FINAL

Supplement Analysis for the

Texas Clean Energy Project

Final Environmental Impact Statement

DOE/EIS-0444-SA-01

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1 INTRODUCTION

This chapter introduces the need for a Supplement Analysis (SA), provides a summary of the project's National Environmental Policy Act (NEPA) process, and identifies the changes made since the Texas Clean Energy Project (TCEP) final Environmental Impact Statement (EIS) was published.

1.1 Background

The TCEP would be located approximately 15 miles (mi) (24 kilometers [km]) southwest of the city of Odessa in Ector County, Texas (Figure 1.1). The TCEP would demonstrate the full integration of carbon dioxide (CO_2) capture and geologic sequestration with a commercial, coal-based polygeneration plant (or polygen plant). The proposed 600-acre (ac) (243-hectare [ha]) polygen plant site is located at the community of Penwell, just north of Interstate (I)-20 and a Union Pacific Railroad (UPRR) line.

Preparation of the EIS for the TCEP began on June 2, 2010, with the publication of DOE's Notice of Intent (NOI) to prepare an EIS. DOE held one public scoping meeting on June 17, 2010, and considered all comments received when defining the scope of the EIS. On March 10, 2011, DOE filed the draft EIS with the U.S. Environmental Protection Agency (EPA) and distributed the document to elected officials, agencies, Native American tribes, organizations, and members of the general public. EPA's Notice of Availability was published in the *Federal Register* on March 18, 2011 (76 *Federal Register* 14968). This notice started a 45-day comment period on the draft EIS, which continued until May 2, 2011. During this period, DOE held one public hearing on April 5, 2011, and considered all comments received individually and collectively.

After expanding specific discussion areas based on public comments received on the draft EIS and updating or modifying the technical data analyzed in the draft EIS, DOE distributed the final EIS on July 28, 2011, again to elected officials, agencies, Native American tribes, organizations, and members of the general public. DOE filed the final EIS with EPA on July 28, 2011; and EPA's Notice of Availability was published in the *Federal Register* on August 5, 2011 (76 *Federal Register* 47579). This notice started a 30-day waiting period on the final EIS, which continued until September 6, 2011.

The EIS process concluded with the publication of DOE's Record of Decision (ROD), which was published in the *Federal Register* on September 29, 2011 (76 *Federal Register* 60478-60488). DOE announced in the ROD its decision to provide Summit Texas Clean Energy, LLC (Summit or Proponent) with approximately $450 million in financial assistance for the TCEP on a cost-shared basis.

Since the ROD was published, the plant configuration was modified, specific alternatives associated with the TCEP's process water supply have changed, and there is some additional information on the waste water disposal options. DOE found that it was unclear as to whether these changes warranted a supplemental EIS and therefore prepared this SA to help the agency in making this determination. This SA identifies the pertinent aspects of the changes to the alternatives, the new information, a comparative analysis of the changes, and a brief discussion in light of the criteria contained in the CEQ and DOE NEPA regulations (40 C.F.R. 1502.9[c] and 10 C.F.R. 1021.314[c]) regarding when a supplemental EIS is required.

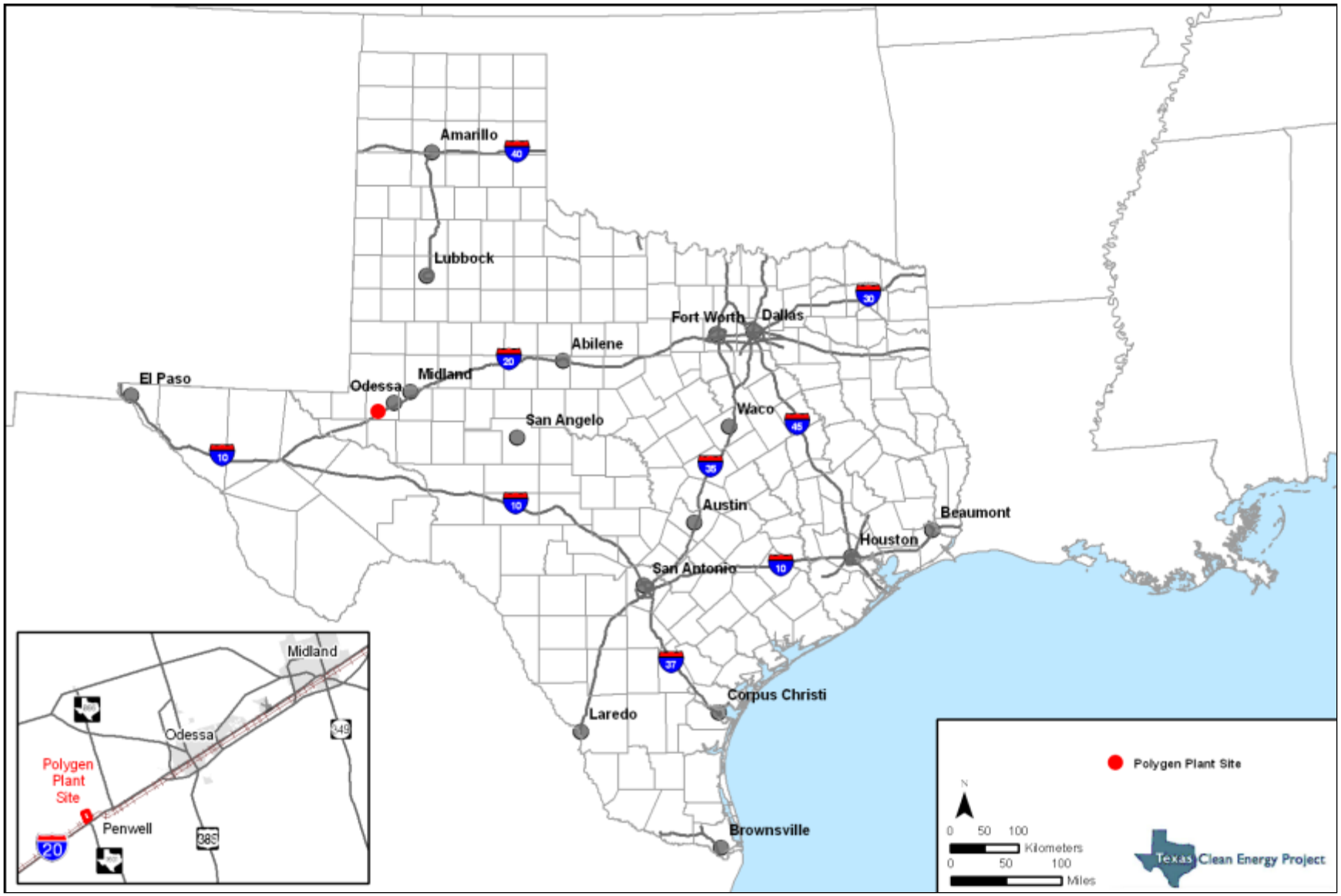

Figure 1.1. General location map.

1.2 Regulatory Drivers

The U.S. Department of Energy (DOE) has prepared this SA for the TCEP final EIS in accordance with NEPA regulations at Title 10 Code of Federal Regulations (C.F.R.) Part 1021.314(c). The Council on Environmental Quality (CEQ) NEPA regulations (40 C.F.R. 1502.9[c]) require the preparation of a supplement to an EIS if "(i) The agency makes substantial changes in the Proposed Action that are relevant to environmental concerns" or "(ii) There are significant new circumstances or information relevant to environmental concerns and bearing on the Proposed Action or its impacts." However, when it is unclear whether a supplemental EIS is required, DOE is directed to prepare an SA to help determine whether the change in the Proposed Action is "substantial" or whether the new circumstances or information are "significant," pursuant to the CEQ regulations (40 C.F.R. 1502.0[c]). The SA will enable DOE's National Energy Technology Laboratory (NETL) to determine whether the existing TCEP Final EIS remains adequate or if the existing EIS should be supplemented.

1.3 DOE's Purpose and Need

The purpose and need for the DOE-NETL action has not changed since issuance of the final EIS. DOE's purpose for its Proposed Action in the final EIS is to advance the Clean Coal Power Initiative (CCPI) Round 3 program by providing financial assistance to projects that have the best chance of achieving the program's objectives, which include the commercialization of clean coal technologies that advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies that are currently in service. Specifically, DOE's purpose and need for selecting TCEP for an award is to demonstrate the commercial-readiness of CO_2 capture and geologic sequestration (through enhanced oil recovery [EOR]), fully integrated with a polygen plant.

1.4 Summit's Purpose and Need

While the purpose and need for Summit's action also has not changed since issuance of the final EIS, the polygen plant design has been modified. Specifically, the polygen plant configuration has been altered to use one larger gasifier, instead of two smaller gasifiers, and to use a larger gas combustion turbine-generator. These changes increase the efficiency of the polygen plant, decrease its costs, and improve the project's return on investment. As a consequence, the plant's availability, resource requirements, by-products, emissions and waste streams change slightly.

Summit's purpose and need are discussed in greater depth in the final EIS. In general, Summit's purpose and need for the TCEP is to continue and expand its business strategy of developing low- and zero-carbon power projects. Specifically, the purpose of the TCEP is to add low CO_2 emissions base-load power to the nation's electricity generation mix, to provide supply stability to offset the irregular nature of West Texas wind generation, and to store captured CO_2 geologically, in this case by using it to boost production of oil wells in the Permian Basin.

The need for the TCEP is to fulfill the regional demand for CO_2 (for use in oil fields) and a firm (nonfluctuating) supply of electric power, including peaking capacity during summer months. There also is a National-level need for urea-based fertilizers. Granulated urea produced at the plant would support the farming industry and reduce annual imports of foreign-produced urea by approximately 10 percent. There are now two newly identified by-products, ammonium sulfate

($[NH_4]_2SO_4$) and liquefied nitrogen gas (liquid N_2), that have potential for local sales. Sales of ammonium sulfate would support the farming industry on an as-needed basis. Sales of the original by-products argon and sulfuric acid (H_2SO_4), along with the newly considered liquid nitrogen, would support various industries including, but not limited to, the oil and gas, food, auto, semiconductor, and welding industries. Sales of inert, nonleachable slag would support cement, concrete, and roofing tile manufacture, as well as road construction in the vicinity of Odessa.

1.5 Scope of the EIS: Original Plant Design, Options, Plans, and Impacts Considered

The EIS describes the proposed project that forms the basis for the impacts analysis. This information includes descriptions of the polygen plant, linear facility options, CO_2 capture and sequestration methods, resources required for the proposed project, by-products and wastes, plans for construction and operations, measures to reduce potential impacts, and post-operations activities. Specific process descriptions include the coal gasification, syngas processing, and CO_2 capture process; power generation process; and, fertilizer production. The EIS also describes the major process components and major equipment including the coal receiving, storage, and handling system; coal drying and grinding system; air separation unit; gasification island with two Siemens SFG-500 gasifiers; a black water treatment plant; the slag handling, storage, and loading system; water-gas shift unit; low-temperature gas cooling unit; mercury removal unit; acid gas removal process; sour water treatment system; H_2SO_4 plant; CO_2 compression and drying facility; liquid N_2 wash; ammonia synthesis unit; urea synthesis unit and handling; and, combined-cycle power block.

The EIS also addresses the disposal of the two types of waste water streams for the polygen plant: 1) reverse osmosis reject water (i.e., brine water) from the source water treatment system and 2) residual industrial waste water from the process water treatment system. The EIS addresses three on-site options that are under consideration for disposal of these streams, consisting of evaporation ponds, deep well injection, and a mechanical crystallizer and filter press system. The brine water from the source water treatment system would only be disposed of through the combination of evaporation ponds and deep well injection because of the larger volume of liquid. However, residual industrial waste water would be disposed of using either evaporation ponds alone or the mechanical crystallizer and filter press system followed by evaporation of any remaining non-recyclable liquids in a solar evaporation pond, with the solid filter cake being disposed of in an off-site landfill.

In the EIS, DOE considers impacts to the natural and human environment from construction and operation of Summit's proposed project, including the polygen plant on a 600-ac (243-ha) site and a total of 21 linear facility options. The linear facility options in the EIS consist of six process waterline alternatives, three natural gas pipeline alternatives, six transmission line alternatives, and four access road alternatives. The EIS considers only one railroad line and one CO_2 pipeline. The EIS provides an evaluation of the environmental consequences that may result from Summit's proposed project, including potential impacts on air quality and greenhouse gas (GHG) emissions; climate; soils, geology, and mineral resources; ground water resources; surface water resources; biological resources; aesthetics; cultural resources; land use; socioeconomics; environmental justice; community services; utility systems; transportation; materials and waste management; human health, safety, and accidents; and noise and vibration.

The EIS specifically addresses five primary and two backup water delivery (pipeline) options. Primary pipeline options include two pipeline options from the Gulf Coast Waste Disposal Authority

(Water Line [WL] WL1 and WL5), one from Occidental (Oxy) Permian (WL2), and two from Fort Stockton Holdings (WL3 and WL4). Three backup pipeline options evaluated in the EIS include one from Texland Great Plains Water Company (WL6) and two options from Fort Stockton Holdings (WL3 and WL4).

1.6 Summary of Changes and New Information

Since the final EIS was published, Summit changed the plant configuration to improve the financeability of the project by reducing plant costs and by increasing the efficiency of the polygen plant. The production and sale of newly identified by-products may also make the project more appealing to investors. Summit has reconfigured the plant to replace two Siemens SFG-500 entrained flow, oxygen-blown gasifiers with a single larger SFG-850 gasifier. There will be a corresponding change in combustion turbine-generator from an SGT6-5000F3 combustion turbine-generator to an SGT6-8000H combustion turbine-generator. While the gross generating output will remain approximately the same at 400 megawatts (MW), the reconfiguration will result in an increase in the electrical output to the grid from 130–213 MW to 140–262 MW on average. As a result of the reconfiguration, the following changes will occur to resource requirements, plant processes, and by-products: coal input will decrease; urea output will increase; overall syngas production will decrease and will be supplemented with natural gas; captured CO_2 will decrease; natural gas required for plant processes will remain approximately the same or slightly decrease; the by-product argon will have new information; the by-products slag and H_2SO_4 will decrease; two newly identified by-products, liquid N_2 and $(NH_4)_2SO_4$, will be added; and emissions from criteria pollutants and GHGs (e.g., CO_2) will decrease.

In addition, new pipeline options have emerged since the final EIS was published. Six new delivery options from three new primary water supply sources, and two new backup water supply sources, are evaluated for the TCEP in this SA. These water sources are as follows:

- Primary water supply options:
    - Capitan Reef Complex Aquifer ground water from Summit's proposed Massey Ranch well field (water lines WL7 and WL8)
    - Capitan Reef Complex Aquifer ground water from the City of Odessa's proposed Ward County well field (water lines WL9 and WL10)
    - Capitan Reef Complex Aquifer ground water from the City of Odessa's proposed Pecos County well field (water line WL11)
- Backup water supply options:
    - Pecos Valley Alluvium Aquifer ground water from the City of Midland's T-Bar Ranch well field, currently in production (water line WL12)
    - Pecos Valley Alluvium and Dockum Aquifer ground water from the Colorado River Municipal Water District's (CRMWD) well field, currently in production (water lines WL9 and WL10)

Figure 1.2 shows the polygen plant site and associated new linear facilities addressed in the SA (water lines WL7–WL10), in relation to all of the previously addressed linear facility options in the

EIS. These previously addressed linear facility options include the six original water pipeline options (water lines WL1–WL6), six transmission line options (transmission lines TL1–TL6), the CO_2 pipeline connector (CO_2), three natural gas pipeline options (natural gas pipelines NG1–NG3), four access roads (access roads AR1–AR4), and one rail spur (rail road RR1). Details regarding these previously addressed options are described in the final EIS.

Additional information has also been gathered from an exploratory well and nearby production wells to support planning for the TCEP's deep well injection option for brine disposal. Although Summit is still exploring the various options, an update on the plans and further consideration of potential impacts is now possible.

To investigate the potential for disposal of brine on site, Summit drilled and tested an on-site exploratory well. Summit's consultant also has gathered information about nearby oil and gas production wells. Although this has assisted Summit with assessing the on-site potential for deep well injection, no decisions have been reached in regard to the number and capacity of injection wells and evaporation ponds for brine disposal.

No other modifications, updates, or expansions have occurred, nor are anticipated to occur, for the plant site, natural gas pipelines, transmission lines, access roads, railroad line, or CO_2 pipeline since the final EIS was published.

1.7 Notice of Supplement Analysis and Comments

On February 24, 2015, DOE announced the availability of the Draft TCEP Supplement Analysis on the NETL website at http://www.netl.doe.gov/library/environmental-impact-statements and on the DOE website at http://energy.gov/nepa/downloads/eis-0444-sa-01-supplement-analysis. The Notice of Availability initiated a 30-day public comment period regarding the changes to the proposed project since the final EIS was published, the potential impacts associated with these changes, and possible project alternatives.

The public comment period ended on March 23, 2015. DOE received two responses from agencies who had commented on the draft and/or final TCEP EIS. The U.S. Department of the Interior provided a response of no comment on March 4, 2015 and the Texas Parks and Wildlife Department (TPWD) provided comments similar to those received during the EIS review process on March 27, 2015. These comment letters are provided in Appendix A.

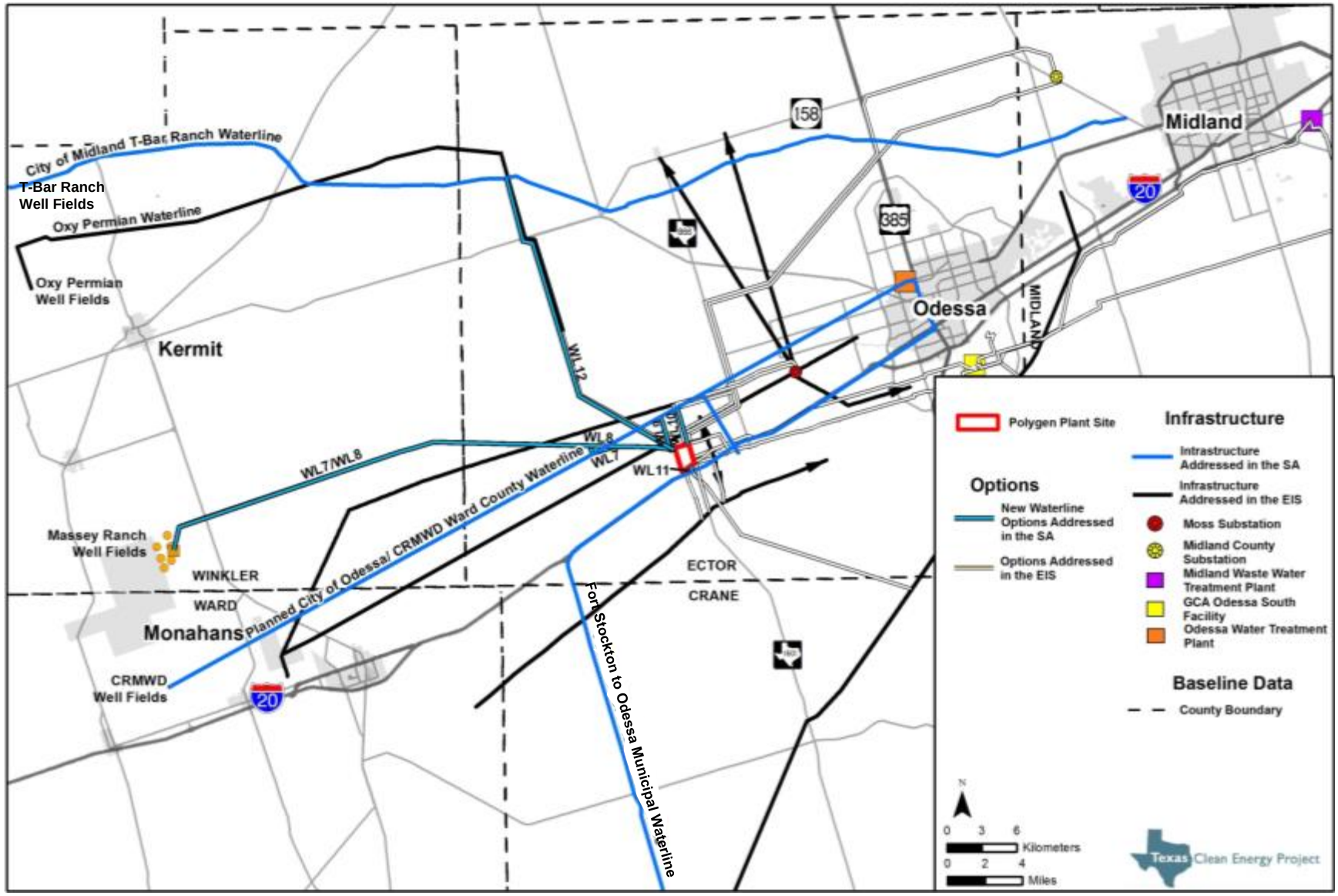

Figure 1.2. Polygen plant site and associated linear facilities addressed in the SA and EIS.

2 DESCRIPTION OF PROJECT CHANGES AND NEW INFORMATION

This chapter describes the changes to the polygen plant configuration, new process water supply sources and waterline options being considered, and the new studies associated with the deep well injection option for brine disposal.

2.1 Polygen Plant Reconfiguration

As stated in Section 1.4, since the EIS was published the polygen plant configuration has been altered to reduce the overall cost of the TCEP and to increase the efficiency of the polygen plant's processes. A summary of the overall component changes is presented below, followed by a detailed description of the components, resource requirements, and processes associated with this reconfiguration.

2.1.1 Overview of the Reconfiguration

The polygen plant reconfiguration includes replacing the two SFG-500 gasifiers identified in the EIS with one SFG-850 gasifier of the same design. The reconfiguration will also require a corresponding change in the combustion turbine-generator from an IGCC SGT6-5000F3 combustion turbine-generator to an IGCC SGT6-8000H combustion turbine-generator. The SFG-850 gasifier is larger in capacity and size (i.e., diameter) than the two SFG-500 gasifiers described in the EIS; however, it would produce less syngas than the original two SFG-500 gasifiers combined. To compensate for this decrease in syngas, natural gas would now supplement the syngas fuel that feeds the larger, more efficient SGT6-8000H combustion turbine-generator. The larger turbine eliminates the need for supplemental natural gas-fueled duct burners that were required in the original design to sustain the combined power generation at approximately 400 MW (gross). On average, this syngas/natural gas blend would allow the combustion-turbine-generator to send between 140 and 262 MW (net) to the grid. As with the original configuration, there is the potential for the combustion turbine-generator to operate at 100 percent power generation capacity using solely natural gas (no syngas, and thus no coal, would be required in this scenario). This scenario would likely occur less than 10 percent of the time, based on contract limits with power purchasers. Under the 100-percent natural gas scenario, there would be no opportunity for Summit to produce the other marketable products that result only from syngas production, such as urea, $(NH_4)_2SO_4$, liquid N_2, and CO_2, which further reduces this scenario's likelihood.

The revised process flow diagram for the TCEP is shown in Figure 2.1. In addition, the updated polygen plant layout is provided in Figure 2.2.

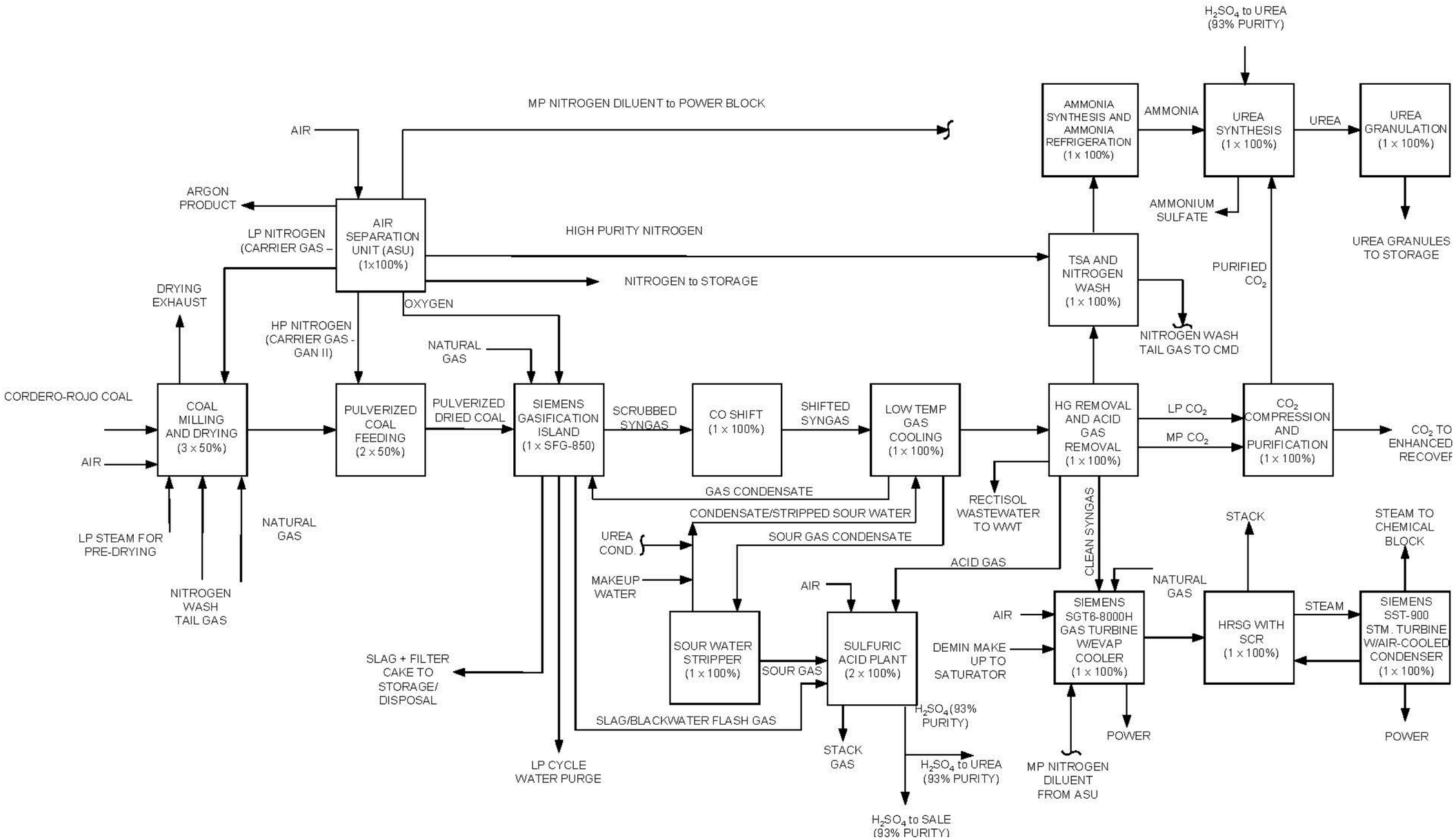

Figure 2.1. Revised TCEP process flow diagram.

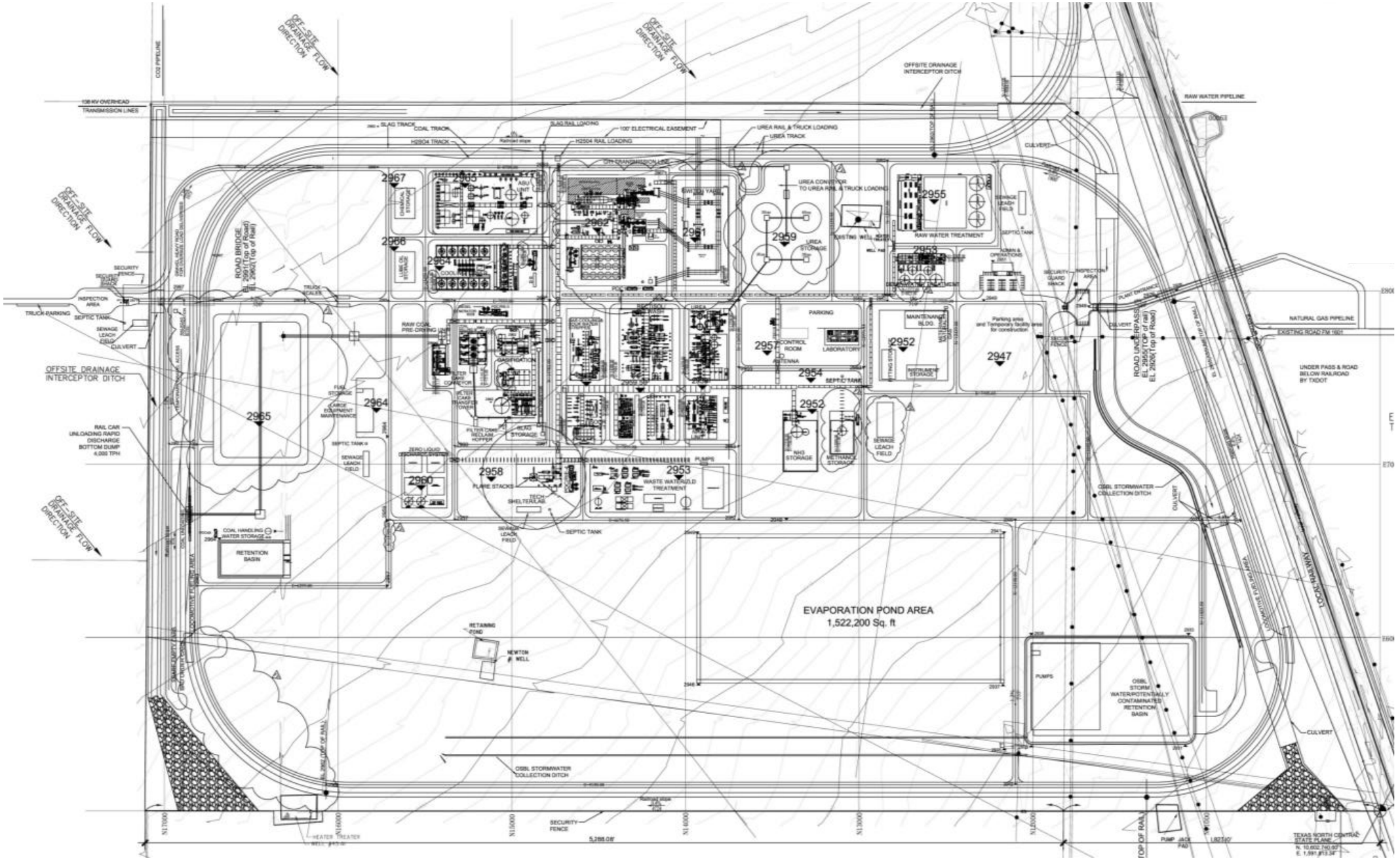

Figure 2.2. Revised polygen plant layout.

2.1.2 Coal Requirements

The polygen plant reconfiguration will require a reduction in coal feed from 5,800 tons (tn) (5,262 metric tons [t]) per day as stated in the EIS to 4,611 to 5,097 tn (4,183 to 4,624 t) per day. No significant changes to the transportation intervals (e.g., two 150-car trains per day and two to three 150-car trains per week) of coal to the polygen plant are expected as a result of the polygen plant reconfiguration. However, on an annual basis, there will likely be fewer 150-car trains overall as arrivals are expected to be less frequent in nature and less at the regular intervals anticipated in the EIS. In addition, no changes to the storage of coal are expected; storage will remain at 45 days of total capacity with approximately 9 days of active storage and 36 days of inactive storage.

2.1.3 Syngas Production

The polygen plant reconfiguration will have an overall lower amount of syngas production as a result of the new single SFG-850 gasifier having a lower capacity than the two SFG-500 gasifiers combined. The total amount syngas produced by the SFG-850 gasifier is distributed through two syngas streams: one to the ammonia/urea synthesis unit and the other to the power block. The amount of syngas required to operate the ammonia/urea synthesis unit will increase by approximately 18 percent from 1,077 million British Thermal Units (MMBtu) per hour under the old configuration to 1,273 MMBtu per hour to achieve higher ammonia/urea production (see Section 2.1.4). This increase to the ammonia/urea synthesis unit, combined with the decreased gasifier capacity, allows for an even smaller amount of syngas available to the power block. Syngas available to the power block will decrease between 10 and 43 percent from 1,718 MMBtu per hour as identified in the EIS to 1,205 to 1,559 MMBtu per hour. This decrease, however, will be supplemented with natural gas to maintain approximately the same amount of gross power generation output (see Section 2.1.6).

2.1.4 Urea Production

Urea production will be increased due to the additional amount of clean syngas now being sent to the ammonia/urea synthesis unit (see Section 2.1.3). Typical urea production will be between 2,532 to 2,600 tons (2,297 to 2,359 t) per day as compared to 1,485 to 2,079 tn (1,347 to 1,886 t) per day as stated in the EIS. No significant changes to the transportation of urea from the polygen plant are expected as a result of the new polygen plant reconfiguration.

2.1.5 Carbon Dioxide Capture and Markets

The polygen plant reconfiguration will result in a decrease in CO_2 captured. This occurs because of the overall lower syngas production. Approximately 7,760 to 8,577 tn (7,040 to 7,781 t) per day of total CO_2 is expected to be captured, as compared to 8,219 tn (7,456 t) per day as stated in the EIS. On an annual basis, the amount of captured CO_2 would decrease from 3 million tn (1.8 million t) per year, as stated in the EIS, to 2.4 to 2.6 million tn (2.2 to 2.4 million t) per year. The EIS identified the amount of CO_2 required for urea production as 600 to 1,512 tn (544 to 1,372 t) per day, whereas the polygen plant reconfiguration would require 1,726 to 1,908 tn (1,566 to 1,731 t) per day. As a result, the polygen plant reconfiguration would send 6,034 to 6,670 tn (5,474 to 6,051 t) per day of CO_2 to the EOR industry as compared to 8,633 to 9,100 tn (7,832 to 8,255 t) per day in the EIS.

2.1.6 Natural Gas Requirements

As a result of the polygen plant reconfiguration, the natural gas required for coal drying, and gasifier and flare pilots will be reduced or at the same levels as what was identified in the EIS. The polygen plant reconfiguration will now use the low pressure steam for pre-drying, then natural gas and tail gas for subsequent drying, thereby reducing the amount of natural gas compared to the original configuration, even with the use of natural gas to supplement syngas in the power block (see Section 2.1.3). The polygen plant would typically require between 1,012 to 1,111 MMBtu per hour of natural gas, but has the potential to require 1,998 MMBtu per hour (or 17.5 trillion Btu per year), which is the same or less than was identified in the EIS.

2.1.7 Power Generation

Electricity output will be increased as a result of the polygen plant reconfiguration. The TCEP will replace the SGT6-5000F3 combustion turbine-generator with an SGT6-8000H combustion turbine-generator. The combustion turbine capacity would increase between 30 and 43 percent from 230 MW as identified in the EIS to a range of 298 to 330 MW. The combined-cycle output would range from 377 to 440 MW, though on average would be comparable to the 400 MW identified in the EIS. Net output to the power grid would range from 140 to 262 MW when operating on the expected average syngas/natural gas blend at 83.7 percent capacity or from 398 to 440 MW when using 100 percent natural gas. These operating capacities are an increase from the 130 to 213 MW net output estimated in the EIS.

Due to the larger combustion turbine-generator, there could be a minor increase in the diameter of the gasifier unit (likely no greater than 20 percent). There will be no decrease in the emissions stack height or diameter. As a result, the polygen plant layout has been altered slightly (see Figure 2.2).

2.1.8 Marketable By-products

Several changes in the quantities and constitution of by-products associated with the polygen plant reconfiguration would also occur. Under the original configuration, the EIS reported slag production at 489 tn (444 t) per day, whereas under the polygen plant reconfiguration, slag production is expected to be 640 to 708 tn (581 to 642 t) per day. The original number in the EIS appears to be erroneous. Due to a decrease in coal consumption, there will actually be a corresponding decrease in slag production. H_2SO_4 production will also decrease from 56 tn (51 t) per day as stated in the EIS to 48 to 52 tn (44 to 47 t) per day, due to the reduced amount of coal required and potentially from the production of ammonium sulfate, $(NH_4)_2SO_4$. Argon was identified in the EIS as a by-product, but no quantity was estimated at that time. With the polygen plant reconfiguration, argon would be produced at a nominal rate of 81 to 89 tn (73 to 81 t) per day, based on the expected size of the air separation unit required to supply oxygen to the SFG-850 gasifier. No changes to the transportation (e.g., rail cars per day, trucks per week, storage days) of H_2SO_4, or argon from the polygen plant have been reported by Summit.

Liquid N_2 production has been identified as a new marketable product. Approximately 66 to 69 tn (60 to 63 t) per day of liquid N_2 is expected to be produced. $(NH_4)_2SO_4$ would be another newly identified by-product with a 25 to 28 tn (23 to 25 t) per day generation based upon H_2SO_4 production. These newly identified by-products are expected to be either trucked or transported via rail on a regular basis to local markets when sales can be made. Summit has not reported which type of transportation would be used, though it can be estimated that two to three trucks per day

would be required for liquid N_2 transport, and approximately one truck per day would be required for $(NH_4)_2SO_4$, based on an average semi-truckload capacity of 26 tons per truck.

2.1.9 Air Emissions

The reconfiguration of the polygen plant is expected to reduce pollutant and CO_2 emissions, although the exact quantities of the criteria pollutants and GHG emissions remain to be determined. Summit estimates the final information will not be available until February 2015; however, the point source emissions are not expected to be higher than those provided in the EIS. Total emissions per year are not expected to exceed air permit limits due to the reduced coal consumption and the lower capacity factor. Fugitive emissions from the gasifier and other emitters are expected to be even less than described in the EIS. Point source emissions from the SGT6-8000H combustion turbine-generator will be somewhat close to the prior Siemens SGT6-5000F3 model, as the plant reconfiguration plans to maintain a selective catalytic reduction (SCR) and carbon monoxide (CO) catalyst. The TCEP will be reconfigured to ensure total emissions from the SGT6-8000H will not exceed the air permit limits.

2.2 Process Water

Since the EIS was published, Summit has determined that plant processes will require an average volume of 4.2 million gallons (gal) (15.9 million liters [L]) per day and a maximum volume of 4.5 million gal (17.0 million L) per day of clean process water. Summit may have to acquire up to 7.0 million gal (26.5 million L) per day, on average, of raw source water during peak demand to meet the process water needs of the polygen plant. If less saline raw source water is available, then the demand for source water would be reduced.

In addition to the process water options originally described in the EIS, source water for the plant could be supplied by a waterline originating from one of the three new primary water sources as described in Section 1.6 and below. Furthermore, two new backup water source options are being considered, which could provide water to the TCEP when the primary water supply is not available. The locations of the water sources and waterline options for the TCEP are shown in Figure 2.3. For purposes of this analysis all water delivery (pipeline) options require a 50-foot permanent right of way and a 150-foot temporary right of way for construction.

2.2.1 Primary Water Supply

2.2.1.1 MASSEY RANCH WATER SUPPLY

Summit has contracted with a private entity (Massey Ranch) to provide rights to capture, withdraw, produce, treat, and transport brackish (moderately saline and nonpotable) ground water from the Capitan Reef Complex Aquifer on the Massey Ranch in Winkler County. The Massey Ranch is located near the former Chevron USA O'Brien Water System, a well-known, high-production well field for the brackish Capitan Reef Complex Aquifer spanning Ward and Winkler Counties. Six new production wells and a pump station are planned for this water supply option to produce the approximately 7 million gal (26.5 million L) per day of raw water required by the TCEP.

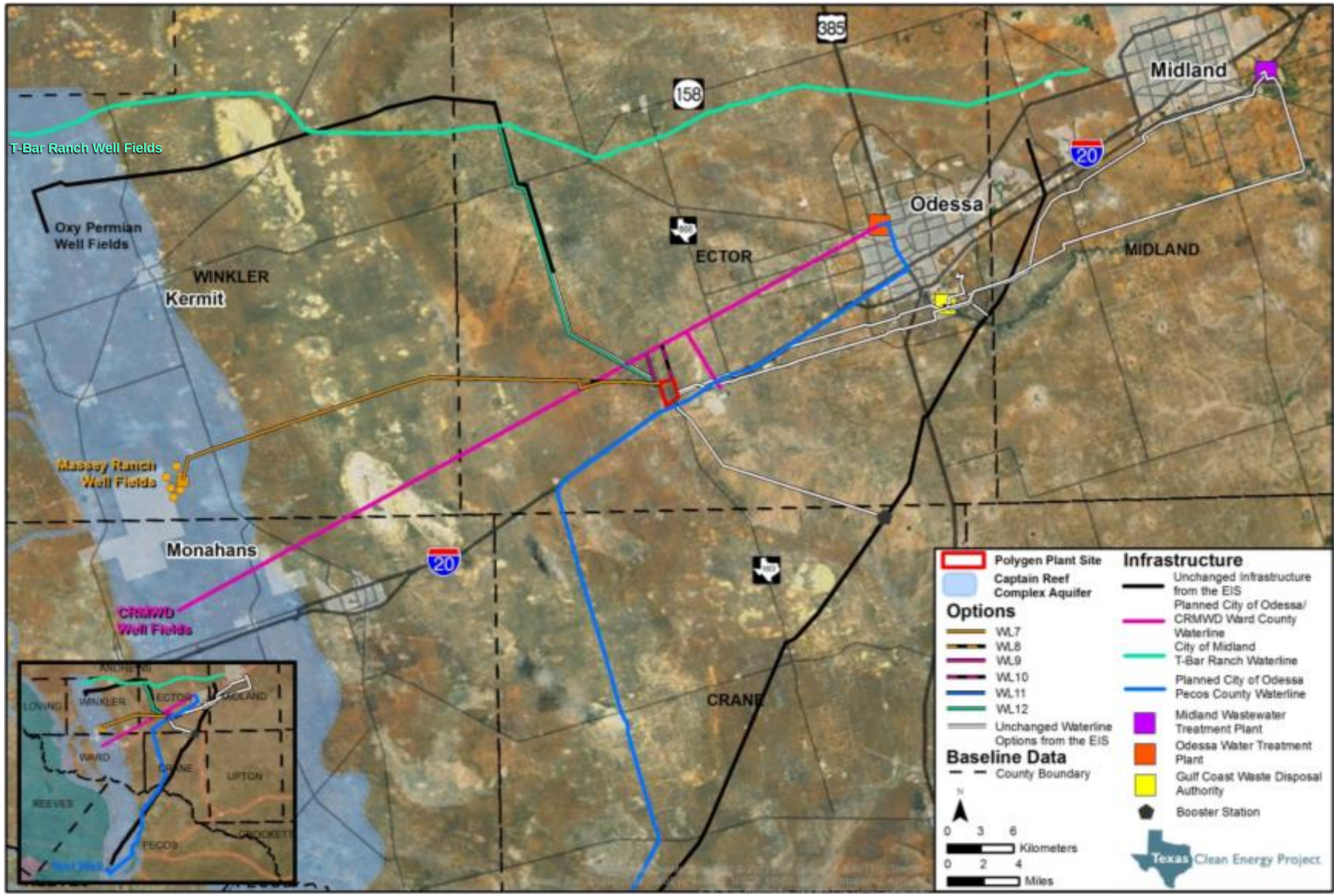

Figure 2.3. Proposed routes for the new process water pipeline options (WL7–WL12).

There are two waterline options (WL 7 and WL8) that could provide source water to the TCEP from the Massey Ranch well field through a new maximum 36-inch-(in)-diameter (91-centimeter-(cm)-diameter) pipeline (see Figure 2.3). WL7 would span approximately 28.8 mi (46.3-km) in length, and WL8 would span approximately 28.5 mi (45.9 km) in length. The route for WL8 is essentially the same as WL7 with the exception of a 0.3-mi (0.4-km) shortcut that would allow for a shorter, more efficient pipeline if land access is granted. In addition to existing right-of-way (ROW), approximately 13.0 mi (20.1 km) and 13.3 mi (21.4 km) of new ROW would be required for WL7 and WL8, respectively.

The Massey Ranch well field has been determined to have sufficient supply to meet the TCEP water demand (ARCADIS 2012). Because this waterline would be built solely for TCEP use, it is expected the TCEP would be the only user of this well field and pipeline. A 1.0-ac (0.40-km) area surrounding each of six well head locations was assumed in this analysis to be disturbed, totaling 6.98 ac (2.82 ha). The footprint of the Massey Ranch well field will be evaluated in this SA in addition to the waterline options.

Source water from Massey Ranch would require treatment to meet gasifier manufacturer specifications, similar to the Oxy-Permian waterline option (WL2) as described in the EIS. In particular, the source water from this portion of the Capitan Reef Complex Aquifer has been documented to contain an increased concentration of hydrogen sulfide (H_2S) (ARCADIS 2012), which would require the use of an H_2S treatment plant at the polygen plant site. No desalination would occur at the Massey Ranch well field.

A preliminary study of various H_2S treatment alternatives was conducted for Summit, in which a peroxide oxidation process with a headspace chemical scrubber or an air stripper followed by the LOCAT® process for offgas treatment were preliminarily recommended for H_2S treatment (CH2M Hill 2012). The LOCAT® process is a liquid phase oxidation process based on a dilute solution of organically chelated iron in water than converts H_2S to water and elemental sulfur. Summit would need to measure the actual concentrations of raw water constituents to determine the need for and type of treatment processes that would be necessary at the polygen plant if this water supply option is chosen. The fate of H_2S and its constituent components after treatment would also depend on the type of treatment process chosen, though Summit would ensure no amendment to their air permit would be required. Likely elemental sulfur or sulfate would be produced from the recommended preliminary treatment processes, which would be precipitated out and/or disposed of in an appropriate manner that has yet to be determined.

2.2.1.2 CITY OF ODESSA'S WARD COUNTY WATER SUPPLY ALTERNATIVE

Currently in the conceptual stages, the City of Odessa's Ward County water supply project has been proposed to provide drinking water to the City of Odessa. The City of Odessa could provide water to the TCEP via one of two potential connector pipelines (WL9 and WL10). The City of Odessa would use the same 42-mi (68-km) pipeline corridor and well field location as the proposed CRMWD water supply project, which is a separate project that will pump water to the City of Odessa (and other customers) from the Pecos Valley Alluvium and Dockum Aquifers beneath the North Ward County Well Field (see Section 2.1.2.1 below for details on the CRMWD water supply project), located 9 mi west of the town of Monahans and approximately 30 mi (48.3 km) southwest of the proposed TCEP.

The water source for the City of Odessa's Ward County option would be the brackish Capitan Reef Complex Aquifer located below the two CRMWD source aquifers. The City of Odessa's Ward County

option is planned to transport a minimum of 10 million gal (38 million L) per day and up to a maximum of 50 million gal (189 million L) per day. The City would build a desalination and treatment plant at the well field, with expectations to treat between 10 and 50 million gal (38 and 189 million L) per day on an annual basis. This treatment plant would meet the TCEP's specifications for water supply, which would likely reduce the amount of water required by the project to 4.5 million gal (17.0 million L) per day.

If the City selects this alternative, the TCEP could use 9 percent of this system's maximum capacity and up to 45 percent of the supply when this system is operating at minimum capacity. To serve the TCEP, Summit would construct a 2.1-mi (3.4-km), maximum 36-in-diameter (91-cm-diameter) connector pipeline (WL 9) from the northwest corner of the polygen plant site to the City of Odessa's Ward County waterline. All of Summit's connector pipeline would require new ROW. Alternatively, Summit could construct along a separate route, using a 2.0-mi (3.2-km), maximum 36-in-diameter (91-cm-diameter) connector pipeline (WL 10) from the northeast corner of the polygen plant site to the City of Odessa's Ward County waterline, all of which would also require new ROW. Only the connector pipeline options, WL 9 and WL 10, are being evaluated in this SA as the potential impacts to the natural and human environment from the construction and operation of the Ward County water supply option are being evaluated by a third party separate from this SA and are not subject to DOE control.

The viability of the City of Odessa's Ward County water supply project could be dependent on the sale of water to the TCEP as a means to finance the City's water project for municipal use. Thus, the TCEP's use of water from this system could have positive impacts on the financing of the city's proposed new water supply system as it would enable the project to proceed with less delay and costs to its municipal users. Conversely, delays and higher costs could occur to its municipal users if Summit chooses a different option.

In March 2012, the City of Odessa issued a request for proposals (RFP) for development of the water resource and delivery of water and interviewed multiple proposers in September 2012. Through several iterations of the RFP process continuing through the end of 2012, the City chose Texas Aqua Partners (TAP) as the water resource development and delivery consortium. However, further actions were postponed until the City could determine whether this alternative or the Pecos County water supply alternative (discussed below in Section 2.1.1.3) best suited the City's needs. Due to land acquisition and cost-sharing issues with the Pecos County water supply alternative, the City determined in November 2013 that using source water from Ward County, either through the stand-alone plan with TAP or in conjunction with CRMWD's larger-scale project (discussed below in Section 2.1.2.1), would provide a better match for the City's water supply needs. The City has entered into a Memorandum of Understanding (MOU) with TAP, which is expected to finalize their cost estimates in early 2014. From then, the City will determine how best to proceed, either with this Ward County water supply alternative or with CRMWD's larger-scale project. Both approaches include plans for supplying water to TCEP.

2.2.1.3 CITY OF ODESSA'S PECOS COUNTY WATER SUPPLY ALTERNATIVE

Also in the conceptual stages, the City of Odessa's Pecos County water supply project is a second water supply alternative for providing a significant drinking water source to the City of Odessa. Under this alternative, the City of Odessa would provide water to the TCEP through a waterline connector (WL11) that would tie into the proposed 93-mi (149.6-km) City of Odessa's Pecos County main line transporting ground water to Odessa from Pecos County. The City of Odessa's Pecos County waterline is planned to transport a minimum of 10 million gal (38 million L) per day and up

to a maximum of 50 million gal (189 million L) per day of treated water that would meet TCEP's specifications. TCEP's maximum requirement of up to 7.0 million gal (26.5 million L) per day of raw source water would likely be reduced to 4.5 million gal (17. million L) because the water would be treated prior to delivery at the polygen plant site. Therefore, if selected the TCEP could use 9 percent of this system's maximum capacity and up to 45 percent of the supply when this system is operating at minimum capacity. To serve the TCEP, Summit would construct a 0.3-mi (0.5-km), maximum 36-in-diameter (91-cm-diameter) connector pipeline (WL 11) along FM 1601 at the southern corner of the polygen plant site. This connector pipeline would connect to Odessa's proposed Pecos County waterline within the existing ROW of I-20.

As with the Ward County water supply option, the viability of the City of Odessa's Pecos County water supply project could be dependent on the sale of water to the TCEP as a means to finance the City's water project. Thus, the TCEP's use of water from this system could have positive impacts on the City's proposed new water supply system as it would enable the project to proceed with less delay or costs to its municipal users. In addition, the City of Fort Stockton would also benefit from selling its water treatment capacity to Odessa, which would allow Fort Stockton to fund various utility improvement projects. The City of Fort Stockton would provide desalination for a fee. Conversely, delays and higher costs could occur for municipal users if a different option is chosen.

The water source would be the Belding Area portion of the Capitan Reef Complex Aquifer located approximately 70.0 mi (112.7 km) south of the proposed TCEP. Ground water from the Capitan Reef Complex Aquifer in the Belding Area would require treatment to meet TCEP specifications prior to entering the connector pipeline to the TCEP site, though the level of treatment and possibly even quantity of source water required by TCEP could likely be reduced due to the better water quality of this alternative. The source water is planned to be conveyed from the proposed well field located approximately 11 miles southwest of the City of Fort Stockton in Belding to Fort Stockton's water treatment plant for desalination prior to its transfer along existing ROWs to the City of Odessa. The existing City of Fort Stockton water treatment plant is a reverse osmosis (RO) plant that currently is designed with a maximum daily capacity of 7.0 million gal (26.5 million L) per day with a 7.5 million gal (28.4 million L) storage capacity (City of Fort Stockton 2013). Peak consumption in 2013 was 4.5 million gal (17.0 million L) per day (City of Fort Stockton 2013). The treatment plant sends its RO reject water to its waste water treatment facility to be diluted and reused for irrigation purposes (Dominguez 2014). Eventually, if the well field expanded to exceed the capacity either of the Fort Stockton RO plant or the waste water treatment facility, it is possible that either the existing plant(s) would require expansion or a new desalination plant would be built at the well field. It is uncertain at this time where the city of Fort Stockton would dispose of the RO reject water if a new plant would be required. Nor is it certain whether the city of Fort Stockton or Odessa would pay for this future expansion plant, if this alternative is chosen (Water Quest, Inc. 2013b).

The City of Odessa began negotiations for an interlocal agreement with Fort Stockton in the fall of 2012 to jointly approach this project, which would meet Odessa's water supply needs while providing an alternative source of revenue for Fort Stockton. To obtain a production well permit through the Middle Pecos Groundwater Conservation District (MPGCD), an applicant must have data from at least two wells, one of which should be an observation well, in order to conduct an aquifer test (MPGCD 2010). An aquifer test provides an estimate of parameters of the aquifer over a large area. Therefore, the City of Odessa agreed to initially fund a test well to determine the viability of the project. If results of the test well indicated long-term project viability, a larger and more expensive well would be drilled and subjected to longer-term pump testing (Water Quest, Inc.

2013b). This second well would allow for aquifer testing and completion of a permit application to the MPGCD.

If the aquifer testing continued to indicate long-term project viability, well field development would occur in stages over time, beginning with the minimum required 10 million gal (38 million L) per day well field (Water Quest, Inc. 2013b). This staged approach would provide opportunity to identify impacts occurring from each stage and provide an opportunity to change the plans or to cease further development if necessary. The City of Fort Stockton currently owns 1.5 to 2 sections in the area where the test well occurs with capacity for four wells per section. Complete field development would require additional lands to the southwest, with the expectation that expansion would occur on acquired lands sold by private landowners.

The test well was constructed from April to June 2013, with initial testing and analysis completed in July 2013, and additional testing completed by November 2013. A Draft Testing and Analysis Report was submitted by Water Quest, Inc. to the cities of Odessa and Fort Stockton in August 2013 (Water Quest, Inc. 2013a). The analysis included the results of the initial 72-hour pumping test with a 24-hour recovery and three water quality grab-samples. Initial test results indicated that water quality is generally favorable, only exceeding the TCEQ drinking water standards for total dissolved solids (TDS), sulfate, and iron (Water Quest, Inc. 2013a). Regional studies suggest an overall lower salinity in this area (2,000 parts per million [ppm]) (George et al. 2011); however, the field estimates for TDS at the test well were even lower, with TDS ranging from 1,040 to 1,050 ppm (Water Quest, Inc. 2013a). While the quality of this groundwater is worse than drinking water standards allow, it would require substantially less treatment, brine disposal, and possibly even a lesser source water quantity required for the TCEP than the other water supply options.

In addition, initial results indicated that the test well was efficient, pumping at a constant rate of 0.46 million gal [1.74 million L] per day (Water Quest, Inc. 2013a). Preliminary information does suggest favorable conditions for development of an ultimate maximum capacity of a 50 million gal (189 million L) per day well field, though production wells would likely need acid stimulation to promote adequate long-term production yields (Water Quest, Inc. 2013b). The actual yield of the proposed well field, maximum drawdown of the water levels, depth at which the Capitan Reef must be tapped, and transmissivity during periods of production-level pumping cannot be estimated based on the preliminary data (Water Quest, Inc. 2013b). These factors cannot be quantified or determined in advance of putting wells into production.

Results also indicated that the test well experienced interference from and is hydraulically connected to the Belding Farms well, an irrigation well that is located approximately 2 miles away from the test well (Water Quest, Inc. 2013a). The Belding Farms irrigation well is the only other well that pulls water from the Capitan Reef Complex Aquifer in that region. While the Belding Farms irrigation well could have been used as the second observation well to conduct aquifer testing and complete the permit application, it could not be considered due to faulty well casing (Water Quest, Inc. 2013b).

The project's exploration phase stalled in November 2013 after cost-sharing negotiations could not be resolved. In addition, there was some concern over the acquisition of private lands needed for expansion of the well field. While this alternative for the City of Odessa is still in consideration because the desalination costs would be less as a result of the lower TDS values and because the well field could also tap the Edwards-Trinity Aquifer in the future as a back-up, this alternative for the City of Odessa and for TCEP is not currently as viable as other options.

2.2.2 Backup Water Supply

Because each of the new primary process water supply options are in the early stages of development and may not be ready to supply water when the TCEP is ready to operate, Summit is also considering a number of temporary, backup water supply options. These options would supply water to the TCEP in the event that the chosen primary water supply is not yet in production when TCEP becomes operational, as well as when the primary water supply is out-of-service for maintenance or operating at reduced capacity. Backup water supply options under consideration are described below.

2.2.2.1 CRMWD'S PECOS VALLEY ALLUVIUM AQUIFER WATER SUPPLY

Under this option, CRMWD would provide a temporary backup water supply to the TCEP by way of one of two potential connector pipelines that would use the same footprint as WL9 and WL10 (first discussed above in Section 2.1.1.2). Either WL9 or WL10 would connect to CRMWD's existing 42-mi (68-km) water main line from their recently expanded North Ward County Well Field located approximately 30.0 mi (48.3 km) southwest of the proposed TCEP. The CRMWD water supply project was completed in May 2013 and includes 21 new wells in the North Ward County Well Field and four new pump stations. Water for the CRMWD water supply project originates from the Pecos Valley Alluvium and Dockum Aquifers. CRMWD is using this system solely as an emergency source of water to back up their surface supply.

WL9 would require construction of a 2.1-mi (3.4-km), maximum 36-in-diameter (91-cm-diameter) connector pipeline from the northwest corner of the polygen plant site to the CRMWD pipeline, all of which would require new ROW. WL10 would require construction of a 2.0-mi (3.2-km), maximum 36-in-diameter (91-cm-diameter) connector pipeline from the northeast corner of the polygen plant site to the CRMWD pipeline, all of which would require new ROW. Source water from the CRMWD water supply project would require treatment at the polygen plant site to meet TCEP's specifications.

The viability of the CRMWD water supply project is entirely independent of the TCEP. The CRMWD currently provides raw water from three reservoir lakes and five well fields to the Cities of Odessa, Midland, Big Spring, and certain other municipal and non-municipal customers. The new CRMWD water supply project increases potential existing delivery capacity of 28 million gal (106.0 million L) per day (CRMWD 2012) by 30 million gal (113.6 million L) per day, totaling 58 million gal (219.6 million L) per day of raw water to its existing customers. CRMWD has sufficient excess supply to meet the TCEP water demand on a temporary basis. If chosen as the backup water supply option, the TCEP could temporarily use 23 percent of the new water supply that would be available through this waterline.

CRMWD issued an RFP in July 2013 for additional water supply to assist the City of Odessa with its anticipated water demands. CRMWD is currently reviewing the submitted proposals and will reconvene in early 2014 with the City of Odessa to determine how best to proceed. The City of Odessa could select either the Ward County water supply alternative (discussed above in Section 2.1.1.2) or CRMWD's larger-scale project, which would allow Odessa to tap into CRMWD's line and allow TCEP to purchase water as an interim solution and long-term back-up plan.

2.2.2.2 CITY OF MIDLAND'S T-BAR RANCH WATER SUPPLY

Under this option, The City of Midland would make available to the TCEP a temporary backup water supply from Midland's existing 76-mi (122-km) main line, which spans from Winkler County to Midland County. Summit would construct a connector pipeline (WL12) to convey water from the T-Bar Ranch main line to the TCEP. WL12 would require construction of an 18.4-mi (29.6-km), maximum 36-in-diameter (91-cm-diameter) connector pipeline going north from the northwest corner of the plant site and then along the corridor for an existing Oxy-Permian waterline. Approximately 8.7 mi (14.0 km) of new ROW would be required. Source water from the City of Midland's T-Bar Ranch would require treatment at the polygen plant site to meet gasifier manufacturer specifications for the TCEP.

The viability of the City of Midland's T-Bar Ranch water supply project is entirely independent of the TCEP. This project began operations in December 2013. The City of Midland plans to initially pump 10 million gal (37.8 million L) per day from 21 wells tapping the Pecos Valley Alluvium Aquifer, spanning the 22,000-ac (8,903-ha) T-Bar Ranch, with a forecast increase up to 38 million gal (143.8 million L) per day at the time when its contract expires in 2029. If chosen as the backup water supply option, the TCEP could temporarily use 70 percent (during minimum capacity) of the total water that would be initially available through this pipeline.

Since operation began in December 2013, the quality of the water supply has slowly started to decline. Increased levels of arsenic have been identified in the source water. The City of Midland has purchased additional water rights to the south of their current well field and is working with the Midland County Fresh Water Supply District Number 1 to design a well that would tap into the Capitan Reef Complex Aquifer at this location. The city plans to desalinate the Capitan Reef Complex water on site and blend it with their current supply from the Pecos Valley Alluvium to reduce arsenic levels prior to transport to Midland.

2.3 Exploratory Well and Brine Disposal Options

Summit plans to use process water from either treated brackish ground water from an off-site source or treated waste water effluent from the City of Midland in the operation of its polygen plant processes. The process water would be treated on site using reverse osmosis (RO) technology, and a significant amount of brine concentrate could be produced as a by-product of this treatment process, depending on which water supply Summit selects.

Changes to the estimates of brine disposal have been made since the final EIS was published. The EIS discloses that a minimum of 0.76 million gal (2.88 million L) per day of reject water would require disposal if source water from the Gulf Coast Water Authority (WL1 or WL5) is selected, whereas a maximum of 1.43 million gal (5.41 million L) per day would require disposal if source water from Oxy-Permian (WL2) is selected. Based on a review of the new waterline options, Summit now anticipates a maximum of 2.5 million gal (9.5 million L) per day could require disposal if source water from either Oxy-Permian (WL2), Massey Ranch (WL7–WL8), the City of Odessa's Ward County water supply alternative (WL9 or WL10), or either of the new back-up water supply options is selected, with the expectation that the City of Odessa's Pecos County water supply alternative (WL11) would generate less brine due to its lower salinity. These quantities remain estimated and may change based on actual water quality of the chosen option.

As stated in the EIS, three on-site options for disposal of the brine reject water are being evaluated for feasibility: deep well injection, evaporation ponds, and a mechanical crystallizer and filter press

system. As part of the evaluation of the deep well injection option, Summit submitted an application to drill a test well to the Texas Commission on Environmental Quality (TCEQ) in May 2011, and received a final approval letter for the well from TCEQ on September 23, 2011.

Summit's subcontractor, Subsurface Technology, Inc. (Subsurface), began work on the test well in December 2011, and continued into January 2012 (Subsurface 2012). The test well was sited approximately 4,500 feet (ft) (1,372 meters [m]) north of the UPRR rail line that runs east–west along the southern boundary of the polygen plant site (Subsurface 2012). The well was drilled to characterize the following three Permian-age subsurface formations and determine their viability as long-term injection zones:

- Queen Formation (3,000–3,500 ft [914–1,067 m])
- Clear Fork Formation (5,000–6,200 ft [1,524–1,890 m])
- Wichita Formation (6,200–7,300 ft [1,890–2,225 m])

The test well was initially drilled below a conductor casing to 1,500 ft [457 m] at 12.3 in diameter (31.1 cm diameter), then a 9.6-in-diameter (24.4-cm-diameter) casing was installed, and the annulus (the area between the borehole and the casing) was cemented. The casing was then pressure-tested to 1,000 pounds per square inch (psi). Next, the borehole was drilled to a total depth of 7,350 ft [2,240 m] at 8.8 in diameter (22.4 cm diameter), and a 5.5-inch-diameter (14.0-cm-diameter) casing was installed to depth and cemented. Pressure, temperature, and other measurements were made to investigate well integrity. All depths were measured relative to the Kelly bushing, which was situated 13 ft (4 m) above ground surface (Subsurface 2012). It should be noted that the base of the lowermost Underground Source of Drinking Water (USDW) has previously been identified at 1,020 ft [311 m].

Injectivity testing began in the lowermost Wichita Formation, followed by the Clear Fork Formation and finally the shallower Queen Formation. The injectivity testing in the Wichita Formation resulted in an estimated maximum injection rate of approximately 0.12 million gal (0.45 million L) per day per well, which means that a minimum of 24 injection wells perforated in the Wichita Formation would be required to dispose of an estimated target volume of 2.88 million gal (10.9 million L) per day. However, as subsequently noted by Summit and Weegar-Eide & Associates, LLC (Weegar-Eide), in their calculations Subsurface did not account for pressure interference between wells, which may substantially decrease injection rates. In addition, Subsurface did not allow for the need for backup well capacity to handle disposal requirements when a subset of the wells would be unavailable due to routine testing/maintenance or longer-term issues such as well mechanical problems.

Injectivity testing in the Clear Fork Formation indicated a much lower estimated maximum injection capacity of approximately 0.03 million gal (0.11 million L) per day per well, and results for the Queen Formation were inconclusive because well casing cement had invaded the formation around the well preventing injection (Subsurface 2012). As identified by Weegar-Eide, the Queen Formation includes active hydrocarbon producing areas close to the polygen plant site and, therefore, "the Queen Formation likely presents too many issues regarding oil/gas well penetrations and possible local impacts to oil/gas production to be considered a viable injection candidate" (Weegar-Eide 2012). Summit also concurs that the Queen Formation should not have been considered as a candidate for deep well injection due to producing wells nearby, among other factors.

Weegar-Eide also noted that injection testing of the Subsurface test well only included perforations in a portion of the Wichita Formation (approximately 5,946–6,000 ft [1,812–1,829 m]) and that additional perforations through the casing of the well and retesting at greater depths within the Wichita Formation may provide greater injectivity (Weegar-Eide 2012). Additional perforations may be supplemented by acid treatments and/or hydraulic fracturing (hydro-fracking) to increase injection volumes (Weegar-Eide 2012).

Weegar-Eide has proposed the consideration of drilling a new deep test well or recompletion of the existing test well to a significantly greater depth (i.e., to the Ellenburger Group beginning at approximately 12,000 ft [3,658 m]) (Weegar-Eide 2012). Previous studies and drillings to that depth have demonstrated somewhat more favorable porosity and permeability than that available in other, shallower layers (Weegar-Eide 2012). Weegar-Eide stated that the average porosity of the Ellenburger Group at a depth of 12,500 ft (3,810 m) is approximately 4 percent, with a range between 2 and 6 percent, and the average rock permeability is approximately 20 millidarcys (md), with a range between 1 to 100 md (Weegar-Eide 2012). The average porosity for the karst-modified Ellenburger Group reservoir is similar at 3 percent; however, the average permeability is greater at 32 md, with a range between 2 and 750 md (Weegar-Eide 2012). Data review of the nearby SandRidge Exploration and Production, LLC (SandRidge) Class II injection well suggested comparable parameters.

Although Weegar-Eide recommended acid stimulation and/or hydro-fracking as options to achieving greater injection flow within the Ellenburger Group, it is noted that injection within the Ellenburger Group is not without potential issues (Weegar-Eide 2012). Such issues include cost of drilling to those depths; faults within the formation that may result in compartmentalization of the reservoir; variability of conditions within the formation that may not be identified with completion of only one or a handful of test wells and available data; and potential adverse impacts to oil and gas production within the formation as a result of large-scale, long-term injection and subsequent increased hydraulic pressures (Weegar-Eide 2012).

In summary, Summit is considering further testing of the Wichita Formation by reperforating the existing on-site test well. Summit may also explore the Ellenburger Group by recompleting the existing test well to a significantly greater depth. However, Summit's decision is on hold until after a water supply option is selected. If Summit chooses the City of Odessa's water supply alternatives, the quality of the source water could reduce the quantity of brine disposal such that the TCEP would need only a combination of evaporation ponds and a mechanical crystallizer and filter press system. However, if the selected water supply option requires disposal of a larger quantity of brine, deep well injection on site would be considered further. Further testing of the Wichita Formation and exploration into the Ellenburger beneath the plant site would enable Summit to estimate the appropriate combination of injection wells, on-site evaporation ponds, and mechanical crystallizer and filter press system, all of which are described further in the EIS.

3 RESOURCE AREAS CONSIDERED BUT DISMISSED

This chapter describes the resource areas that were considered but dismissed during the review of the polygen plant reconfiguration, new process water supply, and pipeline options, and it also considers new information associated with the deep well injection option for brine disposal. These resources are anticipated to experience no changes in impacts associated with the various changes or expansions of the project as considered in this SA.

3.1 Climate

No changes to impacts on climate are anticipated from the addition of the polygen plant reconfiguration or new options for Summit's proposed project. The existing climate, along with the impacts to and from regional temperatures and severe weather are not expected to change for any of the new options.

3.2 Mineral Resources

No changes in the nature of mineral resource impacts are anticipated from the polygen plant reconfiguration or any of the new options. There will be a small reduction in coal feed (between 12 to 20 percent) required for the polygen plant. While this constitutes a small change in the amount of sub-bituminous coal delivered from the Powder River Basin in Wyoming, which could mean a comparable reduction in mining and/or depletion rate for the resource, there are no changes in conclusions that differ from those stated in the EIS.

No changes in the general nature of mineral resource impacts are anticipated for any of the new linear facility options. Although the soils that underlie the new linear facilities contain sand, gravel, and clay deposits, none of these are economically extractable resources. The same situation exists at the Massey Ranch well field. Minor borrow pits already exist in this area and opportunities for further shallow excavation of materials would suffer relatively minor loss of available acreage for pits.

There is the potential for active or inactive natural gas and oil wells to be located near the new linear facilities, but these wells would be avoided during construction and operation. The siting of new oil and gas wells in the future would not be notably restricted. Therefore, the locations of the new infrastructure and waterlines in the affected counties are not expected to change the findings in this section of the EIS. Disposal of brine water could affect oil and gas wells in any of the formations considered as possible injection zones, but these effects would be assessed and considered during the process of selecting an injection target with the goal of not injecting into any strata where TCEP's injection could materially alter the existing production of oil and gas. Adversely affecting oil and gas operations could create liability for Summit. Therefore, a significant risk of adversely affecting oil and gas operations would render an injection reservoir unacceptable.

3.3 Aesthetics

No changes in the nature of aesthetic resource impacts are anticipated from the polygen plant reconfiguration or any of the new options. Physical structures may vary slightly in different

locations, but no buildings or equipment are expected to be larger than what was identified in the EIS, though some may be smaller in size. For example, while there will be a slight increase in the SFG-850 gasifier diameter (no more than 20 percent larger than the SFG-500 gasifier model as described in the EIS), the replacement of two gasifiers with one will slightly reduce the overall gasifier footprint within the polygen plant. No increase to the emissions stack height or diameter is expected. While this constitutes a small change in the physical composition and layout of the plant, there are no changes that would affect the height, form, color, contrast, and overall visibility of structures or the associated visual impacts in a capacity that differs from the aesthetics analysis in the EIS. Off site, the new process water pipelines would be buried along the road margins and would not be expected to change the findings as reported in the EIS. In places where new pipeline segments would go across the landscape without following an existing road or other ROW, the extent and character of the impacts would be the same as previously addressed in the EIS – only the location would change. The Massey Ranch well field infrastructure would not create notable visual impacts relative to the impacts that already exist at and near this location from various types of past development activities, including past water well development.

3.4 Community Services

Only de-minimus changes in general community service impacts are anticipated. The permanent and temporary work force is expected to remain the same at 150 workers and 1,500 workers during peak construction, respectively. While the pool of staff resources in the area would remain the same, there is a small possibility that more workers would be available locally due to the increase in industry demand over the past several years in the Midland-Odessa area. Analysis in the EIS assumed that all workers for the construction phase of the TCEP would already reside in the region of influence (ROI). For the operations phase, it was assumed that most of the workers would be from the ROI and those who were not would commute or relocate to the ROI; however, no change to the capacity of community services would be expected because of the small workforce that may relocate (less than 1 percent). The proposed polygen plant reconfiguration or options would not materially change the workforce or the demands on community services relative to what was addressed in the EIS. The development of the Massey Ranch well field would not affect public services, and usage of water from this field is not expected to significantly affect community water supplies, ranch water supplies, or commercial water supplies and usage. The impacts of usage of water from other potential new water supplies (the municipal well fields) is still under review, but the currently available information suggest that adverse impacts are not expected for the primary water supply options. Usage of water from CRMWD's Pecos Valley Alluvium and Dockum well field could have significant impacts if the TCEP were to consume water from this source long-term; however, this option would only be used for short-term and back-up water supply. The locations of the new TCEP waterlines and infrastructure in Ector and Winkler Counties are not expected to change the findings in the EIS.

3.5 Transportation

Only de-minimus changes in transportation impacts are anticipated from the polygen plant reconfiguration or the construction and operation of any of the new options in Summit's proposed project. While there will be 12 to 20 percent decrease in coal feed and slag, a 56 to 71 percent increase in urea production, and a 7 to 14 percent decrease in H_2SO_4, the overall transportation requirements for coal, slag, urea, and H_2SO_4 are not expected to change on a significant basis as a result of the polygen plant reconfiguration. There would be additional transportation requirements

for liquid N_2, and $(NH_4)_2SO_4$, though on a minor, but regular basis. Therefore, the polygen plant reconfiguration or options would not materially change the overall transportation demands relative to what was addressed in the EIS. Road and railroad crossings for the proposed new pipeline options would be made by directional drilling or by conventional trenching depending on the traffic levels and subsurface conditions. Potential impacts would be similar to those described in the EIS, although on different roads and railroad segments. Traffic delays would be temporary and of short duration as pipelines are installed beneath roads. TCEP's access roads and local transportation-related features and impacts remain unchanged. Development of the Massey Ranch well field would not affect public roads in a manner other than as described above in this paragraph. The locations of the new TCEP waterlines and infrastructure in Ector and Winkler Counties are not expected to change these findings.

3.6 Materials and Waste Management

Only de-minimus changes in materials and waste management impacts are anticipated with the polygen plant reconfiguration and with construction and operation of any of the new options in Summit's proposed project. There will be a 12 to 20 percent decrease in coal feed and slag, a 56 to 71 percent increase in urea production, and a 7 to 14 percent decrease in H_2SO_4. With the reduction in overall plant size, there will likely be a comparable decrease in construction wastes generated and materials committed to the polygen plant, although the magnitudes would not differ substantially from what was analyzed in the EIS. The sources to obtain construction materials for new linear facilities (including concrete, asphalt, aggregate and fill material as well as steel piping and process units) are generally described in the EIS. The locations and amounts of the new TCEP waterlines and infrastructure in Ector and Winkler Counties are not expected to materially change the findings in this section of the EIS.

3.7 Noise and Vibration

No changes in the nature of noise and vibration impacts are anticipated with the polygen plant reconfiguration or the construction and operation of the new options in Summit's proposed project. Construction of any of the new linear facilities and infrastructure would result in the same temporary noise impacts as described in the EIS -- only the locations would change. Population densities along the new routes are similar to the population densities along the water-supply pipeline routes described in the EIS – a very low population density. The locations of the new TCEP waterlines and infrastructure in Ector and Winkler Counties are not expected to change the findings in the EIS, other than the change in location of impacts.

4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS FOR THE CONSIDERED RESOURCES

This chapter describes the existing natural and human environment associated with the polygen plant reconfiguration and the new options in Summit's proposed project (the new process waterline and water supply options and new information on the deep well injection option for brine disposal) and characterizes these current conditions as a baseline for environmental analysis. Potential environmental impacts that the new components in Summit's proposed project may have on the natural and human environment in the ROI are also disclosed. The ROI establishes the area of review for potential impacts and varies in size depending on the resource affected.

4.1 Air Quality and Greenhouse Gas Emissions

4.1.1 Background

This section identifies and describes the changes in air quality and GHG emissions associated with the construction and operation of the reconfigured polygen plant. This section also presents the emissions and environmental impacts associated with each of the proposed new options.

4.1.2 Region of Influence

The ROI for air quality has expanded from that described in the EIS to include the location of the new water supply and waterline options and the Massey Ranch well field. The Area of Significant impact used for the air dispersion modeling in the EIS encompassed a 31-mi (50-km) radius around the proposed polygen plant, which fully captures the changes associated with the polygen plant reconfiguration and the new waterline options being evaluated in this SA. While the City of Odessa's Pecos County water supply project and the City of Midland's T-Bar Ranch water supply well field would be located outside this 31-mi (50-km) radius, air quality impacts along these linear facility options and associated infrastructure would be typical of those addressed for the original water supply options that also extended outside that radius. Thus, for the purposes of this analysis there is no change to the area evaluated for air quality impacts. For consistency, the term ROI is used in this section.

4.1.3 Methodology and Indicators

The same methodology used for air quality in the EIS, including the modeling approach and effects screening limits, indicators, and data sources, is also used in this SA.

4.1.4 Affected Environment

With the exception of the expanding the air quality ROI to include Summit's new waterline options, the affected environment for air quality remains the same as described in the final EIS. The elements of the affected environment addressed in the final EIS included regional wind speed and direction, local and regional air quality, hazardous air pollutants, GHGs, proximity to Class I and II areas, and air quality management plans. Following publication of the final EIS, there have been no changes to the seven residences within 1.0 mi (1.6 km) of the polygen plant site that are identified

as sensitive receptors. There are also no sensitive receptors in the vicinity of the Massey Ranch well field.

4.1.5 Environmental Impacts of Summit's Proposed Changes

4.1.5.1 CONSTRUCTION

Air quality impacts associated with the construction of the reconfigured polygen plant would be similar to what was identified in the EIS as there would be only minor changes to the design layout and building structure. Summit anticipates the same quantities of worker vehicles and construction equipment would be required for the reconfigured polygen plant. Therefore, the same types and magnitude of impacts from local and short-term criteria pollutant emissions and dust generation as what was disclosed in the EIS would be anticipated.

Air quality impacts associated with the construction of the proposed new options would include dust generated by construction of the water supply pipeline (all new water supply options) and any new access roads and pads for well field equipment (Massey Ranch water supply option only), with the amount of the emissions varying as a function of the length of the new pipelines and the area of disturbance for new roads and pads. Therefore, the area of disturbance for the pipelines, roads and pads has been estimated for each option. Table 4.1 provides a worst-case estimate of dust emissions generated by construction activities per linear facility option.

Table 4.1. Estimated PM Emissions from Construction of the Linear Facility Options

Linear Facility Option	Area (ac [ha])	PM (tons per month)*
WL7	702.3 (284.2)	842.8 (764.6)
WL8	626.4 (253.5)	751.7 (681.9)
WL9	51.5 (20.8)	61.8 (56.1)
WL10	48.7 (19.7)	58.4 (53.0)
WL11	8.0 (3.2)	9.6 (8.7)
WL12	446.4 (180.7)	535.7 (486.0)
Massey Ranch Well Field	7.0 (2.8)	8.4 (7.6)

* Calculations based on EPA's conservative factor of 1.2 tons per month of total particulate matter (PM) emissions per acre from heavy construction activities (EPA 1995)

Equipment emissions, including diesel engine emissions from drilling equipment, excavators, graders, cranes, and trucks, would also occur, with the amount of the emissions varying as a function of the time required for construction of the pipeline and access roads. Table 4.2 provides an estimate of the emissions associated with general heavy construction equipment such as diesel bore/drill rigs, diesel excavators, diesel cranes, non-road diesel trucks, diesel crawler tractor/dozers, and commercial welders, based on EPA's NONROAD 2008a model (EPA 2008). Construction of the TCEP is expected to be complete within one year, based on Summit's estimated schedule and similar construction projects in the area (i.e., City of Midland's T-Bar Ranch waterline).

Table 4.2. Estimated Pipeline Corridor Construction Emissions[a]

Equipment Type	CO (tons)	NO_x (tons)	PM_{10} (tons)[b]	SO_2 (tons)	VOC (tons)
Diesel Bore/Drill Rigs	0.08	0.66	0.66	2.94	0.02
Diesel Excavators	0.15	0.59	0.04	2.94	0.04
Diesel Cranes	0.15	0.66	0.02	2.94	0.02
Non-Road Diesel Trucks	0.16	0.71	0.03	2.97	0.04
Diesel Crawler Tractor/Dozers	0.22	0.60	0.03	2.97	0.02
Commercial Welders	0.67	0.68	0.10	3.85	0.13
Total	**1.43**	**3.90**	**1.15**	**18.61**	**0.25**

[a] Emissions based on NONROAD 2008a emissions factors and on the total equipment use (estimated as 100,000 horsepower hours) for the year-long construction schedule.

[b] Emission factors for construction equipment do not differentiate between PM_{10} and $PM_{2.5}$.

Where well drilling would occur, drill rig diesel emissions would vary as a function of the amount of drilling. Changes in direct impacts to air quality would occur as a result of the construction of any one of the new process waterline options with the amount of change being proportional to the length of the waterline constructed by Summit and the location of the impacts varying with the route selected. For projects proposed by the municipalities, if larger diameter pipelines would be installed in anticipation of sales of water to the TCEP, an additional increment of emissions may be attributable to the TCEP even though Summit would not be constructing these pipelines. Changes in impacts would similarly occur for the new well field development activities. Options for water supply previously addressed in the EIS did not involve new well field development by any party - Summit, municipalities, or third parties.

4.1.5.2 OPERATIONS

As a result of the polygen plant reconfiguration and Summit's new waterline options, the air quality could change from what was described in the final EIS, although this change would be de minimus. The polygen plant reconfiguration will replace two smaller SFG-500 gasifiers with a single larger SFG-850 gasifier and, as a result, will require a reduction in coal feed. Natural gas and syngas combustion would also be at or lower than what was identified in the EIS. These changes in the plant design could result in a change in the expected air emissions with regard to total quantity, proportions of criteria pollutants, velocities, and temperatures of emitted gases, although specific emissions data are not anticipated to be finalized until mid-2015. In addition, fugitive emissions would likely be reduced compared to those anticipated in the EIS, and water vapor emissions may change as a function of the change in turbine size. Changes in syngas consumption in the combustion turbine-generator and urea production plant would also likely occur.

While the emissions rates of criteria pollutants have not yet been calculated for the reconfiguration, total emissions are expected to remain within the existing limits of the TCEP Prevention of Significant Deterioration (PSD) air permit issued by the TCEQ. No revisions to the air permit are anticipated at this time. As a result, point source emissions from the new SGT6-8000H combustion turbine-generator are expected to be similar in magnitude and composition to the point source

emissions from the original Siemens SGT6-5000F3 combustion turbine-generator, which is the largest contributor to polygen plant NO_2 and H_2SO_4 emissions. Emissions from the gasifier and other emitters would likely be even less. Because Summit needs to honor the TCEQ air permit limits, as previously established, Summit will require the polygen plant reconfiguration to be modified until the emissions would comply with the permit limits. Therefore, effects to air quality are expected to be similar to those described in the EIS.

Due to the reduction in coal consumption rate and an increase in combustion turbine-generator efficiency there will also likely be a reduction in CO_2 direct emissions (and indirect emissions), which in turn, correspond to a change in CO_2e emissions, though this remains to be determined.

Water from the Capitan Reef Complex Aquifer, as proposed in the Massey Ranch water source option, has been documented to contain an increased concentration of H_2S (ARCADIS 2012), which could require treatment (off-gassing or capture and sequestration). If the Massey Ranch water supply option (WL7 or WL8) is selected, the current plan is to pump the source water to the polygen plant site, where the H_2S would be removed via an H_2S treatment system at the polygen plant site. If the Massey Ranch water source is selected, there could be minor air emissions at the TCEP associated with the treatment of the higher concentration of H_2S. All of the water treatment technologies that Summit is evaluating would chemically remove H_2S from the Massey Ranch water by converting it to other compounds or elements (Summit 2012). Summit has also reviewed several processes that would release the H_2S from the source water as a gas, but the H_2S would be captured and/or otherwise treated so that there would not be any impact to overall emissions (Summit 2012).

Any necessary treatment of H_2S associated with third-party well fields (i.e., the City of Odessa's Ward County water supply alternative, City of Odessa's Pecos County water supply alternative, City of Midland's T-Bar Ranch water supply, and the CRMWD water supply) would be covered by the developer's air permit, and not directly attributable to TCEP.

As stated in the EIS, it is already expected that TCEP operations would produce and emit H_2S, an odorous compound, in small quantities of fugitive emissions (e.g., through valve or pump packing). Depending on the wind direction, even small volumes of H_2S odor could create a nuisance for the seven residences within 1.0 mi (1.6 km) of the polygen plant site. Although the likelihood of a large, accidental release, such as a pipe rupture, is low, such an event would result in odors that would be noticeable beyond the boundaries of the TCEP. Texas regulates H_2S odors under nuisance laws; upon receipt of an odor complaint, the TCEQ would investigate the odor for frequency, intensity, duration, and offensiveness.

4.1.6 Mitigation

Preliminary recommendations for the treatment and mitigation of H_2S could include either a peroxide oxidation process with a headspace chemical scrubber or an air stripper followed by LOCAT® for offgas treatment (CH2M Hill 2012) (see Section 2.1.1.1 for details). Summit would need to measure the actual concentrations of raw water constituents to determine the need for and type of treatment processes that would be necessary at the polygen plant if the Massey Ranch waterline option is chosen. The fate of H_2S and its constituent components after treatment would also depend on the type of treatment process chosen, though Summit will ensure no amendment to their air permit would be required. No other changes in mitigation have been identified from what is discussed in the EIS.

4.2 Soils and Geologic Resources

4.2.1 Background

This section identifies and describes soils and geologic resources that could be affected by the construction and operation of any one of the new options for water supply to Summit's TCEP. This section also presents the environmental impacts associated with each of the proposed options. Note that no changes to soils and geologic resource impacts are expected to result from the polygen plant reconfiguration.

4.2.2 Region of Influence

For this SA, the soils ROI applies to all soils within a 1.0-mi (1.6-km) radius of the six new linear facilities and the well field at Massey Ranch. The geology ROI is threat or resource specific and was used to evaluate the potential for geologic events (e.g., earthquakes, landslides, and sinkholes) to affect the construction and operation of the new linear facilities.

4.2.3 Methodology and Indicators

The same methodology, data sources, and indicators used for soils and geologic resources in the EIS are also used in this SA.

4.2.4 Affected Environment

4.2.4.1 SOILS

Soils in the ROI have been mapped by the Natural Resources Conservation Service. A complete list of soil types in the soils ROI, their map unit descriptions, and the total surface area of soil types that could be impacted by the new linear facilities are included in the site assessment report developed for the TCEP for project components addressed in this SA (SWCA Environmental Consultants [SWCA] 2012a) and is incorporated by reference.

The potential for wind and water erosion is an important consideration relating to project impacts to soils. Wind and water erosion potential for soils associated with TCEP's new linear facility options are summarized in Table 4.3 for each new TCEP water supply option. The majority of the soils have a moderate to low water erosion potential and a moderate to high wind erosion potential. None of the soil map units in the project area are considered to be prime or unique farmland soils, though portions along WL7 and WL8 cross sand dune fields that have soil assemblages with special ecological significance. TPWD has identified this area as the "Shinnery Sands Ecoregion, " which includes areas subject to wind erosion.

Table 4.3. Wind and Water Erosion Potential of Soils as Total Land Area and Percentage of Area Potentially Affected in the TCEP's New Options

Facility	Erosion Potential	Wind Erosion (ac [ha])*	Percentage	Water Erosion (ac [ha])*	Percentage
WL7					
	High	37.10 (15.01)	7	37.10 (15.01)	7
	Moderate	107.28 (43.41)	20	126.92 (51.36)	24
	Low	382.30 (154.71)	73	362.66 (146.76)	69
	Total	**526.68 (213.13)**	**100**	**526.68 (213.13)**	**100**
WL8					
	High	7.90 (3.20)	8	37.10	8
	Moderate	16.68 (6.75)	17	97.99 (107.53)	21
	Low	75.43 (30.53)	75	334.69 (400.61)	71
	Total	469.77 (40.48)	100	469.77 (40.48)	100
WL9					
	High	n/a	n/a	n/a	n/a
	Moderate	17.84 (7.22)	46	38.64 (15.64)	100
	Low	20.79 (8.42)	54	n/a	n/a
	Total	**38.64 (15.64)**	**100**	**38.64 (15.64)**	**100**
WL10					
	High	n/a	n/a	n/a	n/a
	Moderate	36.51 (14.78)	100	36.51 (14.78)	100
	Low	n/a	n/a	n/a	n/a
	Total	**36.51 (14.78)**	**100**	**36.51 (14.78)**	**100**
WL11					
	High	n/a	n/a	n/a	n/a
	Moderate	6.08 (2.46)	100	6.08 (2.46)	100
	Low	n/a	n/a	n/a	n/a
	Total	**6.08 (2.46)**	**100**	**6.08 (2.46)**	**100**
WL12					
	High	43.22 (17.50)	13	n/a	n/a
	Moderate	166.95 (67.56)	50	326.36 (132.08)	97
	Low	124.70 (50.46)	37	8.51 (3.44)	3
	Total	**334.87 (135.51)**	**100**	**334.87 (135.51)**	**100**
Massey Ranch Well Field					

Table 4.3. Wind and Water Erosion Potential of Soils as Total Land Area and Percentage of Area Potentially Affected in the TCEP's New Options

Facility	Erosion Potential	Wind Erosion (ac [ha])*	Percentage	Water Erosion (ac [ha])*	Percentage
	High	0.49 (0.20)	7	0.49 (0.20)	7
	Moderate	1.40 (0.57)	20	1.68 (0.68)	24
	Low	5.11 (2.07)	73	4.83 (1.95)	69
	Total	**7.00 (2.83)**	**100**	**7.00 (2.83)**	**100**

Note: n/a = not applicable.

*Areas based on temporary construction ROW of 200 feet.

4.2.4.2 GEOLOGY

The near-surface geologic units of the geology ROI are the same as what is addressed in the EIS, with the addition of Maxon Sandstone/Glen Rose Limestone occurring in various thicknesses. On the surface, the new linear facility options occur almost entirely on geologic units consisting of unconsolidated caliche, windblown sand, and alluvial deposits, as well as limestone.

The subsurface geologic characterization also has not changed since the EIS was published. However, anticipated potential targets for brine water injection have been updated based on the results of the on-site test well and subsequent studies, which revealed that several geologic formations were not suitable for long-term deep well injection. The EIS states that the Queen, Clear Fork, and Wichita Formations beneath the proposed polygen plant site were identified as potentially viable injection zones for the brine water injection well option due to their favorable thickness (850–1,500-ft [259–457-m]), lithology (e.g., sandy and/or dolomitic), porosity, and permeability (Subsurface 2011). They were also thought to be sufficiently separated from the Dockum Aquifer, the only underground source of drinking water, by approximately 1,600 ft (488 m) of confining units (Subsurface 2011).

The on-site test well revealed a much lower than anticipated injection rate in the Wichita Formation of approximately 0.12 million gal (0.45 million L) per day per well (Subsurface 2012), which would require at least 21 injection wells to dispose of the currently estimated volume of 2.5 million gal (9.5 million L) per day. This injection rate would also likely be much lower when accounting for pressure interference between wells and backup well capacity (Weegar-Eide 2012). However, only one portion of this formation was tested, and greater injectivity could result from retesting at greater depths, especially if supplemented by acid stimulation and/or hydro-fracking (Weegar-Eide 2012).

The Clear Fork Formation indicated an even lower estimated maximum injection capacity of approximately 0.03 million gal (0.11 million L) per day per well (Subsurface 2012). The results for the Queen Formation are inconclusive because breakdown pressure was never achieved due to mechanical problems (Subsurface 2012), most likely the result of casing cement intrusion into the surrounding formation. It was later determined that regardless of testing, the Queen Formation is not an ideal candidate for deep well injection because it likely presents possible local impacts to oil and gas production that use the same formation (Weegar-Eide 2012).

The Ellenburger Formation, which is a much deeper layer (12,000 ft [3,658 m]) than the above three former candidates, is now thought to be the likely target for deep well injection for the TCEP, because previous studies and drillings to that depth have demonstrated somewhat more favorable porosity and permeability than in these other shallower layers (Weegar-Eide 2012). However, there are potential issues that could also eliminate the Ellenburger Formation as a target for deep well injection: increased costs associated with drilling to such depths; faults within the formation that may cause compartmentalization; variability of conditions within the formation that may not be identified with completion of only one test well and available data; and potential adverse impacts to oil and gas production within the formation as a result of large-scale, long-term injection and subsequent increased hydraulic pressures (Weegar-Eide 2012). Further ongoing studies to determine the suitability of this target formation are on hold until Summit determines whether the selected water supply option requires deep well injection of brine reject water.

4.2.5 Environmental Impacts of Summit's Proposed Changes

4.2.5.1 SOILS

Disturbance to soils would primarily occur during construction of water pipelines (to a primary water supply and to a back-up water supply). Potential impacts during construction of the selected process waterline options would include permanent or temporary removal of soils, erosion of soils, and possible contamination of soils from hazardous material spills. No impacts to prime farmland are anticipated because the new linear facilities would not cross such designated lands.

Most of the soils along the new linear facilities have a moderate ranking for both wind and water erosion potential (see Table 4.1). In a few areas, these process waterline options cross open sand dunes intermittently stabilized by small shrubs. These sand dunes are elevated as much as 50 ft (15.2 m) above the surrounding land surface and represent a significant area of recharge due to the lack of vegetation and high permeability of the sand (Ashworth 1990). During construction activities, there would be a high potential for wind erosion and the generation of dust if WL7 or WL8 was selected and a moderate to low potential if other linear facility options were selected. Controls, such as the stabilization of disturbed areas and wetting of exposed soils, could be used to minimize these impacts. Once construction is finished, the disturbance to soils would be reduced. As disturbed areas become revegetated or otherwise stabilized, further impacts to soils would be negligible.

4.2.5.2 GEOLOGY

New Linear Facilities and Massey Ranch Well Field

Unconsolidated caliche, windblown sand, alluvial deposits, and limestone comprise most of the surface area that would be affected by the linear facility options. The potential for impacts to geologic resources and from events such as earthquakes, landslides, and subsidence would be low due to the relatively flat surface topography and lack of karst geology and geological faulting.

Brine Water Injection Wells

If concentrated brine water injection wells were constructed on the site, injected brine and displaced native fluids could migrate from the target strata into other adjoining strata. This risk is very low because the geologic characteristics of the target injection zones (Ellenburger Formation and Wichita Formation) and the overlying strata would be sufficient to prevent leakage into the

much shallower, overlying drinking water aquifer (Dockum Aquifer). The reservoirs that could be used are hydrogeologically isolated from any potable water aquifers (i.e., there are one or more thick and laterally continuous, low-permeability rock units between the target reservoir and any potential drinking water supply). There would be sufficient vertical separation (over 10,000 ft [3,048 m] for the Ellenburger and over 6,200 ft [1890 m] for the Wichita) and five barrier formations between the target injection zones and potential drinking water aquifer to prevent contamination of shallow, potable water supplies. In addition, there is no evidence of faults that extend from these depths to the shallow fresh water aquifers or ground surface, and oil accumulations in strata at intermediate depths suggest that the strata maintain effective seals to prevent vertical migration of fluids. The brine water injection wells, if used, would dispose of brine water that is expected to be nonhazardous. The wells would be located, constructed, and operated as Class I wells in accordance with EPA and TCEQ regulations.

Other potential impacts from injection wells remain the same as described in the EIS. Seismic events caused by the deep well injection of brine water would be unlikely due to operational procedures limiting injection pressures. Alteration of target formations over geologic time through rock-water chemical reactions and mobilization of some chemical constituents, are unlikely to occur due to the injected brine having chemical characteristics similar to the native brines in the formation.

4.2.6 Mitigation

If TCEP's pipelines and associated access roads cross dune habitats, mitigation measures would be developed and put into effect to reduce the potential for long-term impacts. Measures may include alternative techniques for pipeline installation and ROW maintenance, including burial of the pipeline in the stable substrate beneath the shifting sands, restoration of the disturbed surface of the substrate beneath the shifting sands, replacement of dune sand that has been temporarily removed while the pipeline is installed, and recontouring of the land surface and dunes to the (approximate) original form and contour.

To reduce the risk of injected brines, displaced native fluids, and fluid pressures affecting nearby oil and gas operations, the two shallower target formations will no longer be considered for injection by TCEP. Before injection would be undertaken into the deeper Wichita and Ellenburger Formations, additional studies would be undertaken to assess the risk of impacts on oil and gas operations nearby in these two formations. No other changes in mitigation have been identified from what is discussed in the EIS.

4.3 Ground Water Resources

4.3.1 Background

This section identifies and describes ground water resources that could be affected by the construction and operation of any one of the new linear facility options for water supply to Summit's TCEP. This section also presents the environmental impacts associated with each of the proposed options. Note that no changes to ground water resource impacts are expected to result from the polygen plant reconfiguration.

4.3.2 Region of Influence

The ROIs for ground water resources have expanded from what was analyzed in the EIS to now potentially include process water sourced from the southern part of the Capitan Reef Complex Aquifer, the Pecos Valley Alluvium Aquifer or the Dockum Aquifer, as described below. Process water for the proposed polygen plant could be obtained from either treated waste water effluent from the City of Midland or treated brackish ground water from an off-site source. Thus, two ROIs are considered for ground water resources in this SA:

- The *process water ROI* consists of the portions of aquifers that could be used to obtain water for plant processes. The polygen plant would require an average of 4.2 million gal (15.9 million L) per day and a maximum of 4.5 million gal (18.9 million L) per day of clean process water. In order to obtain these requirements of clean process water, TCEP could require up to 7.0 million gal (26.5 million L) per day of raw source water depending on the quality of that raw water. The aquifers that could supply process water under the new options include the Capitan Reef Complex Aquifer and, temporarily, the Pecos Valley Alluvium and Dockum Aquifers (Figures 4.1 and 4.2). Depending on the well field, areas of effect occur in Winkler, Ward, or Pecos Counties.
- The *project area ROI* consists of the aquifers that underlie the new linear facility options and the Massey Ranch well field option. This would include the areas along each linear facility corridor and surrounding the proposed new well field at Massey Ranch. This ROI also includes the required 2.5-mi (4.0-km) area of review required by the TCEQ for the potential on-site deep injection wells. The Dockum, Edwards-Trinity (Plateau), Ogallala, and Pecos Valley Alluvium Aquifers underlie these areas (Figure 4.1).

4.3.3 Methodology and Indicators

The same methodology, regulatory requirements, data sources, and indicators used for ground water resources in the EIS are also used here in the SA.

4.3.4 Affected Environment

The footprint of the affected environment for ground water resources has expanded from the final EIS to include the new linear facilities and Massey Ranch well field. Impacts extend into Winkler, Ward, or Pecos Counties. No changes have occurred to the Texas Water Development Board (TWDB) state water plan for Region F, which includes Ector County and the project area, since the EIS was published. The potentially affected Edwards-Trinity (Plateau) and Pecos Valley Alluvium are major aquifers (see Figure 4.1), whereas the Capitan Reef Complex and Dockum are minor aquifers (see Figure 4.2) all of which are described below.

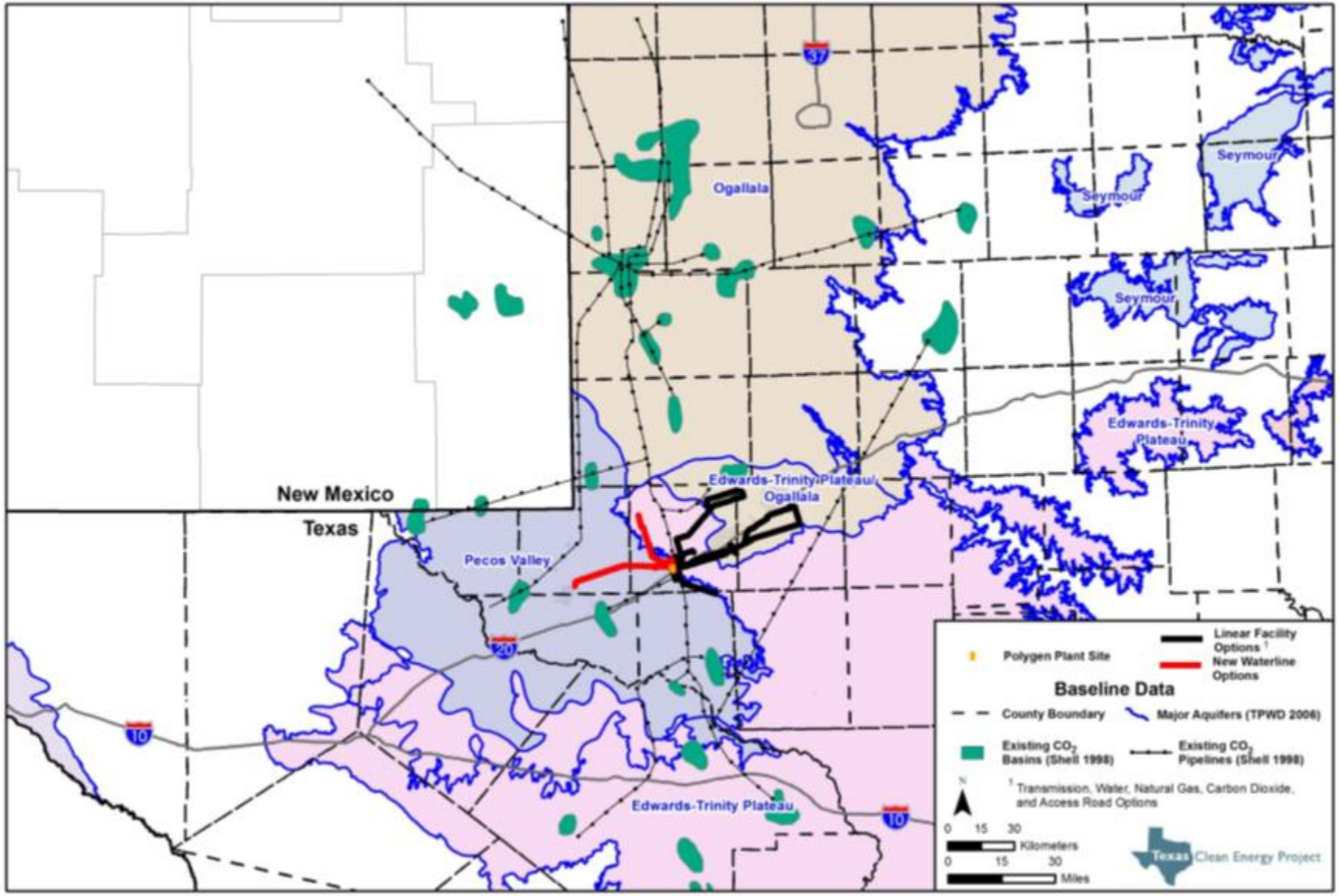

Figure 4.1. Major aquifers in the ground water regions of influence.

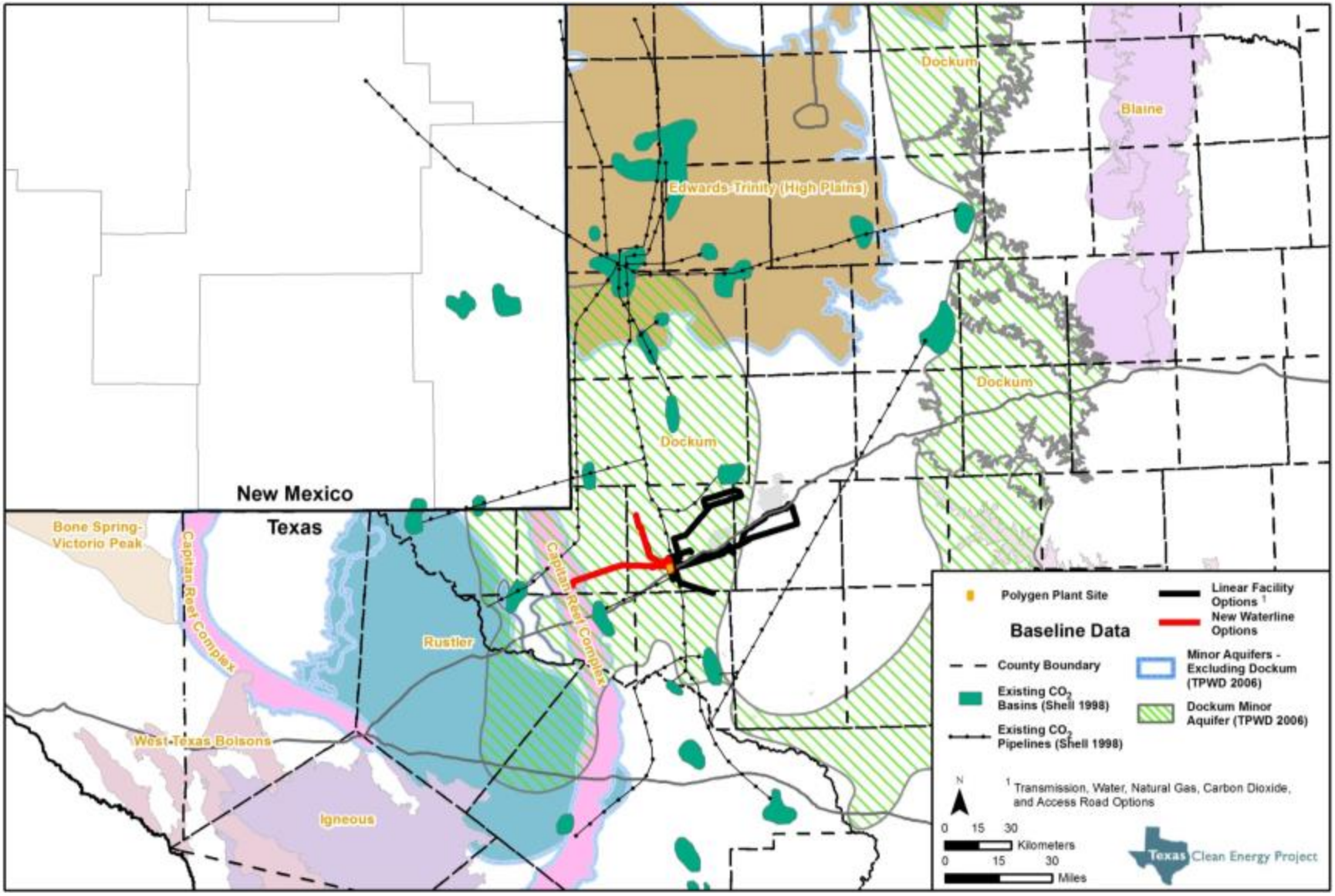

Figure 4.2. Minor aquifers in the ground water regions of influence.

4.3.4.1 EDWARDS-TRINITY (PLATEAU) AQUIFER

The Edwards-Trinity (Plateau) Aquifer is a major aquifer that spans from the Hill Country of Central Texas to the Trans-Pecos region of West Texas and provides water to 38 counties. This aquifer is located immediately to the north and east of the polygen plant site (see Figure 4.1). This aquifer underlies portions of WL10 and WL12 in the project area ROI.

The maximum saturated thickness of the aquifer is greater than 800 ft (244 m). The chemical quality of water in the Edwards-Trinity (Plateau) Aquifer can range from fresh to slightly saline. Most of the Edwards-Trinity (Plateau) Aquifer lies beneath water-table conditions; however, where it is fully saturated and exhibits low permeability, artesian water conditions are present. Irrigation activities account for approximately 70 percent of the ground water usage from the aquifer, with municipal water use and livestock supplies accounting for the remainder. Water well yields can range from 50 gal (189 L) per minute where the saturated thickness is thin to greater than 1,000 gal (3,785 L) per minute. Water levels have remained relatively stable because recharge has normally maintained the relatively low volumes of pumping throughout the aquifer (TWDB 2001). Annual supply from the Edwards-Trinity (Plateau) Aquifer in Pecos County (source area for WL3 and WL4) is approximately 37 billion gal (142 billion L) or 114,849 ac-ft.

4.3.4.2 PECOS VALLEY ALLUVIUM AQUIFER

The Pecos Valley Alluvium Aquifer is a major aquifer located in the upper portion of the Pecos River Valley of West Texas and provides water to nine counties, including Ector and Crane. The Pecos Valley Alluvium Aquifer could be a backup water source for the TCEP through either the CRMWD's water supply option (waterline would use the same footprint as WL9 or WL10) or the City of Midland's T-Bar Ranch water supply option (WL12). It also lies beneath the six new process waterline options in the project area ROI (see Figure 4.1).

The Pecos Valley Alluvium Aquifer has a saturated thickness of approximately 250 ft (76 m). Approximately 80 percent of the ground water pumped from this aquifer is used for irrigation, with the remainder used for municipal supplies, industrial use, and power generation. Moderate to large yields of ground water can generally be expected from wells using this aquifer. Water from this aquifer is typically hard because sulfate and chloride are the predominant constituents. Naturally occurring arsenic and radionuclides exceed primary drinking water standards and some deterioration of quality has resulted from past petroleum industry and irrigation activities. Water level declines have historically occurred in excess of 200 ft (60 m) in south-central Reeves and northwest Pecos Counties, but have moderated since the mid-1970s due to a decrease in irrigation pumpage (TWDB 2001).

4.3.4.3 CAPITAN REEF COMPLEX AQUIFER

The Capitan Reef Complex is a minor aquifer in West Texas that is located approximately 25 mi (40 km) west of the polygen plant site (see Figure 4.2). This aquifer is the process water source for WL7, WL8, and WL11 in the process water ROI, underlies WL7 and WL8 in the project area ROI, and is the source water for WL9 and WL10, if the City of Odessa's Ward County water supply option is selected.

The Capitan Reef Complex Aquifer is a slender, arc-shaped aquifer approximately 10–14 mi (16–23 km) wide that extends from two locations in Texas northward into New Mexico where it provides

water to the City of Carlsbad. Except near the main recharge areas, this aquifer generally contains poor quality water, and yields a wide range of quantities of moderately brackish water. The saturated thickness of this minor aquifer widely varies. Most of the ground water pumped from this aquifer in Texas is used for water-flooding operations in oil reservoirs (EOR). A small amount is used for irrigation of salt-tolerant crops. Over the last 70 years, water levels have declined in some areas as a result of localized heavy production (TWDB 2001).

4.3.4.4 DOCKUM AQUIFER

The Dockum Aquifer is a minor aquifer that is located in West Texas and the Texas panhandle. It underlies much of the Ogallala Aquifer, the northern extent of the Edwards-Trinity (Plateau) Aquifer, and the eastern extent of the Pecos Valley Alluvium Aquifer. This aquifer lies beneath the entire project area ROI (see Figure 4.2), and could be a backup water source for the TCEP (WL9, WL12).

In 1947, ground water depth of the Dockum Aquifer was measured at 205.6 ft (62.7 m) at a well located immediately south of the proposed polygen plant site (Texas Board of Water Engineers 1947; TWDB 2006); however, recent estimations suggest the ground water depth has dropped to approximately 320 ft (98 m) (TWDB 2003). The quality of the Dockum water is generally poor and contains sodium levels that may be damaging to irrigated land (TWDB 2003). In Ector County, water quality of the Dockum Aquifer ranges from fresh to brackish (TWDB 2003). Irrigation and public supply use is limited. Recharge to the Dockum Aquifer occurs primarily by precipitation and stream flow across the outcropping strata and where permeable portions of the aquifer are overlain by other aquifers such as the Pecos Valley Alluvium Aquifer.

4.3.5 Environmental Impacts of Summit's Proposed Changes

4.3.5.1 GROUND WATER QUANTITY

The polygen plant would require water during construction, process water during operations, and potable water during both construction and operations phases. Summit anticipates that no changes to water consumption requirements are expected as a result of the polygen plant reconfiguration. As stated in the EIS, the TCEP could require up to 7.0 million gal (26.5 million L) per day of raw source water to meet the clean process water requirements of the polygen plant, depending on the quality of that raw water. Six new delivery options from three new primary water supply sources and two backup water supply sources are evaluated for the TCEP in this SA. These water sources are as follows:

- Capitan Reef Complex Aquifer ground water from Summit's proposed Massey Ranch water supply (WL7 and WL8)
- Capitan Reef Complex Aquifer ground water from the City of Odessa's proposed Ward County water supply alternative (WL9 and WL10)
- Capitan Reef Complex Aquifer ground water from the City of Odessa's proposed Pecos County water supply alternative (WL11)
- Pecos Valley Alluvium Aquifer ground water from the City of Midland's new T-Bar Ranch water supply (WL12)
- Pecos Valley Alluvium and Dockum Aquifer ground water from the CRMWD's new water supply (WL9 and WL10)

Water from the three primary water sources would come from the Capitan Reef Complex Aquifer. In the past, much of this aquifer has been used for secondary oil recovery purposes in Ward and Winkler Counties; however, no pumping for secondary oil recovery has been reported since 1992 (ARCADIS 2012). Other portions of the aquifer are used for irrigation purposes in Pecos, Culberson, and Hudspeth Counties, and for a gas storage project in northern Pecos County (George et al. 2011; ARCADIS 2012). Most recently, this brackish aquifer is being considered for public water supply after significant treatment. The TWDB ground water availability model for the Capitan Reef Complex Aquifer has yet to be completed (TWDB 2012) and thus, quantitative analysis of impacts from this ground water source remains to be determined. Withdrawal from this aquifer for secondary oil recovery purposes is expected to play a very minor, if not non-existent, role in the future. Instead, lower salinity portions of the Capitan Reef Complex Aquifer are increasingly being considered for public water supply and crop irrigation.

The western portion of the aquifer in New Mexico has lower salinity (<500 milligrams per liter total dissolved solids [TDS]), with marginal salinity (1,000-3,000 mg/L TDS) in irrigated areas in Culberson and Hudspeth Counties. Water quality in deeper portions of the aquifer in Ward and Winkler Counties is poorer (3,000 – 10,000 mg/L TDS); this is the portion of the aquifer from which some proposed water supply options (Massey Ranch water supply and City of Odessa's Ward County water supply) would come. Regional studies suggest an overall lower salinity, with salinity at or below 2,000 ppm, in the Belding Area of the Capitan Reef Complex Aquifer in Pecos County, where the City of Odessa's Pecos County water supply would originate (George et al. 2011).

The City of Carlsbad in Eddy County, New Mexico, located 105 mi (169.0 km) northwest of the TCEP, produced a total of 2.73 billion gal (10.33 billion L) in 2010 from the Capitan Reef Complex Aquifer and is expected to continue at this volume, with anticipated increases to meet population growth (ARCADIS 2012). Due to the distance and extent of the aquifer, production for the TCEP is not expected to impact the water supply for the City of Carlsbad (ARCADIS 2012). Ground water production for irrigation purposes is also a use of this aquifer (up to approximately 7.68 million gal [29.1 million L) per day), with much of the production coming from the Diablo Farms in northern Culberson and Hudspeth Counties, approximately 200.0 mi (321.9 km) west of the TCEP. Some aquifer use occurs in Pecos County where ground water quality is suitable for crops (ARCADIS 2012). Enstor, which is a gas storage company, is another significant producer of ground water from the Capitan Reef Complex Aquifer in northern Pecos County, approximately 40.0 mi (64.4 km) southwest of the TCEP. Enstor is expected to increase its demand up to a maximum of 2.52 billion gal (9.54 billion L) per day in the near future and continue at these very high levels over the next several years (ARCADIS 2012). The existing pumping from the aquifer for municipal, agricultural, and industrial uses are not in the near vicinity of the proposed water supply options. In addition, the Oxy-Permian production operation previously produced water from the Capitan Reef Complex Aquifer in the same area, and reportedly was able to provide over 25 million gal (95 million L) per day (Smith 2010) during operation for the purposes of secondary oil recovery. The Oxy-Permian well fields use the Capitan Reef Complex Aquifer and are located approximately 6.0 mi (9.7 km) northwest of the town of Kermit, Texas. Based on the operational history of the Oxy-Permian production operation, the magnitude of withdrawal from the TCEP appears to be of low impact compared to the productive capacity of the aquifer and the current level of use (Smith 2010); however, quantitative analysis of the proposed pumping is hindered by the lack of a ground water availability model (TWDB 2012).

The Massey Ranch water supply option (TCEP's option WL7 or WL8) would be built by Summit to produce the approximately 7 million gal (26.5 million L) per day of raw water required by the polygen plant. The six proposed production wells and pump station would be located on a privately

owned ranch in the midst of a highly prolific portion of the aquifer approximately 15.6 mi (25.1 km) southeast of the existing Oxy-Permian production operation and approximately 25 mi (40 km) west of the TCEP in southern Winkler County, Texas. In this area, the Capitan Reef Complex Aquifer is characterized by high primary porosity, high permeability, and extensive karstification, which results in a very high transmissivity, and high well yields of 1.0 million gal (3.8 million L) per day or greater (ARCADIS 2012). Because the amount of water proposed to be produced is significantly less than that produced in the past for secondary oil recovery, the uses of this aquifer for the public supply, irrigation, and commercial purposes identified above are not expected to be affected by the TCEP. This conclusion is reached because the combined pumping of the public supply wells, new commercial and irrigation activities and the TCEP would be substantially less than the pumping that had been sustained by the past pumping activities for EOR (Smith 2010).

The City of Odessa's Ward County water supply alternative (TCEP's option WL9 or WL10) would use the Capitan Reef Complex Aquifer, which sits below the Pecos Valley Alluvium and Dockum Aquifers currently used by CRMWD in the same well field. This well field, known as the North Ward County Well Field, is located approximately 30 mi (48.3 km) southwest of the proposed TCEP. The City of Odessa would use the same pipeline corridor as CRMWD to transport its produced water to the Odessa Water Treatment Facility. Studies indicate the depth to the Capitan Reef Complex Aquifer in the North Ward Well Field ranges from 3,500 to 4,000 ft (1,067 to 1,219 m) bgs with an estimated aquifer thickness ranging from 700 to 2,000 ft (213 to 610 m) (DBS&A 2012) and typical well yields varying from 1.0 to 1.4 million gal (3.8 to 5.3 million L) per day or greater (ARCADIS 2012; George et al. 2011). The City of Odessa's Ward County waterline is planned to transport a minimum of 10 million gal (38 million L) per day and a maximum of 50 million gal (189 million L) per day. The TCEP could use approximately 70 percent of the city's water supply during the initial stages, but would utilize only 14 percent of the proposed system when at full capacity (Morton 2013). The City of Odessa's Ward County water supply alternative is expected to have sufficient excess supply to meet the TCEP's water demand.

The City of Odessa's Pecos County water supply alternative (TCEP's option WL11) would also produce from the Capitan Reef Complex Aquifer, but in the Belding Area, approximately 70.0 mi (112.7 km) south of the TCEP. This part of the aquifer is approximately 58 mi (93.3 km) from the proposed Massey Ranch well field and 72 mi (115.9 km) from the Oxy-Permian production operation. This area is relatively near the southern recharge areas of the Capitan Reef Complex Aquifer, where salinity is not as high. The estimated total ground water currently available for permitting from MPGCD for this aquifer is approximately 9.8 million gal (37.1 million L) per day (MPGCD 2010), and almost none of it is currently being used, meaning there should be sufficient supply to meet the TCEP's water demand (Water Quest, Inc. 2013b; Morton 2013). This supply is expected to meet TCEP's specifications after treatment at the well field, which would allow TCEP to use only 4.5 million gal (17.0 million L) per day and leave 5.3. million gal (20.1 million L) per day available for the City of Odessa to use. If untreated raw water is supplied to TCEP, then the full 7.0 million gal (26.5 million L) per day of raw source water would be required for treatment and only 2.8 million gal (10.6 million L) per day would be available for the City of Odessa, which may not be an economically viable option for the city. Initial results from the proposed project's water supply test well suggests the aquifer could easily supply the City of Odessa with its maximum 50 million gal (189 million L) per day demand. It is uncertain, though unlikely, whether TCEP's water demand would adversely impact the Capitan Reef Complex Aquifer. Additional testing, including an aquifer test, would be required to further characterize the specific water source capacity and TCEP's potential impact.

The City of Odessa's Pecos County water supply alternative could adversely impact the irrigation well on Belding Farms (Water Quest, Inc. 2013b). Draw-down of this well was experienced during the initial well test in 2013, although quantifying the long-term extent of impact would require further testing (Water Quest, Inc. 2013). In the down-dip direction to the north of the Pecos County water supply test well, the nearest wells that pull from the Capitan Reef Complex Aquifer are located near the Pecos River over 40 miles to the north, a distance too great to reveal an impact (Water Quest, Inc). No other wells are known to tap the Capitan Reef Complex Aquifer either to the east or west. In the up-dip direction to the south of the Pecos County water supply test well, there are several wells in the outcrop region on the Glass Mountains (Water Quest, Inc.). It is uncertain, though unlikely, whether there would be an adverse impact (e.g., from drawdown of the water table) on wells in the outcrop region. There are no known producing wells in the Capitan Reef Complex Aquifer on the properties immediately to the south.

The City of Midland's T-Bar Ranch water supply project (TCEP's backup waterline option WL12) is expected to have sufficient excess supply to meet the TCEP water demand as a backup water supplier (Morton 2013). Typical well yields in this area for the Pecos Valley Alluvium Aquifer are moderately high, ranging from 0.07 to 1 million gal (2.6 to 3.7 million L) per day or greater, though recharge is somewhat slow (Ashworth 1990). The City of Midland plans to initially pump 10 million gal (37.8 million L) per day, with an increase of up to 38 million gal (143.8 million L) per day when its CRMWD contract expires in 2029. If Summit selects this supply for its backup water option, the TCEP could use 70 percent of the initially planned pumping rate until TCEP's primary water source becomes operational. Due to a water quality issue with arsenic, the City of Midland may need to tap into the Capitan Reef Complex Aquifer south of the T-Bar Ranch well field, provide on-site desalination, and blend it with the T-Bar Ranch Pecos Valley Alluvium water prior to transport to Midland to reduce arsenic levels. It is unknown at this time at what capacity the City of Midland plans to use the Capitan Reef Complex Aquifer.

The CRMWD would have sufficient excess supply to temporarily meet the TCEP water demand as a backup water supplier (Morton 2013). Water from CRMWD's system (TCEP's backup waterline option WL9 or WL10) would come from the Pecos Valley Alluvium and Dockum Aquifers. The pipeline would originate approximately 30.0 mi (48.3 km) west of the TCEP in the North Ward County Well Field. The primary users of water from this source would remain the Cities of Odessa, Midland, Big Spring, and certain other municipal and non-municipal customers; the TCEP would use approximately 12 percent of the yield rate from this proposed water source until TCEP's primary water source becomes operational.

In all of these options except for the Massey Ranch water supply option, the TCEP would reduce water availability to the involved municipalities and other users of the systems proposed or currently under construction by the municipalities. At the very least, the TCEP would reduce the municipal water supply associated with these options on a temporary basis until full capacity can be achieved in the cases of the primary water sources or until the TCEP converts over to its primary water source, as in the case of the backup water suppliers. It remains unknown to what extent the impact would occur as a result of the extra increment of pumping from these well fields in an effort to supply the TCEP.

4.3.5.2 GROUND WATER QUALITY

Impacts to ground water quality from the construction and operation of any one of TCEP's new waterline options would be similar in nature and magnitude as those described in the EIS for the initial waterline options. Impacts from the construction of the new linear facilities would include

the potential for fuel, oils, lubricants, and other potentially hazardous construction materials being released to the land surface and shallow subsurface. It is not likely that such materials would seriously degrade ground water due to the relatively small quantities involved, implementation of spill controls, and the depth of the ground water below the surface.

The construction of the process water pipelines would require hydrostatic testing to certify the material integrity of the pipeline before use. These tests consist of pressurizing the pipeline with water and checking for pressure losses from pipeline leakage. The source and quantity of water for hydrostatic testing would be dependent on the available water sources. After the tests, the used hydrostatic test water should be analyzed and disposed of in accordance with applicable regulations and based on its chemical contents.

Operation and maintenance of the new waterlines would comply with TPDES permit requirements. A release from a water pipeline carrying significant levels of H_2S (WL7 or WL8) should be rapidly detected and repaired. There could be a small localized area of discharge of raw water bearing H_2S. Implementing BMPs in this localized area would be used in the event this type of discharge could occur

Ground water quality from municipal water supply systems could also be impacted as a result of the additional increment of TCEP-related pumping may potentially cause the municipal water systems to entrain lower quality water into their wells via up-coning of deeper ground water with higher TDS. This would be of greater concern for well fields in the Pecos Valley Alluvium Aquifer (CRMWD's North Ward County Well Field and perhaps the City of Midland's T-Bar Ranch well field). It could occur to a much lesser degree for the Capitan Reef Complex Aquifer well fields, although there could be some long-term benefits to inducing movement of cleaner water from areas closer to the recharge regions toward the well fields.

4.3.6 Mitigation

If the City of Odessa's Pecos County water supply alternative was chosen for TCEP, mitigation measures to compensate for the draw-down impact to the Belding Farms irrigation well associated with the project could potentially include the proposed project paying for work over or replacement of the existing Belding Farms irrigation well, or the project could supply Belding Farms with water to cover the losses (Water Quest, Inc. 2013b).

If Summit chooses a back-up water supply alternative that uses the Pecos Valley Alluvium Aquifer (CRMWD water supply or City of Midland's T-Bar Ranch water supply), mitigation measures could be appropriate. In this case, the municipal owner of the chosen well field would (1) monitor the quality of water produced from the wells and measure the static and dynamic water levels and (2) establish triggers or thresholds that, if exceeded, would require reduced usage of water from the particular well field.

No other mitigation efforts have been identified from what was discussed in the final EIS.

4.4 Surface Water Resources

4.4.1 Background

This section identifies and describes surface water resources that could be affected by the construction and operation of one of the new options for water supply to Summit's TCEP. This section also presents the environmental impacts associated with each of the proposed options. Note that no changes to surface water impacts are expected to result from the polygen plant reconfiguration.

4.4.2 Region of Influence

The ROI for surface water resources has expanded to include the location of the proposed Massey Ranch well field, and the six new linear facilities. The surface water ROI in this SA consists of the areas where the new linear facilities would intersect surface water resources, and areas downstream (300 ft [91 m]) of each intersection. The downstream area is included because such areas could be affected by changes in stream bank stability and downstream movement of eroded soils.

4.4.3 Methodology and Indicators

In addition to the same methodology, data sources, and indicators used for surface water resources in the EIS, DOE conducted a field investigation on August 28 through 30, 2012, to document the existing conditions for surface water resources along the new linear facilities.

4.4.4 Affected Environment

Existing surface water conditions are described in this section. The project area now spans 24 sub-watersheds as identified in Figure 3.7.

4.4.4.1 WETLANDS, WATERWAYS, WATER BODIES, AND WATER QUALITY

The new linear facilities with water bodies in their proposed corridors are WL7, WL8, and WL12 (Table 4.4; Figure 4.4). There are no wetlands or water bodies within the proposed footprint of the Massey Ranch well field. The NHD, U.S. Geological Survey topographic maps, and/or aerial photographs suggest the other process water pipelines potentially cross other surface waters, but a field evaluation and desktop analysis of these areas did not reveal surface water indicators. The total area of water bodies in the combined corridors is approximately 0.053 ac (0.0021 ha).

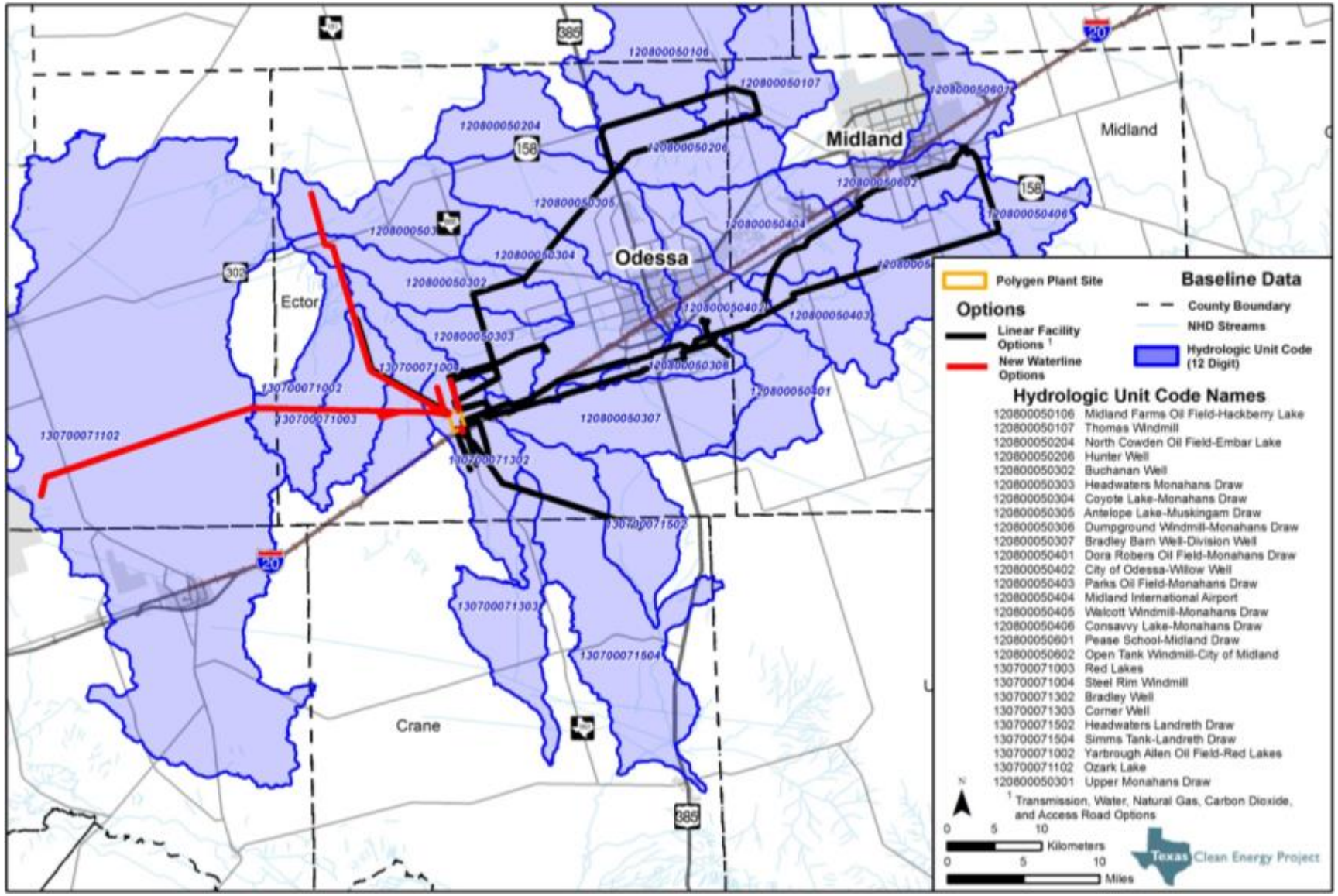

Figure 4.3. Sub-watersheds in the project area.

Table 4.4. Summary of Existing Waterways Along the Massey Ranch Water Supply Options.

Water Body ID‡	Linear Facility Option (Inset)	Water Body Type^	Length (ft [m])	Area (ac [ha])#
WW1*	WL7/WL8 (A)	Ephemeral drainage	159.81 (48.71)	0.015 (0.006)
WW2*	WL7/WL8 (A)	Ephemeral drainage	191.30 (58.30)	0.022 (0.009)
WW3†	WL12 (B)	Ephemeral drainage	181.49 (55.32)	0.016 (0.006)
Total			**532.60 (162.34)**	**0.053 (0.021)**

‡ The Water Body ID is an arbitrary numerical ID assigned by SWCA during the field investigation.

^ Water Body Types follow U.S. Army Corps of Engineers definitions of waterways: an ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year.

Areas are based upon an assumed temporary right-of-way width of 150 ft.

* Lengths for these water bodies were derived from field investigation.

† This water body length was derived from geographical information systems analysis of aerial photography because access to the surface water was unavailable.

Both ephemeral drainages along WL7 and WL8 (Inset A on Figure 4.4; representative photograph in Figure 4.5) that could be crossed by linear facilities are isolated and have evidence of past and current disturbances (e.g., excavation, livestock use, and roads). The ephemeral drainages flow into what appears to be areas previously used for mining and/or have been dredged for material to build and maintain roads in surrounding oil and gas development. There is no significant nexus to any traditional navigable waters and, therefore, these ephemeral waterways would be considered nonjurisdictional.

DOE reviewed approximately 9.3 mi (15.0 km) of WL12 during preparation for the EIS because it is in the same corridor for WL2; the remaining 9.1 mi (14.6 km) is within the footprint of the existing Oxy-Permian pipeline ROW. Based on previous field survey, aerial photography interpretation, and map data, the waterway at this location likely functions as an ephemeral drainage (Inset B on Figure 4.4).

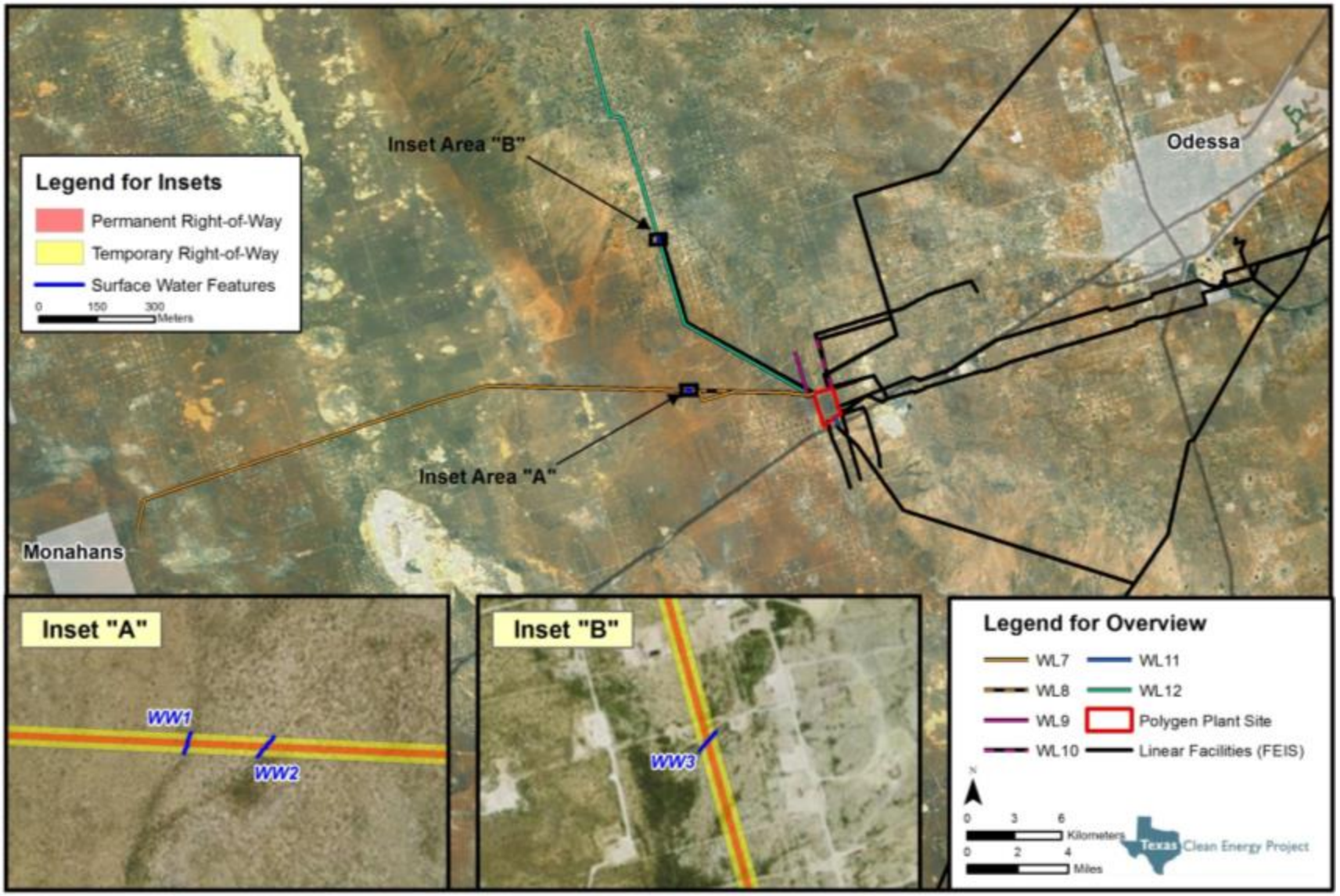

Figure 4.4. Existing surface water conditions along the new linear facility options.

Figure 4.5. Representative view of WW2 (ephemeral waterway) facing upstream (north).

4.4.4.2 FLOODPLAINS

WL7, WL8, and WL12 would intersect mapped floodplains, which are in closed topographic systems associated with ephemeral playas or depressional areas (i.e., they are not associated with waterways). The process water pipelines would be buried and, thus, no permanent aboveground structures would be placed within the 100-year floodplains, and construction would therefore not result in increases to the 100-year flood elevation or present barriers to floodway passage.

4.4.5 Environmental Impacts of Summit's Proposed Changes

4.4.5.1 WETLANDS, WATER BODIES, WATERWAYS, AND WATER QUALITY

The nature and magnitude of impacts to surface waters associated with the polygen plant site, including those from flooding and salt loading to waters of the U.S., have not deviated from what is addressed in the EIS. However, impacts associated with the new linear facilities and the Massey Ranch well field are explained here in the SA. For each of the new options, impacts to drainage ways, wetlands and water quality resulting from construction would be minimal. Once construction was complete, there would be no permanent aboveground structures in or adjacent to surface waters. Restoration procedures, such as soil stabilization and revegetation, would be carried out according to applicable regulations and the terms of the TCEP EIS Record of Decision (ROD) and Mitigation Action Plan (MAP).

Construction of linear facilities could result in short-term impacts, including increased turbidity and sedimentation, streambed disturbance, and removal of stream bank vegetation. These impacts and their intensity would be minimal because construction would affect a maximum of 0.10 ac (0.04 ha) of ephemeral waterways (Table 4.4). Because these waterways are considered isolated and thus, nonjurisdictional, a Clean Water Act Section 404 permit is not required. In addition, the construction activities affecting surface water resources would comply with existing regulatory requirements, such as storm water construction permits, that mandate runoff controls and erosion management. This would result in elimination or significant reduction of potential adverse impacts.

4.4.5.2 FLOODPLAINS

Review of flood potential showed that flooding has a low potential to occur due to the low frequency of local heavy rainfall events in Ector and Midland Counties (H_20 Partners 2010). No permanent aboveground structures would be placed in the 100-year floodplains, and construction would therefore not result in increases to the 100-year flood elevation or present barriers to floodway passage. Floodplain impacts from new linear facilities are limited because these facilities cross only minimal floodplain areas and the only aboveground structures would be temporary access roads during construction. Temporary access roads would be removed upon construction completion but will follow the approved project SWPPP during construction to minimize sedimentation and filling of any downstream floodplains.

4.4.6 Mitigation

No changes in mitigation have been identified from what is discussed in the EIS.

4.5 Biological Resources

4.5.1 Background

This section identifies and describes biological resources that could be affected by the construction and operation of the new options in Summit's proposed project. This section also presents the environmental impacts associated with the new options. Note that no changes to biological resource impacts are expected to result from the polygen plant reconfiguration.

4.5.2 Region of Influence

The ROI for biological resources has expanded to include the proposed location of the new waterline options and the Massey Ranch well field. The biological ROI in this SA consists of the area in which direct and indirect impacts could occur to terrestrial and aquatic habitat, migratory birds, and federally- and state-protected species. The ROI encompasses the new linear facility ROWs and the Massey Ranch well field plus a 0.5-mi (0.8-km) buffer zone around these areas to account for potential disturbance from project noise or vibration.

4.5.3 Methodology and Indicators

In addition to the same methodology, data sources, and indicators used for biological resources in the EIS, DOE conducted a field investigation on August 28 through 30, 2012, to document the existing conditions for biological resources along the new linear facilities. Also, a new TPWD

Natural Diversity Database review was conducted on September 13, 2012, to capture any updates to the database since 2010.

4.5.4 Affected Environment

The existing conditions for terrestrial and aquatic species, migratory birds, and rare, threatened, and endangered species are generally the same throughout the ROI; therefore, the following descriptions of existing biological resources apply generally to the new linear facilities and Massey Ranch well field.

4.5.4.1 TERRESTRIAL SPECIES

The new linear facilities would be constructed and operated in the High Plains ecoregion of Texas (Griffith et al. 2007). This ecoregion is characterized by smooth and slightly irregular plains scattered with playa lakes, which are isolated wetlands in shallow depressions. The polygen plant site and linear facilities addressed in the EIS include the more arid subregions of the High Plains ecoregion, including the Llano Estacado and Arid Llano Estacado. Although new linear facilities include the Arid Llano Estacado subregion, two additional subregions have been identified along WL7 and WL8: Shinnery Sands and Chihuahuan Basins and Playas subregions. The Shinnery Sands subregion consists of sand hills and dunes stabilized by Havard oak (*Quercus havardii*) brush and is located in southwest Ector County and central Winkler County (Figure 4.6). The Chihuahuan Basins and Playas subregion includes the far western extent of Winkler County (Figure 4.6). It is assumed that the terrestrial species occurring in these subregions could occur in the ROI.

Vegetation

As stated in the EIS, the Arid Llano Estacado subregion is described as a short-grass prairie vegetated primarily by buffalograss (*Bouteloua dactyloides*) and grama species (*Bouteloua* spp.). The Shinnery Sand subregion is described as having a sparsely vegetated shrub and grassland cover vegetated by a variety of shrub species as well as sand dropseed (*Sporobolus cryptandrus*), sand bluestem (*Andropogon hallii*) and giant sandreed (*Calamovilfa gigantea*). The Chihuahuan Basins and Playas subregion has typical desert vegetation species including creosotebush (*Larrea tridentata*), fourwing saltbush (*Atriplex canescens*), blackbrush (*Coleogyne ramosissima*), gypsum grama (*Bouteloua breviseta*) and alkali sacaton (*Sporobolus airoides*). However, a significant portion of these subregions has been altered by oil and gas production, ranching, and agricultural activities in the past 100 years, which have caused habitat fragmentation and the encroachment of shrub species such as mesquite (*Prosopis glandulosa*) and narrowleaf yucca (*Yucca angustissima*). This disturbance is evident throughout the ROI, which now fully supports the Mesquite Shrub-Grassland vegetation community known to occur in these subregions. Invasive and noxious species (as defined under federal and state laws) are also present in the project area, with cover ranging from 0 percent to approximately 30 percent, based on a visual estimate conducted during the 2012 field investigation. The observed invasive or noxious species in the project area included bermudagrass (*Cynodon dactylon*), Russian thistle (*Salsola kali*), salt cedar (*Tamarix* sp.), and common sunflower (*Helianthus annuus*).

The dominant shrub species in the Mesquite Shrub-Grassland vegetation community observed in the ROI include mesquite with fewer Havard oak, sand sagebrush (*Artemesia filifolia*), shadscale saltbush (*Atriplex confertifolia*), soaptree yucca (*Yucca elata*), burning bush (*Euonymus alatus*), and creosotebush. Shrubs in this dominant community range from 2 to 7 ft (0.6 to 2.1 m) in height, with densities ranging from 30 to 70 percent and interspersed with patches of bare ground.

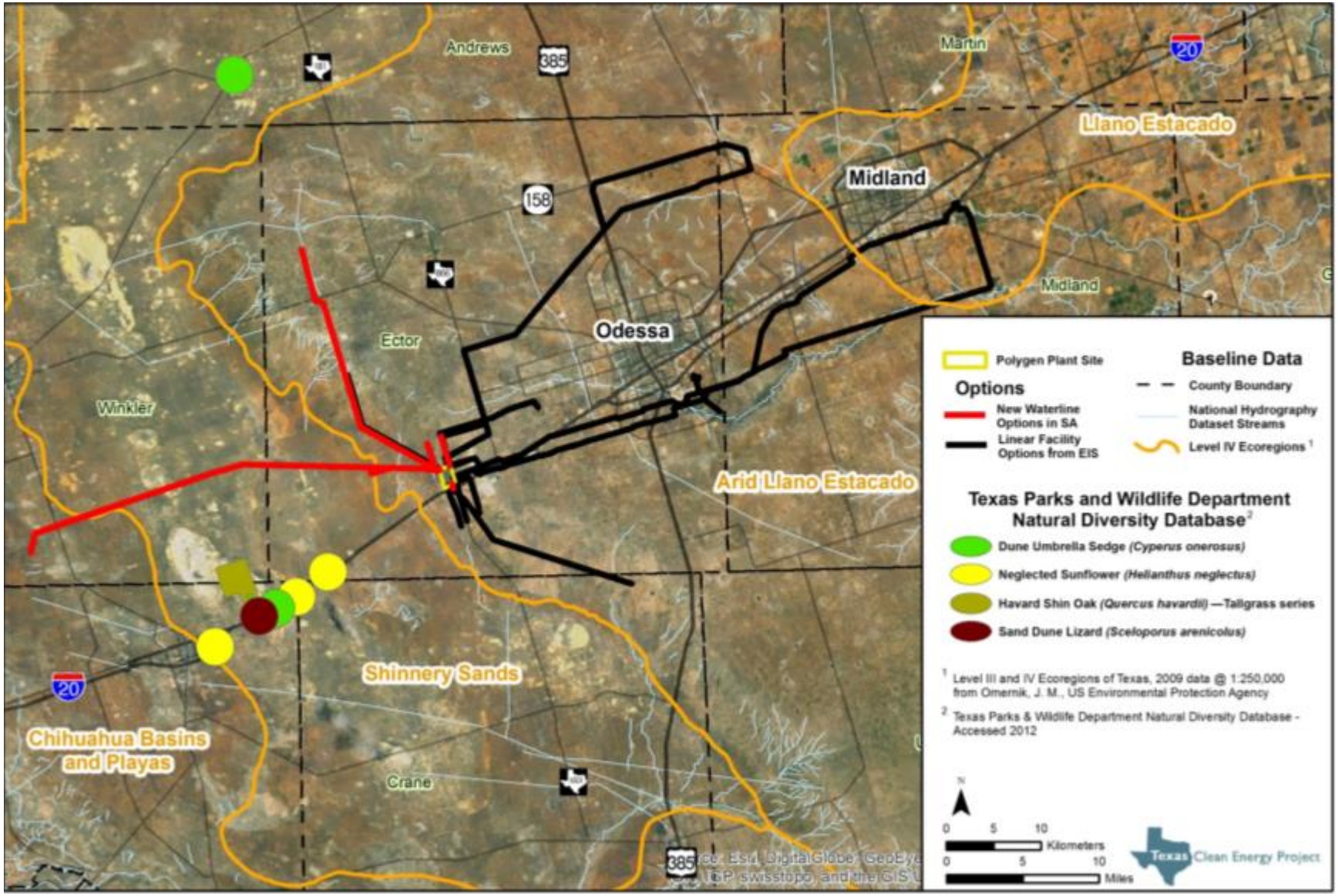

Figure 4.6. Ecoregions and Texas Parks and Wildlife Department Natural Diversity Database locations near the TCEP.

Herbaceous vegetation observed in the project area includes black grama (*Bouteloua eriopada*), needle grama (*Bouteloua aristada*), Drumm's clemantis (*Clemantis drummondii*), silverleaf nightshade (*Solanum eleagrifolium*), James' galleta (*Pleuraphis jamesii*), tumblegrass (*Schedomardus paniculatus*), Johnson grass (*Sorghum halepense*), puncture vine (*Tribulus terrestris*), Lehmann's lovegrass (*Eragrostis lehmanniana*), green spangletop (*Leptochloa dubia*), ear muhly (*Muhlenbergia arenacea*), prostrate pigweed (*Amaranthus albus*), scarlet globemallow (*Sphaeralcea coccinea*), twistspine pricklypear (*Opuntia macrorhiza*), blazing star (*Mentzelia*), *Croton* sp., *Ipomoea* sp., Russian thistle, bermudagrass, and common sunflower.

Wildlife

The same species of mammals, snakes, lizards, amphibians, and turtles that are identified in the EIS as occurring in the Llano Estacado and Arid Llano Estacado subregions also occur in the Shinnery Sands and Chihuahuan Basins and Playas subregions (Garrett and Barker 1987; Schmidly 2004; Werler and Dixon 2000). More than 300 species of birds have been documented in these subregions (Hewetson et al. 2006; Midland Naturalists, Inc. 2010). Because of the presence of suitable habitat in the ROI and the widespread occurrence of these wildlife species and their mobility, it is likely that they would be present in the ROI.

4.5.4.2 AQUATIC SPECIES

The ROI for the new linear facilities contains no wetlands, no intermittent or perennial waterways, and no water bodies that would support aquatic species.

4.5.4.3 MIGRATORY BIRDS

The ROI occurs in the Central Flyway, a major migratory route used by birds traveling between wintering and breeding grounds. The list of migratory bird species identified in the EIS as regular migrants, common migratory birds with potential to winter in the ROI, and common migratory birds expected to breed in scrubland habitats remain the same for the SA's biological ROI.

4.5.4.4 RARE, THREATENED, AND ENDANGERED SPECIES

The USFWS (2012) and TPWD (2012) list seven threatened and endangered or candidate species as occurring, formerly occurring, or having the potential to occur in Ector and Winkler Counties. TPWD lists an additional 13 wildlife and two plant species as rare.

Based on the results of the TPWD Natural Diversity Database review (see Figure 4.6) and the 2012 field investigation conducted by DOE, it was determined that the ROI provides suitable habitat for one state-listed threatened species, the Texas horned lizard (*Phrynosoma cornutum*), as well as 13 rare species including mammals, reptiles, migratory birds, and plants (Table 4.5). No federally protected species are known to occur or were observed on or near the new linear facilities or the Massey Ranch well field, and no designated critical habitat occurs in or adjacent to these areas. Additionally, the *Update to the Federally Listed Species Habitat Evaluation for the Texas Clean Energy Project in Ector and Winkler Counties, Texas* (SWCA 2012b) also reports that no federally listed species are likely to be adversely affected near the project area.

Table 4.5. State-Listed Rare, Threatened, and Endangered Species with Potential to Occur in the Biological Resources Region of Influence

Common Name (scientific name)	Listing Status*	County	Habitat Description	Potential for Occurrence in Biological Resources ROI	Range
Birds					
Baird's sparrow *(Ammodramus bairdii)*[†]	R	Ector Winkler	Occurs in shortgrass prairie with scattered low bushes and matted vegetation.	Suitable habitat in ROI; very rare or rare migrant that could occur in ROI on occasion.	Breeds in northern Great Plains and winters in Trans-Pecos, Mexico, and possibly Southern Plains; very rare to rare migrant in western half of Texas; few records from High Plains.
Ferruginous hawk (*Buteo regalis*)[†]	R	Ector Winkler	Occurs in open country, primarily prairie, plains, and grasslands, particularly in areas with prairie dogs.	Suitable habitat in ROI.	Uncommon to common winter resident in High Plains and Trans-Pecos.
Mountain plover (*Charadrius montanus*)[†]	R	Ector Winkler	Occurs in shortgrass plains and bare/plowed fields.	Suitable habitat in ROI for migrating individuals.	Migrant through most of West Texas; localized areas in western two-thirds of Texas as very rare summer resident and winter resident.
Prairie falcon (*Falco mexicanus*)[†]	R	Ector Winkler	Occurs in open, mountainous areas, plains, and prairies; nests in cliffs.	Suitable habitat in ROI.	Rare to uncommon migrants and winter residents in the High Plains.
Snowy plover (*Charadrius alexandrines*)[†]	R	Ector Winkler	Subspecies (Western snowy plover [*C.A. nivosus*]) is also listed as rare; occurs in flat sandy beaches, salt flats, sandy areas with little vegetation, saline lakes, and major rivers.	Suitable habitat in ROI for migrants and summer residents.	Migrant throughout the High Plains; uncommon summer resident in portions of Midland County and surrounding counties to northeast.
Western burrowing owl (*Athene cunicularia hypugaea*)[†]	R	Ector Winkler	Occurs in open grasslands, especially prairie, plains, and savanna, sometimes in vacant lots or airports, particularly in areas with prairie dogs.	Suitable habitat in ROI, particularly in areas with prairie dogs.	Uncommon to common summer resident and uncommon to rare winter resident in western half of state; rare to very rare migrant and winter visitor farther east and south to coastal prairies.

Table 4.5. State-Listed Rare, Threatened, and Endangered Species with Potential to Occur in the Biological Resources Region of Influence

Common Name (scientific name)	Listing Status*	County	Habitat Description	Potential for Occurrence in Biological Resources ROI	Range
Mammals					
Black-tailed prairie dog (*Cynomys ludovicianus*)	R	Ector Winkler	Lives in large family groups in dry, flat, short grasslands with low, relatively sparse vegetation, including areas overgrazed by cattle.	Suitable habitat in ROI.	West and western-central Texas.
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)	R	Ector Winkler	Occurs in habitats ranging from desert scrub to piñon-juniper woodlands characterized by rocky, broken country; roosts in caves, mines, and occasionally buildings.	No caves or mines located near ROI; could roost in buildings or fly over ROI.	West Texas.
Swift fox (*Vulpes velox*)	R	Ector	Prefers shortgrass prairie, mesa country along borders of valleys, sparsely vegetated habitats on sloping plains, hilltops, and other well-drained areas; adapted to pasture, plowed fields, and fencerows.	Potential to occur in ROI.	West Texas.
Reptiles					
Dune sagebrush lizard (*Sceloporus arenicolus*)	R	Winkler	Confined to active sand dunes near Monahans; dwarf shin-oak sandhills with sagebrush and yucca.	Suitable habitat in ROI.	Southeastern New Mexico and adjacent Texas.
Spot-tailed earless lizard (*Holbrookia lacerata*)	R	Ector Winkler	Inhabits moderately open prairie-brushlands with fairly flat areas free of vegetation and other obstructions, including disturbed areas.	Suitable habitat in ROI.	Central (Edwards Plateau) and south-western Texas.
Texas horned lizard	T	Ector Winkler	Open, arid and semiarid regions with sparse vegetation, including grass, cactus, scattered brush, or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rocks when inactive; breeds March to September.	Suitable habitat in ROI.	Currently restricted to the western third of Texas.
Plants					
Dune umbrella-sedge (*Cyperus onerosus*)	R	Winkler	Moist to wet sand in swales and other depressions among active or partially stabilized	Suitable habitat in ROI.	Restricted to the Monahans-Kermit sandhills.

Table 4.5. State-Listed Rare, Threatened, and Endangered Species with Potential to Occur in the Biological Resources Region of Influence

Common Name (scientific name)	Listing Status*	County	Habitat Description	Potential for Occurrence in Biological Resources ROI	Range
			dunes.		
Havard's machaeranthera (*Xanthisma viscidum*)	R	Ector Winkler	Occurs on calcareous or sandy soils in Chihuahuan Desert shrublands or mesquite grasslands.	Suitable habitat in ROI.	In West Texas.

Note: No federally listed species are known to occur in the ROI.

Sources: Bockstanz and Cannatella (2000); Lockwood and Freeman (2004); Poole et al. (2007); Schmidly (2004); TPWD (2010); USFWS (2010).

* TPWD listing designation: T = Threatened; R = Rare.

† Rare species that are also protected under the Migratory Bird Treaty Act.

TPWD lists the dune umbrella sedge (*Cyperus onerosus*) as a rare species, although this species is not listed as threatened or endangered under state or federal law (TPWD 2012). Potential habitat for this species was observed in the ROI during field investigation, but no individuals were observed. TPWD also listed Havard Shin Oak-Tallgrass series as a natural community that could be impacted by project activities. This series occurs chiefly on sandy soil in Andrews, Crane, Ward and Winkler Counties. It is strongly associated with two species: the neglected sunflower (*Helianthus neglectus*) and dunes sagebrush lizard (*Sceloporus arenicolus*). Although neither species is federally or state protected, the neglected sunflower is considered rare and the dunes sagebrush lizard is considered a species of concern. Although no neglected sunflower specimens were observed during the site visit, the species could exist in the ROI where deep sand sheets and dunes are present (Figure 4.6).

Dunes sagebrush lizard habitat has recently been mapped in Texas by Texas A&M University and ranked based on the likelihood of occurrence. All potential areas of dunes sagebrush lizard habitat were surveyed by DOE during the site visit. Areas along the ROI that were mapped as either 'Low' or 'Very Low' likelihood of occurrence were overgrown with herbaceous vegetation and shrub species (other than the Havard Oak) and, therefore, not considered potential habitat (Figure 4.7). DOE identified four isolated areas that appear to be suitable habitat for the species (Figure 4.8). Additionally, these areas were in the habitat mapped as 'Very High' likelihood of occurrence for the species.

Figure 4.7. Representative photograph of a sand dune/Havard oak community that is too overgrown to be considered potential dunes sagebrush lizard habitat; identified by DOE.

Figure 4.8. Representative photograph of dunes sagebrush lizard habitat, identified by DOE. Facing southeast from County Road 404 (CR 404) adjacent to the WL7 and WL8.

4.5.5 Environmental Impacts of Summit's Proposed Changes

4.5.5.1 TERRESTRIAL SPECIES

The primary direct impacts to terrestrial species from construction and operation of the linear facilities or the Massey Ranch well field would be the removal or disturbance of the Mesquite Shrub-Grassland vegetation community and the wildlife species that are associated with it. Vegetation could be permanently removed from 1.8 to 174.5 ac (0.7 to 70.6 ha), and could be temporarily removed from or disturbed on an additional 3.7 to 343.5 ac (1.5 to 139.0 ha) during construction, depending on which new water supply and linear facility option is selected. The range in vegetation removal is based on the smallest and largest acreage combinations of the linear facility options as identified in Table 4.6. These impact areas from both construction and operational activities are based on the conservative assumption that all areas are currently vegetated; however, there are several developed areas along the linear facilities where vegetation does not occur or where vegetation would not be impacted.

Table 4.6. Impacts to Terrestrial Habitat from Summit's New Options.

Linear Facility Option	Temporary/ Construction Impact Area (ac [ha])[1]	Permanent/ Operational Impact Area (ac [ha])[2]	Potential Noise Disturbance Area (ac [ha])[3]	Total Length (mi [km])
WL7	518.0 (209.6)	174.5 (70.6)	18,949.9 (7,668.8)	28.8 (46.3)
WL8	516.1 (208.9)	172.5 (69.8)	18,756.0 (7,590.3)	28.5 (45.9)
WL9	38.2 (15.5)	12.7 (5.1)	1,382.2 (599.4)	2.1 (3.4)
WL10	36.4 (14.7)	12.1 (4.9)	1,316.4 (532.7)	2.0 (3.2)
WL11	5.5 (2.2)	1.8 (0.7)	197.5 (79.9)	0.3 (0.5)
WL12	334.5 (135.4)	111.5 (45.1)	12,110.5 (4,901.0)	18.4 (29.6)
Massey Ranch Well Field	7.0 (2.8)	7.0 (2.8)	647.0 (261.8)	n/a

[1] The temporary/construction impact area based on a 150-ft-wide (45.7m-wide) corridor.
[2] The permanent/operational impact area is based on a 50-ft-wide (15.2m-wide) corridor.
[3] Area potentially affected by noise is based on a 0.5-mi (0.8-km) buffer (i.e., 1-mile-wide [1.6-km-wide] corridor) plus the temporary/construction impact area to determine the maximum area of impact.

Additionally, invasive and noxious plant species could invade disturbed areas during construction and operation of the linear facilities. The relative level of possible impact associated with each option is indicated by the length of the linear facility, as identified in Table 4.6.

Construction noise (e.g., vehicular traffic, construction activities) may temporarily displace wildlife during construction of the linear facilities. However, this impact is expected to be minimal because displaced wildlife would quickly return after construction activities ceased. Table 4.6 shows the maximum area of wildlife habitat anticipated to be affected by noise during construction of each linear option. The area affected is based on the assumption that construction noise would largely attenuate to background levels within 0.5 mi (0.8 km) of the new linear facilities.

4.5.5.2 AQUATIC SPECIES

As described in the surface water resources section (Section 4.4), no intermittent or perennial waterways or aquatic habitat of any kind are present along the new linear facilities or in areas to be disturbed at the Massey Ranch well field. There would be no off-site waste water discharges, and storm water would be controlled through a construction Storm Water Pollution Prevention Plan (SWPPP). Compliance with Texas Pollutant Discharge Elimination System (TPDES) permit requirements would minimize off-site discharge or erosion associated with construction activities and operational maintenance (i.e., drainage of the pipeline for testing and servicing) that could impact downstream aquatic habitat.

4.5.5.3 MIGRATORY BIRDS

Impacts to migratory birds from TCEP's construction and operations related to the selected process water supply would remain the same as those described in the EIS. The total acreage of habitat loss would vary by water supply and linear facility option (see Table 4.6). In areas adjacent to the TCEP's facilities, disturbance from construction and operational noise could displace migratory birds or negatively affect their reproductive success until they habituate.

4.5.5.4 RARE, THREATENED, AND ENDANGERED SPECIES

Habitat loss for the threatened Texas horned lizard and 13 state-listed rare species including the dunes sagebrush lizard could occur from the construction and operation of some of the new facility options. The total acreage of habitat loss would vary by water supply and linear facility option (see Table 4.6). Fatalities of Texas horned lizards, their prey (harvester ants), and state-listed rare species such as the dunes sagebrush lizard could occur during construction of the facilities. Impacts to these species during operation of the buried pipelines would be unlikely. Overall, potential impacts to Texas horned lizards and dunes sagebrush lizard would be greater than other listed wildlife species, because of their decreased mobility and preference for habitat in areas where construction may occur. In addition, potential habitat for the state-listed rare dune umbrella sedge could occur along WL7 or WL8, though no plants were identified during the field surveys. The nearest known location is approximately 15 mi (24 km) to the southwest of the TCEP in the Monahans State Park. If Summit chooses the Massey Ranch water supply option, there is potential for the Dune Umbrella Sedge to be removed during construction grading activities, though impacts to this species is expected to be minor to negligible.

4.5.6 Mitigation

The ROD for the final EIS described mitigation measures for migratory birds and rare, threatened, and endangered species additional to what was described in the EIS. Specifically, these are:

- Before land disturbance at the plant site and along the utility corridors, Summit shall survey areas to be disturbed and undertake measures to protect wetlands, waterways (including non-jurisdictional waters), playa lakes, rare species (e.g., the sand dune lizard, federal candidate for listing) and critical habitats (e.g., the Shinnery Oak Sand Dune habitat), and state-listed rare species (particularly the Texas horned lizard), as specified in the MAP. As appropriate, Summit shall consult with the USFWS and TPWD regarding special natural communities and features, as well as rare species and their habitats.

- To reduce impacts to species protected under the MBTA, ground disturbing activities in areas of potential breeding habitat shall be avoided during the breeding and nesting season (March 1 through July 31). If this seasonal avoidance is not practicable, a qualified biologist shall survey the potentially affected area prior to any ground disturbing activities to determine if nesting is underway; and buffer areas shall be established as needed to protect eggs and young birds until they fledge. Owls and hawks may nest in this area at other times of year. Surveys shall be conducted for owl and hawk nests, and buffer areas shall be established around active nests. If a power transmission line route crosses or is located near a water body or playa lake bed, the adjacent section of the line shall have line markers to reduce the potential for bird collisions. To prevent electrocution of perching raptors and to reduce power outages and maintenance, Summit shall consider the use of various protection measures such as adequate line spacing, perch guards, and insulated jumper wires.

4.1 Cultural Resources

4.1.1 Background

This section identifies and describes cultural resources that could be affected by the construction and operation of one of the new options for water supply to Summit's TCEP project. This section also presents the environmental impacts associated with each of the proposed options. Note that no changes to cultural resource impacts are expected to result from the polygen plant reconfiguration.

4.1.2 Region of Influence

The ROI for cultural resources has expanded from the EIS to include the new linear facilities and the location of the Massey Ranch well field. The cultural resources ROI include areas within a 200-ft-wide (61.0-m-wide) ROW surrounding the new facilities.

4.1.3 Methodology and Indicators

In addition to the same methodology, regulatory requirements, data sources, and indicators used for cultural resources in the EIS, DOE conducted a field investigation on September 10 through 14, 2012, to document the existing conditions for cultural resources along the new linear facilities. The survey efforts focused exclusively on five high probability areas, which had a cumulative length of 6.9 mi (11.1 km), or 10 percent of the total length of the surveyed new linear facilities.

4.1.4 Affected Environment

There are no previously recorded sites in the ROI eligible for the National Register of Historic Places (NRHP). One newly recorded archeological site, a historic artifact scatter, is located in the proposed corridor of WL7 and WL8. The site is located on the western edge of an ephemeral, washed out swale in the eastern-most high probability area. The site is not recommended by DOE as eligible for the NRHP for a variety of reasons. Given the prevalence of the disturbances in this area, coupled with the sparse artifact assemblage, and lack of diagnostic attributes or cultural features, this site has a low research value and as such, is not considered eligible for the NRHP.

4.1.5 Environmental Impacts of Summit's Changes

The construction of WL7 or WL8 could affect one newly recorded archaeological site. This site is not eligible for the NRHP because it is poorly preserved and lacks significant artifacts or features. No other cultural resources have been documented within the corridors of the other new linear facilities associated with the proposed TCEP.

The field investigation determined that despite the absence of NRHP-eligible sites or other documented cultural resources, construction of any of the proposed linear facilities has the potential to affect previously undocumented cultural resources. Areas with low potential for harboring intact, significant cultural resources are those portions of the linear facilities that parallel existing roadways or pipeline ROWs. These segments of the linear features are primarily located along CR 404 and along I-20. The remaining segments of the proposed linear features traverse open land, and have a moderate probability for harboring cultural resources. This is due primarily to the prevalence of oil and gas development throughout the region, which has taken a heavy toll on the landscape.

A cultural resources survey of the TCEP linear facilities would be conducted after the alignments have been finalized and prior to construction, in compliance with recommendations provided by the Texas Historical Commission on September 10, 2010. Although the probability is considered low, should any cultural resources or human remains be discovered during the pre-construction surveys for the linear facilities, the Texas Historical Commission/State Historic Preservation Office would be immediately contacted and consulted.

4.1.6 Mitigation

No changes in mitigation have been identified from what is discussed in the EIS.

4.2 Land Use

4.2.1 Background

This section identifies and describes existing land uses and public access and recreation areas that could be affected by the construction and operation of the new options for water supply to Summit's TCEP. This section also presents the environmental impacts associated with each of the proposed options. Note that no changes to land use impacts are expected to result from the polygen plant reconfiguration.

4.2.2 Region of Influence

The land-use ROI in this SA consists of the applicable linear facility and construction-footprint buffer areas, which are located 200 ft (61 m) from the centerline of each new linear facility. Also included is the footprint of the proposed Massey Ranch well field.

4.2.3 Methodology and Indicators

The same methodology, data sources, and indicators used for land use in the EIS are also used here in the SA.

4.2.4 Affected Environment

This section describes existing land uses, existing land-use plans, and public access and recreation areas that could be affected by the construction and operation of the new linear facilities addressed in this SA.

Existing Land Uses

The corridors in which the supplemental waterlines would be located generally pass through land that is rural and sparsely populated. Most of the land use in these areas is related to oil and gas extraction, and ranching. Numerous well field leases occur in the vicinity of the new linear options. According to the Railroad Commission of Texas, Apache Corporation, Devon Energy Production Co, L.P., and XTO Energy Inc. are the most prevalent operators in Crane, Ector, Ward, and Winkler Counties whereas Occidental Permian LTD. is the most prolific throughout the Permian Basin (Railroad Commission of Texas 2014).

Other land uses include support services for the oil and gas industry (such as drilling and equipment storage). Figure 4.9 identifies the locations of the residential areas along the new waterline options. Table 4.7 identifies the areas that contain existing transportation and utility (electrical transmission and distribution lines and pipelines) ROWs that the new waterline options would cross.

Table 4.7. Existing Land Uses, other than Oil and Gas Activity, along Summit's New Options.

Linear Facility Option	Type of Land Use Crossed	Distance and Direction from Polygen Plant Site (mi [km])	Total Length (mi [km])	ROW Use/Occupancy (if applicable)
WL7	Transportation ROW	13.0 (20.9) west	13.0 (20.9)	CR 404
	Transportation ROW	25.4 (40.9) west	0.02 (0.03)	SH 18
	Utility ROW	13.0 (20.9) west	13.0 (20.9)	138-kV transmission line
	Utility ROW	23.0 (37.0) west	0.32 (0.51)	Existing pipeline ROW
	Utility ROW	7.3 (11.7) west	<0.01(.02)	Existing transmission line
WL8	Transportation ROW	13.0 (20.9) west	13.0 (20.9)	CR 404
	Transportation ROW	25.4 (40.9) west	0.02 (0.03)	SH 18
	Utility ROW	13.0 (20.9) west	13.0 (20.9)	138-kV transmission line
	Utility ROW	23.0 (37.0) west	0.32 (0.51)	Existing pipeline ROW
	Utility ROW	7.3 (11.7) west	<0.01 (.02)	Existing transmission line
WL9	Utility ROW	0.5 (0.80) north	0.1 (0.16)	Existing transmission line
WL10	Utility ROW	0.6 (0.97) north	0.1 (0.16)	Existing transmission line
WL11	Transportation ROW	14.0 (22.5) north	0.03 (.05)	CR 302
	Transportation ROW	12.0 (19.3) north	0.01 (.02)	CR 2019
	Utility ROW	3.2 (5.1) north	<0.01 (.02)	Transmission line
	Utility ROW	0.62 (.10) north	<0.01 (.02)	Transmission line
WL12	Transportation ROW	0.04 (0.06) south	0.25 (0.40)	CR 1601
	Transportation ROW	0.29 (0.47) south	0.04 (0.06)	I-20 westbound frontage road
	Transportation ROW	0.01 (0.02) south	<0.01 (.02)	Railroad

Table 4.7. Existing Land Uses, other than Oil and Gas Activity, along Summit's New Options.

Linear Facility Option	Type of Land Use Crossed	Distance and Direction from Polygen Plant Site (mi [km])	Total Length (mi [km])	ROW Use/Occupancy (if applicable)
Massey Ranch Well Field	n/a	n/a	n/a	n/a

kV = kilovolt; SH = State Highway; CR = County Road.

Land-Use Plans and Regulations

All of the new waterlines would be located in unincorporated Ector and Winkler Counties. Neither county has a land-use plan, zoning regulations, or development standards that would be applicable to the new linear facilities. Additionally, none of the new waterline options pass through any incorporated areas such as the City of Odessa, the City of Midland, or City of Kermit.

Public Access and Recreation Areas

The Penwell Knights Raceway is the only public access and recreation area in the ROI, but it is no longer in use. It is accessed from I-20 via the I-20 frontage road and FM 1601. None of the new linear facilities would pass through or near this raceway.

4.2.5 Environmental Impacts of Summit's Changes

This section describes the potential impacts of the new linear facilities on existing land uses, the extent to which those facilities would be consistent with existing land-use plans, and the potential impacts of the proposed linear facilities on public access and recreation areas.

Existing Land Uses

Construction of the linear facilities would have temporary impacts on some adjacent lands. The construction ROW would be used for activities such as trenching, equipment movement, and materials laydown. Construction work would consist of activities such as land clearing, trenching, pipe installation, backfilling, compacting, and hydrostatic testing for leakage, cleanup, and restoration. Where appropriate, street and driveway pavements would be cut and temporarily covered during pipeline construction to maintain access. All regulated road and rail-line crossings would be accomplished using directional drilling technology, which allows for site-specific locations of the pipeline to be buried beneath lands without disturbing the surface directly above the pipeline. The ability to use some lands for their existing uses (oil and gas development, utility and road ROWs, and cattle grazing) would be temporarily affected during construction but would not be affected during operations.

Most of the lands that the process waterlines would pass through are primarily used for oil and gas extraction and ranching. The new linear facilities would be located in existing ROWs where possible, which would reduce potential land-use impacts. The new linear facilities would be buried and would have little to no impact on the ability to use adjacent lands. Table 4.8 shows the area requiring new ROW or land access for the linear facilities and the Massey Ranch well field.

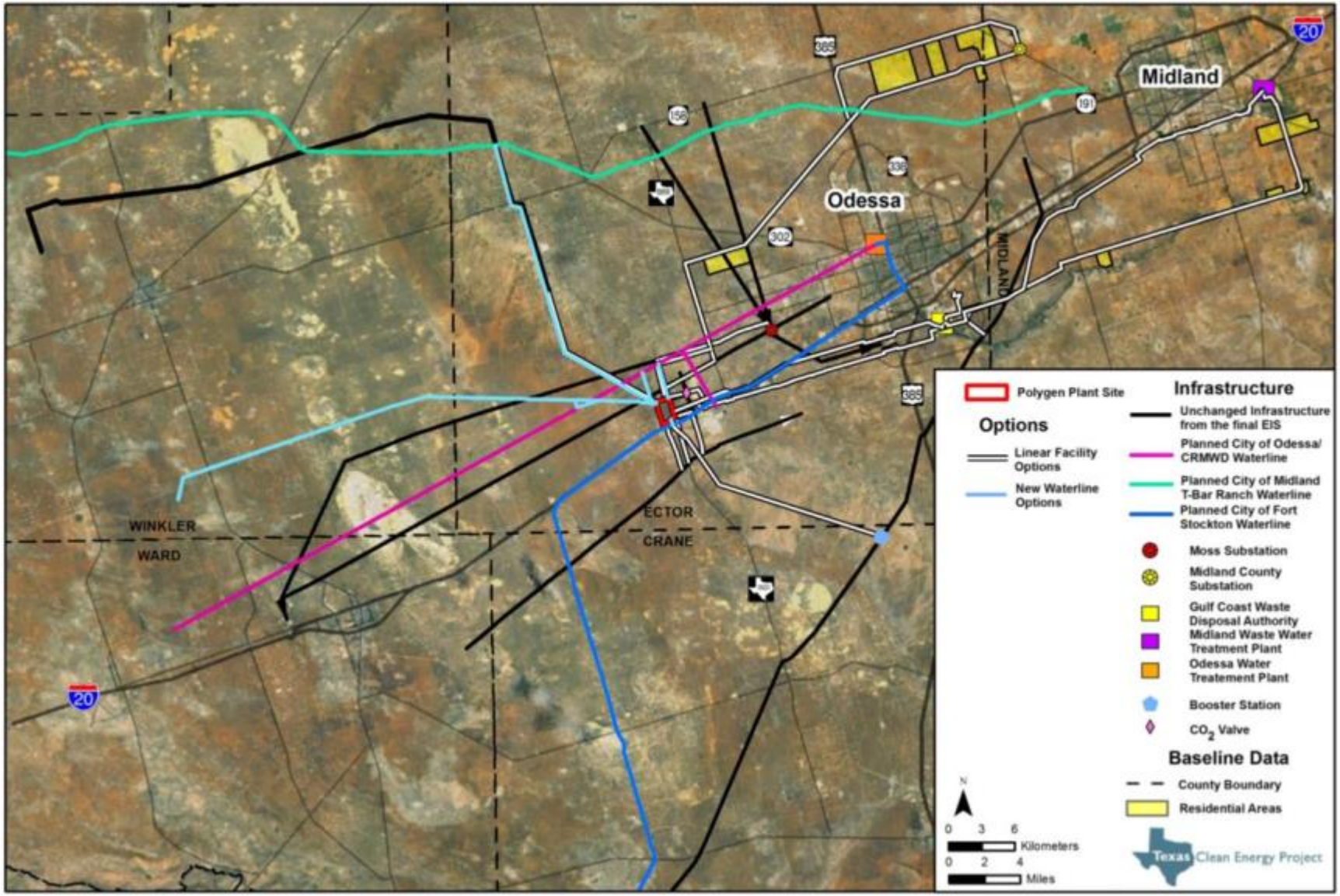

Figure 4.9. Residential areas along the linear facilities.

Table 4.8. New Rights-of-way Acreage Requirements for Summit's New Options.

Linear Facility Option	New ROW Acreage Requirement (ac [ha])	Percentage of Linear Facility Option Requiring New ROW (%)
WL7	78.8 (31.9)	45
WL8	80.6 (32.6)	47
WL9	12.7 (5.1)	100
WL10	12.1 (4.9)	100
WL11	0 (0)	0
WL12	52.7 (21.3)	47
Massey Ranch Well Field	7.0 (2.8)	n/a

Note: Represents the permanent (operational) ROWs, not temporary (construction) ROWs.

None of the new linear facility options would pass through or be adjacent to existing residential areas (see Figure 4.9). In addition, no residential developments are planned near the new linear facilities.

Consistency with Comprehensive Land-Use Plans and Regulations

None of the new linear facilities would pass through lands that are subject to land-use controls (zoning).

Public Access and Recreation Areas

None of the new linear facilities would pass through lands that include public access or recreations areas.

4.2.6 Mitigation

No changes in mitigation have been identified from what is discussed in the EIS.

4.3 Socioeconomics

This section identifies and describes the existing socioeconomic conditions that could be affected by the construction and operation of the polygen plant reconfiguration and new options in Summit's proposed project. For the purpose of this SA, data are presented for new areas only. The same conditions evaluated in the EIS are analyzed in terms of population levels, housing requirements, and economic output.

4.3.1 Region of Influence

The socioeconomic ROI for this SA is Ector and Winkler Counties because TCEP's new proposed facilities and activities are located in these two counties. In terms of affected environment, Ector, County was described in the EIS, therefore only Winkler County is described in this document. Data

relevant to Midland, Crane and Ward Counties were presented in the EIS. The following analysis of potential impacts focuses on Winkler County only.

4.3.2 Methodology and Indicators

The same methodology, data sources, and indicators used for the EIS are used for the SA.

4.3.3 Affected Environment

4.3.3.1 DEMOGRAPHICS

Population in Winkler County was 6,933 in 2010, down 3.3 percent from 7,173 in 2000. The population is expected to grow by over 16 percent between 2010 and 2020, but remain relatively flat between 2020 and 2040. Population projections for 2020, 2030, and 2040 for Winkler County are presented below in Table 4.9.

Table 4.9. Current and Projected Population in Winkler County, the Socioeconomic Region of Influence covered by this SA.

Location	2010 Population	2020 Projected Population	2030 Projected Population	2040 Projected Population	Percentage Change
Winkler County	6,933	8,044	8,048	7,951	14.68%
Texas	25,145,561	28,005,740	31,830,575	35,761,165	42.2%

Source: U.S. Census (2010)

4.3.3.2 HOUSING

Using American Community Survey (ACS) estimates for housing data for 2010 (based on data between 2005 and 2009), the vacancy rate for Winkler County was higher than for the state of Texas. There were over 500 vacant homes in the county in 2010. Median home values in Winkler County were much lower ($80,000 less) than the state in 2010. Total housing units and occupancy rates are presented below in Table 4.10.

Table 4.10. Estimates of Total Housing Units and Occupancy Rate (based on ACS 2005–2009).

Location	Total Housing Units	Occupied	Percentage Occupied	Vacant	Percentage Vacant	Median Home Value
Winkler County	3,074	2,521	82.0%	553	18.0%	$38,900
Texas	9,407,692	8,268,046	87.9%	1,138,646	12.1%	$118,900

Source: U.S. Census (2010)

4.3.3.3 ECONOMICS

As in the EIS, economic factors considered in this supplement analysis include gross domestic product (GDP), industry employment, and taxes and revenues.

Gross Domestic Product

As discussed in the EIS, GDP is the contribution of private industry and government to the ROI's output. GDP, or value added, is equal to the gross output (which consists of sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate inputs (which consist of energy, raw materials, semi-finished goods, and services that are purchased from domestic industries or from foreign sources). The top ten industries in terms of GDP in Winkler County are presented below in Table 4.11.

Economic output associated with petroleum refiners, support activities for oil and gas, and extraction of oil and gas dominate among revenue generating sectors in Winkler County.

Table 4.11. Gross Domestic Product in Winkler County; Top Ten Industries.

Sector	Gross Domestic Product
Petroleum refineries	$275,140,200
Support activities for oil and gas operations	$178,768,000
Extraction of oil and natural gas	$71,479,220
Commercial and industrial machinery and equipment rental and leasing	$32,623,840
Imputed rental activity for owner-occupied dwellings	$23,391,120
Employment and payroll only (state and local government, education)	$16,853,810
Transport by pipeline	$15,646,290
Real estate establishments	$15,436,650
Construction of new nonresidential commercial and health care structures	$14,487,960
Transport by truck	$14,152,980

Source: IMPLAN (2008)

Industry Employment

Total employment in the County was over 2,800 in 2009. The top five employment sectors in Winkler County are presented below in Table 4.12. As with other counties in the ROI, and as discussed in the EIS, the support activities for oil and gas sector dominated area employment. According to the Bureau of Labor statistics, unemployment in Winkler County in 2010 was 7.9 percent, compared to 8.1 percent for the state.

Table 4.12. Employment by Industry (number of jobs).

Sector	Number of Jobs
Support activities for oil and gas operations	581
Employment and payroll only (state and local government, education)	318

Table 4.12. Employment by Industry (number of jobs).

Sector	Number of Jobs
Employment and payroll only (state and local government, non-education)	237
Extraction of oil and natural gas	114
Food services and drinking places	111
Construction of new nonresidential commercial and health care structures	99
Transport by truck	96
Retail Stores - Food and beverage	72
Construction of new residential permanent site single- and multi-family structures	70
Commercial and industrial machinery and equipment rental and leasing	70

Source: IMPLAN (2008)

Taxes and Revenues

Winkler County levied $10.5 million in property taxes in 2009, based on a 0.667 property tax rate. As reported in the EIS, property taxes are paid into three county government general funds: the general fund, the farm-to-market roads and flood control fund, and the road and bridge fund.

4.3.4 Environmental Impacts of Summit's Changes

Social and economic impacts to demographics, housing, and economics, expected from construction and operation of the waterline as an ancillary feature to the polygen plant were analyzed in the EIS. The EIS includes the analysis of six potential waterline routes. The primary difference between waterline alternatives considered in the EIS and this SA is the location of the new waterlines options (WL7, WL8, WL9, or WL10) that extend into Winkler County. Construction and operation of the new waterline options do not represent activity expected to generate significant additional employment, GDP, or taxes beyond what was analyzed in the EIS. The primary difference is that a small portion of economic activity would be distributed in Winkler County. However, the workforce associated exclusively with the proposed new options is expected to be so small as to not have a meaningful change in impacts beyond what was analyzed in the EIS.

No change in the number of construction workers or in relocation of workers are expected to result from the polygen plant reconfiguration. There may be a de minimus change in the proportion of local hires versus non-local hires due to the increase in workforce associated with the oil gas industry boom that started around 2010-2011 in Ector and Midland counties. While the quantities of products may change slightly as a result of the new configuration, this should not adversely affect the associated markets in any greater degree than was identified in the EIS.

4.3.4.1 DEMOGRAPHICS

As expressed above, no meaningful change in demographics is expected if the chosen waterline and water supply are located in Winkler and Ector Counties. Additionally, the EIS reports that there was an adequate existing workforce for project construction, and almost no need for highly skilled workers to relocate to the area. Therefore, no impacts to existing population levels are expected. The possible location of the chosen waterline and new water supply in Winkler County is not expected to increase the county's population or alter the county's prosperity level with regard to demographics.

4.3.4.2 HOUSING

As above, no meaningful change in impacts to housing is expected if the chosen waterline and water supply is located in Winkler and Ector Counties. The EIS reports for the areas covered that there was an adequate existing workforce for project construction and therefore no need for additional area housing. The EIS also reports that for operations, there was adequate housing vacancies and inventory to satisfy project needs. The possible location of the waterline and well field in an alternate area of the County is not expected to change the findings of the EIS with regard to housing.

4.3.4.3 ECONOMICS

As above, no change to the economic output (GDP, employment, taxes, and revenues) of the new options is expected beyond what is presented in the EIS; the overall GDP would be the same; however, impacts would be distributed across a bigger ROI, which now includes Winkler County.

The City of Odessa is partially dependent on TCEP as a customer to maintain viability of their chosen water supply alternative, whether it would be the Ward County water supply alternative, the Pecos County water supply alternative, or purchasing water from the CRMWD's water supply project. As of 2012, the CRMWD would charge the City of Odessa $2.20 per 1,000 gal (3,785 L) of water, totaling $40.5 million annually, whereas the City of Fort Stockton would charge between $4.70 and $5.25 per 1,000 gal (3,785 L) of water, totaling up to $95.8 million annually (Fort Stockton Pioneer 2012). Therefore, either entity could benefit from the sale of water to the City of Odessa, although the extent of benefit remains unknown at this time. The City of Odessa would finance their project in part through the sale of water to the TCEP, which would alleviate some of the taxable burden on Odessa citizens. Citizens in the Odessa area would pay a higher cost for a new water supply if the TCEP does not use the city's proposed new water supply (regardless of whether it comes from Ward County or Pecos County). TCEP's contribution in sharing the costs remains unknown at this time because no agreement has been reached.

4.3.5 Mitigation

No changes in mitigation have been identified from what is discussed in the EIS.

4.4 Environmental Justice

4.4.1 Region of Influence

As with the socioeconomics analysis, the ROI for the supplement analysis of environmental justice is Ector, Ward, and Winkler Counties and associated census tracts, because the new linear facilities

are located in these three counties. Ector and Ward Counties' socioeconomic conditions are described in the EIS, and therefore, only Winkler County is described in this SA. There are three census tracts in Winkler County (Census Tracts 9502, 9503, and 9504); the portion of the project that lies within Winkler County is physically located in Census Tract 9504 (see Figure 4.10). Note that no changes to environmental justice issues are expected to result from the polygen plant reconfiguration.

4.4.2 Methodology and Indicators

As in the EIS, this analysis assesses the presence and percentage of minority populations and/or low-income populations in the ROI and determines whether those communities would experience disproportionately high and adverse impacts as a result of the new waterlines and water supplies associated with the TCEP. The same data sources, indicators, and definitions of minority communities and low-income populations are employed in this SA.

4.4.1 Affected Environment

Minority Communities

Two of the three tracts in Winkler County have a minority population that exceeds the state's minority population level (27 percent); Tracts 9502 and 9503 are more than 50 percent Hispanic or Latino.

Low-income Populations

According to the Current Population Report of 2000, the national poverty rate in 2000 was 11.3 percent (U.S. Census Bureau 2000). In the ROI, no tract includes more than 50 percent of individuals or families living below the national poverty level. Specifically, 15.6 percent of the individuals in Winkler County are below the national poverty level, which is 4.3 percent higher than the national poverty rate.

4.4.2 Environmental Impacts of Summit's Changes

Two of the three census tracts in Winkler County are minority and/or low-income communities. These are Census Tracts 9502 and 9503. In terms of air quality, project emissions during construction and operation would not contribute to exceedances of NAAQS and would not be expected to cause significant air quality or human health impacts. No long-term impacts to surface water or ground water are anticipated as a result of the new activities.

Short-term beneficial impacts to environmental justice communities could include an increase in employment opportunities and potentially higher wages or supplemental income through jobs created during facilities construction. No disproportionately high and adverse impacts would occur to low-income or minority populations as a result of the new linear facilities associated with TCEP's construction operations.

4.4.3 Mitigation

No changes in mitigation have been identified from what is discussed in the EIS.

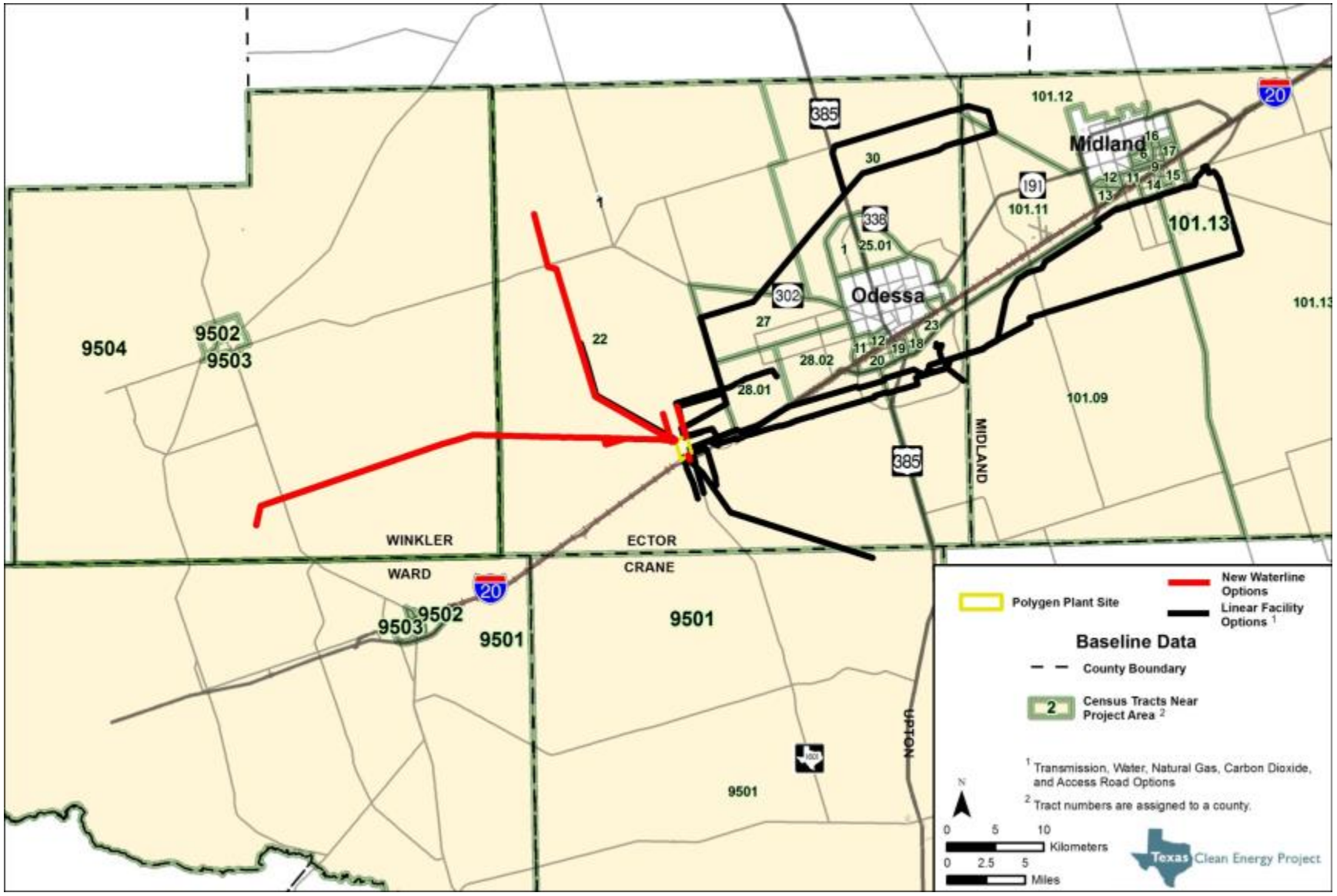

Figure 4.10. Census tracts in the region of influence.

4.5 Utility Systems

4.5.1 Background

This section identifies and describes utility systems that could be affected by the construction and operation of the new options in Summit's proposed project. This section also presents the environmental impacts associated with the proposed new options. Note that no changes to utility system impacts are expected to result from the polygen plant reconfiguration.

4.5.2 Region of Influence

The ROI for utility systems has expanded to include the new linear facilities and the Massey Ranch well field. The utility systems ROI in this SA consists of 1) the proposed and existing infrastructure that provides process water to nearby existing users and that would provide service to the proposed project; and 2) the pipelines, transmission lines, and other utility lines that lie in or across the foot print of the new options in Summit's proposed project.

4.5.3 Methodology and Indicators

The same methodology, data sources, and indicators used for utility systems in the EIS are also used here in the SA.

4.5.4 Affected Environment

4.5.4.1 PROCESS WATER

Existing water sources in West Texas are used for a variety of activities related to oil and gas extraction, agriculture and livestock use. While the Massey Ranch waterline and the City of Odessa's two waterline alternatives from Ward and Pecos Counties are still in the design stages, both the CRMWD and the City of Midland's T-Bar Ranch waterlines are functioning and operational. Discussion of the affected environment of these current and proposed systems are below.

Primary Water Sources

Primary process water required for the TCEP, as shown in Figure 2.3, could come from the following three new potential sources:

- WL7 and WL8 would receive brackish ground water from a newly constructed well field on the privately owned Massey Ranch.
- WL9 and WL10 would receive brackish ground water from the City of Odessa's Ward County water supply. The mainline is proposed to be built by the City of Odessa at the North Ward County well field where it will be treated prior to transport to the city's existing water system.
- WL11 would receive brackish ground water from the City of Odessa's Pecos County water supply. The mainline is proposed to be built by the City of Odessa mostly along existing road ROWs from the Belding Area, southwest of the City of Fort Stockton in Pecos County, where it will be treated prior to transport to the City of Odessa's existing water system.

Existing conditions for each primary water supply option are described below.

The Massey Ranch water supply option (WL7 and WL8) would be built solely for TCEP use and would supply the approximately 7 million gal (26.5 million L) per day of raw water required by the polygen plant. The Massey Ranch well field would be located near the former Chevron USA O'Brien Water System, a well-known, high-production well field for producing brackish water (moderately saline and nonpotable) of the Capitan Reef Complex Aquifer spanning Ward and Winkler Counties. Ground water from this aquifer would require desalination and removal of H_2S, along with other treatment at the polygen plant site prior to use. In the 1960s, the O'Brien Water System was capable of producing at a rate of 25.2 million gal (95.4 million L) per day; however, with the significant reduction in demand for water used for water-floods in the oilfields of West Texas, heavy demand for water from this region of the aquifer no longer exists (Smith 2010).

The City of Odessa's Ward County water supply alternative is in the conceptual stages and is currently on hold until the City of Odessa determines whether this alternative or the Pecos County water supply alternative best suits the city's needs. The water source for the City of Odessa's Ward County water supply would be the Capitan Reef Complex Aquifer, located below the CRMWD's source aquifers in the Pecos Valley Alluvium and Dockum Formation. Ground water from this region of the aquifer is brackish and would require desalination, H_2S removal, and additional treatment prior to use in the TCEP. If developed by the City of Odessa, this water supply alternative would use the same 42-mi (68-km) pipeline corridor and well field location as the CRMWD's water supply project, which was completed in 2013.

Currently in the developmental stage, the City of Odessa's Pecos County water supply alternative has been proposed to provide drinking water to the City of Odessa from an alternate source that would require less desalination and treatment. The water source would be the Capitan Reef Complex Aquifer in Pecos County. The proposed site of the well field was tested during 2013 to determine its ground water quality and yield. Initial results of the proposed project's test well indicated low TDS in the water (1,040 to 1,050 ppm [Water Quest, Inc.]), which could require substantially less treatment, brine disposal, and possibly even a lesser source water quantity required for the TCEP than other supply options. In addition, initial test results indicated enough water to meet the City of Odessa's, and particularly TCEP's, water demand (Morton 2013; Water Quest, Inc. 2013a; 2013b). Further testing is necessary to determine the aquifer characteristics across the well field.

Backup Water Sources

Backup process water planned for the TCEP in the event the primary water supply is not yet operational when TCEP begins its commissioning could come from the following two potential sources:

- WL9 and WL10 could also be used to receive brackish ground water from the CRMWD's mainline, which extends from CRMWD's North Ward County well field to the Odessa Water Treatment Plant.

- WL12 would convey brackish ground water from the City of Midland's T-Bar Ranch mainline, which spans Winkler and Ector Counties.

Existing conditions for each backup water supply option are described below.

The CRMWD's water supply (also accessible to the TCEP using WL9 and WL10) would provide a temporary and backup supply to the TCEP from its mainline recently constructed from their newly expanded North Ward County well field located in Ward County. The CRMWD's project was completed in May 2013 and includes 21 new wells in Ward County and four new pump stations. CRMWD is using this system solely as an emergency source of water if their surface supply runs dry. This supply is expected to have sufficient water to meet the TCEP's demand as a backup or short-term water supplier (Morton 2013). The water sources for the CRMWD's project include the Pecos Valley Alluvium and Dockum Aquifers. Source water from the CRMWD's project would require treatment to meet TCEP's specifications. The CRMWD currently provides raw water from three reservoir lakes and five well fields to the Cities of Odessa, Midland, Big Spring, and certain other municipal and non-municipal customers. The new CRMWD water supply project would increase CRMWD's existing delivery capacity of 28 million gal (106.0 million L) per day (CRMWD 2012) by 30 million gal (113.6 million L) per day of raw water.

The City of Midland's T-Bar Ranch water supply (accessible to the TCEP via WL12) would provide a temporary and backup water supply to the TCEP from its mainline that spans Winkler County to Midland County. This option would have sufficient water to temporarily meet the TCEP's demand as a backup or short-term water supplier. Source water from the City of Midland's T-Bar Ranch would require treatment to meet gasifier manufacturer specifications. The City of Midland plans to initially pump 10 million gal (37.8 million L) per day from 21 wells spanning the 22,000-ac (8,903-ha) T-Bar Ranch, with an increase up to 38 million gal (143.8 million L) per day after its CRMWD contract expires in 2029. The project became operational in December 2013, though water quality issues with arsenic are already evident. The City of Midland has purchased additional water rights to the south of their current well field and is working with the Midland County Fresh Water Supply District Number 1 to design a well that would tap into the Capitan Reef Complex Aquifer at this location. The city plans to desalinate the Capitan Reef Complex water on site and blend it with their current supply from the Pecos Valley Alluvium to reduce arsenic levels prior to transport to Midland.

4.5.4.2 TRANSMISSION LINES

There several unnamed power lines that would intersect the new waterline routes. WL7 and WL8 would intersect existing Oncor transmission lines located 15.2 mi (24.5 km), 7.2 mi (11.6 km), and 0.9 mi (1.4 km) away from the proposed polygen plant site. WL9 and WL10 would intersect an existing Oncor transmission line located 0.5 mi (0.8 km) and 0.6 mi (1.0 km) away from the proposed polygen plant site, respectively. WL12 would intersect existing Oncor transmission lines located 12.5 mi (20.2 km), 8.9 mi (14.3 km), 3.2 mi (5.2 km), and 0.6 mi (1.0 km) away from the proposed polygen plant site. WL11 and the water well sites at Massey Ranch would not intersect any existing Oncor transmission lines.

4.5.4.3 NATURAL GAS PIPELINE

One natural gas pipeline would intersect two of the new waterline routes (WL7 and WL8), approximately 22.8 mi (36.7 km) to the northwest of the polygen plant site.

4.5.4.4 CARBON DIOXIDE PIPELINE

No CO_2 pipelines are currently located along any of the new waterline option routes.

4.5.5 Environmental Impacts of Summit's Changes

4.5.5.1 CONSTRUCTION

Existing utilities infrastructure could inadvertently be damaged or have service disrupted during construction of the new linear facilities. The ROWs for the new linear facilities would include intersections with existing potable water and sewer lines, overhead or buried transmission lines, gas utility lines, fiber optic cables, and other utility system facilities. The potential for inadvertent damage or service disruption during construction would vary based on proposed construction methods and proximity of the proposed linear facility to existing utility systems, but would be greatest during trenching activities. Summit would work with the owners of the utilities and the owners of oil and gas field collector pipelines to delineate, protect or relocate these facilities, as necessary, to avoid damages caused by the construction and operation of TCEP's chosen options for linear facilities.

All new linear facility ROWs would be of sufficient width and access to allow for the safe construction of TCEP's facilities without interfering with existing utilities. Construction would include controls and prudent construction procedures (e.g., the identification and marking of all existing utility infrastructure in the work areas) to further reduce impacts to existing utilities. Prior to construction, the construction contractor would perform reconnaissance surveys and would record, delineate, and flag the locations of all utility lines in the new linear facility ROWs. During construction, controls such as hand digging of trenches in select areas would decrease the potential for construction equipment, particularly trenching equipment, to sever or damage existing underground lines.

Table 4.13 provides estimates of the numbers of intersections between each new waterline and existing pipelines and roadways.

Table 4.13. Intersections between Summit's New Options and Existing Utility Systems.

Process Waterlines	Construction Method	Distance (mi [km])	Number of Known Pipeline ROW Crossings*	Number of Transportation ROW Crossings
WL7	Machine trenching would be used in areas that do not intersect existing utility lines.	28.8 (46.3)	9	2
WL8	Machine trenching would be used in areas that do not intersect existing utility lines.	28.5 (45.9)	9	2
WL9	Machine trenching would be used in areas that do not intersect existing utility lines.	2.1 (3.4)	3	0
WL10	Machine trenching would be used in areas that do not intersect existing utility lines.	2.0 (3.2)	2	0
WL11	Machine trenching would be used in areas that do not intersect existing utility lines.	0.3 (0.5)	3	3

Table 4.13. Intersections between Summit's New Options and Existing Utility Systems.

Process Waterlines	Construction Method	Distance (mi [km])	Number of Known Pipeline ROW Crossings*	Number of Transportation ROW Crossings
WL12	Machine trenching would be used in areas that do not intersect existing utility lines.	18.4 (29.6)	46	2
Massey Ranch Well Field	Construction would include grading and filling of the site and drilling wells.	n/a	0	0

*Several of the identified pipeline ROW crossing types are unknown and/or unnamed.

4.5.5.2 OPERATIONS

Impacts to the existing utility systems associated with the TCEP's process water supply are addressed below. Because no changes to TCEP's transmission line, natural gas line, or CO_2 pipeline options, their capacities, or these systems' infrastructures have occurred since the final EIS was published, no further discussion on the impacts to these utility systems is warranted.

Waterline Options 7 and 8

Under this option, Summit would withdraw, treat, and transport brackish ground water from the Capitan Reef Complex Aquifer beneath Massey Ranch in Winkler County. Six production wells and one pump station would be installed by Summit for this water supply option. The waterline options, WL7 and WL8, would be new pipelines constructed by Summit. This water supply would not directly affect water supply services to others.

Waterline Options 9 and 10

Under these options, TCEP's process water would be obtained from the City of Odessa's proposed Ward County water supply project. The viability of the City of Odessa's Ward County water supply project could be dependent on the sale of water to the TCEP in an effort to finance the City's water project for municipal use. TCEP's use of water from this system could beneficially impact the City of Odessa's existing water supply as it would enable the city to fund a supplemental water supply at a lower financial burden to its citizens. Citizens in the Odessa area using the existing municipal water supply would benefit from a new water supply only at higher costs if the TCEP does not use the city's proposed new water supply. Summit's coordination and contracting with the City of Odessa would allow for the TCEP's water demand to be accommodated by this new proposed system. TCEP's use of water from this system is not expected to impact the city's existing water treatment plant because a new desalination plant would be required at the well field to treat this water.

The pipeline is planned to transport a maximum of 50 million gal (189 million L) per day. The City of Odessa's Ward County project can meet the City's projected water needs while supplying 14 percent of the total system capacity to the TCEP (Morton 2013). TCEP would use a larger percentage of the system's water initially; however, TCEP's percentage would decrease over time as more wells and infrastructure are brought on line by the City to reach its 50 million gal (189 million L) per day maximum.

If TCEP's WL9 or WL10 option were used to access the CRMWD's Ward County water supply for backup or temporary use, the TCEP would use approximately 12 percent of the capacity of CRMWD's new pipeline until TCEP's primary water source becomes operational. CRMWD is using this system solely as an emergency source of water if their surface supply runs dry. The CRMWD would have sufficient capacity to temporarily meet the TCEP water demand as a backup water supplier without significantly impacting CRMWD's supply to the Cities of Odessa, Midland, Big Spring, and certain other municipal and non-municipal customers (Morton 2013).

Waterline Option 11

Under this option, the City of Odessa's Pecos County project would provide water from a planned mainline extending to the City of Odessa from the Belding Area south of the City of Fort Stockton in Pecos County. As with the Ward County water supply option, the viability of the City of Odessa's Pecos County water supply project could be dependent on the sale of water to the TCEP in an effort to finance its water project for municipal use. Thus, the TCEP's use of water from this system could beneficially impact the City of Odessa's existing water supply as it would enable the city to fund a new water supply at a lower financial burden to its citizens. Citizens in the Odessa area using the existing municipal water supply would benefit from a new water supply only at higher costs if the TCEP does not use the city's proposed new water supply. Summit's coordination and contracting with the City of Odessa would allow for the TCEP's water demand to be accommodated by this new proposed system.

At this time, little is known about the local aquifer yield. Initial results from the Pecos County water supply test well indicate enough water to meet the City of Odessa's, and particularly TCEP's, water demand (Morton 2013; Water Quest, Inc. 2013a; 2013b). Further testing is necessary to determine the specific aquifer yield.

TCEP's use of water from this system is expected to impact the City of Fort Stockton's existing water treatment plant as it would be required to treat the water from the City of Odessa's Pecos County water supply alternative. The Fort Stockton's water treatment plant (RO plant) is currently designed with a maximum daily capacity of 7.0 million gal (26.5 million L) per day with a 7.5 million gal (28.4 million L) storage capacity (City of Fort Stockton 2013). Peak consumption in 2013 is 4.5 million gal (17.0 million L) per day (City of Fort Stockton 2013). The treatment plant sends its RO reject water to its waste water treatment facility to be treated and reused for irrigation purposes (Dominguez 2014). It is not yet known whether a desalination plant would be constructed at the well field or if the existing Fort Stockton RO plant and waste water treatment facility would be upgraded if the well field expanded to exceed the plants' capacities. If this alternative is chosen, Fort Stockton's could likely initially sustain treatment of the additional produced water, but a decision would need to be made as its current capacity would not be able to sustain TCEP's requirement of up to 7.0 million gal (26.5 million L) per day of raw source water in conjunction with the current and future water demands of the City of Fort Stockton.

Waterline Option 12

Under this option, TCEP would obtain temporary and backup water supply from a new system recently constructed by the City of Midland. The City of Midland plans to initially pump 10 million gal (37.8 million L) per day from 21 wells spanning the 22,000-ac (8,903-ha) T-Bar Ranch, with an increase up to 38 million gal (143.8 million L) per day after its CRMWD contract expires in 2029. If Summit chooses this backup water supply option, the TCEP could temporarily use 70 percent of the initial system capacity. However, new or additional wells and treatment capacity could be brought online to provide additional water.

4.5.6 Mitigation

No changes in mitigation have been identified from what is discussed in the EIS.

4.6 Human Health, Safety, and Accidents

4.6.1 Background

This section describes the changes in potential human health and safety impacts that may result from construction and operation of the polygen plant (as reconfigured) and new options to supply water for Summit's proposed project. Primarily, this section addresses occupational and public safety and health impacts that may result from exposure to a hazardous gas and risks to workers and the surrounding community that could result from accidents during construction and operation of the reconfigured polygen plant and the selected new process waterline option (and well field if the Massey Ranch water supply option is chosen).

4.6.2 Region of Influence

The ROI for impacts to human health and safety has expanded to include the reconfigured polygen plant, new linear facilities, and the proposed Massey Ranch well field. The definition of the ROI for impacts to human health and safety has been modified from the EIS to address the potential impacts of gases (e.g., H_2S) for which there is a risk posed by leakages and spills from the new linear facilities and the Massey Ranch well field. This ROI is based on the estimated hazard zone associated with a leak or spill of H_2S. No modeling has been carried out specific to H_2S exposure associated with water supply at the polygen plant site or its linear facilities; however, based on other modeled sites and the *Statewide Rule 36 on Hydrogen Sulfide Safety* (RRC 2012), a worst-case spill scenario could result in hazardous gas concentrations in the air over a down-wind distance of up to 3-miles from a spill site. Such exposure would have the potential to occur along the Massey Ranch water supply pipeline options (WL7—WL8), the proposed Massey Ranch well field, and the City of Odessa Ward County well field, all of which are associated with high H_2S concentrations found in water from the central eastern region of the Capitan Reef Complex Aquifer.

4.6.3 Methodology and Indicators

The analysis of impacts to human health and safety used several indicators to assess type, magnitude, and severity of potential impacts from construction and operation of new options. The potential impact associated with the new options for Summit's proposed project includes H_2S exposure at concentrations at or above OSHA-prescribed limits. Its impact relates to the proximity of sensitive receptors, including workers.

4.6.4 Affected Environment

The potentially affected environment has expanded to include the new options for linear facilities related to water supply and the possible establishment of a new well field at the Massey Ranch. The nature (types and magnitudes) of the health and safety issues are the same as those covered in the EIS; however, the impacted locations have changed or expanded.

4.6.5 Environmental Impacts of Summit's Changes

No changes have occurred to the number or type of sensitive receptors identified in the EIS. In addition, no residences occur within 100 ft (30 m) of the new options for linear facilities associated with the Capitan Reef Complex Aquifer (WL7—WL10). Accidents and human health and safety impacts that may occur as a result of the polygen plant reconfiguration, new linear facilities, and well field are described below.

4.6.5.1 OCCUPATIONAL HEALTH AND SAFETY

The risk to human health and safety posed by the new process waterline options appears to be associated with exposure to H_2S. As discussed in previous sections, water from the Capitan Reef Complex Aquifer associated with the Massey Ranch (WL7—WL8 has been documented to contain a high concentration of H_2S (ARCADIS 2012). A colorless, flammable, and odiferous gas, H_2S occurs naturally in many settings and is frequently found in high concentrations in a variety of settings including natural gas deposits, volcanic gases, and in some ground waters. Frequently, but not always, it is a by-product of anaerobic digestion of organic matter or results from chemical reactions in association with biologic activity. Human exposures can be divided into low-, high-, and very high-level categories. Low-level exposure to H_2S usually produces eye and mucous membrane irritation, whereas high-level and very-high level exposure can be rapidly fatal. H_2S is regulated by the Occupational Safety and Health Administration (OSHA) and has a permissible exposure limit of 20 parts per million (ppm) ceiling concentration and a peak exposure limit of 50 ppm for no more than 10 minutes if no other measurable exposure occurs. Inhalation of concentrations of 500-1000 ppm will cause rapid unconsciousness and death through respiratory paralysis and asphyxiation (USDL 2012).

If the Massey Ranch water supply option (WL7 or WL8) is selected, its source water from the Capitan Reef Complex Aquifer has been documented to contain an increased concentration of H_2S (ARCADIS 2012), which could require the use of an H_2S removal system at the polygen plant site. Additionally, if this option is selected, there is a potential for impacts to health and safety of workers associated with the removal and handling of the H_2S at the polygen plant. All of the water treatment technologies that Summit is evaluating would chemically remove H_2S from the water by converting it to other compounds or elements (Summit 2012). Summit has also reviewed several processes that would release the H_2S from the source water as a gas, but the H_2S would be captured and/or otherwise treated so that risk of exposure to workers is acceptable. Specifically, a preliminary study of various H_2S treatment alternatives was conducted for Summit, in which peroxide oxidation process with a headspace chemical scrubber or an air stripper followed by LOCAT® for offgas treatment were preliminarily recommended for H_2S treatment (CH2M Hill 2012) (see Section 2.1.1.1 for details). Summit would need to measure the actual concentrations of raw water constituents to determine the need for and type of additional treatment processes that would be necessary at the polygen plant. The City of Odessa Water County water supply option (WL9 or WL10) is the only other option sourcing water from the Capitan Reef Complex Aquifer with elevated levels of H_2S; however, water from this option would be treated at the Ward County well field prior to transport to the TCEP. The potential impacts to human health and safety from treatment of the source water at the Ward County well field are being evaluated by a third party separate from this SA and are not subject to DOE control.

As stated in the EIS, it is already expected that TCEP operations would produce and emit H_2S, an odorous compound, in small quantities of fugitive emissions. Depending on the wind direction, even small volumes of H_2S odor could create a nuisance for workers in the vicinity. Although the

likelihood of a larger release is low, such an event would result in odors that could cause discomfort or annoyance to workers and nearby residents. Texas regulates H_2S odors under nuisance laws; upon receipt of an odor complaint, the TCEQ could investigate the odor for frequency, intensity, duration, and offensiveness.

4.6.5.2 TRANSPORTATION SAFETY

No significant changes to the transportation of coal to the polygen plant are expected as a result of the polygen plant reconfiguration, although on an annual basis, there will likely be fewer 150-car trains overall as arrivals are expected to be less frequent in nature and less at regular intervals as anticipated in the EIS. In addition, no changes to the transportation of urea, H_2SO_4, or argon from the polygen plant are expected, although there will be a minor addition of either truck or rail transportation for the newly identified liquid N_2 and $(NH_4)_2SO_4$ by-products. This minor contribution to by-product transport is not expected to be outside of the realm of analysis identified in the EIS, which summarizes that fewer than one fatality (approximately 0.61) would be expected to occur due to the travel of workers during TCEP operations.

4.6.5.3 EXPOSURE TO HAZARDS

If the Massey Ranch waterline option (WL7 or WL8) is selected, workers could be exposed to increased levels of gaseous H_2S during operation of the polygen plant and linear facilities. Exposures to H_2S could result from small fugitive emissions, and, though unlikely, from a large accidental release such as a pipe rupture. Any accidental H_2S release would not result in a contaminated site or spill as defined by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) because H_2S spills would quickly dissipate. Spill prevention and mitigation measures would be developed pursuant to various laws and regulations and would likely include worker safety programs. Worker safety programs typically specify that workers are aware of, and trained in, spill control procedures and related health, safety, and environmental protection policies.

4.6.5.4 POLYGEN PLANT RISK ANALYSES

As stated in the EIS, the highest level of fire risk in the TCEP would result from processes involving the production and transfer of syngas. Under the polygen plant reconfiguration, the overall amount of syngas produced will decrease from what was identified in the EIS. This decrease accounts for a decrease to the power block, a decrease to the combustion turbine, and a slight increase to the ammonia/urea synthesis unit. There may minor changes in components associated with the transfer of syngas to the ammonia/urea synthesis unit to account for this increase in syngas usage (i.e., possibly a slightly larger pipeline). Overall, the risks for fatality posed by potential releases of flammable, toxic, and asphyxiant gases from the proposed TCEP would still remain low and would be similar to the risks as described in the EIS.

The quantities of hazardous materials handled at the reconfigured plant would not differ substantially from what was analyzed in the EIS. The quantity of syngas handled (the hazardous material that would cause the highest level of fire risk) will decrease between 9 and 27 percent. While the quantity of urea has the potential to increase by up to 25 percent, this remains on the same order of magnitude as what was addressed in the EIS. Ammonia would also increase accordingly. While the hazards associated with each material will change compared to the hazards described in the EIS, all the hazards will remain at magnitudes similar to those stated in the EIS. As within the EIS, the hazards and risks associated with the proposed TCEP would continue to be

similar to those of process plant operations worldwide that handle low concentrations of toxic materials in gas streams with the polygen plant reconfiguration.

Hazardous materials held in storage present the greatest hazards. Quantities of ammonia and urea held in temporary storage would remain the same as described in the EIS, meaning the hazards for these materials would remain the same. Although presenting much less hazard, quantities of coal in storage piles would also remain the same as described in the EIS.

4.6.5.5 MITIGATION

Summit plans to use an H_2S treatment system at the polygen plant site, and has also reviewed several processes that would release the H_2S from the source water as a gas, but the H_2S would be captured and/or otherwise treated. If the Massey Ranch waterline option (WL7 or WL8) is selected, additional mitigation of risk to workers from exposure to H_2S includes wearing of personal H_2S monitors and/or use of other H_2S detectors.

5 POTENTIAL CUMULATIVE EFFECTS

5.1 Background

This section identifies and describes the cumulative effects that could occur as a result of the construction and operation of the reconfigured polygen plant and new options in Summit's proposed project in combination with other past, present, and reasonably foreseeable future actions.

5.2 Region of Influence

A project's effects can be mapped as "impact zones" or ROIs to facilitate comparison with the effects of other past, recent, and reasonably foreseeable future actions and trends. The ROI for cumulative effects in this SA has expanded to include the new linear facilities and the proposed Massey Ranch well field; no ROI expansion is expected for the polygen plant's reconfiguration. The definition of the various resource ROIs for cumulative effects have not deviated from the final EIS. Figure 5.1 shows the TCEP's ROIs for a number of resources evaluated in the final EIS and the route or general location of the proposed future projects sponsored by other entities.

5.3 Methodology and Indicators

The same analysis methodology and indicators of importance that were used to evaluate cumulative effects in the EIS are also used here in the SA. The identified issues have been classified as potentially having a high, intermediate, or low level of importance, and only those impacts of intermediate or high importance were evaluated.

5.3.1 Reasonably Foreseeable Future Development: Specific Actions and Trends

Reasonably foreseeable future development actions identified in the final EIS include the following: La Entrada Al Pacifico Rail Corridor; Moss 138-kV Transmission Line Project; I-20 Roadway Resurfacing from Pyote to Monahans; Loop 338 Roadway Repair from State Highway 302 to Yukon Road; I-20 Roadway Repair from State Highway 349 to Farm-to-Market Road 1788; Notrees Power Storage Project; and the City of Midland Satellite WWTP. Since the final EIS was published additional transportation projects have been identified by TxDOT as reasonably foreseeable future development actions, including the following: SH 158 Roadway Rebuild from FM 866 to 0.5 mi (0.8 km) west of FM 1936 (2018, Ector County); New Roadway Construction from the Southern end of JBS Parkway to FM 3503 for 0.7 mi (1.1 km) (2016, Ector County); District-wide Pavement Markers Installation (2015-2017, Ector County); Roadway Widening on FM 1788 from SH 91 to SH158 (2015, Midland County); Roadway Widening on Fairgrounds Road from LP 250 to East Pecan Avenue (2015, Midland County); Upgrade of Drainage Structures along I-20 from 1.0 mi (1.6 km) West of FM 1788 to 1.0 mi (1.6 km) East of FM 1788 (2016, Midland County); Roadway Widening and Rehabilitation on FM 1788 from I-20 Service Road to FM 1787 (2017, Midland County); and Roadway Resurfacing on SH 349 from I-20 to CR 140 (2018, Midland County).

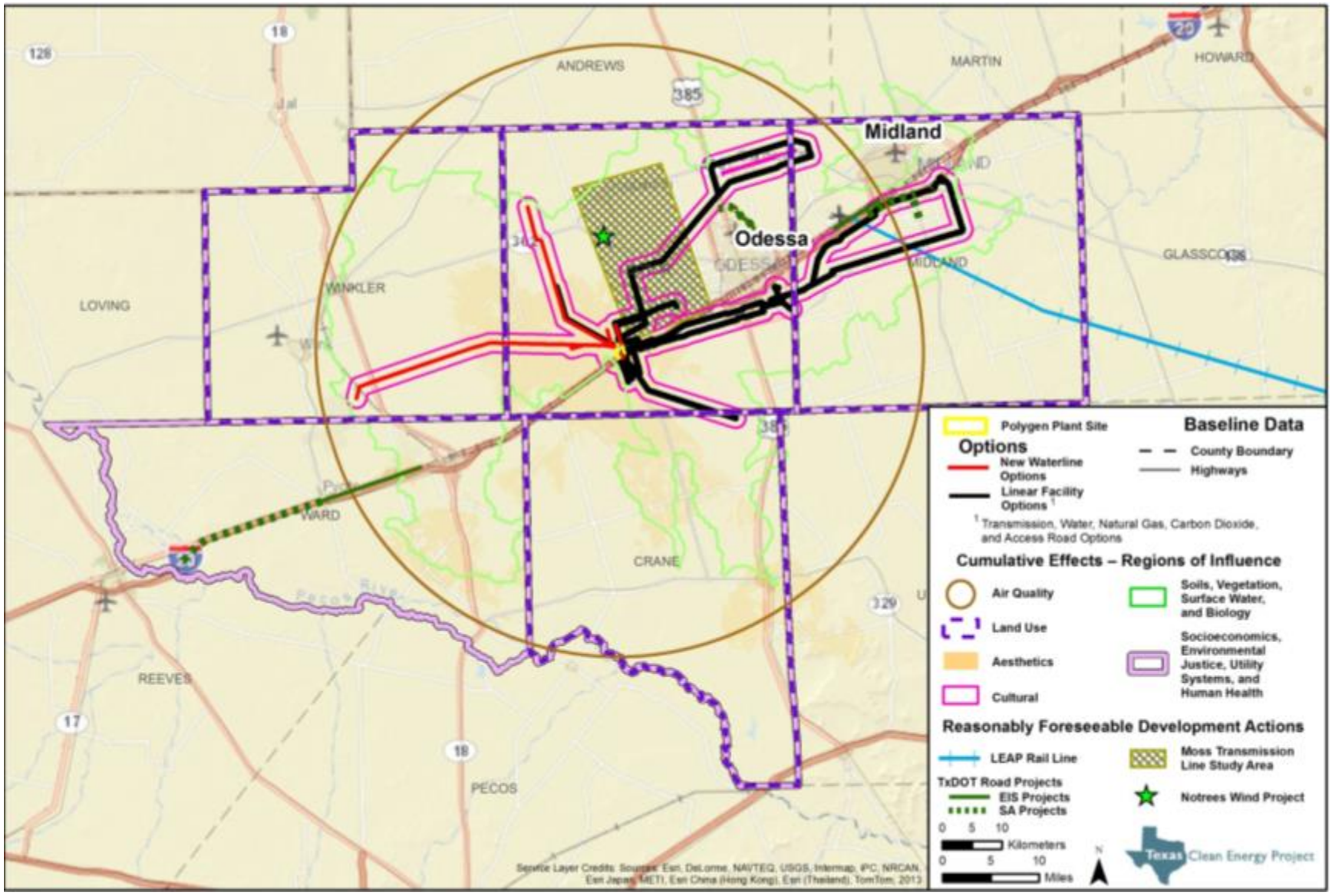

Figure 5.1. Cumulative regions of influence.

In addition, two of the projects associated with the new process waterline options are also considered as reasonably foreseeable future development: the City of Odessa-Ward County waterline project and the City of Odessa-Pecos County waterline project. These projects have been described in Section 2.1.

The City of Midland T-Bar Ranch waterline project and the CRMWD waterline project have already been constructed, are operational, and would not be considered as reasonably foreseeable development; however, they would be considered as past or recent actions and trends that, when combined with the effects from the TCEP, could have a cumulative effect on the surrounding natural and human environment. The City of Midland T-Bar Ranch expansion project into the Capitan Reef Complex Aquifer is also reasonably foreseeable development action. The City of Midland plans to desalinate the Capitan Reef Complex water on site and blend it with their current supply from the Pecos Valley Alluvium to reduce arsenic levels prior to transport to Midland. Little information on the quality of water in this area or the quantity required to increase the quality of its current water supply is available at this time.

After review of federal, state, regional, and local (i.e., the MPGCD) resource management agencies, no other reasonably foreseeable future development actions are known to occur at this time.

5.3.2 Cumulative Effects of Intermediate Importance

In the EIS, the following resources are identified as having cumulative effects of intermediate importance: air quality; soils; mineral resources; biological resources; cultural resources; environmental justice; utility systems; material and waste management; and human health, safety and accidents. Overall, the new components to Summit's proposed project would not add or deter from any of the effects described for all of these listed resources, except for biological and cultural resources. When in combination with the other EIS-identified impacts associated with the TCEP and the reasonably foreseeable projects, the new waterlines would have small areas of temporary and permanent impacts which would cumulatively contribute to wildlife habitat loss and loss or damage to archaeological sites. The Massey Ranch waterline options (WL7 and WL8) would have 526.7 ac (213.1 ha) and 469.8 ac (190.1 ha) of temporary impacts with 175.6 ac (71.1 ha) and 156.6 ac (63.4 ha) of permanent impacts, respectively. TCEP's options for connecting to the City of Odessa's Ward County water supply alternative and/or the existing CRMWD's mainline (TCEP options WL9 and WL10) would have 38.6 ac (15.6 ha) and 36.5 ac (14.8 ha) of temporary impacts with 12.9 ac (5.2 ha) and 12.2 ac (4.9 ha) of permanent impacts, respectively. TCEP's option for connecting to the City of Odessa's Pecos County water supply alternative (TCEP option WL11) would have 6.1 ac (2.5 ha) of temporary impacts with 1.9 ac (0.8 ha) of permanent impacts. TCEP's option to connect to the City of Midland's T-Bar Ranch existing water supply system (TCEP option WL12) would have 334.9 ac (135.5 ha) of temporary impacts and 111.5 ac (45.1 ha) of permanent impacts.

In addition, the Massey Ranch waterline options (WL7 and WL8) pass through small patches of suitable habitat for the dunes sagebrush lizard, a species considered rare by the TPWD (see Section 4.5.4.4). If either of these waterline options is selected, there is potential for the temporary increased disturbance of the dunes sagebrush lizard habitat. The areas identified as habitat are small and isolated and only minor impacts to the dunes sagebrush lizard would be expected to occur during the construction of these waterline options.

5.3.3 Cumulative Effects of High Importance

The following resources are identified in the EIS as having cumulative effects of high importance: climate change and water resources. Although the EIS addressed the TCEP's contribution of GHG and its potential effect on global warming, the new options of Summit's proposed project and the reconfiguration of the polygen plant would not contribute to TCEP's emissions of GHG and would not have an effect on global warming that is different than the emissions and effects contemplated for the waterline and water supply options covered by the final EIS. There would be a small increment of criteria pollutant and GHG emissions related to engine emissions from equipment used in pipeline trenching and construction, in drilling water wells, and from installing and operating water system equipment. Although not quantified, these emissions would be of the same magnitude as the emissions from the trenching and construction activities associated with the Oxy-Permian waterline option or the Midland wastewater option covered in the final EIS.

The new process waterline options would be using ground water from one of the same ground water sources (Oxy-Permian's water system, which taps the Capitan Reef Complex Aquifer in Winkler County) covered in the EIS. However, in light of other recent or reasonably foreseeable projects that use these sources, a discussion of the cumulative effects to water resources is below.

As discussed in the EIS, the TCEP is located in the TWDB Water Planning Region F. As of 2010, approximately 72 percent of current water demand in Region F is associated with agricultural irrigation, with lesser amounts used for municipal, mining, steam electric power generation, livestock watering, and manufacturing purposes. Approximately 70 percent of Region F's existing water supply consists of ground water from the Ogallala, Edwards-Trinity (Plateau), Edwards-Trinity (High Plains), and Pecos Valley Alluvium Aquifers. Based on existing ground water supplies in the region (all aquifers), the TCEP currently has the potential to use approximately 1.4 percent of the annual available ground water, depending on the water source option selected by Summit. This is a 0.5 percent increase from what was identified in the EIS, due to TCEP's revised estimate of the raw water demand of up to 7.0 million gal (26.5 million L).

TCEP's new primary process water options would solely use the brackish Capitan Reef Complex Aquifer. TWDB is still in the process of developing this aquifer's ground water availability model (TWDB 2014). However, a preliminary framework research study was recently conducted by the TWDB and provides the estimated total recoverable storage in Groundwater Management Area (GMA) 3 for the Capitan Reef Complex Aquifer, which is approximately 15,730,000 acre-feet (Jones 2013). The TCEP would require withdrawal of up to 7.0 million gal (26.5 million L) per day of raw water, or 7,842 acre-feet per year, totaling 235,260 acre-feet over the 30-year life of the project. TCEP's consumption of the Capitan Reef Aquifer's water would be approximately 1.5 percent over the life of the project.

In general, this withdrawal of up to 7,842 acre-feet per year for the TCEP could affect the availability and quality of future ground water supplies from this aquifer. In addition, several reasonably foreseeable projects identified by DOE could also produce ground water from this source, which could cumulatively affect the resource's availability and quality.

The Massey Ranch waterline option (WL7 and WL8) would produce from the Capitan Reef Complex Aquifer in southern Winkler County. This option would be built solely to meet the water demand for TCEP's polygen plant. There could be combined, localized impacts to the aquifer if the cities of Midland (via the T-Bar Ranch expansion project in Winkler County) and/or Odessa (from the Ward County water supply alternative) choose options to produce ground water from this aquifer in this

region. If Summit selects this option (requiring 7 million gal (26.4 million L) per day), the City of Odessa selects the Ward County alternative (using a maximum of 50 million gal [189.3 million L] per day), and the City of Midland produces ground water at maximum capacity (using an assumed maximum of 38 million gal [143.8 million L] per day, although the quantity is not yet known), a combined maximum of 95 million gal (360 million L) per day of ground water would ultimately be produced. There would likely be an overall cumulative effect to this ground water source if all three entities produce from this region of the aquifer. If the City of Odessa selects the Pecos County water supply alternative, effects to the aquifer may be lessened as they would be spread out over a greater distance in three counties rather than being concentrated into two counties. To the extent that use of the Massey Ranch ground water supplies for the TCEP caused future users to seek potable water sources elsewhere instead, the TCEP would have an adverse effect on future potable water supplies.

The City of Odessa's Ward County water supply alternative (TCEP options WL9 or WL10) would use the Capitan Reef Complex Aquifer in the North Ward County Well Field. The TCEP could use 9 percent of the maximum capacity of the mainline from this field. If Summit selects this option and the City of Midland's T-Bar Ranch expansion project water supply produces at maximum assumed capacity from this same aquifer, a combined maximum of 88 million gal (333 million L) per day of ground water would ultimately be produced from the Capitan Reef Complex Aquifer. There would likely be an overall cumulative effect in the region to this ground water source. To the extent that use of the City of Odessa's Ward County ground water system for the TCEP caused future users to seek other potable water sources instead, the TCEP would have an indirect effect on future potable water supplies.

The City of Odessa's Pecos County water supply alternative (TCEP option WL11) would also produce from the Capitan Reef Complex Aquifer, but in the Belding Area regulated by the MPGCD, approximately 70 mi (112.7 km) south of the TCEP. The estimated total ground water availability for permitting from this region of the aquifer is approximately 9.8 million gal (37.1 million L) per day (MPGCD 2010). However, initial results from the proposed project's water supply test well suggests the aquifer could easily supply the City of Odessa with its maximum 50 million gal (189 million L) per day demand, which would be sufficient to meet the TCEP water demand (Water Quest, Inc. 2013b; Morton 2013). No other projects have been identified as planned for permitting in this portion of the aquifer; therefore, at this time there appears to be sufficient supply to meet the TCEP demand for treated water, and impacts to this portion of the aquifer would likely be small. A remaining 5.3 million gal (20.1 million L) per day would be currently available to permit for the City of Odessa, which may not be an economically viable option for the city. The Pecos County region of the Capitan Reef Complex Aquifer is recharged from the southern outcrops of the formation (generally in the Glass Mountains area), whereas the Winkler and northern Ward County region of the Capitan Reef Complex Aquifer is recharged from outcrop areas to the northwest in New Mexico. As a result of the different recharge areas, combined pumping in the southern and northern parts of this aquifer by the Cities of Odessa and Midland, respectively, would not likely have cumulative effects. However, both projects could have some degree of cumulative effects with existing users in each region.

The City of Midland's T-Bar Ranch water supply system (TCEP option WL12) would produce primarily from the Pecos Valley Alluvium and potentially the Dockum Aquifer in northwestern Winkler County. This supplier is expected to have sufficient excess water to meet the TCEP's demand on a temporary basis. In this case, TCEP's water use along with the City of Midland's water use, would cause a cumulative draw-down on the Pecos Valley Alluvium Aquifer. This would occur under the monitoring and control of the City of Midland. The City of Midland plans to initially pump

10 million gal (37.8 million L) per day, with an increase of up to 38 million gal (143.8 million L) per day after its CRMWD contract expires in 2029. TCEP's consumption could add up to 7.0 million gal per day to the withdrawals from these two aquifers at this well field.

If Summit selects the Massey Ranch primary water supply, the City of Odessa proceeds with their Ward County water supply, and both suppliers produce ground water at maximum capacity, a combined maximum of 88 million gal (333 million L) per day of ground water would ultimately be produced from the same region of Capitan Reef Complex Aquifer by these two entities. There would likely be an overall cumulative effect to this ground water source if both entities produce from this region of the Aquifer. However, if Midland's T-Bar Ranch increasingly takes water (assumed at a worse case of 38 million gal [143.8 million L] per day) from the Capitan Reef Complex Aquifer and if Summit selects one of the three options that would also produce from the northern region of the Capitan Reef Complex Aquifer, there would likely be an overall greater cumulative effect in this region to the Capitan Reef Complex Aquifer compared to other scenarios. Oxy-Permian already takes water from the Capitan Reef Complex Aquifer at a location a few miles to the south of the T-Bar Ranch well field. To the extent that TCEP's use of the Capitan Reef Complex Aquifer caused future users to seek other potable water sources instead, the TCEP would have an adverse effect on future potable water supplies.

The CRMWD's water system (available via TCEP's options WL9 or WL10) currently produces and would continue to produce from the Pecos Valley Alluvium and Dockum Aquifers in the North Ward County Well Field. This supplier would have sufficient excess supply (TCEP would require 12 percent of CRMWD's supply) to temporarily meet the TCEP water demand until the primary supply is operational. In this case TCEP's water use, along with the CRMWD's water use, would cause a cumulative draw-down on the Pecos Valley Alluvium and Dockum Aquifers. This would occur under the monitoring and control of the CRMWD. DOE is not aware of other users of these two aquifers in this area; thus, no cumulative effects to this source of water are expected to result from the proposed project versus non-CRMWD users in this area. The City of Midland's T-Bar Ranch well field plans to draw water from the Pecos Valley Alluvium Aquifer at a location approximately 25 mi (40 km) to the north-northwest of the City of Odessa's North Ward County Field. The degree of hydrologic interconnection between these two areas of the Pecos Alluvium Aquifer and the nature of the recharge to this aquifer throughout the region is not sufficiently known to assess the potential for cumulative impacts. To the extent that use of the CRMWD ground water supplies for the TCEP caused future users to seek other potable water sources instead, the TCEP would have an indirect effect on future potable water supplies.

6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES AND LOCAL SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

A resource commitment is considered irreversible when impacts from its use would limit future use options and the change cannot be reversed, reclaimed, or repaired. Irreversible commitments generally occur to nonrenewable resources such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity. No changes to the irreversible and irretrievable commitment of resources have occurred since the EIS was published.

A resource commitment is considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for use by future generations until reclamation is successfully applied. Irretrievable commitments generally apply to the loss of production, harvest, or natural resources and are not necessarily irreversible. No changes to the local short-term uses and long-term productivity of the environment have occurred since the EIS was published.

The land that would be committed to develop the proposed TCEP new linear facilities and Massey Ranch well field would include land used for construction staging areas and the footprint of these linear facilities. This land would likely be restricted from some uses during the life of the project, though once the TCEP has been decommissioned and reclaimed, the land would again be available for other uses. Therefore, during the lifespan of the TCEP, land use would experience an irretrievable impact.

The land areas required for the new linear facilities and the proposed Massey Ranch well field would be cleared, graded, and filled, as needed, to suit construction of the project. These actions would result in additional impacts that are irreversible and/or irretrievable. Existing vegetation and soils would be removed, causing mortality of some wildlife, such as burrow-dwelling species and slow-moving species that are unable to relocate when ground-disturbance activities begin. In addition, the vegetation and soil habitats would be lost for future use by wildlife until reclamation could be successfully implemented. The direct mortality of wildlife would be an irreversible impact and the loss of soil (which requires a very long time to generate) would constitute an irreversible and irretrievable resource commitment; however, reclamation would likely include replacing any lost topsoil and not relying on natural soil-producing process. Therefore, it is likely that the soil removal would ultimately be an irretrievable impact but not irreversible.

The clearing and grading actions also pose a risk to cultural resources that may exist at the polygen plant and linear facilities. If cultural resources were discovered during construction, they would be documented and likely relocated from the site. Disturbances to these resources would be considered irreversible.

A small portion of the raw water would become waste water that would be either evaporated in ponds or injected deep underground in suitable formations. Most of the raw water would be converted into process water for the plant. Process water would be used primarily in the cooling towers, which would convert the water to vapor discharges to the atmosphere. Potable water used during construction and operations would be discharged through a septic system. Because the project would not directly discharge any of the water directly back to ground water or surface water, much of this water may be lost to the local area. This would result in an irretrievable

commitment of water resources. In the event a ground water option is used, due to the amount of time required for ground water recharge through the hydrologic cycle, this use could also result in an irreversible commitment of ground water resources. An irreversible commitment of water could also occur for the two temporary water supply options (i.e., taking water from the Pecos Valley Alluvium and Dockum Aquifers), but is unlikely to occur for the permanent water supply options (i.e., the Capitan Reef Complex Aquifer).

Material and energy resources committed for the TCEP would include construction materials (e.g., steel, concrete) and fuels (e.g., coal, diesel, gasoline) With the polygen plant's reconfiguration, less feed stock consumption would mean that the depletion rate of these resources would be lower than was identified in the EIS. All energy used during construction and operation would be irreversible and irretrievable.

Short-term uses of the environment would be associated with construction activities and have been described in Section 4. These include, for example, the use of air and wetlands, as well as the short-term use of land for construction staging areas. Although there are no surface waters that would be impacted by the project, there are wetlands along some of the proposed linear facilities sites that would be disturbed or reduced through land-clearing activities. The disturbance of these wetlands, as well as general vegetation and wildlife habitat along the linear facilities, would be considered short term because they would likely re-establish after the facilities were constructed. Any reductions in wetlands could be long-term or even permanent.

The long-term impacts of land use for the project are described and discussed above in Chapter 4. There would be short-term land use impacts as well. During construction, staging areas and laydown yards would be cleared and made usable. These areas would be reclaimed and restored at the end of the construction phase.

7 CONCLUSIONS

The potential impacts and environmental risks of the polygen plant reconfiguration and additional new options for Summit's proposed project were evaluated and presented in a summary comparison table below (Table 7.1). These potential impacts and environmental risks were found to be similar to those identified in the final TCEP EIS and ROD. Based on these comparisons, the following conclusions can be made:

- Environmental impacts associated with the polygen plant reconfiguration and new options for the TCEP have been evaluated as compared to the proposed project presented in the final EIS (DOE/EIS-0444).

- The polygen plant reconfiguration would replace two Siemens SFG-500 gasifiers with one larger SFG-850 gasifier and an SGT6-5000F3 combustion turbine-generator with an SGT6-8000H combustion turbine-generator. This reconfiguration will result in several changes to the plant design, facility placement, resource requirements, plant processes, primary products, and by-products. The magnitude and composition of the impacts remain similar to those described in the EIS. For example:

    - The reconfiguration would cause a change in the material and feedstock requirements for the polygen plant's construction and operations. Changes in gasifier size, for example, would cause a decrease in the plant's feedstocks (e.g., coal, oxygen) or by-products (e.g., slag, H_2SO_4, captured CO_2) as a result of the lower capacity of the single gasifier unit. Other changes would increase the urea output and electricity to the grid. These changes in feedstocks and products remain within the same magnitude and nature as was stated in the EIS for the original configuration of the plant. The associated environmental impacts also would remain within the same magnitude and nature as those described in the EIS.

    - No changes to the workforce and de minimus changes to transportation are expected. Transportation for coal and most of the polygen plant's by-products would remain the same or would be reduced on an annual basis. New marketable by-products would require additional transportation but on a minor scale. Overall, the quantity and nature of risks are expected to remain approximately the same as those described in the EIS.

    - Plant design and layout would change slightly to accommodate the single SFG-850 gasifier and larger combustion turbine-generator. However, no change in overall impacts to land use, natural resources (e.g., soils, geology, ground water, surface water, vegetation, wildlife), or cultural resources are expected from the reconfiguration.

    - Air emissions would change (e.g., particulate emissions would likely decrease) as a result of the reconfiguration. However, the TCEQ approved air permit limits are not expected to be exceeded or revised upwards. In the EIS, impacts to air quality were analyzed using the maximum allowable air emissions (i.e., the permit limits), and the changes from the reconfiguration are not anticipated to cause greater air emissions or to change stack exhaust gas velocities and

temperatures. Therefore, impacts would not change relative to those described in the EIS. GHGs (e.g., CO_2) would also be reduced on a daily and annual basis due to an increase in combustion turbine-generator efficiency and overall lower fuel use.

- Several new linear facility options and water supply options have been identified and described. Impacts associated with these have been compared to impacts associated with the original options described in the EIS for specific components of the project. While the locations of some impacts have changed (because of the new facilities proposed), the chance, quantity and quality of the impacts remain similar to those described in the EIS. For example:
  - The impacts of building a water supply pipeline to the Massey Ranch and impacts to the Capitan Reef Complex Aquifer in Winkler County, as described in this SA, are very similar to the impacts described in the EIS for the connector pipeline to the Oxy-Permian water line option (WL2) and the usage of Oxy-Permian's water, which comes from the Capitan Reef Complex Aquifer in Winkler County (see Figure 2.3 for locations of these facilities). The Massey Ranch waterline options (WL7 or WL8) would be longer, and would traverse through some sand dune fields which could host the state-listed dunes sagebrush lizard; but this portion of the pipeline would be constructed along the side of an existing road.
  - The impacts of building a connector pipeline to the City of Odessa's Ward County water supply project (WL9 or WL10) would be almost the same as, but less than, the impacts described in the EIS for the connector pipeline to the Oxy-Permian waterline option (WL2); and the usage of the City of Odessa's proposed Ward County well field (tapping the Capitan Reef Complex Aquifer) would have impacts very similar to, and would be located in the same region as, the Oxy-Permian's water well field (see Figure 2.3).
  - The impacts of the City of Odessa's Pecos County water supply alternative and its associated connector pipeline (WL11) has some similarities, but less adverse impacts as compared with the Fort Stockton Holdings (FSH) waterline project and its associated connector pipelines (WL3 or WL4), which were described briefly in the EIS. Now, the City of Odessa is at an impasse in its negotiations with the City of Fort Stockton, so this option appears unlikely to move forward during the time frame of concern for the TCEP to use this water supply.
  - The two temporary water supply options are thought to have a small (non-significant) impact on water availability from these sources, given the duration of water usage should be less than two years. The three associated connector pipelines (WL9, WL10, or WL12) would have impacts similar in location, quality and impacts to linear facility options described in the EIS.
  - The potential for exposure to gaseous emissions of H_2S from the Massey Ranch source water, if a spill occurred, would be approximately the same as for the Oxy-Permian water described in the EIS. The project-related risks would now extend to new locations along the pipeline to Massey Ranch and the Massey Ranch well field.
- The potential environmental impacts from the polygen plant reconfiguration and new options are within the range of environmental impacts presented in the final EIS (DOE/EIS-0444) for the original Proposed Action.

DOE has determined the polygen plant reconfiguration and new options for the TCEP would not constitute a substantial change in action previously analyzed and would not present any new circumstances or information relevant to the environmental concerns and bearing on the previously analyzed actions or impacts, within the meaning of 40 C.F.R. 1502.9(c) and 10 C.F.R. 1021.314. Accordingly, DOE has determined a Supplemental EIS is not required.

Table 7.1. Summary Comparison of Impacts from Summit's New Proposed Waterline Options (WL7-WL12) and the Massey Ranch Well Field for the TCEP.

Resource		Polygen Plant Reconfiguration	WL7	WL8	WL9	WL10	WL11	WL12	Massey Ranch Well Field
Linear Footprint	**Length (mi [km])**	n/a	28.8 (46.3)	28.5 (45.9)	2.1 (3.4)	2.0 (3.2)	0.3 (0.5)	18.4 (29.6)	n/a
	Temporary Disturbance (ac [ha])	n/a	518.0 (209.6)	516.1 (208.9)	38.2 (15.5)	36.4 (14.7)	5.5 (2.2)	334.5 (135.4)	7.0 (2.8)
	Permanent Impact (ac [ha])	n/a	174.5 (70.6)	172.5 (69.8)	12.7 (5.1)	12.1 (4.9)	1.8 (0.7)	111.5 (45.1)	7.0 (2.8)
Air Quality and GHG Emissions		As stated in the EIS, direct impacts from vehicle exhaust and dust-generating activities would occur during construction of the polygen plant and process waterline(s).							
		There would be a minor change in the total quantity, proportions of criteria pollutants, velocities, and temperatures of emitted gases during operation of the reconfigured polygen plant. These changes would fall within the TCEQ-approved air permit.							
Climate		GHG emissions would be reduced on a de minimus basis due to improved combustion turbine-generator efficiency and overall lower fuel use.	No climate impacts to or from construction or operation of the process waterline(s) would occur.						
Soils, Geology, and Mineral Resources		No changes to soil,	Soils: Temporary impacts such as soil disturbance would occur during construction of the process						

Table 7.1. Summary Comparison of Impacts from Summit's New Proposed Waterline Options (WL7-WL12) and the Massey Ranch Well Field for the TCEP.

Resource		Polygen Plant Reconfiguration	WL7	WL8	WL9	WL10	WL11	WL12	Massey Ranch Well Field
		geologic, or mineral resource impacts are expected from the polygen plant reconfiguration.	waterline(s) and/or Massey Ranch well field. See linear footprint areas listed above.						
			Geology: No impacts to geologic resources or from events such as earthquakes, landslides, or subsidence would be expected during construction or operation phases.						
			Mineral Resources: As stated in the EIS, minor obstructions to mineral resource access along the process waterline alignment(s) could occur during construction and operation phases.						
Ground Water Resources		No additional impacts to ground water quantity or quality would occur as a result of construction or operation of the reconfigured polygen plant, process waterline linear facilities, or Massey Ranch well field.							
Surface Water Resources	**Temporary Impacts (ac [ha])**	No changes to surface water impacts are expected from the polygen plant reconfiguration.	0.10 (0.04)	0.10 (0.04)	0	0	0	0.02 (<0.01)	0
			Temporary, short-term impacts during construction activities would be as follows: increased turbidity, sedimentation, streambed disturbance, and stream bank vegetation removal.						
	Permanent Impacts (ac [ha])		0.01 (<0.01)	0.01 (<0.01)	0	0	0	<0.01 (<0.01)	0
			The two ephemeral drainages are considered isolated and nonjuris-dictional and would not require a permit.	The two ephemeral drainages are considered isolated and nonjuris-dictional and would not require a permit.	n/a	n/a	n/a	Based on aerial photo-graphy and similar scenarios, one ephemeral drainage is considered isolated, but it would need to be surveyed if this option was selected.	n/a

Table 7.1. Summary Comparison of Impacts from Summit's New Proposed Waterline Options (WL7-WL12) and the Massey Ranch Well Field for the TCEP.

Resource			Polygen Plant Reconfiguration	WL7	WL8	WL9	WL10	WL11	WL12	Massey Ranch Well Field
Biological Resources (habitat impacts [ac (ha)])	**Terrestrial Species**	**Temporary Impacts**	No changes to biological resource impacts are expected from the polygen plant re-configuration.	518.0 (209.6)	516.1 (208.9)	38.2 (15.5)	36.4 (14.7)	5.5 (2.2)	334.5 (135.4)	7.0 (2.8)
		Permanent Impacts		174.5 (70.6)	172.5 (69.8)	12.7 (5.1)	12.1 (4.9)	1.8 (0.7)	111.5 (45.1)	7.0 (2.8)
	Aquatic Species	**Temporary Impacts**		0	0	0	0	0	0	0
		Permanent Impacts		0	0	0	0	0	0	0
	Migratory Birds*	**Temporary Impacts**		518.0 (209.6)	516.1 (208.9)	38.2 (15.5)	36.4 (14.7)	5.5 (2.2)	334.5 (135.4)	7.0 (2.8)
		Permanent Impacts		174.5 (70.6)	172.5 (69.8)	12.7 (5.1)	12.1 (4.9)	1.8 (0.7)	111.5 (45.1)	7.0 (2.8)
	State-listed Species (Texas horned lizard) *	**Temporary Impacts**		518.0 (209.6)	516.1 (208.9)	38.2 (15.5)	36.4 (14.7)	5.5 (2.2)	334.5 (135.4)	7.0 (2.8)
		Permanent Impacts		174.5 (70.6)	172.5 (69.8)	12.7 (5.1)	12.1 (4.9)	1.8 (0.7)	111.5 (45.1)	7.0 (2.8)
Aesthetics			De minimus changes to the plant design and layout would occur, including an increase in gasifier unit diameter, though this would still be smaller than the two previous gasifier units combined. The changes are not expected to differ	As stated in the EIS, minor, short-term, temporary, adverse impacts during construction activities would occur due to visibility of construction equipment.						

Table 7.1. Summary Comparison of Impacts from Summit's New Proposed Waterline Options (WL7-WL12) and the Massey Ranch Well Field for the TCEP.

Resource		Polygen Plant Reconfiguration	WL7	WL8	WL9	WL10	WL11	WL12	Massey Ranch Well Field
		from the EIS.							
Cultural Resources		No changes to cultural resource impacts are expected from the polygen plant reconfiguration.	No known cultural resources are within the linear facility corridors; one ineligible archaeological site was identified.		n/a	n/a	n/a	n/a	n/a
Land Use	**New ROW Area (ac [ha]) Requirements**	No changes to land use impacts are expected from the polygen plant re-configuration.	78.8 (31.9)	80.6 (32.6)	12.7 (5.1)	12.1 (4.9)	0 (0)	52.7 (21.3)	7.0 (2.8)
	Land-Use Impacts		n/a	n/a	n/a	n/a	n/a	n/a	n/a
Socioeconomics		No additional socioeconomic impacts would occur as a result of the construction or operation of the reconfigured polygen plant, process waterline(s), or Massey Ranch well field.							
Environmental Justice		No disproportionately high and adverse impacts to low-income or minority populations would occur as a result of the construction or operation of the reconfigured polygen plant, process waterline(s), or Massey Ranch well field.							
Community Services		As stated in the EIS, no impacts to community services would occur as a result of the construction or operation of the reconfigured polygen plant, process waterline(s), or Massey Ranch well field.							
Utility Systems	**Number of Known Pipeline ROW crossings**	0	3	3	1	1	2	0	0
	Number of Transportation ROW crossings	0	2	2	0	0	2	3	0
	Utility Impacts	No changes to utility impacts are expected from the polygen plant reconfiguration.	Massey Ranch water supply: No impacts to water treatment utility systems would occur because they would not use existing or planned waterlines owned by others.		City of Odessa-Ward County water supply alternative: The new water system could be strained during the initial startup phase when TCEP demand is approximately 45		City of Odessa-Pecos County Waterline: Little is known about the	City of Midland T-Bar Ranch water supply: The new water system	Massey Ranch water supply: No impacts to water treatment utility systems would occur because TCEP would not use

Table 7.1. Summary Comparison of Impacts from Summit's New Proposed Waterline Options (WL7-WL12) and the Massey Ranch Well Field for the TCEP.

Resource		Polygen Plant Reconfiguration	WL7	WL8	WL9	WL10	WL11	WL12	Massey Ranch Well Field
					percent, but it would decrease over time as more wells and infrastructure are brought on line to reach its daily maximum. The viability of this option could be dependent on the TCEP and benefits to the City of Odessa could occur. <u>CRMWD water supply</u>: CRMWD would have sufficient excess supply to temporarily meet the TCEP water demand without significantly impacting its supply to its customers.		water source capacity. The viability of this option could be depen-dent on the TCEP and benefits to the City of Odessa could occur.	could be strained during the initial startup phase when TCEP demand is 70 percent, but this would be temporary until TCEP's primary source is opera-tional.	existing or planned waterlines owned by others.
Transportation		De minimus changes such as a reduction in annual coal transportation requirements and addition of transportation needs for a small amount of newly identified by-products could occur from the polygen plant reconfiguration.	As stated in the EIS, construction of the process waterline(s) and/or the Massey Ranch well field would cause minor, temporary, and localized congestion at road crossings.						
Materials and Waste Management		With the reduction in overall plant size,	As stated in the EIS, no impacts would occur to supply/demand of materials to construct the process						

Table 7.1. Summary Comparison of Impacts from Summit's New Proposed Waterline Options (WL7-WL12) and the Massey Ranch Well Field for the TCEP.

Resource	Polygen Plant Reconfiguration	WL7	WL8	WL9	WL10	WL11	WL12	Massey Ranch Well Field
	there will likely be a comparable decrease in construction wastes generated and materials committed to the polygen plant.	waterline(s) or Massey Ranch well field. As stated in the EIS, minor impacts to waste collection services and regional disposal capacity would occur during construction of the process waterline(s) or Massey Ranch well field. As stated in the EIS, negligible impacts to waste collection services and regional disposal capacity would occur during operations of the process waterline(s) or Massey Ranch well field.						
Human Health, Safety, and Accidents	Polygen Plant Risk Analyses: There will be a slight decrease in the risk associated with syngas and a de minimus increase in the risk associated with urea and ammonia, though none of these changes differ substantially from what was analyzed in the EIS.	Occupational Health and Safety: Risks of H_2S exposure. Risks and hazards associated with testing of waterline(s) and the operations of the water supply system would be addressed through a worker protection program currently under development by Summit for the TCEP.		Occupational Health and Safety: Risks and hazards associated with construction of process waterline(s) would be addressed through a worker protection program currently under development by Summit for the TCEP.				Occupational Health and Safety: Risk of H_2S exposure. Risks and hazards associated with construction and operation of the Massey Ranch well field would be addressed through a worker protection program currently under development by Summit for the TCEP.
	Transportation Safety: No changes to types of truck or rail transportation hazards are expected for urea, H_2SO_4, or argon,	Transportation Safety: As stated in the EIS, no specific unusual impacts or elevated risks would occur as a result of the construction or operation of the process waterline linear facilities and/or Massey Ranch well field.						

Table 7.1. Summary Comparison of Impacts from Summit's New Proposed Waterline Options (WL7-WL12) and the Massey Ranch Well Field for the TCEP.

Resource	Polygen Plant Reconfiguration	WL7	WL8	WL9	WL10	WL11	WL12	Massey Ranch Well Field
	though there may be slightly fewer coal trains on an annual basis. There also would be a minor addition of either truck or rail transportation for the newly considered marketable Liquid N_2 and $(NH_4)_2SO_4$ by-products.							
		Exposure to Affected Sites: Risk of H_2S exposure at polygen plant, linear facilities, and/or the Massey Ranch well field. Risk during operations of the water supply system could be reduced through spill control and prevention measures.		Exposure to Affected Sites: As stated in the EIS, risk during construction of the process waterline(s) could be reduced through proper due diligence, including conducting a Phase 1 environmental site assessment where needed along ROW sections prior to construction (If necessary) or Phase II environmental site assessments. If necessary, Phase III remedial actions would be performed.				Exposure to Contaminated Sites: Risk of H_2S exposure at well field. Risk during construction and operation of the wells could be reduced through spill control and prevention measures.
Noise and Vibration	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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Appendix A.

Comment Responses on the Draft Supplement Analysis to the Final TCEP EIS

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
1001 Indian School Road NW, Suite 348
Albuquerque, New Mexico 87104

ER 15/0122
File 9043.1

March 4, 2015

VIA ELECTRONIC MAIL ONLY

Cliff Whyte
Director, Environmental Compliance Division
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880

Dear Mr. Whyte:

The U.S. Department of the Interior has reviewed the Draft Supplemental Analysis (SA) for the Final Environmental Impact Statement for the Department of Energy Texas Clean Energy Project, Ector County, Texas [DOE/EIS-0444-SA-1]. In this regard, we have no comment.

Thank you for the opportunity to review this document.

Sincerely,

Stephen R. Spencer, Ph.D.
Regional Environmental Officer

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Chairman-Emeritus
Fort Worth

Carter P. Smith
Executive Director

March 27, 2015

Mr. Cliff Whyte
National Energy Technology Laboratory
P.O. Box 880
Morgantown, WV 26507-0880

RE: Texas Clean Energy Project – Supplement Analysis

Dear Mr. Whyte:

Texas Parks and Wildlife Department (TPWD) has received the supplement analysis (SA) to the Texas Clean Energy Project (TCEP) Final Environmental Impact Statement (EIS). TPWD staff has reviewed the information provided and offers the following information, comments, and recommendations concerning this project.

Previous Coordination

TPWD provided comments on the final EIS on September 5, 2011 and the draft EIS on May 2, 2011.

> **Recommendation:** Please review the above referenced correspondence, as many of the comments and recommendations provided remain applicable to the project as modified.

Changes in the SA

Section 1.6 of the SA states, since the final EIS was published, Summit Texas Clean Energy, LLC (Summit) changed the plant configuration to improve the financeability of the project by reducing plant costs and by increasing the efficiency of the polygen plant. The production and sale of newly identified by-products may also make the project more appealing to investors.

Summit has reconfigured the plant to replace two Siemens SFG-500 entrained flow, oxygen-blown gasifiers with a single larger SFG-850 gasifier. There will be a corresponding change in combustion turbine-generator from an SGT6-5000F3 combustion turbine- generator to an SGT6-8000H combustion turbine-generator. While the gross generating output will remain approximately the same at 400 megawatts (MW), the

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reconfiguration will result in an increase in the electrical output to the grid from 130–213 MW to 140–262 MW on average.

As a result of the reconfiguration, the following changes will occur to resource requirements, plant processes, and by-products: coal input will decrease; urea output will increase; overall syngas production will decrease and will be supplemented with natural gas in the combustion turbine- generator; captured CO_2 will decrease; natural gas required for plant processes will remain approximately the same or slightly decrease; the by-product argon will have new information; the by-products slag and H_2SO_4 will decrease; two newly identified by-products, liquid N_2 and $(NH_4)_2SO_4$, will be added; and emissions from criteria pollutants and GHGs (e.g., CO_2) will decrease.

Additional information has also been gathered from an exploratory well and nearby production wells to support planning for the TCEP's deep well injection option for brine disposal. Although Summit is still exploring the various options, an update on the plans and further consideration of potential impacts is now possible.

To investigate the potential for disposal of brine on site, Summit drilled and tested an on-site exploratory well. Summit's consultant also has gathered information about nearby oil and gas production wells. Although this has assisted Summit with assessing the on-site potential for deep well injection, no decisions have been reached in regard to the number and capacity of injection wells and evaporation ponds for brine disposal.

In addition, new pipeline options have emerged since the final EIS was published. Six new delivery options from three new primary water supply sources, and two new backup water supply sources, are evaluated for the TCEP in this SA.

Primary water supply options:

- Capitan Reef Complex Aquifer ground water from Summit's proposed Massey Ranch well field (water lines WL7 and WL8)

There are two waterline options that could provide source water to the TCEP from the Massey Ranch well field through a new 36-inch diameter maximum pipeline. WL7 would be approximately 28.8-miles in length and require approximately 13.0-miles of new right-of-way (ROW). WL8 is essentially the same as WL7 with the exception of a 0.3-mile shortcut to allow for a shorter,

more efficient pipeline if land access is granted. WL8 would be 28.8-miles in length and require 13.3-miles of new ROW.

- Capitan Reef Complex Aquifer ground water from the City of Odessa's (Odessa) proposed Ward County well field (water lines WL9 and WL10)

Currently in the conceptual stages, the Odessa Ward County water supply project has been proposed to provide drinking water to the City of Odessa. This project could provide water to TCEP via one of two potential 36-inch diameter maximum connector pipelines. Summit could construct a 2.1-mile long connector pipeline (WL9) from the northwest corner of the polygon plant site to the Odessa Ward County waterline. Alternatively, Summit could construct a 2.0-mile long connector pipeline (WL10) from the northeast corner of the polygon plant site to the Odessa Ward County waterline. Both connector pipeline options would require new ROW.

- Capitan Reef Complex Aquifer ground water from the City of Odessa's proposed Pecos County well field (water line WL11)

Also in the conceptual stages, the Odessa Pecos County water supply project is a second alternative for providing a significant drinking water source to Odessa. Under this alternative, Odessa would provide water to the TCEP through a 36-inch diameter maximum connector pipeline (WL11) that would tie into the proposed 93-mile main line transporting ground water from Pecos County to Odessa. Summit would construct 0.3-mile long connector pipeline along FM 1601 at the southern corner of the polygen plant site. The connector pipeline would connect to the proposed Pecos County waterline within the existing ROW of I-20.

Backup water supply options:

- Pecos Valley Alluvium Aquifer ground water from the City of Midland's T-Bar Ranch well field, currently in production (water line WL12)

Under this option, The City of Midland (Midland) would make available to the TCEP a temporary backup water supply from Midland's existing 76-mile long main line, which spans from Winkler County to Midland County. Summit would construct a 36-inch diameter maximum connector pipeline (WL12) to convey water from the T-Bar Ranch main line to the TCEP. This would require construction of an 18.4-mile pipeline going north from the northwest corner of the polygen plant site and then along the corridor of an

existing Oxy-Permian waterline. Approximately 8.7-miles of new ROW would be required.

- Pecos Valley Alluvium and Dockum Aquifer ground water from the Colorado River Municipal Water District's (CRMWD) well field, currently in production (water lines WL9 and WL10)

Under this option, CRMWD would provide a temporary backup water supply to the TCEP by of one of two potential 36-inch diameter maximum connector pipelines (WL9 and WL10) that would connect to CRMWD's existing 42-mile long main water line from their North Ward County well field. Summit could construct a 2.1-mile long connector pipeline (WL9) from the northwest corner of the polygon plant site to the North Ward County waterline. Alternatively, Summit could construct a 2.0-mile long connector pipeline (WL10) from the northeast corner of the polygon plant site to the North Ward County waterline. Both connector pipeline options would require new ROW.

Federal Laws

Endangered Species Act

Federally-listed animal species and their habitats are protected from "take" on any property by the Endangered Species Act (ESA). Take of a federally-listed species can be allowed if it is "incidental" to an otherwise lawful activity and must be permitted in accordance with Section 7 or 10 of the ESA. Federally-listed plants are not protected from take except on lands under federal/state jurisdiction or for which a federal/state nexus (i.e., permits or funding) exists. Any take of a federally-listed species or its habitat without the required take permit (or allowance) from the U.S. Fish and Wildlife Service (USFWS) is a violation of the ESA.

Formerly Proposed for ESA Listing: Dunes sagebrush lizard *(Sceloperus arenicolus)*

In section 4.5.4.4 of the SA it states that all potential areas of Dunes sagebrush lizard (DSL) habitat were surveyed during the site visit.

In December 2010, the DSL was proposed for federal listing under the ESA. Since that time, the USFWS has received new information regarding suitable and occupied habitat for this species, and voluntary conservation measures (discussed below) have been established. Based on these efforts, on June 13, 2012, the USFWS determined the DSL is no longer in danger of extinction. However, the USFWS will closely monitor the conservation measures to

ensure they are being implemented and effectively address identified threats. The USFWS can then reevaluate whether the DSL requires protection under the ESA.

A voluntary conservation program has been created to protect suitable habitat for the DSL and minimize adverse impacts from development. In February 2012, the USFWS approved the Texas Conservation Plan for the Dunes Sagebrush Lizard, which was developed in consultation with the USFWS, the Texas Comptroller of Public Accounts, TPWD, and several other agencies. This plan can be found at http://www.texasahead.org/texasfirst/esaltaskforce/priority/pdf/DSLPlan021312.pdf. The goal of the Texas Conservation Plan is to facilitate continued economic activity in this region and to promote conservation of the DSL in compliance with the ESA for covered activities.

As stated in section 4.5.4.4 of the SA and seen on the attached map, the proposed Massey Ranch to TCEP waterline crosses habitat that has a very high likelihood of occurrence of the DSL. Potential adverse impacts to this species could include removal, fragmentation, and destabilization of sand dune shinnery oak habitat during the construction of the proposed waterline.

Recommendation: TPWD recommends Summit avoid adverse impacts to the DSL and suitable DSL habitat in implementing this project. If total avoidance is not possible during waterline route selection, TPWD recommends Summit review the Texas Conservation Plan and contact the plan administrator, Jason Brooks, at (432) 813-5809 regarding enrollment in the plan and specific mitigation requirements.

TPWD also recommends implementation of the following conservation measures within suitable DSL habitat:

- To minimize additional fragmentation of habitat, maximize use of existing developed areas and ROW
- Within suitable DSL habitat, confine construction to the period during which the DSL is inactive (i.e. October- March)
- Minimize the footprint of the development within DSL habitat (e.g., narrow the ROW width to that which is absolutely necessary for construction)
- Restrict vehicle traffic to the extent feasible

- Avoid aerial sprayed application of approved herbicide for weed control

- Cover open trenches or excavation areas overnight or install escape ramps at an angle of less than 45 degrees (1:1) if left uncovered. Inspect trenches or excavation areas for trapped lizards every morning and prior to backfilling.

- Avoid the introduction of non-native vegetation

- Reclaim DSL habitat with appropriate native vegetation using locally- sourced native seeds and vegetation

- During post construction, control mesquite and other invasive and problematic herbaceous and woody species that would degrade or impair DSL habitat

State Laws

Parks and Wildlife Code, Section 68.015

Section 68.015 of the Parks and Wildlife Code regulates state-listed species. Please note that there is no provision for take (incidental or otherwise) of state-listed species. A copy of *TPWD Guidelines for Protection of State-Listed Species*, which includes a list of penalties for take of species, can be found on-line at http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/habitat_assessment/media/tpwd_statelisted_species.pdf. State-listed species may only be handled by persons with a scientific collection permit obtained through TPWD. For more information on this permit, please contact the Wildlife Permits Office at (512) 389-4647.

Texas horned lizard (*Phrynosoma cornutum*) – State-listed Threatened

In section 4.5.4.4 of the SA, it states that the Region of Influence provides habitat for the Texas horned lizard.

If present in the project area, the Texas horned lizard could be impacted by ground disturbing construction activities. Horned lizards may hibernate on-site in the loose soils a few inches below ground during the cool months from September/October to March/April. Construction in these areas could harm hibernating lizards. Horned lizards are active above ground when temperatures exceed 75 degrees Fahrenheit. If horned lizards (nesting, gravid

females, newborn young, lethargic from cool temperatures or hibernation) cannot move away from noise and approaching construction equipment in time, they could be affected by construction activities.

Recommendation: TPWD recommends that a pre-construction survey be conducted to determine if horned lizards are present on the project site or directly adjacent to the construction area. A useful indication that the Texas horned lizard may occupy the site is the presence of harvester ant (*Pogonomyrmex barbatus*) nests since harvester ants are the primary food source of horned lizards. The survey should be performed during the warm months of the year when the horned lizards are active. Fact sheets, including survey protocols and photos of Texas horned lizard can be found on-line at http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_nature_trackers/horned_lizard/ and at http://www.tpwd.state.tx.us/huntwild/wild/species/thlizard/.

If horned lizards are found on site, TPWD recommends contacting this office to develop plans to relocate them, particularly if there is likelihood that they would be harmed by project activities. To minimize impacts to the Texas horned lizard, TPWD recommends the use of the best management practices (BMPs) described in the *Texas Horned Lizard Watch – Management and Monitoring Packet* which can be found on-line at http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_038.pdf. and *Texas Tortoise Best Management Practices* which can be found on-line at http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/habitat_assessment/media/texas_tortoise_bmps.pdf. Please note that Texas tortoise BMPs are applicable to the Texas horned lizard.

Rare Species

In addition to state and federally-protected species, TPWD tracks special features, natural communities, and rare species that are not listed as threatened or endangered. TPWD actively promotes their conservation and considers it important to evaluate and, if necessary, minimize impacts to rare species and their habitat to reduce the likelihood of endangerment and preclude the need to list. These species and communities are tracked in the Texas Natural Diversity Database (TXNDD). The most current and accurate TXNDD data can be requested at: TexasNatural.DiversityDatabase@tpwd.texas.gov.

No records of rare, threatened, or endangered species have been documented within 1.5 miles of the proposed new water lines in the TXNDD. However, please note that the absence of TXNDD information in an area does not imply that a species is absent from that area. Given the small proportion of public versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare species, the data from the TXNDD do not provide a definitive statement as to the presence, absence or condition of special species, natural communities, or other significant features within your project area. These data are not inclusive and cannot be used as presence/absence data. This information cannot be substituted for on-the-ground surveys.

Recommendation: Please review the TPWD county lists for Ector and Winkler Counties, as rare species could be present, depending upon habitat availability. These lists are available online at http://tpwd.texas.gov/gis/rtest/. If during construction, the project area is found to contain rare species, natural plant communities, or special features, TPWD recommends that precautions be taken to avoid impacts to them. The USFWS should be contacted for species occurrence data, guidance, permitting, survey protocols, and mitigation for federally-listed species. For the USFWS threatened and endangered species lists by county, please visit http://ecos.fws.gov/ipac/.

Determining the actual presence of a species in a given area depends on many variables including daily and seasonal activity cycles, environmental activity cues, preferred habitat, transiency and population density (both wildlife and human). The absence of a species can be demonstrated only with great difficulty and then only with repeated negative observations, taking into account all the variable factors contributing to the lack of detectable presence. If encountered during construction, measures should be taken to avoid impacting wildlife.

TPWD strives to respond to requests for project review within a 45 day comment period. Responses may be delayed due to workload and lack of staff. Failure to meet the 45 day review timeframe does not constitute a concurrence from TPWD that the proposed project will not adversely impact fish and wildlife resources.

TPWD advises review and implementation of these recommendations. If you have any questions, please contact me at (806) 761-4936 or Richard.Hanson@tpwd.texas.gov.

Sincerely,

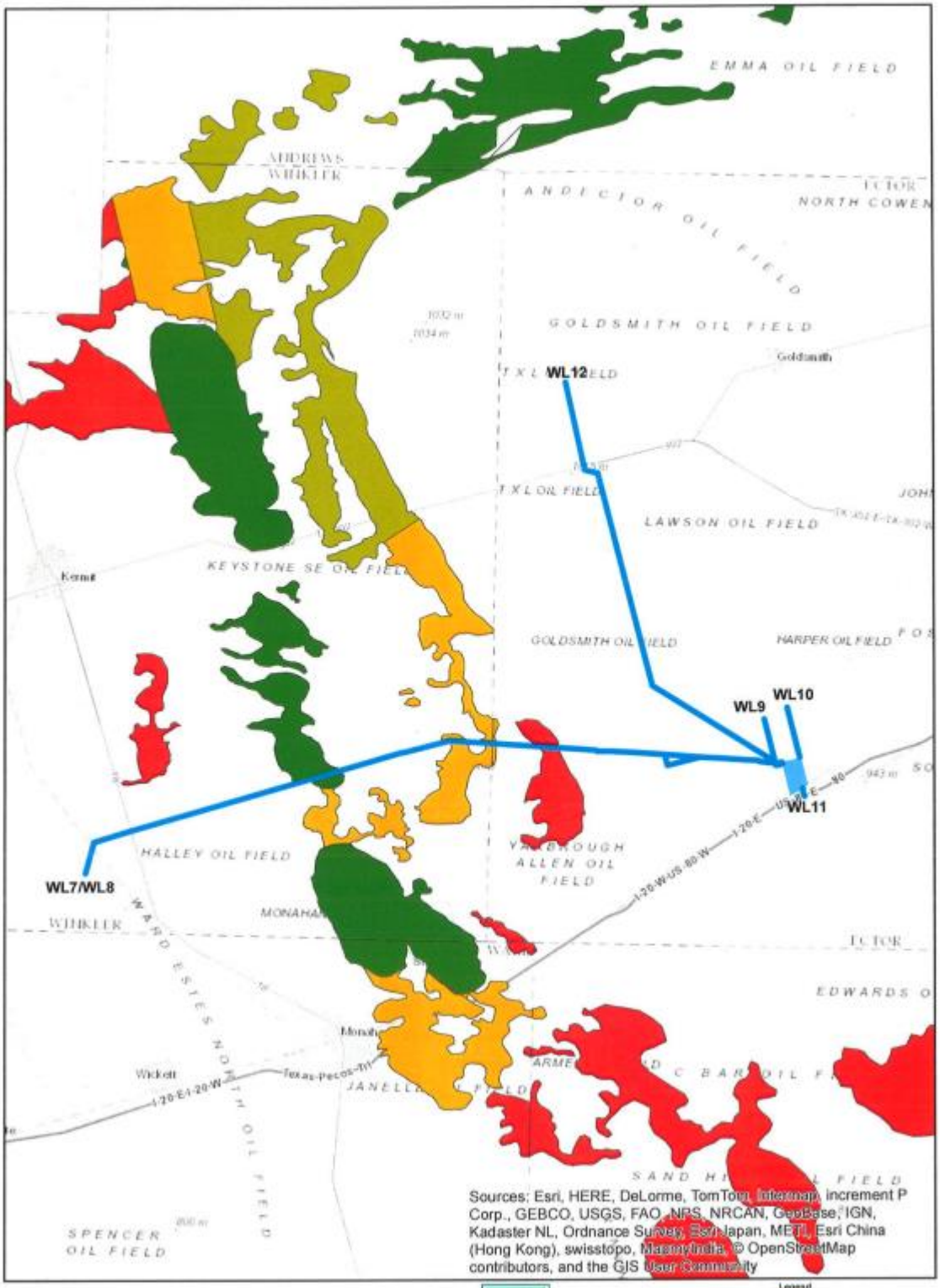
Rick Hanson

Rick Hanson
Wildlife Habitat Assessment Program
Wildlife Division

RH:gg.ERCS-10673

Attachment

Dunes Sagebrush Lizard Permit Area/Likelihood of Occurrence



Date: 03/20/15

Map compiled by the Texas Parks and Wildlife Department, Wildlife Habitat Assessment Program. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.

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