3.3 Soils

Soils issues include the potential disturbance and alteration of native soil profiles and structure, increased soil erosion and compaction, the loss of soil productivity, and change in infiltration rates and associated groundwater recharge.

The study area for direct and indirect impacts for soils encompasses the proposed permit boundary. The soils cumulative effects study area is the same as the direct/indirect study area in addition to surface disturbance associated with past and present actions and RFFAs (see Section 2.7).

3.3.1 Affected Environment

3.3.1.1 Regional Soils

The proposed Rusk Permit Area lies within the West Gulf Coastal Plain section of the Coastal Plain physiographic province (Fenneman 1928). The study area lies within the Western Coastal Plain Major Land Resource Area (MLRA) (NRCS 2006). Soils within the MLRA have developed on level to steep uplands that are highly dissected by streams with floodplains and terraces. The soils in the MLRA formed in residuum, alluvium, and marine sediments. They generally are very deep, well drained to poorly drained, and loamy or clayey with siliceous, mixed, or smectitic mineralogy. Smectites are expanding clays that have a very high shrink-swell capacity. Smectitic clays are commonly referred to as bentonite soils.

The soils information for the study area is based on Soil Survey Geographic (SSURGO) database review and analyses (Soil Survey Staff 2009). The occurrence of soils within the study area is shown in **Figure 3.3-1**.

3.3.1.2 Soil Types in the Rusk Permit Area

Tables E-1 and **E-2** in **Appendix E** summarize the physical and chemical characteristics and reclamation suitabilities of the soil map units that occur within the study area. The dominant soils mapped within the study area are described below. Slopes in the study area range from 0 to 20 percent (nearly level to hilly). Soil textures are highly variable and range from sands to clays. The soils in the study area typically are highly acidic (pH 3.5 to 4.4) to slightly acidic (pH 6.1 to 6.5) to a depth of 80 inches. However, soils such as the Kirvin and Marietta may be slightly alkaline (pH 7.4 to 7.8).

The Sawlit-Sawtown complex occurs on depressions and marine terraces. The Sawlit soils are very deep with textures ranging from loam to clay loam. Although acidic, the upper 36 inches have suitable growth media characteristics. The lower material is 35 percent or more clay, highly acidic, and is not considered suitable as growth media. The Sawtown soils are very deep with textures ranging from clay loam to sandy loam. The upper 49 inches have suitable growth media characteristics. The Estes soils occur on flood plains and are listed as hydric (a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper layers). Estes soils are very deep and have textures ranging from clay to sandy clay loam, with 40 to 60 percent clay in the upper 60 inches. Erosion potential is high on Estes soils, and the soil is highly acidic. Due to the erosion potential of these soils, they are not considered suitable as a growth media. The Kirvin soils occur on interfluves (higher land area between two streams) on coastal plains. Kirvin soils are very deep with textures ranging from fine sandy loam to clay. These soils are slightly alkaline to highly acidic, are prone to water erosion, and have a non-cemented densic (heavily compacted) horizon at 40 inches. Due to the clay content of these soils, only material above 6 inches is considered suitable for use as growth media. Darco soils occur on interfluves on coastal plains. Darco soils are very deep with textures ranging from fine sand to sandy clay loam. Although droughty and prone to wind erosion, the entire soil profile up to 80 inches has suitable growth media characteristics. Gallime soils occur on stream terraces. These soils are very deep with textures ranging from fine sandy loam to clay loam. Gallime soils are slightly acidic to strongly acidic in the upper 29 inches and moderately acidic to very strongly acidic below 29 inches.

In summary, many of the undisturbed soils within the Rusk Permit Area have suitable growth media characteristics in the upper portions of the soil profiles, if amended with lime. Soils with excessive clay or sand content are not considered suitable for use as reclamation growth media.

3.3.1.3 Prime Farmland

Prime farmland soil is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and also is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner, if it is treated and managed according to acceptable farming methods. Thus, prime farmland soils have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Prime farmland soils are permeable to water and air, are not excessively eroded or saturated with water for long periods of time, and either do not flood frequently during the growing season or are protected from flooding (Soil Survey Staff 1993). Approximately 4,144 acres within the study area are occupied by prime farmland soil types as identified by the NRCS. These soils are noted by an asterisk in **Table E-1** in **Appendix E**. NRCS designation of prime farmland soils indicates the suitability of a soil for production of crops; however, it does not necessarily imply historical local cropland use.

A site-specific investigation is required by RCT regulations under the Surface Mining Control and Reclamation Act of 1977 to determine whether NRCS-designed prime farmland soil types within the proposed Rusk Permit Area may be prime farmland historically used for cropland. An investigation of historical land use within the study area was conducted by Sabine to determine if the prime farmland soils have a history of crop production. The investigation included acquiring affidavits of use attesting to the historical use of the tracts containing NRCS-designated prime farmland soils from persons who have specific knowledge of the use of these tracts during the 10 years immediately preceding the acquisition of the land. Based on review of the affidavits of use (described in §12.138(a) of the Sabine's RCT application), it was determined that none of the prime farmland soils identified within the proposed Rusk Permit Area have been historically used as cropland (Sabine 2010d, 2009a).

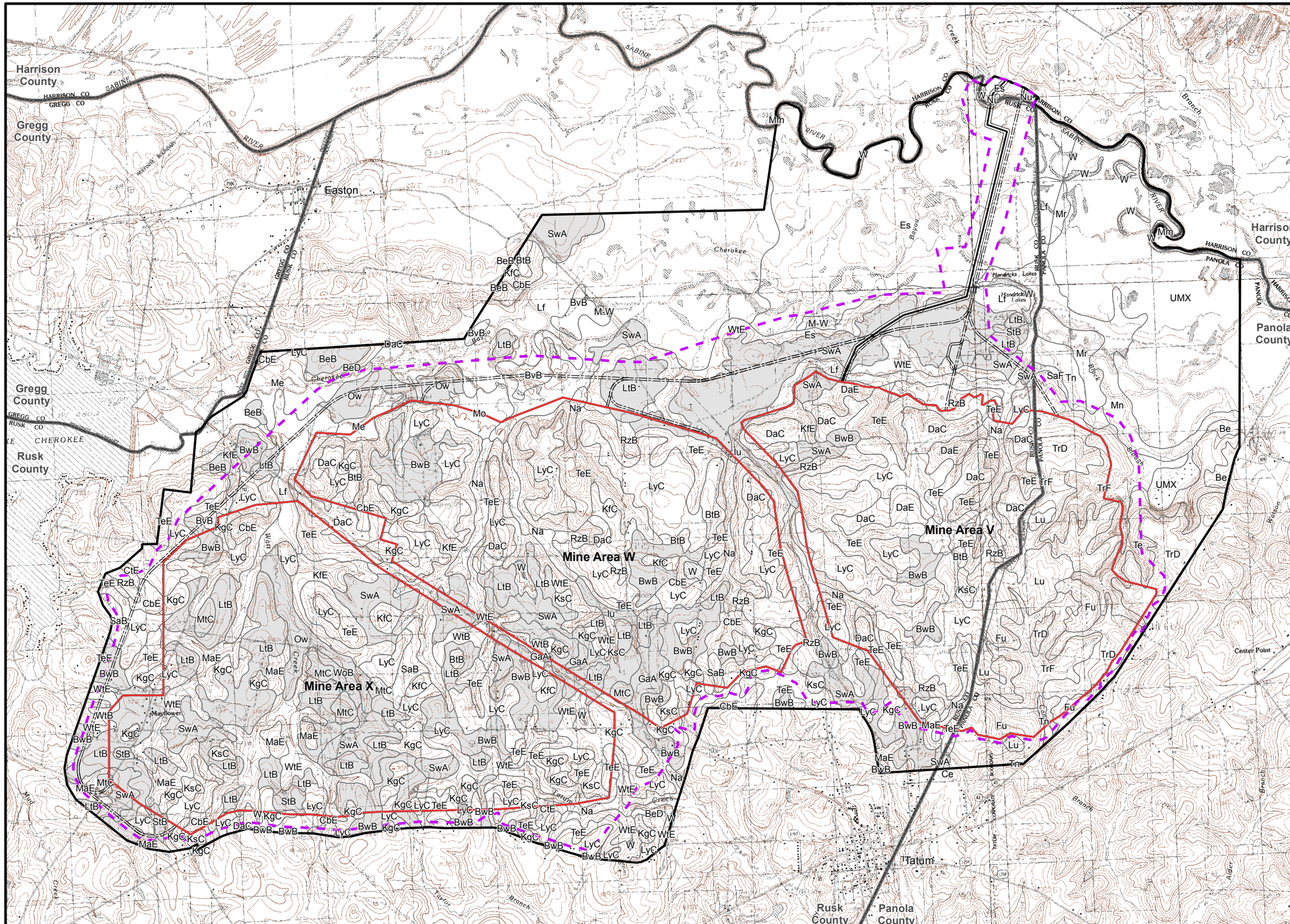
3.3.1.4 Soil Productivity

Soil productivity is primarily a measure of the soils' ability to support a viable vegetative community. Productivity varies with vegetation community, but more importantly, with land management objectives as they relate to which vegetation types are desirable or productive. **Table E-3** in **Appendix E** provides the potential productivity data for selected crops, native grasses, pasture grasses, and common trees. These data have been compiled by the NRCS from various research and productivity measurement studies of specific soils relevant to the proposed Rusk Permit Area. Productivity data presented in the tables represent potential yields under a high level of management.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action

Incremental surface disturbance to soil resources as a result of mine construction and operation would total up to 14,392 acres. Impacts also may occur during reclamation when growth media is redistributed. Potential impacts to soils as a result of the Proposed Action would include an increase in soil erosion due to the removal of vegetation, an alteration of soil structure, and a reduction in soil productivity. Although accelerated erosion due to mining-related soil disturbance could occur at any stage of the project, the maximum potential for erosion within the study area would be expected during construction and operation while soils are loose, with no established cover. Reclamation and the installation of erosion control measures and devices, as described in Section 2.5.2.1, would minimize erosion and the potential for sediment to leave the mine site.



Legend

- Proposed Rusk Permit Area Boundary
- Proposed Mine Areas
- Proposed Life-of-mine Disturbance Boundary
- SSURGO Soil Type
- Prime Farmland Soils
- County Boundary
- Main Haul Roads
- Dragline Walkway

Note: See **Table E-1** in Appendix E for soil mapping unit names.

None of prime farmland soils in the permit boundary have been historically used as cropland (NACC 2009).

Source: Sabine 2009a,b,2010c; SSURGO 2009.

N

0 0.5 1 Miles

Rusk Permit Area EIS

Figure 3.3-1

Soil Types in Rusk Permit Area

07/22/10

Soil compaction would occur in areas that are heavily trafficked by vehicles and equipment. Soil compaction also could occur during reclamation if equipment travels on, or handles, the soils when they are moist or wet.

The native surface soils are loamy to sandy, droughty, moderately to highly erodible by wind and water, and acidic with low fertility. The primary limitations to using the subsoil materials in reclamation are their heavy clay textures (with related structural, crusting and compaction, and permeability limitations) and frequent occurrence of strong acidity. Due to the poor suitability characteristics associated with some of the native soil materials, Sabine has requested approval to use suitable oxidized overburden as a substitute for topsoil and subsoil.

If approved, suitable oxidized overburden would be salvaged during operations as a replacement for topsoil and subsoil. Sabine's selective handling plans for overburden, as described in Section 2.5.2.6, are designed to provide for segregation of sufficient oxidized material to provide a minimum 4-foot cover over all acid-forming, toxic, or combustible materials naturally occurring within the geologic materials. Soil amendments would be applied, if necessary, as determined by a testing program. Revegetation success would be determined in accordance with RCT's 2006 *Procedures and Standards for Determining Revegetation Success on Surface-Mined Lands in Texas* and Sections 12.395 and 12.399 of the Texas Coal Mining Regulations. Revegetation success would be monitored through evaluation of percent ground cover, tree densities, and productivity, as applicable, in relation to the site-specific post-mining land use. The program then would examine, review, and determine the effectiveness of the reclamation efforts to achieve proposed standards of reclamation success.

Similar to the native soil conditions, the limiting factors that would exclude other overburden and interburden materials from use in reclamation primarily are related to texture (strongly sandy grain sizes) and low pH. Where present, these materials generally comprise the lower portion of the oxidized overburden. The unsuitable materials would be avoided through use of the overburden selective handling techniques.

Sabine's investigation indicated that more than sufficient volumes of suitable alternative growth media from overburden sources exist within the proposed mine area. Based on a review of the drill hole data, the combined thickness of the topsoil and oxidized overburden materials that would be suitable for use as growth media ranges from approximately 15 to 50 feet and averages approximately 30 feet. Based on drilling information and Sabine's geologic model, it is projected that approximately 352.2 million cubic yards of suitable overburden are available within the area proposed to be mined during the life of the project, of which approximately 61.7 million cubic yards (approximately 17.5 percent) would be needed for reclamation purposes (Sabine 2010a). A temporary decrease in soil productivity would occur in association with planned soil replacement activities due to a lack or reduction in microbial activity. However, the balanced particle size distribution of the proposed substitute material would provide increased moisture and nutrient storage capacity and would extend throughout the soil profile. Soil productivity gradually would improve with vegetative growth and decomposition. Acidity of the proposed substitute material could be improved by liming. Infiltration rates would increase due to the balanced particle size distribution and result in reduced runoff and increased groundwater recharge.

Mobile equipment (e.g., trackhoes and end-dumps) would be utilized to allow for selective handling of materials and allow for retrieval of suitable plant growth material and inclusion of some less-suitable materials if they are encountered. Mixing of the selected growth media is anticipated to be more thoroughly accomplished under the proposed pit operations approach than it would be under a scraper/bulldozer operation, if the latter were used to salvage native topsoils. The use of more suitable growth media from overburden, as opposed to the salvaging of native topsoil materials, is not anticipated to limit the success of the reclamation program and possibly may enhance it. The reconstructed growth media is anticipated to have post-mine soil textures with an improved balanced particle size distribution, and is not expected to display the adverse physical characteristics of the native topsoil (i.e., excessive sand or clay). To ensure reclamation success, growth media testing would occur after the growth media is applied to the recontoured surface as part of the reclamation program as described in Section 2.5.3.1,

Closure and Reclamation. As a result, it is anticipated that successful site stabilization and restoration of productive post-mining land uses would occur at the Rusk Permit Area as required by RCT regulations.

Based on the planned implementation of erosion control measures (e.g., sediment control ponds, diversion ditches, silt fences, straw bales, and revegetation measures), the potential for soil erosion as a result of surface water discharge is anticipated to be low.

3.3.2.2 No Action Alternative

Under the No Action Alternative, the proposed Rusk Permit Area would not be developed, and the associated disturbance of up to 14,392 acres of soils would not occur. As a result, the direct and indirect impacts to soil resources as described for the Proposed Action would not occur under this alternative. Currently authorized operations at the existing South Hallsville No. 1 Mine (inclusive of the South Marshall Permit Area) and ongoing mine-related effects to 17,600 total acres of soil resources would continue through the completion of reclamation in approximately 2035.

3.3.3 Cumulative Impacts

Past and present actions and RFFAs are described in Section 2.7 and shown in **Figure 2-12**. The past and present actions in the soil resources cumulative effects study area that have resulted, or would result, in the removal and disturbance of native soils include four existing lignite mines (inclusive of the existing South Hallsville No. 1 Mine); two existing power plants and their associated cooling water reservoirs; and other actions for which 404 permits have been issued, include oil and gas exploration and development, pipeline construction, railroad maintenance, highway and road construction, dam construction, and miscellaneous other construction projects. Two RFFAs (the proposed Marshall Lignite Mine and a potential conveyor for the Rusk Permit Area) also occur in the soil resources cumulative effects study area; however, it is anticipated that the potential conveyor would be constructed within the currently proposed disturbance area for the Rusk Permit Area.

Past and present actions and RFFAs have resulted, or would result, in approximately 78,316 total acres of disturbance to native soils. Of this total, the approximately 67,697 acres of lignite mining-related disturbance have been, or would be, incrementally reclaimed over the life of these operations. The majority of the remaining approximately 10,619 acres of disturbance represent a long-term to permanent loss or conversion of native soils. The proposed Rusk Permit Area incrementally would increase the cumulative disturbance to native soils by approximately 14,392 acres, all of which would be incrementally reclaimed over the life of the mine. Based on an estimated waters of the U.S. (including wetlands) total cumulative disturbance of 2,213.3 acres, the known compensatory mitigation for past and present actions, and the proposed compensatory mitigation for the Rusk Permit Area, there would be an estimated net increase of 1,736.5 acres of water of the U.S. (including wetlands) in the cumulative effects study area. An unquantifiable portion of the compensatory mitigation acreage would represent a loss or conversion of native soils to water features.

3.3.4 Monitoring and Mitigation Measures

Sabine has committed to conducting soil sampling in the mine area to ensure that suitable growth media is present for revegetation. Any areas that are deemed as unsuitable material would be covered with a suitable material to the appropriate depth (see Section 2.5.3.1, Rough and Final Grading). The following measures are being considered to further mitigate impacts to soils.

S-1: Rough and final grading only would occur when the soils are dry, below the plastic limit, to reduce soil compaction during reclamation.

Effectiveness: The plastic limit is the lowest water content at which a soil becomes plastic. If rutting occurs, the soil is above the plastic limit and detrimental soil compaction could occur. Soils have an increased compaction potential when moist or wet. This measure would help to reduce soil compaction during reclamation.

S-2: Compacted surface or subsurface soil would be decompacted by deep ripping or subsoiling, prior to revegetation efforts.

Effectiveness: This measure would mitigate project-related soil compaction that would occur during construction and operations while increasing the reclamation and revegetation potential of the soil.

3.3.5 Residual Adverse Effects

Residual adverse effects resulting from the Rusk Permit Area would include the permanent conversion of approximately 182.5 acres of native non-hydric soils to hydric soils as a result of wetland compensatory mitigation.