# 2. PROPOSED ACTION AND ALTERNATIVES

## 2.1 INTRODUCTION

This chapter describes the Proposed Action and alternatives for the Mesaba Energy Project from the perspectives of DOE, the project proponent (Excelsior), and the Minnesota PUC. These perspectives and respective decisions are discussed in the balance of Section 2.1. Section 2.2 describes the technology and principal features of Excelsior's proposed IGCC power plant, including the process equipment, plant utility systems, resource requirements (inputs), discharges, wastes and products (outputs), construction plans, and operational plans, which would be common features of the project irrespective of siting. Finally, Section 2.3 describes the siting and routing alternatives considered by Excelsior for the components of the proposed project, as well as site-specific considerations relating to the respective inputs and outputs at alternative sites.

### 2.1.1 Proposed Agency Action and Alternatives Considered by DOE

#### *2.1.1.1 DOE Proposed Action*

DOE's Proposed Action is to provide a total of $36 million in co-funding (see Section 1.3.2), through a cooperative agreement with Excelsior, for the design and one-year operational demonstration testing period for Phase I of the proposed two-phased Mesaba Energy Project. This first phase would be a nominal 606 $MWe_{(net)}$ IGCC power plant with an estimated cost of $2.16 billion (NETL, 2006a). Phase II, which would be an identical, co-located 606 MWe plant, would be privately financed and not involve co-funding by DOE.

A portion ($22,245,505) of the total funding has been made available for cost-sharing in the first budget period under the cooperative agreement, prior to completion of the NEPA process. The activities eligible for cost-sharing during the first period allow for the development of information (such as project definition, preliminary design, and environmental studies and permitting) that provide the basis for this EIS, consistent with DOE requirements and those of the MDOC, USACE, and USDA Forest Services. This is typical both in the amount of funding and the types of allowable activities for a CCPI project of this scope. Making these funds available does not prejudice DOE's ultimate decision on the proposed action and is consistent with DOE and CEQ regulations (10 CFR 1021.211 and 40 CFR 1506.1, respectively), which restrict DOE from taking action that would have an adverse environmental impact or limit the choice of reasonable alternatives until the ROD has been issued.

DOE may also provide a loan guarantee to Excelsior pursuant to EPAct of 2005 to guarantee a portion of the private sector financing of the project; however, this potential loan guarantee is not part of DOE's Proposed Action. This EIS considers the impacts of both phases of the Mesaba Energy Project as connected actions, consistent with NEPA policy, even though only Phase I would be co-funded under the CCPI Program.

#### *2.1.1.2 Alternatives Determined to be Reasonable by DOE*

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the proposed action in an EIS. The term "reasonable alternatives" is not self defining, but rather must be determined in the context of the statutory purpose expressed by the underlying legislation.

Congress established the CCPI Program with a specific goal — to accelerate commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. The CCPI legislation (Pubic Law No. 107-63) has a narrow focus in directing DOE to demonstrate technology advancements related to coal-based power generation designed to reduce the barriers to continued and expanded use of coal. Technologies capable of producing any combination of heat, fuels, chemicals, or other use byproducts in conjunction with power generation were considered; however, coal is required to provide at least 75 percent of the fuel for power generation. DOE's purpose in considering the Proposed Action (to provide cost-shared funding) is to meet the goal of the program by demonstrating the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application. Other technologies that cannot serve to carry out the goal of the CCPI Program (e.g., natural gas, wind power, conservation) are not relevant to DOE's decision of whether or not to provide cost-shared funding support for the Mesaba Energy Project, and therefore, are not reasonable alternatives.

The CCPI Program only allows for joint funding of proposed projects that have been selected through a solicitation and negotiation process. In 2004, DOE issued the second-round CCPI solicitation. Private sector participants submitted proposals in response to the solicitation. A group of proposals, representing diverse technologies and using a variety of coals, was selected to further the goals of the CCPI Program. DOE's choices were limited by virtue of having to choose from the proposals that were submitted under the solicitation process. The proposed project was selected under the second round of the CCPI Program because of the opportunity to demonstrate the specific technology proposed: the Conoco-Phillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application. Other projects that proposed to demonstrate other technologies are not alternatives to the proposed project for NEPA purposes.

Congress not only prescribed a narrow goal for the CCPI Program, but also directed DOE to use a process to accomplish that goal that would involve a more limited role for the Federal government. Instead of requiring government ownership of the demonstration project, Congress provided for cost-sharing in a project sponsored by the private parties, with the provision for repayment of the public funds invested. Therefore, rather than being responsible for the siting, construction and operation of the projects, DOE is in the more limited role of evaluating CCPI project applications to determine if they meet the CCPI Program's goal. It is well established that an agency should take into account the needs and goals of the applicant in determining the scope of the EIS for the applicant's project. When an applicant's needs and goals are factored into the deliberations, a narrower scope of alternatives may emerge than would be the case if the agency is the proprietor responsible for all project-related decisions.

### ***No Action Alternative***

Under the No-Action Alternative, DOE would not provide cost-shared funding to demonstrate the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application (beyond funding required to complete the NEPA process). In this case, the remaining funding withheld from the Mesaba Energy Project may be made available for other current or future CCPI projects. In the absence of DOE funding, Excelsior could still elect to construct and operate the proposed power plant provided that it could replace the Federal financing component and obtain required permits from state and Federal agencies. Therefore, the DOE No-Action Alternative could result in one of two potential scenarios:

(1) The Mesaba Energy Project would not be built.

(2) The Mesaba Energy Project would be built as planned by Excelsior.

DOE assumes that if Excelsior were to proceed with development in the absence of DOE funding, the project would include all of the features, attributes and impacts as described for the Proposed Action. However, without DOE participation, it is possible that the proposed project would be canceled. Therefore, for the purposes of analysis in this EIS, the DOE No Action Alternative is assumed to be equivalent to a "No Build" Alternative, meaning that environmental conditions would remain in the status quo (no new construction, resource utilization, emissions, discharges, or wastes generated). If the project were canceled, the proposed technology may not be demonstrated elsewhere. Consequently, eventual commercialization of the integrated technologies would probably not occur because utilities and industries tend to use known and demonstrated technologies rather than unproven technologies. This scenario would not contribute to the CCPI Program goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States.

***Alternative Sites***

As described in Section 1.5, Excelsior is required by state regulations to consider at least two potential sites for the proposed plant and two potential alignments for HVTLs. Excelsior's preferred and alternative sites and alignments are described in Section 2.3. Since DOE's decision in this EIS relates to the funding of a project selected competitively in accordance with objectives of the CCPI Program, DOE has not participated in the identification or selection of alternative sites or alignments for the Mesaba Energy Project. However, Excelsior has prepared an analysis of alternative sites within the TTRA (see Appendix F1), in which it concludes that the West Range and East Range sites are the only practicable alternative sites. DOE has reviewed Excelsior's site analysis and found it to be adequate for purposes of determining reasonable site alternatives for this EIS. Accordingly, the West and East Range sites are evaluated in detail as reasonable alternatives. Figure 2.1-1 shows the boundary of the TTRA and the two alternative locations (West Range Site and East Range Site) for the proposed project.

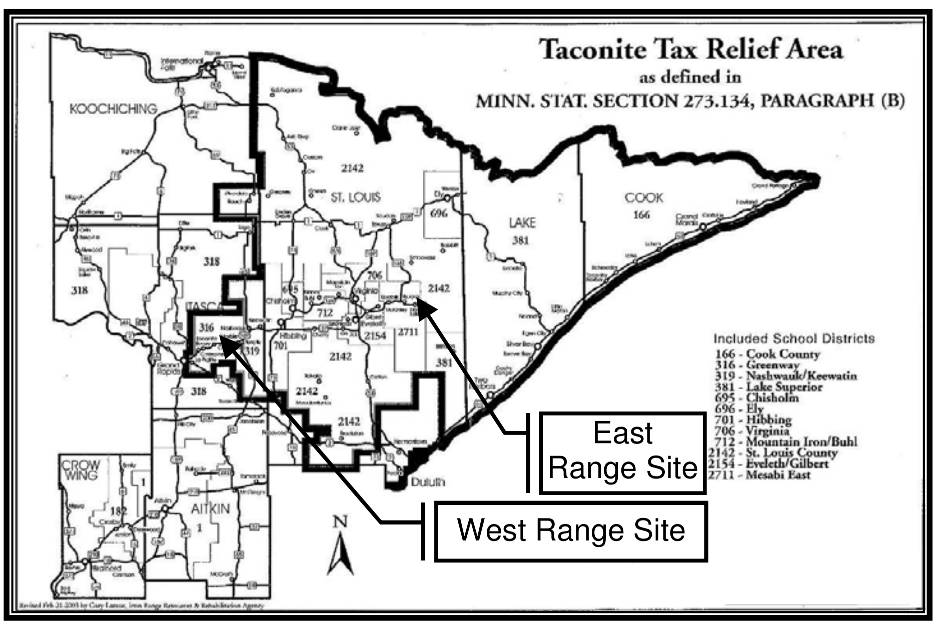



**Figure 2.1-1. West and East Range Sites in Taconite Tax Relief Area**

## ***Alternatives Eliminated from Further Consideration***

DOE considered the following alternatives in addition to the Proposed Action and No Action Alternative. For the reasons described below, DOE elected not to carry these alternatives forward for detailed evaluation in this EIS.

### *Alternative Sizes*

The proposed project could be demonstrated using a smaller-sized plant; however, a smaller-sized plant would not be sufficiently large to demonstrate the large utility-scale commercial viability of the IGCC technology advancements, which is the central purpose of this CCPI project. The smaller-sized, single process system IGCC plant was successfully demonstrated as part of the predecessor Clean Coal Technology (CCT) program at the Wabash River Coal Gasification Repowering Project (Wabash) located in Terre Haute, Indiana. Following the Wabash demonstration, a Value Improving Practices (VIP) process – a formal industry process applying nine separate practices – was applied to examine lessons learned, identify options to improve cost and performance, and optimize the design for application to large utility-scale commercial plant configurations. An availability target above 85 percent would be needed to successfully compete against older technology base load facilities in the power generation industry. Multiple process systems would be required to meet this availability requirement, including a more cost-effective redundancy within the plant, low-cost back-up systems of conventional technologies, and the integration of these features throughout the plant. The proposed project would demonstrate the large utility-scale commercial design configuration resultant from the Wabash VIP process and subsequent research and development consistent with the DOE IGCC Roadmap.

### *Alternative Technologies*

DOE could demonstrate other coal gasification technologies instead of the Proposed Action; however, such alternatives would not demonstrate the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology, which is DOE's purpose for this demonstration project.

### *Other Alternatives*

The alternative of incorporating technologies to reduce the "carbon footprint" of the Mesaba Energy Project was also considered. DOE recognizes that fossil fuel burning is the primary contributor to increasing carbon dioxide ($CO_2$) concentrations in the atmosphere (IPCC, 2001). $CO_2$ is a significant greenhouse gas, and increasing concentrations of greenhouse gases show correlation with global warming. DOE recognizes that there are concerns about the effects of fossil fuel use on global climate change. Therefore, DOE oversees other research programs aimed at reducing the cost of electricity associated with power production and proving the viability of technologies for carbon capture and sequestration (CCS) to reduce $CO_2$ emissions from fossil fuel use. DOE expects that the combined efforts of these programs will enable large-scale plants to come on-line by 2020 that offer 90 percent carbon capture with 99 percent storage permanence at less than a 10 percent increase in the cost of energy services (NETL, 2007). The planned in-service date for the Mesaba Energy Project is well in advance of the timeline for achieving the DOE CCS goal.

Based on an analysis of the current feasibility of carbon capture and sequestration provided in Appendix A2, CCS is not considered a reasonable alternative to DOE's Proposed Action. However, because CCS could become feasible during the commercial lifetime (at least 20 years) of the facility, DOE has evaluated the impacts of implementing CCS during commercial operation of the project in Section 5.1.2.1 of this EIS based on the most current and representative information about available technologies.

### 2.1.2 Proposed Project and Alternatives Considered by Excelsior

Excelsior proposes to construct and operate the 1,212-MWe $_{(net)}$ Mesaba Generating Station at one of two sites in northeastern Minnesota, along with its associated support structures and utility lines. The Mesaba Generating Station would consist of the Mesaba Energy Project (Phase I) and an identical facility (Phase II) on the same site. Phases I and II combined are referred to as the Mesaba Generating Station. Each phase would be rated nominally at peak to deliver 606 MWe $_{(net)}$ to the high voltage switchyard located within the fenced boundary of the site. Section 2.2 describes the technology and principal features, resource requirements, emissions, effluents, and wastes of the proposed generating station as summarized in Table 2.1-1.

In accordance with the Proposed Action, Excelsior has entered into a cooperative agreement with DOE under the CCPI Program to demonstrate features and technologies in the Mesaba Energy Project (Phase I) to improve and advance IGCC processes toward commercial acceptance as described in Section 1.4.

**Table 2.1-1. Expected Operating Characteristics – Mesaba Energy Project (Total for Phases I and II, except where noted)**

| Operating Characteristics | West Range Site | East Range Site |
|---|---|---|
| Generating capacity (MWe)[a] | | |
| Phase I | 606 | <606 |
| Total (Phases I and II) | 1,212 | <1,212 |
| Load Output | | |
| Capacity Factor (percent) | 92 | 92 |
| Coal consumption[b] (tpd) | | |
| Sub-bituminous (PSQ) | 17,100 | 17,100 |
| Bituminous (PSQ) | 12,240 | 12,240 |
| Sub-bituminous/petroleum coke (50:50) (PSQ) | 12,900 | 12,900 |
| Water requirements[c] (gpm) | | |
| Average water use (at 3 COC for West Range) | 10,300 | 7,400 |
| Peak water use | 15,200 | 10,000 |
| Air emissions (tpy) | | |
| Sulfur dioxide ($SO_2$) | 1,390 | 1,390 |
| Oxides of nitrogen ($NO_x$) | 2,872 | 2,872 |
| Particulate matter[d] $\leq$10 microns ($PM_{10}$) | 493 | 709 |
| Carbon monoxide (CO) | 2,539 | 2,539 |
| Mercury (Hg) | 0.027 | 0.027 |
| Lead (Pb) | 0.030 | 0.030 |
| Volatile organic compounds (VOCs) | 197 | 197 |
| Carbon dioxide[e] ($CO_2$) | 10.6(SB)/9.4(B) | >10.6(SB)/>9.4(B) |
| Effluent discharges | | |
| Sanitary wastewater[f] (gpd) | 400 | 400 |
| Cooling tower blowdown discharge[g] (gpm) | 3,500 | 0 |
| Solid wastes[h] (tpy) | | |
| Mercury removal carbon (H) | 14 | 14 |
| Sour water sludge (H) | 30 | 30 |
| Sour water carbon (H) | 48 | 48 |
| Syngas treatment carbon (H) | 60 | 60 |
| Waste char and ash (NH) | 160 | 160 |
| Zero Liquid Discharge (ZLD) filter cake (H) | ~4,400(GI) | ~4,400(GI)/<24,500(PB) |
| Marketable Byproducts (tpd) | | |
| Slag (PSQ) | 1,000 – 1,600 | 1,000 – 1,600 |
| Sulfur (PSQ) | 60 – 330 | 60 – 330 |

[a] The generating capacity at the East Range Site is expected to be approximately 2 MW less than the West Range Site per phase due to the additional load of the enhanced ZLD system at the East Range Site.
[b] Peak use, both phases. Fuel flexibility allows the IGCC power plant to operate on either sub-bituminous coal, bituminous coal, or a coal/petroleum coke blend.
[c] The use of an enhanced ZLD system at the East Range Site would enable a greater number of cycles of concentration, resulting in a lower demand for process water.
[d] Because of the lower quality of water used for cooling at the East Range Site, $PM_{10}$ emissions from cooling towers would be greater than for the West Range Site.
[e] $CO_2$ emissions are a function of the feedstock consumed and of the Mesaba Generating Station's net heat rate. SB = Sub-bituminous coal such as Power River Basin Coal; B = Bituminous coal such as Illinois Basin Coal; East Range Site with enhanced ZLD system would have lower efficiency and higher emissions.
[f] Discharged to publicly owned treatment works (POTWs).
[g] East Range enhanced ZLD system eliminates discharge of cooling tower blowdown.
[h] Fuel dependent; H = Hazardous; NH = Non-hazardous; GI = Gasification Island; PB = Power Block
gpd = gallons per day; gpm = gallons per minute; tpd = tons per day; tpy = tons per year.
PSQ = partial slurry quench mode; COC = cycles of concentration.

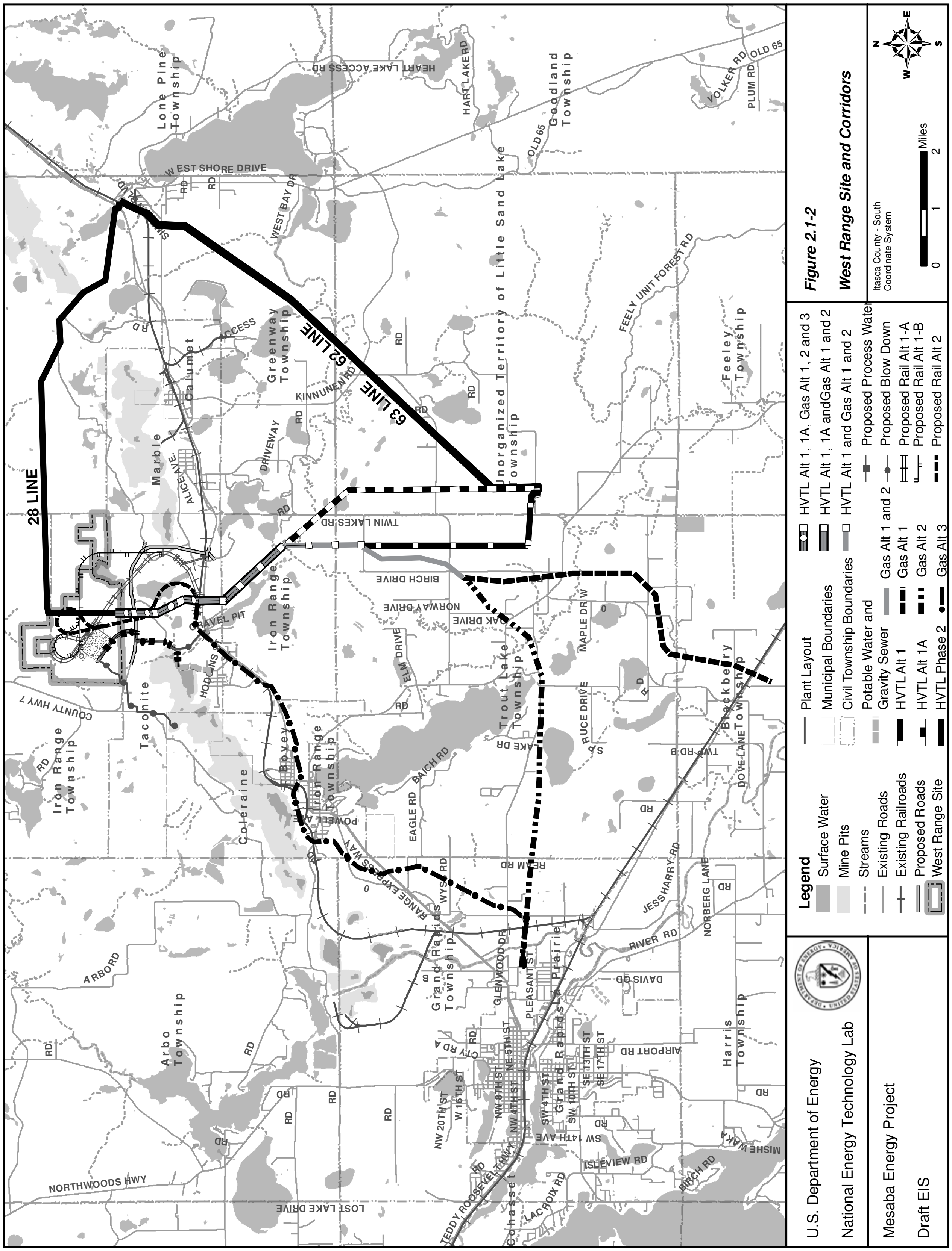
#### 2.1.2.1 West Range Site and Corridors

Excelsior's preferred site for the Mesaba Generating Station is an approximately 1,260-acre property just north of the downtown area of Taconite in Itasca County. The project's generating facilities would connect to the power grid via new and existing HVTL corridors to a substation near the unincorporated community of Blackberry. Excelsior would construct, own, and operate a new natural gas pipeline connecting to an existing 36-inch pipeline owned by Great Lakes Gas Transmission Company (GLG) to provide start-up and backup fuel for the station. Section 2.3 provides a discussion of the site layout and alternative alignments considered for HVTL and gas pipeline corridors, as well as features for water supply, rail and road access. Key features of the West Range Site and corridors are illustrated in Figure 2.1-2.

Excelsior prefers the West Range Site for the location of the Mesaba Generating Station because of its abundant supply of water, greater distance from Class I areas, immediate proximity to two competing rail service providers, reduced electrical losses (shorter power transmission distances than the East Range Site), closer proximity to an abundant supply of natural gas, shorter distance via rail to the base case fuel source, and location outside the Lake Superior Basin watershed. In addition, Excelsior holds an option agreement for the West Range Site from a land owner having significant real estate holdings abutting the site and across which easements for the station's associated facilities would be required. The agreement allows for purchase of mineral rights extending beyond the station footprint and acquisition of easements for the associated facilities under commercially reasonable terms. Excelsior believes that the combination of the above considerations would translate to reduced environmental impacts and project costs.

#### 2.1.2.2 East Range Site and Corridors

Excelsior's alternative East Range Site for the proposed Mesaba Generating Station is an approximately 810-acre site in Hoyt Lakes, St. Louis County, approximately 1 mile north of the downtown area. The project's generating facilities would connect to the grid via existing HVTL corridors that lead to a substation near the unincorporated community of Forbes. Northern Natural Gas (NNG) would construct, own, and operate a gas pipeline as an extension of the company's interstate pipeline system to provide start-up and backup fuel for the station. Section 2.3 provides a discussion of the site layout and alternative alignments considered for HVTL and gas pipeline corridors, as well as features for water supply, rail and road access. Key features are shown in Figure 2.1-3.


U.S. Department of Energy
National Energy Technology Lab
Mesaba Energy Project
Draft EIS
Legend
Surface Water
Mine Pits
Streams
Existing Roads
Existing Railroads
Proposed Roads
West Range Site
Plant Layout
Municipal Boundaries
Civil Township Boundaries
Potable Water and Gravity Sewer
HVTL Alt 1
HVTL Alt 1A
HVTL Phase 2
Gas Alt 1 and 2
Gas Alt 1
Gas Alt 2
Gas Alt 3
HVTL Alt 1, 1A, Gas Alt 1, 2 and 3
HVTL Alt 1, 1A andGas Alt 1 and 2
HVTL Alt 1 and Gas Alt 1 and 2
Proposed Process Water
Proposed Blow Down
Proposed Rail Alt 1-A
Proposed Rail Alt 1-B
Proposed Rail Alt 2
Figure 2.1-2
West Range Site and Corridors
Itasca County - South Coordinate System
0 1 2 Miles
28 LINE
62 LINE
63 LINE
Lone Pine Township
Goodland Township
Greenway Township
Iron Range Township
Unorganized Territory of Little Sand Lake Township
Feeley Township
Trout Lake Township
Blackberry Township
Arbo Township
Grand Rapids Township
Harris Township
Marble
Calumet
Taconite
Coleraine
Bovey
Grand Rapids
Cohasset
La Prairie

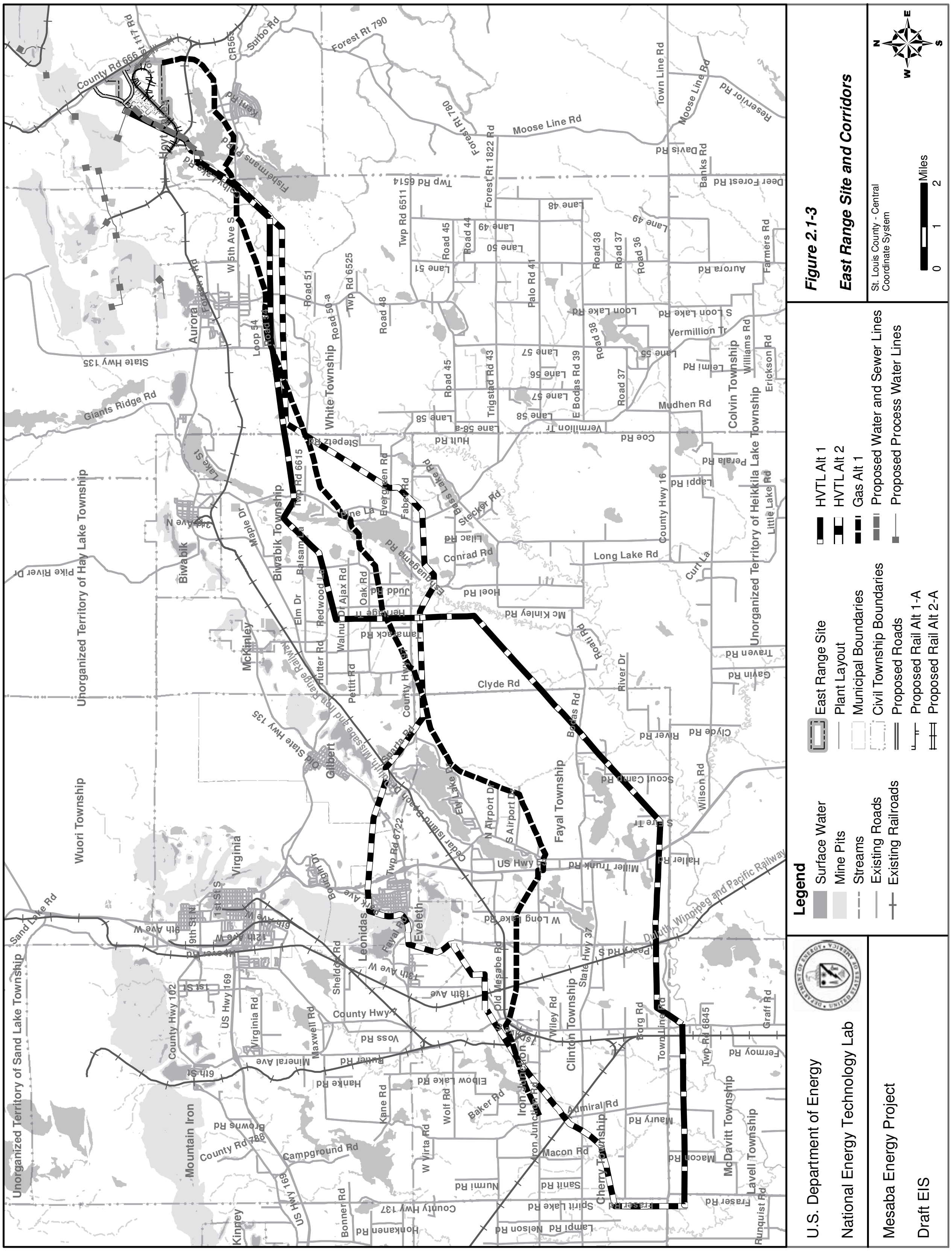


Figure 2.1-3
East Range Site and Corridors
St. Louis County - Central Coordinate System
0 1 2 Miles
Legend
Surface Water
Mine Pits
Streams
Existing Roads
Existing Railroads
East Range Site
Plant Layout
Municipal Boundaries
Civil Township Boundaries
Proposed Roads
Proposed Rail Alt 1-A
Proposed Rail Alt 2-A
HVTL Alt 1
HVTL Alt 2
Gas Alt 1
Proposed Water and Sewer Lines
Proposed Process Water Lines
U.S. Department of Energy
National Energy Technology Lab
Mesaba Energy Project
Draft EIS

#### *2.1.2.3 Site Selection Process and Other Alternatives Considered by Excelsior*

The site selection process required several years of study that included a three-tiered siting process to identify the most favorable location for the Mesaba Generating Station. The first tier was conducted under a state statute enacted in 2003 (Minnesota Statutes § 216B.1694, Subdivision 1(3)) that included a condition allowing up to three "innovative energy projects" to be located in the TTRA. Excelsior then determined which regions throughout the TTRA have the necessary minimum infrastructure (i.e., HVTL, water, gas, etc.), rail access, road access, and other necessary components to support the project. Once the initial candidate areas of the TTRA were identified, a second tier of evaluation was performed that included review of engineering feasibility, environmental compatibility, community support and acceptance, and other criteria. The third tier of evaluation consisted of a detailed analysis of the candidate project sites in Excelsior's Joint Permit Application.

Excelsior documented the site screening and selection process (see Appendix F1) to support its application to the U.S. Army Corps of Engineers for a Section 404 wetlands permit. Excelsior focused its search on areas within the TTRA that have access to existing rail lines and provide the following features:

- Availability of water for cooling and other plant purposes;
- Proximity to existing HVTL corridors to minimize the environmental impacts of interconnection to the regional electrical 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.

These features also were used in the screening of candidate sites. Fifteen sites within the TTRA were initially identified by Excelsior in the search and screening process. Excelsior's document in Appendix F1 provides the rationale for eliminating sites based on the screening criteria. In summary, one site was eliminated from further consideration based on an unsuitable grade for rail access; five sites were eliminated based on insufficient or unproven water supplies; four sites were eliminated based on land acquisition issues; and three sites were eliminated due to the extent of anticipated wetland impacts. The screening process resulted in the selection of two sites, the West Range Site and the East Range Site, for detailed evaluation.

### 2.1.3 Alternatives Available to the Minnesota Public Utilities Commission

As described in Section 1.4.2.3, the Mesaba Energy Project is subject to the siting and permitting process of the Minnesota PUC. Section 1.5.2 outlines the state regulations and requirements applicable to this process. In accordance with these requirements, and after considering the potential impacts of the Mesaba Project, the PUC has the responsibility for taking one of the following actions:

(1) PUC may approve and issue permits for Excelsior's preferred West Range Site and corridors.
(2) PUC may approve and issue permits for Excelsior's alternative East Range Site and corridors.
(3) PUC may disapprove the joint permit application submitted by Excelsior.

## 2.2 DESCRIPTION OF THE PROPOSED PROJECT

DOE would provide a total of $36 million in cost-shared funding (see Section 1.3.2) to Excelsior for the demonstration of advanced IGCC technologies to produce electricity at commercial scale. The proposed IGCC demonstration plant would be designed for long-term commercial operation following the completion of an anticipated 12-month minimum demonstration period under a cooperative agreement between DOE and Excelsior. The project would represent Phase I of the proposed two-phased Mesaba Generating Station. As planned by Excelsior, Phase I would begin service in the fourth quarter of 2011 and Phase II would begin service in 2014. This EIS considers the impacts of both phases as connected actions, even though only Phase I would be co-funded under DOE's CCPI Program.

The balance of this section describes the project as proposed by Excelsior. Information contained in this chapter of the EIS has been obtained from documents prepared by Excelsior and its contractors, including the "Mesaba Energy Project, Joint Application to the Minnesota Public Utilities Commission for the Following Pre-Construction Permits: Large Electric Generating Plant Site Permit, High Voltage Transmission Line Route Permit And Natural Gas Pipeline Routing Permit" (Excelsior, 2006a) and "Mesaba Energy Project, Environmental Supplement" (Excelsior, 2006b).

The subsections of Section 2.2 provide the following information:

- Section 2.2.1 describes the technology selected for the Mesaba Energy Project and the various processes included in the technology.
- Section 2.2.2 describes resource requirements and inputs to the facility.
- Section 2.2.3 describes discharges, wastes, and products from the facility.
- Section 2.2.4 describes plans for facility construction.
- Section 2.2.5 describes plans for facility operation.

### 2.2.1 Technology Selection and Process Description

The Mesaba Energy Project would demonstrate advanced IGCC technologies to produce electricity, including advanced gasification and air separation systems, feedstock flexibility, improved environmental performance characteristics, and improved thermal efficiency as described in Section 1.4.1. The technologies would be more efficient, economical, reliable, and environmentally favorable than conventional coal-fueled steam electric generating plants.

#### *2.2.1.1 Technology Selection*

Excelsior evaluated proposals from three companies to provide gasification technology licenses for the project before selecting the ConocoPhillips E-Gas™ technology in the spring of 2004. Based upon optimization analyses, Excelsior determined that the project should be designed as a "fuel-flexible" facility capable of utilizing petroleum coke, bituminous coal, sub-bituminous coal, and certain combinations of these feedstocks. With such capability, Excelsior determined that the design would minimize energy costs and provide significant long-term benefits to consumers.

The gasification process for the project is based upon ConocoPhillips E-Gas™ technology for gasification of solid feedstocks. The starting point for the design is the 262 $MWe_{(net)}$ Wabash River Coal Gasification Repowering Project (Wabash River plant) in Terre Haute, Indiana. The Wabash River plant was built with Federal co-funding under the DOE's Clean Coal Technology Program (predecessor to the CCPI) and has been in commercial operation since 1995. Following construction of the Wabash River plant, the DOE funded studies of potential performance and technological upgrades, which resulted in numerous recommendations for design and operational improvements. Based in part on the DOE studies and the lessons learned from the Wabash River facility, the Mesaba Energy Project would incorporate several features and technologies for an advanced IGCC process. The substantial advancements being incorporated within the E-Gas™ technology and other plant systems to be integrated and demonstrated in the Mesaba Energy Project would constitute a third generation IGCC facility.

### *2.2.1.2 Integrated Gasification Combined-Cycle Technology*

The project would employ integrated gasification combined-cycle technology. Gasification is the process of converting coal, petroleum coke, or blends of these resources to a gaseous fuel called synthesis gas (syngas). A combined-cycle electric power plant is one that uses both a steam turbine generator and a combustion turbine generator at one location to produce electricity. Combining (integrating) the gasification process with the combined-cycle power plant is known as IGCC, which is an inherently lower-polluting technology to produce electricity from solid feedstocks.

Electric power for each phase of the Mesaba Energy Project would be produced in two CTGs (about 220 $MWe_{(gross)}$ each) and in one STG (up to 300 $MWe_{(gross)}$). The combined power generation for Phases I and II would be up to 1480 $MWe_{(gross)}$. The power generated would be interconnected to the regional electrical grid by a HVTL system. Natural gas would be used to start up the IGCC power plant and as a backup fuel.

In the E-Gas™ process, coal, petroleum coke, or blends of coal and petroleum coke would be crushed, slurried with water, and pumped into a pressurized vessel (the gasifier) along with purified oxygen. In the gasifier, controlled reactions take place, thermally converting feedstock materials into syngas. The syngas is cooled, cleaned of contaminants, and then combusted in a combustion turbine, which is directly connected to an electric generator. The assembly of the combustion turbine and generator is known as a CTG. The expansion of hot combustion gases inside the combustion turbine creates rotational energy that spins the generator and produces electricity. The hot exhaust gases exiting the CTG would pass through a heat recovery steam generator (HRSG), which is a type of boiler, where steam is produced. The resulting steam is piped to a steam turbine that is connected to an electric generator. The expansion of steam inside the steam turbine spins the generator to produce an additional source of electricity.

### *2.2.1.3 Process Components and Major Equipment*

The principal buildings associated with Phase I of the project are listed in Table 2.2-1. The major process equipment is listed in Table 2.2-2. Figure 2.2-1 provides a block diagram showing processes and emission sources for Phase I (Phase II essentially would be the same). Figure 2.2-2 illustrates the principal features of the E-Gas™ process, which are described in the balance of this section.

**Table 2.2-1. Principal Buildings Associated with Phase I of the Mesaba Generating Station**

| Structure | Size |
|---|---|
| Combustion Turbine Generator Building | 230 ft. x 180 ft. x 75 ft. high |
| Steam Turbine Generator Building | 170 ft. x 140 ft. x 90 ft. high |
| Air Separation Unit Building | 375 ft. x 140 ft. x 70 ft. high |
| Heat Recovery Steam Generator | 110 ft. x 55 ft. x 90 ft. high |
| Rod Mill Feed Bins | 155 ft. x 25 ft. x 150 ft. high |

**Table 2.2-2. Major Process Equipment**

| Equipment | Capacity | Ancillary Facilities/Processes |
|---|---|---|
| Air Separation Unit (2 units at 50% capacity each) | 2,507 tons per day per train, based on PRB1 coal operation. | • $N_2$ Booster Compressor for CTG Injection<br>• Liquid Oxygen and Liquid Nitrogen storage |
| Feedstock (Coal/Petroleum Coke) Handling and Storage (1 unit at 100% capacity) | Active storage - 20 days based on PRB1 coal<br>Conveying/Reclaiming based on 8,550 tons per day, as received<br>Feedstock inactive storage – 45 days based on PRB1 coal<br>Flux storage (silos)/conveying/reclaiming (250 tons per day based on 50:50 blend of PRB2:PRB3 coals) | • Rotary Railcar Unloading Facilities and Thaw Shed (Feedstock)<br>• Dust collectors for enclosed feedstock storage areas<br>• Truck unloading facilities (Flux) |
| Gasification Island (3 units at 50% capacity each) | Coal Grinding and Slurry Preparation (2 units at 60% capacity each)<br>Gasification (4,275 tons per day design coal, as received, per gasifier, based on PRB1 coal)<br>Slag Storage and Loading System (1 at 100% capacity) (800 tons per day (wet basis), based on 50:50 blend of PRB2:PRB3 coals) | • High Temperature Heat Recovery<br>• Dry Char Removal<br>• Slag Grinding (1 at 100% capacity)<br>• Slag Dewatering (1 at 100% capacity) |
| Syngas Treating (2 units at 50% capacity each) | | • Syngas Scrubbing<br>• Low Temperature Syngas Cooling<br>• COS Hydrolysis<br>• Recycle Gas Compression<br>• Acid Gas Removal<br>• Acid Gas Enrichment (1 at 100% capacity)<br>• Mercury Removal<br>• Syngas Moisturization<br>• Sour Water System (1 at 100% capacity) |
| Sulfur Recovery and Tail Gas Recycle (2 units at 50% capacity each) | Claus Plant Sulfur Recovery ($O_2$-Blown), (Up to 83 tons per day/train, based on high sulfur Illinois No. 6 operation) | • Molten Sulfur Storage<br>• Molten Sulfur Truck/Rail Loading Facilities (1 at 100% capacity)<br>• Tail Gas Recycle (1 at 100% capacity)<br>• Tank Vent Gas Incineration (1 x 100%) |

**Table 2.2-2. Major Process Equipment (continued)**

| Equipment | Capacity | Ancillary Facilities/Processes |
|---|---|---|
| Power Block | CTG (2 units at 50% capacity each) (220 MW nominal each, based on Siemens-Westinghouse SGT6-5000F combustion turbine assumed for environmental permitting)<br>HRSG & Exhaust Stack (2 units at 50% capacity each)<br>STG (1 at 100% capacity), (Up to 300 MW nominal) | • Surface Condenser (1 at 100% capacity)<br>• Vacuum, Condensate and Boiler Feedwater Systems (1 at 100% capacity)<br>• Power Block Circulating Water System<br>• Raw Water/Demineralizer Water Tankage/Pumps<br>• Demineralizer System<br>• Filtered Raw Water, Firewater/Tankage/Pumps<br>• Wastewater Collection/Wastewater Separation<br>• Plant & Instrument Air<br>• Step-up Transformers |
| General Facilities (1 at 100% capacity) | | • Gasification/ASU Cooling Water/Tower System<br>• ZLD System for Gasification Island Process Waters<br>• ZLD System for Process Condensate Blowdown (East Range only)<br>• Process Condensate Blowdown Holding Tank<br>• Gasification Unit Flare<br>• Emergency Diesel Generators<br>• Natural Gas Distribution<br>• Drains and Blowdowns<br>• Nitrogen Distribution<br>• Potable & Utility Water<br>• Sanitary Sewage System<br>• Stormwater Collection and Treatment |

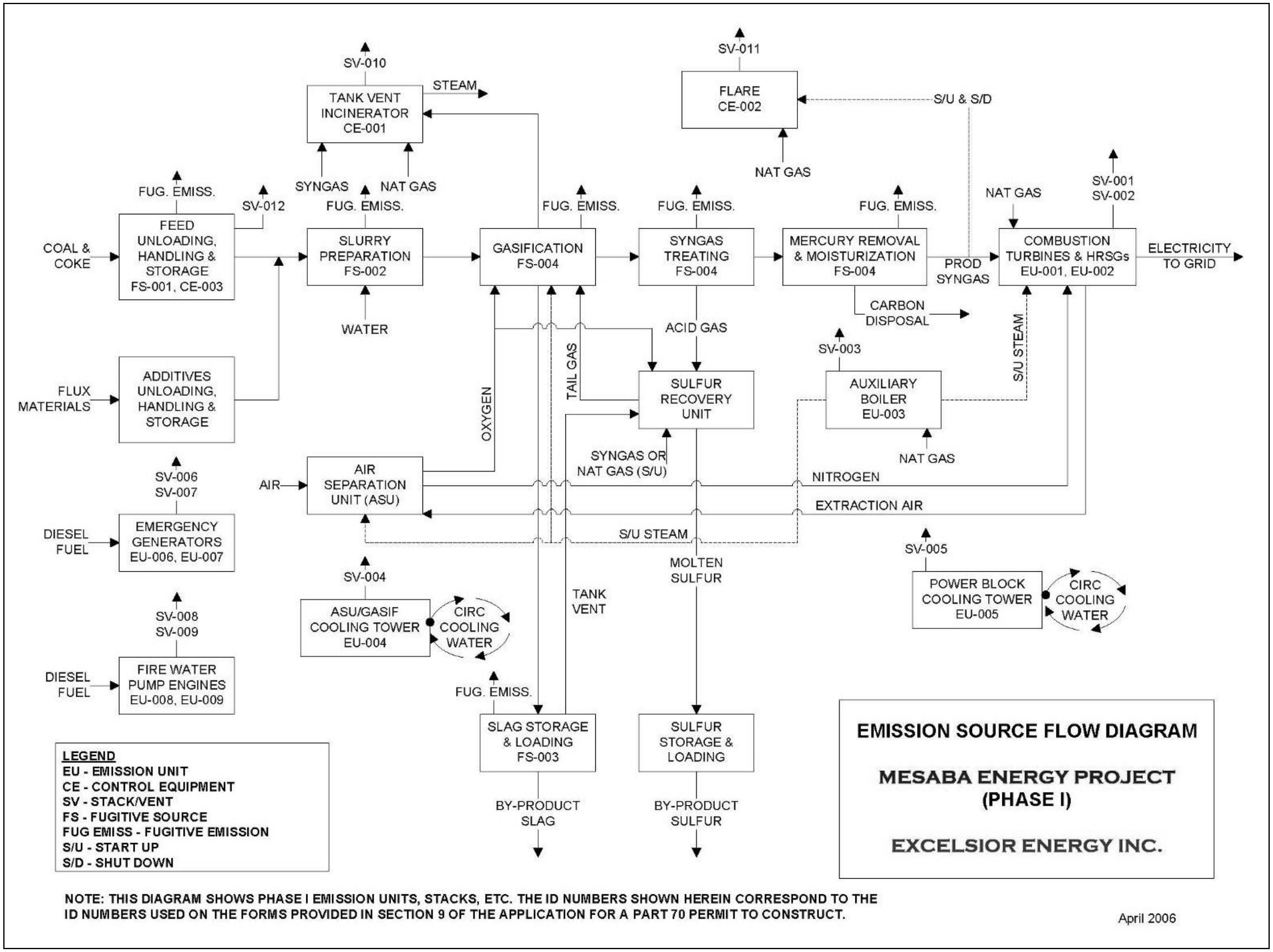



**Figure 2.2-1. Process Block Diagram, Mesaba Energy Project**

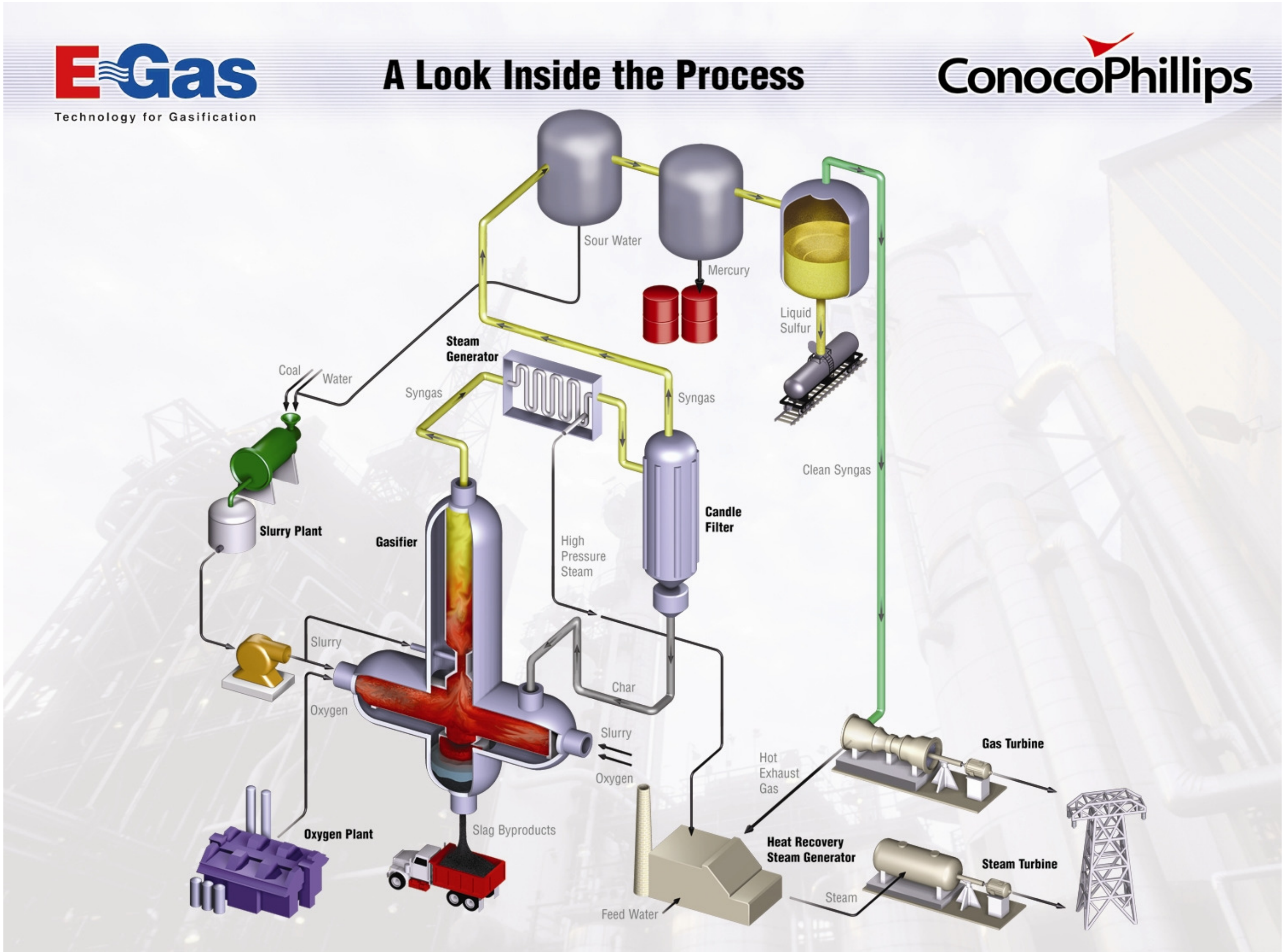



Figure 2.2-2. E-Gas™ Process for IGCC Power Generation

Other buildings associated with Phase I include the control room, administration building, warehouse/maintenance shop, combustion turbine and steam turbine buildings, weather enclosures for the air separation unit (ASU) compressors, slurry preparation, water treatment/laboratory, railcar thaw shed, switchyard control room, several power distribution centers, and a visitor's center. Phase II would consist of a duplicate facility and would require the same structures as described for Phase I.

### *Feedstock Slurry Preparation*

To produce slurry feedstock for the gasifier, the solid fuel would be mixed and ground with treated recycled water and slag fines that are recycled from other areas of the plant producing slurry with a paste-like consistency. The process is illustrated in Figure 2.2-3.

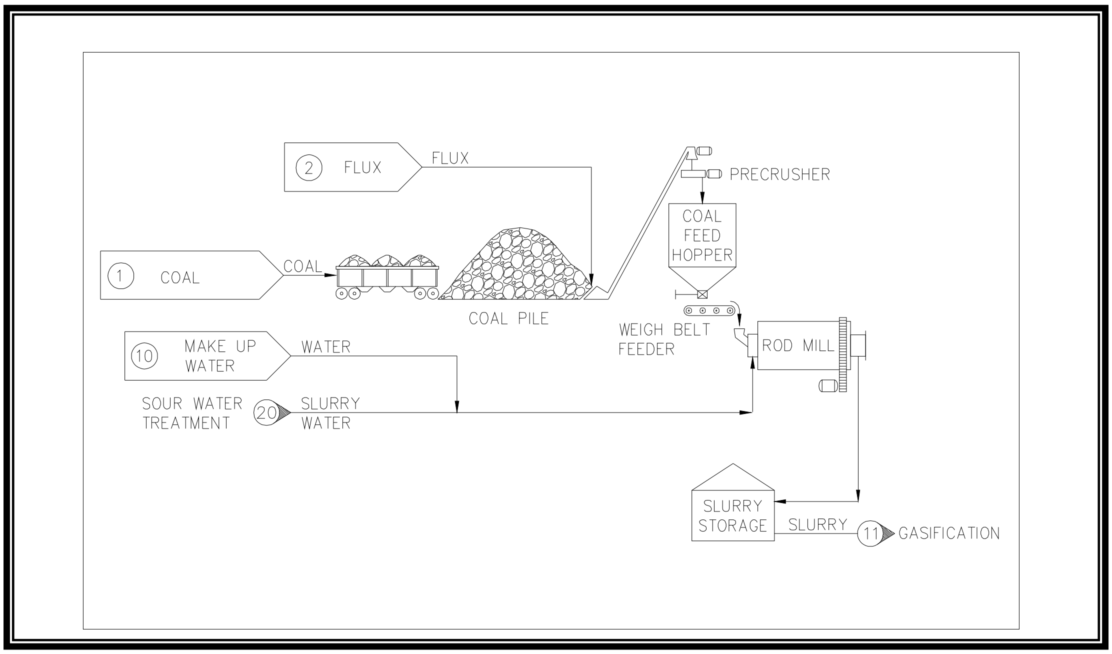



**Figure 2.2-3. Feedstock Grinding and Slurry Preparation**

Tanks, drums, and other areas of potential atmospheric exposure of the slurry or recycle water would be covered and vented into the tank vent collection system for vapor emission control. The entire feedstock grinding and slurry preparation facility would be paved and curbed to contain spills, leaks, wash down, and stormwater runoff. A trench system would carry this water to a sump where it would be pumped into the recycle water storage tank.

### *Gasification and Slag Handling*

The gasifier consists of two stages: a slagging first stage, and an entrained flow, non-slagging second stage. Unlike traditional pulverized coal power plants, where fuel is actually combusted, in an IGCC power plant, slurry is fed to the gasifier along with sub-stoichiometric oxygen ($O_2$) at an elevated temperature and pressure. The feedstock would be almost totally gasified in this environment to form syngas consisting principally of $H_2$, carbon monoxide (CO), carbon dioxide ($CO_2$), and water ($H_2O$). Figure 2.2-4 illustrates the process. Each phase of the Mesaba Energy Project would include three gasification systems.

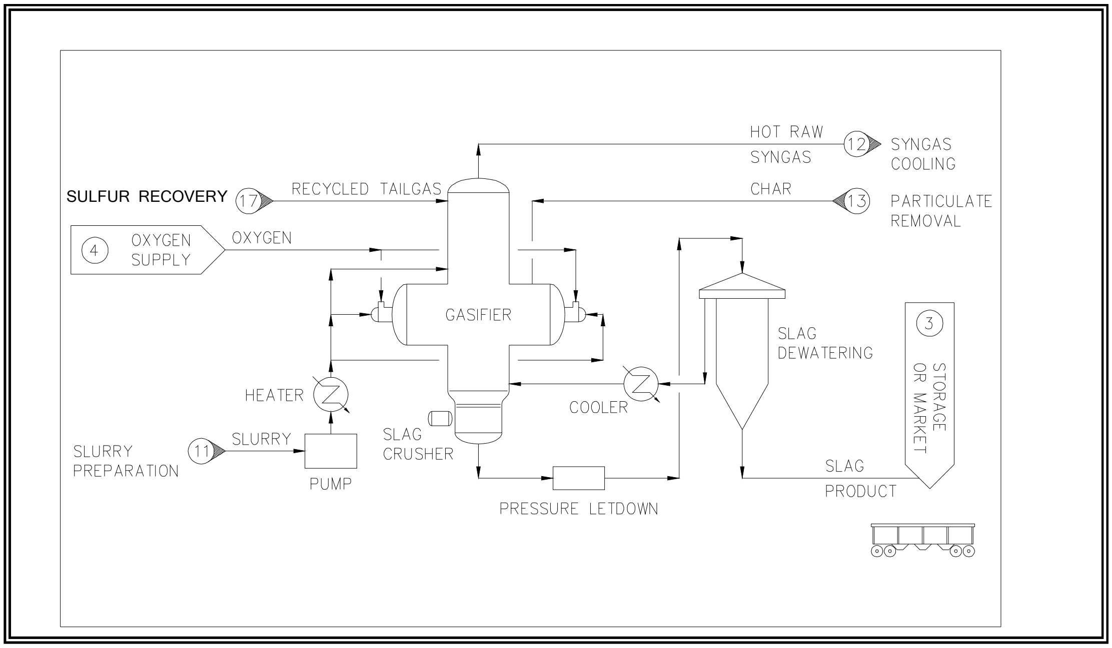



**Figure 2.2-4. Gasification and Slag Handling**

Most of the sulfur in the feedstock is converted to hydrogen sulfide ($H_2S$) during gasification, although a small portion of the sulfur is converted into carbonyl sulfide (COS). Most of the nitrogen in the feedstock is converted to ammonia ($NH_3$). The energy in the feedstock is ultimately converted into CO and $H_2$ with a small amount of methane ($CH_4$). Low-grade coals with lower heating values and higher moisture contents would generate a syngas with more $CO_2$ and $H_2$. Higher quality coals and petroleum coke would result in a syngas that has a much higher CO content. Further processing of the syngas would remove over 99 percent of the sulfur from high-sulfur feedstocks and over 97 percent of the sulfur from low-sulfur, sub-bituminous coal feedstocks. The lower removal rate from low-sulfur coal would result in approximately equal sulfur emissions rates as the higher removal rate from higher sulfur coal. Hence, the final $SO_2$ emission rate achieved using E-Gas™ technology would be independent of the starting sulfur concentration in the feedstock.

Mineral matter in the feedstock and any added flux forms a molten slag, which flows continuously into a water-quench bath. The characteristics of the slag produced in the gasifier would vary with the mineral matter content of the feedstock. The slag/water slurry would then be directed to a dewatering and handling area. Slag production at full load would vary from about 500 tons per day up to a maximum of about 800 tons per day per phase depending upon the ash content of the coal or petroleum coke received. The slag would be dewatered at the facility and transported via rail or truck to market or storage. Section 2.2.3.4 discusses the marketable byproducts of the Mesaba Energy Project, including slag. The impacts associated with materials and waste management during plant operations are described in Section 4.16.2.2.

The raw syngas generated in the first stage flows into the second stage of the gasifier. The gasifier second stage is a vertical refractory-lined vessel in which additional slurry would be reacted with the hot syngas stream exiting the first stage. The feedstock undergoes devolatilization (separation of organic components) and pyrolysis (high temperature decomposition), thereby generating more syngas with higher heat content (less carbon being converted to $CO_2$), because no additional $O_2$ would be introduced into the second stage. This additional slurry lowers the temperature of the syngas exiting the first stage by the endothermic nature of the devolatilization and pyrolysis reactions. Also, water reacts with a portion of the carbon to produce additional CO, $CO_2$, and $H_2$ for subsequent use as syngas fuel for power generation.

Unreacted solid fuel (char) would be carried out of the second stage with the syngas. Certain metals present in the feedstocks in trace quantities and volatile at the temperatures typical of the gasifier would be carried out in their gaseous state as components of the syngas and removed in the cleanup stage. The slag/water slurry would flow continuously into a dewatering bin. The bulk of the slag would settle out in the bin while water overflows into a basin in which the remaining slag fines would settle. The clear water from the settler would pass through heat exchangers where it would be cooled as the final step before being returned to the gasifier quench section. Dewatered slag would be transferred to the slag storage area to be loaded into trucks or rail cars for transport to market or storage. The slurry of fine slag particles from the bottom of the settler would be recycled to the slurry preparation area to be fed back into the gasifier to maximize carbon utilization.

## ***Syngas Cleanup and Desulfurization***

The syngas cleanup and desulfurization systems include the processes for syngas cooling, particulate matter removal, syngas scrubbing, acid gas removal, mercury removal, and potential future retrofit for carbon capture as described in the following paragraphs. In syngas cooling, the hot raw syngas exiting the gasifier system would be cooled converting a significant portion of the heat from the gasifier to high-pressure steam via heat exchangers for use in power generation. After cooling, the syngas (including entrained particulate matter containing carbon that remains available for gasification) would be directed to the particulate matter removal system, as shown in Figure 2.2-5. The gas flows first through a hot gas cyclone for removal of relatively large particles and then passes to the particulate matter filter. The filter vessel contains numerous porous filter elements to remove particulate matter from the syngas (>99.9 percent removal efficiency). Removed particulate matter from both the hot gas cyclone and the dry filter vessel would be recycled to the first stage of the gasifier to further convert particle-bound carbon to syngas and thereby improve carbon conversion efficiency. Continually recycling captured particulate matter to the gasifier promotes higher thermal efficiencies and lowers the carbon content of the slag, making the slag more marketable. Generally, less than one percent of the carbon originally present in the feedstock would be expected to end up in the slag confirming that near complete gasification of the carbon content of the feedstock would be obtained. The particle-free syngas would then proceed to the low temperature heat recovery system.

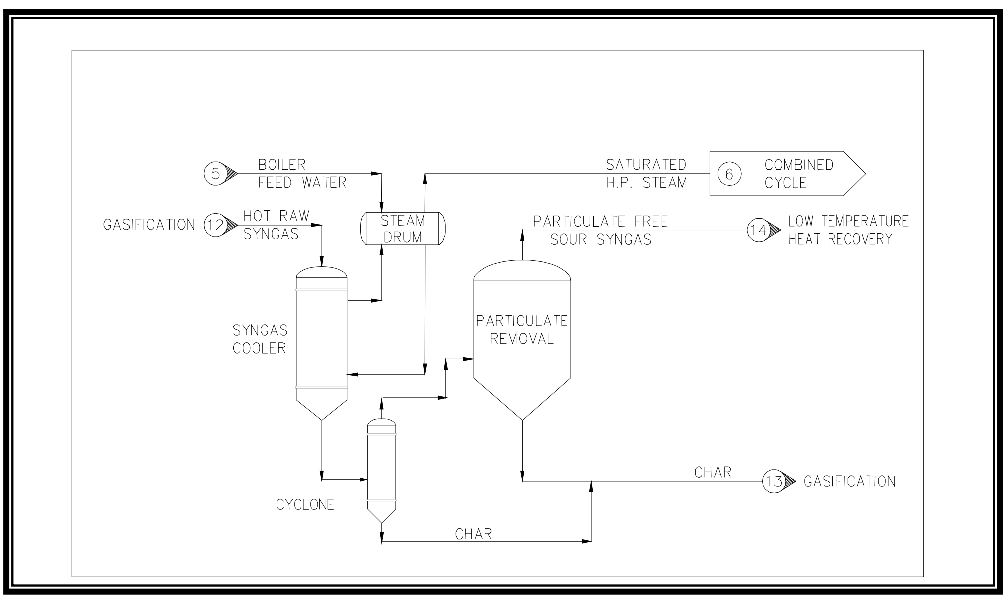



**Figure 2.2-5. Particulate Matter Removal**

Next, the syngas would be scrubbed with recycled sour water (water with dissolved sulfur compounds and other contaminants condensed from the syngas) to remove chlorides and trace metals and to reduce the potential for equipment corrosion and formation of undesirable products in the acid gas removal (AGR) system. A COS hydrolysis unit would be incorporated to achieve a high level of sulfur removal, which would convert the small amount of COS in the syngas to $H_2S$ that could then be efficiently removed in the AGR system.

After hydrolysis, the syngas would be cooled in process heat exchangers to efficiently utilize the relatively low-temperature heat available. Most of the $NH_3$ and a small portion of the $CO_2$ and $H_2S$ present in the syngas would be absorbed in the water condensed by this cooling step. Additionally, some of the trace metals that remained in their gaseous state during the particulate matter removal process would condense. The water would be collected and sent to the sour water treatment unit. The cooled sour syngas would be fed to the AGR system, where the sulfur compounds would be removed to produce a low-sulfur product syngas. The syngas scrubbing process is illustrated in Figure 2.2-6. Each phase of the Mesaba Energy Project would include two gas treatment systems.

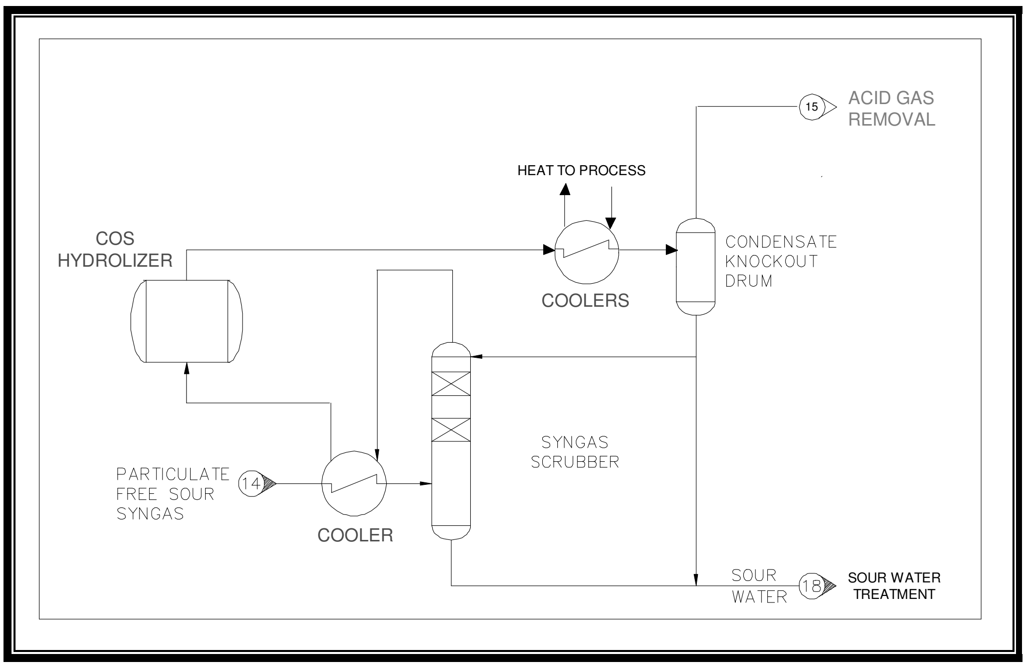



**Figure 2.2-6. Syngas Scrubbing**

The AGR system (Figure 2.2-7) would cause the cool sour syngas to contact an aqueous solution of methyl-diethanolamine (MDEA), which is an amine absorbent that would remove the $H_2S$ to produce a clean product syngas. The $H_2S$-rich MDEA from the bottom of the absorber would flow to a cross heat exchanger to recover heat. The heated rich MDEA would then be directed to the $H_2S$ stripper where the $H_2S$ and $CO_2$ are removed at near atmospheric pressure. A concentrated stream of $H_2S$ and $CO_2$ would exit the top of the $H_2S$ stripper and flow either to the carbon-capture system or directly to the sulfur recovery unit. The lean MDEA would be pumped from the bottom of the stripper to the heat exchanger. The lean MDEA would be further cooled before being stored and then recirculated to the absorber. This unit is a totally enclosed process with no discharges to the atmosphere.

***Mercury Removal and Moisturization***

After removal of sulfur, the syngas would pass through fixed beds of activated carbon prepared with a special impregnate to remove mercury (Figure 2.2-7). Each phase of the Mesaba Energy Project would have two mercury removal units. Multiple beds would be used to obtain optimized adsorption. The lower temperature and lower moisture content of the syngas after the AGR would allow the carbon beds to operate at high efficiencies. The activated carbon capacity for mercury ranges up to 20 percent by weight of the carbon (Parsons, 2002). The mercury removal system would remove enough mercury from the syngas so that the mercury content of the syngas fuel would be no more than 10 percent of the mercury contained in the solid IGCC feedstock. After mercury removal, the product syngas would be moisturized, heated, and diluted with nitrogen for control of nitrogen oxides ($NO_x$) before being used as fuel for power generation in the CTGs.

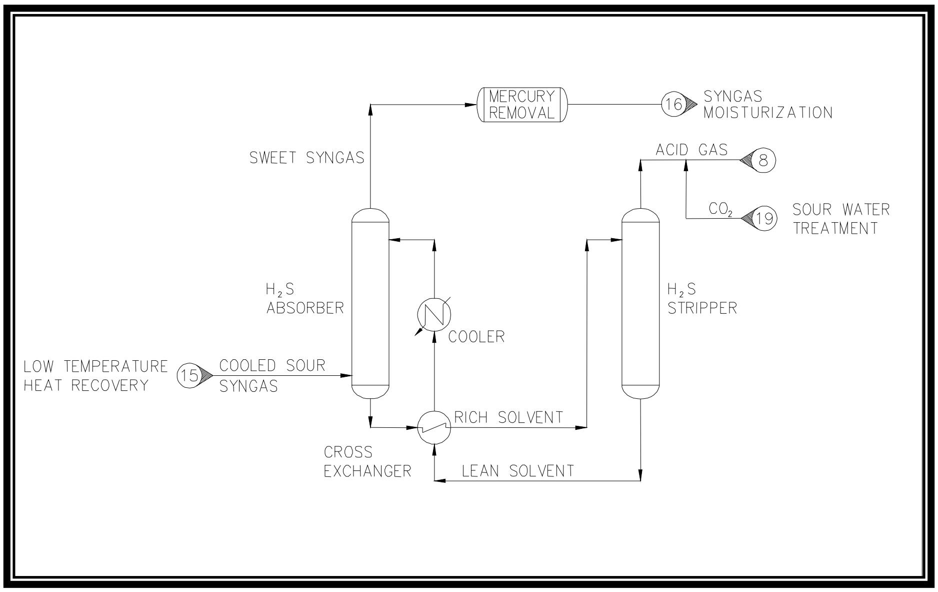



**Figure 2.2-7. Acid Gas Removal and Mercury Removal**

***Potential Carbon Capture Retrofit***

The Mesaba Energy Project design would enable a potential carbon capture retrofit if reductions in $CO_2$ emissions become regulated or economically favorable in the future.

Global emissions of $CO_2$ resulting from fuel combustion have increased from 16 billion tons in 1973 to 27 billion tons in 2005 (IEA, 2007). Another study estimated global emissions of $CO_2$ from fuel combustion to be 28 billion tons in 2003 (Marland et al., 2006). Although $CO_2$ emissions from power plants are not currently regulated under the Clean Air Act, concerns about global warming may result in future controls on emissions of this greenhouse gas. Therefore, the plant would be designed so that it could be modified to allow for the capture of $CO_2$ in the event that reductions in these emissions are required by regulation or encouraged by economic incentives at some time. Because the implementation of carbon dioxide capture and storage technologies for the Mesaba Energy Project is not included in the DOE demonstration project for the CCPI Program (as explained in Section 2.1.1.2), the potential impacts from implementing these technologies are addressed within Section 5.1.2.1 as aspects of the commercial operation of the power station.

There are two primary options for the capture of $CO_2$ in this power plant: (1) removal of $CO_2$ present in the syngas itself, prior to combustion; and (2) converting CO in the syngas to $CO_2$ by catalyzing CO and water into $CO_2$ and $H_2$. Under the first option, the removal of $CO_2$ from the syngas would result in roughly a 30 percent reduction in overall $CO_2$ emissions from the power plant. This would be accomplished by the installation of amine scrubbers upstream or downstream of the acid gas removal system in the IGCC. This approach would remove up to 85 percent of the $CO_2$ in the syngas that fuels the plant and result in an overall $CO_2$ capture rate of 30 percent from the plant. The technology for this option is currently available and could be implemented as early as 2014, following the commercial operation date of Mesaba Phase I, if required by regulation or encouraged by economic incentives. The $CO_2$ capture facilities would likely be located within the existing site requiring an area of approximately 100 by 150 feet to accommodate necessary equipment.

For the second $CO_2$ removal option, the technology to remove the $CO_2$ from the combustion gases is not currently available commercially, but will be demonstrated in the near future as part of DOE's FutureGen Project. This technology would likely increase the capital cost and reduce overall efficiency of the plant, making it more expensive than the first option (30 percent removal). However, the implementation of the first option does not preclude the potential implementation of the second option at some point in the future. Additionally, the project proponent has performed a preliminary study of potential storage (or sequestration) of the carbon dioxide emissions (see Appendix A1). Excelsior has contracted with the Plains $CO_2$ Reduction Partnership (one of seven regional partnerships funded by DOE's Regional Carbon Sequestration Partnership Program) to investigate and, if possible, produce a $CO_2$ sequestration/mitigation plan. As a part of its 4-year Phase II Studies initiated in 2005, the Plains $CO_2$ Reduction Partnership would seek to produce a $CO_2$ management plan specifying conditions required by potential purchasers of $CO_2$.

There are two basic carbon sequestration options: (1) use the captured $CO_2$ for enhanced oil recovery (EOR); and (2) store the captured $CO_2$ within a compatible geologic formation. Both of these options would require the construction of a $CO_2$ pipeline system to convey the pressurized gas from the Mesaba Energy Project to the sequestration site(s). $CO_2$ has proven to be very effective for secondary and tertiary oil recovery by both displacing and decreasing the viscosity of otherwise unrecoverable oil. Under the first carbon sequestration option, the captured $CO_2$ would be pressurized and transported to existing oil fields in north central North Dakota and southwestern Manitoba. This option would require the construction of at least 405 miles of pipeline to convey the gas to sequestration sites required to accommodate the $CO_2$. The captured $CO_2$ could also be stored in geologic formations that act as $CO_2$ sinks, which are typically saline formations. Under the second sequestration option, the captured $CO_2$ would be conveyed via pipeline, to a suitable saline formation located approximately 265 miles from the Mesaba Energy Project area in eastern North Dakota.

All of the CCS options presented above are based on a potential future requirement to reduce $CO_2$ emissions from the Mesaba Energy Project, along with the potential for financial incentives (such as carbon removal credits) that would limit the costs of capture/sequestration from being entirely borne by the utility customers. See Appendix A1 "Excelsior's Plan for Carbon Capture and Sequestration" and Appendix A2 "DOE Analysis of Feasibility of Carbon Capture and Sequestration for the Mesaba Energy Project."

Based on an analysis of the commercial readiness of carbon capture and sequestration presented in Appendix A2, CCS is not considered technically or economically feasible for the Mesaba Energy Project at this time. While both carbon capture and carbon dioxide transport are technically feasible, 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 through ongoing efforts conducted under the DOE Carbon Sequestration Program.

Furthermore, commercially available combustion gas turbines envisioned for this project cannot operate on carbon monoxide-depleted syngas where the hydrogen concentration approaches 100 percent. With regard to economic feasibility, imposition of CCS on the project would increase the cost of electricity such that the Mesaba Energy Project would not be economically viable without an order from the PUC that incorporates the costs associated with CCS within the power purchase agreement. However, the design and construction of the facility would be compatible with future implementation of any of the carbon capture and sequestration options currently being considered.

### ***Sulfur Recovery***

The $H_2S$ carried along in the acid-gas from the AGR system would be converted to elemental sulfur in the sulfur recovery unit (SRU) as illustrated in Figure 2.2-8. Each phase of the Mesaba Energy Project would include two SRUs. The sulfur would be condensed and collected in molten form and could be sold as a by-product raw material for fertilizer or other beneficial uses. The tail gas from the SRU is composed mostly of $CO_2$ and nitrogen with trace amounts of $H_2S$ and $SO_2$ as it exits the last condenser. The liquid sulfur would be pumped from the sulfur pit to a sulfur-degassing unit. The sulfur-degassing unit strips dissolved $H_2S$ out of the liquid sulfur. The degassed sulfur would be pumped from the degassing unit to the sulfur storage tank. The stripped $H_2S$ stream is routed to the tail gas recycle stream to the gasifier. Liquid sulfur from the sulfur storage would be pumped to trucks or rail cars. The sulfur loading equipment would include vapor recovery systems to control fugitive emissions by returning displaced vapors to the storage tank. The SRU is a totally enclosed process with no discharges to the atmosphere.

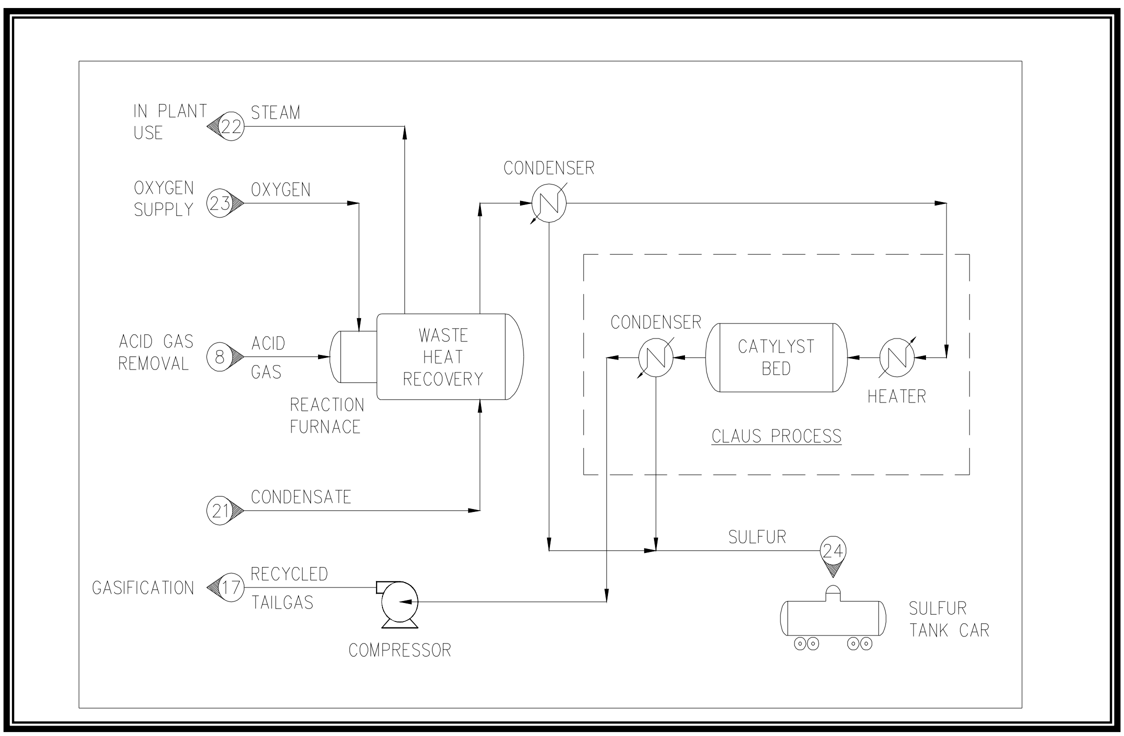



**Figure 2.2-8. Sulfur Recovery Unit**

***Air Separation***

The ASU would provide oxygen for the gasification process and nitrogen for CTG $NO_x$ control and for purging. The ASU contains an air compression system, an air separation cryogenic distillation system ("cold box"), an oxygen pump system and a nitrogen compression system. Two ASU equipment trains would be provided for each phase of the facility. A multi-stage, electric motor-driven centrifugal compressor would compress filtered atmospheric air that may be combined with additional compressed air extracted from the gas turbines in the power block. The combined air stream would be cooled and directed to the molecular sieve absorbers where moisture, $CO_2$ and atmospheric contaminants are removed to prevent them from freezing in the colder sections of the plant. The dry $CO_2$-free air would be separated into $O_2$ and nitrogen gas ($N_2$) in the cryogenic distillation system. A stream containing mostly oxygen would be discharged from the cold box as a liquid and stored in an intermediate oxygen storage tank, from which it would be fed to the gasifier.

The remaining portion of air mainly containing nitrogen would leave the ASU in three separate nitrogen streams. A small portion of high-purity nitrogen would be used in the gasification plant for purging and inert blanketing of vessels and tanks. The largest, but less-pure, portion of the nitrogen would be compressed and sent to the combustion turbines for $NO_x$ emission control. A waste/excess nitrogen stream would be vented to the atmosphere. There would be no emission of regulated air pollutants from the ASU.

***Slag Handling, Storage & Loading***

The slag/water slurry from the gasifier (see Figure 2.2-4) would flow continuously into a dewatering system where slag would be removed in a two-phased settling process. The clear water from the settler would be passed through heat exchangers where it would be cooled as the final step before being returned to the gasifier quench section. Dewatered slag would be transferred by in-plant trucks to the slag storage area to be loaded into on-road trucks or rail cars for transport to market or storage. The dewatered slag would be relatively inert and very moist, and it would not be a source of fugitive emissions.

***Combined-Cycle Power Block***

The power generation portion of the Mesaba Generating Station would be similar to a conventional natural gas combined-cycle plant, which is one of the most efficient commercial electricity generation technologies currently available. Each phase of the station (Phase I and Phase II ) would include two advanced (F Class) CTGs configured to utilize syngas, two HRSGs, and a single STG. Each plant phase would convert the chemical energy contained in the syngas fuel to electricity both directly, through combustion, and indirectly, through steam generation.

In the process, preheated syngas from the gasification section would be mixed with compressed air and supplied to the combustor of the CTG. Diluent nitrogen added to the syngas fuel would reduce the flame temperature in the combustor and thereby reduce the production of nitrogen oxides. The hot exhaust gas exiting the combustor would flow to the expander turbine driving the generator to produce electricity and also turning the air compressor section of the combustion turbine. Hot exhaust gas from the expander would be ducted through the HRSG to generate high-energy steam used to produce additional electricity in the STG. The HRSG would generate three pressure levels of steam and also heat boiler feed water for the syngas cooler in the gasification section. Following heat recovery, the cooled exhaust gas would be discharged to the atmosphere through the HRSG stacks. The HRSG stacks would include emission monitoring instruments as required to verify compliance with applicable emission standards and permit conditions.

#### 2.2.1.4 Plant Utility Systems

**Tank Vent Boiler System**

A tank vent system would be used to convert each off-gas component in the tank vents to its oxidized form ($SO_2$, $NO_x$, $H_2O$, and $CO_2$) before venting them to the atmosphere. The tank vent streams would be composed primarily of air purged through various in-process storage tanks and, with the exception of the off-gas from the slag handling dewatering system, would be routed to the tank vent boiler (TVB). The tank purge gas may contain very small amounts of sulfur-bearing components. The high temperature produced in the TVB would thermally convert any $H_2S$ present in the tank vents to $SO_2$. Heat recovery (in the form of steam generation) would be provided for the hot exhaust gas from the TVB before it is directed to a stack and emitted. Since the slag handling dewatering system off-gas contains high $H_2S$ concentrations, it would be recycled to the gasifier to eliminate a potential source of $SO_2$ emissions if released to the tank vent system.

**Sour Water Treatment**

Water reuse within the gasification plant would minimize water consumption and discharge. Process water containing dissolved contaminant gases produced within the gasification process must be treated to remove dissolved gases before being recycled to the coal grinding and slurry preparation area or being diverted to the Zero Liquid Discharge (ZLD) system.

The dissolved gases would be driven from the water by steam-stripping. Water condensed during cooling of the sour syngas would contain small amounts of dissolved gases ($CO_2$, $NH_3$, and $H_2S$) and other trace contaminants, which would be stripped from the sour water in a two-step process as illustrated in Figure 2.2-9. The $CO_2$ and most of the $H_2S$ would be removed in the $CO_2$ stripper and directed to the SRU. The water exiting the bottom of this column would be cooled, and most would be recycled in the feedstock grinding and slurry preparation. The remaining water would be treated in the $NH_3$ stripper to remove the ammonia and remaining trace components. The stripped ammonia would be combined with the recycled slurry water. A portion of the treated water from the $NH_3$ stripper would be blown down to the ZLD system; the rest would be reused within the plant. The sour water treatment system would be a totally enclosed process with no discharges to the atmosphere.

**Zero Liquid Discharge (ZLD) System**

At either the West Range or East Range location for the generating station, treated water from the $NH_3$ stripper in the gasification process would be released to a ZLD system. The blowdown stream would be pumped to a brine concentrator that uses steam to indirectly heat and evaporate water from the wastewater stream. Resulting water vapor would be compressed and condensed, and the high quality distillate would be recycled to the syngas moisturization system. The concentrated brine would be further processed in a heated rotary drum dryer. There the remaining water would be vaporized and a solid filter cake material collected for appropriate disposal. The use of the ZLD system would prevent the contaminants in the feedstocks from being discharged to receiving waters. For the East Range Site only, an enhanced ZLD system would also treat cooling tower blowdown to eliminate all direct wastewater discharges to receiving waters as necessitated by the stringent requirements applying to discharges of mercury in the Lake Superior Basin watershed.

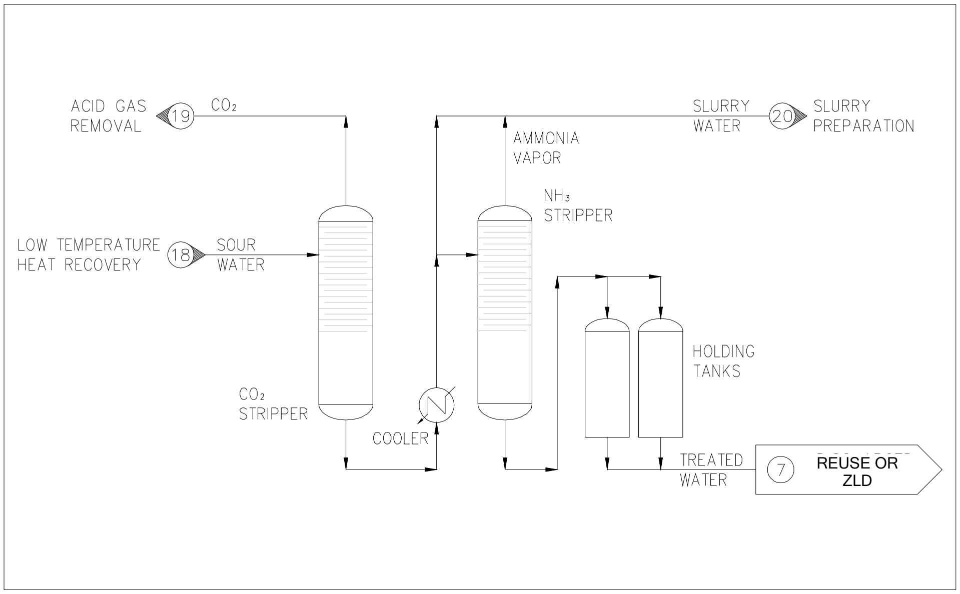



**Figure 2.2-9. Sour Water Treatment System**

## Auxiliary Boilers

Two auxiliary boilers, one for each phase of the Mesaba Generating Station, would provide steam for pre-startup equipment warm up and for other miscellaneous purposes when steam from the gasifiers or HRSGs is not available. The boilers would provide steam in addition to, or in lieu of, the steam that would be generated from the TVBs. Each boiler would produce a maximum of about 100,000 pounds per hour of steam and would be fueled by natural gas. Annual operation of each boiler would be equivalent to or less than 25 percent of the year at maximum capacity. Boilers would be equipped with low $NO_x$ burners to minimize emissions.

## Flare

During unit startup or during short-term combustion turbine outages, an elevated flare at the gasification island would be used to burn off partially combusted natural gas and scrubbed/desulfurized off-specification syngas. Syngas sent to the flare during normal planned flaring events would be filtered, water-scrubbed, and further treated in the AGR and mercury removal systems to remove regulated contaminants prior to flaring. Flaring of untreated syngas or other streams would only occur as an emergency safety measure during unplanned plant upsets or equipment failures.

## Emergency Diesel Engines

A 2-MW emergency diesel generator would be used for the gasification island and a 350-kW emergency diesel generator would be used for the power block. One or two nominal 300-horsepower diesel-driven firewater pumps would be provided for each plant phase. These engines would burn very low sulfur distillate oil. Other than for plant emergency situations, each engine would be operated less than five hours per month for routine testing, maintenance, and inspection purposes.

### 2.2.2 Resource Requirements (and Inputs)

The primary resource requirements for the Mesaba Generating Station (Phases I and II) would include feedstock, natural gas, process water, infrastructure, transportation facilities, and land area. Each resource is discussed in general terms below. Specific sources for these inputs for the West Range Site and the East Range Site are described in Sections 2.3.1 and 2.3.2, respectively. Resources required for construction of the Mesaba Generating Station are discussed in Section 2.2.4, Construction Plans.

#### *2.2.2.1 Feedstock Requirements*

The Mesaba Generating Station would be designed to be "fuel flexible," which means it could operate at or near maximum capacity using various fuels or blends of fuels. This would provide future cost benefits, because it would allow the station to adapt its fuel mix over the life of the facility thereby minimizing the cost of power. Fuel flexibility would also reduce the dependence on a single fuel supplier or transportation provider.

> The Mesaba Generating Station could operate using bituminous coal, sub-bituminous coal, coal/petroleum coke blends, or other blends of these fuels. This fuel flexibility would allow the facility to minimize the cost of power.

The facility would be designed to utilize the following fuels:

- Bituminous coal (e.g., Illinois No. 6) up to 100 percent;
- Sub-bituminous coal (e.g., Powder River Basin [PRB]) up to 100 percent;
- Petroleum coke blended up to 50 percent with coal; or
- Blends of these fuels.

Coal and petroleum coke are typically characterized by their heating value, elemental analysis (percent carbon, hydrogen, nitrogen and sulfur by weight), mineral matter (known as ash), and moisture content.

Phase I would utilize approximately 2.7 million tons of feedstock annually assuming operation at 90 percent capacity. Under maximum feedstock input, and assuming the gasifiers operated in full slurry quench (FSQ) mode, each phase would require a maximum of 8,230 tons of coal (sub-bituminous) per day on an as-received basis. Assuming partial slurry quench (PSQ) operation of the gasifiers, the daily maximum would increase to 8,550 tons on an as-received basis, or about 3 million tons of feedstock per year. With Phase I and Phase II operating at full load with the gasifiers in FSQ mode, a maximum 16,460 tons of coal feedstock per day would be consumed. With the gasifiers operating in PSQ mode at full load, Phase I and Phase II would require a maximum of about 17,100 tons of sub-bituminous coal per day.

Operating in FSQ mode would result in reduced fuel use and, consequently, reduced pollutant emissions/discharges, and Excelsior intends to operate the Mesaba Energy Project in the more-efficient FSQ mode to the extent feasible. However, FSQ is an IGCC design improvement that is subject to further engineering and verification by experience at Wabash River. Therefore, to avoid unrealistic expectations, neither the maximum resource requirements nor maximum pollutant emissions/discharges operating under FSQ are considered in this EIS.

Coal and petroleum coke feedstocks would normally be received by rail in dedicated unit trains from a mine (or refinery). The proposed onsite rail line would be designed based on the following assumptions:

- Unit trains would include up to 135 cars (the average unit train shipment would be comprised of 115 cars).
- Each unit train car would carry an average of 119 tons of feedstock.

- A maximum of three unit trains per day (midnight to midnight) could be received and unloaded based on an unloading rate of four hours per train.

Unloading facilities would include a thawing shed to loosen frozen cargo during the winter season, and a partially enclosed rotary car dumping system with an automatic electro-hydraulic positioning system, which would reduce the run time and associated emissions of the locomotive or switch engine during the entire unloading process. Feedstock materials would fall from the rotated cars into an enclosed unloading pit and would be transferred via a feeder/conveyor system to active storage pile stackers. Four active storage piles for each phase (a total of eight for the Mesaba Generating Station) would provide working feedstock storage. Reclaimers and conveyors would move coal/coke from the active piles to the slurry feed preparation area. Additional inactive storage would be located on the opposite side of the rail sidings to provide a reserve source of feedstock material in the event normal deliveries of unit trains are interrupted. If needed, feedstock from the inactive pile would be moved by mobile equipment (bulldozers, scrapers, and/or front-end loaders) to the unloading pit.

The feedstock handling system would include facilities necessary to unload solid feedstock materials, convey them to storage areas, store them until required, reclaim them from storage, blend them as necessary, and convey the blended materials to the slurry preparation system. On-site storage facilities would be provided for two feedstock materials: coal and petroleum coke. Storage facilities would also be provided for flux, which is a feedstock-conditioning material, described below. The feedstock storage facilities would include, for each phase of the generating station, approximately 20 days of active storage and approximately 25 days of inactive storage. The storage areas would incorporate dust suppression systems (including covered conveyers and other enclosures, dust suppression sprays, and vent filters) and would be paved, lined, or otherwise controlled to enable collection and treatment of stormwater runoff and prevent infiltration of chemical species leached from feedstock materials and/or flux to groundwater.

At the high operating temperatures of the E-Gas™ gasifier, ash in feedstock material would normally melt and drain to the bottom of the gasifier where it would be removed as molten slag and cooled in a water bath until it solidified. Mineral matter in the ash determines the melting temperature of the slag and its viscosity at a specific operating temperature. If too viscous, the slag would not easily flow from the gasifier and could potentially plug the bottom. If too fluid, the slag could be excessively erosive to the refractory in the gasifier. Flux, typically silica/sand, limestone, iron oxide, or a mixture of these materials, would be blended with the feedstock under carefully monitored conditions to control the slag melting point and viscosity.

Flux would be received by truck (or railcar) and pneumatically conveyed to enclosed storage silos equipped with fabric filters for dust control. Flux from storage silos would be automatically blended with feedstock by a weigh belt feeder system. The required quantity of flux would be a small fraction of the total feed, typically less than 250 tons per day per phase.

#### 2.2.2.2 Natural Gas Requirements

Although the primary fuel source for electric power production would be coal-derived syngas, the Mesaba Generating Station would also be capable of operating on natural gas. Natural gas would be used during startup of the facility and as a backup fuel. This ability to operate on natural gas would provide an additional source of available generating capacity (and reliability for periods when the gasification island is unavailable). In addition, it would offer the option of installing the combined-cycle power island early in the construction process (that is, ahead of the gasification island), thereby allowing for electricity production from natural gas until the gasification island could be installed and the unit would begin full baseload operation on coal-derived syngas. Although not currently planned for the Mesaba Energy Project (Phase I), the ability to come online early using natural gas would be a very useful resource planning option for Phase II. Excelsior has proposed permits to allow for natural gas firing at capacity factors of 30 percent, 20 percent, 10 percent, and 5 percent for years 1, 2, 3, and thereafter, respectively. The expected maximum natural gas flow would be about 105 million standard cubic feet of gas per day per phase of the Mesaba Generating Station.

Two major natural gas pipeline transmission companies serve Minnesota's Iron Range: GLG and NNG. The GLG natural gas pipeline system interconnects with NNG's natural gas pipeline system near Carlton, Minnesota. Section 2.3 describes the gas pipeline interconnection alternatives for the West Range and East Range Sites.

### 2.2.2.3 Process Water Requirements

The Mesaba Generating Station would require process water for the following purposes:

- As the prime mover in the steam cycle (Raw water must be treated to ultra purity standards to be used in the HRSG for steam production. The steam produced in the HRSGs is delivered to the steam turbine and condensed for reuse.);
- To condense steam used in the power cycle (Water used for steam production in the HRSGs would be of very high quality and, for economic reasons, would not simply be vented to the atmosphere as low grade steam.);
- To slurry coal for feed to the gasifier; and
- For various other contact/non-contact cooling purposes.

Water requirements for the Mesaba Generating Station would differ somewhat depending on the siting of the project for reasons explained in Section 2.3. The average and peak water requirements are indicated in Table 2.2-3. Peak rates would occur on hot, humid days and would be projected to reach 5,000 to 6,500 gallons per minute per phase or 10,000 to 15,200 gallons per minute for both phases on such days.

**Table 2.2-3. Process Water Requirements**

| Phase | West Range Site[a] | | East Range Site | |
|---|---|---|---|---|
| | Average Annual Demand (gpm [cfs])[b] | Peak Demand (gpm [cfs]) | Average Annual Demand (gpm [cfs]) | Peak Demand (gpm [cfs]) |
| Mesaba Energy Project (Phase I) | 4,000-4,400 (8.9-9.8) | 6,500 (14.5) | 3,700 (8.2) | 5,000 (11.1) |
| Mesaba Generating Station (Phases I & II) | 8,800-10,300 (19.6-22.9) | 15,200 (33.9) | 7,400 (16.5) | 10,000 (22.3) |

[a] To meet water quality criteria, the cycles of concentration in the cooling tower at the West Range Site must be reduced from 5 for Phase I to 3 for Phases I & II, which results in a greater than doubling of water requirements.
[b] gpm – gallons per minute; cfs – cubic feet per second

The maximum process water requirement would be dependent upon many factors including, but not limited to, the cycles of concentration in the cooling towers, fuel consumed, ambient conditions, extent to which cooling tower blowdown is treated to remove total dissolved solids, chemistry of the receiving waters, and water quality criteria standards applied to those waters. The cycles of concentration in the cooling towers would be dependent upon source water chemistry, specifically the concentrations of mercury, total dissolved solids; and hardness. In general, if the source water is relatively low in total dissolved solids the cycles of concentration in the Mesaba Generating Station's cooling towers could be increased, resulting in lower make-up rates.

Abandoned mine pits would be the primary source of water at either the West Range Site or the East Range Site. A water pipeline and pumping system would convey water from the abandoned mine pits to the Mesaba Generating Station. Water from the water pipeline would be filtered prior to use in the Mesaba Generating Station. Sludge from the raw water treatment process would be taken to a local non-hazardous landfill for disposal.

### *2.2.2.4 Infrastructure Requirements*

The project's generating facilities would connect to the power grid via new and existing HVTL corridors to substations located near the unincorporated communities of Blackberry (West Range Site) or Forbes (East Range Site). The HVTL infrastructure would need to be reconstructed and/or reinforced under the Proposed Action for either the West Range Site or the East Range Site as described in Section 2.3.

Electric power would be produced in two CTGs (about 220 MW each) and in one STG (up to 300 MW). The electrical output of the CTG and STG at 16.5-kV and 18-kV, respectively, would be below the level needed for electrical transmission to the grid; hence, transformation to the appropriate voltage would occur prior to the Mesaba Generating Station's switchyard. Excelsior's design and cost for the power plant have been based on such transformation delivering electric power to the switchyard at a voltage of 230-kV.

Based on a nominal net electric output of 606 MW at a 0.90 power factor, one bundled conductor 230-kV transmission line rated at 1,585 Amperes would be sufficient to carry the peak electrical output of either plant phase. A single 345-kV bundled conductor rated at 2,113 Amperes could carry the full 1,212 $MWe_{(net)}$ output from both phases. However, a single transmission line interconnecting the plant to the point of interconnection (POI) would not meet the single failure (n-1) criterion and would result in a total loss of output from the plant in the event of a forced line outage or when line maintenance is required. Therefore, a minimum of three 230-kV HVTLs, two 345-kV HVTLs, or a combination of two 230-kV HVTLs and one 345-kV HVTL would be required to satisfy the single failure criterion design element.

The choice of transforming voltage level for the Mesaba Energy Project between 230 and 345-kV is not solely dependent on the plant site and length of transmission lines. This choice is also dependent on the voltage levels at which the substation currently operates as well as existing "downstream" power flow constraints. Presently, there is no 345-kV voltage transmission infrastructure at either the Blackberry Substation or the Forbes Substation. Efforts to bolster Minnesota Power's (MP) ability to exchange power between regions with fewer attendant losses would dictate that new transmission developments in the region operate at higher voltages. Excelsior believes that 345-kV would be the future standard on which such transmission developments on the Iron Range will be focused and has based its decision for the interconnection voltage on that premise. The results of the Midwest Independent System Operator's (MISO) Interconnection Studies will confirm whether Excelsior's decision regarding the likelihood of future 345-kV development at the two substations is appropriate.

Based upon the results of studies completed to date, MISO has determined that the output of Mesaba Phase I would be fully deliverable within the MISO footprint. For the West Range Site, network upgrades consisting of an additional 230-kV HVTL between the Boswell Substation and the Riverton Substation would be required; however, no such upgrades would be required for the East Range Site. Excelsior has requested that MISO conduct sensitivity analyses to examine whether successful development of the Minnesota Steel project (initially assuming a 300 MW load) would eliminate the need for the additional 230-kV HVTL at the West Range Site. These sensitivity analyses are currently underway. MISO studies are also underway to identify network upgrades required to ensure that Mesaba Phase II would be deliverable within the MISO footprint at the West Range Site. Based upon the results of Excelsior's preliminary studies, some existing transfer capability would be available to deliver the Phase II output; however, it is likely that additional 230-kV and/or 345-kV network upgrades would be required at either site for Mesaba Phase II to resolve local injection issues and ensure full power deliverability to the Twin Cities. As in the case for Mesaba Phase I, for purposes of evaluating the network upgrades required for Mesaba Phase II at the West Range Site, Excelsior has requested that MISO perform sensitivity analyses assuming the successful development of Minnesota Steel but operating at two levels of power demand, 300 MW and 500 MW. The results of the MISO studies are expected to be available later this year.

Because of the pending MISO decisions affecting the interconnection voltage for Phases I and II, Excelsior has requested an HVTL Route Permit that allows flexibility to change its West Range Site interconnection voltage plans. The use of 345-kV at the East Range Site is dictated by the increased power losses that would otherwise occur if the system were operated at 230-kV. Section 2.3 summarizes Excelsior's plans to deal with uncertainties related to MISO's ongoing studies and pending decisions.

Easements across public and private lands would be required to provide HVTLs, pipelines, rail, and highway access to the Mesaba Generating Station. Two HVTL corridors traverse the West Range Site and one HVTL corridor traverses the East Range Site. Easements would also be required for infrastructure associated with the Phase I and Phase II developments, construction of such infrastructure, and operation of the Mesaba Generating Station. Water pipelines would require access from RGGS Land & Minerals, LTD., L.P. (RGGS) for the West Range Site, and from Cliffs-Erie, LLC (CE) and the USDA Forest Services for the East Range Site.

Potable water demand would be generated by construction and operational personnel. Approximately 30 gallons per day per person would be required. During construction peak water demand would be 45,000 gallons per day based on 1,500 construction workers. Once operational, water demand would decrease to 7,500 gallons per day based on 250 workers on site. Use of city water would be anticipated, although on-site treatment of water from abandoned mine pits through filtration and clarification could also be performed to meet potable water standards.

### *2.2.2.5 Transportation Requirements*

Coal and other materials would be delivered to the Mesaba Generating Station primarily by rail, with some materials delivered by truck. The BNSF Railway (BNSF) and the Canadian National Railroad (CN) are the two principal rail providers in the region. Rail loop access to either site would be required, and potential rail alignments are described in Section 2.3. The plans for connecting the BNSF and/or CN with the Mesaba Generating Station on the West or East Range Sites would require plan approvals from the respective companies; however, no other public approvals would be needed.

Rail cars arriving via unit trains would be unloaded using a state-of-the-art rapid discharge rotary dumper with an automatic railcar positioning system. The rail loop and system would allow a full-length 8,000-foot long coal train (i.e., 135-car unit train) to be pulled through the site without uncoupling any of the cars. Each rail car would be rotated upside down inside the rotary dumper building to unload the coal contained therein. The dumper building would be enclosed and maintained under negative pressure during the unloading process to minimize fugitive emissions. Each unit train would take approximately three to four hours to unload.

Other incoming materials delivered via rail could include petroleum coke, flux, and construction materials and equipment. Construction deliveries would require two trains per week. Depending upon the fuel being used, Phase I would produce between 500 and 800 tons per day of slag, which is a black, non-hazardous, glass-like material that has broad industrial uses. Also, depending upon the fuel being used, approximately 30 to 160 tons per day of elemental sulfur would be produced that would be sold and transported off site. Sulfur would be transported off site by rail. Excelsior expects that slag would be sold to local markets and transported off site by truck; however, the project would provide the capability to load slag onto rail cars for transport to more distant markets depending upon economics.

An access road would also be required at either site for the plant. Roadway access would be required for personnel and for deliveries by truck during construction and operation of the plant. Potential access road alignments for the West Range and East Range Sites are described in Section 2.3.

#### *2.2.2.6 Land Area Requirements*

The Phase I site layout would encompass approximately 100 acres. An additional 80 acres of land would be required for a temporary construction staging and laydown area for the Phase I equipment and 5 acres for a concrete batch plant. Since Phase II would be similar to Phase I with respect to its balance of plant equipment, a total of approximately 200 acres would be required for Phases I and II, excluding construction staging and laydown areas. Phase I would use the footprint reserved for Phase II as the construction staging and laydown area; however, an additional 85 acres of land would be used onsite for a construction and laydown area during Phase II. On-site rail alignments, access roads, and utility corridors would also affect the amount of acreage required for project components. The balance of land area on the West or East Range Site would remain wooded to the extent practicable to maintain a buffer area (for visual screening and noise reduction) between the power plant footprint and surrounding land uses. The site layout plans would be developed so as to reduce the extent of impact on environmental resources as practicable within design constraints for the generating station components.

Construction of the proposed rail line to accommodate Phase I and Phase II would require additional off-site ROWs to be obtained. The proposed ROW would be 100 feet wide with additional width needed in some of the cuts or fill sections. The track work would begin immediately after construction approval was received to allow for delivery of construction materials. Rail line construction would require approximately 15 months.

The rail line would be constructed on a 32-foot wide prepared roadbed within the 100-foot wide right-of-way. Permanent or temporary easements may be required in some areas. The side slopes would be 1:3 with a 5-foot wide flat bottom ditch for drainage. The prepared roadbed would have the track offset to one side of centerline to allow for a 12-foot railroad inspection road alongside. The coal unloading process would require the final track elevation to be level; therefore, the approach grades would be limited to 0.3 percent. The grading and track work would conform to the American Railway Engineering and Maintenance of Way Association (AREMA) standards.

Storage requirements for the major process feedstocks and byproducts are shown in Table 2.2-4. The volumes of material storage requirements are for each phase; total storage for both phases would be double the amounts shown.

**Table 2.2-4. Feedstock and Byproduct Storage Requirements for Each Phase**

| Material | Storage Requirements |
|---|---|
| Coal Pile | 385,000 tons (20/25 days active/inactive storage based on maximum PRB-1 coal usage);<br>Dust control; Water runoff control |
| Pet Coke Pile (Storage would be subset of total coal storage) | 105,000 tons (20/25 days active/inactive storage);<br>Dust control; Water runoff control |
| Flux Silo | 4,660 tons (20 days active storage) |
| Sulfur Tanks | Max 162 tons/day generated, based on Illinois No.6 coal (7 days on-site storage; 30 rail cars parked on site) |
| Slag Pile | 34,800 tons (45 day storage, wet basis, using PRB2:PRB3 coal blend) |

## 2.2.3 Discharges, Wastes, and Products (Outputs)

### *2.2.3.1 Air Emissions*

Air emissions by the Mesaba Generating Station would be largely independent of the project site. The block flow diagram in Figure 2.2-1 shows air emission sources and their associated control equipment for the Mesaba Energy Project (Phase I); the Phase II plant would be identical. Refer to Table 2.1-1 for estimated air emissions. Excelsior's design team estimated the maximum and average emission quantities from each emission point using:

- Equipment supplier data;
- Best available control technology (BACT) as proposed for the Mesaba Generating Station in the New Source Review Construction Authorization Permit (Air Permit application);
- Test results for similar equipment at other IGCC facilities, especially the existing Wabash River IGCC plant (which also uses E-Gas™ gasification technology);
- Engineering calculations, experience, and professional judgment; and
- Published and accepted average emission factors, such as the EPA Compilation of Air Pollutant Emission Factors (AP-42).

***Criteria Pollutants***

Emissions of criteria pollutants would occur from the operation of the combustion turbines; TVBs; flares; auxiliary boilers; cooling towers; fugitive emissions from handling, preparation, and storage of coal/coke and slag during the operational phase; and emergency generators and emergency fire and water pump engines. Transportation-related emissions would be low in comparison to the emissions from plant operations.

***Carbon Dioxide Emissions***

The amount of $CO_2$ emitted by the power plant would vary depending on the feedstock, as indicated in Table 2.1-1, and the net heat rate. The project proponent has estimated that the Mesaba Generating Station would emit approximately 10.6 million tons of $CO_2$ per year using mainly sub-bituminous coal. $CO_2$ emissions from power plants are not currently regulated under the Clean Air Act, and there are no economic incentives in place to encourage reductions in the emission of this greenhouse gas. However, as described in the Potential Carbon Capture Retrofit subsection of Section 2.2.1.3, the plant would be designed to allow for future modification to add $CO_2$ capture technology, and the project proponent has performed a preliminary study of the potential geologic sequestration of $CO_2$ emissions from the plant.

### *Combustion Turbine Generators*

The production of syngas at relatively high pressure allows efficient and cost-effective syngas cleanup prior to combustion in the CTGs to produce electricity. Air emissions would be controlled using the following treatment steps applied to the syngas:

- Hot gas particulate matter filtration via cyclone and ceramic filter to achieve more than 99.9 percent removal of particulate matter;
- Water scrubbing to remove soluble contaminants, condensable materials, and suspended particulate matter;
- Amine treatment combined with COS hydrolysis;
- Carbon adsorption for removal of mercury and other trace contaminants; and
- Moisturization (water saturation) for $NO_x$ control and improved power production.

In addition to the syngas treatment, the moisturized product syngas fuel would be diluted approximately 100 percent (1:1) with ASU nitrogen for additional $NO_x$ reduction. Steam injection, in lieu of nitrogen dilution and moisturization, would be used for $NO_x$ control when operating on natural gas. Finally, each CTG would be equipped with inlet air filters to minimize particulate matter emissions potentially caused by advection of suspended atmospheric materials contained in the combustion air.

Emissions from the CTGs are based on the following gas concentrations as emitted at the HRSG stack (or, in the case of particulate matter, the stack emission rate):

#### *Syngas*

- $SO_2$, based on 50 parts per million, volumetric dry (ppmvd) as $H_2S$ in the undiluted syngas, rolling 30-day average and assuming 100 percent conversion of $H_2S$ to $SO_2$
- $NO_x$, 15 ppmvd (at 15 percent $O_2$)
- CO, 15 ppmvd (at 15 percent $O_2$)
- $PM_{10}$, 25 lb/hr/CTG
- Volatile Organic Compounds (VOC), 2.4 ppmvd (at 15 percent $O_2$)

#### *Natural Gas*

- $SO_2$, pipeline-quality natural gas (assumed 1.0 grain/100 standard cubic feet (scf) total sulfur) and assuming 100 percent conversion of sulfur to $SO_2$
- $NO_x$, 25 ppmvd (at 15 percent $O_2$)
- Other criteria pollutants, equal to or less than syngas emission rates

### *Tank Vent Boilers*

Two TVBs, one for each phase, would be designed to safely and efficiently dispose of recovered process vapors from various process tanks and vessels associated with the gasification process. The TVBs would prevent the atmospheric emission of reduced sulfur compounds and other gaseous constituents to the atmosphere that could cause nuisance odors and other undesirable environmental consequences. The TVBs may also be operated on natural gas to produce steam for the Mesaba Generating Station during gasifier shutdowns.

### *Flares*

The elevated flares for each phase would be designed for a minimum 99 percent destruction efficiency for CO and $H_2S$. The flares would normally be used only to oxidize treated syngas and natural gas combustion products during gasifier startup operations. The flares would also be available to safely dispose of emergency releases from the Mesaba Generating Station during unplanned upset events.

### *Fugitive Emissions*

Fugitive emissions are those emissions not caught by a capture system, and that are often due to equipment leaks, evaporative processes, or wind. Such fugitive emissions for the proposed IGCC facility would likely occur, based on normal equipment leakage, and were estimated using standard U.S. EPA fugitive emissions factors for valve seals, pump and compressor seals, pressure relief valves, flanges, and similar equipment.

### *Material Handling Systems*

Fugitive particulate matter emissions (fugitive dust) would be generated by coal/coke and slag handling, preparation, and storage during the operation of the Mesaba Generating Station. Sources of these emissions would include the active and inactive coal/coke storage piles, conveyors/transfer points, slurry preparation area, and the slag storage area. Estimated fugitive emissions are provided in Section 4.3, Air Quality and Climate.

Wet spray dust-suppression systems would be employed at various points in the coal handling and storage and coal slurry processes, which would require that water be supplied to the various injection points. This water could be blended with glycol for freeze point suppression, and/or surfactants (wetting agents) or chemical binding or encrusting agents. Because of the glycol addition, any free water draining from the solids would be captured and treated as required before re-use on-site or disposal off site.

Fugitive dust would be generated from in-plant trucks hauling slag from the gasifier slag handling area to the slag storage pile or bins to await shipment by rail or truck to offsite users. Watering of the roadway near the pile to suppress dust and periodic removal/cleanup of dust-producing material would minimize potential emissions from this source.

### *Cooling Tower Drift*

Particulate emissions would also occur from the cooling towers as a result of drift. The total dissolved solids (TDS) content of the drift is the maximum value estimated from water quality measurement data for the makeup water.

The high concentration of TDS found in process water from mine pits at the East Range Site would be the source of increased $PM_{10}$ emissions from the East Range Site cooling towers relative to such emissions from the West Range Site. TDS in process waters for the East Range Site have been shown to be present at concentrations up to 1,800 milligrams per liter, whereas peak concentrations of TDS in mine pits associated with the West Range Site are on the order of 340 milligrams per liter.

### *Auxiliary Boilers*

The auxiliary boilers would normally operate only when no steam would be available from the gasifiers or HRSGs. The annual capacity factor for these boilers would be 25 percent or less. The auxiliary boilers would include low-$NO_x$ burners for emission control.

***Emergency Diesel Engines***

Diesel engines driving the emergency generators and fire protection pumps would be operated for emergency purposes only and would not operate otherwise for more than 100 hours per year each. The operation of these engines would be an additional although minor source of overall operational air emissions.

### 2.2.3.2 Wastewater Effluents

***Process Water Effluents***

The allowable quantities and concentrations of chemical components in wastewater discharges from the Mesaba Generating Station would be dependent in large part on the characteristics of potential receiving waters. In the case of the West Range and East Range Sites, the receiving waters would be located in different watershed basins that have substantially different water discharge standards. Therefore, this section addresses the general aspects of plant effluents. The site-specific aspects of effluent discharges are addressed for the respective plant locations in Section 2.3.

Although the amounts of water appropriated, consumed, and discharged would vary between the West and East Range Sites, the general requirements for water would be as listed previously in Table 2.2-3. A generalized water balance diagram that applies to both potential sites is shown in Figure 2.2-10.

Wastewater generated from gasification and slag processing operations containing levels of heavy metals and other contaminants from the feedstocks would be treated in a ZLD system. This system would recover distilled water for reuse in the power plant, thereby reducing fresh water consumption, and it would concentrate heavy metals and other contaminants of concern into a solid waste stream. The solid waste, which is likely to be classified as a hazardous waste, would be disposed of at offsite waste management facilities; therefore, no wastewater streams from the ZLD system serving the gasification island would require disposal at either site.

At the West Range Site, the process wastewater discharge would primarily be generated from the removal of portions of condenser cooling water (cooling tower blowdown) as necessary to control dissolved solids in the system. The constituents in the wastewater would essentially be the same materials present from the water supply sources, but they would be more concentrated. The plant cooling towers would be expected to operate approximately three to eight cycles of concentration (COC). Therefore, the contaminants in the cooling water blowdown would be concentrated (due to evaporation in the cooling tower) by about three to eight times the concentration in the water supply source. The Mesaba Generating Station would operate at five COC during Phase I and at three COC for Phases I and II.

In addition to the cooling tower blowdown, process wastewater would be generated from other plant systems, including HRSG blowdown, reject water from the boiler feed water demineralizers and treated stormwater (i.e., processed through an oil/water separator) from plant drains isolated from contamination by process solids/liquids.

Typical chemical additives would be introduced into the circulating water system to control cooling water corrosion and fouling and to neutralize certain undesirable constituents in the plant discharge stream. The majority of the chemicals would be consumed in the plant processes and only residual amounts would be expected in the wastewater discharge. These residual amounts have been specified by Excelsior in its Permit Application under the National Pollutant Discharge Elimination System (NPDES) permit and would be regulated in the permit when issued.

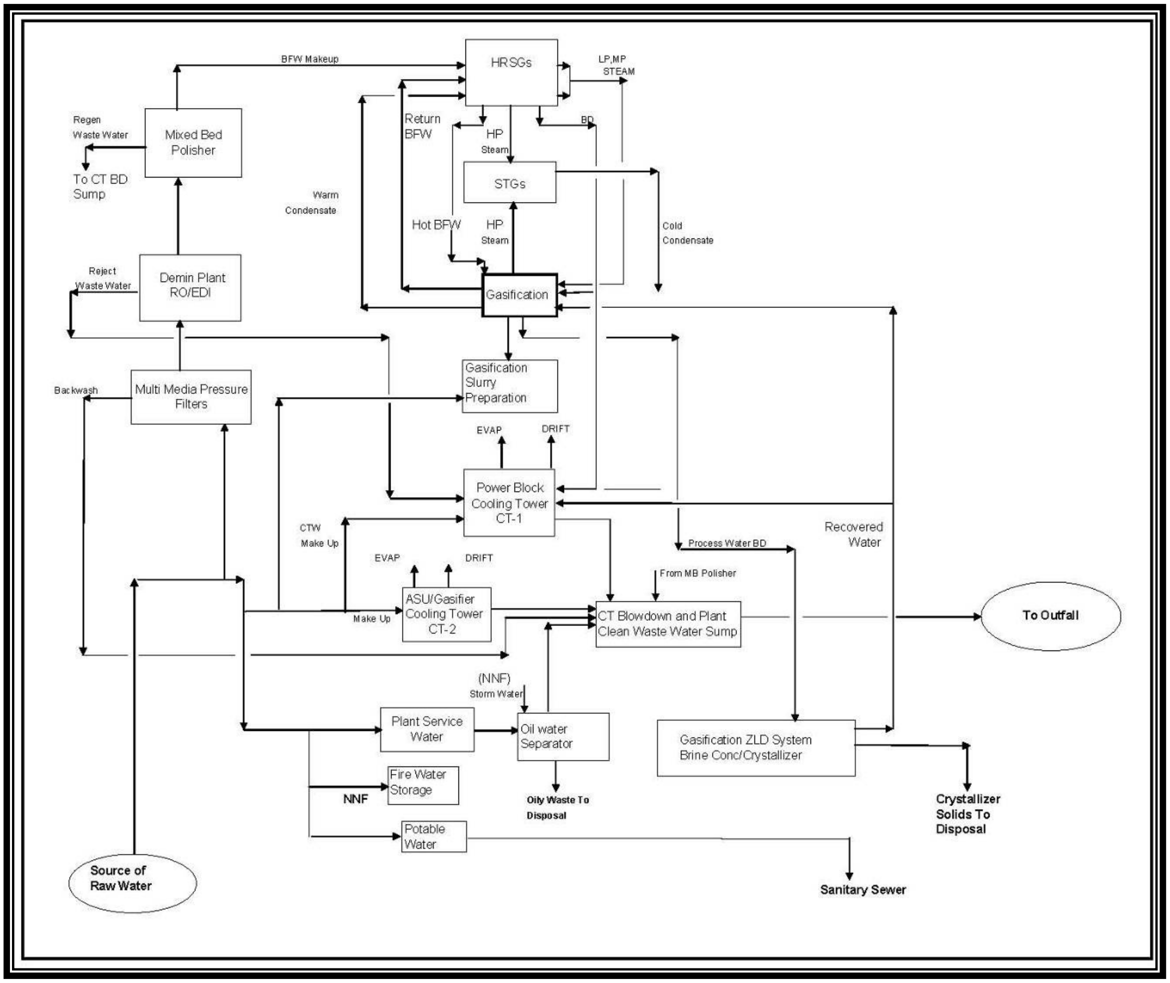



**Figure 2.2-10. Water Balance Diagram Applicable to Phases I & II**

## ***Stormwater Management***

Stormwater runoff from the plant site during operation of the Mesaba Generating Station would be managed in three ways:

- Stormwater with potential to become contaminated with process solids/liquids would be segregated from process equipment by curbs, elevated drain funnels and other means and returned as make-up to the feedstock slurry system or for other process water use.
- Stormwater that could become contaminated with oil (such as water runoff from parking lots) would be routed through an oil/water separator and then to the cooling tower blow down sump prior to discharge off site.
- Stormwater from other areas not associated with industrial activity would be routed to the stormwater detention pond where settling could occur and initial rainfall (“first flush”) could be contained, checked, and released in a controlled manner to a permitted outfall.

***Sanitary Wastewater***

Alternatives for treating sanitary (domestic) wastewater produced by plant employees include connecting to the local/regional publicly owned treatment works (POTW) or providing an onsite septic system with leach field. Excelsior's preferred alternative would be to discharge sanitary wastewater to a local POTW.

Based on the number of personnel required for the operation of Phase I and Phase II (see Section 2.2.5), and using an estimate of 30 gallons per day generated per person, the expected sanitary wastewater discharge would total approximately 3,300 gallons per day for Phase I and 5,500 gallons per day for both phases combined. These flows are based on the generating station having restrooms, locker rooms, showers, and break room facilities. To accommodate flows when additional people would be on site during tours, special maintenance activities, and outages, the capacity of the system would be based on 7,500 gallons per day of sanitary wastewater.

### 2.2.3.3 Solid Wastes

Solid wastes produced during plant operations would include spent catalyst materials (associated with the COS hydrolysis and SRU systems), spent activated carbon beds associated with mercury removal processes, spent activated carbon beds and char sludge associated with the sour water treatment system, the solid waste stream produced by the ZLD system, commercial waste paper, and miscellaneous janitorial streams.

The use of a ZLD process would prevent the discharge of heavy metals and other gasification wastes with the plant wastewater effluent. The solid waste stream from this process, consisting mainly of crystallized solids in a "filter cake," would likely be classified as a hazardous waste due to metals content and would be disposed in an approved hazardous waste landfill or other licensed facility.

Excelsior would manage operational wastes in accordance with applicable regulations, good industry practices and established internal company procedures. Hazardous and non-hazardous wastes would be properly collected, segregated, and recycled or disposed at approved waste management facilities within regulatory time limits and in accordance with requirements. Plant staff would be adequately trained in proper waste handling procedures. Waste manifests and other records and reporting would be maintained as required by regulations and company procedures.

Typically, the ash content of coal would be in the range of 5 to 11 percent as received, and ash in petroleum coke would average about 0.6 percent as received. However, the advanced features of E-Gas™ technology avoid two significant solid waste streams associated with some other types of coal-based power generation: flue gas desulfurization (FGD) solids and ash. Removal of sulfur from IGCC syngas in a relatively concentrated form and the subsequent production of elemental sulfur eliminate these significant solid wastes. Slag production at full load would vary from about 500 tons per day up to a maximum of about 800 tons per day per phase. Slag and elemental sulfur are considered to be potential revenue-producing streams that would be actively marketed by Excelsior.

### 2.2.3.4 Marketable Products

Although the primary product of the Mesaba Generating Station would be electric power, the plant would also produce elemental sulfur and a glass-like, inert slag. A worldwide market exists for elemental sulfur, although its value varies considerably with location, purity, and end use. The sulfur recovered from the SRU would be stored in molten form and could be sold as a raw material for fertilizer and other beneficial uses. No large-scale market exists for slag at this time; however, it is expected that slag can be marketed for asphalt aggregate, construction backfill or landfill cover applications. Slag with a carbon content of less than 5 percent by weight should be marketable as a higher value product such as roofing shingle applications. There is also a potential to market the slag produced from petroleum coke gasification for metals recovery.

The plant also would be designed to be retrofit for carbon-capture technology. Studies for Excelsior to be undertaken as part of the Phase II Plains $CO_2$ Partnership (one of seven regional partnerships funded by the DOE Regional Carbon Sequestration Partnership Program) would produce a $CO_2$ management plan that would specify conditions required by potential purchasers of $CO_2$. The carbon capture system may be added after the generating station is in operation. For PRB coal, Excelsior would expect to capture approximately one third of the carbon (as $CO_2$) in the solid IGCC feedstock. This capture would come at a reduction in capacity and an increase in heat rate.

### *2.2.3.5 Toxic and Hazardous Materials*

Hazardous materials that would be used or stored for project operations include relatively small quantities of petroleum products, liquid oxygen and nitrogen, molten sulfur, catalysts, flammable and compressed gases, amine replacement and reclamation chemicals, water treatment chemicals, and minor amounts of solvents and paints (Table 2.2-5). Materials and estimated quantities for the gasification/ASU blocks were based on experience at the Wabash River plant.

Natural gas and syngas, which are flammable fuels, would be used in the Mesaba Generating Station, specifically for the power block. Natural gas would be used as a startup or auxiliary fuel; it would be utilized directly from the onsite pipeline (connecting to the off-site main pipeline) and would not be stored on site. Syngas, which is a mixture of CO, $H_2$, $CO_2$, and water vapor, would be the primary fuel for the combustion turbines generated on site and not stored. $H_2$ would be used as a generator coolant. The $H_2$ would be stored in pressurized gas tubes on a multi-tube trailer. The tube trailer would be stored outside near the turbine-generators and would meet required building and fire codes. $CO_2$ would be stored and utilized for purging the generators after normal and emergency shutdowns.

Bulk quantities of liquid oxygen and nitrogen would be stored in tanks in the ASU to provide capacity for startups and continued plant operation during short-duration ASU system outages. Other gases stored and used at the facility would include those typically used for maintenance activities, such as shop welding, and emission monitoring and laboratory instrument calibration. These gases would be stored in approved standard-sized portable cylinders, and in appropriate locations.

Water treatment chemicals would be required and stored on site. Bulk chemicals, such as acids and bases for pH control would require storage in appropriately designed tanks, with secondary containment and monitoring. Gaseous chlorine (used/stored in compliance with all applicable regulatory requirements) or hypochlorite bleach may be used for biological control of the various circulating and cooling tower streams. Other water treatment chemicals would be required and used as biocides, pH control, dissolved oxygen removal, and corrosion control for boiler feed water, cooling tower and cooling water treatment. For raw water treatment, coagulants and polymers may also be used. Chemicals used for these purposes are generally specified by the water treatment provider, and are available under a number of trade names. Stored quantities of these materials would be small, ranging from 55-gallon drums to 500-gallon tanks.

**Table 2.2-5. Onsite Toxic and Hazardous Materials (Totals for Phase I and II)**

| Material | Form | Quantity (Phases I and II) | General Location On-Site | Use |
|---|---|---|---|---|
| **GASIFICATION/AIR SEPARATION UNIT AREAS** | | | | |
| **BULK CHEMICALS** | | | | |
| Chlorine or Sodium Hypochlorite | Gas or Liquid | TBD* | | Cooling Towers |
| Sodium Hydroxide | Liquid | 60,000 gallons | Outdoors | Amine Reclamation and Sour Water Treatment |
| Potassium Hydroxide | Liquid | 2,000 gallons | Indoors | Dry Char Filter Cleaning |
| Water Treatment Chemicals | Liquid | Typically 55-gallon drums to less than 500-gallon tank | Indoors | Pump Bldg, Slurry Prep Bldg, Cooling Towers |
| Oxygen (95%) | Liquid | 1,800 tons | Outdoors (Tanks) | ASU Backup Supply |
| Nitrogen | Liquid | 5,000 tons | Outdoors (Tanks) | ASU Backup Supply |
| Molten sulfur | Liquid | 200,000 gallons | Outdoors | By-product for Sale |
| Ammonium lignosulfonate | Liquid | TBD | Indoors | Slurry Prep Bldg for maintaining % solids in slurry |
| **MISCELLANEOUS/DISTRIBUTED MATERIALS** | | | | |
| Paint/Thinners/etc. | Liquid | Minimal | Indoors | Shop/Warehouse |
| Lubrication Grease/Oils | Solid/Liquid | Minimal | Indoors | Pump Bldg, Slurry Prep Bldg., Shop/Warehouse |
| Compressed Gases (Ar, He, $H_2$) | Pressurized Gas | Minimal | Indoors | Lab |
| Chemical Reagents (acids/bases/standards) | Liquid | Minimal | Indoors | Lab |
| **OTHER HAZARDOUS MATERIALS** | | | | |
| Flammable/Toxic Gases ($H_2$, CO, $H_2S$, $SO_2$) | Pressurized Syngas Mixture | TBD | Outdoors | Process Piping/Vessels |
| Acetylene, Oxygen, other welding gases | Gas | Minimal (approved cylinders) | Indoors | Welding |
| Natural Gas | Gas (high pressure) | Gas Pipeline | Supply piping only | Startup/Backup Fuel |

**Table 2.2-5. Onsite Toxic and Hazardous Materials (Totals for Phase I and II)**

| Material | Form | Quantity (Phases I and II) | General Location On-Site | Use |
|---|---|---|---|---|
| Diesel Fuel | Liquid | 2,000 gallons | Outdoors | Emergency generator/fire water pump fuel |
| **POWER BLOCK AREA** | | | | |
| Sulfuric Acid | Liquid | 12,000 gallon aboveground storage tank | Outdoors | Cooling water and BFW pH control; battery acid |
| Sodium Hypochlorite | Liquid | 20,000 gallon aboveground storage tank | Outdoors | Cooling Tower biological control |
| Circulating Water Chemical Additives (e.g., Magnesium nitrate, magnesium chloride, 2-bromo-2-nitropropane-1,3-Diol, 5-chloro-2-Methyl-4-Isothizaoline-3-one) | Liquids | Typically 55-gallon drums to less than 500-gallon tank | Indoors | Corrosion Inhibitor/ Biocides |
| Boiler Feedwater Chemicals (e.g., Carbonic Dihydrazide, Morpholine, Cyclohexamine, sodium sulfite) | Liquids | Typically 55-gallon drums to less than 500-gallon tank | Indoors | Boiler feedwater pH/Corrosion/ Dissolved Oxygen/Biocide control |
| Mineral Insulating Oil | Liquid | 30,000 gallons (estimated, to be confirmed) | Indoors | Electrical Transformers |
| Lubricating Oil | Liquid | 21,000 gallons (estimated, to be confirmed) | Indoors | Combustion Turbine/Steam Turbine/Misc. Equipment Lube Oils |
| Combustion turbine wash chemicals | Liquids | Intermittent use/Chemicals not stored onsite/cleaning by contractor | NA | Combustion Turbine Generator cleaning |
| HRSG Cleaning Chemicals (e.g., HCl, Citric acid, EDTA Chelant, Sodium Nitrite) | Liquids | Multiyear cleaning requirement/ Temporary storage only | Indoors | HRSG Chemical Cleaning |
| Carbon Dioxide | Pressurized Gas | 50,000 standard cubic feet | Outdoors | Generator purging after normal and emergency shut down |
| Hydrogen | Pressurized Gas | 29,000 standard cubic feet | Outdoors (Assumes use of multi-tube trailer. Active volume based on 1 of 10 tubes per trailer) | Generator cooling (To be verified - Assumes use of $H_2$-cooled generators – dependent on selected manufacturer) |

*TBD – to be determined

Diesel fuel would be used for the emergency generator and for the fire water pump. The expected stored quantity (2000 gallons) was based on approximately eight hours of operation of the diesel generator at full output (about 3 MW). This limited storage would require the plant to have contracts with fuel providers specifying that deliveries of diesel fuel could be provided in less than 8 hours in the case of an emergency. Appropriate containment and monitoring for spillage control would be provided.

Other petroleum-containing hazardous materials include the combustion and steam turbine lube oils, steam turbine hydraulic fluid, transformer oils and miscellaneous plant equipment lube oils. These materials would be delivered and stored in approved containers, stored in areas with appropriate secondary containment, and would be used within curbed areas that only drain to internal drains connected to an oil-water separator system. Oil reservoirs, containment areas, and the separators would be checked regularly to identify potential leaks and to initiate appropriate actions.

### *2.2.3.6 Pollution Prevention, Recycling, and Reuse*

The Mesaba Generating Station would be designed to minimize process-related discharges to the environment while demonstrating industrial technology in the use of coal for power generation. Table 2.2-6 lists the key pollution prevention, recycling, and reuse features that would be employed as part of that plan.

**Table 2.2-6. Key Pollution Prevention, Recycling and Reuse Features**

| | |
|---|---|
| Spill Prevention Control and Countermeasure (SPCC) Plan | The SPCC Plan would develop measures to take in the event of a spill, thereby insulating environmental media from the effect of accidental releases. All aboveground chemical storage tanks would be lined or paved, curbed/diked, and would have sufficient volume to meet all regulatory requirements. A site drainage plan would also be developed that would isolate routine, process-related operations from affecting the surrounding environment. |
| Feed Material Handling | The coal storage area would be paved or lined so that runoff can be collected, tested, and treated as necessary. The coal storage area has facilities to control fugitive dust emissions. The coal conveyors would be covered. |
| Coal Grinding and Slurry Preparation | The coal grinding equipment would be enclosed and any vents would be routed to the tank vent incinerator/auxiliary boiler. The water used to prepare the coal slurry would be stripped process condensate (recycled). |
| Gasification, High Temperature Heat Recovery, Dry Char Removal and Slag Grinding | The char produced in gasification would be removed and returned to the first stage of the gasifier (recycled). This improves the carbon conversion in the gasifier and reduces the amount of carbon contained in the gasifier slag. Reduced carbon content makes the slag more marketable and reduces the likelihood that it must be disposed in a landfill. |
| Slag Handling | The slag dewatering system would generate some flash gas that contains $H_2S$. The flash gas would be recycled back to the gasifier via the syngas recycle compressor. Water that is entrained with the slag would be collected and sent to the sour water stripper for recycling. |
| Sour Water System | Sour water would be collected from slag dewatering and the low temperature heat recovery system, and the $NH_3$ and $H_2S$ would be stripped out and sent to the SRU. The stripped condensate would be used to prepare coal slurry. Surplus stripped condensate would be sent to the ZLD unit. |

**Table 2.2-6. Key Pollution Prevention, Recycling and Reuse Features**

| | |
|---|---|
| Zero Liquid Discharge System* | The ZLD system would concentrate and evaporate the process condensate. The ZLD system would produce high purity water for reuse and a solid filter cake for disposal off site. The ZLD would concentrate and dispose of heavy metals and other contaminants in the process condensate. The ZLD would also be a recycle unit because the recovered water would be reused, reducing the total plant water consumption. |
| COS Hydrolysis | The gasifier would produce small quantities of COS that cannot be absorbed in the AGR system. The COS hydrolysis unit would convert COS to $H_2S$, which would then be removed in the AGR unit. The COS hydrolysis unit would improve the sulfur recovery efficiency and reduce the total amount of sulfur in the syngas, and ultimately, the release of $SO_2$ from the HRSG stacks. |
| Mercury Removal Features | The mercury removal unit would use specially formulated activated carbon to capture trace quantities of mercury that may remain in the syngas. Mercury in the sour water handling system would be captured via activated carbon filters strategically placed prior to potential release points. |
| Acid Gas Removal | The AGR system would remove $H_2S$ from the raw syngas and produce a sweet (low sulfur) syngas for use in the combined cycle power block. The AGR would produce concentrated $H_2S$ feed for the SRU. |
| Sulfur Recovery Unit | The SRU would convert the $H_2S$ to elemental sulfur that would be marketed for use as a fertilizer additive or for production of sulfuric acid. The tail gas from the SRU would be recycled back to the gasifier. |
| Fuel Gas Moisturization | The fuel gas moisturization system would improve the recovery of low level heat from the gasification process and serve as a diluent for the syngas used in the combustion turbines. Nitrogen from the ASU would also be used as a diluent. Dry, clean syngas typically has a heating value in the range of 250 to 300 Btu per standard cubic foot. If the dry syngas was used directly in the combustion turbines, the thermal $NO_x$ formed would be too high. Earlier IGCC plants used steam injection for $NO_x$ control, which is less efficient than using fuel moisturization and nitrogen. |
| Integration of the ASU and Power Block | The ASU would produce nitrogen as a by-product; this is an effective diluent for $NO_x$ control. The ASU would require large amounts of electrical power for air compression. Part of the air compression requirements would be provided by the combustion turbine compressors, further integrating the gasification and combined cycle power block portions. This integration reduces the ASU auxiliary power requirement and increases the net power output by the plant. |
| Boiler Blowdown and Steam Condensate Recovery | Boiler blowdown and steam condensate would be recovered from the combined cycle power block and gasification facilities and would be reused as cooling tower makeup. |
| Training and Leadership | All corporate and plant personnel would be trained on continuous improvement in environmental performance especially as such training and programs apply to: i) setting, measuring, evaluating and achieving waste reduction goals and ii) reporting the results of such programs in annual reports made available to the public. |

*A ZLD system would treat water from the bottom of the ammonia stripper at either site to prevent contaminants in feedstocks from being discharged to surface waters. For the East Range Site only, an enhanced ZLD system would also treat cooling tower blowdown to eliminate all direct effluent discharges to receiving waters as necessitated by the stringent requirements applying to discharges of mercury in the Lake Superior Basin watershed.

## 2.2.4 Construction Plans

### *2.2.4.1 Construction Staging and Schedule*

Under Excelsior's proposed schedule, construction of Phase I would begin on the selected site early in 2008 and would be completed by 2011. Construction of Phase II would begin in 2010 and would be operational by 2014. For Phase I start-up, system and feedstock testing, and long-term performance and reliability demonstration of the project would require a minimum of one year (beginning in 2011), after which the plant could continue in commercial operation.

Prior to construction, environmentally sensitive areas at the selected site would be identified and flagged such that these areas would not be disturbed during site preparation activities. In accordance with 40 CFR Part 122.26(b)(14)(x), a Storm Water Pollution Prevention Plan (SWPPP) would be developed to identify best management practices (BMPs) for erosion prevention and sedimentation control that would be implemented during construction. The plan would include a description of construction activities and address the following:

- Potential for discharging sediment and/or other potential pollutants from the site;
- Location and type of all temporary and permanent erosion prevention and sediment control BMPs along with procedures to be used to establish additional temporary BMPs as necessary for the site conditions during construction;
- Site map with existing and final grades, including dividing lines and direction of flow for all pre and post-construction stormwater runoff drainage areas located within the project limits. The site map must also include impervious surfaces and soil types;
- Locations of areas not to be disturbed;
- Location of areas where construction would be phased to minimize duration of exposed soil areas.
- Identify surface waters and wetlands either onsite or within one-half mile from the site boundaries, which could be affected by stormwater runoff from the construction site, during or after construction; and
- Methods to be used for final stabilization of all exposed soil areas.

Initial site preparation activities would include building access roads, clearing brush and trees, leveling and grading the site, bringing in necessary utilities, and undertaking dewatering activities that may be required. Construction of temporary parking, offices, and material storage areas at this time would involve the use of large earthmoving and logging equipment to clear and prepare the site for construction of the plant. Trucks would be required to bring fill material for roadways and the plant, removing harvested timber, removing debris from the site, and stockpiling fill material. Gravel and road base would be utilized for the temporary roads, material storage, and parking areas.

The construction plan description generally would apply to both Phases I and II of the project. The Phase II portion of the Mesaba Generating Station would be installed in the equipment staging and lay down area utilized for Phase I construction. Therefore, a new Phase II staging and lay down area would be identified and prepared at the beginning of the Phase II work, with the required permits and approvals obtained prior to beginning the site preparation work. Detailed construction plans and specifications for Phase II would include provisions necessary to protect construction and plant operating personnel and equipment from potential impacts from the adjacent operating Phase I plant and to minimize operational disruption during Phase II construction.

#### *2.2.4.2 Construction Materials*

Construction material would be delivered to the site by truck and rail. A plant access road would be developed for construction traffic. Completion of the rail spur at the start of construction activities would allow plant equipment to be delivered by rail. An estimated 15 to 20 semi-trailer trucks daily would be required to deliver material to the site. Construction deliveries by rail would likely require two trains per week. The relatively small amounts of ballast required for construction of the rail loop would be obtained from existing quarries that serve the BNSF and CN railway companies. The impacts of the small incremental demand for ballast would not affect the production capacities of the quarries.

During construction, temporary utilities would be provided to support construction offices, worker trailers, lay down areas and the construction areas. Temporary construction power would be provided by the local utility company. Temporary generators could also be used until the temporary power system would be completed. Area lighting would be provided and strategically located for safety and security. Local telecommunication lines would be installed for phone and IT communications. Potable water bottles would be provided for drinking water. Construction water would be supplied either by pumping and treating surface waters in the vicinity or by connection to the local municipal water system.

#### *2.2.4.3 Construction Wastes*

Construction of the Mesaba Generating Station would generate certain amounts of wastes. The predominant waste streams during construction would include site clearing vegetation, soils, and debris, hydrostatic pressure-testing (hydrotest) water, used lube oils, surplus materials, and empty containers.

Surplus and waste materials would be recycled to the extent practical. If feasible, removed site vegetation would be salvaged for pulp and paper production, or recycled for mulch. Construction water use would be heaviest during the testing phase. Hydrotest water would be reused for subsequent pressure tests if practical. Spent hydrotest water would be tested to determine if it exhibits hazardous characteristics. If hazardous, the hydrotest water would be sent offsite for treatment; if non-hazardous, it would be routed to the detention basin for discharge to local surface waters (in accordance with an NPDES permit). Potential scrap and surplus materials and used lube oils would be recycled or reused to the maximum practical extent. Temporary sanitation facilities would include portable toilets that would be cleaned daily and the wastes hauled to a local disposal facility.

Although Excelsior would ultimately be responsible for the proper handling and disposal of construction wastes, construction management, contractors, and their employees would be responsible for minimizing the amount of waste produced by construction activities and would be expected to fully cooperate with project procedures and regulatory requirements for waste minimization and proper handling, storage, and disposal of hazardous and non-hazardous wastes. Each construction contractor would be required to include waste management and waste minimization components in their overall project health, safety, and environmental site plans. Typical construction waste management measures may include:

- Dedicated areas and a system for waste management and segregation of incompatible wastes. Waste segregation should occur at time of generation;
- A waste control plan detailing waste collection and removal from the site. The plan would identify where waste of different categories would be collected in separate stockpiles, bins, etc., with appropriate signage to clearly identify the category of waste;

- Hazardous wastes, as defined by the applicable regulations, would be stored separately from non-hazardous wastes (and other, non-compatible hazardous wastes) in accordance with applicable regulations, project-specific requirements, and good waste management practices;
- Periodic construction supervision inspection to verify that wastes are properly stored and covered to prevent accidental spills and wastes from being blown away;
- Appropriately labeled waste disposal containers; and
- Good housekeeping procedures. Work areas would be left in a clean and orderly condition at the end of each working day, with surplus materials and waste transferred to the waste management area.

#### *2.2.4.4 Construction Labor*

The average number of construction personnel during Phase I (2008 through 2011) would be about 600, with as few as 50 and as many as 1,400 construction personnel onsite at any given time. It is estimated that the on-site work force at the time of peak construction activities would be approximately 1,500 personnel, which would include Excelsior's staff, consultants, and visitors in addition to construction personnel. Excelsior expects that labor would be provided through the local Building Trades.

It is estimated that most of the construction activities would occur during a single shift between the hours of 7:00 am and 5:30 pm, Monday through Saturday. Additional hours and/or a second shift may be necessary to make up schedule deficiencies or to complete critical construction activities. During the warm weather season, a second shift may be utilized to complete civil work activities. There would be X-ray inspection, weld stress-relieving, and some production welding that typically occurs during a second shift. The commissioning activities, prior to initial plant startup, would occur 24 hours per day.

#### *2.2.4.5 Construction Safety Policies and Programs*

Emergency services during construction would be coordinated with the local fire departments, police departments, paramedics, and hospitals. A first aid office would be provided on site for minor first aid incidents. Trained/certified Health Safety and Environmental personnel would be on site to respond and coordinate emergencies. All temporary facilities would have fire extinguishers, and fire protection would be provided in work areas where welding work would be performed.

The natural gas pipeline facilities would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the DOT regulations in Title 49 CFR Part 192 Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards; and other applicable Federal and state regulations, including U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) requirements. These regulations are intended to ensure adequate protection for the public and to prevent natural gas pipeline accidents and failures. Among other design standards, Part 192 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

### 2.2.5 Operational Plans

#### *2.2.5.1 Operational Demonstration Test Plans*

Excelsior would develop and submit an Operational Demonstration Test Plan to the DOE for review and comment prior to plant startup. The plan would be intended to achieve the following objectives:

- Demonstrate mercury removal, activated carbon life expectancy, and operational costs in an IGCC application;
- Demonstrate smooth ramp-up to full capacity and greater than 90 percent annual availability with the spare gasification train;
- Demonstrate manifolding of gasification trains and operational swapping;
- Demonstrate that phased refractory repair contributes to improved gasifier availability; and
- Demonstrate the feedstock-flexible design.

#### *2.2.5.2 Plant Demonstration and Operations*

The plant demonstration would require approximately 12 months. Excelsior would implement the Operational Demonstration Test Plan and document the results of the demonstration in relation to the project objectives.

Following the demonstration phase, Mesaba Generating Station would be operated as a baseload generation facility. The station would operate 24 hours per day except during scheduled outages for maintenance. The facility would be designed for high reliability with multiple process trains. Although the plant would include three gasification trains (from slurry preparation through dry char removal), only two gasification trains would be required for full output (at 50 percent capacity each). The spare train would normally be in standby service unless maintenance was being performed on one of the gasifier trains. The Mesaba Generating Station would be designed to achieve an availability of greater than 90 percent during full operation.

The Mesaba Generating Station would be capable of "single train operation" where only one gasifier and one combustion turbine would operate. The single train plant output would be somewhat below one half of the full load output. Additional turndown would be possible by reducing the gasifier throughput in either of the two trains or single train operation. Operation at reduced loads would be limited by physical constraints, as well as the combustion turbine supplier's emission guarantees, to about 70 percent of the full load output.

The combustion turbine generators must be started on natural gas and loaded to a minimum level before the fuel can be switched to syngas. The combustion turbine generators would be able to co-fire natural gas and syngas within limits set by the combustion turbine manufacturer. The CTGs could also operate on 100 percent natural gas. The power block would be designed to operate on 100 percent natural gas when required, but at reduced capacity relative to operation on syngas.

#### *2.2.5.3 Operational Labor*

Operator hiring and training would begin about one year before the commencement of start-up. Gasification area personnel would need extensive training in plant operations, reactive chemicals and safety, industrial hygiene, and environmental compliance similar to that of operators in refineries and chemical plants. Process simulators would be used as part of the training program. Generally, the staff would consist of management and engineers, shift supervision and operations management, and shift operating personnel. The operations staff would be integrated into the commissioning team so that they would have hands-on experience with the plant when each system is operational after construction.

In addition to operations and management personnel, the Mesaba Generating Station would require qualified staffing to support power production planning; equipment maintenance; procurement; laboratory chemists and technicians; health, safety, and environmental specialists; administrative support; benefits/human relations; and other necessary functions. The expected number of personnel during operations is presented in Table 2.2-7.

**Table 2.2-7. Estimated Operating Staff Required for the Mesaba Generating Station**

| System | Phase I Staff | Phase II Staff | Total Staff (Phases I and II) |
|---|---|---|---|
| Gasification & ASU Subtotal | 96 | 64 | 160 |
| Combined Cycle Power Block Subtotal | 11 | 11 | 22 |
| Total Staff Requirement | 107 | 75 | 182 |

### *2.2.5.4 Health & Safety Policies and Programs*

Facility design features and management programs would be established to address hazardous materials storage locations, emergency response procedures, employee training requirements, hazard recognition, fire control procedures, hazard communications training, personal protection equipment training and accidental release reporting requirements. Significance criteria would be determined on the basis of Federal, state and local guidelines, and on performance standards and thresholds adopted by responsible agencies.

Basic approaches to prevent spills to the environment include comprehensive containment and worker safety programs. The comprehensive containment program would ensure that appropriate tanks, walls, dikes, berms, curbs, etc. are sufficiently contained. Worker safety programs would be established to ensure that workers are aware and knowledgeable about spill containment procedures and related health and environmental protection policies.

The Minnesota Office of Pipeline Safety (MOPS) would have jurisdiction over the gas pipeline. Pipeline facilities would be designed, operated and maintained in accordance with DOT Minimum Federal Safety Standards in 49 CFR Part 192, which defines and specifies the minimum standards for operating and maintaining pipeline facilities. The regulations require an Emergency Plan that would provide written procedures to minimize hazards from a gas pipeline emergency. Key elements of any emergency plan would include procedures for:

- Receiving, identifying, and classifying emergency events such as gas leakage, fires, explosions, and natural disasters;
- Establishing and maintaining communications with local fire, police, and public officials and coordinating emergency responses;
- Making personnel, equipment, tools, and materials available at the scene of an emergency;
- Proactive protection for people and insuring human safety from actual or potential hazards; and
- Emergency shutdown of the system and safely restoring service.

The safety standards specified in Part 192 require each pipeline operator to:

- Develop an emergency plan, working with local fire departments and other agencies, to identify personnel to be contacted, equipment to be mobilized, and procedures to be followed in responding to a hazardous condition caused by the pipeline or associated facilities;

- Establish and maintain a liaison with the appropriate fire, police, and public officials in order to coordinate mutual assistance when responding to emergencies; and
- Establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a natural gas pipeline emergency and report it to appropriate public officials.

Before placing the pipeline in service, a procedural manual for operation and maintenance of the proposed pipeline would be prepared. The pipeline facilities would be operated and maintained in compliance with MOPS regulations. The operator would become a member of the Gopher State Excavators One-Call system that is utilized to prevent damage to underground pipelines by excavators and others performing underground construction. Periodic aerial and ground inspections by pipeline personnel would be conducted to identify dead vegetation, soil erosion, unauthorized encroachment or other conditions that could result in a safety hazard or require preventative repairs or maintenance. In addition, gas leak detection and cathodic protection surveys would be conducted periodically to ensure proper and adequate corrosion protection and proper operation.

### *2.2.5.5 Worst-Case Operating Scenario*

For development of its "worst case" operating scenario, parameters yielding maximum emissions were identified. Operating conditions producing maximum emissions/discharges from the Mesaba Generating Station are identified in Table 2.2-8, which assumes operation of the gasifiers under PSQ conditions and considers known seasonal influences and the range of potential feedstocks for which the Mesaba IGCC Generating Station would be designed to utilize. Pollutant emissions, discharges, and waste products described in this chapter were quantified by Excelsior assuming the conservative PSQ conditions.

**Table 2.2-8. Key Performance Indicators Used to Assess Worst Case Environmental Impacts or Emissions of Mesaba Energy Project (Phase I, PSQ Mode)**

| Performance Parameter | Estimated Range* | Comments |
|---|---|---|
| CTG gross power, MW | 440 | Total for two CTGs |
| STG gross power, MW | 265 – 300 | Varies depending on quantities of steam generated by Gasification Island and HRSGs |
| Net plant generation, MW | 580 – 606 | Output from CTGs plus STG, less internal consumption and losses |
| Coal/coke feed rate, tons/day (as received) | 5,300 – 8,550 | Feed rate to gasifiers |
| Coal/coke feed energy, million Btu/hr (HHV) | 5,280 – 5,910 | Energy content of gasifier feedstock |
| Product syngas energy, million Btu/hr (HHV) | 4,190 – 4,368 | Energy content of syngas fuel delivered to CTGs |
| Coal conversion efficiency | 0.71 – 0.80 | Fraction of solid feedstock energy in syngas feed to CTGs |
| Net overall heat rate, Btu/kW-hr (HHV) | 8,900 – 9,500 | Solid feedstock energy used per unit of net electricity to grid |
| Flux feed, tons/day | 0 – 250 | Conditioning agent for gasifier feedstock |
| Slag by-product production, tons/day | 500 – 800 | Varies depending on feedstock composition and flux use |
| Sulfur by-product production, tons/day | 30 – 165 | Varies depending on feedstock composition |

*emission or discharge range
**Acronym:** HHV – Higher Heating Value

PSQ would be achieved by increasing the slurry feed to the second stage of the gasifier to the point where only slurry is used to quench the syngas, thereby eliminating the thermal loss associated with water used to cool the syngas and increasing the overall efficiency of the plant. These efficiency gains would translate into reduced feedstock use and, consequently, reduced pollutant emissions/discharges. However, PSQ is an IGCC design improvement that is subject to further engineering and verification by experience at Wabash River. Therefore, PSQ's expected benefits have not been reflected in the maximum resource requirements or maximum pollutant emissions/discharges quantified in this EIS.

## 2.3 DESCRIPTION OF ALTERNATIVE SITES AND CORRIDORS

This section describes the unique features of alternatives considered by Excelsior to implement the Mesaba Generating Station at either the West or East Range Site, including potential plant sites and respective alternatives for water sources and receiving waters, natural gas sources, rail and road alignments, and HVTL corridors.

### 2.3.1 West Range Site and Corridors

#### *2.3.1.1 Proposed IGCC Plant Site*

The West Range Site, including the plant footprint and buffer land, is located within the city limits of Taconite in Iron Range Township, Itasca County, Minnesota. The site is generally bounded by County Road (CR) 7 to the west, a HTVL corridor to the north, and the Township boundary to the east (Figure 2.3-1). The site encompasses approximately 1,260 acres zoned by Itasca County for industrial use. Only the northern-most 200 acres of the site are outside the Taconite city limits.

Two HVTL corridors traverse the buffer land, one in a north-south direction and a second in an east-west direction. The HVTLs that occupy the north-south corridor are not currently in use. The closest residential properties are located along CR 7, approximately 3,800 feet west of the proposed power plant footprint, and on the north shore of Big Diamond Lake, approximately 3,850 feet to the southeast.

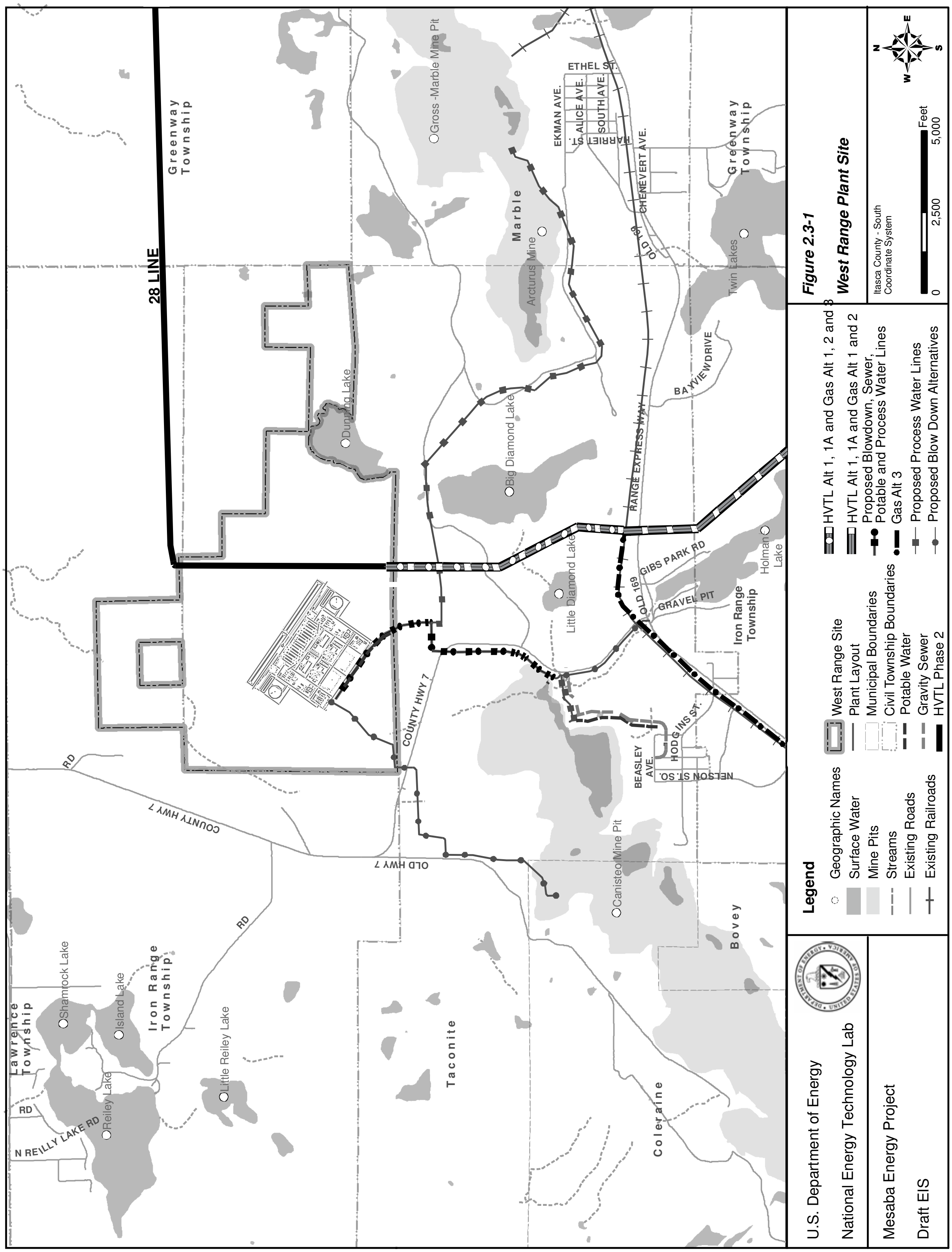



*Figure 2.3-1*
***West Range Plant Site***

#### 2.3.1.2 Transportation Facilities

***Existing Rail Lines in Vicinity of the West Range Site***

The West Range Site is located approximately 1.5 miles north of the mainline tracks of the BNSF and CN Railroads.

***BNSF Rail Line***

Rail shipments of coal from the PRB would be transported on the BNSF rail line across North Dakota and then to Gunn and Taconite, Minnesota. Currently, about six trains per day travel along the BNSF rail line from North Dakota to Gunn at speeds up to 25 miles per hour. From Gunn to the West Range Site (approximately 12.5 miles) BNSF carried about 4 to 10 trains per day. This track is now closed because of danger associated with pit wall collapse. Alternately, the BNSF rail line could be used from Brookston northward to Kelly Lake and Keewatin westward to the West Range Site. This route would primarily be used to transport materials other than coal to the West Range Site. Unit coal trains would only use this route if there were a track problem east of Gunn; use of this route to transport coal from Powder River Basin would increase the travel distance by 100 miles in each direction.

***CN Rail Line***

CN would deliver coal by way of the Superior, Wisconsin, area northward to Virginia, Minnesota, and then west past Hibbing and Keewatin to Taconite/Bovey. CN unit coal trains would approach the West Range Site from the east, travel past the site, and either back into the site or stop in Bovey, have the locomotives disconnect and reconnect to the other end of the train, and access the site from the west. A reverse move would be required for the empty train. Unit coal trains supplied by CN would use an existing siding in Bovey that would need to be lengthened to accommodate this move. Delivery of other materials to the plant would occur via the same type of movement, but with shorter trains.

A short span of existing CN track near the site is temporarily out of service because of the water elevation in the Canisteo Mine Pit (CMP). Since the cessation of mining, the pit has filled with water and affected the integrity of the CN track along the steep edge of the CMP near Bovey. CN has determined that repairs to this line would not be appropriate without a solution to the rising water levels in the CMP. Under common carrier regulations, the track would be required to be repaired and returned to service at the request of BNSF or another shipper. Development of the West Range Site would lower water levels in the pit allowing this section of the rail line to be redeveloped and returned to operation (Excelsior, 2006b).

***Rail Access to the West Range Site***

Coal could be delivered to the West Range Site by either BNSF or CN, which operate on a single track located less than 2 miles from the West Range Site. Direct access to the site would be achieved by the construction of short spurs from the mainline tracks onto the site boundary. Construction of 2 miles of new track would be required between the existing mainline track and the boundary of the West Range Site; an additional 4 miles of new track would be required for the portion of the rail loop within the site boundaries.

Three alternative rail access alignments were considered for the West Range Site, identified as Alternatives 1A, 1B, and 2. The alternatives are shown in Figure 2.3-2 and described below. Table 2.3-1 provides a summary of each alternative.

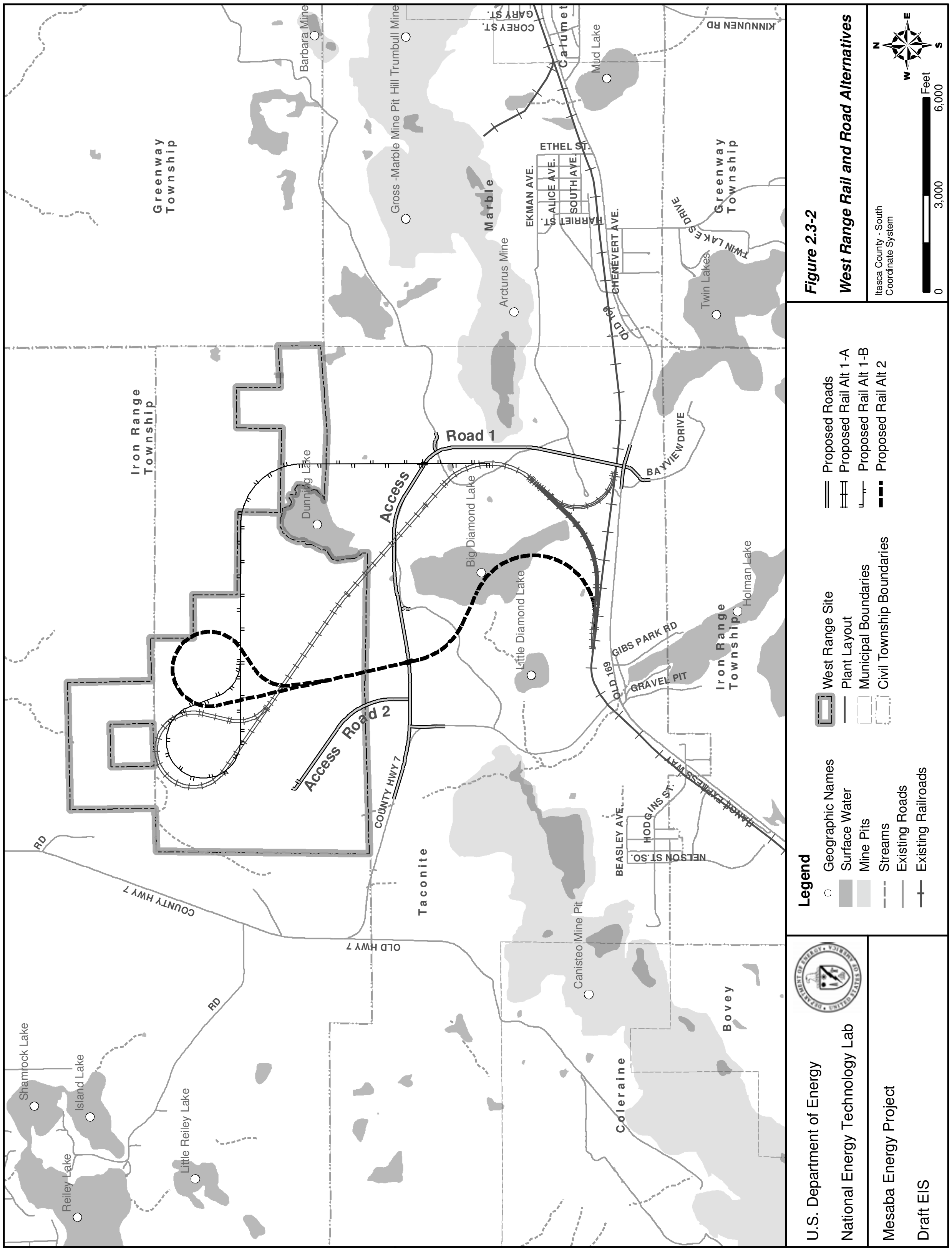



**Figure 2.3-2**
**West Range Rail and Road Alternatives**

**Table 2.3-1. Rail Access Alternatives – West Range Site**

| Attribute | Alternative 1A | Alternative 1B | Alternative 2 |
|---|---|---|---|
| Total length of track (miles) | 6.0 | 6.9 | 4.5 |
| Off-site length of track (feet) | 15,900 | 19,000 | 9,000 |
| Train speed (mph) | 10 | 10 | 10 |
| Maximum grade | 0.30% | 0.35% | 0.40% |
| Maximum Curvature (loaded coal train) | 2 degrees 30 minutes | 3 degrees | 3 degrees |
| Off-site right-of-way (acres) | 35 | 43 | 20 |
| Largest Cut (feet) | 65 | 120 | * |
| Largest Fill (feet) | 25 | 25 | * |
| Approximate Cut Qty (cubic yards) | 3,000,000 | 8,500,000 | * |
| Approximate Fill Qty (cubic yards) | 2,000,000 | 2,000,000 | * |
| Potential wetland impact (acres) | 77 | 64 | * |
| No. of residences within 1,000 feet | 3 | 0 | 0 |
| Closest residence (feet) | 400 | 2,000 | 1,200 |
| Alignment Meets Applicable Standards | Yes | Yes | No |
| Comments | Preferred | Alternative | Eliminated |

Notes:*Was not computed because alignment was eliminated.

### *Rail Alignment Alternatives 1A and 1B*

As shown in Figure 2.3-2, the common alignment for Alternatives 1A and 1B would divide from the existing CN and BNSF main lines that run parallel to U.S. Highway (US) 169, generally following an old railroad grade around the southern tip of Big Diamond Lake. East of the lake, Alternative 1A would turn to the northwest between Big Diamond Lake and Dunning Lake to the proposed generating station. The alignment for Alternative 1B would follow the same route east of Big Diamond Lake. But, instead of diverting northwest between Big Diamond and Dunning Lakes, it would continue north on the east side of Dunning Lake. Once north of the lake, it would bear west to the site. Both Alternatives 1A and 1B would include a loop to the north of the proposed Mesaba Generating Station.

The alignments for Alternatives 1A and 1B would meet a Railroad Design Guideline developed by Excelsior based on BNSF and CN unit train standards and could accommodate access by both rail service providers. Acceptable curve radii require that the track alignment be directed east of Big Diamond Lake. To provide an acceptable grade for Alternative 1A, track would require filling low areas located between the two lakes and cutting from terrain obstacles approaching the plant site. To provide an acceptable grade for Alternative 1B, construction would require cutting through a large tailing pile east of Big Diamond Lake and through a large wetland area on the northeast corner of Dunning Lake; it would also require significant additional contouring near the plant site. The rail loop for either alternative would be mostly on a fill section.

Alternative 1A would be located within 400 feet of a residence on the north shore of Big Diamond Lake and within 700 feet of a residence on the south shore of Dunning Lake. Alternative 1B would pass within about 1,200 feet of the residence on Dunning Lake. Either Alternative 1A or 1B would require construction of a bridge over the proposed new access roadway to the West Range Site to avoid public crossings that could cause traffic disruption near the Mesaba Generating Station. Existing forest roads affected by the rail alignment could be re-routed to avoid traffic disruptions.

Excelsior identified Alternative 1A as the preferred alignment based on cost, better alignment of curves, and lower anticipated environmental impacts. Alignment 1B would place the rail dumper building in an area that would require coal to be conveyed across a greater distance to the Mesaba Generating Station and would require significant earth removal work (as the route would cut across several large tailing piles). The only practical benefit the alignment offers over Alternative 1A is that it would divert rail traffic away from the several residential properties located on Big Diamond and Dunning Lakes. Alternative 1A would require easements over, or acquisition of, some private property. Both alternatives would have a surplus of cut/fill material that would require disposal.

### *Rail Alignment Alternative 2*

Excelsior initially considered Alternative 2 for a rail alignment west of Big Diamond Lake (Figure 2.3-2). However, due to railway routing restrictions, BNSF would not be able to originate a shipment to the site using the CN tracks. Instead, the origination point for the BNSF alignment would be west of the CN rail spur. To maintain acceptable curvatures for this alignment in accordance with the Railroad Design Guideline, based on BNSF standards, the origination point would require the alignment to be routed across a portion of Big Diamond Lake. Excelsior determined that such an alignment would not be economically or environmentally feasible and, therefore, eliminated it from further consideration.

### *Other Rail Alternatives Considered*

Excelsior considered other rail alignments, including CN access from the west side of Big Diamond Lake and BNSF access from the east side of Big Diamond Lake. These alternatives were eliminated from further consideration because of the duplication of tracks, track alignments making it difficult to position the coal dumper, topographic limitations on rail placement to avoid unacceptable curves, and the impact on a larger area around Big Diamond Lake as compared to the other alternatives.

## *Roadway Access to the West Range Site*

The West Range Site is located about 1.5 miles north of US 169, which is a two-lane east-west highway locally, and about 0.25 mile to the east of Itasca CR 7, commonly referred to as “Scenic Highway 7,” which is a two-lane highway running mainly in a north-south direction. Other roadways include the Cross-Range Heavy Haul Road, which is a gravel road used to allow heavy or slow loads to be transported between mines across the Iron Range. The Cross-Range Heavy Haul Road also provides access to a cluster of homes in the Big Diamond Lake/Dunning Lake area. The existing roadway system in the area of the West Range Site is shown on Figure 2.3-2. Excelsior considered two access road components (Access Road 1 and Access Road 2) to provide access to the West Range Site.

### *Proposed Access Road 1*

The Itasca County engineer expressed the county’s interest in re-routing the alignment of CR 7 to better serve local traffic patterns and the additional traffic related to the two large projects undergoing environmental review (the Mesaba Energy Project and a Minnesota Steel Industries, LLC project designed to produce sheet steel from taconite ore). The current intersection of CR 7 and US 169 has poor visibility, relatively steep grades, and problems with slope stability. The realignment of CR 7 (Figure 2.3-2) would serve as the primary access road (Access Road 1) to the Mesaba Generating Station, and would better handle heavy equipment and increased traffic volumes resulting from construction activities tied to the two projects. Itasca County would construct and own the realigned roadway, which would involve constructing a new two-lane roadway beginning at a new access point on US 169, approximately 7,000 feet east of the existing CR 7 intersection. The new road would cross underneath the adjacent rail line, proceed north, then curve west between Big Diamond and Dunning Lakes before terminating in its connection with existing CR 7, just southwest of the West Range Site. The road would pass within a half mile of 22 residences, including 6 residences within 500 feet. The closest residence would be within 300 feet.

Itasca County would seek to move the CR 7 designation to the new roadway and include it as part of the county's state aid system. This would put all future maintenance of the road under the County's responsibility. The section of existing CR 7 between the plant and US 169 would remain in place as either a lower level county road, or be turned over to the City of Taconite as a city street.

#### *Proposed Access Road 2*

Access Road 2 would provide access to the Mesaba Generating Station from Access Road 1 (the new CR 7 alignment). If Access Road 1 were in place prior to construction of Phase I, all construction and plant employee traffic would use it to access the plant site. However, based on the timing of Itasca County's construction of Access Road 1, it might be necessary for the plant to be served by an access road from existing CR 7 (an extension of Access Road 2) until Access Road 1 was completed. If Access Road 1 were never constructed, special turning lanes onto CR 7 and US 169 would be required.

### *2.3.1.3 Water Sources and Discharges*

#### ***Process Water Supply***

For the West Range Site, the process water requirements would range from an annual average of 4,400 gallons per minute for Phase I to 10,300 gallons per minute for Phases I and II. The peak requirements would range from 6,500 gallons per minute (Phase I) to 15,200 gallons per minute (Phases I and II). Excelsior considered three alternatives for providing process water to the West Range Site, including the use of nearby abandoned mine pits, the Mississippi River, and groundwater sources. Each alternative is described below. Excelsior identified Alternative 1 (obtain water from nearby abandoned mine pits) as the preferred alternative.

#### *Process Water Alternative 1 (Obtain Water from Abandoned Mine Pits and Prairie River)*

Alternative 1 (Excelsior's preferred alternative) would involve pumping water from nearby abandoned mine pits, including the CMP, the Lind Mine Pit (LMP), and the Hill Annex Mine Pit (HAMP) Complex (Figure 2.3-3). The HAMP Complex includes the Arcturus, Gross-Marble, Hill-Trumble, and Hill Annex Mine Pits. These pits currently are either filled with water and overflowing, are being pumped to avoid flooding of important historical resources (the Hill Annex Mine State Park) due to rising water levels, or are threatening to flood due to rising water levels. Both the CMP and the HAMP Complex could support the water requirements for Phase I, while additional water resources from the LMP and possibly the Prairie River would be sufficient to support Phase II. Excelsior proposes to withdraw water from the Prairie River at a point downstream of the Prairie Lake Hydropower Facility, so water withdrawals would not impact power production at the hydropower facility.

Routings for the pipelines would be located on public property adjacent to existing transportation corridors wherever practicable. The pumps would be operated remotely from the Mesaba Generating Station.

#### *Alternative 2 (Obtain Water from the Mississippi River)*

For Alternative 2, water would be piped from the Mississippi River to the West Range Site. This would require approximately 10 miles of pipeline and several pump stations, electrical facilities, support structures, and land acquisitions. This alternative was not considered feasible due to the distance from the river and the cost to construct and operate the necessary facilities.

#### *Alternative 3 (Obtain Water from Groundwater Wells)*

For Alternative 3, groundwater wells would be pumped to provide water to the site. Most wells in the area produce only between 200 and 300 gallons per minute; therefore, this alternative would require the development, operation and maintenance of up to 50 groundwater wells, pump stations, force mains, electric services, and support structures to provide adequate flow for the Mesaba Generating Station. For these reasons, Alternative 3 was not considered feasible and was eliminated from further consideration.

### *Process Wastewater Discharges*

Process wastewater discharges would consist primarily of cooling tower blowdown blended with relatively low-flow additional wastewater streams from other plant systems (including HRSG blowdown, boiler feed water demineralizers and intermittent treated water from the oil/water separator serving the plant drainage system). All other contact process water would be managed and treated in the ZLD system. All sanitary wastewater would be treated separately. The projected peak and annual average process wastewater discharge rates for the Mesaba Generating Station are summarized in Table 2.3-2. As described in Section 2.2.3.2, nearly all of the wastewater discharged from the Mesaba Generating Station would be condenser cooling water for control of dissolved solids (cooling tower blowdown). Hence, the constituents in the discharge essentially would be the same as those in the water supply to the plant but more concentrated.

**Table 2.3-2. Estimated Wastewater Discharge Rates to Receiving Waters – West Range Site**

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

The receiving waters for process water discharges from the West Range Site would be the CMP (proposed Outfall 001) and Holman Lake (proposed Outfall 002) as shown in Figure 2.3-3. Wastewater discharge rates to the CMP and Holman Lake would be inversely proportional to the cycles of concentration at which the cooling towers would be operated. The number of cycles of concentration operative in the Mesaba Generating Station would be determined by the concentration of mercury in the CMP waters and the conditions of an NPDES permit for discharges to Holman and Panaca Lakes. Excelsior expects that the Mesaba Generating Station would operate at five cycles of concentration during Phase I and at three cycles of concentration during combined Phases I and II. A NPDES permit would establish limits for parameters such as total concentration of mercury, TDS, and hardness.

### *Potable Water Supply*

During construction, the Mesaba Generating Station would require a peak of 45,000 gallons per day of potable water based on 1,500 personnel using 30 gallons of potable water per day each. After construction of Phase I and II, the water demand will drop to about 7,500 gallons per day assuming 250 individuals on site year around. The annual usage for the facility during normal operation is estimated at approximately 2.7 million gallons. Two alternatives were considered to provide potable water to the West Range Site as described below. Alternative 1 is Excelsior's preferred alternative based on economic and permitting considerations.

### *Alternative 1 (Obtain Potable Water from the City of Taconite)*

The closest potable water source to the site is the City of Taconite. To provide potable water to the West Range Site, an 8-inch diameter pipeline would be constructed from the Taconite system to the site as shown in Figure 2.3-3. A booster station would be needed near the connection point to the city water distribution system in order to provide the required water pressure for the Mesaba Generating Station. The booster station would pump water from the Taconite system at a variable rate from 20 to 100 gallons per minute. The wide pumping range would be required due to the fluctuations in water use that would occur throughout the day at the facility.

Taconite is currently authorized via MNDNR Water Appropriation Permit No. 1976-2206 to withdraw a total of 20 million gallons of groundwater per year to provide for its potable water needs. The most recently published records from the MNDNR show that between 1988 and 2005, inclusive, Taconite's groundwater withdrawal rates varied between 11.3 and 17.3 million gallons per year. The Mesaba Energy Project would require a peak usage rate of 16.5 million gallons per year during construction and average roughly 2.7 million gallons per year of potable water during operations. This indicates that, at present, the Taconite water supply system does not have sufficient capacity to supply potable water to the Mesaba Energy Project during the construction phase and that the system will be close to full capacity once operations of the Mesaba Energy Project begin.

In March 2007, the City of Taconite prepared and adopted a Water Management Plan (SEH, 2007) that identified the improvements required to supply for the needs of the community and the Mesaba Energy Project. These improvements include two additional groundwater wells, additional pumping facilities and booster stations, along with future expansion of water storage facilities. If these system improvements are completed by the time construction begins on the Mesaba Energy Project, there will be sufficient water supply capacity, without impacting the existing firefighting and community needs. However, if these improvements are not completed prior to construction, Excelsior would provide potable water to meet construction workers' needs by bringing in tanker trucks or through development of its own wells.

### *Alternative 2 (Construct On-Site Water Treatment Facility)*

Alternative 2 would consist of constructing an on-site treatment facility with the capacity to treat 7,500 gallons per day of water from the CMP and HAMP Complex to provide potable water to the Mesaba Generating Station. A micro-filtration system would be used to treat raw water pumped to the site from the local mine pits at a rate of 10 gallons per minute to meet potable drinking water standards. This treatment rate was determined based on a run time of approximately 12.5 hours to provide the daily water requirement of the facility. Construction of a building to house the filtration system, a 5,000-gallon underground reservoir, and pump would be required. The pump would supply the water from the reservoir to the facility at the required flow rate and pressure. Excelsior would own the water treatment facility and be responsible for the operation and maintenance of the facility.

The EPA classifies any facility that provides potable water to 25 or more of the same individuals every day as a non-transient non-community public water supply system. Because the Mesaba Generating Station would employ 182 permanent employees it would fall into that classification. Therefore, the treatment facility must be operated by a certified water operator and the treated water must meet all standards of the Federal Safe Drinking Water Act and the Minnesota Department of Health (MDH).

During construction of the Mesaba Generating Station, potable water would not be available until the process water features were completed. Therefore, potable water would be supplied to the site by other means (e.g., tanker trucks) during construction.

## Domestic Wastewater Treatment Alternatives

Excelsior considered two alternatives for treating and disposing of domestic wastewaters produced during construction and operation of Phase I and Phase II. Alternative 1 would include the construction of an onsite wastewater treatment plant. Alternative 2, preferred by Excelsior based on economic and permitting considerations, would connect the Mesaba Generating Station to the Coleraine-Bovey-Taconite wastewater treatment system via the Taconite pump station located approximately 2 miles south of the West Range Site. The alternatives are illustrated in Figure 2.3-3.

### Alternative 1 (Construct On-Site Wastewater Treatment System)

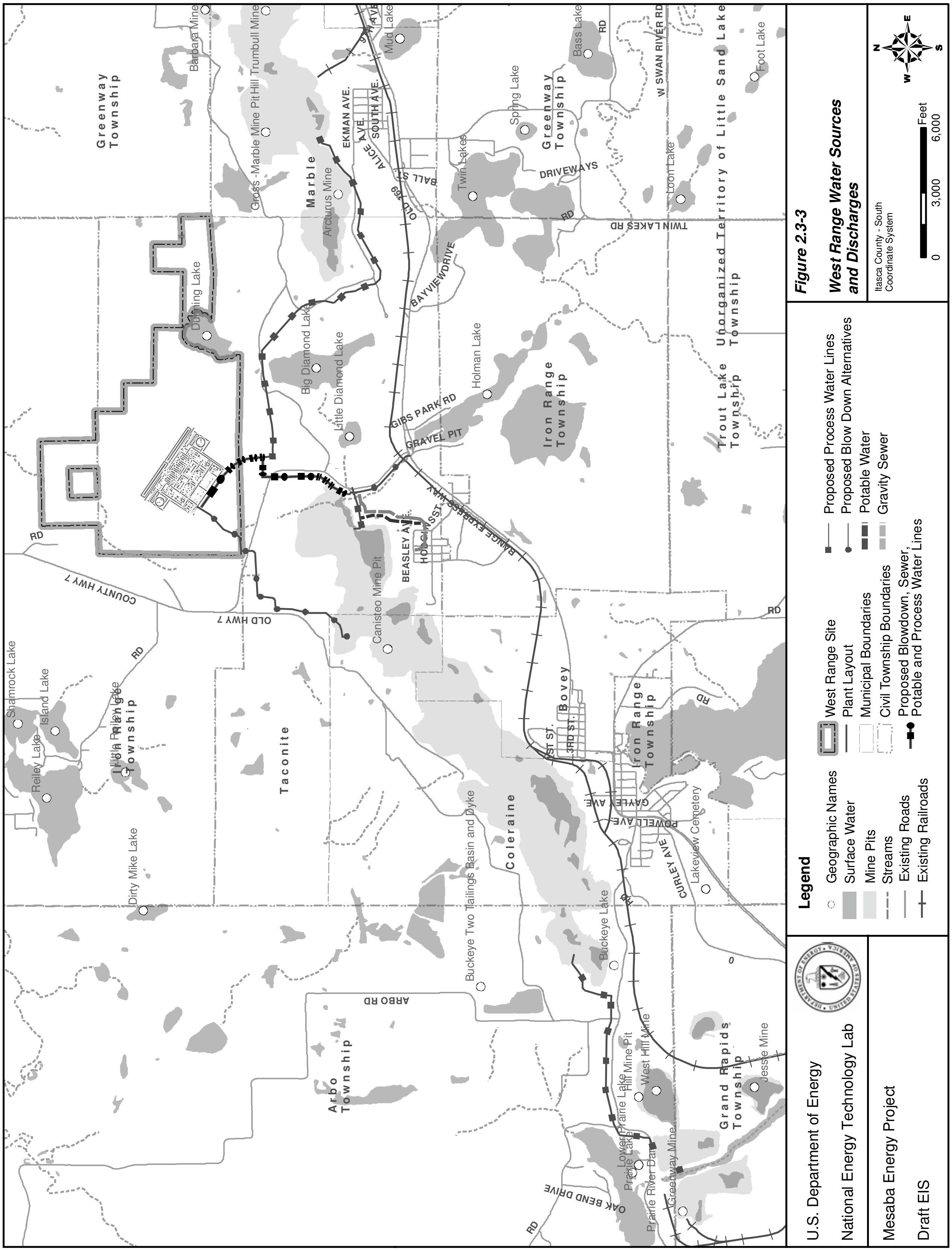
Alternative 1 would consist of constructing an onsite wastewater treatment facility using a stabilization pond adjacent to the Mesaba Generating Station with a capacity to treat 45,000 gallons per day of domestic wastewater (the maximum projected flow during construction). Once Phase I were operational, the wastewater treatment facility would receive a maximum of 7,500 gallons of domestic wastewater per day due to the reduced staff required to operate the station relative to that required during construction, and part of the wastewater treatment facility would be closed in accordance with Minnesota Rules.

Treated effluent from the domestic wastewater treatment facility would be routed off-site either through an 8-inch diameter gravity sewer to Little Diamond Lake or via the cooling tower blowdown pipeline to Holman Lake (or CMP) approximately 1.4 miles south of the West Range Site. The facility would require a NPDES permit to discharge treated domestic wastewater to Little Diamond Lake, Holman Lake, or the CMP. A part-time on-site licensed operator would be required to monitor discharges and ensure that the wastewater treatment facility meets the monitoring and discharge requirements specified in the NPDES permit.

### Alternative 2 (Connect to the Coleraine-Bovey-Taconite Wastewater Treatment Facility)

Alternative 2 would discharge domestic wastewater to the Coleraine-Bovey-Taconite wastewater collection and treatment system, which receives wastewater from the three cities and discharges treated effluent to the Swan River. The system has a design capacity of 499,000 gallons per day and received an average flow of 334,000 gallons per day during the period from January 1 through May 31, 2005. During the wettest 30-day period, the system received an average of 444,000 gallons per day with a peak day of 969,000 gallons per day.

Alternative 2 would consist of constructing approximately 10,000 feet of 12-inch gravity sewer, a pump station, and 2,400 feet of force main from the West Range Site to the City of Taconite's main pump station located in the northeast corner of the city (Figure 2.3-3). The alternative would require a 50-foot construction right-of-way and a permanent 30-foot ROW affecting approximately 14 acres and 8 acres, respectively. The facilities would have the capacity to convey a maximum projected wastewater flow of 30,000 gallons per day during construction (7,500 gallons per day during generating station operations), which is within the existing capacity of the Coleraine-Bovey-Taconite wastewater treatment facility.


U.S. Department of Energy
National Energy Technology Lab
Mesaba Energy Project
Draft EIS
Legend
Geographic Names
Surface Water
Mine Pits
Streams
Existing Roads
Existing Railroads
West Range Site
Plant Layout
Municipal Boundaries
Civil Township Boundaries
Proposed Blowdown, Sewer, Potable and Process Water Lines
Proposed Process Water Lines
Proposed Blow Down Alternatives
Potable Water
Gravity Sewer
Figure 2.3-3
West Range Water Sources and Discharges
Itasca County - South Coordinate System
0
3,000
6,000
Feet
Greenway Township
Marble
Taconite
Coleraine
Bovey
Iron Range Township
Arbo Township
Grand Rapids Township
Trout Lake Township
Unorganized Territory of Little Sand Lake Township
Canisteo Mine Pit
Big Diamond Lake
Little Diamond Lake
Dunning Lake
Holman Lake
Twin Lakes
Spring Lake
Loon Lake
Bass Lake
Foot Lake
Mud Lake
Arcturus Mine
Gross -Marble Mine Pit
Hill Trumbull Mine
Barbara Mine
Shamrock Lake
Island Lake
Reilley Lake
Dirty Mike Lake
Buckeye Two Tailings Basin and Dyke
Buckeye Lake
Lakeview Cemetery
West Hill Mine
Jessie Mine
Greenway Mine
Prairie River Dam
COUNTY HWY 7
OLD HWY 7
ARBO RD
OAK BEND DRIVE
GIBBS PARK RD
GRAVEL PIT
BAYVIEW DRIVE
TWIN LAKES RD
W SWAN RIVER RD
DRIVEWAYS
BALL ST
EKMAN AVE.
SOUTH AVE.
BEASLEY AVE
CURLEY AVE
POWELL AVE
GAYLEY AVE
RANGE EXPRESS WAY

Excelsior prefers Alternative 2 for treatment of domestic wastewater from the Mesaba Generating Station because it would avoid the discharge of treated domestic effluent to public waters impaired for DO and nutrients.

### 2.3.1.4 Natural Gas Facilities

Excelsior proposes to construct, own, and operate one 16-inch (or potentially 24-inch) diameter gas pipeline to supply natural gas to the Mesaba Generating Station that would tap the two existing 36-inch GLG pipelines approximately 12 miles due south of the West Range Site. Three potential natural gas pipeline alternatives were initially considered by Excelsior to provide natural gas to the West Range Site as indicated in The Table 2.3-3. Excelsior identified Alternative 1 as the preferred route (Figure 2.3-4) based on economic factors.

On March 7, 2007, Nashwauk Public Utilities Commission submitted a permit application (PUC Docket No. PL, E280/GP-06-1481) proposing to construct and operate a 24-inch diameter, high-pressure natural gas pipeline between a take-off point on the existing 36-inch GLG pipelines in Blackberry Township and a termination point near the City of Nashwauk. The new pipeline would follow essentially the same alignment as proposed by Excelsior for its natural gas pipeline Alternative 1 between Blackberry and Taconite near the West Range Site. From Taconite, the proposed pipeline would follow an additional 9-mile alignment to the City of Nashwauk. The commission indicated in its application that the proposed pipeline would provide natural gas required to fuel the proposed Minnesota Steel facility and that the Nashwauk Public Utilities Commission would be seeking other industrial customers in the future. Therefore, the proposed gas pipeline would be sized to allow for industrial expansion near Nashwauk. Excelsior has indicated that if this pipeline were approved by PUC and constructed in sufficient time as to be available for use by the Mesaba Energy Project, Excelsior would enter into negotiations with the Nashwauk Public Utilities Commission to purchase nature gas from the utility and would not construct a separate natural gas pipeline for the power plant.

**Table 2.3-3. Natural Gas Pipeline Alternative Routes – West Range Site**

| Attribute | | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|---|
| Pipeline Length | Existing Corridor | 2.5 miles | 10.5 miles | 7 miles |
| | New Corridor | 10.7 miles | 4.5 miles | 5.5 miles |
| Residential Dwellings | Within 300 ft | 3 | 5 | 29 |
| Water Crossings | Stream | 4 | 4 | 4 |
| | Lake | 0 | 0 | 0 |

Both alternate routes, like the preferred route, would involve tapping the two existing 36-inch diameter GLG pipelines. Unlike the preferred route, a pipeline developed along either of the other routes would be licensed/permitted, constructed, owned and operated by NNG (as an interstate pipeline operator) rather than Excelsior. Both alternate routes would originate approximately 9.4 miles southwest of the West Range Site at the La Prairie tap and metering point located in La Prairie, Minnesota. Excelsior or the gas pipeline owner would negotiate with landowners for easements to install the pipeline on each individual tract that the route would cross.

### 2.3.1.5 HVTL Corridors

#### Overview

As discussed in Section 2.2.2.4, power systems are designed according to the single failure (n-1) criterion, which means that the power system must withstand the loss of a single line, generator, transformer or bus bar without any severe disturbance of power supply. Excelsior applied for a HVTL Route Permit including a combination of circuits and routes that would provide the necessary reliable interconnection of Phases I and II to the power grid in accordance with the single failure criterion.

#### Point of Interconnection (POI)

The POI for the Mesaba Generating Station at the West Range Site would be the existing, 230/115-kV Blackberry Substation owned and operated by MP and located approximately 8.5 miles south-southeast of the West Range Site. The station is located at the intersection of CR 10 and CR 434 about equidistant between the unincorporated community of Blackberry and the community of Marble. The Blackberry Substation is the major HVTL hub in the area (Figure 2.3-4).

#### Alternative HVTL Routes to Support the West Range Site

As described in Section 2.2.2.4, Excelsior believes that 345-kV will be the future standard for transmission developments on the Iron Range. Currently, however, there is no 345-kV transmission infrastructure at the Blackberry Substation, and the likelihood of future 345-kV development at the station is dependent on the results of MISO Interconnection Studies. Until such time as MISO confirms its decision on the interconnection voltage for Phases I and II, Excelsior has requested an HVTL Route Permit that would allow flexibility to change its West Range Site interconnection voltage plans. Excelsior's Plan A assumes the use of 345-kV circuits, while Plan B provides a contingency to allow the use of 230-kV circuits. Both plans provide capacity for the Phases I and II combined output and allow for redundancy to meet the single failure criterion. Accordingly, and in compliance with Minnesota Rules Chapter 4400, Excelsior's plans provide for preferred and alternative routes (that follow three potential alignments) as described below and illustrated in Figure 2.3-4.

#### Plan A

Plan A would utilize two 345-kV HVTLs on a single steel pole structure (single ROW) from the Mesaba Generating Station to the Blackberry Substation. This double-circuit 345-kV plan would accommodate the full 1,212-MW output of Phases I and II while meeting the single failure criterion. Each 345-kV HVTL would have sufficient transfer capacity to carry the entire station electrical output, and both lines would be installed during construction of Phase I. For Phase I, each of the two 345-kV HVTLs would be operated at 230-kV, and either line would be capable of supporting the entire output of the plant in the event of a contingency forcing one line out of service. Before Phase II would come on line, each of the 345-kV HVTLs operating at 230-kV would be upgraded to its rated 345-kV capacity and thereafter be capable of conveying the entire output capacity of the generating station to the substation. The necessary upgrades would apply only to electrical substation equipment and involve no modification to the HVTL structures or conductors installed to accommodate Phase I.

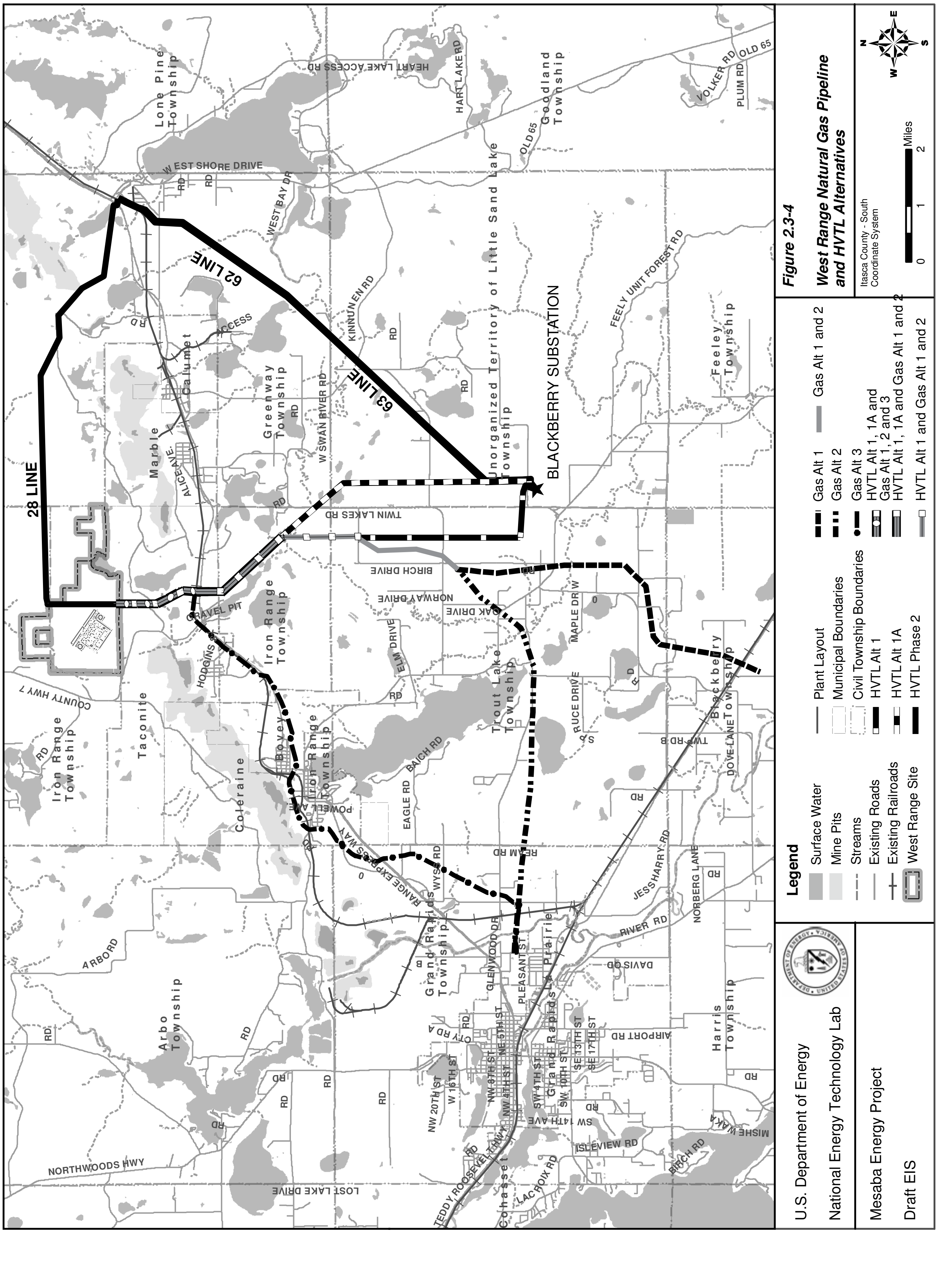



Figure 2.3-4
*West Range Natural Gas Pipeline and HVTL Alternatives*

Plan A provides for a preferred route (WRA-1, following alignment HVTL-1) and an alternative route (WRA-1A, following alignment HVTL-1A) as illustrated in Figure 2.3-4. Both routes would share two common segments (one existing and one new ROW), and each route would include two unique segments (one existing ROW and one new ROW). The major difference between the routes is that WRA-1A would run east of and parallel to Twin Lakes Road, while WRA-1 would run west of and parallel to Twin Lakes Road. Both routes would avoid residences located on the road. Excelsior prefers WRA-1 because it would have fewer water crossings, would cross fewer open fields, would avoid gravel mining operations, and would generally be less visible. Both routes are similar in that they traverse areas that have a similar residential density and are the shortest and most direct routes to the substation.

### *Plan A – Excelsior's Preferred Route (WRA-1)*

The preferred 345-kV double circuit HVTL route (WRA-1) would follow an alignment HVTL-1 including the following four segments:

(1) Approximately 1.6 miles of existing ROW shared with a MP 45 Line (45L) from the southern boundary of the West Range Site south to the retired Greenway Substation located just south of US 169.

(2) Approximately 1.7 miles of new ROW from the retired Greenway Substation south and southeast to a point near Twin Lakes.

(3) Approximately 4.6 miles of new ROW from the point near Twin Lakes south to the point of intersection with MP's 83L (230-kV) and 20L (115-kV) HVTL ROW.

(4) Approximately 1 mile of existing ROW shared with MP's 83L and 20 Line 20L ROW east to the interconnection with the Blackberry Substation.

The new alignment segments would require a ROW with a minimum width of approximately 92 feet; however, Excelsior intends to acquire 100-foot ROWs (150-foot where natural gas pipeline and HVTL would share routes), which would result in a total permanent ROW of approximately 134 acres. Existing HVTL ROWs would not require widening of corridors. Approximately 66 residences would be located within a half mile of the centerline of the preferred alignment, of which 17 would be located within a quarter mile of the alignment. One residence would be located within 300 feet of the alignment and three others would be located within 500 feet.

### *Plan A – Excelsior's Alternative Route (WRA-1A)*

Because route WRA-1 would require acquisition of about 6 miles of new ROW between the Greenway Substation and the point of intersection with MP's 83L and 20L HVTLs, Excelsior is required by Minnesota Rules 4400.1150 Subpart 2.C to consider an alternative route.

The alternative route (WRA-1A) would follow alignment HVTL-1A and include the following four segments:

(1) Same as first segment of WRA-1 (1.6 miles, existing ROW).

(2) Same as second segment of WRA-1 (1.7 miles, new ROW).

(3) Approximately 4.1 miles of new ROW from the point near Twin Lakes southeast then south to the point of intersection with MP's 62L (115-kV) HVTL ROW.

(4) Approximately 0.9 miles of existing ROW shared with MP's 62L (115-kV) HVTL ROW south to the interconnection with the Blackberry Substation.

The new alignment segments would require a ROW with a minimum width of approximately 92 feet. However, Excelsior intends to acquire 100-foot ROWs (150-foot where natural gas pipeline and HVTL would share routes), which would result in a total permanent ROW of approximately 121 acres. Existing HVTL ROWs would not require widening of corridors. Approximately 62 residences would be located within a half mile of the centerline of the preferred alignment, of which 21 would be located within a quarter mile of the alignment. Two residences would be located within 300 feet of the alignment and five others would be located within 500 feet.

### *Plan B*

If MISO determines that the 345-kV transmission infrastructure is incompatible with regional transmission planning initiatives, or if the timetable for building 345-kV transmission in the region would not be acceptable, Excelsior would implement a 230-kV transmission contingency plan. Plan B would begin by interconnecting the generating station to the POI with two 230-kV HVTL circuits mounted on a single steel pole structure, which would accommodate the full 606-MW output of Phase I and meet the single failure criterion. Although the double-circuit 230-kV HVTLs could accommodate the entire 1,212-MW output of the combined Phases I and II, they would not meet the single failure criterion. Therefore, Plan B would provide for an additional HVTL with the construction of Phase II. The routes considered under Plan B are discussed in the four subsections below and shown in Figure 2.3-4.

#### *Plan B, Phase I – Excelsior's Preferred Route (WRB-1)*

The preferred route for the double-circuit 230-kV HVTLs for Phase I of Plan B (WRB-1) would follow alignment HVTL-1, the same as the preferred route WRA-1 of Plan A. However, the single-pole HVTL structures required for 230-kV HVTLs would be shorter, ranging in height from 107 to 143 feet. Approximately 10 structures would be 125 feet or taller. The new alignment segments would require a ROW with a minimum width of approximately 73 feet. Existing HVTL ROWs would not require widening of corridors.

#### *Plan B, Phase I – Excelsior's Alternative Route (WRB-1A)*

The alternative route for the double-circuit 230-kV HVTLs for Phase I of Plan B (WRB-1A) would follow alignment HVTL-1A, the same as the alternative route WRA-1A of Plan A.

#### *Plan B, Phase II – Excelsior's Preferred Route (WRB-2)*

The preferred route for Phase II of Plan B would be the route not selected for the double-circuit 230-kV HVTL in Phase I of Plan B. That is, if Excelsior's route WRB-1 (alignment HVTL-1) were approved for Phase I, route WRB-1A (alignment HVTL-1A) would be the preferred route for the single circuit 230-kV HVTL for Phase II. Conversely, if WRB-1 were not approved as the preferred route for Phase I of Plan B, it would be proposed as the preferred route for Phase II of Plan B.

The structures and new ROW requirements for the separate alignments would be comparable to those described for WRB-1; however, the single-circuit 230-kV alignment would enable the use of shorter poles (by approximately 20 feet). In the segments where the double-circuit 230-kV HVTL alignment would coincide with the single-circuit 230-kV alignment, a minimum permanent ROW width of approximately 138 feet would be required for the parallel pole structures (affecting approximately 1.7 miles of new

ROW). The new alignments for Plan B, Phases I and II (including both routes) would require permanent ROWs affecting approximately 255 acres. Existing HVTL ROWs would not require widening of corridors.

*Plan B, Phase II – Excelsior's Alternative Route (WRB-2A)*

Plan B would require an alternative route for the same reason as Plan A. The alternative route proposed for Phase II of Plan B would combine segments from two existing HVTL corridors, one of which traverses the northern section of the West Range Site. WRB-2A (alignment HVTL Phase 2 in Figure 2.3-4) would follow an alignment including portions of the ROWs for the MP 45L/28L and 62L/63L HVTLs. Because the length of the HVTL for WRB-2A would be about 18 miles, Excelsior proposes to use HVTLs rated at 345-kV on this route to avoid excessive line losses and elaborate switching requirements that would be required for 230-kV. Both of the existing corridors are occupied by 115-kV HVTLs structures owned by MP. Therefore, Excelsior proposes to use delta configuration 345-kV structures with an underbuild feature that would carry the existing 115-kV HVTLs below the arms holding the 345-kV conductors. The delta configuration structures would require a minimum permanent ROW width of approximately 106 feet, which is generally within the parameters of the existing HTVL ROWs. Therefore, the new alignments for Plan B, Phases I and II (including both routes) would require permanent ROWs affecting approximately 134 acres. Approximately 214 residences are located within a half mile of the ROWs that would be used for Alternative Alignment WRB-2A, 98 of which are located within a quarter mile of the ROWs. Eight residences are located within 300 feet of the ROWs and 21 others are located within 500 feet.

### 2.3.2 East Range Site and Corridors

#### *2.3.2.1 Proposed IGCC Plant Site*

The East Range Site, including the power plant footprint and buffer land, is located within the City of Hoyt Lakes in St. Louis County, Minnesota (Figure 2.3-5). The site is generally bounded by CR 666 to the east and a large mine tailings pile to the west. An existing 138-kV HVTL corridor leading to MP's Laskin Substation runs along the western boundary, and a rail line owned by a CN subsidiary runs along the east and south sides of the property. The site encompasses approximately 810 acres of undeveloped property owned by CE within the Superior National Forest and is zoned a mining district (MD) to support mining operations that historically took place within the immediate vicinity of the site. The site has direct access to CR 666 and includes a private, unpaved road used by CE to access its water pumping station on Colby Lake. The closest residential properties are located along the southeast shore of Colby Lake, approximately 1.2 miles south of the power plant footprint.

#### *2.3.2.2 Transportation Facilities*

***Existing Rail Lines in the Vicinity of the East Range Site***

One railroad, a subsidiary of CN, serves the area and could be used to transport coal and other materials to the East Range Site. The nearest access to the BNSF Railway is at Hibbing, 40 miles from the East Range Site. Therefore, the CN would be the only feasible near-term rail provider to the East Range Site. The power plant footprint is located approximately one mile north and one mile west of two CN railroad tracks. The east-west track runs from Eveleth, Minnesota, to Two Harbors, Minnesota. The north-south track connects with the east-west track at Wyman Junction (about 1.7 miles southeast of the East Range Site) and extends north to Embarrass, Minnesota.

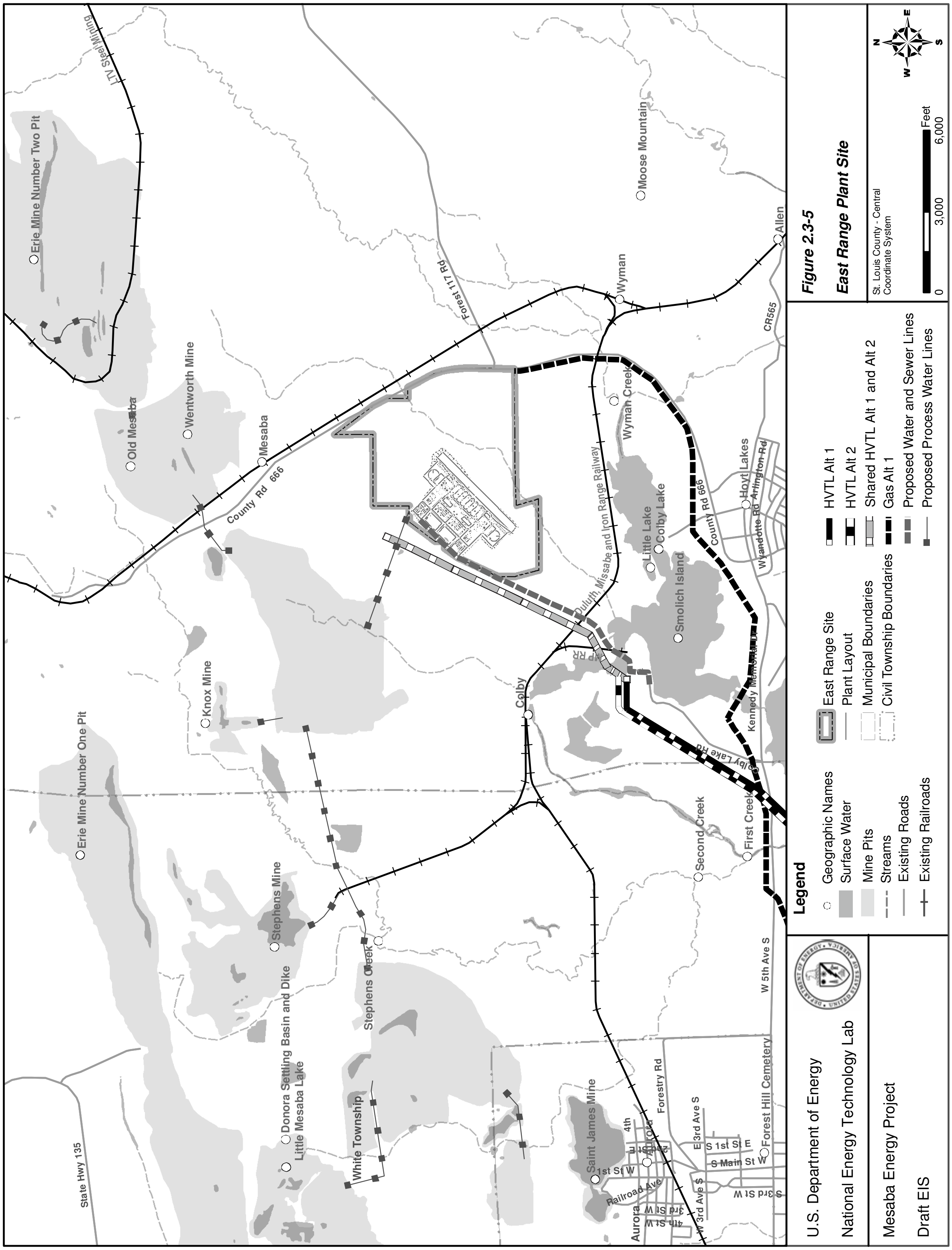



*Figure 2.3-5*
***East Range Plant Site***

The CN operates trains daily on the track serving Minnesota Power's Syl Laskin Generating Station. Coal would be delivered by other railroads to the CN at either Superior, Wisconsin, or at a rail yard south of Eveleth, Minnesota. The CN rail line would be used to deliver coal to the site from Eveleth, and empty trains would return by the same route.

### Rail Access to the East Range Site

Excelsior considered two rail alternative alignments (Alternative 1 and Alternative 2) to connect the East Range Site to the existing CN rail line. The alternatives are shown in Figure 2.3-6 and described below. Table 2.3-4 provides a summary of each alternative.

**Table 2.3-4. Rail Access Alternatives – East Range Site**

| Attribute | Alternative 1 | Alternative 2 |
|---|---|---|
| Total length of track (miles) | 3.4 | 3.5 |
| Off-site length of track (miles) | 1.25 | 2.1 |
| Train speed (mph) | 10 | 10 |
| Maximum grade | 0.40% | 0.40% |
| Maximum Curvature (loaded coal train) | 2 degree 30 minutes | 3 degrees |
| Off-site right-of-way (acres) | 15 | 26 |
| Largest cut (feet) | 50 | 50 |
| Largest fill (feet) | 20 | 20 |
| Approximate cut Qty (cubic yards) | 2,300,000 | 2,100,000 |
| Approximate fill Qty (cubic yards) | 60,000 | 60,000 |
| Potential wetland impact (acres) | 59 | 18 |
| No. of residences within 1,000 feet | 0 | 0 |
| Closest residence (feet) | Over 1,000 feet | Over 1,000 feet |
| Alignment Meets Applicable Standards | Yes | Yes |

### Rail Line Alternative 1

Alternative 1 would provide a traditional coal loop, which could accommodate a unit train that would return in the same direction. The track would originate near MP's Syl Laskin Generating Station rail spur and travel east-northeast to the Mesaba Generating Station. The track would be about 17,800 feet long. No residential dwellings are located near the proposed alignment.

### Rail Line Alternative 2

Alternative 2 would accommodate a complete coal train, but it would cross the site (rather than looping within it) and connect to the CN north-south track just north of Wyman Junction. This track would be about 18,500 feet long with the rotary coal dumper near the midpoint. The track would depart the Syl Laskin spur at an elevation of 1,455 feet, climb to an elevation of about 1,465 to 1,470 feet at the coal dumper, and continue to climb to about 1,485 feet at the north-south CN track. To maintain a workable grade, the track would need to cross under CR 666, which would require construction of a roadway bridge.

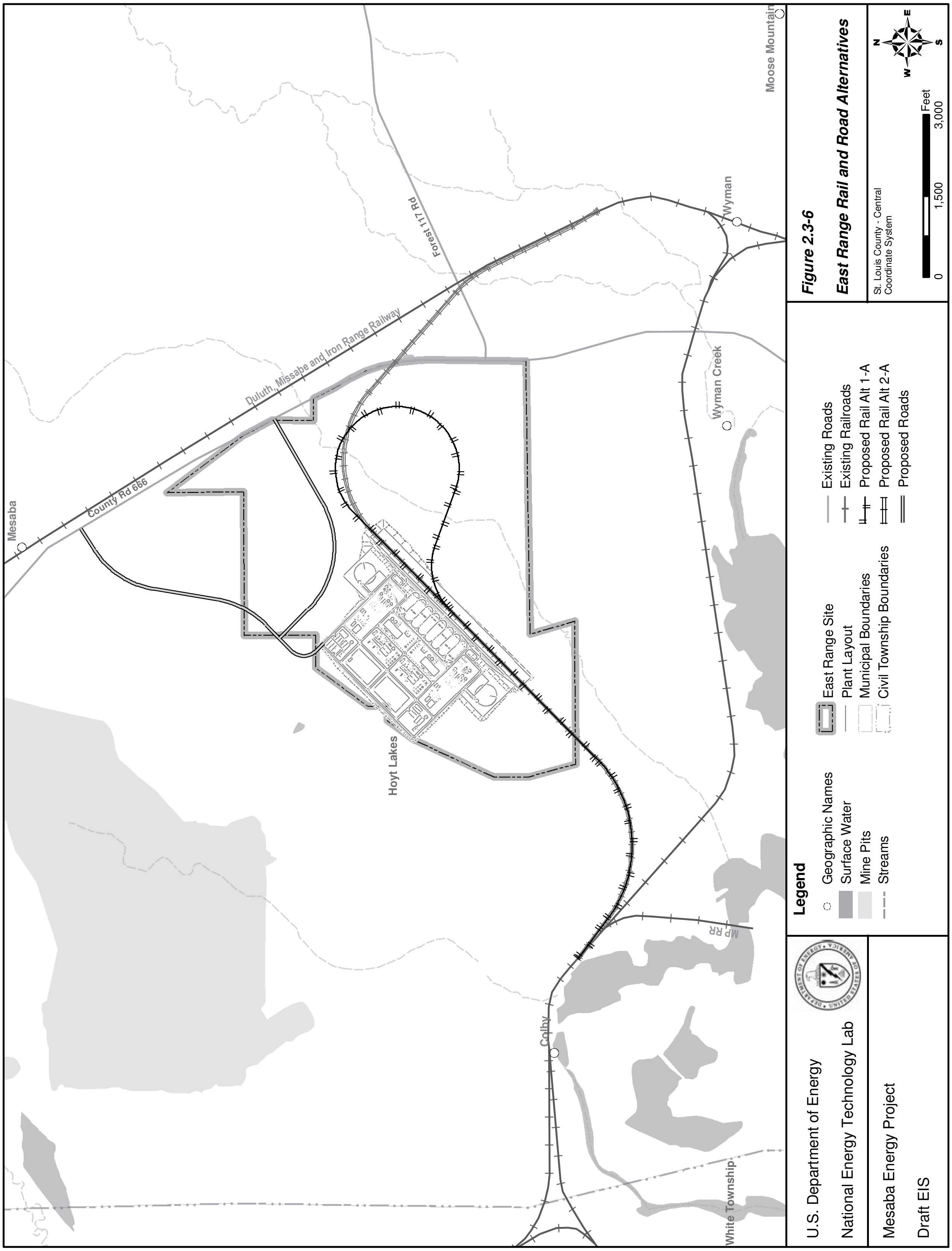



**Figure 2.3-6**

***East Range Rail and Road Alternatives***

This alternative may have a lesser impact on wetlands; however, it would limit the choices for locating the rotary coal dumper, and it would cause trains to climb 35 feet in elevation from west to east making the profile grades difficult. The alternative would also affect a wider area than Alternative 1. Based on these factors, Excelsior prefers Alternative 1.

#### *Other Rail Alternatives Considered*

The East Range Site could also receive shipments of fuel via water at Taconite Harbor, with transportation to the site via CE's privately owned 70-mile rail line that served the former LTV Mining operations. However, Excelsior does not consider this alternative feasible in the near term.

### *Roadway Access to the East Range Site*

#### *Local Roadways*

Roadway transportation in the area of the East Range Site is provided by county roads. The nearest state highway is State Route (SR) 135, approximately 7 miles west of the site. The primary county road is CR 110, which departs from SR 135 in Aurora and passes through Hoyt Lakes. CR 110 is the western terminus of the Superior National Forest Scenic Byway (SR 11). This byway is newly constructed and connects the north shore of Lake Superior with the Mesabi Iron Range. The east-west section of CR 110 in Hoyt Lakes passes approximately 1.6 miles south of the East Range Site. Key local roadways are shown in Figure 2.3-6.

Traffic approaching the East Range Site from the west would travel on CR 110 and turn north onto CR 666 in Hoyt Lakes. This intersection is controlled as a four-way stop. CR 666 extends to the north about 1.6 miles, where it adjoins the eastern boundary of the East Range Site for a distance of about 1.4 miles. It continues beyond the East Range Site for about 2.1 miles north-northwest to the CE administration building. Traffic approaching the East Range Site from the east on CR 110 would turn north onto Hampshire Road in Hoyt Lakes for about 0.3 miles, then turn northeast onto CR 666 toward the site.

#### *Proposed Access Road*

CR 666 adjoins the proposed East Range Site and is the most practical choice for public road system access. The proposed access road (Figure 2.3-6) would consist of a looped roadway intersecting CR 666 at two locations to provide gentle curves and good sightlines. Traffic would enter the site from the north access point. During construction and other periods of peak volumes, traffic would exit the site at the south access point. Having two access points from CR 666 would also provide flexibility in accessing the Station during construction and when maintenance or construction work is performed on CR 666.

## *2.3.2.3 Water Sources and Discharges*

### *Process Water Supply*

The water requirements for the East Range Site would be less than required by the West Range Site because an enhanced ZLD system as described in Section 2.2.1.4 (required to comply with stringent regulations affecting discharges to Lake Superior Basin surface waters) would be used to recycle water to the maximum extent possible. Water requirements can be reduced by up to 700 gallons per minute per phase through such recycling efforts. The enhanced ZLD system would allow for the potential use of wastewaters from other industrial neighbors, but the system would require power above that required for a station at the West Range Site making the generating station at the East Range Site less efficient and more costly to operate. The system also would produce large amounts of residual minerals that would require landfilling in a permitted facility.

Process water for the East Range Site would be drawn from numerous mine pits located in the vicinity. The water level in several of these pits is rising, but there is currently no need to control water levels at any of these pits. Therefore, water could be pumped as needed to support the Mesaba Generating Station. Mine Pit 2 West Extension would serve as the primary source (similar to the CMP at the West Range Site). A permanent pumping station would be added to this mine pit, and the pit would receive input from one or more of the pits listed in Table 2.3-5. Excelsior proposes to link the various mine pits using water intakes, pump stations, and pipelines as illustrated in Figure 2.3-7. In the event of high inflow rates into Colby Lake during spring runoff or during high precipitation events, water also may be pumped from Colby Lake into Mine Pit 2 West Extension.

**Table 2.3-5. Process Water Sources – East Range Site**

| Water Source | Estimated Range of Flow (gpm) | Average Annual Flow (gpm) |
|---|---|---|
| Mine Pit 6[1] | | 1,800 |
| Mine Pit 2 West Extension[1] | | 700 |
| Mine Pit 2 West[1] | | 900 |
| Mine Pit 2 East[1] | | 100 |
| Mine Pit 3[2] | 150-450 | 300 |
| Donora Mine Pit [2] | 130-380 | 260 |
| Stephens Mine Pit [2] | 190-590 | 390 |
| Knox Mine Pit[2] | 20-70 | 45 |
| Mine Pit 9S[2] | 90-270 | 180 |
| Mine Pit 1 Effluent[3] | 0-1,000 | 1,000 |
| PolyMet Mining Dewatering Operations[4] | 2,000-8,000 | 4000 |
| Colby Lake[5] | | 2,900 |
| Total Water Available | | 12,600 |
| Average Water Requirements (Phase I/Phases I and II)[6] | | 3,700/7,200 |
| Peak Water Requirements(Phase I/Phases I and II)[6] | | 5,000/10,000 |

[1]East Range Hydrology Report, MNDNR, Division of Lands and Minerals, Division of Waters, March 2004.

[2]Range of flow based on the surface drainage area to the pit and average yearly rates of runoff. This should be considered a gross approximation as 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.

[3]Minnesota Pollution Control Agency NPDES Permit Issued to Mesabi Nugget. Mine Pit 1 effluent represents the wastewater discharged from Mesabi Nugget's permitted operation of Mine Pit 1 in accordance with terms of a NPDES Permit.

[4]North Met Mine Environmental Assessment Worksheet.

[5]Cliffs-Erie Water Appropriation Permit No. 490135; permitted withdrawal is 12,000 gpm daily average over continuous 60-day average; 15,000 gpm peak; and 6,307.2 million gallons per year (Assumes no discharge from the operation of the Mesaba Generating Station).

[6] From Table 2.2-3.

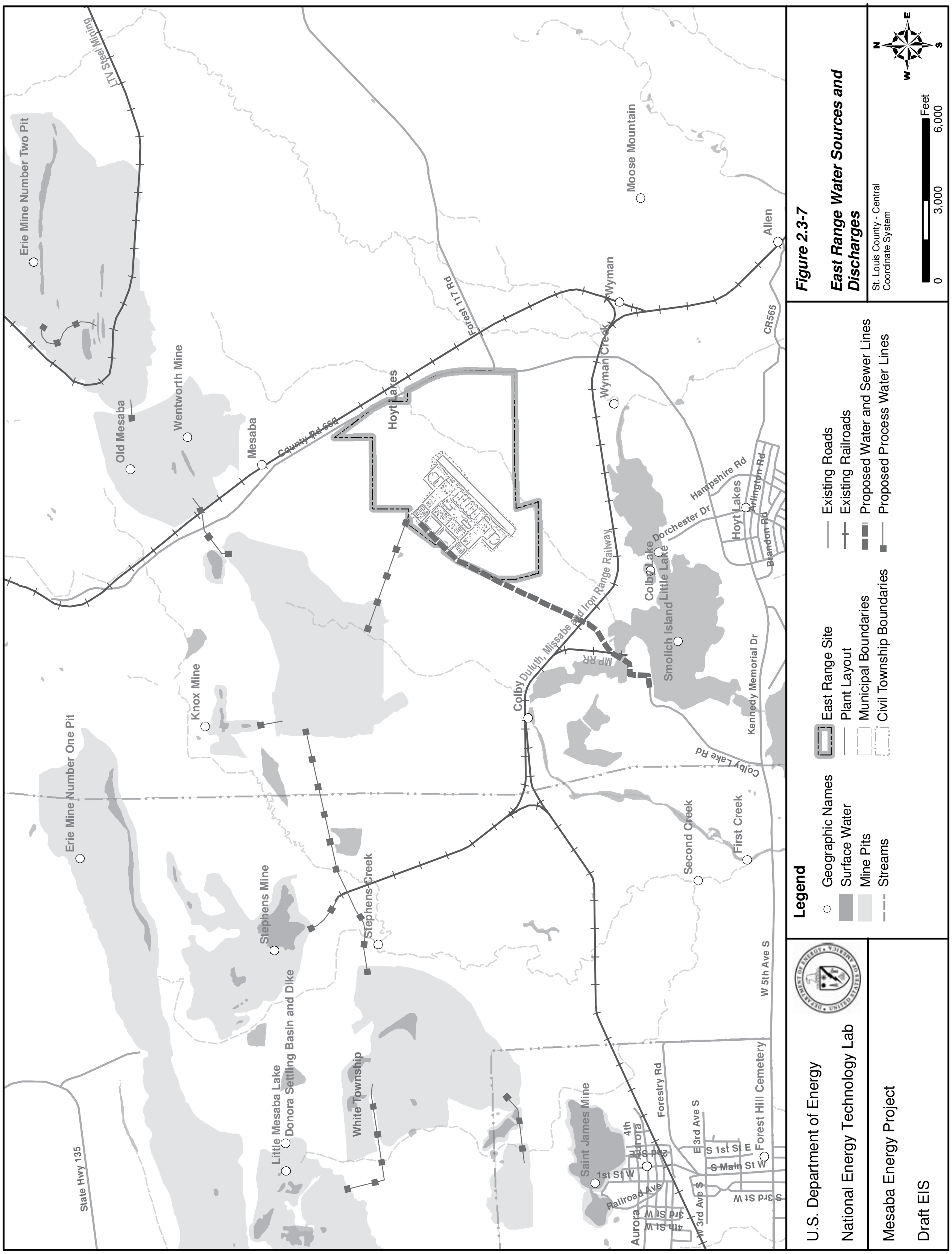


Figure 2.3-7
East Range Water Sources and Discharges
Legend
Geographic Names
Surface Water
Mine Pits
Streams
East Range Site
Plant Layout
Municipal Boundaries
Civil Township Boundaries
Existing Roads
Existing Railroads
Proposed Water and Sewer Lines
Proposed Process Water Lines
St. Louis County - Central Coordinate System
0
3,000
6,000
Feet
N
E
S
W
U.S. Department of Energy
National Energy Technology Lab
Mesaba Energy Project
Draft EIS
Erie Mine Number Two Pit
LTV Steel Mining
Old Mesaba
Wentworth Mine
Mesaba
County Rd 666
Hoyt Lakes
Forest 117 Rd
Moose Mountain
Allen
Wyman
Wyman Creek
CR565
Hampshire Rd
Dorchester Dr
Arlington Rd
Hoyt Lakes
Blandon Rd
Colby Lake
Little Lake
Duluth, Missabe and Iron Range Railway
MP RR
Smolich Island
Kennedy Memorial Dr
Colby
Colby Lake Rd
Knox Mine
Erie Mine Number One Pit
Second Creek
First Creek
Stephens Mine
Stephens Creek
W 5th Ave S
Little Mesaba Lake
Donora Settling Basin and Dike
White Township
State Hwy 135
Saint James Mine
Forestry Rd
Forest Hill Cemetery
Aurora
1st St W
Railroad Ave
E 3rd Ave S
W 3rd Ave S
S 1st St E
S Main St W
S 3rd St W

## ***Process Wastewater Discharges***

The East Range Site is located within the Lake Superior Basin watershed, which is regulated for bioaccumulative chemicals of concern (BCCs), such as mercury, in discharges. Water quality criteria applied to waters located within the Lake Superior Basin are defined at Minnesota Rules 7052.0211 Subpart 3 ("Mixing zones for bioaccumulative chemicals of concern [BCC]") states:

> *After March 9, 1998, acute and chronic mixing zones shall not be allowed for new and expanded discharges of bioaccumulative chemicals of concern (BCC) to the Lake Superior Basin.*

The water quality criterion for mercury in all waters within the Lake Superior Basin watershed is 1.3 nanograms per liter. Sampling in two of the pits from which water supplies for the Mesaba Generating Station would be appropriated showed median concentrations of 0.75 nanograms per liter for Hg, meaning that the cycles of concentration at which the cooling towers could operate would be reduced so severely as to preclude the use of these sources. Excelsior concluded that there are no proven technologies to remove mercury at such low concentrations at the high flow rates that would be necessary to operate the Mesaba Generating Station (the peak discharge from Phase I and II would approach 3,500 gallons per minute).

Excelsior's preferred method for dealing with the mercury discharge limitations at the East Range Site would be to totally eliminate the discharge of cooling tower blowdown by expanding the use of ZLD technologies to address all of the generating station's process wastewater streams. The system would evaporate any water that could not be reused in the plant processes leaving only a solid stream of salts for disposal at a licensed treatment/disposal facility. The process would significantly increase the cost of the Mesaba Generating Station but would enable utilization of the East Range Site.

Excelsior considered discharging process wastewater to the Hoyt Lakes POTW as an alternative, but the POTW does not have sufficient existing capacity to manage the daily volumes of cooling tower blowdown. An expansion of the POTW could not be done without a major non-degradation study.

## ***Potable Water Supply***

Excelsior considered two alternatives to provide potable water to the Mesaba Generating Station at the East Range Site. Alternative 1 would rely on a connection to the Hoyt Lakes water system; Alternative 2 would provide an onsite water treatment facility. Alternative 1 is Excelsior's preferred alternative based on economic and permitting considerations.

### *Alternative 1 (Obtain Potable Water from the City of Hoyt Lakes)*

The City of Hoyt Lakes 1.5 million gallons per day water treatment plant, which treats surface water from Colby Lake, has adequate capacity to meet the potable water needs of the Mesaba facility. For Excelsior's preferred alternative, a 6-inch diameter pipeline would be constructed approximately 11,000 feet from the East Range Site connecting to a 12-inch water main that serves Minnesota Power (Figure 2.3-7). MP uses an average of 75,000 gallons per day or 100 gallons per minute over a 24-hour period, which would leave adequate capacity in the existing 12-inch water main to supply the additional potable water requirement for Phase I and II of 45,000 gallons per day during construction and 7,500 gallons per day during operations. The proposed 6-inch pipeline would provide the required flow and pressure to the Mesaba Generating Station without the need for a booster station. The City of Hoyt Lakes would own and maintain the pipeline, and Excelsior would enter into an agreement with the city to purchase water.

#### *Alternative 2 (Construct Onsite Water Treatment System)*

Alternative 2 would consist of constructing an on-site treatment facility with the capacity to treat 7,500 gallons per day of potable water for Phases I and II operations. A micro-filtration system similar to that required for the West Range IGCC Power Station would be used to treat a portion of the process water procured for project cooling systems that would be pumped to the East Range Site from nearby mine pits. Chemical treatment of the source water may be required to meet all standards of the Federal Safe Drinking Water Act and the Minnesota Department of Health and would be determined during detailed engineering design of the Mesaba Generating Station. Excelsior would own the water treatment facility and be responsible for its operation and maintenance.

During construction of the Mesaba Generating Station, potable water would not be available until the process water features were completed. Therefore, potable water would be supplied to the site by other means (e.g., tanker trucks) during construction.

### *Domestic Wastewater Treatment Alternatives*

Excelsior considered two alternatives for treating and disposing of domestic wastewaters produced during construction and operation of Phases I and II. Alternative 1 would include the construction of an onsite wastewater treatment plant. Alternative 2, preferred by Excelsior based on economic and permitting considerations, would connect the Mesaba Generating Station to the existing Hoyt Lakes wastewater treatment system. The alternatives are illustrated in Figure 2.3-7.

#### *Alternative 1 (Construct Onsite Wastewater Treatment Facility)*

The on-site wastewater treatment facility (WWTF) for the East Range Site would be comparable to the facility described for the West Range Site. A 12-inch gravity sewer would be constructed to convey treated effluent to the mine drainage stream running from northeast to southwest through the site and discharging into Colby Lake.

A disadvantage of this alternative is that the treatment facility would be required to have a capacity of 45,000 gallons per day to meet construction demands, but would receive only about 25 percent of this design flow once construction was completed. Thus, part of the facility would have to be closed and other modifications made to the facility after completion of Phase II. Another disadvantage is that effluent from the system would discharge into Colby Lake, which is the source for the Hoyt Lakes drinking water treatment plant. A part-time on-site licensed operator would be required to monitor discharges and ensure that the wastewater treatment facility meets the monitoring and discharge requirements specified in the NPDES permit.

#### *Alternative 2 (Connect to the Hoyt Lakes Wastewater Treatment System)*

Excelsior's preferred alternative, Alternative 2, would discharge domestic wastewater to the City of Hoyt Lakes' wastewater collection and treatment system. The City of Hoyt Lakes owns, operates and maintains a POTW that receives wastewater from the residential, commercial and industrial establishments within the service area and discharges treated effluent to Whitewater Lake. The system has a design capacity of 680,000 gallons per day and receives an average flow of approximately 300,000 gallons per day.

Alternative 2 would consist of constructing approximately 9,500 feet of 12-inch diameter gravity sewer, a pump station, and about 2,500 feet of 4-inch force main. The wastewater piping would parallel the existing HVTL easement along the west side of the proposed property boundary, south to Colby Lake.

A pump station would be located on the north side of Colby Lake. The 12-inch diameter sewer would have ample capacity to convey the estimated wastewater flow of 45,000 gallons per day during construction, and the Hoyt Lakes wastewater treatment facility has adequate capacity to treat the estimated flow from the proposed project. The City of Hoyt Lakes would operate and maintain the sewer line and would be compensated through sewer user fees.

### 2.3.2.4 Natural Gas Facilities

NNG is the only pipeline company serving the immediate vicinity of the East Range Site. A 10-inch diameter branch of NNG's pipeline from Iron Junction, Minnesota serves the nearby CE plant (the CE branch) and directly abuts the eastern boundary of the East Range Site. However, this branch line lacks adequate capacity to supply the Mesaba Generating Station demand. Therefore, to provide natural gas in the quantity and at the pressure required to supply the Mesaba Generating Station, the following infrastructure would be required:

- Installation of approximately 33 miles of new, 16- to 24-inch pipeline placed within the existing ROW for the 10-inch CE branch line.
- Addition of a new compressor at the existing point where the GLG and NNG pipelines interconnect.
- Installation of an ultrasonic meter facility to serve the Mesaba Generating Station.

The proposed pipeline route is illustrated in Figure 2.3-8. As an interstate pipeline, the East Range natural gas supply pipeline would not be subject to Minnesota Pipeline Route Permit requirements but would be permitted by NNG under the Federal Energy Regulatory Commission (FERC) review process. Approximately 856 residences are located within a half mile of the existing pipeline ROW, 46 of which are located within 300 feet of the ROW.

### 2.3.2.5 HVTL Corridors

#### Overview

Excelsior would configure the high voltage switchyard for the East Range Site at 345-kV for both phases of the Mesaba Generating Station. The option to operate the switchyard at 345-kV at the start of Phase I was based on a 5-MW lower net line loss than would occur if the facilities were operated at 230-kV. Over the project life, the capacity gain associated with the 345-kV option would offset its higher capital cost. The high voltage switchyard required to transmit the entire output from Phase I and Phase II to the point of interconnection with minimum line loss would be installed during construction of Phase I. No further development would be required to accommodate Phase II.

#### Point of Interconnection (POI)

Transmission lines in the vicinity of the East Range Site are part of the MP transmission network known as the "North Shore Loop," which extends from the east end of the Iron Range, along the north shore of Lake Superior, and into Duluth. The 115/138-kV transmission facilities that make up this loop are heavily loaded and currently operate with several special protection schemes involving generation reduction and/or unit tripping to avoid overloading the remaining transmission facilities during critical equipment outages. To minimize the impact on this already constrained local transmission system, Excelsior proposes to construct new HVTLs to the Forbes Substation, approximately 30 miles directly west-southwest of the East Range Site, which would be the POI for the Mesaba Generating Station (Figure 2.3-8). The Forbes Substation is a major electrical hub on the east end of the Iron Range that has 500-kV, 230-kV, and 115-kV buses owned by both MP (115/230-kV) and Xcel Energy (500-kV).

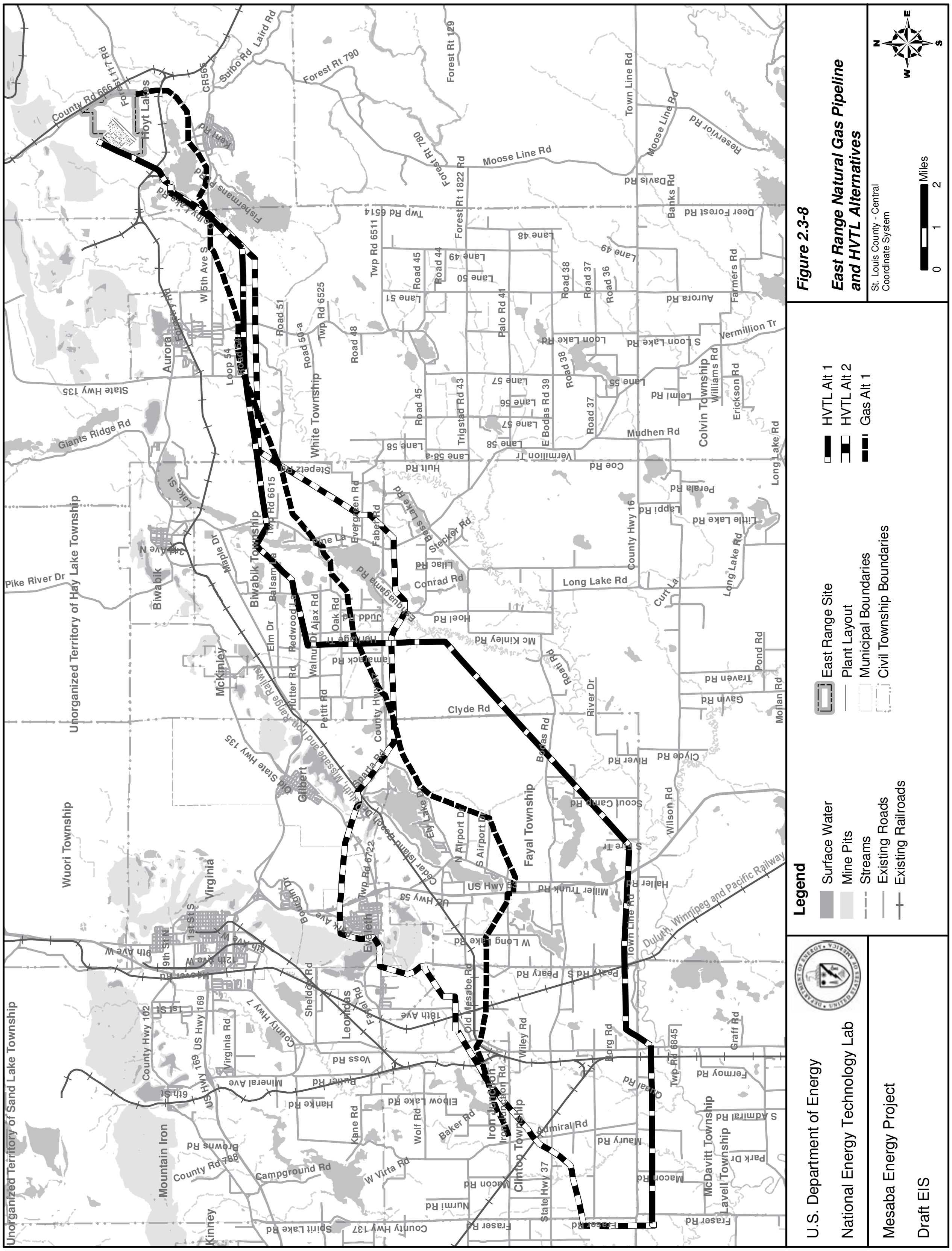


Figure 2.3-8
East Range Natural Gas Pipeline and HVTL Alternatives
St. Louis County - Central Coordinate System
0 1 2 Miles
Legend
Surface Water
Mine Pits
Streams
Existing Roads
Existing Railroads
East Range Site
Plant Layout
Municipal Boundaries
Civil Township Boundaries
HVTL Alt 1
HVTL Alt 2
Gas Alt 1
U.S. Department of Energy
National Energy Technology Lab
Mesaba Energy Project
Draft EIS

Based upon preliminary system studies, interconnecting the Project directly to the Forbes 500/230-kV Substation would result in minimal impact on the underlying MP system, including the already congested "North Shore Loop." The MISO generator interconnection process has been initiated to evaluate Forbes as the POI and to determine what network upgrades are necessary to deliver the output of Phase I to the Xcel Energy control area (Twin Cities).

### *HVTL Alternative Routes to Support the East Range Site*

Excelsior's preferred transmission plan for the East Range Site consists of constructing two new 345-kV HVTLs to link the Mesaba Generating Station with the Forbes Substation. As discussed in Section 2.2.2.4, even though one 345-kV HVTL is sufficient to accommodate the combined full load output of Phases I and II, both new lines must be constructed to address the single-failure criterion concerns. Excelsior proposes to utilize mostly existing ROWs of 115/138-kV HVTL corridors owned by MP that interconnect the Syl Laskin Energy Center with the Forbes Substation and minimize any interruption in electrical service of the existing lines within the corridors selected. Excelsior proposes to use two existing corridors, the 39L/37L corridor and the 38L corridor, as routes for its two 345-kV HVTLs. These routes are illustrated in Figure 2.3-8. The corridors span a length of 33 miles between the East Range Site and the Forbes Substation.

The ROW of a 138-kV line (43L) connecting the Laskin Substation with the CE Substation adjoins the western boundary of the East Range Site. The southern portion of this line could be replaced with double circuit structures to carry the lines from the Mesaba Generating Station and the existing 138-kV HVTL to the Laskin Substation via the existing ROW. However, Excelsior would avoid taking the existing 138-kV HVTL out of service due to the critical role it plays as part of MP's North Shore Loop.

To minimize the impact of the Mesaba Generating Station on the already constrained local transmission system, Excelsior proposes to avoid removing any of the 115/138-kV facilities (the 43L, the Laskin Substation, or the interconnecting HVTLs between the Laskin Substation and the Forbes Substation) from service without providing a replacement HVTL. This can be done in one of two ways. First, the existing 115-kV HVTLs can be handled in "hot" conditions (i.e., HVTLs that are energized) allowing the new HVTL structures to be constructed within the existing ROW and the existing "hot" lines to be transferred to the new structures with no interruption of service. Second, Excelsior could acquire a minimal width of additional ROW along the existing corridor so that new structures can be constructed with less risk.

To avoid the high cost and dangerous conditions associated with "hot" construction methods, Excelsior proposes to acquire an additional 30 feet of ROW along one of the routes between the Laskin and Forbes Substations.

Based on a review of aerial photographs and video taken during overflights of the routes in September 2005, Excelsior identified the 39L/37L corridor as the preferred route along which to acquire the additional 30-foot ROW. For the alternative plan, Excelsior would acquire the additional ROW along the 38L corridor. The preferred and alternative route plans are described in the following subsections.

Either plan would require the acquisition of two new segments of ROW. One new ROW of about 2 miles in length would extend alongside the existing MP 43L HVTL corridor and would connect the Mesaba Generating Station with the initiation point of the 39L and 38L corridors. A second section of about 2 miles of new ROW would be required to link the 39L and 37L corridors near the City of Eveleth.

*Excelsior's Preferred Route Plan (Additional Right-of-Way Taken Along 39L/37L Route)*

Excelsior considers the best option for widening the 39L corridor to involve acquiring ROW on the south side of the existing ROW from the Laskin Substation to CR 97, then moving to the north side from CR 97 to, and across, the Thunderbird Mine. The 39L has single-family residential conflicts in three potential locations and potentially one industrial site conflict. These narrow sections of ROW would necessitate either hot line construction or construction in short, scheduled outage windows on the existing line in affected ROWs. The 37L could be widened on either side of the ROW since the only conflicts involve existing transmission lines, which may require outage windows for construction.

Approximately 962 residences are located within a half mile of the centerline of the existing ROWs of the 39L and 37L, of which 369 are located within a quarter mile of the alignment. Approximately 16 residences are located within 300 feet of the ROWs and 33 others are located within 500 feet.

*Excelsior's Alternative Route Plan (Additional Right-of-Way Taken Along 38L Route)*

The alternative route plan would involve the same alignments as the preferred route plan. However, for the alternative plan, Excelsior would acquire the additional 30 feet of ROW along the 38L corridor. Excelsior determined that the best option for widening the ROW for the 38L corridor would involve acquiring ROW on the north side of the existing structures. This route conflicts with three to four short sections of existing 38L ROW where single family residences are located on the north side of the existing 115-kV ROW. The ROW in these locations is too narrow for a 30-foot expansion. Therefore, Excelsior would propose constructing these sections during short, scheduled line outages, or under hot line construction, on the existing 38L 115-kV centerline.

Approximately 271 residences are located within a half mile of the centerline of the existing ROWs of the 38L, of which 116 are located within a quarter mile of the alignment. Approximately 11 residences are located within 300 feet of the ROWs and 11 others are located within 500 feet.

## 2.4 SUMMARY COMPARISON OF ALTERNATIVES AND IMPACTS

Table 2.4-1 summarizes the potential impacts for the No Action Alternative in comparison to the Proposed Action at either of Excelsior's alternative sites. The baseline conditions that are relevant to the No Action Alternative are described in Chapter 3 for each resource area. The impacts for each environmental resource are based on the detailed analyses of impacts in Chapter 4.

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Aesthetics | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions; no change in viewsheds or aesthetic resources. | **Power Plant Site:** Change in viewshed for properties within sightline of power plant location. Security lighting and aircraft warning lights for power plant may be visible to closest residences (~50 within 1 mi). Three public lands are located within 20 mi, where vapor plumes may be visible at times (Hill Annex Mine State Park, Forest History Center, and Chippewa National Forest). See also: Noise. | **Power Plant Site:** Change in viewshed for properties within sightline of power plant location. Security lighting and aircraft warning lights for power plant may be visible to closest residences (none within 1 mi). Site is on private land within Superior National Forest boundary, and two other public lands are located within 20 mi, where vapor plumes may be visible. See also: Noise. |
| | **Transportation Facilities:** Aesthetic impacts from rail and road construction and operation for closest residences. See also: Noise.<br>• Rail alt. 1A within 0.5 mi of 16 residences (closest within 400 ft).<br>• Rail alt. 1B within 0.5 mi of 8 residences (closest, 2,000 ft).<br>CR 7 realignment and site access road within 0.5 mi of 22 residences (closest within 300 ft). | **Transportation Facilities:** Aesthetic impacts from rail and road construction and operation for closest residences. See also: Noise.<br>No residences within 0.5 mi of either rail alignment alternative (closest, ~1 mi).<br>No residences within 0.5 mi of site access road (closest, >1 mi). |
| | **Water Sources and Discharges:** Temporary aesthetic impacts during construction.<br>• Process water pipelines within 0.5 mi of 104 residences (four within 500 ft).<br>• Cooling water effluent pipelines within 0.5 mi of 14 residences (two within 500 ft).<br>• Potable/sanitary pipelines within 0.5 mi of 114 residences (four within 500 ft). | **Water Sources and Discharges:**<br>• No residences within 0.5 mi of process water pipeline segments (closest residence >0.75 mi).<br>• No cooling water effluent pipeline (enhanced ZLD system).<br>• No residences within 0.5 mi of potable/sanitary pipelines (closest >0.75 mi). |
| | **Natural Gas Facilities:** Temporary aesthetic impacts during construction. Permanently cleared ROW (low-growing vegetation)<br>• Alt. 1 within 0.5 mi of 153 residences (three within 300 ft).<br>• Alt. 2 within 0.5 mi of 339 residences (five within 300 ft).<br>• Alt. 3 within 0.5 mi of 935 residences (29 within 300 ft). | **Natural Gas Facilities:** Temporary aesthetic impacts during construction. Proposed natural gas pipeline on existing pipeline ROW within 0.5 mi of 856 residences (46 within 300 ft). |
| | **HVTL Corridors:** Change in viewshed for properties within sightline of new HVTLs (permanently cleared ROW with low-growing vegetation). Increased height and visibility of power poles in existing HVTL ROWs.<br>• Route WRA-1 within 0.5 mi of 66 residences (four within 500 ft).<br>• Route WRA-1A within 0.5 mi of 62 residences (seven within 500 ft).<br>• Route WRB-2A (existing HVTL ROW) within 0.5 mi of 214 residences (29 within 500 ft). | **HVTL Corridors:** All HVTLs on existing HVTL ROWs; widening of one corridor required (permanently cleared ROW with low-growing vegetation). Increased height and visibility of power poles for properties within sightline of HVTLs.<br>• 38L corridor within 0.5 mi of 271 residences (22 within 500 ft).<br>• 39L/37L corridors within 0.5 mi of 962 residences (49 within 500 ft). |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Air Quality and Climate | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions; no new emissions affecting air quality. | **Power Plant Site:** Annual emissions of criteria pollutants would include 1,390 tons of $SO_2$, 2,872 tons of $NO_X$, 2,539 tons of CO, 0.03 tons of Pb, 493 tons of $PM_{10}$, and 197 tons of VOCs; therefore the facility would be a major source of $SO_2$, $NO_X$, CO, $PM_{10}$, and VOCs under the PSD regulations. Predicted concentrations for each pollutant would be below allowable levels under National Ambient Air Quality Standards (NAAQS) and Minnesota Ambient Air Quality Standards (MAAQS). The plant would potentially emit 0.026 tons per year (tpy) of mercury (below the HAP threshold of 25 tpy) and would include additional technologies to reduce mercury and meet the requirements of the Clean Air Mercury Rule (CAMR). Process modification and improved work practices would be implemented to limit potential annual emission rates.<br><br>Class II PSD increment analysis indicates that the project would comply with all state and Federal increment limits.<br><br>Class I area impacts analysis indicates that the project impacts would be below allowable increments for all pollutants.<br><br>Visibility/regional haze analysis in Class I areas predict that, as a result of the Proposed Action, there would be days with greater than 5% visibility (with a potential for detectable change) or greater than 10% visibility ( a level of unacceptable degradation) at some point each year. Within the Boundary Waters Canoe Area Wilderness (BWCAW), it is 17 to 39 days of >5% visibility and 6 to 15 days of >10% visibility. At Voyageurs National Park (VNP), it is 16 to 25 days with >5% visibility and 1 to 4 days >10% visibility. However, predicted impacts would occur during days of very high relative humidity in winter and would coincide with days of natural visibility degradation due to fog, precipitation, or low clouds.<br><br>Without mitigation or capture/storage (see Section 5.1.2.1), the plant would emit approximately 9.4 to 10.6 million tpy of $CO_2$; thereby adding to the approximately 2.3 billion metric tpy of $CO_2$ from electric power sources nationwide. | **Power Plant Site:** Annual emissions of criteria pollutants would include 1,390 tons of $SO_2$, 2,872 tons of $NO_X$, 2,539 tons of CO, 0.03 tons of Pb, 709 tons of $PM_{10}$, and 197 tons of VOC; therefore the facility would be a major source of $SO_2$, $NO_X$, CO, $PM_{10}$, and VOCs under the PSD regulations. Because of the source water quality at the East Range Site, emissions of $PM_{10}$ would be higher than at the West Range Site. Predicted concentrations for each pollutant would be below allowable levels under NAAQS and MAAQS The plant would potentially emit 0.026 tpy of mercury (below the HAP of 25 tpy threshold) and would include additional technologies to reduce mercury and meet the requirements of the CAMR. Process modification and improved work practices would be implemented to limit potential annual emission rates.<br><br>Class II PSD increment analysis indicates that the project would comply with all state and Federal increment limits.<br><br>Class I area impacts analysis indicates that the project impacts would be below allowable increments for all pollutants.<br><br>Visibility/regional haze analysis in Class I areas predict that, as a result of the Proposed Action, there would be days with greater than 5% visibility (with a potential for detectable change) or greater than 10% visibility ( a level of unacceptable degradation) at some point each year. Within the BWCAW 92 to 131 days of >5% visibility and 44 to 69 days of >10% visibility. At VNP, it is 15 to 26 days of >5% visibility and 4 to 8 days at >10% visibility. However, predicted impacts would occur during days of very high relative humidity in winter and would coincide with days of natural visibility degradation due to fog, precipitation, or low clouds.<br><br>Without mitigation or capture/storage (see Section 5.1.2.1), the plant would emit approximately 9.4 to 10.6 million tpy of $CO_2$; thereby adding to the approximately 2.3 billion metric tpy of $CO_2$ from electric power sources nationwide. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Air Quality and Climate | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| | Odors from $H_2S$ and $NH_3$ would be negligible, because associated processes would be enclosed. | Odors from $H_2S$ and $NH_3$ would be negligible, because associated processes would be enclosed. |
| | The National Park Service (NPS) has established a Deposition Analysis Threshold (DAT) of 0.01 kg/hectare/yr for both sulfur (S) and nitrogen (N) deposition in Class I areas, which is the level below which adverse impacts are not anticipated. The deposition of S in VNP would be very close to the DAT, and deposition of N would be below the DAT. Because the modeled deposition values represent the highest deposition for any receptor in the Class I area, and the annual emissions for the Mesaba plant used in the model are very conservative, it is unlikely that the DAT threshold for S deposition would be exceeded at any point in VNP. Deposition values for S and N in the BWCAW would be below the DAT. | The DAT of 0.01 kg/hectare/yr established by NPS for both sulfur (S) and nitrogen (N) deposition in Class I areas would apply to the East Range Site. The deposition of S in VNP would be very close to the DAT, and deposition of N would be below the DAT. Because the modeled deposition values represent the highest deposition for any receptor in the Class I area, and the annual emissions for the Mesaba plant used in the model are very conservative, it is unlikely that the DAT threshold for S deposition would be exceeded at any point in VNP. Deposition values for S and N in the BWCAW would be below the DAT. |
| | Deposition of mercury would be 1.3 x 10-5 $\mu g/m^3$ at a rate of 0.01 cm/sec over lakes and 0.05 cm/sec over the rest of the watershed. Big Diamond Lake would be within the release plume of future facility emissions; therefore, the concentration and rate of deposition was used to determine the incremental contribution of mercury in fish tissues caught from Big Diamond Lake (see Section 4.17, Health and Safety). Mercury emissions and subsequent deposition would be reduced by the high efficiency IGCC technology combined with the design-added mercury removal carbon absorption beds to ensure that mercury emissions from the facility would be less than 10 percent of the mercury in the feedstock. | Deposition of mercury would be 1.3 x 10-5 $\mu g/m^3$ at a rate of 0.01 cm/sec over lakes and 0.05 cm/sec over the rest of the watershed. Colby Lake would be within the release plume of future facility emissions; therefore, the concentration and rate of deposition was used to determine the incremental contribution of mercury in fish tissues caught from Colby Lake based on the analytical results for Big Diamond Lake (see Section 4.17, Health and Safety). Mercury emissions and subsequent deposition would be reduced by the high efficiency IGCC technology combined with the design-added mercury removal carbon absorption beds to ensure that mercury emissions from the facility would be less than 10 percent of the mercury in the feedstock. |
| | **Transportation Facilities:** Fugitive dust emissions during construction and operations from vehicle traffic, transportation of materials, and material handling. The impacts would be localized and would decrease with distance from site and alignments. | **Transportation Facilities:** Fugitive dust emissions during construction and operations from vehicle traffic, transportation of materials, and material handling. The impacts would be localized and would decrease with distance from site and alignments. |
| | **Water Sources and Discharges, Natural Gas Facilities, and HVTL Corridors:** Fugitive dust emissions during construction related to the respective lengths of potential alignments. | **Water Sources and Discharges, Natural Gas Facilities, and HVTL Corridors:** Fugitive dust emissions during construction related to the respective lengths of potential alignments. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Geology and Soils | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions; no new land disturbance. | **Power Plant Site:** The plant footprint (Phases I & II) would occupy approximately 192 ac. Site grading and preparation for the plant footprint would require approximately 2,975,000 $yd^3$ of cut land and approximately 1,750,000 $yd^3$ of fill land.<br>Although the site is situated on 137 ac of soils classified as prime farmland or prime farmland if drained, no agriculture uses currently occur on the property. The Minnesota Prime Farmland Exclusion Rule does not apply to the site which is in or within 2 mi of a statutory city. | **Power Plant Site:** The plant footprint (Phases I & II) would occupy approximately 192 ac. Based on site topography, grading and preparation for the plant footprint would require less cut and fill volume than the West Range Site.<br>There are no areas designated as prime farmland within the East Range Site boundary and no agriculture uses currently occur on the property. The Minnesota Prime Farmland Exclusion Rule does not apply to the site which is in or within 2 mi of a statutory city. |
| | **Transportation Facilities:** Construction impacts from rail and road alignments. No long-term operational impacts.<br>• Rail alt. 1A would disturb 139 ac, require approximately 3,000,000 $yd^3$ of cut land and 2,000,000 $yd^3$ of fill land, and occupy approximately 38 ac of prime farmland soils.<br>• Rail alt. 1B would disturb 179 ac, require approximately 8,500,000 $yd^3$ of cut land and 2,000,000 $yd^3$ of fill land, and occupy approximately 40 ac of prime farmland soils.<br>CR 7 realignment and site access road construction would disturb 122 ac and occupy approximately 55 ac of prime farmland soil classifications. | **Transportation Facilities:** Construction impacts from rail and road alignments. No long-term operational impacts.<br>• Rail alt. 1 would disturb 77 ac and require approximately 2,300,000 $yd^3$ of cut land and less fill than at West Range.<br>• Rail alt. 2 would disturb 74 ac and require approximately 2,100,000 $yd^3$ of cut land and less fill than at West Range.<br>Access road construction would disturb 45 ac.<br>Impacts on prime farmland could not be determined from data available, because the soil survey for St. Louis County has not been completed. |
| | **Water Sources and Discharges:** Construction of process water supply pipelines would disturb 165 ac and occupy 57 ac of prime farmland soils. Cooling water effluent pipelines would disturb 83 ac and occupy 40 ac of prime farmland soils. Potable/sanitary pipelines would disturb 34 ac and occupy 8 ac of prime farmland. | **Water Sources and Discharges:** Construction of process water supply pipelines would disturb approximately 109 ac. No cooling water effluent pipelines required (due to the use of an enhanced ZLD system). Potable/sanitary pipelines would disturb 25 ac. Impacts on prime farmland could not be determined (soil survey for St. Louis County not complete). |
| | **Natural Gas Facilities:** Construction impacts of alignments.<br>• Alternative 1 would disturb 160 ac and occupy 81 ac of prime farmland soils.<br>• Alternative 2 would disturb 171 ac and occupy 86 ac of prime farmland soils.<br>• Alternative 3 would disturb 142 ac and occupy 66 ac of prime farmland soils. | **Natural Gas Facilities:** Pipeline would be constructed within an existing gas pipeline ROW requiring disturbance of 350 ac. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Geology and Soils | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| | **HVTL Corridors:** Impacts of alignments.<br>• Route WRA-1 would disturb 134 ac and occupy <1 ac of prime farmland soils.<br>• Route WRA-1A would disturb 151 ac and occupy <1 ac of prime farmland soils.<br>• Route WRB-2A would disturb land on an existing HVTL ROW. | **HVTL Corridors:** All HVTLs constructed on existing HVTL ROWs with new towers; widening of one or the other corridor required.<br>• 38L corridor would disturb 455 ac.<br>• 39L/37L corridors would disturb 457 ac. |

| Water Resources | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No changes to water resources in the project area. The Hill-Annex Mine Park would not be dewatered to the level necessary to view all the historical structures in the mine pit. Also, the CMP will likely overflow within the next 4 to 8 years, potentially causing flooding within Coleraine and Bovey. | **Power Plant Site:** Disturbance of land areas during plant construction, as summarized for Geology and Soils, would create potential for erosion and sedimentation. Impacts on surface waters would be minimized through the implementation of a sediment and erosion control (SEC) plan required for a National Pollutant Discharge Elimination System (NPDES) General Construction Permit. Potential impacts during operation would be minimized through the implementation of a stormwater pollution prevention plan (SWPPP) based on state requirements. Runoff from the plant site and coal pile areas would be routed through stormwater management ponds and oil/water separators, limiting the discharge of pollutants. No impacts on groundwater from the construction or operation of the plant are expected.<br><br>**Transportation Facilities:** Disturbance of land areas during road and railway construction, as described for Geology and Soils. Impacts on surface waters would be minimized through the implementation of a SEC plan required for a NPDES General Construction Permit. No impacts on surface waters or groundwater from the operation of the road and railway expected. | **Power Plant Site:** Disturbance of land areas during plant construction, as summarized for Geology and Soils, would create potential for erosion and sedimentation. Impacts on surface waters would be minimized through the implementation of a SEC plan required for a NPDES General Construction Permit. Potential impacts during operation would be minimized through the implementation of a SWPPP based on state requirements. Runoff from the plant site and coal pile areas would be routed through stormwater management ponds and oil/water separators, limiting the discharge of pollutants. No impacts on groundwater from the construction or operation of the plant are expected.<br><br>**Transportation Facilities:** Disturbance of land areas during road and railway construction, as described for Geology and Soils. Impacts on surface waters would be minimized through the implementation of a SEC plan required for a NPDES General Construction Permit. No impacts on surface waters or groundwater from the operation of the road and railway expected. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Water Resources | | |
|---|---|---|
| | **Water Sources and Discharges:** Average process water demand of 8,800 – 10,300 gpm (15,200 gpm peak) from CMP and interconnected mine pits would not adversely affect water sources. Lowering of water level in CMP would reduce potential for overflow impacts on Coleraine and Bovey. Average cooling water discharges of 3,500 gpm (6,000 gpm peak) to CMP; 825 gpm (6,000 gpm peak) to Holman Lake. Discharges of some parameters may exceed water quality standards, however, the cumulative effects on receiving waters would be monitored by operating staff to ensure parameter concentrations do not exceed NPDES permit limits. Potable water use of 7,500 gpd during operation would not adversely affect Taconite water system, however, the existing water system does not have sufficient capacity to provide the 45,000 gpd during construction. Planned improvements to the system would be necessary to handle this demand, or Excelsior would provide potable water via truck during construction. Domestic wastewater discharges would be within the effective treatment capacity of the regional facility.<br>**Natural Gas Facilities:** Best management practices (BMPs) would be implemented to minimize impacts from erosion and sedimentation during construction.<br>**HVTL Corridors:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction. | **Water Sources and Discharges:** Average process water demand of 7,400 gpm (10,000 gpm peak) from interconnected mine pits would not adversely affect water sources. No direct discharge of cooling water to surface waters would occur (due to the enhanced ZLD system). Potable water use of 45,000 gpd during construction and 7,500 gpd during operation would not adversely affect the Hoyt Lakes water system. Domestic wastewater discharges would be within the effective treatment capacity of the municipal facility.<br>**Natural Gas Facilities:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction.<br>**HVTL Corridors:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Floodplains | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions; no impact on floodplains. | **Power Plant Site:** No impact. The site is approximately one mile from the nearest 100-year floodplain along the Prairie River.<br>**Transportation Facilities:** No impact. Proposed rail and access road alignments would be located outside of the 100-year floodplain.<br>**Water Sources and Discharges:** No impact. Construction of pipelines would occur outside of the 100-year floodplain.<br>**Natural Gas Facilities:** Temporary impacts may occur during construction of natural gas pipeline alt. 1, 2, or 3 as a result of trenching, stockpiling of soil, and storage of equipment where pipelines would cross the 100-year floodplain of Swan River or Prairie River However, impacts would be mitigated through the use of construction BMPs, and floodplain contours would be restored following construction. No permanent impacts on flood elevations would occur, because the pipelines would be located below the land surface.<br>**HVTL Corridors:** No impact. Construction of HVTLs would occur outside of the 100-year floodplain. | **Power Plant Site:** No impact. The site is outside of the nearest 100-year floodplain of the Partridge River.<br>**Transportation Facilities:** No impact. Proposed rail and access road alignments would be located outside of the 100-year floodplain.<br>**Water Sources and Discharges:** No impact. Construction of pipelines would occur outside of the 100-year floodplain.<br>**Natural Gas Facilities:** Temporary impacts may occur during construction of the natural gas pipeline as a result of trenching, stockpiling of soil, and storage of equipment where the pipeline would cross the 100-year floodplain of the Partridge River. However, impacts would be mitigated through the use of construction BMPs, and floodplain contours would be restored following construction. No permanent impacts on flood elevations would occur, because the pipelines would be located below the land surface.<br>**HVTL Corridors:** Temporary impacts may occur during widening of HVTL corridors (38L or 39L/37L) where the HVTLs would cross the 100-year floodplain of the Partridge, Embarrass, or East Two River. No permanent impact on flood elevations would occur, because permanent structures would be limited to HVTL towers that have small footprints. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Wetlands | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions; wetlands would remain in their current status. | **Power Plant Site:** Permanent wetland loss or alteration relating to the plant footprint (Phases I & II) would be approximately 31 ac. | **Power Plant Site:** Permanent wetland loss or alteration relating to the plant footprint (Phases I & II) would be approximately 16 ac. |
| | **Transportation Facilities:** Construction of rail and road access would result in loss or destruction of wetlands in areas of permanent impact (without mitigation). Areas of temporary impact could result in the alteration of wetland types and functions:<br>• Rail alt. 1A would have a temporary impact on 26 ac and a permanent impact on 77 ac (including center loop).<br>• Rail alt. 1B would have a temporary impact on impact on18 ac and a permanent impact on 64 ac (including center loop).<br>CR 7 realignment and access road construction would impact 10 ac for temporary ROW; 6 ac for permanent ROW. | **Transportation Facilities:** Construction of rail and road access would result in loss or destruction of wetlands in areas of permanent impact (without mitigation). Areas of temporary impact could result in the alteration of wetland types and functions:<br>• Rail alt. 1 would have a temporary impact on 17 ac and a permanent impact on 59 ac (including center loop).<br>• Rail alt. 2 would have a temporary impact on 18 ac and a permanent impact on 13 ac (no center loop).<br>Access road construction would impact 6 ac for temporary ROW; 3 ac for permanent ROW. |
| | **Water Sources and Discharges:** Construction of pipelines:<br>• Process water supply pipelines would alter 12 ac for temporary ROW (8 ac lost or altered in permanent ROW).<br>• Cooling water effluent pipelines would alter 26 ac for temporary ROW (18 ac lost or altered in permanent ROW).<br>• Potable/sanitary pipelines would alter 4 ac for temporary ROW (2 ac lost or altered in the permanent ROW). | **Water Sources and Discharges:** Construction of pipelines:<br>• Process water supply pipelines would alter <3 ac for temporary ROW (<2 ac lost or altered in permanent ROW).<br>• No cooling water effluent pipelines required (due to the enhanced ZLD system).<br>• No wetlands are located in the alignments for potable/sanitary pipelines. |
| | **Natural Gas Facilities:** Construction of pipelines:<br>• Alt. 1 would alter 25 ac for temporary ROW (17 ac lost or altered in the permanent ROW).<br>• Alt. 2 would alter 29 ac for temporary ROW (18 ac lost or altered in the permanent ROW).<br>• Alt. 3 would alter 13 ac for temporary ROW (9 ac lost or altered in the permanent ROW). | **Natural Gas Facilities:** Construction of the natural gas pipeline would alter 67 ac for temporary ROW (47 ac lost or altered in the permanent ROW). |
| | **HVTL Corridors:** Construction of HVTLs.<br>• Route WRA-1 would alter 30 ac for clearing ROW (<1 ac lost for tower emplacements).<br>• Route WRA-1A would alter 25 ac for clearing ROW (<1 ac lost for tower emplacements).<br>• Route WRB-2A would be constructed in existing HVTL ROWs; no additional wetland impacts for clearing anticipated (<1 ac lost for tower emplacements). | **HVTL Corridors:** All HVTLs would be constructed on existing HVTL ROWs with new towers; widening of one or the other corridor would be required.<br>• 38L corridor would alter 29 ac for clearing ROW (<1 ac lost for tower emplacements).<br>• 39L/37L corridors would alter 27 ac for clearing ROW (<1 ac lost for tower emplacements). |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Biological Resources | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions; biological resources would remain in current status. | **Power Plant Site:** Approximately 155 ac of vegetation communities would be lost or destroyed from construction for Phase I and Phase II. Much of the Iron Range is within the distributional range of the bald eagle, Canada lynx, and gray wolf, which are Federally listed species. The U.S. Fish and Wildlife Service (USFWS) has concurred with DOE's determination that the project is not likely to adversely affect the bald eagle and has agreed to prepare a Biological Opinion (to be included in the Final EIS) addressing potential effects on the lynx and wolf. Eight state-listed plant species (17 occurrences) in general area of site, but no occurrences within the site boundary. Possible, but unlikely, that these species could be affected. | **Power Plant Site:** Approximately 167 ac of vegetation communities would be lost or destroyed from construction for Phase I and Phase II. Much of the Iron Range is within the distributional range of the bald eagle, Canada lynx, and gray wolf, which are Federally listed species. USFWS has concurred with DOE's determination that the project is not likely to adversely affect the bald eagle. In the event that the East Range Site would be selected for the Proposed Action, a Biological Opinion from the USFWS would be required to address potential effects on the lynx and wolf. No known occurrences of state-listed species within 1 mi of site. |
| | **Transportation Facilities:** Construction of rail and road access:<br>• Rail alt. 1A: 54 ac (104 ac within center loop) of vegetation communities lost or destroyed. No known occurrences of state-listed species within 1 mi.<br>• Rail alt. 1B: 55 ac (116 ac within center loop) of vegetation communities lost or destroyed. No known occurrences of state-listed species within 1 mi. | **Transportation Facilities:** Construction of rail and road access:<br>• Rail alt. 1 would result in the loss or destruction of 142 ac (including center loop with 104 ac of impacts) of vegetation communities. Two stream crossings could cause direct mortality to aquatic biota, habitat fragmentation/conversion, increased water temperature, and increased sedimentation (causing loss in macroinvertebrate communities). No known occurrences of state-listed species within 1 mi.<br>• Rail alt. 2 would result in the loss or destruction of 41 ac of vegetation communities. One stream crossing could cause direct mortality to aquatic biota, habitat fragmentation/conversion, increased water temperature, and increased sedimentation (causing loss in macroinvertebrate communities). No known occurrences of state-listed species within 1 mi. |
| | Access roads would result in the loss or destruction of 54 ac of vegetation communities. No known occurrences of state-listed species within 1 mi. | Access roads would result in the loss or destruction of 28 ac of vegetation communities. No known occurrences of state-listed species within 1 mi. |
| | **Water Sources and Discharges:** Construction of pipelines:<br>Process water supply pipelines would result in the loss or destruction of 53 ac of vegetation communities. Five known occurrences of five state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types). | **Water Sources and Discharges:** Construction of pipelines:<br>Process water supply pipelines would result in the loss or destruction of 34 ac of vegetation communities. Four stream crossings could temporarily cause increased sedimentation (causing loss in macroinvertebrate communities) and increased biochemical oxygen demand during construction. No known occurrences of state-listed species within 1 mi. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Biological Resources | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| | Cooling water effluent pipelines would impact:<br>• Alt 1 would cause the loss or destruction of 25 ac of vegetation. No known occurrences of state-listed species within 1 mi.<br>• Alt 2 would cause the loss or destruction of 10 ac of vegetation. No known occurrences of state-listed species within 1 mi.<br>Potable/sanitary pipelines would result in the loss or destruction of 7 ac of vegetation communities<br>**Natural Gas Facilities:**<br>• Alt 1 would cause the loss or destruction of 71 ac of vegetation communities. Nine known occurrences of seven state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types).<br>• Alt 2 would cause the loss or destruction of 43 ac of vegetation communities. Three known occurrences of one state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types).<br>• Alt. 3 would cause the loss or destruction of 43 ac of vegetation communities. No known occurrences of state-listed species within 1 mi.<br>**HVTL Corridors:**<br>• Route WRA-1 would cause the loss or destruction of 93 ac for tree and shrub clearing resulting in habitat conversion within the ROW. Seven occurrences of five state-listed plant species within 1 mi of proposed HVTL, which could be affected during construction and operation.<br>• Route WRA-1A would cause the loss or destruction of 72 ac for tree and shrub clearing resulting in habitat conversion within the ROW. Seven occurrences of five state-listed plant species within 1 mi of proposed HVTL, which could be affected during construction and operation.<br>• Route WRB-2A would not have a permanent impact on vegetation because it would be located within an existing HVTL corridor. Eleven occurrences of eight state-listed plant species and one occurrence of a state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation. | No cooling water effluent pipelines are expected (due to the use of an enhanced ZLD system).<br>Potable/sanitary pipelines would cause the loss or destruction of 5 ac of vegetation communities. No known occurrences of state-listed species within 1 mi of potable/sanitary pipelines.<br>**Natural Gas Facilities:**<br>Proposed alignment would cause the loss or destruction of 187 ac of vegetation communities. Five occurrences of three state-listed plant species and seven occurrences of two state-listed animal species within 1 mi of proposed pipeline. Possible that construction could affect these species.<br>**HVTL Corridors:**<br>• 38L corridor would cause the loss or destruction of 89 ac for tree and shrub clearing resulting in habitat conversion as long as the ROW is maintained. Two occurrences of two state-listed plant species and 16 occurrences of three state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation.<br>• 39L/37L corridors would cause the loss or destruction of 86 ac for tree and shrub clearing resulting in habitat conversion as long as the ROW is maintained. Eight occurrences of five state-listed plant species and eight occurrences of two state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Cultural Resources | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No new structures built, no archaeological or Native American sites disturbed. | **Power Plant Site:** Located within Western Mesabi Iron Range Early Mining Landscape District. MN State Historic Preservation Office (SHPO) has 11 historic properties recorded within the area of potential effect for the West Range Site and corridors. Coordination with SHPO required during construction to avoid or minimize potential impacts to the historic character of the District.<br>No known archaeological resources or Native American cultural resources known to exist within 1 mi of site.<br>The potential for the occurrence of archaeological resources is high within 55 ac (1%) and moderate on 108 ac (2%) of the site.<br>Consistent with the recommendations of the SHPO, a Phase I archaeological survey of locations with high and medium potential was conducted in 2007. Although not yet final, the survey did not uncover any previously unknown resources within the site boundaries.<br>**Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** Located within Western Mesabi Iron Range Early Mining Landscape District. SHPO has 11 historic properties recorded within the area of potential effect for site and corridors. Coordination with SHPO required during construction to avoid or minimize potential impacts to the historic character of the District. No known archaeological resources or Native American cultural resources exist within the transportation or utility corridors.<br>A total of 330 ac (5%) of high potential for archaeological resources and 580 ac (12%) of moderate potential for archaeological resources exists along the HVTLs, rail line, and pipeline corridors (combined for all transportation and utility corridors).<br>Archaeological surveys would be conducted only in those corridors to be permitted by the PUC if the West Range site were selected for permitting. Although surveys would necessarily be completed after the DOE Record of Decision, the Record of Decision would be conditional upon implementing the provisions of an agreement between DOE, SHPO, and appropriate parties for the identification and protection of resources. | **Power Plant Site:** No known archaeological sites or Native American cultural resources identified within 1 mi of the site.<br>The study area (30,471 ac) included the site and associated transportation and utility corridors. A total of 4,862 ac (16%) of the study area has a high potential for archaeological resources and 457 ac (1.5%) has a moderate potential for archaeological resources.<br>Phase I surveys are complete, and the SHPO has agreed that no further study is needed, provided that there would be no terrain disturbance at the Longyear historic site.<br>**Transportation Facilities:** Included in the discussion for the plant site above.<br>**Water Sources and Discharges:** The water pipeline corridors would be located within previously disturbed areas; therefore, these corridors would not be expected to contain archaeological or historical resources.<br>**Natural Gas Facilities:** The natural gas pipeline corridor would follow an existing ROW; therefore, no archaeological or historical resources are anticipated.<br>**HVTL Corridors:** The proposed HVTLs would follow existing HVTL corridors, which would minimize potential for impacts.<br>There are two known archaeological sites located within 0.25 mi of the 39L/37L corridors; however, they are outside of the construction ROW. One National Register of Historic Places (NRHP)-listed building and one potentially eligible building are within the town of Eveleth in the vicinity of the 39L/37L route. One eligible site within the HVTL visual area of potential effect crossed by the HVTL corridor south of the plant site.<br>Archaeological surveys would be conducted only in those corridors to be permitted by the PUC if the East Range site were selected for permitting. Although surveys would necessarily be completed after the DOE Record of Decision, the Record of Decision would be conditional upon implementing the provisions of an agreement between DOE, SHPO, and appropriate parties for the identification and protection of resources |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Land Use | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in land use; sites and corridors would remain in current status. | **Power Plant Site:** Generating station on 1,260-ac site, currently undeveloped and zoned for industrial use. ~50 residential properties within 1 mi of footprint (closest, 0.71 mi); buffered by ~0.5 mi of dense woodlands. No conflict with local or regional zoning ordinances or land use plans.<br>No use of eminent domain is needed to acquire the site footprint and its surrounding buffer land. The use of eminent domain as allowed by MN Statutes 216B.1694 may be necessary to acquire some public and private lands or easements if agreements to purchase such lands or easements (for associated facilities, utilities, or transportation infrastructure; or to interconnect the Project with such features and available water resources) cannot be negotiated with property owners. | **Power Plant Site:** Generating station on 810-ac site, currently undeveloped and zoned for mining use. No residential properties within 1 mi of footprint (closest, 1.28 mi); buffered by ~0.5 mi of dense woodlands. No conflict with local or regional zoning ordinances or land use plans.<br>No use of eminent domain is needed to acquire the site footprint and its surrounding buffer land. The use of eminent domain as allowed by MN Statutes 216B.1694 may be necessary to acquire some public and private lands or easements if agreements to purchase such lands or easements (for associated facilities, utilities, or transportation infrastructure; or to interconnect the Project with such features and available water resources) cannot be negotiated with property owners. |
| | **Transportation Facilities:** Rail alignment alternatives:<br>• Alt. 1A within 0.5 mi of 16 residences (closest, 400 ft).<br>• Alt. 1B within 0.5 mi of 8 residences (closest, 2,000 ft).<br>CR 7 realignment and site access road within 0.5 mi of 22 residences (closest within 300 ft). | **Transportation Facilities:** Rail and road alignments:<br>No residences within 0.5 mi of either rail alignment alternative (closest ~1 mi).<br>No residences within 0.5 mi of site access road (closest >1 mi). |
| | **Water Sources and Discharges:**<br>• Process water pipelines within 0.5 mi of 104 residences (4 within 500 ft).<br>• Cooling water effluent pipelines within 0.5 mi of 14 residences (2 within 500 ft).<br>• Potable/sanitary pipelines within 0.5 mi of 114 residences (4 within 500 ft). | **Water Sources and Discharges:**<br>• No residences within 0.5 mi of process water pipeline segments (closest >0.75 mi).<br>• No cooling water effluent pipeline (enhanced ZLD system).<br>• No residences within 0.5 mi of potable/sanitary pipelines (closest >0.75 mi). |
| | **Natural Gas Facilities:** Natural gas pipelines:<br>• Alt. 1 within 0.5 mi of 153 residences (3 within 300 ft).<br>• Alt. 2 within 0.5 mi of 339 residences (5 within 300 ft).<br>• Alt. 3 within 0.5 mi of 935 residences (29 within 300 ft). | **Natural Gas Facilities:** Natural gas pipeline on existing ROW within 0.5 mi of 856 residences (46 within 300 ft). |
| | **HVTL Corridors:** HVTL routes:<br>• Route WRA-1 within 0.5 mi of 66 residences (4 within 500 ft).<br>• Route WRA-1A within 0.5 mi of 62 residences (7 within 500 ft).<br>• Route WRB-2A within 0.5 mi of 214 residences (29 within 500 ft).<br>NOTE: See Geology and Soils for acreages affected. | **HVTL Corridors:** All HVTL routes on existing ROWs; widening of one or the other corridor would be required.<br>• 38L corridor within 0.5 mi of 271 residences (22 within 500 ft).<br>• 39L/37L corridors within 0.5 mi of 962 residences (49 within 500 ft).<br>NOTE: See Geology and Soils for acreages affected. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Socioeconomics | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing socioeconomic conditions; no potential for economic stimulus from proposed project. | **General:** Project spending and creation of new construction and operation jobs would provide value added benefits to regional economy ($3.1 billion over 6 years during construction; $1.1 billion/yr during operation of both phases; the power plant would be expected to operate commercially for 20 years or more). | **General:** Project spending and creation of new construction and operation jobs would provide value added benefits to regional economy ($3.1 billion over 6 years during construction; $1.1 billion/yr during operation of both phases; the power plant would be expected to operate commercially for 20 years or more). |
| | **Power Plant Site:** No displacement of population, housing, businesses, or jobs. Ten or more residential properties closest to the plant footprint could experience impacts on property values based on proximity to facility and resulting aesthetic and noise impacts. Potential temporary adverse impacts on housing demand related to influx of workers during peak construction (>1,500/yr in 2009-11); less than 3,000 housing units in Census Tract 9810, of which 513 were vacant (non-seasonal) or rental units in 2000. | **Power Plant Site:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated based on distances to nearest residences. Potential temporary adverse impacts on housing demand related to influx of workers during peak construction (>1,500/yr in 2009-11); less than 1,000 housing units in Hoyt Lakes (Census Tract 140), of which 143 were vacant (non-seasonal) or rental units in 2000. |
| | **Transportation Facilities:** No displacement of population, housing, businesses, or jobs. Three residences within 1,000 ft of Rail Alignment Alternative 1A could experience impacts on property values due to proximity and resulting aesthetic and noise impacts. Realignment of CR 7 by Itasca County (connected action) may influence local housing development in vicinity. | **Transportation Facilities:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated based on distances to nearest residences. |
| | **Water Sources and Discharges:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. | **Water Sources and Discharges:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. |
| | **Natural Gas Facilities:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. | **Natural Gas Facilities:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. |
| | **HVTL Corridors:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. | **HVTL Corridors:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| No Action | West Range | East Range |
|---|---|---|
| **Environmental Justice** | | |
| No change in existing conditions relative to minority and low-income populations; no potential for economic benefits from proposed project. | **Power Plant Site:** Minority and low-income populations in the region of influence for the power plant do not exceed 50% of the population and are not meaningfully greater than the percentages in the general population. Therefore, the plant site would not have a disproportionately high and adverse impact on minority or low-income populations.<br>The closest concentrations of American-Indian populations are located approximately 20 mi from the site. Local tribes expressed concern regarding health risks associated with project pollutants and their impact on traditional food sources. However, the increment of mercury (less than 0.5 percent increase) and other pollutants from the project would be very low and human health impacts from fish consumption would be negligible even within 2 mi from the power plant site.<br>**Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** No disproportionately high and adverse impacts on minority or low-income populations are indicated. | **Power Plant Site:** Minority and low-income populations in the region of influence for the power plant do not exceed 50% of the population and are not meaningfully greater than the percentages in the general population. Therefore, the plant site would not have a disproportionately high and adverse impact on minority or low-income populations.<br>The closest concentrations of American-Indian populations are located approximately 50 mi from the site. Local tribes expressed concern regarding health risks associated with project pollutants and their impact on traditional food sources. However, the increment of mercury (less than 0.5 percent increase) and other pollutants from the project would be very low and human health impacts from fish consumption would be negligible even within 2 mi from the power plant site.<br>**Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** No disproportionately high and adverse impacts on minority or low-income populations are indicated. |
| **Community Services** | | |
| No change in existing conditions relative to community services. | **Power Plant Site:** Demands by the generating station may require staff at local fire and emergency response agencies to increase by 30 to 50%. Large numbers of construction workers (>1,500 during 3 years of peak construction) may affect capacities of local law enforcement agencies. Security requirements for the generating station may affect capacities of local law enforcement agencies.<br>**Transportation Facilities:** Potential for delays to emergency response vehicles at 17 rail grade crossings between Grand Rapids and Taconite (8 in Grand Rapids). Approximately 2.5% daily probability of delay at a crossing caused by train serving Mesaba plant; 4% probability of delay from combined rail traffic.<br>**Water Sources and Discharges:** Security requirements for process water intake facilities may necessitate terminating access to Canisteo Mine Pit for recreational boating.<br>**Natural Gas Facilities:** No displacement of providers or change in demand on community services.<br>**HVTL Corridors:** No displacement of providers or change in demand on community services. | **Power Plant Site:** Demands by the generating station may require staff at local fire and emergency response agencies to increase by 20% or less. Large numbers of construction workers (>1,500 during 3 years of peak construction) may affect capacities of local law enforcement agencies. Security requirements for the generating station may affect capacities of local law enforcement agencies.<br>**Transportation Facilities:** Potential for delays to emergency response vehicles at 8 rail grade crossings between Clinton Township and Hoyt Lakes. Approximately 2.5% daily probability of delay at a crossing caused by train serving Mesaba plant; 5.5% probability of delay from combined rail traffic.<br>**Water Sources and Discharges:** No displacement of providers or change in demand on community services.<br>**Natural Gas Facilities:** No displacement of providers or change in demand on community services.<br>**HVTL Corridors:** No displacement of providers or change in demand on community services. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Utility Systems | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions relating to utilities; the region would not benefit from the additional source of power from the Mesaba Energy Project. | **Power Plant Site:** The project would tie into the existing grid without service interruptions and would ensure necessary upgrades to substations and other infrastructure would be installed to prevent system failures. The project would provide another source of power for the region that could reduce outages and help meet future demand.<br>**Transportation Facilities:** No expected impacts.<br>**Water Sources and Discharges:** The Mesaba Energy Project would not adversely affect sanitary wastewater treatment capacity. The wastewater collection system in Taconite currently overflows during heavy rain and high water table events, which may be worsened by new flow from the West Range Site. This collection system would need to be redesigned or repaired regardless of the outcome of this project. During the construction phase of the project, potable water requirements would exceed the capacity of the existing Taconite water supply system; however, planned improvements to the system would provide sufficient supplies. Otherwise, potable water supplies would be brought to the project site by truck.<br>**Natural Gas Facilities:** No impacts on service providers or capacity expected.<br>**HVTL Corridors:** The project's proposed utility lines would be constructed in accordance with all Federal and state regulations, and would pose no adverse impact on other resources. | **Power Plant Site:** The project would tie into the existing grid without service interruptions and would ensure necessary upgrades to substations and other infrastructure would be installed to prevent system failures. The project would provide another source of power for the region that could reduce outages and help meet future demand.<br>**Transportation Facilities:** No expected impacts.<br>**Water Sources and Discharges:** The East Range Alternative would not adversely impact existing potable and sanitary sewer systems, as both have capacity to serve the project.<br>**Natural Gas Facilities:** No impacts on service providers or capacity expected.<br>**HVTL Corridors:** The project's proposed utility lines would be constructed in accordance with all Federal and state regulations, and would pose no adverse impact on other resources. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Traffic and Transportation | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing vehicular traffic; Level of Service (LOS) conditions would remain the same. Realignment of CR 7 might not occur; hence, traffic hazards would remain at intersection of CR 7 and US 169. | **Power Plant Site:** During construction: temporary LOS degradation of US 169 – from a LOS of C to D; however, new CR 7 or proposed improvements at US 169/CR 7 intersection expected to alleviate traffic congestion and hazards.<br><br>During operation: LOS would remain the same on nearby roadways, except for CR 7 (south of new Access Road 1), which would improve from B to A because of new Access Road 1.<br><br>**Transportation Facilities:**<br><br>Rail use during construction and operations is expected to have minimal adverse impacts to baseline rail traffic conditions.<br><br>Access Roads:<br>• Access Road 1 would improve LOS on CR 7 (south of new Access Road 1) from level B to level A.<br>• Access Road 2 would be used by site traffic only and would not impact LOS.<br><br>**Water Sources and Discharges:** Temporary and localized traffic congestion during construction.<br><br>**Natural Gas Facilities:** Temporary and localized traffic congestion during construction.<br><br>**HVTL Corridors:** Temporary and localized traffic congestion during construction. | **Power Plant Site:** During construction: temporary LOS degradation of most of nearby roads; however, lowest LOS would be B (represents free flow traffic with little congestion). Reconstruction of Hampshire Drive expected to minimize potential congestion at intersection of CR 666 and CR 110.<br><br>During operation: LOS would remain the same on nearby roadways, except for CR 666 (north of CR 110), which would degrade from A to B.<br><br>**Transportation Facilities:**<br><br>Rail use during construction and operations is expected to have minimal adverse impacts to baseline rail traffic conditions.<br><br>Access Roads:<br>• Access Road 1 would provide two access points off of CR 666, which would minimize impacts to traffic flow during any future construction or maintenance work on CR 666.<br><br>**Water Sources and Discharges:** Temporary and localized traffic congestion during construction.<br><br>**Natural Gas Facilities:** Temporary and localized traffic congestion during construction.<br><br>**HVTL Corridors:** Temporary and localized traffic congestion during construction. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Materials and Waste Management | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in existing conditions; no increase in the risk of a hazardous waste release. | **Power Plant Site:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated.<br>Additional market analysis would be required to secure a market and avoid disposal of slag (1000-1600 tons per day generated for both phases); however, sufficient capacity is available if disposal of the slag is necessary. Commercially available treatment, stabilization, or disposal for waste streams generated. Generating Station would be regulated as a large quantity generator of hazardous waste (sulfuric acid, spent activated carbon and potentially the ZLD filter cake, as well as smaller quantities of other hazardous wastes). No substantial increase in risk of a hazardous waste release to the environment. Proper handling and storage of wastes in accordance with the Resource Conservation and Recovery Act (RCRA) would be adhered to.<br>**Transportation Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.<br>**Water Sources and Discharges:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.<br>**Natural Gas Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.<br>**HVTL Corridors:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. | **Power Plant Site:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated.<br>Additional market analysis would be required to secure a market and avoid disposal of slag (1000-1600 tons per day generated for both phases); however, sufficient capacity is available if disposal of the slag is necessary. Commercially available treatment, stabilization, or disposal for waste streams generated. Generating Station would be regulated as a large quantity generator of hazardous waste (sulfuric acid, spent activated carbon and potentially the ZLD filter cake, as well as smaller quantities of other hazardous wastes). No substantial increase in risk of a hazardous waste release to the environment. Proper handling and storage of wastes in accordance with RCRA would be adhered to.<br>**Transportation Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.<br>**Water Sources and Discharges:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.<br>**Natural Gas Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.<br>**HVTL Corridors:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Safety and Health | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No added health and safety risk, and no increase in the probability of construction or operational health and safety risks. | **Power Plant Site:** Construction workers would follow a safety plan and standard safety practices to reduce the potential for construction-related impacts. During the 5-year construction period, statistically less than 1 worker fatality (0.4) would occur. During the operational timeframe of the plant, statistically less than 1 operations-related worker fatality (0.01) would occur. Based on air emission modeling results, cancer or morbidity hazards to workers or to the public would be small and would not exceed EPA standards. Specifically, the projected acute, sub-chronic, and chronic non-cancer hazard indices would be 0.5, 0.1, and 0.03, respectively, compared to a threshold index of 1, and the projected cancer risk would be $3x10^{-07}$, compared to a threshold of $1x10^{-05}$. Potential major operating accidents or intentional destructive acts, although not anticipated, could result in fires and localized airborne releases of toxic substances, such as CO, $H_2S$, and $SO_2$. In such cases, plant workers would be the most at-risk of injury or death, although the nearest residents, located 0.6 to 0.8 mi from the plant, would also be at-risk from a large release.<br><br>**Transportation Facilities:** During construction and operation, it is estimated, respectively, that approximately 1.2 and 0.53 fatalities could occur due to the movement of workers and material via trucks and personal vehicles. Because of the relatively low incremental addition of project-related train trips (up to one and two roundtrips per day during Phase I and II, respectively), it is expected that increases to safety hazards at at-grade crossings would be low because baseline vehicular traffic numbers within the region of influence are considered low.<br><br>**Water Sources and Discharges:** No impacts would be expected.<br><br>**Natural Gas Facilities:** No impacts would be expected.<br><br>**HVTL Corridors:** Research regarding the potential for public health risks from the inhalation of pollutant particles charged by HVTLs (i.e., the Henshaw Effect) is currently inconclusive. Therefore, these risks are considered comparable to the risks imposed by tens of thousands of mi of HVTLs already in use throughout the U.S. Electromagnetic field (EMF) exposure from utility lines would fall below the 2-kV/m limit at the edge of the ROW. There would be no permanent residents located in areas exceeding 2-kV/m. | **Power Plant Site:** Construction workers would follow a safety plan and standard construction safety practices to reduce the potential for construction-related impacts. During the 5-year construction period, statistically less than 1 worker fatality (0.4) would occur. During the operational timeframe of the plant, statistically less than 1 operations-related worker fatality (0.01) would occur. Based on air emission modeling results, cancer or morbidity hazards to workers or to the public would be small and would not exceed EPA standards. Specifically, the projected acute, sub-chronic, and chronic non-cancer hazard indices would be 0.5, 0.1, and 0.03, respectively, compared to a threshold index of 1, and the projected cancer risk would be $3x10^{-07}$, compared to a threshold of $1x10^{-05}$. Potential major operating accidents or intentional destructive acts, although not anticipated, could result in fires and localized airborne releases of toxic substances such as CO, $H_2S$, and $SO_2$. In such cases, plant workers would be the most at-risk of injury or death, although the nearest residents, located 1 mi from the plant, would also be at-risk from a large release.<br><br>**Transportation Facilities:** During construction and operation, it is estimated, respectively, that approximately 1.2 and 0.53 fatalities could occur due to the movement of workers and material via trucks and personal vehicles. Because of the relatively low incremental addition of project-related train trips (up to one and two roundtrips per day during Phase I and II, respectively), it is expected that increases to safety hazards at at-grade crossings would be low because baseline vehicular traffic numbers within the region of influence are considered low.<br><br>**Water Sources and Discharges:** No impacts would be expected.<br><br>**Natural Gas Facilities:** No impacts would be expected.<br><br>**HVTL Corridors:** Research regarding the potential for public health risks from the inhalation of pollutant particles charged by HVTLs (i.e., the Henshaw Effect) is currently inconclusive. Therefore, these risks are considered comparable to the risks imposed by tens of thousands of mi of HVTLs already in use throughout the U.S. EMF exposure from utility lines would fall below the 2-kV/m limit at the edge of the ROW. There would be no permanent residents located in areas exceeding 2-kV/m. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Noise | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| No change in noise emissions. There would be no new violations or exceedances of noise standards; however, residential noise Receptor 3 (R3) and Receptor 4 (R4) at the West Range are currently above the MPCA noise thresholds. R3 and R4 are residential areas 3,900 and 4,400 ft, respectively, west of the proposed plant site (see Section 3.18 for noise receptor details). | **Power Plant Site:**<br>During construction:<br>Aggregate noise levels at receptors not expected to exceed the Minnesota Pollution Control Agency (MPCA) daytime threshold of 60 dBA ($L_{50}$).<br><br>Steam blows would be an unavoidable adverse impact. A series of short steam blows, lasting two or three minutes each, would be performed several times daily over a period of two or three weeks during the final weeks of construction. Resultant levels at nearby receptors would range from 88 to 103 dBA; however, steam piping would be equipped with silencers that would reduce noise levels by 20 dBA to 30 dBA at each receptor location.<br><br>During operation:<br>Daytime – MPCA noise thresholds would not be exceeded.<br>Nighttime – Without mitigation, the noise level exceedances above the $L_{50}$ threshold would occur at R2 through R5 and would range from 1.6 dBA (R5) through 3.6 dBA (R4), respectively (R2 through R5 represent residential areas ranging from 3,900 ft to 4,400 ft from the proposed plant site – see Section 3.18 for receptor location details). The noise levels would exceed the $L_{10}$ threshold by 3.4 and 1.5 dBA at R3 and R4, respectively. The greatest predicted increase occurs for the nighttime $L_{10}$ limit at 3 dBA (at R2 and R5) and for the nighttime $L_{50}$ limit at 2.7 dBA (at R2). With the proposed mitigation, it is expected that state noise standards would be met at all sites, except for the $L_{10}$ limit at R3 and R4 because the levels are already over the standard due to their proximities to CR 7. The greatest predicted increase would occur for the nighttime $L_{10}$ limit at 3 dBA (at R2 and R5) and for the nighttime $L_{50}$ limit at 2.7 dBA (at R2). With the proposed mitigation, it is expected that any resulting increase in noise levels from plant operations would not exceed 1 dB, thus would not be perceived at any of the residential receptor locations. | **Power Plant Site:**<br>During construction:<br>MPCA residential daytime noise limits of 60 dBA ($L_{50}$) would be exceeded at one receptor site by 5 dBA; however, this is not a residential receptor and the increase would be temporary (during construction only).<br><br>Steam blows would be an unavoidable adverse impact. A series of short steam blows, lasting two or three minutes each, would be performed several times daily over a period of two or three weeks during the final weeks of construction. Resultant sound levels at nearby receptors would range from 88 to 103 dBA; however, steam piping would be equipped with silencers that would reduce noise levels by 20 dBA to 30 dBA at each receptor location.<br><br>During operation:<br>Noise levels would not exceed daytime or nighttime MPCA thresholds. Without mitigation, predicted daytime and nighttime noise level increases were less than 1.5 dBA, which would not be detectable at any receptor locations. |

**Table 2.4-1. Summary Comparison of Impacts (Phases I & II)**

| Noise | | |
|---|---|---|
| **No Action** | **West Range** | **East Range** |
| | **Transportation Facilities:**<br>Noise levels would range from 57 to 69 dBA at residential receptors R2 and R5 during rail line construction, but would be temporary (during construction only) and would be below the ATPA guideline of 70 dBA.<br>Train horns, as required under Federal Railroad Administration (FRA) regulations would be adverse unavoidable impacts at grade crossings.<br>Access Roads:<br>Access Road 1 (new CR 7) would exceed the nighttime $L_{10}$ threshold at 10 receptor sites (an average decibel increase of 1 dB – 6 dB over and above the threshold of 55 dB) and the daytime $L_{10}$ threshold of 65 dBA would be exceeded by 1 dBA at one receptor. These impacts would be temporary.<br>During operation: All receptor locations would be within the daytime limits ($L_{50}$ of 60 dBA).<br>**Water Sources and Discharges:** Temporary and localized increases in noise levels during construction of water pipelines.<br>**Natural Gas Facilities:** Temporary and localized increases in noise levels during construction of natural gas pipelines.<br>**HVTL Corridors:** Temporary and localized increases in noise levels during construction of HVTLs. | **Transportation Facilities:**<br>Incremental rail noise increase may be discernable at residential noise receptors R1, R2, and R3 (ranging from 800 ft to 9,200 ft from the proposed plant site), but would be short-term (during construction only) and below the ATPA guideline of 70 dBA.<br>Train horns, as required under FRA regulations, would be adverse unavoidable impacts at grade crossings.<br>Access Roads:<br>There are no residences or sensitive noise receptors in proximity to the proposed access road intersecting CR 666.<br>**Water Sources and Discharges:** Temporary and localized increases in noise levels during construction of water pipelines.<br>**Natural Gas Facilities:** Temporary and localized increases in noise levels during construction of natural gas pipelines.<br>**HVTL Corridors:** Temporary and localized increases in noise levels during construction of HVTLs. |

**Acronyms:** ac – acre(s); alt. – alternative; ATPA – Andean Trade Preferences Act; BMPs – best management practices; BWCAW – Boundary Waters Canoe Area Wilderness; CAMR – Clean Air Mercury Rule; CMP – Canisteo Mine Pit; CO – carbon monoxide; $CO_2$ – carbon dioxide; CR – County Road; DAT – deposition analysis threshold; dBA – A-weighted decibels; EMF – electromagnetic field; FRA – Federal Railroad Administration; ft – feet; gpd – gallons per day; gpm – gallons per minute; $H_2S$ – hydrogen sulfide; HAP – hazardous air pollutant; HVTL – high voltage transmission line; IGCC – integrated gasification combined cycle; kg – kilogram; kV – kilovolt; LOS – level of service; m – meter; M – million; MAAQS – Minnesota Ambient Air Quality Standards; mi – mile(s); MPCA – Minnesota Pollution Control Agency; N – nitrogen; NAAQS – National Ambient Air Quality Standards; $NH_3$ – ammonia; $NO_x$ – nitrogen oxides; NPDES – National Pollutant Discharge Elimination System; NPS – National Park Service; NRHP – National Register of Historic Places; Pb – lead; $PM_{10}$ – particulate matter (aerodynamic diameter <10 µm); PSD – prevention of significant deterioration; RCRA – Resource Conservation and Recovery Act; ROW – right-of-way; S – sulfur; SEC – sediment and erosion control; SHPO – State Historic Preservation Office; $SO_2$ – sulfur dioxide; SWPPP – Stormwater Pollution Prevention Plan; tpy – tons per year; US – U.S. Highway; VNP – Voyageurs National Park; VOCs – volatile organic compounds; yd – yard; yr – year; ZLD – zero liquid discharge