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5.9 SOILS

Hydrogen Energy California LLC (HECA LLC) is proposing an Integrated Gasification Combined Cycle (IGCC) polygeneration project (HECA or Project). The Project will gasify a fuel blend of 75 percent coal and 25 percent petroleum coke (petcoke) to produce synthesis gas (syngas). Syngas produced via gasification will be purified to hydrogen-rich fuel, and used to generate a nominal 300 megawatts (MW) of low-carbon baseload electricity in a Combined Cycle Power Block, low-carbon nitrogen-based products in an integrated Manufacturing Complex, and carbon dioxide (CO_2) for use in enhanced oil recovery (EOR). CO_2 from HECA will be transported by pipeline for use in EOR in the adjacent Elk Hills Oil Field (EHOF), which is owned and operated by Occidental of Elk Hills, Inc. (OEHI). The EOR process results in sequestration (storage) of the CO_2.

Terms used throughout this section are defined as follows:

- **Project or HECA.** The HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes, including its linear facilities.

- **Project Site or HECA Project Site.** The 453-acre parcel of land on which the HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes (excluding off-site portions of linear facilities), will be located.

- **OEHI Project.** The use of CO_2 for EOR at the EHOF and resulting sequestration, including the CO_2 pipeline, EOR processing facility, and associated equipment.

- **OEHI Project Site.** The portion of land within the EHOF on which the OEHI Project will be located and where the CO_2 produced by HECA will be used for EOR and resulting sequestration**.**

- **Controlled Area.** The 653 acres of land adjacent to the Project Site over which HECA will control access and future land uses.

This introduction provides brief descriptions of both the Project and the OEHI Project. Additional HECA Project description details are provided in Section 2.0. Additional OEHI Project description details are provided in Appendix A of this Application for Certification (AFC) Amendment.

HECA Project Linear Facilities

The HECA Project includes the following linear facilities, which extend off the Project Site (see Figure 2-7, Project Location Map):

- **Electrical transmission line.** An approximately 2-mile-long electrical transmission line will interconnect the Project to a future Pacific Gas and Electric Company (PG&E) switching station east of the Project Site.

- **Natural gas supply pipeline.** An approximately 13-mile-long natural gas interconnection will be made with PG&E natural gas pipelines located north of the Project Site.

- **Water supply pipelines and wells.** An approximately 15-mile-long process water supply line and up to five new groundwater wells will be installed by the Buena Vista Water Storage District (BVWSD) to supply brackish groundwater from northwest of the Project Site. An approximately 1-mile-long water supply line from the West Kern Water District (WKWD) east of the Project Site will provide potable water.

- **Coal transportation.** HECA is considering two alternatives for transporting coal to the Project Site:

  - **Alternative 1, rail transportation.** An approximately 5-mile-long new industrial railroad spur that will connect the Project Site to the existing San Joaquin Valley Railroad (SJVRR) Buttonwillow railroad line, north of the Project Site. This railroad spur will also be used to transport some HECA products to market.

  - **Alternative 2, truck transportation.** An approximately 27-mile-long truck transport route via existing roads from an existing coal transloading facility northeast of the Project Site. This alternative was presented in the 2009 Revised AFC.

OEHI Project

OEHI will be installing the CO_2 pipeline from the Project Site to the EHOF, as well as installing the EOR Processing Facility, including any associated wells and pipelines needed in the EHOF for CO_2 EOR and sequestration. The following is a brief description of the OEHI Project, which is described in more detail in Appendix A of this AFC Amendment:

- **CO_2 EOR Processing Facility.** The CO_2 EOR Processing Facility and 13 satellites are expected to occupy approximately 136 acres within the EHOF. The facility will use 720 producing and injection wells: 570 existing wells and 150 new well installations. Approximately 652 miles of new pipeline will also be installed in the EHOF.

- **CO_2 pipeline.** An approximately 3-mile-long CO_2 pipeline will transfer the CO_2 from the HECA Project Site south to the OEHI CO_2 EOR Processing Facility.

This section describes the potential environmental consequences of the Project on soils in accordance with California Energy Commission (CEC) requirements. Impacts to agricultural land uses are evaluated in Section 5.4, Land Use and Agriculture. The analysis included in this section focuses on the HECA Project as well as the CO_2 pipeline associated with the OEHI Project. The analysis of the CO_2 EOR Processing Facility associated with the OEHI Project is included in Appendix A-1, Section 4.6, Geology and Soils, and Appendix A-2, Section 2.9, Soils, of this AFC Amendment. No soil impacts related to coal transportation Alternative 2 (Truck Transportation) are expected because the coal transloading facility is an existing use and trucks would use existing roads. Therefore, coal transportation Alternative 2 (Truck Transportation) is not further evaluated in section.

5.9.1 Affected Environment

5.9.1.1 Regional Setting

Section 5.15, Geological Hazards and Resources, provides details on the geology of the Project Site and vicinity. The Project Site is on an alluvial fan complex on the southwestern side of the San Joaquin Valley in the southern end of the Great Valley geomorphic province, which separates the Coast Range to the west from the Sierra Nevada Range to the east. The regional geology consists of Quaternary alluvium (approximately 6,000 to 7,000 feet thick) underlain by a sequence of sediments up to 30,000 feet deep (URS, 2007).

The Project Site covers the majority of Section 10 in Township 30 South, Range 24 East, on the U.S. Geological Survey (USGS) East Elk Hills, California Quadrangle Map.

The Project Site is bounded by Tupman Road to the east, an irrigation canal to the south, and Dairy Road to the west; agricultural land and Adohr Road is located to the north. The Project Site is currently used for farming purposes, including the cultivation of cotton, alfalfa, and onions. Land within the Controlled Area to the north, west, and south of the Project Site is also currently used for the cultivation of these crops. A manufacturing plant, Port Organics Products, Ltd. (Port Organics), was previously located adjacent to the northwest of the Project Site in the Controlled Area. The West Side Canal, Kern River Flood Control Channel, and California Aqueduct are located approximately 500, 700, and 1,900 feet, respectively, to the south of the Project Site. The land southwest of the California Aqueduct is used for mineral and petroleum purposes. The Elk Hills Oil Field is approximately 1 mile south of the Project Site.

The East Side Canal is 1,300 feet east of the northeastern corner of the Project Site (at the intersection of Adohr and Tupman roads) and extends generally from the north to the south, semi-parallel to the eastern border of the Project Site. The northern boundary of Tule Elk State Reserve is 1,700 feet east of the Project Site on Station Road, between the East Side Canal and Morris Road, east of Tupman Road. The reserve extends generally from the north to the south, with the reserve's southern boundary just east of the unincorporated community of Tupman, California.

5.9.1.2 Soil Resources

The soil resource information presented in this section is based primarily on the Soil Survey of Kern County, California, Northwestern Part, prepared by the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS, 1988). Additionally, information for the Soil Survey of Kern County, California, Southwestern Part, was obtained through review of the Soil Survey of Kern County, California, Southwestern Part, prepared by the USDA Natural Resource Conservation Services (USDA NRCS, 2009). Additional soil data was generated the USDA NRCS Web Soil Survey (WSS) database (NRCS, 2012). The WSS database (WSS, 2012) contains official USDA soil survey information as viewable maps and tables for more than 2,300 soil surveys in the United States and its territories. The boundaries of the different soil units for the Project Site and associated linears are shown graphically on Figure 5.9-1, Soil Types. Section 5.14, Water Resources, and Section 5.15, Geological Hazards and Resources, describe the characteristics of the subsurface soil at the Project Site.

The predominant soils at the Project Site and along the associated linears consist of clays, loamy sands, gravely sandy loams, silt loams, fine sandy loams, and sandy loams. The soil mapping units at the Project Site include Buttonwillow clay, 0 to 2 percent slopes; and Lokern clay, 0 to 2 percent slopes.

The soil mapping units in the proposed BVWSD well field and along the process water linear includes Lokern clay, 0 to 2 percent slopes; Lokern clay – saline-alkali, 0 to 2 percent slopes; and Buttonwillow clay, 0 to 2 percent slopes.

The soil mapping units along the transmission linears include Buttonwillow clay, 0 to 2 percent slopes; and Lokern clay, 0 to 2 percent slopes.

The soil mapping units along the potable water linear include the Buttonwillow clay, 0 to 2 percent slopes; and Lokern clay, 0 to 2 percent slopes.

The soil mapping units along the CO_2 linear include the Lokern clay, 0 to 2 percent slopes; Buttonwillow clay, 0 to 2 percent slopes; Elkhills sandy loam, 9 to 50 percent slopes; Cajon loamy sand, 0 to 2 percent slopes; and Cajon loamy sand, 2 to 5 percent slopes.

The soil mapping units along the natural gas linear include Lokern clay, 0 to 2 percent slopes; Buttonwillow clay, 0 to 2 percent slopes; Kimberlina fine sandy loam, 0 to 2 percent slopes; Garces silt loam, 0 to 2 percent slopes; Milham sandy loam, 0 to 2 percent slopes; Garces silt loam, hard substratum, 0 to 2 percent slopes; Westhaven fine sandy loam, 0 to 2 percent slopes; Cajon loamy sand, 0 to 2 percent slopes; and Panoche clay loam, saline-alkali, 0 to 2 percent slopes.

The soil mapping units along the industrial railroad spur linear include the Lokern clay, 0 to 2 percent slopes; Buttonwillow clay, 0 to 2 percent slopes; Kimberlina fine sandy loam, 0 to 2 percent slopes; Garces silt loam, 0 to 2 percent slopes; and Milham sandy loam, 0 to 2 percent slopes.

Table 5.9-1 summarizes the estimated areas of disturbance associated with the Project. Representative soil types and descriptions for the Project Site and associated linears are presented below, and soil properties are summarized in Table 5.9-2.

Buttonwillow Clay, Drained (123), 0 to 2 Percent Slopes

This soil type is a deep, somewhat poorly drained soil in basins, and was formed in alluvium derived dominantly from granitic rock with slopes of 0 to 2 percent. The representative profile is 0 to 60 inches. The surface layer is typically dark-gray clay about 28 inches thick. The upper 27 inches of the underlying material is light-gray to gray, fine sandy loam; and the lower part to a depth of 60 inches is very dark gray. Permeability of this Buttonwillow soil is moderately rapid between depths of 28 and 55 inches, and slow below a depth of 55 inches. Available water capacity is moderate or high, runoff is very slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops and pasture, and most areas of this unit are used for irrigated crops, including alfalfa, barley, cotton, and sugar beets. This soil unit is considered Prime Farmland, if irrigated (USDA SCS, 1988).

Cajon Loamy Sand (125), 0 to 2 Percent Slopes

This soil type is a deep, somewhat excessively drained soil on alluvial fans, and was formed in alluvium derived dominantly from granitic rock. The representative profile is 0 to 60 inches. The surface layer is typically pale-brown loamy sand about 9 inches thick. The upper 35 inches of the underlying material are light-gray sand, and the lower part to a depth of 60 inches or more is stratified light–brownish-gray sandy loam. The vegetation in areas that are not cultivated is mainly annual grasses and forbs. Permeability of this Cajon soil is rapid. Available water capacity is low, runoff is very slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops, but is limited mainly by low available water capacity and the high hazard of soil blowing. Most areas of this unit are used for irrigated crops—mainly, alfalfa, cotton, grapes, and small grain. Among the other crops grown are onions and potatoes. Some areas of this unit are used for urban development. This soil unit is designated as Prime Farmland, if irrigated (USDA SCS, 1988).

Granoso Loamy Sand (121), 2 to 5 Percent Slopes

This soil type is a deep, somewhat excessively drained soil on alluvial fans, and was formed in alluvium derived from mixed rock sources with slopes of 2 to 5 percent. The representative profile is 0 to 62 inches. The surface layer consists of loamy sand about 10 inches thick. The upper 26 inches of the underlying material are loamy sand to sandy loam, and the lower part to a depth of 62 inches is typically sand with some fine sand to loamy sand. Permeability of this Granoso soil is moderate. The soil has a slightly sodic horizon within 30 inches of the soil surface. Available water capacity is low, runoff is slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops. This soil is considered Farmland of Statewide Importance (NRCS, 2009).

Cajon Loamy Sand (126), 2 to 5 Percent Slopes

This soil type is a deep, somewhat excessively drained soil on alluvial fans, and was formed in alluvium derived dominantly from granitic rock. The representative profile is 0 to 60 inches.

The surface layer is typically pale-brown loamy sand about 9 inches thick. The upper 35 inches of the underlying material are light-gray loamy sand, and the lower part to a depth of 60 inches or more is stratified light–brownish-gray sandy loam. The vegetation in most areas that are not cultivated is mainly annual grasses, forbs, and shrubs. Permeability of this Cajon soil is rapid. Available water capacity is low, runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This unit is suited to livestock grazing irrigated crops, but the production of forage is limited by low available water capacity, the high hazard of soil blowing, and low rainfall. This soil unit is designated as Prime Farmland, if irrigated (USDA SCS, 1988).

Elkhills Sandy Loam (146), 9 to 50 Percent Slopes

This soil type is a deep, well-drained soil found primarily on uplifted, dissected old areas of valley fill, and was formed in alluvium derived dominantly from sedimentary and granitic rock. The representative profile is 0 to 65 inches. The surface layer is typically a pale-brown sandy loam about 7 inches thick. The subsurface layer is light–yellowish-brown, fine sandy loam about

22 inches thick. The upper 20 inches of the underlying material are very pale-brown, coarse sandy loam, and the lower part to a depth of 65 inches or more is light gray, stratified gravelly coarse sand, sand, and loamy sand. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered shrubs. Permeability of this Elkhills soil is moderately rapid. Available water capacity is moderate or high, runoff is medium, and the hazard of water erosion is moderate. This unit is suited to livestock grazing, but the production of forage is limited by low rainfall and steepness of slope. This soil is not considered Prime Farmland (USDA SCS, 1988).

Garces Silt Loam (156), 0 to 2 Percent Slopes

This soil type is a deep, well-drained, saline-alkali soil on basin rims, and was formed in alluvium derived dominantly from granitic rock. The representative profile is 0 to 60 inches. The surface layer is typically pale-brown silt loam about 2 inches thick. The subsurface layer is very pale-brown silt loam about 3 inches thick. The upper 32 inches of the underlying subsoil material is light–yellowish-brown clay loam and pale-brown loam; and the lower substratum to a depth of 60 inches or more is very pale-brown loam and light-gray, fine sandy loam. The vegetation in areas not cultivated is mainly salt-tolerant annual grasses, forbs, and shrubs. Permeability of this Garces soil is very slow. Available water capacity is low to high, runoff is very slow, and the hazard of water erosion is slight. Most areas of this unit are used for irrigated crops—mainly, barley, cotton, and sugar beets, as well as almonds, alfalfa, and wheat. Some areas are used for irrigated pasture, livestock grazing, and urban development. This soil unit is designated as Farmland of Statewide Importance (USDA SCS, 1988).

Garces Silt Loam, Hard Substratum (158), 0 to 2 Percent Slopes

This soil type is a deep, well-drained, saline-alkali soil on basin rims, and was formed in alluvium derived dominantly from granitic rock. The surface layer is typically light-gray silt loam about 5 inches thick. The upper part of the subsoil is grayish-brown silty clay loam about 10 inches thick; and the lower 27 inches are light–yellowish-brown loam and sandy clay loam. The substratum to a depth of 60 inches or more is stratified, weakly cemented dark–yellowish-brown sandy loam and loam. In some areas, the surface is sandy loam or loam. The soil is moderately to strongly saline-alkali. Permeability of this Garces soil is very slow. Available water capacity is low to moderate, runoff is very slow, and the hazard of water erosion is slight. The effective rooting depth is 60 inches or more, but is somewhat restricted by the weakly cemented substratum. Toxic levels of boron are present in some places. Most areas of this unit are used for livestock grazing. A few areas are used for irrigated crops, irrigated pasture, and urban development. This unit is suited to irrigated, salt-tolerant crops. It is limited mainly by the saline-alkali condition of the soil, the very slow permeability, and depth to the weakly cemented layer (USDA SCS, 1988).

Kimberlina Fine Sandy Loam (174), 0 to 2 Percent Slopes

This soil type is a deep, well-drained soil on alluvial fans and plains, and was formed in alluvium derived dominantly from granitic and sedimentary rock. The representative profile is 0 to 71 inches. The surface layer is typically a brown, fine sandy loam about 9 inches thick. The upper 36 inches of the underlying material are pale-brown, fine sandy loam; and the lower part to

a depth of 71 inches is pale-brown silt loam. The vegetation in areas not cultivated is mainly annual grasses, forbs, and a few scattered shrubs. Permeability of this Kimberlina soil is moderate. Available water capacity is high, runoff is slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops and has few limitations. Most areas of this unit are used for irrigated crops—mainly, almonds, alfalfa, cotton, and grapes. Other crops grown include potatoes, sugar beets, pistachios, and onions. Some areas are also used for irrigated pasture, limited livestock grazing, and urban development. This soil is considered Prime Farmland, if irrigated (USDA SCS, 1988).

Kimberlina Fine Sandy Loam (179), Saline-Alkali, 0 to 2 Percent Slopes

This soil type is a deep, well-drained soil on recent alluvial fans and plains, and was formed in alluvium derived dominantly from granitic and sedimentary rock. The representative profile is 0 to 71 inches. The surface layer is typically a brown, fine sandy loam up to 9 inches thick. The upper 36 inches of the underlying material are brown, fine sandy loam; and the lower part to a depth of 71 inches is pale-brown silt loam. The native vegetation is mainly salt-tolerant annual grasses, forbs, and a few scattered shrubs. The soil is slightly to moderately saline-alkali, and permeability of the Kimberlina soil is moderately slow. Available water capacity is very low to moderate, runoff is slow, and the hazard of water erosion is slight. This unit is well-suited to irrigated crops that are saline-alkali tolerant, and is commonly used for row and field crops such as cotton, alfalfa, and barley. This soil is considered Farmland of Statewide Importance (USDA SCS, 1988).

Lokern clay (187), Drained, 0 to 2 Percent Slopes

This soil type is a deep, somewhat poorly drained soil in basins, and was formed in alluvium derived from mixed rock sources, dominantly granitic rock. The representative profile is 0 to 60 inches. The surface layer is dark-gray clay about 21 inches thick. The upper 27 inches of the underlying material are gray and dark-gray clay; and the lower part to depths of 60 inches or more is light–brownish-gray, fine sandy loam. The vegetation in areas not cultivated is mainly annual grasses, forbs, and shrubs. Permeability of this Lokern soil is slow. Available water capacity is high, runoff is very slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding, but is protected by dams or levees. This unit is suited to irrigated row and field crops, as well as irrigated pasture. Most areas of this unit are used for irrigated crops, including cotton, alfalfa, sugar beets, barley, rice, and wheat. This soil unit is considered Prime Farmland, if irrigated (USDA SCS, 1988).

Lokern Clay (188), Saline-Alkali, Drained, 0 to 2 Percent Slopes

This soil type is a deep, somewhat poorly drained soil in basins, and was formed in alluvium derived dominantly from mixed rock sources, dominantly granitic rock. The representative profile is 0 to 60 inches. The surface layer is typically dark-gray clay about 21 inches thick. The upper 27 inches of the underlying material are gray and dark-gray clay; and the lower part to a depth of 60 inches or more is light–brownish-gray, fine sandy loam. The soil is moderately to strongly saline-alkali. The vegetation in areas not cultivated is mainly annual grasses, forbs, and shrubs. Permeability of this Lokern soil is slow. Available water capacity is moderate or high, runoff is very slow, and the hazard of water erosion is slight. This soil is subject to rare periods

of flooding, but is protected by dams or levees. Toxic levels of boron are present in places. This unit is suited to irrigated row and field crops that are salt-tolerant, as well as irrigated pasture. Most areas of this unit are used for irrigated crops—mainly, cotton and alfalfa. This soil unit is not considered Prime Farmland (USDA SCS, 1988).

Milham Sandy Loam (196), 0 to 2 Percent Slopes

This soil type is a deep, well-drained soil on recent alluvial fans, plains, and low terraces, and was formed in alluvium derived dominantly from granitic and sedimentary rock. The representative profile is 0 to 60 inches. The surface layer is light–brownish-gray sandy loam about 4 inches thick. The upper 6 inches of the subsoil are pale-brown sandy loam; and the lower 39 inches are yellowish-brown loam and clay loam. The substratum to a depth of 60 inches or more is pale-olive sandy loam. The vegetation in areas not cultivated is mainly annual grasses and forbs, with a few scattered shrubs. Permeability of the Milham soil is moderately slow. Available water capacity is high, runoff is very slow, and the hazard of water erosion is slight. This unit is suited to hay and pasture, as well as to irrigated crops, with few limitations. Most areas of this unit are used for irrigated crops—mainly, cotton, alfalfa, almonds, grapes, pistachios, olives, onions, peppers, and wheat. Some areas are used for irrigated pasture or livestock grazing. This soil is considered Prime Farmland, if irrigated (USDA SCS, 1988).

Kimberlina Fine Sandy Loam (212), Saline-Sodic, 0 to 2 Percent Slopes

This soil type is a deep, well-drained soil on alluvial fans, and was formed in alluvium derived from granitic and sedimentary rock. The representative profile is 0 to 71 inches. The surface layer is typically a fine sandy loam up to 9 inches thick. The upper 36 inches of the underlying material are fine sandy loam to sandy loam, and the lower part to a depth of 71 inches is stratified silt loam to sandy clay loam. The soil has a slightly saline horizon within 30 inches of the soil surface, and a moderately sodic horizon within 30 inches of the soil surface. Permeability of the Kimberlina soil is moderate. Available water capacity is moderate, runoff is slow, and the hazard of water erosion is slight. This unit is well-suited to irrigated crops that are saline-sodic. This soil is considered Farmland of Statewide Importance (NRCS, 2009).

Torriorthents, Stratified, Eroded-Elkhills Complex (232), 9 to 50 Percent Slopes

This soil type is a deep, well-drained soil found primarily in areas of uplifted, dissected valley fill and on hills, and was formed in alluvium derived dominantly from sedimentary and granitic rock. The surface layer ranges from loamy sand to silty loam. The next layer is stratified silty loam to clay over stratified gravelly sand to silty clay loam. Many areas are saline-alkali. This soil supports little—if any—vegetation. Permeability of the Torriorthents is moderate to slow. Available water capacity is moderate to high, runoff is rapid, and the hazard of water erosion is high. This unit is poorly suited to livestock grazing, because the production of forage is limited by low rainfall, the hazard of erosion, salt content, and steepness of slope. This soil is not considered Prime Farmland (USDA SCS, 1988).

Westhaven Fine Sandy Loam (245), 0 to 2 Percent Slopes (245)

This soil type is a deep, moderately well-drained soil found on flood plains and alluvial fans, and was formed in alluvium derived mainly from granitic rock. The surface layer is typically light–brownish-gray, fine sandy loam about 11 inches thick. The upper 17 inches of the underlying material are pale-brown silt loam; and the lower part to a depth of 61 inches is brown clay and white clay loam. In some areas, the surface layer is loamy fine sand or silty loam. Permeability is moderately slow. Available water capacity is high or very high. Runoff is slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops—mainly, cotton, alfalfa, and sugar beets. Some areas are used for duck ponds (USDA SCS, 1988).

Soil maps and surveys are available from NRCS for the Northwest and Southwest Section of Kern County, which includes the Project Site and associated linears (NRCS Maps Number CA666 and CA691).

5.9.1.3 Agriculture and Important Farmlands

Information regarding Agriculture and Important Farmlands is presented in Section 5.4, Land Use, of this AFC Amendment.

5.9.2 Environmental Consequences

Appendix G of the California Environmental Quality Act (CEQA) identifies the following criteria for determining the significance of impacts to soils resources. The Project would result in a significant impact if:

- It would result in substantial soil erosion or loss of topsoil, degradation of soils or farmland, changes in topography, or unstable soil conditions.
- It is an unstable soil or soil that would become unstable because of the Project, and potentially result in landslide, lateral spreading, subsidence, liquefaction, or collapse.
- It is located on expansive soil, creating substantial risks to life or property.
- It would place septic tanks or alternative wastewater disposal systems on soils incapable of adequately supporting these systems, where sewers are unavailable for the disposal of wastewater.

The assessment of Project impacts to the soil resource is based on soils information presented in SSURGO data and the Phase I Environmental Site Assessment report prepared by URS in April 2012 (see Appendix L, Phase I Environmental Site Assessment), and consideration of best management practices (BMPs). URS conducted a geotechnical investigation for the Project Site in 2009 (URS, 2009), and filed it in Appendix P of the 2009 Revised AFC. Information related to the geotechnical investigations and associated findings are provided in Section 5.15, Geological Hazards and Resources, in this AFC Amendment.

The Universal Soil Loss Equation is typically used to quantify water-induced soil loss in agricultural areas. The Revised Universal Soil Loss Equation (RUSLE2) was used to estimate the potential amount of soil erosion under existing conditions, during construction, and during plant operation from the Project Site, the construction laydown area north of the Project Site (controlled area), and the industrial railroad spur. The results of the RUSLE2 soil erosion calculations are summarized in Table 5.9-3. Under existing conditions, the estimated soil erosion is 9.6 tons per acre per year for the Project Site, 1.5 tons per acre per year for the construction laydown area, and 4.6 tons per acre per year for the railroad spur. During construction, the Project Site and the construction laydown area (depicted on Figure 2-5, Plot Plan) and the railroad spur (Alternative 1, Rail Transportation) (Figure 5.9-1 pages 4 and 5) will be stripped of vegetation. Under these conditions the vegetative cover will be eliminated and the soil erosion during construction activities is estimated at approximately 41.7 tons per acre per year for the Project Site, 0.7 ton per acre per year for the construction laydown area, and 4.6 tons per acre per year for the railroad spur. However, during construction the use of BMPs will minimize the potential for soil erosion so that the impact will be less than significant. Once the Project has been constructed, the Project Site will either be covered with facilities, asphalt, concrete, or rock surfacing or revegetated in some areas. During operation soil erosion is estimated at 5.2 tons per acre per year for the Project Site, 1.5 tons per acre per year for the construction laydown area, and 0.3 ton per acre per year for the railroad spur. Additionally, after construction, storm water will be managed such that there will be zero liquid discharge from the site. In summary, during construction, the potential for erosion would be greater than for the period of operations but will be managed through the implementation of BMPs to minimize impacts; and after construction, the potential for erosion will be less than significant due to surface coverage and storm water management.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The two main soil mapping units at the Project Site are the Buttonwillow clay and the Lokern clay, which have wind erodibility groups of 8 and 7, respectively. As such, the soils have a low potential for wind erosion. The implementation of mitigation measures presented in Section 5.9.4 will reduce the potential for wind erosion from the Project Site during construction and operational activities.

5.9.2.1 Construction-Related Impacts

Minor construction-related impacts to the soil resources are associated with development of the Project, including minor grubbing, grading, and trenching for installation, operation, and maintenance of above-ground electrical-power transmission line and underground pipelines for process water, CO_2, natural gas, and potable water. Approximately 800 acres of land will be disturbed during construction activities (including the linear facilities), of which 453 acres will be on the Project Site (see Table 5.9-1).

An update of the Phase I Environmental Site Assessment (ESA) of the Project Site, originally prepared in 2009, has been conducted in accordance with American Society for Testing and Materials (ASTM) guidance document *ASTM Standards on Environmental Site Assessments for Commercial Real Estate*, Designation Practice E 1527, as required by the California Energy Commission (CEC) for an AFC. The ESA report is included in this AFC Amendment as

Appendix L. The objective of the Phase I ESA was to identify Recognized Environmental Conditions (RECs) that may exist on the Project Site. The ASTM guidance document defines RECs as "the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property."

Based on information generated for the Phase I ESA prepared by URS (2012), the following RECs were identified at the Project Site:

- The 2010 Phase II investigation conducted by AECOM identified elevated concentrations of petroleum hydrocarbons and other contaminants on the former equipment wash area immediately north of the Project Site boundary (AECOM, 2010). Because the vertical and horizontal extent of contamination were not defined by the Phase II ESA, and this wash area discharged into a ditch south of the Farm Operations Area boundary, the contamination is considered a potential off-site REC to the Project Site.

- Stained soils were observed during the Project Site visit, as detailed in Section 6.3.13 of the Phase I ESA. The soil staining is likely to derive from handling of fuels, lubricating oils, and/or pesticides. The AECOM 2010 Phase II ESA sampled in the vicinity of the stained soil and identified selected contaminants; however, the extent of any subsurface impacts is not defined.

In addition to the above RECs, the following potential environmental issues were noted, which in URS' opinion are not considered RECs:

- Surficial samples collected from the agricultural fields on the Project Site identified concentrations of the pesticides dieldrin, endrin, and endosulfan that exceed the Regional Water Quality Control Board (RWQCB) Environmental Screening Levels (ESLs), but did not exceed the state California Human Health Screening Level (CHHSL) or federal Regional Screening Levels (RSLs). These results are consistent with the historical agricultural use, and no consistent spatial pattern of pesticides above ESLs was observed.

- An agency database lists five former USTs at Palm Farms, Inc., on Adohr Road. Because the Project Site is also located on Adohr Road, and the property was purchased from Palm Farms, Inc., the USTs may have historically been on or adjacent to the Project Site. The 2010 AECOM Phase II ESA investigated selected potential locations for these USTs, and identified no USTs and no contamination associated with USTs.

URS recommended further investigation be conducted at the Project Site to determine the presence and/or extent of potential environmental contamination associated with the RECs. The investigation should address potential contamination arising from each REC, and environmental issues listed above, including the following areas:

- Performing step-out sampling to investigate the vertical and horizontal extent of contamination in the area adjacent to the former equipment wash area, including sampling surficial soil and sediment along the drainage ditch where washwater was discharged, to evaluate potential impact to the Project Site.

- Performing step-out sampling to investigate the vertical and horizontal extent of contamination in the stained-soil area adjacent to the drainage ditch, including sampling surficial soil.

The existing Project Site topography is generally flat, but some grading will be required to provide a level area for the Project. The surficial soils will likely be excavated and re-compacted or replaced with granular soils in and adjacent to the areas of Project facilities. Preliminary grading plans indicate that approximately 500,000 cubic yards of soil required for construction will be derived from off-site sources. Several potential borrow sites for the Project have been identified within a 5-mile radius of the Project Site, including Syndex Ready Mix. Additionally, soil removed through grading activities is expected to be reused on site to construct berms at the northwestern and northeastern portions of the Project Site; therefore, no on-site or off-site fill disposal is expected. However, it may be necessary to dispose of vegetative matter and excavated debris. Disposal site options are described in Section 5.13, Waste Management, of this AFC Amendment. Additional details related to the construction and installation of the electrical transmission line and pipelines for water supply, natural gas, and CO_2 are provided below under Section 5.9.2.3, Linear Facilities Impacts.

Potential impacts during construction activities on soil resources may include alteration of the existing soil profile, increased soil erosion, and soil compaction. Alteration of the existing soil profiles, including the mixing of soils, will alter the physical, chemical, and biological characteristics of native soils and underlying geology. Soil erosion causes the loss of topsoil and can increase the sediment load in surface-receiving waters downstream of the construction site. Soil action can decrease infiltration rates, resulting in increased runoff and erosion rates. The magnitude, extent, and duration of construction-related impacts depend on the erodibility of the soil; the proximity of the construction activity to a receiving water body; and the construction methodologies, duration, and season. The mitigation measures outlined in Section 5.9.4, Mitigation Measures, will reduce the potential for impacts to soil resources, resulting from construction of the Project, to less-than-significant levels.

5.9.2.2 Project Site Impacts

Project construction activities (including site preparation) at the Project Site will be partially overlapped by commissioning activities before the Project is operational. Land disturbances related to development activities are expected to be conducted on the Project Site. Excavation work will consist of the removal, storage, and/or disposal of earth, sand, gravel, vegetation, organic matter, loose rock, boulders, and debris as necessary for construction. Disposal site options are described in Section 5.13, Waste Management, of this AFC Amendment. Materials suitable for backfill will be stockpiled at designated locations using proper erosion protection methods. During the construction phase of the Project, erosion and sediment control measures such as mulching, jute netting, culverts, sediment detention basins, etc., will be temporarily installed as required by local regulations.

Areas to be backfilled will be prepared by removing unsuitable material and rocks. The bottom of an excavation will be examined for loose or soft areas. If observed, these areas will be excavated fully; backfilled with suitable material; and compacted. Backfilling will be done in layers of specified thickness (lift). Soil in each lift will be properly moistened to facilitate

compaction to achieve the specified density. To verify compaction, representative field-density and moisture-content tests will be performed during compaction.

Existing topsoil will be removed as needed. Graded areas will be smoothed, compacted, free from irregular surface changes, and sloped to drain. Structures and their foundations and equipment anchors will be designed according to the International Building Code (IBC), and the Kern County Building Code. Should there be a conflict in code requirements, the more conservative requirements will be implemented. Project-related soil erosion will be minimized through implementation of erosion control measures described in Section 5.9.4, Mitigation Measures. Therefore, impacts from soil erosion are expected to be less than significant.

5.9.2.3 Linear Facilities Impacts

The Project will include the construction, installation, operation, and maintenance of new under- and above-ground linear facilities, including a railroad spur, electrical power transmission line, as well as a potable water, process water, natural gas, and CO_2 pipeline.

Construction, installation, operation, and maintenance of the underground process water pipeline will result in minor, mostly temporary soils impacts. The source of the process water is the proposed BVWSD well field located approximately 15 miles northwest of the Project Site. The approximate well field location is a northwest-oriented rectangular area on the western side of the BVWSD service area near Seventh Standard Road and the California Aqueduct (Figure 5.9-1 Page 1). While the exact location of the wells has yet to be determined, the conceptual design is for a northwesterly trending line of five wells (three operational and two redundant). The wells are expected to be spaced at approximate intervals of 0.25 mile, although final spacing will be determined during well field installation and testing activities. The proposed wells are expected to extend to depths of 300 to 400 feet below grade. Each well site is expected to temporarily disturb an area of approximately 100 feet by 150 feet and to permanently disturb an area of approximately 100 feet by 100 feet (Krieger, 2009). Construction of the BVWSD well field will likely result in minor, mostly temporary soils impacts. Project construction-related soil erosion will be minimized through implementation of BMPs and erosion control measures described in Section 5.9.4, Mitigation Measures.

A natural gas pipeline will interconnect with a PG&E natural gas pipeline north of the Project Site. The interconnect will consist of one tap off the existing natural gas line and one metering station at the beginning of the natural gas linear adjacent to the PG&E Inlet. The metering station will be 100 feet by 100 feet, surrounded by a chain-link fence. In addition, there will be a metering station at the end of the natural gas linear, on the western side of the Project Site, and a pressure-limiting station on the Project Site. Construction, installation, operation, and maintenance of the underground natural gas pipeline will result in minor, mostly temporary soils impacts. Project construction-related soil erosion will be minimized through implementation of BMPs and erosion control measures described in Section 5.9.4, Mitigation Measures.

The approximately 5-mile new railroad spur (Alternative 1, Rail Transportation) will connect the Project Site to the existing SJVRR Buttonwillow railroad line, north of the Project Site. Construction of the railroad spur will involve grading, possible soil excavation and compaction and the placement of railroad ballast for the spur tracks. Although there will be permanent soil

disturbance along the railroad spur, the soil will be covered by the ballast thus reducing the potential for water erosion along the spur alignment. Additionally, land that may have been available for agricultural use will no longer be available for this intended use. However, the overall anticipated amount of permanent disturbance is approximately 33 acres along the approximate 5-mile alignment. Project construction-related soil erosion will be minimized through implementation of erosion control measures described in Section 5.9.4, Mitigation Measures. Additionally, because the spur alignment will be covered in ballast material to support the tracks, soil erosion during operation of the spur will be reduced. Therefore, impacts from soil erosion are expected to be less than significant.

Construction of the transmission line will require installing approximately 26 (15 off-site and 11 on-site) tubular-steel transmission structures and the supporting foundations. Construction will also involve stringing the conductor and the optical ground wires. After the line is completed, regular preventive maintenance and inspections will be required. Temporary access roads will need to be constructed within the transmission line ROW, except where the line runs parallel to existing roads. A small area around each structure site will need to be disturbed temporarily during the construction period. The approximate area that may be temporarily disturbed is quantified in Section 4.8.3. Roadway matting may be used on the road and around the area of each structure to minimize the effects of the construction vehicles and the construction activity. The time to construct the entire transmission line is estimated to be approximately 3 months. Construction, installation, operation, and maintenance of the above-ground electrical transmission line will result in minor, mostly temporary soils impacts. Project construction-related soil erosion will be minimized through implementation of BMPs and erosion control measures described in Section 5.9.4, Mitigation Measures.

The potable water supply linear will be approximately 1 mile in length, and be located in the electrical transmission line ROW. The potable water pipeline will cross the East Side Canal using standard industrial installation methods. When feasible, crossing of the canal will be performed when the canal is dry, using dry-ditch techniques. If water is present at the time of crossing the canal, conventional open-cut, flume variation of open-cut, or dam-and-pump variation of open-cut may be used. BMPs to be implemented with conventional open-cut waterbody crossings include, but are not limited to, the following: material excavated from the trench will be stockpiled above the canal banks; excavated trench material will generally be used as backfill; and the canal will be returned to its pre-construction contours to the extent practicable. Construction, installation, operation, and maintenance of the potable water supply line will result in minor, mostly temporary soils impacts. Project construction-related soil erosion will be minimized through implementation of BMPs and erosion control measures described in Section 5.9.4, Mitigation Measures.

Alternative 2 for the transportation of coal to the Project Site is truck transport via existing roads from an existing coal transloading facility located in Wasco northeast of the Project Site. The truck route distance is approximately 27 miles.

Products produced as part of the Project will be transported off site via truck (and/or rail if Alternative 1 is implemented). With the exception of Alternative 1 (Rail Transportation), no off-site linear under- or above-ground facilities will be constructed, installed, operated, or maintained to transport these materials off site. Therefore, with the exception of Alternative 1

(Rail Transportation), no resulting off-site linear soil impacts will be created. The disturbed acreage associated with on-site access roads has been accounted for in the disturbed acreage of the Project Site.

Table 5.9-1, Project Disturbed Acreage, indicates the anticipated acreage that will be disturbed through the process of installing the linear facilities required to operate the Project, and is broken down into temporary disturbance area (resulting from construction and installation), and permanent disturbance area (resulting from operation and maintenance).

The general process for constructing and installing the underground linear facilities will involve clearing brush, grading and trench excavation, installation of the pipelines, connecting linear facilities, lowering facilities into trenches, backfilling, compaction, and revegetation, if required. Once pipelines are covered, hydrostatic testing will commence to ensure structural integrity.

Horizontal Direction Drilling (HDD) will be used to install the CO_2 pipeline under the Westside/ Outlet Canal, the Kern River Flood Control Channel (KRFCC), and the California Aqueduct. BMPs for HDD would include silt fencing around the drill sites, energy dissipation devices for discharging water from hydrostatic testing of the pipeline, selecting drilling fluids for environmental compatibility, and removing spent fluids from the areas immediately adjacent to the aqueduct and canal for safe disposal. In addition, soil erosion control measures would be implemented to prevent runoff and impacts to water quality.

Construction and installation of above-ground linear facilities (the 230-kilovolt (kV) electrical transmission line) will follow a sequence similar to that of underground facilities, with trench excavation being replaced by augering of holes to facilitate placement of the utility poles, followed by backfilling and compaction. Grade cuts will be restored to their original contours, and affected areas will be restored to their original state to minimize the potential for erosion. To the extent possible, the material excavated from trenches and auger holes will be used to backfill around the poles and in the trenches. Additional excess material that cannot be reused along the easement corridor, because it will be susceptible to increased erosion, will be transported to another reuse area or disposed of at an off-site landfill facility. During construction and installation, the soil in the alignment for the linear facilities may become more susceptible to erosion. The extent of this construction-related impact on soils and agricultural lands, however, will be temporary, and appropriate BMPs will be implemented to minimize potential impacts. With the implementation of mitigation measures described in Section 5.9.4, Mitigation Measures, no significant impacts to native soil, receiving-water bodies, or area agricultural lands are anticipated at or near linear facilities.

5.9.2.4 Materials and Equipment-Staging Area Impacts

With the exception of the construction staging area north of the Project Site in the Controlled Area, and the construction staging area for the railroad spur (for Alternative 1, Rail Transportation), temporary construction areas will be located entirely within the 453-acre Project Site, and will be used for equipment staging and storage, construction staff parking, and job trailers. The worker parking and equipment staging will not be paved, but crushed aggregate material will be placed on the laydown to minimize the potential for erosion. Additionally, soil stabilizers will be used in traffic areas to reduce the potential for the generation of fugitive dust

from traffic in unpaved areas. Erosion control measures (more fully described in Section 5.9.4, Mitigation Measures) such as track-out areas and silt fencing, will be implemented during construction activities to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation. With the implementation of mitigation measures described in Section 5.9.4, no significant impacts to native soils, receiving-water bodies, or area agricultural lands are anticipated at or near the Project Site.

5.9.2.5 Operation-Related Impacts

Routine vehicle traffic during Project operation will be limited to existing paved roads and the Project Site access road, which will be paved. Permanent storm-water management measures will be implemented at the Project Site, such as a perimeter drainage berm(s), storm-water retention, and other appropriate BMPs. In addition, with the implementation of mitigation measures described in Section 5.9.4, Mitigation Measures, Project operation will not disturb soil or result in increased erosion or compaction.

5.9.2.6 Effects of Emissions on Soil-Vegetation Systems

Emissions from electrical generating facilities, including nitrogen oxide (NO_X) from the combustors or drift from the cooling towers, may have an adverse effect on soil-vegetation systems in the facility vicinity. This is primarily a concern when environments that are highly sensitive to nutrients or salts, such as serpentine layers (soils and bedrock that are acidic, dry, erodible, and nutrient-poor) are downwind from the facilities. No known occurrences of ultramafic (serpentinite) bedrock have been identified in the Project area. State-of-the-art air emissions control and monitoring equipment will be installed to reduce, control, and measure air emissions (e.g., NO_X). The addition of small amounts of nitrogen to the surrounding agricultural use areas created by air emissions from the Project is considered negligible, given the likely use of nitrogen-rich fertilizers used by farmers for crop enhancement. A Continuous Emissions Monitoring System (CEMS) will be installed to monitor the emissions, as required by laws, ordinances, regulations, and standards (LORS). Cooling towers will be equipped with high-efficiency mist eliminators to reduce particulate-matter emissions. Given the use of air emission control technology equipment and the likely use of nitrogen-rich fertilizers for crop enhancement, the effects of emissions on soil vegetation systems is considered to be less than significant. For further discussion, please refer to Section 5.1, Air Quality, in this AFC Amendment.

Also, because serpentinite has not been identified in the Project area, there are no concerns related to naturally occurring asbestos (Churchill, 2008) such as release of asbestos during soil disturbance activities.

5.9.2.7 OEHI Project

An analysis of the potential of the OEHI Project to impact soils is included in Appendix A-1, Section 4.6, Geology and Soils, and Appendix A-2, Section 2.9, Soils, of this AFC Amendment. Appendix A concludes that with implementation of recommended mitigation measures, the OEHI Project will not have significant adverse impacts to soils.

5.9.3 Cumulative Impacts Analyses

Under certain circumstances, CEQA requires consideration of a project's cumulative impacts (CEQA Guidelines § 15130). A "cumulative impact" consists of an impact that is created as a result of the combination of the project under review together with other projects causing related impacts (CEQA Guidelines § 15355). CEQA requires a discussion of the cumulative impacts of a project when the project's incremental effect is cumulatively considerable (CEQA Guidelines § 15130[a]). "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (CEQA Guidelines § 15065 [a][3]).

When the combined cumulative impact associated with a project's incremental effect and the effects of other projects is not significant, further discussion of the cumulative impact is not necessary (CEQA Guidelines § 15130[a]). It is also possible that a project's contribution to a significant cumulative impact is less than cumulatively considerable and thus not significant (CEQA Guidelines § 15130[a]).

The discussion of cumulative impacts should reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great a level of detail as is provided for the effects attributable to the project under consideration (CEQA Guidelines § 15130[b]). The discussion should be guided by standards of practicality and reasonableness (CEQA Guidelines § 15130[b]).

A cumulative impact analysis starts with a list of past, present, and probable future projects within a defined geographical scope with the potential to produce related or cumulative impacts (CEQA Guidelines § 15130[b]). Factors to consider when determining whether to include a related project include the nature of the environmental resource being examined, the location of the project, and its type (CEQA Guidelines § 15130[b]). For purposes of this AFC Amendment, Kern County was contacted to obtain a list of related projects, which is contained in Appendix I. Depending on its location and type, not every project on this list is necessarily relevant to the cumulative impact analysis for each environmental topic.

Soil loss from non-agricultural uses will likely reduce soil erosion due to use as a developed area for commercial, industrial or residential land uses. Land use in the area is mainly agricultural with oil production to the southwest. Continued use or proposed use of land for agricultural purposes will not likely increase soil loss. Based on review of the projects identified in Appendix I, overall soil loss in the area will be reduced due to the change in land use from agricultural uses to developed areas, such as commercial and industrial uses. Therefore, no significant cumulative impacts to soils are expected. Cumulative impacts related to agricultural land conversion are addressed in Section 5.4, Land Use and Agriculture.

An analysis of the potential of the OEHI Project to impact soils is included in Appendix A-1, Section 4.6, Geology and Soils, of this AFC Amendment. Appendix A-1 concludes that with implementation of recommended mitigation measures, the OEHI Project will not have significant adverse cumulative impacts to soils.

5.9.4 Mitigation Measures

This section describes mitigation measures that will be implemented to reduce potential Project-related impacts to soils.

The following mitigation measures will be implemented, thereby mitigating potential Project impacts to less-than-significant levels. These mitigation measures are consistent with those identified in BVWSD's Final Environmental Impact Report which included BVWSD's well field (Krieger and Stewart, 2010). An acceptable level of soil erosion, as used herein, is defined as that amount of soil loss that will not affect (i.e., limit) the potential long-term beneficial uses of the soil as a growth medium, or adversely affect water resources because of accelerated erosion and subsequent sedimentation. Refer to Section 5.14, Water Resources, for mitigation measures related to potential impacts to water quality associated with soil erosion.

- **Soil-1.** Conduct grading operations in compliance with good industry standard practice and Kern County grading permit requirements.

- **Soil-2.** Conduct construction and operational activities in accordance with a construction-phase Storm Water Pollution Prevention Plan (SWPPP) and associated monitoring program.

- **Soil-3.** Temporary Erosion Control Measures. Typically, temporary erosion control measures include revegetation, slope stabilizers, dust suppression, construction of berms and ditches, and sediment barriers. Vegetation is the most desirable form of erosion control because it stabilizes the soil and maintains the landscape, and implementation of vegetation is feasible due to the quality of soil.

During construction of the Project, employment of control measures will minimize the wind-blown erosion of soil from construction areas, such as dust suppression (spraying water) and timely vegetation of barren construction areas. BMPs identified in the Erosion Control Plan and SWPPP will be in place prior to the commencement of ground-disturbing activities. At this time, these plans do not exist, but they will be developed and implemented prior to initiation of any on- or off-site ground-disturbing activities.

Sediment barriers such as straw bales or silt fences will slow runoff and trap sediment. Generally, placement of barriers will occur at the base of exposed slopes below disturbed areas. Placing barriers around the Project and the property boundary serves as prevention against sediment leaving the Project Site. Runoff retention basins, drainage diversions, and other large-scale sediment traps are not expected to be needed because of the relatively level topography. Soil stockpiles generated during construction will be covered, and protected from precipitation if left on site for extended periods of time.

- **Soil-4. Permanent Erosion Control Measures.** Following construction of the Project, permanent control measures will be implemented to minimize water and wind-blown erosion of soil from the Project, such as wind barriers, vegetation of barren post-construction areas and earthen berms, and conducting periodic monitoring (inspections) for erosion due to wind or water impacts and initiation of corrective actions to address issues discovered though monitoring. BMPs identified in the Erosion Control Plan and SWPPP will be in place prior

to the initiation of operations. These plans will be developed and implemented prior to commencing operation of the completed Project.

With implementation of the mitigation measures listed above, impacts to the soils resources will be less than significant due to construction and operation of the Project.

5.9.5 Laws, Ordinances, Regulations, and Standards

The following LORS are applicable to protection of soil resources and protection of surface water quality from potential Project-induced erosion impacts. Table 5.9-4 provides a summary of these applicable LORS. As presented in Section 5.9.7, Permits Required and Permit Schedule, the Project will be constructed and operated in accordance with applicable LORS and permit conditions.

5.9.6 Involved Agencies and Agency Contacts

Agencies with jurisdiction to issue applicable permits and/or enforce LORS related to soils resources are shown in Table 5.9-5, Agency Contacts.

5.9.7 Permits Required and Permit Schedule

Table 5.9-6, Applicable Permits, lists all applicable permits for the Project in the area of soils.

5.9.7.1 Federal Authorities and Administering Agencies

The federal LORS applicable to this Project, as detailed in Table 5.9-4, Summary of LORS – Soils, were authorized by the U.S. Environmental Protection Agency (USEPA) and USDA. The Clean Water Act empowers the USEPA with regulation of wastewater and storm-water discharges into surface waters by using National Pollutant Discharge Elimination System (NPDES) permits and pretreatment standards. The administering agency for LORS authorized by USEPA is the RWQCB, Central Valley Region, under the direction of the State Water Resources Control Board (SWRCB); however, the USEPA may retain jurisdiction at its discretion.

The USDA prescribes standards of technical excellence for the SCS, now called the NRCS, for the planning, design, and construction of soil conservation practices. The administering agency for LORS authorized by the USDA (Farmland Protection Policy Act) is the NRCS.

5.9.7.2 State Authorities and Administering Agencies

The state LORS applicable to this Project and listed in Table 5.9-4, Summary of LORS—Soils, are administered by the California Environmental Protection Agency (Cal/EPA). With respect to the Project, the California Public Resources Code provides for protection of environmental quality by requiring entities to submit information to the CEC concerning potential environmental impacts. The CEC is the administering agency, and the CEC's decision on the AFC must include consideration of environmental protection.

The CEQA guidelines pertaining to potential impacts to soils, as found in the Act, specify that an impact may be considered significant from a soils standpoint if the project results in substantial soil erosion or loss of topsoil. The CEC is the administering agency for potential impacts to soils.

The California Porter–Cologne Water Quality Control Act of 1952 requires adequate protection of water quality by appropriate design, sizing, and construction of erosion and sediment controls. An NPDES California General Activities Construction Permit is necessary if an area greater than 1 acre will be disturbed. Because the facility will recycle storm water during operation, an operational NPDES permit will not be required.

5.9.7.3 Local Authorities and Administering Agencies

The local LORS applicable to this Project as shown in Table 5.9-3 are administered by Kern County.

5.9.8 References

AECOM, 2010. Phase II Environmental Site Assessment Report, Proposed Hydrogen Energy California Project Site, Adohr and Dairy Roads, Kern County, California. December.

Churchill, Ronald, 2008. Personal telephone conversation between Eric Barndt, URS Corporation, and Mr. Ronald Churchill, State of California Department of Conservation Senior Engineer Geologist.

Krieger and Stewart, Incorporated (Krieger), 2009. Final Environmental Impact Report for the Buena Vista Water Storage District Buena Vista Water Management Program. December.

Soil Conservation Service, U.S. Department of Agriculture (USDA SCS), 1988. Soil Survey of Kern County Northwestern Part. September 1988.

URS (URS Corporation), 2007. Final Phase I Environmental Site Assessment, BPAE and Area Kern Front Parcels, Kern Front Oil Field. May 18, 2007.

URS (URS Corporation), 2009. Preliminary Geotechnical Investigation, Proposed Hydrogen Energy California Project (HECA), Kern County, California, URS Job No. 289067571.

URS (URS Corporation), 2012. Phase I Environmental Site Assessment, HECA Project Site, Buttonwillow, California.

USDA NRCS (U.S. Department of Agriculture, Natural Resources Conservation Service), 2009. Soil Survey of Kern County Southwestern Part.

Web Soil Survey (WSS), 2008. U.S. Department of Agriculture, Natural Resources Conservation Service. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/.

Table 5.9-1
Disturbed Acreage

Project Component	Size	Approx. Linear Length (miles)	ROW Construction	ROW Permanent	Temporary Disturbance (acres)	Permanent Disturbance (acres)
Project Site	453 acres	NA	NA	NA	453	453
Electrical transmission line	Temporary disturbance: 25-foot wide road throughout linear length, plus up to 25-foot-diameter structural base for each of 15 poles. Permanent disturbance: Only the up to 25-foot-diameter structural base for each of 15 poles.	2.1	100 feet	100 feet	7	0.17
Natural gas linear	Temporary disturbance: 50 feet wide along linear length, plus 100-foot by 100-foot metering station at the inlet. Permanent disturbance: Only the metering station at the inlet.	13	50 feet	25 feet	79	0.23
BVWSD well field and process water pipeline	Temporary disturbance: 50 feet wide along linear length, plus 50-foot by 50-foot area of disturbance around each of 5 wells. Permanent disturbance: Only the areas around each well.	15	50 feet	25 feet	91.2	0.29
Potable water pipeline	Temporary disturbance: 10 feet wide along linear length. Permanent disturbance: None.	1	10 feet	N/A	1.25	NA
Railroad spur	Single track railroad. Temporary disturbance: 75 feet wide along linear length, plus 3 acres of laydown area. Permanent disturbance: 60 feet wide along linear length.	5.3	75 feet	60 feet	51.2	38.6

Table 5.9-1
Disturbed Acreage (Continued)

Project Component	Size	Approx. Linear Length (miles)	ROW Construction	ROW Permanent	Temporary Disturbance (acres)	Permanent Disturbance (acres)
Temporary Construction Areas	Temporary disturbance: 91 acres in the Controlled Area. Permanent disturbance: None.	NA	NA	NA	91	None
OEHI CO_2 pipeline	Temporary disturbance: 50 feet along linear length, plus 4 entry/exit pits (100-foot by 150-foot each) for HDD, plus two 50-foot by 50-foot valve box areas. Permanent disturbance: Only the two 50-foot by 50-foot valve box areas.	3.4	50 feet	25 feet	22.1	0.11
Total Disturbance					**795.5**	**492.3**

Source: HECA Project.

Notes:

BVWSD = Buena Vista Water Storage District

CO_2 = carbon dioxide

NA = not applicable

ROW = right-of-way

Table 5.9-2
Soil Mapping Units—Descriptions and Properties

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Kern County Northwestern Part											
Buttonwillow clay, drained, 0 to 2% slopes (123)	Clay	No restrictive feature within 200 cm	Somewhat poorly drained	High	C	7s	5	0.24	7.9–8.4	High	Prime Farmland if irrigated
Cajon loamy sand, 0 to 2% slopes (125)	Loamy sand	No restrictive feature within 200 cm	Somewhat excessively drained	Negligible	A	7s	5	0.15	7.4–8.4	Moderate	Prime Farmland if irrigated
Cajon loamy sand, 2 to 5% slopes (126)	Loamy sand	No restrictive feature within 200 cm	Somewhat excessively drained	Negligible	A	7e	5	0.15	7.4–8.4	Moderate	Prime Farmland if irrigated
Elkhills sandy loam, 9 to 50% slopes, eroded (146)	Gravely sandy loam	No restrictive feature within 200 cm	Well drained	Medium	B	7e	5	0.20	7.4–8.4	High	Not Prime Farmland
Garces silt loam, 0 to 2% slopes (156)	Silt loam	No restrictive feature within 200 cm	Well Drained	Very High		7s	4	0.49	7.9-9.0	High	Farmland of state-wide importance
Garces silt loam, hard substratum, 0 to 2% slopes (158)	Silt loam	N/A	Well drained	Very slow	B	N/A	N/A	N/A	N/A	N/A	N/A
Kimberlina fine sandy loam, 0 to 2% slopes (174)	Fine sandy loam	No restrictive feature within 200 cm	Well drained	Very low	B	7c	5	0.24	6.6–8.4	High	Prime Farmland if irrigated
Kimberlina fine sandy loam, saline-alkali, 0 to 2% slopes (179)	Fine sandy loam	No restrictive feature within 200 cm	Well drained	Medium	B	7s	5	0.24	7.9–8.4	High	Farmland of State-Wide Importance

Table 5.9-2
Soil Mapping Units—Descriptions and Properties (Continued)

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Lokern clay, drained, 0 to 2% slopes (187)	Clay	No restrictive feature within 200 cm	Moderately well drained	High	C	7s	5	0.28	7.9–8.4	High	Prime Farmland if irrigated
Lokern clay, saline-alkali, drained, 0 to 2% slopes (188)	Clay	No restrictive feature within 200 cm	Moderately well drained	Very High	D	7s	5	0.28	7.9–8.4	High	Not Prime Farmland
Milham sandy loam, 0 to 2% slopes (196)	Sandy loam	No restrictive feature within 200 cm	Well drained	Medium	B	7c	5	0.32	7.4–8.4	High	Prime Farmland if irrigated
Panoche clay loam, 0 to 2% slopes (211)	Clay loam	No restrictive feature within 200 cm	Well drained	Low	B	7c	5	0.43	7.4–8.4	High	Prime Farmland if irrigated
Panoche clay loam, saline-alkali, 0 to 2% slopes (214)	Clay loam	No restrictive feature within 200 cm	Well drained	Medium	B	7s	5	0.43	7.4–8.4	High	Farmland of State-Wide Importance
Torriorthents stratified, eroded-Elkhills complex, 9 to 50% slopes (232)	Sandy loam, gravelly sandy loam	No restrictive feature within 200 cm	Well drained	Medium to high	C	7e	5	0.20	7.4–8.4	High	Not Prime Farmland
Westhaven fine sandy loam, 0 to 2% slopes (245)	Sandy loam	No restrictive feature within 200 cm	Moderately well drained	Medium	B	7c	5	0.37	7.4-8.4	High	Prime farmland if irrigated
Kern County, Southwestern Part											
Granoso loamy sand, 2 to 5% slopes (121)	Loamy sand	No restrictive feature within 200 cm	Somewhat excessively drained	Very low	A	7e	5	0.17	7.4–8.4	Low	Farmland of State-Wide Importance

Table 5.9-2
Soil Mapping Units—Descriptions and Properties (Continued)

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Kimberlina fine sandy loam, saline-sodic, 0 to 2% slopes (212)	Fine sandy loam	No restrictive feature within 200 cm	Well drained	Low	B	7s	3	0.24	7.9–8.4	High	Farmland of State-Wide Importance

Source: USDA SCS, 1988; NRCS, 2009.

Notes:

1 *Depth to Bedrock or Restrictive Feature:* Represents a restrictive layer that is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

2 *Hydrologic Soil Groups:* Are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms. The four hydrologic soil groups are:

Group A – Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B – Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C – Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D – Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

3 *Land Capability Classes: Class 7* soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forest land, or wildlife. *Subclass s* indicates that the soil is limited mainly because it is shallow, droughty, or stony; *Subclass c* indicates that the soil is limited by climates that are very cold or very dry; and *Subclass e* indicates susceptibility to erosion is the dominant problem or hazard affecting use with erosion susceptibility and past erosion damage comprising the major soil factors that affect soils in this subclass; Subclass s indicates that the soil is limited mainly because it is shallow, droughty, or stony.

4 *T Factor:* is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

5 *Erosion Factor K:* indicates the susceptibility of a soil to sheet and rill erosion by water. *Factor K* is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of *K* range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

6 *Risk of Corrosion:* pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer. For uncoated steel, the risk of corrosion—expressed as “low,” “moderate,” or “high” —is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

cm = centimeter
% = percent
N/A = not available

Table 5.9-3
Summary of Soil Erosion Loss Calculations

Feature	Area (acres)	Activity	Estimated Soil Loss due to Water Erosion (tons/year)
Project Site	453	Existing	9.6
		Construction	41.7
		Operation	5.2
Laydown Area	91	Existing	1.5
		Construction	0.7
		Operation	1.5
Railroad Spur	51.2	Existing	4.6
		Construction	4.6
		Operation	0.3

Source: HECA Project, 2012.
Note:
Soil losses (tons/acre/year) are estimated using RUSLE2 software available online: http://fargo.nserl.purdue.edu/rusle2_dataweb/. The soil characteristics were estimated using RUSLE2 soil profiles corresponding to the mapped NRCS soil unit. Estimates of actual soil losses use the RUSLE2 soil erosion value multiplied by the affected area.

Table 5.9-4
Summary of LORS—Soils

LORS	Applicability	Conformance
Federal Jurisdiction		
The Federal Water Pollution Control Act of 1972; Clean Water Act of 1977 (including its 1987 amendments)	Establishes requirements for any facility or activity that has or will discharge waste (including sediment due to accelerated erosion) that may interfere with the beneficial uses of receiving waters.	Sections 5.9.2, Environmental Consequences, and 5.9.2.1, Construction-Related Impacts
U.S. Department of Agriculture, SCS. National Engineering Handbook (1983), Sections 2 and 3	Planning, design, and construction of soil conservation practices.	Sections 5.9.2, Environmental Consequences, and 5.9.2.1, Construction-Related Impacts
State Jurisdiction		
California Public Resources Code 25523(a): 20 CCR Chapter 6; §1752, §1752.5, §§2300-2309, and Chapter 2, Subchapter 5, Article 1, Appendix B, Part (i)	Protection of environmental quality.	Sections 5.9.2, Environmental Consequences, and 5.9.2.2, Project Site Impacts
California Environmental Quality Act, California PRC Chapter 21000 *et seq.*; Guidelines for Implementation of the CEQA, 14 CCR Chapter 3; §§15000-15387, and Appendix G	Substantial soil erosion or loss of topsoil, degradation or loss of available agricultural land, agricultural activities, or agricultural land productivity in the Project area, alteration of agricultural land characteristics due to plant air emissions, or conversion of prime or unique farmland, or farmland of state-wide importance, to non-agricultural use.	Sections 5.9.2, Environmental Consequences, and 5.9.2.2, Project Site Impacts
The California Porter-Cologne Water Quality Control Act of 1952; California Water Code, §§1326 – 13269; and 23 CCR Chapter 9	Requires adequate protection of water quality by appropriate design, sizing, and construction of erosion and sediment controls.	Sections 5.9.2, Environmental Consequences, and 5.9.2.2, Project Site Impacts
Local Jurisdiction		
Kern County Building Inspection Division Building Permit – Kern County Zoning Ordinance, Chapter 17.08	A building permit is required for any construction which physically changes or adds structures to your property or for work regulated by local Codes or Ordinances.	Section 5.9.2, Environmental Consequences
Kern County Building Inspection Division Grading Permit – Kern County Zoning Ordinance, Chapter 17.08 and 17.28.070	No person shall do any grading or cause the same to be done without first having obtained a grading permit from the building official.	Section 5.9.2, Environmental Consequences

Source: HECA Project, 2012.
Notes:
CCR = California Code of Regulations
CEQA = California Environmental Quality Act of 1970
LORS = laws, ordinances, regulations, and standards
PRC = Public Resources Code
SCS = Soil Conservation Service

Table 5.9-5
Agency Contacts

Agency	Contact	Address	Telephone
Natural Resource Conservation Service (NRCS) Area 3 Office	Edd Russell, Soil Scientist	4974 E Clinton Way, Ste. 114 Fresno, CA 93727	(559) 252-2191 x 104
NRCS Richard E. Lyng USDA Service Center	Christopher Paris, Soil Scientist	430 G Street Davis, CA 95616	(530) 792-5634
Regional Water Quality Control Board Central Valley Region	Doug Patterson	1685 E Street Fresno, CA 93706	(559) 445-5156
Kern County Planning Department	Lorelei H. Oviatt, AICP Division Chief	Public Services Building 2700 "M" Street, Suite 1000 Bakersfield, CA 93301	(661) 862-8866
Kern County Land Division	Holly Nelson, Supervising Planner	Public Services Building 2700 "M" Street, Suite 1000 Bakersfield, CA 93301	(661) 862-8625
Kern County Building Inspection Division	Charles Lackey, Director	Public Services Building 2700 "M" Street, Suite 1000 Bakersfield, CA 93301	(661) 862-8650

Source: HECA Project, 2012.

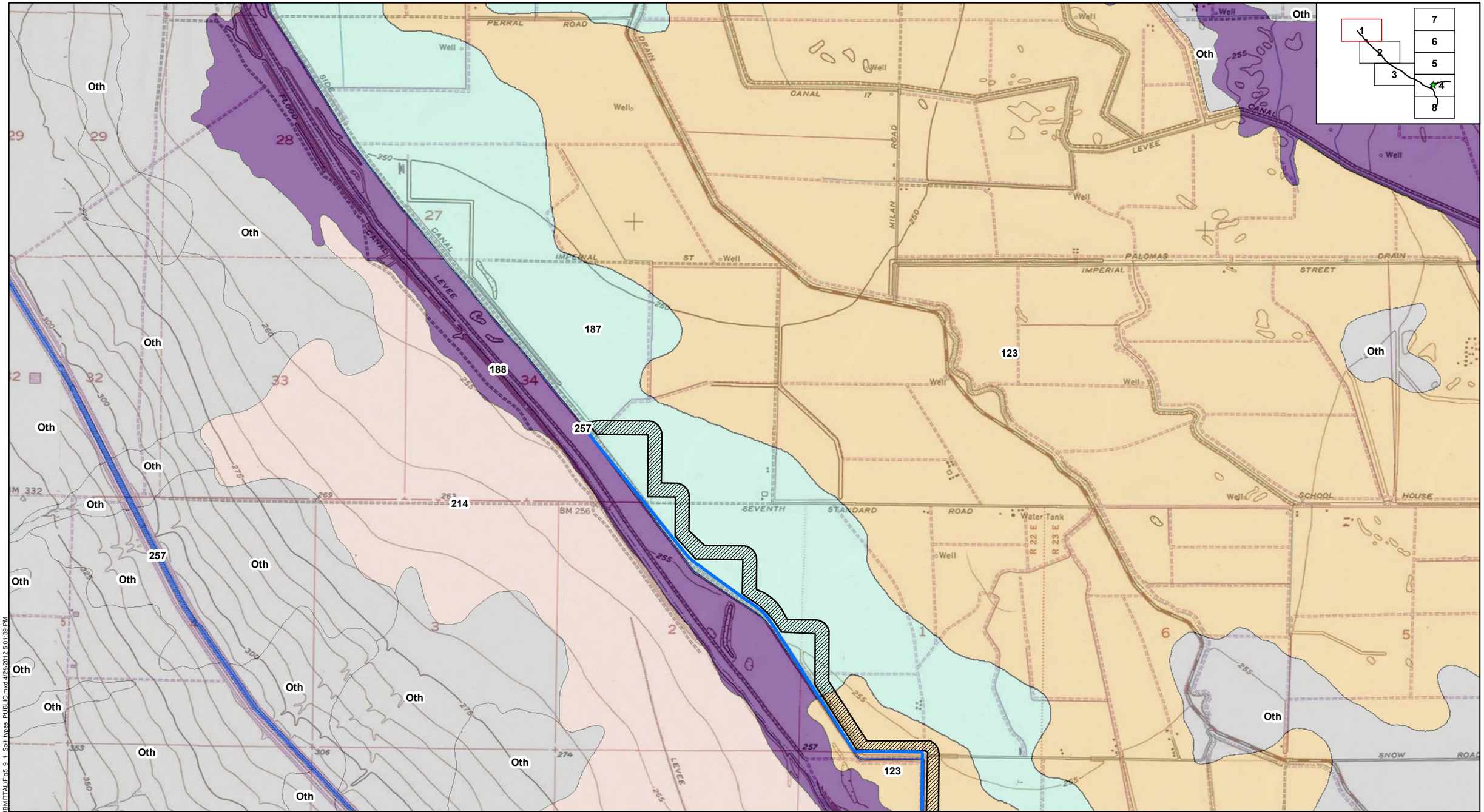
Note:

NRCS = Natural Resource Conservation Service

Table 5.9-6
Applicable Permits

Responsible Agency	Permit	Schedule
Regional Water Quality Control Board Central Valley Region	NPDES Construction	Notice of Intent filed 30 days prior to construction
Kern County Building Inspection Division	Building Permit	Prior to initiation of construction
Kern County Building Inspection Division	Grading Permit	Prior to initiation of construction

Source: HECA Project, 2012.



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
Proposed NG Valve Station[1]
Rail Laydown Yard[1]

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Soil Types
Oth - Other Soils
121 - Granoso Loamy Sand
123 - Buttonwillow Clay, Drained
125 - Cajon Loamy Sand
126 - Cajon Loamy Sand
146 - Elkhills Sandy Loam, Eroded
156 - Garces Silt Loam
158 - Garces Silt Loam, Hard Substratum
174 - Kimberlina Fine Sandy Loam
179 - Kimberlina Fine Sandy Loam, Saline-Alkali
187 - Lokern Clay, Drained
188 - Lokern Clay, Saline-Alkali, Drained
196 - Milham Sandy Loam
212 - Kimberlina Fine Sandy Loam, Saline-Sodic
214 - Panoche Clay Loam, Saline- Alkali 0 to 2 percent slope
232 - Torriorthents Stratified, Eroded-Elkhills Complex
245 - Westhaven Fine Sandy Loam
257 - Water / W - Water

Note:
1. Feature temporarily designated as confidential

N
0 1,000 2,000 FEET

SOIL TYPES

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Kern County, California

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FIGURE 5.9-1(1)

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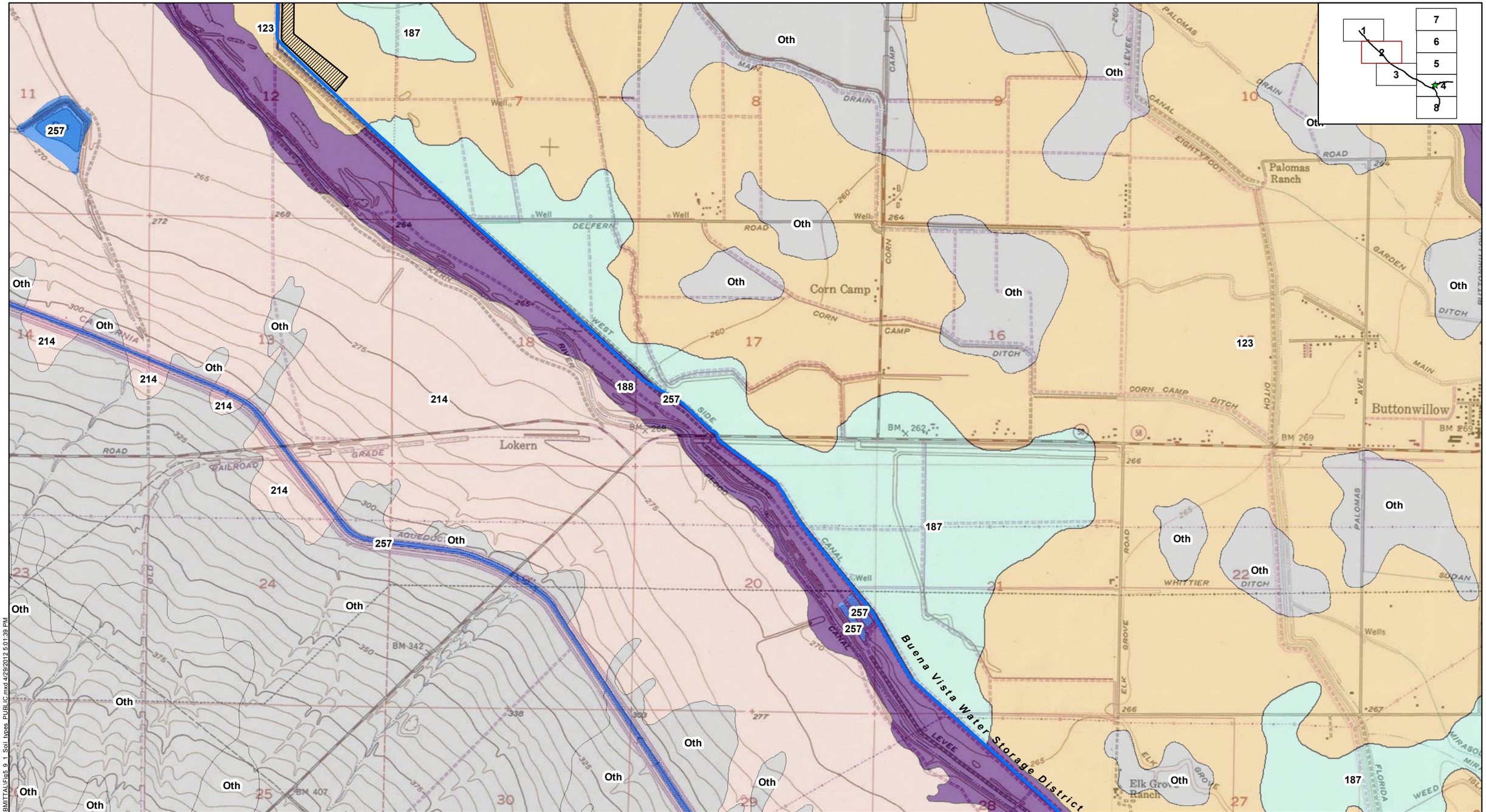
Source: Aerial Imagery, Bing Maps, 2009.



SOIL TYPES

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Kern County, California

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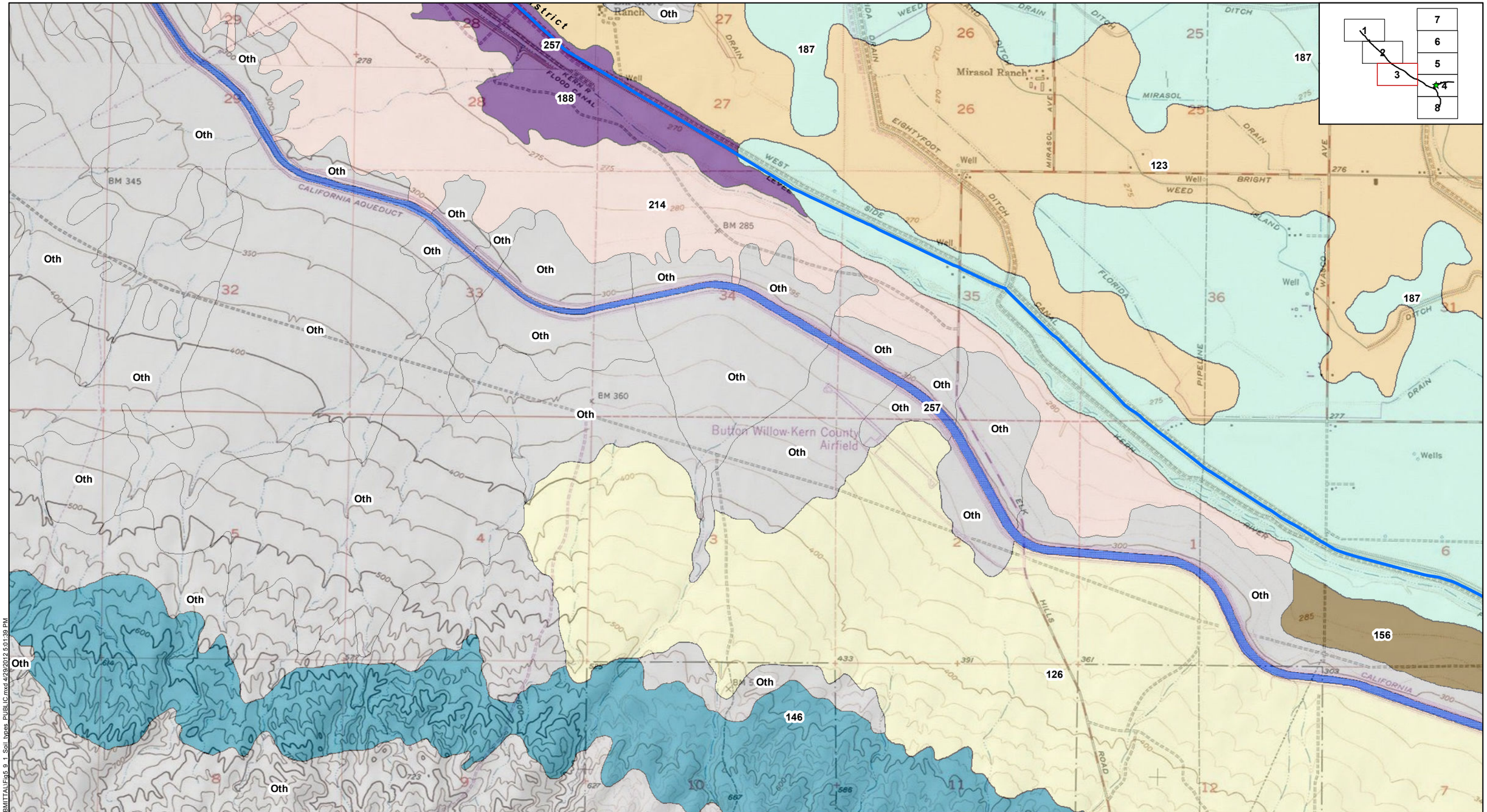
FIGURE 5.9-1(2)



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
Proposed NG Valve Station[1]
Rail Laydown Yard[1]

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Soil Types
Oth - Other Soils
121 - Granoso Loamy Sand
123 - Buttonwillow Clay, Drained
125 - Cajon Loamy Sand
126 - Cajon Loamy Sand
146 - Elkhills Sandy Loam, Eroded
156 - Garces Silt Loam
158 - Garces Silt Loam, Hard Substratum
174 - Kimberlina Fine Sandy Loam
179 - Kimberlina Fine Sandy Loam, Saline-Alkali
187 - Lokern Clay, Drained
188 - Lokern Clay, Saline-Alkali, Drained
196 - Milham Sandy Loam
212 - Kimberlina Fine Sandy Loam, Saline-Sodic
214 - Panoche Clay Loam, Saline- Alkali 0 to 2 percent slope
232 - Torriorthents Stratified, Eroded-Elkhills Complex
245 - Westhaven Fine Sandy Loam
257 - Water / W - Water

Note:
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SOIL TYPES

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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.9-1(3)

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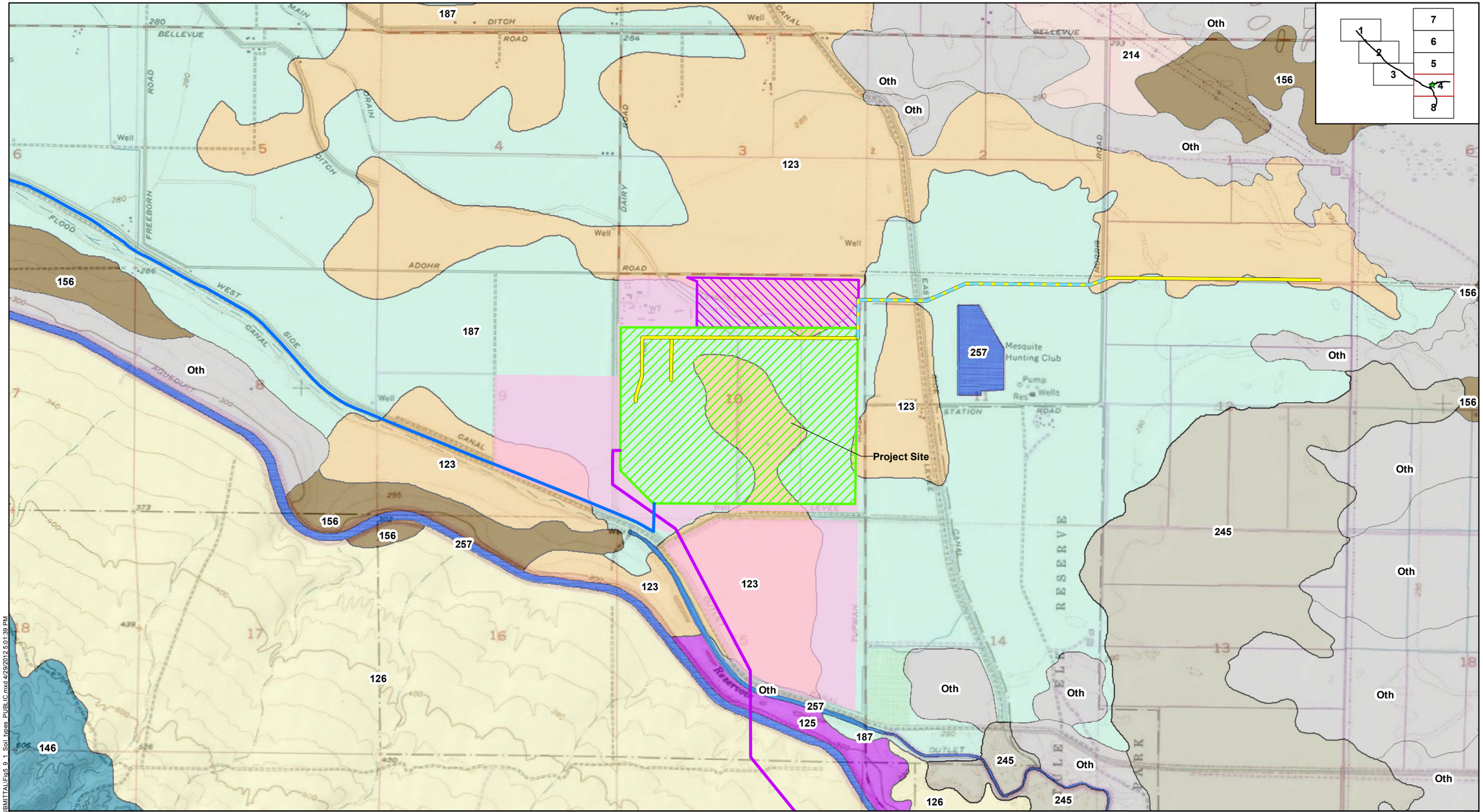
Source: Aerial Imagery, Bing Maps, 2009.



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
Proposed NG Valve Station[1]
Rail Laydown Yard[1]

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Soil Types
Oth - Other Soils
121 - Granoso Loamy Sand
123 - Buttonwillow Clay, Drained
125 - Cajon Loamy Sand
126 - Cajon Loamy Sand
146 - Elkhills Sandy Loam, Eroded
156 - Garces Silt Loam
158 - Garces Silt Loam, Hard Substratum
174 - Kimberlina Fine Sandy Loam
179 - Kimberlina Fine Sandy Loam, Saline-Alkali
187 - Lokern Clay, Drained
188 - Lokern Clay, Saline-Alkali, Drained
196 - Milham Sandy Loam
212 - Kimberlina Fine Sandy Loam, Saline-Sodic
214 - Panoche Clay Loam, Saline- Alkali 0 to 2 percent slope
232 - Torriorthents Stratified, Eroded-Elkhills Complex
245 - Westhaven Fine Sandy Loam
257 - Water / W - Water

Note:
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SOIL TYPES

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Kern County, California

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FIGURE 5.9-1(4)

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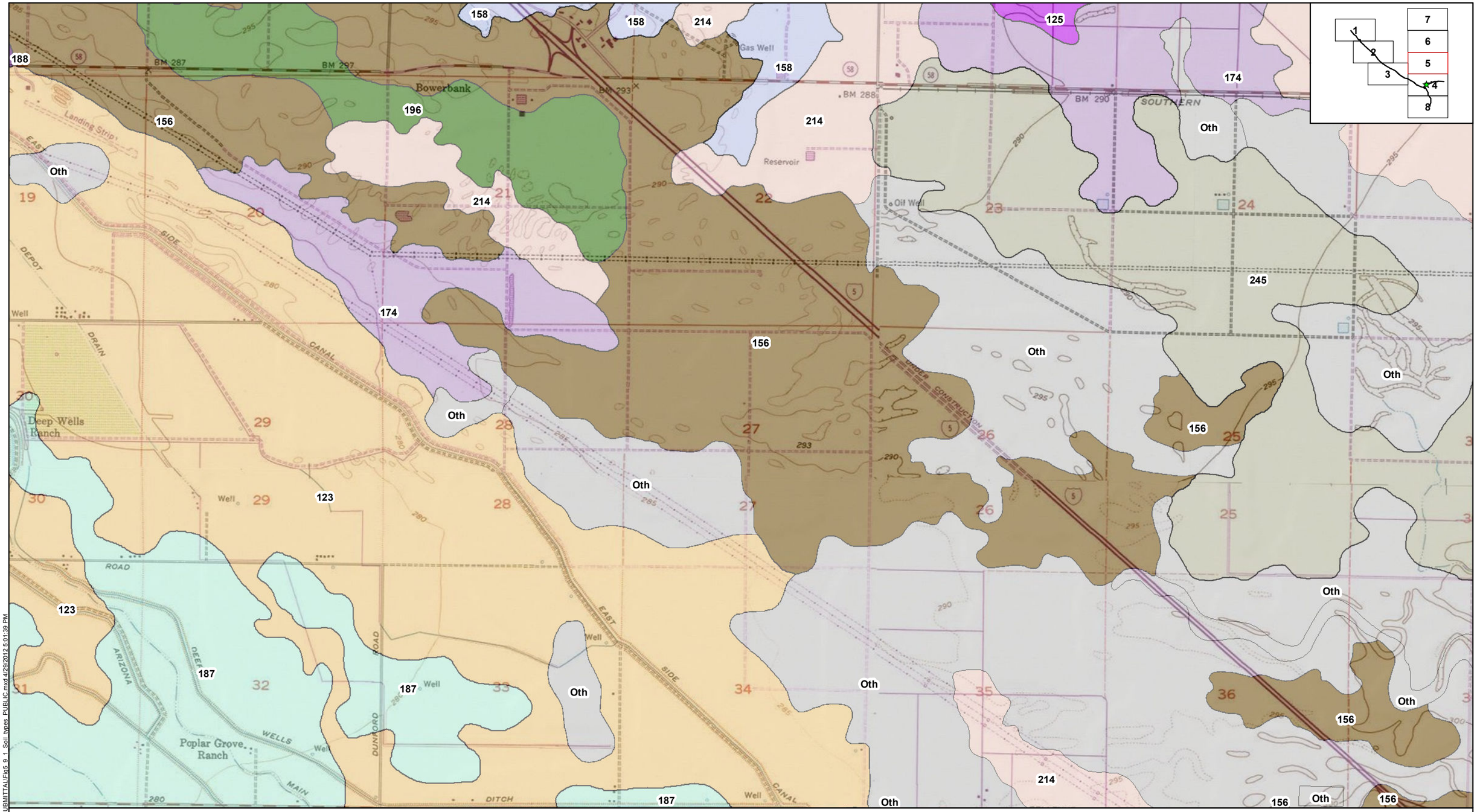
Source: Aerial Imagery, Bing Maps, 2009.



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
Proposed NG Valve Station[1]
Rail Laydown Yard[1]

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Soil Types
Oth - Other Soils
121 - Granoso Loamy Sand
123 - Buttonwillow Clay, Drained
125 - Cajon Loamy Sand
126 - Cajon Loamy Sand
146 - Elkhills Sandy Loam, Eroded
156 - Garces Silt Loam
158 - Garces Silt Loam, Hard Substratum
174 - Kimberlina Fine Sandy Loam
179 - Kimberlina Fine Sandy Loam, Saline-Alkali
187 - Lokern Clay, Drained
188 - Lokern Clay, Saline-Alkali, Drained
196 - Milham Sandy Loam
212 - Kimberlina Fine Sandy Loam, Saline-Sodic
214 - Panoche Clay Loam, Saline- Alkali 0 to 2 percent slope
232 - Torriorthents Stratified, Eroded-Elkhills Complex
245 - Westhaven Fine Sandy Loam
257 - Water / W - Water

Note:
1. Feature temporarily designated as confidential

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SOIL TYPES

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FIGURE 5.9-1(5)

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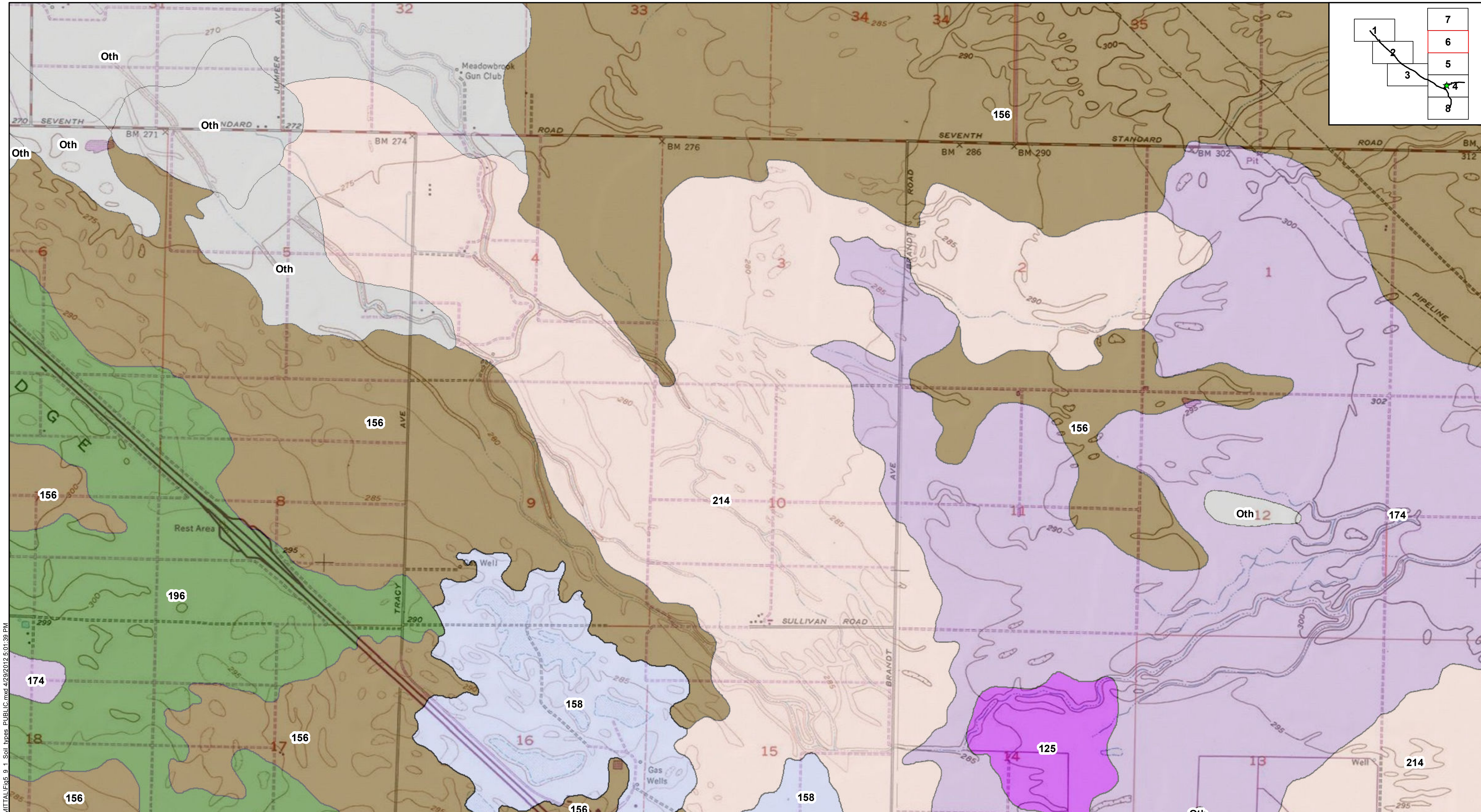
Source: Aerial Imagery, Bing Maps, 2009.



Project Site	Carbon Dioxide	Soil Types	146 - Elkhills Sandy Loam, Eroded	187 - Lokern Clay, Drained
Construction Staging Area	Natural Gas[1]	Oth - Other Soils	156 - Garces Silt Loam	188 - Lokern Clay, Saline-Alkali, Drained
Controlled Area	Potable Water	121 - Granoso Loamy Sand	158 - Garces Silt Loam, Hard Substratum	196 - Milham Sandy Loam
BVWSD Well Field	Process Water	123 - Buttonwillow Clay, Drained	174 - Kimberlina Fine Sandy Loam	212 - Kimberlina Fine Sandy Loam, Saline-Sodic
Proposed NG Valve Station[1]	Railroad[1]	125 - Cajon Loamy Sand	179 - Kimberlina Fine Sandy Loam, Saline-Alkali	214 - Panoche Clay Loam, Saline- Alkali 0 to 2 percent slope
Rail Laydown Yard[1]	Transmission	126 - Cajon Loamy Sand		

232 - Torriorthents Stratified, Eroded-Elkhills Complex
245 - Westhaven Fine Sandy Loam
257 - Water / W - Water

Note:
1. Feature temporarily designated as confidential

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SOIL TYPES

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Kern County, California

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FIGURE 5.9-1(6)

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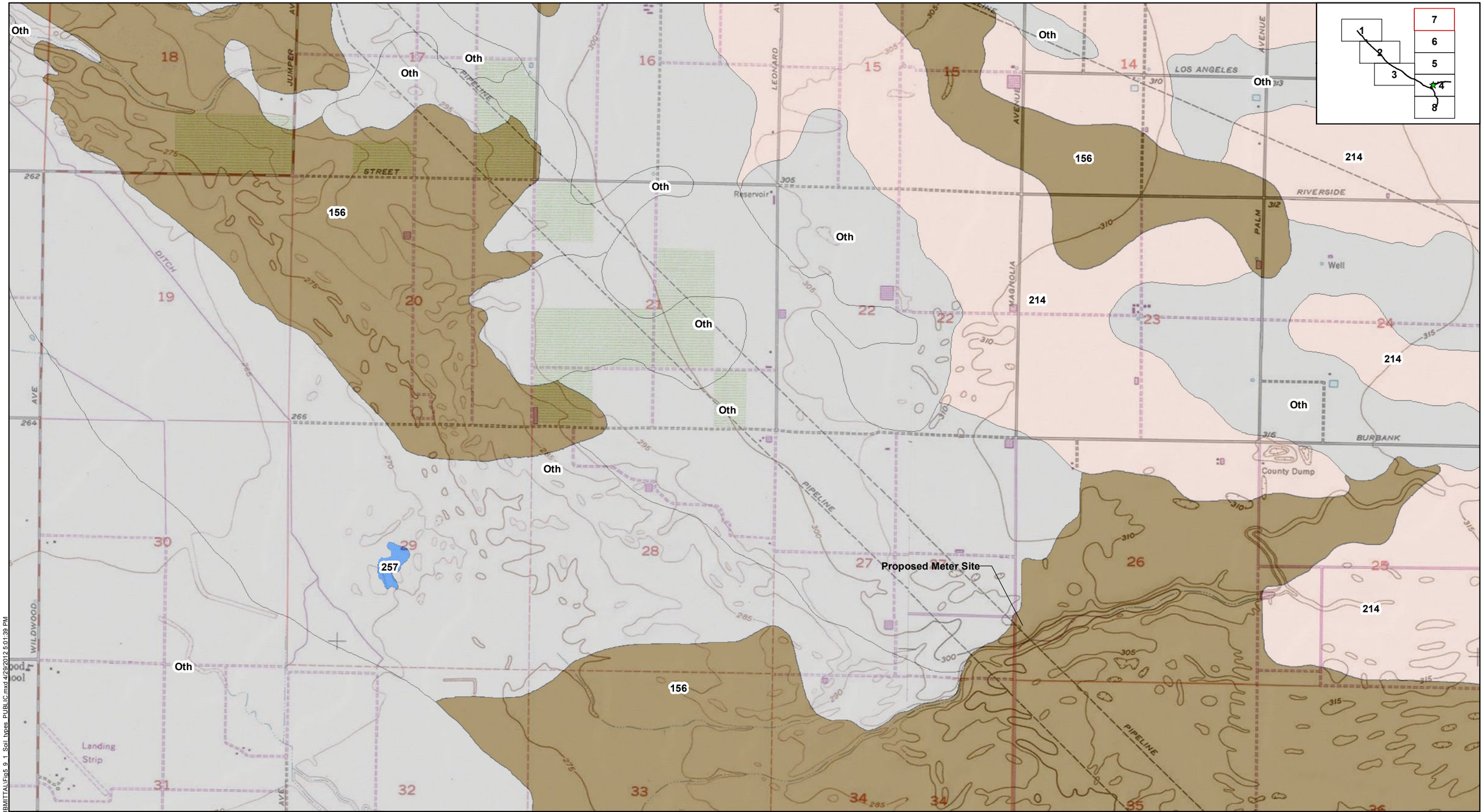
Source: Aerial Imagery, Bing Maps, 2009.



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
Proposed NG Valve Station[1]
Rail Laydown Yard[1]

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Soil Types
Oth - Other Soils
121 - Granoso Loamy Sand
123 - Buttonwillow Clay, Drained
125 - Cajon Loamy Sand
126 - Cajon Loamy Sand
146 - Elkhills Sandy Loam, Eroded
156 - Garces Silt Loam
158 - Garces Silt Loam, Hard Substratum
174 - Kimberlina Fine Sandy Loam
179 - Kimberlina Fine Sandy Loam, Saline-Alkali
187 - Lokern Clay, Drained
188 - Lokern Clay, Saline-Alkali, Drained
196 - Milham Sandy Loam
212 - Kimberlina Fine Sandy Loam, Saline-Sodic
214 - Panoche Clay Loam, Saline- Alkali 0 to 2 percent slope
232 - Torriorthents Stratified, Eroded-Elkhills Complex
245 - Westhaven Fine Sandy Loam
257 - Water / W - Water

Note:
1. Feature temporarily designated as confidential

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SOIL TYPES

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Kern County, California

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FIGURE 5.9-1(7)

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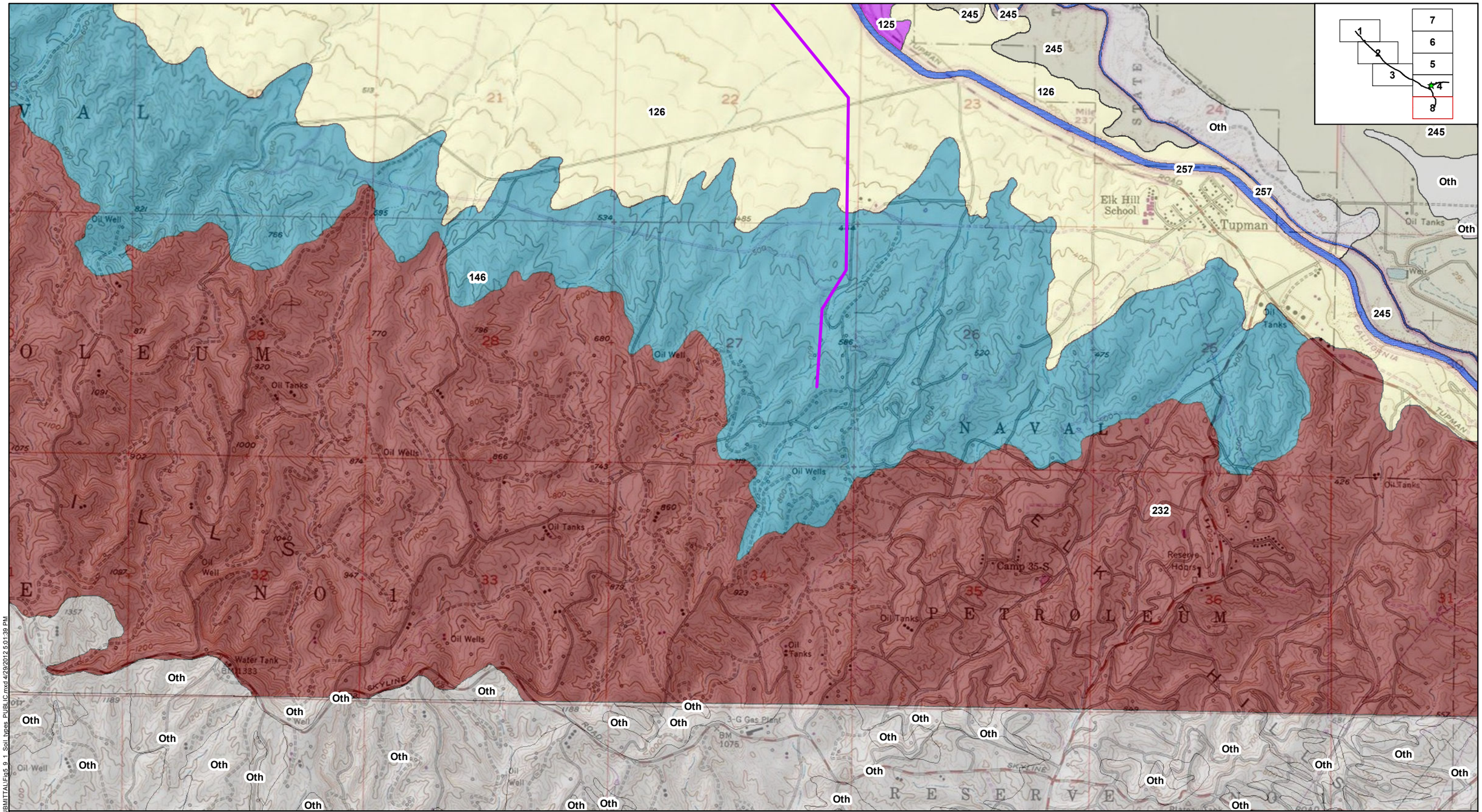
Source: Aerial Imagery, Bing Maps, 2009.



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
Proposed NG Valve Station[1]
Rail Laydown Yard[1]

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Soil Types
Oth - Other Soils
121 - Granoso Loamy Sand
123 - Buttonwillow Clay, Drained
125 - Cajon Loamy Sand
126 - Cajon Loamy Sand
146 - Elkhills Sandy Loam, Eroded
156 - Garces Silt Loam
158 - Garces Silt Loam, Hard Substratum
174 - Kimberlina Fine Sandy Loam
179 - Kimberlina Fine Sandy Loam, Saline-Alkali
187 - Lokern Clay, Drained
188 - Lokern Clay, Saline-Alkali, Drained
196 - Milham Sandy Loam
212 - Kimberlina Fine Sandy Loam, Saline-Sodic
214 - Panoche Clay Loam, Saline- Alkali 0 to 2 percent slope
232 - Torriorthents Stratified, Eroded-Elkhills Complex
245 - Westhaven Fine Sandy Loam
257 - Water / W - Water

Note:
1. Feature temporarily designated as confidential

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Kern County, California

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FIGURE 5.9-1(8)

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Source: Aerial Imagery, Bing Maps, 2009.