Chapter 5.
Potential Cumulative Effects

5 POTENTIAL CUMULATIVE EFFECTS

5.1 Approach and Analytical Perspective

5.1.1 Background

Compliance with NEPA requires an analysis of cumulative effects for each alternative (40 C.F.R. § 1508.25(c)(3)). Cumulative effects are the collective result of the incremental effects of an action that, when added to the impacts of other past, present, and reasonably foreseeable future actions, would affect the same resources, regardless of what agency or person undertakes those actions (40 C.F.R. § 1508.7). Cumulative effects can result from actions that have individually minor impacts but that collectively impose significant impacts over a period of time. DOE considers a reasonably foreseeable action to be a future action that has a realistic expectation of occurring. These include (but are not limited to) actions under analysis by a regulatory agency, proposals being considered by state or local planners, plans that have begun implementation, or future actions that have been funded.

Humans have been altering the area in which the TCEP would be constructed and operated since people began settling the region. In combination with natural processes, these past and present actions and activities have produced the affected environment, which is described in detail in Chapter 3. The impacts of the proposed TCEP on the existing environment were also described in Chapter 3. In this chapter, DOE describes the potential for cumulative effects of the TCEP and reasonably foreseeable future actions. The following sections describe the process DOE used to identify potential cumulative effects issues, the project impact zones for various resources, the areas of analysis (the resource, ecosystem, or human community that could be affected cumulatively), and the reasonably foreseeable future development actions and trends occurring in the areas of analysis. A two-tiered approach was used to consider and present the cumulative effects related to the most important issues identified by DOE.

5.1.2 Project Impact Zones and Areas of Analysis

Cumulative effects are analyzed on the basis of particular environmental resources or impact areas. Depending on the particular issue, this area of analysis either is a human community (e.g., the Odessa–Midland area), an ecosystem (e.g., the southern High-Plains ecosystem), or a resource as described on a regional, national, or global level (e.g., air quality within an Air-Quality Control Region). Because information and statistics often are compiled by governmental agencies based on their areas of jurisdiction, these political boundaries may be substituted as proxies for the more appropriate natural or socioeconomic boundaries.

For most resources, a project's effects can be mapped as "impact zones" or ROIs, as was done in the analysis of direct and indirect effects in Chapter 3, to facilitate comparison with the effects of other past, recent, and reasonably foreseeable future actions and trends. Figure 5.1 shows the TCEP's ROIs for a number of resources, and it shows the route or general location of the two proposed future projects sponsored by other entities (described in Section 5.1.3).

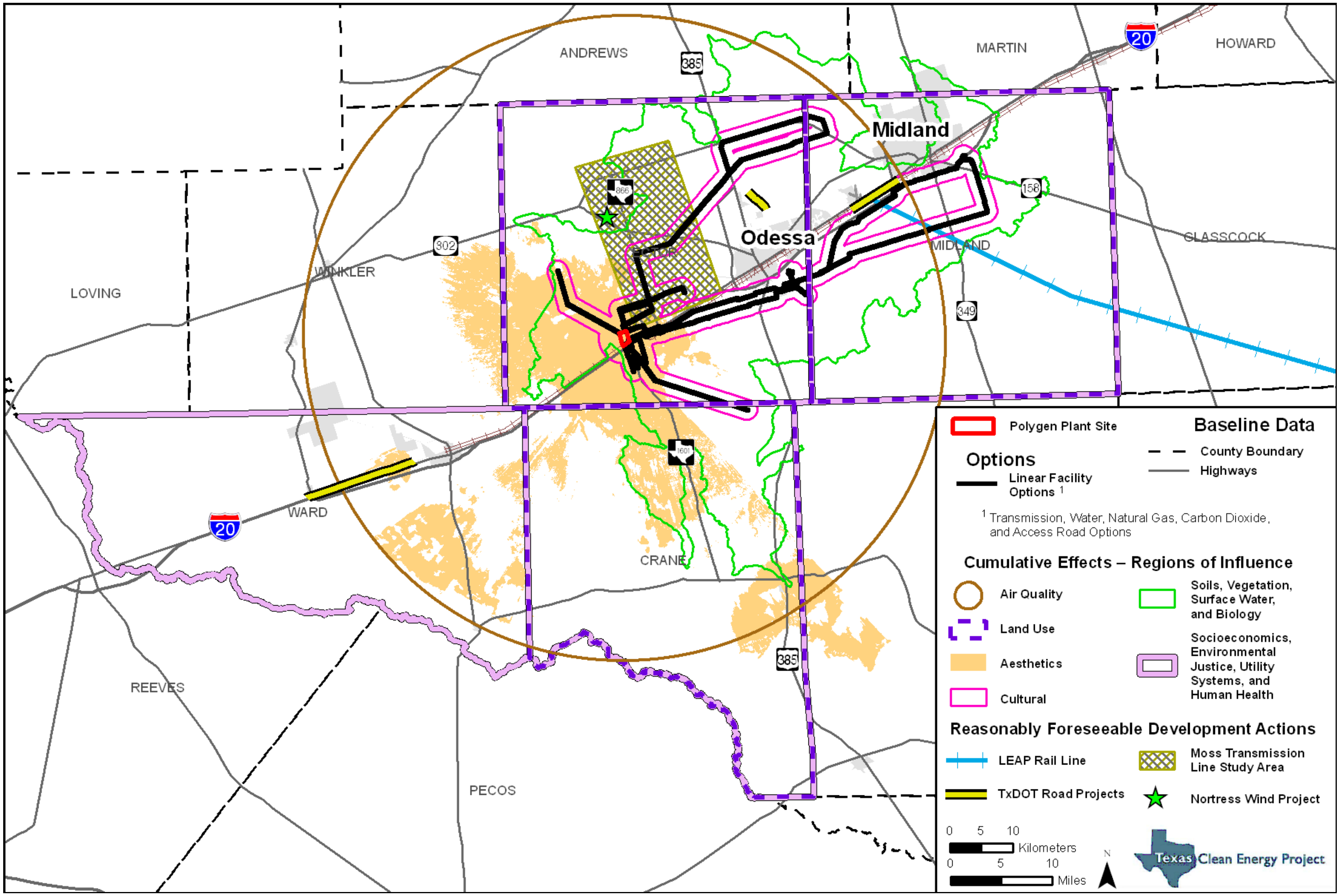

Figure 5.1. Cumulative regions of influence.

5.1.3 Reasonably Foreseeable Future Development: Specific Actions and Trends

For this cumulative effects analysis, reasonably foreseeable future development was considered in the context of 1) specific proposals and 2) general trends in the region. The predicted environmental effects of specific proposals and general development trends were considered together with those of the TCEP to produce a description of the combined or cumulative environmental effects.

To identify specific proposals that might impose cumulative environmental effects in the region, DOE sought information on specific projects, developments, or activities that might have effects that would overlap with those of the TCEP. This included a search for conventional electric power projects, large industrial facilities, transportation projects, large commercial developments, municipal projects, water supply projects, and other such projects in the Odessa region. ***Seven*** reasonably foreseeable projects were identified: the La Entrada al Pacifico (LEAP) Rail Corridor**;** the Moss 138-kV Transmission Line Project**; *three TxDOT projects (I-20 Roadway Resurfacing from Pyote to Monahans, Loop 338 Roadway Repair from SH 302 to Yukon Road, and I-20 Roadway Repair from SH 349 to FM 1788); the Notrees Power Storage Project; and, the city of Midland Satellite WWTP Plant***. Other proposals that were determined to be highly speculative at this point in time (i.e., projects having a significant chance of not going forward as currently proposed) were not considered. Regarding the analysis of trends, a current trend was assumed to continue into the future unless there was reason to believe that the trend may change. Various organizations produce forecasts that can support the analysis of cumulative effects, and these were used where they were available and relevant.

5.1.3.1 LA ENTRADA AL PACIFICO RAIL CORRIDOR

There is an ongoing feasibility study for a new rail corridor to be constructed as part of the existing LEAP trade corridor between the U.S. and Mexico. As shown in Figure 5.1, this proposed rail corridor would connect the existing LEAP line in the cities of Midland and Odessa in Midland and Ector Counties, Texas, respectively, to the existing South Orient rail line in the city of San Angelo, Tom Green County, Texas. No approvals or timelines for this project have been set. It is assumed that there would be an approximately 109-mi (175-km) rail line distance between the Odessa–Midland area and the San Angelo junction with a 15-ft (4.6 m) rail bed width. For purposes of this cumulative effects analysis, the rail corridor is assumed to disturb approximately 198 ac (80 ha) spanning Midland, Glasscock, Reagan, Sterling, and Tom Green Counties (footprint of the project). This approximation is based on available data.

5.1.3.2 MOSS 138-KV TRANSMISSION LINE PROJECT

The Public Utility Commission of Texas recently recognized the need for the completion of a substantial transmission system expansion to address transmission constraints that limit the delivery of electricity within Competitive Renewal Energy Zones to the rest of the ERCOT grid. Oncor was selected by the Public Utility Commission of Texas to build the proposed West B switching station located on ***SH*** 158, approximately 14 mi (32 km) northwest of the city of Odessa, and to build a 14-mi (32-km) single-circuit 138-kV transmission line that would connect the proposed West B switching station to the existing Moss Switching Station located approximately 6 mi (10 km) southwest of Odessa. It is assumed that a typical 100-ft (30-m) ROW would be used. For purposes of this cumulative effects analysis, the Moss project is assumed to disturb 170 ac (70 ha) (footprint of the project). This approximation is based on existing maps and data for the proposed expansion. At this stage, several alternative routes are being considered for the 14-mi (32-km) transmission line; therefore, the entire study area is identified on Figure 5.1.

5.1.3.3 INTERSTATE 20 ROADWAY RESURFACING FROM PYOTE TO MONAHANS

TxDOT has funded an 11.2-mi (18.0-km) roadway resurfacing project in Ward County on I-20 from west of Pyote to west of Monahans. Project design is scheduled to begin in October 2011. By February 2012, the design, environmental clearances, utility coordination, and ROW coordination are expected to be complete. The project is scheduled to be advertised for bids in November 2012. Based on TxDOT's project schedule, it is expected that the resurfacing activity would coincide with the construction of the transmission interconnection and the gasification and power island construction at the plant. It is assumed that a typical 100-ft (30-m) ROW would be used. For purposes of this cumulative effects analysis, the footprint of this I-20 roadway resurfacing project is assumed to be approximately 135 ac (55 ha). New disturbance is likely to occur within the ROW, where staging is expected to occur; however, no roadway surface area expansion will be constructed.

5.1.3.4 LOOP 338 ROADWAY REPAIR FROM STATE HIGHWAY 302 TO YUKON ROAD

TxDOT has funded a 2.5-mi (4.0-km) roadway repair project in Ector County on Loop 338 from SH 302 to 0.5 mi (0.8 km) north of Yukon Road. Construction bids for the proposed project were advertised in June 2011, with project implementation to follow. It is possible that the roadway repair activity would be occurring concurrently with polygen plant site mobilization and preparation. It is assumed that a typical 100-ft (30-m) ROW would be used. For purposes of this cumulative effects analysis, the footprint of this roadway repair project is assumed to be approximately 30 ac (12 ha). New disturbance is likely to occur within the ROW, where staging is expected to occur; however, no roadway surface area expansion will be constructed.

5.1.3.5 INTERSTATE 20 ROADWAY REPAIR FROM STATE HIGHWAY 349 TO FARM-TO-MARKET ROAD 1788

TxDOT has funded a 5.4-mi (8.7-km) roadway repair project in Midland County on I-20 from 0.4 mi (0.6 km) east of SH 349 to 0.4 mi (0.6 km) east of FM 1788. The project is scheduled to be advertised for bids in December 2012. It is expected that the roadway repair activity would coincide with TCEP construction activities. It is assumed that a typical 100-ft (30-m) ROW would be used. For purposes of this cumulative effects analysis, the footprint of this roadway repair project is assumed to be approximately 66 ac (27 ha). New disturbance is likely to occur within the ROW, where staging is expected to occur; however, no roadway surface area expansion will be constructed.

5.1.3.6 NOTREES POWER STORAGE PROJECT

DOE recently completed the grant approval process to provide funding to Duke Energy Business Services to install a series of large-scale batteries capable of storing 20 MW of electricity produced by the 153-MW Notrees wind farm in Ector and Winkler Counties. Duke Energy chose Xtreme Power to design, install, and operate the network of batteries set on a

newly constructed, approximately 4-ac (1.6-ha) concrete pad in the corner of the existing wind farm. The system would store surplus energy and discharge it whenever electricity demand is at its peak. The wind farm is located on 162 ac (65.6 ha) east of the town of Notrees and south of the town of Goldsmith in Ector County, Texas; however, for purposes of this cumulative effects analysis, the footprint of this project is assumed to be the 4-ac (1.6-ha) pad site.

5.1.3.7 CITY OF MIDLAND SATELLITE WWTP PLANT

The city of Midland has proposed constructing a small satellite membrane bioreactor WWTP that would process a side stream of municipal sewage water for the purposes of making it fit for a number of human contact reuses. This project is still in the early planning stages, and details such as the exact location, footprint dimensions and many other aspects have not been released. The design would allow for the treatment of 100,000–290,000 gal (378,541–1,097,769 L) per day using screening, biological treatment, membrane filtration, and chlorination to produce the reclaimed water, with the solids and reject water being returned to the municipal sewer line from which the waste water was taken. The footprint of the plant would be smaller than a conventional WWTP of the same capacity. Reclaimed water would be used by Midland College and perhaps others for landscape irrigation instead of the potable water, which is currently used.

5.1.4 Analysis Methodology

DOE assembled an internal team of environmental professionals to propose, list, and classify potential issues related to cumulative effects, based on the results of the public scoping process, the results of the environmental impacts analyses conducted for this EIS, and the assessment of potential environmental impacts of future development and trends in the region. The identified issues were then classified as potentially having a high, intermediate, or low level of importance. Indicators of importance are listed in Table 5.1.

Table 5.1. Indicators of Importance for Cumulative Effects Issues

High importance	• The incremental effect, alone, would generally be considered a *significant impact*, as this phrase is used in context of NEPA review and analysis. • An analysis of cumulative effects for this issue would be required to support a reasoned-decision among the alternatives. • Society, in general, has a history or record of being concerned about this type of cumulative effect, and two or more of the factors of intermediate importance are present.
Intermediate importance	• There is a regulatory/resource threshold or physical limit (e.g., utility capacity) that might be exceeded or that is approaching an exceedance in the cumulative effect, and this potential exceedance of the threshold or physical limit is of significance from the viewpoint of NEPA review, federal decision making, and public disclosure. • There is a governmental organization or nationally recognized nongovernmental organization that has a history or record of being concerned about the cumulative effect. • The cumulative effect issue was raised during the scoping process by either a governmental organization or by more than one nongovernmental entity or person, and the particular issue is not irrelevant or inconsequential in federal decision making. • Issue is indicated to be important judging by the fact that one or more governmental or nongovernmental organizations have published statistics or trends on the issue.
Lesser importance	• Issues not having any of the indicators listed in the two categories above.

Issues identified as having either a high- or intermediate-level of importance were given to resource specialists for further investigation. For each issue, these specialists searched for relevant information on past and current activities and their environmental impacts in the area of concern to establish a basis upon which to consider the TCEP's potential impacts. Trends in past and current activities and their environmental impacts were projected into the future for at least the expected 30-year life of the project, to the extent that the projection was considered to be reasonable. Where usable forecasts were found, a judgment was made as to whether the forecast already encompassed projects such as the TCEP. If not, the potential impacts of the TCEP were added to the forecast.

Table 5.2 describes potential cumulative effects issues with a high- or intermediate-level of importance. Those shown in red were determined to have high importance as defined in Table 5.1 and are discussed in detail in Section 5.2.2. Issues shown in blue were determined to have intermediate importance as described in Table 5.1 and are discussed further in Table 5.3. For all remaining identified issues, DOE determined that no further review was warranted because they do not have any of the seven indicators of importance described in Table 5.1.

Table 5.2. Potential Cumulative Effects Issues for Each Resource

Resource	Cumulative Effects Issues
Air Quality	• Emissions of criteria pollutants, HAPs, dust, Hg, and GHGs • Successful implementation of the TCEP, whereby it encourages the development of other low emissions, carbon capture and storage coal-based power plants in substitution for or as replacements of conventional coal plants nationwide, thereby reducing overall power plant emissions

Table 5.2. Potential Cumulative Effects Issues for Each Resource

Resource	Cumulative Effects Issues
Climate	• GHG emissions
Soils	• Soil contamination from HAP deposition (e.g., Hg) • Conversion of soils from one quality to another quality (e.g., prime farmland soils converted to nonprime soils) • Construction-related soil erosion and soil loss • Increase in impervious soil cover and its potential effects on soil functions
Mineral Resources	• Production/depletion trend of oil and natural gas, specifically regarding CO_2-based EOR, in the Permian Basin and in the U.S. • Access to limestone resource along Concho Ridge • Patterns and trends in land development that hinder access to oil and gas resources (e.g., drilling site locations)
Ground Water Resources	• Potable water supplies • Increase in water consumption, which could displace other competing water uses • Increase in impervious soil cover as an effect on ground water recharge • Ground water contamination from ***deep well injection of brine water,*** petroleum resources, CO_2, or brine water as a result of improperly managed EOR activities • ***Ground water contamination from brine water as a result of deep well injection activities***
Surface Water Resources	• Water consumption impacts on stream flows • Increase in impervious soil cover impacting interflow and flood potential • Surface water contamination from soil erosion or inadequate spill prevention
Biological Resources	• Habitat loss and fragmentation and wildlife displacement associated with land development • Loss or change in vegetation in disturbed areas from native to non-native (potentially invasive) species • Increase in power transmission lines that contribute to bird and bat mortality as a result of collisions with wires and cables • Increase in the amount of roadways and the amount of vehicle traffic, which correlates with animal kills/injury by *collisions* • ***Potential increase in hazards to migratory birds due to presence of solar evaporation ponds***
Aesthetics	• Industrial, commercial, residential, or agricultural development • Night lighting and night glow impacts in the sky
Cultural Resources	• Potential for disturbance of undiscovered cultural or historic resources
Land Use	• Land use conversions
Socioeconomics	• Housing supply and worker availability • TCEP's CO_2 as a new supply, which could impact the regional CO_2 market and other proposed near-term suppliers of CO_2 in the region
Environmental Justice	• Increased CO_2-based EOR possibly causing adverse impacts on minority or low-income populations or communities • Disproportionate and adverse impacts on minority or low-income communities from the construction and operation of the TCEP and other reasonably foreseeable projects

Table 5.2. Potential Cumulative Effects Issues for Each Resource

Resource	Cumulative Effects Issues
Community Services	• Effects on community services based on the need for construction and operations workers
Utility Systems	• Increase in demand for water as an additional incentive for the FSH pipeline project or other proposed water supply projects given the trends in usage of water and waste water resources • Increase in the load on the power grid and proposed capacity increases in the grid locally
Transportation	• Rail traffic • Vehicle traffic
Materials and Waste Management	• Increase in coal consumption as compared to the national increasing trend of coal consumption, which could result in a further acceleration of national coal consumption and an earlier resource depletion date • Construction materials availability
Human Health, Safety, and Accidents	• Exposures to hazardous air emissions (e.g., Hg) • Increase in rail and vehicle traffic contributing to rail and road traffic accident rates • Increase in CO_2 pipeline mileage, which could increase the risks of an accident • Increase in the amount of high voltage transmission lines and associated hazards
Noise and Vibration	• Noise and vibrations associated with increasing rail and vehicle traffic • Operational noise

Note: Issues coded in red have been determined to have high importance as defined in Table 5.1 and are discussed in detail in Section 5.2.2. Issues coded in blue have been determined to have intermediate importance as described in Table 5.1 and are discussed further in Table 5.3. Issues that are neither coded as blue or red were determined to have none of the importance (see Table 5.1) and, for that reason, were eliminated from further analysis or discussion.

5.2 Cumulative Effects

5.2.1 Cumulative Effects of Intermediate Importance

Issues that have been identified as having intermediate importance are discussed in Table 5.3.

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Air Quality	Currently, the ROI and the local counties are an attainment area for all criteria pollutants. There are no regional monitoring/sampling data on which to base a trend analysis; however, the TCEQ reports a statewide trend in decreased emissions (TCEQ 2011).	Operations would increase the concentration of NO_2, PM_{10}, $PM_{2.5}$, and SO_2, ranging from an increase (over current ambient air quality) of up to 9 percent for PM_{10} to 200 percent for NO_2 (1-hour standard) at the points of maximum impact as determined by the Class II air quality modeling performed for the project.	Dust, PM, and emissions from construction of ***all seven*** specifically identified projects would likely occur on a temporary basis during construction. Operation of the LEAP project would result in additional mobile source air emissions from an undetermined increase in rail traffic; no increase in air emissions would occur from the operation of the ***other*** project***s***.	The TCEP's ROI and the counties hosting this project would remain an attainment area. Cumulative increases in concentrations of air pollutants would likely remain below NAAQS and PSD increments.	Significant adverse cumulative effects on air quality are not expected. Further evaluation not warranted.
Soils	No trend data were identified for HAP deposition as a result of industrial development in the area of analysis.	Potential soil deposition of air pollutants such as Hg could occur, but impacts would be negligible due to the low quantity of emissions (e.g., 0.001 tn [0.0009 t] per year of Hg).	No soil contamination from air pollutants expected beyond the negligible amounts caused by typical mobile emissions from trains.	Cumulative increases in concentrations of air pollutants would continue to remain below thresholds established in air quality standards.	No significant contribution expected to deposition rates and soil accumulation of hazardous substances. Further evaluation not warranted.

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Mineral Resources	The estimated oil reserves in the Permian Basin are approximately 95.4 billion barrels. As of 2006, approximately 33.7 billion barrels have been recovered (DOE 2006). Since January 2007, another 716 million barrels have been produced (RRC 2011).	TCEP would add 3 million tn (2.7 t) to the CO_2 market annually. This equates to approximately 9.3 million barrels of oil (DOE 2008).	No contribution from the identified reasonably foreseeable projects is expected. Demand for CO_2 in the EOR process will likely continue to increase. Kinder Morgan, the primary supplier for the Permian Basin, currently has the capacity to produce and deliver approximately 27.5 million tn (24.9 million t) per year. The TCEP would add 3 million tn (2.7 million t) per year. Kinder Morgan does not currently have plans for expansions to their system (Hattenbach 2011).	The available CO_2 supply to the Permian Basin will not increase in the reasonably foreseeable future. The addition of the TCEP CO_2 will provide needed capacity.	The use of CO_2 has allowed the recovery of petroleum resources previously unrecoverable using conventional methods. Historically, EOR has resulted in approximately an 8 percent increase in oil recovery in the Permian Basin. Recovery rates of up to 14 percent are projected (DOE 2006). Further evaluation not warranted.

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Biological Resources	Impacts including loss, fragmentation, and displacement to wildlife habitat began to escalate in 1925 with the discovery of oil in the Permian Basin (City of Odessa 2004). Since the 1920s, the region has experienced continual growth with periodic stabilizations, which have been dependent on the vigor of the oil industry (City of Odessa 2004; City of Midland 2005). This upward trend in residential, commercial, and industrial continues to impact wildlife habitat**.** ***Impacts to wildlife from ingesting or contacting brine (becoming sick, impaired, or dying) at industrial evaporation ponds have also been associated with the development of oil and gas and power generation industries.***	TCEP would result in ***732–1,632*** ac (***296–660*** ha) of habitat loss. ***TCEP could also install up to 160 ac (65 ha) of solar evaporation ponds, which would be used to dispose of dissolved solids and other constituents from plant processes.***	The LEAP and Moss projects would collectively contribute to approximately 260 ac (105 ha) of habitat loss***.*** ***The TxDOT project footprints cover approximately 231 ac (94 ha), much of which is already roadway surface; staging areas adjacent to the roadways could contribute to additional habitat loss.*** ***The Notrees Power Storage Project would cover 4 ac (1.6 ha) of habitat loss on the 162-ac (65.6-ha) wind farm.*** ***Construction of an undetermined size of the city of Midland Satellite WWTP would result in habitat loss.*** ***Solar evaporation ponds have been and continue to be used by industrial sources to dispose of dissolved solids and other constituents throughout the ROI. Wildlife injesting or contacting the brine water from these ponds could become sick, impaired, or even die. However, bird deterrent systems such as bird netting are increasingly being used to reduce these potential impacts to wildlife.***	A cumulative ***1,335–2,235 ac (540–904 ha)*** of habitat loss could occur from the TCEP and reasonably foreseeable projects. Studies quantifying the cumulative trend for impacts to wildlife habitat have not been identified. ***Up to an additional 160 ac (65 ha) of solar evaporation ponds could contribute to the existing area of ponds in the ROI. Studies quantifying the cumulative trend for impacts from solar evaporation ponds have not been identified. Placement of protective netting over the ponds would mitigate this potential effect.***	The impacts to wildlife habitat resulting from the TCEP combined with the LEAP and Moss projects would not be significant. Continued development in the region, even at a slow rate, could cumulatively have more significant impacts. Further evaluation not warranted. ***TCEP's solar evaporation ponds would incrementally increase the area of exposed ponds within the ROI and could cumulatively affect birds that may ingest or contact brine water; however, placement of protective netting over the ponds would mitigate this potential effect. Further evaluation not warranted.***

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Cultural Resources	Impacts to cultural resources have occurred as a result of increasing trend in oil and gas development.	The TCEP would result in ***977–2,582*** ac (***395–1,045*** ha) of ***temporary*** disturbance. Cultural surveys would be conducted prior to construction activities. Appropriate mitigation (avoidance or recovery) would be implemented. No historic structure would be directly impacted.	The LEAP and Moss projects would collectively contribute to approximately 260 ac (105 ha) of disturbance. ***The TxDOT project footprints cover approximately 231 ac (94 ha), much of which is already roadway surface; staging areas adjacent to the roadways could contribute to additional surface disturbance.*** ***The Notrees Power Storage Project would cover 4 ac (1.6 ha) of disturbance on the 162-ac (65.6-ha) wind farm.*** ***Construction of an undetermined size of the city of Midland Satellite WWTP would result in disturbance.***	A cumulative ***1,580–3,185 ac (639–1,289 ha)*** of disturbance could occur from TCEP and reasonably foreseeable projects with the respective potential for cumulative risk for loss or damage to archaeological sites.	Based on the TCEP's planned mitigation, a low likelihood of significant adverse effects to cultural resources is expected. Further evaluation not warranted.

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Environmental Justice	Disproportionately negative impacts to minority or low-income communities have not occurred as a result of oil and gas exploration and production in the Permian Basin. The location of the oilfields was driven by the geology and not by regional demographics.	Beneficial impacts to populations in the short term from increased employment opportunities during construction phase of the TCEP. Operation of the TCEP would not disproportionately impact minority or low-income communities.	Beneficial impacts to populations in the short term from increased employment opportunities during construction phase of ***all*** projects.	There could be beneficial impacts to minority or low-income communities in the short term from increased opportunities for employment during the construction phases of the foreseeable projects. On a regional level, there would be no disproportionate impacts to minority or low-income communities as a result of EOR practices associated with TCEP, because the potentially affected oil fields in the Permian Basin are already in place, and future oil field development would be dependent on the geology of the area, not on demographics.	No disproportionately adverse cumulative effects would occur to minority or low-income populations. Further evaluation not warranted.

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Utility Systems	ERCOT peak demand of 65,776 MW in 2010 (ERCOT 2010b). Transmission upgrades already needed to facilitate current and historical demands for power, mostly in the large eastern markets in Texas.	TCEP would supply approximately ***130***–213 MW of base-load power to the existing grid system.	ERCOT forecast demand to grow to 96,000 MW in 2030. ERCOT projects a need for new generation of approximately 6,400 and 33,000 MW in 2015 and from 50,000 to 70,000 MW in 2030; future demand for transmission capacity to continue to grow based on projected growth in demand for power. The Moss project would increase the efficiency in the delivery of electricity produced in the Competitive Renewal Energy Zones to the electric market. ***The Notrees Power Storage Project would be capable of storing when available and delivering up to 36 MW of power to ERCOT during peak demand periods.*** The LEAP***, TxDOT, and city of Midland Satellite WWTP*** project**s** ***are*** not anticipated to place a significant demand on existing utility services.	TCEP would provide needed base-load generation to support growth in ERCOT demand. Upgrades to existing transmission system would likely be required as a result. The foreseeable Moss project would increase the delivery efficiency of electricity to support growth in ERCOT demand and would be expected to support the transmission of the TCEP's electricity to markets.	The TCEP and Moss project combined would be beneficial to supply and would convey electricity to the electricity demand areas. Further evaluation not warranted.

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Materials and Waste Management	261 billion tn (236 billion t) of U.S. coal reserves (Energy Information Administration 2010a) were recognized in 2009. This would supply the U.S. at current demand levels for approximately 230 years. Total demand for U.S. coal reached 1.12 billion tn (1.01 billion t) in 2008 and production was 1.17 billion tn (1.06 billion t) (National Mining Association 2011). ***The current U.S. market for urea is approximately 3.05 million tn (2.76 million t) per year, with approximately 5.6 million tn (5.1 million t) currently imported (Inter-Chem Blue Book 2011).***	The TCEP would consume 2.1 million tn (1.9 million t) per year of coal, which would contribute 0.02 percent to the U.S. consumption of the recognized coal reserves over the life of the project (30 years). ***TCEP would generate a maximum of 0.76 million tn (0.67 million t) per year of urea and sell it to a major plant nutrient marketer in the U.S.***	No coal consumption is expected to occur from the reasonably foreseeable projects described in this Chapter. On a national level, the U.S. coal demand has increased only slightly over recent years. The Energy Information Administration is currently projecting a 0.4 percent per year increase in U.S. coal demand until 2030, with no prediction made further into the future (Energy Information Administration 2010b). ***The Inter-Chem Blue Book is projecting similar capacity and production rates for urea in the U.S. to 2010 (Inter-Chem Blue Book 2011).***	The TCEP's contribution appears to be included in the national forecast made by the Energy Information Administration (or is within the error in this projection) (Energy Information Administration 2010b). ***The maximum 0.76 million tn (0.67 million t) per year that TCEP would generate and sell could satisfy approximately 25 percent of the average U.S. market for urea and could offset imports by as much as 14 percent.***	At Energy Information Administration's forecast rate of acceleration in coal consumption (0.4 percent per year), there is approximately a 160-year coal supply in the currently recognized reserves, with or without the TCEP's individual consumption. Further evaluation not warranted. ***Urea manufactured at the polygen plant would significantly reduce foreign imports of this material.***

Table 5.3. Evaluation Summary of Cumulative Effects for Issues of Intermediate Importance

Resource	Background/Historical Trends	Contribution from TCEP	Contribution from Other Reasonably Foreseeable Projects (or trends/forecasts)	Total Cumulative Effects	Conclusion
Human Health, Safety, and Accidents	Impacts to human health and safety historically increased with the new work associated with the industrial revolution (Aldrich 2001), such as the oil and gas industry in the ROI. Current safety programs and OSHA requirements has contributed to the decreasing impacts to human health and safety (Aldrich 2001). ***Fatality rates have steadily decreased from 2003 through 2010 (from 1.75 to 1.45 fatalities per 100 million vehicle mi [161 million vehicle km]) and are predicted to decrease to 1.38 by 2014.***	Increase in risks to human health and safety (5.25 recordable incidents per year) related to TCEP operation. Increase in risks associated with TCEP vehicle traffic from vehicle accidents (< 1 fatality over life of project).	Potential increase in risks to human health and safety from power line operations from worker exposure to electrocution, injury from falling, and structural failure as a result of the Moss project ***and the Notrees Power Storage Project.*** Potential increase in rail injuries from construction of the LEAP project. ***Based on the TxDOT average fatal accident rate of 1.41 fatalities per 100 million vehicle mi (161 million km) traveled in 2012, construction activities associated with the 19.1 mi (30.7 km) of reasonably foreseeable TxDOT roadway projects would result in an insignificant increase in the potential for accidents (2.7×10^{-7}).***	Projected recordable incidents for the TCEP are low. Potential for risks with the Moss project would be lower because fewer personnel would be needed to operate the transmission line. Given the current railroad safety programs in place, significant increases in risk associated with the LEAP project would not be anticipated. ***Safety protocols for TxDOT project work would mitigate any significant increase in risk associated with roadway improvement project construction.***	There is a low likelihood for significant cumulative effect to human health, safety, and accidents in the ROI. Further evaluation not warranted.

5.2.2 Cumulative Effects of High Importance

This section addresses potential cumulative effects of GHG emissions and water consumption as a result of the construction and operation of the TCEP and specific future proposals and general trends in the cumulative effects ROIs. DOE identified these two cumulative effects issues as having high importance. GHG emissions are widely associated with global climate change, a topic of national debate. Further, during the public scoping process for this EIS, water consumption by the TCEP and its possible impacts on regional water supplies was identified as an important environmental issue for the people of West Texas.

5.2.2.1 CLIMATE CHANGE

The human and natural causes of climate change and the impacts of climate change are global in scope. GHG emissions, which ***are believed*** to contribute to climate change, do not remain localized, but become ***dispersed throughout*** the Earth's atmosphere. Therefore, this analysis cannot separate the particular contribution of TCEP GHG emissions to regional or global climate change from the many other past, present, and reasonably foreseeable projects that have produced or would produce or mitigate GHG emissions. Rather, this analysis focuses on the cumulative effects of GHG emissions and climate change from a global perspective.

Background

A worldwide environmental issue is the likelihood of changes in the global climate as a consequence of global warming produced by increasing atmospheric concentrations of GHGs (IPCC 2007a). The atmosphere allows a large percentage of incoming solar radiation to pass through to the Earth's surface, where it is converted to heat energy (infrared radiation) that is more readily absorbed by GHGs than incoming solar radiation. The heat energy absorbed near the Earth's surface increases the temperature of air, soil, and water.

GHGs include water vapor, CO_2, methane, nitrous oxide, O_3, and several chlorofluorocarbons. Although GHGs constitute a small percentage of the Earth's atmosphere, they are responsible for its heat-trapping properties. Water vapor, a natural component of the atmosphere, is the most abundant GHG, but its atmospheric concentration is driven primarily by changes in the Earth's temperature. As such, water vapor ***can*** amplify the effects of other GHGs such as CO_2. The second-most abundant GHG is CO_2, which remains in the atmosphere for long periods of time. Due to human activities, atmospheric CO_2 concentrations have increased by approximately 35 percent over preindustrial levels. Fossil fuel burning, specifically from power production and transportation, is the primary contributor to increasing concentrations of CO_2 (IPCC 2007a). In the U.S., stationary CO_2 sources include energy facilities (such as coal and natural gas power plants) and industrial facilities. Industrial processes that emit these gases include cement manufacture, limestone and dolomite calcination, soda ash manufacture and consumption, CO_2 manufacture, and aluminum production (Energy Information Administration 2009). In addition, industrial and agricultural activities release GHGs other than CO_2—notably methane, NO_x, O_3, and chlorofluorocarbons—to the atmosphere, where they can remain for long periods of time.

In the preindustrial era (before 1750 A.D.), the concentration of CO_2 in the atmosphere appears to have been 275 to 285 ppm (IPCC 2007a). In 1958, C.D. Keeling and others began measuring the concentration of atmospheric CO_2 at Mauna Loa in Hawaii (Keeling et al. 1976). The data collected by Keeling's team and others since then indicate that the amount of CO_2 in the atmosphere has been steadily increasing from approximately 316 ppm in 1959 to 386 ppm in 2008 (National Oceanic and Atmospheric Administration 2010b). This increase in atmospheric CO_2 is attributed almost entirely to human activities.

Impacts of Greenhouse Gases on Climate

Climate is as the average weather of a region, or as the statistical description of a region's weather in terms of the means and variability of relevant parameters over time periods ranging from months to thousands of years. The relevant parameters include temperature, precipitation, wind, and dates of meteorological events such as first and last frosts, beginning and end of rainy seasons, and appearance and disappearance of pack ice. Because GHGs in the atmosphere absorb energy that would otherwise radiate into space, the possibility that human-caused emissions of these gases could result in warming that might eventually alter climate was recognized soon after the data from Mauna Loa and elsewhere confirmed that the atmosphere's content of CO_2 was steadily increasing (IPCC 2007a; National Oceanic and Atmospheric Administration 2010b).

Changes in climate are difficult to detect because of the natural and complex variability in meteorological patterns over long periods of time and across broad geographical regions. There is much uncertainty regarding the extent of global warming caused by human-induced GHG emissions, the climate changes this warming has or will produce, and the appropriate strategies for stabilizing the concentrations of GHGs in the atmosphere. The World Meteorological Organization and United Nations Environment Programme established the IPCC to provide an objective source of information about global warming and climate change, and IPCC's reports are generally considered to be an authoritative source of information on these issues.

According to the IPCC fourth assessment report, "[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC 2007b). The IPCC report finds that the global average surface temperature has increased by approximately 0.74 degrees Celsius in the last 100 years, global average sea level has risen approximately 150 millimeters over the same period, and cold days, cold nights, and frosts over most land areas have become less frequent during the past 50 years. The report concludes that most of the temperature increases since the middle of the twentieth century ***are "***very likely due to the observed increase in anthropogenic [GHG] concentrations."

The 2007 report estimates that, at present, CO_2 accounts for approximately 77 percent of the global warming potential attributable to human-caused releases of GHGs, with most (74 percent) of this CO_2 coming from the combustion of fossil fuels. Although the report considers a variety of future scenarios regarding GHG emissions, CO_2 would continue to contribute more than 70 percent of the total warming potential under all of the scenarios. The IPCC therefore believes that further warming is inevitable, but that this warming and its effects on climate could be mitigated by stabilizing the atmosphere's concentration of CO_2 through the use of 1) "low-carbon technologies" for power production and industrial processes, 2) more efficient use of energy, and 3) management of terrestrial ecosystems to capture atmospheric CO_2 (IPCC 2007b).

Environmental Impacts of Climate Changes

The IPCC and the U.S. Climate Change Science Program have examined the potential environmental impacts of climate change at global, national, and regional scales. The IPCC report states that, in addition to increases in global surface temperatures, the impacts of climate change on the global environment may include

- more frequent heat waves, droughts, and fires;
- rising sea levels and coastal flooding;
- melting glaciers, ice caps, and polar ice sheets;
- more severe hurricane activity and increases in frequency and intensity of severe precipitation;
- spread of infectious diseases to new regions;
- loss of wildlife habitats; and
- heart and respiratory ailments from higher concentrations of ground-level O_3 (IPCC 2007b).

On a national scale, average surface temperatures in the U.S. have increased, with the last decade being the warmest in more than a century of direct observations (U.S. Climate Change Science Program 2008). Impacts on the environment attributed to climate change that have been observed in North America include

- extended periods of high fire risk and large increases in burned areas;
- increased intensity, duration, and frequency of heat waves;
- decreased snowpack, increased winter and early spring flooding potentials, and reduced summer stream flows in the western mountains; and
- increased stress on biological communities and habitat in coastal areas (IPCC 2007b).

On a regional scale, there is greater natural variability in climate parameters that makes it difficult to attribute particular environmental impacts to climate change (IPCC 2007b). However, based on observational evidence, there is likely to be an increasing degree of impacts such as coral reef bleaching, loss of specific wildlife habitats, reductions in the area of certain ecosystems, and smaller yields of major cereal crops in the tropics (IPCC 2007b). For the northern hemisphere, regional climate change could affect physical and biological systems, agriculture, forests, and amounts of allergenic pollens (IPCC 2007b).

TCEP Potential Greenhouse Gas Emissions

The TCEP ***would*** demonstrate the technical and economic feasibility of capturing a high percentage of CO_2 produced by the use of coal in an IGCC electricity and chemicals production plant. Carbon in the coal would be converted mostly into syngas components: CO_2, CO, and small amounts of COS and other carbon forms. The polygen plant's water-gas shift reactor and acid gas removal units would convert most of the CO and COS in the syngas into CO_2. Accounting for the combustion of natural gas along with the gasification of coal, approximately 90 percent of the total CO_2 produced at the plant would be captured. Approximately 95 percent of the carbon in the coal feedstock would be captured as CO_2.

Carbon ***from*** the coal used at the TCEP would take one of three primary pathways:

1. Approximately 5 percent of the coal's carbon would not be captured and would pass through as CO_2 or would be converted to CO_2 in the ***gas turbine*** and duct burner as small amounts of carbon-bearing compounds are fully oxidized. This CO_2 emission to the atmosphere would amount to approximately 0.3 million tn (0.27 million t) per year during normal plant operations, or 9 million tn (8 million t) over a 30-year life of the plant. A small

amount of carbon would go into slag and particulates. Preferably the slag would be sold for beneficial uses; alternatively it would be sent to a landfill. Most of the particulates would be filtered out of the syngas and sent to a landfill.

2. Approximately 90 percent of the coal's carbon would be captured as CO_2**. *Of the captured CO_2, approximately 85–94 percent*** would be sold in the regional (Permian Basin) EOR market with an expectation of permanent sequestration of almost all of ***this*** CO_2. Th***e*** CO_2 amount ***that*** would ***be sold in the EOR market would range from*** approximately ***2.5–***3.0 million tn (***2.3–***2.7 million t) per year during normal plant operations or ***75–***90 million tn (***68–***82 million t) over *a* 30-year life of the plant**, *depending on electricity and urea demand***.

3. ***Of the captured CO_2, a***pproximately ***6–15*** percent would be used to make urea to be sold on the national market with no expectation of permanent sequestration of ***this*** CO_2. Because the urea would be used to make fertilizer, this CO_2 is assumed to remain in the surface and near surface environment of the Earth but would benefit the production of crops and vegetation. The CO_2 captured in the urea product would amount to approximately ***0.22–0.55*** million tn (***0.20–0.50*** million t) per year during normal plant operations or ***6.6–16.5*** million tn (***6.0–15.0*** million t) over a 30-year life of the plant**, *based on minimum and maximum capacities***.

The electric power sector in the U.S. releases approximately 2.64 billion tn (2.40 billion t) of CO_2 annually; U.S. coal-fired power plants account for 2.17 billion tn (1.97 billion t) of that amount (EPA 2010g). Globally, 54 billion tn (49 billion t) of CO_2-equivalent anthropogenic GHGs are emitted annually, with fossil fuel combustion contributing approximately 32 billion tn (29 billion t) of that amount. Annual emissions of CO_2 from the TCEP would add to these emissions.

If the TCEP is not built, it cannot be assumed that the additional emissions attributed to the TCEP would be avoided. Other less efficient or more CO_2-emitting fossil fuel power plants might be constructed in its place, existing plants might produce more power thereby increasing their CO_2 emissions, or existing, less efficient or more CO_2-emitting fossil fuel power plants might remain online instead of being replaced.

It is likely that new fossil fuel-based electricity generating plants will be built in Texas and elsewhere in the U.S. Although renewable energy projects have been proposed and are being developed in Texas, as they are in other parts of the country, ERCOT has projected demand for additional generating capacity (including replacement of some existing capacity) that is greater than the projected capacity of new renewable sources. Similar projections have been made in other regions of the U.S. Renewable sources (wind and solar) are intermittent, requiring additional base-load to firm up electric power supplies. Although a DOE decision to contribute funding to the TCEP would not make it "reasonably foreseeable," within the meaning of 40 C.F.R. § 1508.7 that future fossil fuel-based power plants will incorporate carbon capture, successful construction and operation of the TCEP could demonstrate the feasibility of incorporating the capture of CO_2, making it more likely that it **w**ould be incorporated into ***new*** fossil fuel power ***plants*** electricity generation. Should the TCEP demonstrate the feasibility of utility-scale electric power generation with carbon capture, it could result in the incorporation of carbon capture in **new** power plant**s**, with resulting reductions in CO_2 emissions from new electricity generating capacity built in the future.

Because the TCEP is designed for 90 percent carbon capture, ***it*** represents a step toward reducing GHG emissions from both from coal and natural gas ***power plants***.

5.2.2.2 WATER RESOURCES

Background

The proposed TCEP is located within the TWDB Water Planning Region F. Region F includes 32 counties in West Texas extending from Brownwood, McCulloch, and Mason Counties in the east to Reeves County in the West. Borden and Scurry Counties comprise the northern boundary and Pecos, Crockett, Sutton and Kimble Counties make up the southern boundary. As of 2010, approximately 72 percent of current water demand is associated with agricultural irrigation, with lesser amounts used for municipal, mining, steam electric power generation, livestock watering, and manufacturing purposes.

Water sources within Region F are 17 surface water reservoirs and 11 aquifers supplying ground water. Approximately 70 percent of the region's existing water supply consists of ground water from the Ogallala, Edwards-Trinity (Plateau), Edwards-Trinity (High Plains), and Pecos Valley Aquifers. Based on existing ground water supplies in the region (all aquifers), the TCEP has the potential to use approximately ***0.9*** percent of the annual available ground water, depending on the water source option selected by Summit.

Potable Water

The cit**ies** of Odessa and Midland get their potable water primarily from man-made reservoirs, with lesser amounts of water supplied **by** ground water aquifers. In Ector County, approximately 7.0 billion gal (26.6 billion L) or 21,583 ac-ft of water was used for municipal purposes in 2007 (TWDB 2011). Of that amount, approximately 6.0 billion gal (22.8 billion L) or 18,493 ac-ft came from surface water sources and 1.0 billion gal (3.7 billion L) or 3,070 ac-ft came from ground water sources. In Midland County, approximately 9.2 billion gal (34.8 billion L) or 28,288 ac-ft of water was used for municipal purposes in 2007. Approximately 7.2 billion gal (27.2 billion L) or 22,077 ac-ft came from surface water sources and 2.0 billion gal (7.6 billion L) or 6,211 ac-ft came from ground water sources. DOE reviewed TWDB historical water use data for the period from 1974 through 2004 and found that the trend in both Ector and Midland Counties has been an increase in the use of surface water sources and a corresponding decrease in the use of ground water for potable water.

Nonpotable Water

In Ector County, approximately 1.6 billion gal (6.2 billion L) or 5,069 ac-ft of water was used for nonmunicipal purposes in 2007. Of that amount, approximately 337.9 million gal (1.2 billion L) or 1,037 ac-ft came from surface water sources and 1.3 billion gal (4.9 billion L) or 4,032 ac-ft came from ground water sources. In Midland County, approximately 5.44 billion gal (20.59 billion L) or 16,700 ac-ft of water was used for nonmunicipal purposes in 2007. Approximately 10.7 million gal (40.7 million L) or 33 ac-ft came from surface water sources and 5.43 billion gal (20.55 billion L) or 16,667 ac-ft came from ground water sources.

Supply and Demand Forecasts and Uses

The Region F Water Plan states that the total water demand for the region will increase from 261.7 billion gal (990.9 billion L) or 803,376 ac-ft per year in 2010 to 265.5 billion gal (1.0 trillion L) or 814,991 ac-ft per year by 2060 (TWDB 2010c). TWDB projects that 198.7 billion gal (752.4 billion

L) or 610,000 ac-ft per year will be available in 2060. This represents a projected shortage of 78.2 billion gal (296.0 billion L) or 240,000 ac-ft per year by 2060.

Although none of the reasonably foreseeable projects identified by DOE would consume water, the withdrawal of up to ***4.5*** million gal (***17.0*** million L) of water per day, or ***5,041*** ac-ft per year, for the TCEP could affect future ground water supplies in varying degrees depending on the water source option selected by Summit:

- Gulf Coast Waste Disposal Authority Option: The GCA Waterline option (WL1 ***and WL5***) would supply treated municipal waste water for use as process water by the TCEP. The municipal waste water would come from the municipalities of Odessa and Midland. This ***waste*** water would continue to be ***produced*** and treated by the municipalities regardless of the TCEP's ***re***use. ***The city of Midland has plans for a small percentage of its waste water to be processed to higher quality through a small satellite WWTP (to be installed at or near the point of use). This cleaned waste water would then be used for landscaping and lawn maintenance by Midland College and perhaps another entity, thereby offsetting the use of potable water as now occurs. The volume of treated water provided to Midland College would vary from 100,000 gal (378,541 L) per day in the winter to 290,000 gal (1,097,769 L) per day in the summer.***

- Oxy Permian Option: Oxy Permian operates a network of pipelines that provide brackish (highly saline and nonpotable) ground water from the Capitan Reef Complex Aquifer. The Oxy Permian Waterline option (WL2) would provide process water to the TCEP from the existing pipeline system. Oxy-Permian would withdraw additional amounts of ground water to meet the TCEP's process water needs.

- Fort Stockton Holdings Option: Currently in the developmental stages, the FSH waterline project has been proposed to provide drinking water to the cities of Midland and Odessa. Under this option, FSH would provide water to the TCEP from two potential waterlines (WL3 and WL4). If it were built, the TCEP could use approximately 10 percent of the total water that would be available through the FSH waterline. The FSH water source would be ground water from the Edwards-Trinity (***Plateau***) Aquifer located near the city of Fort Stockton, which is approximately 66 mi (106 km) southwest of the proposed TCEP. The FSH water is currently permitted for agricultural irrigation activities on the FSH farms in Fort Stockton. This water has already been accounted for in the 2011 Texas Water Plan (TWDB 2010c), and the FSH mainline project would represent a change in the use for the water rather than a new demand on water.

Conclusions

The city of Midland has indicated that it would allocate a small percentage (up to 3 percent) of its waste water to be processed to higher quality through a small satellite WWTP for landscaping purposes. Combined with the approximately 40–50 percent diversion of Midland's waste water for TCEP use, the cumulative actions would result in a diversion of up to 53 percent of Midland's waste water to reuse activities. A beneficial impact could occur from the continuation of the current crop production on the spray irrigation fields, while gaining reuse (via landscaping and industrial development) benefits for the community. A potential adverse, indirect impact could occur if waste water used by the TCEP were not available to the city of Midland in the future and Midland needed this waste water for better uses, such as meeting the demand for municipal potable water. However, for WL1 ***and WL5***, DOE assumes that the municipal waste water from Odessa and Midland would not be used in the future ***(during the term***

of the contract between the city of Midland and Summit) for potable water. Thus, the TCEP's industrial use of the GCA water would not directly affect potable water supplies in the region. However, if the TCEP's use of this municipal waste water caused future users to rely on potable water sources instead of this waste water source, then the TCEP would have an indirect effect on future potable water supplies.

The Oxy Permian system is not utilized at its full capacity and the demand for water from that system for use in EOR has been declining as oil fields are requiring less supplemental water for their EOR needs. The current pumping rate is estimated to be as low as 50 percent of the former peak rate. If Summit chooses WL2, the TCEP's proposed water consumption would not likely affect current or anticipated future EOR water needs.

Although the TCEP's potential use of ground water from the Oxy Permian water supply would not result in an increase over historical pumping rates, it would require Oxy Permian to increase its withdrawal of ground water above current levels. Flow in the small, ephemeral streams of West Texas is driven primarily by rainfall with some contributions from seeps and springs. Increased pumping of ground water could affect flows from seeps and springs that originate in the aquifers where the pumping occurs.

The Oxy Permian water is saline and, for that reason, it is not used as a potable water source and is not likely to be used as a potable water source in the future. As noted above for WL1 ***and WL5***, if the TCEP's use of this nonpotable saline ground water caused future users to rely on potable water sources instead, then the TCEP would have an indirect effect on future potable water supplies.

Under WL3 and ***WL4***, FSH would convert water currently being used for agriculture to municipal and/or industrial uses, but would not increase current ground water withdrawal rates. Thus, the use of this water for the TCEP would not be expected to impose cumulative effects on ground water availability in the region. To the extent that use of the FSH ground water supplies for the TCEP caused future users to seek potable water sources instead, the TCEP would have an indirect effect on future potable water supplies.

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