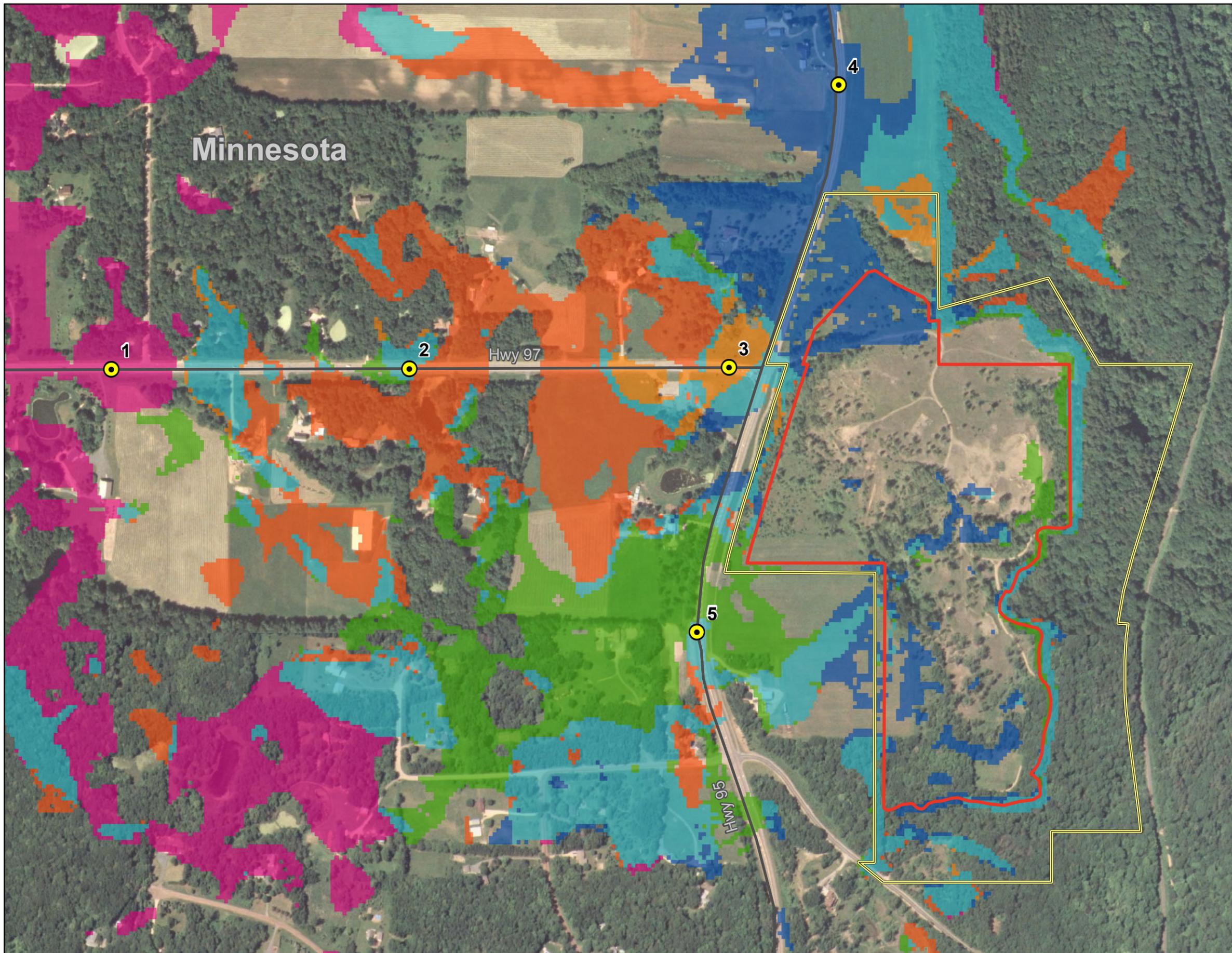
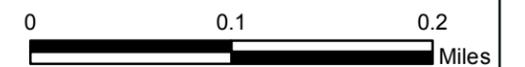
-  1
-  2
-  2+ Observer Points
-  3
-  4
-  5

 Project Limit Area

 Property Boundary

 State Highways

2005 NAIP Aerial Photo



P.O. Box 1480 Maple Grove, MN 55311-6480  
 Phone: (763) 425-4191 Fax: (763) 425-7153

# Zavoral Mining and Reclamation Project

## Figure 4

### Zavoral Viewshed Analysis

Observer Points, River

Visible Areas From Observer Points

St. Croix River

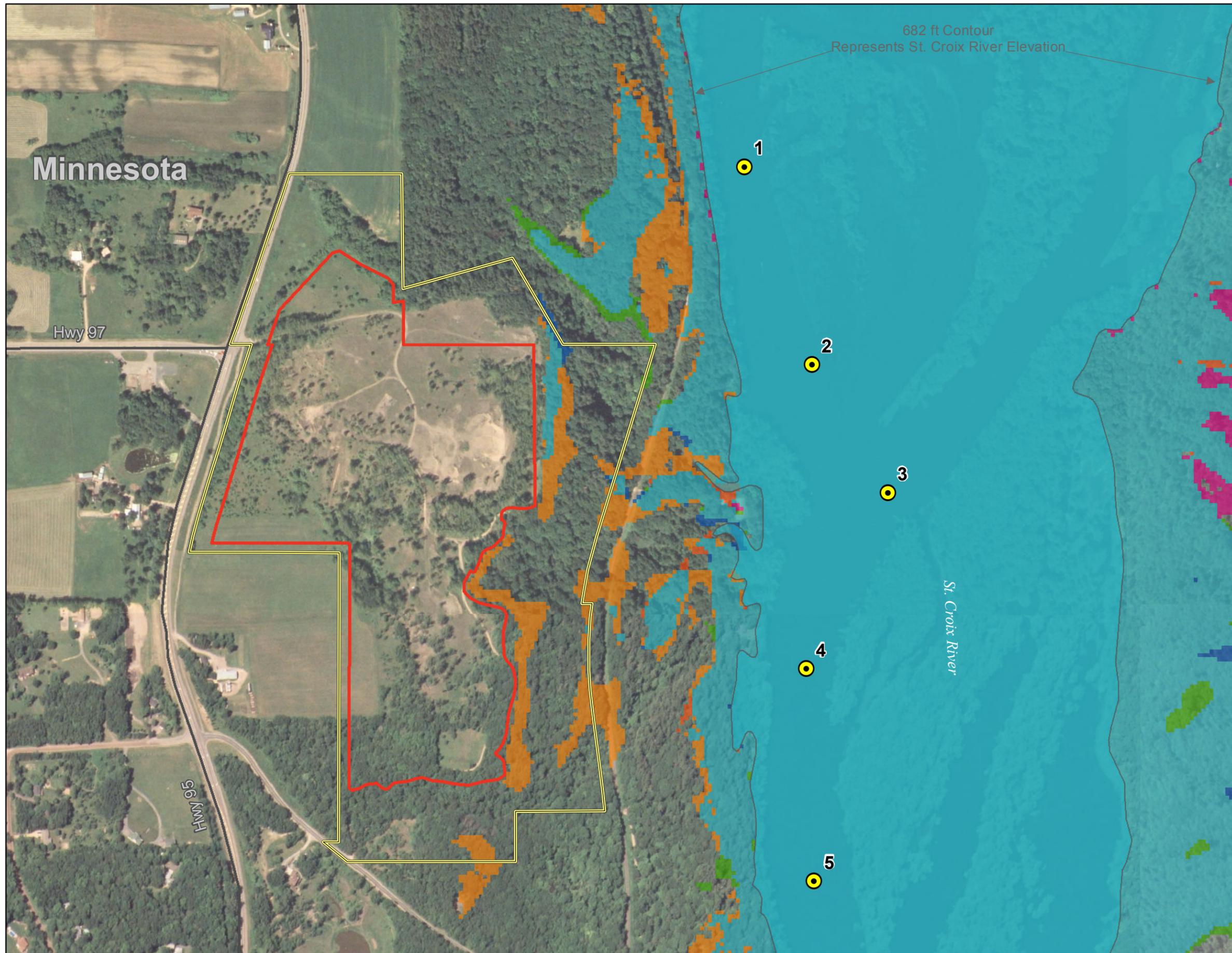
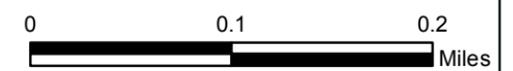
- 1
- 2
- 2+ Observer Points
- 3
- 4
- 5

Project Limit Area

Property Boundary

State Highways

2005 NAIP Aerial Photo



**TILLER**  
CORPORATION

P.O. Box 1480 Maple Grove, MN 55311-6480  
Phone: (763) 425-4191 Fax: (763) 425-7153

# Zavoral Mining and Reclamation Project

## Figure 5

### Zavoral Viewshed Analysis

 Observer Points, WI

Visible Areas From Observer Points

Wisconsin

-  1
-  2
-  2+ Observer Points
-  3
-  4
-  5

 Project Limit Area

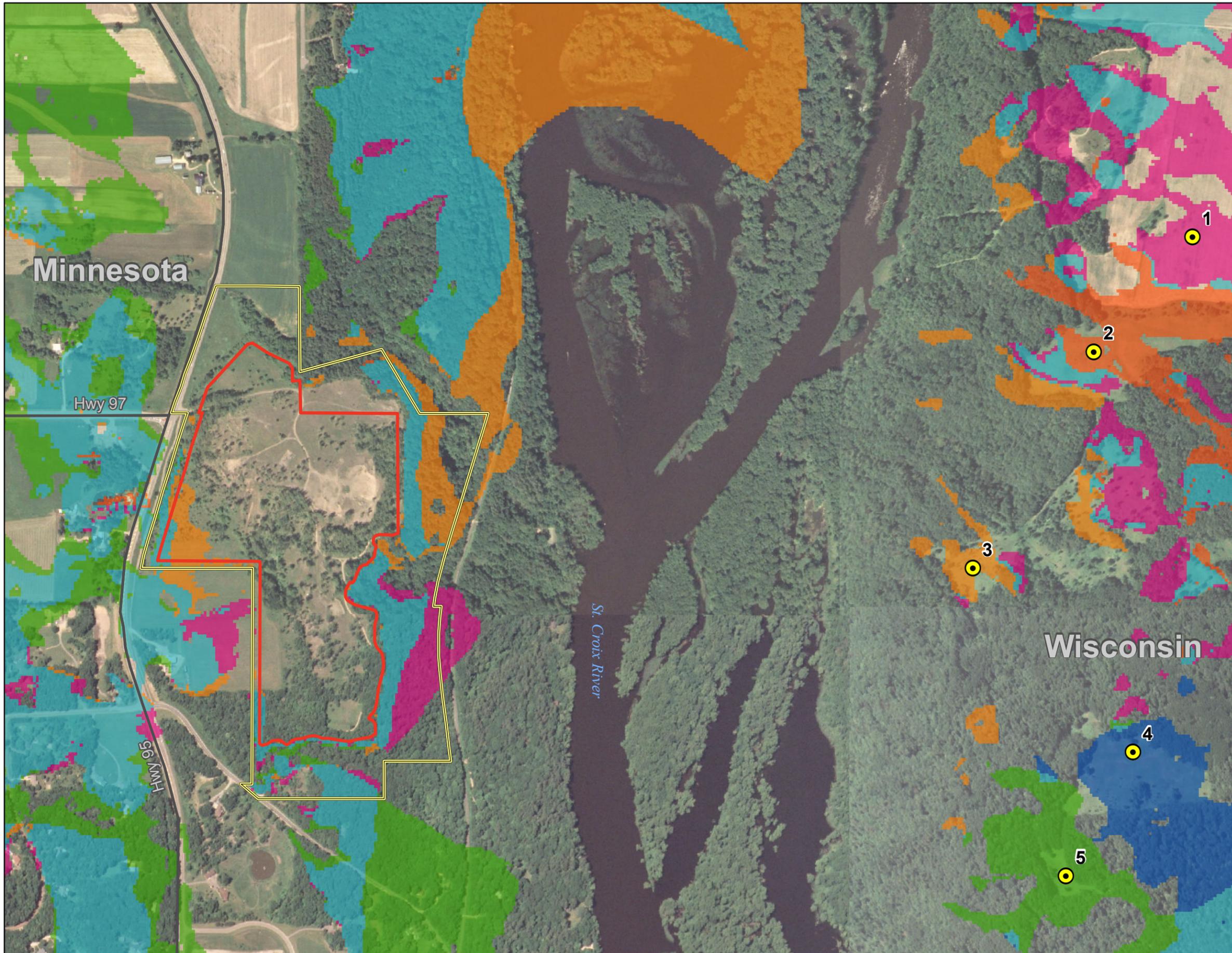
 Property Boundary

 State Highways

2005 NAIP Aerial Photo



N



P.O. Box 1480 Maple Grove, MN 55311-6480  
Phone: (763) 425-4191 Fax: (763) 425-7153









