U.S. Department of Energy
in cooperation with
Minnesota Department of Commerce

MESABA ENERGY PROJECT

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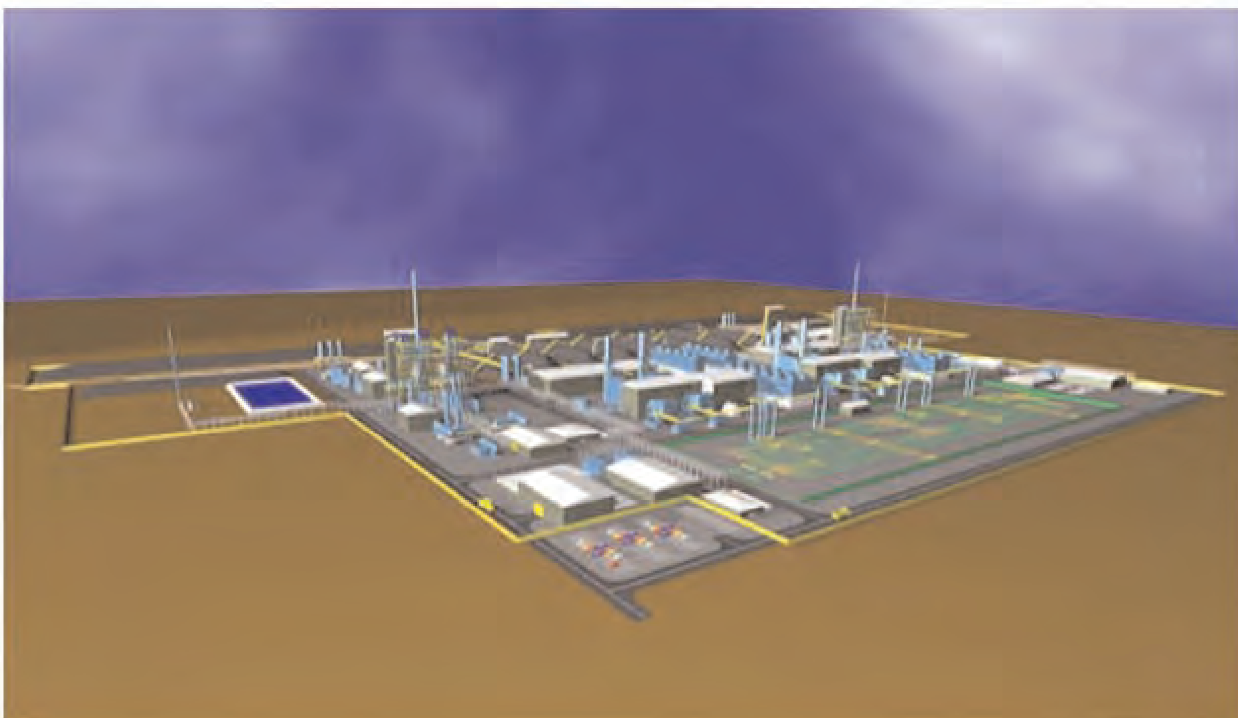

NOVEMBER 2007

Office of Fossil Energy
National Energy Technology Laboratory

APPENDIX A
Carbon Capture and Sequestration –

Excelsior's Plan (A1), DOE Analysis of Feasibility (A2)

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APPENDIX A1
Excelsior's Plan for Carbon Capture and Sequestration

(Note: Color versions of figures in this Appendix are included in the file posted at the DOE NEPA website: http://www.eh.doe.gov/nepa/docs/deis/deis.html)

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PUBLIC VERSION

Mesaba Energy Project

Mesaba One and Mesaba Two

Plan for Carbon Capture and Sequestration

Prepared by

EXCELSIOR ENERGY INC.

October 10, 2006

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Executive Summary

Excelsior Energy Inc., the developer of the Mesaba Energy Project has prepared this plan to identify the opportunities for capture and sequestration of carbon dioxide ("CO_2") emissions from its integrated gasification combined-cycle ("IGCC") power stations. This carbon capture and sequestration plan ("CCS Plan") was prepared to provide a concrete option for the State of Minnesota to meet its obligations under future CO_2 regulations, which if promulgated, would affect coal-fired power plants, including the Mesaba Energy Project. We undertook the plan with the goal of providing the Minnesota Public Utilities Commission (the "Commission") with information about all options that are available now and in the future with respect to carbon management through capture and geological sequestration from the Mesaba Project.

The decision to implement a carbon capture and sequestration ("CCS") program is one that the Commission must weigh from time to time, based upon the costs to ratepayers associated with CCS and the benefits to ratepayers associated with a CCS program. This Plan provides a framework within which the Commission can make such a decision. The costs to ratepayers of implementing CCS would include additional capital and operating costs, reduced output and plant efficiency, and potential downtime to implement the system. The benefits would include any revenues from enhanced oil recovery ("EOR"), and the ability to cost-effectively comply with any form of legislation limiting or regulating carbon dioxide emissions as part of an initiative to stabilize atmospheric concentrations of greenhouse gases ("Carbon Constraints"), whether in the form of avoiding carbon taxes or the purchase of allowance credits, or the ability to reduce carbon emissions to levels specified on a fleetwide or statewide basis.

The first option for CCS presented by the Mesaba Project entails capture and sequestration of carbon dioxide present in the syngas, which represents 30% of the total carbon dioxide emissions from the plant. Technologically, this option would entail the installation of amine scrubbers downstream of the acid gas removal system in the IGCC power stations to remove up to 85% of the CO_2 in the synthesis gas that fuels the plants. This process would result in an overall CO_2 capture rate of 30% for the plant. This technology is available now to achieve 30% capture at a relatively low cost to ratepayers. This option could be implemented as early as 2014, following the commercial operation date for the first unit of the Mesaba Energy Project. Implementation of CCS prior to the availability of credits or carbon avoidance benefits would rely exclusively on revenues that may be available from EOR. Sequestration at EOR sites would have higher costs, due to the longer distances to the candidate oil fields, than would sequestration in saline formations closer to the plant site. Those additional costs would be weighed against the revenues that would accompany the supply of CO_2 for EOR. A decision to implement this form of CCS prior to the imposition of Carbon Constraints would have to weigh the likelihood that the base line emissions year would be established such that reductions implemented before that date would be given credit.

The second, longer-term option for CCS presented by the Mesaba Project would reduce CO_2 emissions by approximately 90%. This option could be implemented following the successful demonstration by the United States Department of Energy's FutureGen project of full capture from an IGCC plant. The costs of this option are significantly higher than the 30% capture approach using currently available technology. Significant ongoing research and development

efforts sponsored by the Department of Energy ("DOE") are expected to reduce these costs significantly and result in commercial offerings of these technologies. Given the fact that IGCC is a least-cost source of carbon reductions in the power sector,[1] these deeper reductions are likely to be cost justified in the event Carbon Constraints are imposed that require any meaningful reduction in total greenhouse gas emissions. Implementation of the 30% capture option would not preclude later decisions to increase capture levels to 90%.

In an EOR scenario, the captured carbon dioxide would be transported via pipeline to oil fields in North Dakota, southwestern Manitoba, and/or southeastern Saskatchewan. Once the CO_2 arrives at its destination, it would be sequestered underground, potentially in connection with enhanced oil recovery operations.

Alternatively, the saline formation scenario would entail transporting the CO_2 to a saline formation located much closer to the plant site, reducing the pipeline costs but also eliminating the revenues associated with the sale and beneficial use of the CO_2.

The economics of CCS look promising. The 30% capture option identified in the CCS Plan would enable CO_2 capture at a cost per ton below that of any other existing power plant in the state.[2] IGCC plants' ability to economically capture CO_2, combined with the potential for revenues described above, have the potential to significantly decrease the cost of CCS.

Under this proposed CCS Plan, Excelsior would commit to undertake capture, transportation and sequestration of carbon dioxide, upon a decision by, and at the direction of, the Commission, upon approval of a modification to the proposed power purchase agreement that would allow for Excelsior to be compensated at a reasonable cost of capital for the necessary capital investments, and to be made whole on the other costs associated with the CCS program. This commitment, together with Excelsior's ongoing work to refine the costs and technical means to implement CCS, will position the state to respond in a timely and economic fashion to carbon constraints.

I. Introduction

This ability to capture and sequester CO_2 is important because Carbon Constraints are likely to be implemented within the next ten years. As evidence of this, various proposals to regulate

[1] See the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472-/M-05-1993. Also, see presentation by Julianne M. Klara, NETL/DOE, Gasification Technologies Conference, *Federal IGCC R&D: Coal's Pathway to the Future*, Oct. 4, 2006, a*vailable at* http://gasification.org/Docs/2006_Papers/49KLAR.pdf.

[2] According to a compilation of studies by the Intergovernmental Panel on Climate Change, the net cost of 90% capture for an IGCC plant is $18/ton less than a new supercritical coal plant and $30/ton less than a new natural gas plant. This difference would increase significantly when considering 30% capture at an IGCC plant, and increase further when compared to retrofitting existing plants. As Minnesota currently has no identified geological sequestration options, pipeline costs would be significant for any plant in the state. Even allowing for a shorter pipeline, no existing or new non-IGCC power plant in Minnesota could capture at a price per ton as low as Mesaba Energy Project. Intergovernmental Panel on Climate Change, *IPCC Special Report: Carbon Dioxide Capture and Storage*, p. 25 (2005), *available at* http://arch.rivm.nl/env/int/ipcc/pages_media/SRCCS-final/ccsspm.pdf.

greenhouse gas emissions ("GHGs") have been introduced in the United States Congress, and various states have embarked upon their own GHG programs.

Identification of strategies to comply with likely Carbon Constraints is a critical element of protecting Minnesota's consumers and economy. Excelsior is working in conjunction with the Energy and Environmental Research Center ("EERC") as part of the Plains CO_2 Reduction Partnership ("PCOR") initiative to develop CO_2 management options for the Mesaba Energy Project based on evaluations of sequestration opportunities associated with regional geologic formations/features and nearby terrestrial features.[3]

What follows is Excelsior's CCS Plan for the first two of six IGCC units to be constructed over time on three state-authorized sites within the Taconite Tax Relief Area of northeastern Minnesota. The proximity of the three sites with IGCC units, together with the potential opportunities for carbon sequestration identified by the EERC, affords the State of Minnesota the opportunity to carefully plan for and implement the most cost-effective and flexible response to carbon constraints.

II. Background: Mesaba Energy Project Phases I and II

The IGCC Power Station described in this document consists of Phase I and Phase II of the Mesaba Energy Project ("Mesaba One" and "Mesaba Two," respectively). Each phase is nominally rated at peak to deliver 606 megawatts ("MW") of electricity to the bus bar.

Excelsior has submitted the necessary regulatory petitions and preconstruction permit applications to support construction of Mesaba One and Mesaba Two. The key pending regulatory filings made in connection with the Mesaba Project include the following: On December 22, 2005, Excelsior submitted to the Commission a petition to approve a Power Purchase Agreement with Xcel Energy under Minn. Stat. § 216B.1693 and 1694. On June 16, 2006, Excelsior submitted a Joint Permit Application for a Large Electric Power Generating Plant Site Permit, a High Voltage Transmission Line Route Permit, and a Natural Gas Pipeline Route Permit to the Commission for Mesaba One and Mesaba Two. On June 28, 2006, Excelsior submitted applications for New Source Review Construction Authorization and National Pollutant Discharge Elimination System Permits to the Minnesota Pollution Control Agency for Mesaba One and Mesaba Two. On June 29, 2006, Excelsior submitted an application for a Water Appropriation Permit to the Minnesota Department of Natural Resources.

When operational, the Mesaba Energy Project will allow Minnesota and the nation to benefit from the environmental advantages that IGCC technology offers over conventional, solid fuel alternatives. Beyond its capability for achieving an emission profile unmatched by conventional coal combustion systems, IGCC is adaptable to capture significant amounts of carbon dioxide

[3] The EERC is part of the University of North Dakota and has been selected by the Department of Energy to develop a regional vision and strategy for dealing with carbon management in the Plains Region (including the Canadian Provinces of Alberta, Saskatchewan, and Manitoba, and the states of Montana, NE Wyoming, North Dakota, South Dakota, Nebraska, Minnesota, Wisconsin, Iowa, and Missouri). *See* PCOR Partnership Profile, http://www.undeerc.org/pcor/partnership.asp.

from the synthesis gas prior to its combustion. Mesaba One and Two will be configured to allow for the installation of additional equipment that can capture up to 30% of the potential carbon in its selected feedstock.

III. Regulatory Context for Carbon Capture and Sequestration

Excelsior's intent in proposing a framework for CCS is to commence a process to identify and define conditions for development of CCS when state or national considerations require GHG reductions, and/or when such reductions might otherwise become an economic choice for the ratepayers of Northern States Power Company under the PPA, in the context of Mesaba One and Mesaba Two. Excelsior's efforts will advance state decision makers' practical knowledge regarding the role IGCC and the Mesaba Energy Project can play in achieving actual reductions in the state's CO_2 emissions.

Several states are undertaking initiatives to reduce greenhouse gas emissions, most notably carbon dioxide, in isolated sectors of their economies.[4] To achieve significant reductions of such emissions, it is probable that future climate change initiatives will extend nationwide and to all sectors of the economy. The ability to physically reduce the volume of GHG emissions from Minnesota's economic activity will be a critical component to the state's economic health,

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[4] Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York and Vermont have formed the Regional Greenhouse Gas Initiative ("RGGI") with the goal of creating a regional cap-and-trade program. The plan will begin addressing carbon dioxide emissions from power plants in the member states by capping 2009 carbon dioxide emissions at current levels. Beginning in 2015, RGGI states will begin reducing carbon dioxide emissions to achieve a 10% reduction by 2019. To facilitate the process, power plants will receive CO_2 emission allowances, which they may trade with other power plants. *See* Press Release, Regional Greenhouse Gas Initiative, States Reach Agreement on Proposed Rules for the Nation's First Cap-and-Trade Program to Address Climate Change (Aug. 15, 2006), *available at* http://www.rggi.org/docs/model_rule_release_8_15_06.pdf; Regional Greenhouse Gas Initiative, Model Rule (Aug. 15, 2006), *available at* http://www.rggi.org/docs/model_rule_8_15_06.pdf.

Similarly, California recently enacted legislation that calls for the development of regulations and market mechanisms that will reduce the state's greenhouse gas emissions by 25% by 2020. The law will impose mandatory caps beginning in 2012 and will incrementally tighten emission limits to reach the 2020 goals. *See* Press Release, Gov. Arnold Schwarzenegger, Gov. Schwarzenegger Signs Landmark Legislation to Reduce Greenhouse Gas Emissions (Sept. 27, 2006), *available at* http://gov.ca.gov/index.php?/press-release/4111/; California Global Warming Solutions Act of 2006, Assembly Bill No. 32, *available at* http://www.leginfo.ca.gov/pub/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf.

In 2001, Massachusetts developed regulations that apply to power plants in the state. Under the regulations, CO_2 emissions may not exceed the historical actual emissions for the three-year period from 1997 to 1999, and CO_2 emissions may not exceed 1800 lbs/MWh. See Massachusetts Dept. of Environmental Protection, Governor Swift Unveils Nation's Toughest Power Plant Regulations, Inside DEP, April/May 2001, at 1, *available at* http://www.environmentalleague.org/Issues/Enforcement/ DEPMay2001.pdf#search=%22Governor%20Swift%20air%20regulations%22; 310 Mass. Code Regs. 7.29 (2004), *available at* http://enviro.blr.com/display_reg.cfm/id/48436.

whether the constraints require roll-backs from any one sector or sources, or whether the constraints take the form of a tax or a cap-and-trade system. The precise form that the Carbon Constraints take is outside the scope of this CCS Plan, and in any event is not critical to the analysis of IGCC, which has the lowest cost of capture of any fossil fuel technology.[5] In a carbon-managed economy, large sources of CO_2 emissions that can economically achieve significant GHG reductions will likely be the major source of CO_2 offsets for other economic sectors whose only meaningful alternative for achieving reductions may be the purchase of GHG offset credits. Because IGCC is the technology best suited to carbon capture of all the fossil technologies,[6] it is a least-cost means to achieve actual reductions in GHG emissions, and will therefore very likely be able to achieve emission reductions at a cost below where credits will trade or where tax levels are established in order to signal sufficient reductions to meet the national program goals. Mesaba One and Mesaba Two are therefore likely to be ideal sources of carbon offsets under such circumstances, and are likely to provide the state with a meaningful, cost-effective hedge in meeting any federally-imposed GHG reductions.

IV. Preliminary Plan Description and Analysis

There are two primary components of the CCS Plan. First, Excelsior identifies the most promising, commercially available CO_2 capture technology to install at the IGCC power station. As described later in this section, an amine scrubber process currently has the most potential for carbon capture at the Mesaba Project. Second, Excelsior develops engineering plans for different methods of sequestering the captured CO_2. Based upon studies to date, the CCS Plan suggests a staged development of CO_2 pipelines from its Iron Range plant sites to North Dakota oil fields and proximate locations. The pipelines would likely utilize existing railroad, pipeline, or transmission line rights of way.

A. CO_2 Capture

Several processes have been proposed for carbon capture in coal power plants, consisting primarily of scrubbing or membrane separation-based processes. In conventional coal plants, the carbon must be scrubbed from very large volumes of stack gases at low pressures and temperatures. The most mature and proven of these is amine scrubbing, which is similar to the process used by the Mesaba Energy Project to capture sulfur from the syngas. In this process, the amine solution first adsorbs carbon dioxide from the gas being treated, and then CO_2-enriched amine is regenerated, recycling the amine and producing a relatively pure stream of CO_2.

IGCC plants enable pre-combustion capture of CO_2, which provides the intrinsic advantages of treating an undiluted and pressurized gas stream. An additional advantage enjoyed by IGCC is that CO_2 captured from high-pressure syngas requires less compression before transport and/or storage.[7]

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[5] See Ref. 1.
[6] *Ibid*.
[7] The volumetric flow of the pre-combustion IGCC syngas stream is far smaller than the post-combustion

The Mesaba Energy Project features a design that is adaptable to carbon capture, which enables relatively simple upgrades to be made in order to commence carbon capture. These upgrades entail installing a CO_2 amine scrubber downstream of the acid gas removal system and adding driers and compressors for captured CO_2. In this design, the CO_2 available for capture is limited by the proportion of carbon dioxide in the syngas, which varies for different fuels. Up to 30% of the potential CO_2 could be removed from the design subbituminous coal, while up to 20% could be removed from other design feedstocks.

Higher capture rates are not commercially available today, but will be demonstrated in the future. This is the primary objective of DOE's FutureGen project, which aims to capture at least 90% of the CO_2 from a non-commercial plant to begin operation in 2013. After such a demonstration of commercial viability, the Mesaba Energy Project could achieve 90% capture by adding a gas reheater and a water gas shift reactor upstream of the CO_2 amine scrubber. The shift reactor process converts CO to CO_2 by the following reaction:

$$CO + H_2O \rightarrow CO_2 + H_2$$

Nearly all of the carbon in the resulting syngas stream is in the form of CO_2, enabling the amine scrubber to remove at least 90% of the CO_2. However, at the current state of technology, this process would increase capital cost and reduce efficiency of the plant, making it more expensive for capturing CO_2 on a per ton basis than the 30% configuration. It should be noted that a plant that has implemented 30% capture would still be technically capable of being converted to capture 90% once the technology is demonstrated by DOE's FutureGen project.

Because the 90% approach has not yet been demonstrated and the 30% approach is the most mature and proven option, Excelsior concludes that the 30% approach is the most likely candidate for CCS in the near term. The 30% CO_2 capture configuration represents a cost-effective, commercially available option today for the Mesaba Project.[8]

B. Economic Considerations Relating to Sequestration

The potential economic drivers for CCS by the Mesaba Energy Project include opportunities to supply the CO_2 to an oil field for sale and use in enhanced oil recovery ("EOR"), and the opportunity for financial benefits to ratepayers from reductions in the costs of complying with carbon limits imposed in the future. This CCS Plan contains information on economical sequestration opportunities within the oil fields located in closest proximity to the Mesaba IGCC power stations. Because CO_2 used for EOR is also sequestered, the Mesaba Energy Project would likely earn carbon credit revenues (or avoid costs in other carbon limit scenarios) once regulations limit CO_2 emissions, which would be in addition to the EOR revenues. Therefore, investments in pipeline infrastructure for EOR will provide additional value as a method of sequestration once a carbon credit market is established.

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stream in a conventional coal plant, which enables the size of treatment equipment to be reduced. Also, as this treatment is conducted at approximately 400 psi, the additional compression required to pipeline the CO_2 is reduced.

[8] See the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472-/M-05-1993.

1. Enhanced Oil Recovery

Carbon dioxide has been proven to be very effective for secondary and tertiary oil recovery by both displacing and decreasing the viscosity of otherwise unrecoverable oil. Upon extraction of the oil, the EOR process easily removes pressurized CO_2 and recycles it by reinjecting into the pool. Economic benefits from EOR have been realized in at least two regions in North America. Kinder Morgan CO_2 has a CO_2 pipeline network of 1100 miles servicing the Permian Basin in western Texas and eastern New Mexico.[9] Similarly, the Dakota Gasification Project in the Northern Plains pipes CO_2 over 200 miles to the Weyburn oil field in southeastern Saskatchewan. The market for CO_2-based EOR is still available in oil fields across the country, so the Mesaba Energy Project, by virtue of its advanced stage of development, may be poised to exploit some of the most economical oil recovery operations available to the benefit of Minnesota ratepayers.

2. Carbon Credits or Other Economic Benefits of CCS

Carbon credits or other economic benefits derived from CCS under other forms of potential carbon regulation also represent a potential economic driver for the Mesaba CCS development, with future regulation in the U.S. determining the final value of the carbon benefits generated by CCS undertaken by the Mesaba Energy Project.

D. CCS Approach

This CCS Plan analyzes the most promising initial approach for CCS from the Mesaba Energy Project under present circumstances, which would entail capture of 30% of the CO_2 generated by the power stations and would direct that captured CO_2 to EOR sites. This approach requires a longer pipeline than would direct sequestering of CO_2 in closer, non-EOR sites. Therefore, targeting EOR sites will require higher front-end costs than if Excelsior were to sequester carbon simply to meet carbon limits without providing CO_2 for EOR opportunities. EOR and future carbon credit markets may offset the higher costs associated with initially targeting EOR sequestration sites.

While the timetable for implementation of regulations governing the operation of a carbon-managed economy is unknown, Excelsior anticipates that it would have adequate time to implement the power station upgrades and construct a CO_2 pipeline.

Numerous in-depth studies exist describing the technological means to capture 90% of the carbon dioxide from an IGCC plant.[10] Because of the real-time research and development efforts with respect to 90% capture, and the expected reductions in costs of this option as the technologies are demonstrated, Excelsior has not attempted to quantify the costs nor describe the technological approach in detail in this phase of the plan.

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[9] See Kinder Morgan CO_2, http://www.kindermorgan.com/about_us/about_us_kmp_co2.cfm.
[10] For a summary of such studies, see the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472/M-05-1993.

V. Currently Available Regional Sequestration Studies and Experience with CO_2 Pipelines

A. Regional Sequestration Studies

The EERC has extensively characterized three major types of sinks for carbon sequestration that are within the appropriate geographic proximity of the Mesaba Energy Project. The options are geological sequestration in oil fields (for enhanced oil recovery or storage only) or saline formations, and terrestrial sequestration (primarily using wetlands). Terrestrial sites are not suited to accommodate direct injection of CO_2 because such sites rely on changing the existing physical configuration of large areas of the earth's surface, rather than accepting the direct input of CO_2 at a stationary point. This CCS Plan focuses on geological sequestration, to which IGCC is uniquely suited.

Oil fields have proven to be CO_2 sinks with sufficient storage capacity to accommodate CCS projects equivalent to the long-term output of all six phases of the Mesaba Energy Project. Fields in the Permian Basin in western Texas have sequestered CO_2 for decades at scales even larger than those addressed in this CCS Plan.

During Phase I of the PCOR project, the EERC conducted exhaustive bottom-up characterizations of the EOR potential for each field in the PCOR region.[11] The EERC's methodology has produced reliable and conservative estimates of the CO_2 capacity for EOR in each field. This data forms the basis for the EOR-driven scenarios in the CCS Plan by the Mesaba Energy Project presented below. The economic benefits that could be achieved from EOR alone (that is, not including sales of carbon credits) are substantial. For example, the EERC projects that the total value of oil that could be recovered by EOR in North Dakota alone exceeds $15 billion (at a price per barrel of $59.50).[12]

Saline formations have the potential for still greater sequestration capacity than oil fields. The EERC's studies of the CO_2 sequestration capacity of the Broom Creek Formation in North Dakota have confirmed this observation.[13]

B. Experience with CO_2 Pipelines

Carbon dioxide suppliers, purchasers, and third parties that own existing CO_2 pipelines provide practical knowledge about how such pipelines operate. CO_2 pipelines are similar to natural gas pipelines, and they can transport CO_2 from its source to a sink. The primary difference between CO_2 and natural gas pipelines is that CO_2 pipelines require higher pressures (roughly 2,000 psi

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[11] *See* PCOR Partnership, *Plains CO2 Reduction (PCOR) Partnership (Phase I) Final Report/July–September 2005 Quarterly Report*, January 2006, *available at* http://gis.undeerc.org/website/PCORP/cdpdfs/FinalReport.pdf.

[12] EERC, Presentation, Potential Sequestration Options in the Plains CO2 Reduction (PCOR) Partnership Region & Estimated Capacities, Aug. 9, 2006 (on file with Excelsior Energy).

[13] Testimony of Edward N. Steadman, Oct. 10, 2006, MPUC Docket No. E-6472/M-05-1993, OAH Docket No. 12-2500-17260-2.

instead of 1,000 psi). Dedicated CO_2 pipelines are currently used for EOR in the Permian Basin and the Weyburn Oil Field. In the Kinder Morgan pipeline, which services the Permian Basin, 1 billion cubic feet per day of CO_2 is compressed from 800 to 2,000 psi and transported 500 miles.[14] Applying this knowledge, IGCC power stations will dry and compress carbon dioxide and inject it into pipelines. Over long pipeline distances, booster stations will periodically recompress the CO_2.

VI. Scenarios to Be Further Investigated

This section evaluates five CCS configurations associated with the Mesaba Energy Project in an effort to give policymakers further information about potential CCS options. CCS based on EOR alone will be examined for the 30% capture configuration, across one to six Mesaba Energy Project units (each unit is assumed to have roughly 600 megawatts of capacity). As discussed in Section IV, the 90% capture configuration is not yet commercially available. Therefore, although this may change in time, Excelsior does not assume 90% capture for the purpose of generating the economics in this CCS Plan. As a simplifying baseline assumption, this CCS Plan further assumes that cost-sharing opportunities with other CO_2 sources will not be available.

A. Scenario 1

For Scenario 1 and its alternatives, pipelines would be constructed between the three Mesaba Energy Project's Iron Range plant sites (each site containing two generating units) and a cluster of oil fields in north central North Dakota, the southwestern corner of Manitoba, and the southeastern corner of Saskatchewan. Many of these oil fields are either unitized or run by a single operator, which expedites the establishment of EOR in a field. (Unitization is a process by which field operators combine all oil and gas interests in a field into a single operation.) Non-unitized, multiple operator fields may take longer to set up EOR, so the readily available fields would be advantageous and the likely economic choice. For the main trunk pipeline connecting the plants and oil fields, two options for rights of way ("ROWs") are shown in Figure 1. The pipeline corridors in these scenarios follow existing rail ROWs only for the purpose of illustration – other potential corridors may exist.

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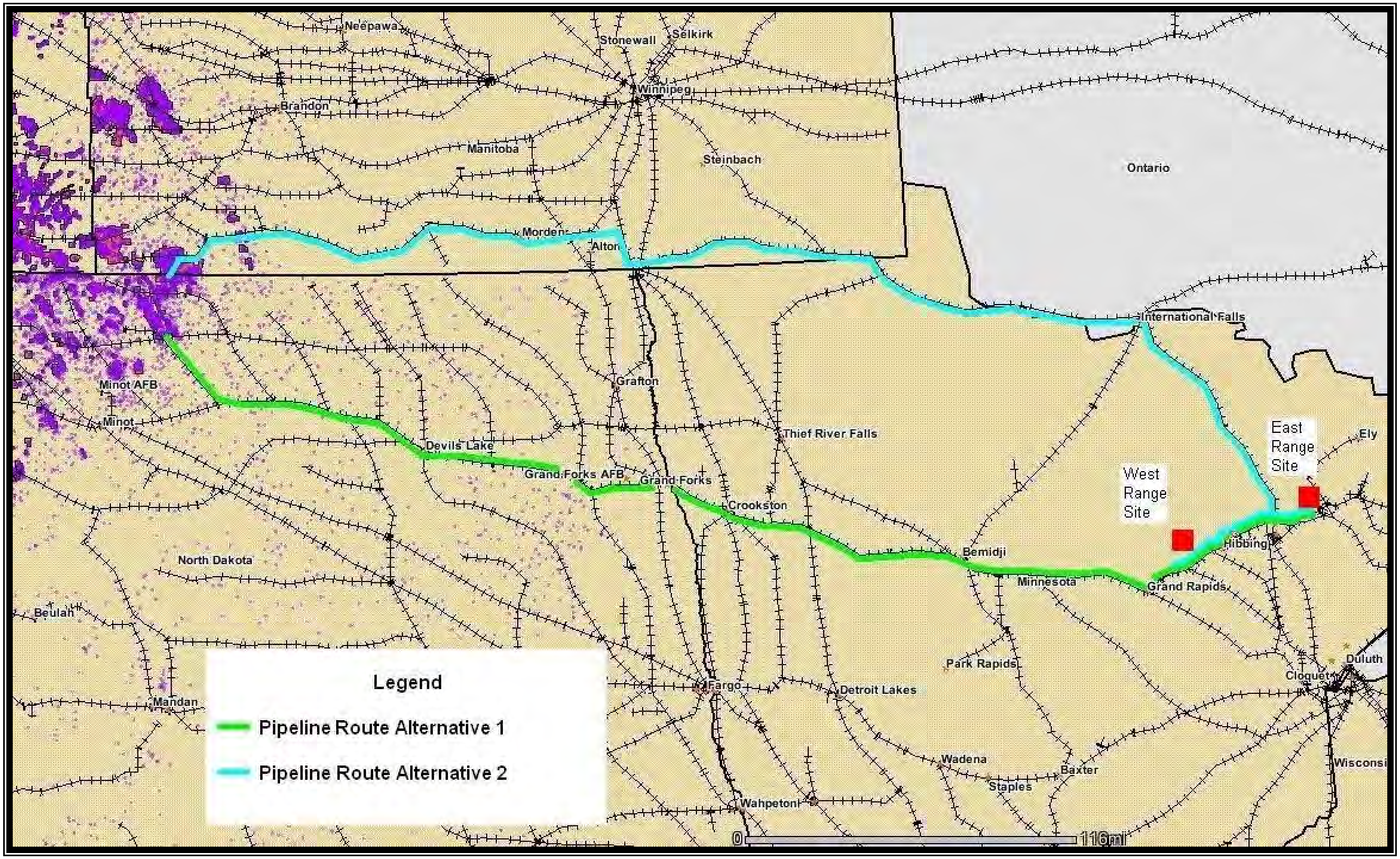
[14] Kinder Morgan, Cortez Pipeline and McElmo Dome, http://www.kindermorgan.com/business/co2/transport_cortez.cfm.

Figure 1. Potential Pipeline Routes for the Mesaba Energy Project CO_2 Pipeline

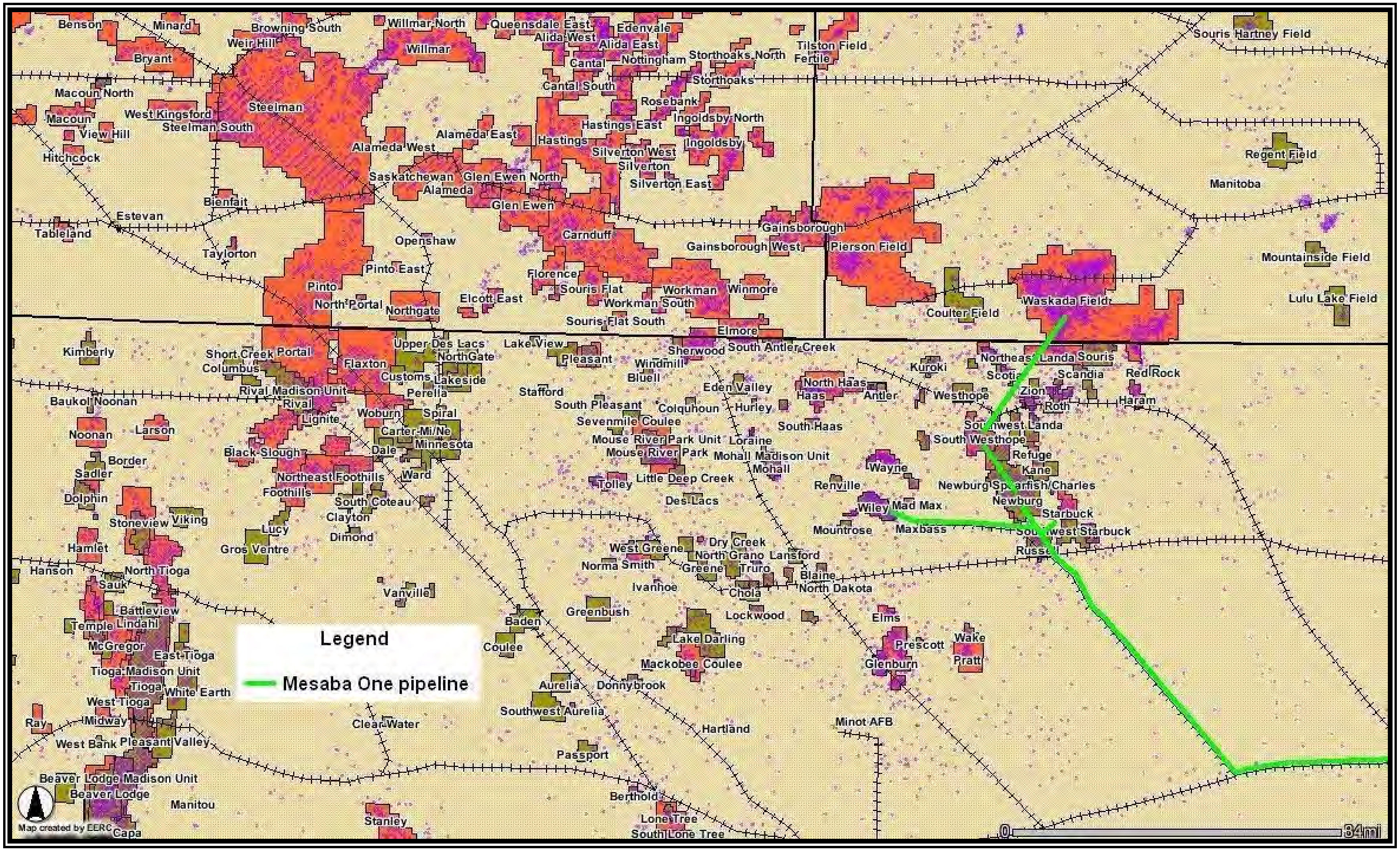


Source: EERC

B. Scenario 1A

For the CO_2 captured at Mesaba One, a cluster of oil fields in north-central North Dakota and southwestern Manitoba are targeted, with preliminary expectations that such fields could accommodate EOR for 22 years. This duration, which is used throughout the analysis of the various scenarios, corresponds to that of the financial model and does not reflect cessation of capture. Following existing railroad track (for purposes of illustration) from the preferred West Range site, a 12-inch pipeline approximately 405 miles long could reach the first proposed oil field. Over the course of 22 years, an additional 40 miles of pipeline would be needed to connect to nearby fields. Two of the fields are unitized. The pipeline network needed to serve this scenario is shown in Figure 2.

Figure 2. Western Terminus of CO_2 Pipeline Serving Mesaba One

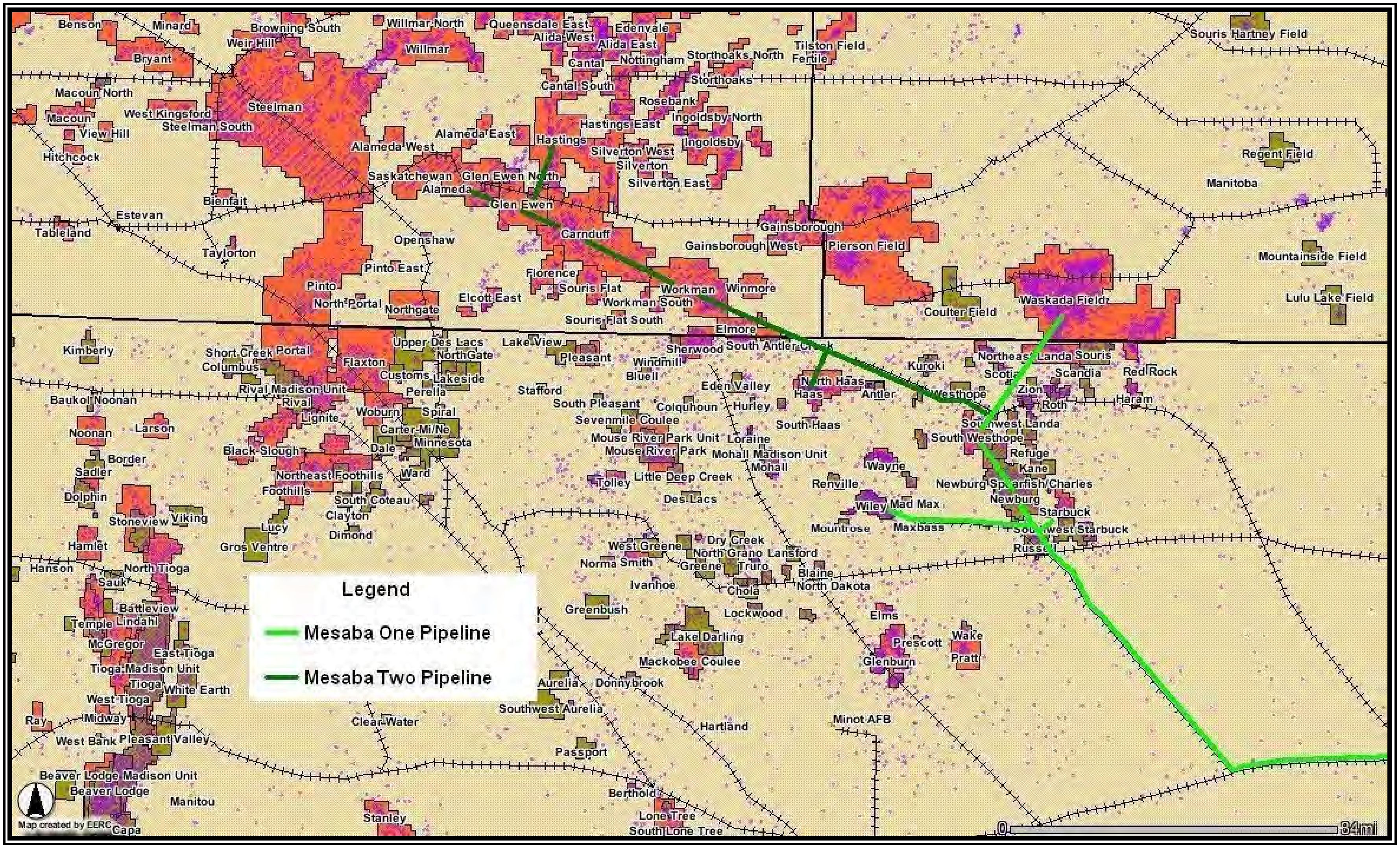


Source: EERC

C. Scenario 1B

For Mesaba One and Two, the network of pipelines would expand to a chain of oil fields in southeastern Saskatchewan. To accommodate 22 years of EOR from both units, approximately 120 additional miles of pipeline would be added for a total system length of 525 miles. This length is inclusive of additions required for a single unit as described above, and such additions could be staged. To illustrate the economies of scale, it will be assumed that the trunk pipeline is sized to accommodate two units, such that looping (i.e., duplicating) the 405 mile base pipeline is not necessary. The pipeline network for this scenario is shown in Figure 3.

Figure 3. Extension of Western Terminus of Mesaba One Pipeline to Accommodate Mesaba Two



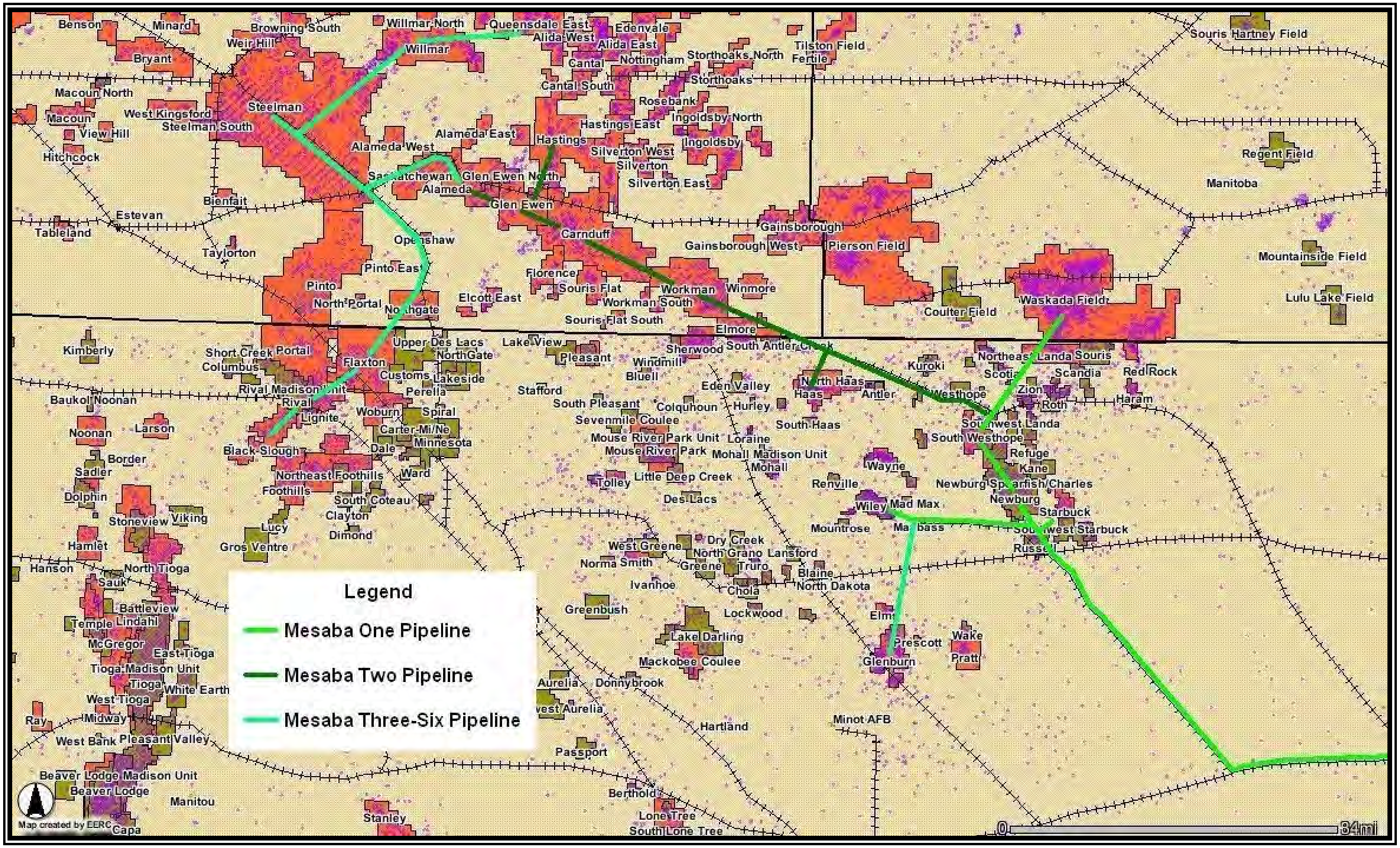
Source: EERC

D. Scenario 1C

For Mesaba Units One through Six, the pipeline network could reach much larger fields in Saskatchewan and North Dakota. The incremental pipeline additions for these units would include 85 new miles, for a total system length of 610 miles, as shown in Figure 4. While this scenario would be the most efficient and economical, the degree of uncertainty is too great to model even on a preliminary basis at this time. This scenario demonstrates that the potential for EOR present a CCS opportunity, and that a cost-shared pipeline accommodating multiple sources is a very promising means to defray the overall final costs of CCS.

The introduction of carbon credits or other benefits for reductions under mandated carbon constraints to these scenarios would improve the economics presented in the CCS Plan and would not otherwise intrinsically alter the ideal implementation of pipeline routes. Other sources may be induced to pursue EOR, but the relative cost competitiveness among those sources would not likely change.

Figure 4. Extension of Western Terminus of Pipeline to Accommodate Mesaba One Through Mesaba Six



Source: EERC

E. Scenario 2

Scenario 2 considers CCS based solely on carbon credit revenues or other benefits of CCS under carbon constraints, with the Mesaba Energy Project as the only source. In this case, CO_2 would only need to be piped approximately 265 miles from the West Range site to the Lower Cretaceous saline formation in eastern North Dakota.[15] Once again, existing right-of-way is shown for purposes of illustration. The EERC projects that the capacity of this saline formation dwarfs that of the oil fields considered in Scenario 1, so it is expected that the same pipeline route could serve all units at 30% or 90% capture.[16] The route in Scenario 2 is shown in Figure 5.

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[15] See the Oct. 10, 2006 testimony of Edward N. Steadman, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472-/M-05-1993

[16] EERC, Presentation, Potential Sequestration Options in the Plains CO2 Reduction (PCOR) Partnership Region & Estimated Capacities, Aug. 9, 2006 (on file with Excelsior Energy).

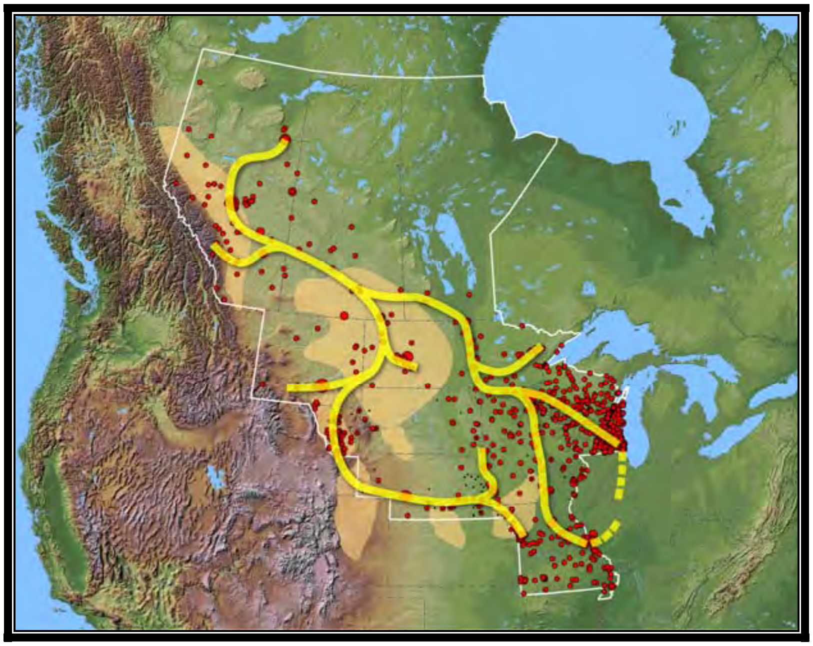
Figure 5. CO_2 Pipeline to Saline Formations for Carbon Credits (No EOR)

Source: EERC

E. Scenario 3

As Scenario 1C begins to demonstrate, the economies of scale for CO_2 transport could be significant. In a fully implemented GHG regulatory scheme, it would be conceivable that the majority of large industrial facilities (epitomized by large electric generation facilities) would be capturing CO_2. The EERC's vision for a major pipeline system serving the PCOR region is laid out in Figure 6. As the map shows, the concentration of industry on the Iron Range makes it a likely route for a major artery of the CO_2 network.

Figure 6. EERC's Vision of CCS in a Carbon Managed Economy



Source: EERC

VII. Preliminary Economic Analysis

Excelsior used the Mesaba Energy Project's proprietary financial model to identify the breakeven value of CO_2 (in 2006$ per ton) captured in the 30% approach for each scenario identified in Section VI. This modeling is preliminary in nature and is intended to i) illustrate economic dependencies around important CCS Plan variables rather than absolute costs and ii) determine whether a more thorough investigation is justified. All cases assumed that capital outlays associated with CCS occur in 2011, and that CO_2 capture commences in the third quarter of 2014 and continues for 22 years (through the duration of the financial model).

The financing structure and economic assumptions used in the modeling of these carbon capture scenarios are consistent with Excelsior's assumptions in its current financial model used to evaluate the Mesaba Energy Project. The cases are modeled to recover the costs associated with the CCS program and maintain the required return to the projects equity investors. The effects of the sensitivities shown below are displayed as changes in NPV from a base case and are calculated using an 8% discount rate. Estimates for the cost of 90% removal are not available, so only 30% capture was modeled.

Fluor developed an estimate for the cost of the 30% capture configuration,[17] and Excelsior integrated that estimate into the Mesaba Energy Project's financial model. There are two main economic impacts associated with carbon capture: equipment capital cost and reduced plant capacity, which also causes an increase in plant heat rate. The equipment includes the amine stripper and the CO_2 drier and compressor. Plant capacity is reduced and heat rate is increased because these processes are steam driven, and because the CO_2 would need to be replaced by steam as a diluent for NO_x control. In an attempt to determine if CCS can be accomplished without additional costs to utility ratepayers, the cost of fuel increase on a megawatt-hour (MWh) basis corresponding to the heat rate increase was attributed and charged to the CCS project in the model assumptions. Total capital cost additions are currently estimated to be [**BEGIN TRADE SECRET: END TRADE SECRET**] and the anticipated increased O&M costs for that equipment is [**BEGIN TRADE SECRET: END TRADE SECRET**]. The capacity reduction for the IGCC Power Station is currently estimated to be [**BEGIN TRADE SECRET: END TRADE SECRET**], with the increased heat rate expected to be [**BEGIN TRADE SECRET: END TRADE SECRET**].

As for pipeline cost estimates, the Dakota Gasification Project's ("DGP") CO_2 pipeline to the Weyburn oil field was used as the basis for estimating costs. The DGP pipeline was built for $120 million in 1997, and consisted of 204 miles of nominal 12" and 14" Schedule 40 pipeline.[18] Conservatively assuming it was all 12" pipeline and escalated to 2005 dollars, the total cost for a CO_2 pipeline in the Northern Plains is assumed to be $60,920 per inch-mile. Based on the design capacity of the Weyburn pipeline, a nominal 12" Schedule 40 pipeline is sufficient to transport CO_2 produced by 30% capture at Mesaba One, with the Mesaba One and Two units requiring a 14" pipeline. A further conservative assumption utilized in the analysis is that the total pipeline network is built up front. Costs could be reduced by deferring network expansions to additional oil fields

Excelsior Energy modeled Scenarios 1A, 1B, and 2, and the results are presented in Table 2. For Scenarios 1A and 1B, revenues could be earned from both EOR and carbon credits sales (or through other carbon reduction benefits to ratepayers when constraints are imposed). This data illustrates that the economies of scale are important for CCS – the required price per ton drops significantly with larger volumes of CCS, despite the fact that 80 additional miles and an increased diameter for the pipeline would be necessary. Scenario 2 demonstrates that the Mesaba Energy Project could capture and sequester carbon at an even lower overall cost, although such capture could not reap EOR revenues. As explained above, these cost estimates are illustrative rather than predictive, and conclusions should be limited accordingly. The accuracy of these estimates must be refined by additional study before the economic viability of the project can be judged.

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[17] Fluor Enterprises, Inc., *Mesaba Energy Project Partial Carbon Dioxide Capture Case*, October 2006, attached as Exhibit DC __ (DC-7) to the Oct. 10, 2006 testimony of Douglas H. Cortez, OAH Docket No. 12-2500-17260-2, MPUC Docket No. E-6472/M-05-1993.

[18] See p. 857 of Kovschek, A. R. *Screening Criteria for CO2 Storage in Reservoirs*, Petroleum Science and Technology, 2002. Vol. 20, No. 7&8, pp. 841-866. Also, see Dakota Gasification Company, *available at* http://www.dakotagas.com/SafetyHealth/Pipeline_Information.html.

Table 2. Cost of Captured CO_2

	EOR	Pipeline length	Total CCS Cost ($/ton)
Scenario 1A	Yes	445 miles	$40
Scenario 1B	Yes	525 miles	$35
Scenario 2	No	265 miles	$32

Due to the high degree of uncertainty in many of the important assumptions, Excelsior conducted a sensitivity analysis. Scenario 1A was used as the base case for this analysis, and the results are shown in Table 3. Pipeline costs represent the greatest source of uncertainty, both in terms of the uncertainty of the cost assumed and impact that assumption has on total project cost. It is crucial that the range of this cost be narrowed, and the engineering studies proposed in Section I would address these and other issues. While the effect of capacity loss is nearly as material to the analysis, there is greater modeling certainty in the assumed values.

Table 3. Sensitivity Analysis of CCS Costs

Factor	Case	Input Value Assumed	Required CO2 Value/Total CCS Cost
Pipeline Cost	Low	$30,145/in-mi	$30/ton CO_2
	Base	$60,290/in-mi	$40/ton CO_2
	High	$90,435/in-mi	$50/ton CO_2
Plant Capital	Low	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	Base	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	High	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
Capacity/ Heat Rate	Low	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	Base	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	High	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
Plant O&M	Low	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	Base	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
	High	[**BEGIN TRADE SECRET:**	**END TRADE SECRET**]
Pipeline O&M	Low	$890/mi-yr	$40/ton CO_2
	Base	$1,780/mi-yr	$40/ton CO_2
	High	$2,760/mi-yr	$41/ton CO_2

It is important to note that the greatest uncertainty surrounding the economics of a CCS project is revenue, as EOR depends upon volatile oil prices and carbon credit prices (or other economic benefits from reductions under carbon constraints) depend upon future regulation. However, such uncertainties are not specific to the Mesaba Energy Project and must be overcome by any major undertaking of CCS. The figures presented in the remainder of this section elaborate upon the modeled impact of CO_2 prices on the net present value of different scenarios in the CCS Plan.

Figure 7 shows the impact that the value of CO_2 has on project economics. This value for CO_2 is derived from either EOR or a combination of EOR and carbon credits or other CCS regulatory benefits, and corresponds to Scenario 1A with the baseline assumptions described above. Similarly, Figure 8 examines this impact if revenues are from carbon credits exclusively (that is, no EOR). CO_2 would be sequestered in saline formations, corresponding to Scenario 2. Thus, for Figure 8 the impact to the NPV is based on Scenario 2's $32/ton case as the $0 NPV reference.

Figure 7. Sensitivity to Changes in Total CO_2 Revenue (\$/ton CO_2) in Scenario 1A

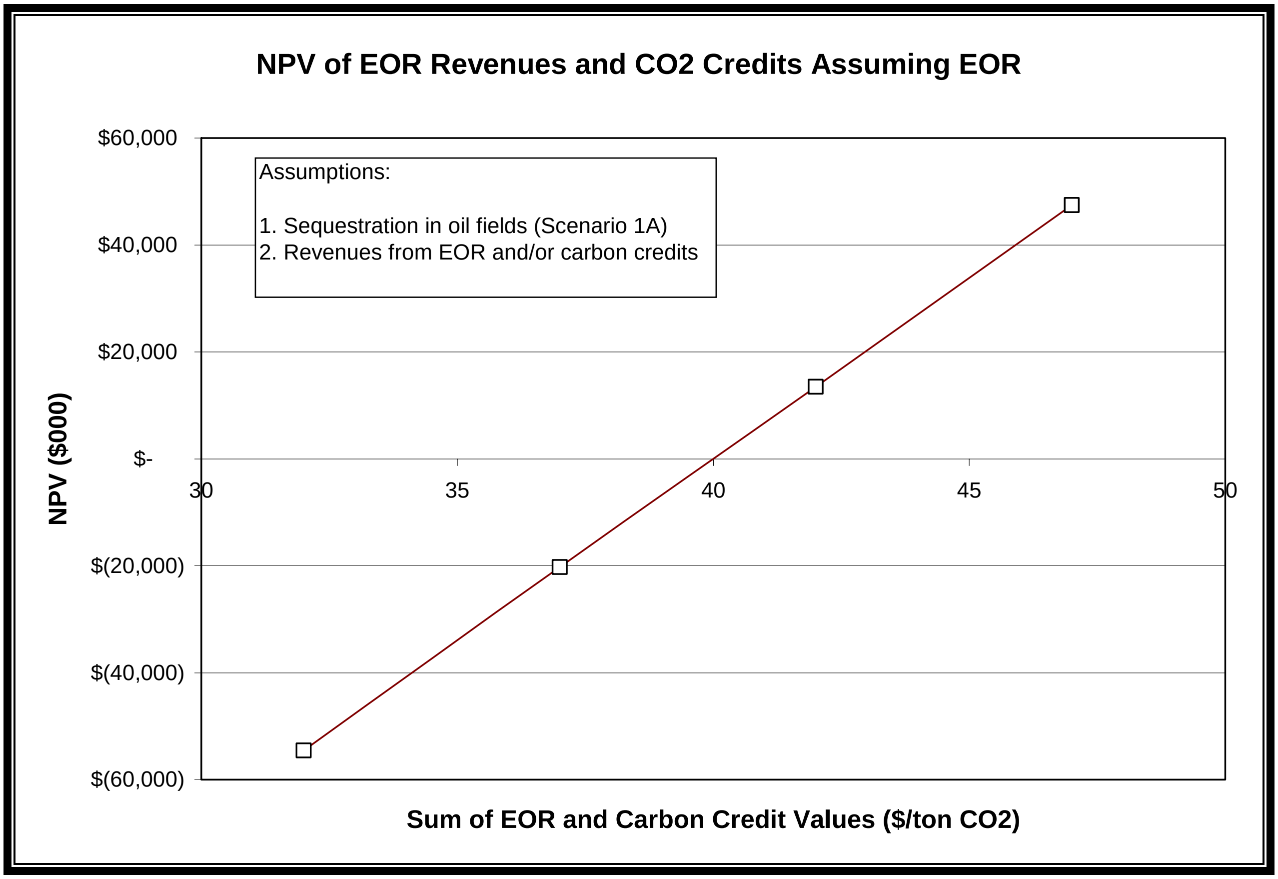
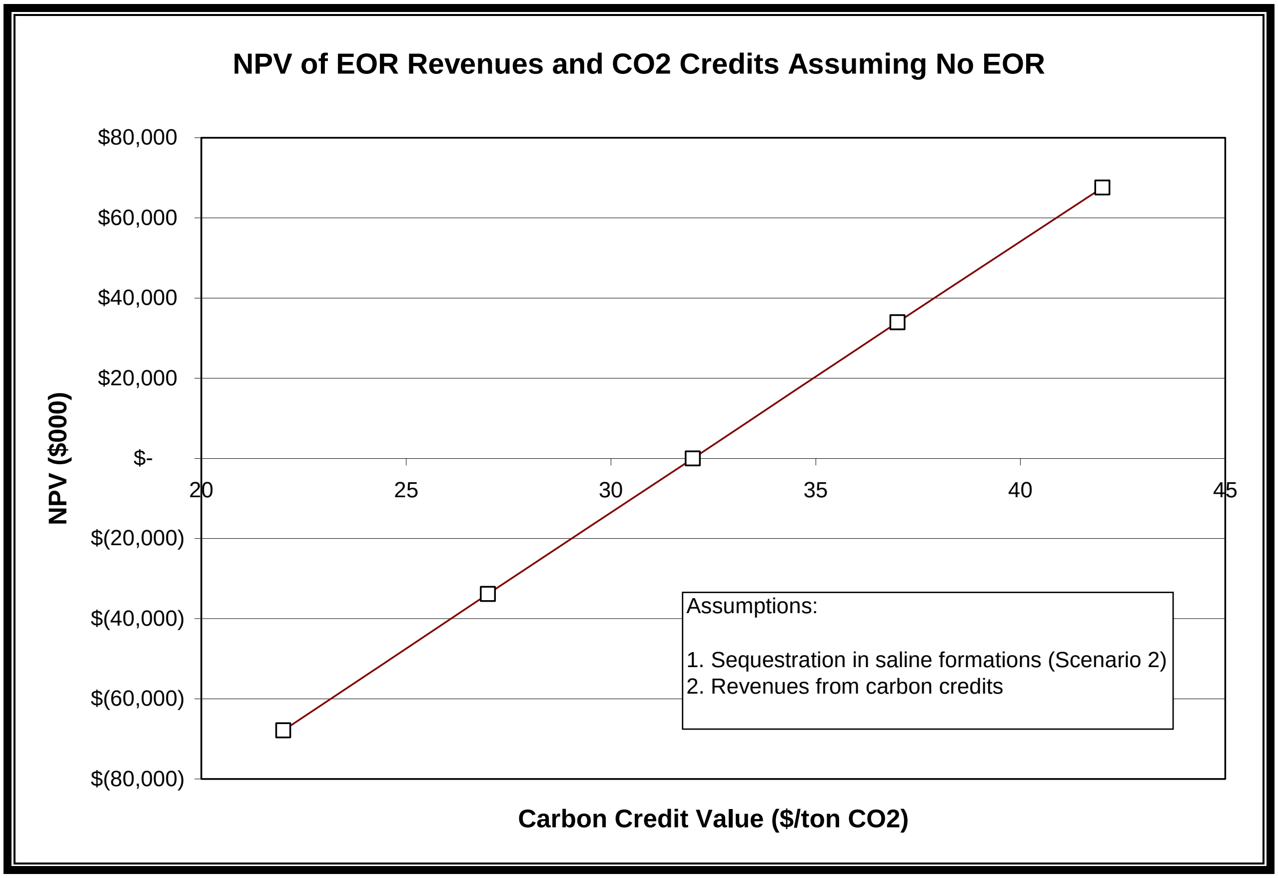
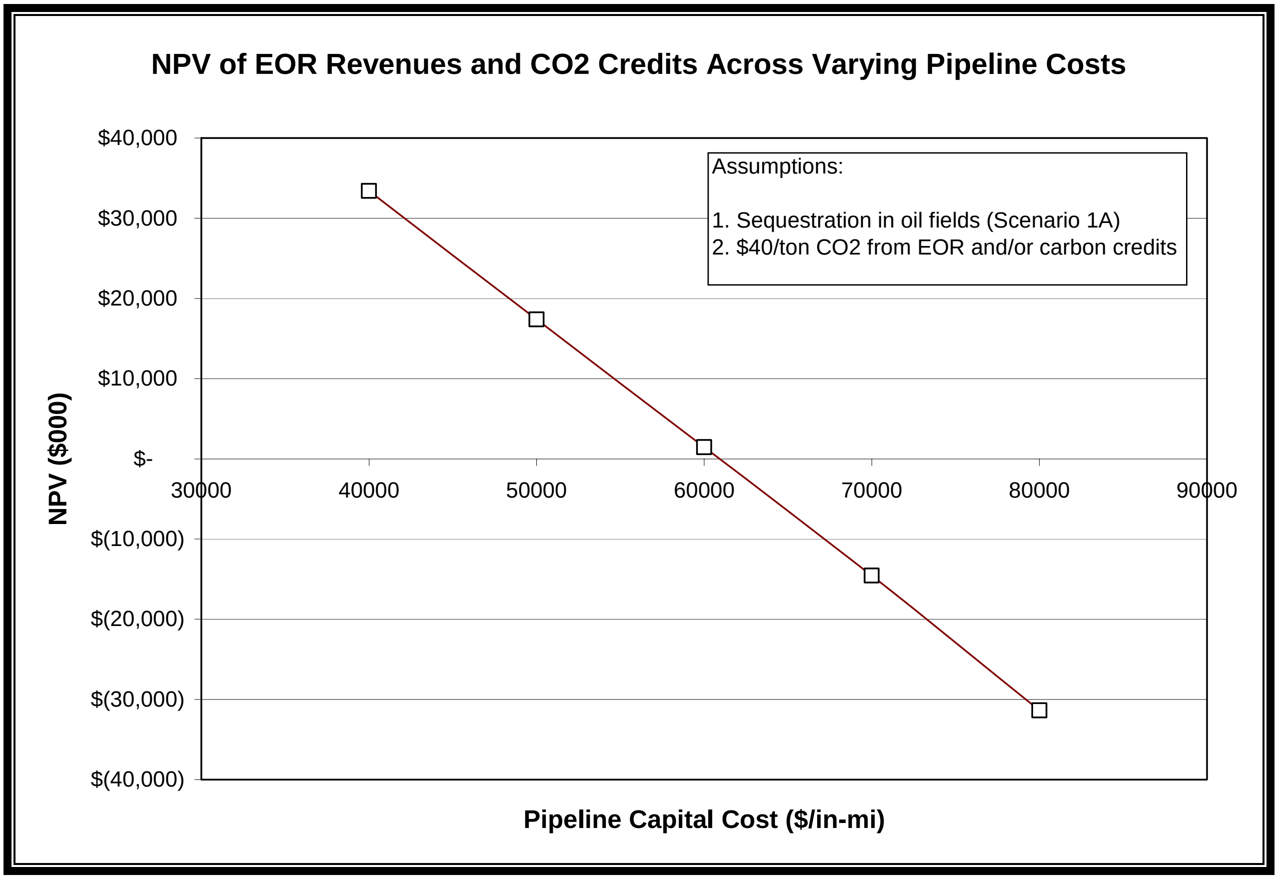


Figure 8. Sensitivity to Changes in Carbon Credit Revenue ($/ton CO_2) in Scenario 2



Changes in the NPV of different scenarios in the CCS Plan due to changes in pipeline costs are shown in Figure 9. This figure assumes that the total value of CO_2 will average $40/ton.

Figure 9. Sensitivity to Changes in Pipeline Costs ($/in-mi) in Scenario 1A



Carbon credits are currently trading at approximately \$17/ton in Europe.[19] The value of CO_2 for EOR is highly variable according to oil prices, specific field geology, and source competition. At oil prices of \$15–20/bbl, CO_2 can be worth \$10–16/ton for EOR, and more at higher prices of oil.[20] As carbon regulations are introduced and become stricter, and as the price of oil increases, the price of CO_2 can be expected to rise. Although it is premature to conclude whether CCS in any scenario presented here is economical, Excelsior believes that additional study towards that end is warranted.

The alternative sources of CO_2 for EOR in the fields identified in Scenario 1 are limited. The largest of these by far are conventional coal plants in the region, but post-combustion CO_2 capture for such sources has only been demonstrated at pilot scale. The cost per ton is expected to be higher for conventional coal than for the Mesaba Energy Project, even if a much shorter pipeline is assumed for the former.[21] Ethanol plants and natural gas processing facilities are able

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[19] The market closing price on October 18 was €12.90 (http://www.pointcarbon.com), which is equivalent to \$16.25 USD.

[20] Intergovernmental Panel on Climate Change, IPCC Special Report: Carbon Dioxide Capture and Storage, p. 33 (2005), *available at* http://arch.rivm.nl/env/int/ipcc/pages_media/SRCCS-final/ccsspm.pdf.

[21] See Ref. 2.

to produce CO_2 at a much lower cost than conventional coal plants, but lack the capacity to saturate the EOR market. Fields along the pipeline built by the Dakota Gasification Project can accommodate its supply for decades to come. Therefore, it is reasonable to expect that EOR revenues could be available to the Mesaba Energy Project across the time frames proposed.

Excelsior assumes that it will be positioned to obtain partial DOE cost sharing for construction of the CO_2 pipeline. However, irrespective of such funding potential, Excelsior believes it is in the interests of the both the Mesaba Project and the state to better understand the economic drivers for CCS programs and the need to firm up equipment/construction costs at the plant, along the pipeline route, and at the oil fields. Detailed engineering studies conducted under carefully defined scopes of work will help refine such costs.

The EERC, in conjunction with Excelsior, will develop CO_2 management options for the Mesaba Energy Project based on evaluations of sequestration opportunities associated with regional geologic formations/features and nearby terrestrial features. The study will match carbon sinks to the Mesaba Project and rank the sinks according to engineering, economic, and public-acceptance considerations. The schedule calls for the EERC to complete an analysis of the identified CO_2 management options in December 2006. Excelsior will use the results of this analysis to narrow the scope of its Phase III proposal to the DOE for demonstrating the commercial readiness of carbon sequestration via IGCC.

In preparing the Phase III proposal, the EERC and Excelsior will formulate best practices required to accomplish sequestration of CO2 from IGCC facilities and publish the results as part of a manual that can be used by others undertaking IGCC projects.

VIII. Summary and Conclusions

Excelsior has prepared this CCS Plan to offer the Commission and Minnesota ratepayers options to capture and sequester a significant portion of the CO_2 emissions from the Mesaba Energy Project. Based on the scientific and technical considerations, marketplace and operating assumptions, the financial analyses, and future carbon regulations assumed in this CCS Plan, Excelsior anticipates that future technical studies will verify that it will be feasible to capture and sequester CO_2 emissions from the Mesaba Energy Project. As explained in the CCS Plan, the most promising CCS scenario is for Excelsior to transport its CO_2 via high-pressure pipelines to the depleted oil fields associated in the Williston Basin located in North Dakota, southwestern Manitoba, and southeastern Saskatchewan.

This CCS Plan reflects the work undertaken to date by Excelsior and the PCOR initiative. Significant work remains to refine the engineering and economic information it contains. This work will be advanced by the PCOR initiative. Excelsior will continue to update this information as its work with PCOR progresses. Excelsior would be amenable to exploring a commitment with the Commission to apply the final $2 million of its RDF award to further efforts to refine this plan. If feasible from the Commission's perspective, Excelsior would propose to accelerate the funding of that amount in order to facilitate a more rapid completion of a detailed engineering plan and cost proposal for CCS. Excelsior anticipates that such a detailed plan could be developed within a year from the date such funding is made available. The CCS Plan could also serve as the foundation for a competitive proposal in response to the Department of Energy's ("DOE") planned Phase III solicitation for demonstrating full scale CCS projects. Accelerating development of a very detailed plan would enhance Minnesota and the Mesaba Project's prospects to obtain federal matching funds under DOE programs.

It is in the long-term interests of the state to proceed expeditiously with the development of feasible CCS options. Excelsior looks forward to working with regulators, stakeholders, and industry participants to provide the important hedge to Minnesota consumers offered by the timely development of carbon capture and sequestration.

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APPENDIX A2
DOE Analysis of Feasibility of Carbon Capture and Sequestration for the Mesaba Energy Project

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APPENDIX A2
DOE ANALYSIS OF FEASIBILITY OF CARBON CAPTURE AND SEQUESTRATION FOR THE MESABA ENERGY PROJECT

This section discusses carbon capture and sequestration (CCS) and examines why it is not commercially feasible for the proposed action. The discussion includes consideration of the technical and economic feasibility of CCS given current and expected state-of-the-art technologies, foreseeable developments, market forces, and the regulatory framework in relation to the expected in-service date of the project.

The Mesaba Energy Project was selected in 2004 under the Clean Coal Power Initiative (CCPI) Round 2 Funding Opportunity Announcement. CCS was not a requirement of the Round 2 announcement, was not proposed in Excelsior's application submitted in response to the announcement, nor is it included within the project as negotiated and awarded in the DOE Cooperative Agreement. CCS will be the focus of the future CCPI Round 3 Funding Opportunity Announcement.

DOE has parallel research programs aimed at reducing the cost of electricity associated with power production and proving the technical viability of CCS technology. Advancements in gasification, turbine, and CCS technology must converge to make CCS technically and economically feasible. Projects like Mesaba will advance the state-of-the-art in gasification technology thereby making CCS more likely to be deployed in the future.

DOE expects that the combined efforts of these programs will enable large-scale plants to come on-line by 2020 that offer 90% carbon capture with 99% storage permanence at less than a 10% increase in the cost of energy services[1]. The planned in-service date for the Mesaba Energy Project is well in advance of the timeline for achieving the DOE goal.

Technical Feasibility of Carbon Capture

As discussed in Section 2.2.1.3, Section 5.1.2, and Appendix A1, Excelsior has presented a multiple-option carbon management plan to the Minnesota Public Utilities Commission (PUC). At its baseline, the Mesaba Energy Project would be designed with sufficient space available in its footprint for future installation of carbon capture equipment. Adjacent systems would also be designed to facilitate modification for interfacing the carbon capture equipment.

The plan includes the option of using commercially available amine scrubbers to remove carbon dioxide from the syngas stream prior to combustion in the gas turbines that would, assuming 100% subbituminous coal input, result in a nominal 30% reduction in overall carbon dioxide emissions from the plant. Incorporation of this base case carbon capture scenario would result in an adverse impact to plant efficiency and the price of electricity. Other commercially available capture technologies, such as Selexol® and Rectisol® would have a greater adverse impact on plant efficiency and the price of electricity[2].

Excelsior's carbon management plan for the Mesaba Energy Project includes an additional option to convert the carbon monoxide present in the syngas to carbon dioxide for greater removal, if future conditions justified this option. This could conceivably result in about a 90% reduction in overall carbon dioxide emissions from the plant. However, the technologies required for this rely on a gas turbine that is capable of running on hydrogen-rich gas. For example, this process relies on converting water and carbon monoxide to carbon dioxide and hydrogen, as shown in the reaction below, using a water-gas shift reactor.

$$CO + H_2O \rightarrow CO_2 + H_2$$

This results in a carbon monoxide-depleted, hydrogen-rich syngas. Conventional, commercially available combustion gas turbines envisioned for this project cannot operate on carbon monoxide-depleted syngas where the hydrogen concentration approaches 100%. Currently commercially-available combustion gas turbines at sizes much smaller than those envisioned for this project operate on hydrogen-rich fuels. These machines are typically operating on a blend of hydrogen (typically less than 60% hydrogen) and some other energy containing fuel, such as carbon monoxide or methane. However, the size, combustion technology and vintage of these smaller and older machines results in poor performance in terms of low efficiency and high emissions. This current experience, on smaller machines fueled with a hydrogen blend, does not translate to technology for larger machines fueled with nearly 100% hydrogen that would be needed for the Mesaba project, where high efficiency and low emissions are a requirement.

Currently, advanced turbines are in development that address these issues but are not expected to be commercially available at the Mesaba project's in-service date. Even when these advanced turbines are commercially available, the option of precombustion decarbonization to produce a hydrogen fuel would result in substantial capital cost, reduce overall plant efficiency and adversely impact the price of electricity from the Mesaba project. Testimony sponsored by Excelsior in the PUC docket estimated that under the 90% removal scenario, capital equipment cost could increase by up to 40%; corresponding increases in the net plant heat rate would approach 21%[3]. Other independent estimates are that the addition of 90% capture technologies to a gasification plant would increase the cost of energy by about 17%[4] and decrease the net power plant efficiency by about 6-9%[5].

Technical Feasibility of Carbon Dioxide Transport

There are no sufficiently characterized geologic reservoirs capable of sequestering carbon dioxide within the state of Minnesota. The nearest geologic formation of potential interest would be the Lower Cretaceous saline formation approximately 265 miles from the proposed West Range Site. The nearest formation with the potential for revenues would be associated with enhanced oil recovery (EOR) in the Williston Basin of North Dakota. Both scenarios would require a pressurized pipeline; such a pipeline would need to extend at least 400 miles to reach the Williston Basin. Much experience has been gained in the design, construction and operation of pipelines for transport of carbon dioxide for EOR. There are about 3,000 miles of existing carbon dioxide pipeline in the United States, including examples of pipelines up to 500 miles in length. It is therefore technically feasible to build a pipeline to oil fields or other sequestration sites within about 500 miles from the Mesaba Energy Project location. However, assuming rights-of-way, permits and off-take agreements could be obtained, the cost associated with the transport would significantly increase the cost of electricity.

Technical Feasibility of Carbon Sequestration

Sequestration options include suitable EOR and injection into compatible geologic formations. Beneficial reuse, such as carbonation for soda pop, does not constitute sequestration because it ultimately results in release to the atmosphere. Sequestration is the subject of a great deal of research relative to the efficacy of long-term storage (i.e., permanence) and characterizing suitable "carbon sinks" to ensure that any potential adverse environmental impacts are understood and minimized. DOE has created a network of seven Regional Carbon Sequestration Partnerships to develop the technology, infrastructure, and regulatory framework necessary to implement carbon sequestration in different regions of the Nation. Planning for large-scale sequestration tests is scheduled to begin in fiscal year (FY) 2008 and the tests would run through FY 2017. The purpose of the tests is to demonstrate that large quantities (e.g. one million tons of carbon dioxide per year) can be transported, injected, and stored safely, permanently, and economically.[1]

Large-scale and long-term commercial application of carbon dioxide injection for EOR has occurred in the Texas Permian Basin and in the Weyburn field of the Williston Basin. However, these are economically-driven operations to increase oil production not necessarily scientifically-driven to prove the technical feasibility of permanently sequestering carbon.

Therefore, the technical feasibility of carbon sequestration for the Mesaba Energy Project cannot be validated in the near-term until extensive field tests are conducted to fully characterize potential storage sites and the long-term storage of sequestered carbon has been demonstrated and verified. Further, an MIT study[4] concluded that the major uncertainties surrounding geologic sequestration should be resolved within 10-15 years, which is consistent with the DOE Carbon Sequestration Program goal.

Economic Feasibility of Carbon Capture and Sequestration

The effect of CCS on the cost of electricity from the Mesaba Energy Project has not been quantified. However, there have been a number of studies of the costs of CCS for IGCC plants that show the costs of CCS could increase the cost of electricity by as much as 40%,[6] depending on assumptions regarding the value of the carbon dioxide produced. No statutory or regulatory requirement exists for CCS. Nor does a viable market currently exist for carbon credits. Environmental and construction permitting associated with transport and sequestration would significantly delay the project, further increasing the cost of electricity. Even if the carbon dioxide could be sold for EOR operations, the revenues from carbon dioxide (estimated at about $20 per ton) would be grossly insufficient to recover such costs. Hence, imposition of CCS on the project will effectively make the cost of electricity non-competitive.

Summary Conclusion

Carbon capture and sequestration is not considered feasible for the Mesaba Energy Project at this time. However, the carbon management plan for the Mesaba Energy Project is a logical starting point from which the PUC can derive findings and thereby establish the appropriate timing and price at which carbon capture and sequestration becomes in the Minnesota ratepayers' interest. Without an order from the PUC that incorporates the costs associated with CCS within the power purchase agreement, the Mesaba Energy Project would not be economically viable.

References

1. Carbon Sequestration Technology Roadmap and Program Plan, 2007, NETL.
2. Comparative IGCC Performance and Costs for Domestic Coals, Conoco-Phillips, Gasification Technology Council, May 2005.
3. Prepared Rebuttal Testimony of Douglas H. Cortez on behalf of Excelsior Energy Inc. and MEP-I LLC, October 10, 2006, page 9.
4. The Future of Coal in a Greenhouse Gas Constrained World, MIT, http://sequestration.mit.edu/pdf/GHGT8_Herzog_Katzer.pdf
5. DOE/NETL 401/053106
6. Cost and Performance Baseline for Fossil Energy Plants, DOE/NETL-2007/1281, May 2007.

APPENDIX B
Air Quality Analysis Data

(Note: Color versions of figures in this Appendix are included in the file posted at the DOE NEPA website: http://www.eh.doe.gov/nepa/docs/deis/deis.html)

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B.1 AIR QUALITY IMPACT ASSESSMENT

B.1.1 Predictive Modeling Approach

The AERMOD air quality model was used with the PRIME building downwash algorithm (Version 04300) for the Mesaba IGCC Power Plant modeling (Excelsior, 2006). The PRIME downwash algorithm in the AERMOD model accounts for building wake effects on dispersion. Direction-specific building dimensions and related parameters are generated with EPA's BPIP PRIME program. The Minnesota Pollution Control Agency (MPCA) prefers the AERMOD modeling system and EPA has included AERMOD as an approved guideline model. No wet or dry depletion/deposition was included in the modeling. The model was set to RURAL dispersion because the terrain/land use within 3 kilometers of the site is almost completely rural. The AERMOD was used with all regulatory options, and included:

- stack-tip downwash
- elevated terrain effects
- calms processing
- missing data processing
- "upper bound" values for supersquat buildings
- no exponential decay

The MPCA has processed meteorological data suitable for input to AERMOD for many locations in Minnesota. At Excelsior's request, Mr. Dennis Becker provided on July 5, 2005, an AERMET data file that was processed specifically for the area including the IGCC Power Plant Footprint, were used for the Mesaba IGCC Power Plant modeling with AERMOD. The meteorological data are based upon Hibbing, Minnesota hourly surface weather observations for the years 1972 through 1976.

The initial air quality modeling addressed the individual point sources of the Mesaba Energy Project, Phase I and Phase II, including four combustion turbine generator (CTG) stacks, two tank vent boiler (TVB) stacks, two auxiliary boilers, and two flare stacks, as well as all fugitive PM_{10} sources (Excelsior, 2006). The modeling was conducted to determine which pollutants will have significant ambient air impacts, and to identify the significant impact area (SIA) for each pollutant. Modeling was conducted for the criteria air pollutants, SO_2, carbon monoxide (CO), NO_X, and particulate matter less than 10 microns (PM_{10}), their respective applicable averaging time, and each operating scenario (i.e., normal operations, flaring, and startup). Ozone (O_3) emissions could not be modeled or analyzed because O_3 is not emitted directly from a combustion source. The O_3 precursor, volatile organic compounds (VOCs) were below the prevention of significant deterioration (PSD) significant threshold (see Table B.1-1). Emissions of lead (Pb) were not modeled because the potential Pb emissions from the proposed project will be less than the PSD significant threshold.

Table B.1-1. Annual Criteria Air Pollutant Emission (Phase I and Phase II)

Pollutant	PSD Significance Threshold (TPY)	Plantwide Potential to Emit (TPY)
CO	100	2,539
NO_X	40	2,872
SO_2	40	1390
PM	25	503

Table B.1-1. Annual Criteria Air Pollutant Emission (Phase I and Phase II)

Pollutant	PSD Significance Threshold (TPY)	Plantwide Potential to Emit (TPY)
PM_{10}	15	493[1]/709[2]
O_3 as VOC	40	197
Pb	0.6	0.03

(1) West Range Site
(2) East Range Site: Higher emissions because water quality at the East Range Site results in higher PM_{10} emissions from the cooling tower.
Source: Excelsior, 2006a

The SIA was determined for those pollutants, which are shown to have a significant impact in ambient air at any point. The SIA was defined for each pollutant as a circle, centered on the plant site, with a radius equal to the greatest distance to a significant impact for any applicable averaging time or emission scenario. No further modeling was conducted if any pollutant did not have a significant impact. However, for pollutants with significant impact, additional modeling was carried out to evaluate compliance with PSD increments and national ambient air quality standards (NAAQS). Applicable significant impact levels (SIL), PSD increments, and NAAQS are provided in Table B.1-2.

Table B.1-2. Applicable Air Quality Standards, Increments and SILs for Phase I and Phase II

Pollutant	Averaging Time	NAAQS ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)
SO_2	1-Hour	1,300	512	25
	3-Hour	915	512	25
	24-Hour	365	91	5
	Annual	60	20	1
NO_2	Annual	100	25	1
PM_{10}	24-Hour	150	30	5
	Annual	50	17	1
CO	1-Hour	40,000	NA	2,000
	8-Hour	10,000	NA	500

Source: Excelsior, 2006a

Source input for increment modeling included all point sources associated with Phase I and Phase II and all regional increment-consuming sources included in the emissions inventory provided by the MPCA. In addition to those sources included in the increment analysis, additional nearby sources (provided by MPCA) were added to the source inventory. Regional source impacts were included (for worst-case modeled impact times and receptors), by modeling the First-Approximation Run Data (FARDATA) emission inventory appropriate to the West Range Site and East Range Site, as provided by MPCA modeling staff. For comparison to the NAAQS, a background concentration representing natural or pristine background plus one SIL was added to all model-predicted concentrations.

In addition to the modeling analyses described above, model results were applied to address other PSD requirements: the potential need for pre-construction monitoring and additional impact analyses relating to growth, soils and vegetation, visibility impairment, and deposition.

B.1.1.1 Modeled Emissions Rates

The maximum expected point source criteria pollutant emission rates from each phase of the Mesaba Energy Project for different averaging times and operating scenarios, as presented in Tables B.1-3, B.1-4, and B.1-5, were used as model input for the air modeling analyses. The stack parameters in Table B.1-6 were also used as input data. The data presented in Table B.1-3 represent emissions during normal operation of Phases I and II, which were modeled as the "base case" to define the expected air quality impacts of the Mesaba IGCC Power Plant. To address emission rates and stack gas conditions for short-term averaging times, air modeling was also carried out for applicable averaging times (24 hours and less) using the emission rates given in Tables B.1-4 and B.1-5. The emission rates represent worst-case maximum emissions for each scenario.

Other sources at the Mesaba IGCC Power Plant will consist of two emergency fire pumps and two emergency diesel generators per phase. Because these sources will operate for only short time periods, when the primary emission sources will not be in operation, they were not included in the air modeling analyses. Hours of operation for these other sources will likely be limited by permit conditions. The emissions from periodic testing of these emergency resources are negligible in comparison to the sources shown in Tables B.1-3 through B.1-6. Fugitive emissions of PM_{10} will result from the storage and handling of coal and other materials have been modeled under normal operations and are provided in Table B.1-3.

Table B.1-3. Modeling Emission Rates for Normal Operation (1) – Each Phase

Source	Averaging Time	SO_2		CO		PM_{10} (2)		NO_x	
		lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Combustion Turbines Generator (3)	1-Hour	183	23.06	95	11.97				
	3-Hour	152	19.15						
	8-Hour			95	11.97				
	24-Hour	114	14.36			25	3.15		
	Annual	76	9.58			25	3.15	158	19.91
Tank Vent Boiler	1-Hour	8.4	1.06	5.9	0.74				
	3-Hour	7.5	0.94						
	8-Hour			5.9	0.74				
	24-Hour	6.4	0.81			0.7	0.09		
	Annual	3.6	0.45			0.2	0.03	6	0.76
Auxiliary Boiler	1-Hour	0.37	0.05	9.6	1.21				
	3-Hour	0.37	0.05						
	8-Hour			9.6	1.21				
	24-Hour	0.37	0.05			0.65	0.08		
	Annual	0.09	0.01			0.16	0.02	1.16	0.15

Table B.1-3. Modeling Emission Rates for Normal Operation [(1)] – Each Phase

Source	Averaging Time	SO_2		CO		PM_{10} [(2)]		NO_x	
		lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Flare	1-Hour	0.01	0.001	1.1	0.14				
	3-Hour	0.01	0.001						
	8-Hour			1.1	0.14				
	24-Hour	0.01	0.001			0.02	0.002		
	Annual	2.8	0.35			0.38	0.05	3.1	0.39

(1)Short-term emissions represent normal plant operation on syngas fuel; annual emissions are worst-case annual operation including flaring, gasifier outages, etc.
(2)PM_{10} emissions include filterable and condensable portions.
(3)There will be two CTGs per phase. Modeling emission rates should be doubled.
Source: Excelsior, 2006a

Table B.1-4. Modeling Emission Rates for Worst-Case Flaring Scenario – Each Phase

Source	Averaging Time	SO_2		CO		PM_{10} [(1)]		NO_x	
		lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Flare	1-Hour	1,040	131.04	5,680	715.67				
	3-Hour	734	92.48						
	8-Hour			5,345	637.46				
	24-Hour	183	23.06			14.1	1.78		

(1)PM_{10} emissions include filterable and condensable portions
Source: Excelsior, 2006a

Table B.1-5. Modeling Emission Rates for Worst-Case Start-up Operating Scenario – Each Phase

Source	Averaging Time	SO_2		CO		PM_{10} [(1)]		NO_x	
		lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Combustion Turbines Generators [(2)]	1-Hour	183	23.06	2,740	345.23				
	3-Hour	152	19.15						
	8-Hour			541	68.21				
	24-Hour	114	14.36			25	3.15		
Tank Vent Boiler	1-Hour	8.4	1.06	5.9	0.74				
	3-Hour	7.5	0.94						
	8-Hour			5.9	0.74				
	24-Hour	6.4	0.81			0.7	0.09		
Auxiliary Boiler	24-Hour	0.37	0.05	9.6	1.21	0.65	0.08		
Flare	1-Hour	0.11	0.01	22	2.77				
	3-Hour	0.11	0.01						

Table B.1-5. Modeling Emission Rates for Worst-Case Start-up Operating Scenario – Each Phase

Source	Averaging Time	SO_2		CO		PM_{10} (1)		NO_x	
		lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
	8-Hour			22	2.77				
	24-Hour	0.11	0.01			0.32	0.04		

(1) PM_{10} emissions include filterable and condensable portions
(2) There will be two CTGs per phase. Modeling emission rates should be doubled.
All flare emissions and Combustion Turbine CO emissions represent start-up operation. These rates exceed Normal Operation values. All other emission rates are worst-case Normal Operation values, which are higher than during startup.
Source: Excelsior, 2006a

Table B.1-6. Modeling Stack Parameters

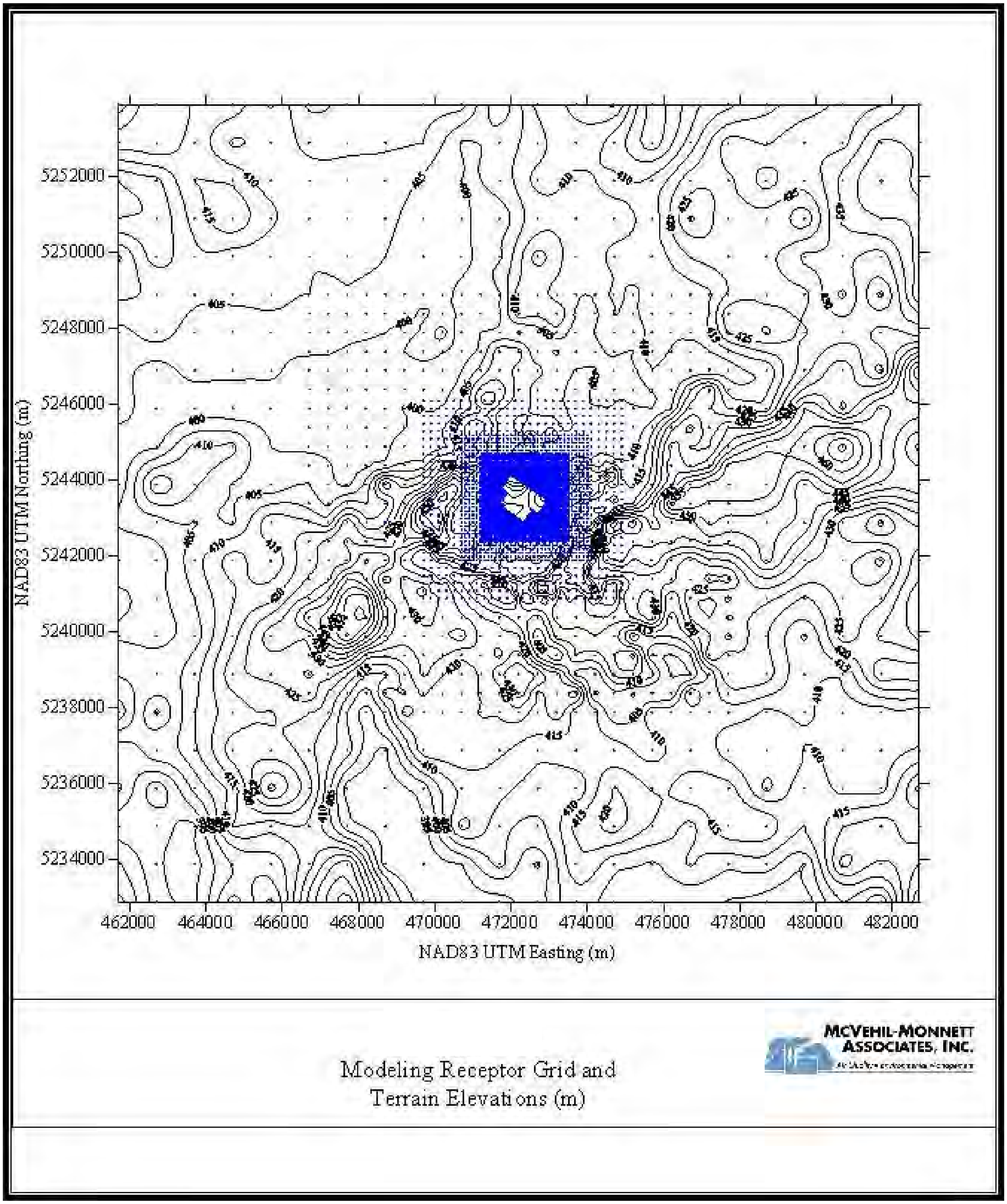
Source/Scenario	Averaging Time	Stack Height (m)	Stack Diameter (m)	Gas Temperature (K)	Velocity (m/s)
Combustion Turbines Generator	Normal Operation	45.72	6.1	394.3	20.08
	Startup	45.72	6.1	366.5	11.64
Tank Vent Boiler	Short-term	64.01	1.83	579.8	8.46
	Annual	64.01	1.83	579.8	1.95
	Start-up	64.01	1.83	579.8	5.21
Auxiliary Boiler		12.19	1.52	422.1	9.7
Flare (1)	Normal Operation	56.39	0.25	1,273	20
	Start-up	56.39	1.11	1,273	20
	Flaring: 1-hr	56.39	10.72	1,273	20
	Flaring: 3-hrs	56.39	10.4	1,273	20
	Flaring: 8-hrs	56.39	10.4	1,273	20
	Flaring: 24-hrs	56.39	7.36	1,273	20
	Flaring: Annual	56.39	0.25	1,273	20

(1) Flare parameters determined by SCREEN 3 methodology based on total heat release.
(2) There will be two CTGs per phase. Modeling emission rates should be doubled.
Source: Excelsior, 2006a

As part of the NAAQS analysis, a Good Engineering Practice (GEP) Height analysis was conducted. The evaluation demonstrated that all the stacks are less than GEP; therefore they were modeled at their actual heights.

B.1.1.2 Receptor Grid

The receptor grid that was modeled for the Mesaba IGCC Power Plant (see Figure B.1-1) consists of seven nested Cartesian grids covering a total 441-square-kilometer (170-square-mile) area surrounding the plant site. Receptors are located along the Project fence line with a spacing of 10 meters. The inner Cartesian grid, with a spacing of 25 meters, covers an approximate 2.5-square-kilometer area surrounding the plant site.



Note: Terrain elevations were determined from USGS 7.5 minute DEM data and were processed with AERMAP.

Source: Excelsior, 2006

Figure B.1-1. Modeling Receptor Grid and Terrain Elevations (m)

Successive grids have gradually increasing spacing at greater distances from the fence line, as are provided in Table B.1-7.

Table B.1-7. Mesaba IGCC Power Plant Receptor Grids

Grid Level	Level Description	Spacing
1st	IGCC Power Plant fence line	10-meter
2nd	2.4 km area around site	25-meter
3rd	0.25-km wide border	50-meter
4th	0.5-km wide border	100-meter
5th	1.0-km border	200-meter
6th	3.0-km border	500-meter
7th	5.0-km wide border	1,000-meter

Source: Excelsior, 2006

B.1.1.3 Regional Source Input and Background Concentrations

To account for impacts of distant and regional sources, the FARDATA approach developed by MPCA was applied. With this approach, a distant/regional modeling inventory FARDATA was included in AERMOD EVENT model runs for highest impact cases. The FARDATA provided an approximation of the date-/time-specific impacts of all regional sources, which were added to the impacts from the Mesaba Energy Project and nearby sources. Regional source inventories applicable to modeling for the Mesaba IGCC Power Plant prospective project sites were included in all PSD increment and NAAQS modeling analyses. Data on increment-consuming (or expanding) sources were provided (by Chris Nelson of MPCA on 8/17/05) from the following “nearby”/regional major sources (Excelsior, 2006a):

- Blandin Paper Company/Rapids Energy Center
- Potlatch – Grand Rapids
- Minnesota Power – Clay Boswell
- Keewatin Taconite

Of note, the major emission reduction plans recently announced by Minnesota Power for its Syl Laskin, Clay Boswell, and Taconite Harbor power generation facilities were not included in the modeling analysis; thereby introducing a further degree of conservatism into the resulting emission profiles.

Increment consuming emissions were included in the input file as positive numbers and increment-expanding emissions (decreases since the baseline date) were included as negative numbers. Total modeled emissions of regional increment sources are listed in Table B.1-8.

Table B.1-8. Regional Sources Modeled Emissions for Mesaba Energy Project PSD Increment Modeling

Source	SO_2		PM_{10}		NO_x	
	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
Blandin Paper Company	-178.68	-22.513	-0.13	-0.016	-116.91	-14.73
	595.66	75.052	53.84	6.784	117.72	14.832
Minnesota Power – Clay Boswell	6,130.89	772.48	510.9	64.373		
Potlatch – Grand Rapids			63.4	7.988	95.67	12.054

Source: Excelsior, 2006a

For comparison to PSD increments, one SIL is added to final model-predicted concentrations, in accordance with MPCA guidance. For the NAAQS analyses, one SIL plus a “natural background” concentration was added to total model-predicted concentrations (Excelsior, 2006a). The natural background concentrations in Table B.1-9 were utilized.

Table B.1-9. Natural Background Concentration Modeled

Pollutant	Average Time	Concentration ($\mu g/m^3$)
SO_2	Short-term	10
	Annual	2
NO_2	Annual	5
PM_{10}	24-Hour	20
	Annual	10

Source: Excelsior 2006

B.1.2 Class I Area-Related Modeling Approach

An air quality modeling analysis was conducted to estimate impacts of the Phase I and Phase II Mesaba IGCC Power Plant on air quality in Class I areas. The Class I air quality related value (AQRV) analyses addressed PSD Class I increments for SO_2, PM_{10}, and NO_X, sulfur (S) and nitrogen (N) deposition, and visibility impairment (regional haze). The dispersion modeling analysis used standard EPA long-range transport modeling methodologies, and followed guidance as presented in EPA’s Guideline on Air Quality Models, the IWAQM Phase 2 report, and the FLAG Phase I report (Excelsior, 2006b). The analyses also incorporated suggestions and guidance received in pre-application meetings with the U.S. Forest Service and the National Park Service (Excelsior, 2006b). The Class I analyses addressed impacts to the Boundary Waters Canoe Area Wilderness (BWCAW), Voyageurs National Park (VNP), and the Rainbow Lakes Wilderness (RLW). The distance from the Project to the closest point in each of these Class I areas is approximately 61 miles (98 kilometers) for the BWCAW, 75 miles (121 kilometers) for VNP, and 117 miles (188 kilometers) for RLW. The next closest Class I area, Isle Royale National Park, is more than 300 kilometers from the station, beyond the distance where long-range transport modeling has been shown to provide realistic impact predictions.

The CALPUFF air quality model was used for all Class I area analyses. CALPUFF is the approved EPA long-range transport model referenced in the Guideline on Air Quality Models and consists of the following three components:

- The CALMET model for processing of meteorological data;
- The CALPUFF model for the transport and dispersion calculations; and
- The CALPOST model for analysis and post-processing of model results.

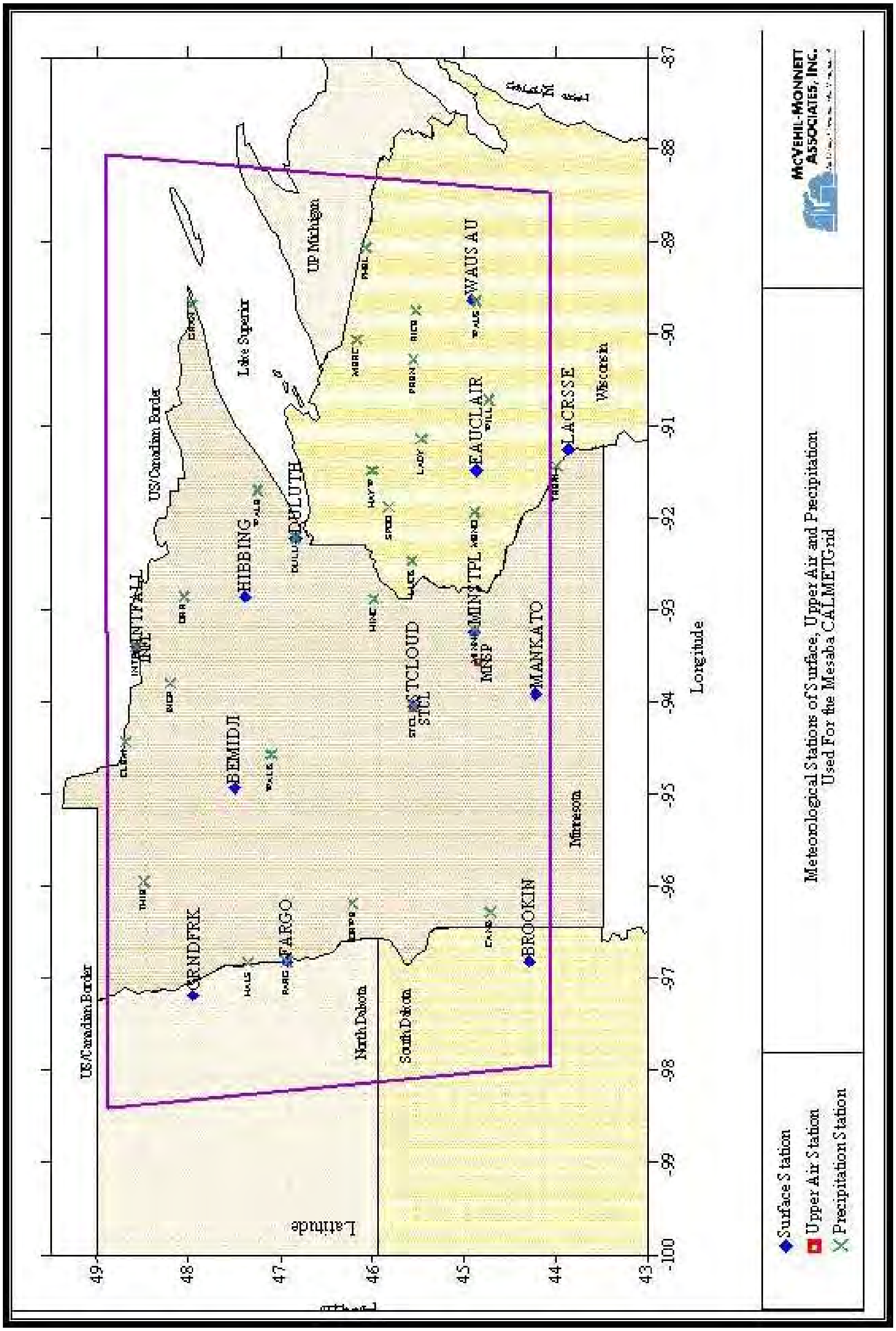
Input options and data utilized in the models generally corresponded to default or recommended values; however for the Mesaba Energy Project, a list of representative, project specific input parameters, were used (see Table B.1-10).

Table B.1-10. CALMET/CALPUFF Non-Default Input Parameters

Input Group	Parameter	Mesaba Selection	Explanation
CALMET			
5	IKINE	1	Kinemateic effects option used to better account for terrain effects
	RMAX 1	30 km	No default values
	RMAX 2	40 km	No default values
	RMAX 3	40 km	No default values
	TERRAD	15 km	No default values
	R1	5	No default values
	R2	15	No default values
CALPUFF			
3	Species Modeled	SO_2, SO_4, NO_X, EC, SOA, $PM_{2.5}$, HNO_3, NO_3	Modeled all species emitted by Mesaba sources, and others (HNO_3, NO_3) involved in plume chemistry
4	LSAMP	F	No gridded receptors (sampling grid) used
8	Part. Size	Mean = 0.48	All particulate species assumed $PM_{2.5}$
		Std. Dev. = 2	
11	MOZ	0	Constant ozone background
	$BCK0_3$	40.0 ppb	Representation background ozone concentration
	$BCKNH_3$	1.0 ppb	Conservative background ammonia concentration (0.5 ppb recommended for forested lands)
12	NSPLIT	3	Puff-splitting used (default)

Source: Excelsior, 2006

The CALPUFF modeling analysis used meteorological data for the years 1990, 1992, and 1996. Additional surface, upper air, and precipitation data were used in CALMET to refine the meteorological fields. Hourly surface data from 13 stations were used along with precipitation data from 28 stations. Upper air data from two stations were used: St. Cloud, Minnesota and International Falls, Minnesota for 1990 and 1992, and Minneapolis, Minnesota and International Falls, Minnesota for 1996. Figure B.1-2 shows the locations of meteorological stations used for the CALMET processing.



Source: Excelsior, 2006

Figure B.1.2. Meteorological Stations of Surface, Upper Air, and Precipitation Used for CALMET Modeling of Mesaba Energy Project

B.1.2.1 Class I Areas Modeling Domain

The CALMET/CALPUFF modeling domain was a 700- by 500-kilometer area approximately centered on the Mesaba IGCC Power Plant proposed project sites site, with a 4-kilometer grid spacing. The coordinate system was Lambert Conformal. Receptor locations within each of the Class I areas were obtained from the National Park Service. Figure B.1-3 shows the modeling domain, terrain elevation contours, and the modeling receptors.

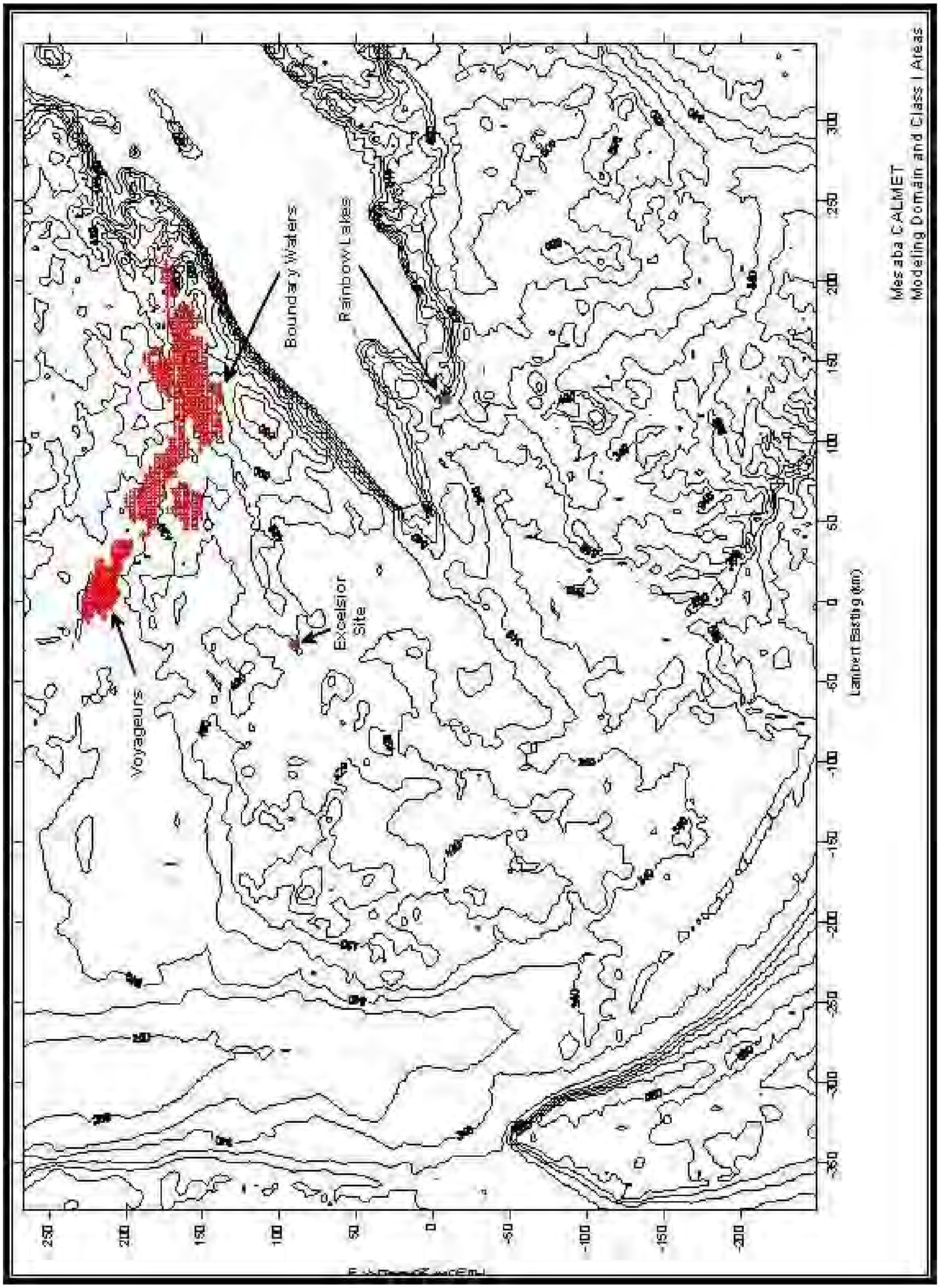
B.1.2.2 Modeled Emission Rates

Pollutant emission rates (Table B.1-11) represent the maximum expected emissions and the appropriate averaging times from the Mesaba IGCC Power Plant for Phase I and Phase II and are used for CALPUFF modeling.

Table B.1-11. Modeling Emission Rates For Phase I and Phase II CALPUFF Modeling

Parameter	Averaging Time	Combustion Turbines (each of four)	Tank Vent Boilers (each of two)
Stack height (m)		45.72	64.01
Stack diameter (m)		6.1	1.83
Temp (K)		394.3	579.8
Velocity (m/s)	Short-term	20.1	8.46
	Annual	20.1	1.95
SO_2	3-hr (g/s)	19.15	0.94
	24-hr	14.36	0.81
	Annual	9.58	0.45
NO_x	3-hr (g/s)	19.66	2.46
	24-hr	19.66	2.46
	Annual	19.91	0.76
Elemental Carbon (g/s)	All time periods	0.787	0
Sulfate (g/s)	All time periods	0.945	0
Organic aerosol (g/s)	All time periods	1.397	0
$PM_{2.5}$ (g/s)	All time periods	0	0.088
PM_{10} (g/s)	All time periods	0	0

Source: Excelsior, 2006



Source: Application to Minnesota Pollution Control Agency for a Part 70 Permit to Construct, URS 2006

Figure B.1-3. CALMET Modeling Domain and Class I Areas Included in Analysis

APPENDIX C
Air Emission Risk Analysis Data

(Note: Color versions of figures in this Appendix are included in the file posted at the DOE NEPA website: http://www.eh.doe.gov/nepa/docs/deis/deis.html)

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Air Emission Risk Analysis

Excelsior Energy Inc.
Mesaba Energy Project

Taconite, Itasca County, Minnesota

SEH No. A-EXENR0502.03

June 2006

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Air Emission Risk Analysis

Excelsior Energy Inc.
Mesaba Energy Project
Taconite, Itasca County, Minnesota

Prepared for:
Excelsior Energy Inc.

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Signature Page

Excelsior Energy Inc.
Mesaba Energy Project
Air Emission Risk Analysis
June 2006

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(Signature) (Date)

Thomas A. Henning, PE, Project Engineer

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(Signature) (Date)

Gloria Chojnacki, Senior Scientist

List of Abbreviations/Terms

AERA	Air Emissions Risk Analysis
AERMOD	a steady-state plume air dispersion model
AP-42	Compilation of Air Pollutant Emission Factors
benzo(a)phenanthrene	chrysene
bis(2-ethylhexyl)phthalate	DEHP
bromoethane	methyl bromide
butanone, 2-	methyl ethyl ketone
CD-ROM	compact disc
chloroethane	ethyl chloride
chloromethane	methyl chloride
chrysene	benzo(a)phenanthrene
cm/yr	centimeters per year
COPC	contaminants of potential concern
CTG	combustion turbine generator
DEHP	bis(2-ethylhexyl)phthalate
EC	exposure concentration
ELCR	excess lifetime cancer risk
dibromoethane	ethylene dibromide
dichloroethane, 1,2-	ethylene dichloride
dichloromethane	methylene chloride
ethyl chloride	chloroethane
ethylene dibromide	dibromoethane
ethylene dichloride	dichloroethane 1,2-
Excelsior	Excelsior Energy Inc.
ft	feet
g/s	grams per second
g/yr	grams per year
Hg^0	elemental mercury
HI	hazard index
HHRAP	Human Health Risk Assessment Protocol
HRV	health risk value
HVTL	high voltage transmission line
hydrofluoric acid	hydrogen fluoride
hydrogen fluoride	hydrofluoric acid
HQ	hazard quotient
I	inhalation exposure concentration
IGCC	Integrated Coal Gasification Combined Cycle
IHB	inhalation health benchmarks
IRAP	Industrial Risk Assessment Program – Human Health
lb/yr	pounds per year
kg	kilogram
kg/day	kilogram per day
km	kilometer

m	meters
methyl bromide	bromoethane
methyl chloride	chloromethane
methyl chloroform	trichloroethane, 1,1,1-
methyl ethyl ketone	butanone, 2-
methylene chloride	dichloromethane
MDNR	Minnesota Department of Natural Resources
mg/kg-day	milligram per kilogram per day
mi	miles
MDH	Minnesota Department of Health
MN	Minnesota
MNDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
m/s	meters per second
MWe	megawatts of electricity
m/yr	meters per year
m^3/yr	cubic meters per year
NAAQS	National Ambient Air Quality Standards
NE	northeast
ng/m^2-yr	nanograms per square meter per year
PBT	persistent, bioaccumulative, and toxic chemical
perchloroethylene	tetrachloroethylene
pg/m^3	picograms per cubic meter
ppm	parts per million
Project	Mesaba Energy Project
Q	COPC emission rate
Q/CHI	Q (Emission Rate)/Critical Health Index
RASS	Risk Assessment Screening Spreadsheet
T	COPC inhalation health benchmark (IHB)
tetrachloroethylene	perchloroethylene
trichloroethane, 1,1,1-	methyl chloroform
TVB	tank vent boiler
µg/m^2-yr	micrograms per square meter per year
µg/m^3	micrograms per cubic meter
U of M	University of Minnesota
UR	chemical specific unit risk
U.S. EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator mapping coordinates
yr	year
10^{-5}	1 in 100,000
10^{-6}	1 in 1,000,000 or one millionth

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Air Emission Risk Analysis

Excelsior Energy Inc.
Mesaba Energy Project

Taconite, Itasca County, Minnesota

Prepared for Excelsior Energy Inc.

1.0 Introduction

Excelsior Energy Inc. (Excelsior), an independent energy development company based in Minnetonka, MN, is proposing to build, own and operate (potentially under agreement with an operating company) the Mesaba Energy Project (the "Project"), an Integrated Coal Gasification Combined Cycle (IGCC) power plant located on Minnesota's Iron Range. The Project consists of a proposed two-phase generating station, each phase of which would nominally generate 600 megawatts of electricity (MWe) for export to the electrical grid. The commercial in-service date for Phase I is scheduled for 2011; Phase II is scheduled for 2013.

Figure 1, "Site Location Map" is a general location map showing the area within which Excelsior has focused its search for potential Project sites. The Project search area is located within a larger region in Northern Minnesota identified as the Taconite Assistance Area. Figure 2, "Facility Plan - Aerial View" provides a local aerial view of this site, the Project's current site layout plan and the infrastructure required to support Project operation.

2.0 Process and Sources Description

Excelsior's corporate vision is to bring to Minnesota, via the application of advanced technologies, energy, innovation and economic development. Excelsior has chosen IGCC as the vehicle to achieve this mission. The Project would use ConocoPhillips' E-Gas™ Technology for solid feedstock gasification. A full description of the facility and emission units is included in the Mesaba Energy Project Prevention of Significant Deterioration Permit to Construct Application dated June 2006 (Excelsior, 2006).

3.0 AERA Methodology

An Air Emissions Risk Analysis (AERA) is conducted on the Mesaba Energy Project to identify the sources or groups of sources, chemicals and associated pathways that may pose an unacceptable risk to the public as a result of air emissions. In general, the term risk refers to the excess risk of developing cancer and the potential for non-cancer health effects as the result of exposure to air emissions. The AERA, as developed by the Minnesota Pollution Control Agency (MPCA), includes both a quantitative and qualitative evaluation of emissions and potential pathways. The AERA is conducted in general accordance with the procedures contained in the MPCA Air Emissions Risk Analysis (AERA) Guide viewed on-line (MPCAa).

Because emission source stacks are less than 100 meters in height, AERA evaluation was completed for the area within a three-kilometer radius of the proposed facility emission points (MPCAa.) The three-kilometer buffer radius for both Phase I and Phase II can be seen on Figure 2.

MPCA AERA forms are included in Appendix A, "AERA Forms."

3.1 Quantitative Evaluation

The quantitative analysis is conducted using several methods as follows.

3.1.1 RASS and Q/CHI

Risk Assessment Screening Spreadsheets (RASS) are risk assessment screening tools developed by MPCA which are sometimes used as a preliminary evaluation of risk for a proposed project. With the RASS, dispersion factors found on "look-up" tables are used to predict pollutant concentrations (i.e. off-site impacts) at specific locations. Excelsior has elected to conduct detailed risk evaluations that use more sophisticated dispersion modeling techniques to better refine the evaluations. Because the more detailed risk evaluations are completed, the RASS screening evaluation is not necessary and therefore not included in this AERA. However, toxicity values and other risk information included in the RASS are used in the detailed evaluations (see Section 4.0).

One method Excelsior uses to evaluating risk is called the Q/CHI method (Q = emission rate and CHI = Critical Health Index). With this method, risk is estimated at each emission source stack by computing a Q/CHI quotient for the chemicals of concern. A Q/CHI quotient is arrived at by dividing the chemical emission rates by the individual chemical inhalation health benchmarks (IHBs). The combined Q/CHI quotients are then evaluated at specific receptor locations by inputting the quotients into a refined dispersion model. The Q/CHI approach calculates risk while correlating both time and space for each location. The Q/CHI method is also used to predict both acute and sub-chronic risks associated with the facility.

With the Q/CHI method, risk due to the inhalation pathway is estimated for chemicals causing carcinogenic and non-carcinogenic effects. For chemicals contributing to non-carcinogenic effects, risk is evaluated for acute (1-hour emission average) and sub-chronic (1-month average) time periods. Risks for chemicals contributing to carcinogenic effects are based on the probability that an individual will develop cancer over a lifetime.

Risk at a specific location is additive for all sources. Chemicals having cancer endpoints are considered to have an acceptable risk level if an individual chemical produces a cancer risk less than one in one million (10^{-6}) and an individual chemical, having non-cancer endpoints, produces a hazard index less than 0.1. Also, if the sum of the individual chemical cancer risks is less than one in 100,000 (10^{-5}) and the sum of the individual non-cancer hazard quotients (hazard index) is less than 1, risk is also considered at an acceptable level for a facility.

3.1.2 IRAP

A third method using the Industrial Risk Assessment Program – Health (IRAP) View model is used to predict chronic risks. IRAP was developed by Lakes Environmental Software, Inc. to comply with the requirements of the *U.S. EPA Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (HHRAP) guidance document (U.S. EPA, 2005).

This complex protocol was developed to estimate human health risk at hazardous waste combustion facilities from multi-pathway exposure to chemicals released to the ambient air. With IRAP, risk is predicted via direct (inhalation) and indirect (ingestion of or contact with soil, plants, fruits, vegetables, beef and milk, chicken and eggs, and fish) pathways for each scenario (resident adult, resident child, farmer adult, etc.) specified. Worst-case annual emission rates are used in the IRAP evaluation.

3.1.3 Fish Consumption

Risk associated with ingestion of fish tissue potentially contaminated with mercury is evaluated using the MPCA's *Mercury Risk Estimation Method for the Fish Consumption Pathway (Local Impacts Assessment),* (MPCA, 2006). This method assumes that there is a linear relationship in a given lake between the atmospheric mercury deposition rate and fish tissue methylmercury concentrations. The relationship is used to estimate the non-cancer oral hazard quotients due to fish tissue ingestion based on increases in mercury deposition as a result of facility emissions.

The method combines current fish tissue mercury concentrations with potential increases in atmospheric deposition to arrive at an estimate of future methylmercury tissue concentrations. Risk associated with ingestion of fish tissue potentially affected by other contaminants of concern associated with the facility is evaluated using the IRAP model.

3.2 Qualitative Evaluation

Because many issues that could potentially impact health cannot be readily quantified, a qualitative analysis is conducted that provides supplementary information to the quantitative assessment. Information that may be included in the qualitative assessment include among others: land use and receptor information; sensitive populations; persistent, bioaccumulative, and toxic chemicals (PBTs); farmers, resident and fisher populations; emissions related to shutdowns or breakdowns; internal combustion engines; and chemicals emitted but not assessed quantitatively. At times, chemicals may not have readily available IHBs, may have a closely related chemical toxicity value as a surrogate, or a PBT may not have multimedia factors developed. These issues may be discussed in the qualitative evaluation.

4.0 Quantitative Analysis

4.1 Chemicals of Potential Concern

Chemicals of potential concern (COPC) are chemicals that could be released from a facility, regardless of their toxicity or emission rate. The COPCs included in the AERA are the HAPs listed in the Mesaba Energy Project Prevention of Significant Deterioration Permit Application. Emission rates for these compounds are estimated using the following sources (listed in order of preference):

- Results of regulatory test programs at the existing Wabash River, Indiana, E-Gas IGCC facility - adjusted, if appropriate, for the expected worst-case feeds to the Mesaba Energy Project
- Equipment supplier information
- Published emission factors and reports applicable to IGCC facilities
- Engineering calculations and judgment
- U.S. EPA emission factors (AP-42)

COPC emissions at the IGCC Power Station will be reduced by the inherently low polluting IGCC technology and many of the same process features that control criteria emissions. A large portion of the heavy metals and other undesirable constituents of the feed will be immobilized in the non-hazardous, vitreous slag by-product and prevented from causing adverse environmental effects. Gaseous and particle-bound COPCs that may be contained in the raw syngas exiting the gasifiers will be totally or partially removed in the syngas particulate matter removal system, water scrubber and AGR systems described above. In addition, the mercury removal carbon absorption beds will ensure that mercury emissions from the IGCC Power Station will be less than 10 percent of the mercury present in the feedstock, as received.

Dioxin and furan emissions are expected to be negligible from the plant. Dioxins and furans are formed as a by-product of combustion when hydrocarbons are burned in the presence of chlorine. Dioxin and furan formation is an issue at medical waste and municipal waste incinerators where chlorine from plastics or other sources are burned with organic wastes. We expect the chlorine concentration in the product syngas to be low. Data from the Wabash River plant shows chorine concentrations to be below test detection limits.

Emissions of total chromium are estimated using emission data available from the Wabash River plant. However, emission data is not available to show the fraction of total chromium in the hexavalent state. Table 1.1-18 from AP-42 Section 1.1 (Bituminous and Subbituminous Coal Combustion) shows a hexavalent chromium emission factor being 30 percent of the total chromium emission factor. We use this factor, 30 percent, to estimate the hexavalent fraction of total chromium from the Mesaba Energy Project.

Table 1, “Chemicals Evaluated in the AERA”þresents a summary of estimated COPC emissions for the Phase I and Phase II IGCC Power Station. Additional detail regarding the sources and calculation methods used to estimate facility emissions are found in the Mesaba Energy Project Prevention of Significant Deterioration Permit to Construct Application dated June 2006 (Excelsior, 2006). (Note: the emissions presented in Table 1 may differ slightly from those presented in the current Prevention of Significant Deterioration Permit to Construct Application. The emissions in Table 1 were used in the draft Permit Application and AERA submitted to MPCA in April 2006. Some comments on the AERA by the MPCA have been made, but the AERA review process has not been completed. Since that time, adjustments have been made in the Permit Application, including emissions of chemicals contained in Table 1. These changes will be included in future revisions to the AERA after technical comments have been received.)

4.2 Exposure Assessment

The exposure assessment quantifies the intake and uptake by the body of COPCs by several exposure pathways. In the Q/CHI Method, potential risk via the inhalation pathway only is evaluated. Health risks are assessed for short-term (acute) and mid-term (sub-chronic) exposures.

After importing dispersion model files specific for the facility, IRAP indicates the grid locations having the highest modeled unitized concentration or deposition rates for user specified areas of concern. Exposure scenarios are then selected at the maximum grid locations. Exposure scenarios available include adult and child farmer, adult and child resident, and adult and child fisher. Risk for various exposure pathways is calculated by IRAP for each exposure scenario selected at a grid location. Table 2, "IRAP Receptors and Scenarios Evaluated" identifies the maximum grid receptors for this facility and the pathways chosen for risk estimation using IRAP. Table 3, "IRAP Exposure Pathways Evaluated" identifies the exposure pathways evaluated as recommended by HHRAP (U.S. EPA, 2005). Figure 3 "IRAP Receptor Locations" indicates the locations of the receptors evaluated.

4.3 Toxicity Assessment

Inhalation toxicity values are used to calculate potential facility-specific inhalation risks from COPCs emitted to the air. Toxicity values compiled by MPCA and the Minnesota Department of Health (MDH) from readily available and acceptable sources and included in the RASS are used as IHBs for the Q/CHI Method. The various sources of the IHB are referenced in the RASS (MPCAa, MPCAb). U.S. EPA HHRAP default toxicity information included in IRAP is used for the IRAP evaluation method (U.S. EPA, 2005).

For risk assessment purposes, COPCs fall into either or both of two categories: those having the potential for producing carcinogenic (cancer) effects and those that may produce non-carcinogenic effects. Some chemicals are capable of producing both responses.

The dose-response assessment for COPCs producing carcinogenic effects assumes that there is no toxicity threshold dose. In other words, there is no dose of carcinogenic compounds that is not associated with risk. The IHBs found in RASS and IRAP are specified so the additional lifetime cancer risk to an individual exposed for a lifetime to the COPC is expected to be equal to or less than 10^{-5} of developing cancer (MPCAa).

The dose-response assessment for COPCs producing non-carcinogenic effects assumes that an exposure level exists below which no adverse health effects would be expected. This threshold dose, in theory, is protective of all receptors that may be exposed at that level, including sensitive populations. The IHBs found in RASS and IRAP for COPC producing non-carcinogenic effects are expected to be below this threshold dose.

4.4 Risk Characterization

Risk characterization summarizes the exposure and toxicity assessment outputs to describe the risks from COPCs emitted to the air from the facility. This includes assessment of cancer risk in excess of that expected over a lifetime of exposure and acute, sub-chronic and chronic non-cancer risk.

Based on MPCA guidance, if the cancer risk for each COPC evaluated is less than or equal to one in one million (10^{-6}), or the individual COPC non-cancer hazard quotient is less than 0.1 the risk is considered acceptable. In addition, if the sum of the individual COPC cancer risks is less than 10^{-5} and the sum of the individual non-cancer hazard quotients (hazard index) is less than 1, quantitative risk associated with the facility is considered acceptable. However, a qualitative analysis must still be conducted.

Health risk calculation for the inhalation of COPCs producing carcinogenic effects is as follows:

$$ELCR = (EC)(UR)$$

where:
ELCR = Excess Lifetime Cancer Risk
EC = Exposure concentration in the air ($\mu g/m^3$)
UR = Chemical Specific unit risk, $(\mu g/m^3)^{-1}$

Health risk for the inhalation of COPCs producing non-carcinogenic effects is evaluated by comparing an exposure concentration in the air with the IHB, also referred to as the hazard quotient, as follows:

$$HQ = \frac{I}{IHB}$$

where:
HQ = Hazard Quotient
I = exposure concentration ($\mu g/m^3$)
IHB = Inhalation Health Benchmark ($\mu g/m^3$)

To express the overall potential for non-carcinogenic effects posed by exposure to more than one chemical or to more than one pathway, the U.S. EPA has developed an approach which assumes that simultaneous exposures to multiple chemicals could result in an adverse health effect assuming the same mechanism of action, or target organ. This approach is called the hazard index and is expressed as follows:

$$HI = \sum_{i=1}^{n} HQ_i$$

where:
HI = Hazard Index
HQ_i = Hazard quotient for the *i*th chemical
N = number of chemical HQs

4.5 Quantitative Results – Q/CHI

The Q/CHI approach to calculating risk from air emission contaminants estimates risk at each stack by computing chemical-specific air toxic Q/CHI quotients for COPCs having both carcinogenic and non-carcinogenic endpoints. Q/CHI quotients are calculated as follows:

$$Q/CHI\ Quotient = \frac{Q}{T}$$

where:
Q = COPC emission rate (grams/second)
T = corresponding COPC IHB ($\mu g/m^3$)

Toxicity values or IHBs, as supplied by MPCA in the RASS spreadsheet, are used in this process (MPCAb). A combined Q/CHI quotient of COPCs for each emission point is then calculated for acute (hourly) and sub-chronic (30-day) non-cancer endpoints.

4.5.1 Dispersion Modeling

The Q/CHI quotients are then evaluated at multiple receptors on a grid using AERMOD, a refined dispersion model. AERMOD input files, receptor grids, meteorological data and assumptions are the same as those used for the ambient air quality modeling conducted for the

Mesaba Energy Project Prevention of Significant Deterioration Permit to Construct Application dated June 2006 (Excelsior, 2006). The acute and sub-chronic Q/CHI quotients are modeled for five years of meteorological data (1972, 1973, 1974, 1975, and 1976). The result is a prediction of combined hazard indices, correlated for time and space, at each receptor location.

Supporting documentation for the Q/CHI dispersion model input and output is included in Appendix B, "Electronic Submittals."

4.5.2 Air Toxics Screen

The acute and sub-chronic health risks attributable to facility emissions as calculated by the Q/CHI method indicate the following:

1. The maximum-modeled inhalation acute non-cancer hazard index is 0.52.
2. The maximum-modeled sub-chronic non-cancer index is 0.13.

Both modeled Q/CHI hazard indices are below the MPCA acceptable total hazard index of 1.0.

The following chemicals do not have IHB values in RASS and are therefore also not evaluated by the Q/CHI method: acetophenone, biphenyl, cobalt, dimethyl sulfate, methyl hydrazine, and proprionaldehyde. Risk associated with acetophenone is evaluated by the IRAP method.

A summary of the Q/CHI modeled air toxics acute and sub-chronic pollutant screen is found on Table 5, "Q/CHI COPC Screen Results." The maximum-modeled Q/CHI acute values occur south and east of the proposed facility. The maximum modeled Q/CHI sub-chronic values occur north of the proposed facility. An iso-concentration plot of Q/CHI modeled values indicates a bi-modal pattern consistent with the wind rose pattern for the meteorological time period used. Q/CHI impacts are shown on Figure 4, "Acute Q/CHI Impacts" and Figure 5, "Sub-chronic Q/CHI Impacts."

4.6 Quantitative Results – IRAP

The IRAP method of estimating risk associated with the proposed facility is conducted at six representative areas of concern. The areas of concern are chosen to represent rural residents, small or hobby farm residents, a working farm, lake area residents and fishers. Eleven receptor locations are evaluated within the three-kilometer buffer radius from the proposed facility sources. The receptors are placed at the grid nodes within each area of concern having the highest contribution from all the sources combined for each air parameter. Receptor locations can be seen on Figure 3.

4.6.1 Dispersion Modeling

Air dispersion modeling of the site using a unit emission rate of 1 g/sec is conducted using AERMOD. AERMOD input files, receptor grids, meteorological data and assumptions are the same as those used for the ambient air quality modeling analysis, with one exception. For the IRAP risk assessment dispersion modeling, deposition is included. Actual discrete emission rates for each pollutant are entered into the IRAP model. For the vapor phase, wet vapor deposition and wet depletion are specified. The particulate phase modeling included wet and dry-vapor deposition, and wet and dry-vapor depletion. It is assumed that all particulate matter is less than 2.5 microns in diameter. Modeling is conducted using five years of meteorological data (1972, 1973, 1974, 1975, and 1976). The maximum of all the air parameter values for the grid nodes is specified in the IRAP model.

Dispersion model input and plot files are imported into IRAP and all sources, as described in Section 2.0, are included to complete the IRAP risk assessment.

Supporting documentation for dispersion modeling used for the IRAP method is included in Appendix B.

4.6.2 IRAP Set-up

Default assumptions for site parameters and exposure scenario assumptions used in IRAP are those recommended in the U.S. EPA HHRAP guidance document (U.S. EPA, 2005). Default assumptions used are summarized on Table 6, “IRAP Site Parameter Assumptions” and Table 7, “IRAP Exposure Scenario Assumptions.”

Site specific assumptions used for all receptors in the IRAP evaluation include the following:

- Big Diamond Lake chosen as the water body evaluated
- Big Diamond Lake watershed chosen as the watershed evaluated. The Big Diamond Lake watershed boundary is determined using the Metadata for Minnesota Watershed Boundaries database available from the Minnesota Department of Natural Resources website. We modified the watershed boundary near some mining pits to reflect current topography.
- USLE cover management factor = 0.1 (USEPA recommendation for grass and agricultural cover as default. HHRAP B-4-13) (U.S. EPA, 2005)
- USLE rainfall (erosivity) factor = 75 yr^{-1} (U.S. EPA Fact Sheet 3.1 833-F-00-014 - Storm Water Phase II Final Rule - Erosivity Index Zone Map (U.S. EPA, 2001))
- Depth of water column = 9 m (MDNR Lake Finder)
- Current velocity = 0 (Not used in the equation for lakes - HHRAP p.4-9) (U.S. EPA, 2005)
- Average volumetric flow rate through Big Diamond Lake = 387,000 m^3/yr (watershed area * 0.5 * average annual surface run-off from HHRAP p. 4-9 (U.S. EPA, 2005)

  Ave. annual run-off = 0.23 m/yr - MPCA “Detailed Assessment of Phosphorus Sources to Minnesota Watersheds” Figure 3-2 (MPCA, 2004); Techniques for Estimating Peak Flow on Small Streams in Minnesota, Water-Resources Investigations Report 97-4249 (MNDOT, 1997))
- Average annual evapotranspiration = 48.26 cm/yr (Climate of Minnesota Technical Bulletin 322 (U of M, 1979))
- Average annual irrigation = 0 (no irrigation assumed)
- Average annual precipitation = 71.4 cm/yr (MPCA “Detailed Assessment of Phosphorus Sources to Minnesota Watersheds” Figure 3-1 (MPCA, 2004)
- Average annual runoff = 23 cm/yr (MPCA “Detailed Assessment of Phosphorus Sources to Minnesota Watersheds”Figure 3-2 (MPCA, 2004); Techniques for Estimating Peak Flow on Small Streams in Minnesota, Water-Resources Investigations Report 97-4249(MNDOT, 1997))

- Wind velocity = 3.9 m/s (Default - HHRAP Table B-4-20 and Table B-4-21 (U.S. EPA, 2005))

Exposure scenarios selected for receptors in the working farm area of concern include adult and child resident, adult and child farmer, and adult and child fisher. Exposure scenarios selected for receptors in the lake, rural resident and hobby farm areas of concern include adult and child resident, and adult and child fisher.

The following chemicals do not have toxicity information included in IRAP, but are evaluated by and Q/CHI method: 2-chloracetophenone, hexane, hydrogen fluoride, manganese, methyl methacrylate, methyl tert butyl ether, 5-methylchrysene, and sulfuric acid. These chemicals are addressed in Section 5.8, "Miscellaneous Chemicals."

Biphenyl, cobalt, dimethyl sulfate, methyl hydrazine, and proprionaldehyde do not have toxicity information included in IRAP and they also are not evaluated by the Q/CHI method.

4.6.3 IRAP Results

Chronic health risk attributable to facility emissions are calculated by the IRAP method at each separate receptor location. IRAP results indicate that the predicted carcinogenic risk from all combined facility emission sources and COPCs are less than 10^{-5} and non-carcinogenic hazard indices are less than 1.0 at all representative locations.

Cancer risk ranges from 9.1×10^{-7} to 5.0×10^{-8} with the highest total facility cancer risk predicted at receptor RI_1 for an adult fisher, within the Big Diamond Lake Resident area of concern. Location RI_1 is southeast of the site. Non-cancer hazard indices range from 0.032 to 0.0028 with the highest total facility hazard index predicted at receptor RI_3 for a child fisher, within the Big Diamond Lake Resident area of concern. Receptor locations can be seen on Figure 3. Individual receptor cancer risk and hazard indices can be found in Table 8 "IRAP Risk Summary by Exposure Scenarios," Table 9 "IRAP Cancer Risk Summary by Exposure Pathways," and Table 10 "IRAP Hazard Index Summary by Exposure Pathways" breaks down the individual receptor risks by intake pathways.

The chemicals contributing to the majority of predicted carcinogenic impact to residents, fishers and farmers are cadmium (worst case is 7.2 x 10^{-7}), indeno(1,2,3-cd)pyrene (worst case is 1.8 x 10^{-7}), and arsenic (worst case is 1.1 x 10^{-7}). While the chemical contributing to the majority of predicted non-carcinogenic impact is acrolein (worst case is 0.0031). However, all are below the acceptable MPCA risk values.

4.7 Fish Consumption Pathway – Mercury

4.7.1 Fishable Bodies of Water

The tallest stacks at the facility are the tank vent boiler stacks at 64.01m (210 ft). Based on AERA guidance (MPCAa), for facilities with stack heights less than 100 meters, fishable lakes within a 3 km radius should be considered under the fish consumption pathway. "Fishable" bodies of water are those that contain water year-round in a year that receives at least 75 % of the normal annual precipitation for that area. Four fishable bodies of water lie, at least in part, within 3 km of the proposed facility stacks: Dunning Lake, Big Diamond Lake, Little Diamond Lake and the Canisteo Mine Complex. These bodies of water can be seen on Figure 2.

Dunning Lake is located approximately 4,300 feet (0.8 mi) east, Big Diamond Lake is located approximately 4,800 feet (0.9 mi) southeast, Little Diamond Lake is located approximately 7,000 feet (1.3 mi) south, and the Canisteo Complex is approximately 6,200 feet (0.2 mi) south. Biologists from SEH conducted a site reconnaissance and determined that no fishable streams are located within 3 km of the proposed facility. Water from Big Diamond Lake flows through a wetland system to Little Diamond Lake, which in turn flows to Holman Lake to the south.

Approximately nine property owners currently have seasonal homes on Big Diamond Lake; one or two properties have residents living on the lake year around. The other three bodies of water within 3 km of the facility have fewer, if any, residences located on their shores. Dispersion modeling for mercury indicates Big Diamond Lake is within the release plume of future facility emissions. In addition, Big Diamond Lake had the most readily available lakes data including a fish species survey. Figure 6, "Mercury Emissions Dispersion Model Isoconcentrations"shows the isoconcentrations resulting from the dispersion modeling of mercury in relation to the vicinity bodies of water. Based on the above information, Big Diamond Lake is the body of water chosen to evaluate consumption of potentially contaminated fish tissue.

4.7.2 Mercury Risk Estimation for Subsistence Fish Consumption

The methodology used to estimate human health risk for subsistence fish consumption is based on the *Summary of MPCA's Mercury Risk Estimation Method for the Fish Consumption Pathway (Local Impacts Assessment): April 7, 2006* (MPCA, 2006). The estimation of risk is completed using the MPCA Local Mercury Assessment spreadsheet, "Calculation of Local Mercury Hazard Quotients (HQ) from Mercury Emissions from a Project", version 1.4, dated April 13, 2006.

4.7.2.1 Fish Consumption Model Input

The source of specific input information required for the estimation of risk associated with fish consumption is as follows:

- Background mercury deposition:
  - wet-plus-dry ambient deposition (flux) = 12.5 μg/m^2-yr – Minnesota default to lake surfaces and 33.6 μg/m^2-yr to rest of the watershed
  - 10 % watershed deposition transported to water body
  - Lake Finder database lake area for Big Diamond Lake = 122 acres (MNDR Lake Finder)
  - Watershed area for Big Diamond Lake determined using IRAP = 760 acres
- Mercury mass deposited to lake and watershed due to facility emissions
  - Determined by site-specific air dispersion modeling in AERMOD
  - Concentration over lake and watershed = 1.3 x 10^{-5} ug/m^3
  - Hg^0 Depositional Velocity = 0.01 cm/sec over the lake and 0.05 cm/sec over the rest of the watershed
  - All mercury emissions are assumed to be elemental mercury (Hg^0)
- Methylmercury estimation in fish fillet
  - Reference species of fish is Northern Pike

  - Database used to determine the current fish tissue concentration = "Allfish 04 NE lakes only" provided electronically as an Excel spreadsheet by MPCA

- Risk assumptions
  - Daily fish consumed = 0.142 kg/day
  - Adult body weight = 70 kg
  - Reference dose for methyl mercury = 1.0 x 10^{-4} mg/kg-day

4.7.2.2 Current Total Mercury in Fish Tissue Estimation

Because no actual mercury in fish tissue data are available for fish residing in Big Diamond Lake, the database for all lakes in northeast Minnesota is used to determine the total mercury fish tissue concentration from a fish at the 90^{th} percentile. The "Allfish 04 NE Lakes only" database is first narrowed down to consider only Northern Pike. The database is further narrowed down by removing all entries for Northern Pike that are incomplete for either fish length or mercury concentration.

The database was apparently developed on a "per sampling event" basis, so it often includes multiple fish for a given length and mercury concentration. For example, for a given sampling date, the database may include '4' for the number of fish sampled (designated under 'NOFISH' in the spreadsheet) and then include one value each for length (LENGTHIN) and mercury concentration (HGPPM). The assumption is made that the length and mercury concentration values in the database represented average values for all fish collected on that date.

Because the database was apparently configured on a 'per sampling event' basis and includes averages for sampling events, it does not allow an accurate determination of the true 90^{th} percentile and average length based on a total number of fish. To accommodate this shortcoming, SEH modified the database to best approximate a database developed on a 'per fish' basis. To accomplish this, the database is expanded to include an individual entry for each fish collected. Where multiple fish are collected on a given day, the average values given for length and mercury concentration are entered as the 'true' value for each fish. Although this modification likely produces a lower standard deviation than the true population, it is judged to be the best solution given the available data.

Statistics are run on the modified database to produce the following results:

N = Total fish in the modified database = 9,375 Northern Pike

Minimum length = 6.7 inches

Maximum length = 45.5 inches

4.7.2.2.1 *Determination of Mercury Concentration in the 90th Percentile Length Fish*

90th percentile length fish = 27.8 inches

Number of fish of 27.8 inches = 33 fish

Mean mercury concentration of all 27.8 inch fish = 0.56 ppm (standard deviation = 0.40)

As a check on the sensitivity of the data, the mean is also calculated on all fish within 0.5 inches from the 90th percentile length (i.e. – in the range 27.3 - 28.3 inches). There are 379 fish in that range with a mean mercury concentration of 0.56 ppm (standard deviation = 0.35).

4.7.2.2.2 *Determination of Mercury Concentration in the Average Length Fish*

Average length fish = 21.8 inches

Number of fish of 21.8 inches = 105 fish

Mean mercury concentration of all 21.8 inch fish = 0.39 ppm (standard deviation = 0.26)

As a check on the sensitivity of the data, the mean is also calculated on all fish within 0.5 inches from the average length (i.e. – in the range 21.3 - 22.3 inches). There are 1,259 fish in that range with a mean mercury concentration of 0.38 ppm (standard deviation = 0.21).

4.7.3 Mercury in Fish Tissue Risk Results

Estimation of risk associated with fish consumed by adult subsistence fishers on Big Diamond Lake as conducted with the MPCA Local Mercury Assessment spreadsheet indicates the following:

- Mercury Loading Summary:
  - Mercury loading to the lake from the project = 0.08 g/yr
  - Background mercury loading to the lake = 16.51 g/yr
- Incremental increase in mercury in fish tissue from the project - average fish size = 0.002 ppm
- Incremental increase in mercury in fish tissue from the project – 90th percentile fish size = 0.003 ppm
- Water quality Standard Hazard Quotient:
  - Average fish size

    Ambient Hazard Quotient relative to water quality standard = 1.95

    Incremental Hazard Quotient relative to water quality standard from the project = 0.01
  - 90th percentile fish size-

    Ambient Hazard Quotient relative to water quality standard = 2.80

    Incremental Hazard Quotient relative to water quality standard from the project = 0.01
- Subsistence Fisher Hazard Quotient:
  - Average fish size

    Ambient Subsistence Fisher Hazard Quotient = 8.5

    Incremental Subsistence Fisher Hazard Quotient from the project = 0..04
  - 90th percentile fish size

    Ambient Subsistence Fisher Hazard Quotient = 12.2
    Incremental Subsistence Fisher Hazard Quotient from the project = 0.06

4.7.4 Discussion of Results of Mercury in Fish Tissue

Predicted concentrations of mercury in fish tissue under ambient conditions, assuming no significant local sources of mercury, indicates that a subsistence adult fisher consuming 0.142 kg per day of fish caught in Big Diamond Lake would have a hazard quotient of 8.5 to

12.2. The range is dependent upon the size of the fish being in the range of average (21.8 inches) to the 90^{th} percentile (27.8 inches).

The predicted increment attributable to proposed facility emissions results in a hazard quotient ranging from 0.04 to 0.06 (again, the values are size of fish dependent.) Thus risk to a subsistence fisher due to ingestion of fish tissue after the facility is constructed is roughly increased by 0.5 percent. The predicted non-carcinogenic hazard quotient is less than the acceptable MPCA risk value of 1.0 via the fish ingestion pathway of fish caught from Bid Diamond Lake

An electronic copy of the MPCA Local Mercury Assessment spreadsheet for both the 90^{th} percentile and average fish size as well as the northeast Minnesota lakes "Allfish 04"database is included in Appendix B.

The MPCA Hg-2003 evaluation can be found in the Mesaba Energy Project Prevention of Significant Deterioration Permit to Construct Application dated June 2006 (Excelsior, 2006).

4.8 Fish Consumption Pathway - PBTs

Risk associated with ingestion of fish tissue with potential concentrations of COPCs, including mercury, is evaluated using the IRAP model. IRAP results indicate that the predicted carcinogenic risk from all combined facility emission sources and COPCs is less than 10^{-5} and non-carcinogenic hazard indices is less than 1.0 via the fish ingestion pathway of fish caught from Big Diamond Lake. In order to assess the impact of contaminants other than mercury on fish tissue ingestion, Hg^0 emissions were removed from IRAP and re-modeled. IRAP results for the fish ingestion pathway without mercury were similar to the results that included Hg^0 emissions. This suggests that the contribution from Hg^0 to fish tissue in Big Diamond Lake is minimal.

Cancer risk for an adult fisher is 2.9×10^{-7} and for a child fisher is 3.8×10^{-8}. The non-cancer hazard index is 0.00013 for an adult fisher and 0.00085 for a child fisher. Risk results for the fish ingestion pathway for both the IRAP and MPCA methods are summarized on Table 11, "Risk Summary by Fish Consumption Pathway."

5.0 Qualitative Analysis

The qualitative analysis provides supplementary information to the quantitative risk assessment. This information provides a description of the facility location, potential receptors at risk and facility emissions that could not be evaluated in the quantitative evaluation.

5.1 Land Use/General Neighborhood Information

The project site includes approximately 1,260 acres of mostly undeveloped property for which Excelsior has obtained, from RGGS Land & Minerals, LTD., L.P., an option to purchase surface rights. The site is currently unoccupied by any residential dwellings and has no direct access. Figure 2 provides a close-up location map of this site, the Project's current site layout plan and the infrastructure required to support Project operations. Figure 7, "Existing Land Use/Land Cover" shows current land use near the Project site.

The Mesaba Energy Project is located in Town 56, Range 24, Section 10, Itasca County, Minnesota. The site is generally bounded by County Road No. 7 to the west, the city limits of Taconite to the south, a high voltage transmission line (HVTL) corridor to the north, and the Township boundary to the east. The site is zoned industrial according to the Iron Range Township Zoning map.

Grand Rapids, Minnesota (Itasca County, population 7,764) (City-Data.com) is located approximately 15 km (9 mi) to the southwest and Hibbing, Minnesota (St. Louis County, population 17,071) (City-Data.com) is approximately 32 km (20 mi) to the east of the proposed facility. The area within 1 km (0.6 mi) of the proposed facility stacks is rural and not populated. The land is rocky, hilly and boggy. There are no structures within 1 km of the facility stacks.

Itasca County has a population density of 16.5 persons per square mile (based on the 2000 census.) There are no cities or towns are located within 3 km of the facility stacks. The town of Marble (population 695 in year 2000) (City-Data.com) is located 6.5 km (4 mi) southeast of the proposed facility. The towns of Taconite (population 315) (City-Data.com) and Bovey (population 662) (City-Data.com) are located 4.4 km (2.7 mi) and 6.3 km (4 mi), respectively southwest of the facility stacks.

The poverty rate in Itasca County, is approximately 8.6 percent of the population.

The Envirofacts database (U.S. EPA) lists one source of potential air pollutants in the 55709 zip code area where the facility will be located. Wm J. Schwartz & Sons Inc., a non-metallic crushed and broken limestone mining and quarrying facility is listed in this zip code area (Bovey, MN, approximately 4.4 miles southwest of the proposed facility.) An additional source of air pollutants is found in the 55786 zip code area (Taconite, MN, approximately 2.7 miles southwest of the proposed facility). This listing is for Troumbly Bros. Inc., a non-metallic crushed rock and broken limestone construction sand and gravel facility. No toxic releases are noted within either zip code area.

5.2 Receptor Information

5.2.1 Sensitive Receptors

No sensitive receptors, such as residences, schools, daycares, recreation centers, playgrounds, nursing homes or hospitals are located within 1 km of the proposed facility stacks.

5.2.2 Farmers and Residents

The plant site is fairly remote and the land Excelsior Energy has optioned provides more than one-quarter mile buffer between the nearest residential dwelling and the fenced area enclosing the generating facilities. No farms or residences are located within 1 km of the proposed facility stacks. The nearest residence is located approximately 1.1 km (0.7 mi) to the west. A hobby farm and horse riding recreation facility is located approximately 1.7 km (1.1 mi) west-southwest of the proposed Mesaba Energy facility. The nearest farm is located approximately 3 km (1.9 mi) northwest of the facility. Cattle, horses and ponies appear to be raised on this farm with hay as a crop.

5.3 Mixtures and Surrogate Values

Similar chemicals or chemicals within a mixture may be grouped to evaluate risk. When grouped, an IHB for a specific chemical within that group may be applied to the compounds, groups or mixtures containing a fraction of that specific chemical. The IHB applied to the group or mixture is known as a surrogate value.

All chemicals included in the Mesaba Energy Project AERA, with the exception of cyanide and nickel, are evaluated using their own respective IHBs. The toxicity value for hydrogen cyanide is used as a surrogate for cyanide in the acute risk evaluation and the toxicity value for nickel subsulfide is used as a surrogate for nickel in the long term cancer risk evaluation in Q/CHI.

5.4 Sensitizers

Chemical sensitizers are those that may cause sever reactions to those persons who may have been exposed to the chemical previously and have become sensitized to that chemical. A person may also have a sensitized reaction to chemicals that may be structurally similar to the original exposure chemical. Chemicals that are known respiratory sensitizers that are included in the AERA and have an IHB are beryllium, formaldehyde and nickel. Any persons sensitive to the above chemicals could be affected by emissions from the proposed facility.

5.5 Developmental Toxicants

Several chemicals evaluated in the Mesaba Energy Project AERA have been assigned Health Risk Values (HRVs) by the Minnesota Department of Health and California Reference Exposure Levels as known developmental toxicants. These chemicals may have an adverse effect on a developing fetus and therefore, should be given special consideration. The chemicals listed in Table 1 as a developmental toxicant include arsenic, benzene, carbon disulfide, chloroform, ethyl benzene, ethyl chloride and mercury.

The acute hazard index for mercury is low at 0.39, yet above the acceptable MPCA risk limit for an individual COPC. Chronic risk as determine by IRAP for mercury is negligible.

The acute HRVs are considered to be ceiling values, which should not be exceeded for developmental toxicants. The acute or ceiling value is exceeded for arsenic.

5.6 Persistent, Bioaccumulative, and Toxic Chemicals

All PBTs identified as COPCs from the proposed facility and found on Table 1 have been evaluated in the AERA. No additional PBTs have been identified.

5.7 Additivity by Toxic Endpoint

Risk predicted by the Q/CHI method indicated that acute and sub-chronic non-carcinogenic inhalation risks are at acceptable levels for the proposed facility. IRAP modeling predicted that both carcinogenic and non-carcinogenic chronic risks within a 3 km radius of the proposed facility are also at acceptable levels.

The risk conclusions are arrived at by adding individual chemical hazard quotients across all pathways and COPCs regardless of the organs or body systems affected (toxic endpoints). This is a very conservative approach to evaluating risk to human health because in reality, different chemicals may impact different systems or toxic endpoints. A refined risk evaluation would allow for determining risk by focusing on the risk related to individual body systems.

Since the risk evaluations based on the Q/CHI and IRAP methods using the conservative approach has determined that human health risk is at acceptable levels, a refined evaluation by toxic endpoints is not be conducted.

5.8 Miscellaneous Chemicals

A number of chemicals do not have toxicity information included in IRAP, and are therefore, not evaluated in IRAP. The following chemicals, however, are included in the Q/CHI method for characterizing risk to human health: 2-chloracetophenone, hexane, hydrogen fluoride, manganese, methyl methacrylate, methyl tert butyl ether, 5-methylchrysene, and sulfuric acid.

Hexane, hydrogen fluoride, methyl methacrylate, and methyl tert butyl ether have hazard indices across all exposure routes as calculated by RASS that are 0.1 or less and are considered to have relatively low risks (MPCAa). 2-Chloracetophenone, manganese, 5-methylchrysene, and sulfuric acid have acceptable risk ratios as evaluated by the Q/CHI method.

6.0 AERA Summary

An AERA is conducted on the Mesaba Energy Project to identify the sources or groups of sources, chemicals and associated pathways that may pose an unacceptable health risk to the public as a result of the proposed facility air emissions.

The AERA is completed using several methods. Acute and sub-chronic risks are determined by the Q/CHI methodology. Chronic risks are determined using the IRAP model methodology. Risk associated with fish tissue ingestion is determined using the MPCA Draft Mercury Risk Estimation Method for ingestion of mercury in fish tissue and IRAP is used to determine risk associated with fish contaminated by contaminants other than mercury. Because detailed risk evaluations are completed for this project, MPCA's screening evaluation using the RASS process is not included in the AERA.

The acceptable MPCA risk level for chemicals producing carcinogenic effects from all combined facility emission sources is less than one in 100,000 (10^{-5}). For chemicals producing non-carcinogenic effects, a hazard index less than 1.0 is acceptable.

The acute and sub-chronic health risks as determined by the Q/CHI method are 0.52 and 0.13, respectively. Both hazard indices are below the acceptable MPCA total hazard index of 1.0.

Chronic health risks as determined by IRAP at 11 receptors representing rural residents, hobby and working farmers, and lakeshore residents indicate that the following:

- Cancer risk ranges from 9.1×10^{-7} to 5.0×10^{-8}
- Non-cancer hazard indices range from 0.032 to 0.0028

Both ranges are below the acceptable MPCA health risk levels.

Predicted risk associated with the ingestion of fish tissue caught from Big Diamond Lake indicates that the hazard quotient incremental contribution of mercury in fish tissue ranges from 0.04 to 0.06 (dependant on fish size).

The predicted cancer risks from all combined facility emission sources and COPCs range from 2.9×10^{-7} to 3.8×10^{-8}. The predicted non-cancer hazard indices range from 0.00013 to 0.00085. Health risks predicted by both methods indicate results that are below acceptable MPCA risk levels.

7.0 References

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List of Tables

Table 1
Chemicals Evaluated in the AERA
(Phase 1 plus Phase 2)

CAS or MPCA No.	Compound	Annual HAP Emission (ton/year)			Total Phase 1 Ton/year	Phase 1 and Phase 2 Ton/year
		CTGs	TVB	Flare		
75-07-0	Acetaldehyde	0.046	1.6E-04	3.9E-04	0.046	0.092
98-86-2	Acetophenone	0.023	7.9E-05	2.0E-04	0.023	0.046
107-02-8	Acrolein	0.44	1.5E-03	3.8E-03	0.448	0.896
7440-36-0	Antimony	0.028	2.6E-04	6.6E-04	0.029	0.058
7440-38-2	Arsenic	0.061	1.4E-03	3.5E-03	0.066	0.131
71-43-2	Benzene	0.061	0.026	0.066	0.153	0.307
100-44-7	Benzyl chloride	1.07	3.7E-03	9.2E-03	1.081	2.162
7440-41-7	Beryllium	0.0066	7.9E-06	2.0E-05	0.007	0.013
92-52-4	Biphenyl	0.0026	9.0E-06	2.2E-05	0.003	0.005
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	0.11	3.9E-04	9.6E-04	0.113	0.225
75-25-2	Bromoform	0.06	2.0E-04	5.0E-04	0.059	0.118
7440-43-9	Cadmium	0.24	5.3E-05	1.3E-04	0.243	0.486
75-15-0	Carbon disulfide	1.16	4.0E-03	1.0E-02	1.178	2.356
463581	Carbonyl sulfide				0.000	0.000
532-27-4	Chloroacetophenone, 2-	0.0106	3.7E-05	9.2E-05	0.011	0.022
108-90-7	Chlorobenzene	0.033	1.1E-04	2.8E-04	0.033	0.067
67-66-3	Chloroform	0.091	3.2E-04	7.9E-04	0.092	0.184
0-00-5	Chromium, total	0.013	9.8E-04	2.5E-03	0.017	0.033
7440-47-3	Chromium, (trivalent)	0.01	6.9E-04	1.7E-03	0.012	0.023
18540-29-9	Chromium, (hexavalent)	0.0039	2.9E-04	7.4E-04	0.005	0.010
7440-48-4	Cobalt	0.0066	1.1E-03	2.8E-03	0.011	0.021
98-82-8	Cumene	0.0081	2.6E-05	6.6E-05	0.008	0.016
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	0.144	4.4E-03	1.1E-02	0.160	0.319
77-78-1	Dimethyl sulfate	0.073	2.5E-04	6.3E-04	0.074	0.148
121-14-2	Dinitrotoluene, 2,4-	4.3E-04	1.5E-06	3.7E-06	0.000	0.001
100-41-4	Ethyl benzene	0.14	0.030	0.074	0.248	0.496
75-00-3	Ethyl chloride (Chloroethane)	0.063	2.2E-04	5.5E-04	0.064	0.128
106-93-4	Ethylene dibromide (Dibromoethane)	0.0018	6.3E-06	1.6E-05	0.002	0.004
107-06-2	Ethylene dichloride (1,2-Dichloroethane)	0.061	2.1E-04	5.3E-04	0.061	0.123
50-00-0	Formaldehyde	0.43	1.5E-03	3.7E-03	0.435	0.871
110-54-3	Hexane	0.10	3.5E-04	8.8E-04	0.102	0.205
7647-01-0	Hydrochloric acid	0.099	3.0E-04	7.4E-04	0.100	0.199
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	1.3	5.3E-05	1.3E-04	1.266	2.531
78-59-1	Isophorone	0.88	3.1E-03	7.6E-03	0.894	1.788
7439-92-1	Lead	0.014	6.3E-05	1.6E-04	0.014	0.029
7439-96-5	Manganese	0.026	2.2E-03	5.5E-03	0.034	0.068

CAS or MPCA No.	Compound	Annual HAP Emission (ton/year)			Total Phase 1 Ton/year	Phase 1 and Phase 2 Ton/year
		CTGs	TVB	Flare		
7439-97-6	Mercury	0.013	6.1E-04	1.5E-04	0.013	0.027
74-83-9	Methyl bromide (Bromomethane)	1.21	0.011	0.027	1.245	2.490
74-87-3	Methyl chloride (Chloromethane)	0.81	5.5E-03	1.4E-02	0.827	1.653
71-55-6	Methyl chloroform (1,1,1 - Trichloroethane)	0.030	1.1E-04	2.6E-04	0.031	0.061
78-93-3	Methyl ethyl ketone (2-Butanone)	0.59	2.1E-03	5.1E-03	0.602	1.204
60-34-4	Methyl hydrazine	0.26	9.0E-04	2.2E-03	0.262	0.525
80-62-6	Methyl methacrylate	0.030	1.1E-04	2.6E-04	0.031	0.061
1634-04-4	Methyl tert butyl ether	0.053	1.8E-04	4.6E-04	0.054	0.108
75-09-2	Methylene chloride (Dichloromethane)	0.056	5.2E-04	1.3E-03	0.057	0.115
91-20-3	Naphthalene	0.063	7.5E-04	1.9E-03	0.066	0.132
7440-02-0	Nickel	0.0099	3.9E-03	9.8E-03	0.024	0.047
108-95-2	Phenol	0.93	1.1E-02	2.8E-02	0.970	1.940
123-38-6	Proprionaldehyde	0.579	2.0E-03	5.0E-03	0.586	1.173
7784-49-2	Selenium	0.014	2.2E-04	5.5E-04	0.015	0.030
100-42-5	Styrene	0.038	1.3E-04	3.3E-04	0.039	0.077
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.066	2.3E-04	5.7E-04	0.066	0.133
108-88-3	Toluene	0.00084	0.0104	0.0261	0.037	0.075
108-05-4	Vinyl acetate	0.012	4.0E-05	1.0E-04	0.012	0.024
1330-20-7	Xylenes	0.056	0.012	0.030	0.098	0.196
	Total federal HAPs	***11.6***	***0.1***	***0.4***	***12.1***	***24.2***
	Other Emissions					
56-55-3	Benz[a]anthracene	5.8E-05	2.0E-07	5.0E-07	5.9E-05	1.2E-04
207-08-9	Benzo(k)fluoranthene	1.7E-04	5.8E-07	1.4E-06	1.7E-04	3.4E-04
50-32-8	Benzo[a]pyrene	5.8E-05	2.0E-07	5.0E-07	5.9E-05	1.2E-04
218-01-9	Chrysene (Benzo(a)phenanthrene)	1.5E-04	5.3E-07	1.3E-06	1.5E-04	3.1E-04
193-39-5	Indeno(1,2,3-cd)pyrene	9.4E-05	3.2E-07	8.1E-07	9.5E-05	1.9E-04
3697-24-3	Methylchrysene, 5-	3.3E-05	1.1E-07	2.8E-07	3.3E-05	6.7E-05
7664-93-9 14808-79-8	Sulfuric acid and sulfates	64.0	0.2	1.4	65.7	131.4
	Total Volatile Organic Compounds (VOC)	9.8	0.1	0.3	10.3	20.6

(Note: the emissions presented in Table 1 may differ slightly from those presented in the current Prevention of Significant Deterioration Permit to Construct Application. The emissions in Table 1 were used in the draft Permit Application and AERA submitted to MPCA in April 2006. Some comments on the AERA by the MPCA have been made, but the AERA review process has not been completed. Since that time adjustments have been made in the Permit Application, including emissions of chemicals contained in Table 1. These changes will be included in future revisions to the AERA after technical comments have been received.)

Table 2
IRAP Receptors and Scenarios Evaluated

Receptor #	Area of Concern	UTM X	UTM Y	Exposure Scenario Evaluated					
				Adult Resident	Child Resident	Adult Farmer	Child Farmer	Adult Fisher	Child Fisher
RI_1	Lake Resident	473,500.00	5,242,275.00	X	X			X	X
RI_2	Lake Resident	473,300.00	5,241,475.00	X	X			X	X
RI_3	Lake Resident	473,500.00	5,242,175.00	X	X			X	X
RI_4	Riding Stable	470,500.00	5,242,675.00	X	X			X	X
RI_5	Riding Stable	469,900.00	5,242,875.00	X	X			X	X
RI_6	NE Hobby Farm	473,100.00	5,246,075.00	X	X			X	X
RI_7	Farm	470,200.00	5,246,375.00	X	X	X	X	X	X
RI_8	Rural Resident	470,900.00	5,244,675.00	X	X			X	X
RI_10	Rural Resident	470,900.00	5,244,575.00	X	X			X	X
RI_11	Rural Resident	470,800.00	5,244,675.00	X	X			X	X
RI_12	Rural Resident	470,500.00	5,244,275.00	X	X			X	X

Table 3
IRAP Exposure Pathways Evaluated

Exposure Pathways	Exposure Scenarios (Receptors)					
	Adult Farmer	Child Farmer	Adult Resident	Child Resident	Adult Fisher	Child Fisher
Inhalation of vapors and particulates	X	X	X	X	X	X
Incidental ingestion of soil	X	X	X	X	X	X
Ingestion of drinking water from surface water sources	X	X	X	X	X	X
Ingestion of homegrown produce	X	X	X	X	X	X
Ingestion of beef	X	X				
Ingestion of milk from homegrown cows	X	X				
Ingestion of homegrown chicken	X	X				
Ingestion of homegrown pork	X	X				
Ingestion of fish	X	X	X	X	X	X

Table 4
Q/CHI COPC Screen Results
Phase I and Phase II

Inhalation Q/CHI	Averaging Period	Totals – Two Phases	Acceptable Value	Passed/Failed
Acute Non-Cancer	1-hour	0.52	1.0	Passed
Sub-Chronic Non-Cancer	30-day	0.13	1.0	Passed

Table 5
IRAP Site Parameter Assumptions

Site Parameters	Value	Symbol	Units
Soil dry bulk density	1.5	bd	g/cm^3
Forage fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_forage	--
Grain fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_grain	--
Silage fraction grown on contam. eaten by CATTLE	1.0	beef_fi_silage	--
Qty of forage eaten by CATTLE each day	8.8	beef_qp_forage	kg DW/day
Qty of grain eaten by CATTLE each day	0.47	beef_qp_grain	kg DW/day
Qty of silage eaten by CATTLE each day	2.5	beef_qp_silage	kg DW/day
Grain fraction grown on contam. soil eaten by CHICKEN	1.0	chick_fi_grain	--
Qty of grain eaten by CHICKEN each day	0.2	chick_qp_grain	kg DW/day
Average annual evapotranspiration	48.26	e_v	cm/yr
Fish lipid content	0.07	f_lipid	--
Fraction of CHICKEN's diet that is soil	0.1	fd_chicken	--
Universal gas constant	8.205e-5	gas_r	atm-m^3/mol-K
Average annual irrigation	0	i	cm/yr
Plant surface loss coefficient	18	kp	yr^-1
Fraction of mercury emissions NOT lost to the global cycle	0.48	merc_q_corr	--
Fraction of mercury speciated into methyl mercury in produce	0.22	mercmethyl_ag	--
Fraction of mercury speciated into methyl mercury in soil	0.02	mercmethyl_sc	--
Forage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_forage	--
Grain fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_grain	--
Silage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_silage	--
Qty of forage eaten by MILK CATTLE each day	13.2	milk_qp_forage	kg DW/day
Qty of grain eaten by MILK CATTLE each day	3.0	milk_qp_grain	kg DW/day
Qty of silage eaten by MILK CATTLE each day	4.1	milk_qp_silage	kg DW/day
Averaging time	1	milkfat_at	yr
Body weight of infant	10	milfat_bw_infant	kg
Exposure duration of infant to breast milk	1	milkfat_ed	yr
Proportion of ingested dioxin that is stored in fat	0.9	milkfat_f1	--
Proportion of mothers weight that is fat	0.3	milkfat_f2	--
Fraction of fat in breast milk	0.04	milkfat_f3	--
Fraction of ingested contaminant that is absorbed	0.9	milkfat_f4	--
Half-life of dioxin in adults	2555	milkfat_h	days
Ingestion rate of breast milk	0.8	milkfat_ir_milk	kg/day

Site Parameters	Value	Symbol	Units
Viscosity of air corresponding to air temp.	1.81e-04	mu_a	g/cm-s
Average annual precipitation	71.4	p	cm/yr
Fraction of grain grown on contam. soil eaten by PIGS	1.0	pork_fi_grain	--
Fraction of silage grown on contam. soil and eaten by PIGS	1.0	pork_fi_silage	--
Qty of grain eaten by PIGS each day	3.3	pork_qp_grain	kg DW/day
Qty of silage eaten by PIGS each day	1.4	pork_qp_silage	kg DW/day
Qty of soil eaten by CATTLE	0.5	qs_beef	kg/day
Qty of soil eaten by CHICKEN	0.022	qs_chick	kg/day
Qty of soil eaten by DAIRY CATTLE	0.4	qs_milk	kg/day
Qty of soil eaten by PIGS	0.37	qs_pork	kg/day
Average annual runoff	23	r	cm/yr
Density of air	1.2e-3	rho_a	g/cm^3
Solids particle density	2.7	rho_s	g/cm^3
Interception fraction - edible portion ABOVEGROUND	0.39	rp	--
Interception fraction - edible portion FORAGE	0.5	rp_forage	--
Interception fraction - edible portion SILAGE	0.46	rp_silage	--
Ambient air temperature	298	t	K
Temperature correction factor	1.026	theta	--
Soil volumetric water content	0.2	theta_s	mL/cm^3
Length of plant expos. to depos. - ABOVEGROUND	0.164	tp	Yr
Length of plant expos. to depos. - FORAGE	0.12	tp_forage	Yr
Length of plant expos. to depos. - SILAGE	0.16	tp_silage	Yr
Average annual wind speed	3.9	u	m/s
Dry deposition velocity	3	vdv	cm/s
Wind velocity	3.9	w	m/s
Yield/standing crop biomass - edible portion ABOVEGROUND	2.24	yp	kg DW/m^2
Yield/standing crop biomass - edible portion FORAGE	0.24	yp_forage	kg DW/m^2
Yield/standing crop biomass - edible portion SILAGE	0.8	yp_silage	kg DW/m^2
Soil mixing zone depth	1.0	z	cm

Table 6
IRAP Exposure Scenario Assumptions

DESCRIPTION	Resident Adult	Resident Child	Farmer Adult	Farmer Child	Fisher Adult	Fisher Child	UNITS
Averaging time for carcinogens	70	70	70	70	70	70	yr
Averaging time for noncarcinogens	30	6	40	6	30	6	yr
Consumption rate of BEEF	0.0	0.0	0.00114	0.00051	0.0	0.0	kg/kg-day FW
Body weight	70	15	70	15	70	15	kg
Consumption rate of POULTRY	0.0	0.0	0.00061	0.000425	0.0	0.0	kg/kg-day FW
Consumption rate of ABOVEGROUND PRODUCE	0.0003	0.00042	0.0003	0.00042	0.0003	0.00042	kg/kg-day DW
Consumption rate of BELOWGROUND PRODUCE	0.00014	0.00022	0.00014	0.00022	0.00014	0.00022	kg/kg-day DW
Consumption rate of DRINKING WATER	1.4	0.67	1.4	0.67	1.4	0.67	L/day
Consumption rate of PROTECTED ABOVEGROUND PRODUCE	0.00057	0.00077	0.00057	0.00077	0.00057	0.00077	kg/kg-day DW
Consumption rate of SOIL	0.0001	0.0002	0.0001	0.0002	0.0001	0.0002	kg/d
Exposure duration	30	6	40	6	30	6	yr
Exposure frequency	350	350	350	350	350	350	day/yr
Consumption rate of EGGS	0.0	0.0	0.00062	0.000438	0.0	0.0	kg/kg-day FW
Fraction of contaminated ABOVEGROUND PRODUCE	0.25	0.25	1.0	1.0	0.25	0.25	--
Fraction of contaminated DRINKING WATER	1.0	1.0	1.0	1.0	1.0	1.0	--
Fraction contaminated SOIL	1.0	1.0	1.0	1.0	1.0	1.0	--
Consumption rate of FISH	0.0	0.0	0.0	0.0	0.00117	0.000759	kg/kg-day FW
Fraction of contaminated FISH	1.0	1.0	1.0	1.0	1.0	1.0	--
Inhalation exposure duration	30	6	40	6	30	6	yr
Inhalation exposure frequency	350	350	350	350	350	350	day/yr
Inhalation exposure time	24	24	24	24	24	24	hr/day
Fraction of contaminated BEEF	1	1	1	1	1	1	--
Fraction of contaminated POULTRY	1	1	1	1	1	1	--
Fraction of contaminated EGGS	1	1	1	1	1	1	--
Fraction of contaminated MILK	1	1	1	1	1	1	--
Fraction of contaminated PORK	1	1	1	1	1	1	--
Inhalation rate	0.63	0.30	0.63	0.30	0.63	0.30	m^3/hr
Consumption rate of MILK	0.0	0.0	0.00842	0.01857	0.0	0.0	kg/kg-day FW
Consumption rate of PORK	0.0	0.0	0.00053	0.000398	0.0	0.0	kg/kg-day FW
Time period at the beginning of combustion	0	0	0	0	0	0	yr
Length of exposure duration	30	6	40	6	30	6	yr

Table 7
IRAP Risk Summary by Exposure Scenarios

Location	Risk	Exposure Scenario Evaluated						
		Resident		Farmer		Fisher		Risk Acceptance Criteria Ca = 1E05 HQ = 1
		Adult	Child	Adult	Child	Adult	Child	
RI_1 – Lake Resident	Cancer Risk	6.2E-07	2.5E-07	N/A	N/A	9.1E-07	2.9E-07	Passed
	Hazard Index	0.015	0.032	N/A	N/A	0.015	0.032	Passed
RI_2 – Lake Resident	Cancer Risk	5.2E-07	2.1E-07	N/A	N/A	8.1E-07	2.4E-07	Passed
	Hazard Index	0.013	0.028	N/A	N/A	0.013	0.028	Passed
RI_3 – Lake Resident	Cancer Risk	6.2E-07	2.5E-07	N/A	N/A	9.1E-07	2.9E-07	Passed
	Hazard Index	0.015	0.032	N/A	N/A	0.015	0.032	Passed
RI_4 – Riding Stable	Cancer Risk	1.6E-07	6.5E-08	N/A	N/A	4.6E-07	1.0E-07	Passed
	Hazard Index	0.0036	0.0079	N/A	N/A	0.0037	0.0080	Passed
RI_5 – Riding Stable	Cancer Risk	1.3E-07	5.0E-08	N/A	N/A	4.2E-07	8.8E-08	Passed
	Hazard Index	0.0028	0.0062	N/A	N/A	0.0029	0.0063	Passed
RI_6 – NE Hobby Farm	Cancer Risk	2.6E-07	1.1E-07	N/A	N/A	5.6E-07	1.4E-07	Passed
	Hazard Index	0.0064	0.014	N/A	N/A	0.0065	0.014	Passed

Location	Risk	Exposure Scenario Evaluated						
		Resident		Farmer		Fisher		Risk Acceptance Criteria Ca = 1E05 HQ = 1
		Adult	Child	Adult	Child	Adult	Child	
RI_7 – Working Farm	Cancer Risk	1.9E-07	7.4E-08	9.1E-07	2.3E-07	4.8E-07	1.1E-07	Passed
	Hazard Index	0.0047	0.010	0.0050	0.011	0.0048	0.010	Passed
RI_8 – Rural Resident	Cancer Risk	4.0E-07	1.6E-07	N/A	N/A	6.9E-07	2.0E-07	Passed
	Hazard Index	0.0093	0.021	N/A	N/A	0.0095	0.021	Passed
RI_10 – Rural Resident	Cancer Risk	4.0E-07	1.6E-07	N/A	N/A	6.9E-07	2.0E-07	Passed
	Hazard Index	0.0093	0.021	N/A	N/A	0.0094	0.021	Passed
RI_11 – Rural Resident	Cancer Risk	3.7E-07	1.5E-07	N/A	N/A	6.7E-07	1.9E-07	Passed
	Hazard Index	0.0088	0.019	N/A	N/A	0.0089	0.020	Passed
RI_12 – Rural Resident	Cancer Risk	3.2E-07	1.3E-07	N/A	N/A	6.2E-07	1.7E-07	Passed
	Hazard Index	0.0076	0.017	N/A	N/A	0.0077	0.017	Passed

Table 8
IRAP Cancer Risk Summary by Exposure Pathways

Location	Scenario	Pathway									Total Risk	Acceptance Criteria = 1E-5
		Inhalation	Produce	Beef	Poultry	Eggs	Fish	Milk	Pork	Soil		
RI_1 – Lake Resident	Fisher Adult	2.7E-07	3.3E-07				2.9E-07			1.9E-08	9.1E-07	Passed
	Fisher Child	1.2E-07	9.2E-08				3.8E-08			3.5E-08	2.9E-07	Passed
	Resident Adult	2.7E-07	3.3E-07							1.9E-08	6.2E-07	Passed
	Resident Child	1.2E-07	9.2E-08							3.5E-08	2.5E-07	Passed
RI_2 – Lake Resident	Fisher Adult	2.3E-07	2.7E-07				2.9E-07			1.5E-08	8.1E-07	Passed
	Fisher Child	1.0E-07	7.5E-08				3.8E-08			2.9E-08	2.4E-07	Passed
	Resident Adult	2.3E-07	2.7E-07							1.5E-08	5.2E-07	Passed
	Resident Child	1.0E-07	7.5E-08							2.9E-08	2.1E-07	Passed
RI_3 – Lake Resident	Fisher Adult	2.7E-07	3.3E-07				2.9E-07			1.9E-08	9.1E-07	Passed
	Fisher Child	1.2E-07	9.2E-08				3.8E-08			3.5E-08	2.9E-07	Passed
	Resident Adult	2.7E-07	3.3E-07							1.9E-08	6.2E-07	Passed
	Resident Child	1.2E-07	9.2E-08							3.5E-08	2.5E-07	Passed
RI_4 – Riding Stable	Fisher Adult	6.9E-08	9.0E-08				2.9E-07			5.1E-09	4.6E-07	Passed
	Fisher Child	3.1E-08	2.5E-08				3.8E-08			9.5E-09	1.0E-07	Passed
	Resident Adult	6.9E-08	9.0E-08							5.1E-09	1.6E-07	Passed
	Resident Child	3.1E-08	2.5E-08							9.5E-09	6.5E-08	Passed
RI_5 – Riding Stable	Fisher Adult	5.3E-08	6.9E-08				2.9E-07			3.9E-09	4.2E-07	Passed
	Fisher Child	2.4E-08	1.9E-08				3.8E-08			7.3E-09	8.8E-08	Passed
	Resident Adult	5.3E-08	6.9E-08							3.9E-09	1.3E-07	Passed
	Resident Child	2.4E-08	1.9E-08							7.3E-09	5.0E-08	Passed
RI_6 – NE Hobby Farm	Fisher Adult	1.2E-07	1.4E-07				2.9E-07			8.0E-09	5.6E-07	Passed
	Fisher Child	5.1E-08	3.9E-08				3.8E-08			1.5E-08	1.4E-07	Passed
	Resident Adult	1.2E-07	1.4E-07							8.0E-09	2.6E-07	Passed
	Resident Child	5.1E-08	3.9E-08							1.5E-08	1.1E-07	Passed
RI_7 – Working Farm	Farmer Adult	1.1E-07	5.2E-07	6.5E-08	8.7E-09	7.6E-10		2.0E-07	2.1E-09	7.3E-09	9.1E-07	Passed
	Farmer Child	3.7E-08	1.1E-07	4.3E-09	9.1E-10	8.1E-11		6.5E-08	2.4E-10	1.0E-08	2.3E-07	Passed
	Fisher Adult	8.4E-08	9.7E-08				2.9E-07			5.5E-09	4.8E-07	Passed
	Fisher Child	3.7E-08	2.7E-08				3.8E-08			1.0E-08	1.1E-07	Passed
	Resident Adult	8.4E-08	9.7E-08							5.5E-09	1.9E-07	Passed
	Resident Child	3.7E-08	2.7E-08							1.0E-08	7.4E-08	Passed

Location	Scenario	Pathway									Total Risk	Acceptance Criteria = 1E-5
		Inhalation	Produce	Beef	Poultry	Eggs	Fish	Milk	Pork	Soil		
RI_8 – Rural Resident	Fisher Adult	1.7E-07	2.1E-07				2.9E-07			1.2E-08	6.9E-07	Passed
	Fisher Child	7.7E-08	5.9E-08				3.8E-08			2.3E-08	2.0E-07	Passed
	Resident Adult	1.7E-07	2.1E-07							1.2E-08	4.0E-07	Passed
	Resident Child	7.7E-08	5.9E-08							2.3E-08	1.6E-07	Passed
RI_10 – Rural Resident	Fisher Adult	1.7E-07	2.1E-07				2.9E-07			1.2E-08	6.9E-07	Passed
	Fisher Child	7.6E-08	5.9E-08				3.8E-08			2.3E-08	2.0E-07	Passed
	Resident Adult	1.7E-07	2.1E-07							1.2E-08	4.0E-07	Passed
	Resident Child	7.6E-08	5.9E-08							2.3E-08	1.6E-07	Passed
RI_11 – Rural Resident	Fisher Adult	1.6E-07	2.0E-07				2.9E-07			1.1E-08	6.7E-07	Passed
	Fisher Child	7.2E-08	5.5E-08				3.8E-08			2.1E-08	1.9E-07	Passed
	Resident Adult	1.6E-07	2.0E-07							1.1E-08	3.7E-07	Passed
	Resident Child	7.2E-08	5.5E-08							2.1E-08	1.5E-07	Passed
RI_12 – Rural Resident	Fisher Adult	1.4E-07	1.8E-07				2.9E-07			1.0E-08	6.2E-07	Passed
	Fisher Child	6.0E-08	4.9E-08				3.8E-08			1.9E-08	1.7E-07	Passed
	Resident Adult	1.4E-07	1.8E-07							1.0E-08	3.2E-07	Passed
	Resident Child	6.0E-08	4.9E-08							1.9E-08	1.3E-07	Passed

Note: Blank cells indicate pathway was not evaluated for the scenario.

Table 9
IRAP Hazard Index Summary by Exposure Pathways

Location	Scenario	Pathway: Inhalation	Produce	Beef	Poultry	Eggs	Fish	Milk	Pork	Soil	HQ Total	Acceptance Criteria = 1
RI_1 – Lake Resident	Fisher Adult	0.014	0.0003				0.0001			0.000005	0.015	Passed
	Fisher Child	0.032	0.0005				0.0001			0.000042	0.032	Passed
	Resident Adult	0.014	0.0003							0.000005	0.015	Passed
	Resident Child	0.032	0.0005							0.000042	0.032	Passed
RI_2 – Lake Resident	Fisher Adult	0.012	0.0003				0.0001			0.000004	0.013	Passed
	Fisher Child	0.028	0.0004				0.0001			0.000033	0.028	Passed
	Resident Adult	0.012	0.0003							0.000004	0.013	Passed
	Resident Child	0.028	0.0004							0.000033	0.028	Passed
RI_3 – Lake Resident	Fisher Adult	0.014	0.0003				0.0001			0.000004	0.015	Passed
	Fisher Child	0.032	0.0005				0.0001			0.000042	0.032	Passed
	Resident Adult	0.014	0.0003							0.000004	0.015	Passed
	Resident Child	0.032	0.0005							0.000042	0.032	Passed
RI_4 – Riding Stable	Fisher Adult	0.004	0.0001				0.0001			0.000001	0.004	Passed
	Fisher Child	0.008	0.0001				0.0001			0.000011	0.008	Passed
	Resident Adult	0.004	0.0001							0.000001	0.004	Passed
	Resident Child	0.008	0.0001							0.000011	0.008	Passed
RI_5 – Riding Stable	Fisher Adult	0.003	0.0001				0.0001			0.000001	0.003	Passed
	Fisher Child	0.006	0.0001				0.0001			0.000008	0.006	Passed
	Resident Adult	0.003	0.0001							0.000001	0.003	Passed
	Resident Child	0.006	0.0001							0.000008	0.006	Passed
RI_6 – NE Hobby Farm	Fisher Adult	0.006	0.0001				0.0001			0.000002	0.006	Passed
	Fisher Child	0.014	0.0002				0.0001			0.000017	0.014	Passed
	Resident Adult	0.006	0.0001							0.000002	0.006	Passed
	Resident Child	0.014	0.0002							0.000017	0.014	Passed
RI_7 – Working Farm	Farmer Adult	0.005	0.0004	0.00001	0.0000	0.0000		0.00001	0.0000	0.000001	0.005	Passed
	Farmer Child	0.010	0.0006	0.00001	0.0000	0.0000		0.00002	0.0000	0.000012	0.011	Passed
	Fisher Adult	0.005	0.0001				0.0001			0.000001	0.005	Passed
	Fisher Child	0.010	0.0002				0.0001			0.000012	0.010	Passed
	Resident Adult	0.005	0.0001							0.000001	0.005	Passed
	Resident Child	0.010	0.0002							0.000012	0.010	Passed

Location	Scenario	Pathway									HQ Total	Acceptance Criteria = 1
		Inhalation	Produce	Beef	Poultry	Eggs	Fish	Milk	Pork	Soil		
RI_8 – Rural Resident	Fisher Adult	0.009	0.0002				0.0001			0.000003	0.009	Passed
	Fisher Child	0.020	0.0003				0.0001			0.000027	0.021	Passed
	Resident Adult	0.009	0.0002							0.000003	0.009	Passed
	Resident Child	0.020	0.0003							0.000027	0.021	Passed
RI_10 – Rural Resident	Fisher Adult	0.009	0.0002				0.0001			0.000003	0.009	Passed
	Fisher Child	0.020	0.0003				0.0001			0.000027	0.021	Passed
	Resident Adult	0.009	0.0002							0.000003	0.009	Passed
	Resident Child	0.020	0.0003							0.000027	0.021	Passed
RI_11 – Rural Resident	Fisher Adult	0.009	0.0002				0.0001			0.000003	0.009	Passed
	Fisher Child	0.019	0.0003				0.0001			0.000025	0.019	Passed
	Resident Adult	0.009	0.0002							0.000003	0.009	Passed
	Resident Child	0.019	0.0003							0.000025	0.019	Passed
RI_12 – Rural Resident	Fisher Adult	0.007	0.0002				0.0001			0.000002	0.008	Passed
	Fisher Child	0.017	0.0003				0.0001			0.000021	0.017	Passed
	Resident Adult	0.007	0.0002							0.000002	0.008	Passed
	Resident Child	0.017	0.0003							0.000021	0.017	Passed

Note: Blank cells indicate pathway was not evaluated for the scenario.

Table 10
Risk Summary by Fish Ingestion Pathway

Location	Risk	IRAP – Total COPCs		MPCA – Mercury only
		Adult	Child	Adult
Big Diamond Lake Fisher	Cancer Risk	2.9E-07	3.8E-08	N/A
	Hazard Quotient	0.00013	0.000085	Ambient = 8.5 – 12.2* Facility increment = 0.04 – 0.06*

***Note – Hazard quotient for ambient mercury in fish tissue concentrations and facility increments are dependant upon the size of the fish.**

List of Figures

Appendix A

AERA Forms

AERA-01: Deliverable Checklist
AERA-02: Maps Form
AERA-03: Dispersion Factor Analysis
AERA-04: Emergency Internal Combustion Engine Certification
AERA-05: Emissions

Permit Forms
(See Mesaba Energy Project Prevention of Significant Deterioration Permit to Construct Application)

GI-01: Facility Information
GI-02: Process Flow Diagram
GI-03: Facility and Stack/Vent Diagram
GI-04: Stack/Vent Information
MI-01: Building and Structure Information
CR-01: Certification

Mercury Guidance and Form
(See Mesaba Energy Project Prevention of Significant Deterioration Permit to Construct Application)

Hg-2003: Assessing the Impacts of Mercury Release to Ambient Air

Appendix B

Electronic Submittals –

Q/CHI Spreadsheet

Q/CHI Modeling Input/Output

IRAP

IRAP Dispersion Modeling Input/Output

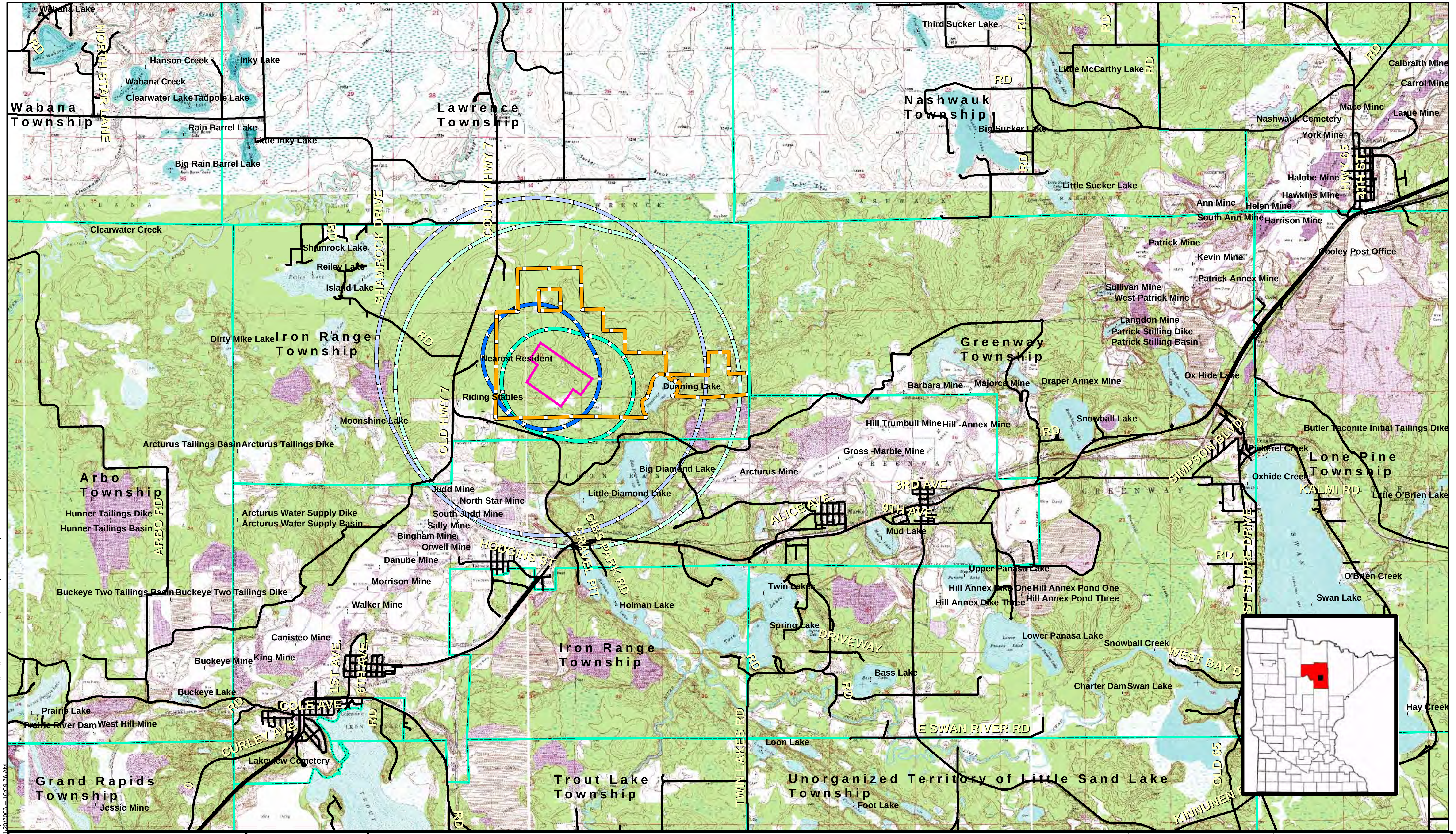
Mercury Dispersion Modeling Input/Output

MPCA Local Mercury Assessment Spreadsheet – 90th Percentile

MPCA Local Mercury Assessment Spreadsheet – Average Length

“Allfish 04 NE Lakes only” Database

The electronic Submittal CD will be included when the Prevention of Significant Deterioration Permit to Construct is submitted to the MPCA.



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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range Site

Feb. 2006

Legend

- West Range Site
- (Geographic Names
- Civil Township
- Phase 1 Stack (1 km Buffer)
- Phase 1 Stack (3 km Buffer)
- Phase 2 Stack (1 km Buffer)
- Phase 2 Stack (3 km Buffer)
- Existing Roads
- Fence Line

Source: USDA 2003 DOQQs, Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
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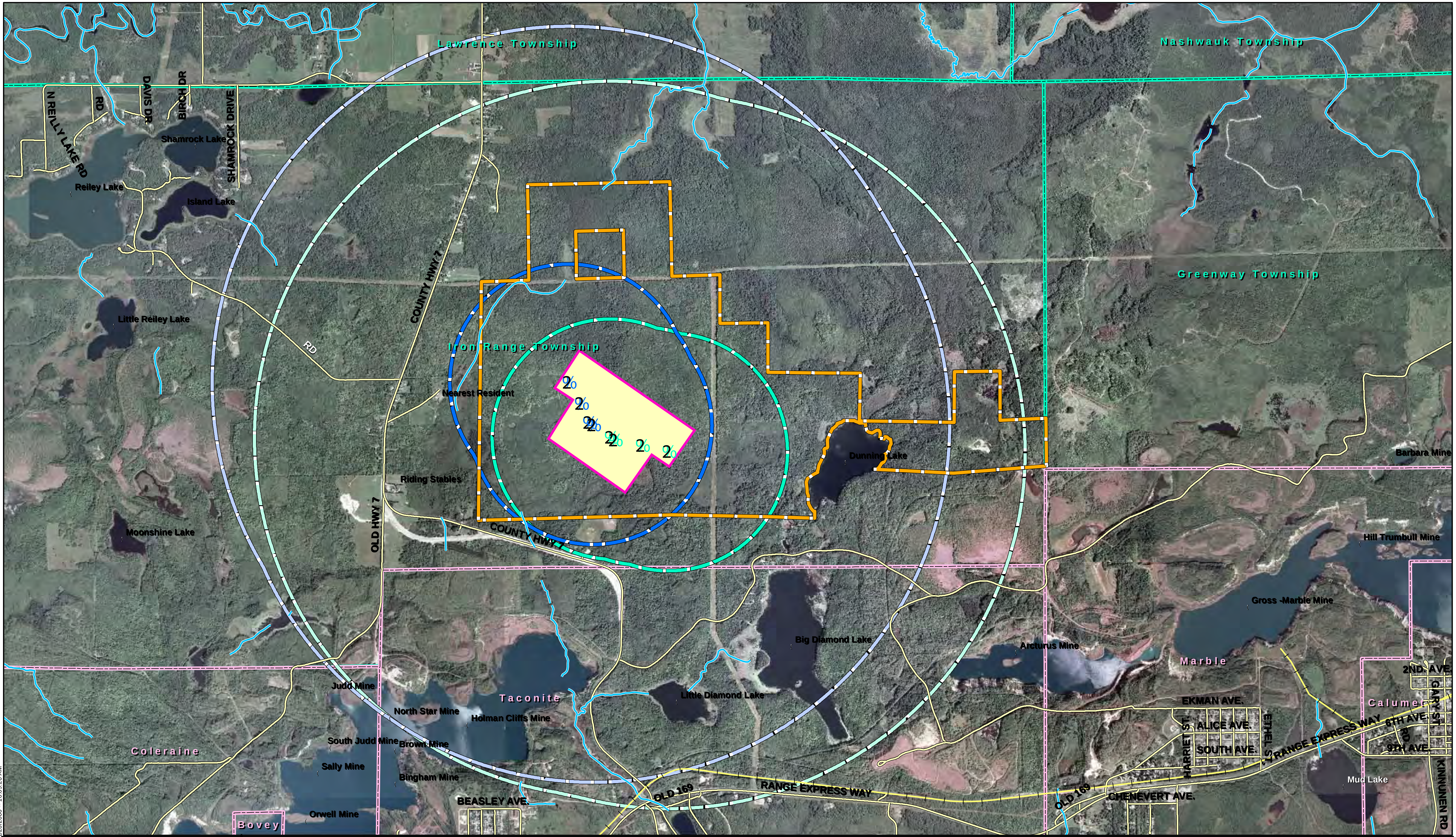
Figure 1 of 7

Site Location Map

Itasca County - South Coordinate System

4



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Excelsior Energy Inc. / Mesaba Energy Project	West Range Site / Feb. 2006	Legend	Figure 2 of 7 / Facility Plan Aerial View	Itasca County - South Coordinate System

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West Range Site

Feb. 2006

Legend

- West Range Site
- Plant Layout
- Phase 1 Stacks
- Phase 2 Stacks
- Phase 1 Stack (1 km Buffer)
- Phase 1 Stack (3 km Buffer)
- Phase 2 Stack (1 km Buffer)
- Phase 2 Stack (3 km Buffer)
- Geographic Names
- Municipal Boundaries
- Civil Township
- Streams
- Existing Roads
- Existing Railroads
- Fence Line

Source: USDA 2003 DOQQs, Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

Figure 2 of 7

Facility Plan Aerial View

Itasca County - South Coordinate System

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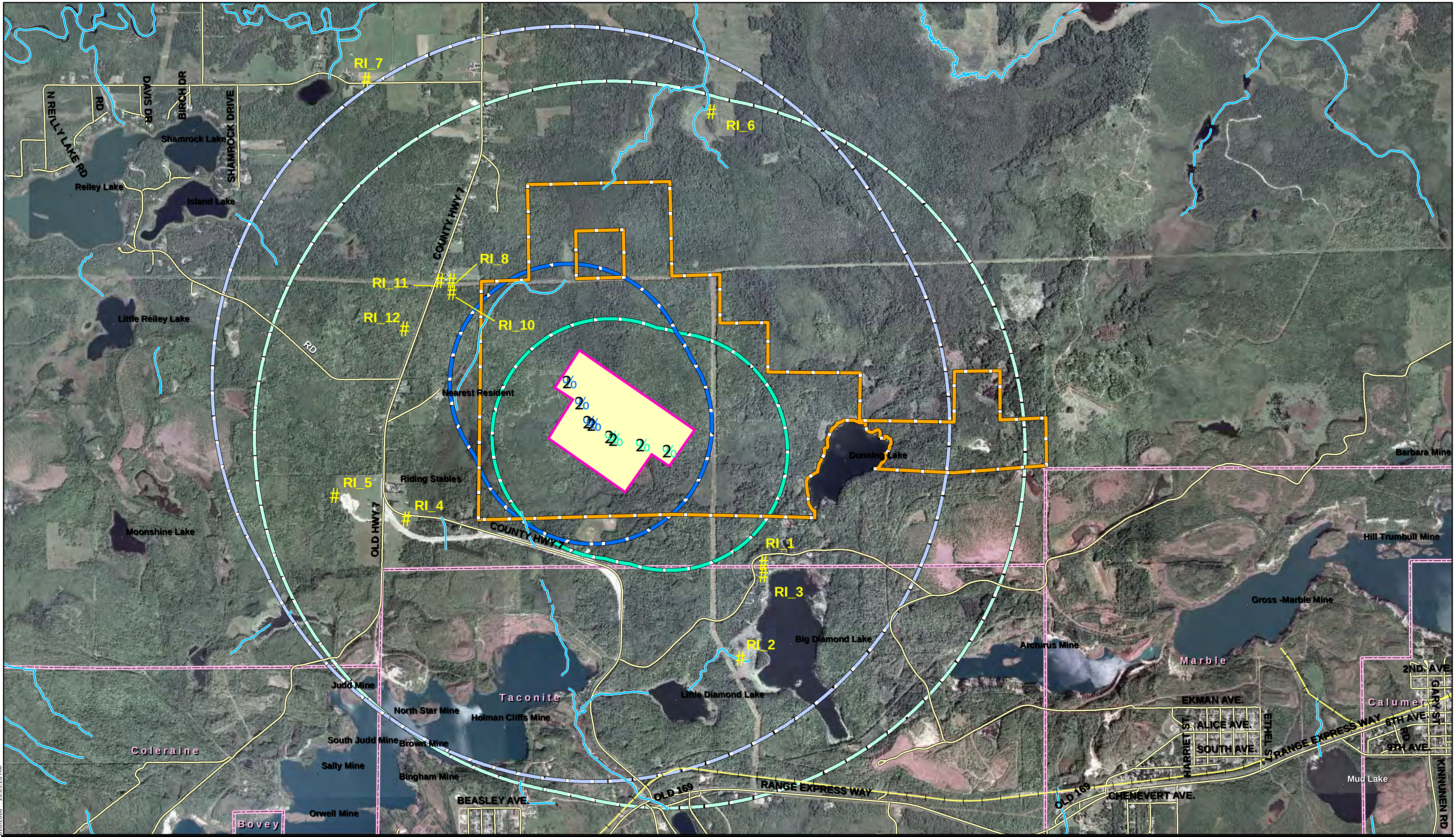

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West Range Site

Feb. 2006

Legend

- West Range Site
- Plant Layout
- Phase 1 Stacks
- Phase 2 Stacks
- Phase 1 Stack (1 km Buffer)
- Phase 1 Stack (3 km Buffer)
- Phase 2 Stack (1 km Buffer)
- Phase 2 Stack (3 km Buffer)
- Geographic Names
- Municipal Boundaries
- Civil Township
- Streams
- Existing Roads
- Existing Railroads
- Fence Line
- IRAP Receptors

Source: USDA 2003 DOQQs, Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
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Figure 3 of 7

IRAP Receptor Locations

Itasca County - South Coordinate System

4

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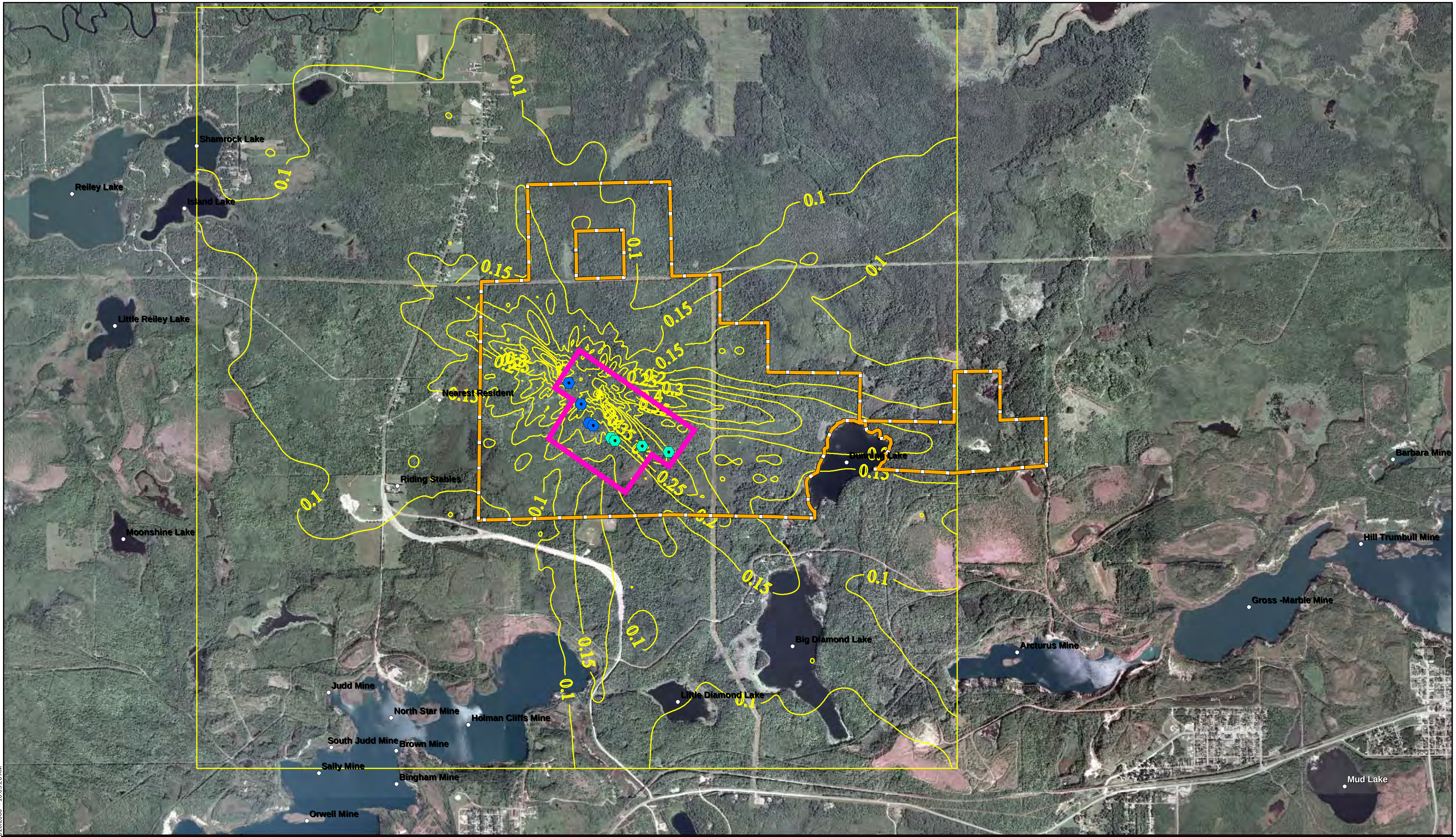

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West Range Site

Feb. 2006

Legend

- West Range Site
- Phase 1 Stacks
- Phase 2 Stacks
- Geographic Names
- Fence Line
- ERER Impact Contours
- 0.15 Acute Risk Hazard Quotient

Source: USDA 2003 DOQQs, Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

Figure 4 of 7

Acute Q/CHI Impacts

Itasca County - South Coordinate System

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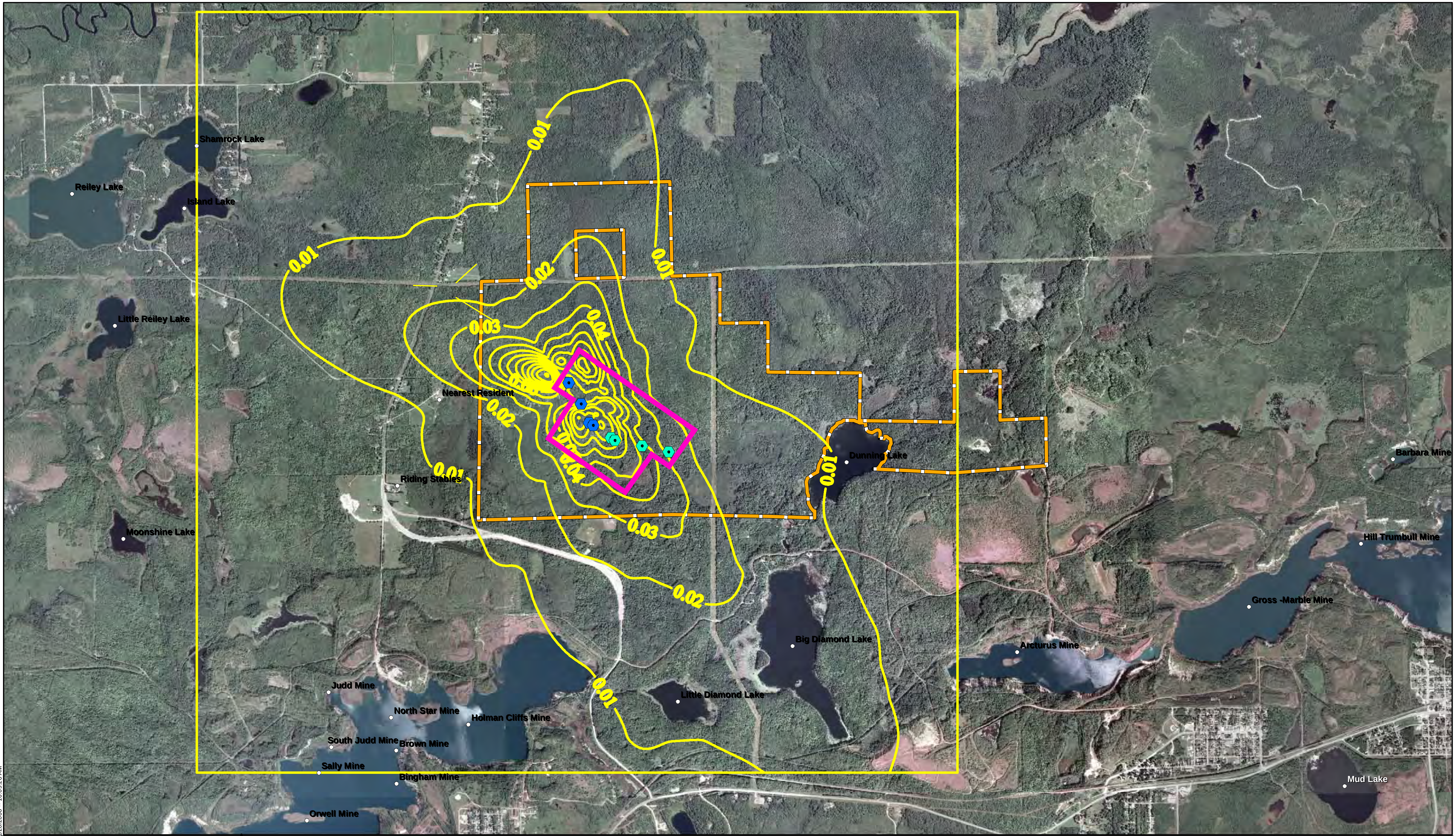

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Excelsior Energy Inc. / Mesaba Energy Project	West Range Site	Legend	Figure 5 of 7
Energy, Innovation, and Economic Development for Minnesota 11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305 Phone 952.847.2360 Fax 952.847.2373	Feb. 2006	West Range Site; Phase 1 Stacks; Phase 2 Stacks; Geographic Names; Fence Line; ERER Impact Contours; 0.03 Subchronic Risk Hazard Quotient	Sub-chronic Q/CHI Impacts

Source: USDA 2003 DOQQs, Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
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Itasca County - South Coordinate System

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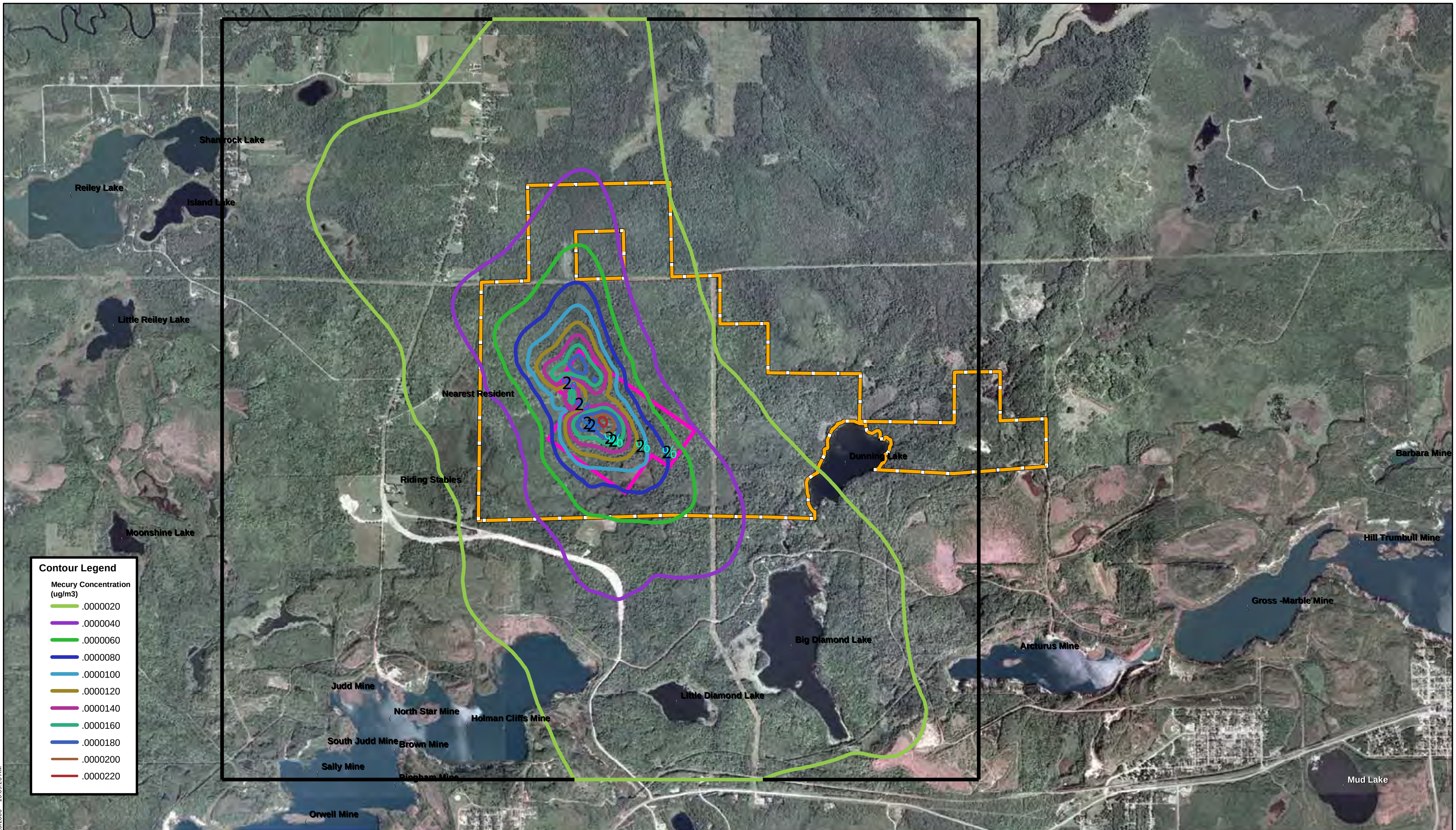

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Energy, Innovation, and Economic Development for Minnesota

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Phone 952.847.2360 Fax 952.847.2373

West Range Site

Feb. 2006

Legend

- West Range Site
- Geographic Names
- Fence Line
- Phase 1 Stacks
- Phase 2 Stacks

Source: USDA 2003 DOQQs, Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
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Figure 6 of 7

Mercury Emissions Dispersion Model Isoconcentrations

Itasca County - South Coordinate System

4

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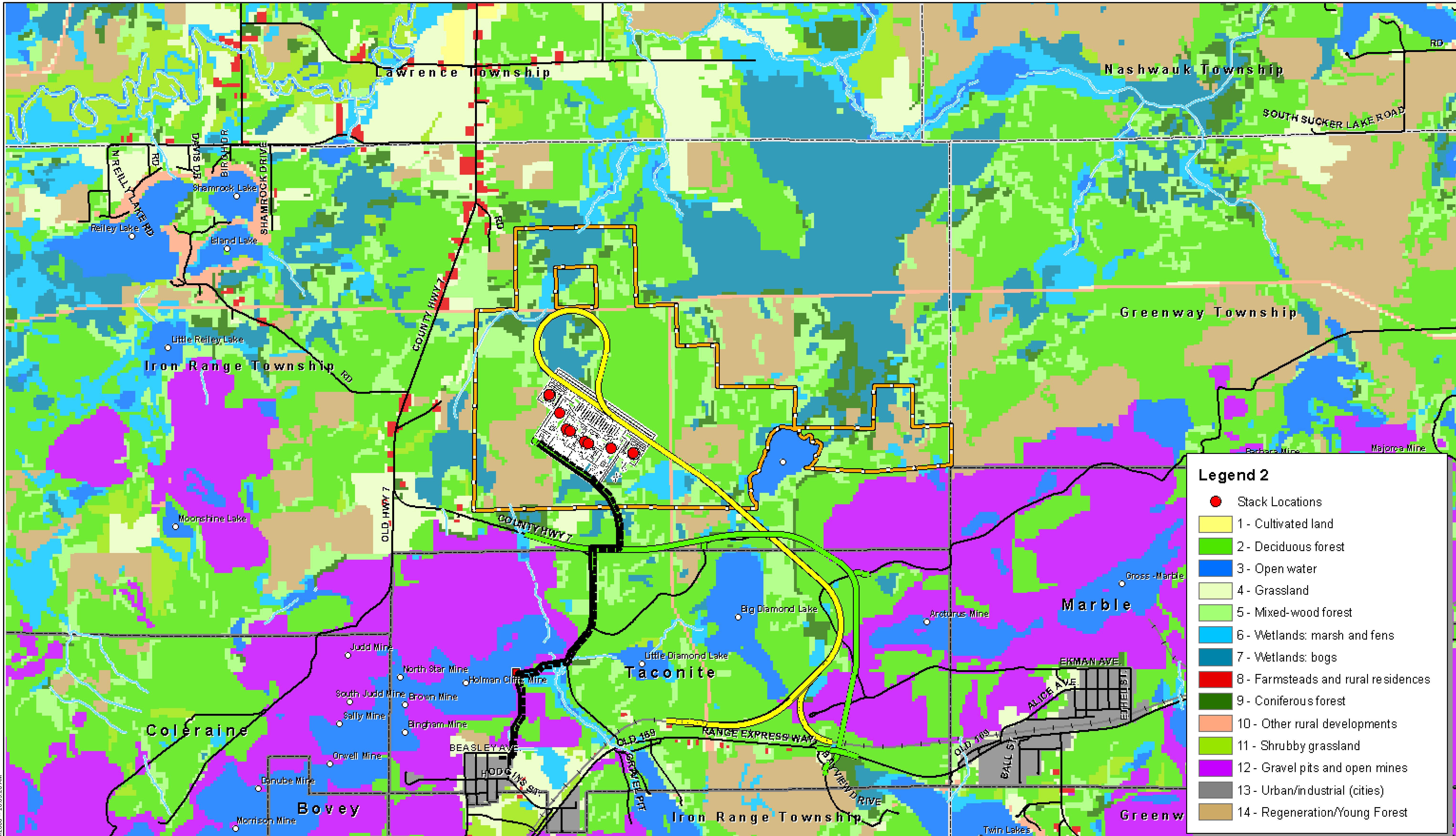

Excelsior Energy Inc. / Mesaba Energy Project	West Range Site	Legend	Figure 7 of 7	4
Energy, Innovation, and Economic Development for Minnesota. 11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305 Phone 952.847.2360 Fax 952.847.2373	Feb. 2006	Plant Layout; West Range Site; Rail Alt 2; Proposed Roads; Proposed Utilities: Sanitary Sewer, Potable Water, Sanitary Pump Station; Geographic Names; Municipal Boundaries; Civil Township; Existing Roads; Existing Railroads; Streams	Existing Land Use Land Cover	Itasca County - South Coordinate System

Source: Manitoba Remote Sensing Centre, Itasca County, MN DNR, MN DOT, USGS, Fluor, Excelsior Energy, and SEH.

APPENDIX D
Cumulative Impact Analyses –

Approach, Air (D1), Health Risk (D2), Water Resources (D3), Wetlands (D4), Wildlife Habitat (D5), Rail Traffic (D6)

(Note: Color versions of figures in this Appendix are included in the file posted at the DOE NEPA website: http://www.eh.doe.gov/nepa/docs/deis/deis.html)

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D. APPROACH TO CUMULATIVE IMPACTS ANALYSIS

D.1 PURPOSE

The U.S. Department of Energy (DOE) and Minnesota Department of Commerce (MDOC) are preparing an Environmental Impact Statement (EIS) for the Mesaba Energy Project in the Iron Range of northeastern Minnesota as announced in a Notice of Intent published in the *Federal Register* on October 5, 2005. This paper specifically and exclusively provides an intended approach for addressing cumulative environmental impacts of the Mesaba Energy Project that will satisfy the Federal National Environmental Policy Act (NEPA) requirements and the Minnesota Rules promulgated in accordance with the Minnesota Power Plant Siting Act (Statutes 116C.51 through 116C.69).

D.2 BACKGROUND

D.2.1 Federal Requirements

The President's Council on Environmental Quality (CEQ) defined "cumulative impact" in regulations implementing the procedural provisions of NEPA as follows:

> *"Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.* (40 CFR 1508.7)

In its implementing procedures for NEPA, DOE has stated its policy "…to follow the letter and spirit of NEPA; comply fully with the CEQ Regulations; and apply the NEPA review process early in the planning stages for DOE proposals" (10 CFR 1021.101). Therefore, DOE regulations require the consideration of cumulative impacts in published NEPA documents.

D.2.2 State Requirements

Minnesota Rules Chapter 4410, Parts 4410.0020 through 4410.6500 implement the environmental review procedures established by the Minnesota Environmental Policy Act (MEPA). Part 4410.1700, Subpart 7, Item B, specifically requires the responsible governmental unit (RGU) to consider the "cumulative potential effects of related or anticipated future projects." However, because it involves a large electric power generating plant (LEPGP), the Mesaba Energy Project is not subject to the requirements of Chapter 4410 (see Part 4400.1700, Subpart 12). Instead the project is subject to Minnesota Rules Chapter 4400, which does not require the consideration of cumulative impacts comparable to Part 4410.1700, Subpart 7. Therefore, no specific state requirement for consideration of cumulative impacts for the Mesaba Energy Project is indicated. However, MDOC may consider cumulative impacts in response to comments received during the state scoping process.

D.3 REASONABLY FORESEEABLE FUTURE ACTIONS

Based in part on the Scoping Environmental Assessment Worksheet (EAW) for the proposed Minnesota Steel Project near Nashwauk, Minnesota, which is subject to Minnesota Rules Part 4410.1700, Subpart 7, Item B (defined above), the following past and ongoing actions and potential projects represent "reasonably foreseeable future actions" in the vicinity of the preferred and alternative sites for the proposed Mesaba Energy Project.

D.3.1 Ongoing Actions

- National Pollutant Discharge Elimination System (NPDES) permitted discharges to the Swan River and Prairie River.
- NPDES permitted discharges to the St. Louis River watershed.
- Logging of state and county lands in the Arrowhead Region.
- Logging on private lands in the Arrowhead Region.
- Butler Taconite and predecessor natural ore operations.
- Keewatin Taconite Company and predecessor natural ore operations.
- Hibbing Taconite Company and predecessor natural ore operations.
- Cliffs-Erie and predecessor natural ore operations.
- Other taconite operations located in the Arrowhead Region.
- Minnesota Power plant operations in Itasca County (Clay Boswell), St. Louis County (Syl Laskin, M.L. Hibbard), and Lake County (Taconite Harbor).
- Public utility power plants in Hibbing and Virginia.
- UPM-Kummene Blandin Paper Mill in Grand Rapids and proposed expansion.
- Non-utility electric power plants in Arrowhead Region (Silver Bay, Alliant Energy, Lake Superior Paper).
- Planned or ongoing roadway improvements or substantial tracts of commercial/residential development that have been identified in any comprehensive planning documents, or that have been approved by the county or city.

D.3.2 Potential Future Emissions Sources

- Proposed Minnesota Steel Project – north of Nashwauk
- Proposed PolyMet Mining project – north of Hoyt Lakes
- Proposed Mesabi Nugget plant – north of Hoyt Lakes
- Proposed Laurentian Wood-Fired Generation Plants – near Hibbing and Virginia (The Laurentian Energy project is a semi-public partnership involving Hibbing Public Utilities and Virginia Public Utilities to provide renewable energy to Xcel Energy. Two wood-fired boilers for power generation, less than 25 MW each, would be built at each existing facility.)

D.4 POTENTIALLY AFFECTED RESOURCES

Although the lists of ongoing activities and potential future emissions sources in the regions of influence for the West and East Range Sites are substantial, various factors affect the potential for cumulative impacts on potential resources. For example, potential impacts on vegetation and archeological resources generally would be limited to the locations of anticipated land disturbance, which are specific to the individual projects. However, the impacts of air emissions may extend many miles beyond the individual project areas. Based on consideration of the regions of influence for impacts on environmental resources, the following resources have been identified that may be affected by cumulative impacts from the Mesaba Energy Project (including Phase II) in combination with other reasonably foreseeable actions in the Arrowhead Region. The potential cumulative impacts have been listed respectively for the preferred West Range Site and the alternative East Range Site.

D.4.1 West Range Site

- Air quality in Federally administered Class I areas (e.g., Boundary Waters Canoe Area Wilderness [BWCAW], Voyageurs National Park [VNP]) including "regional haze."
- Water quality in Federally administered Class I areas (e.g., BWCAW, VNP) due to deposition of pollutants and acidification.
- Deposition and bioaccumulation of mercury emissions in water resources/aquatic species.
- Effects of inhalation of air toxics emissions.
- Effects on water supplies, quantity, and quality in the Swan River watershed.
- Loss of wetlands in the Swan River watershed.
- Wildlife habitat loss, fragmentation, and obstruction of travel corridors in the Swan River watershed.
- Impacts of increased train traffic on regional communities between (and including) Grand Rapids and Hibbing along the US 169 corridor (noise, delays at grade crossings, obstruction of emergency vehicle access to service areas), taking into consideration the potential for disproportionate impacts on low-income populations (environmental justice).

D.4.2 East Range Site

- Air quality in Federally administered Class I areas (e.g., BWCAW, VNP) including "regional haze."
- Water quality in Federally administered Class I areas (e.g., BWCAW, VNP) due to deposition of pollutants and acidification.
- Deposition and bioaccumulation of mercury emissions in water resources/aquatic species.
- Effects of inhalation of air toxics emissions.
- Effects on water supplies, quantity, and quality in the Partridge River watershed.
- Loss of wetlands in the Partridge River watershed.
- Wildlife habitat loss, fragmentation, and obstruction of travel corridors in the Partridge River watershed.
- Impacts of increased train traffic and lengths on regional communities between (and including) Hoyt Lakes, Virginia, and Iron Junction (noise, delays at grade crossings, obstruction of emergency vehicle access to service areas), taking into consideration the potential for disproportionate impacts on low-income populations (environmental justice).

D.5 RESOURCES NOT LIKELY TO BE AFFECTED CUMULATIVELY (WITH BASIS)

Based on currently available information, there are some resources that are not expected to experience measurable cumulative impacts, although the EIS for the Mesaba Energy Project will address the specific impacts of the project on these resources in accordance with NEPA and Minnesota Rules Chapter 4400. Also, as additional information becomes available or as a result of public comments received, the need for a cumulative impact analysis for these resource areas will be reassessed. The resource areas and the basis for not including a cumulative impact analysis for these areas at this time are as follows:

- Demographics – The Mesaba Energy Project (including Phase II) is estimated to create approximately 182 permanent jobs by 2013, which, when added to other foreseeable actions in the region, would not affect population and housing substantially given that the population of Itasca County is expected to grow by 3,600 persons and St. Louis County is expected to grow by 5,400 (between 2000 and 2010).

- Community Services – As in the case of demographics, the project, when added to other foreseeable actions, is not expected to affect demands on local community services substantially, other than the impacts from the frequency and length of trains.
- Land Use – The Mesaba Energy Project and other foreseeable projects would have relatively small areas of influence in the context of land use, and the areas of influence would not be expected to overlap.
- Environmental Justice – As in the case of land use, areas of influence for environmental justice would not be expected to overlap for the respective projects.
- Traffic – As in the case of demographics and land use, the respective foreseeable projects would not contribute substantial amounts of new automobile traffic and would not utilize the same roadways and intersections concurrently.
- Geology and Soils – Potential adverse impacts on earth resources would be site-specific in context (small areas of influence) and not substantially cumulative provided that appropriate erosion and sedimentation controls are implemented in accordance with state and Federal regulations.
- Cultural Resources – As in the case of geology and soils, potential adverse impacts would be site-specific.
- Materials and Waste Management – The Mesaba Energy Project and other foreseeable projects would have relatively small areas of influence in the context of material and waste management, and the areas of influence would not be expected to overlap.
- Noise – An increase to noise levels will likely result from the increase in the number, frequency and length of trains, plant noise, and truck traffic. Cumulatively, noise levels would not affect the local areas where each project is located. Impacts from the Mesaba Energy Project and other foreseeable projects would affect relatively small areas of influence that would not be expected to overlap.
- Light and Glare – As in the case of land use, areas of influence for light and glare would not be expected to overlap for the respective projects.
- Safety and Health – There is a potential for cumulative impacts of mercury deposition and bioaccumulation to water resources and aquatic species. Otherwise, the foreseeable projects are not expected to contribute to substantial cumulative impacts on safety and health based on distance between potential radii of influence areas.
- Biological Resources – No known populations of endangered plant species have been identified that would be impacted by the Mesaba Energy Project.

D.6 RECOMMENDED CUMULATIVE ANALYSIS

D.6.1 Air Quality Impacts on Class I Areas

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request the following information from Excelsior as part of the Environmental Information Volume: air quality modeling to assess the cumulative impacts of continuous air emissions from Mesaba Energy Project emissions at the respective West and East Range Sites, taking into account projected emissions from the reasonably foreseeable projects listed in Section 3.2. The air quality model would provide an air quality analysis to determine the impacts on the national ambient air quality standards (NAAQS) and Prevention of Significant Impacts (PSD) increments associated with the construction and operation of the Mesaba Energy Project (including Phase II) combined with the proposed foreseeable projects. Excelsior would be required to obtain, from publicly available information, projected emissions from these foreseeable sources. These foreseeable sources are potentially new major sources of regulated pollutant emissions that would be required to provide the following information in order to comply with the PSD regulations:

- Background concentrations of each regulated pollutant using distant and regional sources in order to establish baseline concentrations.
- Variance in land use and topography in the proposed locations for the future projects in order to determine air dispersion of pollutants.
- Highest concentration for each pollutant under the facilities' various worst-case operating scenarios (e.g., startup, normal operations, flaring, etc.) in order to establish potential to emit.
- Identification of all best available control technologies (BACT) through a BACT analysis in order to establish mitigation measures.

For instances in which the data is not publicly available, Excelsior will provide an estimated representation of the emissions based on similar types of operations and activities. Adjustment of modeling parameters for other existing and foreseeable emission sources to account for reductions in emissions based on potential changes in regulatory controls on emissions would also be performed. Additionally, an impact analysis to assess the cumulative impact of air emissions on visibility caused by any increase in emissions from the Mesaba Energy Project combined with the reasonably foreseeable projects would be conducted, including the cumulative visibility effects on Federal Class I areas within 250 kilometers of the Mesaba Energy Project and the future projects. Overall, the cumulative impact analysis for air quality will take into consideration recommendations by the U.S. Department of Agriculture (USDA) Forest Service, Superior National Forest, as a cooperating agency for the EIS.

D.6.2 Water Quality Impacts on Class I Areas

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, deposition modeling to predict the cumulative effects of deposition on water quality in Class I areas within 250 kilometers, taking into account the existing and reasonably foreseeable emission sources. Overall, the cumulative impact analysis for water quality will take into consideration recommendations by the USDA Forest Service, Superior National Forest, and the U.S. Army Corps of Engineers (USACE), as cooperating agencies for the EIS.

D.6.3 Mercury Deposition and Bioaccumulation

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, deposition modeling to predict the cumulative effects from deposition of mercury on bioaccumulation in fish and qualitative impacts on eagles, taking into account the existing and reasonably foreseeable emission sources.

D.6.4 Air Toxics Inhalation Risk

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, air emission risk assessment modeling to predict the cumulative effects of inhalation of air toxics emissions. Emissions generated by the Mesaba Energy Project (including Phase II) in combination with future projects may potentially contribute other hazardous air pollutants such as acetophenone, 2-chloroacetophenone, hexane, hydrogen fluoride, manganese, methyl methacrylate, methyl tert butyl ether, 5-methylchrysene, sulfuric acid, cadmium, indeno(1,2,3-cd)pyrene, arsenic, and acrolein. It is possible that the atmospheric load contributed by the Mesaba Energy Project may increase the load emitted by the other potential future emission sources listed in Section 3.2. However, based on the results of the current air emission modeling effort for the Mesaba Energy Project, the contribution is anticipated to be negligible.

D.6.5 Water Supply, Quantity, and Quality

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, estimates of water withdrawals and effluent pollutant loadings, respectively in the Swan River and Partridge River watersheds, based on projections from water and sewer utilities and reasonably foreseeable projects identified in Section 3. These projections should then be added to the water withdrawals and discharges by Mesaba Energy Project (including Phase II) to predict the cumulative effects on water quantity and quality in the respective watersheds.

D.6.6 Loss of Wetlands

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request from Excelsior, as part of the Environmental Information Volume, estimates of wetland acreage that may be lost due to development of foreseeable projects identified in Section 3. Estimates of wetlands lost to development may be derived from available approved permits. In some cases the USACE lists permits that have been approved on its website and includes the acreages of wetlands impacted. In such situations, rough estimates of wetland acreage lost could be determined by coordinating with the regulatory agencies. The estimated acreage to be lost for development of foreseeable projects should then be added to the acreage expected to be lost for the respective Mesaba Energy Project (including Phase II) at preferred and alternative sites, and the cumulative acreage should be compared to the estimated total wetland acreage in respective watersheds, Swan River and Partridge River, for the West and East Range Sites. Consideration should be given to wetland acreage that would be replaced through mitigation, taking into account the comparative quality of wetlands lost/replaced and the effects of wetland fragmentation.

Overall, the cumulative impact analysis for wetlands will take into consideration recommendations by the USACE, St. Paul District, and the USDA Forest Service, Superior National Forest, as cooperating agencies for the EIS. When making recommendations about wetland impacts, a cooperating agency would be expected to provide appropriate data to support the suggested analysis, such as baseline acreage for past and present wetlands in the affected watersheds, descriptions of the functions and values of the wetlands to the respective watersheds, and the likelihood for wetland mitigation to be required within the watershed for ongoing and future projects.

D.6.7 Wildlife Habitat Loss, Fragmentation, and Obstruction of Movement

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request the following information from Excelsior as part of the Environmental Information Volume: estimates of wildlife habitat acreage that may be lost for development of foreseeable projects identified in Section 3. Overall, the cumulative impact analysis for wildlife habitat loss will take into consideration recommendations by the USDA Forest Service, Superior National Forest, as a cooperating agency for the EIS. When making recommendations about wildlife impacts, the cooperating agency would be expected to identify particular species of interest and provide estimates of habitat location (maps) and acreage in the Iron Range for use in the cumulative impact analyses. The cooperating agency would also be expected to provide estimates of locations (maps) and growth in acreage of non-native invasive and predator species in the Iron Range along with estimations of the types of human activities that have caused the influx and growth of these species.

The estimated acreage to be lost for development of foreseeable projects should be added to the acreage expected to be lost for the respective Mesaba Energy Project (including Phase II) preferred and alternative sites, and the cumulative acreage should be compared to the estimated total wildlife habitat acreage in respective watersheds for the West and East Range Sites based on general vegetated acreage and on specific estimates of habitat acreage for species of interest as provided by the cooperating agency. Consideration should be given to the cumulative effects on habitat fragmentation and the obstruction of wildlife travel corridors by combined project actions. Possible cumulative effects metrics could include increases in miles and density of roads (and trails) affecting habitat for lynx and wolf, and reductions in nest trees for eagles.

D.6.8 Impacts of Increased Frequency and Lengths of Trains

If not otherwise available in documents/reports previously generated by Excelsior, DOE and/or MDOC will request the following information from Excelsior as part of the Environmental Information Volume: estimates of rail traffic requirements, including frequencies and lengths of trains, to serve foreseeable projects identified in Section 3. The anticipated routes of trains should be projected and added to the rail traffic requirements and projected routes of trains for the Mesaba Energy Project (including Phase II) at respective West and East Range Sites. The results should be evaluated for cumulative impacts on communities along the respective rail routes between Grand Rapids and Hoyt Lakes, with particular consideration for at-grade crossings causing obstruction of emergency vehicle access to service areas, traffic delays, and increased noise. These cumulative impacts should be evaluated also for potential disproportionate effects on low-income populations in compliance with environmental justice requirements.

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APPENDIX D1
Air

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Cumulative Air Quality Impact Analysis for Class I Areas

Prepared by McVehil-Monnett Associates, Inc.
November 10, 2006

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CUMULATIVE AIR QUALITY IMPACT ANALYSES FOR CLASS I AREAS

1. Introduction

Air quality modeling was carried out to assess the cumulative impacts of existing and reasonably foreseeable future sources at Class I areas. The analyses addressed the Boundary Waters Canoe Area, Voyageurs National Park, and The Rainbow Lakes Wilderness Area. For each Class I area, model results were obtained to evaluate PSD increment consumption (for SO2, NO2, and PM10), total air quality impact and compliance with ambient air quality standards (for the same pollutants), deposition of sulfur and nitrogen compounds, and visibility impacts. A visibility assessment was not conducted for Rainbow Lakes Wilderness Area, since visibility is not considered a critical value for Rainbow Lakes.

Mercury emissions from major existing and proposed sources were included in modeling. Results for mercury consisted of predicted average concentrations of mercury in air at receptors in each Class I area. The mercury concentration results were obtained to provide a basis for estimation of potential mercury deposition in water bodies and to the land surface.

2. Modeling Methodology

All modeling utilized the CALPUFF model system, the EPA Guideline methodology for simulation of long-range transport and dispersion. The CALPUFF system includes CALMET for preparation of meteorological data, CALPUFF for calculation of pollutant concentrations, and CALPOST for processing of results to generate average concentrations, deposition rates, and visibility impacts. Options and input variables in the models were generally selected per standard guidance from the US EPA and Federal Land Managers (FLMs).

Meteorological data for the modeling represented calendar years 2002, 2003, and 2004. The basic meteorological data consisted of MM5 meteorological fields obtained from the Minnesota Pollution Control Agency (MPCA). These fields have been used by MPCA for their current regional haze and Best Available Retrofit Technology (BART) analyses. For use in the present cumulative modeling analysis, the MM5 data were augmented by regional meteorological observations from surface, upper air, and precipitation monitoring stations. The MM5 and supplemental meteorological data were processed with CALMET to produce complete meteorological input to CALPUFF for each of the three model years.

Receptors for modeling consisted of the high resolution receptor grids provided by the National Park Service for each of the three Class I areas. Model-predicted concentrations for each receptor included all modeled pollutants on an hourly basis.

Post-processing of CALPUFF results provided for each receptor:

- average concentrations for applicable time periods
  - SO2 - 3-hour, 24-hour, annual
  - NO2 - annual
  - PM10 - 24-hour and annual
- annual deposition of sulfur and nitrogen
- annual concentration of mercury
- light extinction and deciview change relative to natural background visibility

The post-processing programs summarize outputs in terms of highest and second-highest concentrations at any receptor in each Class I area, highest annual concentration in each area, and highest visibility impact for each day in each Class I area.

For visibility calculations "Method 6" of CALPOST was applied. This methodology is recommended by EPA for BART analyses and is being used by the State of Minnesota for regional haze modeling. The Method 6 calculation is an alternative to the Method 2 calculation presented in the Federal Land Managers Air Quality Workgroup (FLAG) report, and has recently been accepted by FLMs for alternative analyses. For Method 6 application in the present analyses, monthly average relative humidity values and annual average natural background concentrations were taken from EPA BART guidance for the applicable Class I areas.

Mercury emissions were modeled only for sources for which emissions data were available; these sources were electric generating plants and proposed new sources. Since the speciation of mercury is not defined for most sources, it was not possible to calculate deposition directly with the CALPUFF model. Mercury was modeled as a non-reactive pollutant with no deposition. Model results for mercury therefore represent a conservative estimate of maximum mercury concentration in the ambient air for all mercury species combined.

3.0 Pollutant Sources Modeled

Emissions data and source parameters for significant sources of SO_2, NO_x, and PM10 in northern Minnesota were assembled for the cumulative Class I modeling analyses. Data were provided by the MPCA, and other information was acquired from permit applications and regulatory submittals. Data on increment consuming sources were obtained from MPCA in 2005 for Mesaba permit application modeling; data on other sources were provided by MPCA in October 2006 in response to a specific request for cumulative Class I source information.

The modeled sources can be classified into the following groups.

(1) Existing sources that have not experienced significant permit or emissions changes since the applicable PSD baseline dates. These sources do not affect PSD increment consumption, and were assumed to continue operation in the future at their current emission rates.

(2) Existing sources that have submitted applications or received permits or permit modifications after the applicable baseline dates. For these sources, emission changes (increases or decreases) since the baseline date were modeled for the cumulative PSD increment analyses. The sources were also included in the future cumulative modeling analyses at their most recent emitting conditions.

(3) Proposed sources not yet in operation. Proposed sources were modeled, at their proposed permit limits, for both PSD increment and future total impact analyses.

(4) Existing sources that are expected to reduce emissions in the future as a result of pollution control projects required for compliance with CAIR, BART, CAMR or other regulations. The sources in this category are the Minnesota Power Boswell, Laskin, and Taconite Harbor generating stations. The planned emission reductions were taken into account for both PSD increment and future total impact modeling analyses.

The emissions data for the sources provided by the MPCA for increment analysis were based on MPCA's records of pollutant-specific baseline dates for northern Minnesota. For visibility and deposition analysis, all existing and proposed sources for which data could be acquired were included. Minor sources and those mining or other sources that emit pollutants at or near the ground were not included in the modeling inventories. Such emissions (mostly PM10) are deposited near the source, and are not expected to have significant impacts at Class I areas. Where reasonable, emissions from multiple stacks or emission points at a single facility were combined for modeling. The total emissions were represented as occurring from one or several stacks with stack parameters typical of the majority of emissions.

For most regional sources, emissions data were available only for SO2, NOx, and PM10. These were therefore the only pollutants modeled for those sources. Where SO4 and/or speciated particulate matter data were available, as for Mesaba One and Mesaba Two, the additional pollutant forms were modeled. Generally only maximum short-term potential emission rates were available. Where rates were given for several averaging times for a given source, the maximum (potential) 24-hour emissions were modeled. For Mesaba One and Mesaba Two, maximum proposed (permit limit) emission rates were modeled for each averaging time.

Table 1 shows all sources and total facility emission rates that were included in the cumulative PSD increment and total impact modeling. Blank spaces in the table indicate that data were not available for the specific pollutant and facility. The "Inc" column in Table 1 shows PSD increment consuming (positive) or expanding (negative) emissions. The "Total" column represents total reasonably foreseeable future emissions. Different emissions inventories were used for the increment modeling and for visibility/deposition modeling. The increment inventories used MPCA data on permitted PSD emissions changes after the pollutant-specific baseline dates. The visibility and deposition analyses included all existing sources for which data were available, proposed new sources, and planned emission reductions at Minnesota Power facilities.

It should be noted that essentially all emission rates in Table 1 represent potential or maximum allowable emissions. For most facilities, actual emissions on any given day are substantially less than maximum emissions allowed by permit. Thus, despite the existence of some missing data, the total emissions included in the modeling are almost certainly a very conservative estimate of actual or typical pollutant contributions to the atmosphere.

Table 1 indicates that total increment emissions are negative for SO_2 and PM10. This result, primarily due to planned emission reductions at Minnesota Power generating stations, means that available PSD increment will expand in the future at the Class I areas of interest, and that air quality can be expected to improve compared to baseline conditions. The planned addition of new sources, including Mesaba One and Mesaba Two, will contribute only a small quantity of SO_2 relative to the projected reduction in future regional emissions.

Table 2 shows a comparison of present emissions from modeled sources to projected future emissions. The totals at the bottom of Table 2 indicate that future emissions of all pollutants will be less than at present. Thus, despite the proposed addition of Mesaba One and Mesaba Two and other new facilities, future regional emissions will be substantially reduced, especially in the case of SO_2. The data in Table 2 reflect only planned emission cuts by Minnesota Power. It is likely that other emission reductions will occur at regional sources as a result of Minnesota BART and other regulatory programs; such reductions could not be quantified for this cumulative analysis.

4.0 Results and Discussion

4.1 Pollutant Concentrations in Class I Areas

Table 3 presents CALPUFF model results for Mesaba One and Mesaba Two alone, at both West Range and East Range sites. Highest predicted concentrations for any year are shown for each Class I area, pollutant, and averaging time. Impacts in the Boundary Waters Canoe Area are higher for the East Range site; at the other Class I areas, impacts are generally similar regardless of the Mesaba site.

Mesaba Project concentrations are "significant" under the PSD regulations for short-term SO_2 emissions at all Class I areas. They are marginally significant for 24-hour PM10 impacts at the Boundary Waters and Voyageurs NP. All annual average impacts are insignificant. Even in the cases of short-term SO_2 and PM10, where Mesaba impacts are significant, they are far below the allowable PSD increment.

Cumulative PSD increment model results are shown in Table 4. Cumulative increment consumption is well below PSD Class I increment limits for all pollutants and Class I areas. The effect of overall regional SO_2 emission reductions is shown for the annual SO_2 increment; negative increment consumption is indicated throughout each Class I area. The cumulative increment results demonstrate that there is little or no overall difference between Class I increment consumption for the West and East Range Mesaba sites.

Table 5 gives the results of total air quality impact modeling for all future regional emissions. Predicted total SO_2, NO_2, and PM10 impacts are far below the applicable state and federal ambient air quality standards. Though background concentrations from natural, distant, and minor sources are not included in the Table 5 results, it is clear that there will be no threat to ambient standards in any Class I area. Again, the difference between West and East Range sites is negligible.

It can be concluded from the results in Tables 3, 4, and 5 that the projected future regional emission scenario, including Mesaba One and Mesaba Two, will not pose a threat to Class I PSD increments or ambient air quality standards. Mesaba Project contributions to total cumulative impacts are small relative to total expected concentrations.

Table 1. Modeled Sources and Emission Rates (lb/day)

Source	SO_2		NO_x		PM10		Hg
	Inc.	Total	Inc.	Total	Inc.	Total	Total
Mesaba Project Phases I and II	11,294	11,294	15,916	15,916	2,417	2,417	.148
Polymet	522	522	1,354	1,354	6,592	6,592	.004
Mesabi Nugget	2,286	2,286	5,714	5,714	2,619	2,619	.206
Minnesota Steel	3,442	3,442	9,962	9,962	18,035	18,035	.222
Laurentian Energy – Hibbing	137	25,992	825	8,985	160	1,697	.040
Laurentian Energy – Virginia	137	16,438	825	6,097	160	3,192	.040
MN Power – Clay Boswell							
#1,2,3	-349,567	116,520	-40,681	13,560	-49,309	2,596	.030
#4	40,458	40,458	49,046	49,056	12,261	12,261	.053
MN Power – Laskin	0	64,763	-9,505	6,335	0	19,010	.055
MN Power – Tac Harbor	-27,200	14,646			0	10,726	.021
Potlatch – Grand Rapids	0	19	2,286	2,286	720	1077	
Blandin Paper – Grand Rapids	10,008	14,295	19	2,876	1,288	1,291	
US Steel – MN Tac			56,477	56,477			
Hibbing Taconite	18,536	18,536			345	345	
MN Power – Hibbard	10,002	10,002					
Boise Cascade	3,398	8,635	0	8,895	0	1,615	
Potlatch – Cloquet	-815	21,193					
Northshore Mining	-499	49,881	0	38,921	0	3,988	
Potlatch – Cook			1,499	3,415	1,066	1,066	
Ispat Inland Mining			0	43,201	0	20,324	
United Taconite					0	19,734	
Keewatin Taconite					0	69,068	
Total	-277,861	418,922	93,737	273,050	-3,646	197,653	0.820

Table 2. Comparison of Present and Future Emissions (lb/day).

Source	SO_2		NO_x		PM10		Hg	
	Present	Future	Present	Future	Present	Future	Present	Future
Mesaba Project Phases I and II	0	11,294	0	15,916	0	2,417	0	.148
Polymet	0	522	0	1,354	0	6,592	0	.004
Mesabi Nugget	0	2,286	0	5,714	0	2,619	0	.206
Minnesota Steel	0	3,442	0	9,962	0	18,035	0	.222
Laurentian Energy – Hibbing	25,785	25,992	8,160	8,985	1,537	1,697	.040	.040
Laurentian Energy – Virginia	16,301	16,438	5,272	6,097	3,055	3,192	.040	.040
MN Power – Clay Boswell #1,2,3 #4	 466,087 40,458	 116,520 40,458	 54,241 49,056	 13,560 49,056	 51,906 12,261	 2,596 12,261	 .311 .534	 .030 .053
MN Power – Laskin	64,763	64,763	15,840	6,335	19,010	19,010	.055	.055
MN Power – Tac Harbor	41,846	14,646			10,726	10,726	.214	.021
Potlatch – Grand Rapids	19	19	2,286	2,286	1,077	1,077		
Blandin Paper – Grand Rapids	14,295	14,295	2,876	2,876	1,291	1,291		
US Steel – MN Tac			56,477	56,477				
Hibbing Taconite	18,536	18,536			345	345		
MN Power – Hibbard	10,002	10,002						
Boise Cascade	8,635	8,635	8,895	8,895	1,615	1,615		
Potlatch – Cloquet	21,193	21,193						
Northshore Mining	49,881	49,881	38,921	38,921	3,988	3,988		
Potlatch – Cook			3,415	3,415	1,066	1,066		
Ispat Inland Mining			43,201	43,201	20,324	20,324		
United Taconite					19,734	19,734		
Keewatin Taconite					69,068	69,068		
Total	777,801	418,922	288,640	273,050	216,913	197,563	1.194	0.820

Table 3. Maximum Predicted Impact of Mesaba Project Phase I and II; Concentrations in μg/m^3.

Class I Area	Pollutant	Averaging Time	Mesaba Max West Range	Mesaba Max East Range	Significance Level	Allowable Increment	Minn/NAAQS
Boundary Waters Canoe Area	SO_2	3-hour	2.16	4.70	1.0	25.0	915
		24-hour	0.42	1.57	0.2	5.0	365
		annual	0.017	0.072	0.1	2.0	60
	NO_2	annual	0.024	0.125	0.1	2.5	100
	PM10	24-hour	0.28	0.55	0.3	8.0	150
		annual	0.014	0.040	0.2	4.0	50
Voyageurs National Park	SO_2	3-hour	1.74	2.15	1.0	25.0	915
		24-hour	0.43	0.59	0.2	5.0	365
		annual	0.018	0.018	0.1	2.0	60
	NO_2	annual	0.028	0.029	0.1	2.5	100
	PM10	24-hour	0.33	0.31	0.3	8.0	150
		annual	0.014	0.013	0.2	4.0	50
Rainbow Lakes Wilderness Area	SO_2	3-hour	0.64	1.02	1.0	25.0	1300
		24-hour	0.17	0.39	0.2	5.0	365
		annual	0.010	0.013	0.1	2.0	80
	NO_2	annual	0.012	0.018	0.1	2.5	100
	PM10	24-hour	0.14	0.29	0.3	8.0	150
		annual	0.010	0.012	0.2	4.0	50
Note: 3-hour and 24-hour average concentrations are "highest second-high" values; annual concentrations are highest values							

Table 4. Maximum Predicted PSD Increment Impact of Mesaba Project and all Existing and Foreseeable Future Sources; Concentrations in µg/m^3.

Class I Area	Pollutant	Averaging Time	Mesaba West Range	Mesaba East Range	Significance Level	Allowable Increment	Minn/NAAQS
Boundary Waters Canoe Area	SO_2	3-hour	8.31	6.83	1.0	25.0	915
		24-hour	1.48	1.80	0.2	5.0	365
		annual	-0.150	-0.124	0.1	2.0	60
	NO_2	annual	0.699	0.732	0.1	2.5	100
	PM10	24-hour	2.10	2.16	0.3	8.0	150
		annual	0.174	0.195	0.2	4.0	50
Voyageurs National Park	SO_2	3-hour	5.94	5.94	1.0	25.0	915
		24-hour	1.40	1.40	0.2	5.0	365
		annual	-0.123	-0.117	0.1	2.0	60
	NO_2	annual	0.341	0.347	0.1	2.5	100
	PM10	24-hour	1.13	1.09	0.3	8.0	150
		annual	0.060	0.062	0.2	4.0	50
Rainbow Lakes Wilderness Area	SO_2	3-hour	2.93	2.69	1.0	25.0	1300
		24-hour	0.79	0.71	0.2	5.0	365
		annual	-0.134	-0.131	0.1	2.0	80
	NO_2	annual	0.071	0.078	0.1	2.5	100
	PM10	24-hour	0.65	0.71	0.3	8.0	150
		annual	0.007	0.009	0.2	4.0	50
Note: 3-hour and 24-hour average concentrations are “highest second-high” values; annual concentrations are highest values							

Table 5. Maximum Predicted Total Impact of Mesaba Project and All Existing and Foreseeable Future Sources; Concentrations in $\mu g/m^3$

Class I Area	Pollutant	Averaging Time	Mesaba West Range	Mesaba East Range	Minn/NAAQS
Boundary Waters Canoe Area	SO_2	3-hour	35.97	37.87	915
		24-hour	11.89	12.95	365
		annual	1.646	1.704	60
	NO_2	annual	1.646	1.680	100
	PM10	24-hour	8.28	8.11	150
		annual	1.004	1.014	50
Voyageurs National Park	SO_2	3-hour	33.99	33.99	915
		24-hour	5.64	5.72	365
		annual	0.854	0.843	60
	NO_2	annual	0.753	0.758	100
	PM10	24-hour	5.62	5.46	150
		annual	0.493	0.494	50
Rainbow Lakes Wilderness Area	SO_2	3-hour	9.44	9.26	1300
		24-hour	4.72	4.60	365
		annual	0.732	0.733	80
	NO_2	annual	0.259	0.261	100
	PM10	24-hour	2.92	3.27	150
		annual	0.275	0.278	50
Note: 3-hour and 24-hour average concentrations are "highest second-high" values; annual concentrations are highest values					

4.2 Deposition of Sulfur and Nitrogen

The CALPUFF/CALPOST programs generate calculations of total annual sulfur and nitrogen deposition to the ground surface by summing contributions from all sulfur and nitrogen species (gaseous and particulate) at each Class I receptor. Results presented here are the highest annual deposition value for any receptor and any of the three years modeled, for each Class I area.

Table 6 shows deposition predictions for Mesaba One and Mesaba Two alone, and Table 7 shows maximum total cumulative deposition from all sources. The highest Mesaba deposition relative to total cumulative deposition ranges from 1.2 percent for West Range sulfur impacts in the Boundary Waters, to 9.6% for East Range nitrogen impacts in the Boundary Waters.

For National Park Service Class I areas (Voyageurs NP) no acceptable deposition values for impacts on soils or waters have been established. A "deposition analysis threshold" of 0.01 kg/ha-yr is given as a level below which no adverse impacts are expected. Model results in Tables 6 and 7 show deposition rates exceeding this significance threshold.

The US Forest Service has defined screening criteria for terrestrial and aquatic impacts of deposition. The "Green Line" criteria define levels "at which it was reasonably certain that no significant change would be observed in ecosystems that contain large numbers of sensitive components". The USFS Green Line levels for the BWCA and Rainbow Lakes are shown in Table 8. Though no similar thresholds are available for Voyageurs NP, it is reasonable to assume that ranges of the same order as those for BWCA and RLWA are appropriate. Table 8 indicates that total sulfur and nitrogen deposition, including background, will be within the acceptable Green Line ranges. It should be noted that the background values shown probably include the current impacts of some of the modeled sources. Therefore the predicted future total deposition data in Table 8 are expected to be conservative.

4.3 Visibility Impacts

The CALPUFF model results for 24-hour average concentrations of particulate pollutants that affect light extinction and visibility were processed using CALPOST Method 6 to define maximum visibility impacts of Mesaba One and Mesaba Two and all regional sources. The results are presented as the number of days per year in each Class I area on which visibility impact (the change from natural or pristine background visibility) exceeds 0.5 deciview (dv), and the 98^{th} percentile (8^{th} highest per year) deciview change. A threshold of 0.5 dv is considered the level at which visibility change is potentially perceptible to a viewer, and is considered the lowest level at which a source is considered to contribute to visibility degradation.

Table 9 shows visibility modeling results for Mesaba One and Mesaba Two alone. For the West Range site, possible visibility impacts are indicated on 17 to 22 days per year in both BWCA and VNP. The 98th percentile (highest) impact is approximately 0.7 dv in both Class I areas. This deciview change corresponds to a potential visibility reduction from 187 km to 175 km in BWCA, and from 190 km to 176 km in VNP. For the East Range site, Mesaba impacts are higher at BWCA because of proximity to that Class I area, and lower at VNP. The 98th percentile visibility impacts represent a potential reduction in clear day visibility from 187 km to 157 km at BWCA, and from 190 km to 177 km at VNP.

The CALPUFF visibility calculations are quite conservative, and tend to indicate the greatest number and magnitude of potential impacts, rather than actual observable impacts. The calculations do not explicitly account for natural visibility degradation due to fog, clouds, or precipitation. Prior analyses have shown that a large fraction of the days on which visibility impacts are predicted for northern Minnesota are days of very low temperature, fog, and/or precipitation on which natural visibility is severely limited.

Results for the cumulative visibility modeling are presented in Table 10. It is clear that visibility issues are significant for the Boundary Waters and Voyageurs Class I areas. Table 9 suggests that possible impacts could occur on two-thirds of all days, and maximum impacts could potentially be as high as 8.7 dv in BWCA, and 8.6 dv in VNP. These correspond to potential visibility reductions from 190 km in pristine conditions to 80 km under worst-case conditions.

As noted above, the visibility calculations tend to overstate the potential for impairment. It should also be recognized that the cumulative modeling assumed maximum allowable pollutant emissions from all sources on every day of the year, a situation that is unrealistic. The visibility processing did not include use of the “ammonia limiting” calculation procedure due to time constraints. This calculation is appropriate where many sources contribute to visibility impacts, and available ammonia may limit the production of nitrate particles. Use of ammonia limiting was shown in a trial run to reduce predicted visibility impacts significantly. Thus, the results presented here should be considered as a worst-case scenario rather than an estimate of actual current or future visibility conditions.

The State of Minnesota is currently addressing visibility in BWCA and VNP under the Regional Haze Rule, and will require BART emission reductions from many sources in the state. Only potential actions at Minnesota Power facilities in northern Minnesota were considered in this analysis. It is expected that many other actions, both voluntary and in response to regulatory requirements, will be taken in the near future to reduce the potential for visibility degradation.

To assess the effectiveness of Minnesota Power’s planned emission controls at Boswell, Laskin, and Tac Harbor, an additional model run was conducted to define cumulative visibility impacts in the absence of those controls. Predicted 98th percentile impacts averaged 1.0 dv higher without the projected Minnesota power emission reductions. Thus, present emissions from those sources, which will be eliminated in the near future, account for approximately 10% of current visibility impacts in BWCA and VNP. The reduced visibility impacts resulting from Minnesota Power controls exceed projected impacts of Mesaba One and Mesaba Two by a significant amount (20 to 80%) for all cases except for East Range Mesaba impacts in BWCA. For that case, Minnesota Power reductions will offset approximately 50% of projected maximum Mesaba impacts.

4.4 Mercury Concentrations

Table 11 gives results of mercury concentration modeling. The concentrations shown, in $\mu g/m^3$, represent the 3-year average highest ambient mercury concentration at any point in each Class I area. There are no accepted standards for ambient mercury levels in air. The predicted values, which estimate maximum levels of combined mercury forms, may be used with assumptions on speciation and deposition velocity to derive conservative estimates of mercury deposition.

Table 6. Deposition Modeling Results (Maximum Annual Deposition) – Mesaba Alone

Class I Area	West Range Site		East Range Site	
	S (kg/ha-yr)	N (kg/ha-yr)	S (kg/ha-yr)	N (kg/ha-yr)
Boundary Waters Canoe Area	1.379 E-2	1.120 E-2	5.618 E-2	4.873 E-2
Voyageurs National Park	1.540 E-2	1.187 E-2	1.988 E-2	1.394 E-2
Rainbow Lakes Wilderness Area	6.826 E-3	5.687 E-3	9.204 E-3	8.176 E-3

Table 7. Deposition Modeling Results (Maximum Annual Deposition) – All Future Sources

Class I Area	West Range Site		East Range Site	
	S (kg/ha-yr)	N (kg/ha-yr)	S (kg/ha-yr)	N (kg/ha-yr)
Boundary Waters Canoe Area	1.146	0.501	1.194	0.508
Voyageurs National Park	0.628	0.267	0.622	0.267
Rainbow Lakes Wilderness Area	0.453	0.124	0.453	0.128

Table 8. Comparison of Projected S and N Deposition Rates to Green Line Criteria for Impacts to Terrestrial and Aquatic Ecosystems.

Class I Area	Parameter	Background [1] (kg/ha-yr)	Maximum Cumulative Impact (kg/ha-yr)	Total (kg/ha-yr)	Green Line [2] Value (kg/ha-yr)
BWC	Terrestrial				
	Total S Depo	2.85	1.194	4.04	5-7
	Total N Depo	4.75	.508	5.26	5-8
	Aquatic				
	Total S Depo	2.85	1.194	4.04	7.5-8
	S + 20% N	3.80	1.296	5.10	9-10
RLWA	Terrestrial				
	Total S Depo	2.98	.453	3.43	5-7
	Total N Depo	5.88	.128	6.01	5-8
	Aquatic				
	Total S Depo	2.98	.453	3.43	3.5-4.5
	S + 20% N	4.16	.479	4.64	4.5-5.5

[1] Background values from Mesabi Nugget Class I Air Modeling Report. Barr Engineering Company, May 2005.

(2) Green Line Values from Screening Procedure to Evaluate Effects of Air Pollution on Eastern Region Wilderness Cited as Class I Air Quality Areas. USFS. 1991.

Table 9. Results of CALPUFF Visibility Modeling for the Mesaba Plant Alone

	2002 (Num Values >.5 DV)	2003 (Num Values >.5 DV)	2004 (Num Values >.5 DV)	2002 8th Highest DV	2003 8th Highest DV	2004 8th Highest DV
East Range Site						
Boundary Waters	129	124	115	1.989	1.655	1.578
Voyageurs	14	13	14	0.699	0.652	0.633
West Range Site						
Boundary Waters	22	22	17	0.647	0.712	0.732
Voyageurs	18	19	20	0.729	0.694	0.708

Table 10. CALPUFF Cumulative Visibility Modeling

	2002 (Num Values >.5 DV)	2003 (Num Values >.5 DV)	2004 (Num Values >.5 DV)	2002 8th Highest DV	2003 8th Highest DV	2004 8th Highest DV
East Range Site						
Boundary Waters	238	244	245	8.734	8.407	7.481
Voyageurs	190	205	189	7.156	6.354	5.713
West Range Site						
Boundary Waters	231	242	244	8.600	8.420	7.635
Voyageurs	189	206	191	6.959	6.340	5.740

Table 11. Results of Mercury Modeling; Average Concentration (μg/m^3)

Class I Area	Mesaba Project Alone		Cumulative – All Sources	
	West Range	East Range	West Range	East Range
Boundary Waters Canoe Area	4.438 E-7	14.960 E-7	6.118 E-6	7.042 E-6
Voyageurs National Park	4.580 E-7	4.489 E-7	2.825 E-6	2.919 E-6
Rainbow Lakes Wilderness Area	2.294 E-7	3.295 E-7	1.492 E-6	1.595 E-6

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APPENDIX D2
Health Risk

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6.4 Cumulative Impacts – Air Toxics Inhalation Risk

Cumulative impacts resulting from inhalation of air toxics emissions from the Mesaba Energy Project, nearby existing facilities, and other potential future emission sources listed in Section 3.2 are evaluated at both the East Range and West Range locations. In addition to the Mesaba One and Mesaba Two, future emissions from the proposed Minnesota Steel Industries (MSI) plant near the West Range location are included in this evaluation. Emission sources considered at the East Range location include the exiting Laskin Energy Center (southwest of the IGCC Power Station footprint [hereafter, the "Footprint"]), the proposed Mesabi Nugget facility (northwest of the Footprint) and the proposed PolyMet Mining (PolyMet) project (north of the Footprint). It should be stressed that only the Laskin Energy Center (Laskin) is currently in operation, in fact permits have not been issued for the MSI or PolyMet facilities to date.

Two proposed wood-fired boilers at the Laurentian Wood-Fired Generation Plants located near Virginia, Minnesota and Hibbing, Minnesota are also listed in Section 3.2 as potential future emission sources. The Laurentian facility at Hibbing would be approximately 35 kilometers (km) from the proposed West Range Mesaba facility, and the Laurentian facility at Virginia would be approximately 40 km from the proposed East Range facility. Because of the relatively large distances from the Mesaba plant, the incremental risk which the Laurentian facilities would contribute due to inhalation of air toxics would not be significant and so are not evaluated further.

<u>Approach</u>

The method to determine potential cumulative impacts to receptors from inhaled (Mesaba One and Mesaba Two) emissions generated by Mesaba One and Mesaba Two and from other potential future emission sources uses a step-wise approach.

The first, more conservative step of the process determines the maximum cancer risk and non-cancer hazard index estimated for each facility. For the most part, this information is obtained from the most current Air Emission Risk Analysis (AERA) data submitted by each facility to the MPCA. For the Laskin facility, risk was estimated based on data obtained from the MPCA Annual Emission Inventory records. The maximum risks are evaluated for acute, sub-chronic, and chronic averaging periods (as available). As a worst-case scenario, it is assumed that the risks are additive and that receptors are exposed to inhaled pollutant concentrations that pose the maximum risks, without regard for the actual location of the risk determination.

The combined maximum cancer risks and maximum hazard indices from potential nearby facilities are compared to the thresholds of concern established by the Minnesota Department of Health (MDH). The threshold of concern for pollutants producing non-carcinogenic effects is 1 and the threshold of concern for pollutants producing carcinogenic effects is 1 in 100,000 or 1×10^{-5}.

If the combined cancer risks and hazard indices are below the MDH threshold values, then it is assumed that the cumulative worst-case risks are at acceptable levels and will not cause appreciable cumulative impacts.

If the combined risks or hazard indices are greater than the MDH threshold values, then the second, more refined, step in the process is conducted. Based on MPCA guidance, screening-level risk is assessed within a buffer zone of 3 km for facilities with stack heights less than 100 meter (m) and within a buffer zone of 10 km for facilities with stack heights greater than 100 m. In the second step, the calculated risks at receptor locations closest to the buffer zone portions common to each of the facilities (overlap areas) being assessed are added and compared to MDH threshold values. The facility buffer zones for the West Range can be seen on Figure 1 and for the East Range on Figure 2.

Because several of the facilities are not currently in operation, a third step of evaluation is conducted on the East Range to evaluate the cumulative effects of Mesaba One and Mesaba Two in combination with each of the Mesabi Nugget and PolyMet facilities separately. The purpose of this evaluation step is to evaluate the contribution of each facility in the event that either the Mesabi Nugget or PolyMet plants do not become operational.

Overview

Information regarding maximum inhalation cancer risks and hazard indices is obtained from the following sources:

- Mesaba Energy Project AERA, and related support files submitted to MPCA dated June 2006
- MSI Human Health Screening-Level Risk Assessment, dated May 2006
- PolyMet Mining, Inc. AERA, dated May 2005
- Mesabi Nugget, LLC, MPCA AERA Internal Form-03, dated April 7, 3005
- MPCA Annual Emissions Inventory record for year 2002, Laskin Energy Center

The MPCA AERA Internal Form-03 for Mesabi Nugget presented two sets of air toxics risk data. The “near field” data, representing the area at or between the Mesabi Nugget property boundary and the Cliffs Erie property boundary, is used for this evaluation. This data set contains the Mesabi Nugget maximum risk experienced by a receptor in the vicinity of Mesaba Energy and PolyMet.

In order to define the screening-level buffer zone areas in common to two or more facilities, SEH obtained stack height and location information for each facility. All facility stack heights, with the exception of MSI, are less than 100 m. At least one MSI stack height is listed at 100 m. Based on this information, or on files obtained from the facility or their consultant regarding buffer zone placement, SEH mapped the buffer zone boundaries. Mesaba One, Mesaba Two, Mesabi Nugget, Laskin, and PolyMet have buffer zones of 3 km. The MSI facility has a buffer zone of 10 km. Because the exact location of the PolyMet stacks are not known, the 3 km buffer zone for this facility is drawn from the approximate plant area boundary. The facility buffer zones for the West Range can be seen on Figure 1, Area A and for the East Range on Figure 2, Areas B and C.

As will be shown in subsequent sections, the maximum inhalation risks posed by two of the proposed facilities near the East Range Mesaba plant are at the MDH threshold values. Additional risk contributed by any other facility will cause the MDH threshold values to be exceeded. The contribution of the East Range Mesaba facility to inhalation risk is between 0.5 and 22 percent in all Step 2 and Step 3 evaluations.

It is also worthy to note that hazard indices and cancer risks are additive if a receptor experiences the emissions from all sources simultaneously. That is, emissions must coincide both spatially and temporally. It is highly unlikely that meteorological conditions would have maximum pollutant concentrations from two or more facilities located at the same time and at the same place. Meteorological conditions that would cause maximum concentrations from one facility at a specific receptor location would cause reduced concentrations at that same location from other facilities. In addition, as discussed below, while refined risk values are used for the Mesaba plant in Step 2 and Step 3 evaluations, maximum risk results must be used for both the Mesabi Nugget and PolyMet projects regardless of the geographical location of the overlap areas. Evaluation of cumulative impacts under these conditions results in greatly overestimated results.

West Range – Step 1 Results

The facilities on the West Range are Mesaba One, Mesaba Two, and MSI. The general area potentially impacted by both facilities can be seen on Figure 1, indicated by Area A. These results are summarized in Table 1.

Table 1
West Range Cumulative Risk – Step 1

Facility	Potential Inhalation Hazard Index/Averaging Period*			Potential Inhalation Cancer Risk*
	Acute (1-hour)	Sub-Chronic (1-month)	Chronic (annual)	
Mesaba	0.5	0.1	0.03	3×10^{-07}
MSI	0.7	Not conducted	0.2	6×10^{-07}
Potential Cumulative Impacts	1**	N/A	0.2	9×10^{-07}
MDH Threshold Values	1	1	1	1×10^{-05}
Cumulative Impact Decision	**Minimal Impacts**	**N/A**	**No Impacts**	**No Impacts**

*Hazard Index and Cancer Risks are reported to one significant figure only as stated in the U.S. EPA's Risk Assessment Guidance for Superfund (RAGS), Volume I – Human Health Evaluation Manual (Part A).

**The sum of the hazard indices is actually greater than one. However, because the hazard index is reported to one significant figure and that value is at the MDH threshold, the cumulative impacts decision is stated as minimal rather than exceeding the limit or having no impacts.

The combined acute hazard indices from both facilities result in a maximum acute cumulative hazard index of 1. A sub-chronic hazard index is not calculated for the MSI facility in the MSI Human Health Screening-Level Risk Assessment; therefore, a cumulative sub-chronic hazard index could not be evaluated. The maximum sub-chronic contribution from Mesaba One and Mesaba Two is 0.1, well below the threshold value of concern established by the MDH. The combined chronic hazard indices from both facilities result in a maximum cumulative hazard index of 0.2.

The combined cancer risks from both facilities results in a maximum cumulative cancer risk of 9×10^{-07}.

Based on the most current risk analyses performed for the Mesaba and MSI facilities, maximum acute and chronic hazard indices and cancer risk will not exceed MDH threshold values. A Step 2 evaluation is not required for these two facilities.

East Range – Step 1 Results

Four facilities are in relatively close proximity near the proposed East Range Mesaba site. Three of those facilities, Mesaba, Mesabi Nugget, and PolyMet are close enough geographically to result in the overlap of all three buffer zones. It is assumed that emissions from all three facilities could potentially impact a receptor in the overlap area. Likewise, the buffer zones for the Mesaba and Laskin facilities overlap. The Laskin buffer zone, however, does not overlap those of either Mesabi Nugget or PolyMet. The general area potentially impacted by Mesaba, Mesabi Nugget, and PolyMet can be seen on Figure 2, indicated by Area B. The general area potentially impacted by Mesaba and Laskin is indicated by Area C.

Mesaba One/Mesaba Two and Laskin Energy Center

Although the Laskin facility has been in operation for some time, an AERA is not available. SEH obtained the most recent air toxics data from the MPCA Annual Emissions Inventory database. The most recent data available was for 2002. Using the Laskin emission source information, SEH performed dispersion modeling of Laskin emissions at a 1 g/sec dispersion rate. Receptors having the maximum dispersion concentrations were identified. The 2002 annual pollutant emission rates and dispersion modeling factors were entered into the most recent version of the MPCA Risk Assessment Screening Spreadsheet (RASS) spreadsheet (dated August, 29, 2006). Inhalation cancer risk and non-cancer hazard indices were then generated by RASS. The Step 1 evaluation of the Mesaba and Laskin facilities is summarized in Table 2.

Table 2
East Range Mesaba/Laskin Cumulative Risk – Step 1

Facility	Potential Inhalation Hazard Index/Averaging Period*			Potential Inhalation Cancer Risk
	Acute (1-hour)	Sub-Chronic (1-month)	Chronic (annual)	
Mesaba	0.5	0.1	0.03	$3 X 10^{-07}$
Laskin Energy Center	0.2	0.01	0.04	$2 X 10^{-06}$
Potential Cumulative Impacts	0.7	0.1	0.07	$2 X 10^{-06}$
MDH Guideline Values	1	1	1	$1 X 10^{-05}$
Cumulative Impact Decision	**No Impacts**	**No Impacts**	**No Impacts**	**No Impacts**

*Hazard Index and Cancer Risks are reported to one significant figure only as stated in the U.S. EPA's Risk Assessment Guidance for Superfund (RAGS), Volume I – Human Health Evaluation Manual (Part A).

The combined acute hazard indices from the proposed Mesaba and Laskin facilities result in a maximum acute cumulative hazard index of 0.7. The combined sub-chronic hazard indices from the two facilities result in a maximum cumulative hazard index of 0.1. The combined chronic hazard indices from both facilities result in a maximum cumulative hazard index of 0.07.

The combined cancer risks from both facilities results in a maximum cumulative cancer risk of $2 X 10^{-06}$.

Based on the most current data and risk analyses performed for the Mesaba and Laskin facilities, maximum acute, sub-chronic and chronic hazard indices, and cancer risk will not exceed MDH threshold values. A Step 2 evaluation is not required for these two facilities.

Mesaba One/Mesaba Two, Mesabi Nugget, and PolyMet
Because the buffer zones of the Mesaba, Mesabi Nugget and PolyMet facilities overlap, a combined evaluation of all three facilities is conducted. The Step 1 evaluation of the Mesaba, Mesabi Nugget and PolyMet facilities is summarized in Table 3. The area potentially impacted by these facilities is shown on Figure 2 as Area B.

Table 3
East Range Mesaba/Mesabi Nugget/PolyMet
Cumulative Risk – Step 1

Facility	Potential Inhalation Hazard Index/Averaging Period*			Potential Inhalation Cancer Risk
	Acute (1-hour)	Sub-Chronic (1-month)	Chronic (annual)	
Mesaba	0.5	0.1	0.03	3×10^{-07}
Mesabi Nugget	1	0.04	0.9	7×10^{-06}
PolyMet	0.7	0.005	1	1×10^{-05}
Potential Cumulative Impacts	2	0.1	2	2×10^{-05}
MDH Guideline Values	1	1	1	1×10^{-05}
Cumulative Impact Decision	**Potential Impacts**	**No Impacts**	**Potential Impacts**	**Potential Impacts**

*Hazard Index and Cancer Risks are reported to one significant figure only as stated in the U.S. EPA's Risk Assessment Guidance for Superfund (RAGS), Volume I – Human Health Evaluation Manual (Part A).

The combined acute hazard indices from all three facilities result in a maximum cumulative hazard index of 2. The combined sub-chronic hazard indices from the three facilities result in a maximum cumulative hazard index of 0.1. The combined chronic hazard indices from all three facilities result in a maximum cumulative hazard index of 2.

The combined cancer risks from all three facilities result in a maximum cumulative cancer risk of 2×10^{-05}.

Based on the most current risk analyses performed for the Mesaba, PolyMet, and Mesabi Nugget facilities, maximum acute and chronic hazard indices and cancer risk exceed the MDH threshold values. A Step 2 evaluation will be conducted for these averaging periods. The maximum sub-chronic hazard index does not exceed MDH threshold values and will not be carried forth into Step 2 of this evaluation.

East Range – Step 2 Results

In Step 2 of the cumulative impacts approach, cancer risk and hazard indices calculated at receptors in specific areas that will most likely be exposed to emissions from more than one facility (rather than maximum risk values used in Step 1) are evaluated.

According to information in the PolyMet and Mesabi Nugget AERAs, air emission risk analyses for both of these facilities are calculated using the MPCA RASS. In this method, a maximum total air concentration from all sources is entered for each pollutant. The RASS spreadsheet does not include the geographical location of the entered concentrations. Geographical refinement of risk using RASS requires entering the concentrations of pollutants at specific receptor locations, rather than the maximum values. Based on the information available to SEH from the MPCA to date, refinement of the maximum hazard index and cancer risk cannot be conducted for either the PolyMet facility or the Mesabi Nugget facility. Therefore, maximum hazard index/cancer risk values must be used for these two facilities in all evaluation steps.

The AERA for Mesaba One and Mesaba Two calculates health indices using the Q/CHI method (Q = emission rate; CHI = Critical Health Index) for acute and sub-chronic time periods. The Industrial Risk Assessment Program (IRAP) is used to calculate cancer risk and chronic hazard indices. IRAP incorporates algorithms in accordance with the U.S. EPA Human Health Risk Assessment Protocol (HHRAP). Both of these methods allow for the geographical examination of inhalation hazard index/cancer risk. In Step 2, hazard index/cancer risk calculated in or near the overlap of facility screening-level buffer zones are used for Mesaba One and Mesaba Two. The results from the East Range Step 2 evaluation are summarized in Table 4.

Table 4
East Range Mesaba/Mesabi Nugget/PolyMet
Cumulative Risk – Step 2

Facility	Potential Inhalation Hazard Index/Averaging*		Potential Inhalation Cancer Risk
	Acute (1-hour)	Chronic (annual)	
Mesaba	0.2	0.01	$1 X 10^{-07}$
Mesabi Nugget	1	0.9	$7 X 10^{-06}$
PolyMet	0.7	1	$1 X 10^{-05}$
Potential Cumulative Impacts – all facilities	2	2	$2 X 10^{-05}$
MDH Guideline Values	1	1	$1 X 10^{-05}$
Cumulative Impact Decision – all facilities	**Potential Impacts**	**Potential Impacts**	**Potential Impacts**
Mesaba Contribution	**10%**	**0.5%**	**1%**

*Hazard Index and Cancer Risks are reported to one significant figure only as stated in the U.S. EPA's Risk Assessment Guidance for Superfund (RAGS), Volume I – Human Health Evaluation Manual (Part A).

The combined acute hazard indices from all three facilities result in a cumulative hazard index of 2. The combined chronic hazard indices from all three facilities result in a cumulative hazard index of 2. The combined cancer risks from all three facilities result in a cumulative cancer risk of $2 X 10^{-05}$.

Based on the most current risk analyses, taking into account geographical location of risk for Mesaba One and Mesaba Two only, acute and chronic hazard indices and cancer risk exceed the MDH threshold values. The acute risk drivers in this scenario are the Mesabi

Nugget facility (HI = 1) and PolyMet facility (HI = 0.7.) The chronic non-cancer risk drivers are also the Mesabi Nugget facility (HI = 0.9) and PolyMet facility (HI = 1) The cancer risk driver is the PolyMet facility (1E-05.)

Because the inhalation risks posed by the risk drivers are at or near the MDH threshold values, additional risk from any facility will cause an exceedance of the threshold values. The contribution of Mesaba One and Mesaba Two to inhalation risk is 10 percent or less in all three cases.

The cumulative risks are relatively small, particularly considering the fact that no geographical refinement of the risks could be applied for two of the three facilities. In addition, cumulative impacts from all three facilities occur in a very limited area (Area B) Land use in this area is primarily mining. The conservative assumptions used to derive the maximum risks (i.e, those of a farmer or residential scenario) are not appropriate for a refined inhalation risk determination in this area (occupational scenario) and greatly overestimate cumulative impact.

East Range – Step 3 Results

Because the geographical buffer zone overlap of all three facilities on the East Range is so small and because none of the facilities being evaluated are operational at this time, it is prudent to evaluate the cumulative effects from each separate facility combined with Mesaba One and Mesaba Two. The results from the East Range Mesaba Project/Mesabi Nugget Step 3 evaluation are summarized in Table 5 and the results from the Mesaba Project/PolyMet Step 3 evaluation are summarized in Table 6.

Table 5
East Range Mesaba/Mesabi Nugget
Cumulative Risk – Step 3

Facility	Potential Inhalation Hazard Index/Averaging*		Potential Inhalation Cancer Risk
	Acute (1-hour)	Chronic (annual)	
Mesaba	0.2	0.01	$1 X 10^{-07}$
Mesabi Nugget	1	0.9	$7 X 10^{-06}$
Potential Cumulative Impacts – Mesaba/Mesabi Nugget	1**	0.9	$7X 10^{-06}$
MDH Guideline Values	1	1	$1 X 10^{-05}$
Cumulative Impact Decision – all facilities	**Minimal Impacts**	**No Impacts**	**No Impacts**
Mesaba Contribution	**20%**	**1%**	**1%**

*Hazard Index and Cancer Risks are reported to one significant figure only as stated in the U.S. EPA's Risk Assessment Guidance for Superfund (RAGS), Volume I – Human Health Evaluation Manual (Part A).

**The sum of the hazard indices is actually greater than one. However, because the hazard index is reported to one significant figure and that value is at the MDH threshold, the cumulative impacts decision is stated as minimal rather than exceeding the limit or having no impacts.

The combined acute hazard indices from the Mesaba and Mesabi Nugget facilities result in an acute cumulative hazard index of 1. The combined chronic hazard indices from both facilities result in a cumulative hazard index of 0.9. The combined cancer risks from both facilities result in a cumulative cancer risk of 7 X 10^{-06}. The contribution of Mesaba One and Mesaba Two to the acute inhalation risk is 20 percent and 1 percent for both chronic non-cancer and cancer risk.

Table 6
East Range Mesaba/PolyMet
Cumulative Risk – Step 3

Facility	**Potential Inhalation Hazard Index/Averaging***		**Potential Inhalation Cancer Risk**
	Acute (1-hour)	**Chronic (annual)**	
Mesaba	0.2	0.01	1 X 10^{-07}
PolyMet	0.7	1	1 X 10^{-05}
Potential Cumulative Impacts – Mesaba/PolyMet	0.9	1**	1 X 10^{-05}**
MDH Guideline Values	1	1	1 X 10^{-05}
Cumulative Impact Decision – all facilities	**No Impacts**	**Minimal Impacts**	**Minimal Impacts**
Mesaba Contribution	**22%**	**1%**	**1%**

*Hazard Index and Cancer Risks are reported to one significant figure only as stated in the U.S. EPA's Risk Assessment Guidance for Superfund (RAGS), Volume I – Human Health Evaluation Manual (Part A).
**The sum of the hazard indices and cancer risks are actually greater than the MDH values. However, because hazard index and cancer risk are reported to one significant figure and that value is at the MDH threshold, the cumulative impacts decision is stated as minimal rather than exceeding the limit or having no impacts.

The combined acute hazard indices from the Mesaba and PolyMet facilities result in a cumulative hazard index of 0.9. The combined chronic hazard indices from both facilities result in a cumulative hazard index of 1. The combined cancer risks from both facilities result in a cumulative cancer risk of 1 X 10^{-05}. The contribution of Mesaba One and Mesaba Two to the acute inhalation risk is 22 percent and 1 percent for both chronic non-cancer and cancer risk.

Taking into account geographical location of risk for Mesaba One and Mesaba Two only, acute, sub-chronic, and chronic hazard indices and cancer risk will not exceed MDH threshold values for the Mesaba plant combined with either the Mesabi Nugget or PolyMet facilities.

<u>Conclusions</u>
Cumulative impacts due to inhalation of air toxics from reasonably foreseeable projects in the vicinity of Mesaba One/Mesaba Two have been examined using conservative assumptions and are found to be at or below levels of concern set by the Minnesota Department of Health.

Data Refinements

To the extent better data become available for Mesaba One/Mesaba Two, Laskin Energy Center, Mesabi Nugget, PolyMet Mining, and MSI projects, subsequent revisions of this Air Toxics Inhalation Risk analysis will be revisited to determine whether the above conclusions are maintained. In general, risks associated with such emissions are found to decrease as the analysis of air toxic impacts become more refined.

APPENDIX D3
Water Resources

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Cumulative Water Resources Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

SEH No. EXENR0502.03

November 2006

Prepared for Excelsior Energy
Cumulative Water Resources Effect Assessment
Mesaba Energy Project

SEH No. EXENR0502.03

Prepared for:
Excelsior Energy

November 2006

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West Range

I. Identification and description of affected watershed: Swan River.

The Swan River Watershed is located in Itasca and St. Louis Counties in Northern Minnesota and is part of the Upper Mississippi River Watershed Basin. Figure 1 shows the Swan River Watershed to a point immediately upstream of the confluence with Trout Creek, the location of Mesaba, and the location of the proposed Minnesota Steel Project.

Human influences related to logging, mining, ditch construction, agricultural activity, dam construction, flow diversion / withdrawal, development of transportation systems, and community development activities have impacted streams in the area, including the Swan River.

The contributing watershed area of the Swan River has been altered primarily through several past mining actions. The land use / cover type was modified significantly through the construction of mining related facilities and, in turn, this alteration has modified the quantity and timing of surficial runoff to the Swan River.

Impacts resulting from the Minnesota Steel Industries ("MSI") project are hydrologically upstream on the Swan River from the Mesaba Energy Project. The Swan River watershed study area was selected at a point sufficiently downstream of the Mesaba's impacts in order to encompass the cumulative impacts within the Swan River Watershed with respect to both the MSI project and Mesaba.

II. Identify existing usage and quality:

Existing Water Appropriation permits from surface waters in the Swan River watershed are shown in **Table 1**.

Table 1 - Existing Water Appropriation Permits for Surface Waters Near the West Range Site within the Swan River Watershed

		Permitted		Reported Pumping (Million Gallons)				
Permittee	**Resource**	**GPM**	**MG/Y**	**2000**	**2001**	**2002**	**2003**	**2004**
MDNR	Hill-Annex Tailing Basin	4500	500	ND	ND	ND	ND	70.3
MDNR	Hill-Annex Mine	7000	3416	ND	ND	621.1	1550.3	1374
Swan Lake Country Club	Oxhide Creek	540	10	4.6	8.5	9.2	8.4	5.8
City of Coleraine	Trout Lake	400	41	37	19.7	19.7	12.1	11.9

Currently, the Swan River is impaired for fecal coliform, dissolved oxygen, and mercury. **Table 18-2** from the **MSI Environmental Assessment Worksheet ("EAW")** includes existing water quality information.

III. Effects from new sources/appropriations

a. Quantity:

i. Mesaba:

The Swan River is affected to the degree that Mesaba One and Mesaba Two will pump water out of the Hill-Annex Mine Pit ("HAMP") complex to the CMP instead of the DNR's current practice of pumping water from the HAMP complex to Upper Panasa Lake, which discharges to Lower Panasa Lake and ultimately the Swan River. The DNR's current NPDES permit allows for annual transfers of water from the HAMP complex at an average pumping rate of 6,500 gpm. However, because of the costs associated with pumping such volumes, seasonal freeze-ups, and pump capacity, the HAMP complex is generally dewatered for 6 months per year at a rate of 6,200 gpm (which is the pump capacity). Therefore, such flows would represent the maximum loss of flow to the Swan River resulting from Mesaba's operations. This maximum would only occur during peak process water demand periods with both Mesaba Phase I and II in operation. Smaller quantities of water are likely to be diverted from the HAMP complex under Phase I if the Canisteo Pit yields more water than estimated and/or if above normal precipitation occurs. Excelsior's regulatory documents (the Joint Application, Environmental Supplement, NPDES Permit Application, and the Water Appropriation Permit Application contain detailed descriptions of Mesaba One and Mesaba Two water uses and the timing of their appropriation. As the Canisteo Pit has no discharge, water appropriated from it will not affect the Swan River or any other streams.

The 9 mile portion of the Swan River between the discharge of the Panasa Lakes and Holman Lake would experience loss of water from the Panasa Lakes discharge point and would not see an increase in flow until the Holman Lake discharge point.

Appropriations from the CMP will be partially offset by discharges of cooling tower blowdown from Mesaba into Holman Lake. Excelsior's NPDES permit application indicates that such discharges to Holman Lake would begin at 800 gpm and decrease to 400 gpm over 30 years. The remainder of cooling tower blowdown would be discharged to the CMP, which does not drain to the Swan River. The exact discharge to each water body will be determined as part of finalizing NPDES permit conditions. See **Table 2** below for a summary of total process water discharges.

Excelsior intends to work within guidelines published by the Minnesota Pollution Control Agency ("MPCA") to establish Total Maximum Daily Load limits to govern discharges of cooling tower blowdown to Holman Lake (*see* "TMDL Work Plan Guidance" issued by MPCA in January 2006 [http://www.pca.state.mn.us/publications/wq-iw1-01.pdf]). This intent will be discussed with the MPCA as part of finalizing NPDES permit conditions for Mesaba One and Mesaba Two. The TMDL process will play a critical role in minimizing cumulative impacts within watersheds affected by the Mesaba Energy Project.

Some withdrawals are possible for Phase I and II from the Lind Mine Pit and the Prairie River (into which the Lind drains). However, MSI will not reduce flows to that watershed and no other projects have been identified to have cumulative impacts to that river, so no further analysis of cumulative impacts on the Prairie River is necessary.

Table 2 – Estimated Process Water Discharge

	Cycles of Concentration	Peak Discharge (GPM)	Average Annual Discharge (GPM)
Phase I	5	1,300	550-900
Phase I and II	3	5,140	2,200-3,500

ii. Minnesota Steel Industries (MSI)

As shown in Table 3, the annual consumptive use of water from the MSI project is 4,063 gpm. This process water would come from surface water runoff to the mine pits and groundwater. The remaining process water would come from surface water sources that currently flow to the Swan River. The amount of process water from surface water runoff and groundwater has not been quantified, but is known to occur; therefore, the total amount of process water taken from the Swan River tributaries would be somewhat less than 4,063 gpm.

Table 3 – Water Consumption by MSI

Location	**Type of Consumption**	**Average annual consumption, gpm**
Crusher, pellet plant and concentrator	Evaporation from thickeners and induration of green balls	416
DRI Plant	Process water and cooling tower losses	1,171
Steel Mill	Cooling tower losses and direct evaporation from hot steel	1,176
Tailings Basin	Losses of water trapped with tailings (voids loss)	1,300
Stream Augmentation*	Replace flow diverted from receiving water bodies	To be determined during permitting *
Total Annual Consumptive Use		4,063*

Source: MSI Environmental Assessment Worksheet, Table 13-2. Note: For assessing cumulative water quantity impacts, stream augmentation is not considered consumptive use.

iii. Nashwauk WWTF

Sanitary wastewater flows to the Nashwauk WWTF from the MSI project could be as high as 21 gpm *(Question 18.b. – MSI EAW).* The effluent would be slightly less that the influent to the WWTF.

iv. Coleraine-Bovey-Taconite WWTF

Mesaba would connect to the wastewater treatment facility for disposal and treatment of domestic wastewater. The maximum estimated increase in 24 hr-averaged flow to the treatment facility during construction would be 31 gpm during construction and 5 gpm during the operational phase of Mesaba Phase I and II. The effluent from the WWTF would be slightly less than the influent.

Due to inflow and infiltration in the existing collection system, sewage bypasses and excess flows relative to the design limit of the treatment plant sometimes occur during times of heavy precipitation or thaw. Excelsior may seek to rehabilitate the collection system or enlarge the pumps to mitigate this situation.

v. Total: Compare to flow of Swan River.

From the above analysis, the maximum cumulative reduction in flow is approximately 10,300 gpm (9,500-9,900 gpm downstream of Holman Lake's outflow into the Swan River). For non-summer flows (without the loss of water pumped from the HAMP complex), the maximum cumulative reduction would be 4,000 gpm (3,200-3,600 gpm downstream of Holman Lake).

The historic mean flow of the Swan River is 29,000 gpm (USGS gage data for the period 1965-1990). However, significant mining has taken place within the watershed during the period of record, which could cause unnaturally high or low flows to be measured in the river during that time period and would be dependent on dewatering and stream augmentation practices during that period.

b. Quality:

Cooling tower blowdown released by the Mesaba One and Mesaba Two consists of water containing concentrations of minerals and other trace constituents concentrated through evaporation; the chemical species of biggest concern are limited to mercury, nutrients, hardness, and total dissolved solids (TDS).

All of Minnesota Steel's process water, including cooling water, will be treated with a zero liquid discharge (ZLD) system. Therefore, the only identifiable discharges associated with MSI are mine pit dewatering operations and periodic tailings basin discharges, and these discharges will not be concentrated through evaporation. As shown in Table 4, the quality of pit water is similar to that of the Swan River, with modestly higher conductivity (TDS) and hardness. All values are well below those of Mesaba's discharge, which in turn is within applicable discharge standards, so cumulative impacts on water quality from dewatering operations are negligible. Tailings basin discharges are likely to have higher TDS, but specific values were not provided in the EAW.

Table 4 – West Range Water Quality

	Swan River	Pit 1	Pit 5/F	Tailings Basin North	Mesaba discharge
Conductivity (uhmos/cm)	340	410	430	360	2,052 mg/L
Hardness (mg/L)	150	180	190	160	2,070
Phosphorous (mg/L)	<0.1	<0.1	<0.1	<0.1	0.5
Mercury (ug/L)	<0.2	<0.1	<0.1	<0.1	4.2 ng/L

Source: Average values from Table 18.2 of MSI's EAW and Table 1.8-21 from the Environmental Supplement to Mesaba's Joint Application Permit. MSI's Pits 1 and 5/F are adjacent and located approximately two miles northeast of the city of Calumet.

East Range

I. Identification and description of affected watershed: Partridge River.

The Partridge River Watershed is located in St. Louis County in Northern Minnesota. The Partridge River watershed is part of the St. Louis River and Lake Superior Watershed Basin. Figure 2 shows the Partridge River Watershed to a point approximately 5 miles downstream of the confluence with First Creek. The Mesaba Energy Project, Mesabi-Nugget, and PolyMet Projects are located within the watershed study area.

Human influences related to logging, mining, ditch construction, agricultural activity, dam construction, flow diversion / withdrawal, development of transportation systems, and community development activities have impacted streams in the area, including the Partridge River.

The contributing watershed area of the Partridge River has been primarily altered through several past mining actions. The land use / cover type was modified significantly through the construction of mining related facilities and, in turn, this alteration has modified the quantity and timing of surficial runoff to the stream.

Lake levels in Colby Lake are augmented with water from Whitewater Reservoir, which also has impacts on the natural flow regime within the Partridge River.

Impacts resulting from the PolyMet project are hydrologically upstream on the Partridge River from Mesaba. The Mesabi-Nugget project is relatively close to the Mesaba Energy Project and shares some of the same sub watersheds. The Partridge River watershed study area was selected at a point downstream of Mesaba's impacts in order to encompass the cumulative impacts within the Partridge River Watershed with respect to the Mesaba Energy Project, Mesabi-Nugget, and PolyMet.

NOTE: *The Mesaba East Range Site will have Zero Liquid Discharge (ZLD) and would not contribute to any cumulative impact on water quality in the Partridge River resulting from the discharge of wastewater from the project. There is no further discussion of water quality needed.*

II. Identify existing usage: EIS Table 2.5-4

Existing Water Appropriation permits for surface waters in the Partridge River Watershed are shown in **Table 5**.

Table 5 - Existing Water Appropriation Permits for Surface Waters Around East Range Site within the Partridge River Watershed[1]

		Permitted		Reported Pumping (Million Gallons)				
Permittee	**Resource**	**GPM**	**MG/Y**	**2000**	**2001**	**2002**	**2003**	**2004**
MP & Cliffs Erie LLC	Colby Lake	12000	6307	2945.7	69.2	ND	ND	ND
MP	Colby Lake	100500	50000	71.4	60.4	63.4	96.1	117.2

[1] Minnesota DNR. http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/idxloc.pdf

		Permitted		Reported Pumping (Million Gallons)				
Permittee	**Resource**	**GPM**	**MG/Y**	**2000**	**2001**	**2002**	**2003**	**2004**
MP	Colby Lake	100500	50000	23851.7	24061.7	24261.9	24132.9	22458.9
MP	Colby Lake	100500	50000	21734.0	24133.9	24185.4	24132.9	23541.8
MP	Colby Lake	10500	50000	51.1	4.0	3.4	0.0	21.1
MP	Colby Lake	10500	50000	4.3	41.6	28.8	0.1	0.4
MP	Colby Lake	100500	50000	17.3	0.1	ND	ND	ND
MP	Colby Lake	10500	50000	474.0	516.4	523.6	525.5	525.1
City of Hoyt Lakes	Colby Lake	1050	160	123.1	116.4	120.4	122.8	120.4
City of Hoyt Lakes	Partridge River		4	2.4	1.8	1.7	2.2	1.5
Cliffs Erie LLC		3600	1155	1055.4	ND	ND	ND	ND
Cliffs Erie LLC		3600	1155	ND	ND	ND	ND	ND
Cliffs Erie LLC		3600	1155	ND	ND	ND	ND	ND
Cliffs Erie LLC		1500	551	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	1860.2	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
City of Aurora		1020	160	73.7	74.7	81.8	106.5	93.4
Cliffs Erie LLC		5000	788	ND	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	316.9	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	ND	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	ND	ND	ND	ND	ND
Cliffs Erie LLC		3000	1050	ND	ND	ND	ND	ND
Cliffs Erie LLC		3000	1050	1807.2	ND	ND	ND	ND

III. Effects from new sources/appropriations

a. Quantity:

i. Mesaba:

Pits 3, 5N, and 5S discharge water to small streams, which flow to the Upper Partridge River, and the Stephens and Knox pits discharge water to small streams that flow to the Lower Partridge River. The Upper Partridge River is defined as the portion of the river upstream of Colby Lake and the Lower Partridge River is the stream reach downstream of the lake.

Pits 3, 5N, and 5S currently contribute an estimated mean flow to the Upper Partridge River of 500 gpm, which would potentially be eliminated if the water is used by Mesaba.

The Stephens and Knox pits contribute an estimated mean flow of 435 gpm to the Lower Partridge River, which would potentially be eliminated if the water is used by Mesaba.
The water sources that would be used for Mesaba are shown in **Table 6**.

Table 6 - Water Source Supply Capability

Water Source (Pits)	**Est. Range of Flow (gpm)**	**Currently Discharging (yes/no)**	**Assumed Sustainable Flow for Water Balance Modeling (gpm)**
2E	ND	N	112
2W	ND	N	898
2WX	ND	N	673
6	ND	N	1,795
Source: MDNR East Range Hydrology Report	Sub-Total		**3,478**
3	150–450	Y	300
5N	30–100	Y	60
5S	90–270	Y	140
9 / Donora	130–380	N	260
9S	90–270	N	180
Stephens	190–590	Y	390
Knox	20–70	Y	45
Source: Surface Water Modeling[1]	Sub-Total		**1,375**
Mesabi Nugget Discharge	1000	N	**1,000**
Source: MPCA NPDES Discharge Permit			

[1]Excelsior estimated the range of flow based only on the surface drainage area to the pit and average yearly rates of runoff. This represents a first order in approximation and the actual flow rates are likely much more dependent on groundwater components. The groundwater inflow/outflow component in this area can be highly variable as a result of fractures in the bedrock and/or highly pervious tailings dikes. Due to the complexity associated with the groundwater component, groundwater inflow/outflow has not been evaluated.

ii. PolyMet

PolyMet will not appropriate water directly from the Partridge River, but it may appropriate water from Colby Lake. Since PolyMet would not directly appropriate water from the Partridge River, there would be no direct impacts on stream flow in the river. PolyMet may have some indirect impacts on the stream flow in the Partridge River by cutting off a portion of the runoff to the river and dewatering of the mine pit which could cause a localized drop in the groundwater levels. This impact has not been quantified.

According to the MDNR, PolyMet may need to appropriate as much as 3000 gpm from Colby Lake, but this is a moving target at this time.

The PolyMet project would appropriate water from Colby Lake through an existing water appropriation permit held jointly by Cliffs-Erie and Minnesota Power.

PolyMet may be able to satisfy some or all of their make-up water need from Colby Lake, by amending and/or transferring part of the authority under this permit. A condition under this permit requires that the permit holder pump water from the Whitewater Reservoir into Colby Lake to offset their appropriation when the water level of Colby Lake is below a determined threshold. The control structure between the Whitewater Reservoir and Colby Lake was owned by Cliffs Erie, but is now owned by Minnesota Power. There is an agreement between Cliff's Erie and Minnesota Power whereby the conditions of the permit would be met. Any assignment of an appropriation permit from one party to another would require the consensus of all parties and the DNR's review and approval. The review would take into consideration effects on Colby Lake and Whitewater Reservoir water levels and outflow from Colby Lake.

PolyMet will reportedly employ a Zero Liquid Discharge system, so it would not contribute any new discharges of water to the system.

iii. Mesabi-Nugget

A water appropriation permit has been issued to Mesabi-Nugget. The permit from the MDNR allows Mesabi-Nugget to pump up to 5,000 gpm from Pit 1 and Pit 2WX would be used as a standby source with a permitted appropriation of 5,000 gpm. Pit 1 does not currently discharge to a surface water.

iv. Hoyt Lakes POTW

At this time, there are no reasonably foreseeable expansions to the Hoyt Lakes POTW. However, Mesaba would connect to the Hoyt Lake wastewater collection and treatment system. The current system discharges to Colby Lake, and additional effluent from the treatment facility would have negligible effects on the Partridge River flows.

The maximum estimated increase in flow to the treatment facility during construction would be 31 gpm during construction and 5 gpm during the operational phase of Mesaba Phase I and II. The effluent would be slightly less than the influent.

v. Total: Compare to low-flow of Partridge River.

Low, average, and high flow estimates for the Upper Partridge River are shown in Table 17-1 of the PolyMet EAW. Low flows are estimated to be in the range of 320-835gpm, average flow is estimated at 17,500gpm, and high flows are estimated at 156,000-161,000gpm. *The low flow* *estimated is the 7Q10 flow, which is a 7-day average low flow with a 10-year reoccurrence interval.* The total maximum flow that Mesaba could remove from the Upper Partridge River could be 500 gpm.

The total maximum flow that Mesaba could remove from the Lower Partridge River could be as much as 450 gpm. This is not cumulative with removals from the Upper Partridge River during low flow conditions, because the water level (and hence outflow) of Colby Lake, which separates the two rivers, is controlled according to existing permits. Currently, a number of different entities appropriate water from Colby Lake. Minnesota Power is required to augment lake levels in Colby Lake and a minimum allowable lake level has been established. When the lake level is at its minimum, flow out of the lake to Lower Partridge River is also at its minimum, which is approximately 13 cfs. This means that flows on the Lower Partridge River should never fall below 13 cfs or 5,835 gpm.

The maximum total estimated amount of water that PolyMet could appropriate from Partridge River (Colby Lake) would be determined by Minnesota Power and the MDNR. The Colby Lake water levels would still be expected to be augmented.

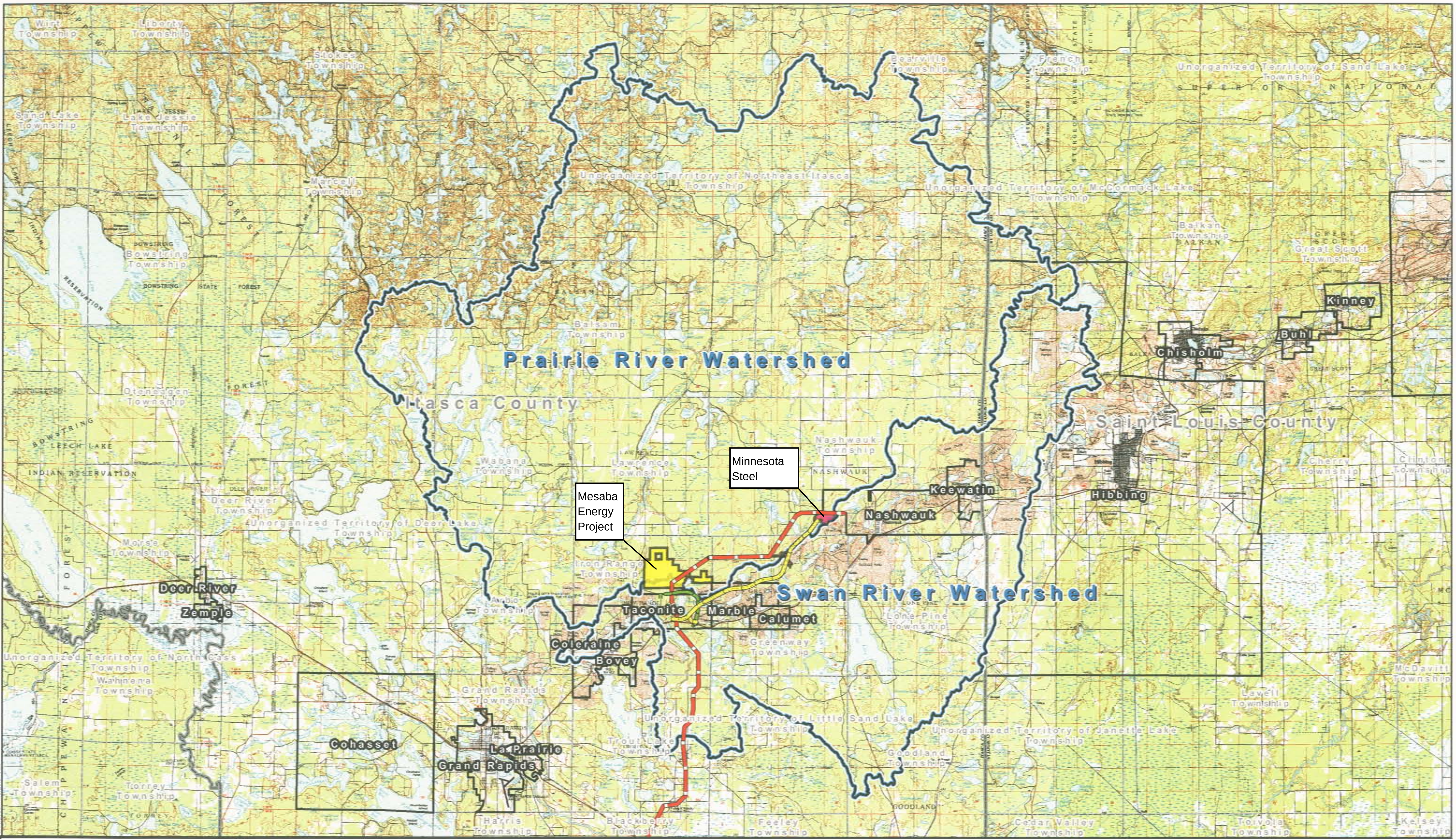
References

Minnesota Department of Natural Resources. "Water Appropriation Permit Index." 2001-2005. Available: http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/idxloc.pdf.

Attachments

Figure 1: Swan River Watershed
Figure 2: Partridge River Watershed

Table 1: Minnesota Steel Industries, Environmental Assessment Worksheet, Table 18-2
Table 2: Minnesota Steel Industries, Environmental Assessment Worksheet, Table 13-2
Table 3: PolyMet, Environmental Assessment Worksheet, Table 17-1



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

West Range

November 2006

Legend

Reasonable and Foreseeable Actions

- Swan River Watershed
- Prairie River Watershed
- Excelsior Energy West Range Site
- MN Steel DRI Plant Site
- Nashwauk Gas Pipeline
- Itasca County Road 7 Realignment
- Itasca County Rail Alignment
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, MN Steel, City of Nashwauk and SEH.
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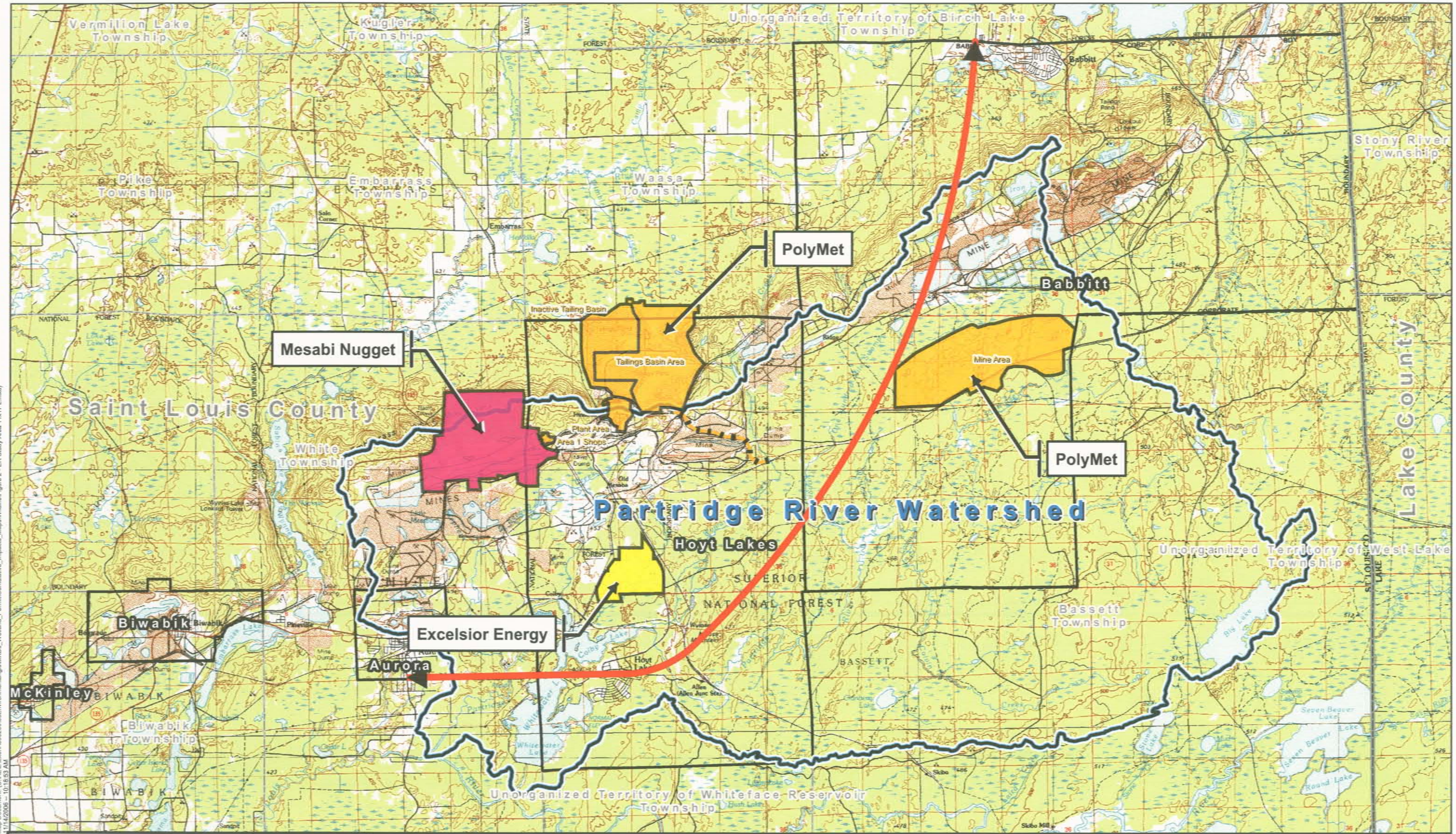
Figure 1

West Range Study Area

UTM, Zone 15, Meters
NAD83

0 5 Miles



Excelsior Energy Inc.	East Range	**Legend**	**Reasonable and Foreseeable Actions**	*Figure 2*	UTM, Zone 15, Meters NAD83
Mesaba Energy Project Energy, Innovation, and Economic Development for Minnesota	November 2006	Partridge River Watershed	Excelsior Energy East Range Site Mesabi Nugget Plant Site PolyMet Sites PolyMet Rail Construction St. Louis County New Hoyt Lakes to Babbitt Connection Municipal Boundaries Civil Township Boundaries County Boundary	*East Range Study Area*	N E S W 0 2 Miles

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, and SEH.
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Table 18-2. Baseline Water Quality Data
Collected by MIS.

				LPA	LPA	LPA	LPA	LPA	LS	LS	LS	LS	LS
PARAMETER / ANALYTE	UNITS	MDL	METHOD	Larue Pit Access	Larue Pit Access	Larue Pit Access	Larue Pit Access	Larue Pit Access	Little Sucker	Little Sucker	Little Sucker	Little Sucker	Little Sucker
SAMPLING ROUND				3	5	6	7	8	3	5	6	7	8
SAMPLED DATE				06/01/99	09/13/99	11/29/99	05/01/00	07/18/00	06/01/99	09/13/99	11/29/99	05/01/00	07/17/00
TIME (MILITARY)							930	915		1445		1005	1535
EASTING (1927 State Plane Feet)				1986318	1986318	1986318	1986318	1986318	1963207	1963207	1963207	1963207	1963207
NORTHING (1927 State Plane Feet)				323566	323566	323566	323566	323566	320739	320739	320739	320739	320739
ELEVATION (feet, from 1997 mapping)				1413.1	1413.1	1413.1	1413.1	1413.1	1389.5	1389.5	1389.5	1389.5	1389.5
AIR TEMP	° F			47	56	24	55		48	56	26	55	
WATER TEMP	° F			62	65	40		70	58	60	24		72
Conductivity	uhmos/cm	1	EPA 120.1	282	299	324	351	349	261	239	327	224	223
Hardness, Total	mg/L	1	EPA 130.2	157	73.3	157	164	146	146	65.8	141	97	94
Color	PCU	5	EPA 110.2	5					50				
pH	SU	0.1	EPA 150.1	8.04	8.44	8.11	8.28	8.65	6.97	7.29	7.58	8.02	8.75
Alkalinity, Carb	mg/L	1	EPA 310.1	<1.0					<1.0				
Alkalinity, Total	mg/L	1	EPA 310.1	149	140				121	86			
Ammonia as N	mg/L	0.1	EPA 350.1	<0.10					<0.10				
Kjeldahl Nitrogen, Total as N	mg/L	0.1	EPA 351.1	0.1	<0.1	0.4	0.66	0.36	2.7	0.4	1	1.01	1.18
Nitrate+Nitrite as N	mg/L	0.1	EPA 353.2	<0.01					<0.01				
Nitrate as N	mg/L	0.1	(NO3+N02)-NO2										
Nitrite as N	mg/L	0.01	EPA 354.1										
Nitrogren: N, Total	mg/L	0.2	TKN+NO2+NO2										
Phosphorus, Total as P	mg/L	0.01	EPA 365.2	0.01	0.01	<0.1	<0.1	<0.01	0.06	0.03	<0.1	<0.1	0.01
Bromide	mg/L	0.1	EPA 320.1										
Calcium	mg/L	1	EPA 200.7	31.7	29.3	34.2	35.2	32.4	32.5	26.3	33.6	24.8	22.7
Chloride	mg/L	0.5	EPA 325.3	1.7					1.5				
Fluoride	mg/L	0.1	EPA 340.1	0.44	0.24	0.012	<0.1	0.24	0.44	0.24	0.18	0.19	0.24
Iron	mg/L	0.03	EPA 236.1	0.06	0.05	0.04	<0.03	0.7	0.43	0.24	0.28	0.07	0.37
Magnesium	mg/L	0.5	EPA 200.7	19.0	17	17.5	18.6	17	15.7	11.7	13.8	8.6	8.57
Manganese	mg/L	0.01	EPA 243.1	0.01	<0.01	0.04	<0.01	0.01	0.26	0.05	0.09	0.04	0.06
Potassium	mg/L	0.5	EPA 200.7	2.7	2.5				1.4	1.5			
Strontium	mg/L	4	EPA 200.7	73.2	68	75	78.4	72.3	79	70.1	78.7	57.4	53.8
Sulfide, Total	mg/L	2	EPA 376.1										
Sulfite	mg/L	0.025	EPA 425.1	<2					<2				
Sulfate	mg/L	1	EPA 375.4	8.92	<1	8.69	8.3	6.8	23.4	<1	32.8	16.6	11.7
Sodium	mg/L	0.5	EPA 200.7	4.1	3.8				4.6	3.2			
Aluminum	µg/L	10	EPA 202.2	0.05	34.6	18.5	22	42.8	0.02	26.4	<10	13.9	57.4
Antimony	ug/L	3	EPA 204.2	<3.0					<3.0				
Arsenic	µg/L	2	EPA 206.2	<2.0	<2	<2	<2	<2	<2.0	<2	<2	<2	<2
Barium	µg/L	10	EPA 200.7	0.01					0.03				
Beryllium	µg/L	0.2	EPA 210.2	<0.2					<0.2				
Boron	µg/L	35	EPA 200.7	<35					44				
Cadmium	µg/L	0.2	EPA 213.2	<0.2					<0.2				
Chromium	µg/L	4	EPA 218.2										
Cobalt	µg/L	1	EPA 219.2	<1.0					<1.0				
Copper	µg/L	1	EPA 220.2	<1.0					<1.0				
Lead	µg/L	1	EPA 239.2	<1.0					<1.0				
Lithium	µg/L	1	EPA 200.7	5.2					3.8				
Mercury--NTS	µg/L	0.2	EPA 245.1	<0.1					<0.1				
Molybdenum	µg/L	5	EPA 246.2	<5.0	<5	<5	<5	<5	<5.0	<5	<5	<5	<5
Nickel	µg/L	2	EPA 249.2	<2.0					<2.0				
Selenium	µg/L	3	EPA 270.2	<3.0					<3.0				
Silica	µg/L	1	EPA 200.7	5480	6220				1620	8410			
Silver	µg/L	1	EPA 200.7										
Thallium	µg/L	4	EPA 279.2	<4.0	<4	<4	<2	<2	<4.0	<4	<4	<2	<2
Tin	µg/L	10	EPA 282.2	<10.0					<10.0				
Titanium	µg/L	10	EPA 283.2	<10.0					<10				
Vanadium	µg/L	4	EPA 200.7	<4.0					<4.0				
Zinc	µg/L	10	EPA 200.7	10					<10				
BOD	mg/L	1	Std Meth 5210	<2					<2				
Chemical Oxygen Demand	mg/L	1	HACH 8000	5.6	<1	3.7	15	3.7	28.9	22.2	38.4	35.3	18.7
Organic Carbon, Total	mg/L	1	EPA 415.1	3.0	2.9	2.2	5.2	2.3	11.4	14.6	11.7	11.2	8.2
Oil and Grease	mg/L	1	EPA 413.1	<0.5					<0.5				
Solids, Total Suspended	mg/L	1.0	EPA 160.2	4.0					4.0				
Solids, Total Dissolved	mg/L	1	EPA 160.1	120	144	128	143	155	128	180	146	98	116.0
Corrosivity Index (Langlier)			Std Meth										
DRO-WATER	mg/L	0.1	WI Modified DRO	<0.10	<0.06	<01	<0.1	<0.1	<0.10	<0.06	<0.1	<0.1	<0.1
GRO-WATER	mg/L	0.1	WI Modified GRO	<0.06	<0.10	<0.1	<0.06	<0.06	<0.06	<0.10	<0.1	<0.06	<0.06
Surfactants	mg/L	0.025	EPA 425.1	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Fecal Coliform	colonies	1	Std Meth 9222										
Residual Chlorine	mg/L		Std Meth 4500-Cl										
Free Chlorine			HACH										
Chlorine (field)			HACH		0.03	0.07	0.07	0.01		0.04	0.04	0.09	0.14
Chlorine (field, second try)			HACH										

	OBCH	OBCH	OBCH	OBCH	OBCH	OBCH	OE	OE	OE	OE	OE
PARAMETER / ANALYTE	O'Brien Creek Head	O'Brien Creek Head	O'Brien Creek Head	O'Brien Creek Head	O'Brien Creek Head	O'Brien Creek Head	Oxhide Extension	Oxhide Extension	Oxhide Extension	Oxhide Extension	Oxhide Extension
SAMPLING ROUND	3	5	6	7	8	8	2	3	5	6	7
SAMPLED DATE	06/01/99	09/14/99	11/29/99	05/01/00	07/17/00	07/17/00	03/15/99	06/01/99	09/13/99	11/29/99	05/01/00
TIME (MILITARY)		1530		1156		1447	1130				1127
EASTING (1927 State Plane Feet)	1985913	1985913	1985913	1985913		1985913	1971955	1971955	1971955	1971955	1971955
NORTHING (1927 State Plane Feet)	297552	297552	297552	297552		297552	304644	304644	304644	304644	304644
ELEVATION (feet, from 1997 mapping)	1343	1343	1343	1343		1343	1347.5	1347.5	1347.5	1347.5	1347.5
AIR TEMP	51	59	24	59				51	56	24	58
WATER TEMP	60	57	34			72		61	65	35	
Conductivity	315	308	293	319	315	280	434	440	384	390	449
Hardness, Total	141	122	148	144	141	128	204	198	88.8	190	195
Color	30				30			10			
pH	8.11	8.24	8.17	8.12	8.11	9.24	8.05	8.16	8.05	7.73	8.19
Alkalinity, Carb	<1.0				<1.0		<1.0	<1.0			
Alkalinity, Total	129	134			129		182	161	138		
Ammonia as N	<0.10				<0.10		<0.10	0.12			
Kjeldahl Nitrogen, Total as N	0.4	0.3	0.7	1.2	0.4	0.76		0.2	<0.1	0.2	1.14
Nitrate+Nitrite as N	<0.01				<0.01			<0.01			
Nitrate as N							<0.10				
Nitrite as N							<0.01				
Nitrogren: N, Total											
Phosphorus, Total as P	0.02	0.03	<0.1	0.01	0.02	<0.01	<0.01	0.01	0.01	<0.1	0.01
Bromide											
Calcium	30.3	26.8	33.7	33.1	30.3	26.4	39.6	39.3	35.5	42.1	43.4
Chloride	5.2				5.2		7.1	5.8			
Fluoride	0.28	0.2	0.12	0.19	0.28	0.45		0.2	0.24	0.14	0.19
Iron	0.18	0.2	0.36	0.48	0.18	0.41	<0.03	0.03	6.59	0.2	0.23
Magnesium	15.6	13.5	15.5	14.8	15.8	14	23.4	24.3	20.1	20.6	21.1
Manganese	0.09	0.06	0.09	0.19	0.09	0.11	0.26	0.03	0.02	0.06	0.07
Potassium	1.7	1.8			1.7		2.6	2.4	2.3		
Strontium	75.7	73.1	80	79.2	75.7	66		115	98.1	113	119
Sulfide, Total					<2						
Sulfite	<2				<0.025			<2			
Sulfate	8.92	4.19	10.7	8.3	8.92	6.3	45.6	36	17.1	43.2	26.7
Sodium	5.9	5			5.9		8.1	7.7	6.6		
Aluminum	0.04	100	48.8	319	0.04	152		0.01	27.3	12.4	<10
Antimony	<3.0				<3.0			<3.0			
Arsenic	<2.0	<2	<2	<2	<2	<2		<2.0	<2	<2	<2
Barium	0.02				0.02			0.02			
Beryllium	<0.2				<0.2			<0.2			
Boron	41				41			52			
Cadmium	<0.2				<0.2			<0.2			
Chromium											
Cobalt	<1.0				<1.0			<1.0			
Copper	<1.0				<1.0			<1.0			
Lead	<1.0				<1.0			<1.0			
Lithium	3.8				3.8			9.3			
Mercury--NTS	<0.1				<0.1			<0.1			
Molybdenum	<5.0	<5	<5	<5	<5	<5	<5.0	<5.0	<5	<5	<5
Nickel	<2.0				<2.0			<2.0			
Selenium	<3.0				<3.0			<3.0			
Silica	1300	5170			1300		2380	5430	5690		
Silver											
Thallium	<4.0	<4	<4	<2	<2	<2		<4.0	<4	<4	<2
Tin	<10.0				<10.0			<10.0			
Titanium	<10.0							<10.0			
Vanadium	<4.0				<10			<4.0			
Zinc	<10.0				<0.06			12			
BOD	<2				<2			<2			
Chemical Oxygen Demand	11.3	11.3	22.2	18.7	11.3	18.7		3.7	<1	7.5	18.7
Organic Carbon, Total	8.5	7.2	7.2	8.2	8.5	6.6		3	3.4	2.5	4.5
Oil and Grease	<0.5				<0.5		<0.5	<0.5			
Solids, Total Suspended	3.0				3.0		<1.0	5.0			
Solids, Total Dissolved	142.0	166	128	144	142	154	219	171.0	122	184	209
Corrosivity Index (Langlier)							-0.13				
DRO-WATER	<0.10	<0.06	<0.1	<0.1	<0.1	<0.1			<0.06	<0.1	<0.1
GRO-WATER	<0.06	<0.10	<0.1	<0.06	<0.06	<0.06		<0.06	<0.10	<0.1	<0.06
Surfactants	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	1	<0.025	<0.025	<0.025	<0.025
Fecal Coliform											
Residual Chlorine											
Free Chlorine							<0.2				
Chlorine (field)		0.04	0.02	0.08		0.07			0.03	0.09	0.1
Chlorine (field, second try)											

Table 18-2. Baseline Water Quality Data
Collected by MIS.

PARAMETER / ANALYTE	UNITS	MDL	OE	P1	P1	P1	P1	P1	P1	P1	P1-5C	P5	P5	P5	P5-D	P5	P5-D	P5	P5-D	P5	P5-D	P5-D	SBL	SBL	SBL	SBL
			Oxhide Extension	Pit 1	Pit 1	Pit 1	Pit 1	Pit 1	Pit 1	Pit 1	Pit 1/5 Channel	Pit 5	Pit 5	Pit 5	Pit F	Pit 5	Pit F	Pit 5	Pit F	Pit 5	Pit F	Pit F	Snowball Lake	Snowball Lake	Snowball Lake	Snowball Lake
SAMPLING ROUND			8	1	3	5	6	7	8	8	2	1	3	5	5	6	6	7	7	8	8	8	3	5	6	7
SAMPLED DATE			07/17/00	03/05/97	06/02/99	09/14/99	11/30/99	05/01/00	07/17/00	07/17/00	03/15/99	03/05/97	06/02/99	09/14/99	09/14/99	11/30/99	11/30/99	05/01/00	05/01/00	07/17/00	07/17/00	07/17/00	06/01/99	09/13/99	11/29/99	05/01/00
TIME (MILITARY)			1400		1030	1430		1304		1305	1000		1000	1400	1400			1318	1322	1340		1335		1430		1116
EASTING (1927 State Plane Feet)			1971955		1971544	1971544	1971544	1971544		1971544			1970468	1970468	1970468	1970468	1970468	1970468	1970468	1970468		1970468	1966716	1966716	1966716	1966716
NORTHING (1927 State Plane Feet)			304644		313782	313782	313782	313782		313782			312869	312869	312869	312869	312869	312869	312869	312869		312869	303787	303787	303787	303787
ELEVATION (feet, from 1997 mapping)			1347.5	1360.1	1360.1	1360.1	1360.1	1360.1		1360.1		1354.5	1354.5	1354.5	1354.5	1354.5	1354.5	1354.5	1354.5	1354.5		1354.5	1357.1	1357.1	1357.1	1357.1
AIR TEMP	° F				58	58	42	59					58	61	59			58	58				51	56	24	55
WATER TEMP	° F		74		61	62	41			70			59	59	61	41	41			69		69	60	62	39	
Conductivity	uhmos/cm	1	419		408	371	381	431	440	428	415		424	381	385	437	418	448	450	453	424	415	285	240	260	269
Hardness, Total	mg/L	1	172		188	161	187	189	198	174	188		201	178	158	204	212	193	196	182	201	184	122	59.3	113	111
Color	PCU	5		<5	5				10			<5	5								5		20			
pH	SU	0.1	8.32	7.82	8.13	8.29	8.2	7.99	8.16	8.53	7.9	7.92	8.13	8.32	8.28	8.23	8.28	8.15	7.92	7.41	8.13	8.4	8.29	8.12	8.19	8.14
Alkalinity, Carb	mg/L	1			<1.0				<1.0		<1.0		<1.0								<1.0		<1.0			
Alkalinity, Total	mg/L	1			146	134			161		164		160	141	142						160		99.0	86		
Ammonia as N	mg/L	0.1		<0.10	0.11				0.12		<0.10	<0.10	0.11								0.11		<0.10			
Kjeldahl Nitrogen, Total as N	mg/L	0.1	0.34	<0.2	0.2	0.2	0.2	0.64	0.2	0.31		<0.2	0.1	<0.1	<0.1	0.2	0.2	0.7	0.47	0.32	0.1	0.27	0.4	0.3	0.5	1.38
Nitrate+Nitrite as N	mg/L	0.1			<0.01				<0.01				0.02								0.02		<0.01			
Nitrate as N	mg/L	0.1		<0.10							<0.10	<0.10														
Nitrite as N	mg/L	0.01									<0.01															
Nitrogren: N, Total	mg/L	0.2		<0.2								<0.2														
Phosphorus, Total as P	mg/L	0.01	<0.01	<0.01	0.01	<0.01	<0.1	<0.1	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.1	<0.1	0.04	<0.1	<0.01	0.01	<0.01	0.02	0.01	<0.1	<0.1
Bromide	mg/L	0.1		<0.1								<0.1														
Calcium	mg/L	1	33.8		40.6	36.2	43.8	43.9	39.3	41	40.3		42.1	38.5	34	43.9	45.2	43.2	43.9	40.4	42.1	14.9	29.6	23.7	29	29
Chloride	mg/L	0.5			7.3				5.8		8.0		6.2								6.2		8.0			
Fluoride	mg/L	0.1	0.27	0.25	0.3	0.36	0.14	0.14	0.2	0.18		0.25	0.3	0.88	0.24	0.12	0.18	0.14	0.14	0.24	0.3	0.18	0.2	0.2	0.12	0.19
Iron	mg/L	0.03	0.17	0.07	<0.03	0.05	0.05	0.07	0.03	0.28	<0.03	0.26	<0.03	0.07	0.03	<0.03	<0.03	<0.03	<0.03	0.12	<0.03	0.18	0.07	0.11	0.07	0.08
Magnesium	mg/L	0.5	20.8	19.6	19.9	17.2	18.9	19.3	24.3	17.4	19.4	25.2	23.4	19.8	17.8	23	24.2	20.8	21	20	23.4	20	11.6	9.4	9.9	9.3
Manganese	mg/L	0.01	0.03	0.02	0.02	0.05	0.01	0.06	0.03	0.07	0.03	0.03	0.02	0.01	<0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.04	0.09	0.06	0.06	0.08
Potassium	mg/L	0.5			2.3	2.2			2.4		2.5		2.5	2.4	2.1						2.5		1.4	1.2		
Strontium	mg/L	4	97.3		95.7	84.3	101	102	115	90.2			111	92.3	91.8	115	119	112	111	97.2	111	97.6	81.5	68.7	78.5	78.1
Sulfide, Total	mg/L	2		<0.5					<2			<0.5									<2					
Sulfite	mg/L	0.025		<2	<2				<0.025			<2	<2								<0.025		<2			
Sulfate	mg/L	1	33.6	36	31.5	39.1	36.9	38.6	36.0	31.5	46.0	42	34.2	41.9	40.6	38.8	39.2	37.8	32	32.7	34.2	33.3	20.0	<1	16.8	17.4
Sodium	mg/L	0.5			6.4	6			7.7		6.8		7.0	6.4	5.8						7.0		7.0	5.6		
Aluminum	µg/L	10	30.2	0.01	0.03	12.4	<10	26.7	0.01	18.9		<0.01	0.01	14.4	16.6	<10	<10	10.8	12.3	14.4	0.01	38	0.02	17.1	<10	19
Antimony	ug/L	3		<4	<3.0				<3.0			<4	<3.0								<3.0		<3.0			
Arsenic	µg/L	2	<2	<1.0	<2.0	<2	<2	<2	<2	<2		<1.0	<2.0	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2.0	<2	<2	<2
Barium	µg/L	10		0.01	0.01				0.02			0.02	0.01								0.01		0.03			
Beryllium	µg/L	0.2		<0.2	<0.2				<0.2			<0.2	<0.2								<.02		<0.2			
Boron	µg/L	35		45.6	<35				52			63	38								38		<35			
Cadmium	µg/L	0.2		<0.2	<0.2				<0.2			<0.2	<0.2								<0.2		<0.2			
Chromium	µg/L	4		<4.0								<4.0														
Cobalt	µg/L	1		<1.0	<1.0				<1.0			<1.0	<1.0								<1.0		<1.0			
Copper	µg/L	1		<1.0	<1.0				<1.0			<1.0	<1.0								<1.0		<1.0			
Lead	µg/L	1		<1.0	<1.0				<1.0			<1.0	<1.0								<1.0		<1.0			
Lithium	µg/L	1			9.8				9.3				10								10		4			
Mercury--NTS	µg/L	0.2		<0.2	<0.1				<0.1			<0.2	<0.1								<0.1		<0.1			
Molybdenum	µg/L	5	<5	<5.0	<5.0	<5	<5	<5	<5	<5	<5.0	<5.0	<5.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5.0	<5	<5	<5
Nickel	µg/L	2		<1.0	<2.0				<2.0			<1.0	<2.0								<2.0		<2.0			
Selenium	µg/L	3		<1.0	<3.0				<3.0			<1.0	<3.0								<3.0		<3.0			
Silica	µg/L	1			8990	7620			5430		2110		7870	6500	7080						7870		1220	2480		
Silver	µg/L	1		<1.0								<1.0														
Thallium	µg/L	4	<2	<4	<4.0	<4	<4	<2	<2	<2		<1.0	<4.0	<4	<4	<4	<4	<2	<2	<2	<2	<2	<4.0	<4	<4	<2
Tin	µg/L	10		<4.0	<10.0				<10.0			<4.0	<10.0										<10.0			
Titanium	µg/L	10		<5.0	<10.0							<5.0	<10.0										<10.0			
Vanadium	µg/L	4			<4.0				12				<4.0								<10.0		<4.0			
Zinc	µg/L	10		<10	12				<0.06			<10	12								<0.06		12			
BOD	mg/L	1		<1.0	<2				<2			<1.0	<2										<2			
Chemical Oxygen Demand	mg/L	1	53	<2.0	3.7	3.7	<1	7.5	3.7	44.4		<2.0	3.7	<1	3.7	<1	<1	<1	7.5	76.2	3.7	28.9	15.0	15	18.7	28.9
Organic Carbon, Total	mg/L	1	2.2	1.8	1.9	1.5	1.9	3.3	3.0	1.2		1.4	1.7	1.3	1.3	1.7	1.6	3	2.6	<1	1.7	<1	6.6	6.8	6.7	8.3
Oil and Grease	mg/L	1		<1.0	<0.5				<0.5		2.1	<1.0	<0.5								<0.5		<0.5			
Solids, Total Suspended	mg/L	1.0		<1.0	1.0				5.0		20.0	1.2	3.0								3.0		3.0			
Solids, Total Dissolved	mg/L	1	190		181.0	178	178	196	171	213	219		185.0	232	210	1?	182	200	213	203	185	133	127	102	120	126
Corrosivity Index (Langlier)											-0.32															
DRO-WATER	mg/L	0.1	<0.1		<0.10	<0.06	<0.1	<0.1	<0.1	<0.1			<0.10	<0.06	<0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.06	<0.1	<0.1
GRO-WATER	mg/L	0.1	<0.06		<0.06	<0.10	<0.06	<0.06	<0.06	<0.06			<0.06	<0.10	<0.10	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.10	<0.1	<0.06
Surfactants	mg/L	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	2	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Fecal Coliform	colonies	1		<1								<1														
Residual Chlorine	mg/L			<0.01								<0.01														
Free Chlorine																										
Chlorine (field)			0		0.06	0.07	0.05	0.08		0.05			0.03	0.03	0.03	0.06	0.06	0.08	0.07	0.06		0.06		0.12	0.06	0.11
Chlorine (field, second try)			0											0.13	0.13									0.2		

Table 18-2. Baseline Water Quality Data
Collected by MIS.

PARAMETER / ANALYTE	UNITS	MDL	SBL Snowball Lake	SBL Snowball Lake	SL1 Swan 1	SL1 Swan 1	SL1 Swan 1	SL1 Swan 1	SL2 Swan 3	SL2 Swan 3	SL3 Swan 3B	SL3 Swan 3	SL3 Swan 6	SL6 Swan 6	SL6 Swan 6B	SL6 Swan 6	TBN TBN (Tailings Basin North)	TBN TBN (Tailings Basin North)	TBN TBN (Tailings Basin North)	TBN TBN (Tailings Basin North)	TBN TBN (Tailings Basin North)	TBN TBN (Tailings Basin North)	UOD Upper Oxhide Diversion	UOD Upper Oxhide Diversion	UOD Upper Oxhide Diversion
SAMPLING ROUND			8	8	4	7	8	8	4	8	6	7	8	4	6	7	2	3	5	6	7	8	3	5	6
SAMPLED DATE			07/17/00	07/17/00	08/25/99	05/02/00	07/17/00	07/18/00	08/25/99	07/18/00	11/30/99	05/02/00	07/18/00	08/25/99	11/30/99	05/02/00	03/15/99	06/01/99	09/14/99	11/29/99	05/01/00	07/17/00	06/02/99	09/14/99	11/30/99
TIME (MILITARY)				1355		1000		1015		1000		1030	1025			1100	1100		1600		1422	1510	1100	1500	
EASTING (1927 State Plane Feet)				1966716	1979911	1979911		1979911	1978326	1978326	1978326	1978326	1977758	1977758	1977758	1977758	1990309	1990309	1990309	1990309	1990309	1990309	1977634	1977634	1977634
NORTHING (1927 State Plane Feet)				303787	293970	293970		293970	301561	301561	301561	301561	288741	288741	288741	288741	319809	319809	319809	319809	319809	319809	319515	319515	319515
ELEVATION (feet, from 1997 mapping)				1357.1	1335.5	1335.5		1335.5	1335.5	1335.5	1335.5	1335.5	1335.5	1335.5	1335.5	1335.5	1372.7	1372.7	1372.7	1372.7	1372.7	1372.7	1503	1503	1503
AIR TEMP	° F				82				78					82					59	26	58		58	62	35
WATER TEMP	° F			68	76			68	76	67	34		67	76	33			58	62	36		72	68	59	33
Conductivity	uhmos/cm	1	408	263	308	362	115	370	311	372	326	366	371	307	317	364	349	355	320	353	385	382	115	109	126
Hardness, Total	mg/L	1	183	110	135	159	48	146	140	154	167	159	152	135	150	160	162	165	143	170	166	174	48	42	54
Color	PCU	5	5		<20		40		<30					<20				20					40		
pH	SU	0.1	8.13	8.8	8.7	8.39	7.35	8.72	8.79	8.65	8.5	8.37	8.73	8.81	8.63	8.36	7.68	7.88	8.25	8.01	7.78	7.29	7.35	7.62	7.67
Alkalinity, Carb	mg/L	1	<1.0		7.5		<1.0		7.5					5			<1.0	<1.0					<1.0		
Alkalinity, Total	mg/L	1	146		125		40.0		123					135			148	148	134				40	42	
Ammonia as N	mg/L	0.1	0.11		<0.1		<0.10		<0.1					<0.1			<0.10	<0.10					<0.10		
Kjeldahl Nitrogen, Total as N	mg/L	0.1	0.2	0.64	0.7	0.98	1	0.55	0.6	0.47	1.3	0.96	0.58	0.6	0.5	0.89		0.3	0.5	0.8	1.39	0.49	1	0.7	0.6
Nitrate+Nitrite as N	mg/L	0.1	<0.01		<0.1		<0.01		<0.1					<0.1				<0.01					<0.01		
Nitrate as N	mg/L	0.1															<0.10								
Nitrite as N	mg/L	0.01															<0.01								
Nitrogren: N, Total	mg/L	0.2																							
Phosphorus, Total as P	mg/L	0.01	0.01	<0.01	<0.01	<0.1	0.03	<0.01	0.02	<0.01	0.1	<0.1	<0.01	0.02	<0.1	<0.1	<0.01	0.02	0.01	<0.1	0.02	<0.01	0.03	<0.01	<0.1
Bromide	mg/L	0.1																							
Calcium	mg/L	1	40.6	26	27.7	32.4	10.4	30	28	30.7	34.5	32.6	30	26.6	30.8	32.3	34.5	36.9	32.6	40.2	39.8	36.4	10.4	9.9	13.1
Chloride	mg/L	0.5	7.3		7.2		5.0		7.4					7.2			7.4	6.6					5		
Fluoride	mg/L	0.1	0.3	0.27	0.28	0.19	0.3	0.32	0.28	0.32	0.22	0.21	0.32	0.24	0.24	0.17		0.24	0.36	0.14	0.19	0.32	0.3	0.36	0.1
Iron	mg/L	0.03	<0.03	0.31	0.03	<0.03	0.9	0.29	0.04	0.25	1.13	<0.03	0.32	0.04	0.09	<0.03	0.04	0.12	0.06	0.34	0.11	0.09	0.9	1.62	2.64
Magnesium	mg/L	0.5	19.9	9.43	18.1	19	5.4	17.5	18.3	17.8	19.6	19	17.8	17.2	17.7	19.2	16.4	17.6	15	16.8	16.3	15.5	5.4	4.1	5.2
Manganese	mg/L	0.01	0.02	0.14	<0.01	0.03	0.29	0.02	<0.01	0.03	0.88	0.04	0.02	0.04	0.09	0.04	0.26	0.1	0.05	0.46	0.31	0.06	0.29	0.17	0.28
Potassium	mg/L	0.5	2.3		2.4		1.2		2.4					2.3			2.3	2.2	2				1.2	1.2	
Strontium	mg/L	4	95.7	69.6	78.3	83.8	39.8	74.5	77.8	78.1	87.2	83.8	78.5	77.5	79	83.8		89.2	77.8	94.1	92.4	84.7	39.8	36.1	41.2
Sulfide, Total	mg/L	2	<2				<2																		
Sulfite	mg/L	0.025	<0.025		<2		<0.025		<2					<2				<2					<2		
Sulfate	mg/L	1	31.5	14	24.3	21.4	<1.0	18.6	23.2	18.9	23	22.4	18	21.1	22.6	22.8	<1.0	13.7	<1	16.8	16.8	11	<1.0	2	9.76
Sodium	mg/L	0.5	6.4		7.3		3.6		7.3					7.2			7.1	7.1	6				3.6	3	
Aluminum	µg/L	10	0.03	94.4	10.1	<10	0.07	<10	13.1	<10	229	<10	18.3	12.2	<10	<10		0.03	21.4	55.1	12.9	12	0.07	52.4	99.2
Antimony	ug/L	3	<3.0		<3		<3.0		<3					<3				<3.0					<3.0		
Arsenic	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		2	<2	<2	<2	<2	2.5	<2	<2
Barium	µg/L	10	0.01		19.8		0.01		20.1					19.7				0.03					0.01		
Beryllium	µg/L	0.2	<0.2		<0.2		<0.2		<0.2					<0.2				<0.2					<0.2		
Boron	µg/L	35	<35		<35		<35		<35					<35				39					<35		
Cadmium	µg/L	0.2	<0.2		<0.2		<0.2		<0.2					<0.2				<0.2					<0.2		
Chromium	µg/L	4																							
Cobalt	µg/L	1	<1.0		<1		<1.0		<1					<1				<1.0					<1.0		
Copper	µg/L	1	<1.0		1.1		<1.0		<1					1.5				<1.0					<1.0		
Lead	µg/L	1	<1.0		<1		<1.0		<1					<1				<1.0					<1.0		
Lithium	µg/L	1	9.8		5.3		2.1		5.3					5.1				4.9					2.1		
Mercury--NTS	µg/L	0.2	<0.1		<0.2		<0.1		<0.2					<0.2				<0.1					<0.1		
Molybdenum	µg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5.0	<5.0	<5	<5	<5	<5	<5.0	<5	<5
Nickel	µg/L	2	<2.0		<2		<2.0		<2					<2				<2.0					<2.0		
Selenium	µg/L	3	<3.0		<3		<3.0		<3					<3				<3.0					<3.0		
Silica	µg/L	1	8990		3.25		2540		3.2					3.45			2080	6070	7050				2540	6450	
Silver	µg/L	1																							
Thallium	µg/L	4	<2	<2	<4	<2	<2	<2	<4	<2	<4	<2	<2	<4	<4	<2		<4.0	<4	<4	<2	<2	<4.0	<4	<4
Tin	µg/L	10	<10.0		<10		<10.0		<10					<10				<10.0					<10.0		
Titanium	µg/L	10			<10				<10					<10				<10.0					<10.0		
Vanadium	µg/L	4	12		<4.0		12		<4.0					<4				<4.0					<4.0		
Zinc	µg/L	10	<0.06		10		<0.06		<10					<10				12					12		
BOD	mg/L	1	<2		2.4		<2		2.4					2.2				<2					<2		
Chemical Oxygen Demand	mg/L	1	3.7	7.5	25.6	25.6	3.7	68.8	32.1	7.5	25.6	22.2	18.7	28.9	15	22.2		11.3	11.3	22.2	30.5	22.2	3.7	18.7	25.6
Organic Carbon, Total	mg/L	1	1.9	5.8	7.9	8.6	12.7	5.2	8.2	5.2	8.8	8.5	5.2	7.5	7.9	8.5		14.5	6.7	7.9	7.2	4.6	12.7	10.2	11.8
Oil and Grease	mg/L	1	<0.5		6.2		<0.5		7.9					4.3			<0.5	<0.5					<0.5		
Solids, Total Suspended	mg/L	1.0	1.0		5.0		4.0		4.0					6.0			1.0	2.0					4.0		
Solids, Total Dissolved	mg/L	1	181	126	173	175	56.0	164	178	190.0	144	180	185	184	140	187	181	146.0	204	152	170	200	56.0	70	62
Corrosivity Index (Langlier)																	-0.67								
DRO-WATER	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.10	<0.06	<0.1	<0.1	<0.1	<0.10	<0.06	<0.1
GRO-WATER	mg/L	0.1	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.10	<0.1	<0.06	<0.06	<0.06	<0.10	<0.06
Surfactants	mg/L	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	2	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Fecal Coliform	colonies	1																							
Residual Chlorine	mg/L																								
Free Chlorine																	<0.2								
Chlorine (field)				0.12	0.13	0.08		0.11	0.04	0.01		0.06		0.06	0.08	0.09				0.06	0.08	0.11	0.07	0.21	0.05
Chlorine (field, second try)																									

Table 13-2. Water Consumption

Location	Type of consumption	Average annual consumption[1], gpm
Crusher, pellet plant and concentrator	Evaporation from thickeners and induration of green balls	416
DRI plant	Process water and cooling tower losses	1,171
Steel mill	Cooling tower losses and direct evaporation from hot steel	1,176
Tailings basin	Losses of water trapped with tailings (voids loss)	1,300
Stream Augmentation	Replace flow diverted from receiving water bodies[2]	To be determined during permitting.
Total consumptive use		4,063+

[1] Average annual figures account for annual shutdowns and downtime. They are slightly lower than the corresponding averages during operation.

[2]Not including possible augmentation of Little Sucker Lake, McCarthy Lake, or Snowball Lake.

Table 17-1 (of PolyMet EAW) – Calculated Low, High, and Average Flow Statistics for Ungauged Portions of the Partridge River

Location	Drainage Area (mi^2)	Low Flow – 7Q10 (cfs)		High Flow – Q2 (cfs)		Average Flow
		Brooks and White	Siegel and Ericson	Siegel and Ericson	This study	Siegel and Ericson
PU-1 without Pit B Area	10.8	0.23	0.05	90	57	6
PU-1 with Pit B Area	14.4	0.33	0.08	114	78	9
PU-2 without Pit B Area	20	0.49	0.13	149	111	13
PU-2 with Pit B Area	23.6	0.61	0.17	171	132	15
PU-3 without Pit B Area	54.4	1.71	0.65	340	325	37
PU-3 with Pit B Area	58	1.86	0.72	358	348	39

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APPENDIX D4
Wetlands

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Cumulative Wetland Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

SEH No. EXENR0502.03

November 13, 2006

(Revised – June 5, 2007)

Prepared for Excelsior Energy
Cumulative Wetland Effect Assessment
Mesaba Energy Project

SEH No. EXENR0502.03

Prepared for:
Excelsior Energy

November 13, 2006

(Revised – June 5, 2007)

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Prepared for Excelsior Energy

Mesaba Energy Project

Introduction

This assessment of cumulative impacts to wetlands has been prepared on behalf of Excelsior Energy for the proposed Mesaba Energy Project and to assist the federal and state agencies in the preparation of the environmental impact statement (EIS).

The Department of Energy (DOE) National Energy Technology Laboratory (NETL) is required by the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321, *et seq*.), the Council on Environmental Quality NEPA regulations (40 Code of Federal Regulations [C.F.R.] Parts 1500-1508), and the DOE NEPA regulations (10 C.F.R. Part 1021) to prepare an EIS as part of its participation in the Mesaba Energy Project.

Similarly, under the Power Plant Siting Act (PPSA) (Minnesota Statutes §§ 116C.51-.697) a site permit from the Public Utilities Commission (PUC) is required to build a large electric power generating plant (LEPGP), including preparation of a State EIS. The EIS requirements under NEPA and the PPSA are substantially similar, and DOE will prepare, in cooperation with the Minnesota Department of Commerce and the Minnesota Public Utilities Commission, a joint EIS that will fulfill the requirements of both state and federal law. The information contained in this report will be used in the preparation of that EIS.

The Minnesota Wetland Conservation Act and Section 404 of the Clean Water Act provide programs for evaluating the project-specific wetland impacts. The NEPA provides the context and carries the mandate to analyze the cumulative effects of federal actions (in this case, funding provided by the DOE). The Council on Environmental Quality (CEQ) regulations for implementing the NEPA defines cumulative effects as:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR § 1508.7).

The consideration of past, present and reasonable foreseeable future actions provide a context for assessing the cumulative impacts on the wetland resources.

Study Area

The PPSA and Applicable Rules requires definition of at least two potential sites for the proposed project, identification of which a preferred site, and justification for its preference. In compliance with these requirements, Excelsior Energy has identified two potential project sites, the West Range site and the East Range site.

The West Range site includes approximately 1,260 acres of undeveloped land within the city limits of Taconite, Minnesota in Iron Range Township as shown on **Figure 1**. The East Range site includes approximately 810 acres of undeveloped property located within the city limits of Hoyt Lakes, Minnesota as shown on **Figure 2**. The West Range site has been identified as the preferred location on which to construct the Mesaba Energy Project, however, final determination of the project site will be made by the Minnesota Department of Commerce and the Minnesota Public Utilities Commission under the PPSA requirements. The EIS includes a description of additional supporting project elements, including roadways, railroad, natural gas and electric transmission, required for operation of the proposed project at both alternative sites. This assessment includes evaluation of the potential wetland impacts from the preferred alternative project elements for each alternate site.

Because many of the primary functions performed by wetlands are related to the surrounding watershed, the study area for the cumulative effects assessment was defined according to the limits of the affected subwatersheds for each alternative site. The paragraphs below describe the study area for both the West Range and East Range sites. The characteristics of the study areas are described in the following sections.

West Range Site

The West Range site is located within subwatersheds on the boundary between the Swan River and Prairie River watersheds. The study area associated with the West Range site (See **Figure 3**) is defined as follows.

1) That part of the Swan River watershed upstream of the point where Holman Lake discharges to the Swan River. The Holman Lake discharge point represents the point on the Swan River affected by discharge and drainage from the West Range site.

2) That part of the Prairie River watershed upstream of Prairie Lake.

Swan River Watershed

The portion of the Swan River watershed considered within the study area covers approximately 114,266 acres extending from just northeast of the City of Grand Rapids to just northwest of the City of Hibbing (**Figure 3**) and then south and east. Seven small communities (Coleraine, Bovey, Taconite, Marble, Calumet, Nashwauk and Keewatin) are located along the Mesabi Iron Range that lies just south of the divide between the Swan River watershed and the adjacent Prairie River watershed to the north. These communities, along with the associated iron and ore mining that support them, represent the primary development in the study area.

Outside of the small urban areas and scattered farmsteads and rural residences, land uses in the watershed primarily consists of ore mine pits and spoil areas. The remainder of this portion of the study area is a mixture of deciduous and mixed forest and wetland. The MNDNR Census of the Land (1996) identifies the primary land cover in the watershed as gravel pits and open mines, deciduous and mixed wood forest and open water.

Prairie River Watershed

The portion of the Prairie River watershed considered in the study area covers approximately 285,890 acres along the same portion of the Mesabi Iron Range (**Figure 3**) but extending north and west. Because the existing communities lie primarily along the southern edge of the iron formation, there are no established communities within this area of the Prairie River watershed. Outside of widely scattered farmsteads and rural residences, land use in the watershed is primarily mixed wood and deciduous forest and wetland. The MNDNR Census of the Land (1996) identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, wetlands, and water.

East Range Site

The East Range site is located in a subwatershed of the Partridge River in St. Louis County, Minnesota. The study area of the East Range site (See **Figure 4**) is defined as point on the Partridge River approximately 5 miles downstream of the confluence with First Creek.

Partridge River Watershed

The portion of the Partridge River watershed considered in the study area covers approximately 88,692 acres extending from the City of Aurora northeast toward the City of Babbitt (**Figure 4**). Outside of the small urban areas of Aurora and Hoyt Lakes and widely scattered farmsteads and rural residences, land use in the watershed is primarily mining, mixed wood forest and wetland. The MNDNR Census of the Land (1996) identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, gravel pits and open mines, wetlands, and water.

Methodology

This analysis includes the evaluation of the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions. The proposed project will be evaluated along with reasonably foreseeable future actions within the study area to determine the potential for cumulative effects on wetland resources for each alternative site.

Previous Conditions (1980s)

The past condition of wetland resources in the project area is defined as the condition that existed at the time of the National Wetlands Inventory (NWI). The existing NWI data is used to represent the wetland area that existed at the time the aerial photography was flown.

Existing Conditions

Wetland areas estimated for the existing conditions were developed by compiling the following data.

1. The NWI was used to identify wetlands in most areas, particularly where additional detailed information was unavailable. However more accurate or more detailed data were used in place of NWI data where available, as described below.

2. Wetlands shown to be disturbed by mining and other development and industry were identified through interpretation of aerial photography. Where wetlands were shown to be filled or otherwise obliterated, they were removed from the "existing wetlands" data.

A "composite" wetlands layer was developed by deleting all of the NWI wetlands from the areas where additional data and/or photo interpretation show that wetlands have been impacted.

Foreseeable Future Conditions

Wetland areas estimated for future conditions were developed by defining reasonably foreseeable projects that are expected to be implemented in the future (± 20 years). In addition to identifying several project currently undergoing separate environmental assessment and permitting, potential future municipal and county highway departments projects were considered. The following table provides a summary of the projects considered reasonably foreseeable in each of the study areas. The potential effects of each project on existing wetland resources was estimated using the existing conditions wetland mapping described above and an assumed footprint of disturbance for each potential future project.

Table 1
Reasonably Foreseeable Future Actions

West Range Site Study Area	East Range Site Study Area
Minnesota Steel Industries	PolyMet Mining NorthMet Project
Nashwauk Gas Pipeline	Mesabi Nugget
Itasca County Highway 7 Realignment	St. Louis County – new roadway from Hoyt Lakes to Babbitt
Itasca County Railroad	

Cumulative Effects Assessment

The past condition of wetland resources in the project area is represented by the resources included on the NWI. Wetland area features used in this assessment were mapped as part of the NWI performed by the US Fish and Wildlife Service (USFWS) and made available in ARC/INFO format by the MNDNR GIS Data Deli. The wetland types described in this assessment utilize the Circular 39 Classification (Shaw and Fredine, 1956), a means of classifying the wetland basins of the U.S. It is composed of 20 types of which 8 are found in Minnesota. Three additional types were added into the GIS database to completely classify the Minnesota NWI wetlands into Circular 39 types. These additional classifications include Type 80

(Municipal and industrial activities, water regime), Type 90 (Riverine systems), and Type 98 (Uplands, i.e., the absence of wetland).

West Range Site

Past Conditions (1980s)

Swan River Watershed

The NWI data shows there are approximately 28,554 acres of wetland habitat in that portion of the Swan River watershed within the study area. At the time of the NWI, wetland habitat represented approximately 25% of the landscape within the study area. The majority of the wetland habitat was either shallow open water, shrub swamp or bog. **Table 2** below provides a summary of the wetlands by wetland type. For simplification, the Circular 39 classification is used.

Table 2
Past Conditions:
Wetlands Previously in the Swan River Study Area

Wetland Type	Description	Total Wetland Area (acres)	Percent of Wetland Area	Percent of Total Area
Type 1	Seasonally flooded basin or flat	3.95	0.01%	0.004%
Type 2	Wet meadow	855.60	3.00%	0.75%
Type 3	Shallow marsh	1,347.86	4.72%	1.18%
Type 4	Deep marsh	566.36	1.98%	0.50%
Type 5	Shallow open water	6,589.87	23.08%	5.77%
Type 6	Shrub swamp	6,009.28	21.05%	5.26%
Type 7	Wooded swamp	2,318.29	8.12%	2.03%
Type 8	Bog	6,320.11	22.13%	5.53%
Type 80	Municipal and industrial activities, water regime	4,501.66	15.77%	3.94%
Type 90	Riverine systems	40.75	0.14%	0.04%
Total		**28,553.73**		**24.99%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.				

Prairie River Watershed

The NWI data shows there are approximately 100,363 acres of wetland habitat in that portion of the Swan River watershed within the study area. At the time of the NWI, wetland habitat represented approximately 35% of the landscape within the study area. As in the adjacent Swan River Watershed, the majority of the wetland habitat was either shallow open water, shrub swamp or bog. **Table 3** below provides a summary of the wetlands by wetland type.

Table 3
Past Conditions:
Wetlands Previously in the Prairie River Study Area

Wetland Type	Description	Total Wetland Area (acres)	Percent of Wetland Area	Percent of Total Area
Type 1	Seasonally flooded basin or flat	627.65	0.63%	0.22%
Type 2	Wet meadow	4,171.95	4.16%	1.46%
Type 3	Shallow marsh	2,260.88	2.25%	0.79%
Type 4	Deep marsh	485.25	0.48%	0.17%
Type 5	Shallow open water	23,686.65	23.60%	8.29%
Type 6	Shrub swamp	24,659.21	24.57%	8.63%
Type 7	Wooded swamp	9,233.76	9.20%	3.23%
Type 8	Bog	34,790.63	34.66%	12.17%
Type 80	Municipal and industrial activities, water regime	230.40	0.23%	0.08%
Type 90	Riverine systems	216.40	0.22%	0.08%
Total		**100,362.78**		**35.11%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.				

Existing Conditions

The existing condition is represented by the “composite” wetlands layer developed from NWI data and aerial photo interpretation as described above. The following sections provide a summary of the existing wetland resources in each of the watershed study areas and a description of the wetland losses to the present.

Swan River Watershed

The existing conditions data shows there are approximately 25,058 acres of wetland habitat in that portion of the Swan River watershed within the study area. This represents a loss of approximately 3,496 acres or 12.24% of the past wetland habitat. The loss represents approximately 3% of the land cover in the study area. **Table 4** below provides a summary of the wetlands by wetland type.

Table 4
Existing Conditions:
Wetlands in the Swan River Study Area

Wetland Type	Previous Wetland Area from NWI (acres)	Wetlands Lost (acres)	Percent Lost	Remaining Area (acres)	Percent of Total Area
Type 1	3.95	0.00	0.0%	3.95	0.004%
Type 2	855.60	15.35	1.8%	840.85	0.74%
Type 3	1,347.86	168.64	12.5%	1,179.22	1.03%
Type 4	566.36	237.55	41.9%	328.81	0.29%
Type 5	6,589.87	1,105.79	16.8%	5,484.08	4.80%
Type 6	6,009.28	275.80	4.6%	5,733.49	5.02%
Type 7	2,318.29	138.85	6.0%	2,179.44	1.91%
Type 8	6,320.11	100.04	1.6%	6,220.07	5.44%
Type 80	4,501.66	1,454.08	32.3%	3,047.58	2.67%
Type 90	40.75	0.00	0.0%	40.75	0.04%
Totals	**28,553.73**	**3,496.1**	**12.24%**	**25,058.24**	**21.93%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.					

The difference between past and present wetland areas is primarily due to the effects of ore mining and establishment of small urban communities. However, the effects of mining and the related human development in this area extends back to the early 1900s when iron mining and mining camps were established as the precursors of the development seen today. There was certainly additional pre-settlement wetland habitat affected by mining and other human disturbance that was removed prior to development of the NWI and therefore prior to the time considered in the scope of this assessment.

Prairie River Watershed

The existing conditions data shows there are approximately 100,264 acres of wetland habitat in that portion of the Swan River watershed within the study area. This represents a loss of approximately 99 acres of wetland or 0.10% of the past wetland habitat. The loss represents only 0.04% of the land cover in the study area. **Table 5** below provides a summary of the wetlands by wetland type. The lesser effect of mining and related human development on the northern side of the iron formation can be seen in the smaller change in wetland loss between the two watersheds.

Table 5
Existing Conditions:
Wetlands in the Prairie River Study Area

Wetland Type	Previous Wetland Area from NWI (acres)	Wetlands Lost (acres)	Percent Lost	Remaining Area (acres)	Percent of Total Area
Type 1	627.65	0.00	0.0%	627.65	0.22%
Type 2	4,171.95	0.86	0.0%	4,171.09	1.46%
Type 3	2,260.88	2.89	0.1%	2,257.99	0.79%
Type 4	485.25	10.97	2.3%	474.28	0.17%
Type 5	23,686.65	0.37	0.0%	23,686.28	8.29%
Type 6	24,659.21	1.01	0.0%	24,658.20	8.63%
Type 7	9,233.76	1.79	0.0%	9,231.97	3.23%
Type 8	34,790.63	2.20	0.0%	34,788.43	12.17%
Type 80	230.40	78.73	34.2%	151.67	0.05%
Type 90	216.40	0.00	0.0%	216.40	0.08%
Totals	**100,362.78**	**98.82**	0.10%	**100,263.96**	35.07%
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.					

Mesaba Energy Project

The Mesaba Energy Project is to be constructed in two phases. Phase I will include construction of Mesaba One, the first IGCC unit, along with associated facilities including high voltage transmission line (HVTL), gas pipeline, roads, railroads, and utilities. Phase II will include construction of Mesaba Two, the second IGCC unit. The preferred alternatives for the supporting infrastructure are intended to support the operation of both IGCC units and are the alternatives for which wetland impacts are described below. **Table 6** below provides a summary of the wetland impacts from the Mesaba Energy Project on the West Range Site. The wetland impacts shown in **Table 6** are a summary of all wetland impacts, both within and outside of the study area defined for this assessment of cumulative effects. The wetland impacts within the study area are divided by subwatershed (Swan River and Prairie River) in the following sections.

Table 6
Summary of Wetland Impacts
Mesaba Energy Project – West Range Site

Project Element	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Wetland Filling									
IGCC Power Station, Phase I							17.33		17.33
IGCC Power Station, Phase II			0.12				1.99	11.52	13.63
Power Transmission (fill)		0.0006	0.0012			0.0013	0.0026	0.0045	0.01
Railroad			0.14			4.80	19.99	1.52	26.45
Plant Access Road (acres in ROW)						3.44	0.39	0.04	3.87
Subtotal Wetland Filling									**61.29**
Temporary Disturbance									
Gas Pipeline (acres in ROW)	0.12	1.28	1.14			3.98	6.94	4.01	17.47
Process Water – Lind Pit to Canisteo (acres in ROW)									0.00
Process Water – Canisteo to IGCC site (acres in ROW)						0.04	0.88	2.81	3.73
Process Water – Gross Marble to Canisteo (acres in ROW)				0.42	0.20	1.33	1.47	0.37	3.79
Process Water – Discharge to Holman Lake						0.32	0.88	2.78	4.07
Process Water – Discharge to Canisteo Pit						5.71	0.24	7.65	13.60
Potable Water and Sanitary Sewer						0.13	0.52	1.14	1.79
Subtotal Temporary Disturbance									**44.45**
Type Conversion									
Power Transmission						8.63	7.37	14.21	30.21
Gas Pipeline						3.98	6.94	4.01	14.93
Process Water – Canisteo to IGCC site						0.04	0.88	2.81	3.73
Process Water – Gross Marble to Canisteo						1.33	1.47	0.37	3.17
Process Water – Discharge to Holman Lake						0.32	0.88	2.78	3.98
Process Water – Discharge to Canisteo Pit						5.71	0.24	7.65	13.60
Potable Water and Sanitary Sewer						0.13	0.52	1.14	1.79
Subtotal Type Conversion									**71.41**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.									

Swan River Watershed

Table 7 is a summary of wetland fill within the Swan River Watershed that would result from construction of the Mesaba Energy Project on the West Range Site. The table includes only those wetland impacts within the Swan River Watershed portion of the cumulative effects study area and only wetland fill impacts. The table excludes temporary wetland impacts or changes in wetland type as well as wetland impacts outside of the cumulative effects study area. The data show that construction of the proposed Mesaba Energy Project on the West Range Site would affect approximately 0.13% of the existing wetland area in the Swan River Watershed (within the study area).

Table 7
Summary of Mesaba Energy Project Wetland Impacts in Swan River Watershed

Wetland Types	Wetland Impact (acres)	Percent of Existing Wetland Area	Percent of Total Area
Type 1	0.00	0.000%	0.0000%
Type 2	0.31	0.037%	0.0003%
Type 3	4.11	0.349%	0.0036%
Type 4	0.42	0.128%	0.0004%
Type 5	0.20	0.004%	0.0002%
Type 6	21.21	0.370%	0.0186%
Type 7	4.25	0.195%	0.0037%
Type 8	2.27	0.037%	0.0020%
Total	**32.77**	**0.131%**	**0.0287%**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.			

Prairie River Watershed

Table 8 is a summary of wetland fill within the Prairie River Watershed that would result from construction of the Mesaba Energy Project on the West Range Site. The table includes only those wetland impacts within the Prairie River Watershed portion of the cumulative effects study area and only wetland fill impacts. The table excludes temporary wetland impacts or changes in wetland type as well as wetland impacts outside of the cumulative effects study area. The data show that construction of the proposed Mesaba Energy Project on the West Range Site would affect approximately 0.02% of the existing wetland area in the Prairie River Watershed (within the study area).

Table 8
Summary of Mesaba Energy Project Wetland Impacts in Prairie River Watershed

Wetland Types	Wetland Impact (acres)	Percent of Existing Wetland Area	Percent of Total Area
Type 1	0.00	0.000%	0.0000%
Type 2	0.00	0.000%	0.0000%
Type 3	0.04	0.008%	0.00001%
Type 4	0.00	0.000%	0.0000%
Type 5	0.00	0.000%	0.0000%
Type 6	0.27	0.001%	0.0001%
Type 7	24.13	0.261%	0.0084%
Type 8	0.00	0.000%	0.0000%
Total	**24.44**	**0.024%**	**0.0085%**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.			

Foreseeable Future Conditions

Reasonably foreseeable future projects in the West Range study area include:

- the proposed Minnesota Steel Industries steel plant northeast of the West Range Site,
- a proposed gas pipeline intended to serve Minnesota Steel and others to be constructed by the Nashwauk Public Utilities Commission,
- a new railroad to serve Minnesota Steel to be constructed by Itasca County,
- and a proposed realignment of County Road 7 also to be constructed by Itasca County.

See **Figure 3** for the location of these potential future projects in relation to the Mesaba Energy Project West Range Site and the cumulative effects study area. No other reasonably foreseeable future projects were identified after consideration of potential projects by the individual municipalities in the study area and the Itasca County Highway Department.

<u>Minnesota Steel</u>

Minnesota Steel Industries, LLC proposes to reactivate the former Butler Taconite mine and tailings basin near Nashwauk and add direct-reduced iron production and steel making and rolling equipment in an integrated facility to make steel directly from Minnesota taconite ore. The MNDNR is currently preparing an Environmental Impact Statement (EIS) for the proposed project.

The Draft Environmental Impact Statement (DEIS) published for the Minnesota Steel project states that an anticipated total of between 945 and 1,163 acres of wetlands and deepwater habitats will be impacted as a result of the project including: plant facilities, mining activities, tailings basin, tailings pipeline, rock and overburden stockpiling. Detailed wetland mitigation planning has begun and an overall mitigation plan is included as part of the DEIS.

Table 9 provides a summary of wetland impacts as reported in the DEIS. The division of impacts between the Swan River and Prairie River watersheds is not known. The Minnesota Steel site lies on or near the division between the two watersheds, similar to the Mesaba Energy Project West Range Site. However, most of the site is believed to be located in the Swan River Watershed.

Table 9
Minnesota Steel
Summary of Wetland Impacts

	Total wetland impacts with Stage I Tailings Basin (acres)	Total wetland impacts with Alternative Tailings Basin (acres)
Type 1	10.5	10.5
Type 2	107.7	71.0
Type 3	94.3	1.1
Type 4	66.1	59.7
Type 5	222.1	99.0
Type 6	231.8	207.8
Type 7	32.1	88.3
Type 8	1.2	9.0
Deepwater	398.2	398.2
Total	**1163.1**	**944.9**

Nashwauk Gas Pipeline

The Nashwauk Public Utilities Commission (NPUC) is planning to construct a natural gas pipeline to provide operating fuel to the Minnesota Steel Industries Nashwauk Taconite Reduction Plant described above. NPUC is proposing to install a 21.5 mile high-pressure natural gas pipeline extending from the existing Great Lakes Gas (GLG) 36-inch pipeline in Blackberry Township to the City of Nashwauk as shown on **Figure 3**.

Construction of the pipeline would result in temporary and some permanent impacts to wetland habitats, although the project has yet to reach a stage in planning where wetland impacts have been assessed. **Table 10** below provides a summary of the wetland habitat identified on the NWI within an assumed 70-foot right-of-way along the proposed alignment. Although the proposed pipeline alignment uses existing rights-of-way where possible, some new ROW will be established, resulting in conversion of wetland types from shrub and forested cover to emergent.

Table 10 Wetland Impacts from Nashwauk Gas Pipeline		
Wetland Type	Swan River Watershed	Prairie River Watershed
	Area in permanent ROW (acres)	
Type 2	0.31	0.00
Type 3	1.56	2.46
Type 4	0.00	0.36
Type 6	5.60	1.36
Type 7	2.07	5.92
Type 8	1.87	4.08
Totals	**11.41**	**14.18**

<u>Itasca County Railroad</u>

Itasca County is planning to construct a railroad spur to provide rail access to the Minnesota Steel Industries Nashwauk Taconite Reduction Plant described above. The rail spur is approximately eight miles in length extending from existing rail lines along Highway 169 in a northeasterly direction to the Minnesota Steel Industries site as shown on **Figure 3**. Construction of the railroad is expected to impact approximately 12 acres of wetland, all within the Swan River Watershed.

<u>Itasca County Road 7 Realignment</u>

Itasca County is also considering realignment of County Road 7 as shown on **Figure 3**. The new roadway would replace the existing County Road 7 which would become part of the entrance to the Mesaba Energy Project. This realignment would occur only if the Mesaba Energy Project was constructed at the West Range Site. If constructed the roadway would impact approximately 1.8 acres wetland area as shown in **Table 11**. All of the wetland impacts would be in the Swan River Watershed.

Table 11 Wetland Impacts from Itasca County Road 7 Realignment	
Wetland Type	Wetland Impact (acres)
Type 4	0.43
Type 6	0.42
Type 7	0.55
Type 8	0.40
Total	**1.80**

East Range Site

Previous Conditions (1980s)

The NWI data shows there are approximately 34,500 acres of wetland habitat in that portion of the Partridge River watershed within the study area. At the time of the NWI, wetland habitat represented nearly 39% of the landscape within the study area. The majority of the wetland habitat (over 60%) was bog. **Table 12** below provides a summary of the wetlands by wetland type.

Table 12
Past Conditions:
Wetlands Previously in the Partridge River Study Area

Wetland Type	Description	Total Wetland Area (acres)	Percent of Wetland Area	Percent of Total Area
Type 1	Seasonally flooded basin or flat	0.00	0.00%	0.00%
Type 2	Wet meadow	235.24	0.68%	0.27%
Type 3	Shallow marsh	552.30	1.60%	0.62%
Type 4	Deep marsh	308.05	0.89%	0.35%
Type 5	Shallow open water	2,847.50	8.25%	3.21%
Type 6	Shrub swamp	4,707.21	13.64%	5.31%
Type 7	Wooded swamp	4,864.80	14.10%	5.49%
Type 8	Bog	20,783.08	60.24%	23.43%
Type 90	Riverine systems	201.90	0.59%	0.23%
Totals		**34,500.08**		**38.90%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.				

Existing Conditions

The existing conditions data shows there are approximately 33,212 acres of wetland habitat in that portion of the Partridge River watershed within the study area. This represents a loss of approximately 1,288 acres or 3.73% of the past wetland habitat. The loss represents less than 0.5% of the land cover in the study area. **Table 13** below provides a summary of the wetlands by wetland type.

Table 13
Existing Conditions:
Wetlands in the Partridge River Study Area

Wetland Type	Previous Wetland Area from NWI (acres)	Wetlands Lost (acres)	Percent Lost	Remaining Area (acres)	Percent of Total Area
Type 1	0.00	0.00	0.0%	0.00	0.00%
Type 2	235.24	10.36	4.4%	224.88	0.25%
Type 3	552.30	39.84	7.2%	512.46	0.58%
Type 4	308.05	169.08	54.9%	138.97	0.16%
Type 5	2,847.50	314.32	11.0%	2,533.19	2.86%
Type 6	4,707.21	176.07	3.7%	4,531.15	5.11%
Type 7	4,864.80	158.71	3.3%	4,706.10	5.31%
Type 8	20,783.08	420.08	2.0%	20,363.01	22.96%
Type 90	201.90	0.00	0.0%	201.90	0.23%
Totals	**34,500.08**	**1,288.46**	**3.73%**	**33,211.66**	**37.45%**
Source: National Wetlands Inventory (NWI) from MNDNR GIS Data Deli.					

As at the West Range Site, the difference between past and present wetland areas is primarily due to the effects of ore mining and establishment of small urban communities. However, the effects of mining and the related human development in this area extends back to the early 1900s when iron mining and mining camps were established as the precursors of the development seen today. There was certainly additional pre-settlement wetland habitat affected by mining and other human disturbance that was removed prior to development of the NWI and therefore prior to the time considered in the scope of this assessment.

Mesaba Energy Project

As described for the West Range Site, the Mesaba Energy Project is to be constructed in two phases. Phase I will include construction of Mesaba One, the first IGCC unit, along with associated facilities including high voltage transmission line (HVTL), gas pipeline, roads, railroads, and utilities. Phase II will include construction of Mesaba Two, the second IGCC unit. The preferred alternatives for the supporting infrastructure are intended to support the operation of both IGCC units and are the alternatives for which wetland impacts are described below. **Table 14** below provides a summary of the wetland impacts from the Mesaba Energy Project on the East Range Site. The wetland impacts shown in **Table 14** are a summary of all wetland impacts, both within and outside of the study area defined for this assessment of cumulative effects. The wetland impacts within the study area are described in **Table 15**.

Table 14
Summary of Wetland Impacts
Mesaba Energy Project – East Range Site

Project Element	Riv.	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Wetland Filling									
IGCC Power Station, Phase I			6.38				5.53		11.91
IGCC Power Station, Phase II		0.003					3.70		3.70
Power Transmission (fill)	0.0006	0.0019			0.0006	0.0211	0.0030	0.0189	0.05
Railroad		0.06				0.85	9.77		10.68
Plant Access Road (acres in ROW)						0.47	2.76		3.23
Subtotal Wetland Filling									**29.57**
Temporary Disturbance									
Gas Pipeline (acres in ROW)	0.18	3.46			0.68	17.58	6.37	18.54	46.81
Process Water – intake (acres in ROW)				0.23	0.29	1.13			1.65
Potable Water and Sanitary Sewer					0.45				0.45
Subtotal Temporary Disturbance									**48.91**
Type Conversion									
Power Transmission						14.87	2.65	11.70	29.22
Gas Pipeline						17.58	6.37	18.54	42.49
Process Water – intake						1.13			1.13
Subtotal Type Conversion									**72.84**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type									

Table 15 is a summary of wetland fill within the Partridge River Watershed that would result from construction of the Mesaba Energy Project on the East Range Site. The table includes only those wetland impacts within the Partridge River Watershed portion of the cumulative effects study area and only wetland fill impacts. The table excludes temporary wetland impacts or changes in wetland type as well as wetland impacts outside of the cumulative effects study area. The data show that construction of the proposed Mesaba Energy Project on the East Range Site would affect 0.10% of the existing wetland area in the Partridge River Watershed (within the study area).

Table 15
Summary of Mesaba Energy Project Wetland Impacts
in Partridge River Watershed

Wetland Types	Wetland Impact (acres)	Percent of Existing Wetland Area	Percent of Total Area
Type 1	0.00	0.000%	0.0000%
Type 2	0.36	0.160%	0.0004%
Type 3	0.21	0.041%	0.0002%
Type 4	0.23	0.166%	0.0003%
Type 5	1.42	0.056%	0.0016%
Type 6	24.15	0.533%	0.0272%
Type 7	6.35	0.135%	0.0072%
Type 8	1.21	0.006%	0.0014%
Total	**33.93**	**0.102%**	**0.0383%**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.			

Foreseeable Future Conditions

Reasonably foreseeable future projects in the East Range study area include:

- the mine portion of the PolyMet Mining project (excluding the processing facility),
- the Mesabi Nugget project, and
- the corridor for a new roadway between Hoyt Lakes and Babbitt as proposed by St. Louis County.

See **Figure 4** for the location of these potential future projects in relation to the Mesaba Energy Project East Range Site and the cumulative effects study area. No other reasonably foreseeable future projects were identified after consideration of potential projects by the individual municipalities in the study area and the St. Louis County Highway Department.

PolyMet Mining, Inc. NorthMet Project

PolyMet Mining Inc. proposes an open pit mine to extract copper, nickel, cobalt and precious metals by dissolution and precipitation from a low-grade mineral deposit. The project includes a new mine area and use of the currently inactive Cliffs Erie taconite processing facility. The MNDNR is currently preparing an Environmental Impact Statement (EIS) for the proposed project.

The Scoping Environmental Assessment Worksheet (SEAW) prepared for the PolyMet Mining project identifies a total of 1,257 acres of wetland that would be impacted by the proposed mining, construction of mine support facilities, rock and overburden stockpiling, and miscellaneous transportation and utility requirements during the life of the project. Preliminary evaluations indicate that approximately one-half of these wetlands are predominantly bog communities. Approximately one-fourth of the potential wetland impacts are predominantly shrub swamp communities. The remaining one-fourth of the potential wetland impacts includes a mix of wet/sedge meadows, shallow marshes, and lowland hardwood swamps.

Table 16 PolyMet Mining Corp. Projected wetland impact summary by wetland type		
Circular 39 Wetland Classification	**Number of Wetlands**	**Area (acres)**
Type 2	6	2.7
Type 2/3	8	24.5
Type 2/7	2	3.3
Type 3	4	32.5
Type 3/6	1	1.9
Type 3/7	1	2.5
Type 3/8	8	48.9
Type 6	12	100.8
Type 6/3	1	4.8
Type 6/7	7	161.5
Type 6/8	4	111.5
Type 7	15	82.5
Type 8	28	647.3
Type 8/7	1	32.0
Total	98	1,256.7

Mesabi Nugget

Mesabi Nugget, LLC (MNC) has proposed a new commercial iron production plant that would use a new process for producing high purity iron (97% metallic iron) directly from iron ore. The company has completed a small-scale pilot plant at Silver Bay and proposes a a large scale demonstration plant (LSDP) on the Ling-Temco-Vought (LTV) property near the City of Aurora (see **Figure 4**). It is not known how much wetland will be affected by the Mesabi Nugget project. It is believed that the project will utilize existing structures and infrastructure and will likely have little, if any, impact to wetlands. **Table 17** below provides a summary of the wetlands shown on the NWI within the project boundary and within the cumulative impacts study area.

Table 17
Mesabi Nugget
Wetlands within project site

Wetland Types	Wetlands Identified within Project Area (acres)
Type 4	2.56
Type 5	29.88
Type 6	27.42
Type 7	23.50
Type 8	2.07
Total	**85.43**
Note: In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.	

St. Louis County New Hoyt Lakes – Babbitt Connection

St. Louis County has proposed a new roadway segment, a new connection between Hoyt Lakes and Babbitt. This segment is part of a larger initiative to more efficiently link the Iron Range communities of Aurora, Hoyt Lakes, Babbitt, and Ely to enhance the potential for new industry and to help mitigate the existing economic situation in the area by developing a new tranportation corridor. To date, several alternative alignments have been identified and evaluation of those alternatives is proposed to begin in 2007. Therefore, no estimate of potential wetland impacts is available for this future project. However, it is expected that because of the extent of wetland habitat in the area, constrution of the project will result in some impact to wetlands.

Conclusions

Table 18 provides a summary of the past and present estimates of wetland habitat in the West Range study area and the area of wetland within the study area that would be filled by the proposed Mesaba Energy Project. It also includes a comparison of potential wetland impacts from other reasonably foreseeable future projects in the study area.

Table 18
Summary of Cumulative Wetland Impacts
West Range Site Study Area

	Swan River Watershed		Prairie River Watershed		Total	
	Wetland Area (acres)	Percent of Present Wetland Area	Wetland Area (acres)	Percent of Present Wetland Area	Wetland Area (acres)	Percent of Present Wetland Area
Past	28,554	---	100,363	---	128,917	---
Present	25,058	12.24% lost from past	100,264	0.10% lost from past	125,322	2.79% lost from past
Mesaba Energy Project	32.77	0.13%	24.44	0.02%	57.21	0.05%
Future Projects						
MSI	945 – 1,163*	3.77% - 4.64%*	0*	---	945 – 1,163	0.75% - 0.93%
Gas Pipeline	11.41	0.05%	14.18	0.02%	25.59	0.02%
Railroad	12	0.05%	0	---	12	0.01%
CR 7	1.8	0.007%	0	---	1.8	0.001%

* The vast majority of wetland impacts are known to fall within the Swan River watershed; however, a small portion of this impact may instead fall within the Prairie River watershed.

Mining and other development in the study area has impacted less than 3% of the wetlands identified on the NWI. Of those remaining, the Mesaba Energy Project would affect 0.05% of the wetlands in the study area. Most of the wetland impacts would occur in the Swan River Watershed.

Similarly, of the reasonably foreseeable future projects, most of the wetland impacts would occur in the Swan River Watershed (within the study area).

This is primarily because the existing mining and human development lies on and south of the iron formation and within the Swan River Watershed. There is little development, other than widely scattered rural residences in the Prairie River Watershed (within the study area).

Of the reasonably foreseeable future projects, the Minnesota Steel Industries project represents the greatest potential impact to wetlands in the study area and is of a magnitude 17 to 20 times greater than the Mesaba Energy Project.

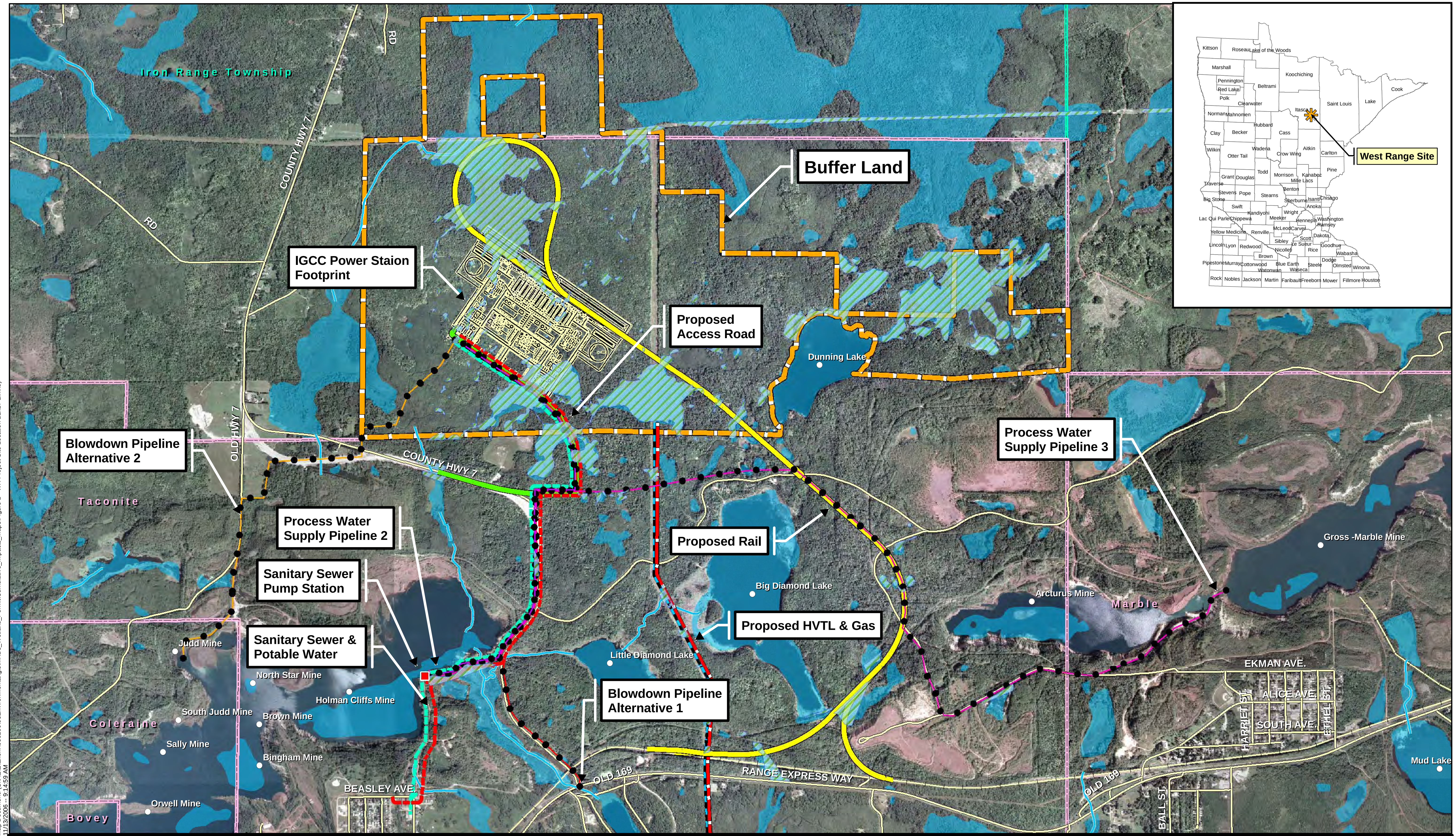
Table 19 provides a summary of the past and present estimates of wetland habitat in the East Range study area and the area of wetland within the study area that would be filled by the proposed Mesaba Energy Project. It also includes a comparison of potential wetland impacts from other reasonably foreseeable future projects in the study area.

Table 19
Summary of Cumulative Wetland Impacts
East Range Site Study Area

	Partridge River Watershed	
	Wetland Area (acres)	**Percent of Present Area**
Past	34,500	---
Present	33,212	3.73% lost from past
Mesaba Energy Project	33.93	0.10%
Future Projects		
PolyMet	1,256.7	3.78%
Mesabi Nugget	Unknown	---
St. Louis County New Hoyt Lakes – Babbitt Connection	Unknown	---

Mining and other development in the study area has impacted less than 4% of the wetlands identified on the NWI. Of those remaining, the Mesaba Energy Project would affect 0.10% of the wetlands in the study area. Of the reasonably foreseeable future projects, the PolyMet NorthMet project represents the greatest potential impact to wetlands in the study area and is of a magnitude nearly 40 times greater than the Mesaba Energy Project.

List of Figures



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Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

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Phone 952.847.2360 Fax 952.847.2373

West Range

November 2006

Legend

- Plant Layout
- Footprint and Buffer Land
- Proposed Rail
- Proposed Access Road

Proposed Utilities

- Potable Water
- Gravity Sewer
- Sanitary Pump Station Alt 2
- Gas Pipeline
- HVTL
- Process Water Pipeline 1
- Process Water Pipeline 2
- Process Water Pipeline 3
- Blow Down Alt 1
- Blow Down Alt 2
- Geographic Names
- Municipal Boundaries
- Civil Township
- Existing Roads
- Existing Railroads
- Streams
- Surveyed Wetlands
- NWI

Source: USDA 2003 DOQQs, USFWS, Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.
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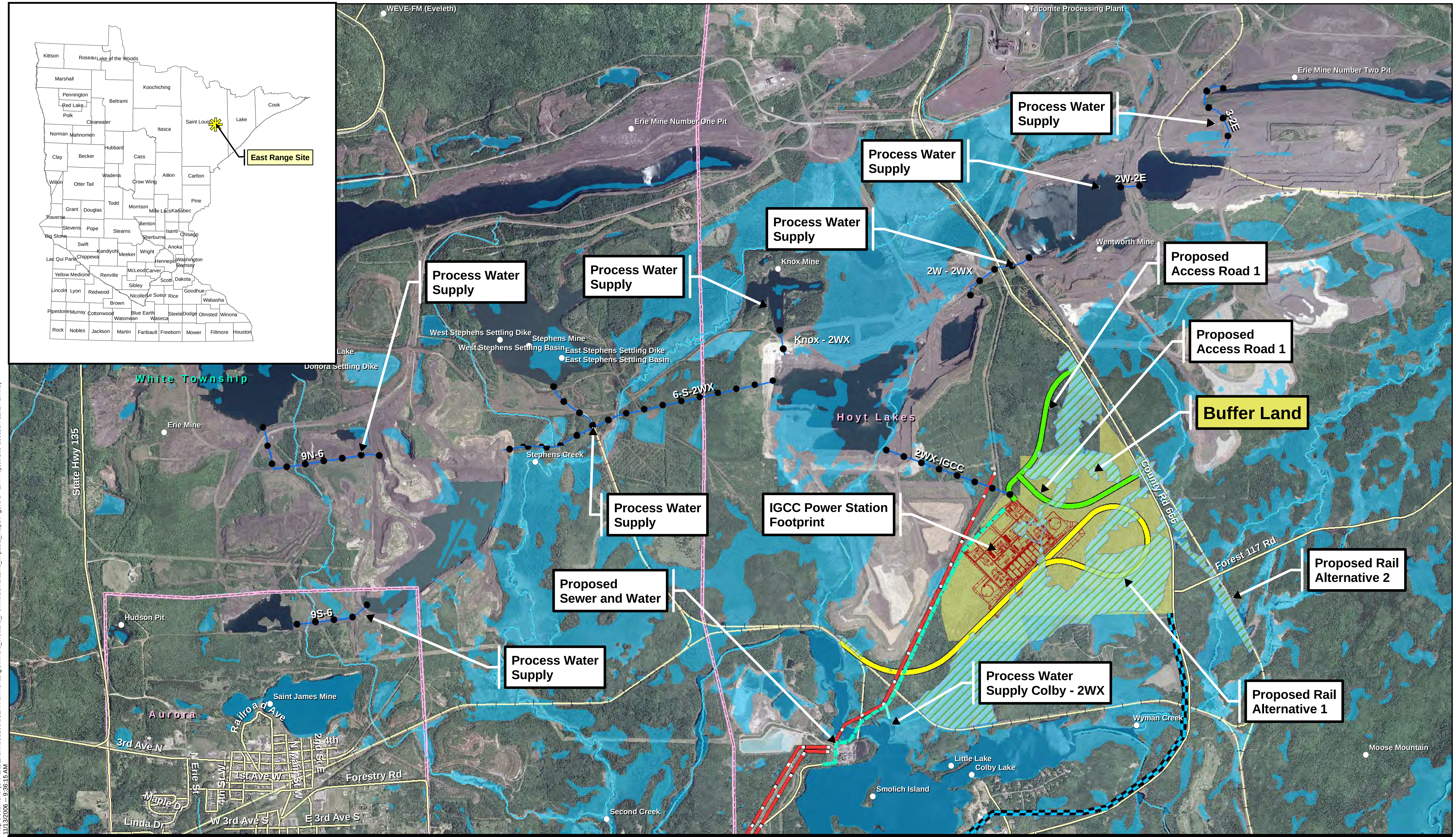
Figure 1

West Range Site Location

Itasca County - South Coordinate System

N W E S

0 2,000 Feet



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East Range

November 2006

Legend

Footprint	Gas Pipeline
Buffer Land	HVTL
Proposed Access Roads	Proposed Sewer and Water
Proposed Rail	Process Water Pipelines
Geographic Names	Existing Roads
Municipal Boundaries	Existing Railroads
Civil Township	Streams
Surveyed Wetlands	NWI

Source: USDA 2003 DOQQs, USFWS, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

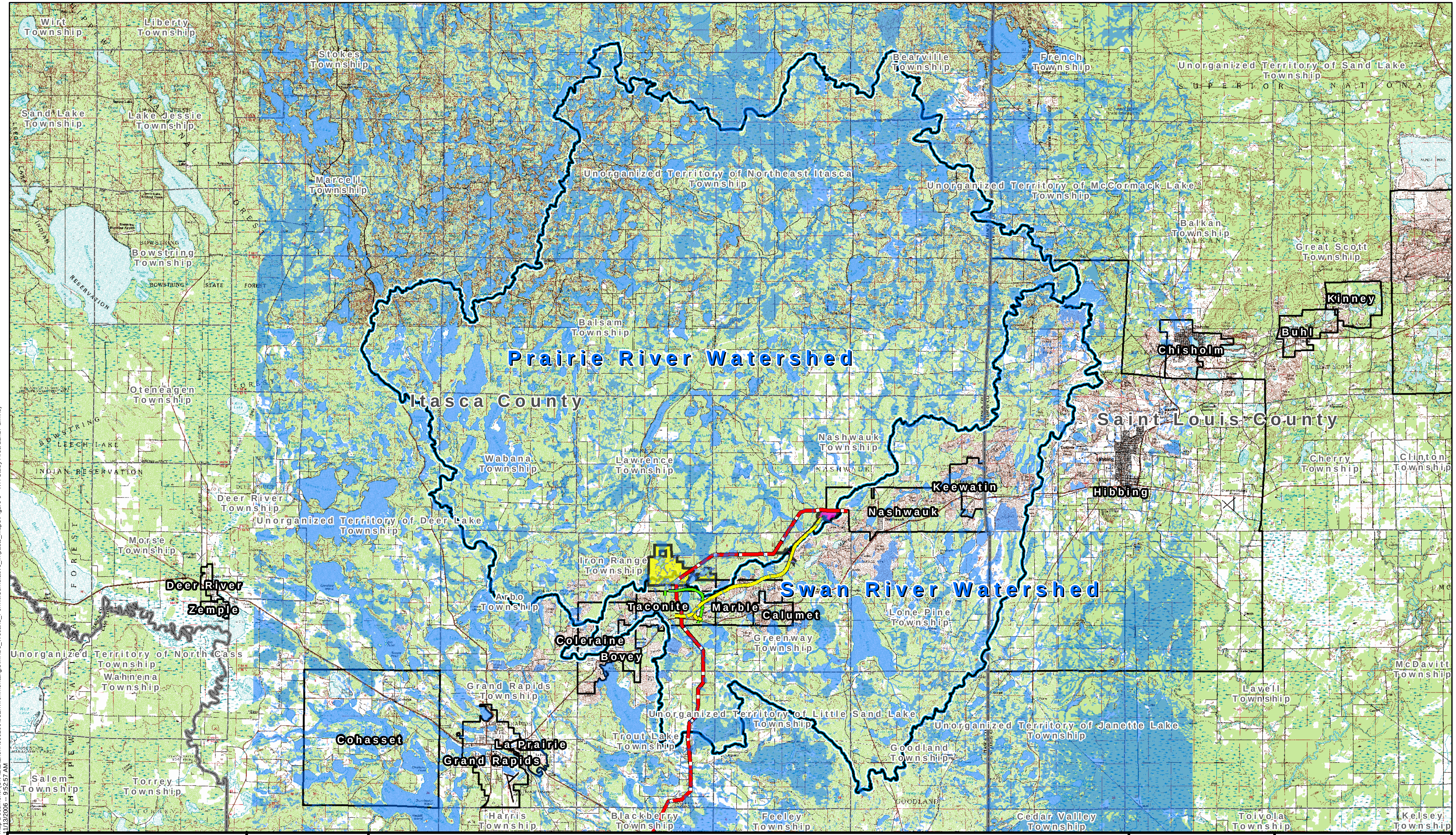
Figure 2

East Range Site Location

St. Louis County - Central Coordinate System

N E S W

0 3,000 Feet



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West Range

November 2006

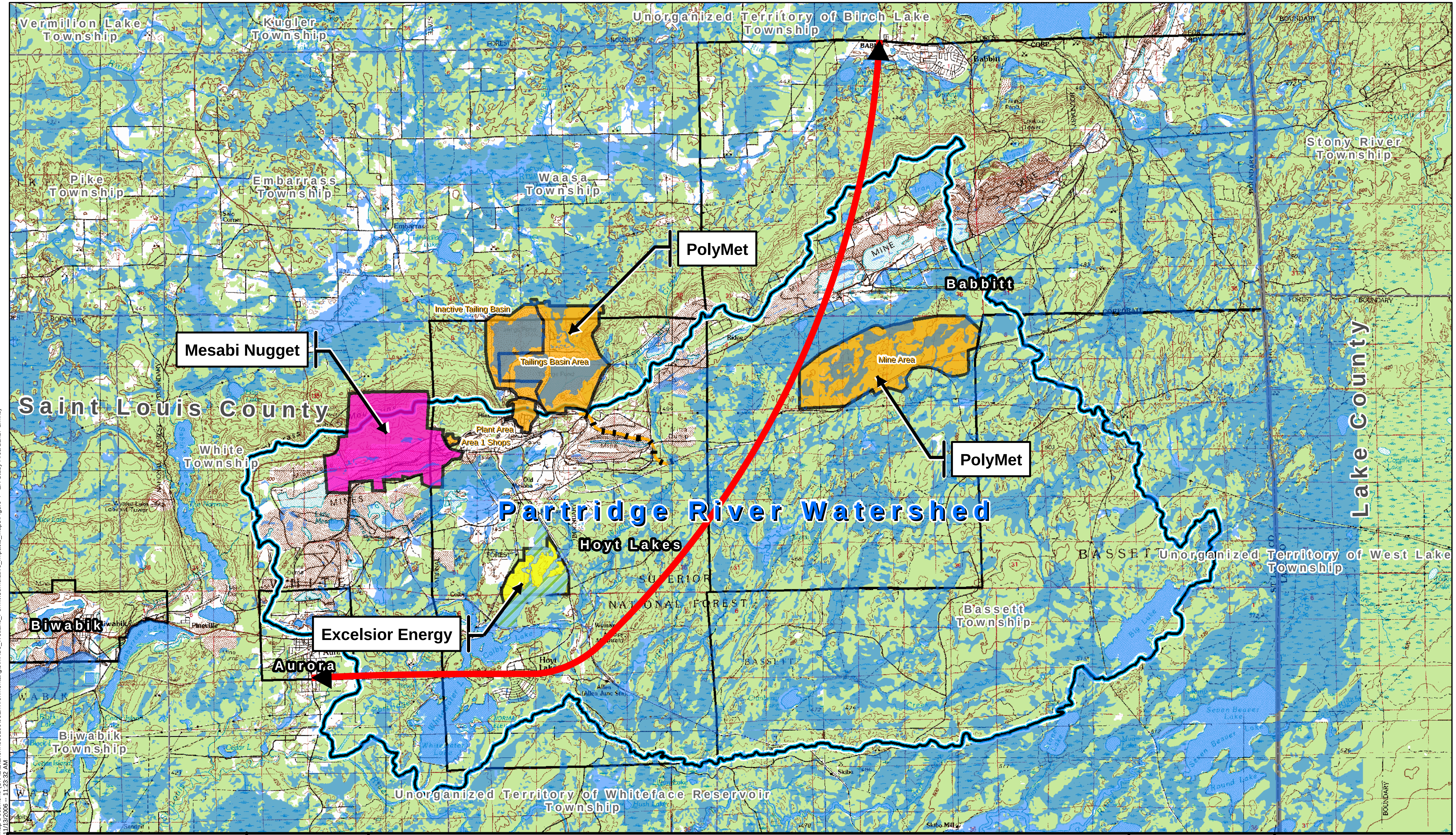
Legend

- Swan River Watershed
- Prairie River Watershed
- NWI
- Surveyed Wetlands
- Excelsior Energy West Range Site
- MN Steel DRI Plant Site
- Nashwauk Gas Pipeline
- Itasca County Road 7 Realignment
- Itasca County Rail Alignment
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, MN Steel, City of Nashwauk and SEH.

Figure 3

West Range Study Area



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East Range

November 2006

Legend

- Partridge River Watershed
- Surveyed Wetlands
- NWI
- Excelsior Energy East Range Site
- Mesabi Nugget Plant Site
- PolyMet Sites
- PolyMet Rail Construction
- St. Louis County New Hoyt Lakes to Babbitt Connection
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, and SEH.

Figure 4

East Range Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 2 Miles

APPENDIX D5
Wildlife Habitat

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Cumulative Wildlife Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

SEH No. EXENR0502.03

November 2006

Prepared for Excelsior Energy
Cumulative Wildlife Effect Assessment
Mesaba Energy Project

SEH No. EXENR0502.03

Prepared for:
Excelsior Energy

November 2006

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Cumulative Wildlife Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

Introduction

This assessment of cumulative impacts to wildlife has been prepared on behalf of Excelsior Energy for the proposed Mesaba Energy Project and to assist the federal and state agencies in the preparation of the environmental impact statement (EIS).

The Department of Energy (DOE) National Energy Technology Laboratory (NETL) is required by the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321, *et seq*.), the Council on Environmental Quality NEPA regulations (40 Code of Federal Regulations [C.F.R.] Parts 1500-1508), and the DOE NEPA regulations (10 C.F.R. Part 1021) to prepare an EIS as part of its participation in the Mesaba Energy Project.

Similarly, under the Power Plant Siting Act (PPSA) (Minnesota Statutes §§ 116C.51-.697) a site permit from the Public Utilities Commission (PUC) is required to build a large electric power generating plant (LEPGP), including preparation of a State EIS. The EIS requirements under NEPA and the PPSA are substantially similar, and DOE will prepare, in cooperation with the Minnesota Department of Commerce and the Minnesota Public Utilities Commission, a joint EIS that will fulfill the requirements of both state and federal law. The information contained in this report will be used in the preparation of that EIS.

The NEPA provides the context and carries the mandate to analyze the cumulative effects of federal actions (in this case, funding provided by the DOE). The Council on Environmental Quality (CEQ) regulations for implementing the NEPA defines cumulative effects as:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR § 1508.7).

The consideration of past, present and reasonable foreseeable future actions provide a context for assessing the cumulative impacts on the wetland resources.

Study Area

The PPSA and Applicable Rules requires definition of at least two potential sites for the proposed project, identification of which a preferred site, and justification for its preference. In compliance with these requirements, Excelsior Energy has identified two potential project sites, the West Range site and the East Range site.

The West Range site includes approximately 1,260 acres of undeveloped land within the city limits of Taconite, Minnesota in Iron Range Township as shown on **Figure 1**. The East Range site includes approximately 810 acres of undeveloped property located within the city limits of Hoyt Lakes, Minnesota as shown on **Figure 2**. The West Range site has been identified as the preferred location on which to construct the Mesaba Energy Project, however, final determination of the project site will be made by the Minnesota Department of Commerce and the Minnesota Public Utilities Commission under the PPSA requirements. The EIS includes a description of additional supporting project elements, including roadways, railroad, natural gas and electric transmission, required for operation of the proposed project at both alternative sites. This assessment includes evaluation of the potential wildlife impacts from the preferred alternative project elements for each alternate site.

Because other cumulative effects studies performed on wetlands are related to the surrounding watershed, the study area for the cumulative effects assessment was defined according to the limits of the affected subwatersheds for each alternative site. This provides a convenient and meaningful study area boundary for assessing wildlife and habitat. Implications on wildlife and habitat at scales extending beyond the study areas are addressed as well. The paragraphs below describe the study area for both the West Range and East Range sites. The characteristics of the study areas are described in the following sections.

West Range Site

The West Range site is located within subwatersheds on the boundary between the Swan River and Prairie River watersheds. The study area associated with the West Range site (See **Figure 3**) is defined as follows.

1) That part of the Swan River watershed upstream of the point where Holman Lake discharges to the Swan River. The Holman Lake discharge point represents the point on the Swan River affected by discharge and drainage from the West Range site.

2) That part of the Prairie River watershed upstream of Prairie Lake.

Swan River Watershed

The portion of the Swan River watershed considered within the study area covers approximately 114,266 acres extending from just northeast of the City of Grand Rapids to just northwest of the City of Hibbing (**Figure 1**) and then south and east. Seven small communities (Coleraine, Bovey, Taconite, Marble, Calumet, Nashwauk and Keewatin) are located along the Mesabi Iron Range that lies just south of the divide between the Swan River watershed and the adjacent Prairie River watershed to the north. These communities, along with the associated iron and ore mining that support them, represent the primary development in the study area.

Outside of the small urban areas and scattered farmsteads and rural residences, land uses in the watershed primarily consists of ore mine pits and spoil areas. The remainder of this portion of the study area is a mixture of deciduous and mixed forest and wetland. The Minnesota Department of Natural Resources (MnDNR) Census of the Land (1996) identifies the primary land cover in the watershed as gravel pits and open mines, deciduous and mixed wood forest and open water.

Prairie River Watershed

The portion of the Prairie River watershed considered in the study area covers approximately 285,890 acres along the same portion of the Mesabi Iron Range (**Figure 3**) but extending north and west. Because the existing communities lie primarily along the southern edge of the iron formation, there are no established communities within this area of the Prairie River watershed. Outside of widely scattered farmsteads and rural residences, land use in the watershed is primarily mixed wood and deciduous forest and wetland. The MnDNR Census of the Land identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, wetlands, and water.

East Range Site

The East Range site is located in a subwatershed of the Partridge River in St. Louis County, Minnesota. The study area of the East Range site (See **Figure 4**) is defined as point on the Partridge River approximately 5 miles downstream of the confluence with First Creek.

Partridge River Watershed

The portion of the Partridge River watershed considered in the study area covers approximately 88,692 acres extending from the City of Aurora northeast toward the City of Babbitt (**Figure 4**). Outside of the small urban areas of Aurora and Hoyt Lakes and widely scattered farmsteads and rural residences, land use in the watershed is primarily mining, mixed wood forest and wetland. The MnDNR Census of the Land identifies the primary land cover in the watershed as deciduous and mixed wood forest, regenerating forest, gravel pits and open mines, wetlands, and water.

Methodology

This analysis includes the evaluation of the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions. The proposed project will be evaluated along with reasonably foreseeable future actions within the study area to determine the potential for cumulative effects on wildlife resources for each alternative site.

Both alternative site study areas for the cumulative effects analyses have been defined to create a scale of reference and a study area boundary that encompasses all the defined reasonable and foreseeable actions. But the cumulative effects implications defined in this assessment for wildlife resources extend beyond the study area. Biota interchange and movement, habitat continuity and ecological scales recognize no such boundaries. So this assessment on wildlife resources will address cumulative effects that may extend beyond the study areas as well as those within it. For example, effects at the regional scales of wildlife population should be addressed, besides those at smaller scales or microhabitats that are located entirely within the study area boundary. Ignoring the effects that occur out side of the study area, despite the obvious and direct link or correlation with variables and effects that occur within the boundary would result in an incomplete study on the cumulative effects on wildlife resources.

Two distinct wildlife habitat settings will be analyzed; terrestrial, and aerial habitats. Terrestrial wildlife habitat settings will utilize the GIS GAP land cover classification data, the MNDNR Ecological Land Classification program codes, the MNDNR's *Action Plan for Wildlife* (MNDNR, 2006) habitat type classifications, and the wildlife travel corridor data and criteria determined in a previous cumulative effects analysis on wildlife (MNDNR, 2006) conducted in the region. Terrestrial wildlife habitat analysis will utilize larger mammals as species to measure effects on due to their motility and ability to disperse over measurable distances. Smaller vertebrates will be addressed strictly from a habitat loss, fragmentation and population change perspective, verses addressing travel corridors and migration that would be expected for the larger fauna. Terrestrial habitat and species analyses will address the following:

1. Direct cumulative habitat loss and fragmentation resulting from development of the project alternatives and the other reasonable/foreseeable actions to all species of terrestrial vertebrates.

2. Both direct and indirect cumulative effects on faunal populations resulting from development of the project and the other reasonable and foreseeable actions.

3. Potential effects on habitat continuity blocks through habitat loss or conversion and fragmentation within the study area boundaries.

4. Cumulative effects on large mammal populations and motilities at local and regional scales that are anticipated under the project alternatives and the reasonable/foreseeable actions.

The above referenced GAP data, previous MNDNR study, and the MNDNR data and guidance documents will be utilized for the terrestrial habitat analyses.

Aerial wildlife habitat and species analyses will address the following:

1. The potential for bird strikes resulting from construction of the facility and the reasonable and foreseeable actions.

2. Potential effects on seasonal migration patterns and populations of migratory birds.

Terrestrial Wildlife and Habitats

The aerial habitat study will mostly rely on existing parametric data and previous studies. The assessment of terrestrial wildlife species and habitats will be accomplished by the following methods.

Previous Conditions (Pre-settlement, or prior to 1900)

The previous conditions will be based on the MNDNR presettlement vegetative cover mapped through the use of land survey data, known as the Marshner map (Marschner, 1974). The Marschner map vegetative communities represent wildlife habitats that were present prior to European settlement, including those preceding any mining, timber harvesting, or other developments. **Figures 3** and **4** show the Marschner codes for both study areas respectively and reflect a mosaic of terrestrial upland and wetland habitats common to the region. Similarly, the GAP data in **Figures 5** and **6** show the same mosaic of habitats, largely influenced by timber practices and to a lesser degree mining.

Existing Conditions

The Marshner map being used for the previous condition is based on data collected long before satellite and GIS technologies developed. Today's land cover databases are developed from aerial imagery and ground level data, all combined with advances in wildlife habitat and ecological classifications developed in recent years. The most comparable to Marschner and useful land cover data for this study is the GAP land cover system. The GAP provides multiple layers of land cover data and the level or layer that is most similar in scale to the Marschner classifications will be considered and utilized for most of this study. Some of the higher level GAP land uses will also be used, in particular for determining direct habitat losses or when an important habitat element needs to be addressed. GAP data are shown in **Figures 5** and **6** for the West and East Range Site study areas respectively.

The GAP data will reflect and show all of the new developments and effects of land usess that have occurred since the data was collected in the 1870s for the Marschner map. This includes mines, roads, cities and towns, and larger scale land conversions (e.g. agricultural).

The GAP data does not provide extensive details on timber harvest related land use changes are not. To adequately assess the existing condition as it applies to the results of timber harvesting and management, other resources will be reviewed and utilized when applicable. The Generic EIS on the on Timber Harvesting and Forest Management in Minnesota (MNDNR, 1992) will be reviewed to identify the existing condition as it relates to the effects of timber harvesting on wildlife. Given the dynamic nature of timber production tracts, where they are subjected to harvesting on a rotational scale, this EIS study may yield the highest level of details possible for describing the existing conditions. This study may also be useful for the assessment for the foreseeable future conditions described in the next section.

Since the region is vegetated with an intact mosaic of terrestrial upland and wetland habitats and lakes, all natural cover is considered wildlife habitat for the purposes of this study. Habitat is extensive and prevalent among the land uses in the region, with qualitative variation. The only areas completely devoid of any element of suitable habitat are full built out industrial sites, intense developments, and active mines are considered poor or non-exsitent wildlife habitats. With that in mind, this should even be qualified further with an example. Federally threatened peregrine falcons (*Falco peregrinus*) nest on the emission stacks of power generating plants located in Cohasset and St. Paul, Minnesota. Technically, emission stacks provide nesting habitat for peregrine falcons. At the same time, the facility structure and impact footprint of these facilities may not provide much else for wildlife habitat, but they are important structures for an important single species of wildlife.

Foreseeable Future Conditions

The reasonable and foreseeable actions defined below will be merged into the GAP data and maps assembled for the existing conditions for future conditions scenario. The following table provides a summary of the projects considered reasonably foreseeable in each of the study areas. The potential effects of each project on existing wildlife resources was estimated using the existing conditions mapping described above and an assumed footprint of disturbance for each potential future project.

Table 1
Reasonably Foreseeable Future Actions

West Range Site Study Area	East Range Site Study Area
Minnesota Steel Industries	PolyMet Mining NorthMet Project
Nashwauk Gas Pipeline	Mesabi Nugget
Itasca County Highway 7 Realignment	St. Louis County – new roadway from Hoyt Lakes to Babbitt
Itasca County Railroad	

Results - Cumulative Effects Assessment

Terrestrial Wildlife and Habitats

Ecological Setting, Wildlife Habitats, and Wildlife Ecology Implications

Study considerations include a determination and description of the ecological conditions in the region (both East and West Range Study Areas), the arrangement of wildlife habitats, and wildlife behavioral and ecological factors that all establish the base condition for analyzing and describing the cumulative effects that are anticipated through the analysis. The GAP data, literature, and best professional judgments used in the analysis are also utilized to assemble this baseline condition.

The ***ecological setting*** of Northeast Minnesota including the Mesabi iron range formation is highly influenced by human land uses and practices relating to natural resources, primarily timber related activities and iron ore mining. The region is relatively undeveloped with a low percentage of permanent land use conversions and natural vegetative cover and surface water resources predominate the landscape level ecological community compositions

Although the GAP data is not consistent or compatible with or as detailed as the MNDNR defined vegetative community codes in the Ecological Classification System program (ECS), correlations between the two are fairly obvious and straightforward.

The GAP data layers were the base data used for the analysis and the ECS is utilized when discussing habitats and ecological implications on specific wildlife species or smaller scales.

Wildlife Habitat character is similar both within the study area and throughout the region. Nearly all of the upland forest habitat is second growth and much of it is subjected to timber harvesting. Timber harvesting tracts are influenced by parcel boundaries and harvesting cycles resulting in a mosaic patchwork of tracts ranging from recently clear cut to older growth stands that will be subjected to harvesting again in the near term. Many tracts of timber have been harvested several iterations over the past 120 years or less. Timber harvesting and management heavily influence and define the upland forest habitats in the region. Ecologically, timber harvesting is a source of disturbance, perturbations, and ecological succession of these habitats.

In the ECS, the communities defined as Fire Dependent Forest/Woodland (FP code prefixes) and Mesic Hardwood Forest (MH code) comprise the forested upland habitats in the study area and region. These ECS codes correlate with the Upland codes in the GAP database. Many of these are influenced again by timber harvesting and management, often altering the character of these vegetative communities. Large expanses of upland habitat are characterized with compositions of early successsional tree species, primarily aspen and birch species (*Populus, betula*) that are harvested before the next successional sere develops. With the ECS based on presettlement vegetative communities, the effects of timber harvesting have resulted in an upland forest that often does not fit neatly into any particular ECS code. The pure monotypic stands of quaking aspen (*P. tremula*) so prevalent throughout the region are the main example, there is no comparable ECS code for this community since it was not present prior to settlement. Again, this is why the GAP data is used for most of the analysis, it most consistently represents the habitats present today.

Permanent ***habitat fragmentation*** is also limited in the region compared to areas further south in the state. Agricultural conversions are sparse, rural development is limited, and urbanization is restricted to existing towns and small cities, with relatively slower growth than other regions. Mines, all of which are concentrated on an axis along the Iron Range, represent a permanent conversion except on abandoned mine land where natural cover has reestablished. Linear facilities, including transmission lines, roads, and utility corridors are also a permanent habitat conversion and agent of habitat fragmentation. Timber harvesting is not considered a fragmentation agent since these vegetative communities become reforested after the disturbance.

Compared to other settings where habitat fragmentation has been studied, the region and study area does not have extensive habitat fragmentation or conversion. For example, the Amazon rain forest setting where many fragmentation studies have occurred is a large region never disturbed anthropogenically that is being fragmented by wide scale land clearing and permanent conversion. Or the studies in Southern Illinois on the effects of fragmentation Neotropical migrants located in a highly agricultural landscape setting. Extensive agriculture has fragmented the once contiguous Eastern deciduous forest community into isolated patches or fragments of forest with bird assemblages that demonstrate the effects of fragmentation (Donovan et. al., 1995). In comparison, northeast Minnesota has extensive forested habitats frequently disturbed by timber harvesting with a relatively low amount of habitat that has been permanently converted. Because of this, fragmentation will focus on the habitats that are permanently converted or lost as a result of the reasonable and foreseeable actions.

Specific wildlife behaviors and ecologies should be recognized prior to making any interpretations on wildlife. The MNDNR 2006 wildlife cumulative effects analysis focuses on "***wildlife travel corridors***" in the main part of their analysis. But this study failed to define the species and justifications for designating such corridors. In particular, defining the species that have behaviors or autecologies requiring the presence of travel corridors as a key habitat element was not established. Compared to other parts of the world, Minnesota does not have any large terrestrial fauna that migrate or are dependent on fixed discrete travel corridors. The exception is the semi-migratory deer herd in the Cascade River watershed along the Lake Superior shore of the state (MNDNR, 2006). Habitats in the region are diffusely distributed and widespread geographically, as are the wildlife species present in the region. Larger mammals are also diffusely distributed and move freely throughout these habitats in a pattern defined by their biology, not geography or for some other extrinsic reason. For the larger, motile mammals with the ability to travel widely, types of habitat and habitat needs define species use and movement in the region, not the presence or absence of barriers, travel corridors, or habitat fragmentation.

The wildlife travel corridors identified in the MNDNR 2006 cumulative effects wildlife analysis were overlaid on the GAP data. These were then redefined and analyzed as ***habitat continuity blocks***. Other areas in the GAP data that were similar as undisturbed polygons of habitat, were also defined as such for discussion in the analysis. This reclassification removes the travel corridor element and replaces with a more ecologically meaningful unit where contiguous and contiguous undisturbed blocks of habitat are defined as the currency. This assumes that these areas provide key linkages for genetic interchange, refugia, and habitat connectivity.

Many smaller species of fauna in the region do have fixed, discrete travel corridors. For example, many reptiles and amphibians make seasonal movements that are habitat based. Aquatic turtles that make annual overland movements to the same upland breeding habitat is a good example. Because these are so numerous and little known, these small travel corridors were not addressed in the analysis. Instead, these small corridors are assumed as habitat losses when they are directly affected by an action. This accounts for all of the effects on the habitat, including the travel corridors when present.

Lastly within this framework, is the subject of ***habitat loss or permanent conversion*** defined as just that; the direct loss or conversion of habitat that will result from the construction of development of infrastructure or permanent fixed facilities. The impact footprint of each reasonable and foreseeable action has been cumulatively analyzed to establish the anticipated amount of total habitat loss and conversion.

West Range Site

Previous Conditions

Terrestrial Wildlife and Habitat

In the previous conditions (presettlement) there are no anthropogenically driven habitat fragmentation vectors or sources of habitat loss/conversion. Timber harvesting disturbances and perturbations were not present, and no mining had occurred.

Existing Conditions

Terrestrial Wildlife and Habitat

In the existing condition, all of the mine land features on the USGS maps shown in the **Figures 1** and **2** are present, as are the cities, towns, rural development, and linear right of ways including highways and utilities. The study area and surrounding region has been subjected to extensive timber harvesting.

Foreseeable Future Conditions

Terrestrial Wildlife and Habitat

The proposed Minnesota Steel Industry (MSI) project, the Mesaba Energy Project, the Nashwauk Gas Pipeline, Itasca County Highway 7 Realignment, and the Itasca County Railroad projects all define the Foreseeable Future Condition for evaluating the cumulative effects on terrestrial wildlife and habitat in the West Range Study Area.

Terrestrial acreages that will be ***habitat losses/conversions*** include ***1,708 acres*** of upland and wetland habitats resulting from the **Mesaba Energy Project**, and ***379 acres*** from the **MSI project**. Acres of impact are not known from the linear project including the Nashwauk Gas Pipeline, Itasca County Highway 7 Realignment Project, and the Itasca County Railroad Project. **Cumulatively** these projects combine to impact ***2,987 acres*** of terrestrial upland and wetland habitat found within the study area. **Existing Condition** wildlife habitat totals within the West Range Site study area is ***400,423 acres***. In the **Foreseeable Future Condition**, there will be an estimated ***397,436 acres*** of wildlife habitat remaining after the cumulative impacts defined in this study. This represents habitat conversions or direct losses resulting from reasonable and foreseeable actions.

These facilities also represent the new wildlife habitat barriers and fragmentation agents. More specifically, the Mesaba Energy Project Site is located directly north of a habitat continuity block delineated in the MNDNR study known as Wildlife Travel Corridor #2 (see **Figure 3**). In comparison, the MSI site is located mostly on the north side of active mine lands and the edge of Wildlife Travel Corridor #3 eastward of the Mesaba Energy footprint. The West Range Site of the Mesaba Energy Project will create permanent habitat loss, fragment habitat, and disrupt habitat continuity along the north side of Wildlife Travel Corridor #2. The MSI Project site will create permanent habitat loss and fragment habitat, and be a wildlife aversion/avoidance element located along the east side of Wildlife Travel Corridor #3.

Results Summary – West Range Site Study Area

1. The most measurable cumulative effects on terrestrial wildlife and their habitats that result from the reasonable and foreseeable actions in the West Range Site study area are direct habitat loss/conversion (2,987 Acres total) resulting from construction of the defined reasonable and foreseeable projects in the study area. The area of direct habitat loss also represents the extent of habitat fragmentation. Within the West Range Site study area 397,436 acres of wildlife habitat will remain after the cumulative effect.

2. The proposed West Range Site Alternative of the Mesaba Energy facility will be located above the Wildlife Travel Corridor #2 block delineated in the MNDNR study, reclassified as habitat continuity blocks in this study. Since portions of the Mesaba Project site will be permanent habitat losses, this represents a potential barrier to animal movement, habitat connectivity, and at smaller scales, genetic interchange. The MSI site is located on the east side of Wildlife Travel Corridor #3, but does not form a geographic barrier for the corridor or affect habitat continuity to the extent that is potential for the Mesaba Project. None of the other reasonable and foreseeable projects are anticipated to create barriers to the habitats continuity blocks within the study area.

3. Within the West Range Site study area, there is 400,427 acres of wildlife habitat mostly comprised of timber harvesting tracts, wetlands, and other natural vegetative cover. Cumulative total habitat losses resulting from the reasonable and foreseeable actions are 2,987 acres total. 397,436 acres total of wildlife habitat will remain within the study area after the cumulative effect. Wildlife Travel Corridor #2, relabeled as a habitat continuity block will be potentially disrupted on the north side by the habitat losses associated with the Mesaba Project site. Two additional habitat continuity blocks (Wildlife Travel Corridors #3 and #4) are also located in the study area that will not be affected.

East Range Site

Previous Conditions

Terrestrial Wildlife and Habitat

In the previous conditions (presettlement) there were no anthropogenically driven habitat fragmentation vectors or sources of habitat loss/conversion. Timber harvesting disturbances and perturbations were not present, and no mining had occurred.

Existing Conditions

Terrestrial Wildlife and Habitat

In the existing condition, all of the mine lands shown on the USGS map in **Figure 2** are present, as are the cities, towns, rural development, and linear right of ways including highways and utilities. The Laskin Power Plant is also present. The study area and surrounding region has been subjected to extensive timber harvesting.

Foreseeable Future Conditions

Terrestrial Wildlife and Habitat

The existing conditions, the proposed PolyMet Mining NorthMet Project, Mesabi Nugget Mine project, St. Louis County Road Project, and the Mesaba Energy Project, Phase II define the Foreseeable Future Condition for evaluating the cumulative effects on terrestrial wildlife and habitat in the East Range Study Area.

Terrestrial acreages that will be ***habitat losses/conversion*** include ***807 acres*** of upland and wetland habitats resulting from the **Mesaba Energy Project**, ***6,431 acres*** resulting from the **PolyMet Mining NorthMet Project**, and ***2,820 acres*** from the **Mesabi Nugget Project**. Estimates for the St. Louis County Road Project were not available. **Cumulatively** this yields ***10,058 acres*** total of habitat conversions or direct losses resulting from reasonable and foreseeable actions within the ***103,644 acres*** of wildlife habitat within the study area under the **Existing Condition**. In the **Future Condition**, ***100,824 acres*** of terrestrial wildlife habitat will remain after the cumulative effect. These facilities and the new linear transportation corridor also represent the new wildlife habitat barriers and fragmentation agents.

All four of the new reasonable and foreseeable projects are set amongst habitats that have been highly fragmented and converted by mining. The Mesaba Energy Project is geographically located south of and between two habitat continuity blocks (Wildlife Travel Corridors #10 and 11 shown on **Figure 4**). The PolyMet Mine project is located within existing mine lands south and west of a habitat continuity block (Wildlife Travel Corridor #12 shown on **Figure 4**). Mesabi Nugget is located on the north side of a habitat continuity black (Wildlife Habitat Block #9, **Figure 4**) and is entirely within mine lands. Of these three projects, the Mesaba Energy Project East Range Site will affect the most wildlife habitat. Despite being on mine lands, the PolyMet Mining NorthMet Project will also result in wildlife habitat losses and conversions.

Results Summary – East Range Site Study Area

1. The most measurable cumulative effects on terrestrial wildlife and their habitats that result from the reasonable and foreseeable actions in the East Range Site study area are direct habitat loss/conversion (2,820 Acres total) resulting from construction of the Mesaba Energy Project, the PolyMet Mining NorthMet Expansion Project, the Mesabi Nugget Project, and the St. Louis County Road Project. The area of direct habitat loss also represents the extent of habitat fragmentation.

2. The proposed East Range Site Alternative of the Mesaba Energy facility nor any of the other reasonable and foreseeable actions will not affect any of the four habitat continuity blocks located within the study area.

3. Within the East Range Site study area, there is 103,644 acres of terrestrial wildlife habitat in the Existing Condition comprised of mostly timber harvesting tracts, wetlands, mine lands, and other natural vegetative cover. Cumulative total habitat losses resulting from the reasonable and foreseeable actions are 2,820 acres and 100,824 acres of wildlife habitat will remain in the Future Foreseeable Condition after the cumulative effect.

Summary Comparison West Range and East Range Study Areas

The following comparisons and conclusions on terrestrial wildlife and habitat are based on the findings above:

1. The West Range study area with 400,423 acres of terrestrial wildlife habitat and the East Range study area at 103,644 acres of terrestrial wildlife habitat are located within the same ecological province known as the Laurentian Mixed Forest. Both study areas are similar located in the same type of setting with similar land uses and wildlife habitats.

2. Both study areas have and will continue to be influenced by timber harvesting.

3. Wildlife habitat loss/conversion totals expected from the reasonable and foreseeable projects are expected to be 2,987 acres cumulatively within the West Range Site and 2,820 acres cumulatively within the East Range Site study areas respectively.

4. There are four habitat continuity blocks within the West Range Site and one block (Wildlife Travel Corridor #2 shown in **Figure 3**) will be potentially affected by the Mesaba Energy Project. There are four habitat continuity blocks in the East Range Study area (**Figure 4**) and none are anticipated to be affected by the reasonable and foreseeable projects.

5. Regionally, the cumulative effects within both study areas are such that no effects on terrestrial species of fauna are anticipated besides direct habitat loss. Cumulative effects on wildlife and habitats within both study areas are anticipated to have negligible effects for the following reasons:

    a. There are no large mammal mass migrations or migration routes within the region or study areas. No disruption of wildlife migration of movement is anticipated as a result of the reasonable and foreseeable actions.

    b. Besides permanent habitat loss and conversion, fauna in the immediate areas near the reasonable and foreseeable actions defined may engage in aversion or avoidance behaviors of these facilities, an effect of habitat loss. With the extensive acreage of habitat expected to remain after these actions, these effects are anticipated to be negligible.

    c. The Mesabi Energy Project West Range Site may be a potential barrier located on the north side of a habitat continuity block, representing the only such effect from a reasonable and foreseeable action. Three other habitat continuity blocks will remain undisturbed in the West Range study area and none of the four habitat continuity blocks will be disturbed in the East Range study area. Effects on habitat continuity blocks are anticipated to be negligible due to the extensive amount of wildlife habitats that will remain after the reasonable and foreseeable actions are expected to occur.

Aerial Habitat and Migratory Birds

West Range Site

Previous Conditions

Aerial Habitat Effects

In the previous conditions, there were no aerial habitat obstructions present that were potential bird collision sources within the Swan River and Prairie River Watersheds, hereafter referred as the study area.

Existing Conditions

Aerial Habitat Effects

In the existing condition, there are no comparable existing aerial habitat obstructions present within the study area. Comparable obstructions are defined as emission stack towers, tall buildings, or other facilities of similar size and magnitude. There are six (6) antenna towers within the study area that are considered a risk for bird collisions and will be included in the evaluation.

Foreseeable Future Conditions

Aerial Habitat Effects

The existing condition six (6) antenna towers, the proposed Minnesota Steel Industry (MSI) project, and the Mesaba Energy Project, Phase II define the Foreseeable Future Condition for evaluating the cumulative effects aerial habitat obstructions on bird flight and aerial habitat.

Literature and Data

A review of the biological sciences literature and data sources confirmed that the majority of the studies and empirical data on bird collisions on stationary structures focused on collisions with radio towers, transmission lines, and windows on buildings. Tower lighting and other light producing structures also generated several studies and data sources. A common thread among these studies is the wide ranging variability of the mortality rates from one site or structure to another. Furthermore, different structures present differing types of mortality. For example, both the poles or towers and the wires produce collision related mortalities on birds on transmission projects. A large body of the bird strike literature addresses bird collisions with moving vehicles, primarily airplanes.

From a bird population perspective, mortality rates in these studies and data sources may number in the thousands, a small percentage of the millions or tens of millions of birds that migrate and have travel flight routes through the study areas of these respective sources. Ecological hypotheses in the literature often focus on addressing acute effects including disproportionate mortalities among certain species, age classes, or temporal periods. Such testing may show that bird collisions can be significant at the species level or during some ecologically driven process.

Lastly, many of these studies, particular those dealing with animal vehicle and bird strikes on airplanes are prevalent in the literature. These studies are conducted from a human safety perspective. Biological effects, if a concern, may often be secondary issues or data in these studies. Some exceptions include studies involving endangered species (e.g. Key deer, bald eagles) or species under some level of threat.

Adequate field sampling and monitoring are required to determine the full cumulative effects of these projects and facilities on bird flight and aerial habitat. Since there is little to no monitoring data results for bird collisions on existing power plant facilities in the Region or beyond and wide variation in the mortality data, calculating a known numerical effect is not possible nor realistic. Instead, this study recognizes the potential for impacts through review and evaluation of these known literature and data sources, followed by projections of potential cumulative effects on bird flight and aerial habitat.

Results – West Range Site Study Area Cumulative Effects on Bird Flight and Aerial Habitat

Data collected on bird collisions with stationary structures show some expected trends (Johnson et al., 2002). Seasonally there are pulses and peaks of collision mortality during the spring and fall migrations. Temporally, collisions peak during night time hours and decline during the day. Ecologically there are differences as well. Migrant passerines often have the highest rates or mortality, a variable driven by a couple of factors including; Passerines include the majority of the bird species found and most migratory birds; passerines are numerically the most abundant bird biomass; and passerines migrate at varying elevations that put them at higher risk for collisions. Behaviorally, certain bird species may be more prone to collisions with structures due to an attractant, mainly lighting. Larger and slower flight birds (e.g. cranes, herons, large raptors) often collide with transmission wires and support wires, another example of a behaviorally driven conflict.

Migrating warbler species often represent the largest numbers of the total passerine mortality in some antenna tower studies (Johnson et. al., Kemper, 1996) . Many authors speculate on and some have investigated the primary causative factors that include behavioral and ecological reason why warblers account for this, and others attempt to demonstrate that the warbler (or similar species) mortality is simply due to their high abundances (Yanagawa, 1999). Behavioral factors are often the sources of collisions with airplanes, for example when gulls or raptors use thermals putting them in zones of conflict and creating species specific disproportionate mortalities in the data.

Several studies on bird collisions with stationary structures have estimated bird mortality rates and the total number of birds in a flight path for comparison. Veltri and Klem (2005) studied the causes of death of birds that collided with antenna towers and windows. They recorded 247 tower confirmed tower collisions during a fall migratory season. The Johnson et.al. studies on bird collisions with wind turbine towers in southwest Minnesota conducted from 1996 to 1999 documented only 55 collision fatalities during this time frame resulting from 354 individual wind towers. After correction factors were applied, they estimated that total annual mortality from the entire project was 72 birds per year for Phase 1 and 314 birds for Phase 2. The radar data showed that an estimated 3.5 million birds migrate over the project each year.

Numerous studies and data gathering efforts have been conducted in the wind turbine study area of southwest Minnesota on elucidating species specific mortality differences and species significant mortalities from collisions with the stationary towers, some with surprising results. Johnson et. al. conducted studies to determine if there was a potential for disproportionate mortality from tower collisions among the raptors that both nest within and migrate through the wind tower study area. They encountered little to no mortalities of raptors, and none for Swainson's hawks (*Buteo swainsoni*) an uncommon species of hawk in Minnesota. During these and other studies, some noticeably high mortalities were actually observed for a species of bat that migrates seasonally through the wind tower (Kolford, 2005) and bird mortalities were relatively low.

The wind tower study area in southwest Minnesota also sheds important insight into the potential importance of setting and topography. The wind tower setting is geologically and geographically similar to Mesabi Iron Range settings of both the West Range and East Range sites. The Iron Range is essentially comprised of a linear northeast/southwest trending ridge, many miles in length that crosses the north-south migration route on a right angle. The wind tower study area is located on the Coteau des Prairie and on the highest ridge of the Coteau that is known locally as Buffalo Ridge, trending for hundreds of miles on a northwest-southeast axis. Both the Iron Range and Buffalo Ridge are linear ridgelines that are as high as 2,100 feet above sea level and are some of the most prominent relief features in the state.

Studies on radio towers have yielded various results. A particular long term study of radio tower bird mortality in Wisconsin (Kemper, 1996) was conducted between 1957 through 1995 counted 121,560 birds comprising 123 species. During this 38 year period, it was estimated that 2 million birds were flying through the study area annually. Radio antenna tower design and lighting may be a source for the higher mortalities compared to the wind tower studies. Birds may be attracted to the warning light beacons on the towers and also colliding with the numerous guy wires and supporting structures in addition to the tower structure itself. Note that the numbers of dead birds are from a long term sample as well.

Besides these previous examples, other studies focus on the behavioral aspects and visual cues that result in bird collisions with structures. Behavioral aspects primarily focus on windows where birds will strike a window in reaction to a reflective image or perceptions that a there are no obstructions. Visual cues apply more often to power lines or other fine structures that need to be more visible to prevent collisions. Neither of these types of studies are relevant to this discussion.

Within the West Range Site study area, two proposed obstructions will be constructed under the future conditions, including the Mesaba Energy Project and the Minnesota Steel Industry facilities. Despite the absence of previous studies or numerical data on power plant towers effects on birds, some general conclusions can be made from the other studies and data.

1. Both structures will cause annual mortality of migrating birds as the results of collisions with the structures, and both are aerial habitat obstructions. Bird mortality will likely be seasonal, with the highest rates occurring during the spring and fall migration periods. The wind tower studies in southwest Minnesota suggest that mortalities may be numerically low or non-existent for some species despite both study areas being located in similar geological/geographical settings.

2. Due to the nature of radio towers and based on previous studies, it is expected the bird mortalities will be highest at the six (6) antenna towers and lowest at the MSI and Mesaba facilities located within the West Range study area.

3. Most species specific bird mortalities occur from conflicts with transportation modes and power transmission lines. Collisions with the antenna towers and facilities structures will likely not be species specific and will mostly be comprised of migrating passerines, possibly warblers, vireos, and other neotropical migrants.

4. The potential bird collision mortality rates at both structures could vary widely between sites, annually, or could be very low to non-existent. Long term monitoring will be necessary after construction of these facilities to determine the effects on birds and the significance of mortality.

5. Migratory birds that will fly over and through the study area will number in the millions annually. Even if bird collision mortality rates for cumulatively reach the thousands, additional studies are necessary to determine if and what level of mortality is considered significant. These include studies conducted and data gathered elsewhere. Mortality rates from other sources are far greater then those caused by collisions with stationary objects, and those in themselves are not considered significant (Janss, 1997) impacts on species populations in most cases.

6. Based on the findings summarized in 1 – 5, the following assessment statement is provided;

   Within the West Range Site study area, cumulative effects will occur on aerial habitat and bird migration as a result of the reasonable and foreseeable actions defined within the study area. Based on previous studies and existing data on the subject of bird collisions, the cumulative effect will be assumed to be bird mortality resulting from collisions with fixed stationary structures defined as the reasonable and foreseeable actions in the study area. Previous studies and data suggest that bird mortality rates that are the result of these collisions will be insignificant on bird populations within or migrating through the West Range Site study area, but future studies are needed to further support this finding. Future studies should *evaluate the cumulative effects on higher scales including regionally and globally, and measure against the cumulative effects of actions that extend beyond the West Range Site study area. It's anticipated that mortalities will be highest for neotropical migrants, mostly passerines and these should be the focus of future studies involving power generating facilities similar to the two proposed within the West Range Site study area.*

East Range Site

Previous Conditions

Aerial Habitat Effects

In the previous conditions, there were no aerial habitat obstructions present that were potential bird collision sources within the Partridge River Watershed hereafter referred as the study area.

Existing Conditions

Aerial Habitat Effects

In the existing condition, the Laskin Energy Center and the three (3) antenna towers within the study area are considered a risk for bird collisions and will be included in the evaluation.

Foreseeable Future Conditions

Aerial Habitat Effects

The three (3) existing condition antenna towers, Laskin Energy Center, the proposed Mesabi Nugget project, proposed PolyMet Mine Expansion project, and the Mesaba Energy Project, Phase II define the Foreseeable Future Condition for evaluating the cumulative effects aerial habitat obstructions on bird flight and aerial habitat in the East Range Site study area.

Literature and Data

A review of the biological sciences literature and data sources confirmed that the majority of the studies and empirical data on bird collisions on stationary structures focused on collisions with radio towers, transmission lines, and windows on buildings. Tower lighting and other light producing structures also generated several studies and data sources. A common thread among these studies is the wide ranging variability of the mortality rates from one site or structure to another. Furthermore, different structures present differing types of mortality. For example, both the poles or towers and the wires produce collision related mortalities on birds on transmission projects. A large body of the bird strike literature addresses bird collisions with moving vehicles, primarily airplanes.

From a bird population perspective, mortality rates in these studies and data sources may number in the thousands, a small percentage of the millions or tens of millions of birds that migrate and have travel flight routes through the study areas of these respective sources. Ecological hypotheses in the literature often focus on addressing acute effects including disproportionate mortalities among certain species, age classes, or temporal periods. Such testing may show that bird collisions can be significant at the species level or during some ecologically driven process.

Lastly, many of these studies, particular those dealing with animal vehicle and bird strikes on airplanes are prevalent in the literature. These studies are conducted from a human safety perspective. Biological effects, if a concern, may often be secondary issues or data in these studies. Some exceptions include studies involving endangered species (e.g. Key deer, bald eagles) or species under some level of threat.

Adequate field sampling and monitoring are required to determine the full cumulative effects of these projects and facilities on bird flight and aerial habitat. Since there is little to no monitoring data results for bird collisions on existing power plant facilities in the Region or beyond and wide variation in the mortality data, calculating a known numerical effect is not possible nor realistic. Instead, this study recognizes the potential for impacts through review and evaluation of these known literature and data sources, followed by projections of potential cumulative effects on bird flight and aerial habitat.

Results – East Range Site Study Area Cumulative Effects on Bird Flight and Aerial Habitat

Data collected on bird collisions with stationary structures show some expected trends (Johnson et al., 2002). Seasonally there are pulses and peaks of collision mortality during the spring and fall migrations. Temporally, collisions peak during night time hours and decline during the day. Ecologically there are differences as well. Migrant passerines often have the highest rates or mortality, a variable driven by a couple of factors including; Passerines include the majority of the bird species found and most migratory birds; passerines are numerically the most abundant bird biomass; and passerines migrate at varying elevations that put them at higher risk for collisions. Behaviorally, certain bird species may be more prone to collisions with structures due to an attractant, mainly lighting. Larger and slower flight birds (e.g. cranes, herons, large raptors) often collide with transmission wires and support wires, another example of a behaviorally driven conflict.

Migrating warbler species often represent the largest numbers of the total passerine mortality in some radio tower studies (Johnson et. al., Kemper, 1996). Many authors speculate on and some have investigated the primary causative factors that include behavioral and ecological reason why warblers account for this, and others attempt to demonstrate that the warbler mortality is simply due to their high abundances (Yanagawa, 1999). Behavioral factors are often the sources of collisions with airplanes, for example when gulls or raptors use thermals putting them in zones of conflict and creating species specific disproportionate mortalities in the data.

Several studies on bird collisions with stationary structures have estimated bird mortality rates and the total number of birds in a flight path for comparison. Veltri and Klem (2005) studied the causes of death of birds that collided with radio towers and windows. They recorded 247 tower confirmed tower collisions during a fall migratory season. Studies on bird collisions with wind turbine towers in southwest Minnesota (Johnson, et.al, 2002) were conducted from 1996 to 1999 documented only 55 collision fatalities during this time frame resulting from 354 individual wind towers. After correction factors were applied, they estimated that total annual mortality from the entire project was 72 birds per year for Phase 1 and 314 birds for Phase 2. The radar data showed that an estimated 3.5 million birds migrate over the project each year.

Numerous studies and data gathering efforts have been conducted in the wind turbine study area of southwest Minnesota on elucidating species specific mortality differences and species significant mortalities from collisions with the stationary towers, some with surprising results. Johnson et. al conducted studies to determine if there was a potential for disproportionate mortality from tower collisions among the raptors that both nest within and migrate through the wind tower study area. They encountered little to no mortalities of raptors, and none for Swainson's hawks (*Buteo swainsoni*) an uncommon species of hawk in Minnesota. During these and other studies, some noticeably high mortalities were actually observed for a species of bat that migrates seasonally through the wind tower and bird mortalities were relatively low.

The wind tower study area in southwest Minnesota also sheds important insight into the potential importance of setting and topography. The wind tower setting is geologically and geographically similar to Mesabi Iron Range settings of both the West Range and East Range sites. The Iron Range is essentially comprised of a linear northeast/southwest trending ridge, many miles in length that crosses the north-south migration route on a right angle. The wind tower study area is located on the Coteau des Prairie and on the highest ridge of the Coteau that is known locally as Buffalo Ridge, trending for hundreds of miles on a northwest-southeast axis. Both the Iron Range and Buffalo Ridge are linear ridgelines that are as high as 2,100 feet above sea level and are some of the most prominent relief features in the state.

Studies on radio towers have yielded various results. A particular long term study of radio tower bird mortality in Wisconsin (Kemper, 1996) was conducted between 1957 through 1995 counted 121,560 birds comprising 123 species. During this 38 year period, it was estimated that 2 million birds were flying through the study area annually. Radio tower design and lighting may be a source for the higher mortalities compared to the wind tower studies. Birds may be attracted to the warning light beacons on the towers and also colliding with the numerous guy wires and supporting structures in addition to the tower structure itself. Note that the numbers of dead birds are from a long term sample as well.

Besides these previous examples, other studies focus on the behavioral aspects and visual cues that results in bird collisions with structures. Behavioral aspects primarily focus on windows where birds will strike a window in reaction to a reflective image or perceptions that a there are no obstructions. Visual cues apply more often to power lines or other fine structures that need to be more visible to prevent collisions. Neither of these types of studies are relevant to this discussion.

Within the East Range Site study area, three new proposed obstructions will be constructed under the future conditions; the Mesaba Energy Project, PoyMet Mine facilities, and Mesabi nugget facilities. The existing Laskin Energy Center and proposed Mesabi Energy facilities are the most similar, and the PolyMet and Mesabi Nugget projects may not have significant or similar obstructions projected into the aerial flight paths of birds. Despite the absence of previous studies or numerical data on power plant towers effects on birds, some general conclusions can be made from the other studies and data.

1 At least two of the reasonable and foreseeable actions defined within the East Range study area will cause annual mortality of migrating birds as the results of collisions with the structures. The Laskin Power Plant and the Mesaba Energy project are the two actions that include or will include aerial habitat obstructions. Bird mortality will likely be seasonal, with the highest rates occurring during the spring and fall migration periods. The wind tower studies in southwest Minnesota suggest that mortalities may be numerically low or non-existent for some species despite both study areas being located in similar geological/geographical settings.

2 Due to the nature of radio towers and based on previous studies, it is expected the bird mortalities will be highest at the three (3) antenna towers and lowest at the Laskin and Mesaba facilities located within the East Range study area.

3 Most species specific bird mortalities occur from conflicts with transportation modes and power transmission lines. Collisions with the radio towers and facilities structures will likely not be species specific and will mostly be comprised of migrating passerines, possibly warblers, vireos, and other neotropical migrants.

4. The potential bird collision mortality rates at both the Laskin and Mesaba facilities could vary widely between sites, annually, or could be very low to non-existent. Long term monitoring will be necessary after construction of these and other facilities will be needed to determine the effects on birds and the significance of mortality.

5. Migratory birds that will fly over and through the study area will number in the millions annually. Even if bird collision mortality rates cumulatively reach the thousands, additional studies are necessary to determine if and what level of mortality is considered significant. These include studies conducted and data gathered elsewhere. Mortality rates from other sources are far greater then those caused by collisions with stationary objects, and those in themselves are not considered significant (Janss, 2000) impacts on species populations in most cases.

6. Based on the findings summarized in 1 – 5, the following assessment statement is provided;

> *Within the East Range Site study area, cumulative effects will occur on aerial habitat and bird migration as a result of the reasonable and foreseeable actions defined within the study area. Based on previous studies and existing data on the subject of bird collisions, the cumulative effect will be assumed to be bird mortality resulting from collisions with fixed stationary structures defined as the reasonable and foreseeable actions in the study area. Previous studies and data suggest that bird mortality rates that are the result*

of these collisions will be insignificant on bird populations within or migrating through the East Range Site study area, but future studies are needed to further support this finding. Future studies should evaluate the cumulative effects on higher scales including regionally and globally, and measure against the cumulative effects of actions that extend beyond the East Range Site study area. It's anticipated that mortalities will be highest for neotropical migrants, mostly passerines and these should be the focus of future studies involving power generating facilities similar to the two proposed within the East Range Site study area.

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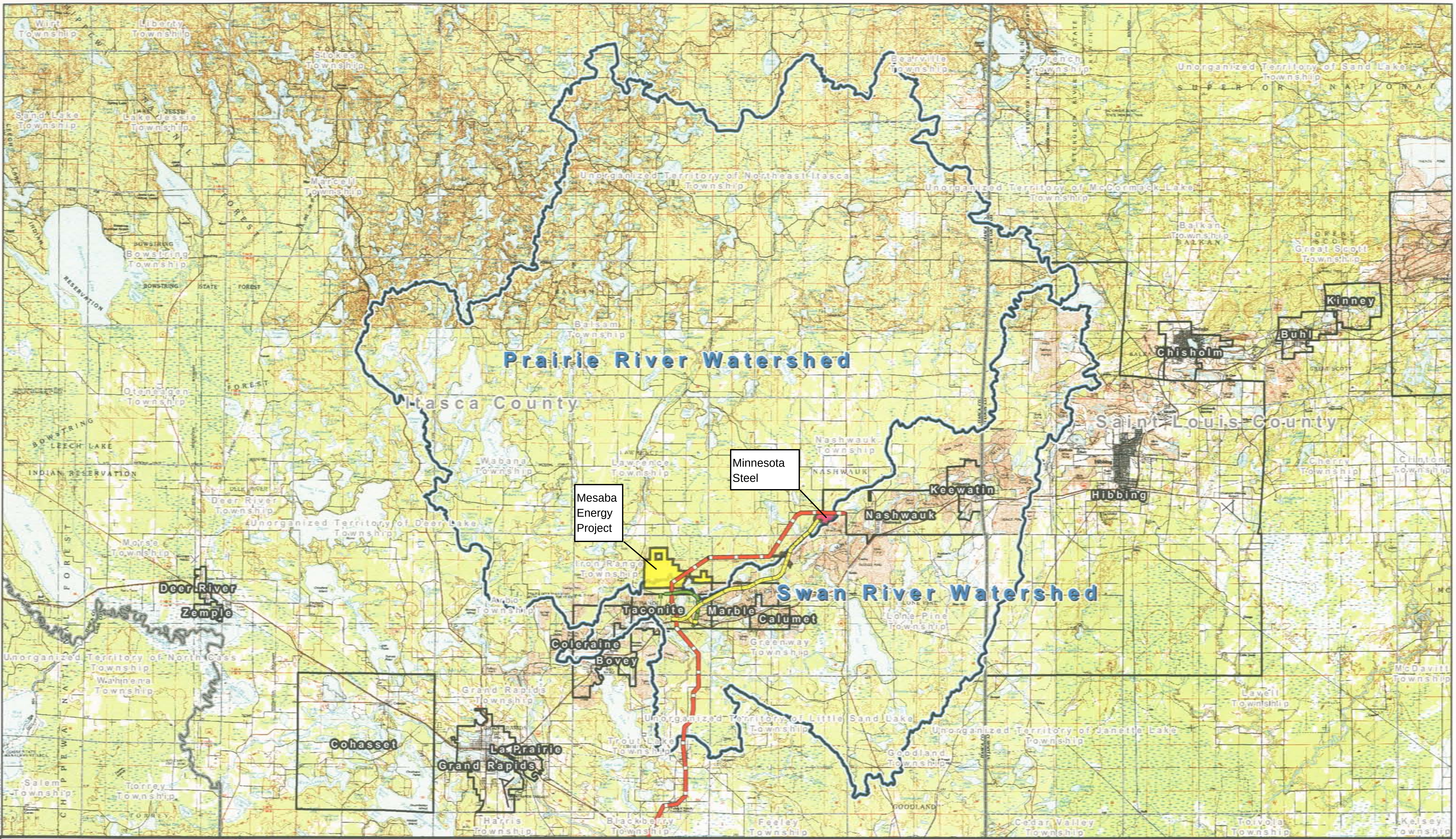
List of Figures



Excelsior Energy Inc.	West Range	Figure 1
Mesaba Energy Project Energy, Innovation, and Economic Development for Minnesota	November 2006	West Range Study Area

Legend

Reasonable and Foreseeable Actions

- Swan River Watershed
- Prairie River Watershed
- Excelsior Energy West Range Site
- MN Steel DRI Plant Site
- Nashwauk Gas Pipeline
- Itasca County Road 7 Realignment
- Itasca County Rail Alignment
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, MN Steel, City of Nashwauk and SEH.
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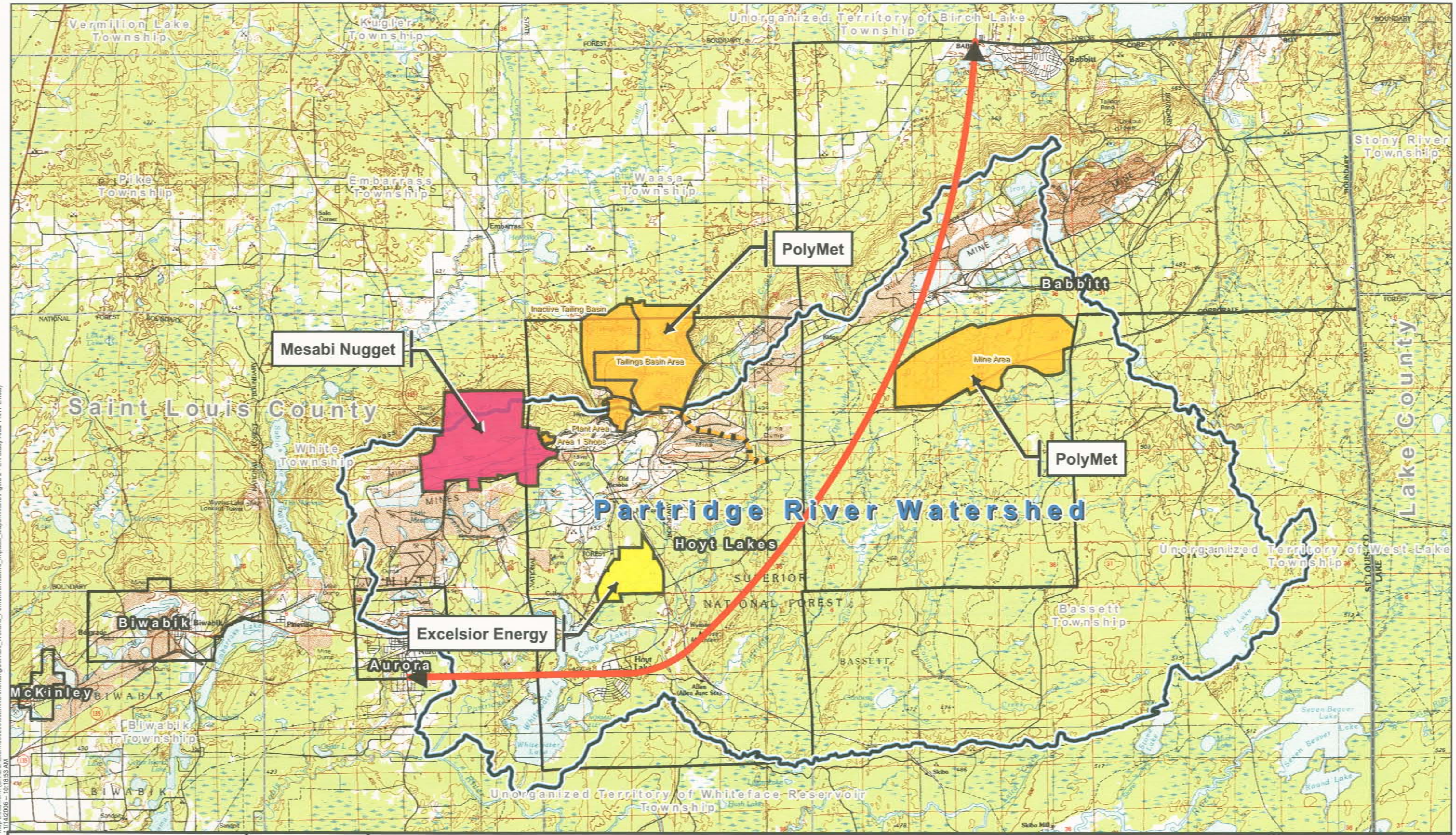


Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

East Range

November 2006

Legend

Reasonable and Foreseeable Actions

- Partridge River Watershed
- Excelsior Energy East Range Site
- Mesabi Nugget Plant Site
- PolyMet Sites
- PolyMet Rail Construction
- St. Louis County New Hoyt Lakes to Babbitt Connection
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

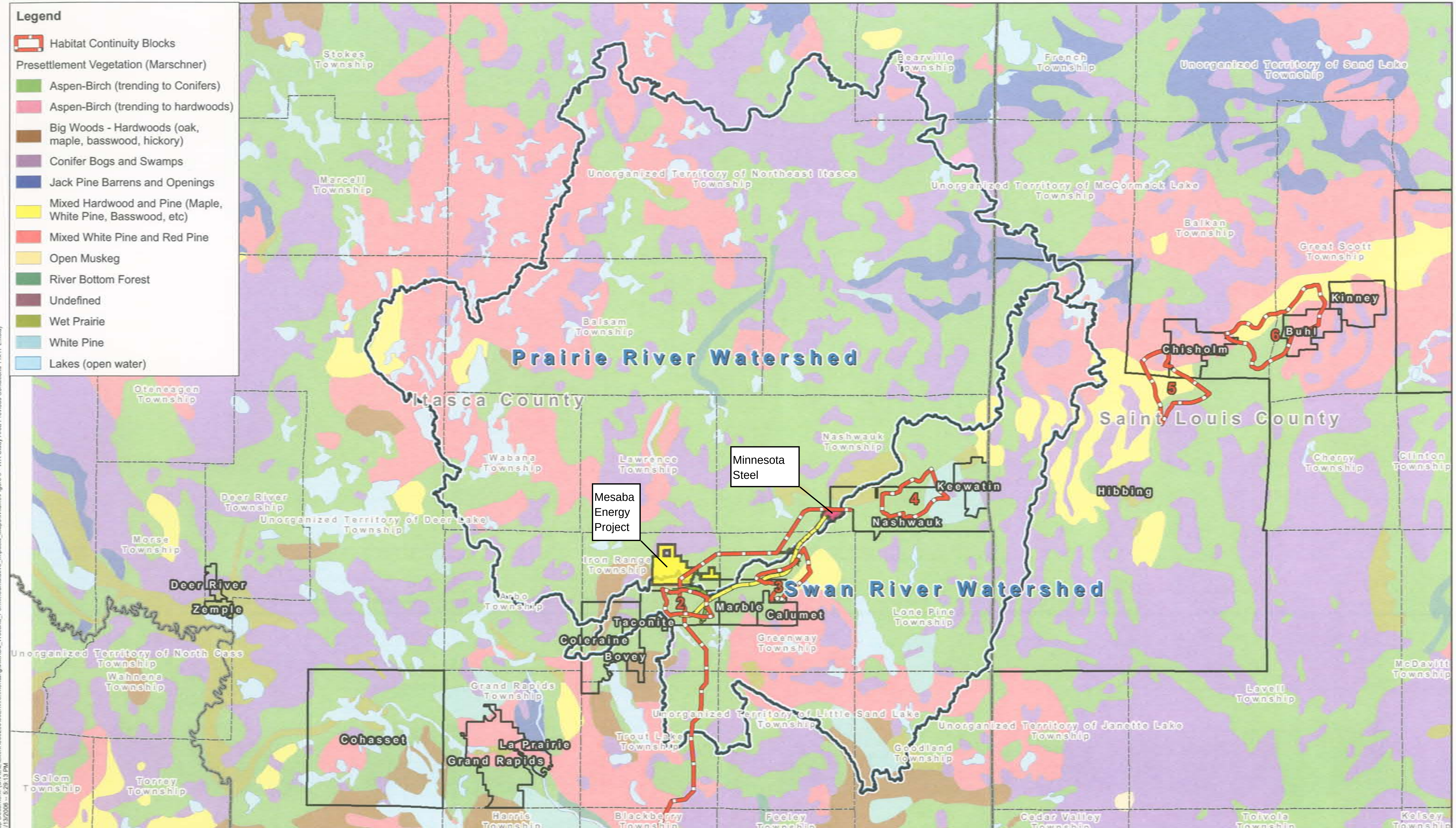
Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, and SEH.

Figure 2

East Range Study Area

UTM, Zone 15, Meters NAD83

0 2 Miles



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

West Range

November 2006

Legend

Reasonable and Foreseeable Actions

- Swan River Watershed
- Prairie River Watershed
- Excelsior Energy West Range Site
- MN Steel DRI Plant Site
- Nashwauk Gas Pipeline
- Itasca County Road 7 Realignment
- Itasca County Rail Alignment
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, MN Steel, City of Nashwauk and SEH.
© 2006 SEH

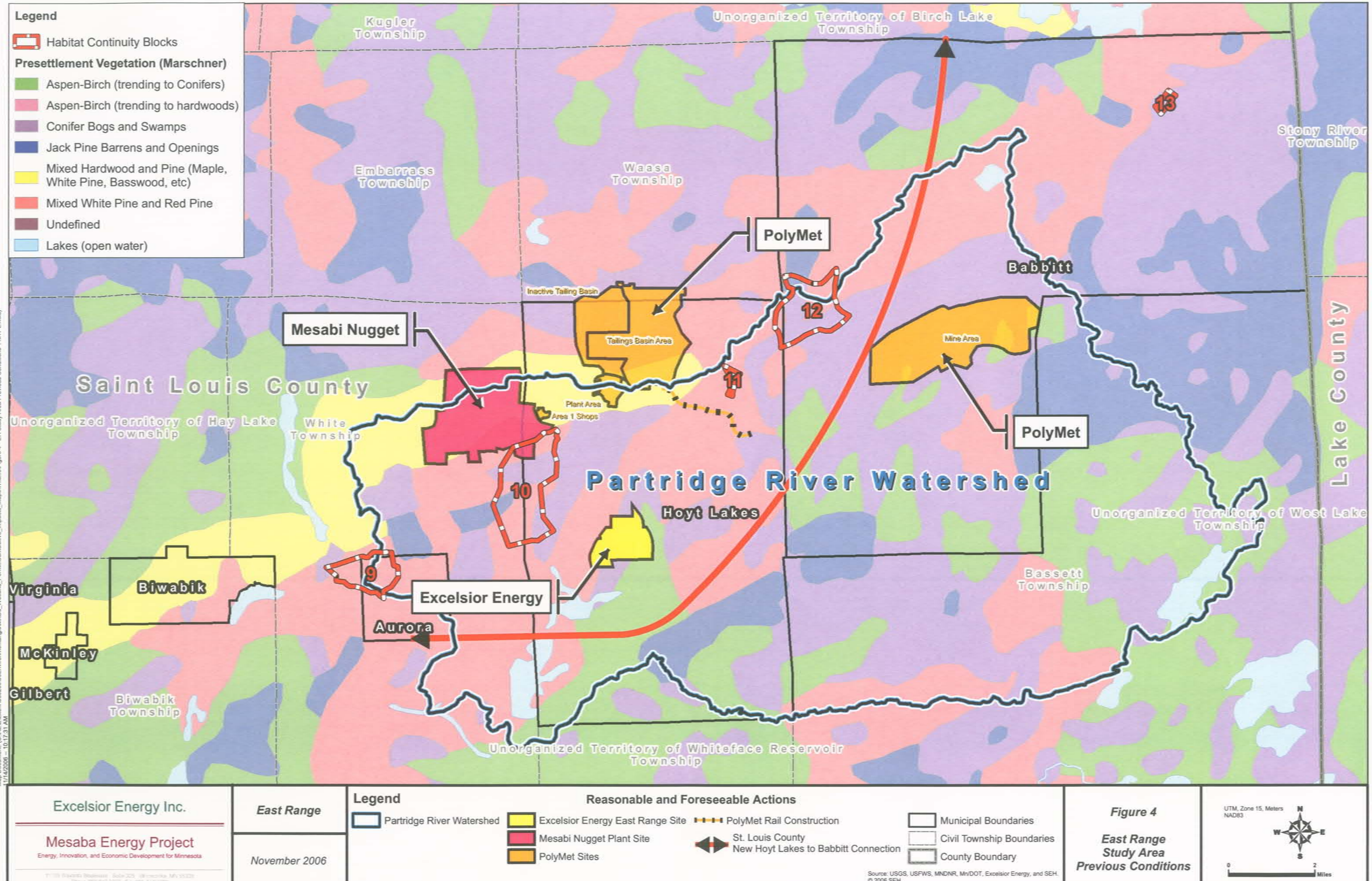
Figure 3

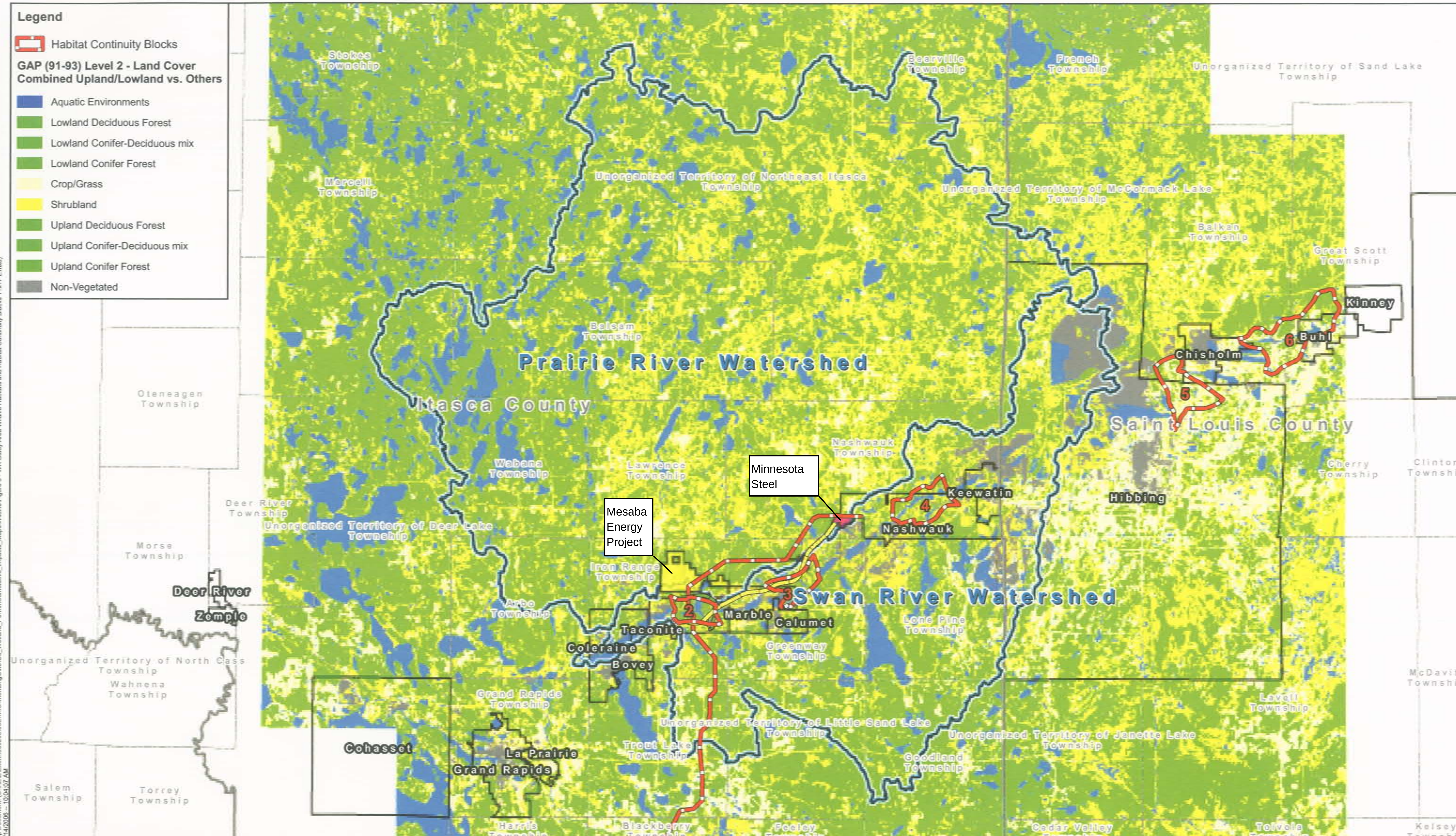
West Range Study Area Previous Conditions

UTM, Zone 15, Meters
NAD83

N W E S

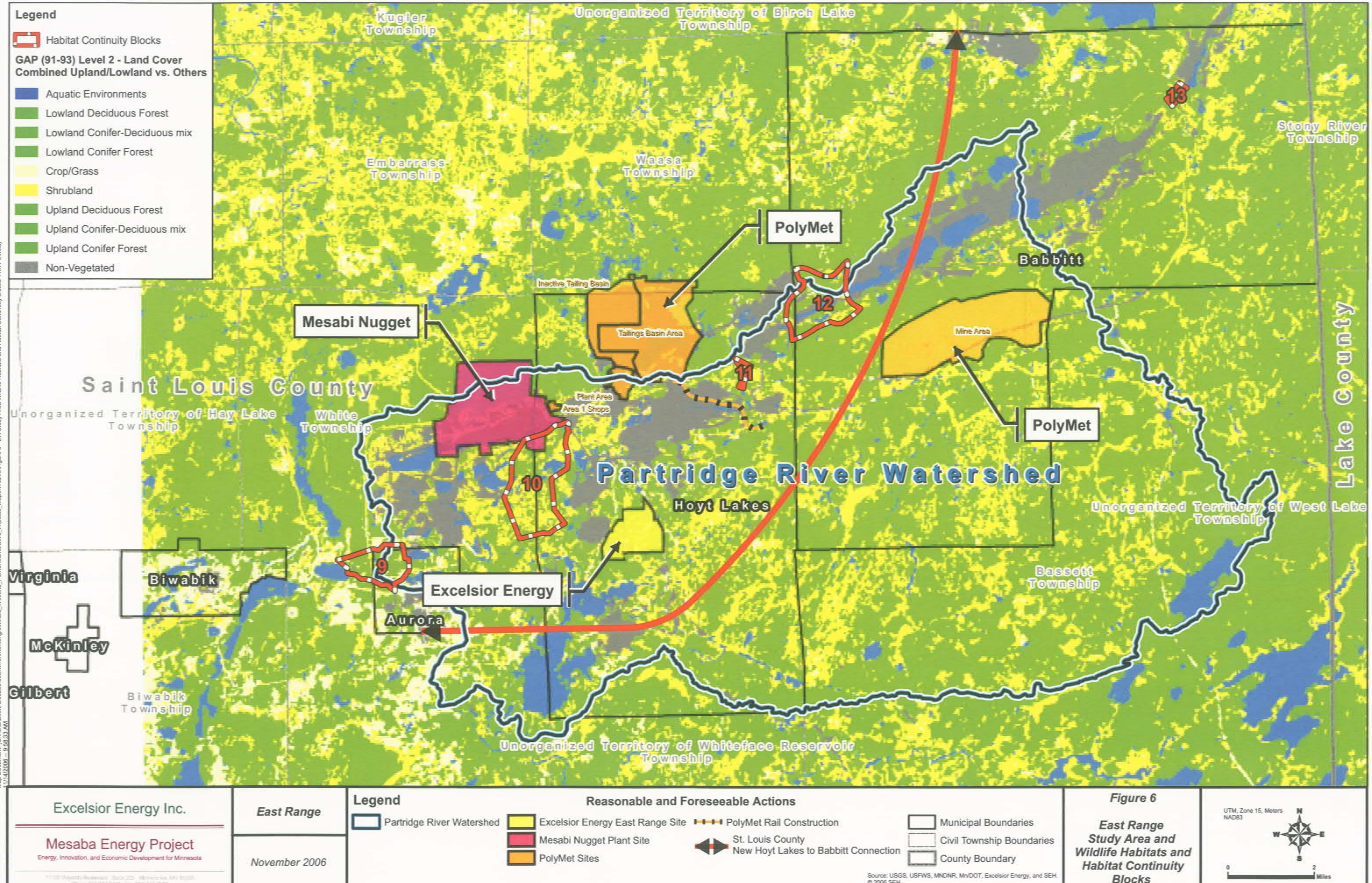
0 5 Miles


Legend
Habitat Continuity Blocks
Presettlement Vegetation (Marschner)
Aspen-Birch (trending to Conifers)
Aspen-Birch (trending to hardwoods)
Conifer Bogs and Swamps
Jack Pine Barrens and Openings
Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)
Mixed White Pine and Red Pine
Undefined
Lakes (open water)
Kugler Township
Unorganized Territory of Birch Lake Township
Embarrass Township
Waasa Township
Stony River Township
PolyMet
Babbitt
Inactive Tailing Basin
Tailings Basin Area
Mine Area
Mesabi Nugget
Saint Louis County
Plant Area
Area 1 Shops
Unorganized Territory of Hay Lake Township
White Township
PolyMet
Lake County
Partridge River Watershed
Hoyt Lakes
Unorganized Territory of West Lake Township
9
10
11
12
13
Virginia
Biwabik
Excelsior Energy
Bassett Township
Aurora
McKinley
Gilbert
Biwabik Township
Unorganized Territory of Whiteface Reservoir Township
11/14/2006 – 10:17:31 AM
Excelsior Energy Inc.
Mesaba Energy Project
Energy, Innovation, and Economic Development for Minnesota
East Range
November 2006
Legend
Partridge River Watershed
Reasonable and Foreseeable Actions
Excelsior Energy East Range Site
Mesabi Nugget Plant Site
PolyMet Sites
PolyMet Rail Construction
St. Louis County New Hoyt Lakes to Babbitt Connection
Municipal Boundaries
Civil Township Boundaries
County Boundary
Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, and SEH.
© 2006 SEH
Figure 4
East Range Study Area Previous Conditions
UTM, Zone 15, Meters
NAD83
N
W
E
S
0
2
Miles



Excelsior Energy Inc. Mesaba Energy Project Energy, Innovation, and Economic Development for Minnesota	*West Range* *November 2006*	**Legend**	**Reasonable and Foreseeable Actions**			*Figure 5* ***West Range Study Area and Wildlife Habitats and Habitat Continuity Blocks***	UTM, Zone 15, Meters NAD83 N W E S 0 5 Miles
		Swan River Watershed	Excelsior Energy West Range Site	Nashwauk Gas Pipeline	Municipal Boundaries		
		Prairie River Watershed	MN Steel DRI Plant Site	Itasca County Road 7 Realignment	Civil Township Boundaries		
				Itasca County Rail Alignment	County Boundary		

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, MN Steel, City of Nashwauk and SEH.



Legend
Habitat Continuity Blocks
GAP (91-93) Level 2 - Land Cover
Combined Upland/Lowland vs. Others
Aquatic Environments
Lowland Deciduous Forest
Lowland Conifer-Deciduous mix
Lowland Conifer Forest
Crop/Grass
Shrubland
Upland Deciduous Forest
Upland Conifer-Deciduous mix
Upland Conifer Forest
Non-Vegetated
Kugler Township
Unorganized Territory of Birch Lake Township
Embarrass Township
Waasa Township
Stony River Township
PolyMet
Babbitt
Inactive Tailing Basin
Tailings Basin Area
Mine Area
Mesabi Nugget
12
13
11
Plant Area
Area 1 Shops
Saint Louis County
Unorganized Territory of Hay Lake Township
White Township
PolyMet
Lake County
10
Partridge River Watershed
Hoyt Lakes
Unorganized Territory of West Lake Township
9
Virginia
Biwabik
Excelsior Energy
Bassett Township
Aurora
McKinley
Gilbert
Biwabik Township
Unorganized Territory of Whiteface Reservoir Township
Excelsior Energy Inc.
Mesaba Energy Project
Energy, Innovation, and Economic Development for Minnesota
East Range
November 2006
Legend
Reasonable and Foreseeable Actions
Partridge River Watershed
Excelsior Energy East Range Site
Mesabi Nugget Plant Site
PolyMet Sites
PolyMet Rail Construction
St. Louis County
New Hoyt Lakes to Babbitt Connection
Municipal Boundaries
Civil Township Boundaries
County Boundary
Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, and SEH.
© 2006 SEH
Figure 6
East Range Study Area and Wildlife Habitats and Habitat Continuity Blocks
UTM, Zone 15, Meters
NAD83
N
W
E
S
0
2
Miles

APPENDIX D6
Rail Traffic

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East Range

Current traffic: **12 trains/day** on the DMIR line

Mesabi Nugget (Module 1):

Product hauled away on private line, do not consider for MEP cumulative impacts
400,000 tpy western coal, 150,000 tpy limestone on DMIR line
Assume 119 tons/car and 115 cars/train, train returns empty
Added traffic: 82 trains/yr → **2 trains/day** (maximum; same for 3 modules as 1)

PolyMet:

Two 30-car trains/wk for limestone → **2 trains/day** maximum

Mesaba One and Two would need a maximum of 4 trains/day (for all cases here, a round trip is considered 2 trains/day). The maximum cumulative train traffic on this line is 20 trains/day, and it is clear from the calculations above that this is a conservative estimate.

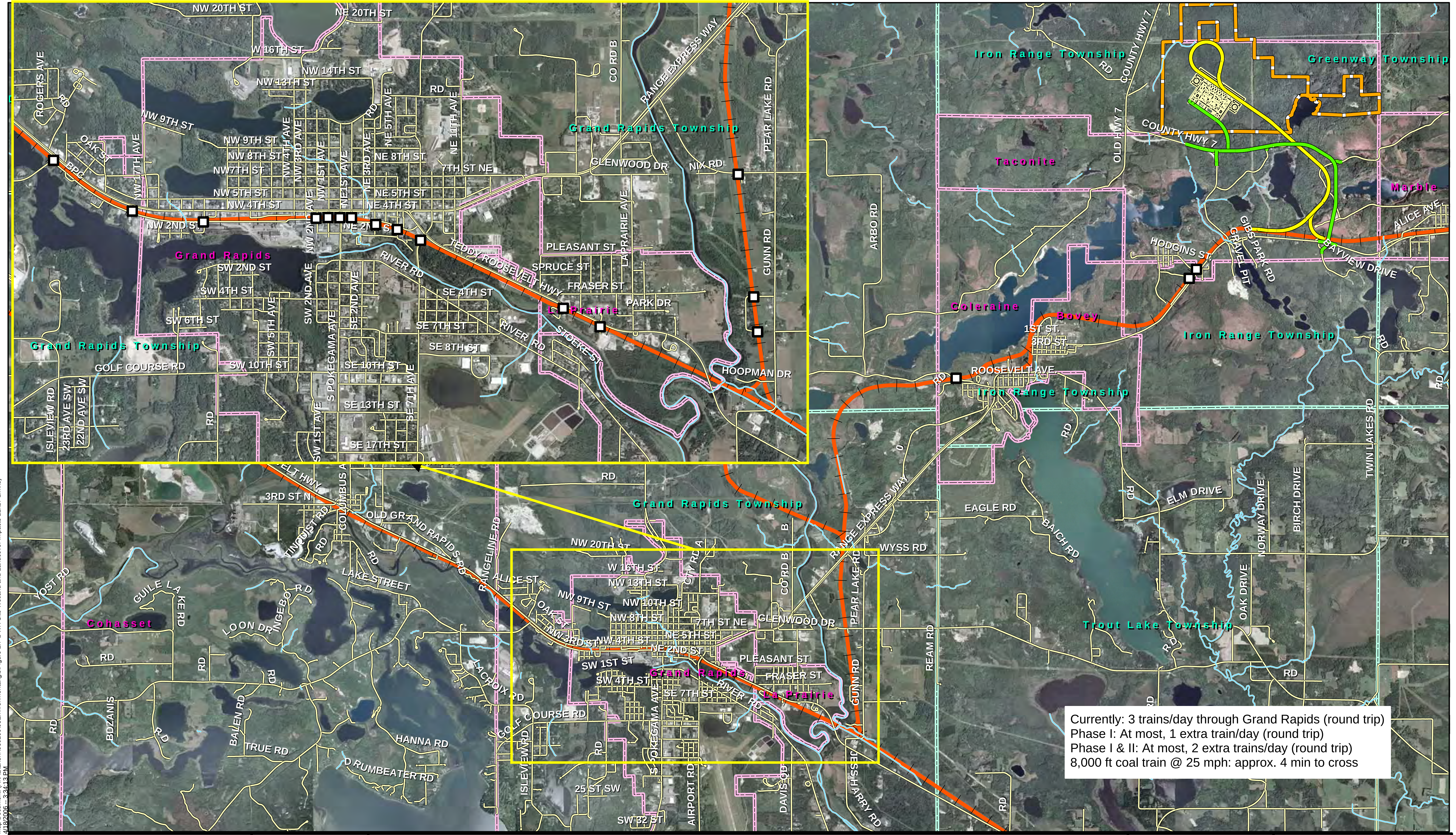
West Range

Rail traffic impacts in Grand Rapids have already been addressed in the permit applications, so I will focus on the segment of rail between Gunn, MN and the proposed site. It is currently inoperable due to rising water levels in the Canisteo Mine Pit, which have weakened the support along the section of track near Bovey, MN. Restoration of service to the line will require dropping of the water levels significantly, followed by reinforcement of the bank along which the rail travels. This has been anticipated, as the permit application describes lowering the water level before plant operation begins. Until this restoration occurs, train traffic from the west to the plant site must be routed south-east to Cloquet, then north and back west by Nashwauk to the plant site.

Current traffic: 0 trains/day now, 4 trains/day 90's-2001, much higher traffic in the 70's

MSI: The local train from Grand Rapids to Superior, WI would likely resume, with up to **4 trains/day**. This could accommodate MSI's needs of 70-90 cars per day (10 incoming, the balance outgoing).

Mesaba One and Two would need a maximum of 4 trains/day, so the maximum cumulative train traffic expected would be 8 trains/day on the segment identified above.



Map Document: (X:\AE\Exenr\050200\03Environmental\gis\Figure 2.7-1 WR Site Wetland and Landcover Impacts 11x17 L.mxd)
4/18/2006 -- 3:34:13 PM

Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

West Range Site

July 2006

Legend

- Footprint and Buffer Land
- Plant Layout
- Proposed Roads
- Rail Alt 1-A
- Geographic Names
- Municipal Boundaries
- Civil Township
- Existing Roads
- Existing Railroads
- Streams
- Railroad Crossings (excludes bridges)

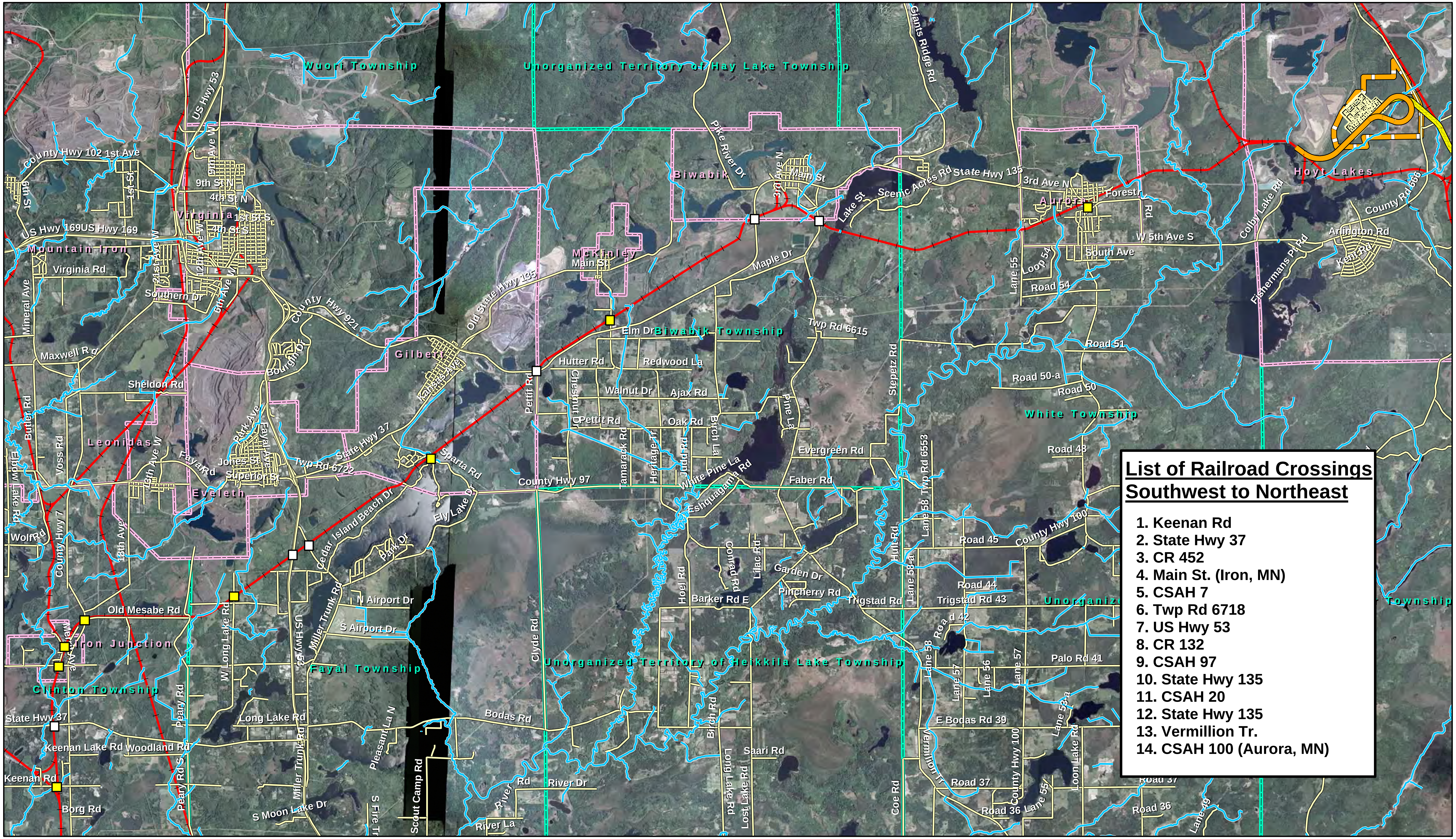
Source: Itasca County, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

Railroad Crossings

Itasca County - South Coordinate System

N S W E

0 2,000 Feet



Excelsior Energy Inc.	*East Range*	**Legend**	*East Range RR Crossings*	St. Louis County - Central Coordinate System
Mesaba Energy Project — Energy, Innovation, and Economic Development for Minnesota — 11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305 Phone 952.847.2360 Fax 952.847.2373	*September 2006*	Footprint and Buffer Land; Plant Layout; Municipal Boundaries; Civil Township Boundaries; Existing Roads; Existing Railroads; Streams; Rail Alternatives: Proposed Rail Alt 1; Rail Alternatives: Proposed Rail Alt 2; Railroad crossing with bridge; Railroad crossing at grade		N, W, E, S — 0 800 Feet

Source: USDA 2003 DOQQs, MNDNR, Mn/DOT, USGS, Fluor, Excelsior Energy, and SEH.

APPENDIX E
Consultation

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E.1 LIST OF CORRESPONDENCE

In the course of preparing this EIS, interaction efforts among state and Federal agencies were necessary to discuss issues of concern or other interests that could be affected by the Proposed Action, obtain information pertinent to the environmental impact analysis of the Proposed Action, and initiate consultations or permit processes. The following consultation letters regarding the Mesaba Energy Project are included:

- Concurrence letters from cooperating agencies for the EIS (Minnesota Department of Commerce; U. S. Army Corps of Engineers, St. Paul District; and U.S. Department of Agriculture, Forest Service, Superior National Forest)
- Formal consultation between the U.S. Department of Energy and the U.S. Fish and Wildlife Service
- Tribal response letters (1854 Authority, Leech Lake Band of Ojibwe, the Mille Lacs Band of Ojibwe Indians, Flandreau Santee Sioux Tribe, U.S. Department of Energy)
- Correspondence between the U.S. Department of Energy and the Minnesota Historical Society

MINNESOTA DEPARTMENT OF COMMERCE

Energy Facility Permitting
85 7th Place East, Ste 500
Saint Paul, MN 55155-2198
Minnesota Department of Commerce

June 8, 2007

Richard Hargis
U.S. Department of Energy
National Energy Technology Laboratory
PO Box 10940
Pittsburgh, PA 15236-0940

RE: Release of the Draft Environmental Impact Statement
Minnesota Department of Commerce Energy Facility Permitting Staff
PUC Docket No. E6472/GS-06-668

Dear Mr. Hargis,

I am in receipt of your request concerning the Minnesota Department of Commerce, Energy Facility Permitting staff's concurrence with the release of the DEIS for the Mesaba Energy Project (MPUC Docket No. E6472/GS-06-668)

The MDOC EFP staff concurs with the DOE decision to release the DEIS.

If you have any question or need further information, please do not hesitate to contact me.

As always, MDOC appreciates the assistance and cooperation of the DOE with these issues.

Thank you.

Sincerely,

William Cole Storm,
State Planning Director
Department of Commerce
Energy Planning & Advocacy
Routing & Siting Unit
85 7th Place East
Suite 500
St. Paul, MN 55101-2198

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL MN 55101-1638

June 5, 2007

REPLY TO
ATTENTION
Operations
Regulatory (2005-5527-WAB)

Mr. Richard Hargis
NEPA Document Manager
U.S. Department of Energy
National Energy Technical Laboratory
PO Box 10940
Pittsburgh, PA 15236

Dear Mr. Hargis:

On December 27, 2006, the St. Paul District Corps of Engineers (Corps) provided comments on a preliminary version of the draft Environmental Impact Statement (DEIS) for Excelsior Energy's IGCC power plant proposal. In that letter, we raised concerns that the DEIS did not adequately document the consideration of a range of alternatives as required under both NEPA and the Clean Water Act Section 404(b)(1) guidelines.

As requested by the Department of Energy (DOE), we have worked with Excelsior Energy to develop a purpose and need statement that is acceptable to the Corps. Excelsior Energy has also responded to our request and provided us with a narrative of the process and criteria they used to identify and analyze the practicability of various power plant sites. We have reviewed the project purpose and need and the alternatives analysis with Excelsior Energy on several occasions. We understand this information has been forwarded to DOE for inclusion in the DEIS. While we believe the latest version of this narrative describes the process and rationale used by Excelsior Energy to select their preferred alternative, we have not endorsed its conclusions and have some question as to whether Excelsior Energy's preferred alternative is the least damaging practicable alternative as required under the 404(b)(1) guidelines.

However, we believe the purpose and need statement is satisfactory for our purposes; and the alternatives analysis in the DEIS, as supplemented by Excelsior Energy's latest input, provides sufficient documentation for review and comment. Although we have not resolved all of our concerns with the analysis necessary for the CWA Section 404 review process, the Corps is in agreement with DOE's release of the draft EIS for public comment. If you have any questions contact Kelly Urbanek at 218-444-6381.

Sincerely,

Robert J. Whiting
Chief, Regulatory Branch

Copy furnished:
Minnesota Department of Commerce
Minnesota Public Utilities Commission

United States Department of Agriculture
Forest Service
Superior National Forest
8901 Grand Ave. Place
Duluth, MN 55808-1122
Phone: (218) 626-4300
Fax: (218) 626-4398

File Code: 2580-3
Date: June 13, 2007

Mr. Richard Hargis
NEPA Document Manager, Office of Major Demonstration Projects
National Energy Technology Laboratory, US Department of Energy
3610 Collins Ferry Road
PO Box 880
Morgantown, WV 26507-0880

Dear Mr. Hargis:

Thank you for providing responses to our concerns. For the purposes of the EIS we feel you have addressed our concerns for most of the issues we raised. As you state, most of these issues will be resolved through the Federal Prevention of Significant Deterioration (PSD) air permitting process. We have a couple of responses to information we read in the document you sent that we'd like to share with you.

We do not agree with the following statement by the project proposer:

The MPCA has stated publicly that the reasonable progress improvements they have charted to date do not reflect such CAIR-related reductions. Further, the MPCA does not appear to have allowed for any benefit that would be derived from the CAIR-related provision requiring new EGUs (of which Mesaba One and Mesaba Two would be considered) to purchase sulfur dioxide allowances each year in an amount equal to the annual sulfur dioxide emissions that they release. Excelsior believes that the purchase of such allowances provides an unparalleled offset compared to new non-EGU sources that are not directly required to do so.

The modeling projections done to determine progress in 2018 for regional haze have always included the affect of CAIR as one of the programs that are "on-the-books." The timing and distribution of emission reductions under CAIR are unknown so a model (IPM) has been used to predict that information.

Purchasing of CAIR-related allowances in an amount equal to the emissions of the Excelsior facility would likely not offset the air quality impacts from the facility at the BWCAW. The location and timing of the emissions reductions that may eventually be caused by the purchase of the allowances by Excelsior on the open market are unknown. They may take place at sources hundreds of miles away from northern Minnesota, at some undetermined time in the future, while Excelsior will be emitting every year at a location near the BWCAW.

Lastly we would like to convey that in previous PSD projects we have not accepted the BART modeling approach used by Excelsior. We will need to discuss this issue (along with the emission inventories used) further with Excelsior and the MPCA during the PSD permitting process.

If you have any questions, please contact Trent Wickman at (218) 626-4372.

Sincerely,

/s/ James W. Sanders
JAMES W. SANDERS
Forest Supervisor

U.S. Department of Energy

National Energy Technology Laboratory

NETL

December 18, 2006

Mr. Paul Burke
U.S. Fish & Wildlife Service
4101 East 80th Street
Bloomington, MN 55425

Re: Section 7 Consultation – Mesaba Energy Project

Dear Mr. Burke:

This letter is to initiate formal consultation under Section 7 of the Endangered Species Act for a proposed action by the U.S. Department of Energy (DOE). As you know, DOE has entered into a cooperative agreement with Excelsior Energy to provide a total of $36 million in cost-shared funding for the Mesaba Energy Project. A description of the proposed project, the specific area affected by the proposed action, the listed species or critical habitat that may be affected and other relevant information is enclosed. Additional information is available in the Joint Permit Application and Environmental Supplement submitted by Excelsior Energy to the Minnesota Department of Commerce. The URL for this documentation is as follows:
http://energyfacilities.puc.state.mn.us/Docket.html?Id=16573
Note that the Minnesota Department of Commerce is a joint lead agency for the preparation of the Environmental Impact Statement for this project.

During the informal consultation process which began in September 2005, you and other representatives of your office indicated that the three species of concern were the bald eagle, grey wolf and Canada lynx. A summary of the record of communications between DOE and the U.S. Fish & Wildlife Service (FWS) was provided to you in an e-mail on September 7, 2006, as well as a report prepared by one of the contractors to Excelsior Energy regarding ecological habitat surrounding the preferred and alternative sites being considered by Excelsior Energy for the project. Based on the informal consultation process, DOE has made a determination that the proposed action may affect, but is not likely to adversely affect, the bald eagle and that the proposed action may affect the grey wolf and Canada lynx. Therefore, DOE is requesting a biological opinion from FWS regarding the potential effects on these two species.

Please let me know if I can provide any additional information. Thank you.

Sincerely,

Richard A. Hargis, Jr.
NEPA Document Manager

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
HARGIS@NETL.DOE.GOV@netl.doe.gov • Voice (412) 386-6065 • Fax (412) 386-4778 • www.netl.doe.gov

United States Department of the Interior

TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
4101 East 80th Street
Bloomington, Minnesota 55425-1665

IN REPLY REFER TO:
FWS/AFWE-TCFO

MAR - 6 2007

Richard A. Hargis, Jr.
NEPA Document Manager
U.S. Department of Energy
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, Pennsylvania 15236

Dear Mr. Hargis:

This responds to your December 18, 2006, letter regarding consultation under section 7 of the Endangered Species Act of 1973, as amended, for the proposed construction of the Mesaba Energy Project (applicant), in Itasca and St. Louis Counties, Minnesota. There are two sites under consideration for plant construction. The West Site is located in Itasca County, near the Town of Taconite, and the East Site is located about 60 miles to the northeast, in St. Louis County, near the Town of Hoyt Lakes, Minnesota. The West Site has been identified as the preferred alternative. The final project site will be selected at the close of the planning process.

By your letter, the U.S. Department of Energy (DOE) is requesting concurrence with the determination that the proposed action may affect but is not likely to adversely affect the federally-listed species the bald eagle (*Haliaeetus leucocephalus*). Further, the DOE has requested the initiation of formal consultation for the gray wolf (*Canis* lupus) and the Canada lynx (*Lynx canadensis*). The Service will consult with the DOE on the project as proposed for the preferred alternative, the West Site. The U.S. Fish and Wildlife Service (Service) has reviewed the information included with your letter and provides the following comments for your consideration

Since 2005, the DOE and the applicant staff have provided comprehensive coordination with the Service on this project, including direct communication through telephone and electronic mail contacts throughout the planning phases for this project. Both the DOE and the applicant are to be commended for this consultation effort.

The Service, in working closely with project staff, has assessed the proposed project's impact on the bald eagle. The bald eagle is broadly distributed across the greater project area, and eagle sightings in the immediate vicinity of the project action area (West Site) are common. The forest canopy provides diurnal roosts, and the neighboring streams and lakes provide forage habitat for the bald eagle. However, the nature of the proposed project is such that roost and forage habitats are not likely to be reduced or diminished for eagles in the action area because only a small proportion of the project site has not already been substantially altered by historic mining activities. Further, there are no known eagle nests within the project site, or within 1,320 feet of the project site boundary. Thus, we concur the DOE determination that the proposed project is not likely to adversely affect the bald eagle.

The Service also concurs with the DOE determination that the proposed action may affect the Canada lynx and the gray wolf. The gray wolf and the Canada lynx are now found in the vicinity of the West Site. The greater challenge is in the apparent vulnerability of lynx and wolf to vehicle collisions when crossing roads. Specifically, any project that results in new roads, new road alignments, widened rights-of-way, or increased vehicle speeds, in habitat occupied by the Canada lynx and the gray wolf may affect these species.

By initiating formal consultation under section 7 of the Act, the Service will be required to prepare a biological opinion, which documents the specific elements of the proposed action and their impact on the listed species. Along with a determination as to whether the project would jeopardize the continued existence of the listed species, the biological opinion may also provide conservation recommendations, an incidental take statement, with reasonable and prudent measures and the terms and conditions of that statement.

The Service is limited to a time period of 135 days in which to provide your office with a final biological opinion for the project. This time period works to ensure a prompt response and a more predictable consultation environment for the project managers. This time period is supposed to begin upon the date of the letter requesting the initiation of formal consultation. However, the Service understands that the DOE and the applicant need to adhere to a project time line that requires a final biological opinion within 60 days. Due primarily to the efforts of the DOE and the applicant in project coordination to date, the Service believes that we can meet this deadline. Therefore, we will make every effort to provide a biological opinion dated on or before April 30, 2007, to be provided to the DOE, with copies to the applicant and other appropriate agencies.

We appreciate this opportunity to work with the DOE and the applicant in the conservation and recovery of federally-listed species. If you have any questions, or if we can be of further assistance, please contact Mr. Paul Burke, of this office, by calling (612) 725-3548, and at extension 205.

Sincerely,

Tony Sullins
Field Supervisor

CC:

David Holmbeck

Mn/DNR – Grand Rapids

1854 Authority

4428 HAINES ROAD • DULUTH, MN 55811-1524
218.722.8907 • 800.775.8799 • FAX 218.722.7003
www.1854authority.org

October 31, 2005

Richard Hargis
U.S. Department of Energy
National Energy Technology Laboratory
P.O. Box 10940
Pittsburgh, PA 15236-0940

RE: Mesabi Energy Project

Dear Mr. Hargis,

The purpose of this letter is to provide comment on the scoping for the Environmental Impact Statement (EIS) for the Mesabi Energy Project.

The 1854 Authority is an inter-tribal natural resource management organization governed by the Bois Forte Band and Grand Portage Band of Lake Superior Chippewa, both federally recognized tribes. The organization manages the off-reservation treaty rights of these bands in the 1854 Ceded Territory of northeastern Minnesota. The 1854 Ceded Territory encompasses all of Lake and Cook counties, most of St. Louis and Carlton counties, and portions of Pine and Aitkin counties.

Band members continue to exercise rights to hunt, fish, and gather guaranteed under treaty with the United States. Resources must be available and safe to utilize for the exercise of these rights. While we are not opposed to pursuing energy and economic development opportunities, we believe that such development should only proceed when all safeguards to protect the environment are ensured. Industrial operations should avoid or minimize negative impacts to the natural resources and utilization of these resources.

The 1854 Authority supports the environmental issues identified for analysis in the EIS. We are particularly concerned with the following issues:

- Atmospheric resources: Potential air emissions should be identified, including the effects on human health and the environment from releases of mercury and other air pollutants. Fish continue to be an important component of the diet of many band members, and mercury contamination is of high concern. Consumption advisories are not the appropriate solution to address mercury in fish. Fish must be made safe to eat through reductions of mercury in the environment. The 1854 Authority questions how additional mercury emissions will be handled with goal of reducing mercury releases in Minnesota.

- Water resources: Impacts to adjacent and downstream water resources should be identified and properly addressed. Issues include effects to water quality, fisheries, and wild rice.

  Cultural resources: Any effects on the exercise of Treaty rights (hunting, fishing, gathering) and the quality of associated resources should be addressed. Appropriate consultation and surveys should be completed to properly identify cultural resources. Impact to any historic or archaeological resources should be avoided.
- Ecological resources: The effects on wildlife populations and associated habitat should be addressed. Game species such as moose, deer, and grouse should be specifically discussed.
- Floodplains and wetlands: Discussion of impacts to wetlands should be included.
- Cumulative effects: Cumulative impacts from this project and other current or proposed industrial activities in the region should be a consideration. Specifically in regards to the East Range Site, other projects (Mesabi Nugget, Polymet) are currently proposed near Hoyt Lakes.

Finally, the federal government has the responsibility to work with Indian bands on a government-to-government basis. Notification and consultation activities must be completed directly with all tribes potentially affected by the proposed project. The planning process and project implementation must recognize the sovereign status of bands and the rights retained by treaty with the United States.

The 1854 Authority would like to remain informed on this project as the process moves forward. Thank you.

Sincerely,

Darren Vogt
Environmental Biologist

cc: Corey Strong, Bois Forte Department of Natural Resources
Curtis Gagnon, Grand Portage Trust Lands and Resources

Leech Lake Band of Ojibwe

George Goggleye, Chairman
Arthur "Archie" LaRose, Secretary/Treasurer

District I Representative
Robbie Howe

District II Representative
Lyman L. Losh

District III Representative
Donald "Mick" Finn

October 10, 2006

U. S. Department of Energy
National Energy Technology Laboratory
Attn: Richard Hargis, NEPA Document Manager
626 Cochrans Mill Road
P. O. Box 10940
Pittsburgh, PA 15236

RE: **Proposed Integrated Coal Gasification Combined Cycle electric generating facility on one of two sites**
Taconite, Itasca County, Minnesota
Hoyt Lakes, St. Louis County, Minnesota
LLBO Land Claim Area
LL-THPO Number: 06-223-NCRI

Dear Mr. Hargis:

Thank you for the opportunity to comment on the above-referenced project. It has been reviewed pursuant to the responsibilities given the Tribal Historic Preservation Officer (THPO) by the National Historic Preservation Act of 1966, as amended in 1992 and the Procedures of the Advisory Council on Historic Preservation (38CFR800).

I have reviewed the documentation; after careful consideration of our records, I have determined that the Leech Lake Band of Ojibwe does not have any concerns regarding sites of religious or cultural importance in this area. We are not interested in being a part of an agreement at this time.

Should any human remains or suspected human remains be encountered, all work shall cease and the following personnel should be notified immediately in this order: County Sheriff's Office and Office of the State Archaeologist. If any human remains or culturally affiliated objects be inadvertently discovered this will prompt the process to which the Band will become informed.

You may contact me at (218) 335-2940 if you have questions regarding our review of this project. Please refer to the LL-THPO Number as stated above in all correspondence with this project.

Respectfully submitted,

Gina M. Papasodora
Tribal Historic Preservation Officer

THE MILLE LACS BAND OF
OJIBWE INDIANS
Executive Branch of Tribal Government

October 25, 2005

Richard A Hargis, NEPA Document Manager
U.S. Department of Energy, National Energy Technology Laboratory
3610 Collins Ferry Road, P.O. Box 880
Morgan Town, WV 26507-0880

Re: Section 106 Consultation and Tribal Review NHPA: Proposed Intergated Coal GasificationCombined Cycle electric generating facility, MN Iron Range, Itasca and St. Louis Counties

Dear Mr. Hargis,

Thank you for the opportunity to review and comment on the above project. It has been reviewed pursuant to the responsibilities given the Tribal Historic Preservation Office by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council of Historic Preservation (36CFR800).

Based on available information we conclude there is no cultural significance to the Mille Lacs Band of Ojibwe within the area described.

Please contact Natalie Weyaus at 320-532-4181 extension 7450 if you have any questions regarding our review of this project.

Respectfully,

Natalie C Weyaus

Natalie Weyaus
Tribal Historic Preservation Officer

Cc: Dennis Gimmestad, MN SHPO Review and Compliance

DISTRICT I
43408 Oodena Drive • Onamia, MN 56359
(320) 532-4181 • Fax (320) 532-4209

DISTRICT II
36666 State Highway 65 • McGregor, MN 55760
(218) 768-3311 • Fax (218) 768-3903

DISTRICT III
Route 2 • Box 233-N • Sandstone, MN 55072
(320) 384-6240 • Fax (320) 384-6190

Flandreau Santee Sioux Tribe

P.O. Box 283 Flandreau, SD 57028 Ph. 605-997-3891
Fax 605-997-3878

Date: September 7, 2005

To: U.S. Department of Energy-NETL

From: Cultural Preservation Officers-Flandreau Santee Sioux Tribe

RE: DOE and NETL notification dated September 1, 2005
Attachment - Your correspondence

No objections, however, if human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, please stop immediately and notify the appropriate persons from our Tribe. Sam Allen and Ray Redwing of our staff are our Cultural Preservation Officers, and NAGPRA Representatives. They can be contacted at the above address and phone number. Thank you.

Cultural Preservation Officers – Flandreau Santee Sioux Tribe
Flandreau, SD 57028

U.S. Department of Energy

National Energy Technology Laboratory

NETL

May 3, 2006

RECEIVED
MAY 11 2006
K.B.I.C.
CHAIRMAN'S OFFICE

Ms. Susan J. LaFernier, President
Keweenaw Bay Indian Community
107 Beartown Road
Barage, MI 49908

Copy to
Todd W & Summer

Dear Ms. LaFernier:

In September of 2005, the Department of Energy (DOE) sent correspondence (see copy enclosed) indicating that the National Energy Technology Laboratory is in the process of preparing an environmental impact statement (EIS) under the National Environmental Policy Act (NEPA) for our participation in the Mesaba Energy project under the Clean Coal Power Initiative Program. Excelsior Energy, Inc., an independent energy development company based in Minnetonka, MN, would build, own, and oversee operation of the Project, which would be an Integrated Coal Gasification Combined Cycle electric generating facility to be located on one of two sites in Minnesota's Iron Range. The western site is located just north of the city of Taconite in Itasca County; the eastern site is located about one and one-half miles north of the city of Hoyt Lakes in St. Louis County.

Should you have any concerns that you have not yet submitted, we would be interested in hearing those concerns. In addition, you will have another opportunity to comment once DOE issues the draft EIS to the public for comment. DOE intends to use the decision making process, which is ongoing under NEPA, in order to satisfy requirements it may have to provide for notification and consultation to tribes in order to insure that all of their concerns are addressed in the draft and that any comments they have on the draft EIS are addressed in the final EIS.

If at any point you have questions, and at your convenience, I would be pleased to discuss the Project and the EIS process with you. Please call me at 412-386-6065 or email me at richard.hargis@netl.doe.gov with any questions you have, as your active participation in this ongoing NEPA process is important to the Department.

Thank you for your assistance and I look forward to hearing from you.

THE KEWEENAW BAY INDIAN COMMUNITY HAS NO INTEREST IN:
PROJECT #: Mesaba Project E.I.S.
Summer Cohen
SUMMER COHEN/THPO/NAGPRA
May 19, 2006
DATE

Sincerely,

Richard Hargis
NEPA Document Manager

Enclosure

U.S. Department of Energy

National Energy Technology Laboratory

September 1, 2005

Mr. James Williams , Jr., Chairperson
Lac Vieux Desert Band of Lake Superior
Chippewa Indians
P.O. Box 249, Choate Road
Watersmeet, MI 49969

Dear Mr. Williams:

The U. S. Department of Energy (DOE), National Energy Technology Laboratory (NETL) is beginning the process of preparing an environmental impact statement (EIS) under the National Environmental Policy Act (NEPA) for our participation in the Mesaba Energy Project (the "Project") under the Clean Coal Power Initiative (CCPI) Program. NETL intends to publish a Notice of Intent in September to prepare the EIS. Excelsior Energy, Inc., an independent energy development company based in Minnetonka, MN, will build, own, and oversee operation of the Project, which is an Integrated Coal Gasification Combined Cycle (IGCC) electric generating facility to be located on one of two sites in Minnesota's Iron Range (please see attachment). Excelsior plans to construct the Project in two phases nominally generating up to 600 megawatts (net) each. The commercial in-service date of the first phase is scheduled for 2011; the second phase is scheduled for 2013.

As the lead Federal Agency, NETL is required to comply with Sections 106 and 110 of the National Historic Preservation Act (NHPA) for this undertaking as well as with NEPA. Therefore, this letter is intended to initiate consultation with your tribal government.

In compliance with the requirements of Minnesota Statutes 116C (Sections 116C.51 to 116C.69, known as the Minnesota Power Plant Siting Act) and Minnesota Rules Chapter 4400, Excelsior is considering two sites for the proposed facility. The western site is located just north of the city of Taconite in Itasca County; the eastern site is located about one and one-half miles north of the city of Hoyt Lakes in St. Louis County (please see attachment). In the case of the western site, the Project's generating facilities would connect to the power grid via new and existing high voltage transmission line (HVTL) corridors to a substation near the unincorporated community of Blackberry; in the case of the eastern site, the generating facilities would connect to the grid via existing HVTL corridors that lead to a substation near the unincorporated community of Forbes. Excelsior would reconstruct and/or reinforce the HVTL infrastructure within the final corridor(s) selected. In conjunction with both phases of the Project, Excelsior anticipates that network reinforcements would be required in other existing HVTL corridors and/or at substations down-network of the existing substations identified. In addition, the project would include intakes from and discharges to surface waters, connections to natural gas pipelines, and connections to various existing transit corridors (rail and road) in the region.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507-0880 ❖ 626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236-0940
REPLY TO: Pittsburgh Office • Hargis@netl.doe.gov • Voice (412) 386-6065 • Fax (412) 386-4775 • www.netl.doe.gov

I would like to request any comments from your tribal government regarding the potential significance of, and potential effects to, any traditional cultural properties, cultural landscapes, or archaeological sites within the two alternative sites for the facility. In addition, I respectfully invite your tribal government to participate in any agreement that may be entered between the NETL, the State Historic Preservation Office (SHPO), and Excelsior.

After you have had the opportunity to review this information, and at your convenience, I would be pleased to discuss the Project and the EIS with you. Please do not hesitate to call me at 412-386-6065 or email me at richard.hargis@netl.doe.gov if you have further questions. Your active participation in this ongoing consultation process will be facilitated if we receive a written response on behalf of your tribal government.

Thank you for your assistance and I look forward to hearing from you.

Sincerely,

Richard A. Hargis
NEPA Document Manager

Enclosures: General Location Map

The Lac Vieux Desert Band of Lake Superior Chippewa Indians have no interest in

Project #: Clean Coal Power NETL

Giiwegiizhigookway Martin/THPO/NAGPRA

9/13/2005
Date

Mesaba Energy Project – Comment Sheet

DOE EIS Public Scoping Meeting

Please Check: ✓ 10/25/05 Taconite, MN *or* ___10/26/05 Hoyt Lakes, MN

Name: James Merhar, Chairman

Representing: Iron Range Area Council for Native Americans

Address: P.O.. Box 373, Bovey, Mn. 55709

Email:

Comment:

The Council in meeting has made the following comments regarding the Mesaba Energy Project projected construction.

The Council demands that an archeological study be made of the area before any construction commences, due to the fact that this area was once in the path of the migrations of our ancestors.

The Council demands a written guARANtee that our rights under the Treaty of 1855 will be protected as to water purity, fishing, hunting and gathering rights. This Treaty is still in effect and we want a written guarantee that your project will not interfere with any rights of ours.

Since our Tribal land is across the road from the proposed site of your plant, the Council wants a written guarantee that there will be no pollution from coal dust or from heavy metals with a ten mile radius. Our Tribal land will be the site for a senior housing in the near future aand we want our residents to be free from polutants - not only our residents but we are concerned for our neighbors.

The Council wants a writtenguarantee that water used in your plant will not be recycled and dumped or fed back into our rivers and lakes to pollute them.

The Council believes that a green site should NOT have been selected for this construction but that an already used site, such as an abandoned mine, should be used so as not to further desecrate the land. Has there been a feasibility study done on other sites such as mentioned.

The Council has grave concerns that this plant will not employ local labor to any great extent so as to improve the economy of the area, but that the employees will be high tech personnel imported from other areas. We would like some assurance that such is not the case and local labor will be the majority hired.

Please submit comments to meeting moderator or send to:

Mr. Richard A. Hargis
National Energy Technology Laboratory
U.S. Department of Energy
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940

Email: Richard.Hargis@NETL.DOE.GOV
Voice: 412-386-6065
Fax: 412-386-4775
Toll-free: 888-322-7436, ext. 6065

MINNESOTA HISTORICAL SOCIETY

State Historic Preservation Office

January 10, 2006

Mr. Richard Hargis
NEPA Document Manager
U.S. Dept. of Energy
626 Cochrans Mill Road
PO Box 10940
Pittsburgh, PA 15236-0940

Re: Mesaba Energy Project
SHPO Number: 2005-3002

Dear Mr. Hargis:

Last August, your agency initiated Section 106 consultation with our office regarding the above referenced federal undertaking. You provided us with cultural resource reports on the two project sites, both of which included a strategy for completion of identification and evaluation surveys for each site. Later last fall, you also provided us with information about public scoping meetings for the project.

As you continue the NEPA process for the project, we would recommend that you include specific information about the Section 106 process in your documents and meetings. This will help to integrate NEPA and Section 106 and assure that the public participation requirements of Section 106 can be addressed in concert with other public involvement.

We look forward to working with you as this planning process proceeds. Contact me at 651-205-4205 with questions or concerns.

Sincerely,

Dennis A. Gimmestad
Government Programs & Compliance Officer

cc: Anne Ketz, The 106 Group

345 Kellogg Boulevard West / Saint Paul, Minnesota 55102-1906 / Telephone 651-296-6126

May 2, 2006

Dennis A. Gimmestad
Government Programs & Compliance Officer
State Historic Preservation Office
345 Kellogg Boulevard West
Saint Paul, Minnesota 55102-1906

Re: Mesaba Energy Project
SHPO Number: 2005-3002

Dear Mr. Gimmestad,

Last August, our agency initiated Section 106 consultation with your office regarding the above referenced federal undertaking. At that time, our agency provided you with two cultural resources reports, one for the east range project site and one for the west range project site. We also provided you with information about public scoping meetings for the project.

Enclosed please find two additional documents for your reivew, one for each of the two project sites. One report is titled, "Archaeological Sampling of the Mesaba Energy Project West Range Site, Itasca County, Minnesota." The other report is titled, "Cultural Resources Preliminary Report for Section 106 of the National Historic Preservation Act of 1966 (as revised) and Cultural Resources Requirements for the National Environmental Policy Act." Please treat these documents as draft and do not quote, cite, or distribute outside your office.

We would appreciate any comments that you may have and please let us know if there is any additional information needed to satisfy the Section 106 consultation requirements for this project. We look forward to working with you and we will be contacting you for your comments.

Sincerely,

George W. Pukanic
Project Engineer

2 Enclosures

cc: Richard Hargis

U.S. Department of Energy

National Energy Technology Laboratory

November 2, 2006

Dennis A. Gimmestad
Government Programs & Compliance Officer
State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Blvd. W.
ST. Paul, MN 55102-1903

Re: Mesaba Energy Project
SHPO Number: 2005-3002

Dear Mr. Gimmestaad:

Last year and early this year we sent you several cultural assessment reports for the east and west range potential plant sites for the Mesaba Energy Project. The reports presented an inventory of NHRP listed and eligible properties within the area of potential effect. A limited archaeological survey was conducted with a focus on areas considered to have the highest potential within the most likely areas of impact. As presented in the reports, no archaeological resources were encountered in either the high or moderate potential areas so identified that underwent testing.

On June 28, 2006, during a conference call with you, I indicated that DOE has made the determination that the proposed project at either the east or west range site would have no adverse effect on any historical or archaeological site. However, you expressed a concern for potential adverse impacts upon the Longyear historic site and the Longyear trail and its maintenance.

On September 5, 2006, you indicated through voice mail that you determined that the City of Hoyt Lakes is the responsible party for the historic Longyear site and trail. You mentioned that you spoke with Richard Bradford, the city administrator, who indicated that he was not aware of any adverse affects. On September 20, 2006, I emailed you a summary of the conversation I had with Richard Bradford. Mr. Bradford informed me that he did not see traffic impacts as a detriment, but on the contrary, he felt that an increase in traffic would bring more awareness to the site and contribute to the attractiveness of visiting the site. There has been a history of high volume traffic to the site when the LTV plant was in operation. However, when the plant closed, traffic was minimal and without word of mouth, visits to the site decreased considerably. He felt that more traffic in the area would bring more awareness to the site and hence would be a positive asset. Also, he did not believe that there would be any visual impacts to the site and certainly not on the maintenance of the site, which you were concerned with. Therefore, DOE has made the determination that there would be no adverse access or

626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236
George.Pukanic@netl.doe.gov • Voice (412) 386-6085 • Fax (412) 386-4775 • www.netl.doe.gov

visual impact to the historic Longyear site based on discussions with the city administrator of Hoyt Lakes.

We request your response to our determination of no adverse effect in accordance with Section 106 of the National Historic Preservation Act. Please let me know if you need any additional information. Thank you.

Sincerely,

George W. Pukanic
Project Engineer

cc: Richard A. Hargis
Jason T. Lewis

MINNESOTA HISTORICAL SOCIETY

November 22, 2006

Mr. George W. Pukanic
Project Engineer
National Energy Technology Laboratory
U.S. Department of Energy
626 Cochrans Mill Road
PO Box 10940
Pittsburgh, PA 15236

RE: Mesaba Energy Project
SHPO Number: 2005-3002

Thank you for your letter of 2 November 2006 regarding the above referenced undertaking.

We appreciate your efforts at considering any potential effects of the project on the E.J. Longyear First Diamond Drill Site, a property listed on the National Register of Historic Places. Based on your assessment and consultation with the City of Hoyt Lakes, it would not appear that the project will have any adverse effects on this property.

However, the status of the completion of the cultural resource surveys for the project areas is not clear to us. You have previously submitted to us several reports completed by The 106 Group, which outlined a strategy for the completion of surveys for both proposed project sites. However, it does not appear that we have yet reviewed the results of the surveys.

We look forward to working with you to complete this review. Contact us at 651-296-5462 with questions or concerns.

Sincerely,

Dennis A. Gimmestad
Compliance Officer

cc: Anne Ketz, The 106 Group

APPENDIX F
Wetlands Documents –

Documentation for USACE (F1), Floodplain and Wetlands Assessment (F2)

(Note: Color versions of figures in this Appendix are included in the file posted at the DOE NEPA website: http://www.eh.doe.gov/nepa/docs/deis/deis.html)

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APPENDIX F1
Documentation for USACE

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DOCUMENTATION PRESENTED TO THE U.S. ARMY CORPS OF ENGINEERS IN SUPPORT OF EXCELSIOR ENERGY INC.'S APPLICATION FOR A SECTION 404 PERMIT

Clean Water Act Section 404(b)(1) Alternatives Analysis

Pursuant to regulations promulgated under Clean Water Act, Section 404(b)(1), the United States Army Corps of Engineers ("Corps") is required to determine that there is no alternative to the proposed action that is practicable, is less damaging to the aquatic ecosystem, and has no other significant, adverse environmental effects. *See* 40 C.F.R. § 230.10(a). The following analysis demonstrates that Excelsior Energy Inc.'s (hereafter "Excelsior") preferred and alternative sites (hereafter, the "West Range Site" and "East Range Site," respectively) represent the only practicable alternatives from which the least environmentally damaging practicable alternative ("LEDPA") will be selected.

OVERALL PROJECT PURPOSE FROM A PUBLIC INTEREST PERSPECTIVE

In its analysis of alternatives to a proposed activity, the Corps is required to "consider and express that activity's underlying purpose and need from a public interest perspective." *See* 33 C.F.R. pt. 325, App. B, § 9(b)(4). The EIS includes a statement of the purpose and need for the project from the standpoint of Excelsior, the Department of Energy ("DOE"), and the State of Minnesota. *See* EIS §§ 1.4.1-.2. Excelsior proposes the following summary as an overall statement of project purpose for concurrence by the Corps:

The Mesaba Energy Project is a multi-purpose project, whose purposes from a public interest perspective include, but are not limited to, the following:

1. ***Confirm the commercial viability of generating electrical power by means of integrated gasification combined cycle ("IGCC") technology in a utility-scale application;***
2. ***Help satisfy Minnesota's need for additional sources of baseload power;***
3. ***Implement the state's energy policies, including:***
    a. ***Ensure safe, reliable, and efficient utility services at fair and reasonable rates;***
    b. ***Enhance competition in the wholesale electric power market within Minnesota;***
    c. ***Develop facilities that make use of innovative generation technology utilizing coal as a primary fuel in a highly efficient combined-cycle configuration;***
    d. ***Develop solid fuel baseload technologies with significantly reduced emissions of particulate matter, mercury, SO_2 and NO_X;***
    e. ***Decrease the State's growing dependence on natural gas for power generation;***
    f. ***Develop solid fuel baseload generation technologies which can capture and sequester carbon emissions;***
    g. ***Develop technologies and facilities capable of using flexible fuel stocks and capable of producing hydrogen, synthetic gas and other fuels to provide energy supply hedges for Minnesota users;***

h. Support the development of energy systems which enhance national security;

i. Fulfill the state's mandate for proposing large electric power generating sites capable of accommodating future capacity expansions; and

4. Utilize the incentives established by the State of Minnesota (see Minn. Stat. §§ 216B.1693-.1694) and the United States government (see 42 U.S.C. § 16513(c)(1)(C)) for the construction and operation of an Innovative Energy Project.

CONSIDERATIONS SUPPORTING NEED FOR THE PROJECT

In light of the above purposes, the following considerations support the need for the project from a public interest perspective.

Need to Confirm IGCC Technology

The need to confirm the commercial viability of IGCC technology in a utility-scale application has been determined by the DOE in furtherance of the Clean Coal Power Initiative ("CCPI"). Congress provided funding and guidelines for this program pursuant to Public Law 107-63 enacted in November 2001. Coal accounts for over 94% of the proven fossil energy reserves in the U.S. and supplies over 50% of the nation's electricity. Priorities covered by the President's National Energy Policy "include increasing the domestic energy supply, protecting the environment, ensuring a comprehensive energy delivery system, and enhancing national energy security." Clean Coal Power Initiative "Program Fact Sheet," *available at* www.fossil.energy.gov. Promoting IGCC technology through the CCPI "provides an important platform responding to these priorities." *Id*. Specifically, "the National Energy Policy seeks to lessen the impact on Americans of energy price volatility and supply uncertainty. Such uncertainty increases as we reduce America's dependence on foreign sources of energy." White House National Energy Policy, "Overview," *available at* www.whitehouse.gov/energy. Because coal is the nation's most abundant domestic fuel resource, the "government's investment in CCPI recognizes the crucial benefits to our nation's economic stability and security that can be achieved through clean coal research." CCPI "Program Fact Sheet," *supra*. U.S. Senator Norm Coleman (R-MN) also explained one of the important purposes of the Mesaba Energy Project,

> [a]s concerns about natural gas prices and supply grow, this project is a step in the right direction. By increasing efficiency and reducing emissions, this project will continue energy production without forsaking the resources that sustain us. I'm proud at [sic] the vision for future energy this project sets before Minnesota and the rest of the country as it means greater diversification of energy and reduction on our dependence on foreign sources of oil.

Press Release: "Coleman Announces $36 Million DOE Grant for Excelsior Energy's Mesaba Energy Project," October 26, 2004.

Need to Provide Baseload Power for Minnesota

The need for additional sources of baseload power to serve Minnesota is documented in the resource plans filed with and approved by the Minnesota Public Utilities Commission

(“MPUC”). These plans are prepared by Minnesota’s electric power utilities pursuant to Minn. Stat. § 216B.2422 and Minn. R. ch. 7843. The utilities are required to estimate the needs of their customers over the forecast period. *See* Minn. Stat. § 216B.2422, subd. 2. The plans demonstrate the following need for additional base load power supplies by the year 2020:

- <u>864-1804 Megawatts (‘MW”) for Northern States Power d/b/a Xcel Energy</u>
  2002 Integrated Resource Plan, p. 44 (MPUC Docket RP-02-2065)
  2004 Updated Integrated Resource Plan, pp. 23, 27 (MPUC Docket RP-04-1752)
  2005 Rate Case, Findings of Fact, pp. 7-8 (MPUC Docket GR-05-1428)
- <u>150 MW for Minnkota Power Cooperative and Northern Municipal Power Agency</u>
  2006 Integrated Resource Plan (MPUC Docket RP-06-977)
- <u>600 MW for Great River Energy</u>
  2005 Integrated Resource Plan, p. 20, (MPUC Docket RP-05-1100)
- <u>150 MW for Dairyland Power Cooperative</u>
  2004 Integrated Resource Plan, pp. 10 to 11 of 53 (MPUC Docket RP-05-184)
- <u>1000 MW for Interstate Power and Light</u>
  2005 Integrated Resource Plan, Initial Filing, Appendix 9C (MPUC Docket RP-05-2029)
- <u>150 MW for Missouri River Energy Services</u>
  2005 Integrated Resource Plan, Supplement, p. 11 (May 8, 2006) (MPUC Docket RP-05-1102)
- <u>294.8 MW for Otter Tail Power Company</u>
  2005 Integrated Resource Plan, (MPUC Docket RP-05-968)
- <u>200 MW for Minnesota Power</u>
  2004 Integrated Resource Plan, Supplemental Filing, p. 22 (MPUC Docket RP-04-865)
- <u>147 MW for Southern Minnesota Municipal Power Agency</u>
  2006 Integrated Resource Plan, p. IV-39 (MPUC Docket RP-06-605)

In addition to the amounts stated above, Excelsior estimates that there may be a need for 600-800 MW for new potential steel and copper-nickel developments on the Iron Range. The grand total of documented need in the resource plans plus the amounts needed for steel and copper-nickel developments ranges from about 4,160 MW on the low end to about 5,300 MW on the high end by the year 2020.

<u>Need to Implement State Energy Policy</u>

The need to promote Minnesota’s energy policies through the development of innovative generation technology utilizing coal as a primary fuel has been determined by the Minnesota Legislature. In its 2003 Special Session, the Minnesota Legislature passed a broad-reaching energy act that, in addition to addressing the storage of spent nuclear fuel, recognized the need to provide for the development of new and alternative sources of energy. *See* 2003 Minn. Laws, 1st. Spec. Sess., ch. 11. Among the options addressed, the Legislature placed special emphasis upon the development of a project “that makes use of an innovative generation technology utilizing coal as a primary fuel in a highly efficient combined-cycle configuration with significantly reduced sulfur dioxide, nitrogen oxide, particulate, and mercury emissions from those of traditional technologies.” *See* 2003 Minn. Laws, 1st. Spec. Sess., ch. 11, art. 4, § 1, *codified as* Minn. Stat. § 216B.1694, subd. 1(1). Further, the Mesaba Energy Project is consistent with Governor Tim Pawlenty’s recently expressed energy policy goal of reduced greenhouse emissions. *See* Governor Tim Pawlenty “State of the State Address,” January 17,

2007. The IGCC technology utilized by the Mesaba Energy Project offers the potential to capture and sequester carbon dioxide if future regulations impose this requirement on coal-fired power plants and/or other sectors of the economy. The Mesaba Energy Project would capture carbon dioxide more efficiently and more cost effectively than other existing power plants in the state. *See* Excelsior Energy, Inc., Mesaba Energy Project Plan for Carbon Capture and Sequestration (October 10, 2006 Revision I). In addition, the Mesaba Energy Project's significantly reduced mercury emissions comport with the "aggressive mercury reduction initiative" that Governor Pawlenty signed into law in May of 2006. *See* Statement of Governor Tim Pawlenty, May 4, 2006.

<u>Need to Utilize State and Federal Incentives for An Innovative Energy Project</u>

A. State Incentives

The need to utilize the incentives established by the Minnesota Legislature is driven by the practicalities and risks of a project of this kind. The legislature properly recognized that special forms of assistance would be necessary to realize the goal of developing an Innovative Energy Project. The specific regulatory incentives established by law are as follows:

- exemption from the requirements for a certificate of need;
- eligibility to increase capacity without additional state review;
- the power of eminent domain for sites and routes approved by the MPUC;
- status as a "clean energy technology" for the supply of electric energy to a utility that owns a nuclear generating facility;
- the right to enter into a contract with a public utility that owns a nuclear generation facility to provide 450 megawatts of baseload capacity; and
- eligibility for a $10 million grant from the renewable development account for development and engineering costs.

See Minn. Stat. § 216B.1694, subd. 2. But for the provision of these incentives, it would be difficult to finance and develop an Innovative Energy Project within the state. In order to take advantage of these important and unique incentives for an Innovative Energy Project, the law specifies that the project must be located on a site "in the Taconite Tax Relief Area" ("TTRA") of northeastern Minnesota. *See* Minn. Stat. § 216B.1694, subd. 1(3). A project located elsewhere in the state would not enjoy these or any similar package of incentives.

The legislature entitled an "Innovative Energy Project" to enter a long term contract with Xcel Energy for the sale of the capacity and energy from the IGCC facility. *See* Minn. Stat. §216B.1694, subd. 2(a)(7). "This incentive – providing a secure off-take agreement — is acknowledged by industry analysts as the key to overcoming the largest single barrier to widespread deployment of the IGCC technology." *See* Executive Summary, Mesaba Energy Report to the Minnesota Public Utilities Commission, MPUC Docket No. E-6472-/M-05-1993 (Dec. 23, 2005), p. 3. Were the Mesaba Energy Project developed on a site outside of the TTRA, it would no longer be entitled to a secure off-take agreement with Xcel, nor any of the other valuable incentives provided to Innovative Energy Projects by the legislature.

B. Federal Incentives

Similarly, the United States Congress has identified the importance of supporting the development of IGCC in the Northeastern Minnesota. In particular, the Energy Policy Act of 2005 ("EPAct 2005") authorizes the Secretary of the Department of Energy to make eligible for loan guarantees "a project located in a taconite-producing region of the United States that is entitled under the law of the State in which the plant is located to enter into a long-term contract approved by a State public utility commission to sell at least 450 megawatts of output to a utility." 42 U.S.C. § 16513(c)(1)(C). *See also* 42 U.S.C. § 16514(b) Not only does this provision expressly require the project to locate in a taconite producing region of the United States, but the project's specific eligibility for loan guarantees is further conditioned upon the its entitlement to a long-term contract with a utility. As discussed above, this entitlement is contingent upon the project's location in the TTRA under Minnesota law, and hence, so too is the federal loan guarantee provision.

Federal loan guarantees are important to the development of innovative and emerging technologies because the lower cost of capital associated with federally guaranteed loans helps to offset the typically higher capital costs of such projects. As a result of lower cost debt financing, the Mesaba Project is expected to achieve cost parity with a utility-owned supercritical pulverized coal plant.

LIMITATION OF ALTERNATIVES TO SITES WITHIN THE TTRA

Taken as a whole, the purposes of the Project require a site within the TTRA.

The commercial viability of IGCC technology on a utility-scale might, in theory, be confirmed elsewhere in the United States. In fact, the Project was selected for DOE funding in a nationwide competitive solicitation process, and it is now generally acknowledged that the Mesaba Energy Project is uniquely positioned to develop an IGCC project on an expedited basis. The important national goals of energy independence and improved environmental performance place a premium on developing this important energy source as soon as possible.

The provision of additional sources of base load electricity might possibly be provided from outside Minnesota. Minnesota's energy policies, however, can only be fulfilled within the state. The construction of an IGCC facility outside the state would leave the broader goals of Minnesota's energy policy unfulfilled. Minnesota's 2003 energy act demonstrates the importance of developing an IGCC facility within the state. It is vital for this energy source to be located within Minnesota's borders, both to provide energy security for the state and also to afford the state the degree of control that allows the state to promote its policy goals.

Ultimately, to qualify for the incentives that the Minnesota Legislature established for the construction and operation of an Innovative Energy Project, the facility must be built within the TTRA. The 2003 legislation expressly provides that, to qualify as an Innovative Energy Project and receive the regulatory incentives, the project must located within the TTRA. *See* Minn. Stat. § 216B.1694, subd. 1(3). The Minnesota Legislature has determined that the incentives for the construction of the Project should be limited to the TTRA. As noted above, these incentives are a practical necessity for the realization of the project, and the United States Congress has also identified the importance of supporting the state's desire to develop IGCC in northeastern Minnesota. *See* 42 U.S.C. § 16513(c)(1)(C).

Governor Pawlenty has been unequivocal in his support of the project and its location within the TTRA:

> The Mesaba Energy Project will supply much-needed energy and jobs in an innovative way that protects our environment and natural resources using an affordable, abundant domestic fuel source.
>
> ***
>
> As a state, our support for this project is part of a longer, long-term economic development strategy that will diversify the economy of the Iron Range. While traditional mining will remain a vital part of the Range economy, we must look to the future for the next generation of economic development projects.

Statement of Governor Tim Pawlenty, October 26, 2004. The benefits of the Mesaba Project to the economy of the Iron Range will not be realized if the Project is constructed outside of the TTRA.

In sum, only a site within the TTRA will fulfill the project's multiple purposes, including the state and federal legislative policies of supporting IGCC development in northeastern Minnesota.

ANALYSIS OF ALTERNATIVES WITHIN THE TTRA

Site Selection Process

Although numerous studies involving the selection of coal-fired power plant sites have been published, a recent presentation by the U.S. Department of Energy's National Energy Technology Laboratory ("NETL") has briefly described the most critical elements as follows[1]:

- Access to transmission lines,
- Available fuel, and
- Water.

The state of Wisconsin has published a host of additional power plant siting criteria that are commonly used in the site selection process.[2] Excelsior's site selection efforts addressed these same fundamental concerns and included the following four steps:

- Developing site selection criteria;
- Identifying potential sites;
- Establishing a short list of sites having the greatest likelihood of licensing success; and

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[1] Hoffmann, Feeley, and Carney, "DOE/NETL's Power Plant Water Management R&D Program –Responding to Emerging Issues,"
8th Electric Utilities Environmental Conference, Tucson, AZ, January 24-26, 2005. *See* http://www.netl.doe.gov/technologies/coalpower/ewr/pubs/05_EUEC_Hoffmann_1.pdf.

[2] Public Service Commission of Wisconsin, "Common Power Plant Siting Criteria." September 1999. *See* http://psc.wi.gov/thelibrary/publications/electric/electric05.pdf.

- Specifying two licensable sites for consideration under rules implementing the state's Power Plant Siting Act, one site of which is to be designated as preferred.

Each of these four site selection steps is discussed in further detail below.

Step One: Development of Site Selection Criteria

Site selection criteria represent specific elements of concern that are collectively used to characterize the potential of an existing site for accommodating the footprint and infrastructure required for Phase I and Phase II of the Mesaba Energy Project (hereafter, "Mesaba One and Mesaba Two," "IGCC Power Station" or the "Station"). Excelsior has divided its site selection criteria into the following three categories: permitting, technical, and site control. Permitting criteria are focused on issues related to the relative feasibility of obtaining preconstruction permits necessary to construct and operate the IGCC Power Station. Technical criteria focused on the feasibility of constructing and operating the Station, and site control criteria considered the likelihood of obtaining site ownership and control in a timely manner with landowner cooperation. Table 1 lists the specific elements considered under each of these three categories.

Step Two: Identifying Initial Sites

Existing Industrial Facilities

Excelsior initiated its siting efforts by identifying within the TTRA numerous sites in separate industrial complexes where the IGCC Power Station could share synergies with existing industrial operations. Such industrial sites might represent a desired option for developing the Station based on the infrastructure that has been constructed to serve existing industrial operations. However, the IGCC Power Station cannot be indiscriminately placed in industrial locations. For example, many sites on the Iron Range, but off the "iron formation" have been used as auxiliary mining lands and include areas where large quantities of rocks and soil (stripped to expose natural mineral resources) have been placed. These areas, commonly referred to as "mine dumps" are not suitable locations upon which to place the IGCC Power Station because there is no feasible way to establish where foundations can be constructed thereon and perform adequately. In general, the same is true for large areas where tailings[3] have been sluiced and left to settle[4].

[3] Waste or refuse left in various processes of milling, mining, etc. From: Webster's New World College Dictionary, 4th Edition, Michael Agnes, Editor, Wiley Publishing, Inc.

[4] Loose, water-saturated sands and silts of low plasticity may have adequate shear strength under static loading conditions; however, if such materials are subjected to vibratory loading, they may lose strength to the point where they flow like a fluid. The process in which susceptible soils become unstable and flow when shocked by vibratory loading is called liquefaction, and it can be produced by vibration from blasting operations, earthquakes, or reciprocating machinery. In very loose and unstable deposits, liquefaction can occur as the result of disturbances so small that they are unidentifiable. *See* www.usace.army.mil/publications/eng-manuals/em1110-2-1911/c-3.pdf page 7.

Table 1. Excelsior's Site Selection Criteria

Code	Permitting Criteria	Description
P1	Air	What is the potential impact on Class I areas, including cumulative impacts of current and proposed projects?
P2	Wetlands	What is the potential for wetland impacts and mitigation if required?
P3	Groundwater	Will there be any solid waste disposal landfills on the site? If so, what is the depth to groundwater and how might groundwater be impacted?
P4	Floodplains	How will the proposed Project impact floodplains on the site?
P5	Water Supply	Are potential sources of water supply available, in what quantity/quality, and from what source or sources?
P6	Wastewater Discharges	Are POTWs located in proximity to the site, and can such POTWs accommodate plant-derived wastewaters? Are there bodies of water nearby that can accommodate the wastewater after appropriate treatment?
P7	Great Lakes Initiative ("GLI")	Is the proposed site located within the Lake Superior Basin watershed? If so, can wastewater discharges meet the low GLI mercury discharge criteria as such limits can be below the background mercury levels found in some Northeastern Minnesota surface waters?
P8	Natural/Cultural Resources	Does the site present any special concerns with respect to areas of archaeological/architectural importance or with respect to threatened and endangered species?
P9	Land Use	Is the current zoning designation compatible with industrial activities? What are the future land use plans for the proposed site and areas surrounding it?
Code	*Technical Criteria*	*Description*
T1	Plant Expansion	Is there sufficient contiguous acreage available to accommodate the Phase I and Phase II Developments, including rail loop, and to isolate the facility for safety, security, dissipation of noise, and other considerations?
T2	Physical Characteristics	What are the size, shape, topography, and underlying soil conditions of the site? What are the subsurface characteristics? Are there any geohazards that would preclude use of the proposed site or confine the proposed facilities to specific areas?
T3	Rail Access	Is there adequate rail access for delivery of key pieces of equipment during construction, and for delivery of coal and pet coke for operation? Is it possible to develop more than one rail transportation option? Can Great Lakes ports be utilized to help meet fuel transportation needs?
T4	Transmission	How and where does the generator interconnection to the transmission system occur? What transmission system network reinforcements, beyond the POI, may be required to accommodate planned generating facilities?
T5	Natural Gas	How and where does the interconnection to the natural gas pipeline system occur and what is its available capacity?
T6	Industrial Processing	How close is the nearest large industrial processing facility? Do potential synergies exist with such facilities, including use of warmed water for industrial process uses, syngas as a substitute for natural gas, common use of facilities, etc.?
Code	*Control Criteria*	*Description*
C1	Site Control	Is it likely that site control can be obtained in a timely manner?

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Although certain owners of existing industrial operations showed an initial willingness to consider co-locating the IGCC Power Station on their sites, none showed a real interest in establishing an agreement that would serve Excelsior's purposes throughout the duration of Minnesota's power plant siting process.[5] As Excelsior will only have the power of eminent domain for sites and routes that are ultimately approved by the MPUC,[6] the unwillingness of such owners to agree to reasonable terms required the company to find other siting options.

<u>Screening Process</u>

Excelsior used geographical information system ("GIS") mapping software to identify areas within the TTRA potentially capable of supporting development of the IGCC Power Station. In general, the areas within the TTRA where Excelsior focused its search depended upon access to existing rail lines (i.e., the means by which coal will be delivered to the Station) and the presence of the following attributes:

- Availability of water for cooling and other Station purposes;
- Proximity to existing high voltage transmission line corridors that can be used to minimize environmental impacts associated with interconnecting the Station to the regional electric grid;
- Feasibility of acquiring large blocks of land in a timely manner,
- Reasonable distance from nearby landowners;
- Reasonable proximity to a major natural gas pipeline; and
- High proportion of upland to wetland areas.

Rail Access

Figure 1 shows the location of major rail trackage within the TTRA. Excelsior has used a six-mile buffer centered on each major rail line (that is, three miles on each side) to provide a general indication of the characteristic area within which Excelsior believes it feasible to construct and operate the IGCC Power Station. The costs and logistical challenges of securing rights of way and constructing rail to a site beyond this buffer, in addition to the likelihood of greater wetland impacts for longer rail alignments, generally renders such sites unworthy of consideration.

Dual rail service via two major rail suppliers using their own track has been identified as a positive attribute in terms of Excelsior's siting evaluation. The optionality created by such fuel supply and transportation diversity allows for fuel supply contracting options that should minimize the Project's fuel costs and allow for a contracting strategy that can incorporate supply contracts of varying terms and supply quantities and spot market access. At a minimum, the Project should have a fuel supply cost that is equal to the fuel supply costs of other regional

[5] The rules established to carry out the State's Power Plant Siting Act processes are found at Minn. R. Chapter 4400. To avoid the possibility of losing a site in the midst of the regulatory processes, Excelsior required some evidence of the owner's long-term intention for serving as a host to the IGCC Power Station.

[6] The statutes established in support of Innovative Energy Projects (Minn. Stat, §216B.1694 Subd. 2(a)(3)) provide such projects "the power of eminent domain, which shall be limited to the sites and routes approved by the … [Minnesota Public Utilities Commission] for the project facilities."

fossil fueled power plants operated by NSP and Minnesota Power.[7] The optionality available to Mesaba Energy Project should allow for fuel mixes that are lower in overall cost than these regional suppliers over the long term[8].

Water Availability

The Joint Application ("JA") Excelsior has submitted in support of the Power Plant Siting process identifies the IGCC Power Station's water requirements depending upon whether or not the Station is located in the Lake Superior Basin watershed. Table 2 provides the water requirements if the Station is located outside the Lake Superior Basin; Table 3 if the Station is located therein.

Table 2. IGCC Power Station Water Appropriation Requirements: Outside Lake Superior Basin

Phase	Average Annual Appropriation (GPM)	Peak Appropriation (GPM)
I	4,000[a]-4,400[b]	6,500
I & II	8,800[b]-10,300[c]	15,200

[a]Based on 8 cycles of concentration ("COC") in the gasification island and the power block cooling towers
[b]Based on 5 COC in the gasification island and the power block cooling towers
[c]Based on 3 COC in the gasification island and the power block cooling towers

Table 3. Water Appropriation Requirements: Inside Lake Superior Basin

Phase	Average Annual Appropriation (GPM)	Peak Appropriation (GPM)
I	3,700[a]	5,000
I & II	7,400[a]	10,000

[a]Based on 8 COC in the gasification island and the power block cooling towers

New facilities (as defined at 40 CFR 125.83) locating on waters of the United States and i) withdrawing more than 2 million gallons per day, ii) using more than 25% of that volume for cooling purposes, and iii) using a cooling water intake structure ("CWIS") to divert such volumes of water to the source are restricted as to the amount of water that can be withdrawn from such waters. Since the Mesaba Energy Project would be a new facility and would meet these criteria it would be subject to rules governing cooling water intake structures (see 66 FR 65256). Such rules restrict the amount of water that can be withdrawn from freshwater rivers, streams, lakes and reservoirs. Withdrawals from freshwater rivers or streams must be no greater than 5 percent of the source waterbody mean annual flow; withdrawals from a lake or reservoir must not disrupt the natural thermal stratification or turnover pattern (except where such disruptions are determined to be beneficial to the management of fisheries). At 40 CFR

[7] Excerpt from October 10, 2006 rebuttal testimony of Ralph Olson before the Minnesota Public Utilities Commission. *See* http://www.excelsiorenergy.com/public/index.html to obtain complete testimony of Mr. Olson regarding Excelsior's fuel procurement strategy.
[8] Ibid, page 2, line 9.

125.84(e), the final rule governing CWISs recognizes that a State may include more stringent requirements to the location, design, construction and capacity of a CWIS at a new facility[9].

In evaluating flows in freshwater rivers or streams, Excelsior used daily flow information obtained from United States Geological Survey gauging stations. Impacts associated with withdrawals from lakes or reservoirs were estimated using information about the area of the specific resource, its maximum depth, and the area of the littoral zone obtained from the Minnesota Department of Natural Resources' ("MDNR") Lake Finder web site[10]. Excelsior assumed no inflow to such resources (approximating conditions that would be present during times of drought) and calculated the time it would take to lower the level of the lake or reservoir to the point where water in the littoral zone was completely depleted.

The use of groundwater in quantities suitable to meet the cooling requirements for the IGCC Power Station are generally discouraged by Minn. R. 4400.3450 ("Prohibited Sites") Subpart 5 ("Sufficient water supply required"). This subpart of Minnesota rules states the following:

> "No site may be designated that does not have reasonable access to a proven water supply sufficient for plant operation. No use of groundwater may be permitted where removal of groundwater results in material adverse effects on groundwater, groundwater dependent natural resources, or higher priority users in and adjacent to the area, as determined in each case.
>
> The use of groundwater for high consumption purposes, such as cooling, must be avoided if a feasible and prudent alternative exists."

High Voltage Transmission Lines/Natural Gas Pipelines

Excelsior's strategy for interconnecting the Station to a major electrical substation is to use existing HVTL corridors to the extent feasible. The further the Station is located from such substations the higher interconnection costs become. In addition, the lower the HVTL voltage within an existing corridor, the narrower the existing right of way ("ROW") for that corridor is likely to be. The voltage for the preferred generator outlet facilities serving MEP-I and MEP-II will be 345 kV. The required ROW for the 345 kV tower configuration to be used for these facilities is generally found to be less than or equal to the current ROW serving many of Minnesota Power's 115 kV HVTLs. This would not be the case for the smaller distribution HVTLs found in the TTRA north and east of Virginia, Minnesota[11]. Therefore, although there is rail track found north of Virginia, there are no suitable sized HVTL corridors within which MEP-I and MEP-II could be placed absent the acquisition of additional ROW.

Although there is existing rail service south of and east of Hoyt Lakes, there are no HVTLs corridors of suitable size to accommodate the right of way required for HVTLs sized to carry the

[9] In the proposed rules, the maximum amount of water that could be withdrawn from a river was 25 percent of the 7Q10 or 5 percent of the mean annual flow, whichever was lower. Although the language including the 7Q10 was dropped from the final rules, the state could deem it appropriate if it appeared that 5% of the mean annual flow did not sufficiently protect aquatic resources.

[10] See http://www.dnr.state.mn.us/lakefind/index.html. The littoral zone is defined as that portion of the lake that is less than 15 feet in depth. The littoral zone is where the majority of the aquatic plants are found and is a primary area used by young fish. This part of the lake also provides the essential spawning habitat for most warmwater fish (e.g. bass, walleye, and panfish).

[11] HVTLs found north and east of Virginia, Minnesota mostly belong to Great River Energy (GRE). See http://www.greatriverenergy.com/about/brochure1.html for a general comparison of right of way widths found in the Great River Energy transmission line portfolio. Also see http://www.tva.gov/power/rightofway/faq.htm,

output of MEP-I and MEP-II. A 115 kV HVTL runs along the North Shore of Lake Superior at the extreme southern end of this region, but water could not be feasibly obtained in the quantity required to support MEP-I and MEP-II[12]

The only natural gas pipelines capable of providing the capacity required by MEP-I and MEP-II are the two 36" diameter Great Lakes Gas Transmission Company pipelines that parallel the southeastern boundary of the TTRA. The further the distance between the Station and this pipeline, the more costly it becomes to interconnect them.

Wetlands

Wetlands and open water cover large areas of the TTRA and represent a determinative factor in almost every siting decision therein. Areas where wetlands represent a primary factor lie in the southern portion of the TTRA within the buffer area of the existing rail lines near the confluence of the St. Louis and Cloquet Rivers. In this proximity, areas that would appear to be capable of supplying sufficient water to MEP-I and MEP-II are excluded due to their relatively high impact on wetland resources.

Property Ownership

As noted previously in this document under "Need to Utilize State and Federal Incentives for an Innovative Energy Project" (*see* Section A entitled "State Incentives") and Footnote No. 6, such projects are granted the power of eminent domain for sites and routes approved by the Minnesota Public Utilities Commission. The statute was written so that site/route selection issues could be discussed in the public forum provided as part of the environmental review process. The rights of existing landowners are provided substantial protection in this arena in that both regulators and project proponents seek to minimize the instances under which eminent domain is exercised. Obtaining sites that consist primarily of dozens of small landowners presents a serious logistical problem and would be very likely to necessitate the use of eminent domain. Therefore, in its site screening process, significant deference is given to locations where the number of landowners is low and where no relocation of residents would be dictated. Additionally, sites already owned and used by other industrial entities as part of their mineral extraction activities within the iron formation are very unlikely to be obtainable through purchase or eminent domain, making the exclusion of such sites appropriate.

Other Exclusion Zones

Iron Formation

Although abandoned mine pits in the iron formation represent an area where there is generally an abundance of water, the formation itself represents an exclusion zone within which non-mining operations are unlikely to be allowed to locate.[13]

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[12] The only appropriate source of water in the area just north of Lake Superior is the lake itself. Excelsior does not believe it is reasonable to assume that a large electric power generating plant would be permitted on the shore of Lake Superior. Further, pumping water from the lake in the quantity necessary to meet MEP-I and MEP-II would not be feasible given the distance and head needed for a plant located a sufficient distance away from the lake.

[13] Excelsior's use of water obtained from mining pits will most always be outside the boundaries of the iron formation.

Native American Reservations

The Fond du Lac Indian Reservation located in the south-central-most part of the TTRA is considered an exclusion zone.

Search Area

Text boxes included on Figure 1 identify large areas of the TTRA that were excluded from consideration as Station sites due to a lack of existing rail service, their distance from existing track, their lack of sufficient transmission line corridors, the ubiquitous presence of wetlands, and/or their lack of sufficient water resources. These exclusions were discussed and justified in the preceding narrative of power plant siting considerations. The cross hatched area in the TTRA shown in Figure 1 (hereafter, the "Search Area") indicates where Excelsior focused its search for potential sites. The Search Area can, in general be described as an overlay of i) rail service and ii) water availability as described by being on the iron formation (i.e., able to be served by mine pit resources) or capable of being served by stretches of the St. Louis River showing evidence as having flow sufficient to satisfy the Station's requirements.

Figures 2 through 23 zoom into various locations within the Search Area to show the sites Excelsior identified as part of its initial screening efforts. In addition, these figures show areas throughout the Search Area that are located with the six-mile rail buffer area, but can be excluded from consideration as practicable alternatives for the IGCC Power Station. Exhibit 1 contains a narrative description for each figure, i) outlining the general location the figure occupies within the Search Area and ii) providing a general indication of why areas within each figure are not suitable for consideration as potential sites for the Station.

Initial Sites Selected

Excelsior initially identified 15 sites within the Search Area during the screening process; these sites are described individually in Exhibit 2. Table 4 cross-references the 15 sites selected with the figure number (i.e., Figures 2-23) within which each site appears.

Table 4. Excelsior Site/Figure Cross Reference List

Site No.	Site Name	Figure No.
1	Clinton Township South	12
2	Clinton Township East	11
3	Clinton Township West	11
4	Clinton Township North	11
5	Manganika Lake	11
6	West Aurora	10
7	Hoyt Lakes West	10
8	West Two Rivers Res.	8
9	East Range Site	10
10	Mountain Iron	8
11	Leonidas	11
12	Buhl	7
13	West Chisholm	7
14	Hibbing Industrial Park	7
15	West Range Site	3

Excelsior sought to minimize potential land-owner conflicts within the Search Area by focusing its attention on finding large blocks of land i) not exclusively zoned for residential development[14] and ii) having relatively few land owners.

Step Three: Narrowing the Number of Potential Sites

Exhibit 2 is a site-by-site compilation of information on each of the 15 sites Excelsior considered as part of its initial screening process. Four of the 15 sites identified in Table 4 could easily be dismissed. Table 5 provides the basis for such decisions; see Exhibit 2 for a thorough analysis of the reason each of these sites could be quickly rejected.

Table 5. Initial Dismissal of Sites During the Screening Process

Site No.	**Site Name**	**Rational for Dismissal**
4	Clinton Township North	High proportion of wetland to upland areas.
8	West Two Rivers Res.	Property was considered unobtainable; reservoir and all its surrounding land owned by one industrial entity unwilling to provide access.
11	Leonidas	Constructability concerns[15] and pervasive wetland impacts.
12	Buhl	Constructability concerns and pervasive wetland impacts.

The information presented in Exhibit 2 contains the basis for narrowing the remaining 11 sites to the two sites considered to be practicable alternatives. Table 6 presents a summary of Excelsior's rationale for dismissing nine of the eleven remaining sites. The two practicable sites ultimately selected for use in the Power Plant Siting process are represented by the Preferred (Site No. 15) and Alternate (Site No. 9) sites, otherwise known as the West and East Range Sites, respectively.

Table 6. Dismissal of Sites During the Screening Process

Site No.	**Site Name**	**Rationale for Dismissal**
1	Clinton Township South	Water unavailable in quantities required year around; development constrained because of existing land owners, forcing expansion into areas where relatively high wetland impacts would occur.
2	Clinton Township East	Insufficient water supplies and wetland impacts associated with Phase I and Phase II developments due to avoidance of existing residential properties and industrial infrastructure.
3	Clinton Township West	Sufficient water supplies are not located close by and IGCC

[14] Although Minn. Stat. § 216E.10 ("Application To Local Regulation And Other State Permits") Subd. 1 ("Site or route permit prevails over local provisions") states that "the issuance of a site permit…shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose government," by looking to locate in areas generally open to industrial development, Excelsior hoped to avoid serious land use conflicts.

[15] Significant portions of property are devoted to "mine dumps," that is, large piles of rocks of mixed size. Construction is difficult due to the inability to ascertain whether or not one has reached bedrock upon which to build foundations. See "Existing Industrial Facilities" under the section entitled "Step Two."

		Power Station developments would be constrained because of Station's proximity to nearby residents.
5	Manganika Lake	Water supplies sufficient to meet the total demand for the combined Phase I and Phase II developments are unproven; significant alteration of infrastructure surrounding the site would be required.
6	West Aurora	Water supplies sufficient to meet the total demand for the combined Phase I and Phase II developments are unproven; close proximity of site to local areas having relatively high residential density; insufficient area to accommodate IGCC Power Station developments.
7	Hoyt Lakes West	Site is partly located within the Mesabi Iron Range iron formation and may be subject to expanded mining operations.
10	Mountain Iron	Site is partly located within the Mesabi Iron Range iron formation and may be subject to expanded mining operations.
13	West Chisholm	Grade required to reach site is not suitable for rail access.
14	Hibbing Industrial Park	Site is currently committed by its owner, Iron Range Resources, to an alternative development plan.

The U.S. Army Corps of Engineers ("USACOE") has requested that Excelsior tabulate for each of the 15 sites the estimated wetlands impact of developing the IGCC Power Station. Excelsior has prepared Table 7 in response to the USACOE's request.

Table 7. NWI Wetland Analysis of Preliminary Sites Selected Under Excelsior's Screening Process

Alt. Site No.	Site Name	NWI Wetland Parcel No. 1 (Acres)	NWI Wetland Parcel No. 2 (Acres)	NWI Wetland Parcel No. 3 (Acres)	NWI Wetland Parcel No. 4 (Acres)	NWI Wetland Parcel No. 5 (Acres)	NWI Wetland Parcel No. 6 (Acres)	NWI Wetland Parcel No. 7 (Acres)	NWI Wetland Parcel No. 8 (Acres)	NWI Wetland Parcel No. 9 (Acres)	NWI Wetland Total Impacts (Acres)
1	Clinton Township S.	28.1	2.3	2.4							32.8
2	Clinton Township E.	0.7	10.9	7.4	5.4	8.9	5.0				38.4
3	Clinton Township W.	1.2	1.6								2.8
4	Clinton Township N.	30.6	9.9	52.0	0.8						93.3
5	Manganika L.	28.7	16.8								45.5
6	W. Aurora	18.4	3.3	1.1	3.7	0.6					27.1
7	Hoyt Lakes W.	10.1	5.1	1.5	2.6						19.3
8	W. Two Rivers Res.	35.0	6.4	6.1	1.4						48.8
9	Hoyt Lakes E. (East Range Site)	10.5	1.7	2.4							14.6
10	Mountain Iron	16.5	1.7	1.9	2.7						22.8
11	Leonidas	9.0	3. 6	2.7	2.7	8.6	1.0				27.6
12	Buhl	40.7	2.5	5.7	19.2						68.1
13	W. Chisholm	25.0	5.0	1.3	1.5						32.8
14	Hibbing Ind. Park	8.6	18.6	2.3	1.9	1.4	0.9	0.7	0.4	0.5	35.4
15	West Range Site	10.3	0.4								10.7

In assembling this information on wetland resource impacts, Excelsior used National Wetland Inventory ("NWI") database information prepared by the U.S. Fish and Wildlife Service from USGS 1:24,000 quadrangle maps.[16] In order to quantify relative wetland impacts on an equivalent basis, Excelsior used the footprint of the IGCC Power Station prepared by Flour (this is the same footprint that appears throughout the EIS) and rearranged it in one of four orthogonal directions (that is, at 0º, 90º, 180º, and 270º angles) thought to best accommodate the expected rail configuration. Figures 24 through 29 show the final configurations analyzed. Only Site No. 3 (Clinton Township West) is seen to have less of an impact on NWI wetlands than either the Preferred or Alternate sites (see Table 6 to see why Site No. 3 has been deemed impracticable).

The analysis presented in Table 7 considers only the area required to accommodate the Station footprint (approximately 180 acres in area for the two phase development). Further evaluations were precluded at this stage due to the detailed, case-by-case analysis required to i) correctly establish the grade and orient the rail spur required to reach the IGCC Power Station and ii) consider other infrastructure requirements.[17] Even so, the assessments should be considered indicative of the relative order of impacts that would be estimated if such further analyses were conducted (the configurations for the West and East Range Sites have been optimized to minimize impacts on wetland resources; by not taking advantage of such optimizations, the NWI figures shown in Table 7 for wetland impacts at these two sites are likely overestimated relative to the others).

A third site, the Hibbing Industrial Park, could be considered a practicable alternative, but an agreement between Iron Range Resources and a private developer precluded its consideration at this time.

Step Four: Final Evaluation of Practicable Alternatives

Excelsior further analyzed the two practicable alternatives identified above and the Hibbing Industrial Park, even though the Industrial Park site is not currently available for development.[18] Excelsior quantitatively ranked the three sites using its site selection criteria and the personal knowledge, judgment, and experience obtained from siting large power plants. The results of these evaluations and rankings were as follows:

1. West Range
2. Hibbing Industrial Park
3. East Range

The methodology consisted of aggregating the site evaluation criteria into the following eight categories:

- Licensability (the relative ease with which a site could be expected to be permitted considering all regulatory hurdles, such permits including, air, NPDES, water appropriation, etc.)

[16] *See* U.S. Fish & Wildlife Service web site at http://wetlandsfws.er.usgs.gov/NWI/download.html.
[17] Each site must accommodate a rail spur and loop, access roads for employees and construction vehicles, transmission line and natural gas pipeline interconnections, process water pipelines, and other utility connections.
[18] Excelsior also included three other currently impracticable alternatives in its analysis (the two industrial sites and the Mountain Iron site [Site No. 10]). The results of the six-site analysis are provided in Excelsior's Environmental Supplement at Section 1.13.1.3.

- Water Supply (quantity of water available and ease with which it could be obtained)
- Local community support (general support within the nearby community)
- Industrial Synergies (proximity to nearby industrial facilities capable of providing some synergy to MEP-I and MEP-II), and
- Transmission/Gas Supply (proximity of site to potential points of interconnection with the regional grid/gas supply lines)
- Local community support (general support within the nearby community)
- Dual Rail (capability to accommodate two rail suppliers providing service from their own track)
- Site Attributes (physical characteristics of site including topographical relief, wetland areas).
- Plant Expansion (capability of accommodating two phases of development)

A group of Excelsior employees that comprised the following disciplines were asked to produce a pairwise comparison of the above eight categories: environment, engineering, development, law, marketing, senior management, and operations. Each person compared each category to each of the other categories to establish the relative weights that each category would be given in the final site ranking analysis. The number of times a specific criterion was identified as being the most important in any pairwise comparison was totaled and divided by the total number of possibilities to establish such relative weights. Table 8 shows the weights assigned to each of the criterion.

Table 8. Weights Assigned to Site Evaluation Criteria By Excelsior Employees

Criterion	Relative Weight (%)
Licensability	20
Water Supply	19
Industrial Synergies	13
Transmission/Gas Supply	11
Local community support	10
Site Attributes	10
Dual Rail	9
Plant Expansion	8
Total	100

Each of the three sites identified above was assigned (by each employee participating in the ranking process) a score on a scale of 1 to 100 for each criterion provided in Table 8. The resulting scores were weighted by the factors provided in Table 8 and are provided in Table 9.

Table 9. Final Site Ranking by Excelsior Employees: Weighted Totals

Criterion	Site No. 15 (West Range Site)	Site No. 14 (Hibbing Ind. Park)	Site No. 9 (East Range Site)
Licensability	118	105	99
Water Supply	106	95	89
Industrial Synergies	12	38	49
Transmission/Gas Supply	57	54	43
Local community support	54	49	57
Site Attributes	55	52	52
Dual Rail	54	45	37
Plant Expansion	46	38	39
Total	**502**	**476**	**465**

Following the site ranking and evaluation, Excelsior proceeded to make its final selection of preferred and alternate sites. The two critical factors considered at this stage were site selection rank and the ability to obtain timely site control. The West Range Site ranked highest for these two factors and has been selected as Excelsior's preferred large electric power generating plant site for the following principal reasons:

- It received the highest ranking score in Excelsior's quantitative analysis.
- It lies outside the Lake Superior Basin watershed, thereby facilitating permitting and licensing.
- Plant make-up water is readily available from the Canisteo Mine Pit ("CMP") and Hill-Annex Mine Pit Complex. Overflow from these abandoned pits is a significant problem for local communities and the MDNR. Use of water from such pits provides a solution for the overflow problems. Alternative sources of water are also available to the West Range IGCC Power Station and in likely quantities to supply any shortfall that could be encountered in supplying Phase I and Phase II developments at the site via mine pit waters alone.
- The site is fairly remote, with only a small number of residential property owners potentially impacted, most of whom use the property on only a seasonal basis.
- The site is located in close proximity to adequately sized natural gas pipelines, existing HVTL corridors, and has the capability of being serviced by two rail providers.
- Excelsior has obtained an option to purchase the site, thereby providing immediate site control.
- Preliminary contacts with Itasca County, city officials from nearby communities, and the Itasca Development Council indicated broad support for the project.

The Hibbing Industrial Park site was originally considered as the alternative site because of the following advantages:

- The location is in an area that local communities have identified and set aside for industrial development. IRR and St. Louis County have also played important roles in assembling a land package of some 850 acres, with additional acreage appearing to be readily available. Impacts on local residences are deemed manageable and local communities are supportive. Additionally, a new Central Range water treatment facility has been proposed for the area.

- Adequate make up water appears to exist in local mine pits.
- Although the site is located within the Lake Superior Basin watershed, it appears that the City of Hibbing's POTW may be of sufficient size to handle such discharges and therefore qualify for a variance from the rigid standards imposed on discharges of mercury by regulations implementing the Great Lakes Initiative.
- The site is located in relatively close proximity to two rail service providers, existing transmission line corridors, and a large industrial facility.

The Hibbing Industrial Park site is under the control of the IRR, but it was not available as a site for IGCC Power Station development. Therefore, the East Range Site was viewed as the best alternative site to evaluate under the Minnesota Power Plant Siting Act process. The rationale for utilizing the East Range Site as the alternate to the West Range Site included the following:

- IRR has secured through negotiation in the LTV bankruptcy proceeding (LTV was the original landowner of property now occupied by Cliffs-Erie ("CE")) an option to acquire land on LTV property near East Range. In a June 15, 2004 letter to U.S. Secretary of Energy Spencer Abraham, the Commissioner of IRR indicated that the agency would convey its option to Excelsior in support of the Mesaba Energy Project.
- Adequate make-up water appears to exist in local mine pits and other surface waters (i.e., Colby Lake and Whitewater Reservoir) in amounts sufficient to support Phase I and Phase II facilities.
- The closest residential neighbors are more than 0.5 miles from the site.
- The site provides ready access to infrastructure needed to support plant operations.

The East Range Site is considered to be less suitable than the West Range Site for the following reasons:

- The generator outlet HVTL facilities required are longer, the n-1 contingency dictates the use of two separate corridors, and more line losses occur over the increased distance.
- The site is within the Lake Superior Basin watershed and subject to regulations implementing the Great Lakes Initiative.
- The Hoyt Lakes POTW would require an expansion to accommodate discharges of cooling tower blowdown.
- Only one rail service provider appears to be feasible and the potential use of connected Lake Superior port appears costly and uncertain from an engineering perspective.
- The site is closer to Class I areas, thereby creating the potential for increased adverse impacts on air quality related values, including a predicted increase in visibility impacts.

USACOE Compliance Summary Matrix

Having identified the two practicable alternatives (i.e., the West and East Range Sites), Excelsior is required to assure that the site which is selected minimizes damages to the aquatic ecosystem and has no other significant adverse environmental effects. Following is a summary of the factors that bear upon this consideration.

<u>Overcome USACOE's presumption that a practicable, less environmentally damaging alternative site, outside special aquatic sites, exists</u>

This presumption is supported by the analysis outlined above in Figures 1-29, Exhibit 1, and in the Site Evaluation Forms contained in Exhibit 2. Combined, this evidence demonstrates that no practicable alternatives for siting the Phase I and Phase II developments of the Project can be found within the TTRA other than at the West and East Range Sites.

<u>No alternative exists that is practicable, is less damaging to the aquatic ecosystem, and has no other significant environmental effects</u>

Introduction

The purpose of this section is to identify and briefly differentiate between the environmental impacts expected to occur at the West vs. East Range Sites as a result of developing and operating the IGCC Power Station. A final determination as to which of the two sites represents the LEDPA will involve ongoing discussions about the valuation of various environmental attributes.

The differentiating factors between the environmental impacts at the two sites are focused on i) direct and indirect impact to aquatic ecosystems, ii) direct and indirect impacts to terrestrial ecosystems, iii) air emissions, including air quality related values in Class I areas, and iv) other environmental attributes, including but not limited to recreational opportunities, aesthetics, traffic, etc. Each of these principal factors will be discussed in the following subsections. A summary of the factors is tabulated at the end of this section. Additional details can be found in the Draft EIS and Excelsior's JA and Environmental Supplement ("ES").

The determination of which of the two sites represents the LEDPA would be based on the analyses contained in documentation prepared to satisfy the Federal NEPA and State site permitting processes, including, but not limited to, the Draft EIS, the public comments on the Draft EIS, and the Final EIS. The findings developed through this process would form the basis for that determination. The following discussion is intended to provide the basis for Excelsior's identification of the West Range site as the preferred alternative and further Excelsior's position that the West Range site is the LEDPA.

Aquatic Ecosystems: Wetlands

The West Range Site was estimated in the JA and ES to permanently impact a total of 172 acres; the East Range Site approximately 133 acres. These impacts assumed the total loss of wetlands within the rail loop at each site, a conservative, worst case assumption. However, since the JA and ES were published, the Nashwauk Public Utilities Commission (hereafter, the "Nashwauk PUC" or the "Utility") has indicated its intent to submit a natural gas pipeline route permit application to serve the Minnesota Steel Project ("MSP").[19] Construction of the pipeline by the Nashwauk PUC must be completed on an expedited schedule capable of providing the MSP a firm supply of natural gas by the end of 2008,[20] far in advance of the IGCC Power Station's start-up needs in 2010. Portions of the planned pipeline route for the IGCC Power Station could share common infrastructure with the route proposed for the MSP by the Nashwauk PUC thus

[19] *See* Minnesota Steel Draft EIS, Minnesota DNR and US Army Corps of Engineers, February 2007 § 6.13.2.4, page 6-48.
[20] *Ibid*, page 6-47.

reducing both environmental impacts and implementation costs.[21] Excelsior has expressed its willingness to cooperate with the Nashwauk PUC in order to facilitate the Utility's pipeline routing process. Given such cooperation, both Excelsior and the Nashwauk PUC presume that the MPUC will suggest the possibility of using one pipeline to serve both entities, an option that Excelsior acknowledged numerous times in its JA.[22] In Table 5.0-1 of the JA, Excelsior identified the specifications for a range of natural gas pipelines which it was considering to construct, the largest of which would be sufficient in size to handle the entire needs of the IGCC Power Station and the MSP.[23] If, in order to serve the MSP in a timely manner, the Nashwauk PUC obtains a natural gas pipeline route permit from the MPUC for a pipeline sufficient in size to serve the MSP and the IGCC Power Station, then Excelsior would seek to purchase its natural gas from the Utility under appropriate terms. In that instance, it becomes clear that the pipeline would have been constructed for the purpose of serving the MSP and that the wetland impacts must be assigned accordingly. This could potentially reduce the wetland impacts attributed to Excelsior at the West Range Site by up to the entire 17 acres noted in the JA, yielding a total permanent impact of 155 acres as compared to 133 acres for the East Range Site.

Aquatic Ecosystems: Habitat in Mine Pits Filled with Water

Operation of IGCC Power Station at the East Range Site would be expected to have a greater impact on aquatic resources established in these mine pits due to the wide swings in water levels that could be expected to occur when operating the Station at full capacity (such swings drawing the water level down to the extent made possible by the design of the cooling water intake structure). This has the potential to impact a significant portion of the aquatic habitats within the numerous pits affected. Although such impacts are not likely to occur simultaneously, nothing would prevent the circumstance from occurring repetitively in the same pit. The feasibility of operating the East Range Site mine pits in such fashion is that i) they are not classified by the MDNR as protected/public waters, ii) the owners of property surrounding the pits have denied the public access to them (the areas having largely been preserved for the benefit of economic development, i.e., mining), and iii) the MDNR has not undertaken efforts to stock fish in the pits.

The potentially affected mine pits and the associated areas now covered by water are identified in Table 10. Although no biological surveys are known to have been conducted in these pits, aquatic communities are likely to have been established through use by birds and amphibians.

[21] Ibid., § 6.13.3.2, page 6-51. Both Excelsior and the Nashwauk PUC presume that the MPUC will suggest that the two pipeline applications be combined to avoid the need for two natural gas pipelines.

[22] *See* Mesaba Energy Project, Mesaba One and Mesaba Two, Joint Application to the Minnesota Public Utilities Commission for the Following Pre-Construction Permits: Large Electric Power Generating Plant Site Permit, High Voltage Transmission Line Route Permit, and Natural Gas Pipeline Route Permit," June 16, 2006, § 1, page 1; § 1,4,1, page 15; § 1.9.3, page 34; § 2.5.4.1, page 84; and § 5, page 353.

[23] Ibid, § 5.1, page 355.

Table 10. Abandoned Mine Pit Water Sources on East Range Site

<table>
<tr><th>East Range Site Mine Pit Water Source</th><th>Bottom Elevation[1] (feet)</th><th>Water Surface Elevation[2] (feet) (November 2005)</th><th>Estimated Surface Area (acres) (November 2005)</th><th>Estimated Volume (acre-ft) (November 2005)</th></tr>
<tr><td>2E</td><td>1,427</td><td>1,492.2</td><td>84</td><td>1,700</td></tr>
<tr><td>2W</td><td>1,282</td><td>1,413</td><td>183</td><td>13,430</td></tr>
<tr><td>2WX</td><td>1,331</td><td>1,405.4</td><td>322</td><td>8,880</td></tr>
<tr><td>6</td><td>1,276</td><td>1,426.6</td><td>207</td><td>18,850</td></tr>
<tr><td>3</td><td>1,522</td><td>1,586.7</td><td>82[4]</td><td>Not Available</td></tr>
<tr><td>5N</td><td colspan="4" rowspan="2">Not Available</td></tr>
<tr><td>5S</td></tr>
<tr><td>9 / Donora</td><td>1,493</td><td>1,547.2</td><td>221[4]</td><td rowspan="4">Not Available</td></tr>
<tr><td>9S</td><td>1,396</td><td>1,475.2</td><td>34[4]</td></tr>
<tr><td>Stephens</td><td>1,377</td><td rowspan="2">Not Available</td><td>246[4]</td></tr>
<tr><td>Knox</td><td>1,362</td><td>39[4]</td></tr>
</table>

1) Bottom elevations are based on blast maps and aerial contour mapping provided by Cliffs-Erie.
2) Water surface elevations are based on field surveys provided by Cliffs-Erie.
3) Surface area and estimated volumes were obtained from the MDNR March, 2004 East Range Hydrology Report.
4) Surface area estimated from 2003 aerial photographs.

Conversely, the MDNR considers the CMP (serving the West Range Site) a recreational resource. In recognition of this, Excelsior's application for a water appropriation permit to the MDNR acknowledges the Company's intent to operate the CMP so as to maintain its water levels within a specific range. The change in water elevation within the Hill-Annex Mine Pit Complex will be subject to a more dramatic change in water elevation, but such lowering will be conducted in a manner to expose historical mining operations and will serve to benefit the purpose of Hill-Annex State Park.

Aquatic Ecosystems: Direct Impacts of Wastewater Discharges

No wastewater discharges associated with the gasification island or the power block will be released to surface waters on the East Range Site. This site is within the Lake Superior Basin where stringent water quality criteria have been established as part of the Great Lakes Initiative ("GLI") that includes a ban on mixing zones for bioaccumulative chemicals of concern (mercury, a trace element found in Minnesota surface waters is designated as such).[24] Given this ban, Excelsior would find it difficult to reduce concentrations of mercury in its cooling tower blowdown ("CTB") to levels below the 1.3 nanogram per liter GLI water quality criterion.[25]

The IGCC Power Station on the West Range Site will be required to obtain a National Pollutant Discharge Elimination System ("NPDES") permit prior to initiating construction. This pre-

[24] *See* http://www.epa.gov/waterscience/gli/mixingzones/.
[25] The mercury concentrations in Pits No. 6 and 2WX on the East Range Site have been measured and found to vary between 0.6 and 1.1 nanograms per liter. The cooling towers would evaporate water obtained from these East Range Site mine pits, thereby concentrating – in about two cycles of concentration or less – the mercury present in the raw cooling water supply above the GLI water quality criteria of 1.3 nanograms mercury per liter.

construction permit will contain conditions designed to prevent adverse impacts to aquatic resources from the Project's proposed discharge of CTB. Categorical standards have been promulgated by the U.S. Environmental Protection Agency ("USEPA") for CTB releases from steam electric generating units.[26] These standards are periodically reviewed and subject to revision.[27] The permit issued for construction of Mesaba One and Mesaba Two will contain provisions derived from the study of many facilities with CTB releases. Cooling tower blowdown from the power block of Mesaba One and Mesaba Two will resemble the cooling tower blowdown from a natural gas combined cycle generating plant (the specific chemistry of the releases being largely dependent upon the chemistry of the source from which the cooling water is taken). A recent permit drafted for a 1,200 MW natural gas-fired combined cycle plant in Illinois indicates the simple conditions attached to systems releasing CTB as their only discharge[28] relative to conditions applied to a large coal-fired power plant discharging process waters coming in contact with combustion by-products.[29]

While Excelsior believes the scenario established in the EIS, Joint Application and NPDES Permit Application is consistent with rules governing the NPDES permit program, outside of circumstances constituting extreme drought, the company will seek to avoid discharge of any CTB to the CMP. Excelsior's focus will be to divert the entire CTB discharge to Holman Lake, while providing offsetting benefits via other projects in the immediate vicinity (see the following section entitled "Aquatic Ecosystems: Indirect Benefits Accompanying West Range Site Development").

Aquatic Ecosystems: Indirect Benefits Accompanying West Range Site Development

Significant positive contributions to aquatic ecosystems will result from the following actions stemming from development of the IGCC Power Station at the West Range Site:

- Reducing inflow and infiltration to the regional waste water treatment plant lift station that currently overflows to Trout Lake during conditions of high precipitation;
- Eliminating the threat of flooding for the CMP that would cause significant degradation of Trout Lake waters;
- Reducing the flow of water from Panasa Lake to the Swan River (a navigable water that is impaired for dissolved oxygen); and
- Preventing water from Trout Lake that may be high in phosphorus and other contaminants associated with historical mining practices from entering into the Swan River as a result of the proposed siphoning of CMP waters.

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[26] U.S. EPA. 1974. Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Steam Electric Power Generating Point Source Category. Washington, DC. (October). U.S. EPA. 1982. Development Document for Effluent Limitations Guidelines and Standards and Pretreatment Standards for the Steam Electric Point Source Category. EPA-440-1-82-029. Washington, DC. (November).

[27] U.S. EPA. 1989. Memorandum to Regional Permit Branch Chiefs and State Directors. "Combined Cycle Electric Generation Plants – Steam Electric Power Generating Point Source Category." (19 December). DCN 01574. U.S. EPA. 1996. *Preliminary Data Summary for the Steam Electric Point Source Category*. EPA 821-Z-96-010. Washington, DC. (April). DCN 00610. U.S. EPA. 1997. *Profile of the Fossil Fuel Electric Power Generation Industry*. EPA/310-R-97-007. Washington, DC. (September). Available online at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/fossil.html. U.S. EPA. 2005b. *Preliminary Engineering Report: Steam Electric Detailed Study*. EPA 821-B-05-005. Washington, DC. (August). Available online at: http://www.epa.gov/waterscience/guide/304m/report_steam_electric.pdf.

[28] *See* http://www.epa.state.il.us/public-notices/2006/invenergy-nelson/index.pdf for the Nelson Energy Center, an existing 1,200 MW natural gas-fired combined cycle power station. The draft permit is 9 pages long.

[29] *See* http://cfpub.epa.gov/npdes/permitissuance/genpermits.cfm for the Eastlake Power Station (an existing coal-fired power station discharging to Lake Erie); the permit is 45 pages long.

Terrestrial Ecosystems: Direct Impacts to Forestland

The West Range Site was estimated in the JA to permanently impact a total of 456 acres of forestland; the East Range Site approximately 294 acres. However, assigning the impacts associated with the natural gas pipeline to the Project on the West Range Site may be unwarranted. As noted above, it now appears that the natural gas pipeline may be constructed by the Nashwauk PUC to serve the Minnesota Steel Project. To avoid double-counting the forestland impacts required for the new natural gas pipeline, the total permanent impacts assigned to the West Range Site may ultimately be reduced by 63 acres (yielding a total permanent impact of 392 acres). Conversely, no forestland impacts were assigned to the natural gas pipeline associated with the East Range Site. This also, in hindsight, may have been inappropriate. Even though the natural gas pipeline on the East Range Site will be constructed and owned by an entity other than Excelsior (in this case, Northern Natural Gas or "NNG"), the pipeline would be constructed for the sole benefit of the Mesaba Energy Project. To construct the natural gas pipeline to serve the East Range Site, NNG would be required to acquire approximately 132 acres of forestland resulting in a total permanent East Range Site impact of 426 acres (294 acres + 132 acres, or approximately 34 acres in excess of that required for the West Range Site).

It is important to distinguish the two scenarios in the preceding paragraph from one another. Although both pipelines will be built by entities other than Excelsior, in the case of the West Range Site, the non-Excelsior entity will be building the pipeline to serve Minnesota Steel; on the East Range Site, the non-Excelsior entity will be building the pipeline to serve the Mesaba Energy Project. Therefore, the assignment of forestland impacts to the Mesaba Project in one instance (East Range Site) and not the other (West Range Site) would not be inconsistent.

Terrestrial Ecosystems: Indirect Impacts Due to Losses Via Solid Waste Disposal

At the West Range Site, Mesaba One and Mesaba Two would generate approximately 4,400 tons per year of hazardous waste from operation of its zero liquid discharge ("ZLD") system; at the East Range Site, the ZLD system would generate up to an additional 24,000 tons per year of solid waste that would require disposal in a non-hazardous waste landfill.[30] The special treatment of cooling tower blowdown at the East Range IGCC Power Station is explained in the section above entitled "Wastewater Discharges: Direct."

Air Emissions: Direct Impacts

The expanded ZLD system required to eliminate cooling tower blowdown at the East Range Site will reduce the electrical output of Mesaba One and Mesaba Two. In addition, the longer HVTLs required to interconnect the IGCC Power Station with the Forbes Substation result in greater line losses. In all, the net effect of the increased auxiliary power consumption and the HVTL losses is expected to reduce i) the efficiency of the Station and ii) the total electrical capacity delivered to the grid by about 9 MW. This loss in baseload output capacity would be expected to be generated elsewhere (that is, if the power is needed, some other power plant(s) will generate it). At times of peak demand, older and less controlled power plants are likely to be called upon to make up for the reduced power output. Excelsior has evaluated the air-emission impacts of the reduced efficiency and electrical output by assuming that replacement power will come from a power plant having the same emission rates as Mesaba One and Mesaba Two. The "excess

[30] The ZLD system on the West Range Site will function to eliminate the discharge of any water contacting the feedstock consumed or the syngas generated. The ZLD system on the East Range Site would eliminate the wastewater generated from contact with syngas and, in addition, the release of cooling tower blowdown.

emissions” attending the East Range Site scenario are as follows: 11.5 tons/yr of sulfur dioxide (“SO_2”), 23.8 tons/yr of nitrogen oxides (“NO_X”), and about 44,000 tons/yr of carbon dioxide (“CO_2”). The increased level of total dissolved solids found in the mine pits on the East Range Site would be the source of additional PM_{10} emissions associated with the drift from the cooling towers. This amounts to an increase of 215 tons/yr (an approximate increase of 44% relative to the West Range IGCC Power Station).

Air Emissions: Indirect Impacts

Unit coal trains must travel increased distances from western coal fields to reach the East Range Site. Provided the water level in the CMP is lowered and the rail line along it is stabilized, the added one way distance trains would have to travel to the East Range Site would be approximately 60-65 miles. If the rail line along the CMP is not stabilized, the added one way distance would approximate 200 miles (trains would be required to go from Gunn to Superior, Wisconsin and then to Hoyt Lakes). In either case, the added distance results in excess air emissions from locomotives, increased grade crossings, and more people affected by noise and traffic.

Air Emissions: Direct Impacts on Air Quality Related Values

The closer proximity of the East Range Site to the Boundary Waters Canoe Area Wilderness (“BWCAW”) and Voyageurs’ National Park (“VNP”) causes a substantive increase in the number of events where modeled visibility impacts resulting from Mesaba One and Mesaba Two occur above the Federal Land Managers’ (“FLMs”) threshold levels of concern (namely 5% and 10% visibility reduction). For the three years of meteorological data considered, the modeled number of events at the East Rate Site above the 5% visibility reduction threshold was more than five times the number modeled for the West Range Site; the number of events above the 10% threshold modeled for the East Range Site was ten times the number modeled for the West Range Site. Although the modeling protocol used by the FLMs to assess visibility impacts in Class I areas is known to over predict the actual visibility impacts, the dramatic increase in the number of events above the thresholds at the East Range Site suggests the relative level of impacts expected.

Other Environmental Attributes: Impacts

The people affected by Mesaba One and Mesaba Two will be comprised of people living near i) the plant footprint, ii) the rail line over which unit coal trains will pass, iii) HVTLs interconnecting the IGCC Power Station to the regional electric grid, iv) the natural gas pipeline, v) process water supply and blowdown pipelines, and vi) utilities providing interconnection to municipal services. Table 11 is provided to summarize the numbers of residents living near infrastructure associated with the Mesaba Energy Project. Additional, unquantified impacts would relate to the added number of grade crossings encountered between the West and East Range Sites and the added emissions due to the longer distance traveled by unit coal trains.

Table 11. Quantitative Comparison of Environmental-Related Attributes: West vs. East Range Sites

Description of Residents within Specified Distance of Project Element	West Range Site	East Range Site

One mile of Power Station Footprint	46	1
One-half mile of HVTL	66	1,233
500 ft of natural gas pipeline	17	87
500 ft of process water & blowdown pipelines	6	0
One-quarter mile of rail line near plant spur	10	0

The number of residents along the HVTLs on the East Range Site is of particular concern given the HVTLs proximity to the Eveleth-Virginia Municipal Airport and the Sky Harbor Airport (deemed a Seaplane Base). Not only will those residents be subject to the visible disturbance of taller HVTL structures, due to the proximity of the airports the HVTL towers may be required to be fit with obstruction lighting. As noted in the ES, this aesthetic impact would be new and visible over significant distances.[31]

HVTL impacts associated with network reinforcements required to ensure that power from Mesaba One and Mesaba Two will be deliverable to the MISO footprint will be determined through the MISO Large Generator Interconnection Procedure.[32] The outcome of this procedure will be influenced by, among other things, projects seeking to expand their existing transmission systems and the success of nearby projects requiring large amounts of power (for example, on the West Range Site, the success of the Minnesota Steel Project would be expected to significantly reduce the network reinforcements required due to the proximity of Mesaba One and Mesaba Two to the Minnesota Steel footprint). The studies being conducted by MISO to evaluate Mesaba One and Mesaba Two will be proceeding in parallel with the environmental review process. The outcome of the MISO process cannot be presupposed.

Discharge must not violate state water quality standards or CWA § 307 toxic effluent standards or bans

Excelsior may be required to obtain a variance for discharging cooling tower blowdown into Holman Lake and the CMP, but only for hardness and total dissolved solids, two parameters that do not represent issues directly related to public health and welfare nor aquatic ecology. As previously noted, Excelsior must obtain preconstruction permits, the conditions of which will be designed to preclude operations that would cause adverse environment impacts. No toxic effluents will be released from the West Range IGCC Power Station in amounts that would violate CWA § 307 as cooling tower blowdown is effectively the only discharge to West Range receiving waters.

The Mesaba Energy Project at either site will be in compliance with the minimum treatment provisions defined at Minn. R. 7050.0185 ("Nondegradation For All Waters") Subp. 3 ("Minimal treatment") in that the project will comply with applicable effluent limitations and water quality standards of this chapter and shall maintain all existing, beneficial uses in the receiving waters. Using the criteria identified in Minn. R. 7050.0185 Subp. 4 ("Additional

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[31] *See* Mesaba Energy Project, Environmental Supplement, June 16, 2006, it, High Voltage Transmission Line Route Permit, and Natural Gas Pipeline Route Permit," § 1, page 1; § 1,4,1, page 15; § 1.9.3, page 34; § 2.5.4.1, page 84; and § 5, page 353.
[31] Ibid, § 5.1, page 355.
[32] *See* http://www.midwestiso.org/page/Large%20Generator for an explanation of the procedure's various steps.

requirements for significant discharges") additional treatment such as the use of ZLD on the West Range Site to eliminate the discharge of cooling tower blowdown is not required to minimize the impact of the discharge on the receiving water (as noted in Subpart 4, the MPCA "shall consider the importance of economic and social development impacts of the project, the impact of the discharge on the quality of the receiving water, the characteristics of the receiving water, the cumulative impacts of all new or expanded discharges on the receiving water, the costs of additional treatment beyond what is required in subpart 3, and other matters as shall be brought to the agency's attention," the combination of which will support Project as now planned). Excelsior has submitted in the JA and ES information to satisfy the requirements under Minn. R. 7050.0185 Subpart 8 ("Determination of reasonable control measures for significant discharges") which includes information regarding the i) positive socioeconomic impacts of the Project, ii) the fact that the Project is employing ZLD to eliminate any discharge of contact cooling/process water, iii) the fact that the only significant use of Holman Lake is for swimming, iv) the fact that the CMP is not on the state's Protected Waters and Wetlands Inventory, v) the fact that no residential dwellings are currently located on Holman Lake or the CMP, vi) the current designation of Holman Lake, vii) the added impact of having to landfill additional salts if the ZLD system was expanded to eliminate CTB, etc.

<u>Project must not jeopardize the continued existence of an endangered species</u>

The U.S. Department of Energy has requested the U.S. Fish & Wildlife Service conduct a Section 7 consultation to confirm the Project is not likely to adversely affect threatened or endangered species or their critical habitats. At this time, there is no indication that either of the two practicable alternatives would be likely to create such adverse impacts.

<u>Must not cause significant adverse effects ("MNCSAE") on municipal water supplies, plankton, fish, shellfish, wildlife, special aquatic sites or other aspects of human health or welfare</u>

All of the mine pits are surface waters that could potentially have some interconnection to the nearby municipal wells through groundwater. The mine pits located on the East Range Site will not receive any discharge from the IGCC Power Station. As previously noted, Excelsior's intent is to eliminate any discharge of CTB to the CMP except under the circumstance of extreme drought. Given this intent, neither the West nor East Range IGCC Power Stations would be expected to have impacts on municipal water supplies.

The Minnesota Department of Health, under the Wellhead Protection Program established by the 1986 Amendments to the Safe Drinking Water Act (*see* 42 U.S.C.A. § 300h-7) is currently conducting an analysis of the wellhead protection zone for local communities around the CMP. Although not complete at this time, preliminary findings from these studies indicate that as the level in the CMP drops below 1,300 ft MSL, the municipal wells close to the pit fall outside of the 10 year wellhead protection zone (currently levels in the Canisteo Mine Pit are above 1,300 ft MSL and at such levels the CMP falls within the wellhead protection zone).[33] In its Water Appropriation Permit Application to the Minnesota Department of Natural Resources, Excelsior has indicated its appropriation of water from the CMP would lower levels therein to between 1260 and 1290 ft MSL with i) the exception of periods of drought when the lower level could

[33] Personal Communication, James Walsh, Minnesota Department of Health, February 23, 2007.

reach 1250 ft MSL and ii) during extremely wet periods when the upper level could range between 1290 – 1300 ft MSL (see page 26 of the Water Appropriation Permit Application). Even though a drop in water level in the Canisteo Mine Pit would lengthen the travel time to nearby municipal wells so that such wells were outside the 10 year wellhead protection zone, it would not preclude water from the CMP from impacting such wells at some point in the future beyond the 10 year travel time.

By reducing levels of water in the CMP and thereby increasing the time it takes for such waters to reach nearby municipal water wells, the West Range IGCC Power Station is expected to positively benefit nearby municipal water supplies by reducing the potential impact of the CMP on groundwater quality (the longer it takes for CMP water to reach a municipal well, the greater the opportunity for "natural" groundwater to dilute it).

No municipal wells are located within at least two miles of any point downstream of Holman Lake for a distance of greater than 16 river-miles. The first municipal well within that distance is the municipal well for Warba, located approximately ¼ to ½ miles due west of the Swan River.[34] No impact on the Warba municipal well(s) are to be expected at this distance downstream of the point where Holman Lake empties into the Swan River.

MNCSAE on life stages of aquatic life and other wildlife dependent on aquatic ecosystems and MNCSAE on ecosystem diversity, productivity, or stability

The wide swings in water levels that could occur at the East Range Site would be expected to have a greater adverse effect on life stages of aquatic life than at the West Range Site (i.e., if the IGCC Power Station was required to completely drain one of the mine pits on the East Range site, any aquatic life therein would be damaged).

At the West Range Site, when operating at five cycles of concentration in the cooling tower, the concentration of sulfate in CTB discharged from Mesaba One and Mesaba Two is expected to be approximately 50 times higher than the current concentration in Holman Lake (the sulfate concentration in CTB is expected to be between 450 and 500 mg/liter and the concentration in Holman Lake is 10 mg/liter). The concentration of sulfate within Holman Lake is expected to range between 200 to 300 mg/liter.

Concern has been raised by the MPCA regarding the relationship between sulfate and the generation of methyl mercury in aquatic environments.[35] However, while it has been demonstrated that the addition of sulfate may stimulate the formation of methyl mercury in peatlands,[36] the relationship may depend on several variables in addition to sulfate. These

[34] See MDNR website at http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/wateruse.html for ArcView shape files contained in avswuds.zip contains active water appropriation permits that including active municipal wells.
[35] May 4, 2006 letter from Minnesota Pollution Control Agency (Richard Sandberg, Manager, Air Quality Permits Section, Industrial Division) to Minnesota Department of Commerce (William Storm, Energy Facility Permitting), page 4. In the letter, the MPCA indicates that increases in sulfate in certain aquatic environments can contribute to the formation of methylmercury in receiving waters.
[36] Branfireun BA, Roulet NT, Kelly CA & Rudd JWM (1999) In situ sulphate stimulation of mercury methylation in a boreal peatland: toward a link between acid rain and methylmercury contamination in remote environments. Global Geochemical Cycles 13: 743-750. Branfireun BA, Bishop K, Roulet NT, Granberg G & Nilsson M (2001)

include organic carbon, the fraction of bioavailable mercury, the presence of adjacent wetlands and peat bogs in particular, and the microbial community structure (not all sulfate reducing bacteria methylate mercury).[37] The monitoring to be conducted to confirm whether or not the water quality criterion for mercury must be lowered from the current 6.9 ng/liter standard in order to avoid adverse impacts, will be the subject of the National Pollutant Discharge Elimination System permitting process.

MNCSAE on recreational, aesthetic or economic values

Although Excelsior has requested that access to the CMP be closed for safety, security and operational purposes, such action is not expected to have a significant adverse impact on recreational values in an area having a plethora of lakes. No significant adverse effects on recreation are expected on the East Range Site.

Other than the visual impacts identified under "Other Environmental Attributes: Impacts" regarding obstruction lighting that may be placed on sections of HVTLs (see page 27), asethetic impacts are expected to be similar on both sites in that plant features (new stacks, cooling tower plumes, night lighting, etc.) and ongoing activities (rail deliveries, traffic, noise, etc.) at the Mesaba One and Mesaba Two footprint will be observable by the public. Noises above Minnesota daytime and nighttime standards will be required to be mitigated to acceptable levels. As residents that live around the West Range Site are currently exposed to road noise from County Road 7 that is above the nighttime noise standards, more mitigation is likely to be required on the West Range Site than on the East Range Site. However, mitigation at both sites is expected to eliminate adverse noise impacts.

The impact on existing economic values at both sites is expected to be positive under all circumstances outside of impacts to residents living closest to the rail lines and HVTLs. Since the HVTLs for the West Range are shorter and less people are affected, the representative impacts are expected to be greater for the East Range Site.

All appropriate and practicable steps taken to minimize adverse impacts

See discussion under the section titled "Discharge must not violate state water quality standards or CWA § 307 toxic effluent standards or bans" to demonstrate that all appropriate and practicable steps have been taken to minimize adverse impacts at both sites. The IGCC Power Station at either the West Range or the East Range Sites will be the cleanest coal fueled power plant operating in Minnesota and cleaner than any other existing coal-fueled power plant in the entire nation.

Summary Table

Parameter	West Range	East Range

Mercury cycling in boreal ecosystems: The long-term effect of acid rain constituents on peatland pore water methylmercury concentrations. Geophys. Res. Lett. 28: 1227-1230.

[37] Macalady JL, Mack EE & Scow KM (2000) Sediment Microbial Community Structure and Mercury Methylation in Mercury-Polluted Clear Lake, California. Appl. Environ. Microbiol. 66: 1479. Porvari P & Verta M (1995) Methylmercury production In flooded soils - a laboratory study. Water, Air, and Soil Poll. 80: 765-773.

Direct Wetland Impacts	155-172 acres	133 acres
Mine Pits Within Which Levels are Expected to Fluctuate Widely	0	11 (>1418 acres)
Wastewater Discharges	Cooling tower blowdown only; many positive accompanying actions	Full zero liquid discharge
Direct Forestland Impacts	329-456 acres	294-426 acres
Hazardous Waste/Solid Waste (HW/SW) Landfilled	4,400 tons/yr (HW)	4,400 tons/yr (HW) <24,000 tons/yr (SW)
Excess SO_2 Emissions	Baseline	11.5 tons/yr
Excess NO_X Emissions	Baseline	23.8 tons/yr
Excess PM_{10} Emissions	Baseline	215 tons/yr
Excess CO_2 Emissions	Baseline	44,000 tons/yr
Additional Rail Miles	Baseline	65-200 miles/delivery (one-way)
Days of >5% Visibility Impairment in Class I Area	Baseline	5 times West Range
Days of >10% Visibility Impairment in Class I Area	Baseline	10 times West Range
Receptors near Plant Site and Infrastructure	145	1,321

Conclusion

Based on the foregoing, the universe of practicable alternatives for the construction of Mesaba One and Two is limited to the West and East Range Sites. Furthermore, the considerations discussed above (some of which are more fully described in the Draft EIS and Excelsior's JA and ES) set forth the basis on which Excelsior has concluded that the West Range Site constitutes the LEDPA.[38]

[38] This discussion has been limited to environmental considerations and does not also address the significant economic benefits accompanying a decision to locate at the West Range Site vs. the East Range Site that would be in the interest of electric ratepayers.

Figures 1-29

See accompanying narrative in Exhibit I

Exhibit 1: Narrative for Figures

Narrative for Figures 1-23

Figure 1: An overview of the TTRA showing the area within which Excelsior's search for practicable alternatives for siting Mesaba One and Mesaba Two was focused. The cross hatched region generally represented areas within the TTRA where access to sufficient water supplies were available, where access to existing rail tracks and HVTL corridors were feasible, and where impacts to wetlands could be minimized.

Figure 2: The western-most portion of the TTRA, in the vicinity of La Prairie and Coleraine, MN, is highly residential and generally unsuitable for siting a large power plant. Only one location appeared to have some potential for low wetland impacts, but the plat map revealed that no large blocks of land were available there, and the close proximity to resort homes on Trout Lake pose insurmountable issues precluding further consideration of the site.

Figure 3: To the east, the next portion of the TTRA, between Coleraine and Pengilly, MN, contains a number of promising-looking sites, but only the preferred West Range site is worthy of further consideration. To the west of that site, the unfavorable topography and the difficulty of routing rail access around the Canisteo Mine Pit eliminates that area from consideration. The area to the east of the preferred West Range site is owned and proposed for use by another industrial entity. The region south of US-169 is covered with lakes and wetlands, and the three areas identified are of insufficient size to site a power plant without having significant wetland impacts.

Figure 4: The portion of the TTRA between Pengilly, MN and Keewatin, MN is much like the previous region. The area north of US-169 is owned and proposed for use by another industrial entity. The region south of US-169 is covered with lakes and wetlands, and is also owned and used by other industrial entities.

Figure 5: The portion of the TTRA between Keewatin, MN and Hibbing, MN is much like the previous region. Nearly the entire area is owned and used by other industrial entities.

Figure 6: The portion of the TTRA just south of Hibbing, MN is dominated by wetlands. The only area that appears to have less wetland is residential and lacks large blocks of available land, making it unsuitable for siting a power plant.

Figure 7: The portion of the TTRA in the vicinity of Chisholm, MN and Buhl, MN contains three of the alternative sites identified in the site selection process. Aside from those areas, the Iron Formation precludes development in much of the region. The area northeast of Chisholm appears promising, but GIS software does not reflect that the nearby rail line has since been removed, rendering that location beyond all the three mile rail line buffers.

Figure 8: The portion of the TTRA between Kinney, MN and Virginia, MN contains two of the alternative sites identified in the site selection process. Aside from those areas, the Iron Formation precludes development in much of the region. Otherwise, the region north of Virginia is largely controlled and used by industrial entities, but the availability of water is unlikely to be

sufficient anyway. The plat map reveals that the area southeast of Kinney contains no large blocks of land suitable for siting a power plant.

Figure 9: The portion of the TTRA between Virginia, MN and Biwabik, MN is dominated by the Iron Formation. Otherwise, the area just west of Gilbert is controlled and used by an industrial entity. East of Gilbert, water availability to the north of the Iron Formation is insufficient for siting a power plant, and the region south of the Iron Formation is dominated by wetlands and residential developments, leaving no areas suitable for power plant siting.

Figure 10: The portion of the TTRA between Biwabik, MN and Hoyt Lakes, MN contains three of the alternative sites identified in the site selection process, including the alternative East Range site. Aside from these sites, the region is dominated by the Iron Formation, residential development, and wetlands that preclude any other sites from being considered. East of Hoyt Lakes, water availability is insufficient for siting a power plant.

Figure 11: The portion of the TTRA in the vicinity of Eveleth and Leonidas, MN contains five of the alternative sites identified in the site selection process. Outside of these locations, the region is dominated by the Iron Formation, residential development and wetlands, which preclude any other sites from being considered for siting a power plant.

Figure 12: The portion of the TTRA in the vicinity of Forbes, MN contains one of the alternative sites identified in the site selection process. Aside from this location, the region is dominated by wetlands and residential development, which preclude other sites from being considered for siting a power plant. The plat map revealed that the area southwest of Forbes and southeast of the St. Louis River contained no large blocks of available land.

Figures 13-18: The large southern portion of the TTRA along the DMIR and DWP rail lines contains vast amounts of wetlands, while generally lacking sufficient water availability for siting a power plant. The few areas with less wetland area lack large blocks of available land.

Figure 19: The southern-most portion of the TTRA in the vicinity of Brookston, MN is dominated by wetlands and residential development. South of the St. Louis River, the Fon du Lac Reservation would complicate power plant siting beyond the issues cited above. The area north of the confluence of the St. Louis and Cloquet rivers would result in significant wetland impacts, due to rail access and because aesthetic considerations would force some setback from the river.

Figure 20: The southwestern-most portion of the TTRA to the west of Brookston, MN contains significant residential development and no large blocks of available land suitable for siting a power plant.

Figure 21: The small portion of the TTRA near Swan River, MN contains significant wetlands, residential development and no large blocks of available land suitable for siting a power plant.

Figure 22: The portion of the TTRA along the BNSF rail near Casco, MN is dominated by wetlands. The two areas with less wetland are either controlled by another industrial entity or lack large blocks of available land.

Figure 23: The portion of the TTRA east of Hibbing and south of Buhl, MN contains two of the alternative sites identified in the site selection process. Aside from these locations, the region is dominated by residential development and wetlands, and sufficient water availability is unlikely.

Narrative for Figures 24-29

Figures 24 through 29 illustrate how Excelsior screened alternative site locations for wetland impacts using the IGCC Power Station footprint and National Wetland Inventory maps. The results of this screening analysis are presented in Table 7. The methodology used in the screening analysis is presented in the text immediately following that table.

Exhibit 2: Site Evaluation Sheets

Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.:	1	Site Name:	Clinton Township South	T:	57N	R:	18W	Section:	25/36	Acres: ~380

Rail Provider:	☐ BN ☒ CN ☐ Other	Distance (mi):	BN +12	CN: OS	Other:

Rail Discussion: Significant wetland and residential areas between BN & CN rail tracks; link between the two systems is unlikely

Other Transportation: Good access via US Highway 53 and CR 37

Water Supply: Long Lake and St. Louis River

Water Supply Discussion: Significant periods of low flow occur in St. Louis River occur at Forbes; Long Lake is relatively small and its shoreline occupied by numerous residential dwellings

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other | Line Nos.: MP 16L, 38L, 39L

HVTL Discussion: Numerous lines; very close to Forbes Substation

General Description

Site is in good location with no topographical constraints; close to HVTL & roads; ~38 miles from BWCA; ~64 miles from VNP. Site has numerous wetland areas and residences that constrain development. Site located in Lake Superior Basin. See Figure 24 for an illustration of how this site would fit into the surrounding area.

Exclusions

Site Selection Criteria			Practicability
☒ Permitting	☒ Technical	☐ Site Control	☐ Cost ☐ Technology ☐ Logistics
P5, P6	T1, T2		

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Combination of wetland area impacts and insufficient water supply to support Phase I and Phase II developments.
Technical	Configuration of plant site & rail loop would be constrained by wetlands and nearby land owners.
Site Control	

NWI Wetland Impacts

Approximately 33 acres of NWI wetlands affected by IGCC Power Station footprint; 44% of site occupied by NWI wetlands.

Quantitative Analysis

The St. Louis River and Long Lake are classified as "waters of the United States." New facilities (as defined at 40 CFR 125.83) locating on such waters and i) withdrawing more than 2 million gallons per day, ii) using more than 25% of that volume for cooling purposes, and iii) using a cooling water intake structure ("CWIS") to divert such volumes of water to the source are restricted as to the amount of water that can be withdrawn from such waters. Since the Mesaba Energy Project would be a new facility and would meet these criteria it would be subject to rules governing cooling water intake structures (see 66 FR 65256). Such rules restrict the amount of water that can be withdrawn from freshwater rivers, streams, lakes and reservoirs. Withdrawals from freshwater rivers or streams must be no greater than 5 percent of the source waterbody mean annual flow; withdrawals from a lake or reservoir must not disrupt the natural thermal stratification or turnover pattern (except where such disruptions are determined to be beneficial to the management of fisheries). At 40 CFR 125.84(e), the final rule governing CWISs recognizes that a State may include more stringent requirements to the location, design, construction and capacity of a CWIS at a new facility.

The USGS formerly operated from August 1964 through March 1990 a gauging station on the St. Louis River near Forbes (the daily flows measured at the gauging station are provided at the following web site: http://www.rsi.mtu.edu/rsidata/superior_watershed/minnesota/daily/04018750.txt. Analyzing this dataset shows the mean annual flow rate at this location to vary between 313 to 782 ft^3/sec with four years where the annual mean flow was less than 400 ft^3/sec (313, 325, 345, and 387 ft^3/sec). The historical data set shows 200 days where flow was less than or equal to 40 ft^3/sec and USGS has computed the 7Q10 flow to be 45.1 ft^3/sec. In the proposed rules, the maximum amount of water that could be withdrawn from a river was 25 percent of the 7Q10 (11.28 ft^3/sec or 5,060 gallons per minute) or 5 percent of the mean annual flow (15.65 ft^3/sec or 7,025 gallons per minute), whichever was lower. The annual average appropriation of water from Mesaba One and Mesaba Two on the West Range Site is expected to range from 8,800 to 10.300 gallons per minute (19.6 to 22.9 ft^3/sec) with a peak flow of 15,200 gallons per minute (33.9 ft^3/sec). On the East Range Site the average annual appropriation is expected to be about 7,400 gpm (16.5 ft^3/sec) and have a peak appropriation of about 10,000 gpm (22.3 ft^3/sec). Clearly, the flow in the St. Louis River at Forbes is insufficient alone to supply the needs of the IGCC Power Station. The DNR Lakefinder indicates that Long Lake has an area of 140 acres with a littoral zone of 76 acres and maximum depth of 33 ft. The littoral zone is defined as that portion of the lake that is less than 15 feet in depth. The littoral zone is where the majority of the aquatic plants are found and is a primary area used by young fish. This part of the lake also provides the essential spawning habitat for most warmwater fishes (e.g. bass, walleye, and panfish). Assuming that the volume of water in the littoral zone is 1,140 acre-feet (i.e., 76 acres x 15 ft.) or 371,444,800 gallons and that there is no flow into the lake from other sources, at the annual average rate of appropriation for the IGCC Power Station (at 3 cycles of concentration), the Station would consume all the water in the littoral zone in 25 days. Excelsior concludes that the only way to make this site work would be to develop and maintain a large reservoir into which water could be continually pumped to provide storage in case of extended dry periods. This is deemed unacceptable given the site's development constraints.

Conclusions

Along with the other issues regarding this site, namely the cramped location and surrounding wetland areas, this site is not deemed to be practicable.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 2 Site Name: Clinton Township East T: 57N R: 18W Section: 11/12 Acres: ~620

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +14 CN OS Other:

Rail Discussion: Two rail suppliers are not possible at this site due to the long distance between the two systems' trackage.

Other Transportation: Good access via CR 7 and 18th Avenue

Water Supply: Elbow Lake, Thunderbird Mine Pit dewatering activities, and other abandoned mine pits.

Water Supply Discussion: Water availability from Elbow Lake is poor. Thunderbird Mine Pit dewatering activity is ongoing at present.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 16L & 37 on site

HVTL Discussion: Good access to Forbes Substation

General Description

Flat area with numerous wetlands and residential properties nearby; ~35 miles to BWCA and ~60 miles to VNP. The site is constrained by residential properties and existing infrastructure; to move in a direction more suitable for development would place the IGCC Power Station footprint completely within the boundary of the Eveleth Taconite mining boundary.

Exclusions

Site Selection Criteria			Practicability		
☒ Permitting	☒ Technical	☒ Site Control	☐ Cost	☐ Technology	☐ Logistics
P9	T1, T2	C1			

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	The only feasible location for development within the area would place the IGCC Power Station Footprint completely within the current mining permit boundary of Eveleth Taconite.
Technical	The site falls within the Eveleth Taconite mine permit boundary which would constrain development, wetlands, HVTL corridors, residential areas, and existing highways will also provide constraints to overall site development.
Site Control	Obtaining site control of the usable property near Site No. 2 is deemed highly improbable.

Other Discussion

Approximately 38 acres of wetlands affected by IGCC Power Station footprint; 23% of site occupied by wetlands.

Quantitative Analysis

The Thunderbird Mine Pit dewatering activity and other temporarily abandoned mine pits are good possibilities for obtaining water, but the logistics for obtaining them have not been studied because the principal downfall of this site is that a significant portion of the upland area bounding the original site lies within the mine permit boundary of Eveleth Taconite. From both wetlands and site development perspectives the site is unworkable. The issues that arise as a result of moving the IGCC Power Station to the West from where it is shown in Figure 25 become obvious.

Conclusions

Site No. 2 is unworkable due to site development constraints (i.e., being within the mining boundary of Eveleth Taconite and/or constrained by existing residential developments and wetland areas).

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 3 Site Name: Clinton Township West T: 57N R: 18W Section: 9/10 Acres: ~410

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +14 CN: OS Other:

Rail Discussion: The option for two rail suppliers is unlikely

Other Transportation: Good access via CR 7

Water Supply: Elbow Lake, Thunderbird Mine Pit dewatering activities, and other abandoned mine pits

Water Supply Discussion: Water availability from Elbow Lake is poor. Thunderbird Mine Pit dewatering activity is ongoing at present.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 16L & 37L corridors within 1 mile

HVTL Discussion: Good access to Forbes Substation

General Description

Site is heavily wooded and currently the site of a County recreation site. Terrain on site will present some topographical challenges and wetland disruptions would occur in creating site access. Site is close to HVTL & roads; ~36 miles from BWCA; ~61 miles from VNP; and located in Lake Superior Basin. Gravel pit appears to be located on site.

Exclusions

Site Selection Criteria: ☒ Permitting (P5) ☒ Technical (T1, T2) ☐ Site Control

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	The water supply strategy for two phase operation is tenuous. Existing county recreation site would be removed. T
Technical	Insufficient room for rail loop, two phase plant footprint and buffer without taking numerous residential dwellings. Site development is constrained by Elbow Lake, residential properties and recreational area; general shape of land available due to constraints does not match plant layout.
Site Control	

Other Discussion

Site No. 3 has the lowest impact on NWI wetlands associated with footprint of IGCC Power Station (~3 acres); about 3% of site covered by NWI wetlands. However, numerous residential properties would be required to be taken. See Figure 25 to see how the Power Station footprint could be configured on this site.

Quantitative Analysis

See Site No. 1 quantitative analysis for a discussion of the issues associated with installation of cooling water intake structures. DNR Lakefinder indicates Elbow Lake is 160 acres in size with a littoral zone of 130 acres. Maximum depth is given as 22 ft. Assuming that the volume of water in the littoral zone is 1,950 acre-feet (i.e., 130 acres x 15 ft.) or 635,366,200 gallons and that there is no flow into the lake from other sources: at the annual average rate of appropriation for the East Range GCC Power Station (7,400 gpm), the Station would consume all the water in the littoral zone in about 60 days. Elbow Lake could be used as a storage reservoir with the Thunderbird mine pit dewatering activities and other temporarily abandoned mine pits augmenting the water supply. Even assuming such augmentation, Elbow Lake water levels would be likely to fluctuate widely making it a poor relatively poor prospect for this site from a permitting perspective without expanding the lake’s boundaries and/or dredging it to increase its volume.

The combination of a dubious water supply strategy, the numerous residential properties that would be within the IGCC Power Station footprint and require displacement of families, and the impact on nearby floodplains make this site unlikely to be well received by the MPUC.

Conclusions

Unworkable due mostly to site constraints. See Figure 25 for support of the quantitative analysis and this conclusion.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 4 Site Name: Clinton Township North T: 58N R: 18W Section: 25, 26, & 35 Acres: ~420

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +15 CN: OS Other:

Rail Discussion: No opportunity for competitive two supplier rail options.

Other Transportation: Good access via CR 7

Water Supply: Thunderbird Mine, Virginia WWTP, West Two Rivers Reservoir, Ispat Inland dewatering, runoff

Water Supply Discussion: Water supply would represent a big challenge.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 16L contiguous with site boundary

HVTL Discussion: Good access to Forbes Substation.

General Description

Site is located within city limits of Mountain Iron. Wetlands and the location of the site within a significant portion of Eveleth Taconite's mine permit boundary effectively preclude development at this site. See Figure 26 for support of this description.

Exclusions

Site Selection Criteria			Practicability		
☒ Permitting	☒ Technical	☒ Site Control	☐ Cost	☐ Technology	☐ Logistics
P2, P9	T1,T2	C1			

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Wetlands and land use (i.e., land is within mine permit boundary of Eveleth Taconite) pose intractable problem.
Technical	Constrained in almost every direction by wetlands, HVTLs, existing rail track, and existing highways.
Site Control	Substantial part of original site boundary located within Eveleth Taconite mine permit boundary.

Other Discussion

Wetlands cover 93 acres of IGCC Power Station footprint and~ 66% of site. See Figure 26.

Quantitative Analysis

No quantitative analysis required beyond the amount of wetlands that would be encumbered and the site's location within the mine permit boundary of Eveleth Taconite..

Conclusions

Wetland impacts and site development constraints eliminate this site from the realm of practicability.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 5 Site Name: Manganika Lake T: 58N R: 18W Section: 23, 24, 25, 26 Acres: ~1375

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +16 CN OS Other:

Rail Discussion: No opportunity for two rail suppliers.

Other Transportation: Good access via CR 102, CR 7, US Highway 169, and Maxwell Road.

Water Supply: Virginia WWTP effluent, Thunderbird Mine Pit dewatering, East/West Pit dewatering, West Two Rivers Reservoir, Mountain Iron WWTP effluent, and other surface water runoff.

Water Supply Discussion: It is doubtful that the necessary water supplies for peak two-phase operation can be assembled into a dependable portfolio.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 16L, 37L on site; MP 38L contiguous with eastern property boundary.

HVTL Discussion: Good access to Forbes Substation.

General Description

Site is completely within city limits of Mountain Iron and is split in half by CR 7. The western half is being developed into lake lots (around Mashkenode Lake) and would preclude development there; significant cultural resources found nearby this lake. Rail loop would encircle Manganika Lake, cause significant wetland impacts and require reconfiguration of roads and other infrastructure. City appeared interested in working with Excelsior to acquire land.

Exclusions

Site Selection Criteria

☒ Permitting — P2, P5

☒ Technical — T1, T2

☐ Site Control

Practicability

☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Water supply for two phase operation is logistical concern. West Two Rivers Reservoir use is unlikely as reservoir was created by US Steel for its own use. Close proximity to residential properties likely to create concerns. Wetland impacts deemed problematic.
Technical	Site development would create significant disruptions of roadway infrastructure and impact new residential development.
Site Control	

Other Discussion

Approximately 45 acres of wetlands impacted by IGCC Power Station footprint; ~ 38% of potential site covered by wetlands. Site located 31 miles from BWCA and 56 miles from VNP. See Figure 26 for configuration of site in general area.

Quantitative Analysis

Water for two phase operation would be required to come from numerous sources, many of which are not predictable (that is , the East and West Pit dewatering from MinnTac, surface runoff, wastewater treatment effluent, the Wacootah and Iroquois Mine Pits, Thunderbird Mine Pit, the Ispat Inland Mine Pit, and other abandoned mine pits). West Two Rivers Reservoir cannot be used as it is owned by U.S. Steel.

The biggest problem with this site is due to development constraints that would place the IGCC Power Station footprint too close to existing residential areas within the Mountain Iron city limits. Wetland impacts associated with site development would be significant.

Conclusions

Unworkable due to site constraints and feasibility of establishing predictable water supplies for two phase operation..

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 6 | Site Name: West Aurora | T: 58N | R: 15, 16W | Section: 13 (R16W), 7,8, 17, 18 | Acres: ~2,500

Rail Provider: ☐ BN ☒ CN ☐ Other | Distance (mi): BN +30 | CN OS | Other:

Rail Discussion: Two rail supplier option not available. Rail access to site will require significant cut and fill.

Other Transportation: Good access to State Highway 135.

Water Supply: Embarrass Lake, Mine Pit No. 6 and others from Cliffs Erie

Water Supply Discussion: Poor water availability at this site. Wide fluctuations of lake not acceptable. Logistics associated with obtaining water from Cliffs Erie are problematic.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other | Line Nos.: MP 38L on-site; 39L contiguous with south boundary.

HVTL Discussion: Lengthy, but fair access to Forbes Substation.

General Description

High ground in northeast corner of property most suitable for development. However, large waste rock dump and residential developments in city of Aurora constrain site development. Site is ~26 miles to BWCA; 55 miles to VNP. See Figure 27 for illustration of Station footprint within region assumed for site development..

Exclusions

Site Selection Criteria: ☒ Permitting (P5) | ☐ Technical (T1, T2) | ☐ Site Control

Practicability: ☐ Cost | ☐ Technology | ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Water supply is likely to be insufficient for two phases and Embarrass Lake would undergo wide variation in water levels. Distance is considered too far to be pumped from abandoned mine pits on Cliffs-Erie property. St. James Mine Pit source of Aurora's water supply.
Technical Site Control	Waste rock presents constructability issues and site development is constrained by nearby residential development.

Other Discussion

Approximately 27 acres of wetlands would be affected by IGCC Power Station footprint; ~23% of plant site covered by wetlands. See Figure 26 for an illustration of how the site would be configured within the area.

Quantitative Analysis

DNR Lakefinder indicates Embarrass Lake is 442 acres in size with a littoral zone of 408 acres, a maximum depth of 19 ft. and a median depth of 11 ft. Assuming that the volume of water in the littoral zone is 4,488 acre-feet (i.e., 408 acres x 11 ft.) or 1.462 billion gallons and that there is no flow into the lake from other another source; at the annual average rate of appropriation for the IGCC Power Station of 7,400 gpm the Station would consume all the water in the littoral zone in about 137 days. This makes Embarrass Lake a poor prospect for this site from a permitting perspective.

The biggest issue with respect to this site is its site development constraints. The site is bounded by a mine dump to the West (mine dumps pose a constructability issue because of the uncertainty associated in knowing whether or not bedrock has been encountered), residential areas to the East, the highway to the north, and the rail line and wetlands to the South.

Conclusions

Deemed unworkable from a site development perspective.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 7 | Site Name: Hoyt Lakes West | T: 59N | R: 14, 15W | Section: 31 (14W); 25, 26, 36 | Acres: ~ 1,630

Rail Provider: ☐ BN ☒ CN ☐ Other | Distance (mi): BN ~43 CN < 1 Other:

Rail Discussion: One supplier only. Existing rail bed present on site.

Other Transportation: Road access is poor, indirect and would require easements across Cliffs Erie property.

Water Supply: Abandoned mine pits (No. 6, Denora, Stevens, 2WX, Knox) and Colby Lake

Water Supply Discussion: Mine pits on site not subject to concerns over wide fluctuations, but quality is poorer than mine pits on West Range.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other | Line Nos.: MP 34L, 38L, 39L all ~ 1 mile south

HVTL Discussion: Distance to Forbes Substation is concern (all distances > 33 miles)

General Description

Site is owned by private entity that is unwilling to sell and State of Minnesota. Site is large, disturbed in places, and has significant wetland areas. State of Minnesota owns Section 36 which is school trust land requiring minerals assessment. Site boundary lies within the Iron Formation. Site is ~25 miles from BWCA; 54 miles from VNP. See Figure 27 for illustration of site configuration.

Exclusions

Site Selection Criteria: ☐ Permitting (P9) ☐ Technical ☒ Site Control (C1)

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Plant is located completely within Iron Formation and deemed to be unobtainable.
Technical	
Site Control	Present owner will not sell its property at this location. State of Minnesota would be required to retain minerals underlying site. Acquisition and minerals deemed insurmountable problems.

Other Discussion

Approximately 19 acres of wetlands affected by IGCC Power Station footprint; ~ 34% of plant site covered by wetlands

§ 404 (b)(1) Compliance Summary Matrix

The main problem with this site is related to obtaining site control. As noted above, private owner will not sell its property and the State of Minnesota owns a block of land in the middle of site where the plant would need to be located. This site is in the Iron Formation and therefore, the DNR will have serious concerns about its development as a IGCC Power Station Site.

Wetlands would pose a significant issue if this site were to be developed.

Conclusions

Unworkable due to the inability to acquire site control and underlying ownership of the state's mineral interests.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 8 Site Name: W. Two Rivers Reservoir T: 58N R: 18W Section: 16, 17, 20, 21 Acres: >2,000

Rail Provider: ☐ BN ☐ CN ☒ Other Distance (mi): BN CN <1 Other:

Rail Discussion: CN track runs past site, but presents no real opportunity for modest loop.

Other Transportation: US 169 provides exceptional access.

Water Supply: West Two Rivers Reservoir, West/East Mine Pit dewatering, Mountain Iron WWTP

Water Supply Discussion: Water availability deemed poor based on devotion of West Two Rivers Reservoir to owner’s mining interests.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 25L tap line on-site

HVTL Discussion: MP 25L presents route to Shannon Substation and Forbes Substation via 37L or 16L

General Description

The land surrounding W. Two Rivers Reservoir is owned by an entity which constructed the reservoir especially for its own use (Personal communication, Daniel Hestetune, SEH Engineering, 2005). Preferred site is located within Minntac mine permit boundary; therefore, property is deemed unobtainable. See Figure 26 for preferred building location on this site.

Exclusions

Site Selection Criteria			Practicability		
☒ Permitting	☒ Technical	☒ Site Control	☐ Cost	☐ Technology	☐ Logistics
P5	T1, T2	C1			

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Present owner engaged in mining activities and would be unlikely to grant permission to another party for use of water from West Two Rivers Reservoir.
Technical	Site development is constrained due to US 169 and reservoir on reservoir’s north side. Wetlands constrain developments elsewhere. See Figure 26 in support of this position.
Site Control	Property owner would not grant access to site as it is within mine permit boundary.

Other Discussion

Approximately 49 acres of wetlands would be impacted by IGCC Power Station footprint. See Figure 26.

Quantitative Analysis

Preferred site for IGCC Power Station would be within Minntac mine permit boundary and, therefore, is deemed unobtainable. In addition, West Two Rivers Reservoir is within the mine permit boundary and deemed the exclusive right of the property owner to be used in support of mining activities. Beyond these two factors, wetland impacts would pose a major problem; see Figure 26 as an example of how the site would be constrained in this regard.

Conclusions

Unworkable due to site control issues.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 9 Site Name: East Range Site T: 59N R: 14W Section: 28, 32, 33 Acres: ~810

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN ~44 CN ~3/4 Other:

Rail Discussion: CN is only rail supplier at this location. Lake Superior access would require upgrade of existing track to accommodate unit coal trains.

Other Transportation: Good access via CR 666 and CR 110.

Water Supply: Abandoned mine pits (2WX, 6, Denora, Stephens, Knox, 2, & 3) and Colby Lake

Water Supply Discussion: Widely fluctuating levels of no concern as with West Range Site, but water quality is relatively poor

HVTL: ☒ 115 kV ☐ 230 kV ☒ Other Line Nos.: MP 43L, 38L, 39L, 34L

HVTL Discussion: MP 43L is 138 kV HVTL leading to Syl Laskin Substation where 38L, 39L, and 34L HVTLs originate. Distance to Forbes Substation is significant with the 38L and 39/37L routes being ~ 35 miles each.

General Description

This site is the alternate site described in the Joint Application and Environmental Supplement. The site is located almost completely within the city limits of Hoyt Lakes and is mostly undisturbed with the exception of being periodically logged. The site is the closest of any to the BWCA and VNP being 25 and 54 miles distant, respectively.

Exclusions

Site Selection Criteria: ☐ Permitting ☐ Technical ☐ Site Control

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria
- Permitting
- Technical
- Site Control

Other Discussion

Approximately 15 acres of NWI wetlands affected by IGCC Power Station; ~ 35% of site occupied by wetlands.

§ 404 (b)(1) Compliance Summary Matrix

Section No.	ACOE	Description of Compliance Criteria	Complies	Does Not Comply
§230.10(a)	1	Overcome presumption that practicable, less environmentally damaging alternative site, outside special aquatic sites, exists	X	
	2	No alternative that is practicable, is less damaging to the aquatic ecosystem, and has no other significant environmental effects		X (see narrative text beginning on page 21 of report)
§230.10(b)	3	Discharge must not violate state water quality standards or CWA Section 307 toxic effluent standards or bans		
	4	Project not jeopardize the continued existence of an endangered species		
§230.10(c)	5	Must not cause significant adverse effects ("MNCSAE") on municipal water supplies, plankton, fish, shellfish, wildlife, special aquatic sites or other aspects of human health or welfare		
	6	MNCSAE on life stages of aquatic life and other wildlife dependent on aquatic ecosystems		
	7	MNCSAE on ecosystem diversity, productivity, or stability		
	8	MNCSAE on recreational, aesthetic or economic values		
§230.10(d)	9	All appropriate and practicable steps taken to minimize adverse impacts		

Conclusions

To produce the same amount of electricity as the Phase I and Phase II developments at the West Range Site, the East Range IGCC Power Station would produce an additional 11.5 tons/yr of sulfur dioxide ("SO_2"), 23.8 tons/yr of nitrogen oxides ("NO_X"), and about 44,000 tons/yr of carbon dioxide ("CO_2"). Furthermore, the additional cooling load and associated drift that results from complete zero liquid discharge treatment causes an increase of PM_{10} emissions of 215 tons/yr, which represents an increase of approximately 44%. Also, there is a greater loss of electricity delivered to the East Range Site's point of interconnection with the regional electrical grid and added impacts to air quality related values predicted in the BWCA and Voyageurs' National Park. Aquatic ecosystems in pits may be impacted due to widely fluctuating water levels. See narrative text beginning on page 21 for discussion of environmental elements considered in support of §230.10(a) conclusion.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 10 Site Name: Mountain Iron T: 58N R: 18W Section: 1-3, 10-12 Acres: ~1,520

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +14 CN OS Other:

Rail Discussion: CN only practicable supplier. BN track at one time connected with Mountain Iron site, but trackage has been removed and made into a recreational trail.

Other Transportation: Good access to US 169 and CR 102.

Water Supply: Abandoned mine pits (Wacootah, Iroquois), East & West Pits dewatering flows, Ispat Inland dewatering flows, surface water runoff, Silver Lake overflow.

Water Supply Discussion: Water supply will be stretched and require pumping to a surge basin during high flow periods to accommodate two phase operation.

HVTL: ☒ 115 kV ☒ 230 kV ☐ Other Line Nos.: MP 37L, 25L, 80L (230 kV)

HVTL Discussion: Sufficient HVTL corridors exist to provide route diversity to Forbes Substation.

General Description

The southern boundary of the Iron Formation (IF) runs through the middle part of the site. Negotiations were conducted with City managers and a contract was drawn up and presented to the City Council. The City Council tabled consideration of the contract due to impacts on numerous residents, the strong objection of Minntac (because of the company's intention to mine it), and the concurrence of the Minnesota DNR regarding such intentions. See Figure 26.

Exclusions

Site Selection Criteria			Practicability		
☒ Permitting P9	☐ Technical	☒ Site Control C1	☐ Cost	☐ Technology	☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Too many residents, US Steel, and the DNR objected to the Project's location at this site. Iron formation cuts through site.
Technical	
Site Control	The City of Mountain Iron maintains control of critical parcels of property on site and without their support, the site was not practicable.

Other Discussion

Approximately 23 acres of wetlands impacted by IGCC Power Station footprint. Minnesota DNR (Division of Lands & Minerals) discouraged consideration of this site.

Quantitative Analysis

The Iron Formation cuts across the boundary of this site and MinnTac has indicated its intention to expand its mine permit to encompass such area. As a result of MinnTac's stated interest, the DNR, City of Mountain Iron and numerous residents objected to moving forward; the City, most importantly, withdrawing its support to negotiate a site agreement.

In addition, there are significant number of residents (~80 in number) that would be placed in relatively close proximity to the IGCC Power Station.

Conclusions

Site control and lack of support from the City of Mountain Iron make this site unworkable at this time.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 11 Site Name: Leonidas T: 58N R: 18W Section: 25, 36 Acres: <704

Rail Provider: ☐ BN ☒ CN ☐ Other Distance (mi): BN +16 CN OS Other:

Rail Discussion: Only single provider likely.

Other Transportation: Good access via US Highway 53, CR 37, CR 7 and Fayal Road.

Water Supply: Virginia WWTP effluent, Thunderbird Mine Pit dewatering, East Pit dewatering, West Two Rivers Reservoir, Mountain Iron WWTP effluent, and other surface water runoff.

Water Supply Discussion: Logistics for obtaining water believed to be difficult for two phase operation.

HVTL: ☒ 115 kV ☐ 230 kV ☐ Other Line Nos.: MP 16L tap line

HVTL Discussion: Sufficient connections to Forbes available.

General Description

This site was thought to represent an alternative location for Mesaba Project, but feasibility of building on waste rock, the constraints on development associated with wetlands and the abandoned mine pit discounted its potential. See Figure 26.

Exclusions

Site Selection Criteria			Practicability		
☒ Permitting	☒ Technical	☒ Site Control	☐ Cost	☐ Technology	☐ Logistics
P9	T1, T2	C1			

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	Existing site lies partly within Eveleth Taconite's mine permit boundary and Iron Formation prohibitively constraining developments.
Technical	Waste rock pile presents constructability concerns and the constraints provided by the mine pit to the east, wetlands to the west, and the city to the south preclude effective development of the site.
Site Control	Mining entity would not allow construction of IGCC Power Station with mine permit boundaries.

Other Discussion

Approximately 28 acres of wetlands impacted by the IGCC Power Station footprint.

Qualitative Analysis

The site is too constrained making development unworkable due to conflicts with the Eveleth Taconite Mine Permit boundary, wetlands, existing infrastructure and mine dumps. In addition, mine dump creates constructability issues (see footnote 16 on page 14 of narrative text for explanation of constructability issues).

Conclusions

Site development issues preclude the feasibility of development at this site.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 12 Site Name: Buhl T: 58N R: 20W Section: 17-20 Acres: 850

Rail Provider: ☐ BN ☐ CN ☐ Other Distance (mi): BN +5 CN <1 Other:

Rail Discussion: No existing rail presently serves this site, but at one time CN track served the area.

Other Transportation: Good access via US Highway 169 and CR 453

Water Supply: Sherman Mine Pit, Fraser Mine Pit, Iron Word

Water Supply Discussion: Water availability is uncertain at this site (other factors eliminated consideration of this site).

HVTL: ☐ 115 kV ☒ 230 kV ☐ Other Line Nos.: MP 80L to Forbes

HVTL Discussion: Forbes Substation about 10 miles

General Description

This present owner of the site has refused to sell the part of the site that is north of US 169. Most of the site south of US 169 is a mine dump (which causes constructability issues). Coal delivery issues may exist due to terrain obstacles for the rail track. Constructability concerns regarding the mine dumps on the site south of US 169 preclude serious consideration of the site. See Figure 28.

Exclusions

Site Selection Criteria: ☐ Permitting ☒ Technical (T1, T2) ☐ Site Control

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting

Technical: Constructability issues due to the presence of mine dumps and problems with rail grade are expected. Availability of adequate water supply is concern.

Site Control

Other Discussion

IGCC Power Station footprint must be located away from mine dumps and the only location on site is where wetlands are more prevalent; IGCC Power Station foot print alone would impact approximately 68 acres of wetlands. See Figure 28.

Quantitative Analysis

Constructability issues (see footnote 16 on page 14 for a discussion of the general concern associated with building on a mine dump) would force development of the site footprint into an area having a high proportion of wetlands.

Conclusions

Site development precluded due to constructability issues and constraints posed by wetland areas.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 13 Site Name: West Chisholm T: 58N R: 20W Section: 17-20 Acres: 785

Rail Provider: ☐ BN ☐ CN ☐ Other Distance (mi): BN CN Other:

Rail Discussion: No rail supplier presently can provide service to this site because of grade differences.

Other Transportation:

Water Supply:

Water Supply Discussion:

HVTL: ☐ 115 kV ☐ 230 kV ☐ Other Line Nos.:

HVTL Discussion:

General Description

This site is on a mine dump and provides some constructability issues. Originally, the site was thought to be capable of being served by the rail system delivering taconite pellets to Lake Superior. This however, was not possible as trains could make it up the hill to Hibtac only because they were empty.

Exclusions

Site Selection Criteria

☐ Permitting ☒ Technical T2 ☐ Site Control

Practicability

☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	
Technical	The site is not accessible via train.
Site Control	

Other Discussion

Infeasible to consider this site.

Quantitative Discussion

None required, rail access is not feasible.

Conclusion

Rail access is not feasible.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 14 Site Name: Hibbing Industrial Park T: 57N, 58N R: 20W Section: 3,4 (57N), 33,34 (58N) Acres: 860

Rail Provider: ☒ BN ☒ CN ☐ Other Distance (mi): BN OS CN OS Other:

Rail Discussion: Possibility of two suppliers at this site. However, BN has concerns about unit coal train traffic through Hibbing.

Other Transportation: Good access via US Highway 169.

Water Supply: Abandoned Mine Pits (Hull-Rust dewatering, Iron World)

Water Supply Discussion: Uncertain about how much water is available from Iron World and dewatering from Hull-Rust Mine Pit.

HVTL: ☐ 115 kV ☐ 230 kV ☒ Other Line Nos.: Xcel has 500 kV HVTL that traverses the Site on Route to Forbes Substation

HVTL Discussion: Alternate path to Blackberry Substation is available.

General Description

This site is located in a planned industrial park that has been incorporated into a comprehensive plan for the communities of Hibbing, Chisholm and Buhl. The site is currently owned by IRR and committed to other development. See Figure 28.

Exclusions

Site Selection Criteria

☐ Permitting ☒ Technical T1 ☒ Site Control C1

Practicability

☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting	
Technical	The site is constrained to the north by the Iron Formation, to the south by residential developments, and to the east by mineral mining operations. In order to accommodate the IGCC power station dual rail potential, additional land must be acquired within the Iron Formation or from other landowners outside the boundary of the current owner's property making acquisition more difficult.
Site Control	The IRR has committed the site to another developer's project.

Other Discussion

The IGCC Power Station footprint will impact about 35 acres of wetlands. The potential for dual rail access will be difficult given the proximity of the site to the iron formation (to the north) and residential properties to the south and east.

Quantitative Analysis

See Figures 7 and 28 to see the difficulty of positioning the site footprint within the site boundary and off the Iron Formation.

Conclusions

The site is currently committed to another developer's project and unavailable for development at this time by Excelsior.

Mesaba Energy Project: IGCC Power Station Site Evaluation Sheet

Site Identification

Site No.: 15 Site Name: West Range Site T: 56N R: 24W Section: 2,3,10-12 Acres: ~1,260

Rail Provider: ☒ BN ☒ CN ☐ Other Distance (mi): BN ~2 CN ~2 Other:

Rail Discussion: Both suppliers have access to the site.

Other Transportation: Good access by US 169 and CR 7.

Water Supply: Canisteo Mine Pit, Hill-Annex Mine Pit Complex, Lind Pit, West Hill Mine Pit, and Prairie River

Water Supply Discussion: One of the best places in the TTRA where adequate water supplies are assured for two phase operation

HVTL: ☐ 115 kV ☐ 230 kV ☒ Other Line Nos.: New 345 kV outlet facilities planned ~9 miles in length

HVTL Discussion: Blackberry Substation is point of interconnection.

General Description

A large block of land has been optioned from RGGS and contract agreeing to provide Excelsior mineral rights to 550 acres of property and to provide easements across RGGS land in accordance with commercially reasonable terms. See Figure 29.

Exclusions

Site Selection Criteria: ☐ Permitting ☐ Technical ☐ Site Control

Practicability: ☐ Cost ☐ Technology ☐ Logistics

Discussion of Exclusions, If Any

Site Selection Criteria

Permitting

Technical

Site Control

Other Discussion

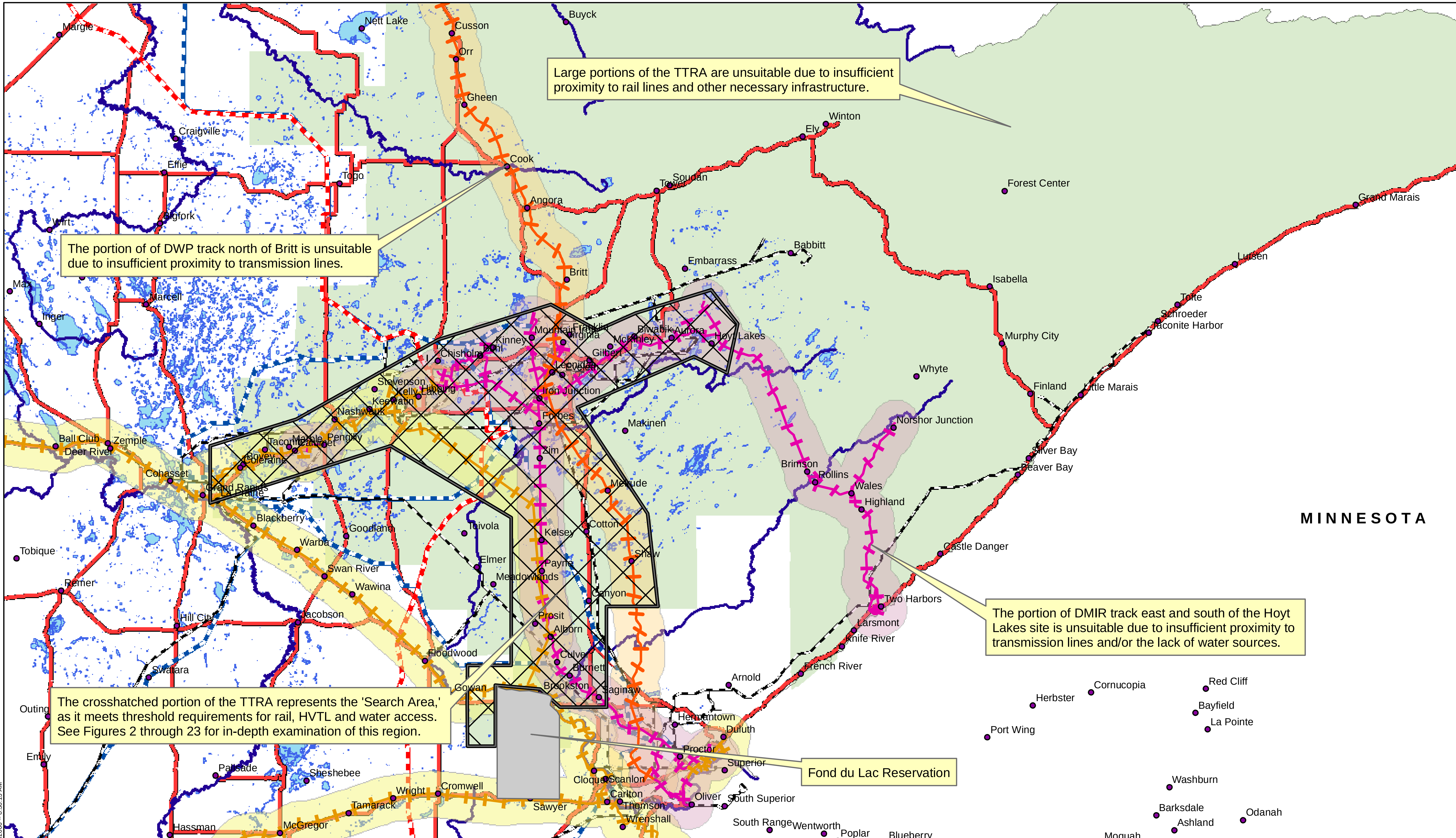
IGCC Power Station footprint would impact only 11 acres of NWI wetlands.

§ 404 (b)(1) Compliance Summary Matrix

Section No.	ACOE	Description of Compliance Criteria	Complies	DNC
§230.10(a)	1	Overcome presumption that practicable, less environmentally damaging alternative site, outside special aquatic sites, exists	X	
	2	No alternative that is practicable, is less damaging to the aquatic ecosystem, and has no other significant environmental effects	X	
§230.10(b)	3	Discharge must not violate state water quality standards or CWA Section 307 toxic effluent standards or bans	X	
	4	Project not jeopardize the continued existence of an endangered species	X	
§230.10(c)	5	Must not cause significant adverse effects ("MNCSAE") on municipal water supplies, plankton, fish, shellfish, wildlife, special aquatic sites or other aspects of human health or welfare	X	
	6	MNCSAE on life stages of aquatic life and other wildlife dependent on aquatic ecosystems	X	
	7	MNCSAE on ecosystem diversity, productivity, or stability	X	
	8	MNCSAE on recreational, aesthetic or economic values	X	
§230.10(d)	9	All appropriate and practicable steps taken to minimize adverse impacts	X	

Conclusions

West Range site is least damaging practicable alternative for the reasons set forth in the narrative text beginning at page 21.



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Lakes

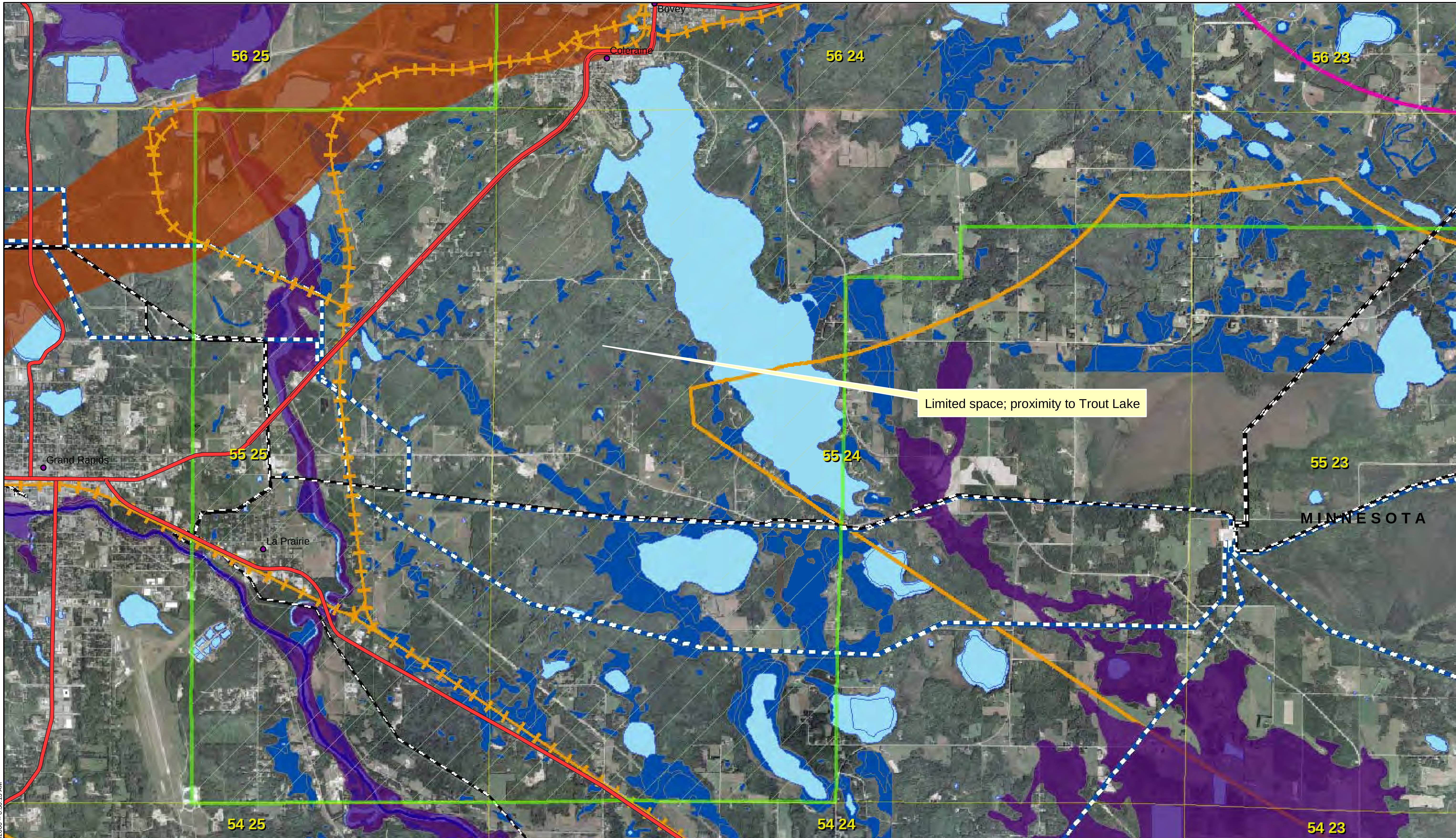
Source: ESRI, Excelsior Energy, and SEH.

Figure 1: Overview of TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 9 Miles



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- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

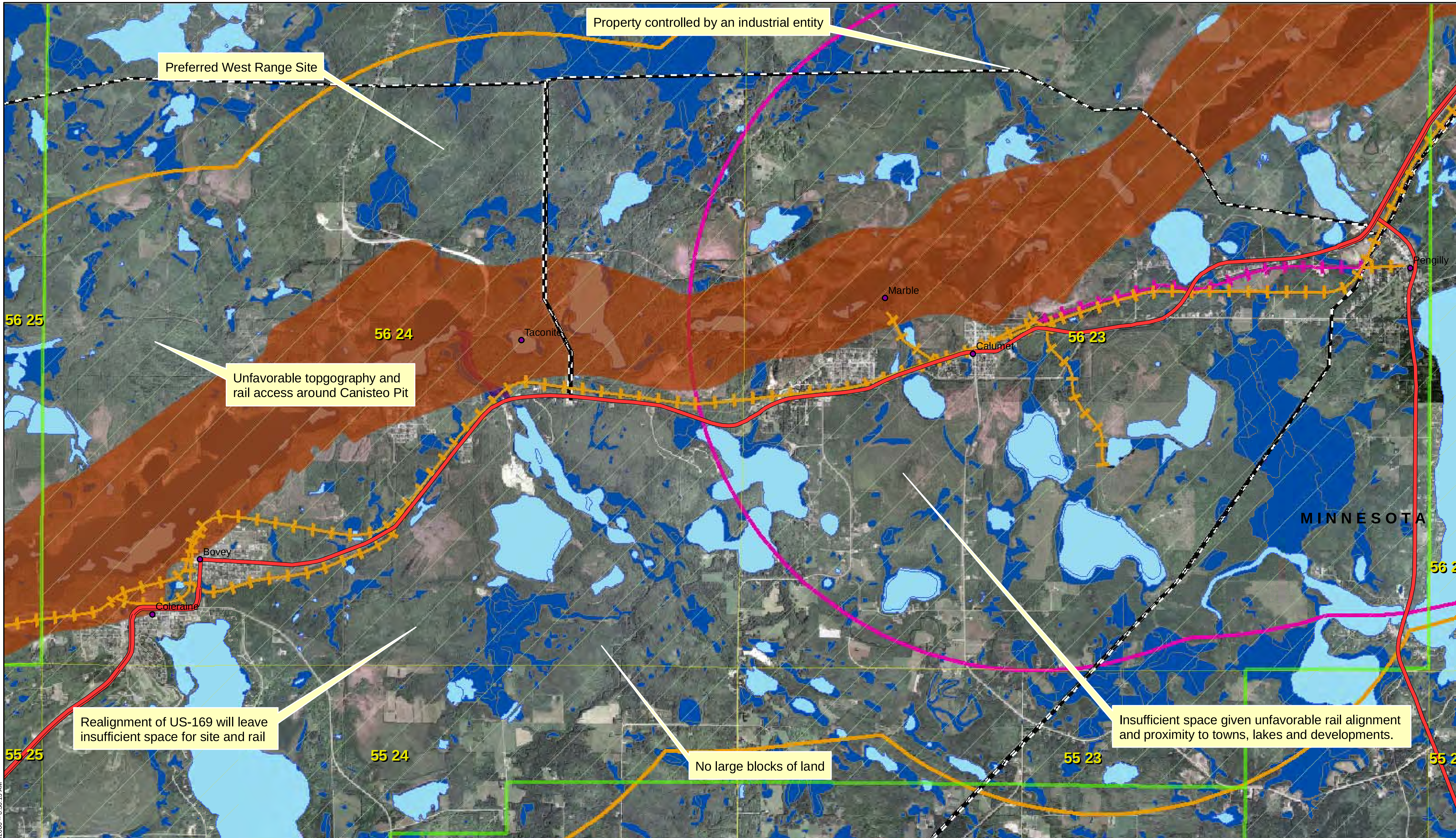
Source: ESRI, Excelsior Energy, and SEH.

Figure 2: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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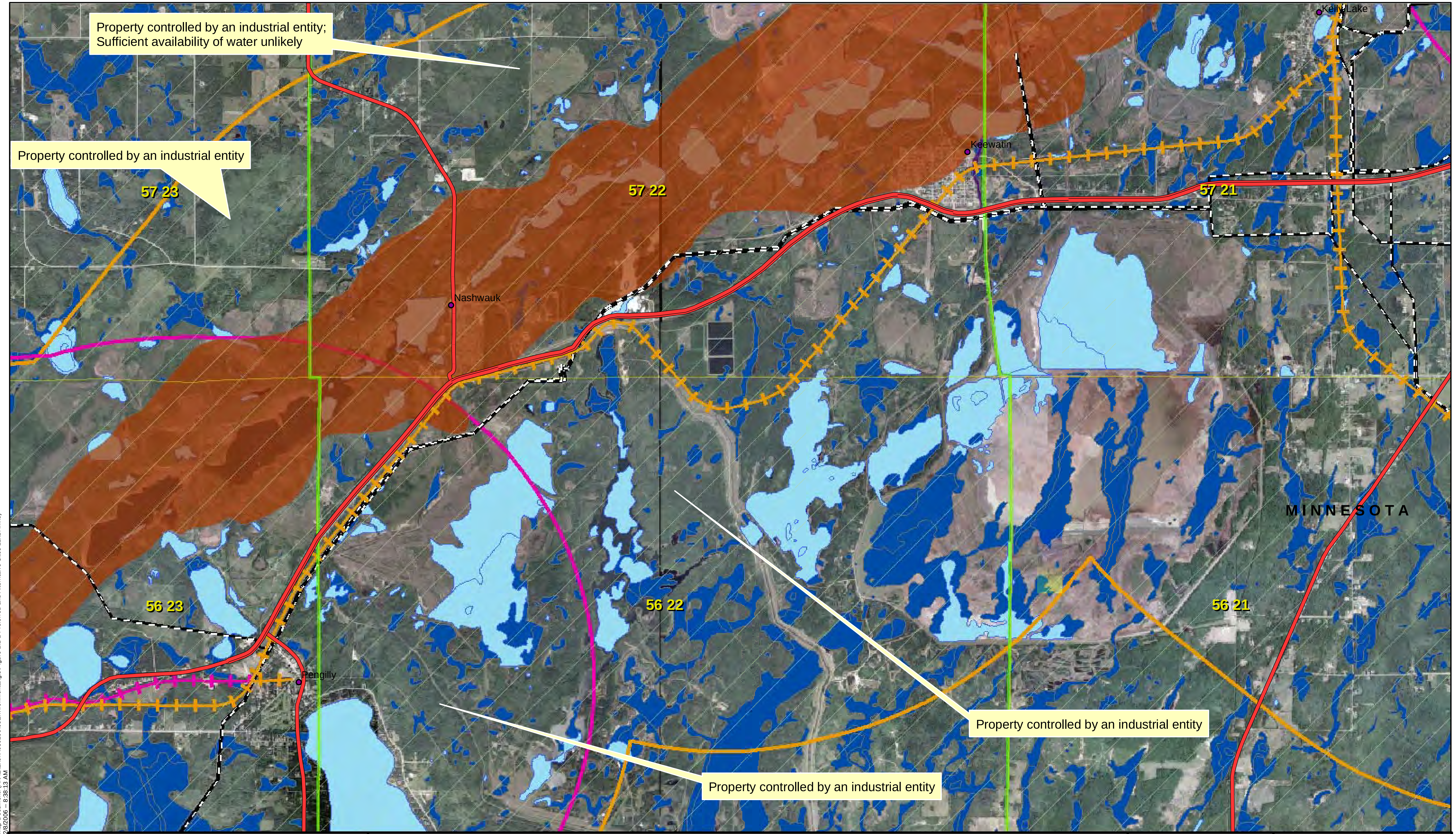
Figure 3: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
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- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
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Figure 4: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles

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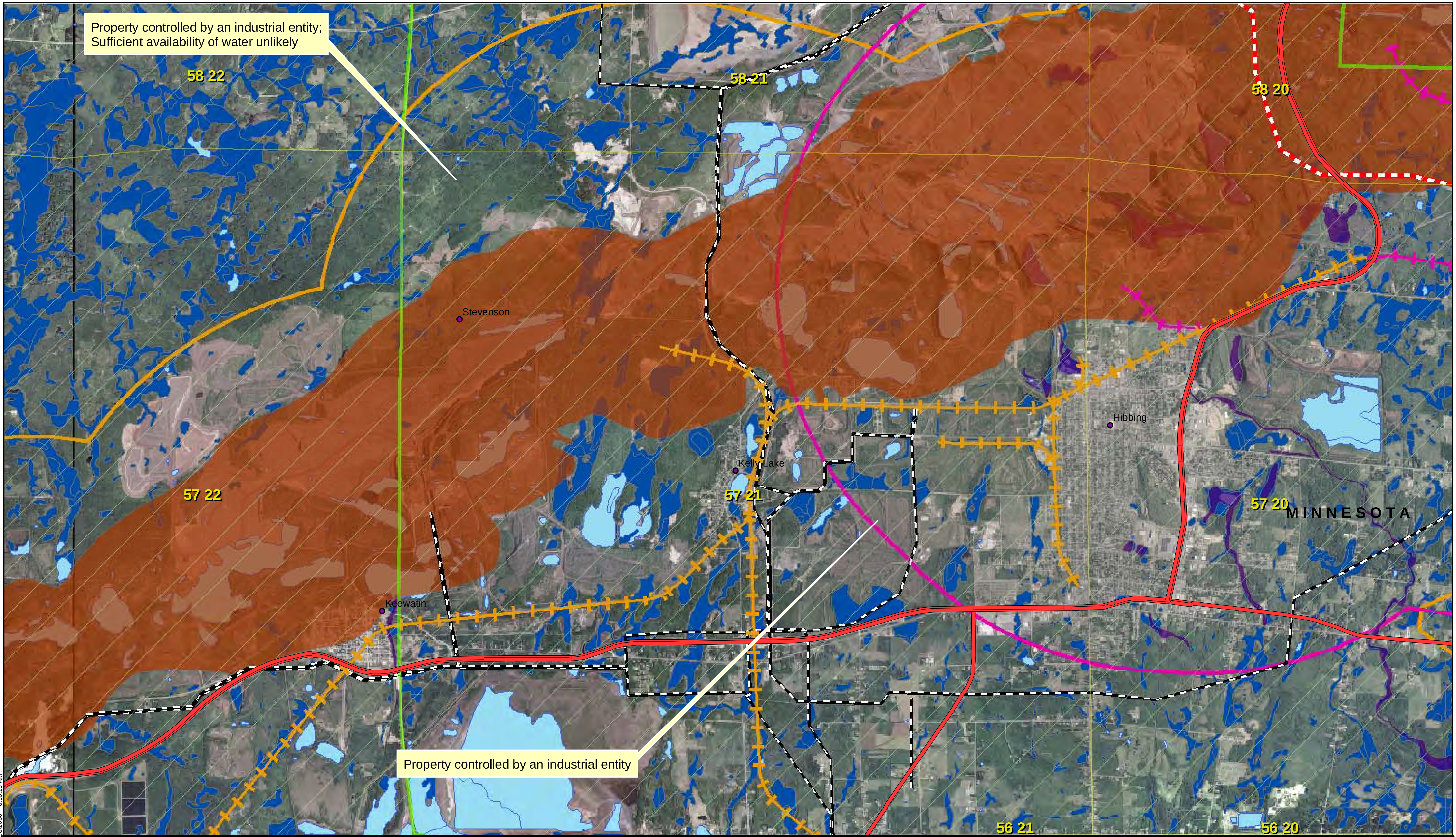

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Taconite Tax Relief Area

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Legend

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- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

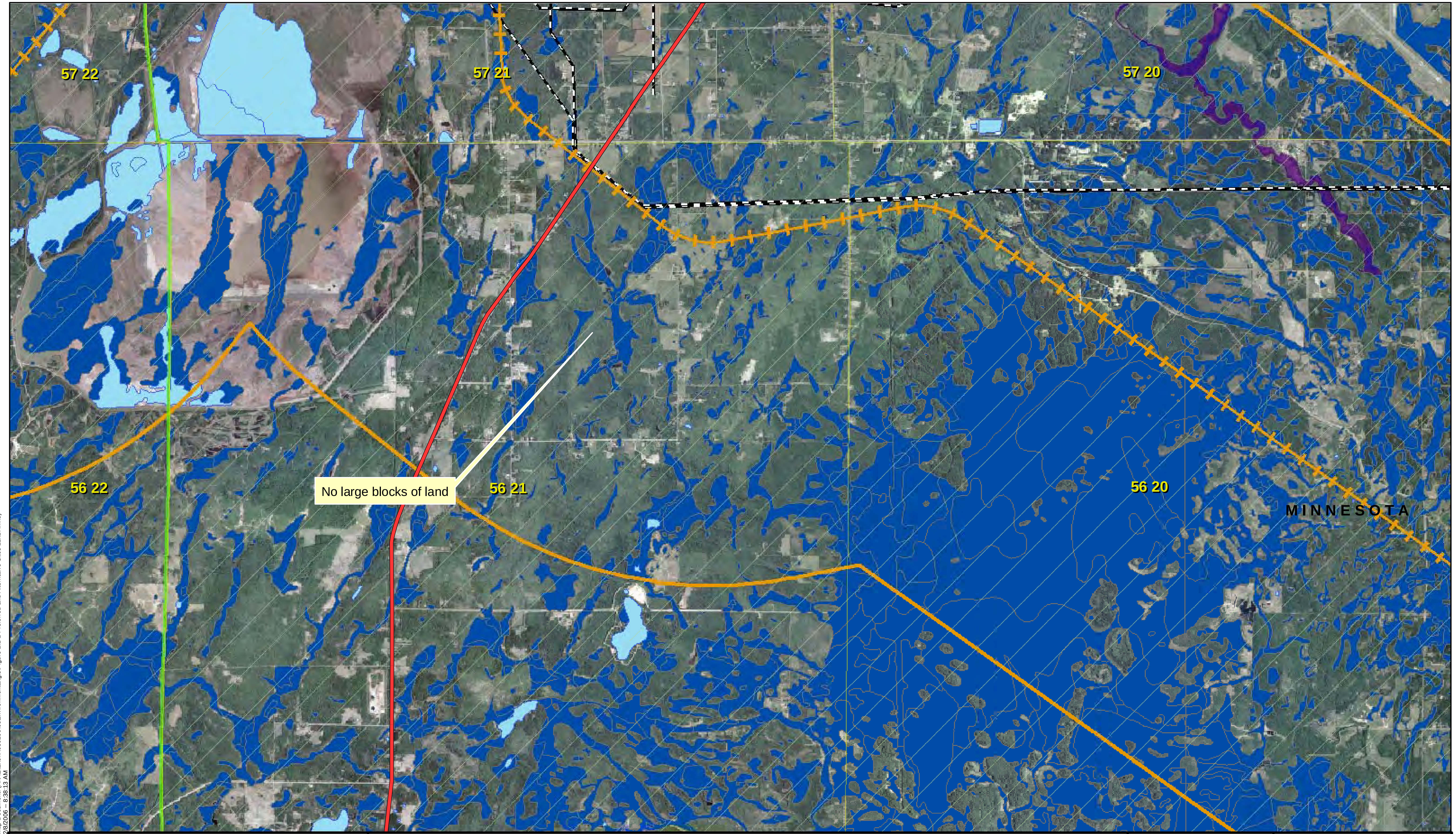
Source: ESRI, Excelsior Energy, and SEH.

Figure 5: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

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- Rivers
- TTRA
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- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

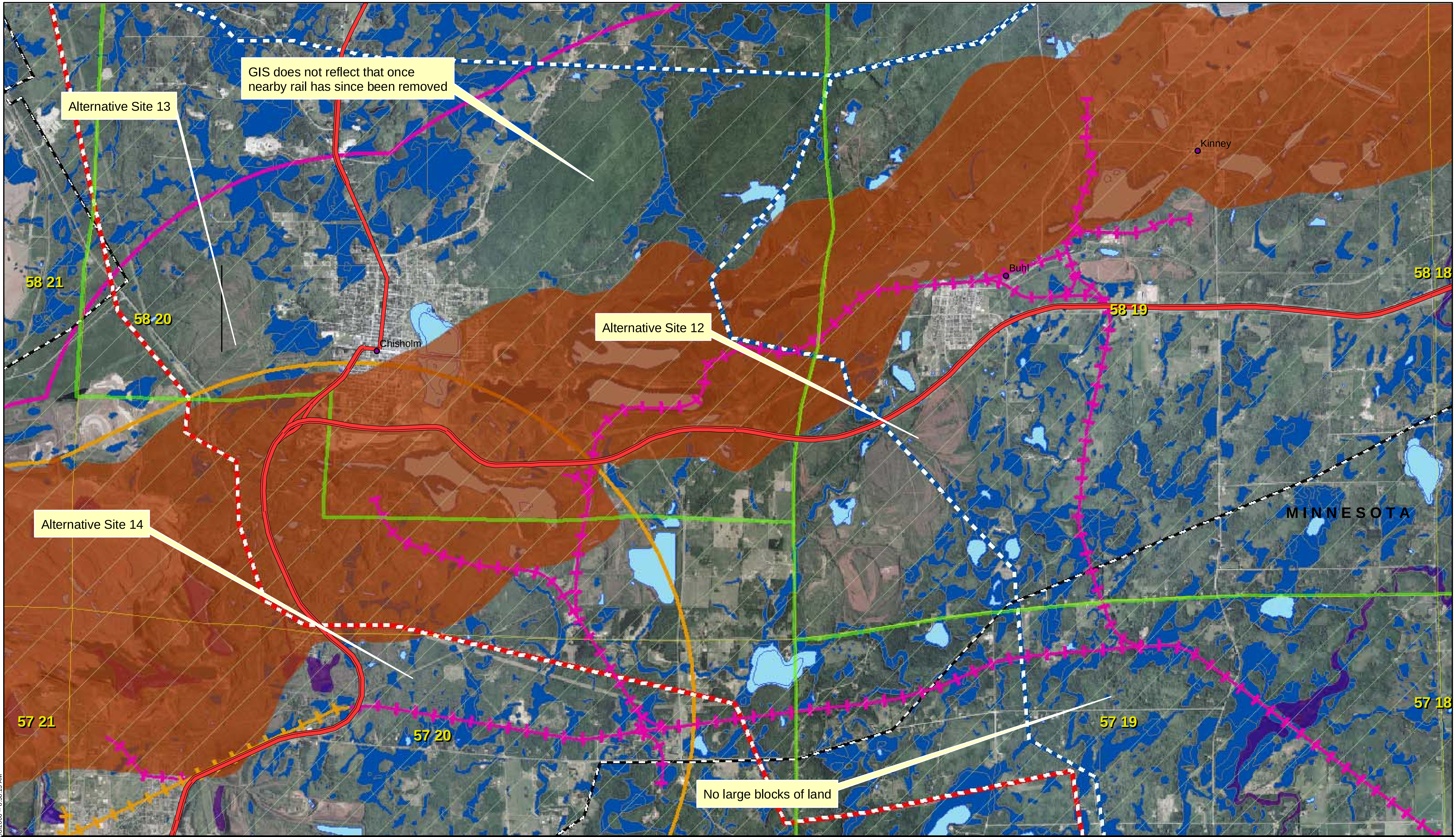
Source: ESRI, Excelsior Energy, and SEH.

Figure 6: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

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- DWP Rail
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- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

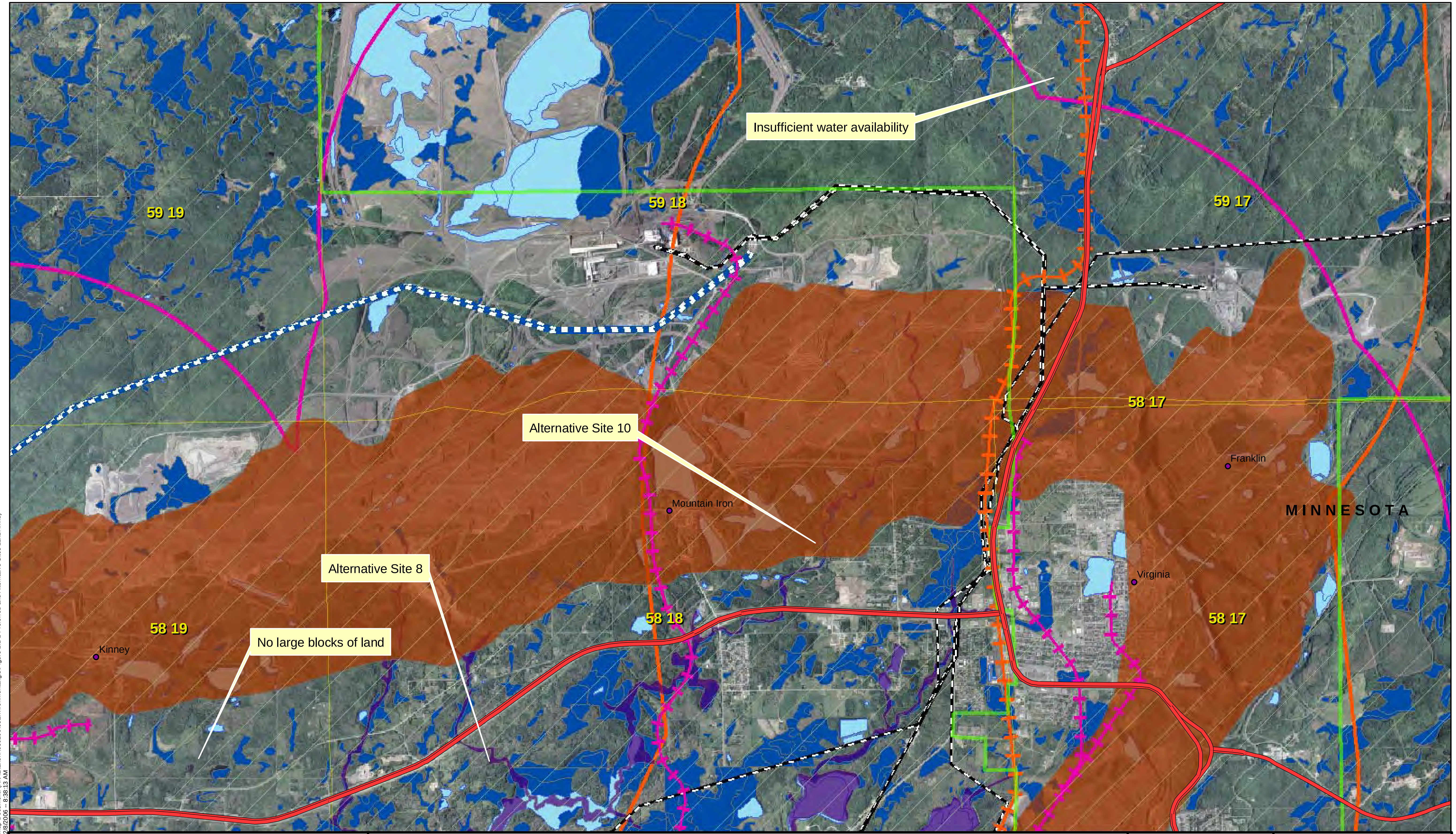
Source: ESRI, Excelsior Energy, and SEH.

Figure 7: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

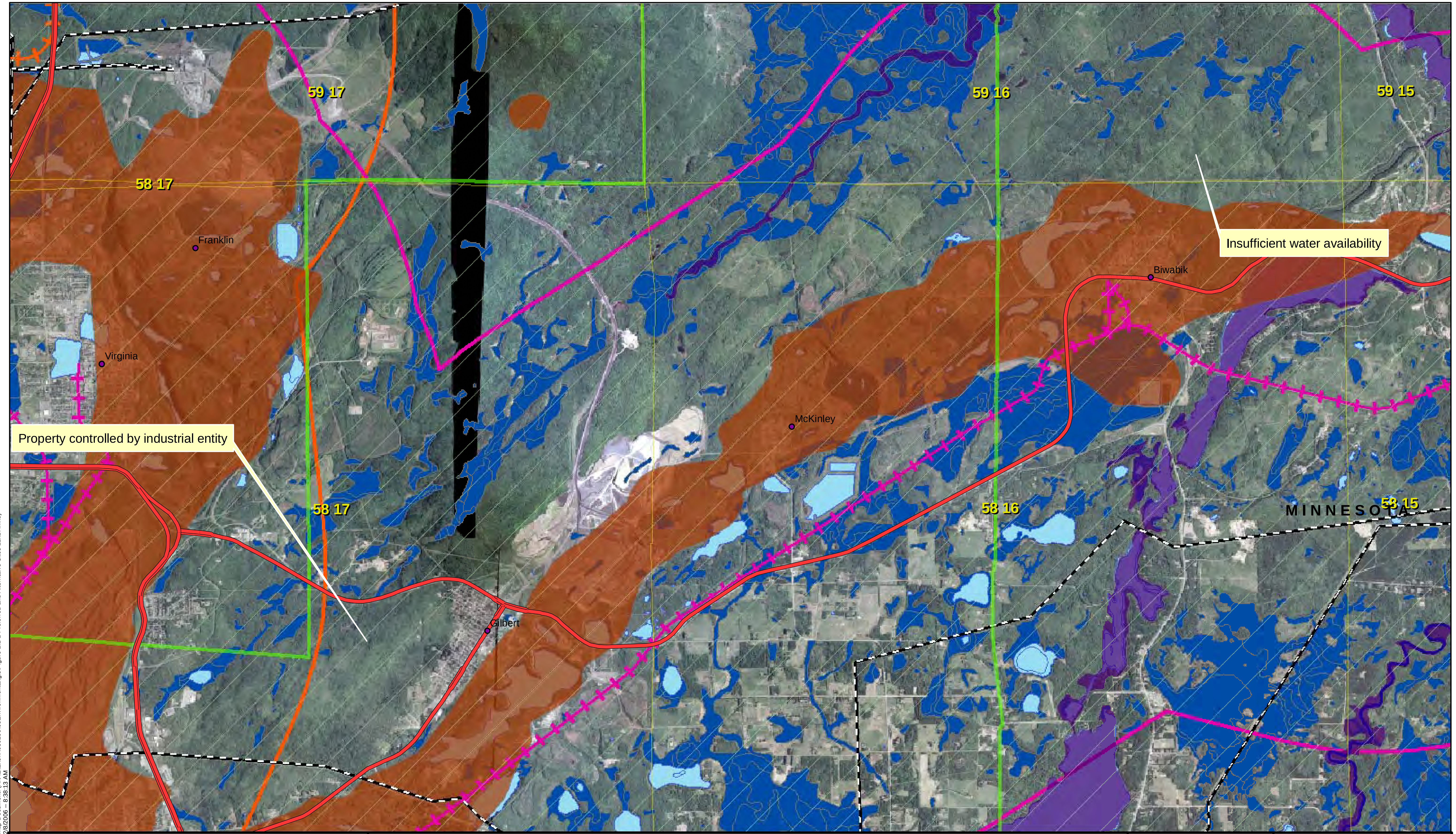
Source: ESRI, Excelsior Energy, and SEH.

Figure 8: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

Cities	BNSF Rail	HVTL_230_kV	Buffer of BNSF	Floodplains
Highways	DMIR Rail	HVTL_115_kV	Buffer of DMIR	Iron Formation
Rivers	DWP Rail	HVTL_345_kV	Buffer of DWP	Lakes
TTRA		HVTL_500_kV		Wetlands

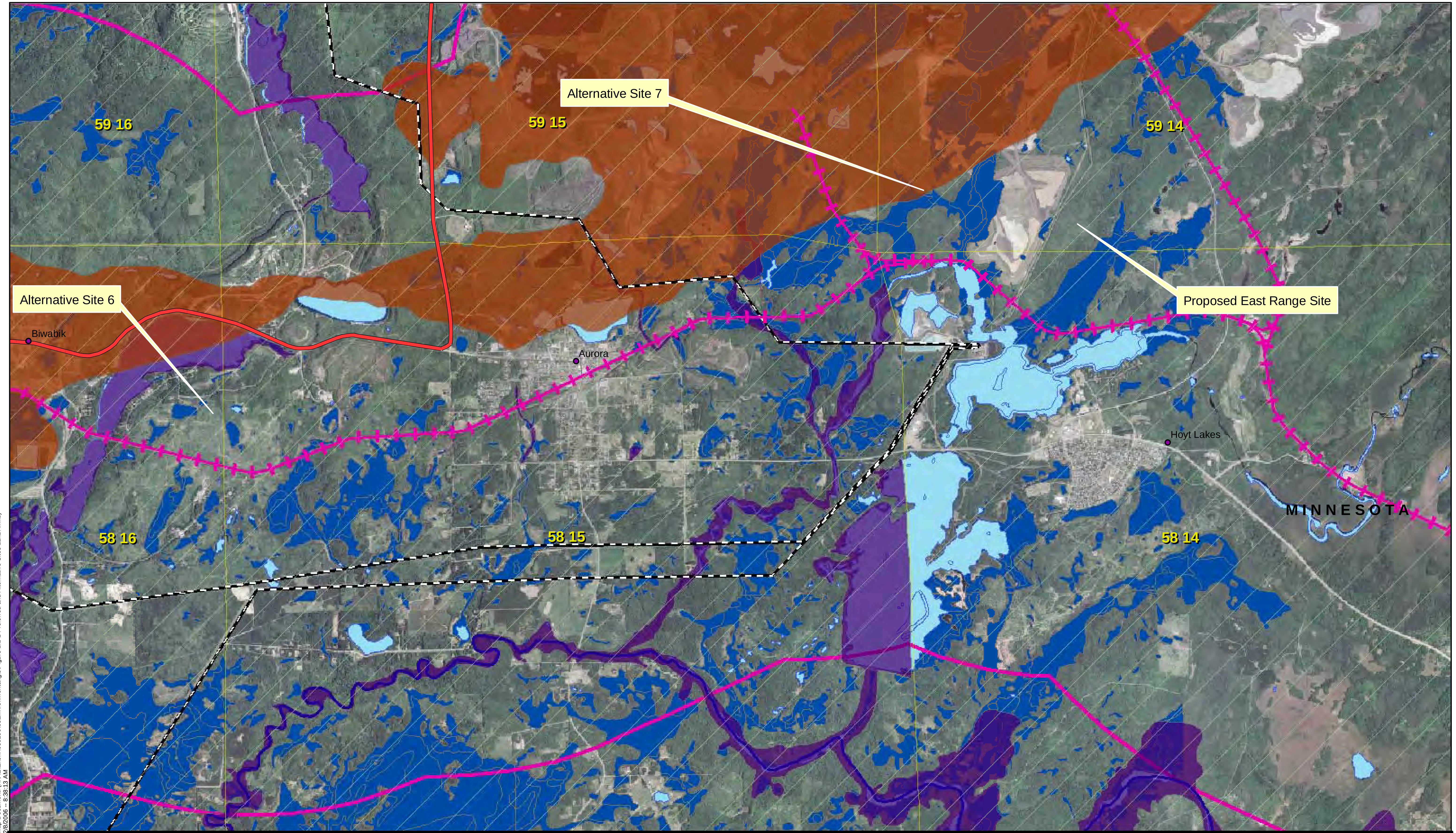
Source: ESRI, Excelsior Energy, and SEH.

Figure 9: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

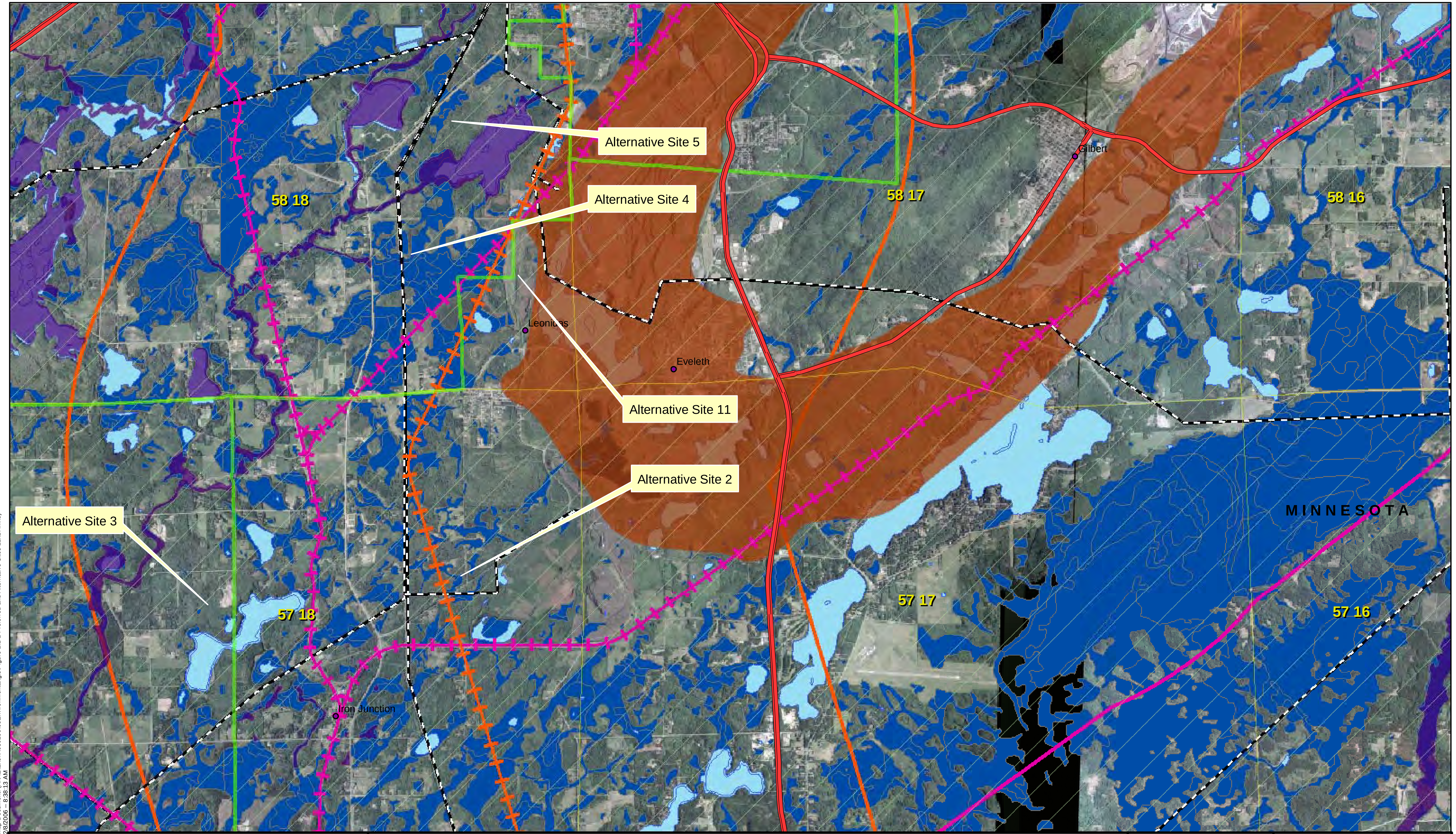
Source: ESRI, Excelsior Energy, and SEH.

Figure 10: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

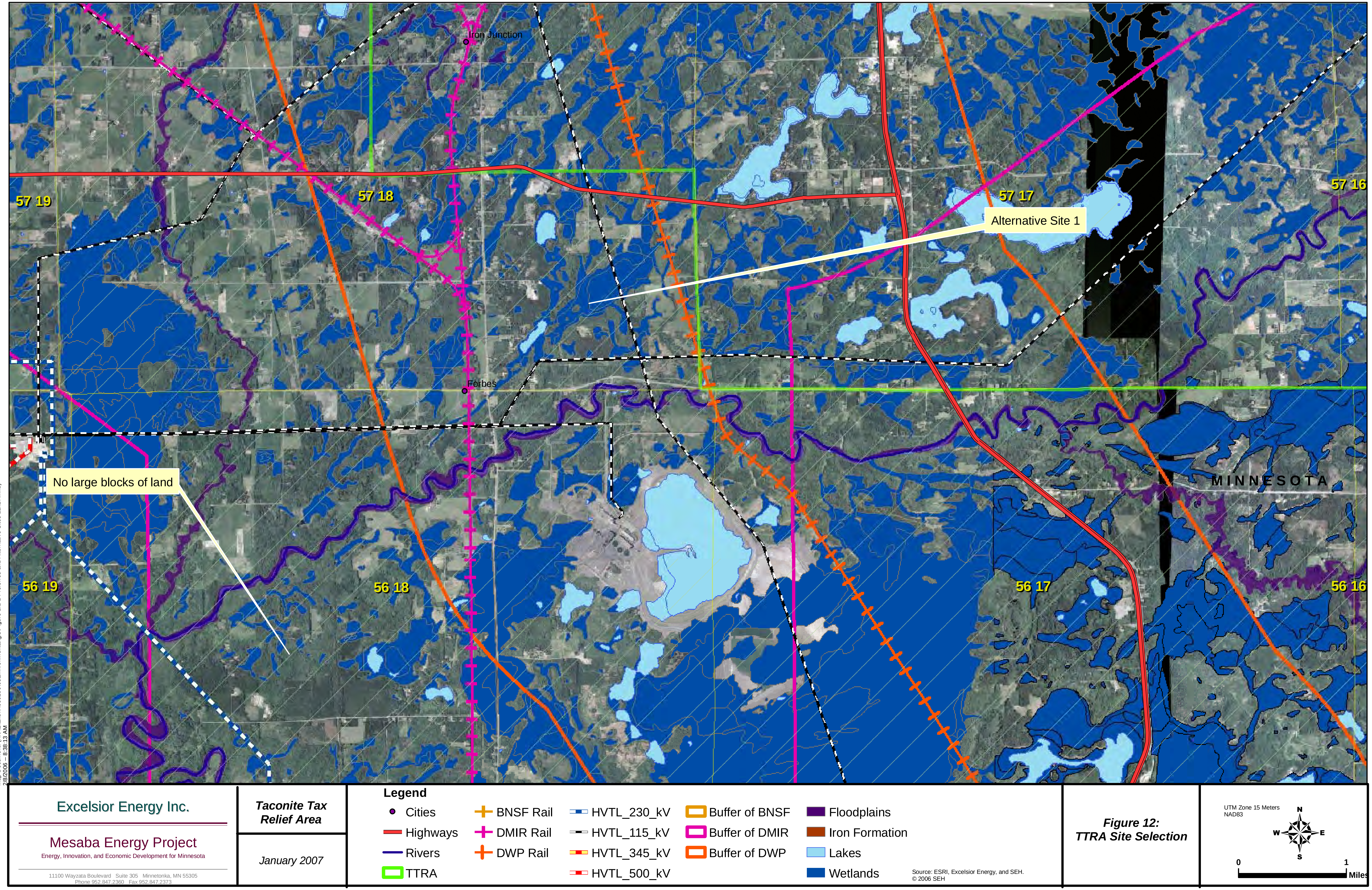
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 11: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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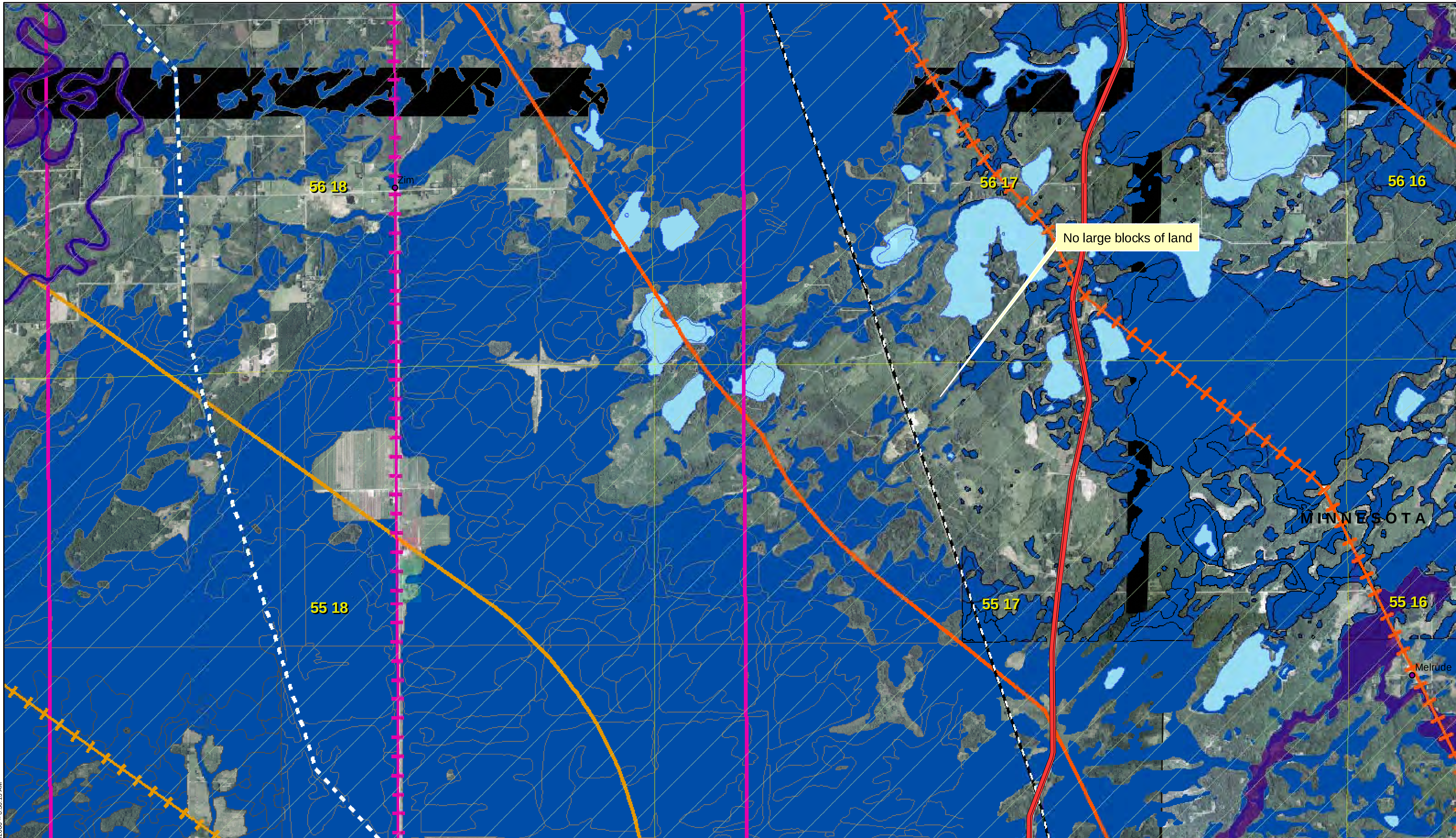
Taconite Tax Relief Area

January 2007

Figure 12: TTRA Site Selection



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Taconite Tax Relief Area

January 2007

Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

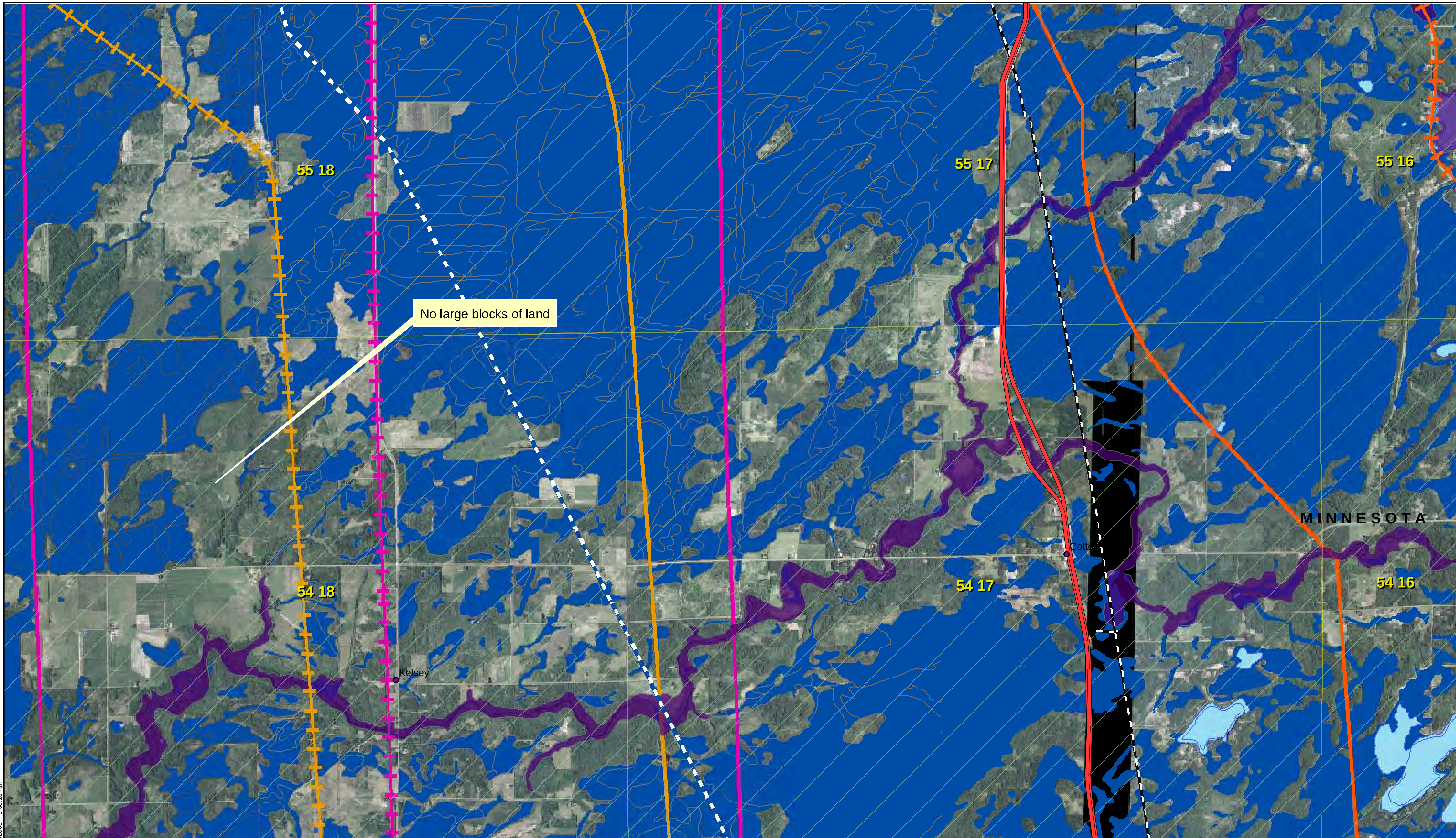
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 13: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

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- Rivers
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- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

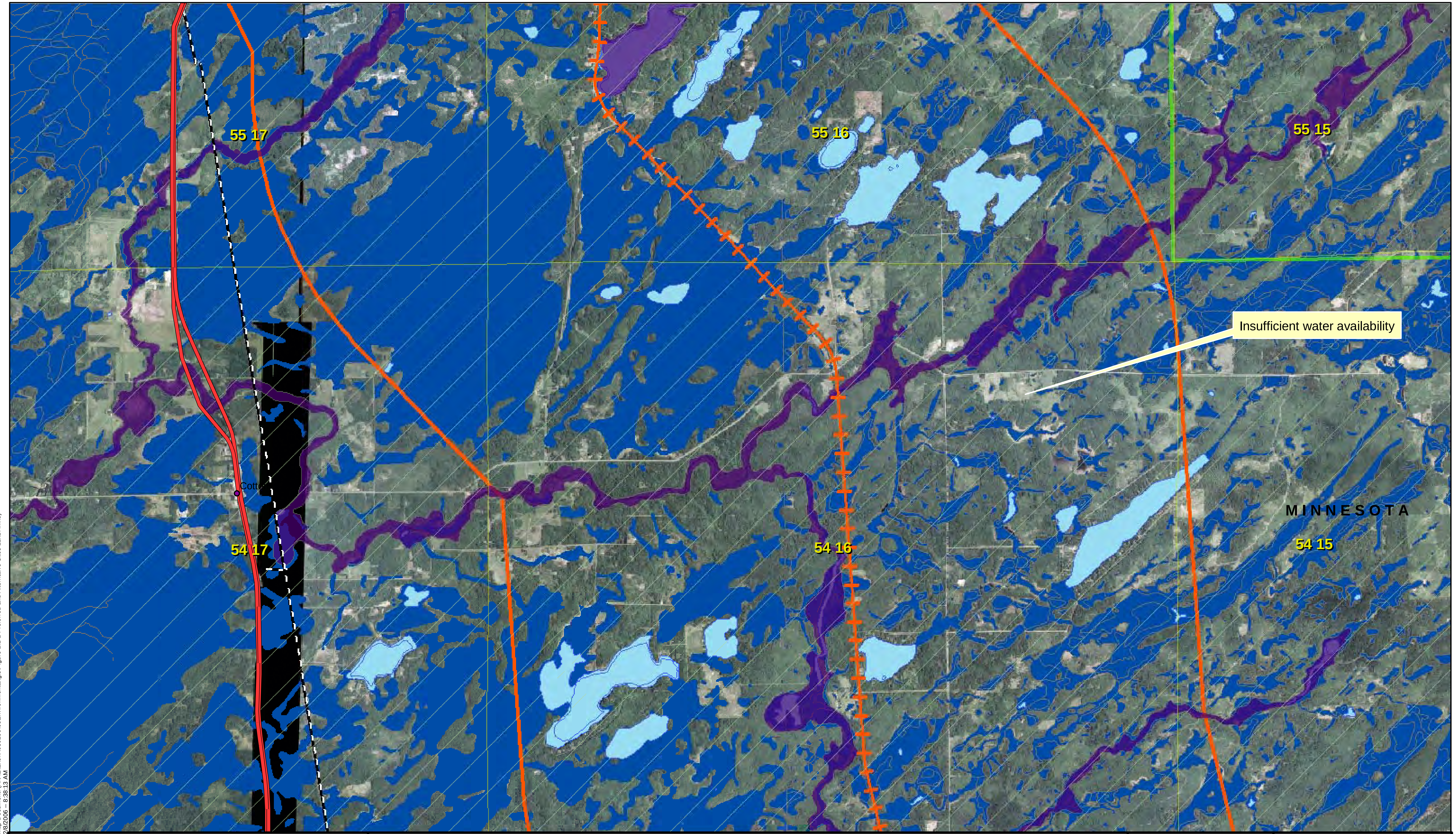
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 14: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

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- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

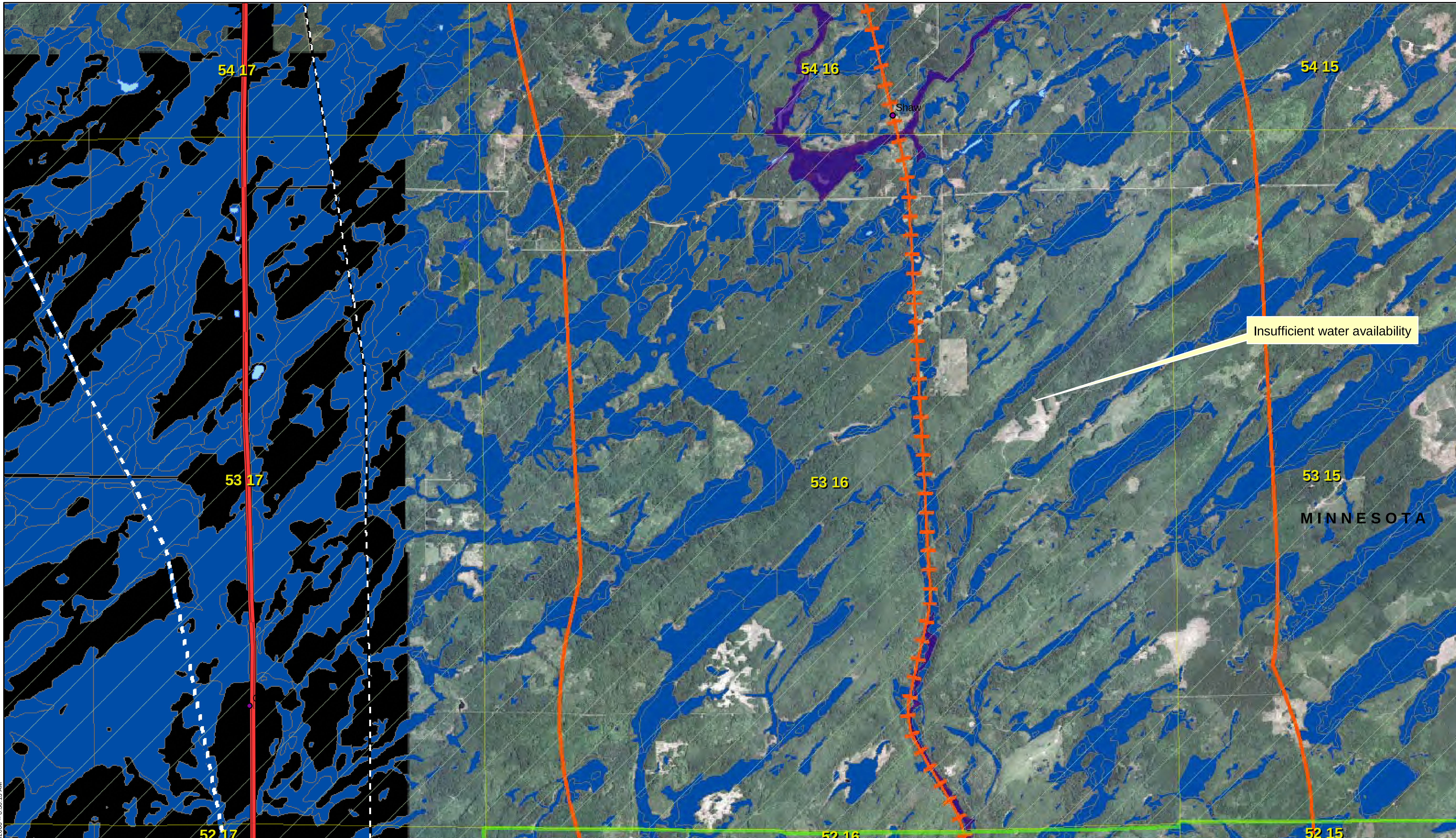
Source: ESRI, Excelsior Energy, and SEH.

Figure 15: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

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- Highways
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- BNSF Rail
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- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
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- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

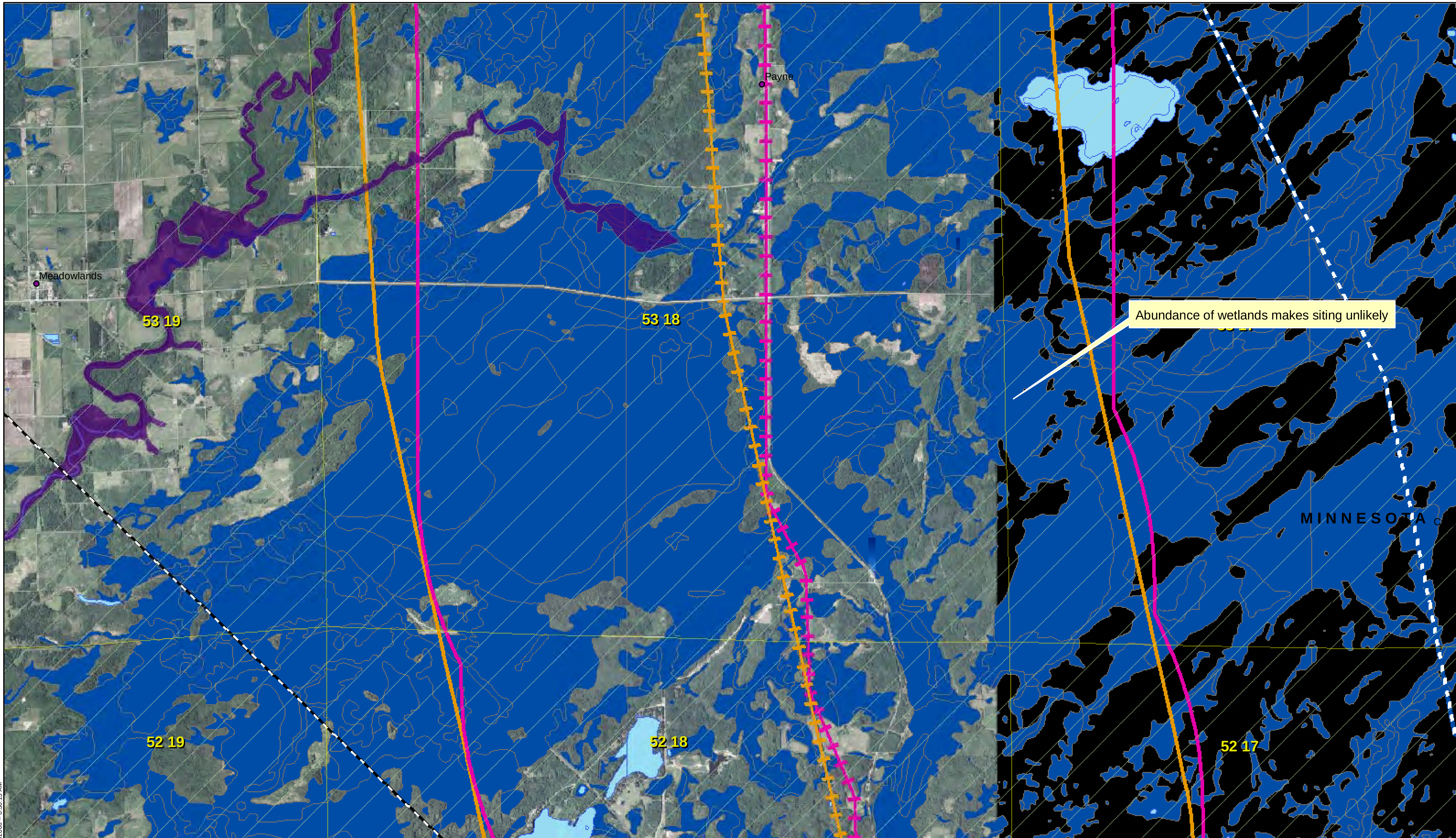
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 16: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

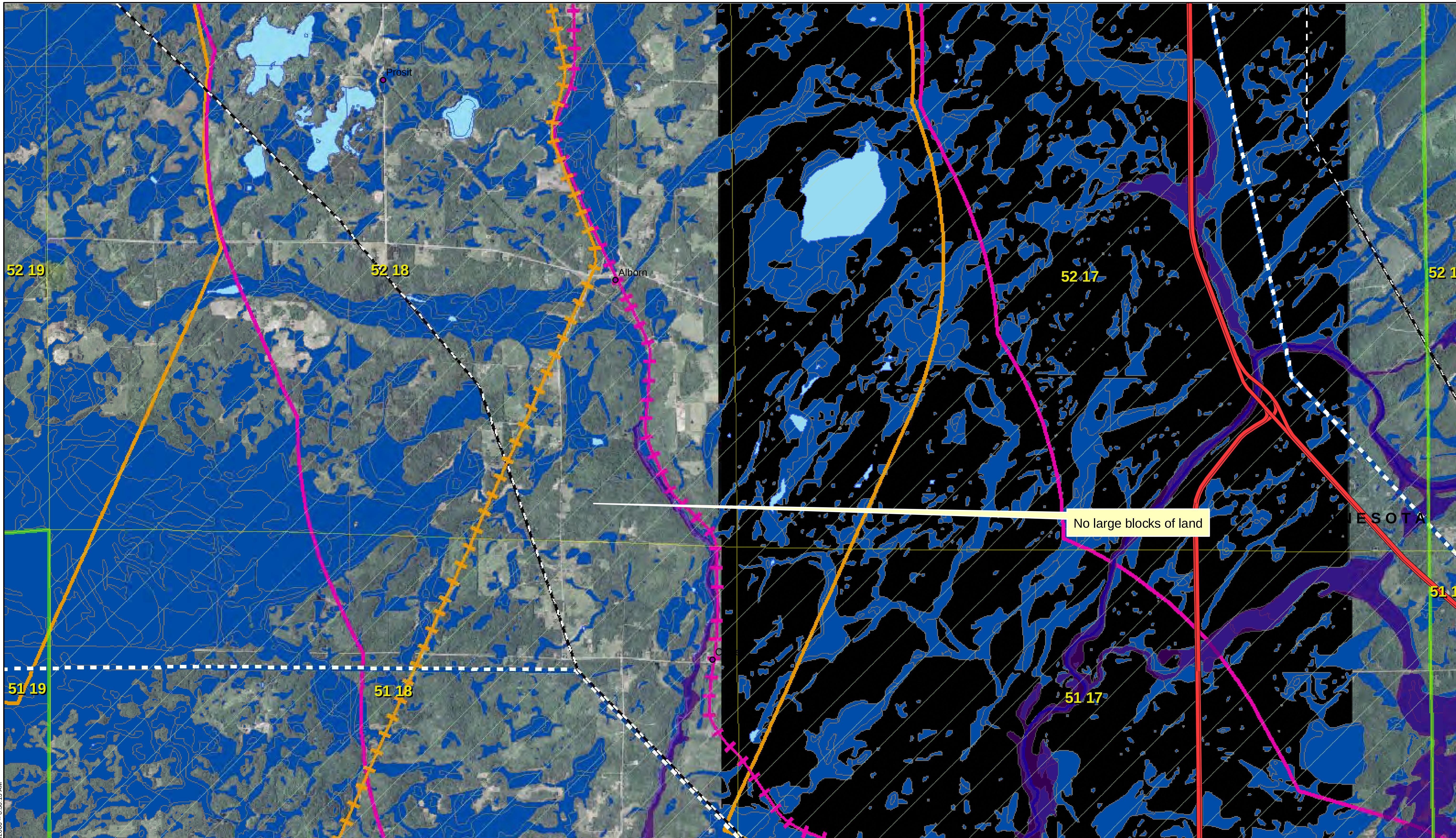
Source: ESRI, Excelsior Energy, and SEH.

Figure 17: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 18: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles

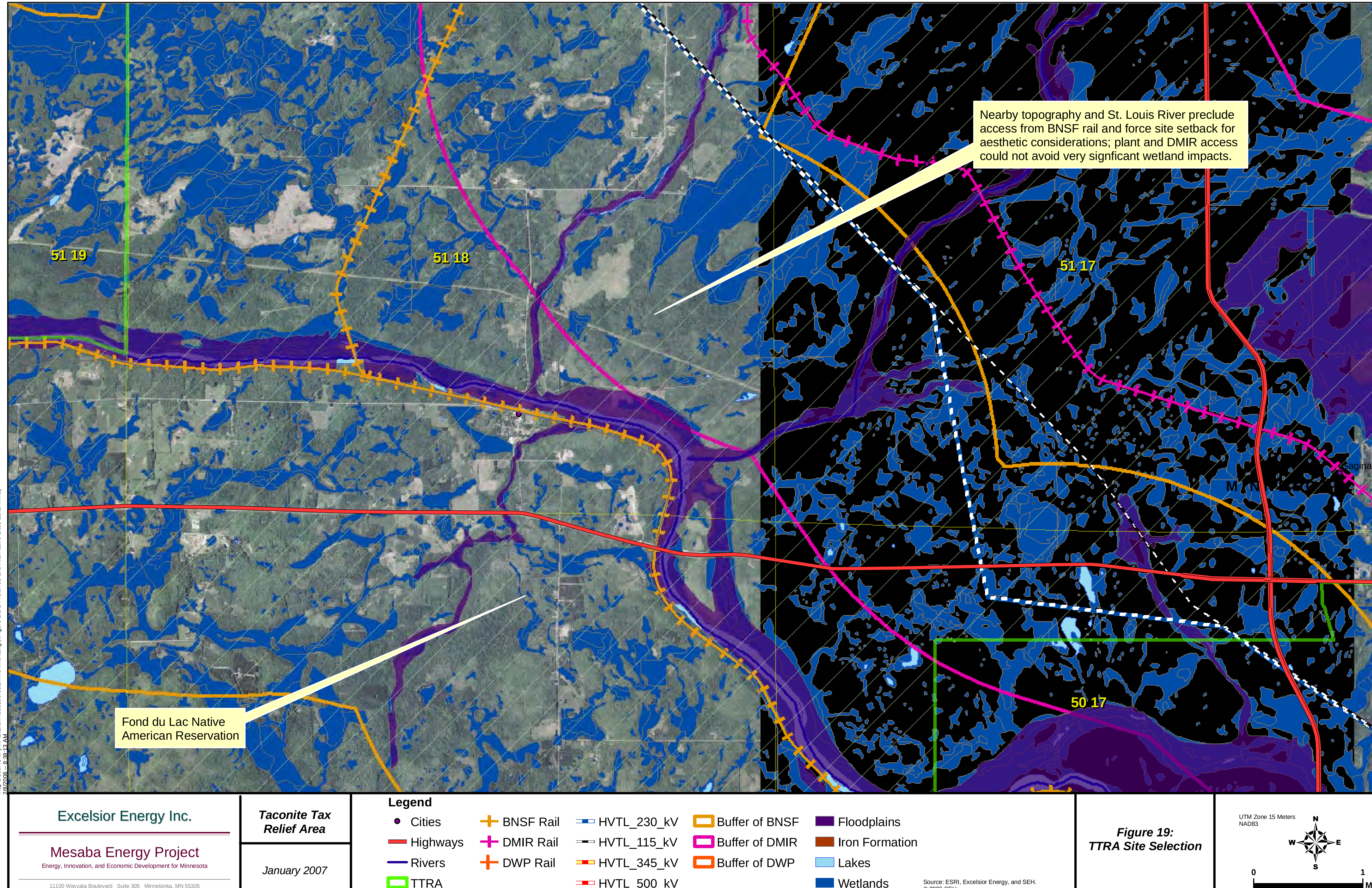

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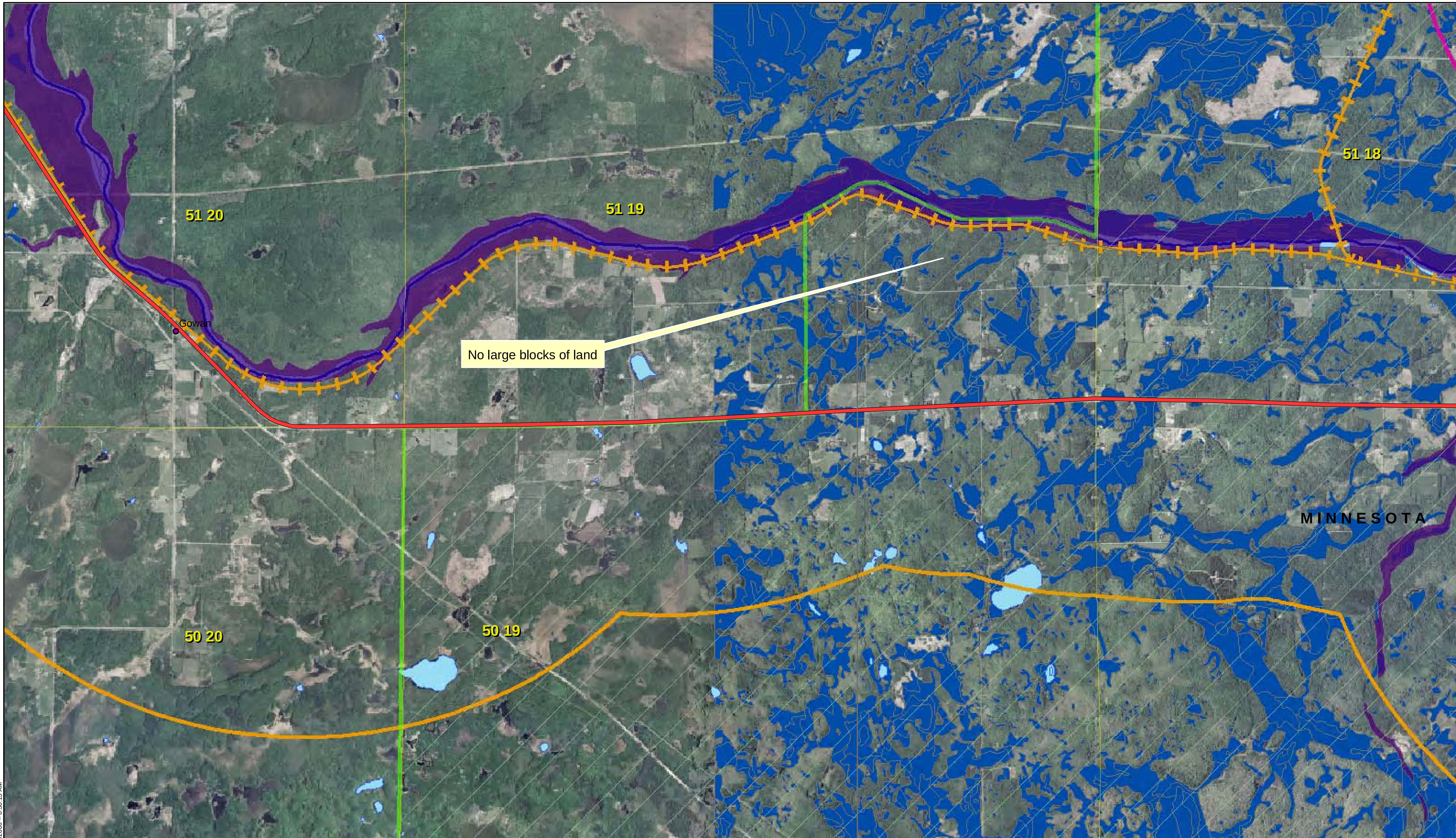
Figure 19: TTRA Site Selection



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Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

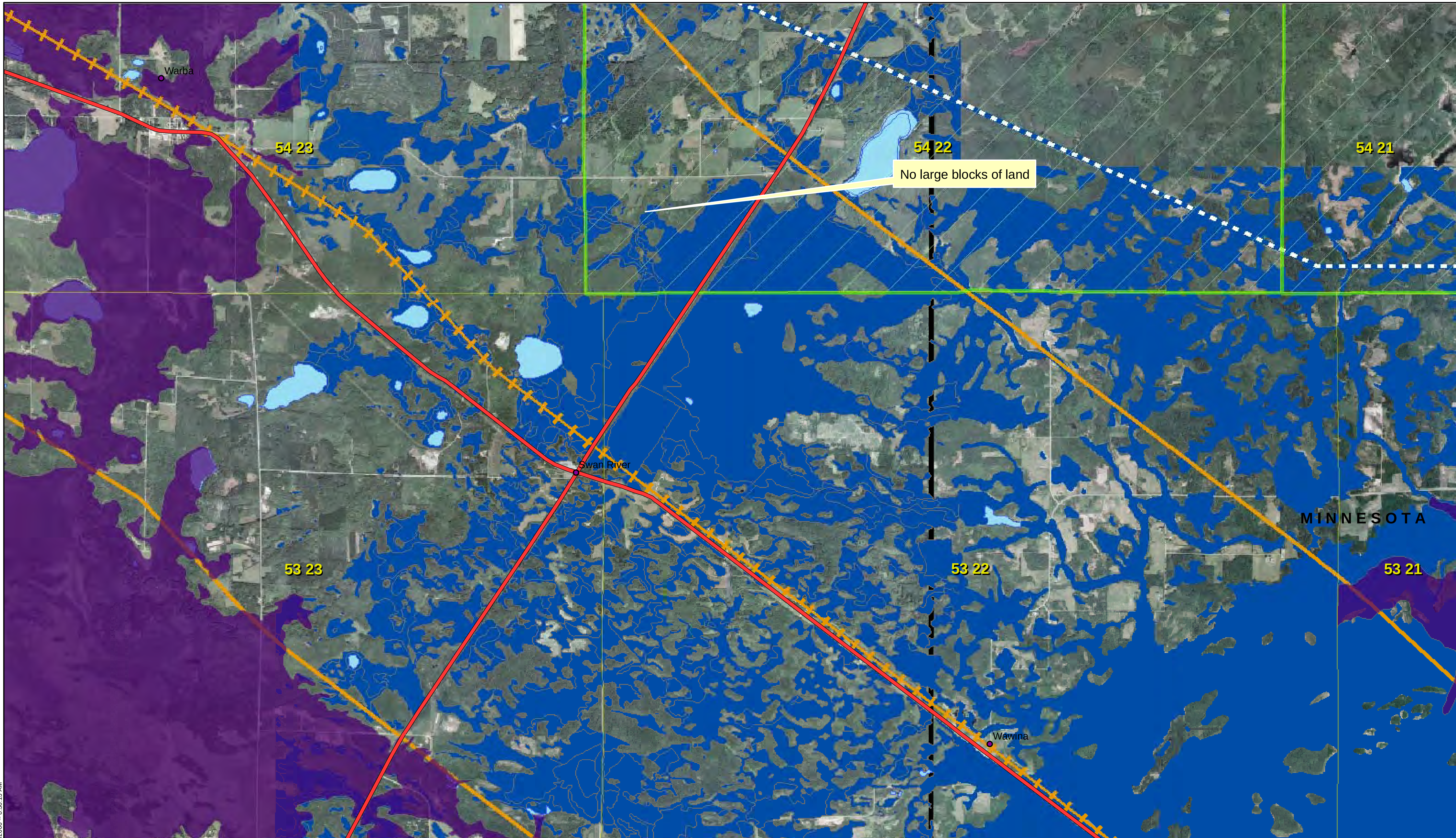
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 20: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

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Legend

- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.

Figure 21: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles

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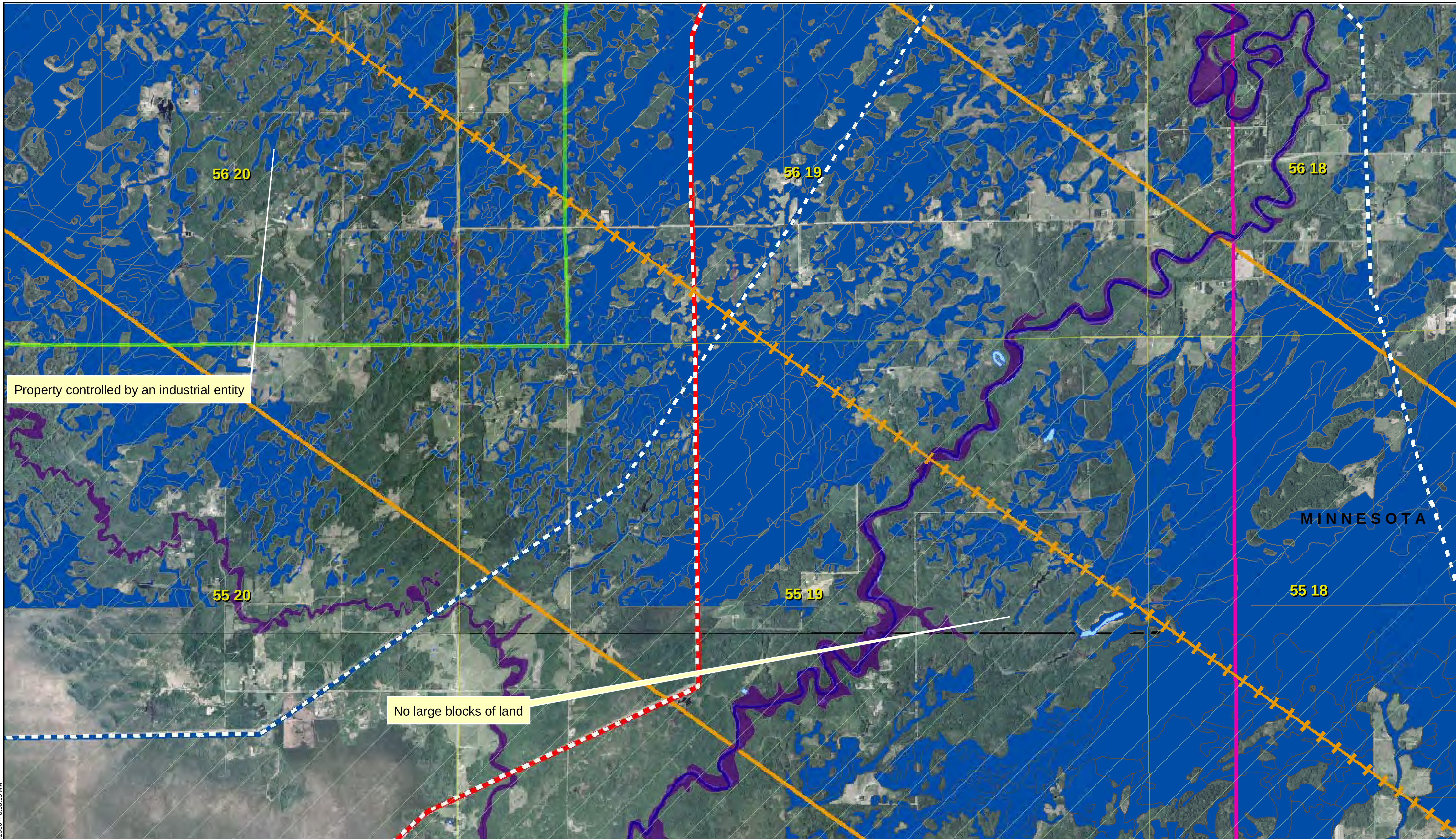

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Taconite Tax Relief Area

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- Cities
- Highways
- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

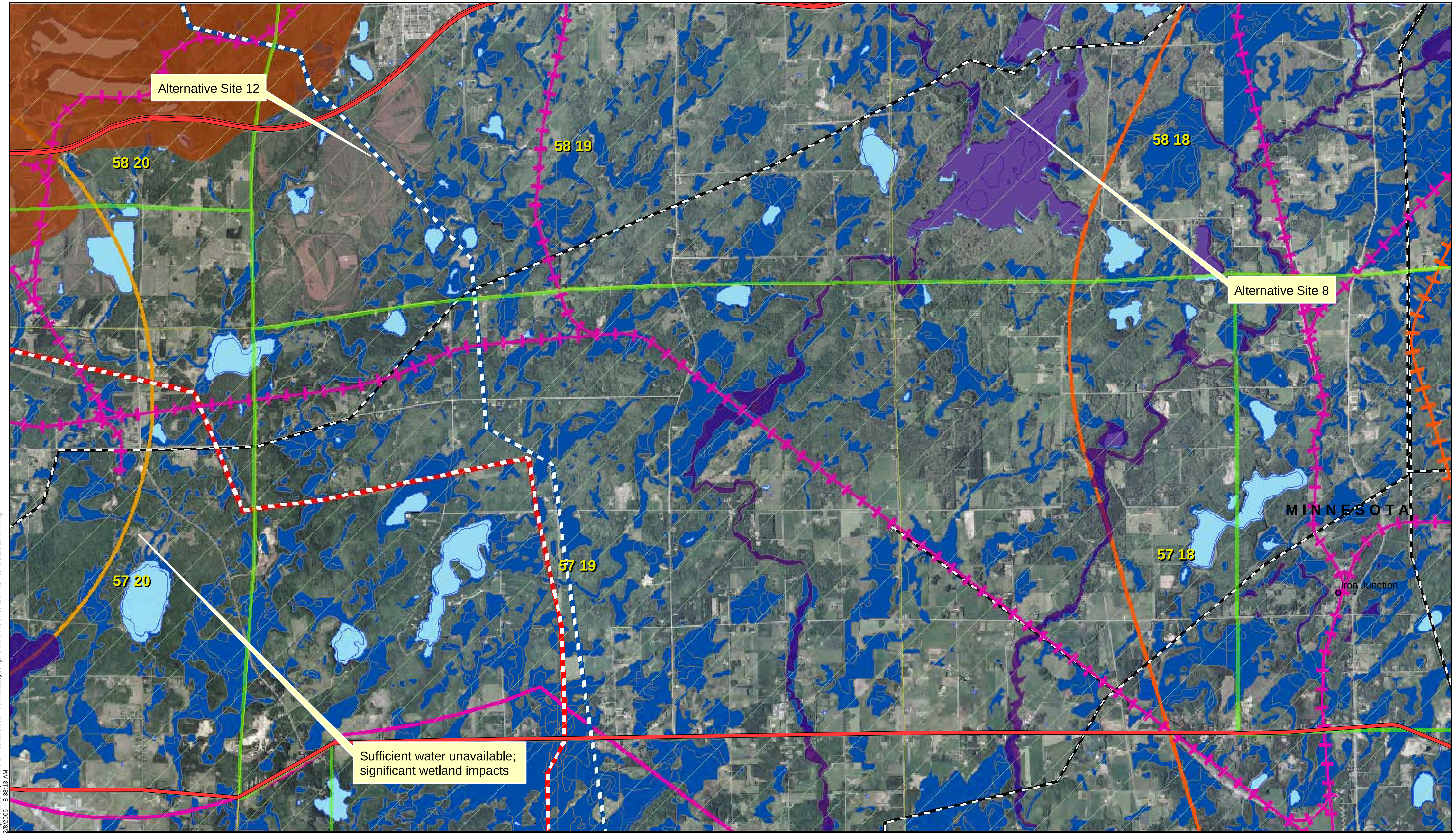
Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 22: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles



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Taconite Tax Relief Area

January 2007

Legend

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- Rivers
- TTRA
- BNSF Rail
- DMIR Rail
- DWP Rail
- HVTL_230_kV
- HVTL_115_kV
- HVTL_345_kV
- HVTL_500_kV
- Buffer of BNSF
- Buffer of DMIR
- Buffer of DWP
- Floodplains
- Iron Formation
- Lakes
- Wetlands

Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Figure 23: TTRA Site Selection

UTM Zone 15 Meters
NAD83

N W E S

0 1 Miles

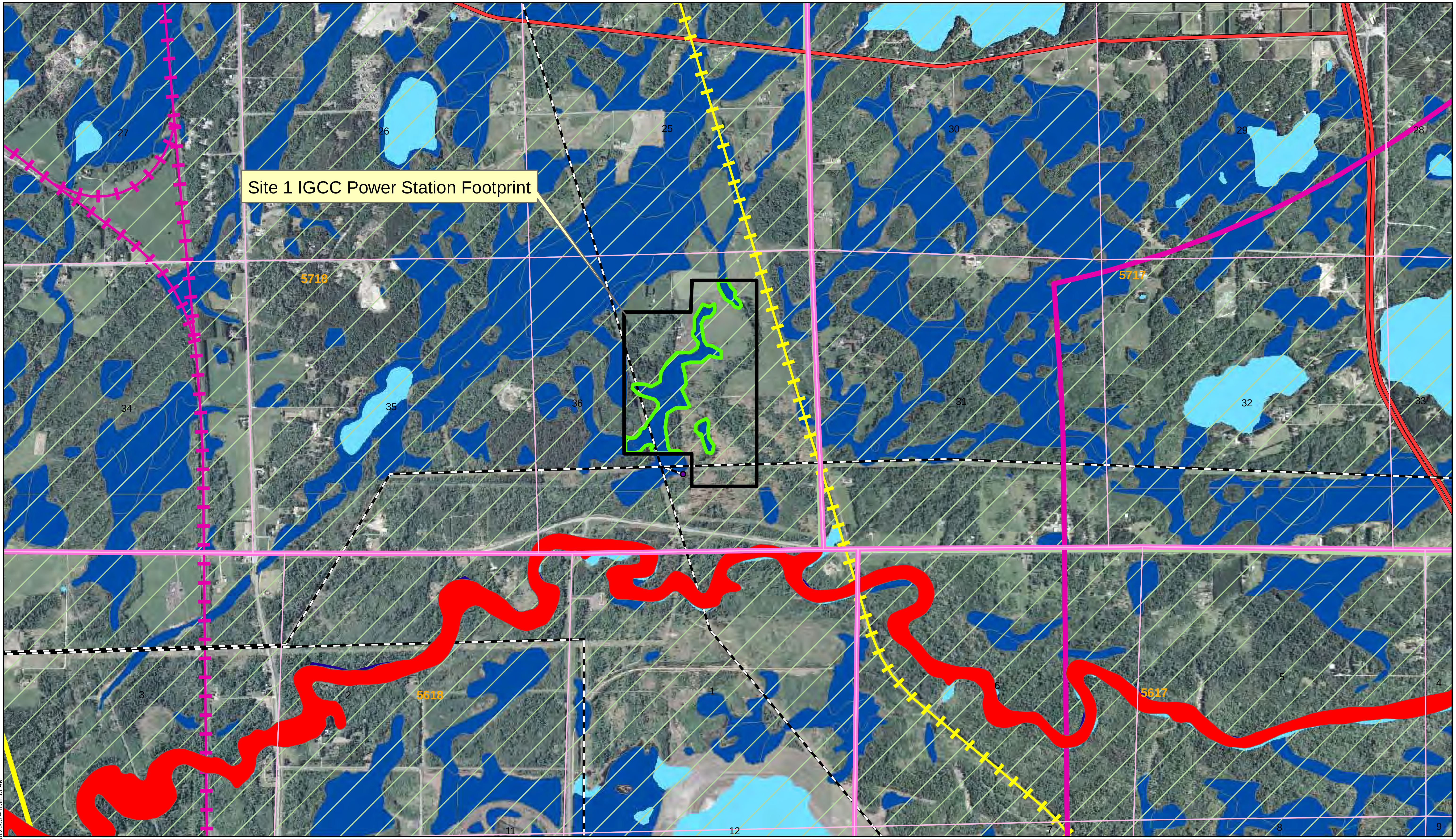

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Figure 24

January 2007

Legend

- fldwy_femapy3
- HVTL_500_kV
- HVTL_345_kV
- HVTL_115_kV
- HVTL_230_kV
- strm_majrvln2
- Buffer_of_TTRA_DMIR_4
- TTRA_DMIR
- Buffer_of_DWP_Rail
- DWP_Rail
- TTRA_CN
- TTRA_BNSF
- road_majorln3
- TTRA_Selection
- lakes
- Lower_48_Wetland_polygons

Source: ESRI, Excelsior Energy, and SEH.

Site 1 Wetland Impacts

UTM Zone 15 Meters
NAD83

N
W E
S

0 830 Feet

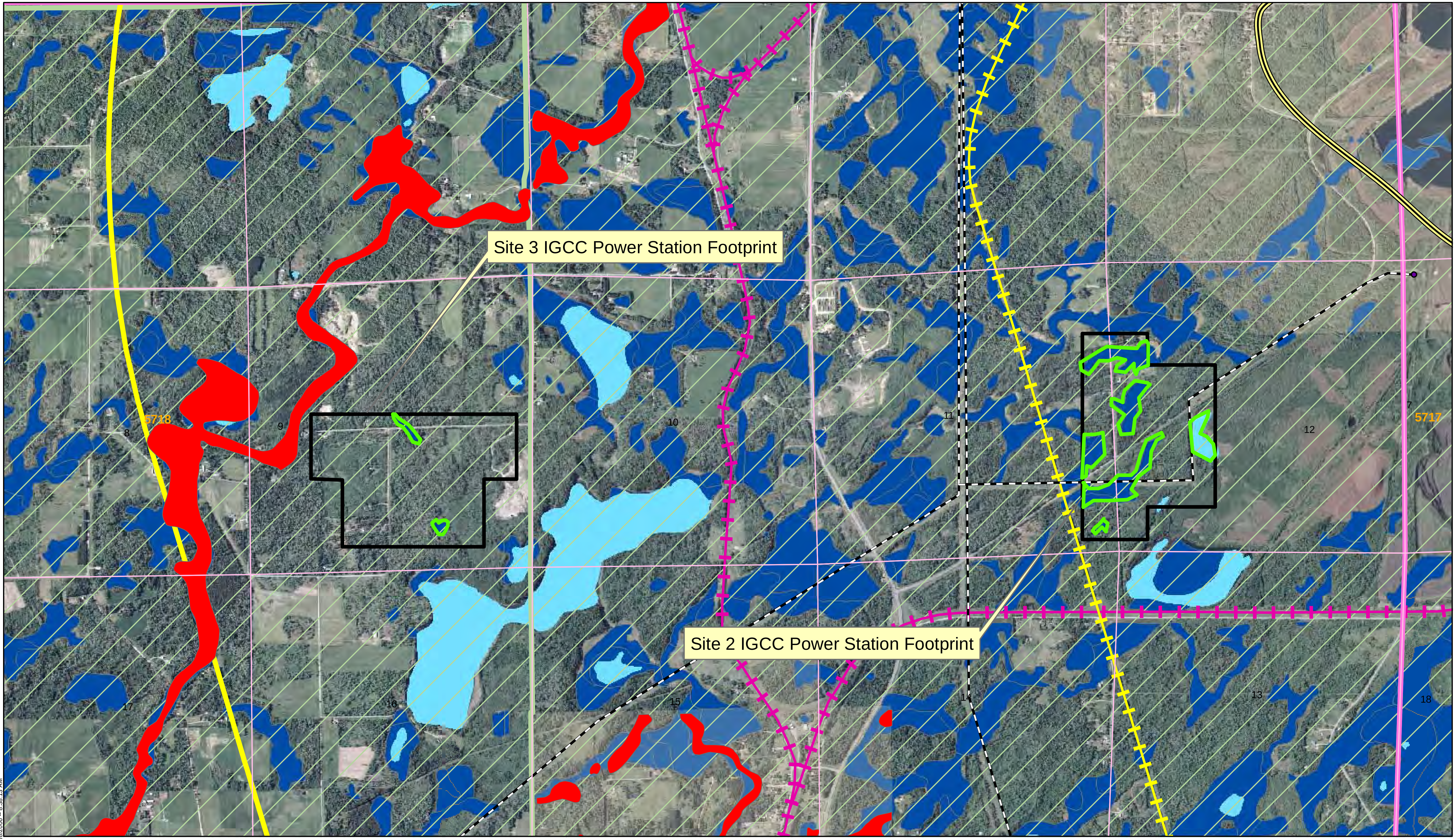

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Figure 25

January 2007

Legend

- fldwy_femapy3
- HVTL_500_kV
- HVTL_345_kV
- HVTL_115_kV
- HVTL_230_kV
- strm_majrvln2
- Buffer_of_TTRA_DMIR_4
- TTRA_DMIR
- Buffer_of_DWP_Rail
- DWP_Rail
- TTRA_CN
- TTRA_BNSF
- road_majorln3
- TTRA_Selection
- lakes
- Lower_48_Wetland_polygons

Source: ESRI, Excelsior Energy, and SEH.

Sites 2 & 3 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 830 Feet

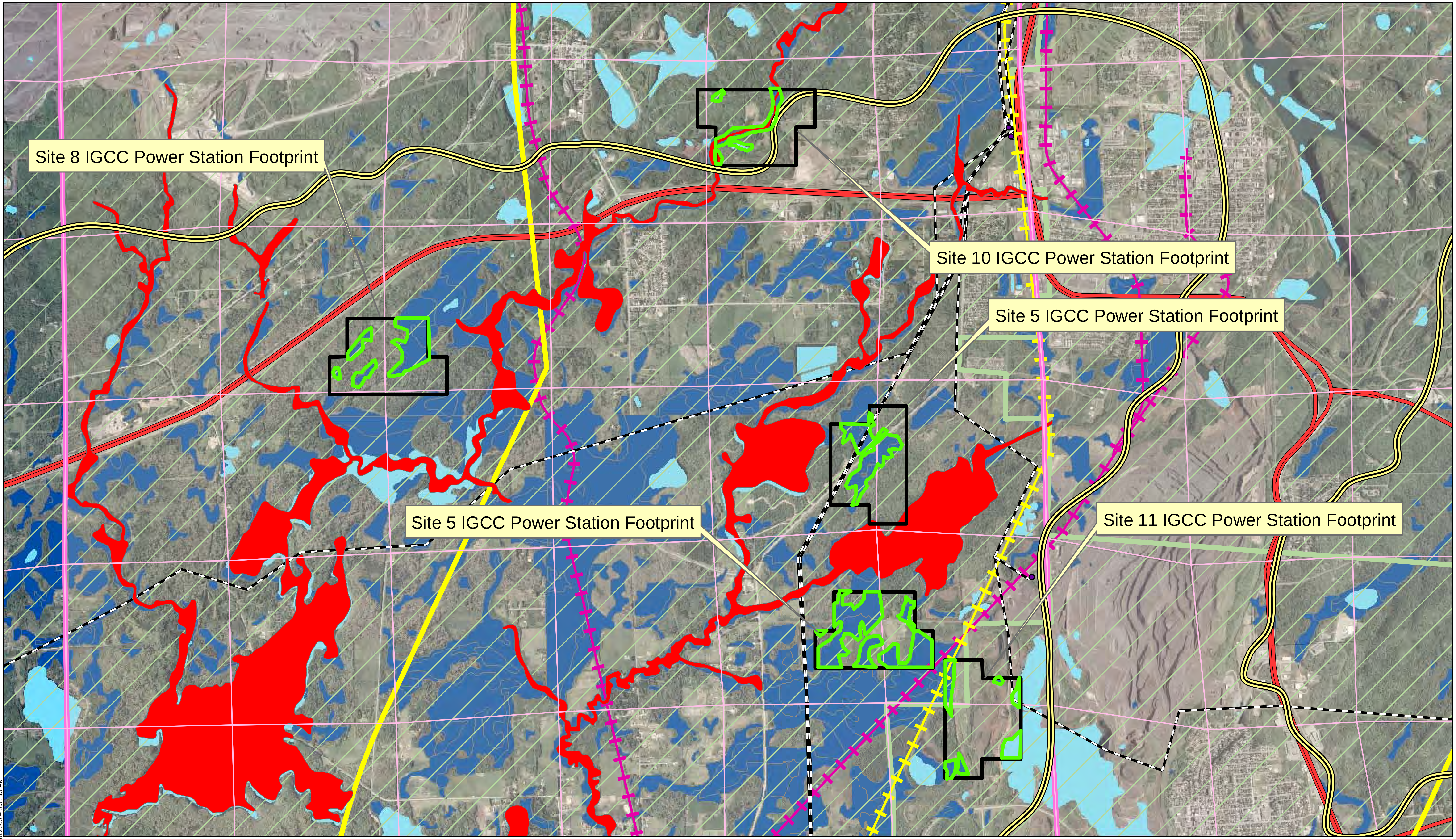

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Figure 26

January 2007

Legend

- fldwy_femapy3
- HVTL_500_kV
- HVTL_345_kV
- HVTL_115_kV
- HVTL_230_kV
- strm_majrvln2
- Buffer_of_TTRA_DMIR_4
- TTRA_DMIR
- Buffer_of_DWP_Rail
- DWP_Rail
- TTRA_CN
- TTRA_BNSF
- road_majorln3
- TTRA_Selection
- lakes
- Lower_48_Wetland_polygons

Sites 4, 5, 8, 10 & 11 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 1,500 Feet

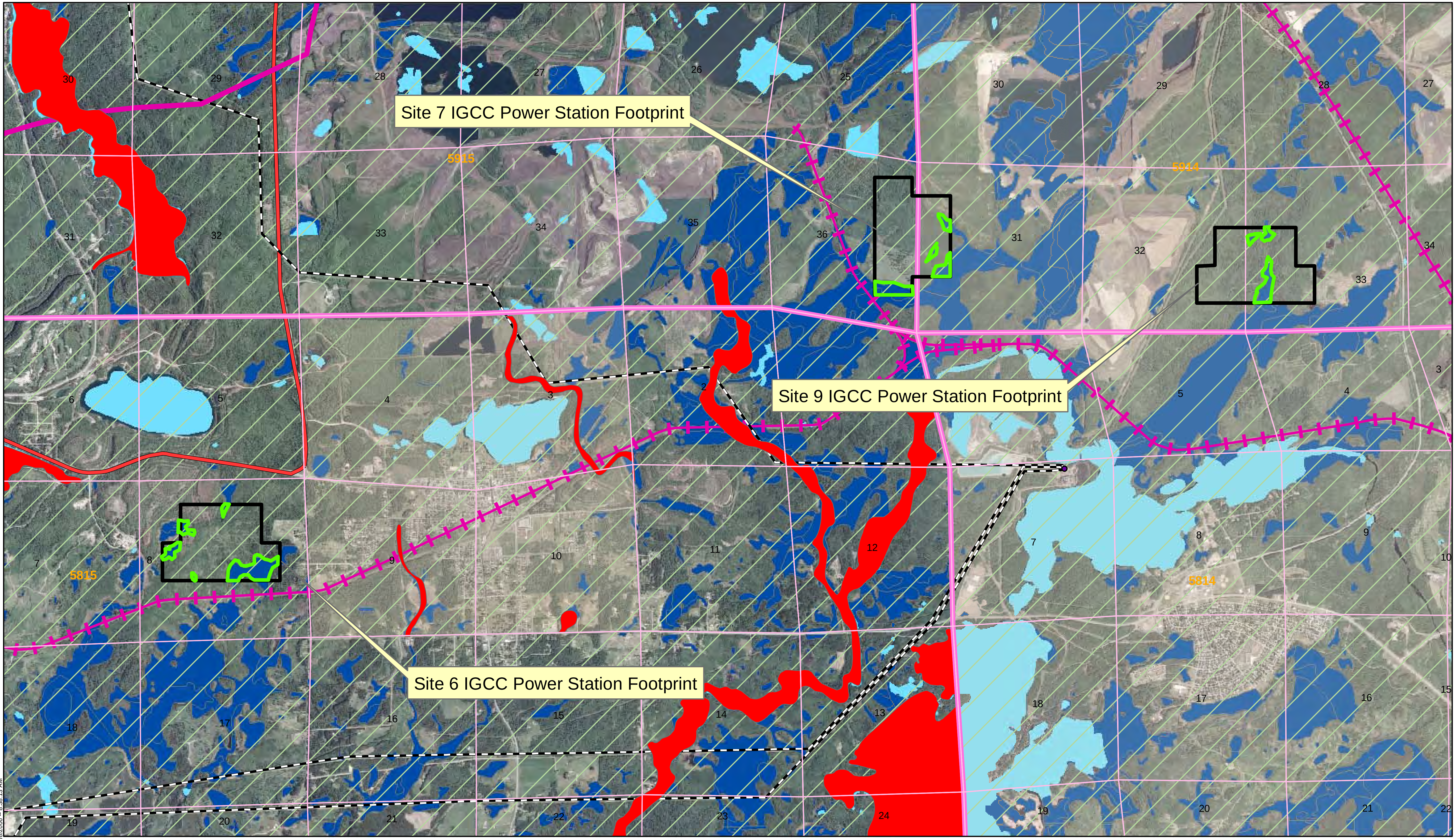

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Figure 27

January 2007

Legend

- fldwy_femapy3
- HVTL_500_kV
- HVTL_345_kV
- HVTL_115_kV
- HVTL_230_kV
- strm_majrvln2
- Buffer_of_TTRA_DMIR_4
- TTRA_DMIR
- Buffer_of_DWP_Rail
- DWP_Rail
- TTRA_CN
- TTRA_BNSF
- road_majorln3
- TTRA_Selection
- lakes
- Lower_48_Wetland_polygons

Source: ESRI, Excelsior Energy, and SEH.
© 2006 SEH

Sites 6, 7 & 9 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 1,500 Feet

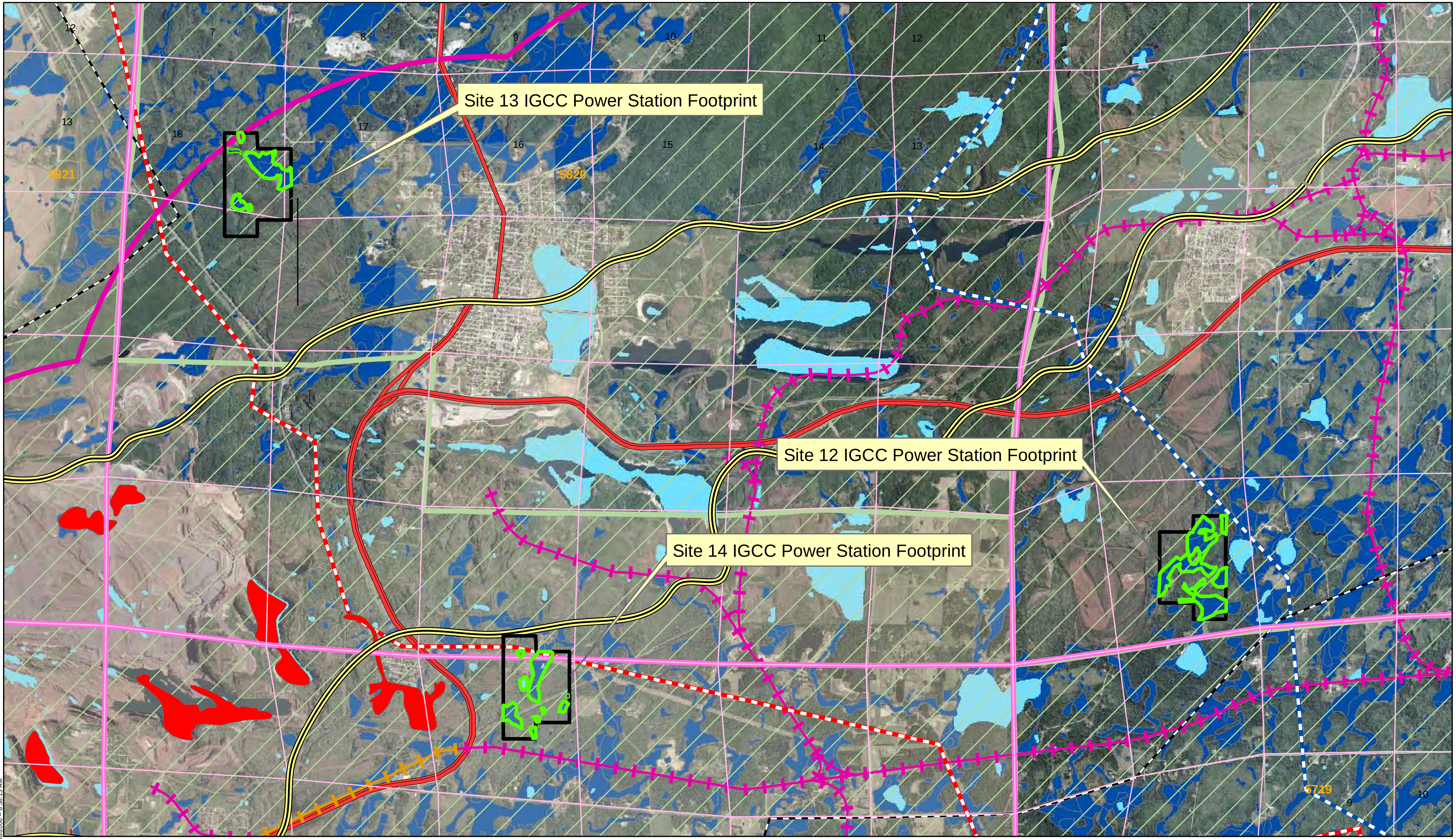

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Figure 28

January 2007

Legend

- fldwy_femapy3
- HVTL_500_kV
- HVTL_345_kV
- HVTL_115_kV
- HVTL_230_kV
- strm_majrvln2
- Buffer_of_TTRA_DMIR_4
- TTRA_DMIR
- Buffer_of_DWP_Rail
- DWP_Rail
- TTRA_CN
- TTRA_BNSF
- road_majorln3
- TTRA_Selection
- lakes
- Lower_48_Wetland_polygons

Source: ESRI, Excelsior Energy, and SEH.
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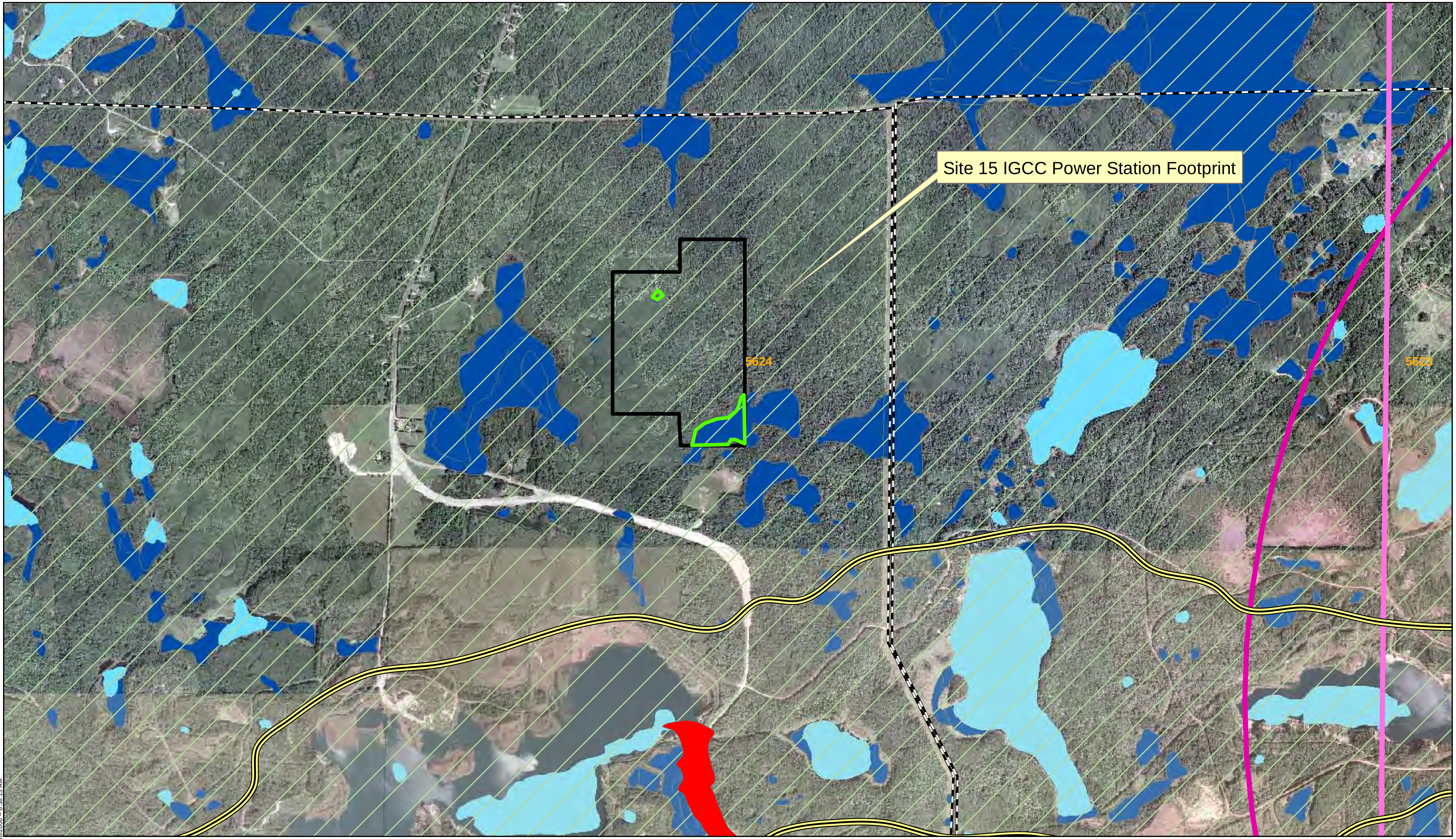
Site 12, 13 & 14 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 1,800 Feet



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

Figure 29

January 2007

Legend

- fldwy_femapy3
- HVTL_500_kV
- HVTL_345_kV
- HVTL_115_kV
- HVTL_230_kV
- strm_majrvln2
- Buffer_of_TTRA_DMIR_4
- TTRA_DMIR
- Buffer_of_DWP_Rail
- DWP_Rail
- TTRA_CN
- TTRA_BNSF
- road_majorln3
- TTRA_Selection
- lakes
- Lower_48_Wetland_polygons

Source: ESRI, Excelsior Energy, and SEH.

Site 15 Wetland Impacts

UTM Zone 15 Meters
NAD83

N W E S

0 830 Feet

APPENDIX F2
Floodplain and Wetlands Assessment

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Table of Contents

F2.1 REGULATORY BACKGROUND

Executive Order 11988 *Floodplain Management* directs each Federal agency to evaluate the potential effects of its actions on floodplains and to ensure that flood hazards and floodplain management are considered in its planning programs. Executive Order 11990 *Protection of Wetlands* directs all Federal agencies to consider wetlands protection in decision making and to evaluate the potential impacts of any new construction proposed in a wetland. As stated in these Executive Orders, Federal agencies shall avoid direct or indirect support of development in a floodplain or new construction in a wetland wherever there is a practicable alternative. Department of Energy (DOE) requirements with respect to Executive Orders 11988 and 11990 are found in Title 10, Code of Federal Regulations (CFR) Part 1022, *Compliance with Floodplain and Wetland Environmental Review Requirements*.

Pursuant to 10 CFR 1022.11, DOE shall determine whether the Proposed Action would be located within a base floodplain (100-year) or critical action floodplain (500-year) and/or a wetland. In order to determine whether a Proposed Action would be located within a base or critical action floodplain, information available relative to site conditions from the following sources, as appropriate, would be reviewed: Flood Insurance Rate Maps (FIRM) or Flood Hazard Boundary Maps prepared by the Federal Emergency Management Agency (FEMA), information from a land-administering agency (e.g., Bureau of Land Management) or from other government agencies with floodplain-determination expertise [e.g., U.S. Army Corps of Engineers (USACE), Natural Resources Conservation Service (NRCS)], information contained in safety basis documents as defined at 10 CFR Part 830, and DOE environmental documents [e.g., National Environmental Policy Act (NEPA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documents]. To determine whether a Proposed Action would be located within a wetland, information available relative to site conditions from the following sources, as appropriate, would be reviewed: USACE “Wetland Delineation Manual” Wetlands Research Program Technical Report Y-87-1 (January 1987) or successor document, U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) or other government-sponsored wetland or land use inventories, NRCS Local Identification Maps, U.S. Geological Survey Topographic Maps, and DOE environmental documents (e.g., NEPA and CERCLA documents). If there is no floodplain/wetland impact identified, the action may proceed without further consideration of the remaining procedures set forth below.

If a Proposed Action is located in or affects floodplains or wetlands, a floodplain/wetlands assessment shall be undertaken. DOE shall prepare the floodplain or wetland assessment concurrent with and included in the appropriate NEPA document to be used as a basis for determining floodplain and/or wetland impacts which may result from the implementation of a Proposed Action. In accordance with 10 CFR 1022.13, assessments shall consist of a description of the Proposed Action including a map showing its location with respect to the floodplain and/or wetland as well as a discussion of its positive and negative, direct and indirect, and long- and short-term impacts on the floodplain/wetland. In addition the assessment shall consider alternatives to the Proposed Action that avoid adverse impacts (including alternate sites, alternate actions, and no action) and evaluate measures that mitigate the adverse effects of actions in a floodplain or wetland.

Per DOE NEPA regulations, this Floodplain and Wetlands Assessment was written in support of an EIS for the Mesaba Energy Project. If DOE determines that there is no practicable alternative to implementing the Proposed Action in a floodplain, then a statement of findings must be prepared and can be included in the Final EIS (FEIS). The statement of findings (10 CFR 1022.14) shall include a brief description of the Proposed Action including a location map, an explanation indicating why the action is proposed to be located in the floodplain, a list of alternatives considered, a statement indicating whether the Proposed Action conforms to applicable floodplain protection standards, and a brief description of steps to be taken to minimize potential harm to or within the floodplain.

F2.2 PROJECT DESCRIPTION

As described in Section 1.3 of the EIS, DOE's Proposed Agency Action is to provide a total of $36 million in co-funding through a cooperative agreement with Excelsior Energy, Inc. to demonstrate technologies under the Clean Coal Power Initiative (CCPI) Program. Excelsior proposes to design, construct, and operate the Mesaba Energy Project, which is a two-phased nominal 606 $MWe_{[net]}$ (1,212 $MWe_{[net]}$ total) Integrated Gasification Combined Cycle (IGCC) power plant to be located in northeastern Minnesota.

The DOE purpose and need for Agency Action (EIS Sections 1.4.1.2 and 1.4.2.2) are to commercially demonstrate IGCC technology, which includes advanced gasification and air separation systems, feedstock flexibility, improved environmental performance characteristics, and improved thermal efficiency. Excelsior's purpose and need for the proposed project are described in EIS Section 1.4.1.1 and 1.4.2.1 and Appendix F1. The proposed IGCC power plant would be designed for long-term commercial operation following a 12-month minimum demonstration period. The project would represent Phase I of a proposed two-phased Mesaba Generating Station; however, the EIS considers both phases of the proposed power plant as connected actions. DOE may also provide a loan guarantee pursuant to the Energy Policy Act of 2005 for a portion of the private sector financing of the project. As described in EIS Section 2.1.1.2, DOE's decision in the EIS relates to the co-funding of a project selected competitively in accordance with the objectives of the CCPI Program, and DOE has not participated in the identification or selection of alternative sites or corridors for the Mesaba Energy Project.

In conformance with Minnesota Rules described in EIS Section 1.5.2, Excelsior has proposed two alternative locations, the West and East Range Sites, for construction of the Mesaba Energy Project in the Taconite Tax Relief Area. Excelsior's process for screening candidate sites and selecting the potential alternative sites is described in EIS Appendix F1. Both of the sites are currently undeveloped, unoccupied, wooded lands located in the immediate vicinity of former iron ore mining operations. The West Range Site is located on approximately 1,260 acres of land owned by RGGS Land & Minerals Ltd. within the city limits of Taconite in Itasca County, Minnesota (see Figure 2.3-1 of the EIS). The East Range Site is located on approximately 810 acres of land owned by Cliffs-Erie, LLC within the western boundary of Superior National Forest and the city limits of Hoyt Lakes in St. Louis County, Minnesota (see Figure 2.3-5 of the EIS). The features of Excelsior's proposed project at the West Range Site are described and illustrated in EIS Section 2.3.1. The features at the East Range Site are described and illustrated in EIS Section 2.3.2.

F2.3 FLOODPLAIN AND WETLAND IMPACTS

This section provides a discussion of the potential impacts of the Proposed Action and alternatives, including impacts that would be associated with each of the project proponent's site alternatives.

F2.3.1 Basis for Assessing Impacts

A floodplain or wetlands assessment is required to discuss the positive and negative; direct and indirect; and long- and short-term effects of the Proposed Action on the floodplain and/or wetlands (10 CFR 1022.13(a)(2)). In addition, the effects on lives and property and on natural and beneficial values of floodplains must be evaluated. For actions taken in wetlands, the assessment should evaluate the effects of the Proposed Action on the survival, quality, and function of the wetlands. If DOE finds no practicable alternative to locating activities in floodplains or wetlands, DOE must design or modify its actions to minimize potential harm to these resources (10 CFR 1022.14(a)).

For the purposes of this Floodplain and Wetlands Assessment, the region of influence for direct impacts to floodplains and wetlands includes the areas of land disturbance. The region of influence for indirect impacts includes those floodplain and wetland areas adjacent to locations that would experience direct impacts. For the Mesaba Energy Project, indirect impacts are expected to be of lesser consequence than direct impacts, because all land disturbing activities would be performed in accordance with appropriate regulatory requirements and BMPs for sediment and erosion control and pollution prevention. Of most importance for avoiding or minimizing impacts on floodplains and wetlands is the careful pre-planning of activities and investigations that aim to identify and assess potential impacts before they occur.

The potential for a Proposed Action to have an adverse impact on floodplains and wetlands has been evaluated by DOE based on whether the Proposed Action located at either alternative site would cause any of the conditions listed in Table F2-1.

Table F2-1. Approach to Impact Assessment

Resource	Basis for Assessing Adverse Impact
Floodplains	Cause construction of aboveground facilities in or otherwise impede or redirect flows in the 100-year floodplain or other flood hazard areas that would adversely affect the qualities or functions of jurisdictional floodplains. Substantially alter flood water discharges and adversely affect drainage patterns, flooding, and/or erosion and sedimentation causing risk to human lives and property.
Wetlands	Cause construction in (dredging or filling of) wetlands or otherwise alter drainage patterns that would adversely affect the qualities or functions of jurisdictional wetlands.

F2.3.2 Floodplains

For the purposes of this assessment, the DOE No Action Alternative is assumed to be equivalent to a "No Build" Alternative (see EIS Section 2.1.1.2). Under the No Action Alternative, there would be no changes to water resources in the project area and floodplains would continue to function in their current form.

Although for its Proposed Action, DOE has not participated in the identification or selection of alternative sites or corridors for the Mesaba Energy Project, DOE evaluated the comparative impacts of Excelsior's proposed project at two alternative sites in the EIS and in this floodplain assessment. The following subsections provide descriptions of potential impacts to floodplains associated with both of Excelsior's site alternatives under consideration for the Proposed Action. The locations of floodplain areas were determined with the use of FEMA Flood Insurance Rate Maps (see EIS Sections 3.6.2.1 and 3.6.2.2 for information on the specific FEMA Flood Insurance Rate Maps that were consulted). Maps showing the locations of floodplains in relation to the West and East Range Sites are provided in Section 3.6 (Floodplains) of this EIS (Figures 3.6-1 and 3.6-2). Potential impacts of the Mesaba Energy Project are described in EIS Section 4.6.

F2.3.2.1 West Range Site Floodplain Impacts

There would be no anticipated impacts to floodplains for the West Range Site with respect to the placement of the Mesaba IGCC Power Plant, the HVTL Alternatives, the Cooling Tower Blowdown Pipelines, Segments 2 and 3 of the Process Water Supply Pipelines, potable water and sewer pipelines, or the transportation corridors because these structures would be situated outside of the boundaries of any 100-year floodplain areas. No 500-year floodplains have been identified that could be impacted by the implementation of the Proposed Action at the West Range Site. No impacts would be expected to result in any locations considered high-hazard areas (portions of riverine floodplains nearest the source of flooding that are frequently flooded and where the likelihood of flood losses and adverse impacts on the natural and beneficial values served by floodplains is greatest).

Proposed utilities that could potentially affect floodplains due to their siting within or near 100-year floodplains include: Natural Gas Pipeline Alternatives 1, 2, and 3, and the Process Water Supply Pipeline – Segment 1 (Lind Pit to Canisteo Pit). These linear corridors are described and illustrated in EIS Section 2.3.1.

West Range Natural Gas Pipeline Alternatives 1, 2, and 3

The Natural Gas Pipeline Alternatives 1, 2, and 3 would each cross at least one 100-year floodplain area. Alternative 1 would cross the Swan River and an adjacent 100-year floodplain. Alternative 2 would cross both the Swan River and the Prairie River and adjacent 100-year floodplains. Alternative 3 would cross the Prairie River and adjacent 100-year floodplains.

During the construction phase of the Mesaba Energy Project there may be some temporary impacts to the floodplain areas caused by the installation of necessary pipelines. These temporary impacts may result from the presence of construction equipment, materials stockpiles, etc. being temporarily situated within the boundaries of the 100-year floodplain areas, which could redirect flood flows during a major storm event. However, these impacts would be minimized through the use of appropriate engineering procedures and BMPs, which would ensure that river and stream flows be maintained during construction. For example, the natural gas pipelines would be directionally drilled beneath these and all other water body crossings at approximately 100 feet from the edge of each water body. This method would ensure that no permanent impacts would occur to floodplains from the placement of structures within water bodies that could divert or otherwise impede stream flows. Upon completion of construction activities within the floodway, the construction equipment and stockpiles would be removed, and contours would be restored to their original grade and seeded, stabilized, or planted with plants native to the region.

West Range Process Water Supply Pipeline – Segment 1 (Lind Pit to Canisteo Pit)

Segment 1 of the Process Water Supply Pipeline would be located in relatively close proximity to a 100-year floodplain area adjacent to the Prairie River. There would be no anticipated impacts associated with this pipeline due to it being placed outside of the floodplain as well as it not crossing any rivers or streams associated with the neighboring floodplain area. All construction equipment and materials would be kept out of the floodplain area.

F2.3.2.2 East Range Site Floodplain Impacts

There would be no anticipated impacts to floodplains for the East Range Site with respect to the placement of the Mesaba IGCC Power Plant, the Process Water Supply Pipelines, potable water and sewer pipelines, or the transportation corridors, because these structures would be situated outside of the boundaries of any 100-year floodplain areas. No 500-year floodplains have been identified that could be impacted by the implementation of the Proposed Action at the East Range Site. No impacts would be expected to result in any locations considered high-hazard areas (portions of riverine floodplains nearest the source of flooding that are frequently flooded and where the likelihood of flood losses and adverse impacts on the natural and beneficial values served by floodplains is greatest).

Proposed utilities that could potentially affect floodplains due to their potential placement within or near 100-year floodplains include HVTL Alternatives 1 and 2 and the Natural Gas Pipeline Alternative 1. These linear corridors are described and illustrated in EIS Section 2.3.2.

East Range HVTL Alternatives 1 and 2

The HVTL Alternative 1 would cross the Partridge River, Cedar Island Lake, the East Two River, and 100-year floodplains adjacent to each of these surface waters. The HVTL Alternative 2 would cross the Partridge River, the Embarrass River, the East Two River, and 100-year floodplains adjacent to each of these surface waters.

Each of the potential HVTL alignments would utilize existing HVTL corridors with negligible alterations required to the ROWs. HVTL Alternative 1 would utilize the existing 38 Line corridor and HVTL Alternative 2 would utilize a combination of the existing 39 and 37 Lines corridors. No permanent impact on flood elevations would occur, because permanent structures would be limited to HVTL towers that have small footprints and these structures would be located outside of floodplains to the extent practicable.

East Range Natural Gas Pipeline Alternative 1

The Natural Gas Pipeline Alternative 1 would cross 100-year floodplains along the Partridge River and an area between Fourth Lake and Esquagama Lake. As previously described for the West Range Site (Section F2.3.2.1), the construction of pipelines may cause some temporary impacts to floodplains, however these impacts would be minimized through the use of appropriate engineering procedures and BMPs to maintain existing river and stream flows. Following construction activities, efforts would be taken to restore floodway contours as closely as possible to their original condition as well as the right of ways (ROWs). Therefore, no permanent impacts to floodplains would be anticipated.

F2.3.3 Wetlands

For the purposes of this assessment, the DOE No Action Alternative is assumed to be equivalent to a “No Build” Alternative (see EIS Section 2.1.1.2). Under the No Action Alternative, there would be no changes to water resources in the project area and wetlands would continue to function in their current form.

Although for its Proposed Action, DOE has not participated in the identification or selection of alternative sites or corridors for the Mesaba Energy Project, DOE evaluated the comparative impacts of Excelsior’s proposed project at two alternative sites in the EIS and in this wetlands assessment. The following subsections provide descriptions of potential impacts to wetlands associated with both of Excelsior’s site alternatives under consideration for the Proposed Action. This section summarizes these potential impacts on wetlands due to construction and operation activities, including how such impacts would be minimized or avoided due to construction practices, or where temporary impacts may be restored.

Wetland areas were determined through the use of USFWS NWI mapping. Also, detailed wetland delineations were performed by Excelsior’s contractors in the areas of the potential power plant site footprints and the immediate vicinity. Land access restrictions have not allowed for field delineations to be performed along the utility and transportation corridors. DOE evaluated the methods, results, and conclusions of the wetland delineations performed by the contractors.

Whenever possible, wetland habitats are characterized based on the USFWS Circular 39 classification scheme as described in Table F2-2. Some wetland areas are described as a complex of different wetland types (e.g., Type 3/6/8).

Table F2-2. Wetland Types and Definitions

Wetland Type	Definition
Type 1 – Seasonally flooded basin or flat	Soil is covered with water or is waterlogged during variable seasonal periods but usually is well-drained during much of the growing season. Vegetation varies greatly according to season and duration of flooding from bottomland hardwoods (floodplain forests) to herbaceous plants.
Type 2 – Wet meadow	Soil is usually without standing water during most of the growing season but is waterlogged within at least a few inches of surface. Meadows may fill shallow basins, sloughs, or farmland sags, or these meadows may border shallow marshes on the landward side. Vegetation includes grasses, sedges, rushes and various broad-leaved plants. Other wetland plant community types include low prairies, sedge meadows, and calcareous fens.
Type 3 – Shallow marsh	Soil is usually waterlogged early during the growing season and may often be covered with as much as 6 inches or more of water. These marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes on the landward side. These are common as seep areas on irrigated lands. Vegetation includes grass, bulrush, spikerush, and various other marsh plants such as cattail, arrowhead, pickerelweed, and smartweed.
Type 4 – Deep marsh	Soil is usually covered with 6 inches to 3 feet or more of water during growing season. These deep marshes may completely fill shallow lake basins, potholes, limestone sinks and sloughs, or they may border open water in such depressions. Vegetation includes cattail, reeds, bulrush, spikerush, and wild rice. In open areas, pondweed, naiad, coontail, water-milfoil, waterweed, duckweed, waterlily, or spatterdock may occur.
Type 5 – Shallow open water	Shallow ponds and reservoirs are included in this type. Water is usually less than 10 feet deep and fringed by a border of emergent vegetation similar to areas of Type 4.
Type 6 – Shrub swamp	Soil is usually waterlogged during growing season and is often covered with as much as 6 inches of water. These occur mostly along sluggish streams and occasionally on flood plains. Vegetation includes alder, willow, buttonbush, dogwood, and swamp-privet.
Type 7 – Wooded swamp	Soil is waterlogged at least within a few inches of surface during growing season and is often covered with as much as 1 foot of water. These occur mostly along sluggish streams, on old riverine oxbows, on flat uplands, and in ancient lake basins. Forest vegetation includes tamarack, arborvitae, black spruce, balsam fir, red maple, and black ash. Deciduous swamps frequently support beds of duckweed and smartweed. Other wetland plant community types include lowland hardwood swamps and coniferous swamps.
Type 8 – Bogs	Soil is usually waterlogged. These occur mostly in ancient lake basins, on flat uplands and along sluggish streams. Vegetation is woody or herbaceous or both, usually on a spongy covering of mosses. Typical plants are heath shrub, sphagnum moss, and sedge. In the North, leatherleaf, Labrador tea, cranberry, and cottongrass are often present. Scattered, often stunted, black spruce and tamarack may occur.

Note: The eight wetland types described in this table include all wetland types defined in the USFWS Circular 39 document that are recognized as existing in Minnesota.

Source: Shaw and Fredine, 1956 (USFWS Circular 39)

Maps showing the locations of wetlands in relation to the West and East Range Sites are provided in Section 3.7 (Wetlands) of this EIS (Figures 3.7-1 and 3.7-2).

Potential indirect impacts would be common to any wetland area adjacent to a location that would experience direct impacts. The main potential indirect impacts that could occur would include increased sedimentation into undisturbed wetland areas that could result from construction activities in neighboring locations as well as changes in local hydrology, resulting in increased surface runoff in some areas, while decreasing surface runoff and subsurface flows in other areas. The utilization of standard engineering design measures and BMPs would reduce indirect impacts to adjacent wetlands.

The wetland acreages impacted by the project as summarized in Sections F2.3.3.1, F2.3.3.2 and in Section 4.7 represent the maximum potential impacts. In DOE's fulfillment of the requirements of Executive Order 11990 as articulated in 10 CFR Part 1022 these impacts would be further minimized and mitigated as described in Section F2.3.3.4.

F2.3.3.1 West Range Site Wetland Impacts

Table F2-3 and the following subsections summarize the estimated total wetland impacts in the temporary and permanent ROWs for the West Range Site and the associated utility and transportation corridors. Total permanent impacts to wetlands would consist of a range of 89.3 to 181.2 acres of wetlands lost. The final impact acreage would be dependent upon the selected utility and transportation corridor alternatives as well as the configuration of the interior of the rail line center loop. Alternative utility and transportation corridors were developed in order to provide a greater range of possibilities in terms of deciding which corridors would cause the least amount of environmental impacts.

West Range IGCC Power Station

Permanent wetland losses for the West Range IGCC Power Station Footprint are estimated at 31 acres, including Phase 1 wetland losses estimated at 17.3 acres and Phase II wetland losses estimated at 13.6 acres. These wetlands are primarily Type 3/7 or Type 7 basins and it is the preliminary opinion of DOE that most of these basins are isolated; however, USACE has not made a final determination of wetland jurisdiction.

Type 7 wetlands are the most abundant wetland type present within the project limits and would incur the most impacts for both phases of the IGCC Power Station. Phase I would have the majority of wetland impacts for the facility, most of which are Type 7 wetlands. The Phase II Development would involve less wetland impact acreage overall, but would include impacts to Type 3 and Type 3/6/8 (bog habitat) wetlands.

Table F2-3. Summary of Total Temporary and Permanent ROW Wetland Impacts for West Range Site and Associated Utility and Transportation Corridors

Project Alternative	Total Wetland Impacts (acres)		
	Temporary ROW		Permanent ROW
	Temporary Impacts in ROW	Permanent Impacts in ROW	Permanent Impacts in ROW
IGCC Power Station	n/a [1]	n/a [1]	30.96
HVTL Alternative 1	n/a [1]	n/a [1]	0.01 [2]
HVTL Alternative 1A	n/a [1]	n/a [1]	0.01 [2]
HVTL Phase II	n/a [1]	n/a [1]	0.03 [2]
Gas Pipeline 1	24.69	0	17.47
Gas Pipeline 2	28.86	0	18.13
Gas Pipeline 3	12.82	0	9.12
Cooling Tower Blowdown Outfall 1 (IGCC Power Station to Canisteo Pit)	20.38	0	13.60
Cooling Tower Blowdown Outfall 2 (IGCC Power Station to Holman Lake)	5.86	0	4.07
Process Water Segment 1 (Lind Pit to Canisteo Pit)	0	0	0
Process Water Segment 2 (Canisteo Pit to West Range Site)	5.48	0	3.73
Process Water Segment 3 (Gross-Marble Pit to Canisteo Pit)	6.17	0	3.79
Railroad Alternative 1A and Center Loop	0 [3]	26.45 [3]	77.08 (includes 64.85 within center loop) [4]
Railroad Alternative 1B and Center Loop	0 [3]	18.11 [3]	64.23 (includes 52.23 within center loop) [4]
Potable Water and Sewer Pipelines	4.48	0	1.79
Roads	9.72	0	5.67
Estimated Range of Total Permanent Wetland Impacts [5]			**89.3 – 181.2**

[1] Temporary construction areas for the Mesaba Generating Station or temporary ROW for the HVTL corridors are not defined for the project area; therefore temporary wetland impacts are not anticipated for these project alternatives.
[2] Permanent impacts in the permanent ROW for HVTL is limited to placement of new power poles.
[3] Impacts in railroad temporary ROW are permanent impacts due to grading in the construction limits, which should be included with total permanent wetland impacts for mitigation purposes.
[4] The impacts for the rail loops could be reduced upon completion of final design specifications associated with the rail corridor.
[5] The range of impact values represents the differing total acreages that could result, which is dependent upon the project alternatives that are ultimately selected and the configuration of the interior of the selected rail line center loop (the low range assumes no center loop impacts and the high range assumes complete center loop impacts).

Source: Excelsior, 2006b

West Range HVTL Alternative 1

For HVTL Alternative 1, an estimate of 0.01 acres of Types 2, 3, 6, 7, and 8 wetlands would be permanently lost for placement of new utility poles. To the extent practicable, wetlands would be avoided for installation of the HVTL, and construction activities would be planned during the winter months to further minimize direct impacts to wetlands. Permanent wetland impacts would be limited to those areas where HVTL utility poles would be placed within wetland habitat.

Tree and shrub clearing in wetlands would be initiated along new areas of ROW to be established for HVTL Alternative 1. An estimated total of 30.2 acres of trees and shrubs would be cleared in Types 6, 7, and 8 wetlands. No vegetation clearing would be anticipated in Type 1-5 wetlands (i.e., herbaceous dominated vegetation in seasonal basins, wet meadow, shallow marsh, or open water wetlands). Direct impacts to these wetlands would not be anticipated because no stump grubbing, excavation, or fill is planned for the areas to be cleared of woody vegetation. Ultimately some wetland areas may be converted to different types (e.g., Type 6 scrub-shrub habitat may convert to Type 2/3 wet meadow/shallow marsh); however, direct loss of wetlands would not be anticipated. In addition, tree clearing activities would be completed during the winter months, thereby avoiding direct impacts to the wetlands from equipment and the bird nesting period which is in compliance with the Federal Migratory Bird Treaty Act. In the future and beyond the scope of this project, maintenance of the ROW would likely include clearing of trees and shrubs that re-establish in wetlands, but maintenance would be completed during the winter months to avoid direct impacts on wetlands or to potential nesting birds.

West Range HVTL Alternative 1A

For HVTL Alternative 1A, an estimate of 0.01 acres of Types 2, 3, 5, 6, 7, and 8 wetlands would be permanently lost for placement of new utility poles. To the extent practicable, wetlands would be avoided for installation of the HVTL, and construction activities would be planned during the winter months to further minimize direct impacts to wetlands. Permanent wetland impacts would be limited to those areas where HVTL utility poles would be placed within wetland habitat.

Similar to HVTL Alternative 1, tree and shrub clearing in wetlands would be initiated along new areas of ROW to be established for HVTL Alternative 1A. An estimated total of 24.5 acres of trees and shrubs would be cleared in Types 6, 7, and 8 wetlands. No vegetation clearing would be anticipated in Type 1-5 wetlands (i.e., herbaceous dominated vegetation in seasonal basins, wet meadow, shallow marsh, or open water wetlands). Direct impacts to these wetlands would not be anticipated because no stump grubbing, excavation, or fill is planned for the areas to be cleared of woody vegetation. Ultimately, some wetland areas may be converted to different types (e.g., Type 6 scrub-shrub habitat may convert to Type 2/3 wet meadow/shallow marsh); however, direct loss of wetlands would not be anticipated. In addition, tree clearing activities would be completed during the winter months, thereby avoiding direct impacts to the wetlands from equipment and the bird nesting period which is in compliance with the Federal Migratory Bird Treaty Act. In the future and beyond the scope of this project, maintenance of the ROW would likely include clearing of trees and shrubs that re-establish in wetlands, but this would be completed during the winter months avoiding direct wetland impacts by equipment or to potential nesting birds.

West Range HVTL Phase 2

For HVTL Phase 2, an estimate of 0.03 acres of Types 2, 3, 6, 7, and 8 wetlands would be permanently lost for placement of new utility poles. To the extent practicable, wetlands would be avoided for installation of the HVTL, and construction activities would be planned during the winter months to further minimize direct impacts to wetlands. Permanent wetland impacts would be limited to those areas where HVTL utility poles would be placed within wetland habitat.

No tree and shrub clearing in wetlands would be anticipated for HVTL Phase 2 as this alternative is proposed along an existing utility corridor maintained by Minnesota Power. In the future and beyond the scope of this project, maintenance of the ROW would likely include clearing of trees and shrubs that re-establish in wetlands, but this would be completed during the winter months avoiding direct wetland impacts by equipment or to potential nesting birds.

West Range Natural Gas Pipeline Alternative 1

Wetlands within the Natural Gas Pipeline Alternative 1 corridor include a total of 24.69 acres of Types 1, 2, 3, 6, and 7 wetland habitats in the proposed temporary ROW. For the permanent ROW, wetland losses would be 17.5 acres. Temporary impacts are needed for construction limits, but would be mitigated by restoring the habitat upon completion of construction activities. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the pipeline corridor.

The Natural Gas Pipeline Alternative 1 would cross approximately 133 linear feet of surface waters, not including adjacent wetland habitat. For water crossings, the natural gas pipeline would be directionally drilled under water bodies starting at approximately 100 feet from the edge of each bank. This method would minimize impacts to wetlands associated with water crossings. Impacts to wetlands adjacent to water bodies include 1.3 acres in the temporary ROW and 0.9 acres of wetland losses in the permanent ROW. The remainder of the natural gas pipeline would include open trench installation. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

West Range Natural Gas Pipeline Alternative 2

Wetlands within the Natural Gas Pipeline Alternative 2 corridor include a total of 28.9 acres of Types 2, 3, 6, 7, and 8 wetland habitats in the proposed temporary ROW. For the permanent ROW, wetland losses would be 18.1 acres. Temporary impacts are needed for construction limits, but would be mitigated by restoring the habitat upon completion of construction activities. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the pipeline corridor.

The Natural Gas Pipeline Alternative 2 would cross approximately 313 linear feet of surface waters, not including adjacent wetland habitat. For water crossings, the natural gas pipeline would be directionally drilled under water bodies starting at approximately 100 feet from the edge of each bank, which would minimize impacts to wetlands associated with water crossings. Impacts to wetlands adjacent to water bodies include 2.2 acres in the temporary ROW and 1.5 acres of wetland losses in the permanent ROW. The remainder of the natural gas pipeline would include open trench installation. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

West Range Natural Gas Pipeline Alternative 3

Wetlands within the Natural Gas Pipeline Alternative 3 corridor include a total of 12.8 acres of Types 2, 3, 4, 6, 7, and 8 wetland habitats in the proposed temporary ROW. For the permanent ROW, wetland losses would be 9.1 acres. Temporary impacts are needed for construction limits, but would be mitigated by restoring the habitat upon completion of construction activities. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the pipeline corridor.

The Natural Gas Pipeline Alternative 3 would cross approximately 236 linear feet of surface waters, not including adjacent wetland habitat. For water crossings, the natural gas pipeline would be directionally drilled under water bodies starting at approximately 100 feet from the edge of each bank, which would minimize impacts to wetlands associated with water crossings. Impacts to wetlands adjacent to water crossings include 2.3 acres in the temporary ROW and 1.6 acres of wetland losses in the permanent ROW. The remainder of the natural gas pipeline would include open trench installation. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

West Range Process Water Supply Pipeline

Segment 1 – Lind Pit to Canisteo Pit

No wetlands have been identified for Process Water Supply Pipeline Segment 1, therefore wetland impacts are not anticipated due to construction or operation activities. Field investigations would be performed prior to construction activities to confirm that impacts would not occur.

Segment 2 – Canisteo Pit to West Range Site

Wetland impacts would be minimized to the maximum extent feasible by routing the process water lines along existing and proposed roadways, railroads, and utility ROWs. Wetland impacts within the proposed Process Water Supply Pipeline Segment 2 corridor include a total of 5.5 acres of Types 3/6/8, 6, and 7 wetland habitat in the 150-foot temporary ROW. For the 100-foot permanent ROW, wetland losses would be 3.7 acres. There are no water crossings associated with the Process Water Supply Pipeline Segment 2. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the Process Water Supply Pipeline Segment 2 corridor. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

Segment 3 – Gross-Marble Pit to Canisteo Pit

Wetland impacts would be minimized to the maximum extent feasible by routing the process water lines along existing and proposed roadways, railroads, and utility ROWs. Process Water Supply Pipeline Segment 3 would include a total of 6.2 acres of Types 4, 5, 6, 6/7, 7, and 8 wetland habitat impacts in the 150-foot temporary ROW. For the 100-foot permanent ROW, wetland losses would be 3.8 acres. Type 6 scrub-shrub wetland would sustain the greatest impacts due to this alternative. There are no water crossings associated with the Process Water Supply Pipeline Segment 3. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the Process Water Supply Pipeline Segment 3 corridor. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

West Range Cooling Tower Blowdown Outfall 1 (Facility to Canisteo Pit)

Wetland impacts would be minimized to the maximum extent feasible by routing the blowdown pipeline along existing and proposed roadways, railroads, and utility ROWs. The blowdown alignment would include a total of 20.4 acres of Types 6, 7, and 8 wetland habitat impacts in the temporary ROW. For the permanent ROW, wetland losses would be 13.6 acres. The blowdown pipeline would be placed in wetlands and below water bodies through open-cut trenching. There are no water crossings (i.e., streams, rivers, or lakes) associated with this alignment for the blowdown pipeline.

Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the pipeline corridor. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

West Range Cooling Tower Blowdown Outfall 2 (Facility to Holman Lake)

Wetland impacts would be minimized to the maximum extent feasible by routing the blowdown pipeline along existing and proposed roadways, railroads, and utility ROWs. The blowdown alignment would include a total of 5.9 acres of Types 3/6/8, 6, 7, and 8 wetland habitat impacts in the temporary ROW. For the permanent ROW, wetland losses would be 4.1 acres. The blowdown pipeline would be placed in wetlands and below water bodies through open-cut trenching.

There are two water crossings associated with the Cooling Tower Blowdown Outfall 2 pipeline alignment. Wetland impacts include the total length of the crossing through water bodies and adjacent wetlands. The total length of water crossings would be 6 linear feet over water, and a total of 50 linear feet in the adjacent wetlands. Impacts to wetlands due to the water crossings are based on a 150-foot temporary ROW and 100-foot permanent ROW. Wetland habitats associated with the water crossings that would be affected include 7,500 square feet (0.2 acres) in the temporary ROW and 5,000 square feet (0.1 acres) of wetland losses in the permanent ROW.

Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the pipeline corridor. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

West Range Potable Water and Sewer Pipelines

Wetland impacts would be minimized to the maximum extent feasible by routing the sewer and water lines adjacent to the process water lines, which would be placed along existing and proposed roadways, railroads, and utility ROWs. Wetland impacts within the proposed sewer and water corridor would include a total of 4.5 acres to Types 3/6/8, 6, and 7 wetland habitats in the 100-foot temporary ROW. For the 40-foot permanent ROW, wetland losses would be 1.8 acres. No water crossings are associated with the water and sewer lines.

West Range Rail Line Alternative 1A

Siting for the railroad alternatives first considered avoidance of both Dunning and Big Diamond Lakes. Preliminary alignments for the railroad included a design that would have required filling as much as one quarter of Big Diamond Lake to maintain railway design standards for grades and turning radii; however this was removed from further consideration based on the extent of potential impact. At the southeast corner of Big Diamond Lake, Alternative 1A was shifted away from Big Diamond Lake to reduce direct impacts on the lakebed and any surrounding aquatic habitat.

Wetland impacts from rail alignments in the vicinity of the West Range Site are essentially unavoidable, because railway design standards require level grades and wide turning radii. The railroad alternatives are the only utility or transportation corridors that have established construction limits, which may be considered as temporary ROW. For the West Range Railroad Alternative 1A, the construction limits (temporary ROW) vary in width from 80 to 450 feet. The permanent ROW for the railroad would be an established 100-foot ROW, which includes the ROW width needed for the center loop.

Permanent wetland impacts within the railroad alternatives would occur within the construction limits (temporary ROW) and the center loop. There would be no temporary wetland impacts anticipated for the railroad alternatives due the necessary grading required for the railroad bed; therefore, those impacts would all be considered permanent. Permanent wetland losses within the construction limits (temporary ROW) would include 26.5 acres. Approximately 77.1 acres of permanent wetland losses would occur in the permanent ROW; of this, an estimated 64.9 acres of Type 7 (wooded swamp) wetlands would be within the center loop of the rail spur for Alternative 1A. Therefore, maximum impacts to wetlands could be 103.5 acres lost to Types 3, 3/6, 3/7/8, 3/6/8, 6, 6/7, and 7 wetlands. The impacts estimated for the center loop may be reduced upon completion of final design when the layout within the center loop is determined. No water crossings are associated with Railroad Alternative 1A.

West Range Rail Line Alternative 1B

For the West Range Railroad Alternative 1B, the construction limits (temporary ROW) vary in width from 60 to 760 feet. The permanent ROW for the railroad would be an established 100-foot ROW, which includes the ROW width needed for the center loop. Permanent wetland losses within the construction limits (temporary ROW) would include 18.1 acres. Approximately 64.2 acres of permanent wetland losses would occur in the permanent ROW; of this, an estimated 52.2 acres of Type 7 (wooded swamp) wetlands would be within the center loop of the rail spur for Alternative 1A. Therefore, maximum impacts to wetlands could be 82.3 acres lost to Types 3, 3/6, 3/7, 5, 5/6/7, 6, 6/7, 6/8, and 7 wetland habitats. The impacts estimated for the center loop may be reduced upon completion of final design when the layout within the center loop is determined. No water crossings are associated with Railroad Alternative 1B.

West Range Access Roads

For the design of access roads, corridors were identified that would minimize overall impacts, considering grading requirements, existing topography, accessible properties, and presence of wetlands, while achieving the access needs for the West Range Site. Although there would be impacts to wetlands due to the placement of corridors, these impacts would be balanced during the overall site grading requirements. In some instances it would become more feasible to impact a small area of wetland than attempt grading hillsides or steep slopes.

Access Roads 1 and 2 that would serve the facility would impact a total of 9.7 acres of Types 1/2/3/5, 3/6/8, 4, 6, 6/7, 7, and 8 wetlands in the 200-foot temporary ROW. For the 12-foot permanent ROW, wetland losses would be 5.7 acres. The largest wetland impacts for roads would be within the large wetland complex near the southern boundary of the West Range Site. No water crossings are associated with the roads.

Because Excelsior has included both road alignments (Access Roads 1 and 2) within its plan for highway access to the power plant at the West Range Site, the impacts of road construction are the combined impacts for both roads. Although Access Road 1 would consist of the realignment of CR 7 by Itasca County as a separate action, it is considered a connected action by DOE to ensure that all potential impacts from the access roads are addressed. In the event that the realignment of CR 7 by Itasca County would not proceed, the effect of constructing only Access Road 2 from the power plant to the existing alignment of CR 7 would likely reduce the wetland impacts by a roughly proportional amount.

F2.3.3.2 East Range Site Wetland Impacts

Table F2-4 and the following subsections summarize the estimated total wetland impacts in the temporary and permanent ROWs for the East Range Site and the associated utility and transportation corridors. Total permanent impacts to wetlands would consist of a range of 99.1 to 143.2 acres of wetland habitat lost. The final impact acreage would be dependent upon the selected utility and transportation corridor alternatives as well as the presence or absence of a rail line center loop and the configuration of the interior of the potential rail line center loop. Alternative utility and transportation corridors were developed in order to provide a greater range of possibilities in terms of deciding which corridors would cause the least amount of environmental damage.

East Range IGCC Power Station

The Mesaba IGCC Power Plant preliminary layout was planned to minimize wetland impacts. Wetland losses for the East Range IGCC Power Station Footprint are estimated at 15.6 acres, of which Phase 1 wetland losses are estimated at 11.9 acres, and Phase 2 wetland losses are estimated at 3.7 acres. Type 7 wetlands are the most abundant within the project limits and would incur the most impacts for both phases of the Mesaba IGCC Power Plant. Phase 1 would have the majority of wetland impacts for the facility, most of which are Type 7 wetlands. Phase 2 would involve less wetland impact acreage overall, but would include impacts to a small Type 2 wetland not impacted by Phase 1.

East Range HVTL Alternative 1

For HVTL Alternative 1, an estimate of 0.05 acres of Types 2, 5, 6, 7, and 8 wetlands would be permanently lost for placement of new utility poles. To the extent practicable, wetlands would be avoided for installation of the HVTL, and construction activities would be planned during the winter months to further minimize direct impacts to wetlands. Permanent wetland impacts would be limited to those areas where HVTL utility poles would be placed within wetland habitat.

Tree and shrub clearing in wetlands would usually be initiated along new areas of ROW. Trees and shrubs would be cleared in Types 6, 7, and 8 wetlands. No vegetation clearing would be anticipated in Type 1-5 wetlands (i.e., herbaceous dominated vegetation in seasonal basins, wet meadow, shallow marsh, or open water wetlands). However, wetlands are not anticipated to be cleared of trees in shrubs for HVTL Alternative 1 because it is located entirely within existing ROW, and this existing ROW is already maintained free of trees and shrubs. In the future and beyond the scope of this project, maintenance of the ROW would likely include clearing of trees and shrubs that re-establish in wetlands, but this would also be completed during the winter months avoiding direct wetland impacts or to potential nesting birds.

There are 21 crossings of streams or water bodies associated with HVTL Alternative 1 that would require crossing 1,194 linear feet of water. Placement of the power poles supporting the HVTL would be designed to avoid direct impacts to streams, rivers, or other bodies of water within the project area. The average expanse between poles would be approximately 650 feet, but in sensitive or otherwise important areas that should be avoided, the expanse between power poles may be shortened to whatever length necessary or lengthened to approximately 1,000 feet. Therefore, wetland impacts within the bed of any water bodies would be avoided.

Table F2-4. Summary of Total Temporary and Permanent ROW Wetland Impacts for East Range Site and Associated Utility and Transportation Corridors

Project Alternative	Total Wetland Impacts (Acres)		
	Temporary ROW		Permanent ROW
	Temporary Impacts in ROW	Permanent Impacts in ROW	Permanent Impacts in ROW
IGCC Power Station	n/a [1]	n/a [1]	15.61
HVTL Alternative 1	n/a [1]	n/a [1]	0.05 [2]
HVTL Alternative 2	n/a [1]	n/a [1]	0.04 [2]
Natural Gas Pipeline Alternative 1	67.29	0	46.81
Process Water Supply Pipeline (Area 2WX to Footprint)	1.45	0	0.87
Process Water Supply Pipeline (Area 2WX to Area 2W)	0	0	0
Process Water Supply Pipeline (Area 2W to Area 2E)	0	0	0
Process Water Supply Pipeline (Area 3 to Area 2E)	0.41	0	0.23
Process Water Supply Pipeline (Knox Mine to Area 2WX)	0	0	0
Process Water Supply Pipeline (Area 6 and Stephens Mine to Area 2WX)	0.45	0	0.26
Process Water Supply Pipeline (Area 9 South to Area 6)	0.54	0	0.29
Process Water Supply Pipeline [Area 9 North (Donora Mine) to Area 6]	0	0	0
Railroad Alternative 1 and Center Loop	0 [3]	17.21 [3]	58.59 (includes 47.91 within center loop) [4]
Railroad Alternative 2 (no center loop)	0 [3]	18.35 [3]	13.37 (no center loop)
Potable Water and Sewer Pipelines	0	0	0
Roads	5.53	0	3.23
Estimated Range of Total Permanent Wetland Impacts [5]			**99.1 – 143.2**

[1] Temporary construction areas for the Mesaba Generating Station or temporary ROW for the HVTL corridors are not defined for the project area; therefore temporary wetland impacts are not anticipated for these project alternatives.
[2] Permanent impacts in the permanent ROW for HVTL is limited to placement of new power poles.
[3] Impacts in railroad temporary ROW are permanent impacts due to grading in the construction limits, which should be included with total permanent wetland impacts for mitigation purposes.
[4] The impacts for the rail loops could be reduced upon completion of final design specifications associated with the rail corridor.
[5] The range of impact values represents the differing total acreages that could result, which is dependent upon the project alternatives that are ultimately selected and the configuration of the interior of the selected rail line center loop (the low range assumes no center loop impacts and the high range assumes complete center loop impacts).

Source: Excelsior, 2006b

East Range HVTL Alternative 2

For HVTL Alternative 2, an estimate of 0.04 acres of Types 2, 5, 6, 7, and 8 wetlands would be permanently lost for placement of new utility poles. To the extent practicable, wetlands would be avoided for installation of the HVTL, and construction activities would be planned during the winter months to further minimize direct impacts to wetlands. Permanent wetland impacts would be limited to those areas where overhead utility poles would be placed within wetland habitat.

The majority of HVTL Alternative 2 is proposed within an existing 100-foot power utility ROW. Approximately 1.5 miles of the proposed corridor is new and would require tree and shrub clearing in wetlands. A total of 0.6 acres of trees and shrubs would be estimated to be cleared in Type 6 wetlands. No vegetation clearing would be anticipated in Type 1-5 wetlands (i.e., herbaceous dominated vegetation in seasonal basins, wet meadow, shallow marsh, or open water wetlands). Direct wetland impacts to these wetlands are not anticipated as no stump grubbing, excavation, or fill is planned for the areas to be cleared of woody vegetation. Ultimately some wetland areas may be converted to different types (e.g., Type 6 scrub-shrub habitat may convert to Type 2/3 wet meadow/shallow marsh); however, direct loss of wetland would not be anticipated. In addition, tree clearing activities would be completed during the winter months, thereby avoiding direct impacts to the wetlands from equipment and the bird nesting period which is in compliance with the Federal Migratory Bird Treaty Act. In the future and beyond the scope of this project, maintenance of the ROW would likely include clearing of trees and shrubs that re-establish in wetlands, but this would be completed during the winter months avoiding direct wetland impacts by equipment or to potential nesting birds.

There are 20 crossings of streams or water bodies associated with HVTL Alternative 2 that would require crossing 1,760 linear feet of water. Placement of the power poles supporting the HVTL would be designed to avoid direct impacts to streams, rivers, or other bodies of water within the project area. The average expanse between poles would be approximately 530 feet, but in sensitive or otherwise important areas that should be avoided, the expanse between power poles may be shortened to whatever length necessary or lengthened to approximately 1,000 feet. Because of this, wetland impacts within the bed of any water bodies would be avoided.

East Range Natural Gas Pipeline Alternative 1

Wetland impacts would be minimized to the maximum extent feasible by routing the process water lines along existing and proposed roadways, railroads, and utility ROWs. Wetland impacts within the proposed Natural Gas Pipeline Alternative 1 corridor would include a total of 67.3 acres of Types 2, 5, 6, 7, 8, and riverine wetlands in the 100-foot temporary ROW. For the 70-foot permanent ROW, wetland losses would be 46.8 acres. These impacts are based upon the NWI maps, because the locations have not been field delineated.

For water crossings, the natural gas pipeline would be directionally drilled under water bodies starting at approximately 100 feet from the edge of each bank. This method would minimize impacts to wetlands associated with water crossings. The East Range Natural Gas Pipeline Alternative 1 would require crossing approximately 792 linear feet of streams and bodies of water, not including adjacent wetland habitat. Impacts to wetlands due to the stream crossings are based on a 100-foot temporary ROW and a 70-foot permanent ROW. Wetland habitats adjacent to the stream crossings that would be affected where the pipeline emerges on either side of the crossing include 21.1 acres in the temporary ROW. These impacts would be temporary in nature and wetlands would be restored upon completion of the installation. The pipeline would also cause 14.8 acres of wetland losses in the permanent ROW. The remainder of the natural gas pipeline would include open trench installation.

East Range Process Water Supply Pipeline – Area 2WX to Site

Wetland impacts would be minimized to the maximum extent feasible by routing the process water lines along existing and proposed roadways, railroads, and utility ROWs. Wetland impacts within the proposed Process Water Supply Pipeline – Area 2WX to Site corridor would include a total of 1.5 acres of Types 3, 7, and 8 wetlands in the 150-foot temporary ROW. For the 100-foot permanent ROW, wetland losses would be 0.9 acres. These impacts are based upon the NWI maps because the locations were not field delineated. There are no stream crossings associated with the Process Water Supply Pipeline – Area 2WX to Site. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the process water line corridor. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

East Range Process Water Supply Pipeline – Area 2WX to Area 2W

No wetland impacts have been identified for Water Process Line – Area 2WX to Area 2W, therefore no affects due to construction or operation activities are anticipated for this alignment.

East Range Process Water Supply Pipeline – Area 2W to Area 2E

No wetland impacts have been identified for Water Process Line – Area 2W to Area 2E, therefore no affects due to construction or operation activities are anticipated for this alignment.

East Range Process Water Supply Pipeline – Area 3 to Area 2E

Wetland impacts would be minimized to the maximum extent feasible by routing the process water lines along existing and proposed roadways, railroads, and utility ROWs. Wetland impacts within the proposed Process Water Supply Pipeline – Area 3 to Area 2E corridor would include a total of 0.4 acres of Type 4 wetlands in the 150-foot temporary ROW. For the 100-foot permanent ROW, wetland losses would be 0.2 acres. These impacts are based upon the NWI maps because the locations were not yet field delineated. There are no stream crossings associated with the Process Water Supply Pipeline – Area 3 to Area 2E. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the water process line corridor. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

East Range Process Water Supply Pipeline – Knox Mine to Area 2WX

No wetland impacts have been identified for Water Process Line – Knox Mine to Area 2WX, therefore no affects due to construction or operation activities are anticipated for this alignment.

East Range Process Water Supply Pipeline – Area 6 and Stephens Mine to Area 2WX

Wetland impacts would be minimized to the maximum extent feasible by routing the process water lines along existing and proposed roadways, railroads, and utility ROWs. Wetland impacts within the proposed Process Water Supply Pipeline – Area 6 and Stephens Mine to Area 2WX corridor would include a total of 0.5 acres of Type 6 wetlands in the 150-foot temporary ROW. For the 100-foot permanent ROW, wetland losses would be 0.3 acres. These impacts are based upon the NWI maps because the locations were not yet field delineated.

There are two stream crossings associated with the Process Water Supply Pipeline – Area 6 and Stephens Mine to Area 2WX corridor. Wetland impacts would include the total length of the crossing through streams and adjacent wetlands. There are no wetlands mapped on the NWI adjacent to the crossing at Second Creek, therefore impacts to adjacent wetlands would be avoided for this crossing. The total length of stream crossings would be 33 linear feet over water, and a total of 270 linear feet in the adjacent wetlands. Impacts to wetlands adjacent to the stream crossings are based on a 150-foot temporary ROW and 100-foot permanent ROW. Wetland habitats adjacent to the stream crossings that would be affected include 0.9 acres in the temporary ROW and 0.6 acres lost in the permanent ROW. Temporary wetland impacts may include tree and shrub clearing for construction staging areas paralleling the water process line corridor. Where soils and vegetation may become disturbed in the construction areas, these areas would be restored by loosening the soils from compaction and reseeding with grasses and forbs native to the region.

East Range Process Water Supply Pipeline – Area 9 South to Area 6

Wetland impacts would be minimized to the maximum extent feasible by routing the process water lines along existing and proposed roadways, railroads, and utility ROWs. Wetland impacts within the proposed Process Water Supply Pipeline – Area 9 South to Area 6 corridor would include a total of 0.5 acres of Type 5 wetlands in the 150-foot temporary ROW. For the 100-foot permanent ROW, wetland losses would be 0.3 acres. These impacts are based upon the NWI maps because the locations were not yet field delineated.

There is one stream crossing associated with this alternative. There are no wetlands mapped on the NWI adjacent to this crossing, therefore impacts to adjacent wetlands would be avoided. The total length of stream crossings would be 3 linear feet over water.

East Range Process Water Supply Pipeline – Area 9 North (Donora Mine) to Area 6

No wetland impacts have been identified for Water Process Line – Area 9 North (Donora Mine) to Area 6 corridor, however, the UGSG topographic map for the area has identified one stream that flows from Donora Mine to Partridge River. Because of the mining activity in the area, it is not clear from aerial photographs whether or not this stream currently exists or what measures have been taken to divert its path. No field investigation has been conducted in this area to date. As such, this crossing is addressed below assuming the stream exists.

There are no wetlands mapped on the NWI adjacent to this crossing, therefore impacts to adjacent wetlands due to stream crossings would be avoided. The total length of stream crossings would be 3 linear feet over water.

East Range Potable Water and Sewer Pipelines

Wetland impacts would be avoided by routing the sewer and water lines along existing and proposed roadways and utility ROWs. Construction of the potable water and sewer pipelines would require crossing approximately 460 linear feet of Colby Lake. Construction of the pipelines would be performed through directional drilling or microtunneling underneath the lake; therefore, no permanent impacts to the lake would be expected. There are no wetlands adjacent to Colby Lake at the point of crossing; therefore, no wetland impacts would be anticipated.

East Range Railroad Alternative 1

Wetland impacts from rail alignments in the vicinity of the East Range Site are essentially unavoidable, because railway design standards require level grades and wide turning radii. The railroad alternatives are the only utility or transportation corridors that have established construction limits, which may be considered as temporary ROW. For the East Range Railroad Alternative 1, the construction limits (temporary ROW) vary in width from 75 to 490 feet. The permanent ROW for the railroad would be an established 100-foot ROW, which includes the ROW width needed for the center loop.

Permanent wetland impacts within the railroad alternatives would occur within the construction limits (temporary ROW) and the center loop. There would be no temporary wetland impacts anticipated for the railroad alternatives due the necessary grading required for the railroad bed, therefore, those impacts are considered permanent. Permanent wetland losses within the construction limits (temporary ROW) would include 17.2 acres. Approximately 58.6 acres of permanent wetland losses would occur in the permanent ROW; of this, an estimated 47.9 acres of wetlands would be within the center loop of the rail spur for Alternative 1A. Therefore, maximum wetland losses could be 75.8 acres to Types 2, 2/3/4/6/7/8, and 6 wetlands. The impacts estimated for the center loop may be reduced upon completion of final design when the layout within the center loop is determined.

Railroad Alternative 1 would require crossing approximately 6 linear feet of streams and bodies of water. Wetland impacts are based upon wetlands adjacent to streams being crossed within the established construction limits. Approximately 15 acres of wetland would be lost due to grading of the railroad bed for Railroad Alternative 1. This includes 8 acres that would be in the corridor’s permanent ROW. Permanent impacts from construction in the streambed for the center loop would be minimized by use of culverts under the railroad bed.

East Range Railroad Alternative 2

For the East Range Railroad Alternative 2, the construction limits (temporary ROW) vary in width from 60 to 500 feet. The permanent ROW for the railroad would be an established 100-foot ROW. There is no center loop associated with East Range Railroad Alternative 2. Permanent wetland losses within the construction limits (temporary ROW) would include 18.4 acres. Permanent wetland losses within the permanent ROW (the railroad bed itself) would include 13.4 acres. Therefore, maximum wetland losses could be 31.7 acres of Types 2, 3/7/8, 6, 7, and 7/8 wetlands.

Railroad Alternative 2 would require crossing approximately 6 linear feet of streams and bodies of water. Wetland impacts are based upon wetlands adjacent to streams being crossed within the established construction limits. Approximately 6.3 acres of wetland would be lost due to grading of the railroad bed for Railroad Alternative 2. This includes 2.6 acres that would be in the corridor’s permanent ROW.

East Range Roads

For the design of access roads, corridors were identified that would minimize overall impacts, considering grading requirements, existing topography, accessible properties, and presence of wetlands, while achieving the access needs for the East Range Site. Although there would be impacts to wetlands due to the placement of the corridors, these impacts would be balanced by the overall site grading requirements.

Roads that would serve the facility would impact a total of 5.5 acres of Types 6 and 7 wetlands in the 200-foot temporary ROW. For the 120-foot permanent ROW, wetland losses would be 3.2 acres. No water crossings are associated with the road alignments.

F2.3.3.3 Wetland Permitting

Implementation of the Mesaba Energy Project would require submittal of a Combined Wetland Permit Application and Replacement Plan, which would be prepared and submitted to the following agencies (Excelsior, 2006b):

- USACE – Section 404 Clean Water Act wetland dredge-and-fill activities permit.
- Minnesota Pollution Control Agency (MPCA) – Section 401 Clean Water Act water quality certification.
- Minnesota Department of Natural Resources (MNDNR) – Public Waters work permit.
- Itasca County Soil and Water Conservation District (SWCD) – Wetland Conservation Act (WCA) approval (West Range Site and Associated Corridors).
- St. Louis County, Minnesota – WCA approval (East Range Site and associated corridors not within the city limits of Hoyt Lakes, Minnesota).
- City of Hoyt Lakes, Minnesota – WCA approval (Associated corridors for East Range Site within the city limits of Hoyt Lakes, Minnesota).

Mitigation of wetland impacts would be in the form of direct replacement or by the purchase of credits through an approved wetland bank. Wetland mitigation would follow USACE and Board of Water and Soil Resources (BWSR) requirements and guidance and include addressing the provisions of the Replacement Plan requirements set forth in the WCA. No specific plans for wetland mitigation have been proposed by the project proponent at this time. Detailed mitigation plans would be created during the wetland permitting process following site selection under the guidance of respective regulatory entities. Documentation accompanying the Combined Wetland Permit Application would include any design details on wetland replacement sites, wetland banks, and/or sources of wetland credit for the project. Mitigation requirements would be determined during the wetland-permitting phase of the project (Excelsior, 2006b).

In accordance with USACE and BWSR wetland mitigation policy, wetland replacement options would be explored in the following sequence:

- Step 1: Project-specific wetland replacement options (on or adjacent to the project site) would be investigated first. If no project-specific wetland replacement opportunities exist or additional mitigation credit is required, Step 2 would be followed.
- Step 2: Potential wetland replacement opportunities within the sub-watershed, watershed, or county where the project is located would be investigated. If no opportunities are available or additional wetland mitigation credit is required, Step 3 would be followed.
- Step 3: Potential wetland replacement opportunities within the MNDNR-defined eco-region, neighboring watersheds or counties or within a geographic area that is as close as possible to the project would be investigated.

F2.3.3.4 Wetland Impact Minimization and Mitigation

The wetland acreages impacted by the project as summarized in Sections F2.3.3.1, F2.3.3.2 and in Section 4.7 represent the maximum potential impacts. DOE expects that the wetland permitting process described above will result in permit conditions enforced by USACE that would address the minimization and mitigation of impacts as described in this section. In addition, DOE could also include minimization and/or mitigation of impacts as a condition of the Record of Decision, if necessary to fulfill DOE's obligations under 10 CFR 1022.

Pursuant to 10 CFR 1022.13(a)(3) "DOE shall evaluate measures that mitigate the adverse effects of actions in a...wetland including but not limited to minimum grading requirements, runoff controls, design and construction constraints, and protection of ecologically sensitive areas." Some of the methods and procedures to be used in the design, permitting and construction of the project are described below. In some instances, specific alternatives are discussed as an example of how the minimization could be achieved. The same process would be applied to whichever alternative is ultimately selected.

Minimize Area of Filling

There are a variety of design options to be exercised and evaluated during the design and permitting of the project that would reduce the area of wetlands to be filled. Some of the options available to the project proponent include:

- When placing fill, instead of employing grass embankments on a 3:1 slope down to the adjacent wetlands, design options could include gabion walls or retaining walls to minimize the footprint of disturbance. The deeper the fill (and therefore the longer the side slope) the more important this is. This approach is effective for all areas of filling whether for the power plant, the access roads, or the new rail lines.
- If, because of grade issues, roads or especially railways need to be placed on high embankment areas with a corresponding wide footprint, consideration would be given to placing some of the rail line or roadway on elevated structures to minimize the wetlands impacted.
- In Section 4.7, both the permanent and temporary ROWs for the railroads and the entire permanent ROWs of the roads are assumed to be totally impacted, with all wetlands filled. During the design process, every attempt would be made to minimize the footprint of the actual permanent fill, thus reducing, potentially by a large amount, the actual wetlands to be filled.

As an example, Rail Line Alternative 1A at the West Range Site would require 103.6 acres of vegetation to be cleared within the permanent ROW, including 77.1 acres of wetlands, 64.9 of which are within the center loop. An additional 108.5 acres of vegetation would be cleared within the broader construction limits including 26.5 acres of wetlands (see EIS Tables 4.7-7 and 4.8-14). However, if other locations for proposed activities within the center loop can be found, the filling of 64.9 acres of wetlands would be minimized or avoided.

Maximize Hydrologic Connections

In order to maintain many of the wetland functions such as flood control, sediment trapping and wildlife habitat, adequate drainage across and through the road and rail ROWs must be maintained. Some of the options available include:

- Frequent spacing of culverts under roadways and railroads.
- Installing several larger culverts that are frequently flowing or inundated with open bottoms that allow the natural substrate of the stream to remain.
- Grade for wide grass swales wherever practicable.

Limit the Number of Wetland Functions Impacted

During the design and construction process, efforts would be taken to minimize the temporary impacts to wetlands and to minimize the permanently filled wetlands. Some of the options available include:

- Limit the compression of temporarily disturbed wetland soils by minimizing heavy vehicular traffic across the compressible soils to the extent possible.

- In wetlands to be temporarily disturbed, stockpile the organic topsoil so that the existing substrate can be replaced after construction has been completed.
- Design roads and railroads to be as close to existing grade as possible, since the smaller the depth of fill, the smaller corresponding width of filling that would be required.

Provide Mitigation

The primary emphasis would be on restoration, enhancement and creation of wetlands within the project area and within the temporary and permanent ROWs of the roads, railroads and utility lines.

Continuing with the prior example of Rail Line Alternative 1A for the West Range Site:

- As an example of wetland restoration, efforts would be made during design and construction to restore grades and allow the 26.5 acres within the temporary disturbance area to be restored to the extent possible.
- As an example of wetland creation, grading plans during detailed design would incorporate measures to create new wetlands in areas adjacent to existing wetlands, such as in the 82 acres (108.5 minus 26.5 acres of wetlands) of upland vegetation cleared for grading outside the permanent ROW.

To the extent that insufficient on-site mitigation areas could be found, off-site mitigation banks and areas would be researched and evaluated in accordance with mitigation guidance provided by USACE.

Best Management Practices (BMPs)

The selection and inclusion of appropriate BMPs would be made during the permitting and design of the project. There are a multitude of BMPs related to stormwater and other indirect impacts to wetlands, which are discussed at numerous websites, including:

USEPA: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

The Minnesota Pollution Control Agency: http://www.pca.state.mn.us/water/stormwater/stormwater-manual.html *and* http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html

University of Minnesota Water Resources Center:

http://wrc.umn.edu/outreach/stormwater/bmpassessment/

Minnesota DOT: http://www.dot.state.mn.us/tecsup/tmemo/active/tm05/06env04.pdf

Some additional information may be available for and included in the FEIS. More detailed discussions concerning USACE permitting may be found in EIS Section 4.7.7. Discussions pertaining to stormwater permitting may be found in EIS Section 4.5.2.5.

APPENDIX G
MDOC Scoping Decision

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MINNESOTA
DEPARTMENT OF
COMMERCE

September 8, 2006

TO: Glenn Wilson, Commissioner
DOC (Tel: 651-296-4026)
Edward Garvey, Deputy Commissioner
DOC (Tel: 651-296-9325)
THROUGH: Marya White, Manager
DOC (Tel: 651-297-1773
FROM: William Cole Storm, Staff
DOC Energy Facility Permitting (Tel: 651-296-9535)
RE: DOC Staff Recommendation on Content of the Environmental Impact Statement
Mesaba Energy Project Proposed by Excelsior Energy, Inc.
PUC Docket No. E6472/GS-06-668

ACTION REQUIRED: Signature of the Commissioner on the attached Order, "Environmental Impact Statement Scoping Decision." Once signed, the Department of Commerce (DOC) staff will mail the notice of the order to interested parties.

BACKGROUND:

Excelsior Energy, Inc. is proposing to construct and operate a coal-feedstock Integrated Gasification Combined Cycle ("IGCC") power plant. The proposed power plant will be constructed in two phases; each phase will be capable of producing approximately 606 MW (net) of baseload power.

The U.S. Department of Energy (DOE) selected the Mesaba Energy Project under the Clean Coal Power Initiative Round 2 solicitation for negotiation of a Cooperative Agreement. Under the Cooperative Agreement DOE would provide financial assistance for the proposed project. On October 5, 2005, DOE published a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) in the Federal Register (70 FR 58207). It is DOE's intent to prepare, in cooperation with the Minnesota Department of Commerce and the Minnesota Public Utilities Commission, an EIS that will fulfill the requirements of both the Federal and State environmental review processes.

Excelsior Energy filed a Joint Permit Application for a large electric power generating plant (LEPGP) site permit, a high voltage transmission line (HVTL) routing permit and a pipeline (partial exemption) routing permit on June 16, 2006.

In an Order dated July 28, 2006, the PUC accepted the Joint Permit Application submitted by Excelsior Energy for the Mesaba Energy Project.

The permit application is being reviewed under the Full Review Process (Minn. Rule Chapter 4400) within the Power Plant Siting Act. Under the full permitting process the applicant is required to submit two sites and/or routes (i.e., a preferred and an alternate) for consideration.

As part of the permitting process, the DOC is responsible for certain procedural requirements (i.e., public notice and meetings), issuing the EIS Scoping Decision and the preparation of an Environmental Impact Statement. A contested case hearing will also be conducted following completion of the draft EIS. The PUC has up to one year from the time the application is accepted to complete the process and make a final decision; that decision includes a determination on the adequacy of the EIS and the determination whether to grant the requested permits, as well as, site/route selection and permit conditions.

EIS Scoping Process

The Minnesota Department of Commerce (DOC) held two public informational and Environmental Impact Statement (EIS) scoping meetings for the Mesaba Energy Project on consecutive nights in the vicinities of the preferred and alternative site in northeastern Minnesota.

The first meeting was held on August 22, 2006, at Taconite Community Center in Taconite. The second was held on August 23, 2006, at Hoyt Lakes Arena in Hoyt Lakes.

In satisfying the notification requirements within Minn. Rules 4400.1350, the public informational and EIS scoping meetings were announced in the *EQB Monitor* on July 31, 2006, and published notices appeared in local newspapers, including: the *Scenic Range News* on July 6; the *Duluth News Tribune, Hibbing Daily Tribune, The Mesabi Daily News,* on July 5, the *Grand Rapids Herald-Review* on July 7; and *The East Range Shopper* on July 3. Additionally, notice was sent to those persons whose names are on the EQB general notification list, regional and local governments, and each person whose property is adjacent to any of the proposed sites or routes.

Both meetings began at 7:00 pm Central Daylight Time (CDT) on the respective nights.

The Taconite meeting adjourned at approximately 10:45 pm, and the Hoyt Lakes meeting adjourned at approximately 9:30 pm. Each scoping meeting was preceded by an open house from 4:00 pm to 7:00 pm, during which DOC, U.S. Department of Energy, Office of Fossil Energy, National Energy Technology Laboratory (DOE-NETL) and Excelsior Energy personnel were available to answer questions.

Information packages were available to attendees that included a fact sheet on the State siting and routing process, and the Draft EIS Scoping Document. Also, Excelsior Energy, Inc. exhibited approximately 25 mounted graphic displays illustrating various features of the proposed project.

Collectively, approximately 400 individuals attended the public scoping meetings, including several individuals who attended both meetings. One hundred and fifty-nine individuals signed the attendance list at Taconite; 123 signed the attendance list at Hoyt Lakes. All attendees were invited to provide comments, either written or spoken, on the proposed project.

Those attendees wishing to speak were given an opportunity to do so. Comment sheets were made available for all attendees wishing to provide written comments.

DOC Energy Facility Permitting (EFP) staff led the presentations and presided over both formal meetings. A court recorder was present at each meeting to ensure that all spoken comments were recorded and legally transcribed. Fifty individuals presented oral comments at the meetings.

In addition, DOC-EFP staff provided an e-mail address for members of the public who preferred to submit their comments electronically, a postal address for those who preferred to mail their comments, a telephone fax number for those who preferred to fax their comments and a toll-free telephone number for those who preferred to speak their comments. In all, 49 comments were submitted via e-mail, US Post Service mail, or fax.

The transcripts and all comments are maintained as part of the Administrative Record.

Comments and Responses

All of the various comment submissions were reviewed to characterize specific issues, concerns, and questions, to ensure the consideration of all substantive concerns. Comments received during the public scoping period are intended to help direct and focus the analysis and contents of the EIS.

Operational Information and Design

Several respondents recommended that project operational information and design details be included in the EIS, including process information, information about the expected efficiency and reliability of the plant, feedstocks, utilities and resource requirements, emissions, and controls. Other comments addressed the physical size of the plant and the expected "footprint", rail alignments, transmission corridors, and various other features.

This information will be incorporated into the project/process description sections of the EIS.

Opinions

A number of comments contained statements of opinion and rhetorical questions, such as the desirability of a particular site. Such comments have not been assimilated into the Scoping Decision in all cases; however, the EIS will attempt to address the subjects raised to the extent appropriate.

Need

Many respondents expressed concerns about the need for the proposed facility, both from the perspective of electricity demand (e.g. exemption from certificate of need) and from the perspective of whether coal use is the best choice to meet that demand.

Because the Department has concluded that this facility qualifies as an "innovative energy project,"[1] and because Minnesota Statue 216B.1694, subdivision 2, item 1, has exempted such a project from demonstrating need, issues related to the need, size or type of the facility are excluded from consideration in this matter. Thus, such issues are not within the scope of the EIS. The DOC will not, as part of this environmental review, consider whether a different size or different type plant should be built instead. Nor will the DOC consider the no-build option.

Viability

Additionally, some of the comments conveyed concern over the long-term operation and viability of the project. Respondents questioned whether the envisioned economic benefits of the proposed facility are valid, and whether economics should outweigh the potentially adverse environmental and human effects of construction and operation of the facility.

There is currently a docket before the PUC pertaining to Excelsior Energy's proposed power purchase agreement (Docket E6472/M-05-1993) that will evaluate many of these concerns.

Overall Environmental Impacts

Numerous comments were received with respect to specific natural resources, environmental welfare and human health issues. The majority of the comments were related to the use of natural resources (e.g., coal, land, water, national parks), the discharge of pollutants to the natural environment (e.g. air, water, wetlands, , CO_2 emissions) and adverse health effects, and the socioeconomic impacts of the project (e.g. jobs, taxes, and property values).

Comments were also received relating to eminent domain, increased vehicular and rail traffic, and demands on local community services (e.g. emergency responders, local water and sewer systems, and tourism/recreation). Concerns were also expressed about connected actions and the cumulative effects of current industrial activities and future projects planned within the vicinity of the Mesaba Energy Project.

These issues, along with the typical LEPGP, HVTL and Pipeline routing and siting impacts, have been incorporated into the proposed Order on the Environmental Impact Statement Scoping Decision.

SCHEDULE: The Draft Environmental Impact Statement will be completed February, 2007.

I:\EQB\Power Plant Siting\Projects - Active\Excelsior - Mesaba Energy\Internal Correspodence\Memo to Commr on content of EIS.doc

[1] *See* Direct Testimony of Eilon Amit, at pp. 5-6, MPUC Docket No. E6472/M-05-1993 (petition of Excelsior Energy, Inc. for approval of a power purchase agreement), filed on September 5, 2006.

MINNESOTA DEPARTMENT OF COMMERCE

In the Matter of Excelsior Energy, Joint (LEPGP, HVTL, Pipeline) Application for the Mesaba Energy Project in Itasca and St. Louis Counties)

ENVIRONMENTAL IMPACT STATEMENT SCOPING DECISION

PUC Docket No. E6472/GS-06-668

The above matter has come before the Commissioner of the Department of Commerce (the Department) for a decision on the content of the Environmental Impact Statement (EIS) to be prepared in consideration of the Joint Permit Application for the proposed Mesaba Energy Project from Excelsior Energy.

Having reviewed the matter, and having consulted with staff, I hereby make the following Order on the content of the EIS:

MATTERS TO BE ADDRESSED

The EIS will address the following matters:

Cover Page
Executive Summary
Table of Contents (Including List of Figures, List of Tables)
Acronyms and Abbreviations
Glossary
1. Purpose and Need for the Proposed Action
    1.1 Introduction
        (Lead Agency, Cooperating Agencies, Project Proponent, Location)
    1.2 Clean Coal Power Initiative (Background and project selection)
    1.3 Proposed Action (Brief synopsis distinguishing between DOE's Proposed Action and project proponent's Proposed Action)
    1.4 Purpose and Need for the Proposed Action
        1.4.1 Purpose of the Proposed Action
        1.4.2 Need for the Proposed Action
            1.4.2.1 DOE Need
            1.4.2.2 Minnesota DOC and PUC Role
            1.4.2.3 Project Proponent Need
    1.5 Regulatory Framework
        1.5.1 National Environmental Policy Act
        1.5.2 Minnesota State Requirements
            1.5.2.1 Minnesota Rules, Chapter 4400
            1.5.2.2 Minnesota Statute 216B.1694 Innovation Energy Project

1.5.2.3 Minnesota Rules, Chapter 4415/18 CFR Part 157 of the Natural Gas Act
1.5.2.4 Minnesota Environmental Policy Act
1.5.2.5 Taconite Tax Relief Area
1.5.2.6 Other State Requirements and Permits

1.6 Scoping of the Environmental Impact Statement
1.6.1 NEPA Scoping Process
1.6.2 Minnesota Rule 4400.1700, subpart 2
1.6.2 Public Comments Received
1.6.3 Special CCPI Considerations under NEPA
1.6.4 Region of Influence
1.6.5 Connected Actions (Phase II Power Plant, County Hwy 7 Realignment)

1.7 Associated Actions
1.7.1 Related NEPA Compliance Actions (Including Final Programmatic EIS, Clean Coal Technology Demonstration Program, DOE, November 1989)
1.7.2 Related DOE CCPI Activities
1.7.3 Related Regional Activities

2. Proposed Action and Alternatives

2.1 Description of the Proposed Action (Non-site-specific description and general features of the Mesaba Energy Project)

2.1.1 Technology Selection and Process Description
2.1.1.1 Technology Selection (Including discussion of lessons learned from Wabash River Coal Gasification Repowering Project)
2.1.1.2 Gasification Combined-Cycle Technology
2.1.1.3 Process Components and Major Equipment (potential carbon capture/transport/sequestering)
2.1.1.4 Plant Utility Systems

2.1.2 Resource Requirements (Inputs)
(General needs for the plant that affect site selection and help frame the later discussion of how site alternatives were selected and how sites were eliminated)
2.1.2.1 Feedstock and Flux Requirements
2.1.2.2 Natural Gas Requirements
2.1.2.3 Process Water Requirements
2.1.2.4 Infrastructure Requirements
2.1.2.5 Transportation Requirements
2.1.2.6 Land Area Requirements

2.1.3 Discharges, Wastes, and Products (Outputs)
2.1.3.1 Air Emissions
2.1.3.2 Water Effluents
2.1.3.3 Liquid Wastes
2.1.3.4 Solid Wastes
2.1.3.5 Marketable Products
2.1.3.6 Toxic and Hazardous Materials
2.1.3.7 Pollution Prevention, Recycling, and Reuse

2.1.4 Construction Plans
2.1.4.1 Construction Staging and Schedule
2.1.4.2 Construction Materials and Suppliers
2.1.4.3 Construction Labor
2.1.4.4 Construction Safety Policies and Programs

- 2.1.5 Operation Plans
  - 2.1.5.1 Test Plans
  - 2.1.5.2 Operational Plans
  - 2.1.5.3 Operational Labor
  - 2.1.5.4 Health & Safety Policies and Programs
  - 2.1.5.5 Worst-case Operating Scenario
- 2.2 Alternatives
  - 2.2.1 Alternatives Available to DOE
    - 2.2.1.1 Proposed Action (Proceed continue cost-shared funding beyond preliminary design/project definition)
    - 2.2.1.2 No-Action Alternative (Do not proceed with the cooperative agreement)
  - 2.2.2 Alternatives Sites Considered (by Excelsior Energy)
    - 2.2.2.1 Preferred West Range Site (Including HVTL & Pipeline corridors)
    - 2.2.2.2 Alternative East Range Site (Including HVTL & Pipeline corridors)
    - 2.2.2.3 Alternatives Eliminated from Detailed Evaluation
  - 2.2.3 Alternatives Available to Minnesota PUC
    - 2.2.3.1 Approve Permits for Preferred West Range Site
    - 2.2.3.2 Approve Permits for Alternative East Range Site
    - 2.2.3.3 Disapprove the Permit Application

3. Affected Environment (Note: This section will contain the described information for both the West Range Site and the East Range Site)
  - 3.1 Introduction
  - 3.X Resource Subject (Note: This "X" outline applies to all resource subjects listed below)
    - 3.X.X.1 Regional and Local Conditions
    - 3.X.X.2 Site-specific Conditions
    - 3.X.X.3 Corridor-specific Conditions
  - 3.2 Aesthetics (daytime and nighttime)
    - 3.2.1 Physical Setting
    - 3.2.2 Viewshed
    - 3.2.3 Scenic Resources
  - 3.3 Air Quality and Climate
    - 3.3.1 Local and Regional Climate
    - 3.3.2 Air Quality Regulations
    - 3.3.3 Local and Regional Air Quality
    - 3.3.4 Sources of Air Pollution
    - 3.3.5 Sensitive Receptors (Including Class I Areas)
    - 3.3.6 Air Quality Management Plans
  - 3.4 Geology and Soils
    - 3.4.1 Geology
    - 3.4.2 Mineral Resources and Mining
    - 3.4.3 Seismic Activity
    - 3.4.4 Soils
    - 3.4.5 Prime Farmland
    - 3.4.6 Potential Formations for Geologic Sequestration of CO_2
  - 3.5 Water Resources
    - 3.5.1 Groundwater
    - 3.5.2 Surface Water

- 3.6 Floodplains
  - 3.6.1 Local Hydrology and Drainage
  - 3.6.2 Flood Hazard Areas
- 3.7 Wetlands
- 3.8 Biological Resources
  - 3.8.1 Terrestrial Ecosystems
  - 3.8.2 Aquatic Ecosystems
  - 3.8.3 Protected Species and Habitats
- 3.9 Cultural Resources
  - 3.9.1 Archeological Resources
  - 3.9.2 Historic Resources
  - 3.9.3 Native American Cultural Resources (includes Indian treaty rights)
- 3.10 Land Use
  - 3.10.1 Existing Land Use/Human Settlement
  - 3.10.2 Zoning Ordinances
  - 3.10.3 Local and Regional Land Use Plans
- 3.11 Socioeconomics
  - 3.11.1 Demographics
  - 3.11.2 Housing
  - 3.11.3 Employment and Income
  - 3.11.4 Business and Economy
- 3.12 Environmental Justice
  - 3.12.1 Minority Populations
  - 3.12.2 Low-Income Populations
- 3.13 Community Services
  - 3.13.1 Law Enforcement
  - 3.13.2 Fire Protection
  - 3.13.3 Emergency Response
  - 3.13.4 Parks and Recreation
- 3.14 Utility Systems
  - 3.14.1 Water
  - 3.14.2 Wastewater
  - 3.14.3 Energy
  - 3.14.4 Telecommunications
- 3.15 Traffic and Transportation
  - 3.15.1 Local Roads and LOS
  - 3.15.2 Rail Access (includes impact of rail traffic on emergency vehicle response)
- 3.16 Materials and Waste Management
  - 3.16.1 Construction Materials
  - 3.16.2 Coal and other Feedstock
  - 3.16.3 Landfills
  - 3.16.4 Recycling Facilities
- 3.17 Safety and Health
  - 3.17.1 Occupational Safety Considerations
  - 3.17.2 Community Health Issues
  - 3.17.3 Local and Regional Receptors/Health Risk Assessment
  - 3.17.4 Electromagnetic Fields (EMF) (Including Henshaw effect)

- 3.18 Noise
  - 3.18.1 Local Ordinances
  - 3.18.2 Existing Sources of Noise
  - 3.18.3 Local and Regional Receptors
- 3.19 Light and Glare
  - 3.19.1 Local Ordinances
  - 3.19.2 Existing Light Sources
  - 3.19.3 Local and Regional Receptors

4. Environmental Consequences (Note: This section will contain the described information for both the West Range Site and the East Range Site)
   - 4.1 Introduction (Including categories of relative impact)
   - 4.X Resource Subject (Note: This "x" outline applies to all resource areas listed)
     - 4.X.1 Approach to Impacts Analysis
       - 4.X.1.1 Region of Influence
       - 4.X.1.2 Method of Analysis
       - 4.X.1.3 Criteria of Impacts
     - 4.X.2 Common Impacts of Proposed Action (Including construction and operation, Phases I & II)
     - 4.X.3 Site-specific Impacts (Including construction and operation, Phases I & II)
       - 4.X.3.1 West Range Site
       - 4.X.3.2 East Range Site
     - 4.X.4 Corridor-specific Impacts (Including construction and operation, Phases I & II)
       - 4.X.3.1 West Range Transmission, Pipeline, and Transportation Corridors
       - 4.X.3.2 East Range Transmission, Pipeline, and Transportation Corridors
     - 4.X.5 Impacts of No-Action Alternative
     - 4.X.6 Mitigation of Adverse Impacts
   - 4.2 Aesthetics
   - 4.3 Air Quality (includes discussions on CO_2)
   - 4.4 Geology and Soils
   - 4.5 Water Resources (surface & groundwater, including the Swan & Mississippi)
   - 4.6 Floodplains
   - 4.7 Wetlands
   - 4.8 Biological Resources
   - 4.9 Cultural Resources (includes Indian treaty rights)
   - 4.10 Land Use/Human Settlement (includes recreational land uses)
   - 4.11 Socioeconomics
   - 4.12 Environmental Justice
   - 4.13 Community Services
   - 4.14 Utility Systems
   - 4.15 Traffic and Transportation (includes impact of rail traffic on emergency vehicle response)
   - 4.16 Materials and Waste Management
   - 4.17 Safety and Health
   - 4.18 Noise
   - 4.19 Light and Glare
5. Summary of Environmental Consequences
   - 5.1 Comparative Impacts of Alternatives
   - 5.2 Potential Cumulative Impacts
   - 5.3 Unavoidable Adverse Impacts and Mitigation

5.4 Irreversible and Irretrievable Commitments of Resources
5.5 Relationship between Short-term Uses of the Environment and Long-term Productivity
6. Regulatory Compliance and Permit Requirements
7. Agencies and Individuals Contacted
8. Distribution List
9. References
10. List of Preparers (Including Conflict of Interest Certification)
11. Index

Appendix

The above guide is not intended to serve as a "Table of Contents" for the EIS document, and as such, the organization of the information and data may not be similar to that appearing in the EIS.

IDENTIFICATION OF PERMITS

The EIS will include a list of permits that will be required for the applicant to construct this project.

ISSUES OUTSIDE OF THE ENVIRONMENTAL ASSESSMENT

Because the Department has concluded that this facility qualifies as an "innovative energy project,"[1] and because Minnesota Statue 216B.1694, subdivision 2, item 1, has exempted such a project from demonstrating need, issues related to the need, size or type of the facility are excluded from consideration in this matter. Thus, such issues are not within the scope of the EIS. The DOC will not, as part of this environmental review, consider whether a different size or different type plant should be built instead. Nor will the DOC consider the no-build option.

SCHEDULE

The EIS shall be completed in February, 2007.

Signed this 13 day of September 2006

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE

Glenn Wilson, Commissioner

I:\EQB\Power Plant Siting\Projects - Active\Excelsior - Mesaba Energy\Environmental Review\Scoping Documents\EIS-scoping-decision.doc

[1] *See* Direct Testimony of Eilon Amit, at pp. 5-6, MPUC Docket No. E6472/M-05-1993 (petition of Excelsior Energy, Inc. for approval of a power purchase agreement), filed on September 5, 2006.

APPENDIX H
Process Water Discharge Alternatives (West Range Site)

(Note: Color versions of figures in this Appendix are included in the file posted at the DOE NEPA website: http://www.eh.doe.gov/nepa/docs/deis/deis.html)

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Environmental Analysis of Alternative Discharge Arrangements:

I. **Increased Discharge to Holman Lake and Reduced or Eliminated Discharge to Canisteo Mine Pit**
II. **Relocation of the Holman Lake Outfall to the Swan River**
III. **Zero Liquid Discharge Treatment**

Prepared by Excelsior Energy Inc.
March 15, 2007

Introduction

Excelsior has analyzed the environmental impacts of three alternative discharge arrangements for cooling tower blowdown ("CTB") from the West Range Site. These represent potential mitigation alternatives to the base case that was proposed in Excelsior's National Pollution Discharge Elimination System ("NPDES") permit application. The mitigation alternatives are not necessarily mutually exclusive. Since the East Range Site's placement within the Lake Superior watershed requires complete zero liquid discharge treatment of all water, no alternatives analysis was performed for that Site.

Discharge Alternative 1: Increased Discharge to Holman Lake and Reduced or Eliminated Discharge to Canisteo Mine Pit

Description

An alternative discharge arrangement to that proposed in Excelsior's application for a NPDES permit would be to discharge a greater portion of the IGCC Power Station's cooling tower blowdown ("CTB") to Holman Lake, thereby significantly reducing or eliminating such discharges to the Canisteo Mine Pit ("CMP") under normal operating conditions. Excelsior is exploring this option, the execution of which will be subject to discussions with the Minnesota Pollution Control Agency ("MPCA"). To examine the full effects possible under this alternative, Excelsior has assumed that 100% of the CTB can be discharged to Holman Lake and that the discharge to the CMP can be eliminated. The ultimate allocation may fall between this case and the one presented in Section 4.5 of the Environmental Impact Statement ("EIS"), and the environmental impacts can be interpolated accordingly.

Water Management Plan

Implementing this alternative would require modest adjustments to the water management plan. These adjustments are the result of the reduction of the appropriation for Phase II by 1,700 gpm (based on five cycles of concentration of CTB rather than three) and a reduction of 300-3,100 gpm of availability from the CMP since its water would no longer be replenished by CTB discharge.

In Phase I operations, the 300 gpm lost from the CMP can be replaced, for example by reducing the discharge from the Hill Annex Mine Pit ("HAMP") Complex to Upper Panasa Lake compared to the base case. The adjusted water management plan is shown in Figure 1. In Phase II, a total of up to 1,400 gpm must be replaced due to the factors mentioned above. The sustainable flows modeled in Excelsior's Water Appropriation Permit application, reproduced in Table 1 below, represent only one possible scenario and were selected to show appropriation from each potential source. An equally likely scenario for Mesaba One and Mesaba Two would be to operate the CMP and HAMP Complex at lower elevations (to obtain flows closer to the maximum estimated flow available) and supplement flows as necessary with water from the Lind

Mine Pit and Prairie River.

Figure 1: Phase I Water Operations Flow Rates: West Range IGCC Power Station

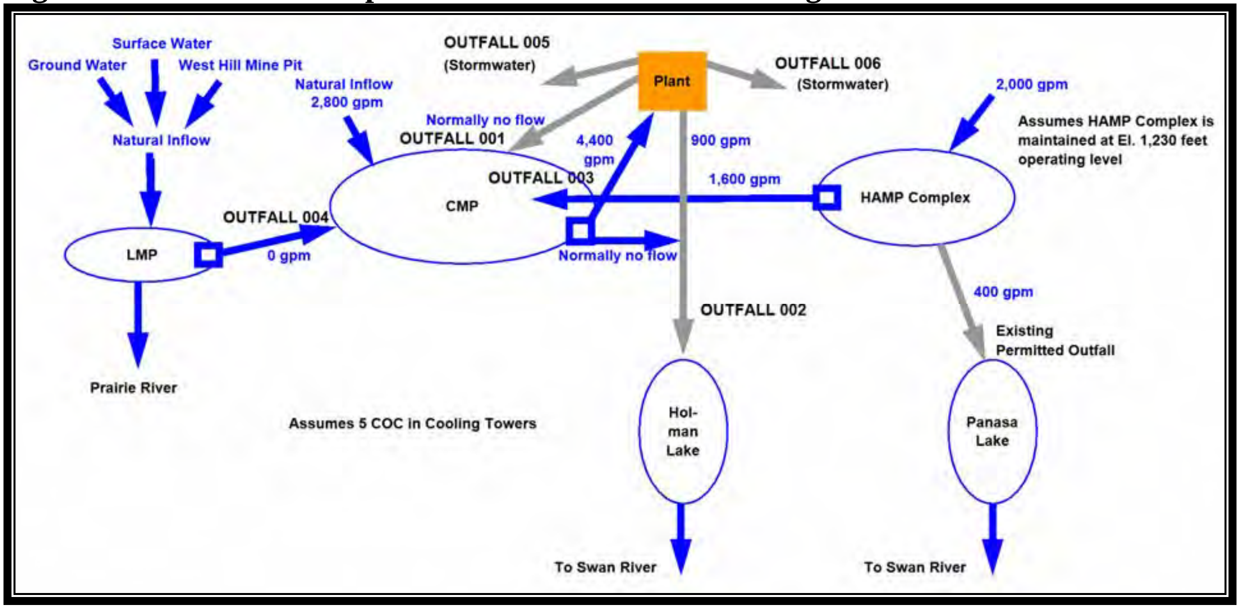


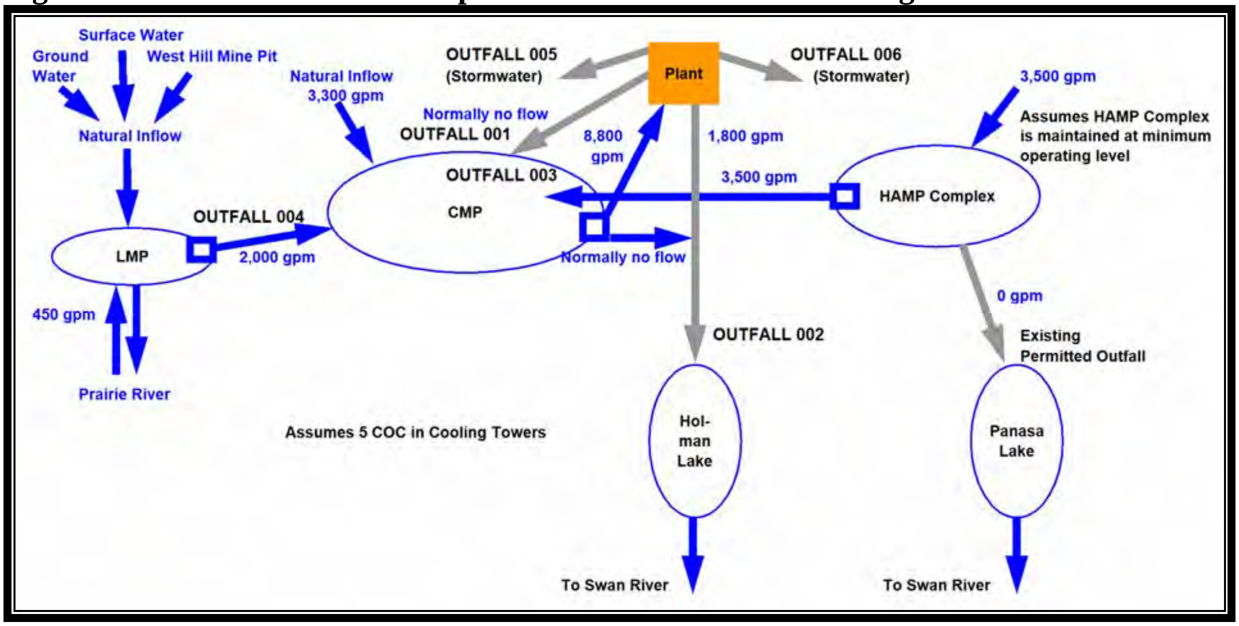
Table 1: Sustainable Flows Modeled in Excelsior's Water Appropriation Permit Application

Water Source	Est. Range of Flow (gpm)	Sustainable Flow for Water Appropriation Modeling (gpm)
Canisteo Mine Pit	810-4,190	2,800
Hill-Annex Mine Pit Complex	1,600-4,030[a]	2,000[b]
Lind Mine Pit	1,600-2,000	1,800[c]
Prairie River	0-2,470[d]	2,470[d]
Discharge from IGCC Power Station	0-3,500	Varies

Notes:
[a]Maximum flow occurs at minimum operating elevation
[b]At an operating elevation of 1,230 ft msl
[c]Based on one summer flow measurement at the LMP outlet and one winter and one summer flow measurement taken at the West Hill Mine Pit outlet
[d]Based on 25% of 7Q10

Figure 2 shows a possible water management plan that could serve Mesaba One and Mesaba Two under the scenario where CTB discharges would be eliminated. In the event that mine pit yields are significantly lower than expected, or during times of extended drought, the option would exist to revert back to the originally proposed arrangement with discharge into the CMP.

Figure 2: Phase I and II Water Operations Flow Rates: West Range IGCC Power Station



Water Quality

The most direct environmental impact associated with this alternative is that by eliminating CTB discharges to the CMP, the water quality of the CMP would remain relatively constant, avoiding the gradual increase in the concentration of pre-existing constituents due to the evaporation of cooling water. Additionally, the water quality of the CTB would no longer escalate as the source water quality would remain relatively constant. This would allow the cooling towers to operate at five cycles of concentration rather than three as specified in the base case. Table 2 shows the estimated concentration of chemical constituents in the CTB discharge for this case. See the section below entitled "Swan River" for further discussion of water quality impacts that would result from water quality trading.

Table 2: Expected IGCC Power Station Discharges and Applicable State Numerical Water Quality Standards

Constituent	Units	Class 2 WQ Standard	Anticipated Effluent Water Quality – Phase I & II (5 COC)
Hardness	mg/l	250	1,540
Alkalinity	mg/l	n/a	--
Bicarbonate	mg/l	n/a	869
Calcium	mg/l	n/a	--
Magnesium	mg/l	n/a	--
Iron	mg/l	n/a	--
Manganese	mg/l	n/a	--
Chloride	mg/l	230	26
Sulfate	mg/l	n/a	487
TDS	mg/l	700	1,685
pH	mg/l	6 - 9	6 - 9
Aluminum	ug/l	125	50
Arsenic	ug/l	53	--
Barium	ug/l	--	--
Cadmium	ug/l	2.0[1]	Note 3
Chromium (6+)	ug/l	32[1]	Note 3
Copper	ug/l	15[1]	Note 3
Fluoride	mg/l	n/a	--
Mercury	ng/l	6.9	4.5
Nickel	ug/l	283[1]	25
Potassium	mg/l	n/a	20
Selenium	ug/l	5	Note 3
Sodium	mg/l	--	--
Specific Conductivity	umhos/cm	1000	2,400[4]
Zinc (3)	ug/l	191[1]	Note 3
Phosphorus	mg/l	1[2]	0.02

[1]Indicates a hardness based standard. It is assumed hardness in the receiving water is >200 mg/L based on available data.
[2]Phosphorus standard is an effluent limit and not a water quality standard.
[3]Results below detection limit.
[4]Values depicted reflect assumed values in the groundwater and LMP

Due to the increased discharge rate of CTB to Holman Lake, concentrations of chemical constituents in Holman Lake would increase, but would not escalate over the long term. Figures 3 and 4 show the modeled concentration of total dissolved solids (TDS) and mercury, respectively, over the life of the project for the base case with CTB discharges to both the CMP and Holman Lake. Figures 5 and 6 show the same for the alternative where CTB discharge to the CMP is eliminated. As in the base case, a variance for hardness and TDS, the standards for which are based on aesthetic rather than health-related concerns, may be necessary.

Figure 3: Water Quality (TDS) of Receiving Waters for Base Case: Discharge to Holman Lake and Canisteo Mine Pit

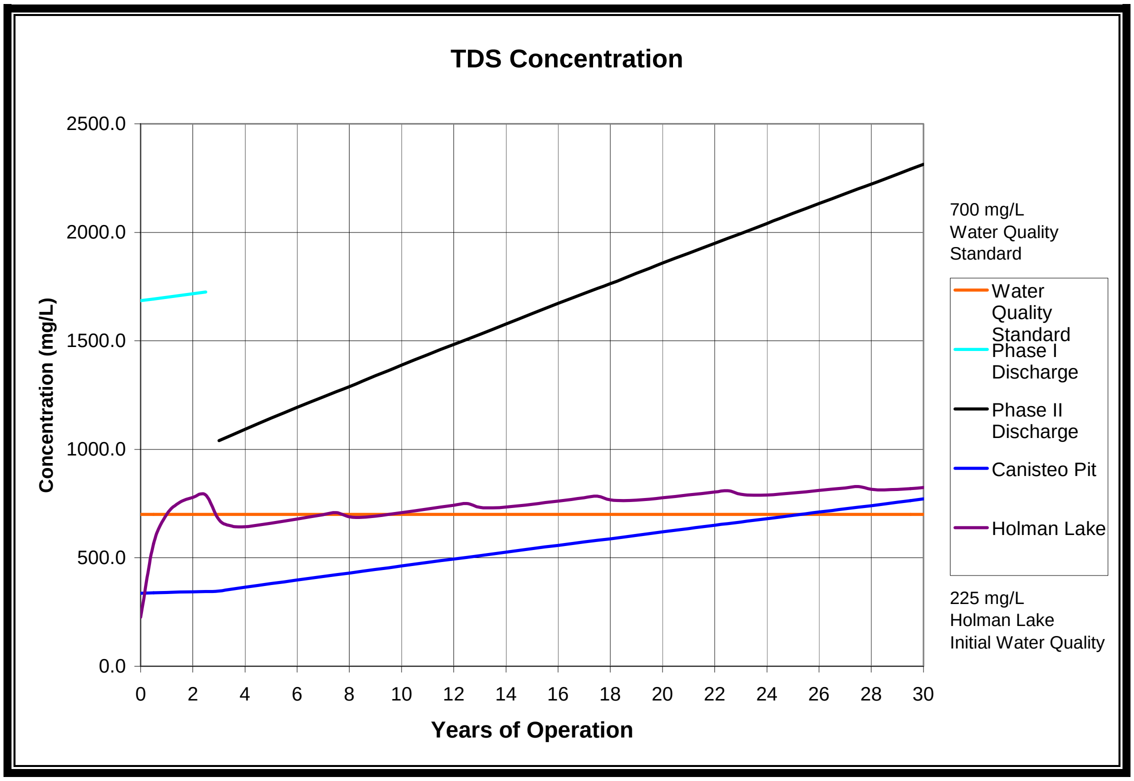


Figure 4: Water Quality (Mercury) of Receiving Waters for Base Case: Discharge to Holman Lake and Canisteo Mine Pit

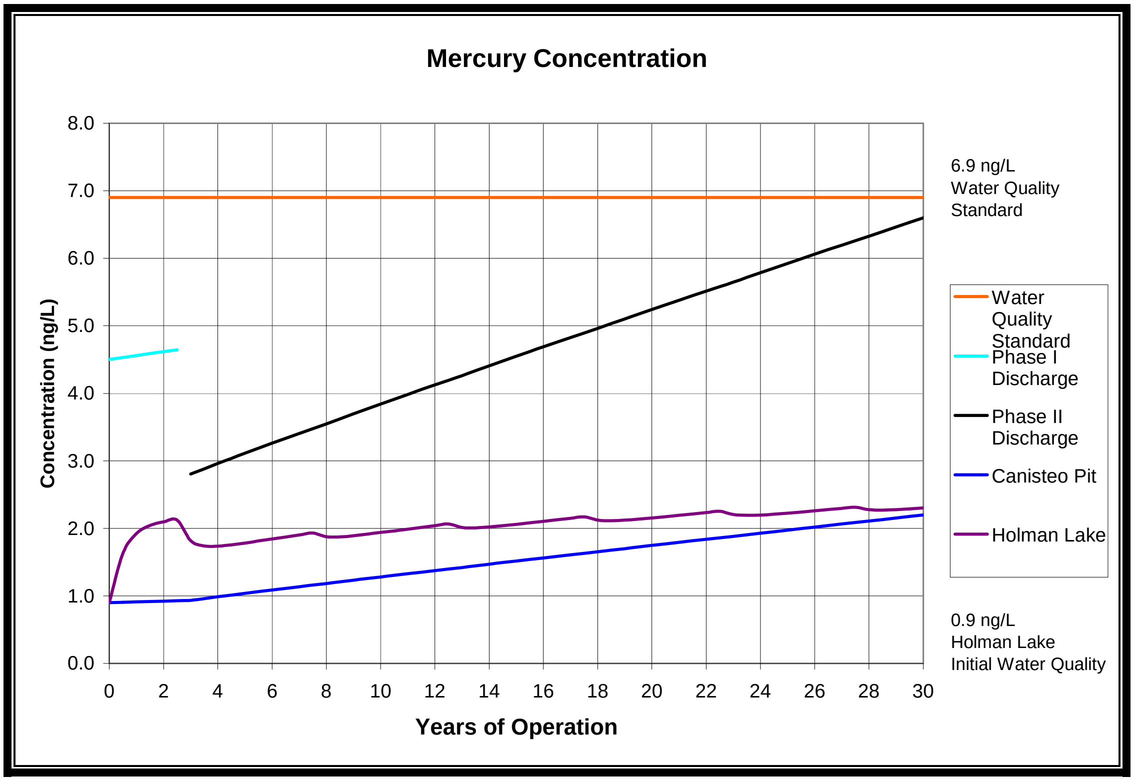


Figure 5: Water Quality (TDS) of Receiving Waters for the Alternative Case: Discharge to Holman Lake Only

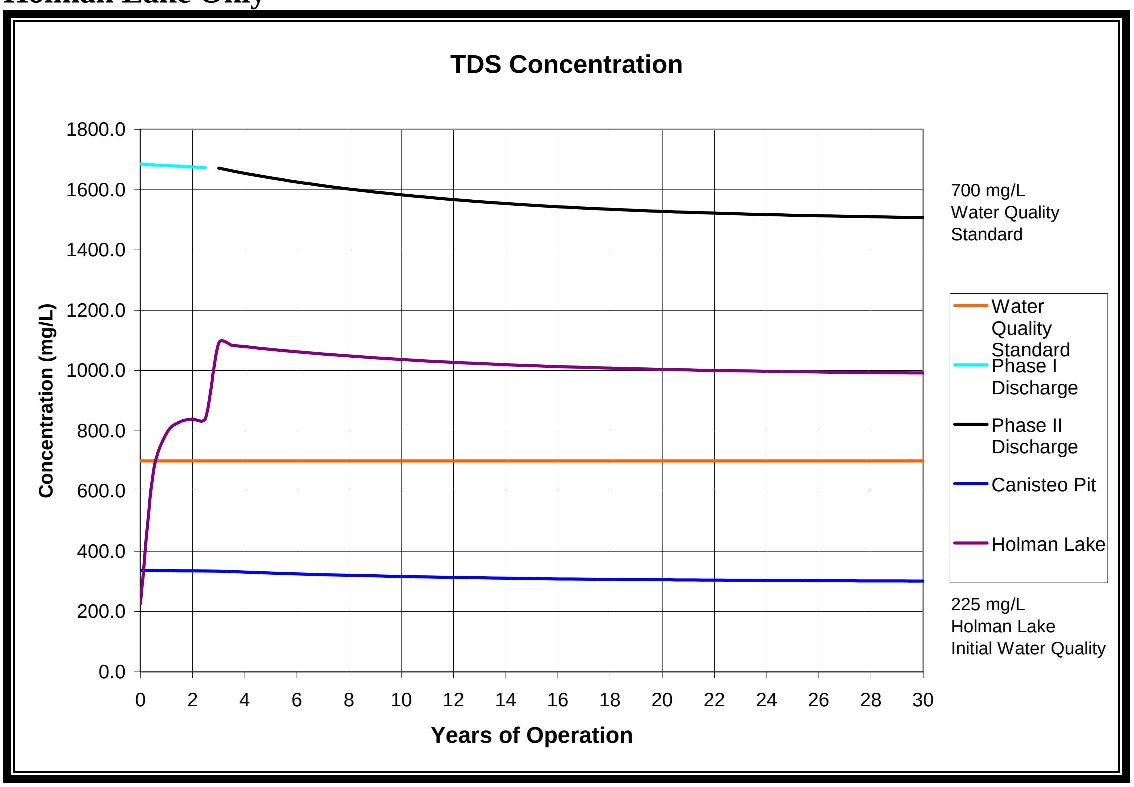
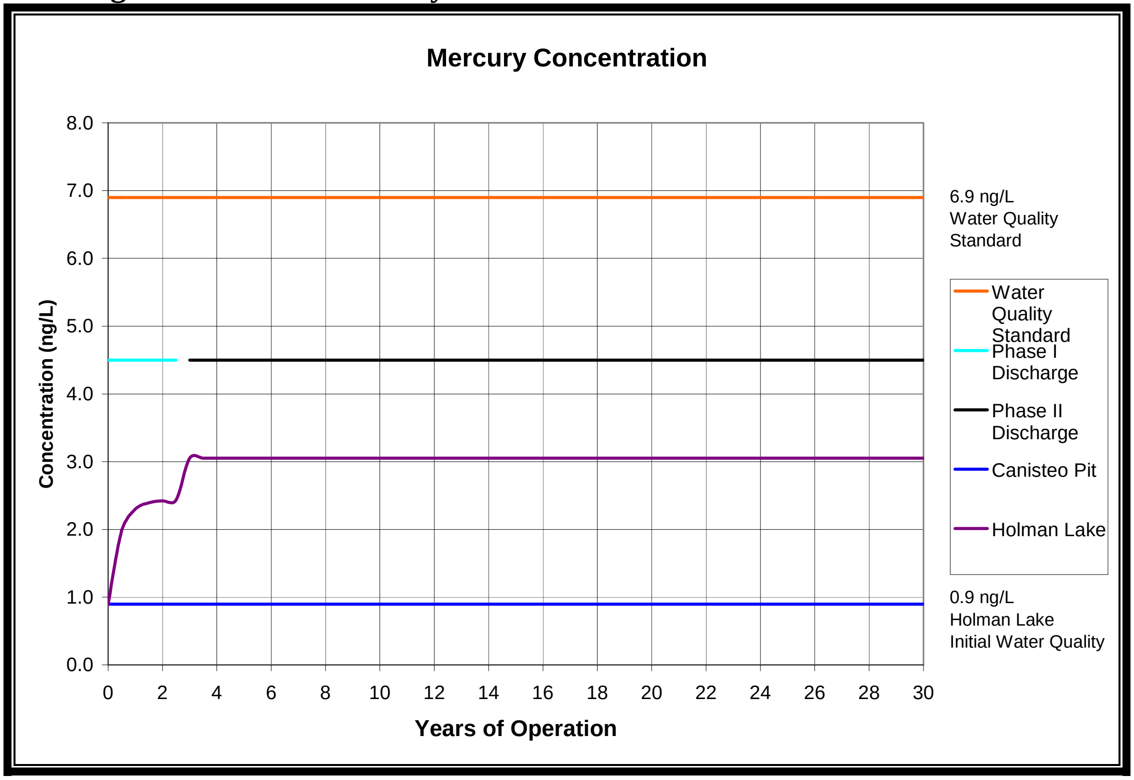


Figure 6: Water Quality (Mercury) of Receiving Waters for the Alternative Case: Discharge to Holman Lake Only



Sulfate

There is currently no water quality standard applicable to sulfate concentrations in the CMP or Holman Lake. However, the MPCA has raised questions regarding the potential relationship between sulfate and the generation of methyl mercury in certain aquatic environments.[1] While it has been demonstrated that the addition of sulfate may stimulate the formation of methyl mercury in peatlands,[2] the relationship may depend on several variables in addition to sulfate. These include organic carbon, the fraction of bioavailable mercury, the presence of adjacent wetlands and peat bogs in particular, and the microbial community structure (not all sulfate reducing bacteria methylate mercury).[3] Therefore, it is unclear at this time whether there would

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[1] May 4, 2006 letter from Minnesota Pollution Control Agency (Richard Sandberg, Manager, Air Quality Permits Section, Industrial Division) to Minnesota Department of Commerce (William Storm, Energy Facility Permitting), page 4. In the letter, the MPCA indicates that increases in sulfate in certain aquatic environments can contribute to the formation of methylmercury in receiving waters.

[2] Branfireun BA, Roulet NT, Kelly CA & Rudd JWM (1999) In situ sulphate stimulation of mercury methylation in a boreal peatland: toward a link between acid rain and methylmercury contamination in remote environments. Global Geochemical Cycles 13: 743-750. Branfireun BA, Bishop K, Roulet NT, Granberg G & Nilsson M (2001) Mercury cycling in boreal ecosystems: The long-term effect of acid rain constituents on peatland pore water methylmercury concentrations. Geophys. Res. Lett. 28: 1227-1230.

[3] Macalady JL, Mack EE & Scow KM (2000) Sediment Microbial Community Structure and Mercury Methylation in Mercury-Polluted Clear Lake, California. Appl. Environ. Microbiol. 66: 1479. Porvari P & Verta M (1995)

be any impact associated with sulfate discharged to Holman Lake via the CTB from Mesaba One and Mesaba Two. To the extent appropriate, this matter will be addressed during the National Pollutant Discharge Elimination System permitting process.

Thermal impacts are expected to be minimal. The thermal modeling presented in the Environmental Supplement, which showed negligible impacts, was based upon a 2,400 gpm flow, which exceeds any flow into Holman Lake that is considered in the base case or this alternative case.

Outflow from Holman Lake

Water flows through Holman Lake and into the Swan River would increase compared to the base case. Table 3 summarizes the conservatively modeled existing flow and the increase in both scenarios. While the relative increase appears large, Holman Lake has historically experienced large fluctuations in flows caused by dewatering flows from nearby mining activity and beaver dam management.   Therefore, historical outflows from Holman Lake have far exceeded those that will result from full CTB discharge, and scouring of the outflow from the lake is not likely to be of concern.

Table 3: Water Flows through Holman Lake

	Existing Flow	Maximum CTB Discharge	Total Outflow
Base Case	1,215 gpm	825 gpm	2,040 gpm
Alternative Case	1,215 gpm	1,800 gpm	3,015 gpm

Swan River

The headwaters of the Swan River are located about nine river-miles upstream of Holman Lake. At the outlet of Swan Lake, the origin of the Swan River, the average flow is approximately 28,000 gpm.[4] No forks in the Swan River occur between its origin and Holman Lake and, within that stretch, three streams from named lakes empty therein (these streams emanate from Snowball Lake, Lower Panasa Lake, and Twin Lakes); therefore, the flow rate at the point at which Mesaba's discharge enters the Swan River is expected to be minimal in relation to the existing flow except during periods of extremely low flow in the Swan River.

The Swan River is impaired for mercury and dissolved oxygen (for which phosphorus is the surrogate chemical of concern). Excelsior anticipates that water quality trading – that is, reducing mercury and phosphorus emissions via contractual arrangements with nearby sources in order to offset Mesaba's discharges – will be a valid approach to addressing these regulatory concerns. The MPCA is developing water quality trading rules, but has already issued NPDES

Methylmercury production In flooded soils - a laboratory study. Water, Air, and Soil Poll. 80: 765-773.

[4] Minnesota Steel Project Draft Environmental Impact Statement. p. 4-50. Feb. 2007 (*see* http://files.dnr.state.mn.us/input/environmentalreview/minnsteel/deis/deis_1.pdf).

permits in the past that featured such trading.[5]

Based on preliminary discussions with nearby sources in the watershed, trading opportunities do exist, since additional controls and improved operating practices could reduce their emissions. It is anticipated that under MPCA oversight, Excelsior could enter into agreements with these nearby sources to ensure that the reductions would take place and to compensate the sources for the cost of the reductions. Trading would occur at a ratio of greater than 1:1, thereby reducing the mass loading of mercury and phosphorus to the Swan River. Therefore, under a water quality trading arrangement, the impairment to the Swan River and downstream waters would decrease.

Air Quality

Particulate matter emissions due to cooling tower drift would decrease slightly due to the water quality of the Canisteo Mine Pit remaining relatively constant. Instead of 39 tons/year for Mesaba One and Mesaba Two, worst case emissions would be expected to decrease to 35 tons/year.

Discharge Alternative 2: Relocation of the Holman Lake Outfall to the Swan River

Description

An alternative discharge arrangement to that proposed in Excelsior's application for a NPDES permit would be to relocate the outfall currently proposed into Holman Lake to instead discharge to the Swan River. This alternative could occur independently of or in conjunction with Discharge Alternative 1 as discussed above. It would reduce the concern of localized impacts associated with discharge into a relatively small lake, and may expand the options for water quality trading mentioned in Alternative 1. Environmental impacts associated with the blowdown pipeline alignment could be minimized by following the proposed HVTL and natural gas pipeline corridors for approximately 4.5 miles to where they cross the Swan River. This crossing is less than half a mile upstream from the confluence of Holman Lake's discharge and the Swan River. While the currently proposed pipeline from the plant to Holman Lake could be eliminated, it may be necessary to maintain the proposed tie-in linking the CMP to Holman Lake in order to manage water levels in the CMP.

Two related alternatives include discharge to the Mississippi River and the Prairie River. The large distance to the Mississippi River (approximately 13 miles) rules it out as a reasonable alternative, even though the larger flow would alleviate some other concerns. The Prairie River has larger flows than the Swan River, but not large enough to dismiss the fundamental

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[5] NPDES permits for Southern Minnesota Beet Sugar Cooperative (2004) and Rahr Malting (1997) both included water quality trading.

environmental concerns associated with blowdown discharge such as the need for variances and mercury impairment. Also, it is anticipated that there would be fewer trading partners available in the Prairie River watershed than the Swan River. Finally, the Prairie River empties into Prairie Lake approximately 13 river miles downstream of the potential discharge point. This lake appears to have many residential property owners located on its shoreline and is impaired for fish consumption due to mercury, adding significant uncertainty regarding the practicality of obtaining the necessary discharge permit.

Water Quality

The most direct environmental impacts of this alternative are associated with the water quality of Holman Lake and Swan River. Because Holman Lake flows into the Swan River, the mass load on the watershed of chemicals of concern, such as phosphorus and mercury, would not change under this alternative. However, the allocation of localized impact between Holman Lake and Swan River would be affected.

Under this alternative, impacts to the water quality of Holman Lake as illustrated in Figures 3-6 would be avoided – i.e, concentrations of TDS, hardness, phosphate, mercury, etc. within the lake would remain at background levels. On the other hand, impacts to the Swan River's water quality would be somewhat magnified, as this alternative bypasses the dilutive effect of discharging into Holman Lake. As discussed in Alternative 1, the average flow of Swan River is at least 28,000 gpm, while the maximum discharge to the Swan River would be 1,800 gpm. Therefore, the impact to water quality during normal flow conditions would be modest. However, because the 7Q10 flow of the Swan River is just 800 gpm,[6] the river could consist primarily of CTB during conditions of extremely low flows. While flow augmentation during such periods could be considered a positive effect, the TDS and hardness concentrations would be relatively high. The maximum possible discharge concentrations would be the same as those identified in Table 2, and the allowable mixing zone of 25% of the 7Q10 flow (200 gpm) would do little to dilute those concentrations. As with the base case, a variance request for TDS and hardness, the standards for which are based on aesthetic rather than health-related concerns, may be necessary.

Thermal Impacts

As with water quality, because the blowdown discharge flow would be approximately 6% of the river flow, this alternative would have minimal thermal impacts during average flow conditions. However, the impact could become very significant during low flows, and would most likely introduce the need for a variance for the temperature of the discharge. During worst-case conditions, blowdown water would leave the plant at approximately 86°F during peak summer temperatures,[7] which just meets absolute state water quality standards, but would exceed the relative limit of 3°F above ambient water temperatures (Minn. R. 7050.0220 subp. 5). Cooling

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[6] United States Geological Survey. Low Flow Application for the Swan River near Calumet, MN. Available: http://gisdmnspl.cr.usgs.gov/lowflow/contData/logPearson/p05216860.pdf.

[7] Excelsior Energy. Appendix E to the Mesaba Energy Project NPDES Permit. Submitted to the MPCA June 2006.

ponds of sufficient size may be able to mitigate thermal concerns. Otherwise, due to the low 7Q10 value for the Swan River, it is unlikely that this standard could be met without a variance.

Sulfate and Other Localized Concerns

The possibility of localized impacts, such as the impact of sulfate on the formation of methyl mercury and concerns surrounding the outflow of Holman Lake, would be reduced. While the possibility of methyl mercury formation would not be completely eliminated, some factors that are suggested to be involved with its formation would be diminished. There would generally be less contact with adjacent wetlands under this alternative, and sulfate would be more fully diluted under normal flow conditions. While some localized impact to the Swan River near the point of discharge is possible (see variance discussions above), they are of lesser concern in a flowing river than in a lake.

Pipeline Alignment Impacts

While this alternative would increase the total miles of blowdown pipeline by approximately two miles, it would be along existing corridors, preventing any impacts associated with new pipeline corridors. A 150-ft right-of-way (“ROW”) is proposed where HVTL and natural gas pipelines share a corridor. The corridor may be able to accommodate the blowdown pipeline as proposed, or slight additional widening may be necessary. Therefore, while such widening may cause additional wetland and land use impacts, the impacts would be very small, and would be minimized by combining infrastructure corridors to the maximum extent possible.

Discharge Alternative 3: Zero Liquid Discharge Treatment

Description

An alternative to the discharge proposed in Excelsior’s NPDES permit application would be to eliminate all CTB discharge through the use of Zero Liquid Discharge (“ZLD”) treatment. A ZLD system on the West Range would be implemented as described for the East Range Site in Section 4.5.4 of the EIS. Outside of the Great Lakes watershed and extremely arid regions, ZLD treatment of power plant cooling water is a nearly unprecedented level of treatment. This alternative would eliminate all CTB blowdown discharge and associated pipelines from the facility and would reduce the facility’s water appropriation needs. ZLD treatment would incur significant capital and O&M costs, reduce plant efficiency and output, and produce additional solid waste and cooling tower drift. It is possible that this alternative could be combined with either of the first two by using ZLD treatment of a slipstream of the CTB, although such an arrangement may be even less cost effective than ZLD alone.

Water Management Plan

Compared to the base case from the permit application, maximum water appropriation needs for two Mesaba phases under this alternative would decrease from 10,300 gpm to 7,000 gpm.[8] However, the proposed CTB discharge from the plant to the CMP of 2,675 gpm (for Mesaba One and Two) would also be eliminated. Overall, the water needs are up to 625 gpm less than the base case, and up to 1,800 gpm less than required under Alternative 1.

Water Quality

As all direct discharges from the plant would be eliminated, water quality impacts to Holman Lake and the CMP as identified in Figures 3-6 would be avoided – i.e., concentrations of TDS, hardness, phosphate, mercury, etc. within the lake would remain at background levels. There would also be no direct water quality impact to the Swan River. The possibility of localized impacts identified for the base case and other alternatives would also be eliminated.

Solid Waste Disposal

The ZLD system for treating CTB would produce significant amounts of non-hazardous salts that must be transported from the site and landfilled. On the East Range, Mesaba One and Two could produce up to 24,000 tons/year of solid waste from this treatment based on the worst-case source water quality, which has a TDS of up to 1800 mg/L.[9] Because the source water quality on the West Range is much better (approximately 340 mg/L TDS[10]), the maximum salt production from ZLD treatment of the CTB would be less than 5,000 tons/year for Mesaba One and Two.

Plant Capacity and Efficiency

Operation of the ZLD system would consume electricity, adding to the parasitic load within the facility, which has two closely connected effects. First, it reduces the net output capacity of the plant. Second, it reduces the efficiency of the plant proportionately to this reduction in capacity. On the East Range Site, plant capacity could be reduced by up to 2 MW (approximately 0.3%), and the corresponding heat rate increase would be 31 Btu/kWh. As mentioned above, the source water quality at the West Range Site is superior, which is likely to reduce the parasitic load of ZLD treatment versus the East Range Site. Therefore, a 2 MW reduction in plant capacity and 31 Btu/kWh increase in heat rate are likely to overestimate this effect for the West Range Site. However, to the degree that efficiency is reduced, air emissions on a per megawatt hour basis will increase (by a maximum of about 0.3%).

Air Quality

The ZLD system will increase particular matter emissions due to cooling tower drift, as the cycles of concentration at which cooling towers operate would likely be increased. If this figure were doubled, particulate emissions due to drift would increase from 39 tons/year to 78

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[8] Excelsior Energy. Appendix D to the Mesaba Energy Project NPDES Permit. Submitted to the MPCA, June 2006.

[9] Excelsior Energy. Environmental Supplement to the Joint Permit Application. Submitted to the MN Public Utilities Commission, June 2006. p. I-155.

[10] *Ibid.*

tons/year, resulting in facility wide particulate emissions of 532 tons/year instead of 493 tons/yr.

Pipeline Alignment Impacts

Under this alternative, all blowdown pipelines from the plant could be eliminated. While most pipelines share corridors with other infrastructure, the approximately two mile blowdown pipeline to Canisteo Mine Pit represents corridor that could be completely eliminated. Wetland impacts may be reduced by up to 17 acres, and land use impacts would be reduced as well.

Summary

The quantifiable differences between the alternatives are tabulated below. Note that Alternative 2 reflects the base case with the Holman Lake discharge diverted to the Swan River. This alternative could be combined with Alternative 1, which would produce the results shown for that alternative. As described in the analysis, Alternative 1 involves a range of possible flow allocations, and it was assumed for the purposes of this summary that all discharge was redirected from the CMP to Holman Lake. The figures below represent maximum values.

Table 4: Quantitative Impact Comparison across Alternatives

Parameter	Base Case		Alt. 1		Alt. 2	
Number of Phases	1	2	1	2	1	2
Discharge to CMP (gpm)	300	2,675	0	0	300	2,675
Discharge to Swan River Watershed (gpm)	600	825	900	1,800	600	825
Net Water Needed (gpm)	4,100	7,625	4,400	8,800	4,100	7,625
Cycles of Concentration	5	3	5	5	5	3
PM Emissions from Drift (tons/yr)	20	39	18	35	20	39

Table 4 (con't)

Parameter	Alt. 1 & 2		Alt. 3	
Number of Phases	1	2	1	2
Discharge to CMP (gpm)	0	0	0	0
Discharge to Swan River Watershed (gpm)	900	1,800	0	0
Net Water Needed (gpm)	4,400	8,800	3,500	7,000
Cycles of Concentration	5	5	≥10	≥10
PM Emissions from Drift (tons/yr)	18	35	39	78