4.4 GEOLOGY AND SOILS

4.4.1 Approach to Impacts Analysis

4.4.1.1 Regions of Influence

The regions of influence are similarly defined for the West Range and East Range Sites, and include the physical setting for all areas that would be directly and indirectly impacted by construction and operation of the Mesaba Generating Station and its associated HVTL, utility, and transportation corridors. The region of influence includes the IGCC power plant buffer lands, the 100- to 150-foot wide HVTL ROWs and the 150-foot wide pipelines ROW. The majority of the temporary construction impacts would be limited to areas closest to the facility footprint and corridor centerlines.

4.4.1.2 Method of Analysis

The evaluation of potential impacts on the physical setting and physiographic resources considered whether the Proposed Action or an alternative would cause any of the following conditions:

- Soil erosion or loss of topsoil;
- The direct conversion of prime and unique farmland to non-agricultural uses;
- The loss of availability of a known mineral resource that would be of value to the region;
- An on-site or off-site landslide, subsidence, or collapse, potentially resulting from a location on a geologic unit or soil that would be unstable as a result of the project;
- Exposure of people or structures to substantial adverse effects from seismic activity;
- The contamination of soil or mineral resources; or
- The loss of paleontological resources that would be of value to the region.

Impacts to the physical setting were assessed based on map and field resource data. The primary information about geology and soils around the West Range and East Range Sites was compiled using regional geology maps, the Itasca Soil Survey, and preliminary NRCS soil data (Excelsior, 2006b; Jirsa et al., 2005; USDA, 1987). At this time, a soil survey for St. Louis County is not available. The environmental consequences discussion in this section addresses the potential impacts to the geology, mineral resources, soil quality, and from seismic events. Certain impacts to the physical setting are related to other resource concerns, specifically impacts from fugitive dust emissions and soil erosion; these impacts are also discussed in Section 4.3 (Air Quality) and 4.5 (Water Resources), respectively.

The disturbance area describes the maximum area where potential impacts to the physical setting may occur. This area would also include the permanent impacts from structures such as foundations and rail beds. The magnitude of potential impacts from increased erosion and farmland loss are defined by the disturbance area, while the presence or absence of construction-restricting deposits (e.g., glacial till and peat) would determine the potential for collapse.

Minnesota Rule 4400.3450, subpart 4 ("Prime Farmland Exclusion") provides that "No large electric power generating plant site may be permitted where the developed portion of the plant site, excluding water storage reservoirs and cooling ponds, includes more than 0.5 acres of prime farmland per megawatt of net generating capacity, or where makeup water storage reservoirs or cooling pond facilities include more than 0.5 acres of prime farmland per megawatt of net generating capacity, unless there is no feasible and prudent alternative." The provision does not apply to areas located within home rule charter or statutory cities, areas located within two miles of home rule charter or statutory cities of the first, second, and third class, or areas designated for orderly annexation under Minnesota Statutes § 414.0325 (Excelsior, 2006a).

4.4.2 Common Impacts of the Proposed Action

The sections below describe the common impacts to the physical setting from the construction and operation of the Proposed Action and alternatives. Since these impacts could occur to some extent at both the West and East Range Sites, they are described in general terms.

4.4.2.1 Impacts of Construction

Direct impacts to the physical setting would occur during construction, which would last three years for Phase I, and an additional two to three years for Phase II. Both the West and East Range Sites would require clear cutting, grading, and basic earthmoving activities during the construction phase. In addition, the network of water (process water, potable water, and sanitary sewers) and natural gas pipelines would primarily require clearing vegetation and trenching. These activities could increase the potential for soil erosion as well as topsoil loss. Implementation of erosion best management practices, such as stockpiling and covering topsoil, installing wind and silt fences, and reseeding the disturbed areas would minimize the long-term impacts from construction. **Prior to construction, Excelsior would use the National Geodetic Survey's website to compare the current location of geodetic markers to the proposed construction corridors. If there were any conflicts, Excelsior would notify the National Geodetic Survey 90 days prior to the markers' potential disturbance by construction.**

Portions of the West Range and East Range structures would be constructed on glacial till. The till is generally a sandy lean clay or clayey sand, which easily retains water, and is generally easily eroded and difficult to re-vegetate, especially when disturbed. Construction activities that disturb glacial till below the topsoil would have the potential to increase erosion. In order to minimize soil erosion and sediment transport, it would be necessary to develop and implement a SWPPP and use techniques as described in the MPCA's *Best Management Practices for Dealing with Storm Water Runoff from Urban, Suburban and Developing Areas of Minnesota* (MPCA, 2000). Establishment of vegetative cover on the till would require placement of topsoil, which would be stockpiled and covered until construction measures were completed. Additional discussions about the potential impacts and mitigation measures on the area vegetation are provided in Section 4.8, Biological Resources.

In areas with a high water table or poor drainage, the saturated glacial till would be unsuitable for building stable foundations. Coarse alluvium consisting of sand and gravel is suitable for use as foundation fill if it is processed to remove cobbles and boulders. Finer grained material would tend to erode easily on slopes if it remains un-vegetated. Alluvial deposits would also need to be compacted to ensure foundation stability, and sand and gravel with high fines content may need to be dewatered if it is too wet. After construction, topsoil replacement over the sand and gravel would improve the establishment of vegetative cover, and reduce the potential erosion impacts.

Organic soils such as peat or muck tend to be spongy and unstable when loaded. These materials are not suitable beneath building or equipment foundations, and they increase the potential for uneven subsidence. To minimize these potential impacts, the peat and muck deposits would be excavated and replaced with competent fill prior to construction of the power station facilities. Excavation of large amounts of peat would contribute to the potential for erosion around the construction site. Along the HVTL corridors, the typical drilled shaft foundation, (e.g., caisson) would not be suitable in the peat deposits, and other foundation types (e.g., helical piles or driven piles) may need to be considered. Peat is also not suitable for support of transmission tower foundations, so the foundations would need to extend through the peat deposit to suitable bearing soils or bedrock. Foundation types and depths would be further evaluated after a geotechnical investigation has been performed in the selected utility corridor.

Peat is also highly compressible and does not support heavy construction equipment; therefore, equipment movement over unstablized organic materials could generate unstable and unsafe conditions. This would be mitigated by use of stabilizing equipment such as crane mats and/or low ground pressure equipment. Construction during the winter months could also reduce the difficulty of construction within areas of peat, and it would minimize erosion impacts to the soft, compressible, wet soils found in the wetlands.

Construction of temporary haul roads would be necessary along the HVTL and other utility corridors to provide access for material delivery and personnel. To minimize the long-term erosion impacts, these haul roads would be removed and vegetation re-established within the ROW.

Both proposed facility sites and corridors would disturb some soils classified as prime farmland soils, as well as soils classified as farmland of statewide importance. These soils require special consideration during construction. The USDA tracks conversions of prime or statewide important soils to other uses through their NRCS. Impacts or direct conversions of prime or statewide important farmland would require completion of a Farmland Conversion Impact Rating, Form AD-1006, by the NRCS in Itasca County and St. Louis County. A soil survey for Itasca County has been completed; however, the NRCS has not completed the soil survey for St. Louis County; therefore, the amount of potentially disturbed farmland soils is not available.

Construction-related impacts to soils could also occur from the accidental release of contaminants such as fuels, lubricants, and antifreeze. These types of materials may be stored in the staging area of the Mesaba Generating Station construction area, and any spills could result in localized soil contamination and could potentially migrate into the groundwater. However, the scale of the project and localized use would preclude large spills. Should a spill occur, prompt response actions (including adequate sampling and remediation) would be performed in accordance with state and Federal regulations.

Standard post-construction restoration activities would reduce the long-term impacts from soil erosion. These activities would include removing and disposing of debris, dismantling all temporary facilities (including staging and lay down areas), leveling or filling tire ruts, employing appropriate erosion control measures, and reseeding areas disturbed by construction activities with vegetation similar to that which was removed. Disturbed areas would be restored to their original condition to the extent practicable.

Route selection and construction of new HVTLs, pipelines, rail alignments, and access roads would be required for the Mesaba Energy Project Phase I. Also, during construction of the Phase I plant, the Phase II footprint would be cleared and prepared as a staging and laydown area for stockpiling of construction materials and storage of equipment, as well as for a cement batch plant. Therefore, the incremental impacts from construction of the Phase II plant would be negligible with respect to the affected site and corridors. With the exception of the temporary use of off-site laydown areas for Phase II construction, which would occur on one or more previously disturbed sites, the impacts on geology and soils would be essentially the same for Phase I as for both phases of the Mesaba Energy Project.

4.4.2.2 Impacts of Operation

The potential impacts to the physical setting from the operation of the Proposed Action would be low when compared to the impacts from construction. The**re is a low** potential of a significant earthquake (Mooney, 1979). Minnesota is located on one of the most stable areas of North America, and earthquakes with a Richter magnitude of 4 or greater are very rare. The lack of high-intensity earthquakes, together with the infrequency of earthquakes in general, implies a low risk level for Minnesota (Mooney, 1979). In addition, the State Building Code considers the state to be in a Seismic Risk Zone 0 (Mooney, 1979) and states that "any seismic earthquake provisions in this code are deleted and not required." Therefore, no activities from construction or operation of the Proposed Action or alternatives would expose workers or local residents to seismic hazards.

Ground surface disturbances related to repair activities to the pipelines, HVTL, roads, and rail alignments could occur during the operation phase of the power station. However, these disturbances would be temporary, would occur within the areas previously disturbed during construction, and would not result in any additional impacts from those previously discussed for construction activities. Repairs may require clearing vegetation and some soil exposure in order to make the necessary repairs; however, with appropriate grading and re-vegetation practices, potential erosion impacts would be mitigated.

Rail and car traffic would increase the potential for soil contamination around the generating station and rail alignments as a result of spills of hazardous materials. However, such spills would likely be small and related to operation of the rail cars and vehicles, rather than a large container spill. Section 4.16, Materials and Waste Management, describes the impacts related to waste and hazardous materials at the power station.

In the event that the project eventually incorporated carbon capture technology, it is possible that carbon dioxide would be transported by pipeline to a yet undetermined sequestration location. Possible effects on geology and soils of this pipeline cannot be determined at this time.

The incremental impacts on geology and soils from operation of the two-phased generating station would be negligible in comparison to the operation of Phase I only.

4.4.3 Impacts on West Range Site and Corridors

4.4.3.1 Impacts of Construction

Table 4.4-1 summarizes the information about surface disturbance and earthmoving activities due to construction of the IGCC power plant. Construction of the plant would occur exclusively within the West Range Site, approximately **1,708** acres. Prior to construction, clearing and grubbing would clear the existing forest for the power station footprint and staging/lay down areas. The existing topsoil would be removed and stockpiled for later restoration use. Extensive grading would be required, generating a flat area for the temporary staging and lay down areas, and a stable foundation for the plant. Some of the fill would cover existing organic soils.

Table 4.4-1. Areas of Disturbance (West Range Site)

Structure	Area of Disturbance (acres)	Total Prime Farmland Soils and Farmland of Statewide Importance (acres)	Earthwork Cut (cubic yards)	Earthwork Fill (cubic yards)
IGCC Power Plant Footprint Phase I	**202**[1]	**88**	**3,100,000**	**2,350,000**
IGCC Power Plant Footprint Phase II	**---**[2]	**65**	**---**[2]	**---**[2]

[1] **Area is for both Phase I and Phase II footprints, and does not include the buffer land that would not be disturbed. The area occupied by Phase II would need to be initially cleared to accommodate the laydown of the building materials.**
[2] **Included in Phase I construction.**

Construction of the Mesaba Generating Station would increase the potential for erosion where the soils are disturbed. Some of the glacial material, such as the Nashwauk and Keewatin series till, have the potential to be easily eroded when disturbed. Excavated peat and muck from the site foundations could also be subject to erosion.

Construction of the Mesaba Generating Station would disturb a maximum of **152** acres of “Prime Farmland,” “Prime Farmland if drained” and “Farmland of Statewide Importance” (Table 4.4-1). Soils within the proposed power plant footprint and in the most disturbed areas would be permanently altered. These soils are currently located in a forested area with no current farming production. NRCS would need to complete Form AD-1006, the Farmland Conversion Impact Rating, to calculate the potential impacts to farmland soils. The entire IGCC power plant would be located within the Taconite city limits, and thus, exempted from Minnesota Regulation 4400.3450, described in section 4.4.1.2.

The only **process water** facilities associated with the West Range Site outside the city limits of Taconite and Marble are the LMP pumping station, Segment 1 of the Process Water Supply Pipeline, and the outfall at its point of termination of the Segment 1 pipeline (Excelsior, 2006a).

Table 4.4-2 presents key information about the HVTL alternative corridors for the West Range location. All of these corridors would require minimal grading, as the transmission tower elevations would vary with the topography. Construction along new corridors (for portions of HVTL Alternatives WRA-1 and WRA-1A) would require clearing and grubbing to clear all vegetation.

The proposed HVTL towers would be constructed at existing grade and be supported by a concrete pier foundation. The standard foundation would require an excavation 15 to 55 feet deep and would be 7 to 12 feet in diameter. Along the existing corridors, the previous HVTL towers would be removed and replaced with the new transmission towers that would accommodate both the existing lines and new HVTL. The disturbance of soils would be expected to be limited to those areas around the new transmission towers, as well as any necessary access roads for the construction equipment. The potential for erosion would be reduced by employing pre- and post-construction best management practices.

Table 4.4-2. Areas of Disturbance Associated with HVTL Corridors (West Range Site)

Structure	Area of Disturbance (acres)	Temporary ROW (width in feet)	Total Prime Farmland Soils and Farmland of Statewide importance (acres)		Tower Foundation Excavation requirements
			Temporary ROW area	Permanent disturbed area	
HVTL Alternative WRA-1	134	150	95	0.029	15-55 feet deep 7 to 12 feet diameter
HVTL Alternative WRA-1A	1**36**	150	77	0.025	15-55 feet deep 7 to 12 feet diameter
HVTL Phase II Alternative Route WRB-2A	—[1]	—[1]	262	0.049	15-55 feet deep 7 to 12 feet diameter

[1] Data not available

The HVTL corridors would cross a variety of glacial deposits, including till, lacustrine, and alluvium. Organic deposits are also present around areas with low topography and shallow water tables. Construction activities would seek to minimize impacts to the peat and muck deposits by operating in these areas during the winter months, while the ground is frozen. In areas where the frozen ground would not support the weight of the construction equipment, cribbing or matting would be laid on the ground to distribute the weight. In addition, other foundations types (helical piles or driven piles) may be considered in areas of easily compressible and wet organic soils to increase the tower stability.

Construction of temporary haul roads could be necessary along the HVTL corridor in the wetland areas to provide access for material delivery and personnel. These haul roads would be completely removed and vegetation reestablished on the ROW. Erosion control measures and accepted best management practices would be implemented to minimize erosion impacts in these areas during construction.

All of the HVTL alternative corridors would cross “Prime Farmland” soils and “Farmland of Statewide Importance.” The soils would be permanently altered where the transmission tower foundations would be constructed. HVTL Alternative WRA-1 would permanently disturb 0.029 acres, Alternative WRA-1A would disturb 0.025 acres, and the Phase II Alternative would disturb 0.049 acres. Some farmland soils within the HVTL ROW may be temporarily disturbed from construction traffic, but would be restored with vegetation (Table 4.4-2).

The HVTL alternatives would cross sections of the Coleraine Formation south of Taconite. The Coleraine formation is an irregular conglomerate bed found between the older bedrock and the glacial deposits. Preserved marine shells and shark and reptile teeth have been recovered from excavated rock from this formation in mine tailing piles around the towns of Coleraine and Bovey. The Hill-Mine Annex State Park also holds fossil hunts in the excavated material. However, most of the Coleraine Formation bedrock in this area is 150 feet or more below the ground surface, which is well below the bottom of the proposed HVTL tower foundations, and no impacts to the fossils are anticipated.

Several pipeline corridors would be constructed as part the West Range IGCC power plant. Table 4.4-3 summarizes the key information used to describe the impacts from the construction of these pipelines. Some pipeline corridors would be constructed within previously undisturbed areas. Portions of the Process Water Segment 3 would require extensive clearing and grubbing activities for the new corridors. Some corridors (Process Water Segment 2, Sewer and Water Pipelines) would follow **CR 7 and would** connect **with** the Mesaba Generating Station **via the ROW for Access Road 3,** which would require **some** additional clearing **in the corridor**. Other corridors (e.g., Process Water Segment 1 pipeline) would cross areas already disturbed from past mining activities. **[Text in the Draft EIS pertaining to Cooling Tower Blowdown Outfalls has been eliminated in this paragraph and Table 4.4-3 based on the proposed use of an enhanced ZLD system at the West Range Site.]**

Construction on the pipeline corridors would attempt to mitigate erosion impacts around steep terrain and areas with poor drainage. On steep terrain or in wet areas, the ROWs may be graded at two elevations or diversion dams may be built to facilitate construction, and would be restored to their original conditions upon completion of construction. Excavation and grading will only be undertaken where necessary to increase stability and decrease the gradient of unstable slopes.

Table 4.4-3. Areas of Disturbance Along Proposed Pipeline Corridors (West Range Site)

Structure	Area of Disturbance (acres)	Temporary ROW (width in feet)	Total Prime Farmland Soils and Farmland of Statewide Importance (acres)		Excavation Requirements
			Temporary ROW Area	Permanent Disturbed Area	
Natural Gas Alternative 1	1**35**	100	**99**	**76**	16-24" diameter pipe; Trench: 72" deep
Natural Gas Alternative 2	84	100	**64**	**58**	16-24" diameter pipe; Trench: 72" deep
Natural Gas Alternative 3	**99**	100	**64**	**51**	16-24" diameter pipe; Trench: 72" deep
Process Water Segment 1	40	150	**3.0**	**2**.0	Trench: 7-8 feet deep
Process Water Segment 2	**39**	150	**32**	**21**	Trench: 7-8 feet deep
Process Water Segment 3	**88**	150	52	35	Trench: 7-8 feet deep
Sewer and Water Line	**35**	100	**22**	**9**	**Sewer**: 12" diameter, trench graded but no deeper than 8 ft **Water**: 12" diameter trench 60" below surface

Potential construction impacts from unstable ground surface would be similar to those previously described for the HVTL corridors. In areas with large quantities of wet organic soils, construction may need to occur during the winter months. Construction of temporary haul roads may also be necessary along Process Water Segment 3 pipeline in the wetland areas to provide stable access for personnel and material delivery. These roads would be completely removed and re-vegetated after construction is complete.

The natural gas pipeline alternatives would initially travel over a new corridor, and either join one of the HVTL Plan A corridors (Gas Pipeline Alignment Alternative 1 and 2), or travel along US 169 (Gas Pipeline Alternative 3). All three alternatives would require minimal grading, but clearing and grubbing would be necessary through existing forest areas.

The potable water and sewer lines would follow the proposed **Access Road 3** and CR 7 to the main municipal pipelines at US 169. Trees and other vegetation would be cleared along the water and sewer pipeline corridor. Standard best management practices, approved by the MPCA, would reduce the potential for soil erosion in these areas. After construction, the vegetation and the roadway surface would be re-established.

Table 4.4-3 presents the potential impacts from pipeline construction activities to soils classified as “Prime Farmland,” “Prime Farmland if Drained,” and “Farmland of Statewide Importance.” If the farmland soils were excavated, covered, or excessively disturbed, than they would be altered from their original designation and effectively impacted. Soils disturbed through trenching activities are included in the permanent disturbed area. Other farmland soils within the construction ROW may be disturbed by traffic or other construction activities, but not significantly altered. Permanent changes to the amount of farmland soils would be reduced by restricting construction traffic to access roads close to the centerline and re-establishing vegetation to pre-construction conditions.

The rail alignment alternatives and access roads would connect the Mesaba Generating Station area to existing highways and main rail corridors. These corridors would be built at the beginning of the construction phase to facilitate personnel, equipment, and materials transport. Table 4.4-4 presents the key information used to describe the potential impacts from construction activities. **[Rail Alternative 1B was eliminated from further consideration based on the Draft EIS analysis. Therefore, text pertaining to Rail Alternative 1B has been eliminated in the following paragraphs and Table 4.4-4.]**

Construction of Rail Line Alternative 1A or **3B** would cut through existing forest to the cleared areas at the Mesaba Generating Station. Near the southern tip of Big Diamond Lake, the alternatives would generally follow an old railroad grade. In order to avoid a large mine tailings pile, Alternative**s** 1A **and 3B** would turn to the northwest to follow a new corridor between Big Diamond Lake and Dunning Lake. Trees and other vegetation would be cleared along the rail line corridor, and the vegetation would be re-established in areas of temporary disturbance after construction is completed on the rail line.

Rail alignments would require cuts and fills to attain an acceptable grade. Cuts would primarily be through till and coarse alluvium, and in some cases bedrock. The rail alternatives would require filling the low areas located between Big Diamond and Dunning Lake, and cutting through uneven terrain. **The Alternative 3B rail loop would also require additional cuts and fills around a 40-foot tall hill.** The rail loop of Alternative 1A would be located on up to 50 feet of fill material. Some of this fill would bury existing organic soils. Some of the cut material (sorted till, granite bedrock) would be used for the fill. Peat and muck would only be used as fill in constructed wetlands.

In the area between Big Diamond Lake and Dunning Lake and up to the power station, Alternative**s** 1A **and 3B** construction would require cuts of 30 to 78 feet below grade. Embankments as high as 36 feet would be required to cross low areas. If a surplus of fill material occurs, it would be graded around the Mesaba Generating Station, covered in topsoil and re-vegetated.

Table 4.4-4. Areas of Disturbance Along Rail Alignment Alternatives and Access Road (West Range Site)

Structure	Area of Disturbance (acres)	Maximum Temporary ROW (width in feet)	Total Prime Farmland Soils and Farmland of Statewide Importance (acres)		Earthwork Cut (cubic yards)	Earthwork Fill (cubic yards)
			Max temporary ROW	Permanent		
Rail Alignment 1A	**118**	Variable (80-450)	**50**	**22**	**3,725,000**	**610,000**
1A Center Loop	—[1]	—[2]	**25**	**27**	—[2]	—[2]
Rail Alignment 3B	**107**	**Variable (80-450)**	**66**	**33**	**2,620,000**	**620,000**
3B Center Loop	**—**[2]	**—**[2]	**—**[2]	**—**[2]	**—**[2]	**—**[2]
Access Road 3	**20**	**200**	**20**	**12**	**—**[1]	**—**[1]

[1]Data not available
[2]Data are included with the rail alignment

Both rail alignments would cross small sections of peat deposits, **although** most of **Rail Alternative 1A** rail loop would be **built on** wet organic soils. In these areas, special construction techniques would be necessary in order to stabilize the railway. It may be possible to construct railroad embankments over the material if the embankments were built up slowly over time. The determining factor would be the extent of long-term secondary compression of the peat and the impact of that compression on the project feature in question. Another option would be to excavate peat and muck deposits and replace the material with competent fill prior to construction, which would expose more topsoil to erosive processes. During construction, crane mats could also be used to mitigate damage to soft organic soils.

Permanent impacts to the soils classified as “Prime Farmland” or “Farmland of Statewide Importance” would occur below the rail bed, and within the area covered by the IGCC rail loop, as presented in Table 4.4-4.

As described in Section 2.3.1.2, the realignment of CR 7 (Access Road 1) has been deferred by Itasca County because of reduced state funding priority. Access Road 1 would be an extension of CR 7 by Itasca County that would require cuts through previously disturbed and undisturbed areas. Such cuts could be significant and the scenic view would be compromised if the road passed too closely to existing residential properties causing numerous driveways to be visible from the highway.

As described in Section 2.3.1.2, Access Road 2 would be contingent on the realignment of CR 7, which has been deferred by Itasca County since publication of the Draft EIS. Access Road 2 would require clearing of wooded areas in the southern part of the property.

Access Road 3 would be built to connect CR 7 to the Mesaba Generating Station **near the southwestern corner of the property**. This would require clearing vegetation and temporarily disturbing some soils within the construction corridor. After construction, vegetation would be re-established in areas of temporary impact. **[Text pertaining to Access Roads 1 and 2 in the Draft EIS has been eliminated in this paragraph and Table 4.4-4 based on the deferment of the CR 7 realignment project by Itasca County.]**

In areas with wet soil, additional dewatering processes and sediment compaction would be necessary to create a stable foundation for the roadbed. The roadway alignments would also cross organic (peat) soils outside of the plant site. To prevent the potential for subsidence, the peat deposits may either be removed or improved by dewatering processes with reinforced embankments. Additional construction procedures would be required to prevent construction impacts from subsidence on soft soils. Crane mats and/or low ground pressure equipment would be used in these areas. Construction during the winter months may also alleviate impacts due to construction.

During construction of Phase I, materials used for construction would initially be stored in the Phase II footprint, which would be prepared for use as a staging and laydown area. Therefore, the incremental impacts from construction of the Phase II plant would be **negligible on the West Range Site property. For Phase II, Excelsior would establish off-site construction staging and laydown areas on 85 acres of land at potential sites described in Chapter 2 and shown in Figure 2.3-3. The potential Phase II laydown areas have all been disturbed during prior uses by mineral extraction companies. Excelsior would select the appropriate sites for the necessary acreage prior to construction, taking into account the potential effects to soil disturbance. The lands would be cleaned and restored to their pre-existing condition at the end of Phase II construction.**

Because route selection and construction of new HVTLs, pipelines, rail alignments, and access roads would be required for the Mesaba Energy Project Phase I, and the Phase II footprint would be used as a laydown area for Phase I construction, the incremental impacts from construction of the Phase II plant would be negligible with respect to the site and affected corridors. Therefore, except for the temporary use of off-site laydown areas that have been previously disturbed, the impacts on geology and soils would be essentially the same for Phase I as for both phases of the Mesaba Energy Project at the West Range Site.

4.4.3.2 Impacts of Operation

No operational impacts other than those discussed in Section 4.4.2.2 are anticipated.

4.4.4 Impacts on East Range Site and Corridors

4.4.4.1 Impacts of Construction

Potential impacts to the physical setting at the East Range Site from construction would be similar to those described for the West Range Site. Phase I and II construction would occur within the **East Range Site property**, encompassing **1,322** acres**, and cause disturbance as indicated in** Table 4.4-5. Part of the forest within the buffer lands has historically been harvested for timber. Prior to construction, the existing vegetation would be cleared and grubbed. The land would be graded and fill would be added, if needed. Topsoil removed during construction would be stockpiled for use during the restoration phase. These construction activities would disturb the soil and increase the potential for soil erosion, especially on the till deposits, which erode easily when disturbed. Careful grading and proper reseeding of the area surrounding the footprint would mitigate these potential impacts.

No organic deposits are located within the buffer land area. Till compacts poorly when wet, so dewatering may be required to ensure that potential impacts from facility subsidence would not occur.

At this time, NRCS has not completed a soil survey for St. Louis County, which includes the proposed East Range IGCC power plant and associated corridors. From the preliminary information available, there are no soils classified as “Prime Farmland” or “Farmland of Statewide Importance” within the East Range Site (Excelsior, 2006b). To verify the preliminary results prior to construction, the NRCS would complete Form AD-1006, the Farmland Conversion Impact Rating.

The proposed East Range IGCC Power Station Footprint and Buffer Land, as well as many of the Station’s associated facilities are located entirely within the city limits of Hoyt Lakes, a statutory city. The Process Water Supply Pipeline Segment 7 is located within the City of Aurora, also a statutory city. The only associated facilities of the East Range Site that lie outside the city limits of Hoyt Lakes or Aurora are Segment 6 and Segment 8 of the Process Water Supply Pipeline. Therefore, the prime farmland exclusion does not apply to either the East Range IGCC Power Station Footprint, Buffer Land, any of the associated facilities or additional lands except for the two identified Process Water Supply Pipeline Segments. No active farming is currently being conducted at the East Range Site.

Table 4.4-5. Areas of Disturbance (East Range Site)

Structure	Area of Disturbance (acres)	Total Prime Farmland Soils and Farmland of Statewide importance (acres)	Earthwork Cut (cubic yards)	Earthwork Fill (cubic yards)
IGCC Power Plant Footprint & Buffer Land	**182**[1]	0[2]	**3,349,000**	**1,146,000**

[1] **Area is for both Phase I and Phase II footprints, and does not include the buffer land that would not be disturbed. The area occupied by Phase II would need to be initially cleared to accommodate the laydown of the building materials.**
[2] Preliminary soil survey results indicate no Prime Farmland Soils or Farmland of Statewide Importance are located in the buffer land area. This number may change when the soil survey is officially released.
Source: Excelsior, 2006b

In general, the HVTL alternative corridors would follow existing ROWs from the Mesaba Generating Station to the Forbes Substation. The existing HVTL structures would be replaced with taller, single-pole steel towers. One new segment would be built around Eveleth to connect the 39L to the 37L at the Thunderbird Mine Substation. Minimal grading would be required, and vegetation would be cleared in areas around Eveleth to provide equipment access and to expand the existing corridors' ROW. To minimize the potential for increased soil erosion from construction, the towers would be built at the existing grade, and cleared areas would be reseeded. Table 4.4-6 presents the area of disturbance, the HVTL ROW and the foundation excavation requirements. Permanent impacts to the soil would occur directly around the foundations of the HVTL structures and along the corridor centerline.

The HVTL corridors would cross a variety of physiographic features, including wetlands, areas with organic (peat) soils, and shallow or exposed bedrock. These areas would require special construction techniques in order to ensure the HVTL structures are stable. The standard drilled shaft foundations would not be possible in peat deposits, which may require helical or driven piles to stabilize the tower. In areas where the bedrock is close to the surface, post-tensioned rock anchors may need to be bored into the bedrock to stabilize the foundation.

Table 4.4-6. Areas of Disturbance Associated with HVTL Corridors (East Range Site)

Structure	Area of Disturbance (acres)	HVTL ROW (width in feet)	Tower Foundation Excavation Requirements
HVTL Alternative 1	**764**	100	15-55 feet deep 7 to 12 feet diameter
HVTL Alternative 2	**753**	100	15-55 feet deep 7 to 12 feet diameter

Organic deposits such as peat are also highly compressible and do not support heavy construction equipment. Therefore, construction in these areas would require the use of crane mats or low ground pressure equipment. Waiting for the organic deposits to freeze during the winter months may also alleviate the difficulty of construction, and it would minimize impacts to of the soft, compressible, wet soils found in the wetlands. Temporary haul roads may need to be constructed along the HVTL corridor in the wetland areas to provide access for material delivery and personnel. These haul roads would be completely removed when vegetation is re-established on the ROW. Potential impacts to wetlands from construction activities are discussed in Section 4.7.

Around Eveleth, the HVTL Alternative 2 corridor would pass by mine pits and tailings piles. A new corridor would connect the 39L to the 37L at the Thunderbird Mine Substation. Where the new HVTL alignment would encounter mine pits, the corridor would be routed around the pit(s), if necessary. If the corridor crossed a tailings pile, special foundations would be required to accommodate the variable soil and rock material within the pile. Standard best management practices would be used to control erosion of the loose surficial materials during construction on the mine tailing.

The preliminary soil survey datasets are not complete for the areas that would be crossed by the HVTL corridors; therefore, the potential impacts to farmlands cannot be determined at this time. The potential impacts would be determined when NRCS generates a Farmland Conversion Impact Rating.

The proposed pipeline corridors would cross bedrock, wetlands, and disturbed mining areas. **The process water pipeline** network would connect the flooded mine pits on Cliffs-Erie property with the Mesaba Generating Station. A cooling tower blowdown pipeline would not be used and an enhanced ZLD system would be added to the power station to treat the blowdown. The area of disturbance, temporary ROW and excavation requirements from pipeline construction are presented in Table 4.4-7.

All of the natural gas pipelines would be located on existing corridors or on disturbed ground. The natural gas pipeline would be constructed within an existing gas pipeline corridor serving Cliffs-Erie. The process water pipelines would be located on soil disrupted by mining activities. The sewer and potable water lines would be placed along the 43L HVTL corridor to connect to the Hoyt Lakes wastewater and drinking water systems, and would cause similar construction impacts to the HVTL corridors. The pipelines would require minimal grading. Around irregular topography, construction of the natural gas pipeline would use grading and cut-and-fill techniques to minimize the potential erosion impacts.

Table 4.4-7. Areas of Disturbance Along Proposed Pipeline Corridors (East Range Site)

Structure	Area of Disturbance (acres)	Maximum Temporary ROW (width in feet)	Excavation Requirements
Natural Gas Pipeline	**128**	100	16-24” diameter pipe; Trench: 72” deep
Process Water 2WX-SITE	16	150	Trench: 10 feet deep
Process Water 2WX-W	10	150	Trench: 10 feet deep
Process Water 2W-2E	2.9	150	Trench: 10 feet deep
Process Water 3-2E	1**2**	150	Trench: 10 feet deep
Process Water K-2WX	3.4	150	Trench: 10 feet deep
Process Water S-2WX	39	150	Trench: 10 feet deep
Process Water 9S-6	9.6	150	Trench: 10 feet deep
Process Water 9N-6	18	150	Trench: 10 feet deep
Sewer and Water Line	2**0**	100	**Sewer**: 12” diameter; Trench graded but no deeper than 8 feet **Water**: Pipe 6” diameter; Trench: 60” below surface

Trenching in the pipeline corridors would excavate both topsoil and subsoil in two subsequent passes. The soils would be separated and stockpiled, then used to restore the post construction landscape. To minimize any impacts that might occur when crossing water bodies, directional drilling may be used. However, in some cases, open cut and fill procedures would still be used to cross water bodies. The impacts would be reduced by using guidance from the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and the MNDNR. Additional impacts to the water resources from directional drilling are addressed in Section 4.5, Water Resources.

Using preliminary soil survey data, the natural gas pipeline corridor was analyzed qualitatively in the immediate area surrounding the East Range buffer land area. One area of potential impact was identified. The natural gas pipeline will affect an area of Cloquet loam as it has been preliminarily mapped by the NRCS. A rough scale, based on preliminary maps, indicates approximately 0.25 acres of "Farmland of Statewide Importance" could be impacted within the natural gas pipeline permanent ROW (70-foot width). However, because this estimate is based on unconfirmed preliminary mapping data, the NRCS would determine the actual acreage of this impact to soils classified as farmland of statewide importance within the East Range project area when it calculates the Farmland Conversion Impact Rating.

The process water pipelines primarily cross deposits from mining operations. In areas with glacial material remaining (Pipelines 6-S-2WX, K-2WX, 2WX-Site, 2WX-2W), the cleared area would be grubbed and any topsoil would be stockpiled for later use. The till found along these pipelines has an "easily erodes" characteristic, which would be minimized with BMPs. The amount of soils classified as "Prime Farmland" and "Farmland of Statewide Importance" has not been determined around the process water pipelines. However, the pipelines would be located in highly disturbed areas from past mining activities.

The rail alignment alternatives and the access road corridors would cross both upland and wetland areas around the Mesaba Generating Station. Table 4.4-8 presents the key information about the rail alignment alternatives and access road used to determine the potential impacts from construction.

The potential impacts would generally be similar to the ones described above and for the road and rail corridors at the West Range Site. The land within the construction ROW would be cleared and grubbed. BMPs and post-construction reclamation would be required to prevent increased loss of topsoil and till. The rail alignment Alternatives 1 and 2 would require filling some of the wetlands to attain the appropriate grade. To maintain stability, muck and peat may need to be removed from these wetlands. Prime Farmland Soil impacts would be calculated when NRCS reviews the NEPA process.

The access road would approach the IGCC facility from the **east**. **It** would primarily cross till, so any cleared areas would be graded and reseeded to minimize the potential for increased erosion. Preliminary soil maps of the area indicate that no soils classified as "Prime Farmland" or "Farmland of Statewide Importance" would be disturbed by the access road construction.

Table 4.4-8. Areas of Disturbance Along Rail Alignment Alternatives and Access Road (East Range Site)

Structure	Area of Disturbance (acres)	Maximum Temporary ROW (width in feet)	Earthwork Cut (cubic yards)	Earthwork Fill (cubic yards)
Rail Alignment Alternative 1	**53**	Variable (75-490)	2,3**9**0,000	**123**,000
Alternative 1 Center Loop	10**5**	—[1]	—[2]	—[2]
Rail Alignment Alternative 2	**58**	Variable (75-490)	2,1**8**0,000	**11**6,000
Access Road	**46**	200	—[1]	—[1]

[1] Data not available
[2] Data are included with the rail alignment

During construction of Phase I, materials used for construction would initially be stored in the Phase II footprint, which would be prepared for use as a staging and laydown area. Therefore, the incremental impacts from construction of the Phase II plant would be **negligible on the East Range Site property. For Phase II, Excelsior would establish off-site construction staging and laydown areas on 85 acres of land at potential sites described in Chapter 2 and shown in Figure 2.3-5. The potential Phase II laydown areas have all been disturbed during prior uses by mineral extraction companies. Excelsior would select the appropriate sites for the necessary acreage prior to construction, taking into account the potential effects to soil disturbance. The lands would be cleaned and restored to their pre-existing condition at the end of Phase II construction.**

Because route selection and construction of new HVTLs, pipelines, rail alignments, and access roads would be required for the Mesaba Energy Project Phase I, and the Phase II footprint would be used as a laydown area for Phase I construction, the incremental impacts from construction of the Phase II plant would be negligible with respect to the site and affected corridors. Therefore, except for the temporary use of off-site laydown areas that have been previously disturbed, the impacts on geology and soils would be essentially the same for Phase I as for both phases of the Mesaba Energy Project at the East Range Site.

4.4.4.2 Impacts of Operation

No operational impacts other than those discussed in Section 4.4.2.2 are anticipated.

4.4.5 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. Therefore, construction and operational impacts associated with the Proposed Action would not occur. Areas within the existing HVTL and pipeline corridors would remain in their current state and would be disturbed by repair activities from ongoing operations. However, areas of disturbance would be smaller than required for the Proposed Action and would be restricted to the existing corridors.

4.4.6 Summary of Impacts

The impacts on geology and soils described below would be essentially the same for the two-phased Mesaba Generating Station as they would for Phase I only.

Basis for Impact	No Action	West Range	East Range
Result in soil erosion or loss of topsoil.	No soil disturbance.	Soils disturbed within construction ROW, may increase erosion.	Soils disturbed within construction ROW, may increase erosion.
Result in direct conversion of prime and unique farmland to non-agricultural uses.	No prime or unique farmland conversion.	The site and buffer lands are exempted from Minnesota Regulation 4400.3450, as they are located within the cities of Taconite and Marble. Only the LMP pumping station, Segment 1 of the Process Water Supply Pipeline, and the outfall at its point of termination of the Segment 1 pipeline have potential for impacting prime farmlands. Depending on which corridors would be selected, approximately **243** to **338** acres of Prime Farmland soils would be disturbed during the construction process.[1]	The site and buffer lands are exempted from Minnesota Regulation 4400.3450, as they are located within the City of Hoyt Lakes. Preliminary information shows no Prime Farmland soils at the East Range power plant site. No soil survey data is currently available for the East Range corridors.
Result in the loss of availability of a known mineral resource that would be of value to the region.	No mineral resource loss.	No mineral resource loss.	No mineral resource loss.
Located on a geologic unit or soil that would be unstable as a result of the project.	Soils remain unmodified.	Portions located on wet glacial till and peat.	Portions located on wet glacial till and peat.
Expose people or structures to adverse effects from seismic activity.	No exposure to seismic activity.	No exposure to seismic activity.	No exposure to seismic activity.
Result in the contamination of soil or mineral resources.	No soil contamination.	Increased potential for spills.	Increased potential for spills.
Result in the loss of paleontological resources.	No loss to paleontological resources.	No loss to paleontological resources.	No loss to paleontological resources.

[1] This range was calculated from the maximum and minimum Prime Farmland values for the West Range power plant site and corridors, found in tables 4.4-1 through 4.4-4. Permanent loss of farmland acreage would occur on the footprints of aboveground structures only. **Pipelines that share corridors would reduce the overall disturbance to prime farmland soils.**