SCANDIA
minnesota

November 8, 2011

Dear Project Advisory Committee Members:

Enclosed is the preliminary draft of the Zavoral Mining and Reclamation Project Environmental Impact Statement (EIS) for your review and discussion at the November 16, 2011 meeting (4:00 to 7:00 p.m.) The agenda for the meeting is also included.

You will see that the Appendices of the EIS are not included. They consist primarily of the technical papers that you reviewed at previous meetings. The input that was already received will be incorporated into the reports included in the draft EIS that will be the subject of the formal comment period early next year.

At our final meeting, we would like to focus on the conclusions, impacts and proposed mitigation measures. We want to know if you believe anything was missed in the analysis. We also want to make sure to allow some time for comments from the public.

We recognize that this is a lot of material to review and invite you to send us any comments not covered at the meeting by December 1, 2011. After that point, the consultants will finalize the draft EIS, taking all comments received into consideration. The "final" version of the draft EIS will be delivered to the city in January.

The next steps will be for the City Council to take action to release the draft for the formal comment period, which we expect to be approximately 45 days after the official notice. A public information meeting will be scheduled during that period. Exact dates and times are yet to be determined.

While the upcoming meeting will be our final PAC session we anticipate that PAC members, and the organizations you may represent, will most likely make additional comments during the formal review process. We welcome your continued involvement.

Thank you for your dedication in participating on the PAC. Please feel free to contact me at 651 433-2274 or by e-mail at a.hurlburt@ci.scandia.mn.us if you have questions about the process going forward.

Sincerely,

Anne Hurlburt

Anne Hurlburt
Scandia City Administrator

14727 209th St. N., Scandia, Minnesota 55073
Phone (651) 433-2274 Fax (651) 433-5112 http://www.ci.scandia.mn.us

City of Scandia
Zavoral Mining and Reclamation Project EIS
Project Advisory Committee (PAC)

Agenda

Wednesday
November 16, 2011
4:00 - 7:00
(Note longer meeting time)
Scandia Community/Senior Center
14727 209th St. N

4:00 Agenda Review and Introductions

4:10 EIS Schedule

4:30 Draft EIS Overview
- Impacts
- Potential Mitigation Measures

4:45 PAC Discussion
- Discussion of Impact Analysis
- Discussion of Mitigation Measures
- Other Impacts or Mitigation Measures

6:15 PAC Recommendations on Alternatives

6:30 Public Comment

7:00 Adjourn

Draft Environmental Impact Statement for the Proposed Zavoral Mine and Reclamation Plan

City of Scandia
Responsible Governmental Unit

Contact for Responsible Governmental Unit:

Ms. Anne Hurlburt
Administrator
City of Scandia
14727 209th Street North
Scandia, MN 55073
(651) 433-2274

Contact for Tiller Corporation:

Mr. Mike Caron
Director of Land Use Affairs
Tiller Corporation
7200 Hemlock Lane, Suite 200
Maple Grove, MN 55311
(763) 315-6004

Abstract: The Tiller Corporation, Inc. (Tiller) proposes to operate a gravel mine on the site of a dormant, unreclaimed gravel mine in the City of Scandia, 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 Zavoral Site, 55 acres are located on portions of the Site that were previously disturbed by mining. An unmined 9-acre area is also included in the proposed mining area. The Site is located along the St. Croix National Scenic Riverway as designated under the National Wild and Scenic Rivers Act and the federal and state Lower St. Croix River Act. Portions of the Site are located within St. Croix River District Zone and scenic easement area. Although the area proposed for mining area is located outside of these limits, Tiller proposes to conduct reclamation activities on about 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement area.

Gravel would be excavated at the Zavoral Site, loaded into trucks, and transported, primarily to the Scandia Mine located between Lofton Avenue and Manning Trail just north of 218th Street in the City of Scandia. The material from the Zavoral Site would be combined with material mined at the Scandia Mine to meet the specified gradations of marketable aggregate produced at the Scandia Mine. Tiller plans to use the material from the Zavoral Site to replace material currently transported to the Scandia Mine from Franconia Township, Minnesota, and the Osceola, Wisconsin, area.

EIS Content: The content of an EIS in Minnesota is established by Minn R ch. 4410.2300. **Table 1** identifies the content requirements and the location of each content requirement in this EIS. The City of Scandia is the Responsible Governmental Unit (RGU) responsible for the preparation and review of environmental documents for the Zavoral Mining and Reclamation Project.

Table 1: EIS Content Requirements

4410.2300 CONTENT OF EIS: An EIS shall be written in plain and objective language. An RGU shall use a format for an EIS that would encourage good analysis and clear presentation of the proposed action including alternatives to the project. The standard format shall be:	
CONTENT REQUIREMENT	LOCATION IN EIS (to be completed for draft EIS)
A. Cover sheet, the cover sheet shall include	Cover Sheet
(1) the RGU;	
(2) the title of the proposed project that is the subject of the statement and, if appropriate, the titles of related actions, together with each county or other jurisdictions, if applicable, where the project is located;	
(3) the name, address, and telephone number of the person at the RGU who can supply further information;	
4) the name and address of the proposer and the name, address, and telephone number of the proposer's representative who can supply further information;	
(5) a designation of the statement as a draft, final, or supplement;	
(6) a one paragraph abstract of the EIS; and	
(7) if appropriate, the date of the public meeting on the draft EIS and the date following the meeting by which comments on the draft EIS must be received by the RGU.	
B. Summary: the summary shall stress the major findings, areas of controversy, and the issues to be resolved including the choice among alternatives.	Pages x-x
C. Table of contents: the table shall be used to assist readers to locate material.	Pages x-x
D. List of preparers: this list shall include the names and qualifications of the persons who were primarily responsible for preparing the EIS or significant background papers.	Pages x-x
E. Project description: the proposed project shall be described with no more detail than is absolutely necessary to allow the public to identify the purpose of the project, its size, scope, environmental setting, geographic location, and the anticipated phases of development.	Pages x-x
F. Governmental approvals: this section shall list all known governmental permits and approvals required including identification of the governmental unit which is responsible for each permit or approval. Those permits for which all necessary information has been gathered and presented in the EIS shall be identified.	Pages x-x
G. Alternatives: the EIS shall compare the potentially significant impacts of the proposal with those of other reasonable alternatives to the proposed project. The EIS must address one or more alternatives of each of the following types of alternatives or provide a concise explanation of why no alternative of a particular type is included in the EIS: alternative sites, alternative technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through comments received during the comment periods for EIS scoping or for the draft EIS. An alternative may be excluded from analysis in the EIS if it would not meet the underlying need for or purpose of the project, it would likely not have any significant environmental benefit compared to the project as proposed, or another alternative, of any type, that would be analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts. Alternatives included in the scope of the EIS as established under part	Pages x-x

4410.2100 that were considered but eliminated based on information developed through the EIS analysis shall be discussed briefly and the reasons for their elimination shall be stated. The alternative of no action shall be addressed.		
H. Environmental, economic, employment, and sociological impacts: for the proposed project and each major alternative there shall be a thorough but succinct discussion of potentially significant adverse or beneficial effects generated, be they direct, indirect, or cumulative. Data and analyses shall be commensurate with the importance of the impact and the relevance of the information to a reasoned choice among alternatives and to the consideration of the need for mitigation measures; the RGU shall consider the relationship between the cost of data and analyses and the relevance and importance of the information in determining the level of detail of information to be prepared for the EIS. Less important material may be summarized, consolidated, or simply referenced. The EIS shall identify and briefly discuss any major differences of opinion concerning significant impacts of the proposed project on the environment.		Pages x-x
I. Mitigation measures: this section shall identify those measures that could reasonably eliminate or minimize any adverse environmental, economic, employment, or sociological effects of the proposed project.		Pages x-x
J. Appendix: if an RGU prepares an appendix to an EIS the appendix shall include, when applicable:		Pages x-x
	(1) material prepared in connection with the EIS, as distinct from material which is not so prepared and which is incorporated by reference;	Pages x-x
	(2) material which substantiates any analysis fundamental to the EIS; and	Pages x-x
	(3) permit information that was developed and gathered concurrently with the preparation of the EIS. The information may be presented on the permitting agency's permit application forms. The appendix may reference information for the permit included in the EIS text or the information may be included within the appendix, as appropriate. If the permit information cannot conveniently be incorporated into the EIS, the EIS may simply indicate the location where the permit information may be reviewed.	

List of Preparers

The following were the primary preparers of the Zavoral Mine and Reclamation Plan EIS.

City of Scandia

Anne Hurlburt
B.S. Urban Planning, Iowa State University
33 years' experience
City of Scandia Administrator-Responsible Governmental Unit

Sherri Buss, R.L.A. (MN)
B.A. Geography and History, Macalester College
M.S. Ecology, University of Minnesota
M.L.A. Landscape Architecture, University of Minnesota
30 years' experience
City of Scandia Planner

AECOM

Leslie H. Knapp, P.G. (MN and WI)
B.A. General Science, Biology Emphasis, University of Northern Iowa
M.A. Earth Science/Geology, University of Northern Iowa
30 years' experience
AECOM Project Manager

Angela Christo, P.E. (MN, IL, IN, KY, MI, OH, and WI), P.T.O.E.
B.S. Civil Engineering, Purdue University
M.S. Management, Purdue University (Calumet)
22 years' experience
Traffic and Roadway Operations

Roger Clay, P.E. (WI and MN), P.H. (WI), CPSWQ (National)
B.S. Water Resources and Biology, University of Wisconsin, Stevens Point
22 years' experience
M.S. Civil and Environmental Engineering, University of Wisconsin
M.S. Water Resources Management, University of Wisconsin
Erosion and Sedimentation, Surface Water, Groundwater Surface Water Interaction

Anthony Coryell
M.S. Geography, University of Memphis
10 years' experience
Solid Waste, Hazardous Waste, Storage Tanks

Robert DeGroot, P.G. (MN and WI), P.E. (MN, WI, CO, and OR)
B.S. Geology and Geography, University of Wisconsin
M.S. Water Resources Management, University of Wisconsin
M.S. Geo-Engineering, University of Minnesota
30 years' experience
Geology, Hydrogeology, Water Use, Groundwater/Surface Water Interaction, and Geologic Hazards

Joseph Muggli
B.S. Environmental Science and Ecology, Minnesota State University Mankato
7 years' experience
Groundwater/Surface Water Interaction, Storage Tanks, and Land Use

Kevin Muellereile, EIT, CFM
B.S. Civil Engineering, University of Minnesota, Minneapolis
4 years' experience
Traffic, Infrastructure, Erosion and Sedimentation, Surface Water, Groundwater Surface Water Interaction

Jeremy Palmer
A.A. Computer Animation, The Art Institute of Phoenix
9 years' experience
Visual Impacts, Visualization

Mark A. Rothfork
B.S. Ecology, Minnesota State University, Mankato
12 years' experience
Environmental Documentation Lead, GIS

Dr. Peter Rzepecki, P.G. (MN and WI), P.H. (National)
M.S. Geography, University of Gdansk, Poland
20 years' experience
Ph.D. Geology, University of Mining and Metallurgy, Krakow, Poland
Water Use, Geological Hazards, Soil Conditions, Erosion and Sedimentation, Surface Water, Groundwater Surface Water Interaction

Brian Stormwind
B.S. Atmospheric Science, State University of New York at Albany
M.S. Atmospheric Science, State University of New York at Albany
20 years' experience
Stationary Source Air Emissions, Odors, Dust

Lisa Welch
B.S. Earth Science, Metropolitan State College of Denver
18 years' experience
Visual Resources

Chris White
B.S. Chemical Engineering
28 years' experience
Stationary Source Air Emissions, Odors, Dust

BRKW, Inc

Michael Bettendorf, MAI
B.A. St. John's University, Collegeville, Minnesota
Over 38 years' experience
Property Values

Richardson, Richter & Associates

Trudy Richter
B.A. English, Stanford University
M.A. Education, Stanford University
J.D. Degree, University of Arizona College of Law
23 years' experience
Public Involvement, Facilitation

Samantha Yocum
B.A. Strategic Communications, University of Minnesota, Minneapolis
4 years' experience
Public Involvement, Facilitation

SBP Associates, Inc.
Steve Platisha
P.E. Environmental Engineering
B.S. Geo Engineering
Master of Planning
25 years experience
Noise Monitoring, Noise Modeling and Analysis

Stantec (formerly Natural Resources Consulting, Inc.)

Terry VanDeWalle
A.A. Fisheries and Wildlife Biology, Kirkwood Community College
B.S. Animal Ecology, Iowa State University
M.S. Biology, Drake University
22 years' experience
Natural Resources, Wetlands, Threatened and Endangered Species

Steven Banovetz
A.S. Agricultural Economics, Kishwaukee College
B.S. Biological Sciences, Northern Illinois University
M.S. Biological Sciences, Northern Illinois University
17 years' experience
Natural Resources, Wetlands, Threatened and Endangered Species

Stacy Carlson
B.A. Biological Resources, University of Northern Iowa
9 years' experience
Natural Resources, Wetlands, Threatened and Endangered Species

TABLE OF CONTENTS

Section Page

LIST OF TABLES

Table **Title**

LIST OF FIGURES

LIST OF APPENDICES

Appendix **Title**

PENDING

LIST OF ABBREVIATIONS AND ACRONYMS

AADT	average annual daily traffic
AAQS	ambient air quality standards
AASHTO	American Association of Highway and Transportation Officials
AG-C	Agricultural Core Area (City of Scandia 2030 Comprehensive Plan)
AST	aboveground storage tank
AOP	Annual Operating Permit
ASTM	American Society for Testing and Materials
bgs	below ground surface
BMP	best management practice
CCES	Critical Connections Ecological Services, Inc.
CESQG	Conditionally Exempt Small Quantity Generator of Hazardous Materials
cfs	cubic feet per second
cm/sec	centimeters per second
CMP	Cooperative Management Plan
CMSCWD	Carnelian-Marine-St. Croix Watershed District
CR	County Road
CSAH	County State Aid Highway
CUP	conditional use permit
CWI	County Well Index
cy	cubic yards
dBA	decibel, A-weighted
DBH	diameter breast height
EAW	environmental assessment worksheet
ECS	Ecological Classification system
EDR	Environmental Data Resources, Inc.
EIS	Environmental Impact Statement
EQB	Environmental Quality Board
Dresel	Dresel Contracting, Inc.
g/m^2	grams per square meter
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
GPS	global positioning system
gpy	gallons per year
lb/hr	pounds per hour
lb/year	pounds per year
MAAQS	Minnesota Ambient Air Quality Standards
MCES	Metropolitan Council Environmental Services
MDA	Minnesota Department of Agriculture
MEQB	Minnesota Environmental Quality Board
mgd	million gallons per day
MGS	Minnesota Geological Survey
mgy	million gallons per year
MIM	Minnesota and Northeast Iowa Morainal

Minn. R. ch.	Minnesota Rules, chapter
Minn. Stat.	Minnesota Statute
MLCCS	Minnesota Land Cover and Classification System
MMUTCD	Minnesota Manual on Uniform Traffic Control Devices
MnDNR	Minnesota Department of Natural Resources
MGS	Minnesota Geological Survey
Mn/DOT	Minnesota Department of Transportation
MOT	Material of Trade
MPCA	Minnesota Pollution Control Agency
mph	miles per hour
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NAC	Noise Area Classification
NEPA	National Environmental Policy Act
NHIS	Natural Heritage Information System (MnDNR)
NHNRP	Natural Heritage and Nongame Research Program (MnDNR)
NPDES/SDS	National Pollutant Discharge Elimination System/State Disposal System
NRC	Natural Resource Consulting, Inc.
NWI	National Wetland Inventory
OHWM	ordinary high water mark
OSCS	Open Space Conservation Subdivision
ORVW	Outstanding Resource Value Water
PAC	Project Advisory Committee
PCB	polychlorinated biphenyl
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than 2.5 microns
PM_{10}	particulate matter with an aerodynamic diameter less than 10 microns
PSD	Prevention of Significant Deterioration
PTE	potential to emit
RGU	Governmental unit responsible for the preparation and review of environmental document
RSEA	Regionally Significant Ecological Area
SAM	Standardized Air Modeling
SDD	Scoping Decision Document
SDS	State Disposal System
SEAW	Scoping Environmental Assessment Worksheet
SHPO	State Historic Preservation Office
SWPPP	Stormwater Pollution Prevention Plan
TA-COS	Take Action - Conserve Our Scandia
TH	Trunk Highway
µg/L	micrograms per liter
USACE	United States Army Corps of Engineers
USAP	Uniform Standards of Professional Appraisal Practice
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey

UST	underground storage tank
VOC	volatile organic compounds
WCA	Minnesota Wetland Conservation Act
WCD	Washington Conservation District
WIN	What's in My Neighborhood

This page intentionally blank

EXECUTIVE SUMMARY

ES.1 PROJECT OVERVIEW

The Tiller Corporation, Inc. (Tiller) proposes to operate a 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 unmined 9-acre area is also included in the proposed mining area **(Figures 1 and 2).**

Tiller prepared a Conditional Use Permit (CUP) Application for the Zavoral Mining and Reclamation Project (or Project; Tiller November 2008). The City's Development Code required that Tiller prepare an Environmental Assessment Worksheet (EAW) for the Project as part of the CUP Application. An EAW was prepared per Minn. R. ch. 4410.4300 (Sunde Engineering 2008). The City of Scandia as the Responsible Governmental Unit (RGU) is responsible for the preparation and review of environmental documents for the Project. On March 3, 2009, the City of Scandia's review of the EAW determined that the Project had the potential for significant impacts and that an Environmental Impact Statement (EIS) was needed to determine the Project's potential for significant environmental impacts.

The Site is located within the jurisdiction of the City of Scandia and partially within the St. Croix National Scenic Riverway as designated under the National Wild and Scenic Rivers Act and the federal and state Lower St. Croix River Act **(Figure 2)**. Minn. R. ch. 6105.0370 § 9 prohibits sand and gravel operations within the St. Croix River District Zone and scenic easement area. The protection of scenic resources within these jurisdictions is guided by the City of Scandia Comprehensive Plan, and the Cooperative Management Plan (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. Although the proposed mining area is located outside these limits, Tiller proposes to conduct reclamation activities on about 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6.

Tiller proposes to develop the mine in phases. Active mining would occur to a maximum depth of 15 feet. Tiller does not propose to excavate into groundwater and would maintain a minimum 3-foot separation from the bottom of the excavation and the groundwater table. Reclamation of the Site would take place concurrently with mining.

Gravel would be excavated at the Zavoral Site, loaded into trucks, and transported, primarily to the existing Scandia Mine (or Mine) located between Lofton Avenue and Manning Trail just north of 218th Street in the City of Scandia **(Figure 3).** The Scandia Mine is also operated by Tiller. Material from the Zavoral Site would be used as add-rock to provide material that would meet the specified gradations of marketable aggregate at the Scandia Mine. Some of the material mined at the Zavoral Site may also be transported directly to construction project sites or other facilities for use and/or processing.

The add-rock from the Zavoral Site may be processed at the Scandia Mine or may be used without processing. Tiller plans to use the material from the Zavoral Site to replace material currently transported to the Scandia Mine from various locations, most recently from Franconia Township, Minnesota, and the Osceola, Wisconsin, area.

ES.2 EIS CONTENT

The content of this EIS is established by the revised Scoping Decision Document (SDD; City of Scandia January 2010). The following items were screened and removed from further review in the EIS as part of the EAW and scoping process that established the scope of this EIS.

- Water surface use
- Water quality (wastewaters)
- Vehicle-related air emissions
- Archaeological/historical/architectural resources
- Prime/unique farmlands
- Impact on infrastructure and public services

The following items were included in the scope of this EIS:

- Land Use
- Economic Impacts
- Cover Types
- Fish, Wildlife, and Ecologically-Sensitive Resources and Threatened and Endangered Species
- Physical Impacts on Water Resources
- Water Use
- Water-Related Land Use Management Districts
- Erosion and Sedimentation
- Surface Water Quality and Quantity
- Geologic Hazards and Soil Conditions
- Traffic
- Stationary Source Air Emissions
- Noise
- Visual Impacts
- Compatibility with Plans and Land Use Regulations
- Cumulative Impacts

The major findings related to these items are summarized below. The alternatives evaluated in this EIS are described in Section 3.0 of this document.

ES 2.1 Current and Future Land Use

Over the last 70 years, land use within the Zavoral Site has transitioned from predominantly cropland in the late 1930s to its current condition as vacant open space largely disturbed by past mining activities. In the late 1960s, sand and gravel mining started to become prevalent at the Site. By the mid to late 1970s, mining had displaced much of the former cropland. Active mining continued into the 1980s.

Within a 1-mile area of the Site current land use consists primarily of single-family residential (52%), agricultural (30%), parks and open space (12%), and seasonal residential (5%) uses. The majority of this surrounding area is being used as rural residential and agricultural/vacant land. The nearest residences are located approximately 600 feet to the south and west and 645 feet to the northwest of the proposed mining limits.

Land use along the proposed haul route between the Zavoral Site and the Scandia Mine on TH 97 consists primarily of single-family residential (49%) and agricultural (42%). The majority of the surrounding area is being utilized as rural residential and agricultural/vacant land.

As described above, the Zavoral Site is within the jurisdiction of the City of Scandia and partially within the St. Croix National Scenic Riverway as designated under the National Wild and Scenic Rivers Act and the federal and state Lower St. Croix River Acts. The City of Scandia's 2030 Comprehensive Plan future land use map indicates that the Zavoral Site is located in an area of Agricultural use. The primary uses in the Agriculture area include agricultural production, single-family residences, and parks and open space.

The Zavoral Site and the Scandia Mine are both located within the Agriculture (AG) District under the City's 2020 Comprehensive Plan, the adopted plan at the time of the Tiller application for the Project (2008). The Development Code that was in place at the time of the Tiller CUP application for the Project included mining as an allowed use within the AG Zoning District, with a CUP.

On March 17, 2009, the Scandia City Council adopted the City's 2030 Comprehensive Plan. The potential locations of new mining operations were discussed as the new Comprehensive Plan and Zoning Ordinance were developed, and one of the goals of the plan was to limit the locations where new mining operations would be allowed in the City of Scandia. The Zavoral Site is within the area now designated as AG-C in the 2030 Comprehensive Plan. The 2030 Plan included policies that mining not be included as an allowed use in the AG C District. Since adoption of the plan, the City's Development Code has been updated to implement the plan's recommendations. The Council adopted the new Development Code in November 2010. Mining is not an allowed use in AG-C Zoning District in the new Code.

These changes in the Comprehensive Plan and Development Code have led to a controversial issue associated with the Project as described in Section ES 4.

Alternative 1 – 5- to 10-Year Operation

If the Project were approved, the existing land use on the Site would be altered from its current mixture of unreclaimed, formerly mined, vacant land; forested land; and small areas of agricultural land to a mining operation. Mining, hauling, and reclamation activities would take place at the Site for a 5- to 10-year

period. Upon the completion of mining, the Site would be reclaimed. The reclamation plan developed for the Project includes final grading and landscaping, which would include creating depressions to provide for infiltration, visual interest, and ecological diversity.

The portion of the Site within the St. Croix National Scenic Riverway would be reclaimed by removing existing stockpiles and completing minor grading. Tiller proposes to plant this area with native dry and mesic prairie seed mixes and native white pines. Reclamation of this previously disturbed land in the St. Croix Wild and Scenic Riverway would improve the scenic nature of the area.

Tiller does not have control over post-mining and reclamation land use at the Site. However, due to requests from PAC members and residents regarding potential future use of the Site post-project, the City has reviewed this issue. Any future development at the Site would need to comply with the City of Scandia Development Code. It is expected residential development could occur or the Site would be left in an open self-sustaining state. The intent of allowable development density is to preserve the rural character of the region and allow for large open spaces dominated by native vegetation. The proposed reclamation plan would result in a Site that is suitable for the uses allowed in the Development Code.

Based on the Scandia Development Code requirements, criteria for the 3.1-acre area within the St. Croix River District and the remaining 111.3 acres outside of the District, the estimated maximum number of residential lots (using the Open Space Conservation Subdivision method) for the entire 114-acre Zavoral Site would be 20.

Alternative 2 – No-Build Alternative

The area would remain as vacant open space rather than be developed and reclaimed as part of the Project. The land use would not be altered from its current mixture of unreclaimed, formerly mined, vacant land; forested land; and small areas of agricultural land. The gravel resource would not be used. Establishment of native prairie and coniferous forest would not occur. The portion of the Site within the St. Croix National Scenic Riverway would not be reclaimed. Vegetation succession would continue to occur. Development at the Site could occur as described under Alternative 1, but Site preparation, such as grading and revegetation, would be required.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

The impacts would be the same as with Alternative 1, but would occur in a reduced timeframe. Mining, hauling, and reclamation activities would take place at the Site for a 3.3- to 5-year period. As a result, the area would be available for post-mining and reclamation use earlier than under Alternative 1. Mining-related activity would be required either more frequently or for longer durations, or a combination of both, in order to bring the Project to completion within the reduced timeframe.

ES 2.2 Environmental Hazards

A database search was conducted for potential on-site and off-site sources of environmental contamination relative to the Zavoral Site. Environmental Data Resources, Inc. (EDR) provided specified state and federal regulatory list information for potential sites of environmental concern located at or in the vicinity of the Zavoral Site. The databases reviewed by EDR were the most recently available as of July 14, 2011.

The Zavoral Site was not listed in any of the databases searched by EDR. Wally's Small Engine Repair (Wally's) located at 20965 St. Croix Trail North was listed as a Conditionally Exempt Small Quantity Generator of Hazardous Materials (CESQG). No violations associated with their CESQG status were identified in the EDR Report. Wally's is identified in the Minnesota Pollution Control Agency (MPCA) "What's in My Neighborhood" (WIMN) database due to the CESQG listing. No other adjacent properties were identified in the EDR report. No known contamination was associated with Wally's; thus, it is not likely to affect the Zavoral Site.

Ekdahl Estates, located approximately ¼ mile southwest of the Zavoral Site, was identified in the EDR report and in the MPCA WIMN database. The WIMN listing was the result of a construction stormwater permit obtained for Ekdahl Estates. No known contamination was associated with Ekdahl Estates, thus the area is not likely to impact the Zavoral Site.

A total of 39 underground storage tank (UST) listings were identified in the EDR Orphan Summary. All of the UST listings were associated with properties in Osceola, Wisconsin or Prescott, Wisconsin. None of these UST listings have potential to impact groundwater beneath the Zavoral Site based on distance and separation relative to the St. Croix River.

ES 2.3 Reclamation Plan

Tiller's consultant CCES prepared a reclamation plan and a forestry management plan for the Site. The following is based on these plans and the AECOM consultant team's review of these plans.

Tiller proposes to leave the Site in a "self-sustaining condition that would meet or exceed current local land use rules regulating sand and gravel mining reclamation." Based on the reclamation and forestry management plans, the Site would be revegetated with native-dominated dry prairie, mesic prairie, and coniferous woodland that would provide stable soil conditions for future land uses (CCES May 2011).

The final grading described in the reclamation plan would result in contours to conform to the City of Scandia's Reclamation Standards contained in Section 8 of Chapter 4 of the Development Code Mining and Related Activities Regulations. The final Site condition would be similar to surrounding landforms characterized by gently sloping fields and steeper sloping bluff areas. In reclamation areas that border forested bluffs, Tiller proposes to plant native coniferous trees to create a natural transition between the existing forested landscape and the newly planted reclamation areas. This transition zone would allow existing tree species along the forested bluffs to seed into the reclamation areas and contribute to the overall species composition over time.

The western portion of the Site would slope from the existing grade along the TH 95 right-of-way down to the finished floor of the mining area. In this area, slopes would not exceed 4:1 in accordance with City regulations. The slopes along the northern portion of the Site would fan out to meet the existing slope along the northern portion of the property, which gradually drops in elevation from approximately 910 feet above mean sea level (msl) to approximately 870 feet msl. The mining area floor would be graded to achieve a gently rolling landscape.

In reclamation areas that border agricultural fields to the southwest and to the north of the Site, the transition would be from gently sloping agricultural fields to native dry and mesic prairie. After mining, Tiller proposes to remove the screening berms along the southwest and west perimeters of the Site to

create a gradual transition between adjacent land uses. In addition, native vegetation in the screening areas would remain post-reclamation to provide visual screening.

Tiller proposes to create six depressions within the reclamation area. These created depressions would be designed to provide for infiltration and prevent stormwater from collecting and stagnating, which otherwise could result in converting the depressions to wetland type of environments. The depressions would be planted with a native seed mix that would establish as a mesic to wet prairie plant community and would include species that tolerate a wider range of moisture levels than the dry prairie species.

There are two possible reclamation approaches for the Site, based on two "topsoil" options. The first option was proposed by Tiller in the reclamation plan for the Site. This approach focuses on revegetating the Site with native dry prairie vegetation using engineered or manufactured topsoil consisting of sandy subsoil available at the Site with added organic soil amendments. This method capitalizes on the relatively sterile and noxious weed-free soil conditions that would exist post-mining. However, the use of manufactured topsoil does not meet the Scandia Ordinance No. 103 definition of topsoil. As a result, AECOM requested that a more detailed description of this first approach be prepared and a second approach be prepared to meet City requirements.

The second approach more closely conforms to the City's mining reclamation ordinance, although it relies on importing topsoil rather than using only soils reclaimed from the Site. Under this approach, Tiller would stockpile the limited remaining native topsoil located within the proposed mining areas (approximately 8 acres), and would import additional topsoil of at least equal quality from various other local sources to provide a topsoil cover of 4 to 6 inches over the Site. Following establishment of topsoil within reclaimed areas, a native mesic prairie species mix, less diverse that that proposed under the original approach planted.

The AECOM consultant team believes that first option, if successful, would result in a more diverse mix of native species and would likely result in less competition with weedy species. However, the reclamation must meet City ordinance requirements and must provide a base suitable for maintaining moisture and have suitable organic content to result in successful reclamation. The City may need to amend the definition of "topsoil" in its Development code to permit the use of the first approach, and possibly the second approach as not all of the topsoil would be obtained from the Site.

A suitable test of the success for the first approach may be to allow for its use in the first phase of reclamation and, if successful, allow for its use in succeeding phases of reclamation. If unsuccessful the City would require Tiller to import topsoil for succeeding phases. This would require close monitoring of the first phase of reclamation and the development of strict and measurable definitions of reclamation success.

Alternative 1 – 5- to 10-Year Operation

The existing land use would be altered from its current mix of unreclaimed, formerly mined, vacant land; forested land; and small areas of agricultural land to a mining operation. Upon completion of mining, the Site would be reclaimed. The reclamation plan developed for the Project includes final grading and landscaping, which would include creating depressions to provide for internal drainage, infiltration, visual interest, ecological diversity, and reestablishment of prairie and coniferous woodland vegetation.

The portion of the Site within the St. Croix National Scenic Riverway would be reclaimed by removing existing stockpiles and completing minor grading. This area would be established with native dry and mesic prairie seed mixes and native white pines. Reclamation of this previously disturbed land in the St. Croix Wild and Scenic Riverway would enhance the habitat and scenic nature of this area.

Alternative 2 – No-Build Alternative

The land use would not be altered from its current mix of unreclaimed, formerly mined, vacant land; forested land; and small areas of agricultural land. The gravel resource would not be used. No reclamation activities would take place on the Site and vegetation succession would be expected to continue to occur.

The portion of the Site within the St. Croix National Scenic Riverway would not be reclaimed. Development at the Site could occur as described under Alternative 1, but grading and other Site preparation would be required.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

The reclamation activities for Alternative 1 and Alternative 3 would be essentially the same. The difference between Alternative 1 and 3 is the timeframe of operation. The compressed timeframe proposed under Alternative 3 would result in reclamation being completed earlier.

ES 2.4 Economic Impacts

Based on evaluations related to visual impacts, land use, and traffic as part of this EIS local tourism is not anticipated to be affected by the Project.

Tiller has identified anticipated labor requirements for the Project. Some of the Site employees required for the Project may or may not result in local hiring. However, the ongoing need for employees and the reduction in costs to haul add-rock to the Scandia Mine could allow Tiller to extend the period of employment for employees.

The City of Scandia and Washington County would be capable of providing public and emergency services for the Project under their existing organization and with the exception of providing for monitoring the Project for compliance with permit requirements and any mitigation measures that the City would implement. This monitoring would require a combination of City staff time and consultant time. It is recommended that the City require Tiller to establish a funding mechanism for this additional need..

Property taxes, the value of some properties, and aggregate material removal production tax income have the potential to be affected by the Project as described in the following subsections.

Property Taxes for the Zavoral Site

Most of the Zavoral Site is classified for property tax purposes as Non-Homestead Rural Vacant Land, with an estimated market value of approximately $8,000 per acre. If and when the Site is mined, the classification of the property (the area to be mined including buffer areas) would change to Commercial. The land value is not likely to change, but the property tax classification rate would change.

The increase in taxes payable to the City of Scandia due to reclassification of the property after analysis would be approximately $1,762 per year. Because of how property taxes are levied (a total levy is set, then spread against all the taxable property) this is not additional revenue that would accrue to the City. An increase in taxes payable for the Zavoral Site would have the effect of lowering the tax burden of other properties within the taxing jurisdiction. The impact on individual properties would be so small as to not be noticeable.

This analysis does not include impacts on the other local property taxing jurisdictions (county, school district, watershed district, or others) nor does it include an estimate of the increased collection of the state property tax that is payable for property classified as commercial. A change in classification from vacant land to commercial would also affect calculations for the Metropolitan Area Fiscal Disparities Levy. It is impossible to determine how this might affect the pool overall or Scandia in particular, and any impact would be extremely small.

Nearby Property Values

AECOM consultant team member, BRKW Appraisals, Inc. a real estate valuation services firm, conducted an analysis of the impact that the Project could have on property values within a 1-mile radius of the Zavoral Site. This study was completed to determine whether the Project would have any negative impact on property values what was anticipated to be the potential impact area of the Project on property values.

The Site has not been operated as a gravel mine for over 20 years. The proposed mining operation would be expected to have the same effect as the introduction of a new gravel mining operation into an area. The current economic situation includes declining property values. The introduction of a perceived negative factor into this environment can have a stronger impact than if appearing in a growth market where demand is more important. The impact could be reflected in price and/or the time a property remains on the market.

It is logical to assume that the value of properties abutting a new gravel mining operation could be adversely affected. This effect dissipates with distance from the mining operation. It was concluded that the impact is limited to a radius of $^1/_4$ mile from the Site. Within that area an up to 2% potential property value reduction was concluded for properties between the bluff and the St. Croix River. A similar situation would exist on the southern side of the Site where an impact up to 2% impact was estimated, except for the Westphal ownership, which abuts the southern Site boundary of and thus may have a somewhat greater impact. A potential property value reduction of up to 5% potential value loss has been established for this property.

Properties within $^1/_4$ mile to the southwest, west, northwest, and north have the potential of being more exposed to the gravel mining operation. Based on Tiller's proposal, an 8-foot-high berm would be installed along the western boundary. However, this is less of a barrier than that available to the properties to the east and south. After analyzing the situation, it was concluded that an impact of up to 5% would reflect the potential value loss to those properties. No value loss was ascribed to the Fusco property, which is a vacant site that being zoned for commercial use and would not be impacted.

In determining the value loss, the Assessor's 2011 Estimate of Market Value was used. Consideration has also been given to the impact of the potential value losses to the real estate taxes from the individual

properties. The resulting tax rates were compared with the potential maximum individual value losses to arrive at the potential annual loss of real estate tax income if these losses were actually realized (to all taxing authorities that base the tax amount on property value). This tax income would not actually be lost unless a sale or new assessed value was established. Any property tax "loss" from these individual properties would be redistributed over other properties in Scandia.

The projected negative impact would remain as long as the facility is in operation. The impact would diminish as reclamation occurred, to a level of zero with completion of the successful reclamation.

This analysis presents possible impacts to property values for use in an EIS process. The County Assessor would not prospectively lower property values or related tax rates for groups of properties based on changes that may or may not occur in the future. The values would not be modified unless sales took place or documented appraisal information for individual properties was submitted for County consideration in the valuation process.

Aggregate Material Removal Production Tax

Minn. Stat. § 298.75 provides for the payment of a production tax on aggregate material removal in certain areas of the state, including Washington County and adjoining Chisago County. The production tax is 21.5 cents per cubic yard or 15 cents per ton of aggregate material excavated in the county. The tax is payable when the aggregate material is transported from the extraction site or sold, whichever occurs first. The tax also applies to aggregate that is imported from a Minnesota county that does not impose the tax, or from another state.

The tax is collected by the county auditor. The county may retain up to 5% for administration and the remainder is credited as follows:

- 42.5% to the county road and bridge fund;
- 42.5% to the city or town in which the mine is located, to be expended for maintenance, construction of roads, highways and bridges; and
- 15% to a special reserve fund for restoration of abandoned pits, quarries or deposits located within the county.

The formula for distribution of this tax was made more favorable to cities in 2009. With 2 active sand and gravel mines in the city, Scandia's revenue from the tax was $17,033.85 in 2009 and $13,035.21 in 2010. The forecasted revenue without the Zavoral Project is about $10,000 for both 2011 and 2012. Scandia credits this revenue to its Public Works Department Budget in the General Fund, which pays for all road maintenance expenditures.

Tiller proposes to extract up to 1.2 million tons of aggregate from the Zavoral site. At 15 cents per ton ($180,000) and after deducting 5% for administration, this would generate $171,000 in taxes to be distributed, $72,675 (42.5%) of which would be payable to Washington County, $72,675 (42.5%) of which would be payable to the City of Scandia, and $25,650 to the county's reserve fund for restoration of abandoned pits.

Tiller has indicated that the add-rock material excavated from the Site would replace add-rock currently excavated and hauled from other sites in Chisago County and/or Wisconsin. To the extent that the add-rock replaces material now excavated in Chisago County, the gravel tax paid to Chisago County would be reduced by the amount that would be paid to Washington County for material excavated from the Zavoral site. This would be new revenue to Washington County and to the City of Scandia.

If add-rock material is currently imported by Tiller from Wisconsin to the Scandia Mine, Tiller should already be paying the aggregate tax to Washington County. Replacing this with material excavated in Scandia, at the Zavoral site, would not generate new tax revenue. Because Tiller has not provided a detailed breakdown of the imported material from Wisconsin, nor does it report that information to the county, it is not possible to estimate how much this might reduce the estimate of new aggregate tax revenue to be paid to Washington County and Scandia.

Alternative 1 – 5- to 10-Year Operation

After mining is complete, the land classification for the Zavoral Site would likely revert from Commercial to Vacant Land (unless the land is developed for some other use.) The longer the mining operation continues, the longer the property will pay property taxes at the higher commercial rate.

The projected negative effect on nearby properties would remain as long as the facility is in operation. The impact would diminish as reclamation takes place, to a level of zero with completion of the reclamation plan. Thus any affect on property values would occur for a longer period of time under Alternative 1.

Table ES1 shows the maximum amount of aggregate tax revenue to be generated annually for each of the alternatives.

Alternative 2 – No-Build Alternative

No changes in Zavoral Site property tax would occur. Nearby property values would not be affected. No aggregate tax revenue would be collected for the Zavoral Site.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

Less tax benefit would be realized than under Alternative 1 due to the Site reverting back to the lower-taxed classification more quickly.

The projected negative effect on nearby properties would occur for a reduced period of time under Alternative 3. Based on the estimated amount of material to be excavated from the Zavoral Site, the

Table ES1 show the maximum amount of aggregate tax revenue to be generated annually for each of the Project alternatives. Alternative 3 would be preferred based on a present-value analysis of the stream of payments from the aggregate tax. This assumes that the tax rate (15 cents per ton) would not change over the life of the Project.

Table ES1: Estimate of Maximum Annual Aggregate Tax Revenue

		Minimum Tons	Maximum Tons
Alternative 1: 5- to 10-year Operation		120,000	240,000
	Gross Tax	$18,000	$36,000
	Scandia Share	$7,267	$14,535
	Years	10	5
Alternative 2: No-Build		*No Tax Generated*	
Alternative 3: Reduced Timeframe - 3.3- to 5-year Operation		240,000	360,000
	Gross Tax	$36,000	$54,000
	Scandia Share	$14,535	$21,802
	Years	5	3+

ES 2.5 Biological Resources

A variety of upland and wetland plant communities, maderate cliffs, and former gravel mining areas were documented during the June/July 2009 field surveys conducted by CCES (CCES December 2009). Of the 114 acres surveyed, approximately 64 acres are proposed to be mined and reclaimed. The existing cover types within the Zavoral Site are described below.

Areas from the bluff line down (east) to the St. Croix River are relatively undisturbed White-pine hardwood and Maple-Basswood forests that run contiguously from the north and south property boundary and extend off-site in both directions. These forest types are of a high to moderate ecological quality with a diversity of tree species found throughout including White pine (*Pinus strobus*), Red oak (*Quercus rubra*), White oak (*Quercus alba*), Paper birch (*Betula papyrifera*), Sugar maple (*Acer saccharum*), Basswood (*Tilia americana*), Ironwood (*Ostrya virginiana*), Bitternut hickory (*Carya cordiformis*), Black ash (*Fraxinus nigra*), Butternut (*Juglans cinerea*), Hackberry (*Celtis occidentalis*), American elm (*Ulmus americana*), Big-tooth aspen (*Populus grandidentata*), and Blue beech (*Carpinus caroliniana*)

The forested area below the bluff is included within an MnDNR designated Regionally Significant Ecological Area (RSEA) of the Twin Cities. The classification of RSEA denotes the presence of a high-quality plant community with the potential to have suitable habitat for rare species located within it. On the Zavoral Site, the RSEA is composed primarily of the White pine-hardwood forest along the steep east-facing bluff, Maple-Basswood forest within the southernmost ravine system, and Black ash swamp seepage subtype located along the eastern boundary of the Site within ravine systems adjacent to the railroad tracks. The Maple-Basswood forests within the survey area showed evidence of moderate impacts from invasive earthworms, such as reduced leaf litter and reduced leaf mold (likely due to earthworm herbivory), reduced herbaceous species cover in the ground layer, soil compaction, and soil erosion.

A query of the Minnesota Department of Natural Resources (MnDNR) Natural Heritage Information System (NHIS) identified seventy 70 historic records of rare plants, animals, fishes, reptiles, mussels, and native plant community occurrences within a 1-mile radius of the Site. Of these 70 historic records, the MnDNR Natural Heritage Program staff determined that the following state-listed species would have the potential to occur on the Site and, if present, would have the potential to be affected by Project activities:

- Kitten-tails (*Besseya bullii*; Minnesota Threatened)
- Bog blue grass (*Poa paludigena*; Minnesota Threatened)

- American ginseng (*Panax quinquifolius*; Minnesota Special Concern)
- Red-shouldered hawk (*Buteo lineatus*; Minnesota Special Concern)
- Blanding's turtle (*Emydoidea blandingii*; Minnesota Threatened)
- Several threatened and endangered species of mussels occurring within the St. Croix River

The MnDNR Natural Heritage Program staff, in a letter dated July 21, 2008 recommended that a rare species and significant natural features survey be conducted on the Site to determine the presence or absence of these state-listed species. As a result, a biological assessment was completed for the entire 114-acre property by a MnDNR-approved surveyor employed by CCES. No surveys were conducted for threatened and endangered mussel species within the St. Croix River because Project activities are not expected to affect these species.

None of the state-listed species identified in the MnDNR's July 21, 2008 letter or from the NHIS query were detected. However, a total of three raptors were observed and recorded during the call-response surveys for Red-shouldered hawks within the Site during the May 2010 surveys, including two Red-tailed hawks (*Buteo jamaicensis*) and one Bald eagle (*Haliaeetus leucocephalus*, Minnesota Special Concern).

Also, a previously undocumented population of Butternut trees (*Juglans cinerea*; Minnesota Special Concern) was detected and documented as part of the CCES survey. Of all of the individual Butternut trees detected throughout the property, one tree appears to be healthy and disease-free with all other individuals affected by an introduced (i.e. nonnative) fungal disease known as Butternut Canker (*Sirococcus clavigignenti-juglandacearum*). It is estimated that this fungal disease has killed 80–90% of the Butternut trees in some regions of the US and has caused a steep decline in Butternut populations of larger diameter at breast height trees of greater than 12 inches throughout Minnesota (Purdue University 2009). Butternut is currently listed as Special Concern by the MnDNR and therefore does not require avoidance, protection, or mitigation for taking of the plant species under Minn. Stat. § 84.0895 (CCES December 2009).

The single Butternut tree that appears to be disease free is also the largest Butternut surveyed on the property and is located outside of the mining and reclamation area at the base of the bluff above the railroad tracks in the central part of the property and is relatively isolated from the other individuals found elsewhere on the property.

Alternative 1 – 5- to 10-Year Operation

In the approximately 9-acre area not disturbed by earlier mining, the Project would result in the loss of:

- 5.2 acres of White Pine Hardwood Forest
- 0.2 acre of Maple Basswood Forest
- 3.4 acres of cropland

The Tiller biological assessment for the Site described the Maple-Basswood forest as showing evidence of moderate impacts from invasive earthworms, such as reduced leaf litter and reduced leaf mold,

reduced herbaceous species cover in the ground layer, soil compaction, and soil erosion. The 5.4 acres of White Pine Hardwood Forest and Maple Basswood Forest that would be lost due to the proposed Project would be reclaimed to a combination of mesic prairie, dry prairie, and White Pine Hardwood Forest.

Approximately 55 acres of altered nonnative cover types would be impacted by mining activities. Approximately 40.8 acres of White Pine Hardwood Forest, Maple Basswood Forest, Black Ash Swamp (seepage subtype), maderate cliff, wetland, and cropland located outside the proposed mining limits would not be directly affected by mining activities.

The maderate cliffs and the Black ash swamp seepage subtype wetlands are located along the eastern edge of the property boundary outside the mining and reclamation limits. At several PAC meetings committee members voiced concern over whether the use of the Zavoral Site Well could result in ground water impacts that would negatively impact the maderate cliffs and Black ash swamp seepage subtype wetlands.

The maderate cliffs and the Black ash swamp seepage subtype wetlands obtain their base flow from groundwater discharged from the shallow aquifers below the Site that consist of the Glacial Drift and the Prairie Du Chien-Jordon Aquifers. The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers. The shallow aquifers at the Site were not influenced by pumping in the deeper aquifer and the projected use of water from the Zavoral Site Well for dust control purposes would not be expected to impact these regionally significant features.

Mining would increase the amount of internal surface drainage at the Site. The Project would improve internal drainage and infiltration, resulting in improved base flow conditions to these areas. This additional water would add to the base flow and reduce the surface water runoff that currently occurs on a portion of the Site. The increase in the base flow is not expected to be significant, but would provide some an incremental increase in the groundwater flow into the seeps and creeks. The decrease in surface runoff should decrease sediment loading to the creeks, should benefit the creeks.

Although the proposed mining would involve the loss of some wildlife habitat, approximately 86% (55 acres) of the impact would occur in previously-mined areas that remain unreclaimed after previous mining on the Site and currently provide low-quality wildlife habitat, primarily for common, disturbance adapted edge species. These species would be temporarily displaced during mining activities, but many of the species would be expected to return to the area once mining and reclamation activities are complete. Since no nesting or roosting areas were identified, the raptors that were observed at the Site would not be expected to be negatively affected due to the large size of the areas that they use.

Alternative 2 – No-Build Alternative

No mining or reclamation activities would take place and there would be no effect to fish, wildlife, or ecologically sensitive resources within the Site. The loss of woodland and cropland not previously affected by mining and temporary displacement of wildlife would not occur. The gravel resource would not be used. No reclamation activities would take place on the Site and vegetation succession would be expected to continue to occur.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

Impacts to fish, wildlife, or ecologically sensitive resources within the Site resulting from Alternative 3 would be the same as for Alternative 1. The loss of forestland and cropland would occur. The compressed timeframe proposed under Alternative 3 would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and allow for reclamation of habitat to begin sooner.

ES 2.6 Water Resources

Portions of the Site that discharge to the creeks referred to as the Middle and South Creeks in this EIS are forested by white pines and other trees. The area discharging to Zavoral Creek is vegetated primarily with nonnative and native grasses. There are several areas with steep slopes within the Site that drain internally which are attributed to previous mining activities.

The topography in the area between the Site and the St. Croix River includes steep slopes and bluffs that have a high risk for erosion. Designated wetlands outside the proposed mining area, but within the Site boundary, include reaches of the three creeks to which the Site is tributary. The creeks are characterized as "ravines with several seep areas along the hillsides." Vertical cuts in soils and soil sloughing occur in areas along Zavoral Creek and Middle Creek.

A stormwater pollution prevention plan (SWPPP) would be implemented for the Project in compliance with the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) and Carnelian-Marine-St. Croix Watershed District (CMSCWD) permits. Tiller has prepared a draft SWPPP for the Project that identifies the use of best management practices (BMPs) to minimize or prevent discharge of stormwater runoff from becoming contaminated or, for sediment laden stormwater from being discharged off-site. Erosion and sedimentation control methods were identified for the individual phases including post-reclamation. As mining progresses, the interior elevation of the Site would be reduced, which would increase the flow of surface water to the interior of the Site.

As described in Tiller's SWPPP the 64-acre area that would be mined and reclaimed includes approximately 53 acres that currently drain internally due to past mining operations. Runoff generated within the internally drained area is not discharged off-site. About 11 acres within the Project limits currently drain off-site.

The potential for erosion and sediment transport exists after the start of operation when soils are exposed for overburden removal or other activity. The potential source of erosion and sediment movement is the 4.6 acres located on the perimeter of Site that would discharge off-site during operation. Watershed areas discharging off-site during operation would include 1.3 acres discharging to Zavoral Creek, 1.0 acre discharging to the Middle Creek, and 2.3 acres discharging to the South Creek. To prevent untreated off-site flow a number of BMPs would be applied.

After reclamation the majority of stormwater runoff would be directed toward the six depressions located in the interior of the Site. The exception is the northwestern most 1.3 acres of the Site that would discharge off-site post-project. This area would be reclaimed during Phase 2. BMPs would remain in place until vegetation and soil stability became well established.

Potential effects of the Project on water resources were investigated by analyzing Site runoff rates during operation and after reclamation, and then comparing these rates to existing conditions. The computer program XPSWMM was used for the analysis of existing conditions, during mining and post-operation conditions to estimate the flows discharged from the Site to Zavoral Creek, Middle Creek, and South Creek. Peak runoff rates for the 2-year, 10-year and 100-year 24-hour duration storm events (2.8, 4.2 and 5.9 inches of rain, respectively, were estimated.

Table ES2 shows the reductions in the 2-year, 10-year and 100-year peak flows comparing existing conditions to conditions during operation. During operation, a berm would be installed on the south end of the Site as close to the mining limits as possible, which would be the boundary between internally drained and off-site discharge areas. For this analysis, it was assumed the berm is an existing ridge. It may be possible during Site grading to construct this berm closer to the Site perimeter. If the south berm can be constructed closer to the mining limits, it would result in lower off-site peak flow rates and increased on-site infiltration than the estimates presented in this analysis.

The flow off-site from each watershed for 2-year, 10-year and 100-year storm events are greatly reduced from existing conditions to post-reclamation (**Table ES3**), which would benefit the tributary streams by reducing risks of erosion and sedimentation. The existing peak flow rate during a 100-year event of 18.7 cfs discharging to the Zavoral Creek would be reduced to 5.0 cfs. The other existing off-site discharge points to the Middle and the South Creeks would be eliminated post-reclamation.

Table ES2: Peak Flow Reductions During Mining

	2-year Peak Flow (cfs)			10-year Peak Flow (cfs)			100-year Peak Flow (cfs)		
	Existing	During Mining	% Reduction	Existing	During Mining	% Reduction	Existing	During Mining	% Reduction
North (Zavoral) Creek Watershed	1.9	0.6	68%	8.3	2.4	71%	18.7	5.4	71%
Middle Creek Watershed	0.7	0.7	0%	2.5	2.5	0%	5.4	5.4	0%
South Creek Watershed	2.4	1.3	46%	10.0	4.9	51%	23.4	11.0	53%

Table ES3: Peak Flow Reductions Post-Reclamation

	2-year Peak Flow (cfs)			10-year Peak Flow (cfs)			100-year Peak Flow (cfs)		
	Existing	Post Reclamation	% Reduction	Existing	Post Reclamation	% Reduction	Existing	Post Reclamation	% Reduction
North (Zavoral) Creek Watershed	1.9	0.5	74%	8.3	2.1	75%	18.7	5.0	73%
Middle Creek Watershed	0.7	0.0	100%	2.5	0.0	100%	5.4	0.0	100%
South Creek Watershed	2.4	0.0	100%	10.0	0.0	100%	23.4	0.0	100%

After mining and reclamation have been completed, the total watershed area with off-site discharges would be reduced from the existing 11.6 acres to 1.3 acres. Approximately 1.3 acres at the north end of the Site would discharge to Zavoral Creek. After reclamation the total capacity of the Site to store and infiltrate runoff would be approximately 60.1 acre-ft, compared to the 26.4 acre-ft of rain falling in the internally drained area during a 100-year 24-hr storm.

Potential geologic hazards are related to the elevation relief between the Zavoral Site and the St. Croix River and the erodible nature of the soil. The surface soils consist of highly erodible granular materials. These soils are generally stable unless water is introduced. Surface water drainage is the primary source of water that could lead to erosion and soil transport.

There is some evidence that a major transportation of soil from the Site to the St. Croix River occurred in the past, primarily based on discussions with area residents and the existence of a delta deposit near the mouth of Zavoral Creek that appears to be the result of a significant erosion event. The cause of this delta deposit is not known. It could be the result of a natural erosion event (major rain event) or the result of human activities.

The potential for overflow from internally drained areas during a large storm event was analyzed for the proposed grading of the Site for final reclamation conditions. For the final proposed Site contours, there is only one potential overflow point for the Site and this would discharge to the South Creek.

Additional analyses were completed to determine a relative probability of the storm or snow melt event that would need to occur to create overflow from the Site post-project. A conservative analysis was completed by ignoring infiltration, evapotranspiration, and interception that would occur during any rain event. It would take two back-to-back 100-year 24-hr storm events (6.1-inches per storm, 12.2 inches total) before Site overflow would occur. If the losses due to infiltration, and interception were included in the analysis, there would be no off-site discharge resulting from back to back 100-year 24-hour storms. The potential of overflow post reclamation is seen to be very small, less than the potential under existing conditions. Prior to reclamation the potential for overflow would be less than under existing conditions as the Site becomes more internally drained as mining occurs and as part of ongoing stormwater management.

Alternative 1 – 5- to 10-Year Operation

Immediately after soil stripping, and prior to overburden removal, there would be a relatively short period of time when potential impacts to downstream water resources could occur. If significant rainfall events occurred during this period, erosion in externally draining perimeter areas of the Site could potentially impact downstream resources including the three small tributaries receiving Site drainage and the St. Croix River. Stormwater and erosion control BMPs would be employed to minimize the potential for this.

After vegetative stabilization, and after overburden removal, the potential for these impacts becomes very small, and less than under existing conditions.

Potential impacts are proportional to potential impacts on flow rates. The Project, regardless of differences in phasing, would reduce peak flows off-site, reduce the risk of erosion, and greatly reduce the risk of overflow. The Project would improve infiltration, resulting in improved base flow conditions for the seeps, springs, and creeks, enhancing the ability of area creeks to support aquatic life.

Alternative 2 – No-Build Alternative

There would be no change in potential impacts to water resources of downstream tributaries and the St. Croix River for the no-build alternative.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

There are no differences in potential environmental impacts to water resources between Alternatives 1 and 3. The only difference between Alternatives 1 and 3 is the difference in time it would take for peak flow reductions and increases in infiltration to occur. Alternative 3 has a shorter overall schedule, and estimated peak flow reductions would occur sooner as a result.

Alternative 3 may reduce the risk for impacts to water resources because the shorter timeframe of Site operation compared to the probability of occurrence of a major storm event. For instance, the probability of a storm event exceeding the 100-year event happening in 5 years is 5%, whereas for a 10 year Project duration (Alternative 2 maximum duration), the probability of this occurrence for a storm of this size is 10%. However, Alternative 3 would increase of the intensity of mining activity during Project operation, increasing the potential sources of pollution during the operation period.

ES 2.7 Water Use

Barton Construction formerly operated the Site's multi-aquifer bedrock well (Minnesota Unique Number 00210498). Available well records show that the Zavoral Site Well is cased to a depth of 245 feet and is completed as an open hole in two aquifer systems—the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer—to a total depth of 648 feet. AECOM determined that Barton's water appropriation permit had expired as part of the coordination conducted with the MnDNR.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn Stat. § 103G.271 4a). The intent of the law is to protect use of the Mt. Simon-Hinckley Aquifer for drinking water purposes in metropolitan counties and prohibit use of this resource for lower priority and nonessential purposes such as lawn watering. A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Project noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements. As described in Section 1.1.2 of this document, due to this and additional evaluation of the resource and its potential use as add-rock, Tiller revised their Project proposal to eliminate all aggregate processing activities (including washing) at the Zavoral Site.

The total annual groundwater use from the Zavoral Site Well is limited to less than 1,000,000 gallons, anything above this level would require a water appropriation permit. At the maximum allowable daily water use of 10,000 gallons per day (gpd), pumping could occur for a maximum of 100 days per year.

Tiller would limit the use of water from the Zavoral Site Well to what is required for dust control at the Site. Tiller's water use projection for dust control purposes is to pump less than 10,000 gpd at a rate of up to 1,200 gallons per minute (gpm). The total annual groundwater use would be less than 1,000,000 mgy.

This would keep the amount of groundwater use to a level below the threshold that requires a water appropriation permit from the MnDNR.

Pumping of groundwater at the maximum rate of 1,200 gpm, would result in pumping for approximately 8 minutes per day to reach the maximum allowable daily water volume of 10,000 gallons. If the pumping rate were reduced to 500 gpm, the maximum allowable daily water volume would be obtained within 20 minutes of pumping.

The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers on the shallow Drift and Prairie Du Chien-Jordon Aquifers. Based on the aquifer test, it appears that area supply wells located to the west, southwest, and northwest of the Site that are screened in the shallow Drift or Prairie Du Chien-Jordan Aquifers would not be affected by pumping the Zavoral Site Well at the rates and volumes proposed for dust control purposes and allowable under law without obtaining a water appropriation permit.

Supply wells screened in the Franconia Aquifer would have some potential to be affected by pumping of the Zavoral Site Well. The Zavoral Cabin Well is the closest well to the Zavoral Site Well that is screened in the Franconia Aquifer. The aquifer test indicated a drawdown of 0.25 feet (3 inches) caused by pumping the Zavoral Site Well during the first 15-minute period of the 4 hour test, which is the time required to reach the maximum daily volume of 10,000 gallons. Supply wells located farther from the Zavoral Site Well would experience even less drawdown. A decline of water level of 3 inches or less can be considered insignificant given the capacity of the aquifer and the limited duration over which the decline would occur. The decline would begin to rebound once the pumping is stopped.

The potential for effects on area surface water features is described in Section ES 2.6.

Alternative 1 – Mining 5- to 10-Year Operation

The total volume of groundwater that could be pumped over the maximum period of operation would be 10,000,000 gallons (1,000,000 mgy for 10 years). The total volume of pumping over the life of the Project may be greater than Alternative 3, however due to the mining occurring for fewer weeks per year, the annual volume of water use could be less than for Alternative 3 (with neither of the alternatives being allowed to use more than 10,000,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

Alternative 2 – No-Build Alternative

No mining at the Site would occur, so no mining related water use would result. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

The total volume of groundwater that can be pumped over the maximum period of operation would be 5,000,000 gallons (1,000,000 mgy for 5 years). The total volume of pumping over the life of the Project may be less than Alternative 1, however due to the mining occurring for more weeks per year, the annual volume of water use could be more than for Alternative 1 (with neither of the alternatives being allowed to

use more than 10,000,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

ES 2.8 Water-Related Land Use Management Districts

Water related land use management districts for the Site are the CMSCWD, the Washington Conservation District (WCD), and the St. Croix River District.

Tiller would be required to obtain a Permit for Stormwater Management from the CSCWD prior to operation that requires a stormwater plan to be submitted to the District for review and approval. To meet CMSCWD permit requirements, the Project would not be allowed to increase peak flow discharge rates to off-site areas, would not be allowed to increase the runoff volume discharge off-site, and would be required to implement appropriate BMPs. The Project would need to meet all of these requirements through on-site infiltration and would not be allowed to increase the level for duration of bounce in downstream waterbodies.

Based on the fact that no wetlands were identified within the mining and reclamation area (Stantec 2010), it is not anticipated that any permits would be required under the programs managed by the WCD.

Tiller proposes to conduct reclamation activities on approximately 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6. This work should be monitored for compliance with regulatory requirements.

The potential for impacts to area surface water bodies is described in other sections of this summary. The Project is consistent with water-related land use management district regulations.

ES 2.9 Solid Waste, Hazardous Waste, and Storage Tanks

Sanitary and Solid Waste

Tiller does not propose to install permanent sanitary waste facilities. Instead, portable sanitary waste facilities would be used and managed by a licensed contractor. It is anticipated that very little solid waste would be produced at the Site and that a waste container within the on-site trailer would be sufficient for waste collection. This would be collected by a Tiller employee on a daily basis during periods when work is occurring at the Site and disposed of at Tiller's Maple Grove facility where waste is picked up by a licensed solid waste hauler for disposal at a licensed waste facility. In the event that increased waste disposal was needed, a dumpster managed by a licensed waste hauler could be brought to the Site.

Hazardous Waste

No hazardous wastes are expected to be generated at the Zavoral Site. Hazardous materials at the Site would be limited to Materials of Trade (MOTs) carried in a service truck, which would come to the Site to perform routine maintenance on operating equipment. The service truck would take all used fluids and

filters from the Site where they would be properly disposed of at the operator's main shop. The service truck would carry a spill containment kit.

Other materials that are not considered hazardous but are expected to be on-site during operations include engine oil, grease, hydraulic fluid, and anti-freeze. The materials would be stored in the on-site trailer in compliance with state, county, and city requirements and regulations.

Storage Tanks

The only material that may be stored in on-site tanks during operation would be diesel fuel. However, Tiller expects that diesel fuel would primarily be brought on-site by a bulk delivery truck that would directly fuel the operating equipment. In the event that fuel storage would be necessary, storage would be in a single 1,000-gallon mobile tank in compliance with state, county, and city requirements and regulations. This tank would be located within the active mining or reclamation phase.

Alternative 1 – 5- to 10-Year Operation

The generation of solid waste, use of MOTs, and delivery and/or storage of diesel fuel would occur during the 5 to 10 years of operation. If a diesel storage tank is not used at the Site, these activities would occur only when mining and/or reclamation activities take place. If diesel is stored at the Site, the tank could remain there for up to 10 years.

Alternative 2 – No-Build Alternative

The no-build alternative would have no impact to solid waste, hazardous waste, or storage tanks because no mining or reclamation activities would take place within the Site.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

If diesel fuel is not stored in a tank at the Site, the generation of solid waste, use of MOTs, and delivery of diesel fuel would occur during the 3.3 to 5 years of operation, but either more frequently or for longer durations or a combination of both. If diesel is stored at the Site, the tank could remain there for up to 5 years.

ES 2.10 Traffic

Raw aggregate material mined at the Zavoral Site would primarily be transported to the Scandia Mine. In some cases, it would be transported directly to construction project sites at currently unidentified locations. The Scandia Mine currently uses or processes add-rock material that is transported to the Scandia Mine from various locations. These include Class A, B, and C aggregate material that falls into two basic categories:

1. Material hauling that would not change regardless of whether the Zavoral Site is permitted.
2. Material hauling that would change if the Zavoral Site is permitted.

These categories are described in detail below.

- **Material hauling that would not change regardless of whether the Zavoral Site is permitted:**

Class A Aggregate: Tiller currently imports Class A aggregate to the Scandia Mine for use in hot mix asphalt production. This Class A aggregate hauled to the Scandia Mine consists of basalt from the Dresser, Wisconsin, area and granite from the St. Cloud, Minnesota, area. Historically this has typically consisted of up to 30 round trips on a typical day for up to 3 days a week (90 round trips a week). The route from Wisconsin is east on TH 243 to south on TH 95 to west on TH 97 to north on County Road (CR) 1 (Lofton Avenue) to the Lofton entrance of the Scandia Mine**.** The route from St Cloud is the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail). These routes are reversed for return trips.

Class B Aggregate: Tiller currently imports Class B aggregate to the Scandia Mine for use in hot mix asphalt production. The number of trucks hauling limestone is up to 30 round trips on a typical day for up to 3 days a week (90 round trips a week). There are two haul routes. One route is from the Bayport, Minnesota, area; trucks hauling limestone travel north on CR-15 and CR 15A (Manning Trail) to the Scandia Mine. The other route is from the west from the Burnsville, Minnesota, area; trucks hauling limestone travel the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail). These routes are reversed for the return trips**.**

- **Material hauling that would change if the Zavoral Site is permitted:**

Class C Aggregate: Tiller currently imports Class C aggregate from Franconia Township, Minnesota, and the Osceola, Wisconsin, area. The existing Class C aggregate haul routes are concentrated on both TH 95 (north), CR 1 (from the south), and TH 97. Tiller has made the commitment that other sources of Class C aggregate, including those currently used, would not be used if the Zavoral Site were permitted until the material from the Zavoral Site was exhausted. This is because the Zavoral Site is closer to the Scandia Mine than the Franconia or Osceola sources and, as a result, is less costly to haul.

The Class C aggregate haul routes currently used are:

- Franconia Township, Minnesota – from the intersection of Sugar Bush Trail N. and TH 95 in Franconia Township to south on TH 95 to west on TH 97 to north on CR 1 (Lofton Avenue) to the Lofton entrance of the Scandia Mine with return trips reversing this route.

- Osceola, Wisconsin, area – trucks typically cross the river at TH 243 from Polk County, which is the closest river crossing to south on TH 95 to west on TH 97 to north on CR 1 (Lofton Avenue) to the Lofton entrance of the Scandia Mine with return trips reversing this route.

These hauling activities have generated a maximum of 265 loads (530 trips) a day with an average of 190 loads (380 trips) a day.

Proposed Haul Route

The proposed haul route from the Zavoral Site to the Scandia Mine is approximately 6.5 miles long. Material would be hauled directly from the Zavoral Site to the Scandia Mine on TH 97 **(Figure 3).** The impacts of alternatives on traffic operations and safety were evaluated on the following roadways:

- TH 97 from Manning to TH 95
- TH 95 from 220th Street to 209th Street
- Manning and Lofton from TH 97 to the Scandia Mine entrance
- Intersections within the study limits

Under Alternatives 1 and 3, truck traffic currently traveling to and from the Scandia Mine along TH 97, TH 95, and TH 243 would be replaced by the direct routes between the Zavoral Site and Scandia Mine. While the Zavoral Site is in operation, Tiller would not haul Class C add-rock to the Scandia Mine from Franconia or Osceola. As a result, in Minnesota, TH 243, and TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles.

In addition to mining, reclamation would be occurring at the Site. Employee and maintenance transportation at the Zavoral Site would be minimal. **Table ES4** summarizes the haul traffic for the three alternatives.

Table ES4: Haul Traffic Summary

Task	Alternative		
	Alternative 1 (5 to 10 Years)	Alternative 2 No-Build (hauling from current add-rock sources)	Alternative 3 (5 Years or Less)
Mining activity	5 to10 years	20 to 30+ Years	3 to 5 years
Tons per year mined	120,000-40,000	120,000-400,000	240,000-360,000
Projected weeks operating per year	6-12	6-20	12-18
Projected loads per year	5,000-12,000	5,000-20,000	10,000-18,000
Typical tons per truckload	20-24	20-24	20-24
Projected loads per day (range)	167-200 trucks 334-400 trips	105-279trucks 210-558 trips	167-200 trucks 334-400 trips
Reclamation topsoil loads per day	0-20 trucks 0-40 trips	Not Applicable	0-20 trucks 0-40 trips
Projected loads per day (range) Add-rock + reclamation	167-220 trucks 334-440 trips	105-279trucks 210-558 trips	167-220 trucks 334-440 trips
Maximum capacity loads per day	280 trucks 560 trips	280 trucks 560 trips	280 trucks 560 trips
Maximum capacity loads per hour	28 trucks 56 trips	28 trucks 56 trips	28 trucks 56 trips
Maximum reclamation topsoil loads per day	20 trucks 40 trips	0	20 truck 40 trips
Total peak (add-rock + reclamation topsoil)	300 trucks 600 trips	280 trucks 560 trips	300 trucks 600 trips

Safety Evaluation

The safety of the roadway system was evaluated by obtaining and reviewing the most current 3 years of crash reports, geometrics and operations, and site reviews.

The study area roadway system includes Trunk Highways, County Roads, and local roads that provide access to all vehicles for local and regional travel. The Trunk Highway system has sufficient capacity for the traffic volumes in the area and meets Mn/DOT requirements for sight distance (including the TH 95 and TH 97 intersection). The County and local roads also meet the County design criteria for rural traffic. The details of the crash analysis are described below. No significant crash problems were identified in the study area during the 3-year period (2008–2010).

Crash data for the key roadways in the study area was collected for the years 2008, 2009, and 2010. Mn/DOT provided updated crash data for the Scandia area for roadway segments and intersections.

The segment crashes are relatively small in number and include run-off road and deer collision crashes. Segment crashes are defined as crashes that occur on a section of roadway between intersections (but not including the intersection). These are typical for rural areas. There appears to be no major contributing factors in terms of roadway geometry and operations. Mn/DOT has reviewed the sight distance at the TH 97 and TH 95 intersection and found no deficiencies. TH 97 was rehabilitated in 2007 and the sight distances met Mn/DOT standard requirements at the 55 mph speed limit. TH 95 was rehabilitated in 2009 and the sight distances met Mn/DOT standard requirements at the 55 mph speed limit.

The intersection crash data collected for the typical 3-year period when evaluating such data is generally low at most intersections. The TH 97 and Lofton intersection had the highest number of crashes during the 3-year period (12 crashes), including five right angle crashes. The TH 97 and Lofton intersection was part of Mn/DOT's resurfacing project. The cause of the crashes is likely driver error by turning in front of vehicles on TH 97. If there are concerns about speeding on TH 97, this is an enforcement issue that requires the attention of the State Patrol. A review of the data does not show involvement of semi-trucks in the area crashes. The data captures actual crashes and does not record near-miss or other close call data.

One fatal crash occurred just north of the TH 97 and TH 95 intersection in 2006 that involved a pedestrian. This data was not provided in the initial crash reports because the incident occurred outside of the typical 3-year crash data collection window. A concerned resident provided information a pedestrian struck by a semi-truck.at a PAC meeting. The State Patrol investigated the crash and found that it was an error by the pedestrian in walking in front of the truck and the driver was unable to stop in time.

Scandia Elementary School

Scandia Elementary School is located on the south side of TH 97 near Oakhill Road. School representatives were contacted and provided information on school bus operations, parent drop-off/pickup, and bike/walk patterns. The school does not cite any major concerns with traffic and safety on TH 97. The school staff recognize TH 97 is a busy highway and do not have activities near the area.

The traffic operation, capacity, and safety were evaluated by AECOM for the school driveways (at TH 97 and Oakhill). No problems were identified with capacity based on traffic volumes and turning movements out of the driveway. TH 97 includes a right-turn lane into the school and a bypass lane westbound around turning vehicles.

A review of the data does not show the involvement of semi-trucks in area crashes. This indicates that there are no reportable crash problems with semi-trucks within the study area roadway system.

Impacts to Bicycle and Pedestrian Facilities

The City of Scandia Trail Plan presents near- and long-term improvement plans for trails in the area and connections to regional trails. The trails are planned for both pedestrian and bicyclists. Safety for pedestrian and bicyclists is an important component in the trail planning process.

- The proposed trail on TH 97 is planned as an off-road trail to be constructed in the long-term plan. The off-road trail is recommended as a safer option, with the 55 mph speed limit and truck traffic in the area.
- The proposed trail on TH 95 is also an off-road trail. This is also recommended as a safer option, with the 55 mph speed limit truck traffic in the area.
- The trail crossing at TH 97 and TH 95 is in the long-term plan and should be reviewed in coordination with traffic and intersection operations. Advanced signing for the trail crossing should be added.
- A trailhead is shown at TH 97 and TH 95. If the Zavoral Site is operational, the location of the trailhead should be reviewed and possibly relocated due to the proximity of the proposed location to hauling vehicles.
- New crossings on TH 97 at Oakhill and Ozark are called out for design with traffic controls. This would most likely be some type of warning flashers, not traffic signals. The use of warning striping should also be reviewed.

Impacts Related to Recreation Area Traffic

The area along the St. Croix River is scenic and provides a range of recreational and scenic driving opportunities. William O'Brien State Park is located approximately 2.5 miles south of the Zavoral Site on TH 95. Recreation traffic is a component in increasing average daily traffic on TH 97 and TH 95 during the spring to fall timeframe. Mn/DOT data recorded on TH 97 (at Automated Traffic Recorder station east of Lofton). The trunk highways have sufficient reserve capacity to handle the change in traffic volume for seasonal traffic. Periods of congestion may be experienced during peak weekend travel times or on a holiday weekend, with or without the Project. Removing the current hauling traffic from the river crossing at TH 243 and the portion of TH 95 north of the Zavoral Site should be beneficial to vehicles using these roadways to get to the state park or enjoy other recreational opportunities in the area.

Alternative 1 – 5- to 10-Year Operation

The existing roadway network is sufficient to handle the daily traffic volumes in the area. TH 97 and TH 95 are state highways designed to accommodate regional traffic. The peak hour truck volumes are also within the capacity of the roadways.

Alternatives 1 and 3 have the same range of loads per day (334-440 projected trips with a maximum of 600 trips). The difference would be the length and duration of mining activity. Alternative 1 spreads the mining out over 5 to 10 years but would only operate hauls for a projected 6 to 12 weeks a year.

Current hauling patterns to the Scandia Mine require trucks to travel longer distances. Tiller has agreed not to haul Class C add-rock to the Scandia Mine from Franconia or Osceola during the period that the Zavoral Site is active. As a result, in Minnesota, TH 243 (including the bridge to Wisconsin), and TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles.

Mn/DOT reviewed the proposed driveway location for the Zavoral Site and determined the intersection sight distance to meet their requirements. A northbound right-turn lane would be required to allow vehicles to reduce speed and move out of mainline traffic to turn. An acceleration lane on TH 97 was not recommended by Mn/DOT, as the trucks are not pulling into high speed traffic and the acceleration lane would be a high cost and high property impact.

Alternative 2 – No-Build Alternative

Alternative 2 (No-Build) is expected to maintain the current level of truck traffic. Alternative 2 is projected to have 210-558 trips with a maximum of 560 trips). The reduction in maximum trips per day is related to no reclamation of the Zavoral Site, resulting in a possible reduction of up to 40 trips a day for topsoil hauling.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

Alternative 3 condenses the mining to 3.3 to 5 years, and the hauls would be projected to occur for 12 to 18 weeks a year. The add-rock haul impacts per day are limited by the maximum number of loads per day, which could be the same for all alternatives, but may be more likely to occur under Alternative 3 than Alternative 1 given the compressed Project timeframe. Under any scenario, the truck volumes are within the capacity of the study area roadway system.

ES 2.11 Air Emissions and Dust

AECOM completed an impact analysis related to Project air emissions and dust that included:

- Preparation of uncontrolled potential to emit (PTE) calculations and mitigated emission calculations for fugitive emission sources for particulate matter (PM), inhalable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).
- Simulation of the atmospheric transport processes (dispersion and deposition) using the USEPA Guideline model AERMOD to calculate ambient concentrations of PM, inhalable particulate (PM_{10}), and fine particulate ($PM_{2.5}$).
- Simulation of deposition of PM to the earth's surfaces using the model AERMOD. The analysis included dry deposition due to gravitational settling and surface impaction due to turbulent air flow near surface elements as well as wet deposition due to wash-out by precipitation.
- Evaluation of potential ambient concentrations of crystalline silica from Site operations.

Modeling Analysis

An ambient air quality modeling analysis was used to predict the ambient air concentrations of PM, PM_{10} and $PM_{2.5}$. The PM modeling results were used to predict deposition of dust onto land and into the St. Croix River. The PM_{10} and $PM_{2.5}$ results were compared to the primary and secondary National Ambient

Air Quality Standards (NAAQS) to determine if the emissions would cause or contribute to an exceedance of the NAAQS.

The Clean Air Act required the USEPA to set NAAQS for pollutants considered harmful to public health and the environment if present in sufficient concentrations. The NAAQS include two types of air quality standards.

- Primary standards protect the public, including the health of sensitive populations such as asthmatics, children, and the elderly.
- Secondary standards protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The model predicted that the worst case uncontrolled impacts from Project sources plus the addition of appropriate background concentrations would result in exceedances of the NAAQS for PM_{10} and $PM_{2.5}$.

The model predicted that the mitigated impacts (after implementation of the Tiller Fugitive Dust Control Plan) from Project sources plus the addition of appropriate background concentrations would not result in exceedances of the NAAQS for PM, PM_{10} ,and $PM_{2.5}$. The NAAQS results for mitigated emissions are summarized in **Table ES5**.

TableES5: Summary of Ambient Air Quality Modeling Analysis for Mitigated Emissions

Mining Phase	Pollutant	Avg. Period	Source Contribution ug/m³	Ambient Background[4] ug/m³	Worst-case (or Average) + Ambient Background ug/m3	NAAQS ug/m3	% of NAAQS
Phase 1	$PM_{2.5}$[1, 2]	24-Hr	6.38	24	30.4	35	87%
		Annual	1.00	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	6.34	43	49.3	150	33%
Phase 2	$PM_{2.5}$[1, 2]	24-Hr	5.00	24	29.0	35	83%
		Annual	0.97	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	8.92	43	51.9	150	35%
Phase 3	$PM_{2.5}$[1, 2]	24-Hr	6.44	24	30.4	35	87%
		Annual	0.95	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	6.77	43	49.8	150	33%

Table Notes:

1. $PM_{2.5}$ 24-hour result is the multiyear average of the H1H values. The average H1H value and the monitored ambient background value are summed and compared to the standard.
2. $PM_{2.5}$ annual result is multiyear annual average concentration over all analysis years. The multiyear average value and the monitored background value are summed and compared to the standard.
3. PM_{10} 24-hour result is H6H concentration over all analysis years. The H6H value and the monitored ambient background value are summed and compared to the standard.
4. Ambient Background Concentrations provided MPCA Standardized Air Modeling (SAM) Spreadsheet [Version 09293].

Deposition Analysis

Deposition modeling was conducted for PM emissions to assess the impact of particulate deposition from the Project. Under normal conditions, only PM_{10} remains in the atmosphere long enough to be considered atmospheric particulates. Therefore, use of PM_{10} for deposition analysis is appropriate for impacts to land and plants.

The uncontrolled emissions would have the potential to adversely impact vegetation around the Site. Following the implementation of mitigation techniques as described in the Tiller Fugitive Dust Control Plan, the concentrations of PM_{10} would be below the primary and secondary NAAQS. As noted above, the secondary NAAQS were established to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Since the deposition analysis shows the highest predicted concentration on any day, all other days would be predicted to have lower impacts. Therefore, it is unlikely that deposition would have an adverse impact on the surrounding land.

The results of the modeling analysis indicate that the uncontrolled PM emissions from the Site would have the potential to be above nuisance dust levels. The mitigated dust levels would be below these levels.

Deposition to Water

The deposition analysis was completed for potential impacts to the St. Croix River. The primary concern would be a significant increase in the amount of sediment in the river.

The maximum deposition of PM into the St. Croix River from the Project was determined by modeling the amount of PM that would be deposited into the river for a distance of 2,200 meters upstream and downstream from the Site under the maximum emission and deposition conditions. The worst-case uncontrolled 24-hour average deposition rate based on an average from the receptors in the above area would increase sediment loading by up to 3.7%. The mitigated average deposition rate would increase sediment loading by less than 0.2% under low flow conditions and by less than 0.01% under high flow conditions.

It is unlikely that fugitive dust would adversely affect the water quality in the St. Croix River under either uncontrolled or mitigated conditions given:

- The existing high degree of variability in the sediment loading in the St. Croix River
- The fact that maximum deposition conditions only occur on 1 day per year
- The proposed mining plan does not include mining activity in the winter, which is when low flow conditions occur.

Silica Analysis

The Occupational Safety and Health Administration (OSHA) has established has assigned a maximum exposure limit (MEL) of 300 micrograms per cubic meter ($\mu g/m^3$) to silica expressed as an 8-hour time weighted average (TWA) for workers. The American Conference of Industrial Hygienists (ACGIH) has recommended a Threshold Limit Value - Time-Weighted Average Limit (TLV -TWA) of between 50 $\mu g/m^3$

and 100 µg/m^3 for the respirable fraction of the dust depending on the type of silica that is present. The ACGIH standard is also intended for workplace applications.

The state of California has developed ambient guidelines for annual average concentrations to protect against chronic non-cancer health effects for the general public, including those in the general population that are most sensitive. These are referred to as Reference Exposure Levels (RELs). California has developed an REL for respirable (i.e., $PM_{2.5}$) silica of 3 µg/m^3.

At AECOM's request, Tiller completed an analysis of the crystalline silica content of the fine aggregate on the Site. The analysis was completed on the fine aggregate because this is the fraction that could become airborne. That analysis showed that 25% of the fine aggregate is crystalline silica.

Based on the results of the NAAQS modeling analysis, the uncontrolled emissions of dust would result in a maximum annual ambient air concentration of silica of 3.8 µg/m^3. The mitigated emissions would result in a maximum annual ambient air concentration of silica of 0.26 µg/m^3, which is well below the California silica guideline.

Alternative 1 – 5- to 10-Year Operation

The impacts described could occur on any day when mining activities were being conducted at the maximum rates described. A reduction in the daily mining rate would result in lower impacts to the environment.

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 and would not be a source of air pollutant emissions.

Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Tiller provided estimates of the maximum hourly, daily, and annual excavation of aggregate and number of haul trucks. These maximum mining rates do not vary between Alternative 1 and Alternative 3. Since the ambient air quality analyses are based on annual and daily emissions, and the PTE calculations for each mining phase represent the worst-case emissions while the facility is operating at maximum capacity, there would be no difference between the maximum or mitigated impacts between Alternative 1 and Alternative 3.

The only differences between Alternative 1 and Alternative 3 are that air emissions would occur for fewer years under Alternative 3, but may occur more frequently each year.

ES 2.12 Noise

The noise analysis is divided into two subsections. The first subsection addresses noise generated on the Site and the impacts to residences and other receptors adjacent to the Site. The second subsection addresses haul truck traffic on public roads and the receptors along TH 95 and TH 97.

A total of 15 locations representing noise-sensitive receptors were identified in the vicinity of the Site.

- Receptors 1 through 6 represent residences adjacent to the Site.
- Receptors 7 through 9 represent some of the homes along the river nearest to the proposed Zavoral Site. Receptor 10 represents a home in Wisconsin.
- Receptors 11 through 13 represent users on the river within the Scenic Riverway. Receptor 11 was placed between the Site and the Rustrum State Wildlife Management Area and Farmington Bottoms State Natural Area.
- Receptors 14 and 15 represent trail users along TH 95.

A noise model was developed by Tiller's consultant David Braslau Associated, Inc. for the receptors described above and the activities at the Site and was reviewed by AECOM consultant team member SBP Associates, Inc. The Tiller noise model and additional work conducted by SBP Associates for the Site activities shows that:

- The projected impacts, at the maximum mining and transport rate would be below the Minnesota Daytime Noise Standards for residential areas.
- Operations at the Site would be audible in the St. Croix Riverway, but the levels would be well within the state rules and would be 0 to 3.8 A-weighted decibels (dBA) above ambient for worst-case mining operations. A noise level difference is generally considered to be noticeable if it is more than 3.0 decibels (dB) more or less than previous levels.

AECOM consultant team member, SBP Associates, Inc. measured noise levels along TH 97 in October 2011 at two locations, one in Scandia at a four way stop and the second west of Scandia where traffic is free flowing at highway speeds. The locations were selected to represent different traffic conditions.

The monitoring was completed during the morning hours after rush hour and represent low traffic noise levels. The monitoring showed that noise levels along TH 97, during low traffic levels, are near the Minnesota Noise L_{10} standards of 65 dBa.

A modeling analysis was completed for 21 residential properties and a school located along TH 97. The modeling analysis showed that the Minnesota L_{10} noise standard is currently exceeded at one residence under low traffic noise conditions. The modeling analysis showed that under maximum haul truck traffic conditions, the L_{10} noise standard would be exceeded at six residences and the L_{50} noise standard would be exceeded at one residence.

Since the low and maximum traffic conditions would not change as a result of the Project, the noise impacts to residences and the school are not predicted to change from current conditions. Noise levels when gravel hauling is occurring would be noticeably higher than during low noise traffic conditions.

Alternative 1 – 5 to 10 Years of Operation

The impacts described could occur on any day when mining activities were being conducted at the maximum rates described. A reduction in the haul rate from the Zavoral Site to the Scandia Mine would

not result in lower noise impacts because the aggregate hauling would still occur from other locations. Noise impacts would be reduced for receptors along TH 243, and TH 95 north of TH 97 that would no longer carry haul traffic, a distance of approximately 7 miles.

Alternative 2 – No Build Alternative

Noise levels would not increase at the Zavoral Site. The No-Build Alternative would not result in lower noise impacts along the existing haul route because the aggregate hauling would still occur from other locations.

Alternative 3 – 3.3 to 5 Years of Operation

Because the noise analyses are based on 6-minute averages, and the noise estimates for each mining phase represent the worst case while the facility is operating at maximum capacity, there would be no difference between the maximum impact between Alternative 1 and Alternative 3. The only differences between Alternative 1 and Alternative 3 are that noise would be generated for fewer years at the Zavoral Site under Alternative 3, but may occur more frequently each year.

ES 2.13 Visual Impacts

The potential for Project activities to be visible from or near sensitive viewpoints on TH 95, 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 were evaluated.

Tiller's Mining and Reclamation Plan has incorporated screening elements such as berms and plantings, as well as reclamation strategies that help mitigate impacts to key viewing areas. Proposed and existing screening berms located along TH 95 and along the southwest perimeter of the Site occur within the 50-foot and 100-foot mining setbacks. The purpose of the berms is to screen the mining and reclamation activities from nearby vehicle, bike, and pedestrian traffic in the area. Construction of the berms would occur as the Site is being developed and may include transplanting of native white pine trees from within the Site to provide additional screening. Transplanting activities for the screening areas would occur simultaneously with the transplanting activities.

Very little of the Site 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 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. 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 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 ¼-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 Site is visible to a limited extent from sensitive viewpoints along roadways and the bike path running between TH 95 and the Site. As seen from TH 95, south of the highway junction with Quinnell Avenue and north of 220th 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.

As shown in the photographic simulations 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.

Alternative 1 – 5- to 10-Year Operation

The majority of the visual impact of the proposed Project would result from short-term Site preparation activities. 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.

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.

In summary, little change would occur in the scenic attractiveness of the overall landscape viewed from any sensitive viewpoint or area during mining activities due to complete or partial screening of proposed activities by existing landforms and vegetation or by proposed berms. When mining and reclamation phases are complete, the Site would be restored to a natural landscape appearance, which could enhance the scenic attractiveness of the Site.

Alternative 2 – No-Build Alternative

Under the No-Build Alternative, no impacts would occur 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 the City comprehensive plan and zoning.

Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The visual impacts under Alternative 3 would be identical to those described for Alternative 1 but would occur over a shorter period of time. This would result in more mining occurring for more weeks each year and more material being mined per year. These activities would be completely or partially screened by

existing landforms or vegetation. As described for Alternative 1, no significant impacts, as determined by the significance criteria, were identified from any phase of the proposed Project.

ES 2.14 Scandia Mine Site

Operations at the Scandia Mine would not change as a result of bringing add-rock material from the Zavoral Site to the Mine. As a result, there would be no change in the effect on fish, wildlife, and vegetation at the Scandia Mine would not change as a result of the Project.

ES-3 POTENTIAL MITIGATION MEASURES

This section summarizes potential mitigation measures that were identified to reduce the impact of the Project.

AECOM has reviewed and provided comments on Tiller's Site reclamation and forestry management plans prepared could contribute to successful Site reclamation. If the Project were approved, the City would work with Tiller to address these comments prior to the issuing a CUP. However, the reclamation must meet City ordinance requirements and must provide a base suitable for maintaining moisture and have suitable organic content to result in successful reclamation. The City may need to amend the definition of "topsoil" in its Development code to permit the use of the first approach, and possibly the second approach as not all of the topsoil would be obtained from the Site.

In addition, the City of Scandia should continue to coordinate with Mn/DOT regarding its Trail Plan to provide a safe bicycle route and avoid conflicts with vehicle traffic on TH 97 (at the 55 mph speed limit).

The following potential mitigation measures have been identified and would be considered as possible conditions of any future CUP for the Project should it be approved:

- Require Tiller to provide a funding mechanism to conduct any and all required monitoring at the Site.
- Require a vegetation establishment and monitoring period of at least 5-years after completion of the Project.
- Develop an adaptive management plan to address long-term management issues.
- Identify the responsible party and funding source for active long-term stewardship of the Site.
- 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 predetermined range established by the City, replacement trees should be provided by Tiller.
- Establish specific criteria for measuring and defining reclamation success that are acceptable to the City (percent cover requirements for seeded native species; limits on aggressive native species, invasive and exotic species, and so on). The diversity of the proposed reclamation must be met in order for the cover type and wildlife habitat evaluations in this EIS to be accurate.

- Specify actions that would be taken by Tiller if reclamation were determined not to be successful and conditions under which reseeding, overseeding, and/or spot seeding or other management methods would be required.
- Construct the berm on the south end of the Site as close to the mining and reclamation limits as possible. This would result in lower off-site peak flow rates and increased on-site infiltration
- Require Tiller to keep records of when the Zavoral Site Well is pumped, and provide these to the City for ground water monitoring activities. This should document both the daily use and total annual pumped volume from the Zavoral Site Well. The daily total should not exceed 10,000 gallons at a maximum pumping rate of 1,200 gpm. The total annual pumping should not exceed 1,000,000 mgy.
- Require that the WCD monitoring point installed for the pump test and collection of baseline data in Zavoral Creek be monitored during the lifetime of the Project. This monitoring should be funded by Tiller.
- Monitor the Black Ash seep subtype wetland boundary mapped by CCES (CCES January 2010) established the baseline boundary of the seep along Zavoral ravine. This monitoring should be funded by Tiller.
- Require Tiller to monitor all on-site construction equipment for leaks and receive regular preventive maintenance. Fueling and maintenance of vehicles would occur within the active mining phase and no “topping off” of vehicle fuel tanks should be allowed.
- Require that any AST at the Site to be locatedmore than 500 feet from surface water to reduce the potential for impacts to surface water.
- Notify the MPCA about all ASTs within 30 days of installation by submitting an AST Notification Form.
- Require Tiller to sample and analyze ground-water for diesel range organics. If it is ever determined that gasoline is to be stored on Site gasoline range organics and benzene should be added to the analyte list.
- Construct the new driveway access directly across from TH 97 as required by Mn/DOT for safe access.
- Require Tiller to record and report the number and source location of trucks hauling add-rock to the Scandia Mine to ensure that additional truck traffic would not result from hauling from the Zavoral Site at peak demand concurrently with other sites (Wisconsin, Washington County, Chisago County, and other Eastern Minnesota locations). The maximum mining level supplied by Tiller for the air quality analysis worst case is higher than the information used for traffic and this monitoring would ensure that the projected traffic levels are not exceeded.
- Install MMUTCD compliant truck warning signs on TH 95 to advise drivers of trucks crossing TH 97 in and out of the proposed Zavoral Site. The installation of warning flashers is another option, but should be discussed with Mn/DOT to evaluate the safety impacts.

- Require Tiller to provide funding for bicycle trail construction between the Site and TH 95 and reconnection as mitigation to implement the City's trail plan.

- Monitor the mitigation methods used at the Site to reduce emissions of fugitive dust for the life of the Project. Records of the sweeping and water application would be maintained to document the fugitive dust control measures. The City should require Tiller to provide a funding mechanism to conduct any and all City-required monitoring at the Site to confirm that sufficient dust control measures are being implemented.

- Require noise mitigation techniques, such as developing berms and screens for the proposed Zavoral Site are implemented. Tiller should provide a funding mechanism for monitoring.

- Monitor to ensure that the proposed screening and reclamation strategies are successfully implemented.

- Establish 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.

ES-4 AREAS OF CONTROVERSY

ES 4.1 EIS Timing and Comprehensive Plan

Take Action - Conserve Our Scandia (TA-COS) is a group of concerned residents that are opposed to the development of the gravel mine on the Zavoral property. TA-COS's stated mission is "To promote sustainable development in Scandia while endorsing conservation of its waters, wildlife, natural and historic resources and beauty, referring to the Scandia Comprehensive Plan as its visionary guide."

In appearances before the Scandia City Council on November 16, 2010, and December 7, 2010, and in letters dated November 23, 2010, and December 6, 2010, TA-COS raised two primary objections to allowing Tiller to continue its application for the CUP.

- First, the TA-COS representative stated that Tiller failed to meet its obligation to complete the EIS within 280 days as required by Minn. Stat. § 116D.04. 2A(h).

- Second, the TA-COS representative stated that the Scandia City Code now prohibits mining on the Zavoral property and Tiller is not entitled to rely on prior zoning codes (Development Code, Chapter 2, Sections 1.3 and 2.4).

In regard to the first item, the City granted the extension in time to prepare the EIS. This is not an uncommon situation and the proposer and RGU were in agreement on granting the extension.

In regard to the second item, the City maintained its position to treat Tiller's 2008 application under the comprehensive plan and ordinances effective at the time of Tiller's application. The Zavoral Site and the

Scandia Mine are both within the Agriculture District established in the City's 2020 Comprehensive Plan, which was the adopted plan at the time of Tiller's CUP application. The adopted Development Code at the time of the application included mining as a permitted use in the Agriculture District.

ES-5 ISSUES TO BE RESOLVED

The purpose of this EIS is to provide decision-makers consisting of the Scandia City Council and other permitting agencies, with the information required to determine if the proposed Project were to have significant impacts and which of the alternatives should selected:

- Alternative 1 – 5- to 10-year Operation
- Alternative 2 – No-Build
- Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

These alternatives are described in Section 3.0 of this document.

Section 4.0 of this document identifies the present environment, effects of the alternatives, and mitigation measures.

PAC Any Others?

This page intentionally blank

1.0 PROJECT DESCRIPTION

1.1 PROJECT OVERVIEW

1.1.1 Project Description

The Tiller Corporation, Inc. (Tiller) proposes to operate a 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 unmined 9-acre area is also included in the proposed mining area **(Figures 1 and 2).**

Tiller prepared a Conditional Use Permit (CUP) Application for the Zavoral Mining and Reclamation Project (or Project; Tiller November 2008). The City's Development Code required that Tiller prepare an environmental assessment worksheet (EAW) for the Project as part of the CUP Application . An EAW was prepared per Minn. R. ch. 4410.4300 (Sunde Engineering 2008). The City of Scandia as the Responsible Governmental Unit (RGU) is responsible for the preparation and review of environmental documents for the Project. On March 3, 2009, the City of Scandia's review of the EAW determined that the Project had the potential for significant impacts and that an Environmental Impact Statement (EIS) was needed to determine the Project's potential for significant environmental impacts.

The Site is located within the jurisdiction of the City of Scandia and partially within the St. Croix National Scenic Riverway as designated under the National Wild and Scenic Rivers Act and the federal and state Lower St. Croix River Acts **(Figure 2)**. Minn. R. ch. 6105.0370 § 9 prohibits sand and gravel operations within the St. Croix River District Zone and scenic easement area. The protection of scenic resources within these jurisdictions is guided by the City of Scandia Comprehensive Plan, and the Cooperative Management Plan (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. Although the proposed mining area is located outside these limits, Tiller proposes to conduct reclamation activities on about 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6.

Tiller proposes to develop the mine in phases. Active mining would occur to a maximum depth of 15 feet. Tiller does not propose to excavate below the groundwater table and would maintain a minimum 3-foot separation from the bottom of the excavation and the groundwater table. Reclamation of the Site would take place concurrently with mining.

Gravel would be excavated at the Zavoral Site, loaded into trucks, and transported, primarily to the existing Scandia Mine (or Mine) located between Lofton Avenue and Manning Trail just north of 218th Street in the City of Scandia (**Figure 3).** Tiller also operates the Scandia Mine. Material from the Zavoral Site would be mined as pit-run

Pit run material- gravel as it occurs in natural deposit

Add-rock- Rock of certain size ranges or quality that is not available at a facility but is needed to meet specifications for the production of various aggregate products made at the facility or pit-run material.

material and used as add-rock to provide material that would meet the specified gradations of marketable aggregate at the Scandia Mine. Some of the material mined at the Zavoral Site may also be transported directly to construction project sites or other facilities for use and/or processing.

The add-rock from the Zavoral Site may be processed at the Scandia Mine or may be used without processing. Tiller plans to use the material from the Zavoral Site to replace material currently transported to the Scandia Mine from various locations, the most recent being from Franconia Township in Minnesota and from the Osceola area in Wisconsin.

The Site was actively mined by multiple operators from the 1960s through the 1980s. Previous mining operations included topsoil and overburden removal; aggregate extraction, crushing, and washing; hot mix asphalt production; material stockpiling; and hauling materials from the Site. The mine operated at the Zavoral Site was taken out of production in the 1980s. Production equipment was removed, but the Site was not reclaimed. Stockpiles remaining on the Site have been used as a source of aggregate. Much of the material in the stockpiles has been removed over the last 8 to 10 years, but irregular landforms remain.

The Scandia Mine operates under an existing CUP (2008 and Annual Operating Permit (AOP) approved by the City of Scandia. The AOP for the Scandia Mine (City of Scandia March 2011), shows that 123,380 tons (2009) and 131,000 tons (2010) of add-rock were brought to the Scandia Mine. Tiller verbally confirmed that this consisted entirely of Class C add-rock (see Section 4.14 for definition). EAWs were completed for mining and processing operations on the Scandia Mine in 1987 and updated to reflect operation changes in 1999.

1.1.2 Revised Mining Proposal

The Project proposal addressed in this EIS is different from Tiller's original proposal as described in the EAW and the original Scoping Decision Document (SDD; City of Scandia April 2009).

Tiller originally proposed to use the existing Zavoral Site Well for processing and gravel washing activities as part of their Project proposal. AECOM determined that Barton's water appropriation permit had expired as part of the coordination conducted with the Minnesota Department of Natural Resources (MnDNR) as part of this EIS process. As part of previous mining activities at the Site, Barton Construction operated the Site's multi-aquifer bedrock well (Minnesota Unique Number 00210498), referred to as the Zavoral Site Well for purposes of this EIS. Available well records show that the Zavoral Site Well is cased to a depth of 245 feet and is completed as an open hole in two aquifer systems, the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer, to a total depth of 648 feet. More information on water use and the Zavoral Site Well is presented in Section 4.8 of this document.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn Stat. § 103G.271 4a). The intent of the law is to protect use of the Mt. Simon-Hinckley Aquifer for drinking water purposes in metropolitan counties and prohibit use of this resource for lower priority and nonessential purposes such as lawn watering. A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Zavoral Site noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements. Tiller has an existing Water Appropriation Permit for mining and processing activities at the Scandia Mine. As a result of this and additional material analysis conducted by Tiller as described below, the SDD was revised (City of Scandia January 2010) to reflect Tiller's revised proposal.

The changes in the Tiller proposal are summarized below.

1.1.2.1 Water Use and Processing

As previously described, Tiller has determined that the material mined at the Zavoral Site could be used without being processed at the Zavoral Site. Instead, that material would be transported as, primarily to the Scandia Mine to provide material that would meet the specified gradations of marketable aggregate.

Tiller revised their Project proposal to eliminate all aggregate processing activities (including washing) at the Zavoral Site. More information on Tiller's proposed mining operations is included in Section 3.1 of this document. More information on Tiller's reclamation plan is included in Section 4.3 of this document.

1.1.2.2 Alternatives

Tiller refined their proposed Project alternatives as described in Section 3.0

1.2 NEED FOR THE PROPOSED PROJECT

The Project would meet two primary needs.

- It would provide local aggregate material to surrounding communities that, in turn, would be used in state, county, and local public improvement projects, and private construction projects. The use of Zavoral Site add-rock at the Scandia Mine would allow Tiller to maximize use of the material at that Mine.
- It would result in the reclamation of previously mined areas at the Zavoral Site. Reclamation would improve the character of the Site and increase the stability of the soils, thereby minimizing environmental effects of unreclaimed areas due to potential erosion and sedimentation.

A mining site that is lacking a particular grain size required to meet marketable material requirements may need to bring in "add-rock" to supplement the specifications for different products. In this case, the Scandia Mine requires add-rock to provide material that would allow them to maximize the use of the material at that Mine

The Zavoral Site deposits are characterized as Superior-lobe gravels due to the way they were deposited by glacial activity. The Superior-lobe gravels contain abundant particles of strong, nonreactive crystalline rock, and only minor amounts of undesirable rock types such as shale or sulfide-bearing slate. Economically viable deposits of sand and gravel occur where they were deposited by nature, whether the location is convenient or not. The availability of the highest quality remaining Superior-lobe sand and gravel deposits in eastern Washington and central Dakota counties is threatened by suburban sprawl (Southwick et al. 2000).

The deposit at the Zavoral Site is a high-quality construction aggregate source. The sand and gravel at the Zavoral Site is characterized as a Richfield terrace deposit.[1] The construction aggregate source evaluation completed by the Minnesota Geological Survey (MGS) further classified aggregate deposits in the seven-county metropolitan area. The deposit at the Site was classified as an excellent to good primary source. For classification as an excellent to good primary source, the following criteria must be met Southwick et al.[2]:

- More than 20% of the material is retained on a number 4 sieve
- Deposit is thicker than 10 feet
- Overlying sediment is no thicker than 10 feet
- Water table is more than 20 feet below land surface
- Deposit must contain less than 1.5% total spall materials.

Part of the reason the deposit at the Site is of such high quality is due to the provenance of the material. The provenance refers to the origin of the material itself. According to Southwick et al., the highest quality sand and gravel deposits in the seven-county metropolitan area were deposited by meltwater from glaciers that advanced from the northeast through the Lake Superior basin during the last glaciation. Sand and gravel from the Superior-lobe contain particles of strong, nonreactive crystalline rock, with minimal amounts of shale or sulfide-bearing slate, otherwise known as deleterious materials. Deleterious materials reduce the quality of the aggregate, due to their susceptibility to degradation. Advances in technology demand an increased need for higher quality specifications of aggregate products. That means the amount of deleterious materials allowed in the aggregate product decreases. Higher quality specifications improve the life-cycle cost of infrastructure.

Southwick et al (2000) further noted that a “pit” in Section 18 near the intersection of TH 95 and TH 97 produced samples that average 0.25% each of shale, iron oxide, and unsound chert.

The hot-mix asphalt plant at the Scandia Mine produces a variety of mixes based on customer demand. These mixes require a very specific gradation of aggregates to meet specifications. Aggregates used for base materials, structural fill, and other construction purposes also require specific gradations of aggregate materials. While the Scandia Mine yields significant amounts of the required aggregate sizes or gradations, it does not have all of the required sizes in the ratios that are required to make specifications to meet market demand. The result is an abundance of certain sizes of aggregate. This is the case at the majority of aggregate production facilities throughout Minnesota.

Tiller has imported add-rock to the Scandia Mine over the past 20 years. This is done to fully use the naturally occurring sand and gravel resource. The add-rock is hauled to the Mine enables nearly 100%

1 Meyer, G.N., and Mossler, J.H., 1999. Primary Sources of Construction Aggregate in the Seven-County Metropolitan Area, Minnesota: Minnesota Geological Survey Miscellaneous Map Series, Map M-102, Plate 1.

2 Southwick, D.L., Jouseau, M., Meyer, G.N., Mossler, J.H., and Wahl, T.E., 2000. *Aggregate Resources Inventory of the Seven-County Metropolitan Area*, Minnesota: Minnesota Geological Survey Information Circular 46.

utilization of Scandia Mine resources. The unprocessed add-rock brought to the Scandia Mine has been over 265,000 tons in a year.

Use of the material from the Zavoral Site as opposed to the more distant sources currently used at the reduces environmental impacts related to hauling, such as the use of fossil fuels and air impacts, as well as costs.

A resource commitment is considered irreversible when direct and indirect impacts from its use limit future use options. Irreversible commitments apply primarily to nonrenewable resources, such as aggregate deposits. A resource commitment is considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for future use. Irreversible commitments apply to loss of production, harvest, or use of natural resources. Mining the aggregate from the Zavoral Site prior to any other development at the Site would meet the need for aggregate material in the metropolitan area and prevent the irreversible commitment of the gravel resource at the Site.

This page intentionally blank

2.0 PERMITS AND APPROVALS

2.1 REQUIRED PERMITS AND APPROVALS

The Zavoral Project would require the permits and approvals listed in **Table 2**.

Table 2: Anticipated Required Permits and Approvals

Jurisdiction	Permits, Approvals, and Other Guidelines
State of Minnesota	
Minnesota Department of Transportation	• Access Permit (TP 1721)
Minnesota Pollution Control Agency	• National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) general permit for Stormwater Discharges Associated with Construction Activities (MN R100001) and the NPDES/SDS General Permit for Construction Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production Facilities (MNG 490000). • Air Emissions Permit
Local Government Unit	
City of Scandia	• Conditional Use Permit – Mining Operation • Annual Operating Permit
Carnelian-Marine-St. Croix Watershed District	• Permit for Stormwater Management

2.2 PROJECT ADVISORY COMIITTEE

A Project Advisory Committee (PAC) was established by the Scandia City Council to facilitate the open exchange of information and to obtain input on the EIS analyses and mitigation measures as they are developed. The PAC is advisory in nature and is composed of members identified in **Table 3**. The City of Scandia values the input of the PAC members, recognizes their contribution, and thanks them for their participation.

The PAC meetings were moderated by Trudy Richter of Richardson, Richter and Associates, Inc., a member of the AECOM consultant team retained by the City to prepare the EIS. The goal of the PAC was to engage in open, purposeful, and transparent discussions so that there is a shared understanding of the environmental review process and the information developed or used as part of that process.

The PAC met five times to provide input during the EIS process, review of project technical documents, and review of the draft EIS. The PAC has provided important advisory input to the process, as cited in this EIS.

The PAC meetings were open to the public and residents, City officials, and other interested parties attended the meetings, asked questions, and provided comments. Information presented at the PAC meetings were made available on the City's webpage.

Table 3: Project Advisory Committee Members

Jed W. Chesnut Scandia Resident	Lisa Schlingerman Scandia Resident
Bill Clapp Scandia Resident	Dan Seemon U.S. Army Corps of Engineers
Gerald Johnson Minnesota Department of Natural Resources	Jim Shaver Carnelian-Marine-St. Croix Watershed District
Thomas Krinke Scandia Planning Commission	Jyneen Thatcher Washington Conservation District
Karen Kromar Minnesota Pollution Control Agency	Kristin Tuenge Scandia Resident
Jim Larsen Metropolitan Council	Michael White Area Resident
Jill Medland National Park Service, St. Croix National Scenic Riverway	

2.3 AREAS OF CONTROVERSY

2.3.1 EIS Timing and Comprehensive Plan

Take Action - Conserve Our Scandia (TA-COS) is a group of concerned residents that are opposed to the development of the gravel mine on the Zavoral property. TA-COS's stated mission is "To promote sustainable development in Scandia while endorsing conservation of its waters, wildlife, natural and historic resources and beauty, referring to the Scandia Comprehensive Plan as its visionary guide."

In appearances before the Scandia City Council on November 16, 2010, and December 7, 2010, and in letters dated November 23, 2010, and December 6, 2010, TA-COS raised two primary objections to allowing Tiller to continue its application for the CUP.

- First, the TA-COS representative stated that Tiller failed to meet its obligation to complete the EIS within 280 days as required by Minn. Stat. § 116D.04. 2A(h).
- Second, the TA-COS representative stated that the Scandia City Code now prohibits mining on the Zavoral property and Tiller is not entitled to rely on prior zoning codes (Development Code, Chapter 2, Sections 1.3 and 2.4).

In regard to the first item, the City granted the extension in time to prepare the EIS. This is not an uncommon situation and the proposer and RGU were in agreement on granting the extension.

In regard to the second item, the City maintained its position to treat Tiller's 2008 application under the comprehensive plan and ordinances effective at the time of Tiller's application. The Zavoral Site and the Scandia Mine are both within the Agriculture District established in the City's 2020 Comprehensive Plan, which was the adopted plan at the time of Tiller's CUP application. The adopted Development Code at the time of the application included mining as a permitted use in the Agriculture District.

PAC-Others?

3.0 PROPOSED PROJECT AND ALTERNATIVES

3.1 PROPOSED PROJECT

3.1.1 Zavoral Site Activities

Zavoral Site activities and the Mining and Reclamation Plan described in this section are the same for the two build alternatives (Alternative 1 and Alternative 3). Alternative 1 is Tiller's preferred alternative and represents a 5- to 10-year operation. Under Alternative 3, mining and reclamation would occur under a reduced timeframe of 3.3 to 5 years. Alternative 2 is the no-build alternative. These alternatives are described in more detail in Section 3.1.2 of this document.

The Project would consist of three mining phases and four reclamation phases as shown in **Figures 4 through 8**. The mining activity for Alternatives 1 and 3 would be conducted using the same operational plan and layout. The difference is the allowable timeframe. The following activities would occur at the Zavoral Site:

- Clearing and grubbing the site of vegetation, as necessary.
- Removing overburden from areas to be mined, and stockpiling the material on-site for potential future use in reclamation.
- Excavating raw aggregate materials.
- Transporting mined aggregate materials (add-rock and/or pit-run gravel); the majority of which would likely be delivered to the Scandia Mine near Manning Trail and 225th Street for use in material produced at that Mine.
- Using the Zavoral Site Well for dust suppression only.
- Delivering and/or storing fuel-related materials such as oil, anti-freeze, grease, and hydraulic fluid on-site.
- Conducting reclamation activities, including grading, placing topsoil or amending Site soils, and seeding and tree transplanting.

The proposed mining operations would result in lowering and a reconfiguring the surface topography, and the reconfiguration and redirection of the existing surface drainage system.

Mining would be conducted in phases starting on the northern portion of the Site and progressing southward, moving generally in a counter-clockwise direction. Reclamation would occur concurrently with mining. Three mining phases and four reclamation phases would occur as shown in **Figures 4 through 8**.

Access to the Site would be off of TH 97 at the intersection with TH 95 on the west side of the Site **(Figure 4).** A new Site access road would be constructed in alignment with TH 97. The realignment of

the Site access and the addition of a right-turn lane are required by the Minnesota Department of Transportation (Mn/DOT).

In general, the reclamation of the Zavoral Site would progress in increments. Reclamation would proceed as phases of mining are completed. City ordinance requires that the amount of reclamation be proportional to mining. The reclamation plan proposes that perimeter areas be sloped and the interior areas backfilled and graded to reclamation grades. Topsoil would be imported from other sites or existing Site soils would be amended (Section 4.3) and vegetation established to reduce erosion.

If the City approves a CUP for the Project, based on City regulations Tiller would be allowed to operate Monday through Friday 7:00 a.m.–7:00 p.m., unless other hours or days of operation are authorized by the City. The proposed mining area is shown in **Figure 4**. Mining limits would conform to City requirements, which require a 50-foot setback from property boundaries and a 100-foot setback from the road right-of-way.

The proposed mining activities can be grouped into three categories:

- Site preparation
- Mine operation
- Mine reclamation

3.1.1.1 Site Preparation

Site preparation would occur over the first 3 to 4 weeks of operation. No buildings or structures would be constructed. Site preparation includes:

- Realigning the Site access road and constructing a right-turn lane
- Constructing the internal main haul road
- Constructing screening berms and removing trees

In a review conducted by Mn/DOT in 2009, the agency required that the Zavoral Site access onto TH 95 be moved south to line up with TH 97 and that a northbound right-turn lane be constructed (Mn/DOT letter to City of Scandia, January 22, 2009). The right- turn lane would be consistent with the design of the existing left-turn lane. This would also match the design on the southbound approach. The sight distance requirements were met based on Mn/DOT reviews of the existing TH 97 and TH 95 intersection, and the 2007 and 2009 rehabilitation projects (Mn/DOT letter to City of Scandia, June 29, 2011). In a recent review of the development this year, Mn/DOT reaffirmed that the improvements outlined in the 2009 letter would be required. The realignment of the Site access would be completed simultaneously with the construction of the main haul road shown in **Figure 4**. Secondary internal haul roads would be constructed during the active phases of mining. Construction of haul roads would require the following equipment: one bulldozer, one compactor, one scraper, one grader, and three to four off-road trucks.

The construction of screening berms would occur along the southwest perimeter of the Site. The screening berms would be constructed within the 50-foot mining setback, which is located between the

Site boundary and the mining limits as shown in **Figures 4 through 8**. The screening berms would be constructed from overburden materials from the Phase 1 mining area. In compliance with the City's Ordinance No. 103 the berms would have a total height not less than 6 feet and would maintain a minimum slope of 3:1 (horizontal:vertical). The berms would be seeded and mulched. A silt fence would be placed at the base of the berm closest to the neighboring property until vegetation becomes established. The screening berms would remain as needed to provide screening throughout the life of the Project, with the potential for removal and reconstruction during certain phases of reclamation. The equipment expected for screening berm construction would include one bulldozer, one scraper, and three to four off-road trucks.

Trees would be removed within the mining limits as necessary. Some of the White pine trees would be transplanted into the Phase 1 reclamation area per the planting schematic as described in the final reclamation plan (Section 4.3). The remainder of the removed trees would be harvested for wood products or used as biofuel. Equipment expected for tree removal would included one excavator, one chipper, one skid loader, and three to four haul trucks. Equipment that may be used to supplement activities during Site preparation includes an excavator, a front-end loader, and a skid loader. A jobsite trailer (8 feet by 25 feet) may be placed within Phase 1.

3.1.1.2 Site Operation

As with most mining operations, overburden would initially be removed from new areas to be mined. The overburden would either be stored on-site within the active mine phase for later use in reclamation, or used immediately in reclamation. At times, mining and reclamation activities would be performed concurrently. This is a common practice, as it is an efficient method of using the overburden materials being extracted in the active mine phase. The concurrent activities also allow efficient use of the portable equipment that would be brought on-site to perform mining activities.

A portion of the overburden would be used to construct the berm along the southwest perimeter of the Site during the initial stages of the Project. Since the majority of the mining would take place on previously disturbed areas, little overburden removal would be required.

Once overburden has been removed from the active mine phase, an active mining face would be initiated. At the active face, an excavator or front-end loader would extract the aggregate material and place the material directly into haul trucks **(Figure 9**). Aggregate would not be stockpiled at the Zavoral Site. The excavator and/or front-end loader would follow the active mine face as it moves through an active mine phase. Secondary haul roads would be constructed and maintained to provide an efficient means of transportation from the active mine face to the main haul road. The equipment expected to operate within an active phase would include one excavator or front-end loader, 15 to 20 haul trucks, one bulldozer, one grader, and one water truck. The operational equipment is portable and would be brought to the Site as needed. The excavator, front-end loader, dozer, and haul trucks would be used to extract and transport the aggregate material. The grader and water truck would be used to maintain haul roads and enforce dust suppression. In addition to the equipment, a jobsite trailer (8 feet by 25 feet) would be placed in the active phase.

Figure 9: Photograph of Add-Rock Loading from Tiller's Maple Grove, Minnesota Operation
Note: A different type of truck that could be used on public roadways would be used at the Zavoral Site.

3.1.1.3 Site Reclamation

Reclamation activity is composed of four phases as shown in **Figures 4 through 8.** With the exception of Phase 1 Reclamation, which consists of the approximately 4-acre previously mined area that is within the St. Croix River District and scenic easement **(Figure 2)**, reclamation activity would proceed as mining of areas is completed. Therefore, the length of time anticipated to conduct reclamation activity is the same as described in Alternatives 1 and 3. The amount of time expected for each reclamation phase is:

- Phase 1 Reclamation: 4 Weeks
- Phase 2 Reclamation: 11 Weeks
- Phase 3 Reclamation: 8 Weeks
- Phase 4 Reclamation: 9 Weeks

Stockpiles remaining from historic mining at the Site would be removed and slopes would be graded to a maximum of 4:1 and shaped as shown in the final reclamation plan (Section 4.3). The Site would be seeded with native grass species and White pines would be transplanted from future mining areas as shown in the planting schematics. Reclamation activity would proceed in phases as mining of areas is completed. Perimeter areas would be sloped and the interior areas backfilled and graded to the approximate restoration grades as indicated in **Figures 4 through 8**. As indicated in **Figure 8**, six shallow depressions would be constructed with the intent to create a more natural landscape. Overland flow would naturally be directed to the low-lying areas, where runoff would infiltrate and recharge groundwater.

Currently, the Site is characterized as containing a significant percentage of nonnative and invasive plant species. Native vegetation would be established. Tiller also prepared a forest management plan. Tiller proposes to leave the Site in a condition that would meet or exceeds the requirements consistent with current local land use rules regulating sand and gravel mining reclamation.

Equipment expected to perform reclamation activities would include one bulldozer, one compacter, one skid loader, and one grader. The reclamation equipment would be moving and grading and compacting material to achieve the required compaction densities. A front-end loader or excavator, three to four off-road trucks, and one scraper would likely operate in concurrence with mining, moving overburden material from the active mining phase to the area being reclaimed. A grader and water truck would be use to maintain haul roads and apply dust suppression.

3.1.1.4 Stormwater Management

This is discussed in Section 4.10 of this document.

3.2 SCANDIA MINE ACTIVITIES

3.2.1 Background

The Scandia Mine is accessed from County Road 15 (Manning Trail), County Road (CR) 1 (Lofton Avenue), and 218th Street North. All three roads are paved **(Figure 3).** The access points have been reviewed by the City of Scandia and Washington County during past permit reviews.

The scope of this EIS includes the identification and analysis of potential impacts that would result from importing aggregate material from the Zavoral Site to the Scandia Mine. No changes in the current mining operations or the reclamation plan are proposed at the Scandia Mine, other than replacing current Class C add-rock sources with material from the Zavoral Site.

The Scandia Mine is an active aggregate production facility operated by Tiller. The Mine has been active since at least 1962 and Tiller has been operating portions of the Mine for over 20 years. Prior to the incorporation of Scandia in 2006, New Scandia Township and Washington County were the permitting authorities, first issuing permits in the late 1980s. Permitted activities include the removal and processing of aggregate (crushing, screening, and washing), the production of hot-mix asphalt, and the recycling of concrete and asphalt products. Final product is sold locally. The operation is located on approximately 435 acres, of which 191 acres would be mined and reclaimed at the conclusion of the mining operation. Environmental review for portions the mining facility, in the form of an EAW, was completed in 1987 as part of the initial permitting process. A second EAW was completed in 1999 to analyze revisions to the mining limits, including the initiation of mining into groundwater.

Mining limits were revised by adding areas to be mined on the eastern side of the property and removing areas to be mined that were more environmentally sensitive on the western side of the property. Mining of common borders is done in conjunction with normal mining operations. The 1999 EAW contemplated mining the common border between the Scandia Mine and the Dresel Contracting, Inc (Dresel) site. Mining between the Scandia Mine and Dresel site was authorized in permits issued by Washington County and New Scandia Township. In 2008 the City of Scandia approved CUPs and AOPs for the Scandia Mine and Dresel sites. These permits also anticipate mining the common border between the

sites. In 2009, Tiller purchased the Dresel property and the City of Scandia transferred the 2009 AOP issued to the Dresel site to Tiller. In 2010, the City of Scandia incorporated the two sites into one AOP. Operations at the Scandia Mine remain consistent with the scope of operations and mining limits reviewed in the previous EAWs, CUPs, and AOPs.

The EAWs completed for the Scandia Mine in 1987 and 1999 (City of Scandia website at: http://www.ci.scandia.mn.us/index.asp?Type=B_LIST&SEC={B8DD8405-7011-4E96-A86B-5FCD4C42F5A7}#{8CD85CD2-E083-49ED-96BD-0A30CA116158} include analysis of the potential impacts of mining and processing activities and the proposed reclamation plan.

A citizen's petition was submitted to the EQB by a Scandia resident regarding the approval of Tiller's CUP for a mining operation. The main issue addressed by the citizen's petition was that Tiller had accelerated its mining timetable with its proposal for mining into the groundwater. The EQB determined that the City of Scandia was the appropriate governmental unit to decide the need for an EAW. Prior EAWs completed in 1987 and 1999 included an analysis of Tiller's mining operations. Plans submitted for the CUP that included mining into the groundwater and creation of the proposed lake were part of the phasing plan identified in the earlier EAWs. These plans provide no substantial change in the proposed project which would affect the potential for significant adverse environmental effects, therefore qualifying the project as exempt from further environmental review. Permits and safeguards required by local, state and federal regulations have not changed, and Tiller is in compliance with these permits and safeguards. The City's hydrogeologist's review of the existing groundwater studies for the Tiller Mine concluded that the impacts of mining into the groundwater will have a negligible effect on ground water tables in the area and on lake levels. The potential impacts evaluated in the 1987 and 1999 EAWs were identified, and no new impacts were identified when the research was reviewed in 2008. The City determined that the Project was exempt from further environmental review.

The information provided below is a summary of operations at the Scandia Mine. It is important to note that add-rock has been hauled to the Scandia Mine consistently over the last 20 years or more and would continue to be hauled to the Mine throughout its remaining life regardless of whether the Zavoral Site was used. The source of the add-rock has no material impact on the operation of the Scandia Mine. The types of processing activities, the volume of material processed, the life of the Mine, mining limits, phase limits, erosion control measures, and other aspects of the operation would remain the same regardless of the add-rock source.

Raw aggregate material mined at the Zavoral Site would be transported to the Scandia Mine for processing. Tiller has indicated that the materials transported from the Zavoral Site would replace the materials from Franconia Township, Minnesota, and the Osceola area in Wisconsin. The following activities would occur at the Scandia Mine:

- Aggregate material brought in from the Zavoral Site would be blended with aggregate material mined at the Scandia Mine or used 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.

- Finished construction aggregate products would be stockpiled at the Scandia Mine until they are hauled off-site by trucks to various construction sites.

Water for processing activities at the Scandia Mine would be drawn from the existing Scandia Mine permitted production well. Water collected in the sediment ponds from washing activities may also be recycled and reused for processing.

3.2.2 Scandia Mine Operations

The mining operation includes removal of overburden; mining and removal of gravel; crushing, washing, screening, and stockpiling materials; recycling concrete and asphalt products; production of hot-mix asphalt; and reclamation activities. Overburden is removed from areas to be mined and is stockpiled on-site and later used for reclamation of completed phases. Aggregate is excavated above groundwater using front-end loaders. A dragline or excavator is used to excavate material within groundwater. Processing consists of crushing, washing, screening, and stockpiling. The locations of these activities vary as mining faces proceed through the mining phases. Recycling of concrete and asphalt occurs at the Mine. Most of the asphalt is recycled through the hot-mix asphalt plant, and the balance of the asphalt and all of the concrete are processed into various aggregate products.

A portion of the processed aggregate and recycled product is loaded onto trucks using front-end loaders, the trucks are weighed, and the product is delivered to projects throughout the area. The balance of the processed aggregate and recycled asphalt is used in a hot-mix asphalt plant, which operates at the Mine. The hot-mix asphalt is stored in overhead silos and is loaded into trucks by gravity, the trucks are weighed, and the product is delivered to projects throughout the area.

Washing at the Scandia Mine occurs as needed based on market demand. The Scandia Mine currently holds an MnDNR water appropriations permit for 18 million gallons per year (mgy) for washing activity and 2 mgy for dust control. In the recent past, there has been no significant demand for washed product. Washing most recently occurred in 2002 and a total of 10.35 mgy of water was used, well below the currently permitted appropriation. T he amount of washed product may change if the demand for aggregate specifications that require washed aggregates increases. Washing that may occur at the Scandia Mine when the Zavoral Site is supplying the Mine would result from increased market demand for washed product not because of add-rock imported from the Zavoral Site. Importing add-rock from the Zavoral Site would have no impact on the volume of water used at the Scandia Mine. Any future washing at the Scandia Mine would be conducted in accordance with the MnDNR Water Appropriations Permit and the Scandia Mine's CUP.

Mining would occur above the groundwater level and into groundwater concurrently in each of the remaining phases at the Mine. Importing add-rock from the Zavoral Site, or any other site, has no impact on phase boundaries or mining limits at the Scandia Mine.

3.2.3 Scandia Mine Stormwater Management

Surface water is managed during active mining in accordance with the Mine's National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Stormwater Pollution Prevention Plan (SWPPP) and consistent with local surface water management plans. This plan includes a number of BMPs, which are incorporated into daily site operations. The BMPs have been designed and

implemented to avoid untreated stormwater discharge from the site, minimize potential for erosion and sedimentation throughout the operation of the site, and provide for site stabilization at the conclusion of mining activity. Erosion and sedimentation control practices used on-site during active mining include silt fence, vegetated screening berms, stormwater sedimentation ponds, wetland buffers, and dust control. Silt fencing is placed as necessary along the limits of each mining phase in areas where topography does not accommodate internal surface water drainage next to sensitive areas. Screening berms around the perimeter of mining areas are vegetated to reduce erosion and to help contain fugitive dust.

A sedimentation basin is located on the floor of the mining operation to handle internal drainage. When needed, water from the sedimentation basin is pumped upland to a secondary sedimentation basin for additional treatment. Vegetative buffer strips are preserved around wetland areas. These buffer strips filter runoff and reduce the potential for sedimentation to occur within the wetland basins.

Add-rock that is hauled to the site is off-loaded over a mining face as opposed to placed into a traditional stockpile. The stormwater management practices in place for the mining operation serve the imported add-rock materials as well.

3.3 ALTERNATIVES

3.3.1 Alternatives to Be Evaluated in this EIS Process

The Revised SDD (City of Scandia 2010) identified three alternatives to be evaluated in this EIS.

The estimated volume of gravel resource at the Zavoral Site was originally determined to be approximately 1.5 million tons at the time the EAW was submitted (Sunde Engineering 2008). By December 2009, Tiller had conducted additional exploratory borings and Project evaluations that indicated the Site would be better suited as an add-rock source. The additional borings indicated the estimated volume of material be revised from 0.8 to 1.2 million tons and the SDD for this EIS was revised (City of Scandia January 2010).

The difference between the two proposed build alternatives is the time period over which mining and reclamation would occur at the Site. The timeframe for Alternative 1 is from 5 to 10 years and for Alternative 3 is from 3.3 to 5 years. Under Alternative 3, to complete the mining within the reduced timeframe, mining activity would need to occur either more frequently, for longer durations, or a combination of both.

Alternative 2 is the No-Build Alternative under which the existing land uses on the Zavoral Site would remain and the Scandia Mine would continue to import add-rock from Franconia Township, Minnesota, and the Osceola area in Wisconsin. The No-Build Alternative does not include the reclamation activities of previously mined areas that are included in Alternatives 1 and 3.

3.3.1.1 Alternative 1 – 5- to 10-year Operation

This is Tiller's preferred alternative. The estimated up to 1.2 million tons of reserve would be mined over a period of 5 to 10 years[3] **(Table 4).**

Table 4: Alternative 1 Mining Schedule

Mining Timeframe	5 Years	10 Years
Tons/Year Mined	240,000	120,000
Estimated Weeks of Operation/Year	12	6
Years per Mining Phase	1.67	3.33

3.3.1.2 Alternative 2 – No-Build Alternative

The Zavoral Site would remain as it is under the No-Build Alternative. The gravel resource would not be used. This aggregate that would primarily be used for the Minneapolis-St. Paul metropolitan area's roads and infrastructure would not be available. Portions of the Site previously disturbed by mining would remain in their currently unreclaimed condition. Class C aggregate would continue to be hauled to the Scandia Mine from other sources.

3.3.1.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Under this alternative, the resource would be mined over a shorter period of time. The estimated up to 1.2 million tons of reserve would be mined over a period of 3.3 to 5 years[4] **(Table 5).**

Table 5: Alternative 3 Mining Schedule

Mining Timeframe	3.3 Years	5 Years
Tons/Year Mined	360,000	240,000
Estimated Weeks of Operation/Year	18	12
Years per Mining Phase	1.1	1.67

3.3.1.4 Project Site with Reasonable Mitigation Measures

The Minnesota Environmental Quality Board (MEQB) rules require consideration of mitigation measures identified through comments on the EAW. This EIS considers all relevant mitigation measures suggested through public and agency comments and recommends incorporation of reasonable mitigation measures into Project design and permitting as warranted.

3.3.2 Alternatives Eliminated from Consideration

An alternative may be excluded from analysis in the EIS under the following conditions (EQB 2010).

- When it does not meet the underlying need for or purpose of the project.

[3] Assumes average operations, based on past traffic information submitted, of 20 loads/hour, 20–24 tons/load, 10-hour days.

[4] Assumes average operations, based on past traffic information submitted, of 20 loads/hour, 20–24 tons/load, 10-hour days.

- When it would likely not have any significant environmental benefit compared to the project as proposed.

- When another alternative, of any type, that would be analyzed in the EIS would likely have similar environmental benefits, but substantially less adverse economic, employment or sociological impacts.

The following alternatives were eliminated from consideration during the EAW and SDD process.

3.3.2.1 Alternative Sites

Off-site alternatives are not being investigated because they do not meet the Project purpose and need of making use of significant aggregate resources that are found within the Zavoral Site. Site alternatives are limited to the presence of the natural resource. This resource is located within the Minneapolis-St. Paul metropolitan area, and may cost-effectively serve the needs of the region. A regional study identified significant aggregate resource areas within the metropolitan region, including the general area in which the Zavoral Site is located, and describes the Region's need for these resources in the future (Southwick et. al. 2000).

3.3.2.2 Technology Alternatives

Technology alternatives are not within the scope of the alternatives to be considered in the EIS. Best practicable technologies for the various activities will be utilized as part of Alternative 1.

3.3.2.3 Modified Scale Alternatives

Modified design or layout alternatives are outside of the scope established for this EIS. However, the area represented for either of the build alternatives (Alternative 1 or Alternative 3) may be modified depending upon the results of the analysis completed for the EIS and the permit requirements for operations on the Site.

The scale of the Project has been modified as reflected in the Revised SDD (City of Scandia 2010). The Zavoral Site Well that Tiller had planned to use as a water source for aggregate processing activities at the Site in their original Project proposal is cased to a depth of 245 feet and is completed as an open hole in two aquifer systems—the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer—to a total depth of 648 feet. AECOM determined that the water appropriation permit for this well had expired as part of the coordination conducted with the MnDNR as part of this EIS process.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn Stat. § 103G.271 4a). A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Zavoral Site noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements. This in addition to further assessment of the aggregate source and its suitability for add-rock at the Scandia Mine resulted in Tiller revising their Project proposal to eliminate all aggregate processing activities (including washing) at the Zavoral Site.

4.0 PRESENT ENVIRONMENT, EFFECTS OF ALTERNATIVES AND MITIGATION

4.1 LAND USE

4.1.1 Zavoral Site

4.1.1.1 Affected Environment

The 114-acre Zavoral Site is located within the south ½ of Section 18, and the north ½ of Section 19, Township 32 North, Range 19 West, along St. Croix Trail North (TH 95) near its intersection with TH 97 City of Scandia, Washington County, Minnesota **(Figure 1).** The Site currently consists of a mixture of unreclaimed, formerly mined, vacant land; forested land and small areas of agricultural land. Existing cover is described in Sections 4.3 and 4.5. The Site is bounded:

- On the south by wooded bluff lands and Quinnell Avenue North
- On the west by agricultural land and TH 95
- On the north by agricultural land and woodland
- On the east by wooded bluff land and the Soo Line Railroad

Over the last 70 years, land use within the Zavoral Site has transitioned from predominantly cropland in the late 1930s to its current condition as vacant open space largely disturbed by past mining activities. In the late 1960s, sand and gravel mining started to become prevalent at the Site. By the mid to late 1970s, mining had displaced much of the former cropland. Active mining continued into the 1980s.

Figure 10 illustrates the 2007 City of Scandia land use map. Within a 1-mile area of the Site current land use consists primarily of single-family residential (52%), agricultural (30%), parks and open space (12%), and seasonal residential (5%) uses. The majority of this surrounding area is being used as rural residential and agricultural/vacant land. The nearest residences are located approximately 600 feet to the south and west and 645 feet to the northwest of the proposed mining limits.

Land use within 500 feet of the proposed haul route on TH 97 between the Zavoral Site and the Scandia Mine area land use consists primarily of single-family residential (49%) and agricultural (42%). The majority of this surrounding area is being utilized as rural residential and agricultural/vacant land (**Figure 11).**

Gravel mines are located in communities throughout the St. Croix River Valley. According to the Twin Cities Aggregate Resources Study (Southwick et al 2000) conducted jointly by the Metropolitan Council, the MGS, and the MnDNR Division of Lands and Minerals, Washington County has large aggregate reserves.

4.1.1.2 Planning Authority for the Zavoral Site

The Zavoral Site is within the jurisdiction of the City of Scandia and partially within the St. Croix National Scenic Riverway as designated under the National Wild and Scenic Rivers Act and the federal and state

Lower St. Croix River Acts. Minn. R. ch. 6105.0370 § 9 prohibits sand and gravel operations within the St. Croix River District Zone and scenic easement area. 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 mining area is located outside these limits. However, Tiller proposes to conduct reclamation activities on approximately 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6.

4.1.1.3 Proposed Land Use

The City of Scandia's 2030 Comprehensive Plan future land use map indicates that the Zavoral Site is located in an area of Agricultural use. The primary uses in the Agriculture area include agricultural production, single-family residences, and parks and open space.

4.1.1.4 Zoning

The Zavoral Site and the Scandia Mine were both designated within Agriculture (AG) District under the City's 2020 Comprehensive Plan, the adopted plan at the time of the Tiller application for the Zavoral Mining and Reclamation Project (2008). The Development Code that was in place at the time of the Tiller CUP application for the Zavoral Mining and Reclamation Project included mining as an allowed use within the Agriculture (AG) Zoning District, with a CUP.

On March 17, 2009, the Scandia City Council adopted the City's 2030 Comprehensive Plan. The potential locations of new mining operations were discussed as the new Comprehensive Plan and Zoning Ordinance were developed, and one of the goals of the plan was to limit the locations where new mining operations would be allowed in the City of Scandia. The Zavoral Site is within the area now designated as AG-C in the 2030 Comprehensive Plan. The 2030 Plan included policies that mining not be included as an allowed use in the AG C District. Since adoption of the plan, the City's Development Code has been updated to implement the plan's recommendations. The Council adopted the new Development Code in November 2010. Mining is not an allowed use in AG-C areas in the new Code.

The AG-C has a residential density of 4 units per 40 acres. Within the 4 per 40 density limit, a variety of lot sizes are encouraged through the use of lot averaging zoning. Lot averaging allows lots of 2 to 5 acres in size or 20 acres or greater. These lot sizes are designed to support continuation of agricultural uses and minimize conflict with residential uses. Bonus densities not exceeding 75% of base density may be earned as an incentive for using open space conservation subdivision (OSCS). Bonuses may be earned only if developers undertake actions such as permanent protection of agricultural land or open space, or protection or enhancement of natural resources. Open space conservation subdivisions in the AG-C must incorporate permanent protection of agriculture as a focal theme of the subdivision. In general, the continued viability of agricultural uses should be considered in the siting of structures and drives.

4.1.1.5 Impacts on Current and Future Land Use

4.1.1.5.1 Alternative 1 – 5- to 10-year Operation

If the Project were approved, the existing land use on the Site would be altered from its current mixture of unreclaimed, formerly mined, vacant land, forested land, and small areas of agricultural land to a mining operation. Mining, hauling, and reclamation activities would take place at the Site for a 5- to 10-year period. Upon the completion of mining, the Site would be reclaimed. The reclamation plan developed for the Project includes final grading and landscaping, which would include creating depressions to provide for infiltration, visual interest, and ecological diversity.

The portion of the Site within the St. Croix National Scenic Riverway would be reclaimed by removing existing stockpiles and completing minor grading. Tiller proposes to plant this area with native dry and mesic prairie seed mixes and native white pines. Reclamation of this previously disturbed land in the St. Croix Wild and Scenic Riverway would improve the scenic nature of the area.

Tiller does not have control over post-mining and reclamation land use at the Site. However, due to requests from PAC members and residents regarding potential future use of the Site post-project, the City has reviewed this issue. Any future development at the Site would need to comply with the City of Scandia Development Code. It is expected residential development could occur or the Site would be left in an open self-sustaining state. The intent of allowable development density is to preserve the rural character of the region and allow for large open spaces dominated by native vegetation. The proposed reclamation plan would result in a Site that is suitable for the uses allowed in the Development Code.

The City has adopted by reference the Washington County regulations for the St. Croix River Shoreland Overlay District. Single Family Residential is the allowed use in this District, which would have the greatest density. Within this area, the minimum lot size for new development is 2.5 acres in the City of Scandia (rural district). This would potentially allow for one residential lot if it meets the following dimensional standards for the District, including:

- Minimum lot width is 200 feet.
- Buildings and septic systems must be set 200 feet from the ordinary high water level and 100 feet from the bluff line.
- No structures or grading on slopes greater than 12%.

The City of Scandia Development Code AG C District applies to the 111.3 acres outside the St. Croix River District and alternatives include Lot Averaging and Open Space Conservation Subdivision (OSCS). Development for the 111.3-acre area would be as guided by the development code:

- Using the lot averaging approach to development: the overall maximum density would be 4 units per 40 acres. The AG-C allows a maximum density of 4 units per 40 acres. Allowed lot sizes are 2.0 to 5.0 acres, or over 20 acres for traditional development. If the landowner were to develop the Zavoral Site after mining this would allow for a maximum of 11 residential units (114 acres/40 acres*4 units).

- Using the OSCS approach: the developer would need to create a "yield plan" as part of preliminary plat submittal that shows the maximum number of dwelling units permitted given the minimum lot size and lot widths for conventional subdivisions and other requirements of the code. This would allow for an estimated maximum of 19 residential lots if they meet the following dimensional standards for the District, including:

    - 55% of the land area proposed for development would need to be dedicated permanently as open space or agriculture.
    - Overall base density of the parcel would be the same as for lot averaging: 4 per 40. Lot sizes in OSCS can be a minimum 1.5 acres.
    - Density bonuses can increase the number of dwelling units allowed, if the developer protects open space, agricultural land, and cultural features. The maximum bonus allowed is 75%.

Based on the criteria for the 3.1-acre area within the St. Croix River District and the remaining 111.3 acres outside of the District, the estimated maximum number of residential lots (using the OSCS method) for the entire 114-acre Zavoral Site would be 20.

4.1.1.5.2 Alternative 2 – No-Build Alternative

The land use would not be altered from its current mixture of unreclaimed, formerly mined, vacant land, forested land, and small areas of agricultural land. The gravel resource would not be used. Establishment of native prairie and coniferous forest would not occur. The portion of the Site within the St. Croix National Scenic Riverway would not be reclaimed. Vegetation succession would continue to occur as described in Section 4.5.

Development at the Site could occur as described under Alternative 1, but grading and vegetation establishment would be required.

4.1.1.5.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The impacts would be the same as with Alternative 1 but would occur in a reduced timeframe. As a result, the area would be available for post-mining and reclamation use earlier than under Alternative 1.

4.1.2 Potential Mitigation Measures

The Project is consistent with existing and proposed land use. No mitigation measures are recommended. Mitigations measures related to reclamation are included in Section 4.3.

4.2 ENVIRONMENTAL HAZARDS

4.2.1 Database Search

The SDD required that a database search be conducted for potential on-site and off-site sources of environmental impacts relative to the Zavoral Site. This search was conducted in general accordance with the American Society for Testing and Materials (ASTM) Standard E1527-05 entitled Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. Standard environmental record sources are defined in Section 8.2.1 of the ASTM standard. These

records consist of selected federal and state environmental databases. ASTM also specifies the appropriate search distances from the Zavoral Site for which these records should be reviewed.

Environmental Data Resources, Inc. (EDR) provided specified state and federal regulatory list information for potential sites of environmental concern located at or in the vicinity of the Zavoral Site. EDR maintains a geographic information system (GIS) listing of various state and federal databases in accordance with the ASTM standard. The database search was based upon ASTM-specified standard record sources. Additionally, databases searched by EDR satisfy records review requirements of the all appropriate inquiry rule. EDR includes these databases, when available, as a part of its report. Descriptions of each database are provided in Part GR-1 of the EDR database report **(Appendix X).** The databases reviewed by EDR were the most recently available as of July 14, 2011.

The EDR report includes various reports detailing database information for each of the sites identified/geocoded within the specified radius. Additional sites with recognized environmental risks were identified, but EDR was not able to map them to specific locations due to insufficient/contradicting address information. These sites were included in EDR's report as "orphan" sites.

The following subsections summarize the findings from the database review:

4.2.1.1 Zavoral Site

The Zavoral Site was not listed in any of the databases searched by EDR.

4.2.1.2 Adjacent Properties

Wally's Small Engine Repair (Wally's) located at 20965 St. Croix Trail North was listed as a Conditionally Exempt Small Quantity Generator of Hazardous Materials (CESQG). No violations associated with their CESQG status were identified in the EDR Report. Wally's is identified in the Minnesota Pollution Control Agency (MPCA) "What's in My Neighborhood" (WIMN) database due to the CESQG listing. No other adjacent properties were identified in the EDR report. No known contamination was associated with Ekdahl Estates, thus the area is not likely to impact the Zavoral Site No known contamination was associated with Wally's; thus, it is not likely to affect the Zavoral Site.

4.2.1.3 Additional ASTM Listings

Ekdahl Estates, located approximately ¼ mile southwest of the Zavoral Site, was identified in the EDR report and in the MPCA WIMN database. The WIMN listing was the result of a construction stormwater permit obtained for Ekdahl Estates. No known contamination was associated with Ekdahl Estates, thus the area is not likely to impact the Zavoral Site

A total of 39 underground storage tank (UST) listings were identified in the EDR Orphan Summary. All of the UST listings were associated with properties in Osceola, Wisconsin, or Prescott, Wisconsin. None of these UST listings have potential to impact groundwater beneath the Zavoral Site based on distance and separation relative to the St. Croix River.

4.2.2 Potential Mitigation Measures

Since no nearby sites present an environmental risk to the Zavoral Site, no mitigation is recommended.

4.3 RECLAMATION PLAN

4.3.1 Zavoral Site

4.3.1.1 Affected Environment

4.3.1.1.1 Plant Communities

Tiller's consultant CCES conducted a biological assessment of the Site (CCES May 2011). Within the Zavoral Site, the majority of upland area located above (west of) the bluff line west to TH 95 was used in the past for sand and gravel mining activities. The inactive mining area covers approximately 56 acres of the Zavoral Site and is now dominated by a mix of native and nonnative woody and herbaceous vegetation. Plant communities within the inactive mining area consist of a combination of altered/nonnative short and long grass communities, altered/nonnative short and long grass with sparse trees communities, and altered/nonnative forest and woodland plant communities.

Small- to medium-sized topsoil, overburden, and aggregate stockpiles occur throughout the inactive mining area that are now revegetating with a mix of native and nonnative trees, grasses, and forbs, including several primary and secondary noxious weeds. Mining faces with steep slopes, depressions, stockpile areas, and larger areas of somewhat level terrain are typical topographical features found throughout the area that was mined. Some areas lack vegetation altogether and consist of exposed sand and gravel.

A detailed description of the plant communities present within the Zavoral Site is included in Section 4.5 of this document.

4.3.1.1.2 Soils

The soils of the Zavoral Site and surrounding landscape are composed of predominantly sandy and silt loam soil types typical of the St. Paul Baldwin Plains. The soils mapped within the 64-acre mining and reclamation area include Antiago silt loam with 2–6% slopes, Emmert gravelly loamy coarse sand with 15–25% slopes, Gotham loamy sand with 1–6% slopes, Pits-gravel, and Santiago silt loam with 6–15% slopes (**Figure 12**). Of these soil types, the majority of the reclamation areas occur within Pits-gravel and Gotham soils with smaller areas occurring within Antiago, Emmert, and Santiago soil types.

The areas previously mined on the Zavoral Site are classified as Pits-gravel soil type and no longer have the original topsoil present. The soil types located immediately adjacent to the 64-acre mining and reclamation area, where agricultural practices still take place and where the forested slopes on the eastern side of the Site are located, include Gotham, Santiago, Antigo, and Emmert soil types. Remnants of these soil types occur within the mining and reclamation area. Topsoil removed from these soil types during overburden removal would be stockpiled for use within each of the reclamation areas.

4.3.1.2 Reclamation Plan Description

Tiller's consultant CCES prepared the reclamation plan and forestry management plan for the Project. The following section is based on these plans and the AECOM consultant team's review of these plans. Tiller proposes to leave the Site in a "self-sustaining condition that would meet or exceed current local land use rules regulating sand and gravel mining reclamation." Based on the reclamation and forestry

management plans, the Site would be revegetated with native-dominated dry prairie, mesic prairie, and coniferous woodland that would provide stable soil conditions for future land uses (CCES May 2011).

CCEs identifies the primary goal of the Zavoral Site reclamation plan and forestry management plan is to establish temporary and permanent vegetation in order to stabilize all newly graded slopes following each phase of mining activity. Reclamation must meet the requirements of the City's mining ordinance. Tiller's design for vegetation reestablishment at the Zavoral Site is "designed around natural community restoration principles and prescriptions appropriate to the Site context, the St. Croix River Valley, and the post-mining site conditions. Native vegetation that is adapted to sandy, well-drained soils would be used to establish vegetation within the 64-acre mining and reclamation areas".

Two types of reclamation activities would take place at the Site, ongoing reclamation activities and mass reclamation activities. Ongoing reclamation activities generally occur each season. Often, materials suitable for reclamation, but not suitable for aggregate production are encountered and these materials are used for ongoing reclamation. In addition, local construction projects often encounter organic materials not suitable for the specific project, and if these materials are suitable for topsoil, they could be accepted and placed in the ongoing reclamation area.

Mass reclamation activities occur concurrently with removal of topsoil and overburden from an area in preparation for mining. The combined activities of topsoil and overburden removal and reclamation are commonly referred to as a stripping/reclamation project. These stripping/reclamation projects occur less frequently depending on aggregate demand. Tiller has stated that is their intent and goal to proportionally open new areas for mining and reclaim during these stripping/reclamation projects. It is important to note that the mining and reclaim areas would not always be exactly the same size in aerial coverage. Overburden removal and reclamation are three dimensional. For example, materials removed from a certain area in preparation for mining may or may not be enough and may be more than enough to reclaim exactly the same number of acres being opened. However, when considering mass reclamation combined with the ongoing reclamation, over time, there is a proportional number of newly opened areas and reclaimed areas (CCES May 2011).

Figures 13 and 14 depict the three mining phases and the four reclamation phases, respectively.

4.3.1.2.1 Phasing and Timing of Mining Operations and Reclamation

4.3.1.2.1.1 Mining and Reclamation Phase 1

Mining Phase 1 would be approximately 22 acres and Reclamation Phase 1 would be approximately 4 acres (**Figure 4**). Mining Phase 1 would be stripped and mined concurrently with Reclamation Phase 1. The maximum active and open area during Mining and Reclamation Phase 1 would be approximately 27 acres.

The Reclamation Phase 1 area includes an area approximately 4 acres in size and is located within the St. Croix River District and scenic easement (**Figure 4**). Mining operations are not planned for this area. This area would be reclaimed during the first phase of reclamation. Timing for the reclamation in Phase 1 is 4 weeks.

Reclamation of this area would involve removing existing stockpiles and then final grading of the area. Slopes within the Reclamation Phase 1 area would be a maximum of 4:1. Once final grading with topsoil

is complete for the Reclamation Phase 1 area, trees would be transplanted into the area followed by seeding the area with a native seed mix described in more detail below. If required, watering of the transplanted trees would continue for the rest of the season after trees have been planted.

4.3.1.2.1.2 Mining and Reclamation Phase 2

Mining Phase 2 would be approximately 17 acres and Reclamation Phase 2 would be approximately 22 acres (**Figure 5**). Mining Phase 2 would be stripped and mined concurrently with Reclamation Phase 2. Reclamation Phase 1 would be vegetated by the start of Mining Phase 2. The maximum active and open area during Mining and Reclamation Phase 2 would be approximately 40 acres.

The Reclamation Phase 2 area is located in the northwest part of the proposed Project. After mining is completed in this area, final grading with a minimum of 4 inches of topsoil would take place before temporary and permanent seed is installed to stabilize the soil. The main haul road located in Reclamation Phase 2 area would remain active in order to access Mining and Reclamation Phases 2, 3, and 4. Timing for the reclamation in Phase 2 is 11 weeks.

4.3.1.2.1.3 Mining and Reclamation Phase 3

Mining Phase 3 would be approximately 21 acres and Reclamation Phase 3 would be approximately 17 acres (**Figure 6**). Mining Phase 3 would be stripped and mined concurrently with Reclamation Phase 3. Reclamation Phase 2 would be vegetated by the start of Mining Phase 3. The maximum active and open area during Mining and Reclamation Phase 3 would be approximately 38 acres.

The Reclamation Phase 3 area is located in the southern part of the proposed Project. After mining is completed in this area, final grading with a minimum of 4 inches of topsoil would take place before temporary and permanent seed is installed to stabilize the soil. Timing for the reclamation in Phase 3 is 8 weeks.

4.3.1.2.1.4 Reclamation Phase 4

Reclamation Phase 4 would commence once Mining Phase 3 is complete. Reclamation Phase 4 would be approximately 21 acres (**Figure 7**). Reclamation Phase 3 would be vegetated by the start of Reclamation Phase 4. The maximum active and open area during Reclamation Phase 4 would be approximately 21 acres. Timing for the reclamation in Phase 4 is 9 weeks.

4.3.1.2.2 Screening Areas

The proposed and existing screening berms located along TH 95 and along the southwest perimeter of the Zavoral Site occur within the 50-foot and 100-foot mining setbacks (**Figure 8**). The 50-foot and 100-foot mining setbacks are currently included as proposed reclamation areas in the reclamation plan (**Figures 4 through 8)**.

The purpose of the berms would be to screen the mining and reclamation activities from nearby vehicle, bike, and pedestrian traffic in the area. Construction of the berms would take place as the Site is being developed and may include transplanting of native white pine trees from within the Site to provide additional screening. Transplanting activities for the screening areas would occur simultaneously with the transplanting activities proposed in Reclamation Phase 1 (**Figures 4 though 8).**

The screening berms would remain as needed to provide screening throughout the life of the Project, with the potential for removal during certain phases of reclamation. Vegetation management tasks included for the 50-foot and 100-foot setback areas would involve some level of weed/invasive plant management including herbicide treatments and prescribed burning where appropriate.

The screening berms would remain as needed to provide screening throughout the life of the Project, with the potential for removal during certain phases of reclamation. Vegetation management tasks included for the 50-foot and 100-foot setback areas would incorporate weed/invasive plant management including herbicide treatments and prescribed burning where appropriate.

4.3.1.2.3 Reclamation Activities

4.3.1.2.3.1 Site Preparation

Tiller proposes that once a mining area within a specific phase is available for reclamation, the area would be final graded with slopes that do not exceed 4:1. Minimum final grades for each of the reclamation areas are shown in Tiller's Mining and Reclamation Plans (**Figures 4 through 8**). Final grading would be completed within areas of any given reclamation phase once a minimum of 4 inches of topsoil is placed over the surface of the ground and grading inspections are completed to plan specifications.

Currently, topsoil is absent from much of the proposed mining area due to previous mining activity so stockpiling of all available topsoil would be needed for reclamation. As topsoil is stripped or removed, it would be set aside on the Site for spreading over the reclamation areas.

Tillers reclamation plan proposes that topsoil would consist of on-site material generated from removal of the soils that overlay the gravel deposits being mined and existing berms. Topsoil over the existing gravel deposits would be separated from any subsoil and overburden removed during the stripping process. If topsoil would need to be stored for longer than a month, a temporary cover crop would be installed over the storage areas to prevent erosion.

To generate the required volume of topsoil for each reclamation area, Tiller proposes to supplement topsoil sources by combining the sandy subsoil available on-site with compost or organic materials imported onto the Site. This engineered or manufactured topsoil would be designed to provide adequate organic matter and nutrients for the seed mixes and trees to establish within each reclamation area. This approach focuses on revegetating the Site with native dry prairie vegetation and capitalizes on the relatively sterile and noxious weed-free soil conditions that would exist post-mining.

Once topsoil is final graded in each reclamation area, Tiller proposes to till the topsoil to a minimum depth of 3 inches before any temporary or permanent seeding takes place. The tillage would help improve seed-to-soil contact as well as increase the amount of initial infiltration, giving the seeds moisture to begin establishment. Following tillage, temporary and permanent seed could be installed.

Tiller proposes to transplant trees as part of on-site reclamation prior to topsoil placement whenever feasible to minimize any touch-up grading to final grades. Timing of the transplanting of any native trees from Mining Phases 1, 2, and 3 would take place while trees are dormant, if possible. The optimum time to transplant trees is prior to active growth in the spring and in the early to late fall once tree growth slows down for the season. However, trees can be moved outside of these optimum times with relatively good

success. If trees are moved during the growing season, watering would be closely monitored and performed as needed to successfully establish each tree.

4.3.1.2.3.2 Surface Hydrology

A SWPPP would be implemented for the Zavoral Site in compliance with the NPDES/SDS permit (Section 4.10).

4.3.1.2.3.3 Installation of Prairie Seeding Areas

For the vast majority of the reclamation areas, Tiller proposes seeding to establish the dry to mesic prairie matrix. For the Project, Tiller proposes to place the native seed mix by broadcasting and/or drilling the seed directly into the topsoil layer.

4.3.1.2.3.4 Seed Mixes

Tiller developed seed mixes that included a mix for dry prairie and mesic prairie. The dry prairie mix would be used in the majority of open areas within each reclamation phase except for the depressions. Plants that are listed in the dry prairie mix have adapted to growing conditions that range from dry to mesic. These depressions would be planted with the mesic prairie mix due to the lower points having more available moisture in the soil. Where the two seed mixes come together on-site a transitional zone approximately 150 feet wide would have seed from both dry and mesic prairie installed. This seeding technique creates a more natural transition between the dry and mesic prairie communities.

4.3.1.2.3.5 Timing for Seeding

Tiller identifies spring to early summer as the optimum time for native prairie seeding when temperatures become warm enough for germination of warm season grasses and forbs. For warm season plant species to germinate, the mean soil temperature needs to be above 65 degrees Fahrenheit (°F). Planting native seed at this time of the year allows the warm season plant species to begin establishing early in the growing season. When seeding in the fall, this same type of seed mix would lie dormant until the following spring when germination takes place.

Reclamation activity would be planned accordingly with the intent to achieve the optimum timeframes for seeding. If final grading does not occur during the optimum seeding time, reclamation areas would be seeded with temporary cover crops until native prairie seeding is appropriate; this would also minimize soil erosion and invasion by weedy species.

4.3.1.2.3.6 Dormant Seeding

When optimum seeding installation cannot be achieved following mining, Tiller proposes to use other methods of seeding installation if necessary. If a dormant seeding method is used to install seed, it is important to note different species are dormant at different times of the year. Dormant seeding for warm-season grasses occurs in early fall as the grasses require 65 °F and above sustained soil temperatures and moisture to germinate. Cool-season grasses would germinate at colder temperatures, requiring a soil temperature at a depth of 1 inch at or below 40 °F. Cool-season grasses generally germinate in a shorter period of time. Since are few cool-season grasses are specified in the seed mixes developed for the Project, timing of dormant seeding would take place in late fall whenever possible. Many forbs do not germinate at all the first year when seeded in the spring as they require a freeze/thaw period (winter) to germinate. Thus, forbs may not appear until the following spring. Dormant seeding is not as reliable a

method for seed installation due to factors such as weather, snow cover, predation, and soil erosion. However, plantings do appear to contain a greater diversity of cool-season grasses and forbs when installed in the fall.

4.3.1.2.3.7 Temporary Erosion Control

After seeding, Tiller proposes to apply mulch to protect and enhance seed germination and to provide temporary erosion control. Since slopes would not exceed 4:1, a clean grain straw or native grass mulch may be applied. Mn/DOT recommends about 2 tons per acre of straw mulch to achieve 90% coverage of an exposed soil surface. If mulch applications are placed too heavily, the mulch can hinder germination or smother new seedlings.

4.3.1.2.4 Vegetation Management of Reclamation Areas

Tiller proposes that vegetation management would take place within each of the reclamation areas. Once each reclaimed area is planted with permanent vegetation, vegetation management, erosion control, and weed management would be required to ensure the establishment of installed seed mixes and transplanted trees. Regular maintenance of each reclaimed area would take place for three growing seasons following initial installation in each phase.

4.3.1.2.4.1 Seeded Prairie Areas

Following the first year of planting and seeding within any of the reclamation areas, Tiller's proposed vegetation management would involve mowing to a height of 6 to 10 inches twice during the growing season and also using spot herbicide treatments to areas with weedy plants present. Mowing helps reduce weedy annual plants from setting seed and becoming established, which can be common from early on after a native seeding has been installed. Native plants that emerge after the first full growing season are relatively small in size and are not damaged by regular mowing. Native plants that establish from seed mixes can take 2 to 4 years before they flower, which is why mowing is a very important technique used early on in establishing areas to prairie. Mulch would be placed around trees.

During the second year following planting and seeding of any reclamation area, Tiller's vegetation maintenance would involve mowing of the reclamation area twice and conducting herbicide treatments once or twice depending on the level of weedy species present.

The third year following planting and seeding, Tiller's vegetation maintenance would involve mowing of the reclamation area twice, conducting herbicide treatments once or twice depending on the level of weedy species present, and conducting a prescribed burn. The prescribed burn would occur on areas seeded with prairie mix and would avoid areas where transplanted trees exist. The prescribed burn would occur between November and December before snow cover, if possible.

4.3.1.2.4.2 Planted and Transplanted Tree Areas

For the trees transplanted into the Reclamation Phase 1 area, Tiller proposes watering once per week during times of little or no rainfall. If rainfall events accumulate to 0.5 to 1 inch of rain in a week, then no watering would be needed for the following 1-week period. If extended periods occur of temperatures above 90 °F with little or no rainfall, the trees would be watered twice a week.

Under Tiller's plan, transplanted trees would continue to be watered during the first growing season until late September or into October depending on the temperature. Most trees would be dormant before mid-October and therefore would not need to be watered. All evergreen trees (white pine) would be thoroughly watered at this time, to maintain good moisture levels in the needles to prevent or minimize winter desiccation (browning of the needles). If trees are transplanted in the fall of the year a watering plan would be implemented for the following growing season.

4.3.1.2.4.3 Mulching Transplanted Trees

Tiller proposes that all trees transplanted into the Reclamation Phase 1 area would be mulched after being planted. Wood chips generated during development of the mining area would be used as mulch. Mulch would be placed around each tree under its dripline to a depth of 4 to 6 inches. Wood mulch helps retain water for a longer period of time in the upper level of the soil horizon where the majority of root activity takes place. Mulch also helps moderate the temperature of the soil, which is conducive to good root regeneration and growth. In the following 3 to 4 years after transplanting, additional mulch may need to be applied once more to ensure that each transplanted tree becomes well established. No additional mulch would be needed around each tree after the second application of mulch, since the native seeding would be established around each tree at this point and would most likely spread to the base of the tree.

4.3.1.2.4.4 Erosion Control

As vegetation germinates and becomes established within each reclamation area, Tiller proposes to monitor for any soil erosion. This would be an ongoing task that may require several Site visits during each growing season until final soil stabilization occurs. For areas with poor vegetation establishment, additional seeding and erosion control measures may need to be installed to prevent erosion. Additional erosion control methods are outlined in the Section 4.10.

4.3.1.2.5 Restoration Performance Monitoring

Once a reclamation area has been planted with permanent vegetation, Tiller proposes that annual monitoring would take place to assess the level of establishment for up to three full growing seasons following initial installation. The following subsections describe general guidelines used to measure the level of establishment for areas planted with native seed. If guidelines are met from year to year, establishment of plant communities like the dry and mesic prairies being proposed for the Zavoral Site would be accomplished within 3 years. When guidelines are not met each year, additional seeding may occur as well as mowing and herbicide treatments.

4.3.1.2.5.1 Year 1 Monitoring

This applies to the Tiller's proposed monitoring for the first full growing season after plant establishment. For areas planted in the fall it would be the following growing season and for spring plantings it would be the current growing season. Cover species for the dry and mesic prairie areas would be present over the entire Site by the end of the growing season (CCES May 2011).

Seedlings of at least three native grasses and three native forbs would be widely dispersed through the seeded area. Example prairie grass species are Slender wheat grass (*Elymus trachycaulus*), Canada wild-rye (*Elymus canadensis*), Big bluestem (*Andropogon gerardi*), Indian grass (*Sorghastrum nutans*), and Little bluestem (*Schizachyrium scoparium*). Example forb species are Black-eyed Susan (*Rudbeckia hirta*), Partridge pea (*Chamaecrista fasciculata*), Blue vervain (*Verbena hastata*), Hoary vervain (*Verbena*

stricta), Early sunflower (*Heliopsis helianthoides*), and Bergamot (*Monarda fistulosa*). All of the species noted above would be present as seedlings and probably would not flower the first year except for Partridge pea and Black-eyed Susan. Grass seedlings could be hard to pick out if the cover crops have put on a lot of growth. The seedlings would normally be 2 to 6 inches tall, whereas the cover crops may be 1 to 2 feet tall.

4.3.1.2.5.2 Year 2 Monitoring

During Tiller's second year of monitoring, the reclamation areas planted with dry and mesic prairie seed mixtures would generally be dominated by cool-season native grasses such as wild-ryes and wheat-grasses. Warm-season grasses would be present but could still be small in stature and scattered throughout the Site. Several of the forbs from Year 1 would be blooming in Year 2.

4.3.1.2.5.3 Year 3 Monitoring

According to Tiller's reclamation plan, Year 3 would be a transitional year for prairie plantings. Transition would almost always be visible from cool-season grasses (Canada wild-rye and slender wheat grass) to warm-season grasses (Big bluestem, Indian grass, Little bluestem, etc.).

In later years, prairie plantings would be dominated by warm-season grasses and late successional forbs. Cool-season grasses should be nearly gone from the Site; however, they may persist in wet depressions, or on north-facing slopes or in partial shade. Annual (Partridge pea) and biennial (Black-eyed Susan's) forbs would also tend to fade out and be replaced by later successional forbs. Wetness, shading, aspect, and temperature would tend to delay transitions.

4.3.1.2.6 Final Condition and Relation to Adjacent Land Uses and Surrounding Drainage Features

Once Project mining and reclamation are completed, Tiller proposes to leave the Site in a self-sustaining condition that would meet or exceed current local land use rules regulating sand and gravel mining reclamation". The Site would be covered by areas of native-dominated dry prairie, mesic prairie, and coniferous woodland that would provide stable soil conditions for future land uses (**Figure 15**; CCES May 2011).

The final grading described in the reclamation plan would result in contours to conform to the City of Scandia's Reclamation Standards contained in Section 8 of Chapter 4 of the Development Code Mining and Related Activities Regulations. The final Site condition would be similar to surrounding landforms characterized by gently sloping fields and steeper sloping bluff areas. In reclamation areas that border forested bluffs, Tiller proposes to plant native coniferous trees to create a natural transition between the existing forested landscape and the newly planted reclamation areas. This transition zone would allow existing tree species along the forested bluffs to seed into the reclamation areas and contribute to the overall species composition over time.

The western portion of the Site would slope from the existing grade along the TH 95 right-of-way down to the finished floor of the mining area. In this area, slopes would not exceed 4:1 in accordance with City regulations. The slopes of the bluff east of the Site are typically steeper than this ranging from approximately 1:1 to 3:1. The slopes along the northern portion of the Site would fan out to meet the existing slope along the northern portion of the property, which gradually drops in elevation from

approximately 910 feet above mean sea level (msl) to approximately 870 feet msl. The mining area floor would be graded to achieve a gently rolling landscape (CCES May 2011).

The final Site condition would be similar in nature to surrounding landforms characterized by gently sloping fields and steeper sloping bluff areas. For reclamation areas that border the forested bluffs, native coniferous trees would be planted to create a natural transition between the existing forested landscape and the newly planted reclamation areas. This transition area would be created along the northern and eastern sides of Reclamation Phases 1, 3, and 4 with the intent of establishing similar tree species that are found within the adjacent forest systems. This transition zone would allow existing tree species along the forested bluffs to seed into the reclamation areas and contribute to the overall species composition over time (CCES May 2011).

For reclamation areas that border agricultural fields to the southwest and to the north of the Zavoral Site, the transition would be from gently sloping agricultural fields to native dry and mesic prairie. Screening berms that occur along the southwest and west perimeters of the Project may be removed to create a gradual transition between adjacent land uses. In addition, native vegetation in the screening areas may remain post-reclamation to provide screening and contribute aesthetically to the Zavoral Site (CCES May 2011).

Established drainageways occur along the bluffs east of the Project that convey stormwater runoff down through the bluffs to the St. Croix River. There would be a rise of 1 to 6 feet from the base of the reclamation area to the eastern edge of the mining limits, which would allow the Project to remain internally drained after reclamation. The post-reclamation drainage patterns would not contribute to erosion of the steeper slopes of the existing bluff area. Tiller proposes to create six depressions within the reclamation area. These created depressions would be designed to provide for infiltration and prevent stormwater from collecting and stagnating, which otherwise could result in converting the depressions to wetland type of environments. The depressions would be planted with a native seed mix that would establish as a mesic to wet prairie plant community and would include species that tolerate a wider range of moisture levels than the dry prairie species (**Figure 8**). These created depressions would have a depth from 0.5 feet to 1.5 feet and range in size from approximately 20,000 square feet to 75,000 square feet.

The majority of post-reclamation areas within the Project would remain internally drained, a condition established from past mining activity that would not impact the function of the existing drainageways. The exception is the northwestern area of the Project. This area would be reclaimed during Reclamation Phase 2. The removal of the BMPs would not occur until vegetation and soil stability are well established. Until stability of the area is evident, stormwater flow would be diverted to the interior of the Site (CCES May 2011).

4.3.1.3 Review of Reclamation Plan

As part of the EIS process, Tiller's reclamation and forestry management plans were reviewed by the AECOM consultant team. There are two possible reclamation approaches for the Site, based on two "topsoil" options. The first option was proposed by Tiller in the reclamation plan for the Site. This approach focuses on revegetating the Site with native dry prairie vegetation using an engineered or manufactured topsoil consisting of sandy subsoil available at the Site with added organic soil amendments. This method capitalizes on the relatively sterile and noxious weed-free soil conditions that

would exist post-mining. However, the use of manufactured topsoil does not meet the Scandia Ordinance No. 103 definition of topsoil. As a result, AECOM requested that a more detailed description of this first approach be prepared and a second approach be prepared to meet City requirements.

Tiller prepared the requested prairie establishment and topsoil specifications for the Site (CCES October 2011). That document compares the two potential reclamation approaches for the Site. Prairie Reclamation Approach 1 is the native prairie revegetation approach that is proposed in the original Zavoral Mine Reclamation Plan. Prairie Reclamation Approach 2 is an alternative approach that meets the City reclamation and revegetation standards, adheres to City ordinances for required topsoil thickness, and takes into account comments from City staff since the submittal of the May 3, 2011 Reclamation Plan. Either option would allow for future development consistent with the AG-C zoning classification. Both approaches are described in detail in **Appendix X** and summarized below:

Prairie Reclamation Approach 1: This approach focuses on reclamation of native dry prairie vegetation using an engineered topsoil consisting of sandy subsoil with added soil amendments. This method capitalizes on the relatively sterile and noxious weed-free soil conditions that would exist post-mining. Weed-free organic soil amendments are imported from a controlled location and mixed with sterile sandy soils on-site to create topsoil that is suitable for native dry prairie seedling establishment but nutrient-poor to a degree that would inhibit the growth of the most potentially problematic noxious weed species. Direct broadcast native seeding would be performed following topsoil establishment. Vegetation establishment monitoring, native species inter-seeding, and weed management are conducted as needed to meet diversity performance standards that shall be consistent with a moderate-quality, naturally-occurring dry prairie plant community on sand-gravel soils in the St. Croix River Valley.

Prairie Reclamation Approach 2: This approach closely follows the City's mining reclamation ordinance. Under this approach, Tiller would stockpile the limited remaining native topsoil located within the proposed mining areas (approximately 8 acres), and would import additional topsoil of at least equal quality from various other local sources. This reclamation approach would meet the City's required four inches of topsoil, at a minimum, and would average 6 inches of topsoil throughout the reclaimed prairie areas to satisfy the City staff's recommendations. Following establishment of topsoil within reclaimed areas, a simplified native mesic prairie species mix would be broadcasted and worked into the topsoil. The simplified native mesic prairie mix would achieve the City's minimum quality and vegetation diversity requirements and would provide coverage of native prairie graminoids and forbs to provide an improved habitat condition, suppress weed establishment, and facilitate cost-effective vegetation management in the short and long terms. Vegetation establishment monitoring, native species inter-seeding, and weed management would be conducted as needed to meet or exceed the minimum vegetation performance standards that are consistent with the City ordinance for reclaimed mining areas.

The second approach more closely conforms to the City's mining reclamation ordinance, although it relies on importing topsoil rather than using only soils reclaimed from the Site. Under this approach, Tiller would stockpile the limited remaining native topsoil located within the proposed mining areas (approximately 8 acres), and would import additional topsoil of at least equal quality from various other local sources to provide a topsoil cover of 4 to 6 inches over the Site. Following establishment of topsoil within reclaimed areas, a native mesic prairie species mix, less diverse that that proposed under the original approach planted.

The AECOM team believes that first option, if successful, would result in a more diverse mix of native species and would likely result in less competition with weedy species for the following reasons:

- Organic amendment of existing and future overburden soils would enhance moisture-holding capacity of the soils which would aid in seed germination and plant establishment. However, it would not meet the current City ordinance.

- The decomposition of supplemental organic materials in amended/engineered soils would provide a long-term nutrient source for establishing vegetation within areas that are now lacking in nutrient quantity and quality.

- Engineered soil would minimize the import of weed seed since imported material would be partially decomposed organic material and not unknown or uncontrolled topsoil or subsoil from areas outside of the Site.

- Engineered soils have the advantage in maintaining uniformity of soil characteristics across the reclamation areas resulting in a higher likelihood of consistent vegetative coverage..

- The predominant vegetation at the Site in its current condition alludes to the poor quality of soil material present today. Reuse of this material would result in similar low-quality vegetative conditions unless overall soil health is improved. Preparing the Site for optimal native vegetation establishment upfront helps to minimize long-term management costs associated with weed control, prescribed burning, and supplemental seeding activities in areas not meeting predetermined vegetative performance criteria.

However, the reclamation must meet City ordinance requirements and must provide a base suitable for maintaining moisture and have suitable organic content to result in successful reclamation. The City may need to amend the definition of "topsoil" in its Development code to permit the use of the first approach, and possibly the second approach as not all of the topsoil would be obtained from the Site.

A suitable test of the success for the first approach may be to allow for its use in the first phase of reclamation and, if successful, allow for its use in succeeding phases of reclamation. If unsuccessful the City would require Tiller to import topsoil for succeeding phases. This would require close monitoring of the first phase of reclamation and the development of strict and measurable definitions of reclamation success.

Other recommended improvements and modifications are presented under Section 4.3.2.

4.3.1.4 Impact Analysis

4.3.1.4.1 Alternative 1 – 5- to 10-Year Operation

The existing land use would be altered from its current mix of unreclaimed, formerly mined, vacant land, forested land, and small areas of agricultural land to a mining operation. Upon completion of mining, the Site would be reclaimed. The reclamation plan developed for the Project includes final grading and landscaping, which would include creating depressions to provide for internal drainage, infiltration, visual interest, ecological diversity, and reestablishment of prairie and coniferous woodland vegetation.

The portion of the Site within the St. Croix National Scenic Riverway would be reclaimed by removing existing stockpiles and completing minor grading. This area would be established with native dry and mesic prairie seed mixes and native white pines. Reclamation of this previously disturbed land in the St. Croix Wild and Scenic Riverway would enhance the habitat and scenic nature of this area.

4.3.1.4.2 Alternative 2 – No-Build Alternative

The land use would not be altered from its current mix of unreclaimed, formerly mined, vacant land, forested land, and small areas of agricultural land. The gravel resource would not be used. No reclamation activities would take place on the Site and vegetation succession would be expected to continue to occur.

The portion of the Site within the St. Croix National Scenic Riverway would not be reclaimed. Development at the Site could occur as described under Alternative 1, but grading and other Site preparation would be required.

4.3.1.4.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The reclamation activities for Alternative 1 and Alternative 3 would be essentially the same. The difference between Alternative 1 and 3 is the timeframe of operation. The compressed timeframe proposed under Alternative 3 would result in reclamation being completed earlier.

4.3.2 Potential Mitigation Measures

As part of the EIS process, Tiller's reclamation and forestry management plans were reviewed by the AECOM consultant team. In addition to the topsoil issues addressed under Section under Section 4.3.2, the City of Scandia would require that Tiller address the following general list of items as part of any future CUP process.

- **Establish Minimum Topsoil/Manufactured Topsoil Thickness**: Proposed topsoil thickness must be reviewed and approved by City. Tiller proposes 4 inches, which is the minimum allowed by the City ordinance; and a common industry standard is 6 inches. Six inches of topsoil/manufactured topsoil is preferred and it should not be tilled, which would increase potential for compaction.

- **Test Site Soils**: Once soils are tested recommendations can then be made as to whether on-site soils could be modified to provide an acceptable topsoil. A qualified agronomist should evaluate sand/silt/clay structure, fertility, and pH of on-site soils and make recommendations regarding its use as topsoil.

- **Use Approved Topsoil/Manufactured Topsoil:** City of Scandia Ordinance No. 103 that pertains to the regulation of mining defines topsoil as "That portion of the overburden which lies within the "A" and "B" horizon of soil closest to the surface and which supports the growth of vegetation."

    - There is limited topsoil available on the Zavoral Site due to past mining activities. As a result, either the material at the Site would need to be modified to produce an engineered

or manufactured topsoil as described in Tillers reclamation plan or topsoil would need to be brought to the Site from other locations.

- In order to provide a suitable planting medium for the establishment of vegetation at the Site, the City would need to develop a topsoil and/or manufactured topsoil specification that meet the needs for this and other mining proposals. Criteria need to be established for what materials are suitable and the City needs to have approval authority. A soil specification is needed as a verifiable criterion for manufactured and/or imported soils. This is the only feasible process to obtain the desired topsoil for revegetation efforts.
- A combination of organics from different sources may not be desirable unless the organics are composted to create a uniform material that can be readily added to poor quality soils as an amendment. Under the best conditions, a single source supplier of organic material (e.g., municipal leaf compost, yard waste recycling company) should be used to maintain consistency of imported material and to ensure uniformity in resulting manufactured soil. The soil manufacturing process is complicated and this important component of the reclamation efforts needs to be addressed in detail.
- Topsoil may need to be brought to the Site if Site topsoil or manufactured Site soils are not suitable. Standards also need to be established for the use of on-site or other topsoil to avoid the use of topsoil containing invasive or weed species.

- **Describe Subgrade Preparation**: The subgrade should be disked and amended with compost or other amendments as necessary. Placed topsoil/manufactured topsoil should not be disked. It would be preferable to disk the subgrade soils to eliminate a barrier/impedance between soil layers/horizons (i.e., create positive drainage and ensure groundwater recharge).

- **Modify Seed Mix and Methods**: The proposed seed mixes should be revised to use 100+ seeds per square foot of permanent native seed for successful establishment of natural areas. An innoculant should be used during seeding to improve growth Native seed mixes should be installed using broadcast sowing on the soil surface given loamy-sandy soil types, followed by the installation of straw erosion control blanket (straw blanket North American Green (NAG) S-75 type) rather than straw crimping. The blanket would protect against soil erosion while keeping sown seed in place and maintaining moisture control for good seed germination.

- **Modify Cover Crop Specification**: ReGreen (slender wheat grass and winter wheat hybrid)is preferred for fall cover crop because winter wheat is allelopathic (competes with other vegetation that is trying to become established). The temporary cover crop and how the Site would be prepared for permanent seeding after the cover crop is established should be clearly specified. The steps that would be taken for the temporary to permanent seeding process if optimal timing is not achieved should be described. A higher frequency of mowing and herbicide treatment during the establishment period should be considered, 3 times during growing season is recommended. Tiller's reclamation plan should include a list of acceptable herbicides. An adaptive management plan should be developed.

- **Describe Tree Transplanting**: Describe how many trees, their size, transplanting method, and the location and arrangement of plantings. Consider savannah habitat as transition from native grassland to forest.

- **Refine Invasive and Aggressive Native Species Control:** Weedy species should be better defined (a list of such species has since been provided by the Washington Conservation District (WCD) through the PAC. In addition:

    - Add spotted knapweed (extremely invasive) control
    - Add to management methods for common buckthorn control which is one of the most critical tasks in forest management.
    - Add to Reed canary grass control methods.
    - Identify methods to keep Boxelder, Quaking aspen, and Eastern red cedar that are prone to being weedy in check.
    - Remove Honeysuckle from the Site.
    - Add to overall forest management including the use of a rotational burn (with follow-up Reed canary grass management) to suppress the growth of nonnative woody species and encourage species diversity.

4.3.2.1 Monitoring

Tiller should provide a funding mechanism for the City to conduct any and all required monitoring at the Site to assess the success of proposed reclamation. Specific criteria for measuring and defining success acceptable to the City need to be established (percent cover requirements for seeded native species, limits on aggressive native species, invasive and exotic species, and so on). Actions that would be taken by Tiller if reclamation were determined not to be successful need to be specified. Conditions under which reseeding, overseeding, and/or spot seeding are required should be identified.

The City should consider extending the establishment and monitoring period to 5-years from 3 years proposed by Tiller. An adaptive management plan should be developed.

4.3.2.2 Incorporate Active Long-term Stewardship

The City should address long-term management and identify related responsible party and funding source for active long-term stewardship of the Site.

4.4 ECONOMIC IMPACTS

Based on evaluations related to visual impacts, land use, and traffic as part of this EIS local tourism is not anticipated to be affected by the Project.

Tiller has identified anticipated labor requirements for the Project. Some of the Site employees required for the Project may or may not result in local hiring. However, the ongoing need for employees and the reduction in costs to haul add-rock to the Scandia Mine could allow Tiller to extend the period of employment for employees.

Tiller has identified anticipated labor requirements for the Project. Under both Alternative 1 and Alternative 3 the number of employees would range from 10 to 25 each working day. The types of jobs would include equipment operators, truck drivers and laborers. Based on the agreements Tiller has in place with various labor unions, the average pay rate for these employees would be $28.50 per hour.

Additional labor would be needed for clearing trees from the site in preparation for mining. Site clearing will employ four to 14 people for a period of approximately three weeks. Based on information from contractors familiar with site clearing the average pay is $20.00 per hour.

Since this Project is replacing add-rock from other sites, it is not anticipated that a change in truck driver employment would occur. As a result, some of the Site employees required for the Project may or may not result in local hiring. However, the ongoing need for employees and the reduction in costs to haul add-rock to the Scandia Mine could allow Tiller to extend the period of employment for employees.

The City of Scandia and Washington County would be capable of providing public and emergency services for the Project under their existing organization and with the exception of providing for monitoring the Project for compliance with permit requirements and any mitigation measures that the City would implement. This monitoring would require a combination of City staff time and consultant time. It is recommended that the City require Tiller to establish a funding mechanism for this additional need.

Property taxes, the value of some properties, and aggregate material removal production tax income have the potential to be affected by the Project as described in the following subsections.

4.4.1 Property Taxes for the Zavoral Site

Most of the Zavoral Site is classified for property tax purposes as Non-Homestead Rural Vacant Land, with an estimated market value of approximately $8,000 per acre. If and when the Site is mined, the classification of the property (the area to be mined including buffer areas) would change to Commercial. The land value is not likely to change, but the property tax classification rate would change. Property taxes are calculated by multiplying the value times the class rate and then multiplying by the local property tax rate.

The class rate for vacant land is 1.25%. Property taxes payable to the City of Scandia on (for example) 100 acres of land valued at $8,000 per acre, or $800,000 total, would be calculated as follows:

$800,0000	X	0.0125	X	0.33557	=	$3,355
Land Value		*Class Rate*		*City Tax Rate, 2011*		*City Tax*

The class rate for commercial land is 1.5% for the first $150,000 of value, and 2% for the remainder. For the same example, the property taxes payable to the City of Scandia would be calculated as follows:

$150,000	X	0.015	X	0.33557	=	$755
$650,000	X	0.02	X	0.33557	=	$4,362
$800,000						$5,117
Land Value		*Class Rates*		*City Tax Rate, 2011*		*Total City Tax*

The difference in taxes payable to the City of Scandia due to reclassification of the property after commencement of mining would be, in this example, is approximately $1,762 per year. Because of how property taxes are levied (a total levy is set, then spread against all the taxable property) this is not additional revenue that would accrue to the City. An increase in taxes payable for the Zavoral Site would have the effect of lowering the tax burden of other property within the taxing jurisdiction. The impact on individual properties would be so small as to not be noticeable.

The above example does not include impacts on the other local property taxing jurisdictions (county, school district, watershed district or others) nor does it include an estimate of the increased collection of the state property tax that is payable for property classified as commercial. A change in classification from vacant land to commercial would also affect calculations for the Metropolitan Area Fiscal Disparities Levy. It is impossible to determine how this might affect the pool overall or Scandia in particular, and any impact would be extremely small.

4.4.2 Nearby Property Value Impacts

AECOM consultant team member BRKW Appraisals, Inc. a real estate valuation services firm, conducted an analysis of the impact that the Project could have on property values within a 1-mile radius of the Zavoral Site **(Figure 16; Appendix X).** This study was completed to determine whether the Project would have any negative impact on property values what was anticipated to be the potential impact area of the Project on property values. This 1-mile radius extends northward to the intersection of TH 95 and Pilar Avenue, westward to near Parish Avenue, southward to near 197th Street and eastward across the St. Croix River to a point approximately $^1/_3$ mile westerly of 280th Street. The area encompasses approximately 3,043 acres of land and water. On the Minnesota side the majority of development involves small acreage home sites (generally 1.5 to 12 acres) along with various larger sites that reach to a maximum size of 115 acres.

This analysis has been made with the **Extraordinary Assumption**[5] that the proposed Project would meet or exceed all MPCA requirements in terms of mining operation. This would be required as part of the permitting process for the Project.

To determine the impact, if any, from the introduction of a gravel mining operation into the area, a study was made of sales of single-family residences within and without gravel mining and sites with perceived environmental hazard areas (i.e. demolition landfill and former superfund site). It is noted that home prices have been declining over recent years due to a variety of economic problems. To avoid the corruption of data from this downturn, single-family home sale activity in the years 2006 and 2007 were selected. This timeframe is a period of market stabilization and change from the rapid increase of property values in the first half of the decade and the sharp declines of the past few years. Based upon this study, it was concluded that a negative impact would most likely occur to property values within, but not beyond, $^1/_4$ mile of the Zavoral Site.

If the question is placed to a perspective property owner as to whether they would prefer living near a gravel mining operation or other residential land use, the answer would invariably be other residential. However, in a property transaction that item becomes one of many factors to be considered such number and size of bedrooms, age/condition, floor plan layout and utility, amenities, and so forth. The sales data contained in this analysis reveals that the market fails to recognize a measurable impact, based on proximity to an existing gravel mine or perceived hazard areas. However, the Zavoral Site has not been operated as a gravel mine for over 20 years. The proposed mining operation has the same effect as the introduction of a new gravel mining operation into an area. The current economic situation includes declining property values. The introduction of a perceived negative factor into this environment can have

[5] The term Extraordinary Assumptions is defined by the Uniform Standards of Professional Appraisal Practice (USPAP) 2010, Page 3 as "an assumption, directly related to a specific assignment, which, if found to be false, could alter the appraiser's opinions and Conclusions.

a stronger impact than if appearing in a growth market where demand is more important. The impact could be reflected in price and/or the time a property remains on the market.

It is logical to assume that the value of properties abutting a new gravel mining operation could be adversely affected. This effect dissipates with distance from the mining operation. It was concluded that the impact is limited to a radius of $^1/_4$ mile from the Site. Within that area an up to 2% potential property value reduction was concluded for properties between the bluff and the St. Croix River. A similar situation would exist on the southern side of the Site where an impact up to 2% impact was estimated, except for the Westphal ownership, which abuts the southern Site boundary of and thus may have a somewhat greater impact. A potential property value reduction of up to 5% potential value loss has been established for this property.

Properties within $^1/_4$ mile to the southwest, west, northwest, and north have the potential of being more exposed to the gravel mining operation. Based on Tiller's proposal, an 8-foot-high berm would be installed along the western boundary. However, this is less of a barrier than that available to the properties to the east and south. After analyzing the situation, it was concluded that an impact of up to 5% would reflect the potential value loss to those properties. No value loss was ascribed to the Fusco property, which is a vacant site that being zoned for commercial use and is not impacted.

In determining the value loss, the Assessor's 2011 Estimate of Market Value was used. Consideration has also been given to the impact of the potential value losses to the real estate taxes from the individual properties. The resulting tax rates were compared with the potential maximum individual value losses to arrive at the potential annual loss of real estate tax income if these losses were actually realized (to all taxing authorities that base the tax amount on property value). This tax income would not actually be lost unless a sale or new assessed value was established. Any property tax "loss" from these individual properties would be redistributed over other properties in Scandia. The potential value losses are concluded as shown in **Table 6.**

The projected negative impact would remain as long as the facility is in operation. The impact would diminish as reclamation occurred, to a level of zero with completion of the successful reclamation.

This analysis presents possible impacts to property values for use in an EIS process. The County Assessor would not prospectively lower property values or related tax rates for groups of properties based on changes that may or may not occur in the future. The values would not be modified unless sales took place or documented appraisal information for individual properties was submitted for County consideration in the valuation process.

Table 6: Property Value-of Potentially Affected Properties

Property Address	Owner	Property Idenficiation No.	2011 Asessor's M. V. For 2012 R.E. Tax	Percent of Potential Value Loss	Potential Value Loss	2011 % Tax Rate	Potential Annual Real Estate Tax Loss
Southeast Sector							
	Zavoral	18-032-19-43-0001	$484,200	2.00%	$9,684	1.01%	$98.23
	Nat. Park Ser.	18-032-19-43-0002/34-0002		0.00%	$0	0.00%	$0.00
20923 Quint	O'Halloron	19-032-19-12-0001	$587,600	2.00%	$11,752	1.03%	$121.05
20853 Quint	Plowman	19-032-19-12-0003	$242,300	2.00%	$4,846	1.00%	$48.34
20921 Quint	Bowlin Family	19-032-19-12-0005	$461,100	2.00%	$9,222	1.01%	$93.47
20919 Quint	Smith	19-032-19-12-0006	$492,400	2.00%	$9,848	1.01%	$99.93
Quint	McClanahan	19-032-19-12-0007/0012	$442,200	2.00%	$8,844	1.01%	$89.14
20789 Quint	Clary	19-032-19-12-0008	$482,900	2.00%	$9,658	1.01%	$98.00
20733 Quint	Fitzpatrick	19-032-19-13-0003/0011	$446,500	2.00%	$8,930	1.01%	$90.31
20699 Quint	Bowin Robert	19-032-19-13-0004/0009	$453,500	2.00%	$9,070	0.99%	$89.90
	Schlingerman L.	19-032-19-13-0005/0006/0010	$448,300	2.00%	$8,966	1.06%	$94.69
20661 Quint	Schlingerman A.	19-032-19-13-0007/24-0017	$172,100	2.00%	$3,442	0.82%	$28.38
- 205th	Clapp, S.	19-032-19-13-0008	$648,400	2.00%	$12,968	1.04%	$135.50
20685 Quinnell	Westphal	19-032-19-21-0002/0003	$380,000	5.00%	$19,000	0.99%	$187.99
		19-032-19-24-0007/0008/0009					
		19-032-19-24-0013/0014					
16797 - 205th	Wallace	19-032-19-24-0015	$157,200	2.00%	$3,144	0.85%	$26.79
	Wurzingler	19-032-19-24-0012	$4,200	2.00%	$84	0.93%	$0.78
20595 Quinnell	Tuenge	19-032-19-24-0011	$156,600	2.00%	$3,132	0.85%	$26.51
20457 Quinnell	Sumerby	19-032-19-13-0001/42-0002	$547,700	2.00%	$10,954	1.00%	$109.62
20455 Quinnell	Eberhart	19-032-19-13-0002	$200,500	2.00%	$4,010	0.99%	$39.69
20525 St. Croix T.	Dietrich	19-032-19-24-0021	$383,400	2.00%	$7,668	0.99%	$75.88
16810 - 205th Ct	Hannah	19-032-19-31-0005	$474,500	2.00%	$9,490	1.00%	$94.60
16775 - 205th Ct	Pary	19-032-19-31-0006	$438,300	2.00%	$8,766	1.00%	$87.38
Southwest Sector							
xxxx St. Croix T.	Scrock	19-032-19-22-0002/0003	$360,800	5.00%	$18,040	0.53%	$95.61
16297 Scandia T.	Fusco	18-032-19-33-0001/0002	$151,000	0.00%	$0	2.42%	$0.00
21060 St. Croix T.	Boesel	18-032-19-44-0001/0003	$342,200	5.00%	$17,110	0.46%	$79.43
16601 Scandia T	Buck	18-032-19-44-0001	$197,300	5.00%	$9,865	0.90%	$88.76
16141 Scandia T	Anderson	18-032-19-43-0010	$444,400	5.00%	$22,220	0.95%	$210.58
16390 - 209th	Herlke	19-032-19-22-0005	$262,900	5.00%	$13,145	0.94%	$123.90
16850 - 209th	Welsh	24-032-20-11-0003	$261,200	5.00%	$13,060	0.95%	$123.43
20939 Quadrant	Fehey	24-032-20-11-0002	$247,400	5.00%	$12,370	1.25%	$154.47
20969 Quadrant	Schwartz	24-032-20-11-0001	$196,200	5.00%	$9,810	1.16%	$114.10
Northwest Sector							
20965 St. Croix T.	Srock	18-032-19-32-0004/23-0002	$325,200	5.00%	$16,260	0.66%	$107.80
21420 St. Croix T	Maguson	18-032-19-32-0002	$392,100	5.00%	$19,605	0.99%	$194.50
16290 Scandia T.	Hendrickson	13-032-20-41-0001	$206,000	5.00%	$10,300	0.77%	$79.40
16240 Scandia T	Wolkerstorfer	13-032-20-41-0004	$368,900	5.00%	$18,445	1.00%	$183.90
16140 Scandia T.	Gilberson	13-032-20-41-0005	$267,400	5.00%	$13,370	0.95%	$126.70
Northeast Sector							
17001 - 220th	Page, G	18-032-19-31-0006	$363,600	5.00%	$18,180	0.96%	$175.37
21565 St. Croix T.	Lundgren	18-032-19-24-0002/13-0003	$252,000	5.00%	$12,600	0.55%	$68.90
	Nat. Park Serv.	18-032-19-42-0003/12-0005	$0	0.00%	$0		
		18-032-19-43-0001/42-0001					
	McGinley	18-032-19-13-0002	$143,200	5.00%	$7,160	1.33%	$95.53
		Totals	$12,885,700		$405,018		$3,758.54
		Rounded to	$12,886,000		$405,000		$3,800.00

4.4.3 Aggregate Material Removal Production Tax

Minn. Stat. § 298.75 provides for the payment of a production tax on aggregate material removal in certain areas of the state, including Washington County and adjoining Chisago County. The production tax is 21.5 cents per cubic yard or 15 cents per ton of aggregate material excavated in the county. The tax is payable when the aggregate material is transported from the extraction site or sold, whichever occurs first. The tax also applies to aggregate that is imported from a Minnesota county that does not impose the tax, or from another state.

The tax is collected by the county auditor. The county may retain up to 5% for administration and the remainder is credited as follows:

- 42.5% to the county road and bridge fund;
- 42.5% to the city or town in which the mine is located, to be expended for maintenance, construction of roads, highways and bridges; and
- 15% to a special reserve fund for restoration of abandoned pits, quarries or deposits located within the county.

The formula for distribution of this tax was made more favorable to cities in 2009. With 2 active sand and gravel mines in the city, Scandia's revenue from the tax was $17,033.85 in 2009 and $13,035.21 in 2010. The forecasted revenue without the Zavoral Project is about $10,000 for both 2011 and 2012. Scandia credits this revenue to its Public Works Department Budget in the General Fund, which pays for all road maintenance expenditures.

Tiller proposes to extract up to 1.2 million tons of aggregate from the Zavoral site. At 15 cents per ton ($180,000) and after deducting 5% for administration, this would generate $171,000 in taxes to be distributed, $72,675 (42.5%) of which would be payable to Washington County, $72,675 (42.5%) of which would be payable to the City of Scandia, and $25,650 to the county's reserve fund for restoration of abandoned pits.

Tiller has indicated that the add-rock material excavated from the Site would replace add-rock currently excavated and hauled from other sites in Chisago County and/or Wisconsin. To the extent that the add-rock replaces material now excavated in Chisago County, the gravel tax paid to Chisago County would be reduced by the amount that would be paid to Washington County for material excavated from the Zavoral site. This would be new revenue to Washington County and to the City of Scandia.

If add-rock material is currently imported by Tiller from Wisconsin to the Scandia Mine, Tiller should already be paying the aggregate tax to Washington County. Replacing this with material excavated in Scandia, at the Zavoral site, would not generate new tax revenue. Because Tiller has not provided a detailed breakdown of the imported material from Wisconsin, nor does it report that information to the county, it is not possible to estimate how much this might reduce the estimate of new aggregate tax revenue to be paid to Washington County and Scandia.

4.4.3.1 Alternative 1 – 5- to 10-Year Operation

After mining is complete, the land classification for the Zavoral Site would likely revert from Commercial to Vacant Land (unless the land is developed for some other use.) The longer the mining operation continues, the longer the property will pay property taxes at the higher commercial rate.

The projected negative effect on nearby properties would remain as long as the facility is in operation. The impact would diminish as reclamation takes place, to a level of zero with completion of the reclamation plan. Thus any affect on property values would occur for a longer period of time under Alternative 1.

Table 7 shows the maximum amount of aggregate tax revenue to be generated annually for each of the alternatives.

4.4.3.2 Alternative 2 – No-Build Alternative

No changes in Zavoral Site property tax would occur. Nearby property values would not be affected. No aggregate tax revenue would be collected for the Zavoral Site.

4.4.3.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Less tax benefit would be realized than under Alternative 1 due to the Site reverting back to the lower-taxed classification more quickly.

The projected negative effect on nearby properties would occur for a reduced period of time under Alternative 3.

Based on the estimated amount of material to be excavated from the Zavoral Site, **Table 7** shows the maximum amount of aggregate tax revenue to be generated annually for each of the Project alternatives. Alternative 3 would be preferred based on a present-value analysis of the stream of payments from the aggregate tax. This assumes that the tax rate (15 cents per ton) would not change over the life of the Project.

Table 7: Estimate of Maximum Annual Aggregate Tax Revenue

		Minimum Tons	Maximum Tons
Alternative 1: 5- to 10-year Operation		120,000	240,000
	Gross Tax	$18,000	$36,000
	Scandia Share	$7,267	$14,535
	Years	10	5
Alternative 2: No-Build		*No Tax Generated*	
Alternative 3: Reduced Timeframe - 3.3- to 5-year Operation		240,000	360,000
	Gross Tax	$36,000	$54,000
	Scandia Share	$14,535	$21,802
	Years	5	3+

4.4.4 Potential Mitigation Measures

The possible impacts to property value and tax base were identified for use in this EIS process. The County Assessor would not prospectively lower property values or related tax rates for groups of properties based on changes that may or may not occur in the future. The values would not be modified

unless sales took place or documented appraisal information for individual properties was submitted for County consideration in the valuation process. The impacts described are speculative and temporary, therefore no mitigation is recommended.

4.5 COVER TYPES

4.5.1 Zavoral Site

4.5.1.1 Affected Environment

According to the MnDNR Ecological Classification System (ECS), ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The Zavoral Site is located entirely in the St. Paul Baldwin Plains and Moraines Subsection of the Minnesota and Northeast Iowa Morainal (MIM) Section.

The MIM is a long band of deciduous forest, woodland, and prairie that stretches nearly 350 miles from Polk County in northwestern Minnesota to the Iowa border. Over $^1/_2$ of this area consists of rugged to hummocky moraines deposited along the eastern margin of the Des Moines ice lobe during the last glaciation. Another $^1/_4$ of the area consists of rolling till or basal till deposited as drumlins. Small sand plains occur locally within the moraines. A rather large sand plain, the Anoka Sand Plain, is present north of the metropolitan area. This level plain is formed from sand deposited by meltwater from the Grantsburg sublobe, a spur of ice emanating from the east flank of the Des Moines lobe (MnDNR 2006).

The presettlement pattern of upland vegetation in the MIM reflects substrate texture and landform topography. These features affected vegetation directly through their influence on moisture and nutrient availability, insolation, and local temperature, and also indirectly through their influence on the frequency and severity of fires. Sandy flat areas were dominated by prairie, savanna, and oak and aspen woodlands. This is especially true of the Anoka Sand Plain and sandy terraces along the major rivers. In these areas, droughty soils and absence of impediments to the spread of fire promoted fire-dependent prairie and woodland vegetation. A large area of prairie, savanna, and oak woodland was also present on gently undulating glacial till in the southern part of the section, adjacent to the extensive prairie lands of western Minnesota. The low-relief landscape in this part of the section afforded few impediments to the spread of fire, including fires that spread into the section from the adjacent prairie region. Woodland and forest dominated sites in the section where fire was uncommon or rare. Fine-textured drift deposited in hummocky moraines supported mesic forests dominated by sugar maple, basswood, American elm, and northern red oak. Even small reductions in fire frequency afforded by streams, lakes, or topographic breaks permitted the formation of forest on finer-textured soils, once formed these forests were highly resistant to burning (MnDNR 2006).

Floodplain and terrace forests were present historically along the valleys of the major rivers, the Mississippi, Minnesota, and St. Croix, and are still prominent today along many stretches of these rivers. Forests of Silver maple occupy the active floodplains, while forests of Silver maple, Cottonwood, Box elder, Green ash, and Elm occupy terraces that flood infrequently. These valleys are also characterized by herbaceous and shrubby river shore communities along shorelines and on sand bars, and in some areas by cliff communities on steep rocky river bluffs. Closed depressions that pond water in the spring provide habitat for open wetlands such as marshes, wet meadows, shrub swamps, and wet prairies.

Peatlands are uncommon in the section and usually develop following formation of sedge or moss mats over sediments in former lake basins (MnDNR 2006.).

4.5.1.1.1 Plant Communities

A variety of upland and wetland plant communities, maderate cliffs, and former gravel mining areas were documented during the June/July 2009 field surveys of the Zavoral Site. Of the 114 acres surveyed, approximately 64 acres are proposed to be mined and reclaimed. The existing cover types within the Zavoral Site are described below **(Figure 17**).

Areas from the bluff line down (east) to the St. Croix River are relatively undisturbed White-pine hardwood and Maple-Basswood forests that run contiguously from the north and south property boundary and extend off-site in both directions. These forest types are of a high to moderate ecological quality with a diversity of tree species found throughout including White pine (*Pinus strobus*), Red oak (*Quercus rubra*), White oak (*Quercus alba*), Paper birch (*Betula papyrifera*), Sugar maple (*Acer saccharum*), Basswood (*Tilia americana*), Ironwood (*Ostrya virginiana*), Bitternut hickory (*Carya cordiformis*), Black ash (*Fraxinus nigra*), Butternut (*Juglans cinerea*), Hackberry (*Celtis occidentalis*), American elm (*Ulmus americana*), Big-tooth aspen (*Populus grandidentata*), and Blue beech (*Carpinus caroliniana*)

The forested area below the bluff line is included within an MnDNR designated Regionally Significant Ecological Area (RSEA) of the Twin Cities. The classification of RSEA denotes the presence of a high-quality plant community with the potential to have suitable habitat for rare species located within it. On the Zavoral Site, the RSEA is composed primarily of the White pine-hardwood forest along the steep east-facing bluff, Maple-Basswood forest within the southernmost ravine system, and Black ash swamp seepage subtype located along the eastern boundary of the Site within ravine systems adjacent to the railroad tracks. The Maple-Basswood forests within the survey area showed evidence of moderate impacts from invasive earthworms, such as reduced leaf litter and reduced leaf mold (likely due to earthworm herbivory), reduced herbaceous species cover in the ground layer, soil compaction, and soil erosion.

At the time of the survey, the majority of upland area located above the bluff (west) had been previously used for sand and gravel mining and was currently inactive. This part of the Zavoral Site is dominated by altered/nonnative short and long grass, altered/nonnative short and long grass with sparse trees, and altered/nonnative forest and woodland plant communities. Many small to medium sized spoil piles occur throughout this area and are now revegetating with a mix of native and nonnative grasses and forbs including primary and secondary noxious weeds. The Minnesota Department of Agriculture defines certain plants as noxious weeds because they are injurious to public health, the environment, public roads, crops, livestock, and other property (MDA no Date).

The primary noxious weeds found in this cover type include Poison ivy (*Toxicodendron radicans*), Bull thistle (*Cirsium vulgare*), and Canada thistle (*Cirsium arvense*). Secondary noxious weeds found in this plant community include Giant foxtail (*Setaria faberii*), Spotted knapweed (*Centaurea maculosa*), Common lambsquarters (*Chenopodium album*), Common milkweed (*Asclepias syriaca*), Quackgrass (*Agropyron repens*), and Annual ragweed (*Ambrosia artemisiifolia*). Other dominant vegetation found within the Zavoral Site includes young Cottonwood (*Populus deltoides*) and White pine (*Pinus strobus*) saplings and trees, which are typical early succession species (i.e. species that are the first to grow back

after disturbance has taken place). Very little potential habitat for the rare species was found in this portion of the Zavoral Site.

Two Black ash swamp seepage subtype wetlands were documented within the property boundary (**Figure 17**). These Black ash-dominated plant communities were assessed to be of moderate ecological quality using the MnDNR's plant community assessment protocols. Steep ravine systems with seepage discharge areas support these streams and wetlands. Seepage wetlands and streams on the property support a diversity of native plant species and provide potential habitat for Bog blue grass (*Poa paludigena*),one of the rare species with potential to occur on the Site;. However, no rare species were located in the Black ash seepage wetland habitats during the surveys. Along the eastern edge of the property in two ravine systems are Black ash swamp seepage subtype wetlands that are dominated by Black ash, Yellow birch (*Betula allegheniensis*), Skunk cabbage (*Symplocarpus foetidus*) and Spotted touch-me-not (*Impatiens capensis*) (**Figure 17**).

Maderate cliff areas were found mainly in the northern half of the Zavoral Site (**Figure 17**). Due to the inaccessibility (i.e. steepness) of these cliff areas, many of the bedrock outcrops have not been directly disturbed by past land use practices. Herbaceous and woody plant species typical of moist cliff habitats are found in these areas, including large populations of Nodding trillium (*Trillium cernuum*), Blue cohosh (*Caulophyllum thalictroides*), Smooth cliff-brake (*Pellaea glabella*), Bulbet fern (*Cystopteris bulbifera*), Wild columbine (*Aquilegia canadensis*), Sugar maple, Black ash, and several moss and liverwort species.

4.5.1.1.2 Wetland Determinations

AECOM consultant team member Stantec, Consulting (formerly Natural Resource Consulting; NRC), conducted a wetland determination at the Site in May 2010 (**Appendix X**). Wetland delineations were conducted using methods described in the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Environmental Laboratory 1987), subsequent guidance documents (USACE, 1991, 1992) and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (USACE 2009). According to procedures described in the 2009 Manual, areas that under normal circumstances reflect a predominance of hydrophytes (water-loving vegetation), hydric soils, and wetland hydrology (e.g., inundated or saturated soils) are considered wetlands. No wetlands were identified within the proposed 64-acre mining and reclamation area during wetland determinations conducted in May 2010.

At PAC Meeting 2, committee members identified the possibility of water use at the proposed Zavoral Site impacting the black ash seeps (Section 4.8) as a concern. PAC members requested that a wetland determination be conducted to establish a baseline boundary for the black ash seeps. Tiller subsequently conducted a wetland determination for the entire 114-acre Site, which included the Black ash seeps, in September and October 2010 (**Appendix X**).

Three wetland areas (approximately 2.98 acres) were identified and delineated outside of the proposed mining and reclamation area (**Figure 18**). Wetland classifications follow Shaw and Fredine (1971) and Cowardin et al. (1979) and are summarized below.

- Wetland A is classified as part palustrine emergent saturated wetland (PEMB; Circular 39 Type 2) and part palustrine forested deciduous saturated wetland (PFO1B; Circular 39 Type 7).

- Wetland B is classified as part palustrine emergent saturated wetland (PEMB; Circular 39 Type 2) and part palustrine forested deciduous saturated wetland (PFO1B; Circular 39 Type 7).

- Wetland C is classified as part palustrine emergent saturated wetland (PEMB; Circular 39 Type 2) and part palustrine forested deciduous saturated wetland (PFO1B; Circular 39 Type 7)

No jurisdictional wetland would be directly impacted by the proposed mining and reclamation activities. Section 4.3 of this document addressed the potential for indirect hydrogeologic impacts.

4.5.1.2 Impact Analysis

4.5.1.2.1 Alternative 1 – 5- to 10-Year Operation

AECOM conducted a GIS analysis to calculate the cover types that currently exist within the 114-acre Zavoral Site. **Table 8** provides the approximate number of acres of each cover type that currently exist on the Site (**Figure 17**) and the approximate number of acres of each cover type that would exist after the proposed mining activities are completed and the Zavoral Site is reclaimed (**Figure 15).** For a detailed discussion of the cover types that are proposed post-reclamation refer to Section 4.3.

Table 8: Existing and Post-Reclamation Cover Types for the Entire 114-Acre Zavoral Site

Estimated acreage of cover types for the entire 114-acre Zavoral Site under existing conditions (Before) and after reclamation (After):

	Before	After		Before	After
Types 1-8 wetlands	2.98	2.98	Altered Nonnative Long Grasses	1.45	0
White Pine Hardwood Forest	26.53	24.26	Altered Nonnative Short Grasses	2.94	2.94
Maple Basswood Forest	6.63	6.42	Altered Nonnative Long Grasses with Sparse Trees	17.00	4.25
Cropland	7.51	4.11	Altered Nonnative Short Grasses with Sparse Trees	31.14	0.28
Maderate Cliff	1.38	1.38	Lawn/landscaping	0	0
Altered Nonnative Forest	6.01	4.41	Impervious Surfaces	1.04	2.22
Altered Nonnative Deciduous Woodland	7.77	0.08	Mesic Prairie	0	18.99
Dry Prairie	0	40.06	Other (Describe)	0	0
Black Ash Swamp	1.62	1.62	TOTAL	114.00	114.00

AECOM conducted a GIS analysis to calculate the cover types that currently exist within 64-acre mining and reclamation area. **Table 9** provides the approximate number of acres of each cover type that currently exist on the Site (**Figure 17)** and the approximate number of acres of each cover type that would exist after the proposed mining activities are completed and the mining and reclamation area is reclaimed (**Figure 19**). For a detailed discussion of the cover types that are proposed post-reclamation refer to Section 4.3.

Table 9: Existing and Post-Reclamation Cover Types for the 64-Acre Mining and Reclamation Area

Estimated acreage of cover types for the 64-Acre mining and reclamation area under existing conditions (Before) and after reclamation (After)

	Before	After		Before	After
Types 1-8 wetlands	0	0	Altered Nonnative Long Grasses	1.55	0
White Pine Hardwood Forest	6.72	3.42	Altered Nonnative Short Grasses	0	0
Maple Basswood Forest	0.21	0	Altered Nonnative Long Grasses with Sparse Trees	13.03	0
Cropland	3.40	0	Altered Nonnative Short Grasses with Sparse Trees	28.18	0
Maderate Cliff	0	0	Lawn/landscaping	0	0
Altered Nonnative Forest	1.49	0	Impervious Surfaces	0	1.17
Altered Nonnative Deciduous Woodland	7.06	0	Mesic Prairie	0.56	18.97
Dry Prairie	1.80	40.44	Other (Describe)	0	0
			TOTAL	64.00	64.00

In the approximately 9-acre area not disturbed by earlier mining, the Project would result in the loss of:

- 5.2 acres of White Pine Hardwood Forest
- 0.2 acre of Maple Basswood Forest
- 3.4 acres of cropland

The Tiller biological assessment for the Site described the Maple-Basswood Forest as showing evidence of moderate impacts from invasive earthworms, such as reduced leaf litter and reduced leaf mold, reduced herbaceous species cover in the ground layer, soil compaction, and soil erosion. The 5.4 acres of White Pine Hardwood Forest and Maple Basswood Forest that would be lost due to the proposed Project would be reclaimed to a combination of mesic prairie, dry prairie, and White Pine Hardwood Forest. Section 4.3 of this document provides additional detail regarding the reclamation plan.

Approximately 55 acres of altered nonnative cover types would be impacted by mining activities. Approximately 40.8 acres of White Pine Hardwood Forest, Maple Basswood Forest, Black Ash Swamp (seepage subtype), maderate cliff, wetland, and cropland located outside the proposed mining limits would not be directly affected by mining activities.

Although the proposed mining would involve the loss of some wildlife habitat, approximately 86% (55 acres) of the impact would occur in previously-mined areas that remain unreclaimed after previous mining on the Site and currently provide low-quality wildlife habitat, primarily for common, disturbance adapted edge species. These species would be temporarily displaced during mining activities, but many of the species would be expected to return to the area once mining and reclamation activities are complete. Since no nesting or roosting areas were identified, the raptors that were observed at the Site not be expected to be negatively affected due to the large size of the areas that they use.

The maderate cliffs and the Black Ash Swamp (seepage subtype) wetlands are located along the eastern edge of the property boundary outside the mining and reclamation limits. They are part of a MnDNR designated RSEA for the Twin Cities. At multiple PAC meetings committee members voiced concern over whether the use of the onsite well for dust control would cause ground water impacts that would negatively impact the maderate cliffs and Black ash swamp seepage subtype wetlands. The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers. The shallow aquifers at the Site were not influenced by pumping in the deeper aquifer and the projected use of water from the Zavoral Site Well for dust control purposes would not be expected to impact these regionally significant features.

Mining would increase the amount of internal surface drainage at the Site. The Project would improve internal drainage and infiltration, resulting in improved base flow conditions to these areas. This additional water would add to the base flow and reduce the surface water runoff that currently occurs on a portion of the Site. The increase in the base flow is not expected to be significant, but would provide some an incremental increase in the groundwater flow into the seeps and creeks. The decrease in surface runoff should decrease sediment loading to the creeks which in turn should benefit the creeks. Therefore, the maderate cliffs and the Black ash swamp seepage subtype wetlands would not be directly or indirectly impacted by the Project.

4.5.1.2.2 Alternative 2 – No-Build Alternative

No mining or reclamation activities would take place and there would be no effect to fish, wildlife, or ecologically sensitive resources within the Site. The loss of woodland and cropland not previously affected by mining and temporary displacement of wildlife would not occur. The gravel resource would not be used. No reclamation activities would take place on the Site and vegetation succession would be expected to continue to occur.

4.5.1.2.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Impacts to existing cover types would be the same under Alternative 3 as under Alternative 1. The loss of forestland and cropland would occur. The compressed timeframe proposed under Alternative 3 would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and allow for reclamation of habitat to begin sooner.

4.5.2 Potential Mitigation Measures

Mitigation measures related to cover types are described under Section 4.3.2. The key component is that reclamation is monitored and managed to ensure that it is successful in order for suitable revegetation and wildlife habitat development to result.

Additionally, Section 4.8.2 identifies that monitoring of groundwater use and specific surface water features and the black ash seep wetland subtype be monitored during the operation of the Site.

4.5.3 Scandia Mine

The cover types within the Scandia Mine would not change as a result of the Project. Add-rock from the Zavoral Site would be hauled to the Scandia Mine and would be unloaded over an active face where it

would be stored until needed. It would not be stockpiled in individual stockpiles over the Mine floor. This practice of storing the add-rock material over the active face would continue regardless of the add-rock source. This activity would not open any areas to be mined prematurely nor would it change or disturb additional areas as storage takes place over the active mining area.

4.6 FISH, WILDLIFE AND ECOLOGICALLY SENSITIVE RESOURCES AND THREATENED AND ENDANGERED SPECIES

4.6.1 Zavoral Site

4.6.1.1 Affected Environment

A query of the Minnesota Department of Natural Resources (MnDNR) Natural Heritage Information System (NHIS) identified seventy 70 historic records of rare plants, animals, fishes, reptiles, mussels, and native plant community occurrences within a 1-mile radius of the Site. Of these 70 historic records, the MnDNR Natural Heritage Program staff determined that the following state-listed species would have the potential to occur on the Site and, if present, would have the potential to be affected by Project activities:

- Kitten-tails (Besseya bullii; Minnesota Threatened)
- Bog blue grass (Poa paludigena; Minnesota Threatened)
- American ginseng (Panax quinquifolius; Minnesota Special Concern)
- Red-shouldered hawk (Buteo lineatus; Minnesota Special Concern)
- Blanding's turtle (Emydoidea blandingii; Minnesota Threatened),
- Several threatened and endangered species of mussels occurring within the St. Croix River.

The MnDNR Natural Heritage Program staff, in a letter dated July 21, 2008 recommended that a rare species and significant natural features survey be conducted on the Site to determine the presence or absence of these state-listed species. As a result, a biological assessment was completed for the entire 114-acre property by a MnDNR-approved surveyor employed by CCES. No surveys were conducted for threatened and endangered mussel species within the St. Croix River because Project activities are not expected to affect these species.

The biological assessment was conducted in June 12 through July 2 of 2009. Field surveys of the 114-acre property were conducted to identify potential habitat for the rare species likely to occur on the property. Once potential habitats (i.e. specific habitats that have the potential to support rare species) were identified and located, thorough and detailed surveys of these habitats were completed to determine the presence of potential rare species.

None of the state-listed species identified in the MnDNR's July 21, 2008 letter or from the NHIS query were detected. However, a total of three raptors were observed and recorded during the call-response surveys for Red-shouldered hawks within the Site during the May 2010 surveys, including two Red-tailed hawks (*Buteo jamaicensis*) and one Bald eagle (*Haliaeetus leucocephalus*, Minnesota Special Concern).

Also, a previously undocumented population of Butternut trees (*Juglans cinerea*; Minnesota Special Concern) was detected and documented as part of the CCES survey. A point location was collected with a submeter accuracy global positioning system (GPS) and incorporated within GIS using ArcGIS 9.2 for each Butternut tree location (**Figure 21)**.

Of all of the individual Butternut trees detected throughout the property, one tree appears to be healthy and disease-free with all other individuals affected by an introduced (i.e. nonnative) fungal disease known as Butternut Canker (*Sirococcus clavigignenti-juglandacearum*). It is estimated that this fungal disease has killed 80–90% of the Butternut trees in some regions of the US and has caused a steep decline in Butternut populations of larger diameter at breast height trees of greater than 12 inches throughout Minnesota (Purdue University 2009). Butternut is currently listed as Special Concern by the MnDNR and therefore does not require avoidance, protection, or mitigation for taking of the plant species under Minn. Stat. § 84.0895 (CCES December 2009).

The single Butternut tree that appears to be disease free is also the largest Butternut surveyed on the property and is located outside of the mining and reclamation area at the base of the bluff above the railroad tracks in the central part of the property and is relatively isolated from the other individuals found elsewhere on the property.

4.6.1.2 Survey Methods

4.6.1.2.1 Vegetation Survey Methods

Meander surveys to document vegetation and the presence of rate species were conducted from June 12 through July 2 of 2009 (CCES December 2009). The following natural habitats and land cover types were surveyed and documented on the Site **(Figure 17).**

- White pine-hardwood forest
- Black ash swamp seepage subtype
- Maple-Basswood forest
- Maderate cliff with forest
- Altered nonnative grasslands, woodlands, and forests, as well as former gravel mining areas

A detailed description of each land cover type is found in Section 4.5.

4.6.1.2.2 Rare Plant Survey Methods

During June 12 through July 2, 2009, all potential areas of the Site were surveyed for the presence of state-listed plant species, with a focus on Kitten-tails (*Besseya bullii*; Minnesota Threatened), and Bog blue grass (*Poa paludigena*; Minnesota Threatened). State-threatened species are protected under Minn. Stat. §84.0895, Protection of Endangered and Threatened Species. Surveys were also conducted for American ginseng (*Panax quinquifolius*; Minnesota Special Concern), because this species is cited in the MnDNR's July 2008 letter.

Surveys for Kitten-tails concentrated on the forested edges and woodland areas throughout the Zavoral Site where native vegetation was present. Suitable habitat for Kitten-tails typically is oak savanna, dry prairie, and oak woodland within the bluffs and terraces of the St. Croix, Mississippi, and Minnesota River valleys. The optimal time to survey for Kitten-tails is late May through June in Minnesota, when Kitten-tails are in flower and/or have set seed.

Surveys for Bog bluegrass focused on the Black ash swamp communities occurring along the eastern boundary of the Zavoral Site. Bog bluegrass is most often found in forested and shrub-dominated wetland habitats that are fed by groundwater seeps and are dominated by Black ash and Yellow birch. The optimal time to survey for Bog bluegrass is late June through mid-July in Minnesota, when Bog bluegrass has set seed.

Surveys for American ginseng focused on the White pine-hardwood forest and Maple-Basswood communities found in the eastern and southern parts of the Site where a previously documented population was found in 1988 by a MnDNR botanist. American ginseng is typically found in mature hardwood forests with little competition in the ground layer, which is typical of the hardwood forests located within the Site. A historic record in the MnDNR's NHIS notes that "a few" American ginseng plants were located on the property in September 1988 by a MnDNR staff botanist on an east-facing forested slope, and that the long-term viability of this small population was estimated at "fair to poor." Special effort was made to attempt to relocate the historic Ginseng population discovered on the subject property in 1988 along the east-facing White pine-hardwood forest slope where it was presumed to be located. Surveys found no populations in this area or elsewhere on the Site.

A previously undocumented rare plant population was detected and documented on the subject property. Butternut (*Juglans cinerea*; Minnesota Special Concern) was identified. A point location was collected with a submeter accuracy global positioning system (GPS) and incorporated within GIS using ArcGIS 9.2 for each Butternut tree location (**Figure 21)**.

Butternut was the rare species found during the survey. No occurrences of Kitten-tails, Bog blue grass, or American ginseng were found during the survey.

4.6.1.2.3 Red Shouldered Hawk Survey Methods

Red-shouldered hawk (*Buteo lineatus*; Minnesota Special Concern) surveys were conducted on several occasions at the Site. The first surveys were conducted during June of 2009. During 2009, surveys were conducted along three transects within forested habitats associated with the river and bluffland by listening for territorial Red-shouldered hawk calls. Suitable habitats were scanned for nest trees, adult hawks, potential nest trees, or young near potential nesting sites. Scanning took place for 8 minutes at every survey location.

At the request of AECOM, additional call-response surveys for red-shouldered hawks at the Site conducted to better ensure appropriate seasonal coverage. The surveys were repeated, for 2 days between May 22 and May 28, 2010, on March 29, 2011, and on April 12, 2011. The surveys covered the timeframe when adults would be expected to establish nesting sites and territories. The purpose of the call-response surveys was to assess the presence or absence of Red-shouldered hawks and active nest sites. Surveys were conducted to elicit a response within a ¼-mile radius of the survey points/transects within the 114-acre Site. Broadcast call-response surveys were conducted according to survey

techniques described by Iverson and Fuller (1991), McLeod (1996), and McLeod and Andersen (1998). Red-shouldered hawk calls were broadcast at 22 points **(Figure 21; Table 10),** located at approximate 100-meter (0.06-mile) intervals along two survey transects within the property. Two survey transects were used to account for major topographic variations (bluff top/river bottom) and habitat (open herbaceous/forested) variations within the subject property **(Figure 21).** The surveys covered the expected timeframe when adults would be establishing nesting sites and territories. Surveys took place during daylight hours (½ hour after sunrise to ½ hour before sunset) and were not conducted during adverse weather conditions, such as heavy rain or high winds (CCES May 2011).

Pre-recorded Red-shouldered hawk calls were played at each point using a portable digital audio (i.e., MP3) player and a handheld megaphone. The output of the megaphone was set to between 100 and 110 decibels at 1 meter from the source using a calibrated sound-level meter (McLeod 1996). The Red-shouldered hawk call broadcast was from the Stokes Field Guide to Bird Songs of Eastern and Central North America (Elliot et al. 1997). During call broadcasts, the megaphone was held at a height of approximately 1.5 meters and the megaphone was rotated 120 degrees between each 20 second broadcast. Each call was played three times consecutively at each point, with an observer turning 120 degrees for each call, such that the full 360-degree circumference was covered. Observers watched for flying hawks and listened for vocalized responses for 4 minutes immediately following the call broadcast. All members of the Order Falconiformes (e.g., hawks, eagles, vultures and falcons) seen or heard during the survey were recorded. The locations of any response, both visual and auditory, were recorded in field notes. When flying birds were observed, the approximate direction of flight was also noted. While walking between points, observers recorded any raptor activity and scanned the forested areas for potential nests. The dominant habitat/plant community type was recorded at each survey point and is consistent with the 2009 land cover classification assessment of the Zavoral Site. The survey was conducted along two transects, each with 11 listening points **(Figure 20).** Listening points were located with a GPS, and were transposed onto digital orthophotographs using ArcGIS™ 9.2 GIS software (CCES May 2011). **Table 10** summarizes the raptors detected during 2010 and 2011 surveys.

None of the state-listed species identified in the MnDNR's July 21, 2008 letter or from the NHIS query were detected. However, a total of three raptors were observed and recorded during the call-response surveys for Red-shouldered hawks within the Site during the May 2010 surveys, including two Red-tailed hawks (*Buteo jamaicensis*) and one Bald eagle (*Haliaeetus leucocephalus*, Minnesota Special Concern).

4.6.1.2.4 Blanding's Turtle Survey Methods

A survey was conducted to determine the presence of Blanding's turtle (*Emydoidea blandingii; Minnesota threatened.*) Blanding's turtle surveys were conducted in June. A meander survey was conducted on 8 dates in June within potential habitats that could support Blanding's turtles and/or turtle nesting sites to determine the presence of Blanding's turtle on the Site. The month of June is the optimal phenological period to survey for Blanding's turtles along the St. Croix River valley in Minnesota, as turtles are mobile and actively breeding and nesting at this time of the season. During Blanding's turtle meander surveys, ecologists surveyed for the presence of mature and immature Blanding's turtles (and other turtle species) within potential habitats throughout the entire 114-acre Site. Furthermore, ecologists surveyed for evidence of turtles (e.g. turtle tracks in sand and along roads), and evidence of turtle nesting (e.g. turtle nesting sites, predated nests or eggs). No occurrences of Blanding's turtles were detected during the survey.

Table 10: Summary of Raptors Detected during the 2010 and 2011 Surveys

Broadcast Point	Dominant Habitat Type [From 2009 MLCCS Land Cover Survey]	Number and Species of Birds Observed			
		Survey 1 (May 25, 2010)	Survey 2 (May 28, 2010)	Survey 1 (March 29, 2011)	Survey 2 (April 12, 2011)
1A	Maple Basswood Forest/ Road Edge	NR	NR	NR	NR
1B	Maple Basswood Forest	NR	NR	NR	NR
1C	White Pine Hardwood Forest	NR	NR	NR	NR
1D	Altered Nonnative Short Grasses with Sparse Trees	1 Red-Tailed Hawk (V/A)	NR	NR	NR
1E	Altered Nonnative Short Grasses with Sparse Trees	NR	NR	NR	NR
1F	Altered Nonnative Deciduous Woodland	NR	NR	NR	NR
1G	Altered Nonnative Short Grasses with Sparse Trees	NR	NR	NR	NR
1H	Altered Nonnative Short Grasses with Sparse Trees	1 Red-Tailed Hawk (V/A)	NR	NR	NR
1I	Altered Nonnative Short Grasses with Sparse Trees	NR	1 Bald Eagle (V)	NR	NR
1J	Altered Nonnative Forest	NR	NR	NR	NR
1K	Altered Nonnative Short Grasses	NR	NR	NR	NR
2A	Maple Basswood Forest	NR	NR	NR	NR
2B	White Pine Hardwood Forest/Ravine	NR	NR	NR	NR
2C	Black Ash Seepage Swamp Edge	NR	NR	NR	NR
2D	White Pine Hardwood Forest	NR	NR	NR	NR
2E	White Pine Hardwood Forest	NR	NR	NR	NR
2F	White Pine Hardwood Forest /Ravine	NR	NR	NR	NR
2G	White Pine Hardwood Forest	NR	NR	NR	NR
2H	White Pine Hardwood Forest	NR	NR	NR	NR
2I	White Pine Hardwood Forest /Stream	NR	NR	NR	NR
2J	White Pine Hardwood Forest	NR	NR	NR	NR
2K	White Pine Hardwood Forest	NR	NR	NR	NR

NR = no response, (V) = Visual Observation, (A) = Auditory Observation

4.6.1.3 Impact Analysis

4.6.1.3.1 Alternative 1 – 5- to 10-year Operation

No threatened or endangered species were found during surveys conducted on the Zavoral Site or are known to exist on the Site. Therefore, no impacts to threatened or endangered species would occur as a result of Alternative 1. A previously unknown population of the Minnesota special concern species Butternut was found on the Zavoral Site.

A total of 33 individual Butternut trees were identified within the 114-acre Zavoral Site **(Figure 21).** However, 32 of the Butternut trees identified are infected with Butternut Canker. Only one Butternut tree appears to be healthy and disease free. The healthy Butternut tree would not be affected by mining and

reclamation activities and is shown in **Figure 21**. The remaining infected 32 butternut trees would be removed from the Zavoral Site to minimize further spread of the disease to the remaining healthy Butternut tree on-site and any other trees nearby. Currently, removal of infected trees is the only method to control the spread of Butternut canker since there are no chemical treatments are available for use to control the destructive fungus (CCES May 2011).

Although the proposed mining would involve the loss of some wildlife habitat, approximately 86% (55 acres) of the impact would occur in previously-mined areas that remain unreclaimed after previous mining operations on the site and currently provide low-quality wildlife habitat, primarily for common, disturbance adapted edge species,. These species would be displaced during mining activities, but many of the species would be expected to return to the area once mining and reclamation activities are complete.

4.6.1.3.2 Alternative 2 – No-Build Alternative

The No-Build Alternative would not affect threatened or endangered species, threatened or endangered species habitat, or other ecologically sensitive resources within the Site. No mining or reclamation activities would take place within the Site.

4.6.1.3.3 Alternative 3 – Reduce Timeframe

Impacts to threatened and endangered species and other ecologically sensitive resources resulting from Alternative 3 would be the same as for Alternative 1. The difference between Alternative 1 and Alternative 3 is the timeframe over which the impacts would occur. Under Alternative 3, which is the compressed timeframe, mining activity would be required either more frequently or for longer durations, or a combination of both, in order to bring the project to completion within the 3.3 – to 5-year timeframe. The compressed timeframe proposed under Alternative 3 would have the advantage of reducing the length of time that wildlife is displaced from the site due to mining activities and allow for reclamation of habitat to begin sooner.

4.6.2 Potential Mitigation Measures

Mitigation measures related to cover types are described under Section 4.3.2. The key component is that reclamation is monitored and managed to ensure that it is successful in order for suitable revegetation and wildlife habitat development to result.

Additionally, Section 4.8.2 identifies that monitoring of groundwater use and specific surface water features and the black ash seep wetland subtype be monitored during the operation of the Site.

4.6.3 Scandia Mine

Operations at the Scandia Mine would not change as a result of bringing add-rock material from the Zavoral Site to the Mine. As a result, there would be no change in the effect on fish, wildlife, and vegetation at the Scandia Mine would not change as a result of the Project.

4.7 PHYSICAL IMPACTS ON WATER RESOURCES

4.7.1 Zavoral Site

4.7.1.1 Affected Environment

4.7.1.1.1 Site Drainage

The Site has a total area of 63.6 acres, 52 acres that have no off-site discharge (is internally drained) and 11.6 acres that discharge off-site to three separate tributaries, all of which drain to the St. Croix River **(Figures 22 and 23)**. All off-site drainage originates in perimeter areas of the Site along the northern, eastern, and southern Site boundaries. The north perimeter watershed, which is 3.43 acres in size, drains to Zavoral Creek, and is partially composed of land in the scenic easement that is part of the St. Croix River District. A 2.19-acre area discharges to the unnamed creek, named Middle Creek in this EIS. The remaining 5.97 acres that drain off-site discharge to the South Creek, as named for this EIS. The watersheds discharging off-site have slopes ranging from 2% to 25% within the mining limits. In comparison, slopes along adjacent areas of the St. Croix River escarpment range up to 100% or higher. The remaining 82% of the Site, runoff is trapped within depressions (internally drained) and does not leave the Site.

The affected environment includes areas downstream of the externally draining perimeter watersheds and the internally drained area. Areas downstream of the Site include steep escarpment areas adjacent to the St. Croix River, small tributaries that either traverse the escarpment or originate in the escarpment. These small tributaries have perennial flow starting near the base of the escarpment, supported by springs occurring there. Above the springs, there is flow in the tributaries during and shortly after periods of significant rain or snow melt. The small tributaries have steep gradients, flow velocities in them would be expected to be relatively fast and erosive as a result. Furthermore, the tributaries discharge to the St. Croix River, a very large stream compared to the tributaries. The areas in the St. Croix River that are subject to Project impacts are relatively small areas near the point where the tributaries discharge to the river. These small areas would be associated with locations where the relatively high velocity of the small tributary inflow is dissipated in the St. Croix River.

Short duration flow measurements were made for Zavoral Creek during the course of the EIS preparation. Other than that, no field data was collected. Information was developed from existing topographic mapping and other existing data, such as soils maps, that was used for the analysis of water resources.

Potential effects of the Project on water resources were investigated by analyzing Site runoff rates during operation and after reclamation, and then comparing these rates to existing conditions. The computer program XPSWMM was used for the analysis of existing conditions, during mining and post-operation conditions to estimate the flows discharged from the Site to Zavoral Creek, Middle Creek, and South Creek. Peak runoff rates for the 2-year, 10-year and 100-year 24-hour duration storm events (2.8, 4.2 and 5.9 inches of rain respectively were estimated. The analysis included 2-yr, 10-yr, and 100-yr recurrence interval 24-hour storm events for the discharges to Zavoral, Middle, and South Creeks **(Table 11).**

Table 11: Peak Off-Site Discharge Rates for Existing Conditions (24-hour Storms)

	Storm Recurrence Interval		
	2-year	10-year	100-year
Discharge to Zavoral Creek (cfs)	1.9	8.3	18.7
Discharge to Middle Creek (cfs)	0.7	2.5	5.4
Discharge to South Creek (cfs)	2.4	10.0	23.4

For the areas of the Site that are internally drained, all runoff infiltrates within depressions and becomes groundwater. The three creeks that the Site discharges to are all considered wetlands downstream of the Site, but only have perennial flow downstream of springs originating along the base of the St. Croix River escarpment. Typically there is flowing water present in all three creeks downstream of the springs with depths ranging from two to six inches (CCES January 2011). Upstream of these springs the creeks only have flowing water during and shortly after storm events or during snow melt periods.

Zavoral Creek, which has a total watershed area of approximately 1,500 acres, was gauged downstream of the Site by the WCD from June 2010 to November 2010 just upstream of a driveway culvert approximately 400 feet upstream of the St. Croix River. During this period Zavoral Creek averaged a depth of 1.4 inches and a flow rate of 0.3 cfs. The data shows the creek flowing steadily with several peaks in flow in response to rain events throughout the recording period, with no peak lasting more than 2 hours. Rain Gauge Station 212881 of the MnDNR State Climatology Office, located on Forest Lake approximately 8 miles west of the Site, recorded over an inch of rainfall on the days containing the largest peaks in flows. The Middle Creek and South Creek watersheds are approximately 400 and 300 acres in size, respectively. Based on the Zavoral Creek gauge, Middle Creek, and South Creek would also have shallow perennial flows downstream of springs occurring at the base of the escarpment, short duration peak flows during large storm events or snow melt and areas with no perennial flow upstream of the springs.

On the St. Croix River, the nearest stream gauge is the U. S. Geological Survey (USGS) gauge 05340500, St. Croix River at St. Croix Falls. This gauge is located 18.7 miles upstream of the Site and has a watershed of 6,240 square miles, over 340,000 times greater than the existing watershed areas draining off-site at the Site. The average flow at this gauge over the 104 years on record is 3,610 cfs. Using a flow duration curve created from daily flows from 1902 to 2011, approximately 99% of the flows recorded at this gauge are above 800 cfs and 35% of flows recorded are above the average of 3,610 cfs with the highest flow of 60,900 cfs recorded on April 25, 2001.

Potential geologic hazards are related to the elevation relief between the Zavoral Site and the St. Croix River and the erodible nature of the soil. The surface soils consist of highly erodible granular materials. These soils are generally stable unless water is introduced. Surface water drainage is the primary source of water that could lead to erosion and soil transport.

Existing on-site storage capacity for capturing and infiltrating stormwater was calculated by delineating the topographic depressions within the Site and using existing topographic mapping. The existing on-site storage capacity was calculated to be approximately 78.1 acre-feet. A 100-year recurrence interval 24-hour duration storm event at this location is 6.1 inches. This equates to a volume of 26.4 acre-feet of

runoff assuming all rain becomes stored in a depression and not lost to evapotranspiration or interception by vegetation. The existing depression areas are depicted on **Figure 23**. The analysis of the capacity for capturing and infiltrating stormwater was completed on the basis of potential overflow point **(Table 12),** of which the Site has three. The other five depression areas would discharge internally to the three listed in **Table 12**, the flow paths are shown in **Figure 23**.

Table 12: Existing On-Site Stormwater Storage

Depression Area	Overflow Elev. (ft)	Max Stage 100-year event (ft)	Max Depth 100-year event (ft)
2	866	862.4	6.4
7	854	853.7	3.7
6	862	855.9	1.9

Depression Area 7 would be the most likely to overflow under existing conditions. Further calculations, conservatively completed by ignoring infiltration, evapotranspiration, and interception, indicate that Depression Area 7 would overflow if a 100-year 24-hour storm (6.1 inches) would be followed the next day by a 5-year 24-hour storm (3.5 inches). This result indicates the likelihood of an overflow event from existing depression areas to an off-site area is small under existing conditions.

4.7.1.1.2 Existing Water Quality

There is limited available water quality data for the creeks and St. Croix River near the Site. The WCD collected water quality samples from Zavoral Creek at varying dates between May 18, 2011 and June 30, 2011 **(Table 13**), all during periods of low flow. USGS records do not have any water quality data more recent than October 16, 2003 at their closest monitoring station, the St. Croix River at St. Croix Falls. The most recent water quality records available from the MPCA relevant to the Site are from September 14, 2006 for Station 06SC017, St Croix River near Rustrum State Wildlife Management Area located 1,000 feet upstream of the Site. **Table 13** shows the comparison of the results from the WCD Zavoral Creek averages and MPCA Station 06SC017 data recorded on September 14, 2006.

Table 13: Water Quality Characteristics of Project Area Water Bodies

	St. Croix River	Zavoral Creek
Data Source	MPCA	WCD (average of 3 samples)
Date Sampled	9/14/2006	5/18-6/30/2011
Temperature (°C)	17.4	11.5
Dissolved Oxygen (mg/l)	9.8	10.6
pH	8.14	8.10
Conductivity (µmhos/cm)	222	532
Total Suspended Solids (mg/l)	2.8	3.0
Total Phosphorus (mg/l)	0.024	0.038

The data for Zavoral Creek represents the groundwater source for the baseflow of the creek, with the creek having relatively low water temperature and relatively high conductivity. Both streams have good levels of dissolved oxygen, relatively high pH, and relatively low total suspended solids. Zavoral Creek

does have higher total phosphorus than the St. Croix River, indicating the groundwater source of Zavoral Creek yields greater phosphorus concentrations than found in the river.

4.7.1.2 Impact Analysis

Potential impacts of the Project on water resources were investigated by analyzing Site runoff rates during and after the Project, and then comparing these rates to existing conditions. The computer program XPSWMM was used for the analysis of existing conditions, during mining and post operation conditions to estimate the flows discharged from the Site to Zavoral Creek, Middle Creek and South Creek. Peak runoff rates for the 2-year, 10-year and 100-year 24-hour duration storm events (2.8, 4.2 and 5.9 inches of rain respectively were estimated **(Table 14).**

Table 14 shows the reductions in the 2-year, 10-year and 100-year peak flows comparing existing conditions to conditions during operation (**Figure 24**). During operation, a berm would be constructed on the south end of the Site as close to the mining limits as possible. This berm would be the boundary between internally drained and off-site discharge areas. For this analysis, it was assumed the berm is an existing ridge. It may be possible during Site grading to construct this berm closer to the Site perimeter. The closer the south berm can be installed to the mining limits, the smaller the watershed draining off-site. As this watershed gets smaller, the peak flow rates to the South Creek during mining and post-reclamation would decrease. During operation, the berm to be installed on the south end of the Site should be constructed as close to the mining and reclamation limits as possible. This would result in lower off-site peak flow rates and increased on-site infiltration than the estimates presented in this analysis.

Table 14: Peak Flow Reductions During Mining

	2-year Peak Flow (cfs)			10-year Peak Flow (cfs)			100-year Peak Flow (cfs)		
	Existing	During Mining	% Reduction	Existing	During Mining	% Reduction	Existing	During Mining	% Reduction
North (Zavoral) Creek Watershed	1.9	0.6	68%	8.3	2.4	71%	18.7	5.4	71%
Middle Creek Watershed	0.7	0.7	0%	2.5	2.5	0%	5.4	5.4	0%
South Creek Watershed	2.4	1.3	46%	10.0	4.9	51%	23.4	11.0	53%

The flow off-site from each watershed for 2-year, 10-year and 100-year storm events are greatly reduced from existing conditions to post-reclamation (**Figure 25; Table 15**), which would benefit the streams to which the Site is tributary by reducing risks of erosion and sedimentation. The existing peak flow rate during a 100-year event of 18.7 cfs discharging to the Zavoral Creek would be reduced to 5.0 cfs. The other existing off-site discharge points to the Middle and the South Creeks would be eliminated post reclamation.

Table 15: Peak Flow Reductions Post Reclamation

	2-year Peak Flow (cfs)			10-year Peak Flow (cfs)			100-year Peak Flow (cfs)		
	Existing	Post Reclamation	% Reduction	Existing	Post Reclamation	% Reduction	Existing	Post Reclamation	% Reduction
North (Zavoral) Creek Watershed	1.9	0.5	74%	8.3	2.1	75%	18.7	5.0	73%
Middle Creek Watershed	0.7	0.0	100%	2.5	0.0	100%	5.4	0.0	100%
South Creek Watershed	2.4	0.0	100%	10.0	0.0	100%	23.4	0.0	100%

After mining and reclamation have been completed, the total watershed area with off-site discharges would be reduced from 11.6 acres to 1.3 acres, three million times smaller than the St. Croix River watershed near the Site. Approximately 1.3 acres at the north end of the Site would discharge to Zavoral Creek. **Figure 8** shows the final reclamation contours. After reclamation the total capacity of the Site to store and infiltrate runoff would be approximately 60.1 acre-ft, compared to the 26.4 acre-ft of rain falling in the internally drained area during a 100-year 24-hr storm.

The potential for overflow from internally drained areas during a large storm event was analyzed for the proposed grading of the Site for final reclamation conditions (**Table 16).** For the final proposed Site contours, there is only one potential overflow point for the Site, which would discharge to the South Creek (**Figure 26**).

Table 16: Proposed Storage

Depression Area	Overflow Elevation (ft)	Maximum Stage 100-year event (ft)	Maximum Depth 100-year event (ft)
5	856	854.3	3.3

The potential for overflow from internally drained areas during a large storm event was analyzed for the proposed grading of the Site for final reclamation conditions. For the final proposed Site contours, there is only one potential overflow point for the Site and this would discharge to the South Creek.

Additional analyses were completed to determine a relative probability of the storm or snow melt event that would need to occur to create overflow from the Site post-project. A conservative analysis was completed by ignoring infiltration, evapotranspiration, and interception that would occur during any rain event. It would take two back-to-back 100-year 24-hr storm events (6.1-inches per storm, 12.2 inches total) before Site overflow would occur. If the losses due to infiltration, and interception were included in the analysis, there would be no off-site discharge resulting from back to back 100-year 24-hour storms. The potential of overflow post reclamation is seen to be very small, less than the potential under existing conditions. Prior to reclamation the potential for overflow would be less than under existing conditions as the Site becomes more internally drained as mining occurs and as part of ongoing stormwater management (**Figures 25 and 26**).

4.7.1.2.1 Alternative 1 – 5- to 10-year Operation

Potential impacts to water quality during operation include:

- Potential downstream sedimentation resulting from exposed soil at excavation areas during stripping and overburden removal,
- Potential pollutants originating from construction equipment operation and washing
- Potential groundwater contamination from on-site equipment fueling
- Washoff of pollutants from areas draining off-site

Immediately after soil stripping, and prior to overburden removal, there would be a relatively short period of time when potential impacts to downstream water resources could occur. If significant rainfall events occurred during this period, erosion in externally draining perimeter areas of the Site could potentially impact downstream resources including the three small tributaries receiving Site drainage and the St. Croix River. Stormwater and erosion control BMPs would be employed to minimize the potential for this.

After vegetative stabilization, and after overburden removal, the potential for these impacts becomes very small, and less than under existing conditions.

Potential impacts are proportional to potential impacts on flow rates. The Project, regardless of differences in phasing, would reduce peak flows off-site, reduce the risk of erosion, and greatly reduce the risk of overflow. The Project would improve infiltration, resulting in improved base flow conditions for the seeps, springs, and creeks, enhancing the ability of area creeks to support aquatic life.

Water quality potential impacts are proportional to potential impacts on flow rates. The Project would reduce the peak flow rates from perimeter areas to downstream tributaries for both during mining and post mining periods (**Tables 14 and 15**). Post mining conditions peak flow rates from externally draining areas of the Site would be reduced from 73% for a 2.8 inch rain, to 100% for larger rain events. The potential water quality impacts would be proportionally decreased by the Project.

4.7.1.2.2 Alternative 2 – No-Build Alternative

There would be no change in potential impacts to water resources of downstream tributaries and the St. Croix River for the no-build alternative.

4.7.1.2.3 Alternative 3 – Reduce Timeframe

There are no differences in potential environmental impacts to water resources between Alternatives 1 and 3. The only difference between Alternatives 1 and 3 is the difference in time it would take for peak flow reductions and increases in infiltration to occur. Alternative 3 has a shorter overall schedule, and estimated peak flow reductions would occur sooner as a result.

Alternative 3 may reduce the risk for impacts to water resources because the shorter timeframe of Site operation compared to the probability of occurrence of a major storm event. For instance, the probability of a storm event exceeding the 100-year event happening in 5 years is 5%, whereas for a 10 year Project duration (Alternative 2 maximum duration), the probability of this occurrence for a storm of this size is

10%. However, Alternative 3 would increase of the intensity of mining activity during Project operation, increasing the potential sources of pollution during the operation period.

4.7.2 Potential Mitigation Measures

The key component is that the proposed SWPPP, erosion and sedimentation control, and BMPs are implemented and maintained.

A Stormwater Management Permit would need to be obtained from the CMSCWD that requires a stormwater plan to be submitted to the District for review and approval. To meet CMSCWD permit requirements, the Project would not be allowed to increase peak flow discharge rates to off-site areas and would not be allowed to increase the runoff volume discharge off-site, and would require appropriate BMPs. The Project would need to meet all of these requirements via on-site infiltration in depression, and would not increase the level for duration of bounce in downstream waterbodies.

The BMPs to be implemented during the Project include minimizing unnecessary equipment on-site and reducing soil from being tracked off-site by vehicles. On-site equipment washing and fueling would be completed in a controlled manner that minimizes the release of pollutants, enforceable BMPs that are included in the project SWPPP. Similarly, on-site fueling would follow industry standard BMPs, as described in the SWPPP, and which would prevent groundwater contamination from this potential source of pollutants.

By minimizing the size of the watersheds that drain off-site immediately after overburden removal, the internal drainage on-site would increase and promote more infiltration, an outcome that would reduce potential off-site water quality impacts. The time soils are exposed would also be restricted, further minimizing potential impacts related to soil erosion and wash off. In addition, during the project, a double row of silt fences and associated vegetated filter strip in perimeter areas would help contain sediments and attached pollutants that may runoff the Site, preventing pollutants from reaching the creeks or the St. Croix River.

The St. Croix River is currently listed as an impaired water of the state for mercury and polychlorinated biphenyls (PCBs). There would be no on-site sources of mercury or PCBs associated with the Project. The SWPPP states, ‘the overall watershed management strategy includes limiting sediment and nutrient loads to the spring creeks along the bluffs of the St. Croix River and maintaining groundwater recharge.’ This overall strategy would be achieved by increasing internal drainage, preventing soil erosion, capturing sediment and minimizing impervious surfaces on-site. PCBs and mercury are mainly distributed to water resources through sediment transport. The proposed BMPs would minimize sediment transport and attached pollutants from discharging off-site to the greatest extent feasible.

As vegetation establishes as reclamation it would help prevent runoff from the Site and would promote infiltration which would improve water quality.

Ground-water should be sampled and analyzed for diesel range organics. If gasoline is to be stored on Site, gasoline range organics and benzene should be added to the analyte list.

4.7.3 Scandia Mine

The Scandia Mine would continue to comply with the Scandia Mine's SWPPP which includes BMPs for daily site operations. These BMPs include silt fence, vegetated screening berms, sedimentation ponds, wetland buffers and dust control. Add-rock from the Zavoral Site that would be imported to the Scandia Mine would be unloaded over an active face where it would be stored until needed. It is not stockpiled in individual stockpiles over the Mine floor. This practice of storing the add-rock material over the active face would continue regardless of the add-rock source. This activity does not open any areas to be mined prematurely nor does it change or disturb additional areas as storage takes place over the active mining area. The additional add-rock from the Zavoral Site would not affect any current stormwater management practices that are already in place.

Refer to Section 4.8.3 for a discussion of Scandia Mine water use.

The potential for impacts on the surface runoff and water quality at the Scandia Mine due to the mining of the Zavoral Site is extremely low because use of add-rock from the Zavoral Site would not change the operations at the Scandia Mine.

4.8 WATER USE

4.8.1 Zavoral Site

4.8.1.1 Affected Environment

4.8.1.1.1 Regional Surficial Geology

The Zavoral Site is located in the area mapped as Upper River Warren Terrace, Glacial Till (Sand and Gravel), Middle Terraces, and Bedrock near the surface in the MGS Geologic Atlas of Washington County, Minnesota Surficial Geology Map (Meyer et al.1990). These deposits are remnants of Pleistocene Age glacial activity. Outwash from the Superior Lobe glacier was deposited in wide plains in the areas where glacial ice melted and flowed from the ice front. As the glacier retreated, ice blocks were left behind, buried in topographic lows on the bedrock surface. The gradual melting of these blocks created many deep depressions and several small lakes in Cottage Grove, Woodbury, and Afton. The outwash deposits consist of sand, loamy sand, and gravel that contains cobbles in places and are commonly overlain by 2 to 5 feet of fine-grained wind-blown loess deposits. The Upper Terrace deposits consist of sand, gravelly sand, and gravel and lie about 160 to 220 feet above the St. Croix River floodplain level. The terrace is pitted due to ice-block melt in the Lake Edith area of Afton. These upper glacial deposits are underlain in the vicinity of the Zavoral Site by glacial till consisting primarily of reddish-brown to reddish-gray, sandy-loam textured, unsorted sediment containing pebbles, cobbles, and boulders with some sand and gravel lenses or beds. Gravel mining is described as being common in the area.

4.8.1.1.2 Regional Bedrock Geology

The bedrock in the area of the Zavoral Site is mapped on the Bedrock Geology Map in the Geologic Atlas for Washington County, Minnesota (Swanson and Meyer 1990). **Figure 27** is a portion of the "Bedrock Map" which includes the Zavoral Site. **Figure 28** shows the stratigraphic column for the region.

The uppermost bedrock unit in the area of the Zavoral Site is the Prairie Du Chien Group (Opc). Although present, most of the Prairie Du Chien Group has been removed within the area during a time when the bedrock was exposed to erosion, prior to deposition of the younger surficial materials described above. Remnants of this dolostone may be encountered on portions of the Site below these unconsolidated surficial materials.

The Jordon Sandstone (Cj) may present on the western portion of the Site. The upper portion of the Jordan Sandstone is a fine- to medium-grained quartz sandstone. The lower portion contains multi-colored beds of mudstone, siltstone, and shale with interbeds of very coarse sandstone.

The St. Lawrence and Franconia Formations (Csf) are mapped as a single geologic unit; however, the two formations have very different characteristics in the area of the Site. The St. Lawrence consists of dolomitic shale and siltstone that is generally thinly bedded. The Franconia consists of thin-bedded to cross-bedded, fine- to coarse-grained sandstone. These geologic formations have very distinctive hydrologic properties that influence the Site groundwater conditions.

Ironton and Galesville Sandstones (Cu) underlay the Franconia Formations. The Ironton and Galesville are silty, fine- to medium-grained sandstones. They are poorly sorted in the upper units grading to well sorted in the lower portion of the formations.

Eau Claire Formation (Ce) consists of siltstone, very fine-grained sandstone, and greenish gray shale. It contains some cementation of the particles. The contact with the overlying Galesville Sandstone is gradual, but contact with the underlying sandstone is abrupt.

The oldest geologic unit of interest for the Zavoral Site is the Mt. Simon Sandstone (Cm). This sandstone unit consists primarily of fine- to coarse-grained quartzose sandstone.

4.8.1.1.3 Groundwater Resources

An aquifer is a rock or sediment that is saturated with groundwater and sufficiently permeable to transmit economic quantities of groundwater to wells and springs.

The groundwater resources in the vicinity of the Zavoral Site can be identified by the following four hydrogeologic units:

- Glacial Aquifer
- Prairie Du Chien-Jordon Aquifer
- Franconia-Ironton-Galesville Aquifer
- Mt. Simon Aquifer

The Glacial Aquifer consists largely of the unconsolidated granular materials in the upper geologic profile. These materials are shallow and are mapped as having “high” sensitivity to pollution in the area of the Zavoral Site in the Washington County Geologic Atlas. This is due to the relatively shallow depth and the lack of a low permeable soil over the granular soils.

The Prairie Du Chien-Jordon Aquifer is the first bedrock aquifer in the area. These geologic units are considered one aquifer because groundwater can readily move between the two units. In addition, the

Prairie Du Chien-Jordon aquifer is also in direct contact with the Glacial Aquifer. This aquifer is mapped with a high to moderate sensitivity to pollution in the Washington County Geologic Atlas.

West and in the vicinity of the Zavoral Site, the shallow Glacial and Prairie Du Chien-Jordon Aquifers are the primary aquifers used as water sources by area wells. These aquifers produce adequate volume and quality for water use in this area.

The St. Lawrence Formation that underlies the Jordon Sandstone is defined as an aquitard or a confining layer, which is a low permeability unit and limits migration of water between aquifers.

The deep Franconia-Ironton-Galesville Aquifer consists of a single hydrogeologic unit that is separated from the Prairie Du Chien-Jordon Aquifer by the St. Lawrence Formation. This aquifer is used as a source of water north and south of the Site in the immediate vicinity of the St. Croix River. This is primarily because the upper aquifers have been removed by erosion and are not present near the river.

The Mt. Simon Aquifer is separated from the Franconia-Ironton-Galesville Aquifer by the Eau Claire Formation. The Mt. Simon Aquifer is infrequently used as an aquifer in the vicinity of the Zavoral Site. However, the Zavoral Site Well is an multi-aquifer well, open to both the Franconia-Ironton-Galesville and Mt. Simon Aquifers and draws water from both aquifers.

4.8.1.2 Zavoral Site Water Use

Barton Construction formerly operated the Site's multi-aquifer bedrock well (Minnesota Unique Number 00210498). Available well records show that the Zavoral Site Well is cased to a depth of 245 feet and is completed as an open hole in two aquifer systems—the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer—to a total depth of 648 feet. AECOM determined that Barton's water appropriation permit had expired as part of the coordination conducted with the MnDNR as part of this EIS process.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn st.. § 103G.271 4a). The intent of the law is to protect use of the Mt. Simon-Hinckley Aquifer for drinking water purposes in metropolitan counties and prohibit use of this resource for lower priority and nonessential purposes such as lawn watering. A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Project noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements. As described in Section 2.0 of this document, due to this and additional evaluation of the resource and its potential use as add-rock, Tiller revised their Project proposal to eliminate all aggregate processing activities (including washing) at the Zavoral Site.

The total annual groundwater use from the Zavoral Site Well is limited to less than 1,000,000 gallons, anything above this level would require a water appropriation permit. At the maximum allowable daily water use of 10,000 gallons per day (gpd), pumping could occur for a maximum of 100 days per year.

Tiller would limit the use of water from the Zavoral Site Well to what is required for dust control at the Site. Tiller's water use projection for dust control purposes is to pump less than 10,000 gpd at a rate of up to 1,200 gallons per minute (gpm). The total annual groundwater use would be less than 1,000,000 mgy.

This would keep the amount of groundwater use to a level below the threshold that requires a water appropriation permit from the MnDNR.

Pumping of groundwater at the maximum rate of 1,200 gpm, would result in pumping for approximately 8 minutes per day to reach the maximum allowable daily water volume of 10,000 gallons. If the pumping rate were reduced to 500 gpm, the maximum allowable daily water volume would be obtained within 20 minutes of pumping.

4.8.1.3 Area Well Information

Information about private wells at and around the Zavoral Site was obtained from the Minnesota County Well Index (CWI) database. The on-line database does not include information about public wells. Information about public wells was obtained directly from the Minnesota Department of Health. Information about the Zavoral Site Well and wells around the Site is included in the following subsections.

4.8.1.3.1 Zavoral Site Well

As described previously, the Zavoral Site Well is 648 feet deep. The well is cased to a depth of 245 feet and finished as a multi-aquifer open hole according to the well log provided in the CWI. The well is cased below the St. Lawrence Formation aquitard and is open to both the Franconia-Ironton-Galesville and Mt. Simon Aquifers. The Zavoral Site Well was drilled through the Eau Claire Formation, (which is also an aquitard) and into the Mt. Simon Sandstone Aquifer. The top of casing of the well was surveyed at an elevation of 866.1 feet msl; the bottom of the well is at an elevation of 218.1 feet msl.

Figure 29 is a schematic is a cross-section that shows the relationship between the geologic formations, the wells in the area, and surface water features (Zavoral Creek and St. Croix River). The Zavoral Site Well is shown in the center of this cross-section. The open-hole portion of the well begins in the Franconia Formation below the St. Lawrence Formation. The St. Lawrence is an aquitard. Because of the presence of this aquitard (St. Lawrence Formation), pumping of the Zavoral Site Well would not be anticipated to influence groundwater in the shallow aquifers (Drift and/or Prairie du Chien – Jordan Aquifers) above the aquitard.

An aquitard is a geologic term for a formation that has a low permeability (ability to allow water to pass through it) that restricts the movement of water between two aquifers (water yielding geologic units).

4.8.1.3.2 Vicinity Wells

Wells within 1.5-Mile Radius

There are 91 wells listed in the CWI database within a 1.5-mile radius around the Zavoral Site Well **(Figure 30).** Eighty-nine of these wells are private/residential wells and two are public/commercial wells.

Only 14 of these 91 wells are completed at depths such that the bottom of the well is at an elevation that is below the elevation of the top of the open section of the Zavoral Site Well. Since the geologic strata (and associated aquifers) dip slightly toward the west-southwest, it is likely that wells that are not deeper than the top of the open section of the Zavoral Site Well are completed in different (shallower) aquifers than the Zavoral Site Well.

The wells completed in shallower aquifers are not as likely to be affected by pumping from the Zavoral Site Well. **Figure 29** shows the relationship between the shallow wells and the Zavoral Site Well. The wells identified in **Figure 29** as Trails End Well and Magnuson Well are screened in the shallow Drift and Jordan Sandstone Aquifers, respectfully. These wells would not likely be affected by pumping of the Zavoral Site Well because the St. Lawrence Formation separating the Franconia-Ironton-Galesville Aquifer (the uppermost aquifer tapped by the Zavoral Site Well) and the next shallower aquifers, the Jordan Sandstone, is acting as an aquitard. Since an aquitard restricts movement of water between aquifers, the Zavoral Site Well, which withdraws water from lower aquifers, should not affect the shallow wells screened above the St. Lawrence Formation aquitard.

The 14 deep wells within a 1.5-mile radius of the Site are all completed in the deep Franconia-Ironton-Galesville Aquifer. This is the upper aquifer that is intercepted by the Zavoral Site Well. None of these wells are completed in the deeper Mt. Simon Aquifer, the lower aquifer intercepted by the Zavoral Site Well. All 14 wells are located either north or south of the Zavoral Site Well, close to the St. Croix River.

The configuration of the deep wells is represented in **Figure 29** with the Zavoral Cabin Well. The Zavoral Cabin Well is located east of the Zavoral Site Well between the Site and the St. Croix River. The deep wells draw water from the same aquifer as the Zavoral Site Well. Pumping of the Zavoral Site Well would be expected to influence the water levels in this aquifer. Water levels in wells near the Zavoral Site Well would be expected to decline during pumping. The decline in water levels would be expected to decrease farther away from the pumping well. At some distance, pumping would have little or no influence on the water levels in the aquifer. The distance from the pumping well, the amount of water removed, and the time over which the pumping occurs would influence the amount of decline in water levels in the aquifer.

Wells within 3-Mile Radius

There are 330 wells listed in the CWI database within a 3-mile radius from the Zavoral Site Well; 306 are private/residential wells and 24 are public/commercial wells.

Out of these 330 wells, only 30 wells are completed at depths such that the bottom of the well is at or below the elevation of the top of the open section of the Zavoral Site Well.

All 30 wells identified are completed in the Franconia-Ironton-Galesville Aquifer, except for one deeper well—New Scandia Fire Hall (Minnesota Unique Number 00593614) located about 8,500 feet west of the Zavoral Site Well. Like Zavoral Site Well, New Scandia Fire Hall Well is completed both in the Franconia-Ironton-Galesville Aquifer and Mt. Simon Aquifer, as a multi-aquifer well.

Almost all of the 30 wells are located north or south of the Zavoral Site Well and close to the St. Croix River. The only two wells in that group that are located west of the Zavoral Site Well are the New Scandia Fire Hall Well, and New Scandia TW-1 Well (Minnesota Unique Number 00593613).

4.8.1.4 Aquifer Test

4.8.1.4.1 Aquifer Test Design

AECOM initially simulated pumping of the aquifer around the Zavoral Site Well for 10 minutes at a rate of 1,200 gpm. Ten minutes is longer than the length of time required to reach the daily maximum volume of

10,000 gpd. The simulation was completed using a numerical computer program, PT1, presented by Walton (1989).

The results of the simulation performed indicated that, after 10 minutes of pumping, water levels would drop by 0.2 feet at a distance of 670 feet from the Zavoral Site Well. Based on the simulation, no drawdown would be observed at a distance of 1,682 feet.

However, to collect Site data, rather than rely on a simulation, AECOM also completed an aquifer test using the Zavoral Site Well. An aquifer test was proposed to evaluate the potential effect of pumping groundwater from the Zavoral Site Well upon groundwater resources and groundwater dependent resources of the area around the Site. The aquifer test was designed to determine if the St. Lawrence Formation is an effective aquitard between the lower aquifers and the upper aquifers. The aquifer test was also used to measure the decline in water levels that would be expected to occur in wells screened in the Franconia Formation, the same aquifer from which the Zavoral Site Well draws water.

The aquifer test was also designed to measure the potential impact of pumping on surface water including the seeps that exist in the bluffs east of the Site. **Figure 29** shows the relationship between the Zavoral Site Well and surface water bodies. The seeps and creeks are located at an elevation above the base of the St. Lawrence Formation. The St. Croix River is apparently located at or near the base of the St. Lawrence Formation. However, based on the water levels shown in **Figure 29**, groundwater flows into the St. Croix River. Pumping could potentially reduce the total volume of groundwater that discharges into the river.

Water level measurements obtained during the aquifer test provided direct evidence of the effect of pumping from the Zavoral Site Well upon the surrounding environment. The data generated allowed a better characterization of the groundwater system and the interaction between groundwater and surface water near the Zavoral Site. The aquifer test pumped several times more water than the maximum daily water production of 10,000 gpd. .

Three existing wells were monitored during the aquifer test (**Figure 31**). These wells were:

- Zavoral Cabin Well located about 1,300 feet east of the Zavoral Site Well. The Zavoral Cabin Well was measured (on May 24, 2010) to be 240 feet deep and, therefore, is completed in the Franconia-Ironton-Galesville Formation. It is representative of other wells close to the St. Croix River and it is the closest deep well to the Zavoral Site Well.

- Trails End Well is located about 1,700 feet west of the Zavoral Site Well. Measurements conducted by AECOM determined that this 4-inch-diameter well is 139 feet deep. The well is shallower than the other nearby wells and is likely completed in sand and gravel deposits above the bedrock.

- Magnuson Well is located about 1,900 feet west-northwest of the Zavoral Site Well. This 175-foot-deep well is completed in Jordan Sandstone Aquifer and is representative of many wells located west, southwest, and northwest of the Zavoral Site and farther away from the St. Croix River.

In addition to monitoring water levels in nearby wells, the following surface water measurements were collected.[6]

- Zavoral Creek at the culvert (near the Zavoral cabin). This monitoring point was located a few feet upstream from the monitoring station installed by the Watershed Conservation District (WCD) for long-term monitoring. The Black Ash Seeps identified by the MnDNR in their comment letter on the EAW for the proposed Project (Sunde 2008). Zavoral Creek is fed by the seeps. AECOM staff conducted a reconnaissance of the Zavoral Site and the seeps on September 1, 2009. The seeps emerge from the rock faces and slopes along Zavoral Creek.

- Zavoral Creek near Crystal Springs, located about 1,100 feet northwest and up-stream of the Zavoral Creek culvert (on the property of Gregory Page).

- Unnamed creek designated as South Creek located about 400 feet south-southeast of the Zavoral Creek culvert. This creek is the next creek south of Zavoral Creek

- Unnamed creek designated as Spring Box Creek located at the north end of a culvert below Quint Avenue North, west of railroad tracks, a short distance down-gradient from spring box, and about 2,800 feet south of the Zavoral Creek culvert.

The purpose for monitoring the creeks near the Zavoral Site during the aquifer test was to document whether measurable changes in water flow occurred during the aquifer test.

Two other monitoring points were observed and measurements taken during the aquifer test:

- St. Croix River stage was measured four times for the aquifer test at a benchmark point established near the Zavoral cabin: 1 day before the aquifer test day (June 28), two times on the day of the aquifer test (June 29), and a final time on June 30, 2010.

- The water pumped from the Zavoral Site Well during the pump test was piped to an on-site depression to prevent excessive runoff, sediment transport, and erosion. This Discharge Pond is located south of the Zavoral Site Well. A staff gauge was installed in the pond. The water level at the staff gauge was observed and recorded a total of five times – three times on the day of the aquifer test (June 29), once the next day (June 30), and a final time on July 2, 2010.7

There is one permitted high capacity well within the 3-mile radius around the Zavoral Site Well—Abrahamson Nurseries well (MnDNR Permit: 2007-0195, MN Unique Well No. 00 733013). Since the permit allows pumping at a rate up to 420 gpm, pumping from that well could interfere and invalidate the pump test. Abrahamson Nurseries was contacted and they agreed to not pump during the period of the pump test or recovery.

The aquifer test started at 9:00 a.m., June 29, 2010. After 4 hours and 20 minutes of pumping, the pump failed (1:20 p.m.) and could not be restarted. The calculated average pumping rate was 664 gpm. The

[6] Two of these monitoring locations and the Watershed District monitoring station were added due to input from the PAC and local residents.

[7] This was added due to input from the PAC.

total volume of water pumped was 172,600 gallons, or more than 17 times the maximum amount of water Tiller would use daily during its seasonal operations at the Zavoral Site. The pumping was planned to be conducted for a longer period of time but was stopped due to the pump failure. A review of the aquifer test measurements indicated that the duration and the volume of water pumped were sufficient to evaluate the impacts of pumping the Zavoral Site Well at the proposed maximum rate of 10,000 gpd. The pumping was also determined to be sufficient to determine if impacts to shallow wells and/or surface water would likely occur due to the planned pumping.

4.8.1.4.2 Aquifer Test Results

Pumping of the Zavoral Site Well created measurable drawdown only in the Zavoral Cabin Well. A drawdown of 0.25 feet (3 inches) occurred after the first 15 minutes of pumping at a rate of approximately 660 gpm (**Figure 32**). This is approximately equal to the maximum daily volume of water that would be pumped during operation. The Zavoral Cabin Well is a 240-foot-deep well completed in the Franconia Aquifer. The Zavoral Cabin Well is located approximately 1,300 feet away from the Zavoral Site Well.

No aquifer test related drawdowns were observed in the other two monitored wells (Trails End Well and Magnuson Well) (**Figure 32**). The lack of drawdown in these wells indicates that the St. Lawrence Formation acts as an effective aquitard. This is consistent with expectations based on the geologic conditions that exist at the Site.

Surface water monitoring conducted in late June through the beginning of July 2010, at several points documented water level fluctuations on the order of a few centimeters (**Figure 33**). Water levels were increasing throughout June 29th, the day of the aquifer test. No discernable change in the increasing trend could be linked to pumping from the Zavoral Site Well. These results are also consistent with what expectations. Surface water appears to be fed by groundwater from the shallow aquifer and precipitation. The St. Lawrence aquitard separates these shallow aquifers from the deep aquifers from which water was drawn for the aquifer test.

The monitoring of the water level in the on-site depression south of the Zavoral Site Well indicated that the pumped water was seeping through the bottom of depression at a relatively constant and slow rate of approximately 15 gpm. The depression was monitored to determine if infiltration would have an impact on the observed readings. Based on the slow rate of water discharge, location of the depression, and comparative surface water readings, it was determined that infiltration of this water did not impact the test results.

The data collected near the Zavoral Cabin indicate that the St. Croix River's stage decreased about 0.2 feet during the aquifer test (**Figure 34**). However, average daily discharge rates were recorded at the USGS Gauging Station 05340500 St. Croix River at St. Croix Falls, Wisconsin, located about 14 miles upriver from the Zavoral Site. The records show a distinct decreasing trend during the time prior to the aquifer test. This decreasing trend coincides with the declining stage as captured by the very limited number of stage measurements taken on the river below the Zavoral Cabin Well during the days before and after the aquifer test.

4.8.1.5 Impact Analysis

The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers

on the shallow Drift and Prairie Du Chien-Jordon Aquifers. Based on the aquifer test, it appears that area supply wells located to the west, southwest, and northwest of the Site that are screened in the shallow Drift or Prairie Du Chien-Jordan Aquifers would not be affected by pumping the Zavoral Site Well at the rates and volumes proposed for dust control purposes and allowable under law without obtaining a water appropriation permit.

Supply wells screened in the Franconia Aquifer would have some potential to be affected by pumping of the Zavoral Site Well. The Zavoral Cabin Well is the closest well to the Zavoral Site Well that is screened in the Franconia Aquifer. The aquifer test indicated a drawdown of 0.25 feet (3 inches) caused by pumping the Zavoral Site Well during the first 15-minute period of the 4 hour test, which is the time required to reach the maximum daily volume of 10,000 gallons. Supply wells located farther from the Zavoral Site Well would experience even less drawdown. A decline of water level of 3 inches or less can be considered insignificant given the capacity of the aquifer and the limited duration over which the decline would occur. The decline would begin to rebound once the pumping is stopped.

The maderate cliffs and the Black ash swamp seepage subtype wetlands are located along the eastern edge of the property boundary outside the mining and reclamation limits. At several PAC meetings committee members voiced concern over whether the use of the Zavoral Site Well could result in ground water impacts that would negatively impact the maderate cliffs and Black ash swamp seepage subtype wetlands.

The maderate cliffs and the Black ash swamp seepage subtype wetlands obtain their base flow from groundwater discharged from the shallow aquifers below the Site that consist of the Glacial Drift and the Prairie Du Chien-Jordon Aquifers. The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers. The shallow aquifers at the Site were not influenced by pumping in the deeper aquifer and the projected use of water from the Zavoral Site Well for dust control purposes would not be expected to impact these regionally significant features.

Mining would increase the amount of internal surface drainage at the Site. The Project would improve internal drainage and infiltration, resulting in improved base flow conditions to these areas. This additional water would add to the base flow and reduce the surface water runoff that currently occurs on a portion of the Site. The increase in the base flow is not expected to be significant, but would provide some an incremental increase in the groundwater flow into the seeps and creeks. The decrease in surface runoff should decrease sediment loading to the creeks, should benefit the creeks.

The discharge of the St. Croix River was about 3,900 times larger than the average pumping rate during the aquifer test. Although a declining stage was measured in the river during the aquifer test, this decreasing trend coincides with the declining discharge of the river as measured by the USGS, and was not due to pumping from the Zavoral Site Well.

The volume of water proposed for mining is a very small percentage of the groundwater that flows through the Site. Groundwater balance estimations indicate that pumping the Zavoral Site Well at a daily limit of 10,000 gallons represents about 0.7% of daily groundwater flow rate across the Site.

The data and calculations presented clearly indicate that pumping from the Zavoral Site Well at a daily limit of 10,000 gallons would only minimally affect groundwater resources around the Site and that any

potential impacts are likely to be insignificant. The Water Use Technical Memorandum (**Appendix X**) provides additional details about the data collected.

4.8.1.5.1 Alternative 1 – Mining 5- to 10-Year Operation

The total volume of groundwater that could be pumped over the maximum period of operation would be 10,000,000 gallons (1,000,000 mgy for 10 years). The total volume of pumping over the life of the Project may be greater than Alternative 3, however due to the mining occurring for fewer weeks per year, the annual volume of water use could be less than for Alternative 3 (with neither of the alternatives being allowed to use more than 10,000,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

4.8.1.5.2 Alternative 2 – No-Build Alternative

No water use would occur. The Zavoral Site Well would not be used since no mining would occur; however, the well would not be abandoned.

4.8.1.5.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The total volume of groundwater that can be pumped over the maximum period of operation would be 5,000,000 gallons (1,000,000 mgy for 5 years). The total volume of pumping over the life of the Project may be less than Alternative 1, however due to the mining occurring for more weeks per year, the annual volume of water use could be more than for Alternative 1 (with neither of the alternatives being allowed to use more than 10,000,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

4.8.2 Potential Mitigation Measures

No mitigation measures are proposed, because no anticipated significant impacts are expected to occur due to the proposed groundwater pumping. The following monitoring to be funded by Tiller is recommended.

- Tiller should keep records of when the Zavoral Site Well is pumped, and provide these to the City for ground water monitoring activities. This should document both the daily use and total annual pumped volume from the Zavoral Site Well. The daily total should not exceed 10,000 gallons at a maximum pumping rate of 1,200 gpm. The total annual pumping should not exceed 1,000,000 mgy.

- The WCD monitoring point installed for the pump test and collection of baseline data in Zavoral Creek should be monitored during the lifetime of the Project.

- The Black Ash seep subtype wetland boundary mapped by CCES (CCES January 2010) established the baseline boundary of the seep along Zavoral ravine. This should be monitored during the life of the Project.

4.8.3 Scandia Mine

The use of add-rock from the Zavoral Site rather than other sources currently used would not change the level of water appropriation at the Scandia Mine.

Water used at the Scandia Mine is obtained from an existing on-site well that is finished in the Quaternary Drift water table aquifer. Water use at the Scandia Mine is expected to remain consistent with the levels evaluated in the EAWs prepared for the mine (1987 and 1999) and the current water appropriation permit. The 1999 EAW analysis included water use of 20 mgy and 600 gpm. The current MnDNR Water Appropriations permit identifies two water use categories and allows for 18 mgy at 500 gpm for sand and gravel washing and 2 mgy and 500 gpm for dust control.

Washing at the Scandia Mine occurs on an as-needed basis. The MnDNR website supports only one water use category; therefore, persons accessing this website for permit information would find a permit with one water use category that allows 18 mgy at 500 gpm for sand and gravel washing. A copy of the actual permit with the two water use categories described above is included as **Appendix X.**

The majority, if not all, of the Class C add-rock hauled from the Zavoral Site would not be washed. Historically, only a small portion of aggregates sold at the Scandia Mine have been washed sand and gravel products. Although the water appropriation permit allows washing and past environmental review has included washing, washed products are only produced as needed to meet market demand.

Washing last occurred at the Scandia Mine in 2002. Average water use over the last 5 years has been less than 2 mgy, even though unprocessed add-rock has been imported. Under the current water appropriation permit levels, the Scandia Mine could produce over 300,000 tons/year of washed product. These production volumes are sufficient for Tiller to meet any reasonable increase in the demand for washed product without necessitating any change to existing permitted activity or further environmental review.

Importing unprocessed Class C add-rock from the Zavoral Site would not change current Mine operations and would not impact water use at the Scandia Mine.

4.9 WATER-RELATED LAND USE MANAGEMENT DISTRICTS

Water related land use management districts at the Site are the CMSCWD, the WCD, and the St. Croix River District.

Tiller would be required to obtain a Permit for Stormwater Management from the CMSCWD prior to operation that requires a stormwater plan to be submitted to the District for review and approval. To meet CMSCWD permit requirements, the Project would not be allowed to increase peak flow discharge rates to off-site areas, would not be allowed to increase the runoff volume discharge off-site, and would require appropriate BMPs. The Project would need to meet all of these requirements through on-site infiltration and would not be allowed to increase the level for duration of bounce in downstream waterbodies.

Based on the fact that no wetlands were identified within the mining and reclamation area (Stantec 2010), it is not anticipated that any permits would be required under the programs managed by the WCD.

Tiller proposes to conduct reclamation activities on about 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6. This work should be monitored for compliance with regulatory requirements.

The potential for impacts to area surface water bodies is described in other sections of this summary. The Project is consistent with water-related land use management district regulations.

4.10 EROSION AND SEDIMENTATION

4.10.1 Zavoral Site

4.10.1.1 Affected Environment

Soils within the Site are categorized by the U.S. Department of Agriculture (USDA) as hydrologic soil Group A, a category comprised of sandy soils (USDA, September 2011). Soils that are sandy infiltrate runoff at relatively high rates. Watershed areas that discharge off-site have well established vegetation, which combined with the sandy nature of the soil, enhances infiltration and decreases the risk of erosion. Surface runoff would occur when the soil is saturated or when the rate of rainfall or snow melt exceeds the infiltration rate. The majority of runoff from the Site is infiltrated and becomes groundwater because of internal drainage and sandy nature of the Site soils.

Portions of the Site that discharge to the creeks referred to as the Middle and South Creeks in this EIS are forested by white pines and other trees. The area discharging to Zavoral Creek is vegetated primarily with nonnative and native grasses. There are several areas with steep slopes within the Site that drain internally which are attributed to previous mining activities.

Approximately 35% of the internally drained watershed areas are forested, the remainder is nonnative and prairie grasses. There are several areas with steep slopes that drain internally which are attributed to mining activities from the mid 60s to the 80s. Existing Site topography is shown on **Figure 23** along with the depression areas that drain internally.

The topography in the area between the Site and the St. Croix River includes steep slopes and bluffs that have a high risk for erosion. Designated wetlands outside the proposed mining area, but within the Site boundary, include reaches of the three creeks to which the Site is tributary. The creeks are characterized as “ravines with several seep areas along the hillsides.” Vertical cuts in soils and soil sloughing occur in areas along Zavoral Creek and Middle Creek.

There is some evidence that a major transportation of soil occurred in the past, primarily based on discussions with area residents and the existence of a delta deposit near the mouth of Zavoral Creek that appears to be the result of a significant erosion event. The cause of this delta deposit is not known. It could be the result of a natural erosion event (major rain event) or the result of human activities.

Potential impacts on erosion and sedimentation exists after the start of construction when soils are exposed for overburden removal or other activity. The source areas of potential erosion and sedimentation project impacts are 4.6 acres on the perimeter of Site which would discharge off-site during

construction (**Figure 24**). Watershed areas discharging off-site during operation would include 1.3 acres discharging to Zavoral Creek, 1.0 acre discharging to the Middle Creek, and 2.3 acres discharging to the South Creek, a total of 4.6 acres, or 7% of the Site.

The watersheds discharging off-site have slopes ranging from 2% to 25% within the mining limits. In comparison, slopes along adjacent areas of the St. Croix River escarpment range up to 100% or higher. The remaining 93% of the Site, runoff is trapped within depressions (internally drained) and does not leave the Site. Internally drained areas would not have potential off-site erosion and sedimentation impacts, as these impacts are the result of runoff.

4.10.1.2 Impact Analysis

4.10.1.2.1 Alternative 1 – 5- to 10-year Operation

Immediately after soil stripping, and prior overburden removal, there would be a relatively short period of time when potential impacts to downstream water resources could occur. If significant rain were to fall during this period, erosion in externally draining perimeter areas of the site could potentially impact downstream resources including the three small tributaries receiving site drainage and the St. Croix River. After vegetative stabilization, and after overburden removal, the potential for these impacts becomes very small, and less than potential impacts for existing conditions.

4.10.1.2.2 Alternative 2 – No-Build Alternative

There would be no change in potential impacts relative to erosion and sedimentation for downstream tributaries and the St. Croix River for the no-build alternative.

4.10.1.2.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Alternative 3 may have less risk for the potential impacts compared to Alternate 1 because the shorter Project duration associated reduces the exposure to rain events. However, Alternative 3 would increase of the intensity of mining activity during project operation, increasing the potential sources of pollution during the operation period.

4.10.2 Potential Mitigation Measures

The Site would require several permits for the management of erosion and sedimentation. Permits include the NPDES/SDS general permit for Stormwater Discharges Associated with Construction Activities (MN R100001), the NPDES/SDS General Permit for Construction Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production Facilities (MNG 490000), and the CMSCWD erosion and sediment control permit.

Permit requirements include a SWPPP, both for construction activities and for the ongoing mining operation. The SWPPP prepared for the Project calls for double row silt fences along with vegetated buffer strips to be installed along the down gradient edge of the perimeter watersheds draining off-site during operation. These BMPs would be installed before overburden removal and would both control the velocity of overland flow and trap sediment on-site. In addition to the silt fence and buffer strips, berms would be constructed on the north and south ends of the Site to divert additional areas where runoff would drain off-site to internally drained areas within the Site.

There are 4.6 acres of the Site along the north, east and south perimeters that would drain off-site via the silt fences and buffer strips; these discharge points are potential areas of erosion where ongoing maintenance of the BMPs would be needed to prevent erosion and subsequent sedimentation in downstream water bodies. To limit exposure after overburden removal, those portions of the Site where overburden would be removed would be graded to drain internally immediately after soil exposure. Because the project would be phased, mining would only occur in one of the three perimeter areas at a time. The maximum potential area of exposed soil draining off-site during a mining phase would be the 2.3 acres discharging to the South Creek (Phase 2).

The St. Croix River is listed as an Outstanding Resource Value Water (ORVW) according to Minn. Stat. § 7050.0180. A requirement of the NPDES/SDS General Permit for Construction Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production Facilities is that all exposed soil areas with a slope of 3:1 or steeper, that have a continuous positive slope to a ORVW or trout waters must have temporary erosion protection or permanent cover within three days after the area is no longer actively being worked. The Project would be managed such that all exposed soil discharging off-site would be revegetated and erosion protection established within three days, a management practice included in the project SWPPP. The NPDES/SDS General Stormwater Permit associated with construction activity states that any drainage from the Site must be stabilized within 200 lineal feet from the property edge, or from the point of discharge into any surface water within 24 hours of connecting to surface water.

There are no diversion berms or swales proposed for the 1.3 acres draining to Zavoral Creek or for the 1.0 acre draining to the Middle Creek because it is not possible to construct effective diversion berms at these locations. Instead, alternative practices must be used at these locations, including minimizing the time when soil is exposed by implementing rapid stabilization techniques. A critical time would be between stripping of topsoil to overburden removal when the slopes would then be drained into the Site. Overburden removal followed by regrading each perimeter area to establish internal drainage would be accomplished immediately after the top soil is disturbed. The extent of disturbed soils draining off-site at any one time is also limited by the phasing of the project. There are three project phases and only one of the three locations where off-site drainage occurs is in each phase. Since the Project would decrease the total surface runoff from the Site compared to existing conditions, the risk of erosion and sedimentation impacts from runoff originating from the Site is also reduced by the Project.

4.10.3 Scandia Mine

There would be no change in potential impacts relative to erosion and sedimentation for the Scandia Mine Site as a result of the Project.

4.11 SURFACE WATER QUALITY AND QUANTITY

4.11.1 Affected Environment

See Sections 4.7 and 4.10.

4.11.2 Impact Analysis

A SWPPP would be implemented for the Project in compliance with the NPDES/SDS and CMSCWD permits. See additional discussion in Section 4.7 and 4.10.

The SWPPP plan would utilize BMPs to minimize or prevent discharge of stormwater runoff from becoming contaminated or, for sediment laden stormwater, from being discharged off site. In addition to the SWPPP, erosion and sediment control methods have been developed for the individual phases including post-reclamation as illustrated in the Mining and Reclamation Stormwater Plans. The Stormwater Plans depict the evolution of drainage patterns as topography is altered throughout the mining and reclamation phases. As mining progresses, the interior elevation of the site would be reduced, which directs the flow of surface water to the interior of the site. The Stormwater Plans also illustrate the BMPs that would be implemented throughout the life of the project.

As described in the SWPPP the area that would be mined and reclaimed includes 64 acres, which includes approximately 53 acres that currently drain internally due to past mining operations which have lowered the grade below the elevation of the surrounding land. As a result, runoff generated within the internally drained area is not discharged off-site. About 11 acres within the Project limits currently drain off-site.

There are three separate areas within the proposed mining limits that currently drain off-site as indicated in the SWPPP Site Map. Stormwater from each of these three areas drain to a separate spring creek that ultimately discharges into the St. Croix River. The northernmost area encompasses approximately 3.10 acres and is located within Phase 1 Mining. The stormwater flows off-site and drains towards an unnamed creek locally known as Zavoral Creek. To prevent untreated off-site flow at this location a number of BMPs would be applied as illustrated in Mining and Reclamation Stormwater Plan Phase 1. The southernmost drainage area consists of approximately 6.64 acres and is located within Phase 2 Mining. The area drains off-site to the southernmost creek located outside of the property boundary. To prevent untreated off-site flow at this location a number of BMPs would be applied as illustrated in Mining and Reclamation Stormwater Plan Phase 2. The central drainage area consists of approximately 1.07 acres and is located in Phase 3 Mining. The stormwater drains off-site to a creek that is also unnamed. To prevent untreated off-site flow at this location a number of BMPs would be applied as illustrated in Mining and Reclamation Stormwater Plan Phase 3.

After reclamation of the Project the majority of stormwater runoff would be directed towards the six depressions located in the interior of the site as illustrated in Mining and Reclamation Stormwater Plan Post-Reclamation. The exception is the northwestern most area of the project. This area would be reclaimed during Phase 2. The removal of the BMPs would not occur until vegetation and soil stability is well established. Until stability of the area is evident, stormwater flow would be diverted to the interior of the Site.

See Sections 4.7 and 4.10.

4.11.3 Potential Mitigation Measures

See Sections 4.7 and 4.10.

4.11.4 Scandia Mine

The 1999 EAW evaluated impacts associated with the mining limits that are consistent with the mining limits that are currently approved in the Scandia Mine CUP. These mining limits include 155 acres to be mined and reclaimed. Add-rock imported to the Scandia Mine is unloaded over an active face where it is

stored until needed. It is not stockpiled in individual stockpiles over the Mine floor. The practice of storing the add-rock material over the active face would continue regardless of the add-rock source. This activity does not open any areas to be mined prematurely nor does it change or disturb additional areas as storage takes place over the active mining area. Utilizing the Zavoral Site as the source of Class C add-rock would not require any change to the approved mining limits or operation or cause any change to impacts to downstream water resources.

4.12 GEOLOGIC HAZARDS AND SOIL CONDITIONS

4.12.1 Zavoral Site

Potential geologic hazards are related to the elevation relief between the Zavoral Site and the St. Croix River and the erodible nature of the soil. The surface soils consist of highly erodible granular materials. These soils are generally stable unless water is introduced. Surface water drainage is the primary source of water that could lead to erosion and soil transport.

There is some evidence that a major transportation of soil occurred in the past, primarily based on discussions with area residents and the existence of a delta deposit near the mouth of Zavoral Creek that appears to be the result of a significant erosion event. The cause of this delta deposit is not known. It could be the result of a natural erosion event (major rain event) or the result of human activities.

AECOM reviewed the Site watershed boundaries for existing conditions, during operation, and reclamation and post-operation conditions. The following observations were made based on the review of Tiller Mining and Reclamation Plans.

- The majority of the Site currently drains internally. Where internal drainage is present the potential for a significant erosion event is small.
- Areas of off-site drainage currently exist on the north and south portions of the Site. These areas are located adjacent to ravines and some potential for erosion exists.
- Mining activity would increase the area of internal drainage and decrease the area of off-site drainage. This would reduce the amount of water available to erode Site granular soils.
- The post-conditions situation eliminates all but 1.3 acres of off-site drainage located at the north end of the Site. The rest of the Site would be internally drained. The watershed for the remaining 1.3 acres of off-site drainage would be reduced from what presently exists thereby reducing the potential for a significant erosion event.
- Tiller is not proposing to process materials at the Zavoral Site, no wash water basins or other features exist that, should a breach or overtopping event occur, would result in a major soil transportation event similar to past events.

The potential for a significant erosion event to occur would be reduced by the implementation of BMPs, as part of the Project to control sedimentation and erosion, and the increase in the area of internal drainage as part of mining related activities. In addition to reducing the off-site drainage, reclamation activities would result in a stable vegetative cover that would further reduce the potential for soil erosion.

4.12.2 Scandia Mine

The geology, soil conditions, and operations at the Scandia Mine would remain the same as those evaluated in the 1989 EAW and the 1999 EAWs. The add-rock source would not affect these conditions.

4.13 SOLID WASTE, HAZARDOUS WASTE, AND STORAGE TANKS

4.13.1 Zavoral Site

4.13.1.1 Solid Waste

Due to the seasonal nature of the Project, no permanent sanitary waste facilities would be constructed. Instead, portable sanitary waste facilities would be used and managed by a licensed contractor.

It is anticipated that very little solid waste would be produced at the Zavoral Site. It is expected that a waste container within the on-site trailer would be sufficient for waste collection. This would be collected by a Tiller employee on a daily basis during periods when work is occurring at the Site and disposed of at Tiller's Maple Grove facility where waste is picked up by a licensed solid waste hauler for disposal at a licensed waste facility. In the event that increased waste disposal was needed, a dumpster managed by a licensed waste hauler could be brought to the Site.

4.13.1.2 Hazardous Waste

No hazardous wastes are expected to be generated at the Zavoral Site. Hazardous materials at the Site would be limited to Materials of Trade (MOTs) carried in a service truck, which would come to the Site to perform routine maintenance on operating equipment. The service truck would take all used fluids and filters from the Site where they would be properly disposed of at the operator's main shop. The service truck would carry a spill containment kit.

An MOT as defined in a fact sheet published by the Mn/DOT[8] is a hazardous material, other than a hazardous waste, that is carried on a motor vehicle:

- For the purpose of supporting the operation or maintenance of a motor vehicle, including its auxiliary equipment (e.g., engine starting fluid or spare wet batteries carried on a tow truck).
- By a private motor carrier, including a vehicle operated by a rail carrier, in direct support of a principal business that is other than transportation by motor vehicle (e.g., landscaping, plumbing, or welding services).

Other materials that are not considered hazardous but are expected to be on-site during operations include engine oil, grease, hydraulic fluid, and anti-freeze. The materials would be stored in the on-site trailer in compliance with state, county, and city requirements and regulations.

[8] Mn/DOT. Minnesota Commercial Truck and Passenger Regulations Fact Sheet: Materials of Trade, St. Paul, MN. Available at: http://www.dot.state.mn.us/cvo/factsheets/hm200mot.pdf.

4.13.1.3 Storage Tanks

The only material that may be stored in on-site tanks during operation would be diesel fuel. However, it is expected that diesel fuel would primarily be brought on-site by a bulk delivery truck that would directly fuel the operating equipment. Therefore, storage of diesel fuel on-site is not expected. In the event that fuel storage would be necessary, storage would be in a single 1,000-gallon mobile tank in compliance with state, county, and city requirements and regulations. This tank would be located within the active mining or reclamation phase.

4.13.1.4 Impact Analysis

4.13.1.4.1 Alternative 1 – 5- to 10-Year Operation

The generation of solid waste, use of MOTs, and delivery and/or storage of diesel fuel would occur during the 5 to 10 years of operation. If a diesel storage tank is not used at the Site, these activities would occur only when mining and/or reclamation activities take place. If diesel is stored at the Site, the tank could remain there for up to 10 years.

4.13.1.4.2 Alternative 2 – No-Build Alternative

The No-Build Alternative would have no impact to solid waste, hazardous waste, or storage tanks because no mining or reclamation activities would take place within the Zavoral Site.

4.13.1.4.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

If diesel fuel is not stored in a tank at the Site, the generation of solid waste, use of MOTs, and delivery of diesel fuel would occur during the 3.3 to 5 years of operation, but either more frequently or for longer durations or a combination of both. If diesel is stored at the Site, the tank could remain there for up to 5 years.

4.13.2 Potential Mitigation Measures

All on-site construction equipment would be monitored for leaks and receive regular preventive maintenance. Fueling and maintenance of vehicles would occur within the active mining phase and no "topping off" of vehicle fuel tanks would be allowed.

Minn. R. ch. 7151 requires registration of aboveground storage tanks (ASTs) over 500 gallons and has additional requirements for tanks over 1,100 gallons, facilities over 1,000,000 gallons, and tanks near surface water.

Regulated ASTs with a capacity of 500 to 1,100 gallons that are within 500 feet of a Class 2 surface water (water that can be used for recreational purposes) are required to:

- Be registered with the MPCA
- Be labeled
- Be constructed using appropriate industry standards
- Have secondary containment

- Have a facility sign posted

As a mitigation measure, the AST should be required to be more than 500 feet from surface water to reduce the potential for impacts to surface water. The MPCA must be notified about all ASTs within 30 days of installation by submitting an AST Notification Form to the MPCA.

Ground-water should be sampled and analyzed for diesel range organics. If gasoline is to be stored on Site gasoline range organics and benzene should be added to the analyte list.

4.13.3 Scandia Mine

Waste handling and material storage at the Scandia Mine would remain the same as those evaluated in the 1989 EAW and the 1999 EAWs and allowed under the current CUP and AOP. The add-rock source would not affect these conditions.

4.14 TRAFFIC

4.14.1 Zavoral Site

4.14.1.1 Affected Environment

Raw aggregate material mined at the Zavoral Site would primarily be transported to the Scandia Mine. In some cases, it would be transported directly to construction project sites. It is not possible to predict the locations of these construction sites. The Scandia Mine currently uses or processes aggregate material that is transported to the Scandia Mine from various locations. These include Class A, B, and C aggregate material that falls into two basic categories:

- Material hauling that would not change regardless of whether the Zavoral Site is permitted
- Material hauling that would change if the Zavoral Site is permitted

These categories are described in detail below.

- **Material hauling that would not change regardless of whether the Zavoral Site is permitted:**

Class A Aggregate: Tiller currently imports Class A aggregate to the Scandia Mine for use in hot mix asphalt production. Annual utilization varies. Average utilization for the past 5 years is 21,500 tons a year. These materials are stored in proximity to the asphalt plant and therefore stockpile size is limited to approximately 2,000 to 2,500 tons.

Class A aggregate typically consists of crushed quarry or mine trap rock (basalt, diabase, gabbro, or other related igneous rock types), quartzite, gneiss, or granite

This Class A aggregate hauled to the Scandia Mine consists of basalt from the Dresser, Wisconsin, area and granite from the St. Cloud, Minnesota, area. Historically this has typically consisted of two to three trucks per day for 1 to 3 days per week depending on utilization. Each of the trucks would haul five loads per day or 10 round trips per day, resulting in a total of up to 30 round trips on a typical day for up to 3

days a week (90 round trips a week). The route from Wisconsin is east on TH 243 to south on TH 95 to west on TH 97 to north on CR 1 (Lofton Avenue) to the Lofton entrance of the Scandia Mine **(Figure 35).** The route from St Cloud is the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail) **(Figure 35)**. These routes are reversed for return trips.

Class B Aggregate: Tiller currently imports Class B aggregate to the Scandia Mine for use in hot mix asphalt production. Annual utilization varies. Average utilization for the past 5 years is 30,000 tons per year. These materials are stored in proximity to the asphalt plant and therefore stockpile size is limited to approximately 2,000 to 2,500 tons.

Class B aggregate typically consists of all other crushed quarry or mine rock, i.e. limestone, dolomite, rhyolite, schist, etc.

The number of trucks hauling limestone is two to three trucks per day for 1 to 3 days per week depending on utilization. Each of the trucks would haul five loads per day or 10 round trips per day, resulting in a total of up to 30 round trips on a typical day for up to 3 days a week (90 round trips a week). There are two haul routes. One route is from the Bayport, Minnesota, area; trucks hauling limestone travel north on CR-15 and CR 15A (Manning Trail) to the Scandia Mine. The other route is from the west from the Burnsville, Minnesota, area; trucks hauling limestone travel the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail). These routes are reversed for the return trips (**Figure 35).**

- **Material hauling that would change if the Zavoral Site is permitted:**

Class C Aggregate: Tiller currently imports Class C aggregate from Franconia Township, Minnesota, and the Osceola, Wisconsin, area. The existing Class C aggregate haul routes (**Figure 35**) are concentrated on both TH 95 (north), CR 1 (from the south), and TH 97. Other sources of Class C aggregate, including those currently used, would not be used if the Zavoral Site were permitted until the material from the Zavoral Site was used up. This is because the Zavoral Site is closer to the Scandia Mine than the Franconia or Osceola sources and, as a result, is less costly to haul.

Class C aggregate typically consists of natural or partly crushed natural gravel obtained from a natural gravel deposit. Material from the Zavoral Site would consist of uncrushed natural gravel.

The Class C aggregate haul routes currently used **(Figure 35)** are:

- Franconia Township, Minnesota – from the intersection of Sugar Bush Trail N. and TH 95 in Franconia Township to south on TH 95 to west on TH 97 to north on CR 1 (Lofton Avenue) to the Lofton entrance of the Scandia Mine with return trips reversing this route.

- Osceola, Wisconsin, area – trucks typically cross the river at TH 243 from Polk County, which is the closest river crossing to south on TH 95 to west on TH 97 to north on CR 1 (Lofton Avenue) to the Lofton entrance of the Scandia Mine with return trips reversing this route.

These hauling activities have generated a maximum of 265 loads (530 trips) a day with an average of 190 loads (380 trips) a day. The most recent Class C aggregate haul event from Franconia Township to the Scandia Mine occurred in July 2010. This was pit run, unprocessed material that was blended and

processed with material present at the Scandia Mine. The haul started the week of July 5 and lasted through July 22. The average number of loads per day was 140 or 280 trips. During this event there were 3 days with 170 loads or 340 trips.

4.14.1.2 Proposed Haul Route

The proposed haul route from the Zavoral Site to the Scandia Mine, shown in **Figure 3,** is approximately 6.5 miles long. The proposed haul route would haul material directly from the Zavoral Site to the Scandia Mine on TH 97. The two "build alternatives" include the same study area, haul facilities, and roadway network. The main difference is the duration of the haul events (total years and number of weeks for the add-rock haul). The impacts of the build alternatives on traffic operations and safety were evaluated on the following roadways:

- TH 97 from Manning to TH 95
- TH 95 from 220th Street to 209th Street
- Manning and Lofton from TH 97 to the Scandia Mine entrance
- Intersections within the study limits

Under the two "build alternatives," truck traffic currently traveling to and from the Scandia Mine along TH 97, TH 95, TH 243 would be replaced by the direct routes between the Zavoral Site and Scandia Mine (**Figures 35 and 3)**. While the Zavoral Site is in operation, Tiller would not haul Class C add-rock to the Scandia Mine from Franconia or Osceola, As a result, in Minnesota, TH 243, and TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles. Trucks with other regional and local destinations would continue to operate on these roadways; however, the overall daily volumes would not include Tiller Class C add-rock haul traffic during the life of the Zavoral Site.

Employee and maintenance transportation at the Zavoral Site would be minimal. One equipment operator, one foreman, and one fuel truck per day, and a maintenance truck (every 2 to 4 days) are expected to access the Site. In addition, mining and restoration would occur at the Site as described in Section 2.0 of this document.

4.14.1.3 Current Traffic Levels in Study Area

Annual average daily traffic (AADT) – the estimate of daily traffic on a road segment that represents the total traffic on a segment that occurs in a 1-year period divided by365 days.

Annual Average Daily Traffic (AADT) volumes **(Figure 36)** have remained fairly constant in the past several years on the main roadways that would be affected by the Project. TH 95 and TH 97 are two-lane state highways that are designed for higher speed traffic (55 mph speed limit) and regional travel. They include bypass lanes in some areas and turn lanes at some intersections. The Traffic Technical Memorandum is included as **Appendix X**.

The intersections at TH 97 at Manning and Olinda are four-way stop intersections. TH 97 has stop sign control at TH 95. None of the intersections in the study area carry sufficient traffic volume to warrant a traffic signal.

Mn/DOT completed roadway construction improvement projects on sections of TH 97 in 2007 and TH 95 in 2009, which are important for mobility and safety on the Trunk Highways. These were primarily pavement rehabilitation, drainage, and associated improvements for safety and maintenance. Washington County does not have improvements planned in their 5-Year Capital Improvement Plan.

The haul traffic related to the three alternatives under consideration in this EIS is described below.

4.14.1.3.1 Alternative 1 – 5- to 10-Year Operation

The projected daily truck volumes **(Figure 37)** were calculated using the following data:

- Alternative 1 is based on 5 to 10 year operation at the Zavoral Site.
- Mining operations would take place for 6 to 12 weeks a year.

Alternative 1 – 5 to 10 years of Mining –
6 to 12 weeks of mining a year
334-400 round trips a day hauling

- Total projected Class C aggregate mined each year for transport from the Zavoral Site, primarily to the Scandia Mine, is120,000 to 240,000 tons.
- The number of loads per year is calculated based on the haul weight and typical weight transferred in one truckload (20 to 24 tons per truckload). The number of loads per year is then converted to "projected loads per day" based on the typical range of truckloads that would be loaded and transported during a working day. This calculates to 167 to 200 truckloads on a typical working day (334 to 400 round trips).
- Tiller has noted that production can vary and be lower than the 167 truckloads. This EIS analyzes the higher level of traffic volume to evaluate the potential impacts to the roadway system.
- The maximum number of trucks in a working day has been defined at 280 trucks (560 round trips). This is based both on historic peaks for the Scandia Mine (530 trips) and on field timing of similar add-rock truck loading conducted at other Tiller sites (**Figure 37**). It takes approximately 2.15 minutes to load a truck. This includes time to periodically reposition excavating equipment and allow trucks to move to the excavator to be loaded. As a result, no more than 28 trucks (60 minutes/2.15 minutes per truck) could be loaded and leave the Zavoral Site. This scenario is unlikely because trucks would need to run at full hourly capacity (28 loads per hour) for 10 consecutive hours to reach this level. However, this EIS analyzes this as the maximum traffic level because a major demand for gravel could generate this peak traffic level.
- Reclamation of the Zavoral Site would proceed in increments as areas of mining are completed. Topsoil or other organic material would be applied to these areas and vegetation established to reduce erosion. Reclamation at maximum levels would result in 40 round trips a day for topsoil. This level would only occur during Phase 1 reclamation but was used throughout the project life as a worst-case peak **(Appendix X).** This reclamation hauling in combination with the add-rock hauling peak would result in a total worst-case peak of 600 round trips per day.

4.14.1.3.2 Alternative 2 – No-Build Alternative

The projected daily truck volumes **(Figure 38)** were calculated using the following data:

- This is the No-Build Alternative. Tiller would continue to import Class C aggregate from the Franconia Township, Minnesota and the Osceola, Wisconsin, area.
- Alternative 2 is based on 20 to more than 30 years of mining at these sites.
- Mining operations would take place for 6 to 20 weeks a year.
- Total projected Class C aggregate mined each year for transport, primarily to the Scandia Mine, is 120,000 to 240,000 tons.

Alternative 2
6-20 weeks of mining a year
210-528 trips hauling
560 trips peak hauling
No reclamation
Total peak haul is 560 round trips a day

- The range of projected loads is shown based on Tiller's records over the past 7 years of operation for the Scandia Mine. This calculates to 105 to 279 truckloads on a typical working day (210 to 528 round trips).
- Tiller has noted that production can vary and be lower than the 105 truckloads. This EIS analyzes the higher level of traffic volume to evaluate the potential impacts to the roadway system.
- The maximum number of trucks in a working day has been defined at 280 trucks (560 round trips. No reclamation would be occurring at the Zavoral Site, so no reclamation topsoil trips are included in this peak number.

4.14.1.3.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The projected daily truck volumes **(Figure 39)** were calculated using the following data:

- Alternative 3 is based on 3 to 5 years of mining at the Zavoral Site.
- Mining operations would take place for 12 to 18 weeks a year.
- Total projected aggregate mined each year for transport from the Zavoral Site to the Scandia Mine is 240,000 to 360,000 tons.

Alternative 3
12 to 18 weeks of mining a year
334–400 trips hauling
560 trips peak hauling
40 trips peak reclamation topsoil
Total peak haul is 600 round trips a day

- The number of loads per year is calculated based on the haul weight and typical weight transferred in one truckload (20 to 24 tons per truckload). The number of loads per year is then converted to "projected loads per day" based on the typical range of truckloads that would be loaded and transported during a working day. This calculates to 167 to 200 truckloads on a typical working day (334 to 400 round trips).

- Tiller has noted that production can vary and be lower than the 167 truckloads. This EIS analyzes the higher level of traffic volume to evaluate the potential impacts to the roadway system.
- The maximum number of trucks in a working day has been defined at 280 trucks (560 round trips.
- Reclamation of the Zavoral Site would proceed in increments as areas of mining are completed.

4.14.1.4 Haul Traffic Summary

Table 17 summarizes the haul traffic for the alternatives.

Table 17: Haul Traffic Summary

Task	Alternative		
	Alternative 1 (5 to 10 Years)	Alternative 2 No-Build (hauling from current add-rock sources)	Alternative 3 (5 Years or Less)
Mining activity	5 to10 years	20 to 30+ Years	3 to 5 years
Tons per year mined	120,000-40,000	120,000-400,000	240,000-360,000
Projected weeks operating per year	6-12	6-20	12-18
Projected loads per year	5,000-12,000	5,000-20,000	10,000-18,000
Typical tons per truckload	20-24	20-24	20-24
Projected loads per day (range)	167-200 trucks 334-400 trips	105-279trucks 210-558 trips	167-200 trucks 334-400 trips
Reclamation topsoil loads per day	0-20 trucks 0-40 trips	Not Applicable	0-20 trucks 0-40 trips
Projected loads per day (range) Add-rock + reclamation	167-220 trucks 334-440 trips	105-279trucks 210-558 trips	167-220 trucks 334-440 trips
Maximum capacity loads per day	280 trucks 560 trips	280 trucks 560 trips	280 trucks 560 trips
Maximum capacity loads per hour	28 trucks 56 trips	28 trucks 56 trips	28 trucks 56 trips
Maximum reclamation topsoil loads per day	20 trucks 40 trips	0	20 truck 40 trips
Total peak (add-rock + reclamation topsoil)	300 trucks 600 trips	280 trucks 560 trips	300 trucks 600 trips

4.14.1.5 Area Roadway Weight Restrictions

The weight restrictions for Minnesota highways vary depending upon the number of axles on a vehicle, the distance between the axles, and the classification of the road. A three-axle dump truck can have a gross weight of 18.5 to 27 tons, depending on the length, and can go up to a gross weight of 30 tons on trunk highways. A six-axle truck can have a gross weight from 33 to 40 tons, depending on the length. Additional weight is not allowed for trucks with more than six axles. Unless a lower weight restriction applies, the maximum gross weight on any Minnesota trunk highway is 40 tons and 36.6 tons on other roads. However, the relatively new Minnesota Regulation 169.824(2)(3) states that the higher 40-ton gross weight limit also applies to roads that provide access to dumping or loading facilities up to 3 miles from trunk highways as well.

Minnesota also has seasonal weight restrictions for roads during the spring thaw to limit road damage during this time of higher damage susceptibility. These restrictions last for a duration of 8 weeks and vary each year, but they typically are in place from February to about the middle of May. These restrictions are 9 tons per axle on county roads and 10 tons per axle for state highways.

The trucks currently hauling to/from the Scandia Mine and plans for hauling from the Zavoral Site would meet the weight limit requirements for the trunk highways and County Routes adjacent to Scandia.

4.14.1.6 Impact Analysis

4.14.1.6.1 Safety Evaluation

The safety of the roadway system was evaluated by obtaining and reviewing the most current 3 years of crash reports, geometrics and operations, and site reviews.

The study area roadway system includes Trunk Highways, County Roads, and local roads that provide access to all vehicles for local and regional travel. The Trunk Highway system has sufficient capacity for the traffic volumes in the area and meets Mn/DOT requirements for sight distance (including the TH 95 and TH 97 intersection). The County and local roads also meet the County design criteria for rural traffic. The details of the crash analysis are described below. No significant crash problems were identified in the study area during the 3-year period (2008–2010).

Crash data for the key roadways in the study area was collected for the years 2008, 2009, and 2010. Mn/DOT provided updated crash data for the Scandia area for roadway segments and intersections. The data is mapped and details included in the technical memorandum in **Appendix X.**

The roadway segments in the study area for crash data included:

- TH 97 from Manning to Lofton
- TH 97 from Lofton to Olinda
- TH 97 from Olinda to TH 95
- Lofton from TH 97 to 228th Street

The intersections in the study area for crash data included:

- TH 97 and Manning
- TH 97 and Lofton
- TH 97 and Meadowbrook
- TH 97 and Oakhill
- TH 97 and Olinda
- TH 97 and TH 95

The segment crashes are relatively small in number and include run-off road and deer collision crashes. Segment crashes are defined as crashes that occur on a section of roadway between intersections (but not including the intersection). These are typical for rural areas. There appears to be no major contributing factors in terms of roadway geometry and operations. Mn/DOT has reviewed the sight distance at the TH 97 and TH 95 intersection and found no deficiencies. TH 97 was rehabilitated in 2007 and the sight distances met Mn/DOT standard requirements at the 55 mph speed limit. TH 95 was rehabilitated in 2009 and the sight distances met Mn/DOT standard requirements at the 55 mph speed limit.

The intersection crash data collected for the typical 3-year period when evaluating such data is generally low at most intersections. The TH 97 and Lofton intersection had the highest number of crashes during the 3-year period (12 crashes), including five right angle crashes. The TH 97 and Lofton intersection was part of Mn/DOT's resurfacing project. The cause of the crashes is likely driver error by turning in front of vehicles on TH 97. If there are concerns about speeding on TH 97, this is an enforcement issue that requires the attention of the State Patrol. A review of the data does not show involvement of semi-trucks in the area crashes. The data captures actual crashes and does not record near-miss or other close call data.

One fatal crash occurred just north of the TH 97 and TH 95 intersection in 2006 that involved a pedestrian. This data was not provided in the initial crash reports and was found after additional research extended past the typical 3-year crash data collection window. A concerned resident provided information a pedestrian struck by a semi-truck.at a PAC meeting. The State Patrol investigated the crash and found that it was an error by the pedestrian in walking in front of the truck and the driver was unable to stop in time.

4.14.1.6.2 Scandia Elementary School

Scandia Elementary School is located on the south side of TH 97 near Oakhill Road. School representatives were contacted and provided information on school bus operations, parent drop-off/pickup, and bike/walk patterns. The school does not cite any major concerns with traffic and safety on TH 97. They recognize it is a busy highway and do not have activities near the area. The following is a summary of the key findings:

- Buses drop off students at 9:05 a.m. (for a 9:15 start of school) and leave at 3:40 p.m. (school is dismissed at 3:30). There are 14 buses for about 390 students. All buses enter on TH 97 in the morning. Half the buses exit on TH 97 and the other half on Oakhill.

- During the year, 35 to 40 students are picked up and dropped off at various times. The north lot is used for pick-up/drop-off to separate personal vehicle traffic from the bus traffic.

- Six students ride bicycles to school (2 to 4 miles) and are required to have a bike/walk pass for safety. No students currently walk to school.

The traffic operation, capacity, and safety were evaluated for the school driveways (at TH 97 and Oakhill). No problems were found with capacity based on traffic volumes and turning movements out of the driveway. TH 97 includes a right-turn lane into the school and a bypass lane westbound around turning vehicles.

A review of the data does not show the involvement of semi-trucks in area crashes. This indicates that there are no reportable crash problems with semi-trucks within the study area roadway system.

4.14.1.6.3 Impacts Bicycle and Pedestrian Facilities

The City of Scandia Trail Plan presents near- and long-term improvement plans for trails in the area and connections to regional trails. The trails are planned for both pedestrian and bicycle users. Safety for pedestrian and bicyclists is an important component in the trail planning process.

- The proposed trail on TH 97 is planned as an off-road trail to be constructed in the long-term plan. The off-road trail is recommended as a safer option, with the 55 mph speed limit and truck traffic in the area.

- The proposed trail on TH 95 is also an off-road trail. This is also recommended as a safer option, with the 55 mph speed limit truck traffic in the area.

- The trail crossing at TH 97 and TH 95 is in the long-term plan and should be reviewed in coordination with traffic and intersection operations. Advanced signing for the trail crossing should be added.

- A trailhead is shown at TH 97 and TH 95. If the Zavoral Site is operational, the location of the trailhead should be reviewed and possibly relocated due to the proximity of the proposed location to hauling vehicles.

- New crossings on TH 97 at Oakhill and Ozark are called out for design with traffic controls. This would most likely be some type of warning flashers, not traffic signals. Warning striping should also be considered.

4.14.1.6.4 Impacts Related to Recreation Area Traffic

The area along the St. Croix River is scenic and provides a range of recreational and scenic driving opportunities. William O'Brien State Park is located approximately 2.5 miles south of the Zavoral Site on TH 95. Recreation traffic is a component in increasing average daily traffic on TH 97 and TH 95 during the spring to fall timeframe. Mn/DOT data recorded on TH 97 (at Automated Traffic Recorder station east

of Lofton) is included in **Appendix X.** The trunk highways have sufficient reserve capacity to handle the change in traffic volume for seasonal traffic. Periods of congestion may be experienced during peak weekend travel times or on a holiday weekend, with or without the proposed Project. Removing the current hauling traffic from the river crossing at TH 243 and the portion of TH 95 north of the Zavoral Site should be beneficial to vehicles using these roadways to get to the state park or enjoy other recreational opportunities in the area.

4.14.2 Impact Analysis

4.14.2.1 Alternative 1 – 5- to 10-Year Operation

The existing roadway network is sufficient to handle the daily traffic volumes in the area. TH 97 and TH 95 are state highways designed to accommodate regional traffic. The peak hour truck volumes are also within the capacity of the roadways.

Alternatives 1 and 3 have the same range of loads per day (334-440 projected trips with a maximum of 600 trips). The difference would be the length and duration of mining activity. Alternative 1 spreads the mining out over 5 to 10 years but would only operate hauls for a projected 6 to 12 weeks a year.

Current hauling patterns to the Scandia Mine require trucks to travel longer distances. Tiller has agreed not to haul Class C add-rock to the Scandia Mine from Franconia or Osceola during the period that the Zavoral Site is active. As a result, in Minnesota, TH 243 (including the bridge to Wisconsin), and TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles.

Mn/DOT reviewed the proposed driveway location for the Zavoral Site and determined the intersection sight distance to meet their requirements. A northbound right-turn lane would be required to allow vehicles to reduce speed and move out of mainline traffic to turn. An acceleration lane on TH 97 was not recommended by Mn/DOT, as the trucks are not pulling into high speed traffic and the acceleration lane would be a high cost and high property impact.

4.14.2.2 Alternative 2 – No-Build Alternative

Alternative 2 (No-Build) is expected to maintain the current level of truck traffic. Alternative 2 is projected to have 210-558 trips with a maximum of 560 trips). The reduction in maximum trips per day is related to no reclamation of the Zavoral Site, resulting in a possible reduction of up to 40 trips a day for topsoil hauling.

4.14.2.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Alternative 3 condenses the mining to 3.3 to 5 years, and the hauls would be projected to occur for 12 to 18 weeks a year. The add-rock haul impacts per day are limited by the maximum number of loads per day, which could be the same for all alternatives, but may be more likely to occur under Alternative 3 than Alternative 1 given the compressed Project timeframe. Under any scenario, the truck volumes are within the capacity of the study area roadway system and can be handled safely.

4.14.3 Potential Mitigation Measures

The following is a list of potential mitigation measures.

- Construct the new driveway access directly across from TH 97 as required item by Mn/DOT for safe access. In a review conducted by Mn/DOT in 2009, the agency required that the Zavoral Site access onto TH 95 be moved south to line up with TH 97 and that a northbound right-turn lane be constructed (Mn/DOT letter to City of Scandia, January 22, 2009). The right-turn lane would be consistent with the design of the existing left-turn lane. This would also match the design on the southbound approach. The sight distance requirements were met based on Mn/DOT reviews of the existing TH 97 and TH 95 intersection, and the 2007 and 2009 rehabilitation projects (June 29, 2011, letter to Anne Hurlburt, City of Scandia. In a recent review of the development this year, Mn/DOT reaffirmed that the improvements outlined in the 2009 letter would be required.

- In order to ensure that additional truck traffic would not result from hauling from the Zavoral Site at peak demand concurrently with other sites (Wisconsin, Washington County, Chisago County, and other Eastern Minnesota locations), the number of trucks hauling Class C add-rock to the Scandia Mine should be recorded and reported by Tiller and limited to the projected maximum level of 280 trucks for Class C aggregate, or 560 trips per day or below, and documentation could be required. The maximum mining level supplied by Tiller for the air quality analysis worst case is higher than the information used for traffic and this monitoring would ensure that the projected traffic levels are not exceeded.

- Truck warning signs that are Minnesota Manual on Uniform Traffic Control Devices (MMUTCD) compliant are recommended on TH 95 to advise drivers of trucks crossing TH 97 in and out of the proposed Zavoral Site. The installation of warning flashers is another option, but should be discussed with Mn/DOT to evaluate the safety impacts.

- Area citizens expressed concern regarding the need for an acceleration lane on TH 97. Mn/DOT responded as follows:

  > "This situation is significantly different than the site at Hwy 95 and 243. At that site, slow moving vehicles are pulling out into high speed southbound traffic and the acceleration lane that was provided allows for trucks to increase speed and then merge into southbound traffic. At the hwy 95/97 intersection, the trucks from the mining site are not pulling into high speed traffic. Once they cross the intersection, all traffic on Hwy 97 is low speed and accelerating as they continue west up to the 55 MPH speed limit. The grade is fairly gradual in this area and trucks are able to accelerate as they go up this relatively gradual grade on Hwy 97. Mn/DOT does not support requiring the developer to install an acceleration lane due to limited benefits, high costs, and impacts to abutting properties along Hwy 97."

- To accommodate the northbound TH 95 right-turn lane, the trail running along TH 95 would be impacted and would need to be relocated or removed. Mn/DOT has indicated that neither the county and or the MnDNR, are willing to take over ownership and maintenance responsibilities of this trail. Given this conclusion that the trail would be a local responsibility, the City could require Tiller to funding some trail construction and reconnection as mitigation to implement the City's trail plan.

- The City of Scandia Trail Plan should be coordinated with Mn/DOT to provide a safe bicycle route and avoid conflicts with vehicle traffic on TH 97 (at the 55 mph speed limit).

4.14.4 Scandia Mine

Washington County was the RGU for the 1999 EAW and is the road authority for CR 15 (Manning Trail) and CR 1 (Lofton Avenue). Traffic and safety issues were reviewed by the County during the 1999 EAW and again during the 2007 City of Scandia and 2008 processes. Maximum daily haul truck traffic of 750 trips was used in both reviews. This number of daily trips would allow for 8,000 to 9,000 tons of material to be transported to and from the Scandia Mine in a given day. This level of hauling would not be expected to occur frequently, but has occurred in the past and would has the potential to occur in the future. Tiller has scheduling control for the Scandia Mine hauling traffic. To avoid equipment and trucking conflicts, and to keep trucks moving efficiently, Tiller would control traffic so that add-rock hauling would not occur when there are large projects hauling outgoing material.

The CUP for the Scandia Mine requires Tiller to post 'trucks hauling' signs for the northbound lane on Manning Avenue and both north and southbound lanes on Lofton Avenue. Supplemental distance signs must also be provided below these signs and the existing sign to inform drivers of the approximate location of the access. Signs must be approved by Washington County and shall meet the County's requirement. Tiller must also restrict truck traffic that imports add-rock to the Mine from using the Lofton Avenue (CR 1) access during non-daylight hours. Non-daylight hours shall be defined as one-half hour after sunset to one-half hour before sunrise. Tiller is required to post a sign at the Manning Avenue access that is similar to the existing sign at the access to Lofton Avenue that restricts trucks using 228th Street, to keep the truck traffic off the local roadway near the Mine

4.15 STATIONARY SOURCE AIR EMISSIONS AND DUST

4.15.1 Zavoral Site

4.15.1.1 Affected Environment

The Clean Air Act required the U.S. Environmental Protection Agency (USEPA) to set NAAQS for pollutants considered harmful to public health and the environment if present in sufficient concentrations. The NAAQS include two types of air quality standards.

- Primary standards protect the public, including the health of sensitive populations such as asthmatics, children, and the elderly.

- Secondary standards protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The USEPA has established and Minnesota has adopted NAAQS for seven principal pollutants, which are called "criteria pollutants," as defined in **Table 18**.

Table 18: National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 $\mu g/m^3$ [2]	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide	53 ppb [3]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [4]	None	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour [5]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual[6] (Arithmetic Average)	Same as Primary	
	35 $\mu g/m^3$	24-hour [7]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [9]	Same as Primary	
	0.12 ppm	1-hour [10]	Same as Primary	
Sulfur Dioxide	0.03 ppm [11] (1971 std)	Annual (Arithmetic Average)	0.5 ppm	3-hour [1]
	0.14 ppm [11] (1971 std)	24-hour [1]		
	75 ppb [12]	1-hour	None	

Source: USEPA 2011 (http://www.epa.gov/air/criteria.html)

[1] Not to be exceeded more than once per year.

[2] Final rule signed October 15, 2008. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[3] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard

[4] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

[5] Not to be exceeded more than once per year on average over 3 years.

[6] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

[7] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).

(10) (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

(11) The 1971 sulfur dioxide standards remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

(12) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

In addition to the NAAQS, Minnesota has adopted State Ambient Air Quality Standards (MAAQS). **Table 19** provides a summary of the MAAQS.

Table 19: Minnesota Ambient Air Quality Standards

Pollutant/Air Contaminant	Primary Standard	Secondary Standard	Remarks
Hydrogen Sulfide	0.05 ppm by volume (70.0 micrograms per cubic meter)		1/2 hour average not to be exceeded over 2 times per year
	0.03 ppm by volume (42.0 micrograms per cubic meter)		1/2 hour average not to be exceeded over 2 times in any 5 consecutive days
Ozone	0.08 ppm by volume (235 micrograms per cubic meter)	same as primary standard	daily maximum 8 hour average; the standard is attained when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to the standard
Carbon Monoxide	9 ppm by volume (10 milligrams per cubic meter)	same as primary standard	maximum 8 hour concentration not to be exceeded more than once per year
	30 ppm by volume (35 milligrams per cubic meter)	same as primary standard	maximum 1 hour concentration not to be exceeded more than once per year
Sulfur Dioxide	80 micrograms per cubic meter (0.03 ppm by volume)	60 micrograms per cubic meter (0.02 ppm by volume)	maximum annual arithmetic mean
	365 micrograms per cubic meter (0.14 ppm by volume)	same as primary standard	maximum 24 hour concentration not to be exceeded more than once per year

Pollutant/Air Contaminant	Primary Standard	Secondary Standard	Remarks
		915 micrograms per cubic meter (0.35 ppm by volume)	maximum 3 hour concentration not to be exceeded more than once per year in Air Quality Control Regions 127, 129, 130, and 132
		1300 micrograms per cubic meter (0.5 ppm by volume)	maximum 3 hour concentration not to be exceeded more than once per year in Air Quality Control Regions 128, 131, and 133
	1300 micrograms per cubic meter (0.5 ppm by volume)		maximum 3 hour concentration not to be exceeded more than once per year
	1300 micrograms per cubic meter (0.5 ppm by volume)		maximum 1 hour concentration not to be exceeded more than once per year
Particulate Matter	75 micrograms per cubic meter	60 micrograms per cubic meter	maximum annual geometric mean
	260 micrograms per cubic meter	150 micrograms per cubic meter	maximum 24 hour concentration not to be exceeded more than once per year
Nitrogen Dioxide	0.05 ppm by volume (100 micrograms per cubic meter)	same as primary standard	maximum annual arithmetic mean
Lead	1.5 micrograms per cubic meter	same as primary standard	maximum arithmetic mean averaged over a calendar quarter
PM-10	150 micrograms per cubic meter	same as primary standard	maximum 24-hour average concentration; the standard is attained when the expected number of days per calendar year exceeding the value of the standard is equal to or less than one
	50 micrograms per cubic meter	same as primary standard	annual arithmetic mean; the standard is attained when the expected annual arithmetic mean concentration is less than or equal to the value of the standard
PM-2.5	65 micrograms per cubic meter	same as primary standard	24-hour average concentration; the standard is attained when the 98th percentile 24-hour concentration is less than or equal to the standard
	15.0 micrograms per cubic meter	same as primary standard	annual arithmetic mean; the standard is attained when the annual arithmetic mean concentration is less than or equal to the standard

Source: Minn. R. ch. 7007.0080, State Ambient Air Quality Standards, 2011 (https://www.revisor.mn.gov/rules/?id=7009.0080)

Areas that meet the ambient air quality standards (AAQS) for the criteria pollutants are designated as being in attainment. Areas that do not meet the AAQS for one or more of the criteria pollutants may be subject to the formal rule-making process and designated as being in nonattainment for that standard. The determination regarding whether an area is in attainment is made by the MPCA using a combination of monitoring for pollutants at multiple locations and computer-based modeling. The results of the AAQS designation is reported to and reviewed by the USEPA regularly. The MPCA also prepares and submits a report on ambient air quality to the Minnesota Legislature each year.

The State of Minnesota and Washington County are in attainment for the NAAQS and MAAQS.

The MPCA has determined the ambient background concentration of criteria pollutants for the purposes of permitting. The background concentration is the average of the third highest reading observed over a 3-year period. Thus, the actual concentration of pollutants is lower than the background concentration at least 98% of the time. **Table 20** shows the background concentration for Scandia.

Table 20: Ambient Air Quality Background Concentrations

Pollutant	Avg. Period	Ambient Background µg/m^3
$PM_{2.5}$	24-Hr	24
	Annual	8.0
PM_{10}	24-Hr	43

Source: MPCA Standardized Air Modeling (SAM) Spreadsheet [Version 09293], 2011 (http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-emissions-and-monitoring/air-dispersion-modeling)

Small concentrations of silica are present in the ambient air as a result of natural causes such as wind blown dust, volcanic activity, etc. Silica is also present in the ambient air as a result of anthropogenic activities such as vehicle traffic on roads, farming, and mining.

No data were identified for the existing background concentration of silica in the ambient air in Minnesota.

4.15.1.2 Air Emissions and Dust Analysis

The following sections discuss the existing site conditions, proposed activities at the Zavoral Site, and the potential impacts from the proposed action.

4.15.1.2.1 Proposed Zavoral Site Activities

Proposed activities at the Site would be divided into four phases as described below.

Phase 1 would involve reclamation activities on an area approximately 4 acres in size, which is located within the St. Croix River District and scenic easement. Gravel mining is not planned for this area but would instead be the first phase of Site reclamation. Reclamation of this area would involve the removal of existing stockpiles and final grading of the area.

Phases 2 and 3 would involve both mining operations and reclamation activities. Phase 2 and Phase 3 would involve the same activities but would be completed in different locations on the property. Mining operations would include:

- Development of haul roads to the mining area;
- Stripping of vegetation and overburden and stockpiling the material on-site for reuse during reclamation activities;
- Excavating the aggregate using front end loaders;
- Loading the aggregate into trucks;
- Transporting the aggregate to the Scandia Mine Site; and

- Reclamation activities, including grading, placing topsoil, and seeding.

Phase 4 would involve final reclamation activities and grading. Stockpiles of overburden would be redistributed and additional topsoil may be transported to the Site for use. The reclaimed areas would be reseeded in accordance with the reclamation plan.

These activities would generate fugitive dust and, to a much lesser degree, particulate from combustion that could be transported off-site and deposited onto nearby land, vegetation, rivers, and lakes.

4.15.1.2.2 Impact Analysis

As discussed in detail in the Air Quality Technical Memorandum in **Appendix X**, the impacts analysis included:

- Preparation of PTE calculations for fugitive emission sources for particulate matter (PM), inhalable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

- Simulation of the atmospheric transport processes (dispersion and deposition) using the USEPA Guideline model AERMOD to calculate ambient concentrations of PM, inhalable particulate (PM_{10}), and fine particulate ($PM_{2.5}$).

- Simulation of deposition of PM to the earth's surfaces using the model AERMOD. The analysis included dry deposition due to gravitational settling and surface impaction due to turbulent air flow near surface elements as well as wet deposition due to wash-out by precipitation. To ensure defensibility of model predicted results, all modeling was conducted according to approved USEPA methodologies presented in the Guideline on Air Quality Models (40 CFR Part 51 Appendix W), and in accordance with MPCA Modeling Guidance posted at http://www.pca.state.mn.us/air/modeling.html#guidance.Evaluation of potential ambient concentrations of crystalline silica from Site operations.

Emission Calculations

PTE calculations were prepared for the following fugitive emission sources:

- Haul truck traffic on paved entry roads using the equation and emission factors published by the USEPA in the AP 42, Fifth Edition, Volume I, Chapter 13: Miscellaneous Sources, Section 13.2.1 Paved Roads. January 2011;

- Haul truck traffic on unpaved haul roads on the Site for three phases of operation using the equation and emission factors from AP-42 Section 13.2.2, Unpaved Roads. November 2006; and

- Mining and loading aggregate into haul trucks using the equation and emission factor for the Source Classification Code 30502503 for Mineral Products Manufacturing and Processing, Sand and Gravel – Construction, Material Transfer and Conveying.

Although both build alternatives include four phases, only Phases 2, 3, and 4 include mining activities. Mining activities, due to their higher intensity, would have the greatest emission rate for fugitive dust. Therefore, the analysis focused on the Phase 2, 3, and 4 mining activities because they represented the worst-case conditions for generation of fugitive dust.

Data provided by Tiller included the number of haul trucks, quantity of aggregate mined, and proposed location of haul roads for the Phase 2, Phase 3, and Phase 4 mining and reclamation activities. As discussed further below, the data represents the maximum activity levels at the Site regardless of the alternative. The data used in the PTE calculations included:

- Maximum number of haul trucks per day (including reclamation topsoil) = 300
- Maximum hourly aggregate excavation and loading = 670 tons
- Maximum daily aggregate excavation and loading = 6,720 tons
- Maximum annual aggregate excavation and loading = 360,000 tons

Haul road distances were calculated for each mining phase using figures for each phase of the mining plan (**Figures 4 through 8)** provided by Tiller showing the haul road locations. Where the maps show more than one loop, the longest loop was used for all truck traffic to provide a maximum estimate of emissions.

The following tables summarize the uncontrolled PTE for the proposed Project. No mitigation techniques were considered as part of the uncontrolled PTE calculations.

The excavation and loading calculations (**Table 21**) do not change based on the mining phase. The maximum mining quantities were used for this calculation.

Table 21: Potential to Emit from Excavation and Loading Operations

Excavation Rate	Hourly		Daily		Annual	
	670 tons/hr		6,720 tons/day		500,000 tons/year	
	Emission Rate	lb/hr	Emission Rate	lb/day	Emission Rate	lb/year
PM	19.4	lb/hr	195	lb/day	14,500	lb/year
PM_{10}	4.3	lb/hr	43	lb/day	3,200	lb/year
$PM_{2.5}$ (17% of PM_{10})	0.7	lb/hr	7	lb/day	544	lb/year

The paved and unpaved road calculations were completed for each mining phase **(Table 22).** Again, all PTE calculations are for uncontrolled emissions. No mitigation techniques were considered.

Table 22: Summary of Potential Emissions from Haul Roads

Phase 2	Paved Entry Road		Unpaved Mine Roads	
	lb/day	lb/year	lb/day	lb/year
PM	677	46,590	1,467	76,299
PM_{10}	135	9,318	521	27,093
$PM_{2.5}$	33.2	2,287	52.1	2,709
Phase 3	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	841	57,875	3,204	166,568
PM_{10}	168	11,575	1,137	59,146
$PM_{2.5}$	41.3	2,841	114	5,915
Phase 4	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	841	57,875	2,188	113,729
PM_{10}	168	11,575	777	40,384
$PM_{2.5}$	41.3	2,841	78	4,038

Tiller has prepared a fugitive dust control plan (Zavoral Mine Dust Control Plan, September 2011) to define the mitigation methods that would be used to reduce emissions of fugitive dust from the Site. A copy of the Zavoral Mine Dust Control Plan is in **Appendix X**. The mitigation methods selected include:

- Paved Roads – Sweeping and washing to remove dirt;
- Unpaved Roads – Placing asphalt fines on the roads, watering, and chemical dust suppression
- Excavation Areas – Watering
- Reclamation material stockpiles - Watering during construction, seeding for long-term mitigation
- Based on published information from the USEPA, these mitigation techniques can effectively reduce fugitive dust emissions. The effect of the proposed mitigation techniques would be:
- Paved Roads – 90% for sweeping and washing;
- Unpaved Roads – 90% for watering, silt load reduced from 25.5 grams per square meter (g/m2) to 6 g/m2 for application of asphalt fines
- Excavation Areas – 90% for water application
- Reclamation material stockpiles – 90% for watering, 100% for seeding

Emission calculations for the mitigated PTE were completed using the same assumptions on mining activity as were used for the uncontrolled PTE calculations. **Table 23** summarizes the mitigated excavation and loading calculations.

Table 23: Potential to Emit from Excavation and Loading Operations

Excavation Rate	Hourly		Daily		Annual	
	670 tons/hr		6,720 tons/day		500,000 tons/year	
	Emission Rate	lb/hr	Emission Rate	lb/day	Emission Rate	lb/year
PM	1.9	lb/hr	19.5	lb/day	1,450	lb/year
PM_{10}	0.4	lb/hr	4.3	lb/day	320	lb/year
$PM_{2.5}$ (17% of PM_{10})	0.1	lb/hr	0.7	lb/day	544	lb/year

The mitigated paved and unpaved road calculations are summarized in **Table 24** for each mining phase.

Table 24: Summary of Potential Emissions from Haul Roads

Phase 2	Paved Entry Road		Unpaved Mine Roads	
	lb/day	lb/year	lb/day	lb/year
PM	87.3	6005	53.8	2794
PM_{10}	17.5	1201	14.3	745
$PM_{2.5}$	4.3	295	1.43	74.5
Phase 3	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	108.4	7460	117	6100
PM_{10}	21.7	1492	31.3	1626
$PM_{2.5}$	5.3	366	3.1	163
Phase 4	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	108.4	7460	80	4165
PM_{10}	21.7	1492	21.4	1110
$PM_{2.5}$	5.3	366	2.1	111

4.15.1.2.3 Modeling Analysis

As described in detail in the Air Quality Technical Memorandum (**Appendix X),** an ambient air quality modeling analysis was used to predict the ambient air concentrations of TSP, PM_{10}, and $PM_{2.5}$. The TSP modeling results were used to predict deposition of dust onto land and into the St. Croix River. The PM_{10} and $PM_{2.5}$ results were compared to the primary and secondary NAAQS to determine if the emissions would cause or contribute to an exceedance of the NAAQS.

The model predicted that the uncontrolled impacts from facility sources plus the addition of appropriate background concentrations would result in exceedances of the NAAQS for PM_{10} and $PM_{2.5}$. The NAAQS results for uncontrolled emissions are summarized in **Table 25.**

Table 25: Summary of Ambient Air Quality Modeling Analysis for Uncontrolled Emissions

Mining Phase	Pollutant	Avg. Period	Maximum Concentration µg/m³	Ambient Background µg/m³	Worst-case + Ambient Background µg/m³	NAAQS µg/m³	% of NAAQS
Phase 1	$PM_{2.5}$	24-Hr	108.4	24	132.4	35	378%
		Annual	11.2	8.0	19.2	15	128%
	PM_{10}	24-Hr	755.9	43	798.9	150	533%
Phase 2	$PM_{2.5}$	24-Hr	101.2	24	125.2	35	358%
		Annual	14.3	8.0	22.3	15	149%
	PM_{10}	24-Hr	829.4	43	872.4	150	582%
Phase 3	$PM_{2.5}$	24-Hr	137.4	24	161.4	35	461%
		Annual	15.1	8.0	23.1	15	154%
	PM_{10}	24-Hr	1013.4	43	1056.4	150	704%

Notes:
$PM_{2.5}$ 24-hour result is the multiyear average of the H1H values. The average H1H value and the monitored ambient background value are summed and compared to the standard.
$PM_{2.5}$ annual result is multiyear annual average concentration over all analysis years. The multiyear average value and the monitored background value are summed and compared to the standard.
PM_{10} 24-hour result is H6H concentration over all analysis years. The H6H value and the monitored ambient background value are summed and compared to the standard.
Ambient Background Concentrations provided MPCA Standardized Air Modeling (SAM) Spreadsheet [Version 09293].
No external sources of emissions were included in this analysis.

The area where the model predicts that the impacts, due to uncontrolled emissions would be above the NAAQS for PM_{10} and $PM_{2.5}$ are shown on **Figures 40 through 45.**

The model predicted that the mitigated impacts from facility sources plus the addition of appropriate background concentrations would not result in exceedances of the NAAQS for PM, PM_{10}, and $PM_{2.5}$ at off-site locations. The NAAQS results for mitigated emissions are summarized in **Table 26**.

Table 26: Summary of Ambient Air Quality Modeling Analysis for Mitigated Emissions

Mining Phase	Pollutant	Avg. Period	Source Contribution ug/m3	Ambient Background[4] ug/m3	Worst-case (or Average) + Ambient Background ug/m3	NAAQS ug/m3	% of NAAQS
Phase 1	PM2.5[1, 2]	24-Hr	6.38	24	30.4	35	87%
		Annual	1.00	8.0	9.0	15	60%
	PM10[3]	24-Hr	6.34	43	49.3	150	33%
Phase 2	PM2.5[1, 2]	24-Hr	5.00	24	29.0	35	83%
		Annual	0.97	8.0	9.0	15	60%
	PM10[3]	24-Hr	8.92	43	51.9	150	35%
Phase 3	PM2.5[1, 2]	24-Hr	6.44	24	30.4	35	87%
		Annual	0.95	8.0	9.0	15	60%
	PM10[3]	24-Hr	6.77	43	49.8	150	33%

Table Notes:

1. PM2.5 24-hour result is the multiyear average of the H1H values. The average H1H value and the monitored ambient background value are summed and compared to the standard.

2. PM2.5 annual result is multiyear annual average concentration over all analysis years. The multiyear average value and the monitored background value are summed and compared to the standard.

3. PM10 24-hour result is H6H concentration over all analysis years. The H6H value and the monitored ambient background value are summed and compared to the standard.

4. Ambient Background Concentrations provided MPCA Standardized Air Modeling (SAM) Spreadsheet [Version 09293].

4.15.1.2.4 Deposition Analysis

Deposition modeling was conducted for PM emissions to assess the impact of particulate deposition from the proposed action. The concentration of particulate decreases with distance, and since the modeling analysis uses historic actual meteorological data, these values represent the highest concentration likely to occur during any one day.

The deposition analysis results showing the highest concentration of particulate matter resulting from uncontrolled emissions at the proposed Zavoral Site are summarized in **Table 27.**

Table 27: Deposition Analysis Results for the Site and the St. Croix River for Uncontrolled Emissions

Deposition to:	Mining Phase	Avg. Period	2004 g/m^2	2005 g/m2	2006 g/m2	2007 g/m2	2008 g/m2	Multiyear Worst-Case g/m^2
St. Croix River	Phase 1	24-Hr	0.03	0.02	0.02	0.02	0.02	0.03
		Annual	0.67	0.70	0.76	0.85	0.84	0.85
	Phase 2	24-Hr	0.03	0.03	0.03	0.03	0.03	0.03
		Annual	1.24	1.36	1.38	1.51	1.53	1.53
	Phase 3	24-Hr	0.05	0.05	0.05	0.03	0.03	0.05
		Annual	1.28	1.46	1.42	1.54	1.55	1.55
Land	Phase 1	24-Hr	0.34	0.35	0.34	0.30	0.34	0.35
		Annual	27.1	28.8	26.3	24.9	26.9	28.8
	Phase 2	24-Hr	0.33	0.35	0.36	0.31	0.35	0.36
		Annual	23.7	25.5	23.2	21.9	23.6	25.5
	Phase 3	24-Hr	0.31	0.33	0.33	0.30	0.34	0.34
		Annual	23.6	25.4	23.2	21.9	23.6	25.4

Table Notes:
24-hour results are H1H deposition rate of PM for each year.
Annual results are the highest annual average deposition for each year.

The deposition analysis results showing the highest concentration of particulate matter resulting from mitigated emissions at the proposed Zavoral Site are summarized in **Table 28.**

Table 28: Deposition Analysis Results for the Site and the St. Croix River for Uncontrolled Emissions

Deposition to:	Mining Phase	Avg. Period	2004 g/m^2	2005 g/m^2	2006 g/m^2	2007 g/m^2	2008 g/m^2	Multiyear Worst-Case
St. Croix River	Phase 1	24-Hr	0.03	0.03	0.03	0.02	0.03	0.03
		Annual	0.74	0.78	0.83	0.94	0.93	0.94
	Phase 2	24-Hr	0.04	0.04	0.04	0.04	0.05	0.05
		Annual	1.7	1.9	2.0	2.2	2.2	2.2
	Phase 3	24-Hr	0.06	0.06	0.06	0.04	0.04	0.06
		Annual	1.65	1.86	1.83	1.99	2.00	2.00
Land	Phase 1	24-Hr	3.80	3.40	3.40	3.50	3.70	3.80
		Annual	20.5	21.7	21.5	18.7	20.3	21.7
	Phase 2	24-Hr	0.23	0.25	0.24	0.21	0.22	0.25
		Annual	26.6	26.4	31.0	24.3	25.5	31.0
	Phase 3	24-Hr	0.34	0.30	0.34	0.25	0.22	0.34
		Annual	15.6	16.7	25.6	14.4	15.5	25.6

Table Notes:
24-hour results are H1H deposition rate of PM for each year.
Annual results are the highest annual average deposition for each year.

Deposition to Land

The deposition analysis was completed for potential impacts to local vegetation. Dust deposits can have significant effects on plant life, though mainly at high dust loadings. This can include:

- Reduced photosynthesis due to reduced light penetration through the leaves. This can cause reduced growth rates and plant vigor. It can be especially important for horticultural crops, through reductions in fruit setting, fruit size, and sugar levels.

- Increased incidence of plant pests and diseases. Dust deposits can act as a medium for the growth of fungal diseases. In addition, it appears that sucking and chewing insects are not affected by dust deposits to any great extent, whereas their natural predators are affected.

Under normal conditions, only PM_{10} remains in the atmosphere long enough to be considered atmospheric particulates. This is reflected in the actions of the USEPA, which eliminated the NAAQS for PM. The PM NAAQS was superseded by the PM_{10} NAAQS on July 1, 1987. Therefore, use of PM_{10} for deposition analysis is appropriate for impacts to land and plants.

Since the uncontrolled predicted concentrations of PM_{10} are above the NAAQS primary and secondary standards, in the absence of mitigation techniques, the concentrations may be high enough to adversely impact local vegetation within the areas shown in **Figures 43 through 45.**

As noted above, the largest area would occur during mining Phase 2 due to longer haul road lengths.

Following implementation of mitigation techniques, the concentrations of PM_{10} are below the primary and secondary standards. As noted above, the secondary NAAQS were established to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Since the deposition analysis shows the highest predicted concentration on any day, all other days would be predicted to have lower impacts. Therefore, it is unlikely that deposition would have an adverse impact on the surrounding land.

Neither the USEPA nor the MPCA has a standard for nuisance dust. Several countries have established nuisance dust standards that can be used for reference in evaluating PM concentrations related to the proposed action. **Table 29** summarizes nuisance dust standards for several countries.

Table 29: Summary of Nuisance Dust Standards

Nuisance: mass deposition measurements				
UK "unofficial" nuisance dust deposition rate[75]	All particulates	200 mg/m^2/day	Annual mean	Serious nuisance
West Australia Nuisance Standard	All particulates	133 mg/m^2/day	Monthly mean	First loss of amenity
		333 mg/m^2/day		Unacceptable reduction in air quality
West Germany Nuisance Standard	All particulates	350 mg/m^2/day	Monthly mean	Possible nuisance
	All particulates	650 mg/m^2/day		Very likely nuisance
Malaysia Air Quality Standard	All particulates	133 mg/m^2/day		Nuisance dust deposition
Israel Air Quality Standard	All particulates	2 * 10^5 kg/km^2/month		Nuisance dust deposition

Source: http://www.goodquarry.com/article.aspx?id=58&navid=2

The results of the modeling analysis indicate that the uncontrolled PM emissions from the Zavoral Site would be above the nuisance dust levels. The mitigated dust levels would be less than the above standards.

Deposition to Water

The deposition analysis was completed for potential impacts to the St. Croix River. The primary concern would be a significant increase in the amount of sediment in the river. To determine if a significant impact occurred, the current amount of sediment (sediment loading) in the St. Croix River near Scandia was obtained from the USGS and compared to the amount that would be added under the worst-case and mitigated conditions from the operations at the Site.

The USGS has been collecting water flow data from the St. Croix River at St. Croix Falls since 1902. Additionally, the USGS collected sediment data in 1981 and 1982 from the same location at St. Croix Falls.

The water flow data shows that flow rates vary substantially over time. Based on the published data, the highest monthly average flow rate in the St. Croix River at St. Croix Falls was 29,600 cubic feet per second (cfs) which occurred in April 2001. The lowest monthly average flow rate in the St. Croix River at St. Croix Falls was 839 cfs, which occurred in August 1934.

The sediment loading data collected by the USGS in 1981 and 1982 showed that the sediment loading in the river ranged from 12.5 tons/day in January to 1,293 tons/day in April.

Extrapolating the sediment data to estimate the minimum and maximum sediment loading at the historic high and low flow rates shows that the minimum sediment loading in the St. Croix would be approximately 4.8 tons/day and the maximum sediment loading would be 2,225 tons/day without any contribution from operation at the proposed Zavoral Site.

The maximum deposition of PM into the St. Croix River from the Project was determined by modeling the amount of PM that would be deposited into the river for a distance of 2,200 meters upstream and downstream from the Site under the maximum emission and deposition conditions. The worst-case uncontrolled 24-hour average deposition rate based on an average from the receptors in the above area is 0.231 g/m^2/day. The worst-case annual average deposition rate based on an average from the receptors in the basin is 10.03 g/m^2/year.

Since the amount of PM that would deposited in the river is a function of the width of the river, the width of the river was estimated at low and high flow rates. The river would be at its widest when the flow rate is highest and at its narrowest when the river is at its lowest flow conditions. **Table 30** shows the results of the deposition analysis.

Table 30: Summary of Sediment Loading in the St. Croix with Uncontrolled Emissions from the Site

Flow Rate Cfs	Current Sediment Loading Tons/day	Contribution from Zavoral Tons/day	% Increase in Sediment Loading
839	4.8	0.2	3.7
29,600	2,225	1.3	0.1

The worst-case mitigated 24-hour average deposition rate based on an average from the receptors in the above area is 0.016 g/m^2/day. The worst-case annual average deposition rate based on an average from the receptors in the basin is 0.7 g/m^2/year.

Table 31 shows the results of the deposition analysis with the mitigated emissions from the proposed Zavoral Site.

Table 31: Summary of Sediment Loading in the St. Croix with Mitigated Emissions from the Site

Flow Rate cfs	Current Sediment Loading Tons/day	Contribution from Zavoral Tons/day	% Increase in Sediment Loading
839	4.8	0.2	0.2%
29,600	2,225	0.09	0.01%

It is unlikely that fugitive dust would adversely affect the water quality in the St. Croix River under either uncontrolled or mitigated conditions given:

- The existing high degree of variability in the sediment loading in the St. Croix River,
- The fact that maximum deposition conditions only occur on 1 day per year, and

The proposed mining plan does not include mining activity in the winter, which is when low flow conditions occur.

4.15.1.2.5 Silica Impacts

Silica is the main component in sand and in rocks like sandstone and granite. Silica is present in the aggregate that would be extracted from the Project Site. Prolonged inhalation exposure to fine silica dust, which is known to occur in some workplace environments involving mining and construction trades can result in a specific adverse health effect known as silicosis. The types of work places for which the risk of silicosis is most prevalent include tunneling and excavation, road building, demolition work and explosive blasting work, as well as slate, granite cutting and glass manufacturing industries, brickmaking and some manufacturing processes involving crystalline silica. Silica exposure to residents or workers in the area around the Project could potentially occur as a result of breathing fugitive dust from the mining and aggregate hauling operations.

The Occupational Health and Safety Administration (OSHA) has assigned a maximum exposure limit (MEL) of 300 micrograms per cubic meter (µg/m^3) to silica expressed as an 8-hour time weighted average (TWA) for workers. The American Conference of Industrial Hygienists (ACGIH) has recommended a Threshold Limit Value - Time-Weighted Average Limit (TLV -TWA) of between 50 µg/m^3 and 100 µg/m^3 for the respirable fraction of the dust depending on the type of silica that is present. The ACGIH standard is also intended for workplace applications.

The above exposure limits are for daily exposure to workers to silica over a typical 8-hour work day. Since the highest 24-hour ambient air quality concentrations for $PM_{2.5}$ shown in **Table 28** represents total respirable dust and not just silica, a direct comparison cannot be made. However, the data indicates that the maximum uncontrolled concentration will be below the OSHA but above ACGIH worker standards. Tiller has conducted workplace monitoring of employees for respirable dust at similar aggregate facilities.

The data collected from those tests indicates that the total respirable dust was below the OSHA TWA. Therefore, the silica content was also below the OSHA TWA. (Tiller, 2010)

The state of California has developed ambient guidelines for annual average concentrations to protect against chronic non-cancer health effects for the general public, including those in the general population that are most sensitive. These are referred to as Reference Exposure Levels (RELs). California has developed an REL for respirable (i.e., $PM_{2.5}$) silica of 3 µg/m^3.

- Tiller has collected a sample of fine aggregate, particles that will pass through a 200 mesh screen, and analyzed this sample for crystalline silica. The fine aggregate was used because it represents the material that has the potential to become airborne during mining or haul truck operation. The analysis showed that the fine aggregate at the Site is 25% crystalline silica.

- Since the California REL is an annual standard, this limit can be compared to the annual ambient air quality concentrations from the Site emissions for PM2.5 shown in Tables 25 and 26 after they have been adjusted for the percentage of crystalline silica contained in the Zavoral aggregate. AECOM assumed that the existing ambient concentration of silica is zero.

- Based on the results of the NAAQS modeling analysis, the uncontrolled emissions of dust would result in a maximum annual ambient air concentration of silica of 3.8 µg/m3. The mitigated emissions would result in a maximum annual ambient air concentration of silica of 0.26 µg/m3, which is well below the California silica guideline.

4.15.1.2.5.1 Alternative 1 – 5- to 10-Year Operation

The above impacts could occur on any day when mining activities were being conducted at the maximum rates described. A reduction in the mining rate would result in lower impacts to the environment.

4.15.1.2.5.2 Alternative 2 – No Build

The No-Build Alternative is based on the existing use continuing at the Site. It would remain as an unreclaimed open space and would not be a source of air pollutant emissions.

4.15.1.2.5.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Tiller provided estimates of the maximum hourly, daily, and annual excavation of aggregate and number of haul trucks. These maximum mining rates do not vary between Alternative 1 and Alternative 3. Since the ambient air quality analyses are based on annual and daily emissions, and the PTE calculations for each mining phase represent the worst-case emissions while the facility is operating at maximum capacity, there would be no difference between the maximum impact between Alternative 1 and Alternative 3.

The only difference between Alternative 1 and Alternative 3 is that air emissions would occur for fewer years under Alternative 3.

4.15.2 Potential Mitigation Measures

As discussed, Tiller has prepared a fugitive dust control plan (Zavoral Mine Dust Control Plan, September 2011) to define the mitigation methods that would be used to reduce emissions of fugitive dust from the

Site. A copy of the Zavoral Mine Dust Control Plan is in **Appendix X**. The specific mitigation methods proposed include:

A. Haul Roads

1. Paving the main haul road with asphalt for the first 300 feet into the Site.

2. Appling asphalt millings to the main haul road, starting from the end of the paved portion of the main haul road down to the base of the mine or approximately 660 feet. Once asphalt millings are applied and graded, truck traffic would compact the material so that after approximately 2 to 5 days the millings surface may be swept and washed.

3. Appling calcium chloride would be applied to the internal haul roads from the edge of the milled portion of the haul road throughout the unpaved haul roads within any given active phase.

4. Watering the unpaved haul roads as needed between applications of calcium chloride. Any secondary haul roads that are in use would be watered on a daily basis (unless there has been precipitation in the last 24 hours). Water trucks would be available on-site whenever there is a hauling event or reclamation activity.

5. Washing the paved and milled portion of the main haul road with a high-pressure low-volume wash twice a day during haul events. This reduces the accumulation of silts on the road surface significantly reducing fugitive dust emissions.

6. Sweeping the Site entrance and the paved portion of the haul road, including that portion surfaced with asphalt millings one to two times per week to remove accumulated sediments. (Washing the paved sections of the haul road twice a day during haul events would reduce the frequency of sweeping needed.)

B. Excavation Area:

The sand and gravel deposit naturally contains some moisture, which helps control fugitive dust emissions associated with the excavation and loading activities. However, during extended dry periods, this may not be sufficient to adequately control fugitive dust. In the event of an extended dry period, water would be applied to the area in the immediate vicinity of the excavation area.

C. Hauling Operations:

Haul trucks traveling from the Site during haul events would be covered with tarps to reduce wind-blown dust. In addition, haul trucks traveling throughout the Site are required to limit their speed to 15 mph or less, which contributes to the reduction of fugitive dust emissions.

D. Reclamation Material Stockpiles

1. Watering stockpiles during construction.

2. Sloping perimeter areas and backfilling and grading the interior areas to reclamation grades. Topsoil application, seeding, and mulching of the graded area would be performed in accordance with the approved Reclamation Plan.

Records of the sweeping and water application would be maintained to document the fugitive dust control measures.

Based on published information from the USEPA, these mitigation techniques can effectively reduce fugitive dust emissions. The effect of the proposed mitigation techniques would be:

- Paved Roads – 90% for sweeping and washing;
- Unpaved Roads – 90% for watering, silt load reduced from 25.5 g/m2 to 6 g/m2 for application of asphalt fines
- Excavation Areas – 90% for water application
- Reclamation material stockpiles – 90% for watering, 100% for seeding.
- The City could require Tiller to pay for monitoring.

4.15.3 Scandia Mine

The 1999 EAW identified that the Scandia Mine operates under two air permits—an Option D Air Permit associated with operation of the asphalt plant and a General Non Metallic Air Emission Permit for operation of the processing and hauling activities. Under the Option D permit, the plant can produce 720 tons per hour. The General Air Emission Permit allows processing of up to 2,750,000 tons of aggregate per year. Average production at the Scandia Mine ranges from about 450,000 to 600,000 tons per year (2007 permit application). Utilizing the Zavoral Site as the source of Class C add-rock would not change production or operation and, as a result, would not require any modification to air permits.

4.16 NOISE ANALYSIS

4.16.1 Zavoral Site

4.16.1.1 Affected Environment

The existing Zavoral Site does not have any current noise sources.

Potential noise receptors near the Site include residential properties, commercial properties, schools and churches, and the St. Croix National Scenic Riverway. Residential properties are located within ¼ mile of the Site. The Rustrum State Wildlife Management Area is located east of the proposed Site, within the boundaries of the St. Croix River. The Farmington Bottoms State Natural Area is located east of the St. Croix River in Wisconsin.

Noise in the area is generated primarily by traffic on TH 95 and TH 97. Existing traffic includes automobiles for local and commuter traffic and truck traffic, including trucks for hauling aggregate to the existing Scandia Mine.

Sound level monitoring was performed December 2009 at two locations at the Zavoral Site boundary just east of TH 95. The north monitoring site was north of the intersection of TH 95 and TH 97. The south monitoring site was south of the intersection of TH 95 and TH 97. Data was collected over 5-minute intervals and provided overall sound level distribution curves from approximately 11:30 a.m. until 3:30 p.m. In addition, more detailed octave band data was collected at the southerly site using 10-second intervals during the period 2:30 p.m. to 3:30 p.m. **Table 32** summarizes the results of the December 2009 noise monitoring.

Table 32: Summary Sound Level Statistics (dBA), December 2009

Sound Level	North Site	South Site
L01	67.0	67.5
L10	58.5	58.0
L50	46.5	41.5
L90	35.5	35.0
L99	33.5	33.5

The Mn/DOT 2006 TH Volumes for the area show about 65% more traffic on TH 95 north of its intersection with TH 97 than south, reflecting a flow of commuter traffic to and from the Twin Cities. This difference in flow is reflected in the summary of sound level statistics of the data from the two sites in **Table 33**. The 5 A-weighted decibels (dBA) difference in the L50 or median level reflects the higher traffic level at the northerly monitoring location.

A traffic noise impact assessment was conducted by SBP Associates, Inc. (SBP) for the travel route between the proposed Zavoral Mine and the existing Scandia Mine. Noise was measured at two locations along TH 97. The first monitoring location, M1, was near the 4-way stop at the intersection of TH 97 and Olinda Trail. The second location, M2, was near the intersection of TH 97 and Newberry Avenue, representing a roadway section with free-flowing traffic. The number and type of vehicles was also monitored.

The monitoring locations are shown in **Figure 46**.The results of the measurements and the number are provided in **Table 33**.

Table 33: TH 97 Noise Monitoring Results - 10/20/11

Monitoring Location	Time	Distance from the monitor to TH 97 Centerline	L_{10} dBa	L_{50} dBa	Number of Cars	Number of Medium Trucks	Number of Heavy Trucks
M1	7:05 am to 8:05 am	80 feet	65	57	276	6	20
M2	8:24 am to 9:24 am	225 feet	63	55	242	6	24

The monitoring was completed during the morning hours after rush hour and represent low traffic noise levels. The monitoring showed that noise levels along TH 97, during low traffic levels, are at or near the Minnesota Noise L_{10} daytime standard of 65 dBa.

4.16.1.1.1 State of Minnesota Noise Regulations

Minnesota State noise standards have been established specifically for daytime and nighttime periods. The MPCA defines daytime as 7:00 a.m. to 10:00 p.m. and nighttime from 10:00 p.m. to 7:00 a.m. For residential land uses including apartments, churches, and schools (Noise Area Classification 1 or NAC-1), the Minnesota State standards for L_{10} are 65 dBA for daytime and 55 dBA for nighttime; the standards for L_{50} are 60 dBA for daytime and 50 dBA for nighttime. For recreational land uses other than designated camping and picnicking areas (NAC-2), the Minnesota State Standards for L_{10} are 70 dBA for daytime and nighttime; the standards for L_{50} are 65 dBA for daytime and nighttime. Minnesota State Noise Standards are shown in **Table 34**.

Table 34: Minnesota State Noise Standards

Land Use	Code	Day (7 a.m. – 10 p.m.) dBA		Night (10 p.m. – 7 a.m.) dBA	
"Residential"	NAC-1	L_{10} of 65	L_{50} of 60	L_{10} of 55	L_{50} of 50
"Commercial" (Includes recreational areas other than designated camping and picnicking areas.)	NAC-2	L_{10} of 70	L_{50} of 65	L_{10} of 70	L_{50} of 65
"Industrial"	NAC-3	L_{10} of 80	L_{50} of 75	L_{10} of 80	L_{50} of 75

Source: Minn. R. ch. 7030.0040, 2011 (https://www.revisor.leg.state.mn.us/rules)

Impacts to Minnesota residences in the Project vicinity would be compared to daytime NAC-1 standards. Impacts to the St. Croix River and trail users would be compared to NAC-2 standards.

4.16.1.1.2 Wild and Scenic Rivers Noise Policy

The NPS has adopted policies related to maintenance of natural soundscapes in parks. The Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway (Minnesota and Wisconsin) was reviewed to identify potential concerns regarding noise levels and to identify any information on existing sound levels. Areas are classified with respect to the potential for noise level expectations of waterway uses. The area by the Zavoral Site is classified in the management plan as "Rural Residential" on the Minnesota side and "Conservation" on the Wisconsin side. These management objectives from the EIS are included below. It can be seen that, with homes and docks on one side of the river, the two objectives are inconsistent.

Rural Residential (p.49 - Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway)

This area would provide a feeling of being on a river in a sparsely developed landscape. As in the small town management areas, the river, natural features, and man-made features would shape the riverway experience. Users would encounter no large concentrations of development or people — small numbers of people would be the rule in this area, with little or no commercial development. Residential settings would be limited to large lot development scattered along the shore and/or bluffs at a lower density than the small town or river town management areas. Natural vegetation would cover significant portions of the shoreline, with some stretches being largely undisturbed. Riverway users could anticipate moderate noise levels. The area would offer abundant opportunities to fish and view wildlife. There might be a few small public recreational support facilities (e.g., docks and launches) and some private docks.

Conservation (p.53 - Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway)

This management area would provide users with a sense of being in a natural setting. Very few signs of development, such as homes, bridges, or agricultural fields, would intrude on this largely natural scene. The river and surrounding biological communities would dominate the user experience. The shoreline would not be disturbed by the few visible signs of development. Forest management would emphasize the undisturbed appearance. This area would provide many opportunities to view wildlife, and there would be abundant opportunities for angling. Access to the river would be limited to a few public carry-in and small craft access points and a very few riparian landowner private docks. Recreational support facilities (e.g., primitive campsites, trails) would be small, limited in number, and largely screened by natural vegetation. With few access points, small numbers of people and infrequent encounters, there would be ample opportunity for quiet and solitude.

With motorized boats permitted on this portion of the river, and with homes and docks along the Minnesota side of the river, the Management Plan objectives indicate that river users can anticipate moderate noise levels.

4.16.1.1.3 Zavoral Site Noise-Related Activities

Proposed activities at the Site would be divided into four phases.

Phase 1 would involve reclamation activities on an area approximately 4 acres in size, which is located within the St. Croix River District and scenic easement. Gravel mining is not planned for this area but would instead be the first phase of Site reclamation. Reclamation of this area would involve the removal of existing stockpiles and final grading the area.

Phases 2 and 3 would involve both mining operations and reclamation activities. Phase 2 and Phase 3 would involve the same activities but be completed in different locations on the property. Mining operations would include:

- Development of haul roads to the mining area;
- Stripping of vegetation, and overburden and stockpiling the material on-site for reuse during reclamation activities;
- Excavating the aggregate using front end loaders;
- Loading the aggregate into trucks;
- Transporting the aggregate to the Scandia Mine; and
- Reclamation activities, including grading, placing topsoil, and seeding.

Phase 4 would involve final reclamation activities and grading. Stockpiles of overburden would be redistributed and additional topsoil may be transported to the Site for use. The reclaimed areas would be reseeded in accordance with the reclamation plan.

Noise would be generated by the use of front end loaders and graders to prepare haul roads and to excavate the aggregate. Noise would also be generated during loading trucks with aggregate and by truck traffic on the Site and on adjacent roads between the Zavoral Site and the Scandia Mine.

As described in Section 4.14, raw aggregate material mined at the Zavoral Site would primarily be transported to the Scandia Mine. In some cases, it would be transported directly to construction project sites. The haul trucks would be a source of noise as they travel on TH 95 and TH 97.

4.16.1.2 Impact Analysis

The noise analysis is broken into two subsections. The first subsection addresses noise generated on the proposed Zavoral Site and the impacts to residences and other receptors adjacent to the Site (**Figure46**). The second subsection addresses haul truck traffic on public roads and the receptors along TH 95 and TH 97 (**Figures 47a and 47b**).

A total of 15 locations representing noise-sensitive receptors were identified in the vicinity of the proposed Zavoral Site. These receptor locations are shown in **Figure 46**.

- Receptors 1 through 6 represent residences adjacent to the Site.
- Receptors 7 through 9 represent some of the homes along the river nearest to the proposed Zavoral Site. Receptor 10 represents a home in Wisconsin.
- Receptors 11 through 13 represent users on the river within the Scenic Riverway. Receptor 11 was placed between the proposed Zavoral Site and the Rustrum State Wildlife Management Area and Farmington Bottoms State Natural Area.
- Receptors 14 and 15 represent trail users along TH 95.

AECOM consultant team member SBP Associates reviewed the noise model that was developed for the above receptors and the activities at the Site. Noise sources included in the model were a front end loader/excavator and haul trucks. The noise level data for the front end loader/excavator was from similar operations during operation. This spectral data for noise level at 50 feet for the excavator and front-end loader is provided in **Figure 48**. The Braslau study used Minnesota noise limits for older trucks for the Haul Truck Noise L_{10}. The haul truck noise spectrum used in the modeling (**Figure 49**) is based on this L_{10} of 82 dBA at 50 feet. Each proposed phase of mining operations was modeled to evaluate the maximum noise levels at the above receptors.

Shielding from topography was evaluated for the three mining phases and was a critical part of the impact analysis. Whenever the line of sight between an assumed source and a receptor site is blocked by topography (barrier), even by 1 foot, the noise reduction benefit is about 5 dBA and increases with increase in effective barrier height.

Shielding currently exists throughout much of the Site due to past mining operations, which have lowered the interior grades below the elevation of the surrounding land. Existing berms and the construction of proposed berms during initial Site preparation would provide additional shielding. A 10-foot berm was assumed along the west side of the Site for all phases. Sound levels were analyzed with these berms since they are proposed as part of initial Site preparations.

For a relatively short period of time, Site operations would occur at the already reduced existing grades within the proposed mining area until an active mine face is established within the initial stages of project development. Once the active face has been established, mining activities would follow the active face throughout the phase, operating in the lowest elevations of the phase or the mine floor. Lower elevations would have the effect of reducing noise levels at all receptors surrounding the Site. The mine floor elevations used for the noise assessment are equivalent to the reclamation grades, which represents a conservative approach to the analysis since the reclamation grades are not representative of the lowest mine floor elevations.

Table 35 presents the maximum modeled impacts at each receptor location, the maximum modeled impacts are determined by adding the maximum excavator noise level for each mine phase to the average on-site haul truck impact.

Table 35: Zavoral Mine Maximum Noise Impact Summary (dBA)

	MN Standard		Phase 1		Phase 2		Phase 3	
Receptor	L_{10}	L_{50}	L_{10}	L_{50}	L_{10}	L_{50}	L_{10}	L_{50}
R1	65	60	52.3	48.7	47.3	41.9	48.8	41.9
R2	65	60	54.0	49.7	50.9	44.8	51.4	44.8
R3	65	60	55.2	51.7	50.2	45.8	49.9	45.8
R4	65	60	53.0	49.5	52.5	48.9	50.2	48.9
R5	65	60	44.4	40.5	44.5	40.7	50.0	40.7
R6	65	60	44.7	41.3	53.5	49.9	45.8	49.9
R7	65	60	42.5	39.0	46.7	43.2	45.9	43.2
R8	65	60	41.9	38.4	46.7	43.2	44.3	43.2
R9	65	60	41.3	37.8	46.6	43.2	42.8	43.2
R10	65	60	35.2	31.4	37.4	33.7	37.5	33.7
R11	70	65	38.6	35.0	38.5	34.8	40.6	34.8
R12	70	65	43.9	40.7	41.0	37.4	42.0	37.4
R13	70	65	35.9	32.3	38.9	35.2	38.4	35.2
R14	70	65	56.5	53.1	48.7	43.3	51.0	43.3
R15	70	65	56.9	52.1	54.2	46.9	54.2	46.9

SBP Associates used the FHWA Highway Construction Noise Model (HCNM) to predict the maximum noise levels determined by adding the maximum excavator noise level for each mine phase to the maximum on-site haul truck impact at the nearest residential location for each of the three mining phases. The HCNM model uses a database of noise levels for construction equipment to calculate the L10 noise level at the desired receptor locations. The results showed that maximum impacts would occur at receptor R3 and would be 58.8 dBA for any of the three mine phases.

All projected impacts are well within the Minnesota Daytime Standards. Based on a spectral analysis of the predicted noise level impacts and predicted ambient levels, the Braslau study determined that the proposed operations at the Zavoral Site would be audible in the riverway, but the levels would be well within the state rules and would be 0 to 3.8 dBA above ambient for worst-case mining operations.

Using the October 2011 monitoring results and the traffic volume information collected during the monitoring, SBP estimated noise levels at 22 sensitive receptor locations along TH 97 under baseline conditions and under maximum capacity conditions. The sensitive receptors are 21 residences and a

school. The low traffic noise levels used as the baseline condition in the model were based on traffic counts collected at monitoring location M2. For maximum noise levels, 60 additional hourly heavy truck trips were added to the baseline reflect maximum haul truck activity during a hauling campaign from the Zavoral Site to the Scandia Mine. The MINNOISE traffic noise model, developed by the Mn/DOT, was used to estimate these noise levels. **Table 36** presents the results of this analysis. Table 36: Zavoral Modeled Traffic Noise Impacts[1]

	Low Traffic Noise Level (dBA)[2]		Maximum Traffic Noise Level (dBA)[3]		Difference	
Receptor	L_{10}	L_{50}	L_{10}	L_{50}	L_{10}	L_{50}
R0	53.6	43.2	62.5	54.5	8.9	11.3
R2	54.9	46.5	61.8	55.1	6.9	8.6
R4	57.5	50.2	61.3	55.2	3.8	5.0
R6	61.0	52.8	64.9	57.7	3.9	4.9
R8	55.0	48.3	58.6	53.0	3.6	4.7
R10	55.7	48.8	59.3	53.5	3.6	4.7
R12	61.2	52.9	65.1	57.9	3.9	5.0
R14	56.5	49.4	60.2	54.2	3.7	4.8
R16	60.3	52.3	64.2	57.2	3.9	4.9
R18	63.9	54.9	67.9	59.9	4.0	5.0
R20	62.8	53.7	67.0	59.1	4.2	5.4
R22	61.7	52.9	65.9	58.2	4.2	5.3
R24	61.3	52.6	65.8	58.4	4.5	5.8
R26	67.9	57.4	72.4	63.0	4.5	5.6
R28	60.3	51.7	64.6	57.2	4.3	5.5
R30	60.7	52.0	65.0	57.5	4.3	5.5
R32	58.2	50.1	62.3	55.6	4.1	5.5
R34	61.0	52.3	65.3	57.8	4.3	5.5
R36	57.1	50.1	60.9	55.0	3.8	4.9
R38	57.5	50.6	61.2	55.3	3.7	4.7
School	59.6	51.4	63.7	56.6	4.1	5.2

[1] Numbers in bold are above State NAC-1 standards.

[2] Low traffic noise levels are during non-rush hour periods with heavy truck traffic at approximately 25% of maximum.

[3] Maximum Traffic Noise levels are for periods when haul truck activity is at peak levels

The modeling analysis showed that the Minnesota L_{10} noise standard is currently exceeded at one residence under low traffic noise conditions. The modeling analysis showed that under maximum haul truck traffic conditions, the L_{10} noise standard would be exceeded at six residences and the L_{50} noise standard would be exceeded at one residence.

4.16.1.2.1 Alternative 1 – 5 to 10 Years of Operation

The impacts described could occur on any day when mining activities were being conducted at the maximum rates described. A reduction in the haul rate from the Zavoral Site to the Scandia Mine would not result in lower noise impacts because the aggregate hauling would still occur from other locations.

However, noise levels when gravel hauling is occurring would be noticeably higher than during low noise traffic conditions.

4.16.1.2.2 Alternative 2 – No Build

The No-Build Alternative is based on the existing use continuing at the Site. It would remain as an un-reclaimed open space and would not be a source of noise.

The No-Build Alternative would not result in lower noise impacts because the aggregate hauling would still occur from other locations.

4.16.1.2.3 Alternative 3 – 3.3 to 5 Years of Operation

The maximum mining and haul rates do not vary between Alternative 1 and Alternative 3. Since the noise analyses are based on 6-minute averages, and the noise estimates for each mining phase represent the worst case while the facility is operating at maximum capacity, there would be no difference between the maximum impact between Alternative 1 and Alternative 3.

The only difference between Alternative 1 and Alternative 3 is that noise impacts would occur for fewer years under Alternative 3.

4.16.2 Potential Mitigation Measures

Noise mitigation techniques, such as developing berms and screens for the proposed Zavoral Site, are included in the Tiller's Mining and Reclamation Plan.

4.16.3 Scandia Mine

The 1999 EAW discussed noise associated with the Scandia Mine and associated controls. Using the Zavoral Site as the source of Class C add-rock add would not change or increase the types of processing activities occurring on the Scandia Mine or the range of noise level that currently occur.

4.17 VISUAL IMPACTS

4.17.1 Zavoral Site

4.17.1.1 Affected Environment

The 114-acre Site is located within the jurisdiction of the City of Scandia and partially within the St. Croix National Scenic Riverway (**Figure 2).** The visual resource area for this analysis includes the Zavoral Site and all areas outside of the Site that could provide views of Project activities. The Visual Assessment Technical Memorandum is included in **Appendix X.**

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, and extensively covered by urban and suburban development, as well as pasture and some crops and woodland (USEPA 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 2.**

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. 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.

4.17.1.2 Proposed Activities

Tiller's Mining and Reclamation Plan includes screening elements such as berms and plantings, as well as reclamation strategies that help mitigate impacts to key viewing areas. Proposed and existing screening berms located along TH 95 and along the southwest perimeter of the Site occur within the 50-foot and 100-foot mining setbacks. The purpose of the berms is to screen the mining and reclamation activities from nearby vehicle, bike, and pedestrian traffic in the area. Construction of the berms would occur as the Site is being developed and may include transplanting of native white pine trees from within the Site to provide additional screening. Transplanting activities for the screening areas would occur simultaneously with the transplanting activities proposed in Phase 1 Reclamation prior to mining activities. Reclamation activities would take place as described in Section 4.3 of this document.

4.17.1.3 Scenic Resource Management (or Special Designations)

The CMP and EIS for the Lower St. Croix National Scenic Riverway were adopted by the 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 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 scenic easement, shown in **Figure 2**. 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 to maintain natural habitat and water quality
>
> Implementation Strategies
>
> Manage and regulate land uses in the Lower St. Croix Wild and Scenic River corridor 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 provides 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 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 goals, policies, and strategies that address visual resources and are applicable to the proposed Project include:

- Land Use 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.
- Land Use Policy 1.3: Establish standards that protect Scandia's scenic views by minimizing the visual impact of new development.
    - Land Use Implementation Strategy 1.3.2: Require landscaping along major collector roads to minimize visual impact of new development.

- Land Use 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.

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.

4.17.1.4 Sensitive Viewing Areas

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.

Very little of the Site 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 available on the City of Scandia website 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 ¼-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 220th 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 are identified on a computer-generated model of Phase 2 mining and reclamation activities **(Figure 50)** and 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.

4.17.1.5 Impact Analysis

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. The contrast evaluation assesses changes to the visual quality of a landscape from the introduction of the proposed Project into the existing landscape. Contrasts were evaluated using photographic simulations of the proposed Project prepared for key viewpoints.

Three key viewpoints are identified on a computer-generated model of Phase 2 mining and reclamation activities **(Figure 50)** and 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 50**. The photograph in **Figure 51** 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.

This photographic simulation (**Figure 52**) provides a view of Phase 2 mining and reclamation activities that would be visible to the public using the bike path for about 6 to 12 weeks. Phase 2 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 viewpoint is located on TH 97 about ¼ mile west of the Site, as shown in **Figure 50**. The photograph in **Figure 53** was taken during leaf-off conditions on TH 97, approximately ¼ mile west of the Site. Trees screen most of the Site. White pine trees 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.

This photographic simulation (**Figure 54**) provides a view of Phase 2 mining and reclamation activities. A short segment of the access road (junction with the highway shown) 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 viewpoint is located on TH 95 approximately ¼ mile north-northwest of the Site as shown in **Figure 50**. The photograph in **Figure 55** 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.

This photographic simulation (**Figure 56**) provides a view of Phase 1 Mining and Phase 2 Reclamation. The existing stockpiles would be removed as part of Phase 3 Mining. 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 the photographic simulations 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.

A goal of the impact analysis is to evaluate the significance of changes introduced by a project and assessed through the contrast evaluation by comparing these changes to existing conditions and management objectives of pertinent land management or government agencies. Significance criteria were based on the issues from public and agency scoping, and from a literature review of issues associated with similar projects.

A significant impact to visual resources would result if the following occur:

- 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.

4.17.1.5.1 Alternative 1 – 5- to 10-Year Operation

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.

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.

In summary, little change would occur in the scenic attractiveness of the overall landscape viewed from any sensitive viewpoint or area during mining activities due to complete or partial screening of proposed activities by existing landforms and vegetation or by proposed berms. When mining and reclamation phases are complete, the Site would be reclaimed to a natural landscape appearance, which could enhance the scenic attractiveness of the Site.

The overall contrasts from the alternative would be none (facilities not visible) to weak (facilities are visible, but do not attract attention).

4.17.1.5.2 Alternative 2 – No-Build Alternative

Under the No-Build Alternative, no impacts would occur 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 the City comprehensive plan and zoning.

4.17.1.5.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The visual impacts under Alternative 3 would be identical to those described for Alternative 1 but would occur over a shorter period of time. This would result in more mining occurring for more weeks each year and more material being mined per year. These activities would be completely or partially screened by existing landforms and vegetation, or by proposed berms. As described for Alternative 1, no significant impacts, as determined by the significance criteria, were identified from any phase of the proposed Project.

4.17.2 Scandia Mine

Currently, unprocessed add-rock is imported to the Scandia Mine and unloaded over an active face where it is stored until needed. It is not stored in individual stockpiles over the Mine floor. The practice of storing add-rock material over the active face would continue regardless of the add-rock source. Stockpiling of aggregates, importing add-rock, and placement of portable equipment are activities that were included in the 1999 EAW and are allowed in the Scandia Mine Site CUP. Regardless of the add-rock source, these activities do not change. Scandia's Mining Ordinance regulates placement of processing equipment and there are no ordinance or permit limits on the volume of materials that can be stockpiled at the Scandia Mine. There would be no change in visual impacts. The characteristic industrial landscape of Scandia Mine would not be changed by the use of Class C add-rock from the Zavoral Site; therefore, no discernible visual impact would occur from the transport and storage of Zavoral Site aggregates at the Scandia Mine.

4.17.3 Potential Mitigation Measures

The visual impacts from Site preparation, operating phases, and reclamation are anticipated to be negligible because proposed screening and reclamation measures included in the Zavoral Mine Plan (**Figures 4 through 8**) provide screening elements such as berms and plantings, as well as ongoing reclamation strategies that mitigate impacts to sensitive 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 predetermined 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 predetermined range established by the City, replacement trees should be provided by Tiller.

4.18 CUMULATIVE IMPACTS

Cumulative impacts are defined as the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. Our understanding is that there is very little development planned for the area. We would hold a meeting with the City of Scandia, including staff to develop the framework for addressing cumulative impacts and refine scope as necessary to address the potential implications of Citizens Advocating Responsible Development (CARD) v. Kandiyohi County, 713 N.W.2d 817 (Minn. 2006). Our current scope includes addressing the cumulative impacts of:

- No new gravel mining operations or other development in the vicinity that would affect water use, traffic levels, noise, vegetation removal, or air quality are planned.

- Discussions with the City have indicated that no future development is planned that could affect area traffic levels.

- The City is not aware of any actions occurring within the St. Croix River District or vicinity or in the Project vicinity, particularly those that would affect natural resources, groundwater, or surface water resources

This page intentionally blank

5.0 SUMMARY OF POTENTIAL MITIGATION MEASURES

This section summarizes potential mitigation measures that were identified to reduce the impact of the Project.

AECOM has reviewed and provided comments on Tiller's Site reclamation and forestry management plans prepared could contribute to successful Site reclamation. If the Project were approved, the City would work with Tiller to address these comments prior to the issuing a CUP. However, the reclamation must meet City ordinance requirements and must provide a base suitable for maintaining moisture and have suitable organic content to result in successful reclamation. The City may need to amend the definition of "topsoil" in its Development code to permit the use of the first approach, and possibly the second approach as not all of the topsoil would be obtained from the Site.

In addition, the City of Scandia should continue to coordinate with Mn/DOT regarding its Trail Plan to provide a safe bicycle route and avoid conflicts with vehicle traffic on TH 97 (at the 55 mph speed limit).

The following potential mitigation measures have been identified and would be considered as possible conditions of any future CUP for the Project should it be approved:

- Require Tiller to provide a funding mechanism to conduct any and all required monitoring at the Site.
- Require a vegetation establishment and monitoring period of at least 5-years after completion of the Project.
- Develop an adaptive management plan to address long-term management issues.
- Identify the responsible party and funding source for active long-term stewardship of the Site.
- 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 predetermined range established by the City, replacement trees should be provided by Tiller.
- Establish specific criteria for measuring and defining reclamation success that are acceptable to the City (percent cover requirements for seeded native species; limits on aggressive native species, invasive and exotic species, and so on). The diversity of the proposed reclamation must be met in order for the cover type and wildlife habitat evaluations in this EIS to be accurate.
- Specify actions that would be taken by Tiller if reclamation were determined not to be successful and conditions under which reseeding, overseeding, and/or spot seeding or other management methods would be required.
- Construct the berm on the south end of the Site as close to the mining and reclamation limits as possible. This would result in lower off-site peak flow rates and increased on-site infiltration
- Require Tiller to keep records of when the Zavoral Site Well is pumped, and provide these to the City for ground water monitoring activities. This should document both the daily use and total annual pumped volume from the Zavoral Site Well. The daily total should not exceed 10,000

gallons at a maximum pumping rate of 1,200 gpm. The total annual pumping should not exceed 1,000,000 mgy.

- Require that the WCD monitoring point installed for the pump test and collection of baseline data in Zavoral Creek be monitored during the lifetime of the Project. This monitoring should be funded by Tiller.
- Monitor the Black Ash seep subtype wetland boundary mapped by CCES (CCES January 2010) established the baseline boundary of the seep along Zavoral ravine. This monitoring should be funded by Tiller.
- Require Tiller to monitor all on-site construction equipment for leaks and receive regular preventive maintenance. Fueling and maintenance of vehicles would occur within the active mining phase and no "topping off" of vehicle fuel tanks should be allowed.
- Require that any AST at the Site to be locatedmore than 500 feet from surface water to reduce the potential for impacts to surface water.
- Notify the MPCA about all ASTs within 30 days of installation by submitting an AST Notification Form.
- Require Tiller to sample and analyze ground-water for diesel range organics. If it is ever determined that gasoline is to be stored on Site gasoline range organics and benzene should be added to the analyte list.
- Construct the new driveway access directly across from TH 97 as required by Mn/DOT for safe access.
- Require Tiller to record and report the number and source location of trucks hauling add-rock to the Scandia Mine to ensure that additional truck traffic would not result from hauling from the Zavoral Site at peak demand concurrently with other sites (Wisconsin, Washington County, Chisago County, and other Eastern Minnesota locations). The maximum mining level supplied by Tiller for the air quality analysis worst case is higher than the information used for traffic and this monitoring would ensure that the projected traffic levels are not exceeded.
- Install MMUTCD compliant truck warning signs on TH 95 to advise drivers of trucks crossing TH 97 in and out of the proposed Zavoral Site. The installation of warning flashers is another option, but should be discussed with Mn/DOT to evaluate the safety impacts.
- Require Tiller to provide funding for bicycle trail construction between the Site and TH 95 and reconnection as mitigation to implement the City's trail plan.
- Monitor the mitigation methods used at the Site to reduce emissions of fugitive dust for the life of the Project. Records of the sweeping and water application would be maintained to document the fugitive dust control measures. The City should require Tiller to provide a funding mechanism to conduct any and all City-required monitoring at the Site to confirm that sufficient dust control measures are being implemented.

- Require noise mitigation techniques, such as developing berms and screens for the proposed Zavoral Site are implemented. Tiller should provide a funding mechanism for monitoring.

- Monitor to ensure that the proposed screening and reclamation strategies are successfully implemented.

- Establish 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.

This page intentionally blank

6.0 REFERENCES

INCOMPLETE

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.

City of Scandia, Zavoral Mining and Reclamation Project, Revised Scoping Decision Document, January, 2010: Available at: http://www.ci.scandia.mn.us/vertical/Sites/%7B2F1D9A41-1D4D-4195-A3E4 159328E3F399%7D/uploads/%7B03C3823C-CE9C-42D4-AB61-72CC7FF18F80%7D.PDF

City of Scandia, Zavoral Mining and Reclamation Project, Final Scoping Decision Document, April 2010: Available at: http://www.ci.scandia.mn.us/vertical/Sites/%7B2F1D9A41-1D4D-4195-A3E4-159328E3F399%7D/uploads/%7B95D9B189-3E99-411A-8C12-6173E9A3898B%7D.PDF

Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe. 1979. Classification of Wetland and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Office of Biological Services. Washington D.C.

Critical Connections Ecological Services Inc. 2011. Forest Management Plan. Zavoral Property Forest Management Plan. Scandia, Washington County, Minnesota. May 3, 2011.

Database of the Minnesota County Well Index (CWI) (http://www.health.state.mn.us/divs/eh/cwi/

Environmental Laboratory. 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. U.S. Army Corps of Engineers Waterways Experiment Station. Vicksburg, MS.

Environmental Protection Agency (USEPA). 2007. Minnesota Level III and IV Ecoregions. ftp://ftp.epa.gov/wed/ecoregions/mn/mn_eco_desc.pdf. Reviewed July 19, 2011.

Minnesota Environmental Quality Board (EQB). May 2010. Guide to Minnesota Environmental Review Rules. Available at: http://www.eqb.state.mn.us/documents/Guide%20to%20MN%20ER%20 Rules-May%202010.pdf.

Minnesota Department of Agriculture (MDA) No Date. http://www.mda.state.mn.us/plants/badplants/noxiouslist.aspx

MnDNR. 2006. Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife, Comprehensive Wildlife Conservation Strategy, Division of Ecological Services, 2006.

National Park Service (NPS). 2002. Cooperative Management Plan and Environmental Impact Statement for the Lower St. Croix National Scenic Riverway.

Shaw, Samuel, and C. Gordon Fredine. 1971. Wetlands of the United States. Circular 39. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Washington, D.C. 67 pp.

Sunde Engineering, Environmental Assessment Worksheet, Zavoral Property Mining and Reclamation Project , Scandia, MN (November 2008), (released for public comment by the City of Scandia on December 16, 2008). Available at: http://www.ci.scandia.mn.us/vertical/Sites/%7B2F1D9A41-1D4D-4195-A3E4-159328E3F399%7D/uploads/%7B1E920375-0ABF-46E4-ADC9-A7577FF2653A%7D.PDF

Tiller Corporation, Conditional Use Permit Application, Zavoral Mining and Reclamation Project, , November 2008, Available at:http://www.ci.scandia.mn.us/vertical/Sites/%7B2F1D9A41-1D4D-4195-A3E4-159328E3F399%7D/uploads/%7B90960971-A9CD-4510-9F28-8DBD3B311D44%7D.PDF

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.

USACE "Clarification and Interpretation of the 1987 Manual," memorandum from Major General Arthur E. Williams dated 6 March 1992.

USACE "Implementation of the 1987 Corps Wetland Delineation Manual," memorandum from John P. Elmore dated 27 August 1991.

USACE "Questions & Answers on the 1987 Manual," memorandum from John F. Studt dated 7 October 1991.

U.S. Army Corps of Engineers. 2009. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region