

## **4.16 MATERIALS AND WASTE MANAGEMENT**

### **4.16.1 Approach to Impacts Analysis**

#### **4.16.1.1 Regions of Influence**

Two regions of influence were identified for evaluating impacts associated with materials and waste management at both the West Range and East Range Sites and the proposed corridors. The first region of influence was the area within the buffer land boundaries of each proposed site where the Mesaba Generating Station, access roads, and rail spurs would be located, as well as the construction ROWs along the proposed HVTL and gas pipeline corridors. A second, larger region of influence was also considered that included any potential off-site sources that could affect the West Range or East Range Sites, as well as the commercial availability of treatment, storage and disposal facilities located in Minnesota, Itasca County (West Range Site), St. Louis County (East Range Site), or out of state that could receive waste streams from the construction and operation of either site.

#### **4.16.1.2 Method of Analysis**

The potential for materials or waste to affect the environment was considered for both the construction phase and the operational phase. The analysis considered the types and quantities of materials expected to be used and stored for construction and operations, the quantity and type of non-hazardous and hazardous waste that would be generated from construction and operation, storage practices and containment, and whether available treatment, storage and disposal facilities had the capability and the capacity to accept the non-hazardous and hazardous waste generated.

The evaluation of potential impacts from the use of hazardous and non-hazardous materials or the generation of hazardous and non-hazardous waste considered whether the Proposed Action or an alternative would cause any of the following conditions:

- The use of hazardous materials would create reasonably foreseeable conditions that would increase the risk of a hazardous material release;
- The volume of solid waste generated would (directly or indirectly) affect the capacity of solid waste collection services and landfills;
- Wastes would be created for which there are no commercially available disposal or treatment technologies;
- The quantity of hazardous wastes generated would (directly or indirectly) affect the capacity of hazardous waste collection and disposal services; and
- Waste generation would create reasonably foreseeable conditions that would increase the risk of a hazardous waste release to the environment.

### **4.16.2 Common Impacts of the Proposed Action**

Potential impacts associated with the construction and operation of the proposed Mesaba Generating Station, access roads, rail lines, HVTLs, water lines, and gas pipeline corridors would, for the most part, be the same at either the West Range Site or the East Range Site. Therefore, common impacts associated with construction and operations are discussed in this section. Specific impacts from materials and waste management unique to the West Range Site and the East Range Site are discussed in Sections 4.16.3 and 4.16.4, respectively.

#### **4.16.2.1 Impacts of Construction**

Construction of Phase I and Phase II of the Mesaba Generating Station would occur over a period of **approximately six years between 2010 and 2016**. Construction activities would include the construction of the Phase I and Phase II Mesaba Generating Station and associated access roads and rail lines,

construction of the HVTL corridors, and construction of natural gas pipelines. Construction of the power plant, rail lines and access roads would occur within the buffer land boundary. Construction of the HVTLs, water lines, and gas pipelines would occur outside of the buffer land boundary as previously described in Chapter 2.

### **Construction Materials**

Construction materials would include water used for hydrotesting, diesel fuel, gasoline, cleaning materials, solvents, concrete, wood, metal, glass, construction equipment, power plant equipment, materials to operate and maintain equipment (oil, batteries, etc.), and other materials commonly used for building construction. Construction water would be supplied **as described in Section 4.14**. Gravel and road base would be used for temporary roads, material storage, and parking areas. General office materials such as paper, packaging, etc., would also be used. In addition to the materials listed, construction of the rail lines would require ballast, subballast, and railroad ties. Materials required for the construction of the HVTLs would include power lines and structures, and gas pipeline construction would require piping and welding materials in addition to the above-listed materials.

Construction materials would be delivered to the construction site (or to the gas pipeline and HVTL corridors) primarily by truck. Completion of the on-site rail spur would also allow rail deliveries to the site. Local, regional, or national suppliers would provide the necessary construction materials. Whenever feasible, supplies would be obtained from local suppliers.

Construction material storage areas would be located within the planned construction **staging and laydown areas described in Sections 2.2.4.1 and 2.3.1.1**. **The staging and laydown areas for Phase I plant construction would be established on the Phase II plant footprint. For Phase II construction, Excelsior would establish off-site construction staging and laydown areas comprising a total 85 acres of land in one or more locations. In identifying candidate locations, Excelsior considered properties owned by mineral extraction firms or tax forfeiture lands that have been cleared or disturbed during prior activities and, therefore, do not contain surface waters, wetlands, or sensitive natural resources. Candidate sites also have access to local roadways and are within a 10-mile radius of the respective plant footprint. Excelsior would select one or more of the candidate locations for staging and laydown use near the permitted generating station site prior to Phase II construction. Access to construction sites and staging areas would be controlled for personnel and vehicles by a security fence around the site boundary, and all construction materials would be stored within the secured fence area. Secondary containment would be provided for liquid hazardous material storage. Staging areas up to several acres also would be required along the HVTL and gas pipeline corridors for storing construction materials and equipment. These areas would be fenced to control access, and secondary containment would be provided for liquid hazardous material storage.**

Preventative measures such as providing fencing around the construction site, establishing contained storage areas, and controlling the flow of construction equipment and personnel would reduce the potential for a release to occur. In the event that a release should occur, immediate action would be taken to contain and clean up a release in accordance with Federal, state, and local regulations. Construction personnel would be trained in the proper handling and storage practices for construction materials, as well as the response to any leaks or spills during construction. **Among other requirements, the Mesaba Generating Station would be subject to an Emergency Response Program to be developed in compliance with OSHA Standard 1910.120, which would include an Emergency Response Plan (1910.120[q]) as explained in Section 4.13.**

## **Construction Waste**

### ***Non-Hazardous Waste***

Non-hazardous waste generated during construction would include trees and debris from site clearing activities, scrap materials, and sanitary waste. Table 4.16-1 lists the non-hazardous wastes and the quantities expected to be generated during construction **for each phase of the Mesaba Generating Station**. To the extent practical, surplus materials and non-hazardous wastes generated during construction would be recycled.

Solid waste and sanitary waste generated during construction would be limited to common construction-related waste streams. In-state or out-of-state landfills or recycling facilities would have the capability and capacity to accept these wastes.

### ***Hazardous Waste***

The primary hazardous wastes generated during construction would include spent hydrotest water, used oils, cleaning wastes and solvents, spent welding materials, used oil filters, fluorescent/mercury lamps, oily rags and absorbents, empty hazardous material containers, and used batteries. The quantity of each hazardous waste stream that would be generated during construction **for each phase of the Mesaba Generating Station** is shown in Table 4.16-1.

Based on the estimated quantities of hazardous waste that would be generated during construction, the Mesaba Generating Station could be regulated as a large-quantity generator of hazardous waste. Under RCRA of 1976, a large-quantity generator generates 1,000 kilograms per month or more of hazardous waste, or more than 1 kilogram per month of acutely hazardous waste. RCRA requirements for large-quantity generators include:

- May only accumulate waste on site for 90 days (certain exceptions apply).
- Do not have a limit on the amount of hazardous waste accumulated on site.
- Must always have at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. Large-quantity generators must have detailed, written contingency plans for handling emergencies.
- Must submit a biennial hazardous waste report that reports to EPA the generation, management, and final disposition of hazardous waste generated by the facility.

Hazardous waste generated during construction would be properly managed and stored on site in accordance with RCRA. Preventative measures such as providing fencing around the construction site, establishing contained storage areas, responding immediately to spills, and controlling the flow of construction equipment and personnel would help reduce the potential for a release to occur.

The quantity and type of hazardous waste that would be generated during construction would be limited to typical construction-related waste streams commonly accepted by treatment, storage and disposal facilities, and commercially available treatment or disposal would be available.

### **Non-Hazardous and Hazardous Waste Minimization and Storage**

To reduce the risk of a release of non-hazardous or hazardous construction wastes to the environment, an Environmental Management System and a Pollution Prevention/Waste Minimization Program would be developed, which would include an evaluation of alternatives to eliminate, reduce, or minimize the amounts of materials used and, subsequently, the amounts of wastes generated. Project planning would include reviews of forecasted hazardous material purchases and use, and the investigation of less-hazardous substitutes. Potential areas for source reduction and recycling would also be identified to reduce the quantity of materials used and waste generated. In accordance with state and county recycling goals, construction wastes would be reused or recycled whenever feasible.

**Table 4.16-1. Estimated Construction Waste Streams (Phase I and II)**

Waste Description	Approximate Quantity Per Phase	Likely Disposal or Treatment Method
<b>Non-Hazardous Solids</b>		
Site clearing – waste vegetation, salvageable timber, and miscellaneous debris clearing	Cut: 3,100,000 cubic yards (West Range Site) 3,349,000 cubic yards (East Range Site) Fill: 2,350,000 cubic yards (West Range Site) 1,146,000 cubic yards (East Range Site)	Sell salvageable timber for pulp and paper production, sell or donate waste wood for use as fire wood, mulch for recycle, or dispose in non-hazardous landfill. Reuse soils for berms and landscaping, mulch and recycle organic debris, recycle or landfill inorganic debris.
Scrap materials, debris, and trash (wood, metal, plastic, paper, packaging, office wastes, etc.)	40 cubic yards/week	Recycle or non-hazardous waste landfill
<b>Non-Hazardous Liquids</b>		
Sanitary waste from workforce (Portable chemical toilets)	400 gallons/day	Pumped and disposed by contractor
<b>Hazardous Solids</b>		
Spent welding materials	400 pounds/month	Hazardous waste landfill
Used oil filters	100 pounds/month	Hazardous waste landfill
Fluorescent/mercury vapor lamps	30 units/year	Recycle
Misc. oily rags, oil adsorbents	1 drum/month	Recycle or Hazardous waste landfill
Empty hazardous material containers	1 cubic yard/week	Hazardous waste landfill
Used lead/acid and alkaline batteries	1 ton/year	Recycle
<b>Hazardous Liquids</b>		
Used lube oils, flushing oils	10 drums/month	Recycle
Hydrotest water (One time during commissioning, reuse as practical, test for hazardous characteristics)	1.2 million gallons (total Phases I and II)	Hazardous – approved disposal facility Non-hazardous – drain to detention basin and release (need permit)
Steam turbine and HRSG cleaning wastes (Chelates, mild acids, Total suspended particulate matter, and/or EDTA - one time during commissioning)	700,000 gallons (total Phases I and II)	Approved hazardous or non-hazardous disposal facility
Solvents, used oils, paint, adhesives, oily rags	200 gallons/month	Recycle or approved hazardous waste disposal facility

Construction management personnel, contractors, and their employees would be responsible for minimizing the amount of waste produced by construction activities, and would be required 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 would include:

- Dedicated waste management areas and a system for waste management and segregation of incompatible wastes, with waste segregation occurring 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 or bins, and appropriate signage provided to clearly identify the category of each collection stockpile.
- Storage of hazardous wastes separate 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 inspections to verify that wastes are properly stored and covered to prevent accidental spills and releases.
- Appropriately labeled waste disposal containers.
- Good housekeeping procedures. Work areas would be left in a clean and orderly condition at the end of each working day, and surplus materials and waste would be transferred to the waste management area.
- Appropriate waste management training for the construction workforce.

Consistent with standard construction practices, a Spill Prevention, Control and Countermeasures (SPCC) Plan would be implemented that would include the use of secondary containment in storage and use areas, as well as best management practices and procedures for handling materials. Spill response kits would be available for use in the event of an accidental spill. In the event of a reportable release, notifications would be made to all applicable Federal (e.g., National Response Center), state (e.g., Minnesota Duty Officer), and local (e.g., Fire Department) agencies. Remediation activities, if necessary, would be done in accordance with all applicable Federal, state, and local regulations.

#### **4.16.2.2 Impacts of Operation**

##### **Operations Materials**

Once operational, the main materials used at the Mesaba Generating Station would include feedstock and natural gas. As described in Chapter 2, the power plant would be fuel flexible, using various fuels or blends of fuels, which would include bituminous coal (e.g., Illinois No. 6); sub-bituminous coal (e.g., Powder River Basin), petroleum coke blended up to 50 percent with coal, or other blends of these fuels. Phase I and II operations would utilize approximately 6 million tons of feedstock annually.

Though the primary fuel source for electric power production would be coal-derived, the Mesaba Generating Station would also be capable of operating on natural gas. Natural gas would be provided **as described in Section 4.14**. The maximum natural gas flow would be approximately 105 million standard cubic feet of gas per day per phase.

Hazardous materials that would be used or stored once the plant is operational include petroleum products, liquid oxygen and nitrogen, molten sulfur, catalysts, flammable and compressed gases, amine replacement and reclamation chemicals, water treatment chemicals, solvents, and paints. Table 2.2-8 provides a list of potentially hazardous materials that would be used and stored on site.

**Operations Material Storage**

Material storage requirements for feedstocks are shown in Table 4.16-2. The numbers presented are for each phase, with the total storage requirements for both phases being double those shown.

**Table 4.16-2. Feedstock Storage Requirements (Each Phase)**

<b>Material</b>	<b>Storage Requirements</b>
Coal Pile	<b>385,000 tons (20/25 days active/inactive storage based on maximum PRB1 coal usage);</b> Dust control; Water runoff control.
Petroleum Coke Pile	<b>105,000 tons (20/25 days active/inactive storage)'</b> Dust control; Water runoff control.
Flux Silo	<b>4,660 tons (20 days active storage).</b>
<b>Sulfur Tanks</b>	<b>Max 162 tons/day generated, based on Illinois No.6 coal (7 days on-site storage; 30 rail cars parked on site)</b>
<b>Slag Pile</b>	<b>34,800 tons (45 day storage, wet basis, using PRB2:PRB3 coal blend)</b>

Feedstocks would be delivered by rail cars that would be unloaded using a state-of-the-art rapid discharge rotary dumper with an automatic railcar positioner. Each rail car would be rotated 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.

Natural gas would be piped directly to the site (i.e., not stored on site). The gases that make up the syngas (carbon monoxide, hydrogen, and carbon dioxide) would be stored in pressurized gas tubes on a multi-tube trailer outdoors in accordance with required building and fire codes. Carbon dioxide would be stored and utilized for purging of the generators after normal and emergency shutdowns. Bulk quantities of liquid oxygen and nitrogen would be stored in tanks in the ASU.

Other gases (e.g., acetylene and oxygen) would be stored in approved standard-sized portable cylinders generally located at the point of use. Petroleum-containing materials such as lube oils, steam turbine hydraulic fluid, and transformer oils would be stored indoors in 55-gallon drums or in aboveground storage tanks. These materials would be delivered in approved containers, stored in areas with appropriate secondary containment, and 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 for potential leaks and to ensure they are working properly. Bulk chemicals, such as acids and bases for pH control, would be stored in appropriately designed tanks equipped with secondary containment and monitoring systems. Gaseous chlorine (used and stored in compliance with all applicable regulatory requirements) or hypochlorite bleach may be used for biological control of the various circulating water and cooling tower streams. Other water treatment chemicals would be stored in containers ranging from 55-gallon drums to 500-gallon tanks stored indoors or in secondarily contained outdoor storage areas. Smaller containers of miscellaneous oils, chemicals and cleaners would also be used and would be stored indoors in appropriate containers and storage locations.

Diesel fuel would be used for the emergency generator and for the fire-water pumps. The stored quantity would allow for approximately eight hours of operation of the diesel generator at full output (about 3 MW). Appropriate containment and monitoring for spill control would be provided.

An SPCC Plan would be implemented that would include the use of secondary containment in storage and use areas, as well as best management practices and procedures for handling materials. Spill response kits would be available for use in the event of an accidental spill. In the event of a reportable release,

notifications would be made to all applicable Federal (e.g., National Response Center), state (e.g., Minnesota Duty Officer), and local (e.g., Fire Department) agencies. Remediation activities, if necessary, would be done in accordance with all applicable Federal, state, and local regulations.

Preventative measures such as providing secondary containment would help reduce the potential for a release to occur. In the event that a release should occur, immediate action would be taken to contain and clean up a release in accordance with Federal, state and local regulations. Facility personnel would be trained in the proper handling and storage practices for materials used, as well as in spill response actions.

### **Operations Waste**

#### **Non-Hazardous Waste**

Non-hazardous waste generated during operations would, for the most part, be confined to the operation and maintenance of the Mesaba Generating Station. Only incidental amounts of non-hazardous waste would be generated from the operation of the HVTLs, gas pipelines, and rail lines from routine maintenance activities and clearing of vegetation.

**IGCC power plants do not produce the coal combustion ash associated with conventional coal-fired power plants.** Slag, a black non-hazardous glass-like material, would be the primary non-hazardous waste generated during operations. **Toxicity Characteristic Leaching Procedure test results for slag from the E-Gas™ process are provided in Table 4.16-3.** Depending upon the fuel being used, Phase I would produce between 500 and 800 tons of slag per day (both phases would produce twice that amount). During operations, 45-day storage would be provided for slag, which equates to a maximum of approximately 32,000 tons of slag being stored on site at any time for Phase I or 64,000 tons of slag for Phase I and II combined. Approximately 292,000 tons of slag would be generated annually per phase.

**Minnesota Rules 7035.2860 (Beneficial Use of Solid Waste) addresses standing beneficial use determinations in Subparagraph 4. Item K applies to the use of coal combustion slag as a component in manufactured products such as roofing shingles, ceiling tiles, or asphalt products. Item L applies to the use of coal combustion slag as a sand blast abrasive. The rules permit these uses as specified without contacting the MPCA.**

Although no large-scale market exists for slag at this time, successful applications of slag reported by the Wabash River **Project** include concrete cement feedstock, road construction applications (filler for asphalt, blasting grit), roofing material, structural fill, and alternative landfill cover. It has been determined that the blasting grit and roofing granules market provides the best opportunity at this time; however, the single local slag dealer contacted does not have the capacity to accept all of the slag generated from the Mesaba Power Plant. Additional slag dealers or blasting grit/roofing materials manufacturers would need to be identified to maximize marketing of slag (EERC, 2006). If the Mesaba Energy Project generates more slag than the market can accept, then the slag will be land filled. Two existing landfills (in Virginia and Canyon, MN) have roughly 8.7 million cubic yards of permitted capacity (combined), with land available for additional expansion beyond the currently permitted capacities. **If eventually expanded, these landfills would require approval through the state permitting process.**

Elemental sulfur will also be generated as a **non-hazardous** byproduct of power plant operations **and stored in molten form.** It is estimated that approximately 60,000 tons of sulfur would be generated per year per phase of the project. In the United States, production of sulfuric acid is the major use of elemental sulfur, accounting for 90 percent of elemental sulfur consumption. **For comparison, the Wabash River Project reportedly markets its high-purity elemental sulfur in the agricultural chemicals market.** Excelsior is in the process of identifying local markets for elemental sulfur, most likely within the fertilizer manufacturing industry, which utilizes elemental sulfur for manufacture of sulfuric acid (EERC, 2006).

<b>Table 4.16-3 Toxicity Characteristic Leaching Procedure test results for E-Gas™ Slag</b>		
<b>Toxicity Characteristic Leaching Procedures</b>	<b>RCRA Regulatory Level, mg/l</b>	<b>Leachate from E-Gas Slag, mg/l</b>
<b>Metals</b>		
Arsenic	5	<0.5
Barium	100	<0.5
Cadmium	1	<0.5
Chromium	5	<0.1
Lead	5	<1
Mercury	0.2	<0.002
Selenium	1	<0.1
Silver	5	<0.1
<b>Organics</b>		
Pyridine	5	<0.5
1,4-Dichlorobenzene	7.5	<0.5
o-Cresol	200	<0.5
m- & p- Cresol	200	<0.5
Hexachloroethane	3	<0.5
Nitrobenzene	2	<0.5
Hexachloro-1,3-butadiene	0.5	<0.5
2,4,6-Trichlorophenol	2	<0.5
2,4,5-Trichlorophenol	400	<0.5
2,4-Dinitrotoluene	0.13	<0.5
Hexachlorobenzene	0.13	<0.5
Pentachlorophenol	100	<0.5
<b>Volatile Organics</b>		
Vinyl Chloride	0.2	<0.005
1,1-Dichloroethylene	0.7	<0.005
Methyl Ethyl Ketone	200	<0.005
Chloroform	6	<0.005
1,2-Dichloroethane	0.5	<0.005
Benzene	0.5	<0.005
Carbon Tetrachloride	0.5	<0.005
Trichloroethylene	0.5	<0.005
Tetrachloroethylene	0.7	<0.005
Chlorobenzene	100	<0.005
1,4-Dichlorobenzene	7.5	<0.005

Source: Excelsior Energy. 2006a

Other non-hazardous solid wastes generated annually during operation of Phase I and Phase II would include refractory brick and insulation from gasifier repairs (360 tons), spent catalyst materials associated with the COS hydrolysis and SRU systems (approximately 70 tons), scrap metal (200 cubic yards), waste paper and cardboard (320 cubic yards), and combined industrial waste (320 cubic yards) as shown in Table 4.16-4. Non-hazardous solid wastes would be recycled or reused on site when possible. If recycling or reuse were not feasible, non-hazardous solid waste would be disposed of at an off-site non-hazardous waste landfill.

Sanitary wastewater generated during operation of the Mesaba Generating Station **is addressed in Section 4.14.** [Text in the Draft EIS on this subject has been deleted at this point.]

### ***Hazardous Waste***

Table 4.16-4 summarizes the expected hazardous waste streams that would be generated during Mesaba Generating Station operation. **The wastes generated for the Mesaba Energy Project Phase I would be approximately half the quantities listed for the combined Phases I and II.** Hazardous waste generated during operations would be limited, for the most part, to the operation of the generating station. Any hazardous waste generated from the operation and maintenance of the HVTLs, gas pipelines, and rail lines would likely be limited to small amounts of oils and cleaning solvents generated from the maintenance of equipment.

Operational hazardous wastes would include ZLD filter cake; process waste sludges, residues, and spent cleaning materials (acids and ash); used oils and fluids; and cleaning and maintenance wastes. The predominant hazardous wastes generated annually would include spent sulfuric acid (14,000 gallons) and ZLD filter cake (4,400 tons **per year from treatment of process water and an additional <24,500 tons per year from treatment of cooling tower blowdown water**). Spent sulfuric acid would be disposed of off site at a licensed disposal facility. [Text addressing sulfur in the Draft EIS has been deleted at this point and relevant information has been added to the preceding subsection] 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. Other hazardous wastes generated would be recycled, treated, or disposed of at a permitted hazardous waste landfill.

Due to the quantity of hazardous waste generated, the Mesaba Generating Station would likely be regulated as a large-quantity generator of hazardous waste and would need to adhere to the requirements under RCRA for the handling **of generated hazardous waste**. Hazardous waste generated during operations would be properly managed and stored on site in accordance with RCRA and Minnesota regulations (Minnesota Rules, Chapter 7045).

The quantity and type of hazardous waste that would be generated during operations would be accepted by treatment, storage and disposal facilities, and therefore, commercially available treatment or disposal would be available. Although specific hazardous waste landfills have not been identified, Excelsior is currently negotiating with a waste management company that operates 13 permitted hazardous waste treatment, storage and disposal facilities throughout the U.S., which can accept the types of wastes expected from construction and operation of the Mesaba Generating Station. The nearest permitted facilities operated by this company are located within eastern Wisconsin.

### ***Waste Minimization and Storage***

The Mesaba Generating Station would be designed to minimize process-related discharges to the environment compared to other coal-powered plants. For instance, the use of a ZLD process would prevent the discharge of heavy metals and other gasification wastes in wastewater. The advanced features of E-Gas™ technology would also eliminate two solid waste streams (flue gas desulfurization solids and ash) associated with some other types of coal-based power generation. Table 2-2.6 lists the storage, waste minimization, or recycling processes that would be incorporated into the design of the Mesaba Generating

Station to further minimize generation of waste. In accordance with state and county recycling goals, whenever possible, operational wastes would be reused or recycled.

**Table 4.16-4. Annual Quantity of Non-Hazardous and Hazardous Waste Generated from Phase I and Phase II Operations**

Waste Description	Comments	Annual Quantity <sup>a</sup>	Status <sup>b</sup>	Likely Disposal or Treatment Method
<b>Used Catalysts and Sorbents</b>				
COS hydrolysis catalyst	Proprietary composition	42 tons	NH	Non-hazardous landfill
Hydrolysis catalyst support balls	Alumina silicate	14 tons	NA	Recycle
Claus sulfur recovery catalyst	Activated alumina	28 tons	NH	Non-hazardous landfill
Claus catalyst support balls	Activated alumina	10 tons	NA	Recycle
Hydrogenation catalyst	Cobalt molybdenum	6 tons	NA	Metals reclaim
Hydrogenation. catalyst support balls	Alumina silicate	2 tons	NA	Recycle
Amine regenerator carbon filter	Activated carbon	26 tons	H	Stabilize, hazardous waste landfill
Syngas treatment carbon	Activated carbon	60 tons	H	Stabilize, hazardous waste landfill
Mercury removal carbon	Impregnated carbon	14 tons	H	Stabilize, hazardous waste landfill
Sour water carbon	Activated carbon	48 tons	H	Stabilize, hazardous waste landfill
MDEA reclaim ion exchange	Ion exchange resin	0.4 tons	NH	Non-hazardous waste landfill
<b>Other Process Wastes</b>				
Slag	IGCC by-product	584,000 tons	NH	Market for reuse or landfill
Elemental Sulfur	IGCC by-product	120,000 tons	NH	Market for reuse or off-site treatment
ZLD filter cake (Gasification Island)	Inorganic and organic salts	4,400 tons	H	Stabilize, hazardous waste landfill
ZLD filter cake ( <b>Cooling Tower Blowdown</b> )	Inorganic and organic salts	<24,500 tons	<b>NH<sup>c</sup></b>	<b>Characterize, dispose as non-hazardous or hazardous wastes</b>
Refractory brick and insulation	Gasifier repairs	360 tons	NH	Non-hazardous waste landfill

**Table 4.16-4. Annual Quantity of Non-Hazardous and Hazardous Waste Generated from Phase I and Phase II Operations**

Waste Description	Comments	Annual Quantity <sup>a</sup>	Status <sup>b</sup>	Likely Disposal or Treatment Method
MDEA sludge	Reclaimer bottoms	10,000 gallons	H	Incinerate or hazardous waste landfill
Sour water sludge	Char carryover in syngas	30 tons	H	Incinerate
Waste char and ash	Maintenance cleaning	160 tons	NH	Non-hazardous waste landfill
Amine absorber residues	Iron and salts	20 cubic yards	NH	Non-hazardous waste landfill
<b>Other Process Wastes</b>				
Metallic filter elements		60 cubic yards	H	Stabilize, hazardous waste landfill
Spent citric acid	Cleaning solution	40 drums	H	Approved disposal facility
Spent soda ash	Cleaning solution	40 drums	H	Approved disposal facility
Spent sulfuric acid	Line cleaning solution	14,000 gallons	H	Approved disposal facility
Off-line combustion turbine wash wastes	Detergent and residues	15,000 gallons	NH <sup>c</sup>	Characterize, dispose as non-hazardous or hazardous wastes
HRSG wash water (infrequent)	Detergent, residues, neutralized acids	100,000 gallons	NH <sup>c</sup>	Characterize, dispose as non-hazardous or hazardous wastes
Raw water treatment sludge and used water filter media	Solids removed from makeup water to plant	TBD	NH <sup>c</sup>	TBD

**Table 4.16-4. Annual Quantity of Non-Hazardous and Hazardous Waste Generated from Phase I and Phase II Operations**

Waste Description	Comments	Annual Quantity <sup>a</sup>	Status <sup>b</sup>	Likely Disposal or Treatment Method
<b>Miscellaneous Streams</b>				
Used oil	Lube oils, oil from oil/water separator	8,000 gallons	NA	Send to reclaimer
Spent grease		16 drums	NH	Blend to gasifier feed
Miscellaneous solvents, coal tars		2 drums	H	Solvent reclaimer
Flammable lab waste		2 drums	H	Blend to gasifier feed
Scrap metal	Steel, aluminum, etc.	200 cubic yards	NH	Recycle
Waste paper and cardboard	Office, shops, packing, etc.	320 cubic yards	NH	Recycle
Combined industrial waste	Used PPE, materials, small amounts of refractory, slurry debris, etc.	320 cubic yards	NH	Non-hazardous waste landfill

Notes:

<sup>a</sup> **Approximate quantities for Phases I and II combined of the Mesaba Generating Station. A Phase I power plant alone would generate approximately half these amounts.**

<sup>b</sup> NH= non-hazardous, H=hazardous, NA=not applicable (**subject to recycling rules**)

<sup>c</sup> This waste stream would likely be non-hazardous, however, testing would have to be done to determine if it exhibits hazardous waste characteristics

To reduce the risk of a hazardous substance release to the environment, an Environmental Management System and a Pollution Prevention/Waste Minimization Program would be developed during the planning, construction, and operational phases, which would include an evaluation of alternatives to eliminate, reduce, or minimize the amounts of hazardous materials used and hazardous wastes generated. Project planning would include reviews of forecasted hazardous material purchases and use, and the investigation of less-hazardous substitutes. Potential areas for source reduction and recycling could also be identified to reduce the quantity of materials used and waste generated.

In addition, the SPCC Plan would anticipate contingency spill events, thereby protecting environmental media from the effects of accidental releases. All aboveground storage tanks would be lined or paved, curbed/diked, and have sufficient volume to meet all regulatory requirements. The plant would have a drainage plan that would isolate routine, process-related operations from affecting the surrounding environment. 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 protective equipment training, and accidental release reporting requirements. The Mesaba Generating Station would comply with all applicable OSHA hazardous material requirements. **An Emergency Response Plan would be required by OSHA Standard 1910.120[q] as explained in Section 4.13.** Emergency services would be coordinated with local fire departments, police departments, paramedics, and hospitals. A first aid office would be maintained on site for minor first aid incidents. Trained/certified Health Safety and Environmental personnel would be continuously on site to respond to and coordinate emergencies.

Waste minimization and pollution prevention programs would be implemented, and 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. A comprehensive secondary containment program would ensure that appropriate tanks, walls, dikes, berms, curbs, etc., would be used to provide adequate secondary containment for liquid storage. Worker training and safety programs would be established to ensure that workers are aware and knowledgeable of spill containment procedures and related health and environmental protection policies.

### **4.16.3 Impacts on West Range Site and Corridors**

#### **4.16.3.1 Impacts of Construction**

No additional materials would be used or wastes generated during construction of the West Range Site other than those described in Section 4.16.2.1. The quantity of solid waste generated would be more than for the East Range Site because the HVTL alternatives would be located on more new ROW than for the East Range Site; therefore, more clearing of trees and vegetation would likely be required.

Based on the conclusions of a Phase I assessment performed for the West Range Site (described in Section 3.16.2.1) (SEH, 2005a), several on-site and off-site areas of potential concern were identified that could be affected by the West Range Site. The Phase I Site Assessment identified solid waste (trash, batteries, old equipment) on and adjacent to the site, and stained areas along railroad ties located along the eastern boundary of the West Range Site. During construction, any such materials located within the construction site would be removed and disposed of properly, and would not have an adverse impact on construction of the site. If any evidence of a release from these materials at the site were noted during construction (stained soil or stressed vegetation), the affected soil or vegetation would be removed from the site, necessary remediation or cleanup would be conducted, and removed materials would be disposed of properly. A Phase I assessment was not performed for the HVTLs and gas pipeline corridors that would be associated with the West Range Site.

Based on information available from MPCA, two closed landfills are located in Itasca County: the Iron Range Sanitary Landfill and the Grand Rapids Landfill. The Iron Range Sanitary Landfill is located along the southern border of the West Range Site adjacent to the Itasca County Transfer Station, and the Grand Rapids landfill is located approximately 10 miles southwest of the West Range Site. Exceedances of VOCs and metals were detected in monitoring wells at the Iron Range Landfill during 2002 to 2003 (MPCA, 2004a). Based on the MPCA report, groundwater flow from the landfill is to the south/southeast away from the West Range Site; therefore, West Range Site groundwater conditions would not be expected to be affected by the closed landfill. The closed Grand Rapids Landfill is located approximately 10 miles to the southwest of the West Range Site and would not affect the West Range Site.

#### **4.16.3.2 Impacts of Operation**

The West Range Site would not use any materials or generate any additional non-hazardous or hazardous wastes other than those presented in Section 4.16.2.1. No adverse impacts would be expected to occur from the operation of the proposed Mesaba Generation Station at the West Range Site beyond those discussed in Section 4.16.2, Common Impacts of the Proposed Action.

#### **4.16.4 Impacts on East Range Site and Corridors**

##### **4.16.4.1 Impacts of Construction**

No additional materials would be used or wastes generated during construction of the East Range Site other than those described in Section 4.16.2.1. The quantity of non-hazardous solid waste generated would be less for the East Range Site than for the West Range Site because the HVTLs would be located along existing utility lines and therefore, less clearing of trees and vegetation would likely be required for the East Range Site.

One closed landfill, the Hoyt Lakes Sanitary Landfill, is located approximately 3,000 feet south of the East Range Site along Hoyt Lakes Road. Groundwater monitoring has detected low levels of intermittent VOCs in the groundwater beneath the closed landfill site (MPCA, 2006d). Groundwater in the area flows southward; therefore, East Range Site groundwater conditions would not be expected to be affected by the closed landfill.

##### **4.16.4.2 Impacts of Operation**

The East Range Site would not use any materials or generate any additional non-hazardous or hazardous wastes other than those presented in Section 4.16.2.2. **[Text in the Draft EIS pertaining to the use of an enhanced ZLD system exclusively at the East Range Site has been deleted at this point]** No adverse impacts would be expected to occur from the operation of the proposed Mesaba Generating Station at the East Range Site beyond those discussed in Section 4.16.2, Common Impacts of the Proposed Action.

#### **4.16.5 Impacts of the No Action Alternative**

For the purposes of this EIS, as explained in Section 2.1.1.2, the DOE No Action Alternative is assumed to be equivalent to a “No Build” Alternative. Under the No Action Alternative, materials would not be delivered and stored for the construction or operation of the Mesaba Generating Station, access roads, rail lines, HVTLs, or gas pipelines. Subsequently, no non-hazardous or hazardous waste would be generated from the construction or operation of the Mesaba Generating Station.

### 4.16.6 Summary of Impacts

Basis for Impact	No Action	West Range	East Range
Create reasonably foreseeable conditions that would increase the risk of a hazardous material release.	No increase in the risk of a hazardous waste release.	Proper handling and storage of wastes in accordance with RCRA would be adhered to minimize potential for a release of a hazardous material to the environment.	Proper handling and storage of wastes in accordance with RCRA would be adhered to minimize potential for a release of a hazardous material to the environment.
Volume of solid waste generated would directly or indirectly affect the capacity of solid waste collection services and landfills.	No solid waste would be generated.	In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated.  Additional market analysis would be required to secure a market and avoid disposal of slag (500-800 tons per day generated).	In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated.  Additional market analysis would be required to secure a market and avoid disposal of slag (500-800 tons per day generated).
Wastes would be created for which there are no commercially available disposal or treatment technologies.	No wastes would be generated.	Commercially available treatment, stabilization, or disposal for waste streams generated.	Commercially available treatment, stabilization, or disposal for waste streams generated.
Quantity of hazardous waste generated would directly or indirectly affect the capacity of hazardous waste collection and disposal services.	No hazardous wastes would be generated.	In-state or out-of-state hazardous waste collection services and treatment, stabilization or disposal facilities would have the capability and capacity to accept hazardous wastes generated.	In-state or out-of-state hazardous waste collection services and treatment, stabilization or disposal facilities would have the capability and capacity to accept hazardous wastes generated.
Waste generation would create reasonably foreseeable conditions that would increase the risk of a hazardous waste release to the environment.	No hazardous wastes would be generated.	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.	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.

## 4.17 SAFETY AND HEALTH

### 4.17.1 Approach to Impacts Analysis

#### 4.17.1.1 Region of Influence

The public health and safety region of influence consists of the persons residing within 3 kilometers (1.9 miles) of the proposed IGCC facility footprint (for air emissions); public roads and at-grade crossings near the proposed plant sites (for transportation safety); and residences adjacent to proposed HVTLs and natural gas corridors. Safety of on-site workers (construction and operation) is also evaluated.

#### 4.17.1.2 Method of Analysis

Human health and safety-related impacts were considered from both contaminant exposure and worker safety perspectives. Methods to assess worker safety-related impacts were based on application of accident and incident rate data as described in Section 3.17 for activities that are expected to be associated with the Proposed Action.

Transportation safety issues related to traffic accidents were evaluated by using the average traffic fatality rate for the state of Minnesota. The estimated number of potential vehicular traffic fatalities was based on assuming a total distance traveled from workers commuting during both the construction and operational phases. Based on Mn/DOT traffic accident data over the years 2001 through 2005, an average fatality rate of 1.2 per 100 million vehicle miles traveled was used to predict fatalities as a result of the Proposed Action during construction and operations. Regarding rail transport and at-grade crossings, safety impacts as a result of increased rail activity from the project are discussed in a qualitative manner.

An AERA was conducted on the Mesaba Energy Project (see Appendix C) to identify the sources or groups of sources, chemicals, and associated pathways that may pose a risk to the public as a result of air emissions. The AERA, as prescribed by the MPCA, includes both quantitative and qualitative evaluation of emissions and potential **exposure** pathways.

Since emission source stacks for the plant would be less than 100 meters in height, the AERA evaluation was completed for an area within a 3-kilometer radius of the proposed facility emission points (MPCA, 2004b). Several methods of quantitative analysis were conducted.

The first method was to estimate risk using the Risk Assessment Screening Spreadsheet (RASS) developed by MPCA. The RASS method is used to predict both acute and sub-chronic risks associated with the facility, and as a screening tool it uses very conservative default dispersion assumptions.

The second method, the **Q/CHI** approach, estimates risk from each emission source stack by computing a **Q/CHI** quotient for the chemicals of concern. The **Q/CHI** has several advantages over the RASS, in that it models dispersion specific to each emission unit, automatically calculates hazard indices with respect to time and space, and takes into consideration exhaust parameters (exit velocities and temperatures) and terrain.

In both the RASS and **Q/CHI** methods, risk due to the inhalation pathway is estimated for chemicals causing carcinogenic and non-carcinogenic effects. Risk at any location is additive for all sources. Risk levels for chemicals having cancer endpoints are considered to be within U.S. EPA standards if an individual chemical produces a cancer risk less than one in one million ( $10^{-6}$ ) and an individual chemical, having non-cancer endpoints, produces a hazard index less than 0.1 (EPA, 2005). Also, if the sum of the individual chemical cancer risks is less than one in 100,000 ( $10^{-5}$ ) and the sum of the individual non-cancer hazard quotients (hazard index) is less than 1, risk is also considered to be within U.S. EPA standards.

A third method, the Industrial Risk Assessment Program (IRAP) – Health View model, was used to predict chronic risks. IRAP was developed by Lakes Environmental Software, Inc., to comply with the

requirements of the U.S. EPA Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities guidance document (EPA, 2005). This complex protocol was developed to estimate human health risk at hazardous waste combustion facilities from multi-pathway exposure to chemicals released to the ambient air. With IRAP, risk is predicted via direct (inhalation) and indirect (ingestion of or contact with soil, plants, fruits, vegetables, beef and milk, chicken and eggs, and fish) pathways for each scenario (resident adult, resident child, farmer adult, etc.) specified. Worst-case annual emission rates are used in the IRAP evaluation.

Risk associated with ingestion of fish tissue potentially contaminated with mercury was evaluated using the MPCA’s Draft Mercury Risk Estimation Method for the Fish Consumption Pathway (Local Impacts Assessment) (MPCA, 2006f). The method combines current fish tissue mercury concentrations with potential increases in atmospheric deposition to arrive at an estimate of future methylmercury tissue concentrations. Risk from ingestion of fish tissue potentially affected by other contaminants of concern associated with the facility was also evaluated using the IRAP model.

Emission rates for **chemicals of potential concern** were estimated using the following sources (listed in order of preference):

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

The chemicals of potential concern evaluated in the AERA are shown in Table 4.17-1. **Based on comments from MPCA, the emission rates were revised to reflect additional conservatism for the purposes of risk assessment.** Table 4.17-2 shows the exposure pathways evaluated.

**Table 4.17-1. Chemicals Evaluated in the AERA (Phases I and II)  
 Reflecting Additional Conservatism for Risk Assessment**

Compound	Total Phase I Tons/year	Phase I and Phase II Tons/year
Acetaldehyde	0.045	0.089
Acetophenone	0.022	0.045
Acrolein	0.44	0.87
Antimony	0.030	0.059
Arsenic	0.11	0.21
<b>Benz[a]anthracene</b>	<b>5.7E-05</b>	<b>1.1E-04</b>
Benzene	0.52	1.0
<b>Benzo(k)fluoranthene</b>	<b>1.6E-04</b>	<b>3.2E-04</b>
<b>Benzo[a]pyrene</b>	<b>5.7E-05</b>	<b>1.1E-04</b>
Benzyl chloride	1.0	2.1
Beryllium	0.006	0.013
Biphenyl	0.003	0.005
Bis(2-ethylhexyl)phthalate (DEHP)	0.11	0.22

**Table 4.17-1. Chemicals Evaluated in the AERA (Phases I and II)  
 Reflecting Additional Conservatism for Risk Assessment**

Compound	Total Phase I Tons/year	Phase I and Phase II Tons/year
Bromoform	0.057	0.11
Cadmium	0.46	0.92
Carbon disulfide	1.1	2.29
Carbonyl sulfide	0.000	0.000
Chloroacetophenone, 2-	0.010	0.020
Chlorobenzene	0.032	0.065
Chloroform	0.089	0.18
Chromium, total	0.018	0.036
Chromium, (trivalent)	0.013	0.027
<b>Chromium, (hexavalent)</b>	<b>0.005</b>	<b>0.011</b>
<b>Chrysene (Benzo(a)phenanthrene)</b>	<b>1.5E-04</b>	<b>3.0E-04</b>
Cobalt	0.023	0.046
Cumene	0.008	0.016
Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	0.18	0.36
Dimethyl sulfate	0.072	0.14
Dinitrotoluene, 2,4-	4.3E-04	8.5E-04
Ethyl benzene	0.48	0.95
Ethyl chloride (Chloroethane)	0.062	0.12
Ethylene dibromide (Dibromoethane)	0.002	0.004
Ethylene dichloride (1,2-Dichloroethane)	0.060	0.12
Formaldehyde	0.43	0.85
Hexane	0.10	0.20
Hydrochloric acid	0.097	0.19
Hydrogen fluoride (Hydrofluoric acid)	1.2	2.4
<b>Indeno(1,2,3-cd)pyrene</b>	<b>9.2E-05</b>	<b>1.8E-04</b>
Isophorone	0.87	1.7
Lead	0.22	0.044
Manganese	0.046	0.092
Mercury	0.017	0.035
Methyl bromide (Bromomethane)	1.3	2.6
Methyl chloride (Chloromethane)	0.82	1.6
Methyl chloroform (1,1,1 -Trichloroethane)	0.029	0.059
<b>Methylchrysene, 5-</b>	<b>3.2E-05</b>	<b>6.5E-05</b>

**Table 4.17-1. Chemicals Evaluated in the AERA (Phases I and II)  
 Reflecting Additional Conservatism for Risk Assessment**

Compound	Total Phase I Tons/year	Phase I and Phase II Tons/year
Methyl ethyl ketone (2-Butanone)	0.59	1.2
Methyl hydrazine	0.25	0.51
Methyl methacrylate	0.029	0.059
Methyl tert butyl ether	0.052	0.10
Methylene chloride (Dichloromethane)	0.059	0.12
Naphthalene	0.081	0.16
Nickel	0.057	0.11
Phenol	1.9	3.8
Propionaldehyde	0.57	1.1
Selenium	0.025	0.049
Styrene	0.037	0.075
<b>Sulfuric acid and sulfates</b>	<b>62.8</b>	<b>125.6</b>
<b>2,3,7,8-Tetrachlorodibenzo-pdioxin (as equivalents)</b>	<b>1.7E-09</b>	<b>3.5E-09</b>
Tetrachloroethylene (Perchloroethylene)	0.064	0.13
Toluene	0.098	0.20
Vinyl acetate	0.011	0.022
Xylenes	0.17	0.33

HAP – Hazardous Air Pollutant

**Table 4.17-2. IRAP Exposure Pathways Evaluated**

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

In response to comments by MPCA on the Draft EIS, a more conservative basis was established for the AERA emissions inventory and is reflected in the information presented in Table 4.17-1. Specifically, the highest measured value of any chemicals of potential concern quantified in a valid stack test was used instead of the average of several valid tests (chemicals of potential concern emission rates were derived by averaging the results from valid stack tests at the Wabash River Plant).

The AERA determined that chemicals of potential concern emissions at the Mesaba Generating Station would be reduced by the inherently low polluting IGCC technology and many of the same process features that control criteria emissions. A large portion of the heavy metals and other undesirable constituents of the feedstock would be immobilized in the non-hazardous, vitreous slag by-product and prevented from causing adverse environmental effects. Gaseous and particle-bound chemicals of potential concern that may be contained in the raw syngas exiting the gasifiers will be totally or partially removed in the syngas particulate matter removal system, water scrubber, and AGR systems.

#### **4.17.1.3 Evaluation of Impacts**

The evaluation of potential impacts on public safety and health considered whether the Proposed Action or an alternative would cause any of the following conditions:

##### Construction and Operational Safety

- Increase the risk to worker safety and health during facility construction and/or operation.

##### Transportation Safety

- Increase traffic fatalities.
- Increase safety risks for at-grade rail crossings.

##### Community Health Risks

- Create a cancer risk to the public exceeding one in one million ( $10^{-6}$ ) for an individual chemical or a risk exceeding one in 100,000 ( $10^{-5}$ ) for the sum of individual chemicals (EPA, 2005).
- Create a non-cancer health (morbidity) risk to the public as expressed by a hazard index exceeding 0.1 for an individual chemical or exceeding 1.0 for the sum of individual chemicals (EPA, 2005).
- Create an incremental health risk to subsistence fishers as expressed by a hazard index exceeding 1.0 for mercury via the fish ingestion pathway (MPCA, 2006f).
- Create a risk to public health and safety from EMF exposure.
- Create a risk to public health and safety from exposure to charged particulates.

### **4.17.2 Common Impacts of the Proposed Action**

#### **4.17.2.1 Worker Safety**

##### **Construction and Operation Safety Statistics**

Worker safety-related impacts associated with the Proposed Action would be associated with facility construction, operation of industrial equipment, and transportation of materials and wastes to and from the sites. For these project-related areas, notable differences are not expected between the two alternative site locations. Therefore, a comparative discussion of worker safety-related impacts is not provided in this section. Based on the incident rates developed by the Bureau of Labor Statistics (see Section 3.17), the potential for work-related incidents and accidents are presented in Table 4.17-3.

**Table 4.17-3. Predicted Incidents for the Proposed Action**

Industry	Estimated Number of Workers	Potential for Recordable Incidents per Year	Potential Lost Workday Cases per Year	Potential Number of Fatalities (based on rate per 100,000 FTEs)
Construction (peak)	2,985	173	66	<1 (0.4)
Utilities (nominal)	107	3	<1	< 1 (0.01)

**Coal Gasification Plant Health and Safety Risk Factors**

In 1978, the National Institute for Occupational Safety and Health issued a publication on the occupational exposures in coal gasification plants (NIOSH, 1978). This document does not necessarily reflect the decades of advances in coal gasification technology, including the combined-cycle process that would be included in the Mesaba Energy Project. However, it provides useful information regarding the types of occupational health and safety factors associated with coal gasification plants.

According to **the National Institute for Occupational Safety and Health**, a significant source of worker exposure in all coal gasification plants would be periodic, unpredictable leaks from process lines, vessels, flanges, valves, pumps, and other equipment (NIOSH, 1978). Design and operational measures that can reduce accidents may include performing routine inspections of equipment and process lines, providing adequate general ventilation in closed process areas, designing relief valves piped to emergency vents away from work spaces, isolating hot process equipment or lines to prevent contact, and installing automatic gas leak monitoring systems and alarms. Noise can present significant chronic and acute health hazards to workers unless adequate controls are integrated into plant design, and unless such controls are satisfactorily maintained and strictly enforced (NIOSH, 1978).

The principal occupational hazards associated with coal handling (excluding mining) result from chronic dust inhalation, fire, and explosions. To reduce dust dispersion, coal should be stored in closed bins or silos and kept thoroughly moistened during handling and transport.

**4.17.2.2 Transportation Risks**

**Estimated Fatalities During Construction and Operation**

During the construction and operation phases, personnel and material would be moved by personal vehicles and trucks. Such movements of personnel and material could lead to roadway accidents.

It is estimated that there would be a maximum of 1,500 personnel on site during the peak construction period. The accident analysis performed in this section assumes an average of 700 workers per month over a five-year construction period (including Phase I and II construction and material transport). It is assumed that each worker would make two trips per day over six days a week each year. To provide a conservative upper bound estimate of roadway accidents, it was assumed that all workers would individually make daily vehicle trips of 50 miles per day on roadways (same for both West Range and East Range Sites), even though it is likely that many construction workers would reside closer to the project sites and carpool often with other workers. If each trip is assumed to be 50 miles in length, then collectively, over the five-year period, the total number of miles driven by all workers would be approximately 101 million miles.

Based on a fatal accident rate of 1.2 fatalities per 100 million vehicle miles traveled, approximately 1.2 fatalities could occur due to the movement of workers and material via trucks and personal vehicles during construction (estimate is same for both West Range and East Range Sites).

During operations, it is assumed that approximately 107 employees would be required for Phase I and 75 employees for Phase II, for a total of 182. Assuming every employee travels an average of 50 miles per day to work, five days per week for 48 weeks a year, this would collectively total approximately 44 million miles traveled over a 20-year period over operations. Based on a fatal accident rate of 1.2 fatalities per 100 million vehicle mile traveled, approximately 0.53 fatalities could occur due to the travel of workers during operation (estimate is same for both West Range and East Range Sites).

### **Rail Transport and At-Grade Crossing Safety During Construction and Operation**

Concerning safety issues, particular attention is paid to public at-grade rail-highway crossings because of the project's use of the rail transport of material inputs and outputs. It is anticipated that a unit train could include up to 135 cars (approximately 8,000 feet total length) with an average unit train comprising 115 cars. Most of the trains in the region travel at speeds of up to 25 miles per hour. Therefore, 115- and 135-car unit trains could take approximately three and four minutes, respectively, to clear a public at-grade crossing, which would cause delays for local emergency vehicles (see Section 4.11, Community Services).

The examination of at-grade crossing safety typically considers the expected numbers and locations of grade crossings, the volume of both vehicle and rail traffic at crossings, the nature of road traffic (e.g., trucks versus passenger vehicles), the design and safety features of the crossings, and train and vehicle speeds in the vicinity of any crossings.

Because the transport of coal from the PRB to the northeastern Minnesota region is approximately 1,200 miles long, it traverses many public at-grade crossings and any addition of train trips would increase the likelihood of crossing accidents within this existing rail corridor. Up to one roundtrip (i.e., two train trips) a day is anticipated for Phase I, and for Phase II, up to two roundtrips (i.e., four train trips) are anticipated. As discussed in Section 4.15.2.2, the proposed incremental increase to train traffic would not be significantly different in comparison to existing rail conditions given the highly active and well established coal production and rail activities in the region. Therefore, the increase in safety hazards within the existing rail route is expected to be minimal.

The location of at-grade crossings on rail routes near the West Range and East Range Sites were identified in Sections 3.15.3.2 and 3.15.3.3, respectively. Since the frequency of train trips for both Phases I and II is considered a relatively low number and the vehicular traffic volumes are considered low to moderate at these crossings, the increase in safety hazards at the rail crossings would be low. In general, details on the operating characteristics of the trains are unknown at this time; however, it is expected that the proposed rail operations for transport of coal and other potential materials would coordinate with other rail transport movements and rail travel would occur at recommended speeds of up to 25 miles per hour, and therefore, would minimize potential rail accidents at both project sites.

### **4.17.2.3 Human Health Risks**

#### **Carcinogenic and Non-Carcinogenic Morbidity Risks**

Human health risks are generally evaluated in comparison to thresholds established by regulatory agencies, including EPA and MPCA, having jurisdiction for standards of exposure. A threshold is determined by the concentration of a chemical or airborne particle below which no appreciable adverse health effects are expected to occur. Examples of thresholds include reference doses, Health Advisories, NAAQS, and American Conference of Governmental Industrial Hygienists Threshold Limit Values for workers. With respect to carcinogens, the product of the chemical-specific exposure and the respective Slope Factor results in a predicted excess lifetime risk. The threshold or "acceptable" excess lifetime cancer risk comprises a range of  $10^{-6}$  (per million) to  $10^{-4}$  (per ten thousand). These values represent excess cancer risks ranging from one additional person per million people exposed to one additional person per ten thousand people exposed. Excess cancer risks to exposed populations lower than one per million people are

**considered negligible, and risks greater than one in ten thousand people exposed constitute a significant elevation in excess cancer risk.**

Human health-related risks associated with release of potentially harmful contaminants from stack emissions were evaluated under the AERA (see Appendix C). Based on analysis in Section 4.3, health-related risks would not be expected from emissions of criteria pollutants from the proposed power plant, because the concentrations are well below EPA's NAAQS, which are set to protect public health and the environment.

**Screening-level results using the RASS methodology were calculated in the original AERA (SEH, 2006i) and were above levels of potential concern. As approved by MPCA, subsequent revisions of the AERA did not update or include RASS results because the results were known to exceed screening levels, and compliance relied on the more rigorous Q/CHI and IRAP methodologies instead. [Text in the Draft EIS presenting specific results of the RASS screening test was deleted, because some emission rates have since been revised.]**

The Q/CHI approach calculated chemical-specific air toxic quotients for chemicals having both carcinogenic and non-carcinogenic endpoints. These quotients were then evaluated at multiple receptors on a grid using AERMOD, a refined dispersion model, with five years of meteorological data. The acute and sub-chronic health risks calculated by the equivalent risk emission rate (ERER) method indicate:

- The maximum-modeled inhalation acute non-cancer hazard index is **0.72**.
- The maximum-modeled **inhalation** sub-chronic non-cancer index is **0.041**.

Both modeled ERER hazard indices are below the MPCA total hazard criterion of 1.0.

Next, the IRAP method of estimating risk was used to evaluate the impacts of the proposed facility for six representative areas of concern that include adult and child residents, farmers and fishers (Table 4.17-2). Eleven receptor locations were evaluated within the 3-kilometer buffer radius from the proposed West Range facility sources.

**Total chronic** health risks attributable to facility emission sources were calculated by the IRAP method at each receptor location **and the highest cumulative results were reported**. The results indicate that the predicted **cumulative** carcinogenic risk from all combined facility sources is less than  $10^{-5}$  and non-carcinogenic hazard indices are less than 1.0 at all representative locations. Specifically, as can be seen from Table 4.17-4 the highest **cumulative** cancer risks posed by the project to adult and child residents are  $1.4 \times 10^{-6}$  and  $2.3 \times 10^{-7}$ , respectively. The highest **cumulative** risks to adult and child farmers are  $2.5 \times 10^{-6}$  and  $4.6 \times 10^{-7}$ . The highest **cumulative** risks to adult and child fishers are  $1.4 \times 10^{-6}$  and  $2.5 \times 10^{-7}$ . The highest **cumulative** morbidity hazards posed by the project to adult and child residents are **0.080** and **0.081**, respectively. The highest **cumulative** morbidity hazards to adult and child farmers are **0.081** and **0.082**. The highest **cumulative** morbidity hazards to adult and child fishers are **0.080** and **0.081**.

**Table 4.17-4. IRAP Summary of Highest Total Risks and Hazard Indices by Exposure Scenarios <sup>(1)</sup>**

Receptors with Highest Risk <sup>(2)</sup>	Exposure Scenario Evaluated						Comparison to Criteria
	Resident		Farmer		Fisher		
	Adult	Child	Adult	Child	Adult	Child	
<b>Cancer Risk (Criterion = <math>1 \times 10^{-5}</math>)</b>							
RI-3 – Property Boundary	$1.4 \times 10^{-6}$	$2.3 \times 10^{-7}$	$2.5 \times 10^{-6}$	$4.6 \times 10^{-7}$	$1.4 \times 10^{-6}$	$2.5 \times 10^{-7}$	Passed
<b>Morbidity Hazard Index (Criterion = 1)</b>							
RI-3 – Property Boundary	<b>0.080</b>	<b>0.081</b>	<b>0.081</b>	<b>0.082</b>	<b>0.080</b>	<b>0.081</b>	Passed

<sup>(1)</sup> Included all chemicals and pathway/route of exposure.

<sup>(2)</sup> Distance and direction from center of power plant footprint: RI-3 – 0.6 miles to the southeast

### **Mercury Risks from Fish Consumption**

Based on AERA guidance for facilities with stack heights less than 100 meters, fishable lakes within a 3-kilometer radius should be considered under the fish consumption pathway. **For the West Range Site, four fishable bodies of water lie, at least in part, within 3 kilometers of the proposed facility stacks: Dunning Lake, Big Diamond Lake, Little Diamond Lake, and the Canisteo Mine Complex. Since Big Diamond Lake has the most residences surrounding it, has the most readily available data (including a fish species survey), and is in the approximate center of the release plume of potential future facility emissions (based on dispersion modeling for mercury), and therefore, the most impacted lake, it was chosen to evaluate consumption of potentially contaminated fish tissue.**

**Fishable** bodies of water are those that contain water year-round in a year that receives at least 75% of the normal annual precipitation for that area.

The methodology used to estimate human health risk for subsistence fish consumption is based on the *Summary of MPCA's Mercury Risk Estimation Method for the Fish Consumption Pathway (Local Impacts Assessment)* (MPCA, 2006f). Estimation of risk associated with fish consumed by adult subsistence fishers on Big Diamond Lake indicated the following:

- Background mercury deposition to the lake (other sources) = 16.5 grams per year
- Mercury deposition to the lake from the proposed plant = 0.08 grams per year
- Incremental increase in mercury in fish tissue from the proposed plant = 0.003 parts per million
- Ambient Subsistence Fisher Hazard Quotient = **11.1**
- Incremental Subsistence Fisher Hazard Quotient from the proposed plant = **0.06**

**As noted above, the predicted increment attributable to the proposed facility emission results in a hazard quotient of 0.06. Thus, any additional risk to a subsistence fisher resulting from ingestion of fish tissue after the facility is constructed is negligible. The incremental hazard quotient is less than the MPCA risk value of 1.0 via the fish ingestion pathway. However, the hazard quotient from background mercury sources already exceeds the MPCA risk threshold as indicated above.**

While the ERER, IRAP and mercury impacts to subsistence fishers calculations focused on features of the West Range Site, the results would be similar for the East Range Site. Since the West Range Site is located near more fishable lakes, the mercury impacts to fishermen would potentially be less at the East Range Site.

The 1854 Authority, an inter-tribal natural resource management organization governed by the Bois Forte Band and Grand Portage Band of Lake Superior Chippewa, expressed concerns during the public scoping period of the Mesaba Project about the impacts of the project's air pollutants on fish consumption. The analysis based on the subsistence fishers exposure scenario demonstrates that human health impacts from fish consumption would be negligible even within 3 kilometers of the power plant.

### **Mercury Risks from Consumption of Other Traditional Food Sources**

The 1854 Authority also expressed concern over the effects to water quality, fisheries, and wild rice. The Minnesota Sea Grant College Program sponsored a study between 2001 and 2003 addressing similar concerns regarding the potential health risks associated with consuming aquatic-based Native American traditional foods, such as wild rice, waterfowl, and moose (Renwick, et.al., 2003). The study focused on the bioaccumulation of mercury and lead contaminants within these food sources and analyzed samples of waterfowl tissue, wild rice, and moose muscle and liver from the reservation of the Fond du Lac Band of Ojibwe, located in the Lake Superior Basin of Minnesota. Methylmercury had already been found in high levels in a variety of fish from several of the reservation's lakes, which prompted the further study of other food sources. The study's preliminary results revealed that the potential health risks of consuming wild rice, water fowl, and moose were minimal and that the nutritional, cultural, and economic benefits

appeared substantial. Based on the findings of this study and given the very low increment of mercury and other pollutants that would be emitted from the Mesaba Energy Project and its distance from the closest reservation lands (greater than 20 and 50 miles from the West Range and East Range sites, respectively), the health risks associated with the consumption of traditional Native American foods would be negligible.

### **Risks from Dioxins, Furans, and Chromium**

Emissions of one chemicals of potential concern group—chlorinated dioxins and furans—are expected to be negligible from the Mesaba Generating Station. The chlorine concentration in the product syngas is expected to be low, as chlorine is expected to be removed both by the gasification process itself and also during the water wash treatment process before syngas combustion. Data from the Wabash River Plant shows that chlorine concentrations are below test detection limits. The activated carbon bed treatment system at the Mesaba Generating Station is expected to scrub any potential organic compounds to *de minimis* levels, thereby avoiding the potential for formation of dioxins or furans during their subsequent combustion.

The combustion characteristics of syngas (i.e., carbon monoxide and hydrogen precursors in the presence of excess air at high temperatures in the combustion turbine) further support the expectation that dioxin and furan emissions would be insignificant. Those two precursors would quickly be oxidized to carbon dioxide and water, thereby decreasing the probability of an intermediate formation of high molecular weight condensation substances.

Although dioxin and furan emissions are expected to be insignificant, a sensitivity analysis on the risk impact of dioxin (as equivalents) was conducted at the MPCA's request at two receptor locations near the proposed Mesaba Generating Station. In this analysis, annual emissions rates of dioxin from all emission sources were adjusted to result in a carcinogenic risk due to dioxin equivalents alone of  $10^{-6}$  (one in one million). The two scenarios selected for this evaluation were the adult farmers and adult fishers, because these two populations are predicted to be most at risk at these two locations.

The analysis was conducted under two separate operating scenarios. In the first scenario, both Mesaba Phases I and II would operate at full capacity with the emission sources being two CTGs, one flare, and one TVB for each phase. In the second scenario, only Phase I on the eastern-most footprint would be operational at maximum emission rates.

Two receptor locations were selected for the analysis. The Receptor 3 location, southeast of the property boundary, is the area predicted to receive the maximum project impacts outside of the property boundary. Receptor 3 is closest to fishable waters. The Receptor 7 location, northwest of the property boundary, is in an area that is relatively clear of trees and brush and represents the more likely location for a working farm.

The results of this analysis indicated that dioxin emission rates predicted to result in a  $10^{-6}$  dioxin equivalent carcinogenic risk would be lowest at the Receptor 3 location for the farmer scenario. The emission rates that would result in a  $10^{-6}$  dioxin equivalent carcinogenic risk at Receptor 3 location for the fisher scenario would need to be one order of magnitude higher. These emission rates would be the lowest with either both phases or one phase operating. Operation of Phase I alone would result in emission rates that are roughly one-half of those from both phases. Therefore, the emission rate required to produce a risk of  $10^{-6}$  with Phase I operating alone would be approximately double that with both phases running.

The analysis also indicated that the emission rates, which would result in a  $10^{-6}$  dioxin equivalent risk for the fisher scenario at the Receptor 7 location, would be lower than those for the farmer scenario at the same location. All modeling conducted for this analysis resulted in a cumulative risk from all chemicals of potential concern which did not exceed one in 100,000 ( $10^{-5}$ ).

Emissions for another chemicals of potential concern —total chromium—were based on testing of product (cleaned) syngas at the Wabash River Plant. Chromium exists primarily in two oxidative states, hexavalent chromium ( $\text{Cr}^{+6}$ ) and trivalent chromium ( $\text{Cr}^{+3}$ ). Because  $\text{Cr}^{+6}$  is significantly more toxic than  $\text{Cr}^{+3}$ , it is important that the appropriate inhalation health benchmarks and emission rates are used in the calculation of risk. The following information documents the approach for calculating the chromium emission rates used in the IRAP risk model in order to demonstrate that the approach is conservative. Although the test result showed the chromium concentration was below the detection limit, one-half the test's detection limit was used as the basis for the chromium emission rate calculation for the Mesaba Generating Station. Since there were no test data for hexavalent chromium, the ratio of the AP-42 emission factors for hexavalent chromium to total chromium (30 percent) was used as a surrogate.

The method of estimating hexavalent chromium emissions was very conservative. First, the only chromium species stable enough to survive the high temperatures within the gasifier are the metal itself, chromium (III) nitride, chromium (III) sulfide, chromium (II) sulfide, chromium (II) selenide, or chromium (III) oxide. As noted below, these species have melting points at or near the operative temperature in the gasifier (approximately 2,500°F in the first stage and 1,700°F in the second stage). Therefore, whereas those species will not be gases, they will likely be retained on particles and ultimately partitioned within the slag matrix. Second, chromium (VI) oxide melts at 390°F and decomposes above 480°F to chromium (III) oxide. Third, there are several steps in the syngas cleanup process that will remove particles and the chromium bound to them so that the amount of total chromium entering the turbines is very low.

As a point of reference, emission factors for hexavalent and total chromium from turbines burning natural gas/refinery gas, and distillate oil (published by the California Air Resources Board) were compared with the AP-42 ratios used in the AERA. The ratios of hexavalent to total chromium emission factors for turbines burning those fuels are 14 percent, 11 percent, and 2.5 percent, respectively, which are considerably less than the 30 percent assumed in the AERA for Mesaba.

#### **Particulate Matter (2.5 microns or less) Risks**

Particulate matter (PM) comprises both solid particles and liquid droplets found in air. PM in the atmosphere is the result of direct emission of natural and manmade sources, or emissions of other pollutants that react in the atmosphere to form PM. These solid and liquid particles come in a wide range of sizes. Specifically, sources of particles with aerodynamic diameters between 2.5 and 10 microns (referred to as "coarse") include crushing or grinding operations and dust from paved or unpaved roads. Particles less than 2.5 microns in aerodynamic diameter ( $\text{PM}_{2.5}$ ) (referred to as "fine" particles) can be emitted directly (e.g., smoke from a fire), or they can form from chemical reactions of gases such as sulfur dioxide, nitrogen dioxide, and some organic gases. Sources of  $\text{PM}_{2.5}$  include power plants, gasoline and diesel engines, wood combustion, high-temperature industrial processes such as smelters and steel mills, and forest fires. However, the source of  $\text{PM}_{2.5}$  can be difficult to ascertain because half or more of the  $\text{PM}_{2.5}$  mass is often composed of secondarily formed species, thereby masking the point of origin. Additionally,  $\text{PM}_{2.5}$  has a lifetime on the order of several days, allowing it to disperse widely and travel long distances.

$\text{PM}_{10}$  emissions pose a health concern because they can be inhaled into and accumulate in the respiratory system. Health effects associated with short-term exposure to coarse particles include premature death in people with heart or lung disease, hospital admissions for heart disease, increased hospital admissions and doctors' visits for respiratory disease, increased respiratory symptoms in children and decreased lung function. However, there is no evidence to suggest that there is a link between long-term exposure to coarse particles and health problems.

As with other pollutants, the health risks associated with exposure to elevated levels of PM<sub>2.5</sub> are greatest with sensitive populations, such as the young, elderly and those with underlying medical issues. The small size of PM<sub>2.5</sub> (less than one-seventh the average width of a human hair) facilitates particles lodging deeply into the lungs. Health studies have shown a significant association between exposure to fine particles and premature mortality. Other important effects include aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions, emergency room visits, absence from school or work, and restricted activity days), lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems, such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to fine particle exposure include older adults, people with heart and lung disease, and children. Health effects associated with long-term exposure to PM<sub>2.5</sub> include premature death in people with heart and lung diseases, death from lung cancer, reduced lung function, and development of chronic respiratory disease in children.

In a study of fine particulate air pollution and mortality in nine California counties, Ostro et al. (2006) presented pooled estimates with 95 percent confidence intervals of percent changes in different daily mortality categories per 10 ug/m<sup>3</sup> of PM<sub>2.5</sub> increment. Their predictions were as follows:

Mortality Category	Percent Change (95% CI)
All-cause	0.6 (0.2 to 1.0)
Cardiovascular	0.6 (0.0 to 1.1)
Respiratory	2.2 (0.6 to 3.9)
Age >65 years	0.7 (0.2 to 1.1)
Ischemic heart disease	0.3 (-0.5 to 1.0)
Diabetes	2.4 (0.6 to 4.2)

CI – confidence interval

PM<sub>2.5</sub> was included in the AERA analysis because of the potential health effects associated with this pollutant. To demonstrate that the risks associated with PM<sub>2.5</sub> emissions from the Mesaba Generating Station would be within acceptable limits, the results of the NAAQS Dispersion Modeling effort, showing the impacts of PM<sub>10</sub> emissions from the plant, were considered. As explained in Section 4.3, PM<sub>2.5</sub> emissions were scaled from PM<sub>10</sub> emissions based on research reported by EPA (USEPA, 2005) and using a conservative multiplier of 0.11 for relative PM<sub>2.5</sub> from PM<sub>10</sub> values. As reported in Tables 4.3-9 and 4.3-10, the impacts from both PM<sub>10</sub> and PM<sub>2.5</sub> emissions would meet Minnesota and Federal ambient standards. The combined particulate emissions from the Mesaba Generating Station, nearby sources, and background concentrations would be less than Minnesota and Federal PM<sub>2.5</sub> ambient standards. In addition, although MPCA does not publish a PM<sub>2.5</sub> background concentration, the PM<sub>2.5</sub> background concentration is expected to be less than the PM<sub>10</sub> background concentration.

As indicated in Section 4.3.2.5, all point sources associated with Phase I and Phase II were included in the source input for PSD increment modeling. Additionally, to account for distant and regional sources, data on nearby major increment-consuming (or -expanding) sources were also included as source input. This data was accumulated from MPCA and recent permit applications. For the Final EIS, a more refined regional source inventory, applicable to modeling for the Mesaba Generating Station at both the West Range and East Range sites, was developed and used in all PSD increment and NAAQS modeling analyses. For NAAQS modeling, total allowable emissions from significant nearby sources were included in the input file (see Appendix B for a list of regional sources and the modeled emissions).

Although the Mesaba Generating Station is expected to release particulates during operation, the newest technologies will be used to ensure minimization of releases. The anticipated health impacts from the incremental increase in PM<sub>2.5</sub> emissions by the facility are expected to be negligible. The current elevated air impacts to the region are primarily attributable to transboundary input from sources outside of Minnesota.

### 4.17.3 Corridor-Specific Impacts

The primary public safety aspects of utility corridors are associated with EMF from HVTLs and accidents related to natural gas lines.

#### 4.17.3.1 HVTL Lines

As stated in Section 3.17, only four states have edge of ROW electric field standards and only two states have edge of ROW magnetic field standards (NIEHS, 2002). **Minnesota has a standard for the electric field within the ROW of 8-kV per meter but no standard applicable to the edge of the ROW.** For the purposes of this EIS, the standard for assessing human health impacts is **8-kV per meter within the ROW. In addition, a target of less than 2-kV per meter** at the edge of the ROW for electric fields and **a target of 150 mG for 69-kV to 230-kV lines or 200 mG for lines up to 500-kV for magnetic fields are considered protective of human health.**

The EMF values presented in this section are based on calculations performed with the ENVIRO computer program (ENVIRO is a program originally designed for the Electric Power Research Institute as part of the EPRI EMF Workstation under project RP2472-3, which is now licensed for use through ENERTECH Consultants; see [http://www.enertech.net/emfw/products/emfw\\_products.html#ENVIRO](http://www.enertech.net/emfw/products/emfw_products.html#ENVIRO)). It provides calculations for conductor surface gradients, electric field, magnetic field and audible noise.

#### West Range

The current 28L ROW is 145 feet in width and the 62L ROW varies from 160 to 340 feet. The proposed new ROWs between the former Greenway Substation and the Blackberry Substation would be 100 to 150 feet under all alternatives. Though different configurations of the lines and support structures can greatly influence the electric and magnetic fields, the most conservative configurations (showing the greatest field strength at 50 feet from the centerline [CL]) are provided here. Based on the minimum width of proposed and existing ROWs, 50 feet from centerline (100 feet total) is considered the point of compliance (edge of ROW) with the human health standards **for these lines.**

Figure 4.17-1 (**revised for the Final EIS**) shows the electric and magnetic field levels for the 230-kV double circuit without the 115-kV underbuild. Figure 4.17-2 (**revised for the Final EIS**) shows the electric and magnetic field levels for the 345-kV single circuit with a delta configuration without a 115-kV underbuild on the new ROW route.

The magnetic fields at 50 feet from centerline are below both the 150 mG and 200 mG **targets** for 230-kV and 345-kV lines, respectively. **The electric fields for the 230-kV and 345-kV lines would be within the 8-kV per meter Minnesota standard inside the ROW, and the electric field for the 230-kV line would be within the 2-kV per meter target at the edge of the ROW. The electric field for the 345-kV single-circuit delta configuration would be slightly above the 2-kV per meter target at the edge of the ROW (this configuration would be used off-site in one very short segment in WRB-2A on the West Range site and for the new ROW segment linking the 37L and 39L HVTLs that would serve the East Range site).** Since the nearest residence to any of the HVTL routes for the West Range Site would be greater than 100 feet from the centerline, there would be no permanent receptors within an electric field greater than 2-kV per meter.

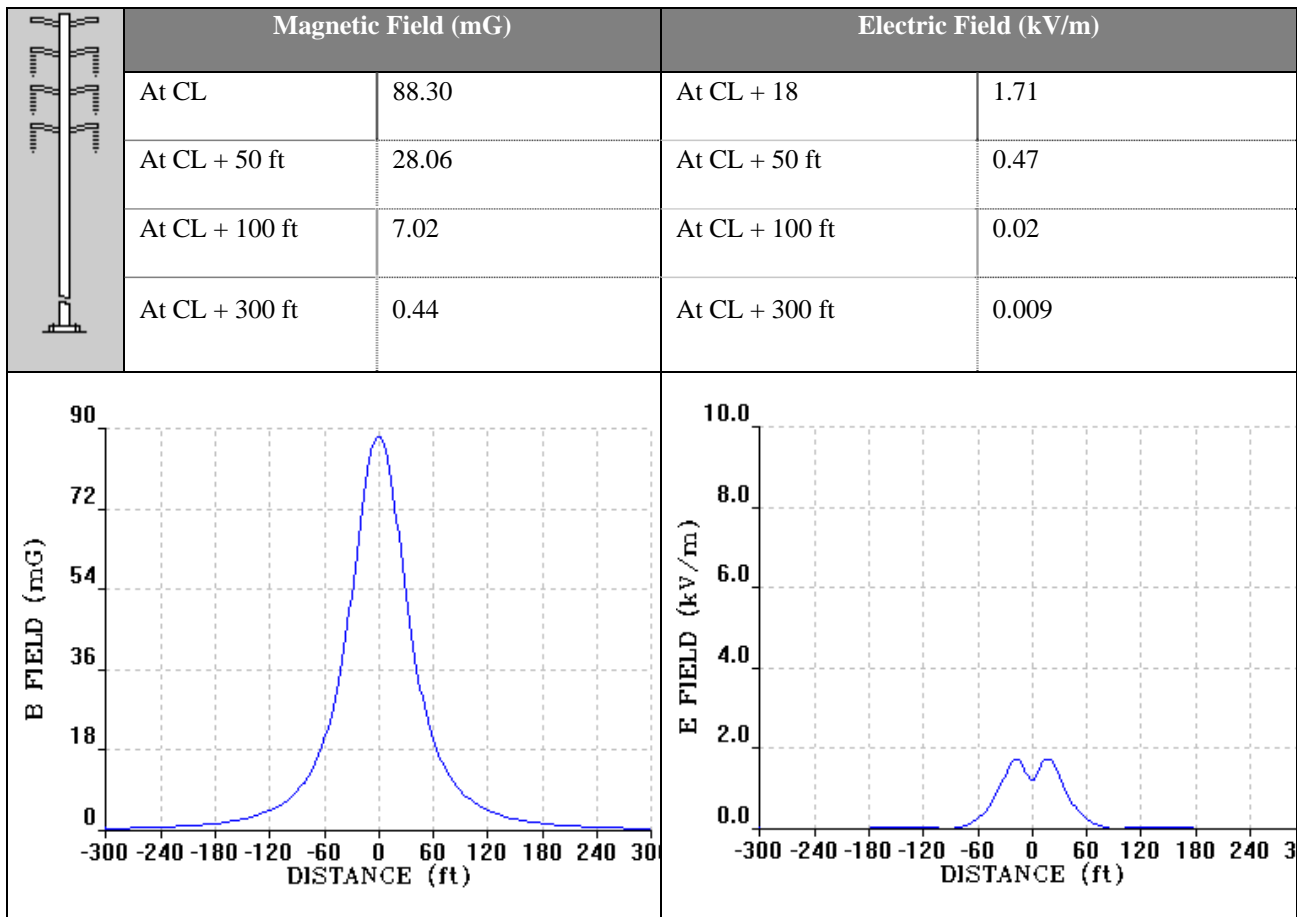


Figure 4.17-1. West Range, EMF for 230-kV – 2 Circuit Vertical Configuration

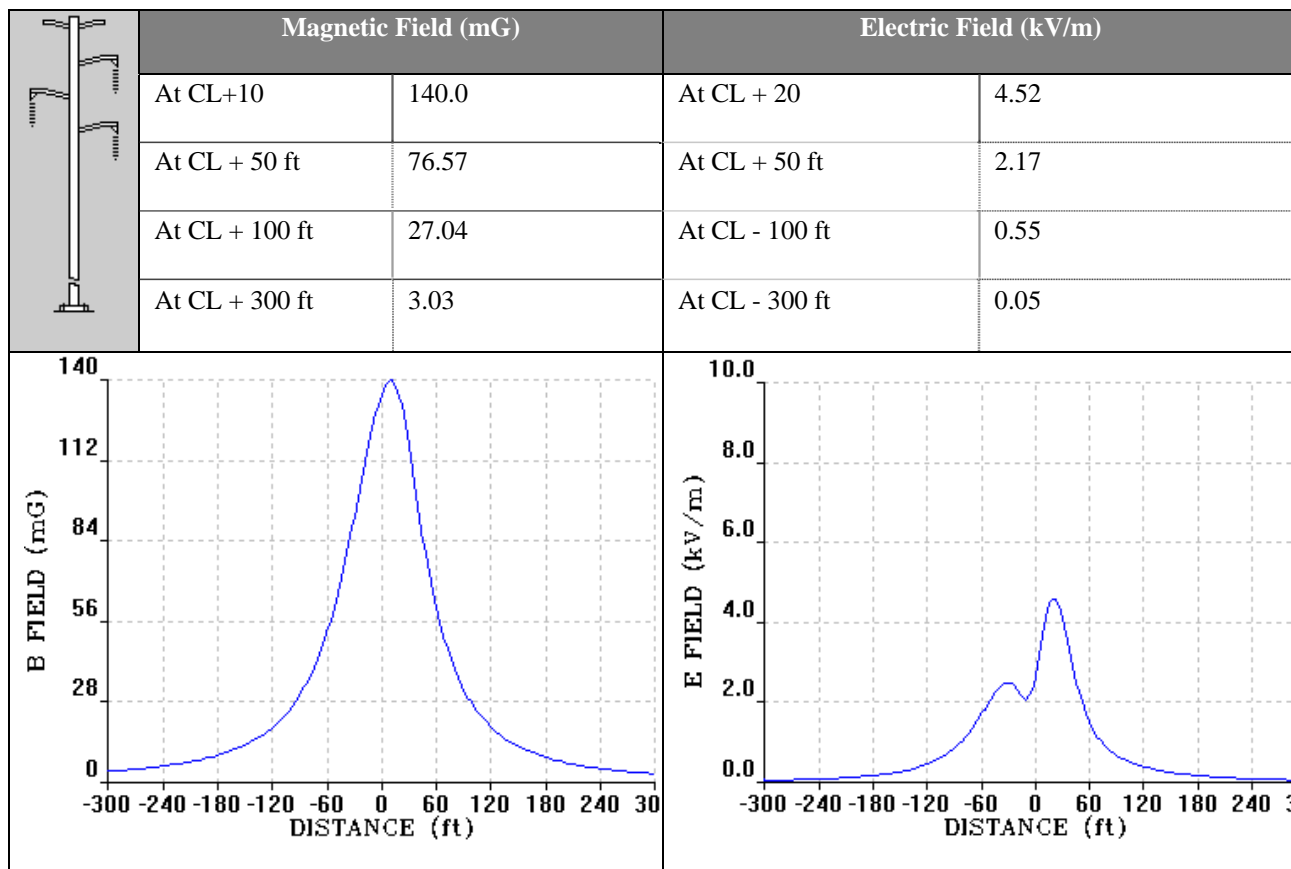
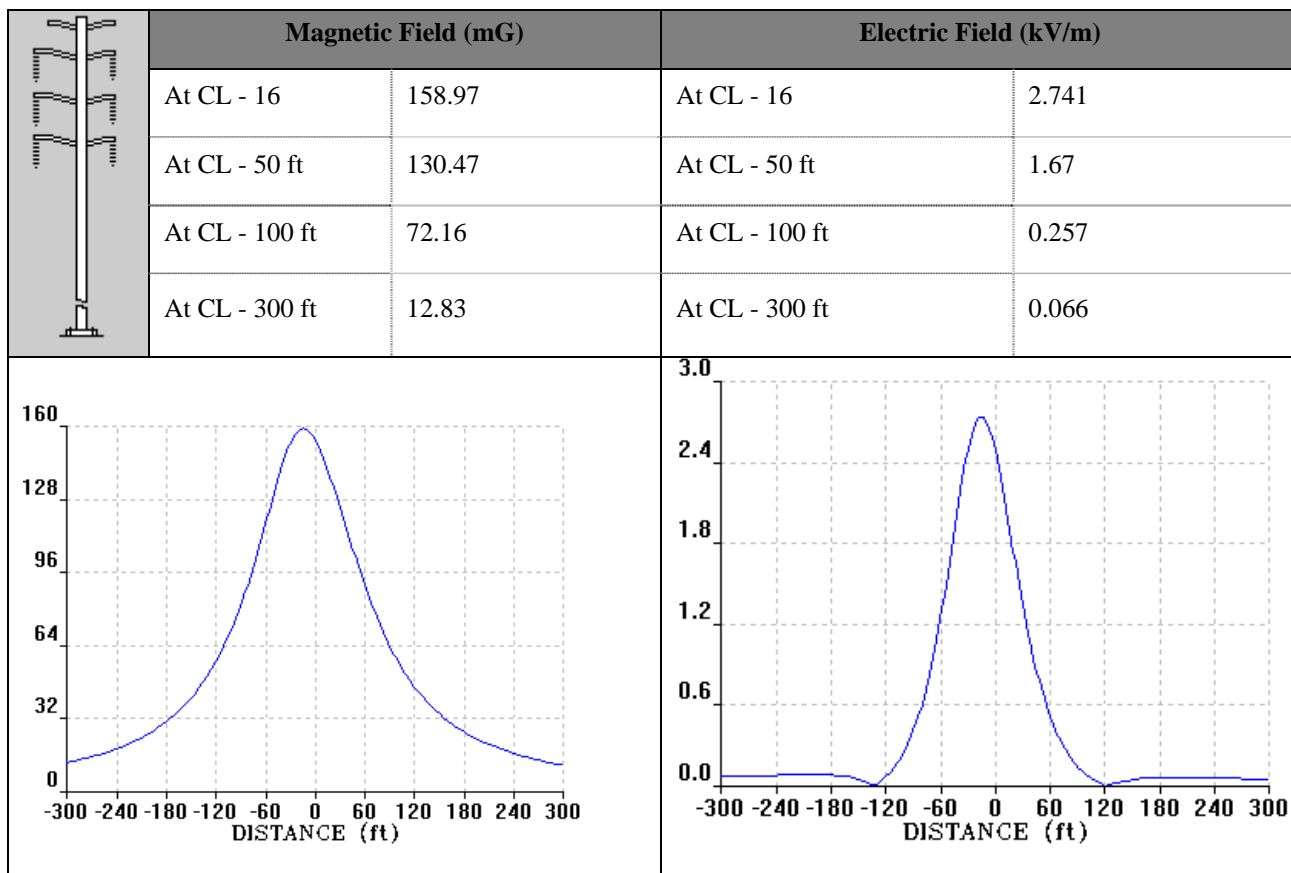


Figure 4.17-2. West Range, EMF for 345-kV – 1 Circuit Delta Configuration

**East Range**

The 37L, 38L, and 39L ROWs are currently 100 feet in width. The proposed new ROW to parallel the 43L corridor would be 100 feet in width. Under the two alternatives for routing, existing ROWs would be widened by 30 feet.

Figure 4.17-3 shows the electric and magnetic field levels for the 345-kV vertical configuration and 115-kV vertical configuration on a single steel pole (worst case fields under the Proposed Action). The magnetic field at 50 feet from centerline is well below the 200 mG **target** for the 345-kV lines. The electric field is below the **8-kV per meter Minnesota standard within the ROW and below the 2-kV per meter target** at 50 feet from the centerline. There is one residence within 50 to 100 feet of the centerline of the current 38L route, and 2 residences are within 50 to 100 feet of the centerline of the current 39L/37L route. These residences **would not be exposed to EMF above the 8-kV per meter standard for Minnesota, but they could fall within** areas where the electric fields exceed 2-kV per meter under the Proposed Action.



**Figure 4.17-3. East Range, EMF for 345-kV – Vertical Configuration Bundle with 115-kV - Vertical Configuration Rail**

**Henshaw Effect**

As discussed in Section 3.17.5.3, Professor Denis L. Henshaw of England hypothesized that electric fields at the surface of power line conductors cause increased charges on particles, thereby increasing the likelihood of inhaled particles being deposited on surfaces inside the lungs and airways, even at considerable distances from the line. In theory, these events could lead to increases in respiratory ailments and other diseases. Similarly, a British study (**Draper, 2005**) found elevated rates of childhood leukemia at distances up to 600 meters (2,000 feet) from electric lines, where magnetic fields are similar to background levels. **However, the author of the study found no causal link between childhood leukemia and EMF. Moreover, a recent study (Jeffers, 2007) could not support the hypothesis that ion exposure from HVTL charges increases lung deposition of airborne particles.**

As stated previously, all the electric fields at the edge of the ROWs would be below 2-kV per meter (a standard based on other state guidelines). The medical basis for some of the state standards relating to electric fields from HVTLs is unknown, though there is research that indicates that some older models of active implantable medical devices, such as pacemakers, begin to show inappropriate behavior at fields as low as 1.5 to 2-kV per meter (although newer models may be unaffected at fields as high as 20-kV per meter) (National Grid, 2006). Consequently, it is not known whether the 2-kV per meter electric field standard at the edge of the ROW would be protective with respect to reducing or eliminating potential Henshaw Effects.

It also is not possible to accurately calculate the levels of charge that pollutant particles acquire near HVTLs. The nature of pollutant particles depends on location; although for the purposes of calculation, a typical pollutant population may be specified together with an assumed particle size distribution. How such particles may charge near a power line also depends on their initial charge. Nevertheless, it seems likely that the pollutant particles downwind of a power line in corona do have somewhat larger average charges on them as a result of corona discharge. The distribution and deposition of such charged particles is another variable which is greatly influenced by atmospheric charges, humidity, wind speed and direction, terrain, vegetation, and other weather conditions (NRPB, 2004).

The potential impact of corona ions on health would depend on the extent to which they increase the dose of relevant pollutants to target tissues in the body. It is not possible to estimate the impact precisely, because of uncertainties about the:

- Extent to which corona effects increase the charge on particles of different sizes, particularly within buildings;
- Exact impact of this charging on the deposition of particles in the lungs and other parts of the respiratory tract; and
- Dose-response relation for adverse health outcomes in relation to different size fractions of particle.

However, it seems unlikely that corona ions would have more than a small effect on the long-term health risks associated with particulate air pollutants, even in the individuals who are most affected. In public health terms, the proportionate impact will be even lower because only a small fraction of the general population live or work close to sources of corona ions (NRPB, 2004).

Since the research regarding the Henshaw Effect and its potential health implications in real-world conditions is inconclusive at this time, any potential health effects from charged particles resulting from HVTLs introduced by the Proposed Action cannot be quantitatively ascertained in this EIS. **As described in Section 3.17.5.3, substantial research has been, and continues to be, conducted by academic laboratories, as well as the most qualified health research organizations in the world, including NIEHS and the WHO, into the potential health risks from EMF exposure. In spite of these efforts, there are no established health criteria or quantifiable impact assessment methods currently accepted for determining adverse effects to human health with respect to EMF exposure or the Henshaw Effect.**

#### **4.17.3.2 Natural Gas Pipelines**

The Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety governs natural gas pipeline safety. Natural gas pipelines and their operators are subject to numerous safety requirements and regulations. Operator requirements include routine maintenance and inspection, integrity testing, installation and monitoring of automatic leak detection systems and alarms, establishing written emergency preparedness and response plans, and ensuring that their employees are fully trained and qualified (OPS, 2006a).

Within Minnesota, there are approximately 27,800 miles of gas transmission and distribution lines. Between 2003 and 2005, there was an average of 5.6 accidents associated with these lines (OPS, 2006b). This translates to approximately one accident per every 5,000 miles of gas transmission or distribution lines. The project would require the installation of between 13 and 33 miles of new natural gas transmission lines depending on the site and route selected. Statistically, the accident rate associated with these lengths of new natural gas line would be negligible.

#### **4.17.4 Intentional Destructive Acts**

Although concerns have been raised about the vulnerability of nuclear power plants to terrorist attack (Behrens and Holt, 2005), the potential for such attacks on coal-based power plants has not been

identified as a threat of comparable magnitude. However, as with any U.S. energy infrastructure, the proposed power plant could potentially be the target of terrorist attacks or sabotage. In light of two recent decisions by the U.S. Ninth District Court of Appeals (*San Luis Obispo Mothers v. NRC, Ninth District Court of Appeals, June 2, 2006*; *Tri Valley Cares v. DOE, No. 04-17232, D.C. No. CV-03-03926-SBA, October 16, 2006*), DOE has examined the potential environmental impacts from acts of terrorism or sabotage against the facilities proposed for the Mesaba Energy Project.

Although risks of sabotage or terrorism cannot be quantified, because the probability of an attack is not known, the potential environmental effects of an attack can be estimated. Such effects may include localized impacts from releases of toxic substances at the proposed power plant and associated facilities, which may be similar to what would occur under an accident or natural disaster. To evaluate the potential impacts of sabotage or terrorism, DOE considered failure scenarios without specifically identifying the cause of failure. For example, potentially harmful chemicals could be released as a result of component failure or human error (or a combination of both), or from such external events as aircraft crashes, seismic events, or other natural events as high winds, tornadoes, floods, ice storms, other severe weather, and fires (both natural and human-caused). Likewise, for truck and rail tanks, releases can occur from accidents or component failure during transport or from human error during transfer to the storage tanks at the facility.

Hazardous events considered for the proposed power plant caused by intentional destructive acts included: gas releases and exposure to toxic gas clouds, fires, and vapor cloud explosions. A particular concern associated with the release of a gas is exposure to a toxic component within the dispersing gas cloud. Evaluations of these hazards indicate:

- Toxic hazards would be dominated by the potential releases of H<sub>2</sub>S and SO<sub>2</sub> from the Sulfur Recovery Unit (Claus process). The potential releases may pose a health hazard to plant workers and residents in the immediate vicinity of the proposed power plant. Based on information in Section 3.17.4.2, there are no schools, daycare centers, recreation centers, playgrounds, nursing homes, or hospitals located within 0.5 miles of the West Range Site or East Range Site. The nearest residences are approximately 0.6 to 0.8 miles from the West Range Site and about 1 mile from the East Range Site.
- Potential releases of carbon monoxide from the syngas process stream of the gasifiers could result in the longest downwind toxic impact distance. The potential releases may pose a health hazard to plant workers and closest residents to the proposed power plant.
- Fire hazards at the plant site would not extend beyond the West Range Site or East Range Site.
- Under all worst-case scenarios, plant workers would be the most at-risk of injury or death.

#### **4.17.5 Impacts of the No Action Alternative**

For the purposes of this EIS, as explained in Section 2.1.1.2, the DOE No Action Alternative is assumed to be equivalent to a “No Build” Alternative. Under the No Action Alternative, worker accidents associated with other regional industrial sites and construction projects would still occur. Incremental health risks associated with the operation of the power plant and its associated air emissions would not occur. Furthermore, the electric and magnetic fields introduced by new or reconfigured HVTLs would not occur under the No Action Alternative.

### 4.17.6 Summary of Impacts

Basis for Impact	No Action	West Range	East Range
Increase the risk to worker safety and health during facilities construction and/or operation.	If the power plant were not constructed, there would be no increase in the probability of construction or operational health and safety risks.	Construction workers would follow a safety plan and standard construction safety practices. Therefore, construction-related health and safety impacts would be comparable to those of similar industrial projects. The storage and handling of coal can release inhalable dust, although this too would be minimized through engineering controls and plant safety practices	Impacts would be <b>comparable to</b> those for the West Range Site <b>based on comparable project conditions at both sites.</b>
Increase traffic fatalities	There would be no increase in vehicular traffic, and therefore, no increase in traffic-related fatalities on public roads would occur.	During the 5-year construction period, statistically less than 2 traffic-related worker fatalities would occur. During the operational timeframe of the plant, statistically no more than 1 traffic-related worker fatality would occur.	Impacts would be <b>comparable to</b> those for the West Range Site <b>based on comparable project conditions at both sites.</b>
Create safety risks for at-grade rail crossings	There would be no increase in rail traffic, and therefore, there would be no increase in safety hazards at at-grade crossings.	Because of relatively low incremental addition of daily train trips, it is expected that increases to safety hazards at at-grade crossings would be low.	Impacts would be <b>comparable to</b> those for the West Range Site <b>based on comparable project conditions at both sites.</b>
Create a cancer risk to the public, including particular receptor categories, exceeding the EPA standard ( $1 \times 10^{-5}$ ).	No change in cancer risk beyond existing conditions, although other projects planned for the region could emit pollutants of concern that may pose additional cancer risk.	Based on <b>AERA</b> results, cancer risks posed by the project would be small. As presented in Table 4.17-4, the highest cumulative cancer risks posed by the project to adult and child residents are $1.4 \times 10^{-6}$ and $2.3 \times 10^{-7}$ , respectively. The highest risks to adult and child farmers are $2.5 \times 10^{-6}$ and $4.6 \times 10^{-7}$ . The highest risks to adult and child fishers are $1.4 \times 10^{-6}$ and $2.5 \times 10^{-7}$ .	<b>The risks would be comparable to, or less than, those for the West Range Site as explained in Appendix C, Section 2.1 (Volume 2).</b>
Create a morbidity hazard to the public, including particular receptor categories, exceeding the EPA standard (1.0).	No change in morbidity rate beyond existing conditions, although other projects planned for the region could emit pollutants of concern that may pose additional morbidity risk.	Based on <b>AERA</b> results, the morbidity hazards to the public would be small. As presented in Table 4.17-4, the highest cumulative morbidity hazards posed by the project to adult and child residents are <b>0.080</b> and <b>0.081</b> , respectively. The highest morbidity hazards to adult and child farmers are <b>0.081</b> and <b>0.082</b> . The highest morbidity hazards to adult and child fishers are <b>0.080</b> and <b>0.081</b> .	<b>The hazards would be comparable to, or less than, those for the West Range Site as explained in Appendix C, Section 2.1 (Volume 2).</b>
Create a risk to public health and safety from EMF exposure.	No change in existing EMF exposure from current power lines in the region.	EMF exposure from utility lines would be within the 2-kV/m limit at the edge of the ROW. There would be no permanent residential receptors located in areas exceeding 2-kV/m.	Impacts would be <b>comparable to</b> those for the West Range Site <b>based on comparable project conditions at both sites.</b>

Basis for Impact	No Action	West Range	East Range
Create a risk to public health and safety from exposure to charged particulates.	No change in the risk of health hazards associated with existing power lines and any current exposure to charged particulates.	Because the Henshaw Effect is largely unverified in terms of human health impacts, there is no conclusive means to determine whether charged particulates from new HVTLs would cause public health risks.	Impacts would be <b>comparable to</b> those for the West Range Site <b>based on comparable project conditions at both sites.</b>