2.0 Alternatives Including the Proposed Action

2.1 Evolution of Current USACE Fort Worth District Regulatory Framework and Section 404 Mitigation Guidelines for Surface Coal and Lignite Mines in Texas

2.1.1 Evolution of Current USACE Fort Worth District Regulatory Framework

USACE evaluation of applications for authorization of surface coal and lignite mining operations in the USACE Fort Worth District historically relied on environmental analyses in EISs prepared by the USEPA in the 1980s and 1990s for the respective mining operations. These EISs were prepared at a time when USEPA was responsible for administering the National Pollution Discharge Elimination System (NPDES) program relative to Section 402 of the CWA. Following USEPA's delegation of the NPDES program to the State of Texas, the USACE became the lead federal agency relative to NEPA compliance due to its Section 404 jurisdiction over surface coal and lignite mining operations in Texas.

Utilizing the USEPA EISs afforded the USACE Fort Worth District the opportunity to authorize many past surface coal and lignite mining proposals under different types of General Permits. The ongoing operations at existing mines and continued need for coal/lignite as a fuel source has resulted in more recent applications for authorization of proposed surface coal and lignite mine expansion areas and satellite mines beyond the geographic limits of the study areas in the USEPA EISs. These more recent applications typically have been evaluated under more rigorous Standard Permit review procedures involving public participation through Public Notice distribution and NEPA documentation (environmental assessments [EAs]) commensurate primarily with the potential impacts to aquatic resources. Project-specific EISs were prepared by the USACE (as lead federal agency) for two large mine expansion areas (Three Oaks Mine and Rusk Permit Area), based on USACE's determination that these projects had the potential to result in significant impacts.

In 2011, facing uncertainty with the potential 2012 reissuance of NWP 21 for Surface Coal Mining Activities, the Fort Worth District initiated development of an expedited Standard Permit procedure (i.e., LOP) – CESWF-11-LOP-3. This LOP was developed to provide a potential permitting option for: 1) projects anticipated to require re-authorization of existing permits for which previously authorized impacts were not expected to be completed during the authorized NWP 21 term, and 2) possibly other proposed surface coal and lignite expansion areas or new mine locations with potential aquatic resource impacts below the thresholds prescribed in the LOP. The LOP-3 procedure was finalized in January 2012 and has been utilized to authorize several relatively small mining projects. For projects that would exceed the LOP thresholds, a more substantive review process through evaluation as an individual permit (IP) would be required. The LOP-3 aquatic resource impact thresholds are identified in **Table 2-1**. The thresholds that would trigger a review under an IP, as well as the thresholds for NWP 21 and NWP 49, also are presented in the table.

Table 2-1 Existing Regulatory Framework

Permit Type	Acreage Limit	Linear Footage Limit	Agency Coordination Requirement	Resource Limitations
NWP 21	0.5	300 linear feet of stream (perennial, ephemeral, or intermittent), unless waived for ephemeral and intermittent streams	Coordination for waiver	No regional conditions limiting use

Table 2-1 Existing Regulatory Framework

Permit Type	Acreage Limit	Linear Footage Limit	Agency Coordination Requirement	Resource Limitations
NWP 49 – Coal Remining Activities[1]	None	None	No	Mine, reclamation and mitigation plan must result in a net increase in aquatic resource functions
LOP-3	20 acres	20,000 linear feet of stream, with no more than 1,000 linear feet for perennial streams	Yes[2]	Forested wetlands cannot make up more 50 percent of the waters of the U.S. impact area
IP	>20 acres	No limit	Yes	None

[1] May be authorized for mining and reclamation of lands previously mined for coal/lignite if the proposed activities are currently authorized, or are in the process of being authorized, under the Surface Mining Control and Reclamation Act (SMCRA) of 1977. New coal/lignite mining activities may be authorized in conjunction with the remining activities if: 1) the proposed new mining disturbance is 40 percent or less of the proposed total disturbance and 2) the overall mining plan would result in a net increase in aquatic resource functions.

[2] LOP-3 requires agency concurrence.

2.1.2 Evolution of Current USACE Fort Worth District Section 404 Mitigation Guidelines

The USACE Fort Worth District applies a consistent approach to Section 404 mitigation guidelines, compliant with the 2008 Mitigation Rule, irrespective of project type or permitting mechanism. While the site selection, goals and objectives, and implementation plans of compensatory mitigation proposals required few edits, other elements required by the Mitigation Rule necessitated changes and/or additions. These changes or additions included: 1) long-term protection of compensatory mitigation sites through an acceptable and appropriate real-estate covenant (e.g., conservation easement); 2) financial assurances of compensatory mitigation success through an acceptable and appropriate financial instrument (e.g., escrow account, letter of credit, or performance bond); and 3) long-term monitoring of sound, measurable, ecologic condition-based performance metrics as success criteria for compensatory mitigation projects. Also, coordination of recent project-specific proposals with resource agencies has resulted in the addition of standard language to compensatory mitigation plans requiring submittal of post-reclamation aquatic resource design plans to USACE and the resource agencies for review and USACE approval prior to construction. These design plans include but are not limited to plan, profile, and dimension measurements based on appropriate regional hydrographic and geomorphological data and successful as-built streams/systems on and/or near the respective mitigation site. This additional mitigation plan element goes beyond the Mitigation Rule requirements to further ensure aquatic resource reclamation success.

2.2 Proposed Action

Under the Proposed Action, the USACE Fort Worth District's current regulatory framework for surface coal and lignite mines in Texas (as described in Section 2.1.1, Evolution of Current USACE Fort Worth District Regulatory Framework) would be modified as discussed below. Also, USACE's permit review for potential future surface coal and lignite mine expansion areas and satellite mines proposed within the study areas for this REIS would follow the USACE proposed categories for future NEPA tiering or supplementation.

No changes to the USACE Fort Worth District's current Section 404 mitigation guidelines for surface coal and lignite mines in Texas are proposed. As such, the current Section 404 mitigation guidelines described in Section 2.1.2, Evolution of Current USACE Fort Worth District Section 404 Mitigation Guidelines, would continue to be implemented under the Proposed Action. As discussed in Chapter 1.0, under this REIS the USACE will not render a decision on any specific mine project. Rather, submittal of project-specific permit applications, development and evaluation of separate project-specific NEPA and 404(b)(1) analyses, and subsequent issuance of all required local, state, and federal permits would be required prior to development of any future surface coal or lignite mine expansion area or satellite mine in any of the study areas.

2.2.1 Proposed USACE Fort Worth District Regulatory Framework for Surface Coal and Lignite Mines in Texas

The proposed USACE Fort Worth District regulatory framework for surface coal and lignite mines in Texas is presented in **Table 2-2**. The proposed framework includes the establishment of a Regional General Permit (RGP) and a new LOP that includes modifications to the acreage and a change from agency concurrence (agreement) to agency coordination as compared to the process for the existing LOP-3. Resulting thresholds that would trigger evaluation of a potential future surface coal/lignite mine expansion under the existing IP process also are shown in the table. Changes to the terms and general conditions of NWPs may only occur at the USACE Headquarters level; USACE Districts may elect to add regional conditions to NWPs, after public review and USACE Division approval. At this time, no regional conditions are proposed to be added to NWP 21 or NWP 49.

Table 2-2 Proposed Regulatory Framework

Permit Type	Acreage Limit	Linear Footage Limit	Agency Coordination Requirement	Resource Limitations (type)
NWP 21[1]	0.5	300 linear feet of stream (perennial, ephemeral, or intermittent), unless waived for ephemeral and intermittent streams	Coordination for waiver	No regional conditions limiting use
NWP 49 – Coal Remining Activities[1,2]	None	None	No	Mine, reclamation and mitigation plan must result in a net increase in aquatic resource functions
RGP	0.5 – 10 acres	Study Areas 1-4: 20,000 linear feet all stream types, with no more than 1,000 total linear feet for perennial streams Study Areas 5-6: 30,000 linear feet all stream types, with no more than 1,000 total linear feet for perennial streams	No	Forested wetlands cannot make up more than 50 percent of the waters of the U.S. impact area; no impacts to bogs; no impacts to bald cypress-tupelo swamps

Table 2-2 Proposed Regulatory Framework

Permit Type	Acreage Limit	Linear Footage Limit	Agency Coordination Requirement	Resource Limitations (type)
LOP	10 – 25 acres	No limit[3]	Yes	Forested wetlands cannot make up more than 50 percent of the waters of the U.S. impact area
IP	>25 acres	No limit	Yes	None

[1] Reflects existing thresholds and resource limitations for the NWP 21 and NWP 49; no changes are proposed.

[2] May be authorized for mining and reclamation of lands previously mined for coal/lignite if the proposed activities are currently authorized, or are in the process of being authorized, under SMCRA. New coal/lignite mining activities may be authorized in conjunction with the remining activities if: 1) the proposed new mining disturbance is 40 percent or less of the proposed total disturbance and 2) the overall mining plan would result in a net increase in aquatic resource functions.

[3] USACE Fort Worth District will review each proposed action on a case-by-case basis.

2.2.2 Categories for Future NEPA Tiering or Supplementation

Tiered and supplemented NEPA documents for potential future surface coal and lignite mine expansion areas or satellite mines within the REIS study areas would incorporate by reference the REIS analysis and rely on future project-specific Section 404/10 and RCT permit applications, site-specific environmental baseline field studies, and project-specific plans for life-of-mine development and reclamation/closure to provide the level of detail needed to support the future project-specific NEPA analyses. A supplemented NEPA document also would require additional information to support the analysis due to project-specific issues or updated information since preparation of the REIS (e.g., newly listed threatened or endangered species with the potential to occur in the future proposed mine area). The preparation of future tiered and supplemented NEPA documents would be in accordance with the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508).

The USACE proposed categories for future project-specific surface coal and lignite mining NEPA tiering or supplementation are described below. The Section 404/10 permit requirements also are identified for each category.

Category 1: Those projects that meet the criteria for a NWP, RGP, or LOP as specified in **Table 2-2**. Other factors related to future project-specific impacts also would be considered in the USACE's decision relative to the use of these permits versus an IP. From a NEPA perspective, Category 1 projects would have no net anticipated significant impacts, as would be determined by the USACE under their authority as the lead federal agency for NEPA compliance.

Category 1 projects typically would require a NWP, RGP, LOP, or IP and a basic EA with a potential Finding of No Significant Impact (FONSI).

Category 2: Those projects that would result in impacts to waters of the U.S. in excess of the LOP criteria specified in **Table 2-2**. From a NEPA perspective, Category 2 projects would have no net anticipated significant impacts, as would be determined by the USACE under their authority as the lead federal agency for NEPA compliance.

Category 2 projects would require an IP and a more robust EA with a potential FONSI or mitigated FONSI.

Category 3: Those projects that would result in impacts to waters of the U.S. in excess of the LOP criteria as specified in **Table 2-2** (similar to Category 2). From a NEPA perspective, Category 3 projects would have the potential for significant impacts, as would be determined by the USACE under their authority as the lead federal agency for NEPA compliance.

Category 3 projects would require an IP and an EIS.

In accordance with the requirements of NEPA, if an EA analysis of projects in Categories 1 or 2 results in the identification of previously unanticipated significant impacts that cannot be mitigated, a subsequent EIS would be required. USACE, as the lead federal agency for NEPA compliance, also would have the authority to require an EIS without the preparation of an EA if it is determined that the action would have the potential to result in significant impacts, even if the impacts could be mitigated to a less than significant level.

2.2.3 Study Areas

Six study areas have been identified for the REIS as shown in **Figure 1-1**. The study areas were delineated by the USACE Fort Worth District in coordination with Texas Mining and Reclamation Association to define areas within the coal/lignite belt in Texas that are in reasonable proximity to existing surface coal and lignite mines with potential for future development of mine expansion areas or satellite mines. Locations within each of the study areas that would not be available for future surface coal or lignite mine development, including existing development areas (e.g., existing mines, towns, reservoirs, etc.), parks (federal, state, and local), and National Wildlife Refuges, were excluded from the study areas. The resulting total acreage of each study area, the estimated maximum disturbance acreage associated with anticipated requests for future surface coal and lignite mining authorizations, and the resulting estimated percent of each study area that potentially would be affected are identified in **Table 2-3**.

Table 2-3 Summary of Study Areas

Proposed Action Study Areas	Approximate Total Acreage in Study Area	Estimated Maximum Disturbance Acreages Associated with Potential Requests for Future Authorizations	Estimated Percent of Study Area Potentially Disturbed under Anticipated Requests for Future Authorizations
Study Area 1	912,500	13,500	1.5
Study Area 2	1,449,300	50,200	3.5
Study Area 3	1,219,200	50,600	4.2
Study Area 4	365,300	9,800	2.7
Study Area 5	180,800	9,500	5.3
Study Area 6	252,300	25,000	9.9
Total	4,379,400	158,600	3.6

2.2.4 Description of a Typical Surface Coal and Lignite Mine

To facilitate the analysis of direct, indirect, and cumulative impacts associated with potential future development of coal and lignite mine expansion areas or satellite mines in Texas, a description of the typical construction, operations, and closure/reclamation activities and typical mine components are summarized below. Ranges are provided, as needed, to bracket the potential development activities associated with both a typical mine expansion and a typical satellite mine, as well as to account for regional differences. For these descriptions, a mine expansion, based on its proximity to the existing

mine, is anticipated to utilize some or most of the ancillary facilities (e.g., mine offices, truck shop, warehouse facilities, coal or lignite storage facilities, etc.) at the existing mine. A satellite mine, due to its distance from the existing mine, is anticipated to require construction of some additional separate ancillary facilities.

A list of equipment that would be used at a typical mine expansion area or satellite mine is presented in **Table 2-4**. The estimated number of personnel that potentially would be employed by phase of activity is presented in **Table 2-5** by study area. Operations would be conducted 24 hours per day, 365 days per year. The estimated annual payroll including benefits for each study area is presented in **Table 2-6**.

Table 2-4 Typical Equipment List

Equipment[1]	Quantity	Horsepower Rating	Average Annual Operating Hours/Unit
Dragline (up to 120-cubic yard)	1 – 6	Electric	3,000 – 7,000
Continuous-miner	1 – 2	950 – 1,200	2,000 – 5,000
Excavator/Backhoe (3- to 18-cubic yard)	1 – 5	404 – 1,400	2,000 – 6,800
Front-end Loader (5- to 15-cubic yard)	1 – 9	272 – 880	2,000 – 6,000
Haul Truck (120- to 240-ton)	2 – 15	469 – 1,450	2,000 – 6,000
Shovel	1	1,400 – 2,000	5,000 – 6,000
Scraper	1 – 2	250 – 950	100 – 4,500
Grader	1 – 7	165 – 350	2,000 – 6,000
Dozer	2 – 7	200 – 580	2,800 – 7,000
Crawler Dozer	3 – 25	449 – 700	2,000 – 8,000
Rubber Tired Dozer	1	498 – 500	1,000 – 4,700
Bottom Dump Truck (240-ton)	9	– –	Up to 4,600
Water Truck	1 – 7	469 – 1,487	1,600 – 5,600
Long-haul Truck	3 – 18	924 – 1,450	Up to 5,000
End-dump Truck	4 – 21	925 – 1,450	2,500 – 5,800
Utility Front-end Loader, Tool Carrier, Cable Reeler	1 – 23	149 – 200	500 – 1,000
Utility Backhoe	1 – 3	450	Up to 3,000
Passenger Van (12- to 15-passenger)	1 – 5	245 – 315	1,000 – 3,000
Pick-up Truck	6 – 111	300 – 315	1,000 – 5,000
Fuel/Lube Truck	1 – 5	280 – 469	1,000 – 7,200
Welders Truck	1 – 2	300 – 310	50 – 3,000
Mechanics Truck	1 – 9	280 – 330	100 – 3,000
Boom Truck	1 – 12	300 – 310	500 – 3,000
Lowboy w/Tractor	1 – 6	300 – 1,350	500 – 3,000
Tire Truck	1 – 3	300 – 310	—
Hydromulcher	1	140	—
Diesel Pumps	4 – 73	71 – 160	500 – 1,250
Electric Pumps	2 – 34	75 – 125	Up to 1,000
Generator	1 – 14	—	Up to 50

Table 2-4 Typical Equipment List

Equipment[1]	Quantity	Horsepower Rating	Average Annual Operating Hours/Unit
Poly Pipe Fusion Machine	1	2	Up to 250
Welders, Diesel or Gasoline	7 – 40	64	Up to 50
Pump Tractor/Skidder	1 – 2	95 – 250	500 – 2,000
Cable Tractors	1 – 4	100 – 120	2,000 – 3,600
Crane (50- to 65-ton)	1 – 3	250 – 300	250 – 750

[1] Contractor equipment for earth moving and reclamation also would be used, as needed.

Table 2-5 Estimated Employment Numbers by Mine Phase

Study Area	Mine Phase	Existing Employees[1]	New Hires	Contract Workers[2]	Total
Study Area 1	Construction	50 – 200	0	0 – 100	50 – 300
	Operations	100 – 300	0	0 – 90	100 – 390
	Closure/Final Reclamation	50 – 100	0	0 – 50	50 – 150
Study Area 2	Construction	10 – 260	0	30 – 150	40 – 410
	Operations	10 – 260	0-30	10 – 40	50 – 300[3]
	Closure/Final Reclamation	10 – 100	0-30	10 – 40	50 – 140[3]
Study Area 3	Construction	20	0	300	320
	Operations	105 – 320	0	4 – 50	109 – 370
	Closure/Final Reclamation	80	0	0	80
Study Area 4	Construction	50 – 200	0	0 – 100	50 – 300
	Operations	100 – 300	0	0 – 90	100 – 390
	Closure/Final Reclamation	50 – 100	0	0 – 50	50 – 150
Study Area 5	Construction	0	0	45	45
	Operations	232	30	0	262
	Closure/Final Reclamation	60	0	0	60
Study Area 6	Construction	14	0	30	44
	Operations	14	251	0	265
	Closure/Final Reclamation	30	0	30	60

[1] Assumes existing work force would transition from existing operations to the potential future mine expansion area or satellite mine.

[2] The majority of the contract workers would be new hires.

[3] Values not additive as they reflect the variables for a typical mine expansion area or satellite mine.

Table 2-6 Estimated Annual Payroll including Benefits

Study Area	Estimate Annual Payroll including Benefits[1,2] (million dollars)
Study Area 1	25
Study Area 2	4.5 – 63
Study Area 3	37 – 50
Study Area 4	30
Study Area 5	20
Study Area 6	27

[1] Values in 2013 dollars.

[2] Values do not include estimated payroll/benefits for contract workers.

Prior to initiation of mining, proposed ancillary facilities (e.g., equipment fueling and parking area, temporary or long-term coal or lignite storage areas, office and shop facilities) and primary haul roads and utility corridors necessary to provide access between the initial mining area and existing or proposed ancillary facilities would be constructed. Erosion control measures and surface water control facilities for the initial development area also would be installed and constructed, respectively. These construction activities primarily would occur during the first year of the mine life and typically would result in the largest annual disturbance acreage. Surface disturbance would continue to occur incrementally throughout the life of the mine as mine pits and haul roads advance, additional surface water control facilities are installed, and existing roads and utilities within the mine area are relocated. The total disturbance area for any specific future surface coal or lignite mine expansion area or satellite mine would vary depending on a variety of factors, primarily including the tons of recoverable coal or lignite per acre (which would vary with location) and the annual production rate required to continue to meet supply obligations. The total maximum estimated acreage of potential future mine-related disturbance within each of the study areas is identified in **Table 2-3**.

The life of a typical mine expansion would range from approximately 1 to 30 years. For a typical satellite mine, it would range from approximately 5 to 30 years. The time period associated with the three general mine phases generally would be:

- Construction or development activities (primarily in mine year 1);
- Operations or steady-state mining activities (starting in mine year 1 or 2 and continuing for up to 30 years); and
- Closure and final reclamation activities (up to 5 years following the completion of mining).

Overburden and interburden (the material to be removed above and between, respectively, the coal and lignite seams) primarily would be removed using draglines to uncover the coal or lignite seams. Both highwall and spoil side positions may be used by the draglines. A truck and shovel fleet or dozers may be used in addition to, or in place of, draglines for overburden and interburden removal. Blasting typically would not be required. If blasting is required, it would be conducted in accordance with RCT regulations. The volume of overburden production would vary with the depth at which the recoverable coal or lignite resource occurs; interburden production also would vary. The minimum mineable coal or lignite thickness considered to be recoverable varies but typically ranges from 0.5 to 4.0 feet. The range of overburden/interburden to coal/lignite stripping ratios and the estimated future annual coal/lignite production by study area are presented in **Table 2-7**.

Table 2-7 Typical Stripping Ratios and Estimated Future Annual Coal/Lignite Production by Study Area

Study Area	Range of Overburden/Interburden to Coal/Lignite Stripping Ratios[1]	Estimated Annual Coal/Lignite Production by Study Area[2] (million tons)
Study Area 1	3.0 – 12.0	3.0
Study Area 2	5.5 – 13	0.4 – 8.2
Study Area 3	3.5 – 20.0	1.9 – 10.7
Study Area 4	3.9 – 5.0	6.7
Study Area 5	12.0	3.3
Study Area 6	10.5	3.0

[1] Reflects million cubic yards of overburden/interburden moved to recover a million tons of coal/lignite.

[2] Based on current supply obligations of existing coal and lignite mines.

Once an initial box cut (pit) is excavated, overburden and interburden from each subsequent pit would be backfilled into the previous pit and graded to approximate original contour. This surface then would be suitable for completion of reclamation procedures including rough and final grading, placement of growth media or prime farmland soils (as applicable), testing of growth media for suitability, seeding and planting, installation of permanent erosion control structures, and other final reclamation tasks. The sequence of activities would be implemented to achieve post-mining land uses and long-term reclamation goals of landowners and as approved by permitting agencies prior to site construction.

As the active mine pit advances, existing roads would be closed incrementally by the jurisdictional agency in advance of mine operations. Alternate public and landowner access routes would be provided prior to road closures. In some locations, these alternate road alignments would be permanent. In other locations, the roads would be returned to their original alignment as sequential operations and reclamation activities advance. In general, roads that are returned to their original alignment would be reopened approximately 5 to 15 years after being mined through and following approval of the appropriate jurisdictional agency.

Utilities (e.g., natural gas pipelines, transmission lines, etc.) would be rerouted and removed in advance of mining. Utilities may be permanently rerouted at the discretion of the owner in advance of mine operations. Pipelines located within 100 feet of a mine permit area would be maintained in accordance with RCT regulations.

All oil and gas wells within an area of proposed mining would be sealed in accordance with RCT regulations. Oil and gas wells that would be mined through would be plugged in accordance with 16 Texas Administrative Code (TAC) 3.14.

Surface lignite and coal mining in Texas typically occurs on company and privately owned lands. Privately owned lands would be leased or purchased prior to mine development.

An ongoing exploration program typically would be conducted within the overall proposed mine expansion area or satellite mine, but outside of the initial RCT-approved 5-year mine permit area, to further define the coal or lignite deposit as mining plans are developed. Cement plugs would be installed in the exploration drill holes within 2 days of completion. If flowing water, oil and/or gas, or zones of alternating or unusable water quality are encountered, cement plugs would be installed to prevent flow from, or mixing within, the drill hole.

2.2.4.1 Typical Construction Phase

Receipt of all required local, state, and federal permits would be required prior to initiation of mine construction (see Chapter 1.0). Typical construction activities and mine components developed during the construction phase are described below.

Surface Water Control Facilities

Surface water control facilities would be constructed in appropriate locations prior to initiation of construction to control runoff from disturbance areas, including the initial mining area and infrastructure areas, and to divert runoff from adjacent undisturbed areas around mine disturbance areas. These facilities would be designed to minimize erosion and to control the quality of surface water discharged from the site. Structures would be designed, constructed, and maintained in accordance with RCT requirements. All surface water runoff from mine disturbance areas would be monitored by the mine operator and discharged through Texas Pollutant Discharge Elimination System (TPDES) regulated outfalls in accordance with TPDES permit criteria as required by TCEQ. Typical surface water control facilities would include the following:

- Temporary sediment control measures (e.g., drop structures, terraces, silt fences, vegetation, check dams) would be installed to minimize erosion, trap sediment, and stabilize reconstructed soils.
- Temporary and permanent fresh water diversions would be constructed to divert runoff from undisturbed areas around the mine disturbance areas.
- Temporary and permanent storm water diversions would be constructed to direct runoff from mine disturbance areas to sediment control ponds prior to discharge.
- Sediment control ponds would be designed and constructed to contain storm water runoff from mine disturbance areas and provide for adequate retention time or treatment (e.g., addition of flocculants or chemical additives) to allow collected runoff to meet TPDES discharge limits.

Following construction, pond embankments and the surrounding area disturbed during construction would be revegetated or otherwise stabilized. A stable vegetative cover would be maintained on all embankments. Each pond would be routinely monitored as required by MSHA and RCT regulations until the structure is removed or converted to a permanent installation.

Dewatering and Depressurization Systems

Dewatering of overburden would be necessary where saturated sands or water-bearing lenses occur in proposed mine areas. Dewatering would reduce the amount of groundwater entering the pits and would stabilize the highwall and spoil for safety reasons and to allow efficient operations. Underburden depressurization also would be necessary at some mines to reduce the head pressure and, thereby, prevent pit floor heaving and instability of spoil and highwalls that could result in unsafe work conditions for personnel and equipment. Dewatering and depressurization operations would be accomplished through the incremental installation of dewatering or depressurization wells as mine pits advance. The required number of dewatering and depressurization wells and the associated pumping rates would be dependent on site-specific hydrologic conditions.

Dewatering wells would be decommissioned immediately prior to being mined through and, if shallower than the final depth of mining, would not be plugged. Dewatering wells that extend below the final depth of mining or were constructed adjacent to a mine area, and depressurization wells no longer needed for mining purposes, would be plugged in accordance with RCT and TCEQ regulations or retained for non-mining purposes with approval of TCEQ.

Dewatering and depressurization well water would be used on-site or disposed of in accordance with TCEQ requirements via sediment control ponds in accordance with TPDES criteria or, if the water meets TPDES discharge standards without treatment, discharged directly to the nearest surface water channel. Alternately, the water may be discharged to injection wells in accordance with mine-specific RCT and TCEQ authorization.

Clearing and Grubbing

Once surface water controls are in place, vegetation removal would be completed by clearing and grubbing equipment. Clearing operations would be conducted in advance of ancillary facility construction and incrementally in advance of pit excavation. Vegetation removal would be conducted outside of the peak migratory bird breeding season, to the extent possible. Cleared vegetation would be used to construct brush piles and/or windrows for wildlife cover, recycled into mulch, buried in the pit along with overburden material, or burned in accordance with state and local regulations. Where present, merchantable timber typically would be removed by the landowner or a contractor.

Prime Farmland and Other Topsoil Handling

Prime farmland as defined by the Natural Resources Conservation Service (NRCS) is land that has the best combination of physical and chemical soil characteristics for crop production. Unless a negative prime farmland determination has been issued by the RCT (determined based on site-specific investigations and the criteria in TAC Section 12.138 [TAC 2013]), topsoil and subsoil salvage operations on prime farmland would be conducted in advance of construction activities and incrementally in advance of pit excavation. Topsoil and subsoil would be salvaged separately to a depth of 4 feet using backhoes and end-dump trucks or scrapers. These materials would be directly placed (subsoil then topsoil) on regraded areas as part of the reclamation sequence to the extent possible, or segregated and stockpiled for future reclamation purposes. Depending on the planned duration of storage, stockpiles may be stabilized through seeding and the installation of erosion controls (i.e., diversion channels or berms) and best management practices (BMPs) (e.g., silt fences or staked straw bales) to control sediment transport. Appropriate signage would be placed at stockpile locations to prevent possible use of the material for purposes other than reclamation.

At sites not designated as prime farmland, topsoil and suitable overburden material would be salvaged separately or together for use as a growth media in accordance with site-specific RCT requirements. Sufficient growth media would be salvaged to provide a suitable cover depth (a minimum of 4 feet) for reclamation purposes. These materials would be directly placed on regraded areas (suitable overburden then topsoil where salvaged separately) as part of the reclamation sequence to the extent possible or stockpiled for future reclamation purposes. Stockpile stabilization and signage would be the same as described above for prime farmland soils.

Main Haul Roads and Transportation Corridors

Primary haul roads would be constructed to provide access between the initial mining area and proposed ancillary support facilities. For future proposed mine expansion areas and satellite mines, a transportation and utility corridor typically would be constructed to connect the mine expansion area to the existing mine facilities. The transportation corridor would include a haul road and potentially a conveyor corridor, depending on the mine site. The transportation corridor would facilitate the transfer of mining equipment (e.g., draglines, truck and shovel fleet, etc.) to the mine expansion area, provide access to existing ancillary facilities, and facilitate the transport of coal or lignite (via truck or conveyor) from the mine expansion area to existing coal/lignite stockpiles or handling facilities. Construction typically would include the placement of appropriate fill and road surfacing material, installation of drainage channels and culverts, where needed, and placement of riprap for reinforcement and erosion control. As soon as practical, temporary disturbance areas would be revegetated.

Ancillary Support Facilities

Ancillary Facilities

Mine expansion areas and satellite mines would utilize the facilities at the existing mine, typically including the mine office, truck shop, truck wash, warehouse facilities, portions of the existing haul road(s), and the coal/lignite storage and handling facilities. New facilities may include temporary coal/lignite storage stockpiles, employee facilities, an equipment repair area, fueling and parking area, a water truck fill station, an overland conveyor with associated coal handling facilities, and non-lignite storage areas. Most or all of these facilities would be constructed for a satellite mine.

Electrical Power Supply

Electrical power supply would be provided by the local power provider typically via a 138-kilovolt (kV) transmission line. For mine expansion areas and satellite mines, the transmission line may be installed in the transportation corridor that would be constructed to connect to the existing mine site (see Main Haul Roads and Transportation Corridor subsection above), or alternately installed to connect to the closest existing transmission line in coordination with the local power provider. Transmission lines for satellite mines would connect to the local grid as determined in coordination with the local power provider. Substations would be installed, as needed. Distribution lines would be installed within the mine area between the 138-kV transmission line and portable substations. The portable substations would be relocated, as needed, as mining operations advance. Trailing cables would be used to convey power from the portable substations to the mine pit to feed the draglines and support the dewatering system. Distribution lines also would be constructed, as needed, to provide power to the mine maintenance and office facilities as well as the stockpile/blending facilities to feed the crusher, stacker, and conveyors.

All power lines and transmission lines would be designed and constructed in accordance with guidelines presented in Reducing Avian Collisions with Power Lines (Avian Power Line Interaction Committee [APLIC] 2012) and Suggested Practices for Avian Protection on Power Lines (APLIC 2006).

Access Roads

Access roads would be constructed to facilitate construction and maintenance of sediment control ponds and other surface water control facilities (e.g., freshwater diversions), provide access to groundwater pump sites, provide access to surface water and groundwater monitoring sites, and provide access for clearing and grubbing equipment. Drainage channels and culverts would be installed during road construction, as needed, and erosion controls (e.g., rock sediment traps, silt fences, earth berms) would be installed in the roadway ditches to minimize erosion and retain sediment. These roads would remain in place, as needed, following construction to provide access for monitoring and maintenance purposes.

Coal Transport and Coal Handling Facilities

For a typical mine expansion area, trucks would be used to transport coal/ lignite from the mine expansion area to existing coal/lignite stockpiles or handling facilities as discussed above in the Main Haul Roads and Transportation Corridor subsection. Alternately, an overland conveyor may be constructed within the transportation corridor to transport lignite or coal between a typical mine expansion area and existing stockpiles or coal/lignite handling facility. The conveyor would be covered to provide for wind protection/dust control and to minimize additional coal/lignite moisture as a result of precipitation. A conveyor maintenance facility, as well as new coal handling facilities to prepare the run-of-mine coal/lignite for transport by conveyor (including a truck dump and crushing and transfer equipment with dust control equipment), also would be constructed in the mine expansion area.

For a typical satellite mine, coal/lignite storage and handling/blending facilities would include truck dumps; crusher(s); overland, reclaim, and transfer conveyors for transport of coal/ lignite; stockpiles; sampling and analysis systems; and dust control equipment. Coal/lignite transport via rail, if proposed in the future, would require construction of a new rail spur. Prior authorization from the jurisdictional

agencies and agreements with railroad companies, as applicable, would be required prior to construction and operation.

Water Supply

Water used for dust suppression would be obtained from dewatering/depressurization wells, sediment control ponds, or other sources authorized by TCEQ. Potable water for mine expansion areas and satellite mines typically would be obtained from privately owned groundwater wells at existing mine office complexes or from a local water provider. For satellite mine locations, either a new potable water source (i.e., groundwater well) would be permitted and developed or the water would be obtained from a local provider.

Wastewater

Collection and handling of wastewater associated with both potable and non-potable water supplies (as would be required for satellite mines) would be conducted in accordance with applicable permits and building codes. Design and construction of an on-site sewage treatment system would be in compliance with all applicable local and state regulations to ensure groundwater protection.

Water associated with facilities and equipment washing would be collected by the surface water control facilities in place within the facilities area. A dedicated sediment pond would be used to recycle this water, where possible. Any oil contained in this water would be removed by oil separation equipment prior to reuse or discharge. Discharge of excess water would be conducted in compliance with TCEQ permit criteria. Solids retained in the sediment pond periodically would be removed and disposed of in the mine pit.

Fuel and Lubricant Storage

Flammable fluids (e.g., gasoline or diesel fuel) or other materials (e.g., oil, grease, anti-freeze, solvents) classified as toxic or hazardous by TCEQ and other applicable regulatory authorities would be registered, transported, stored, labeled, handled, and disposed of in accordance with applicable regulatory requirements. In addition, a state-required and -approved Spill Prevention, Control, and Countermeasure (SPCC) Plan would be implemented to minimize the potential for, and resulting impacts of, an on-site spill or release of these materials.

For mine expansion areas and satellite mines, fuels and lubricants typically would be stored at the existing mine facilities or, for diesel fuel and gasoline, at a new equipment fueling area that would include above-ground storage tanks installed in accordance with a state-approved SPCC Plan. Typically, there would be no increase in use or consumption of any of these materials as operations transition from the existing mine to the mine expansion area. However, there would be an extended period of transport to, and use at, the mine site. For a satellite mine, required fuel and lubricant storage facilities would be constructed in accordance with applicable regulatory requirements. A temporary increase in the storage, use, and consumption of these materials may occur during construction and the period of operations overlap with the existing mine; there also would be an extended period of transport and use of these materials.

Refuse and Solid Waste Disposal

During construction and operations, short-term storage areas for non-coal wastes (e.g., combustible refuse, non-combustible refuse, flammable liquids, and chemicals) would be registered with the TCEQ and other applicable agencies as required under federal regulations. Temporary placement and storage of non-coal wastes would be in a controlled manner within the mine plan area to ensure that any leachate and surface runoff would not degrade surface water or groundwater, fires would be prevented, and the area would remain stable and suitable for reclamation and revegetation. Disposal of non-coal wastes would be in accordance with TCEQ's regulations in order to meet all local, state, and federal

requirements. Waste materials would be reclaimed and reused or salvaged whenever practical. Unsalvageable combustible wastes would be disposed of by controlled burning under TCEQ regulations, when possible. As applicable, some non-coal wastes (e.g., crushed galvanized culverts) would be removed from the mine site in accordance with TCEQ regulations.

During construction and operation, some non-coal wastes (i.e., trees, tree by-products, and rocks) would be disposed of in the mine backfill. Wastes would be compacted and covered. Suitable growth media (a minimum of 4 feet) would be placed over the site, slopes stabilized, and the area revegetated. These activities would be conducted in accordance with all local, state, and federal requirements.

Fencing, Site Security, and Fire Management

During the construction phase, perimeter fencing, gates, earthen berms, and appropriate signage would be installed to control public access. These facilities would be maintained throughout the life of the mine.

During construction and operation, prescribed fires may be used for fire management within the mine boundary, as well as for burning of cleared vegetation in advance of mining. Mobile equipment capable of excavating, burying, or extinguishing fires would be available on site. Prescribed fires would be conducted in accordance with state and local regulations and coordinated with local fire control authorities.

Lighting

During construction and operations, mobile light plants would be used in the mine pit areas as may be required by MSHA or to address safety and operations practices to provide for night mining activity. Mobile lighting equipment also would be used for the transportation and utility corridor.

Initial Mining Area

Prior to mining, ramps and main haul roads would be constructed in the initial mine area in accordance with mine plans that would address MSHA and RCT regulations. Ramps and haul roads incrementally would be constructed over the life of a mine as the mine pits advance. Crushed rock or other RCT-approved surfacing material would be used as a road surfacing material to provide for all-weather travel. Bottom ash also may be used as a road surfacing material with prior approved from TCEQ and RCT. BMPs (e.g., water, approved chemical dust suppressant, periodic road maintenance) would be used to control fugitive dust emissions from road surfaces. In preparation for mining, overburden would be removed from the initial mine area (box cut) using draglines or mobile equipment (e.g., dozers, scrapers, backhoes/excavators, end-dump trucks, and front-end loaders) to expose the upper coal or lignite seam. The overburden would be placed in an adjacent temporary out-of-pit stockpile. Selective handing of overburden, as needed, would be conducted for all mine areas to ensure adequate volume of suitable plant growth media. The remainder of the overburden, as well as the interburden removed from between the coal or lignite seams, would be side-cast into a previously mined-out pit during normal operations. Spoil from the initial pits would be sequenced so the upper portion (a minimum of 4 feet) would meet the criteria of plant growth media. Overburden and interburden from subsequent pits would be graded to tie into the adjacent topography and drainage patterns established by the graded spoils from the initial pit.

Utility Relocations and Road Closures

Prior to mining, existing public roads and utilities located within the initial mine development area would be closed or relocated, respectively, as needed and approved.

Ground-truthing of all utility locations would be conducted prior to mining. During construction and operations, removal and relocation of pipelines, transmission lines, and other utilities would be negotiated with the respective owners of the utilities prior to disturbance. This work would be completed by, or under the direction of, the utility owners.

Portions of public roads would be closed or temporarily may be affected by bridge or overpass construction at various times during the life of a typical mine. All required approvals from the jurisdictional agencies and alternate public and landowner access would be provided prior to closure of any public road segment. Unless a variance is obtained from the jurisdictional agency, mining activities would not be conducted within 100 feet of a public road right-of-way (ROW) until the road has been closed by the jurisdictional agency.

2.2.4.2 Typical Operations Phase

The operations phase would include activities associated with normal, steady-state mining operations up to initiation of closure and reclamation activities. Typical mining, maintenance, and concurrent reclamation activities conducted during the operations phase are described below.

Surface Water Control Facilities

BMPs (e.g., silt fences, straw bales, riprap) would be used throughout operations to limit erosion and reduce sediment transport as a result of storm water runoff from the mine disturbance areas. Storm water diversions and sediment control ponds would be installed during the construction phase and incrementally over the life of a mine. These facilities would be used to divert and route storm water and to control sediment in surface water runoff from newly disturbed lands during mine pit advancement. TPDES-regulated outfalls (discharge locations) would be installed, where needed, to facilitate discharge from sediment control ponds. The design, construction, and operation of these facilities would be in accordance with RCT and MSHA requirements. Storm water diversions also would be constructed to divert storm water runoff from undisturbed areas around disturbance areas, where needed.

To facilitate mining, a series of berms, ditches, or sumps would be constructed in and around the mine pits to control surface water and groundwater inflow. These water control features incrementally would be installed in appropriate locations throughout the life of a mine as operations advance. Collected water would be pumped to a sediment control pond prior to discharge.

Berms and ditches would be used in rough graded areas to maintain dry pit conditions, to provide a safety feature and address MSHA requirements along the highwall edge, and to retain sediment within the disturbance areas. These sediment and water control measures would be used in conjunction with sediment control ponds, and installed incrementally where needed as operations advance. No berm or ditch that would increase a pond watershed area would be constructed without prior approval of the RCT.

Following storm events, the water quality of the contained storm water runoff would be monitored on a continuous basis. When the water quality meets TPDES permit criteria, the water typically would be discharged down to the sediment storage level of the pond. Between storm events, the sediment control ponds would be dewatered to an elevation that would provide sufficient storage capacity to retain runoff from a 10-year/24-hour storm event or as required by RCT.

During operations, drainage and sediment control facilities and installed erosion controls would be routinely inspected and maintained. Sediment periodically would be removed from the ponds to maintain adequate containment volume for a 10-year/24-hour storm event or as required by RCT. Grading would be conducted to maintain site drainage patterns.

Dewatering

During operations, additional dewatering wells would be installed, where required, in advance of pit excavation to partially dewater overburden and interburden zones. Additional depressurization wells also would be installed at some mines, depending on site-specific hydrologic conditions, to reduce the head pressure below the advancing pit floor. Water pumped from these wells would be used or discharged in

accordance with procedures described in the Dewatering and Depressurization Systems subsection under Section 2.2.4.1, Typical Construction Phase.

Dewatering wells would be decommissioned immediately prior to being mined through. Decommissioning would include removal of electrical cables, pipelines, pumps, and ancillary equipment. Dewatering wells typically would not be plugged as they would be shallower than the final depth of mining. Dewatering wells that would extend below the level of mining or were constructed adjacent to the actual mine area, and depressurization wells no longer needed for mining purposes, would be plugged in accordance with RCT and TCEQ regulations or retained for non-mining purposes.

Seepage and surface runoff collected in the active mine pit would be pumped to nearby sediment control ponds for treatment, as needed, to meet TPDES permit criteria prior to discharge to local drainages. Alternately, the water may be discharged to injection wells in accordance with mine-specific RCT and TCEQ authorizations.

Clearing and Grubbing

Clearing and grubbing to remove vegetation would be conducted incrementally in advance of pit excavation. Clearing practices, including minimizing clearing to the extent needed at any given time, timing clearing operations to avoid the peak migratory bird breeding season, to the extent possible, and disposal of cleared vegetation would be conducted as discussed in the Clearing and Grubbing subsection under Section 2.2.4.1, Typical Construction Phase.

Prime Farmland and Other Topsoil Salvage and Stockpiling

Salvage of prime farmland soil, where present, and other topsoil would occur incrementally throughout the life of a mine as the mine pit advances. Salvage and handling procedures would be the same as described in the Prime Farmland and Other Topsoil Handling subsection under Section 2.2.4.1, Typical Construction Phase.

Haul and Access Road Construction

Haul roads in the active mine area would be extended as mining operations advance, and access roads would be constructed or extended, as needed, to provide access for ongoing maintenance and monitoring purposes. Road surfaces would be maintained on a regular basis by grading, ditch cleaning, and adding additional RCT-approved surfacing material.

Access and haul roads would be constructed and maintained to have adequate drainage control (e.g., ditches, culverts) designed to safely pass peak runoff from a 10-year/6-hour precipitation event or as required by RCT. Erosion control measures (e.g., rock sediment traps, silt fences) would be installed in the roadway ditches to minimize erosion and retain sediment and would be used in conjunction with the sediment control ponds.

Structures for road crossings of perennial or intermittent streams would include bridges and culverts. Bridges and culverts would be designed and constructed to accommodate runoff from a 10-year/6-hour precipitation event or as required by RCT. Final design plans would be approved by RCT prior to construction. Low-water crossings would be designed, constructed, and maintained to prevent erosion of the structure or streambed and additional contributions of suspended solids to stream flow.

If haul road or access road crossings of active pipelines should be necessary, a minimum of 6 feet of compacted material (or as agreed with the pipeline owner) would be placed between the pipeline and the road that crosses over it. No excavation would be allowed within 100 feet or the depth of the cut, whichever is greater, of an active oil or gas pipeline without prior approval by RCT.

Fugitive dust generation from haul roads typically would be controlled by water sprays, approved chemical dust suppressants, and regular maintenance and/or slow-curing liquid asphalt as allowed by TCEQ. Other fugitive dust emission controls would include proper loading of haulage trucks to limit spillage (i.e., not over-loading); prompt removal of coal, rock, or soil from roads; compaction of unpaved roads, as needed; and restriction of travel of unauthorized vehicles on other than established roads.

Overburden and Interburden Removal

The size, depth, highwall slopes, and bench heights of active mine pits would vary by mine depending on site-specific conditions (e.g., geologic structure).

During operations, draglines would work from one end of the pit area to the other, with spoil side-cast into a previously mined-out pit (**Figure 2-1**, Typical Mine Sequence). Alternately, mobile equipment would be used for overburden and interburden removal, with the material placed in end-dump trucks for transport to a previously mined-out pit. Per RCT requirements, the backfilled spoil subsequently would be regraded to establish a graded surface at the approximate original contour. Overburden would be selectively handled, as needed, to ensure placement of a minimum cover of suitable growth media (a minimum of 4 feet) on regraded backfill for reclamation purposes. Growth media and prime farmland soils, where present, would be hauled directly to and redistributed on regraded areas to the extent possible, or alternately placed in temporary stockpiles. Sequential overburden and interburden removal, pit backfilling and regrading, and growth media placement would continue throughout the life of a mine. As a result of sequential backfilling of the mine pits and concurrent reclamation, the acreage of mine pit-related disturbance at any given time during operations typically would range from 250 to 650 acres.

Depending on the designated future mine-specific post-mining land use for the final mine pit(s), the pit(s) may be backfilled and reclaimed as described above or allowed to fill with water, resulting in end lakes. Alternately, a series of smaller end lakes may be constructed along drainages in the reclaimed landscape. End lake designs would be submitted to RCT and TCEQ for approval.

Lignite Mining and Transport

Lignite seams typically would be mined using backhoes, front-end loaders, or a continuous miner, with the lignite loaded into bottom or end-dump trucks for transport. The loaded trucks would haul the coal or lignite to temporary stockpiles or a truck dump area at a coal/lignite handling or blending facility. Alternately, coal or lignite would be transported to existing mine facilities via overland conveyor or rail as discussed in the Coal Transport and Coal Handling Facilities subsection under Section 2.2.4.1, Typical Construction Phase.

Coal or lignite placed in storage areas, uncovered in the active pits, or located beyond the margins of the active pits would be monitored regularly for burning material. If burning coal or lignite is identified, mining equipment would be available to bury the burning material, or diesel and electric pumps would be available to flood the area, as appropriate, to extinguish the burning material. Unmined coal or lignite beyond the pit margins would be inspected prior to backfilling and covered with overburden (a minimum of 4 feet).

Ancillary Support Facilities

Ancillary support facilities, as described in the Ancillary Support Facilities subsection under Section 2.2.4.1, Typical Construction Phase, would be used throughout the life of a typical mine.

Utility Relocations and Road Closures

Utilities (pipelines, transmission lines, and other utilities) incrementally would be relocated in advance of operations, as needed. Relocations would be completed in coordination with the controlling company.

Buffers for utilities outside of active mine areas as required by RCT (e.g., 100-foot buffer for pipelines) would be adhered to unless a variance is obtained from RCT.

During operations, general mining or reclamation activities would not be conducted within the 100-foot buffer zone of public roads until the roads have been closed by the jurisdictional authority or a buffer zone waiver and authorization have been obtained from the RCT and jurisdictional authority, respectively. Public roads located within the mine area would be closed or relocated (as approved by the jurisdictional authority) sequentially over the life of the mine in advance of pit development. Temporary road closures for bridge or overpass construction (installed to provide safe separation of mine-related traffic from public traffic) also would occur incrementally, as needed. All required approvals from the jurisdictional agencies and alternate public and landowner access would be provided prior to closure of any public road segment.

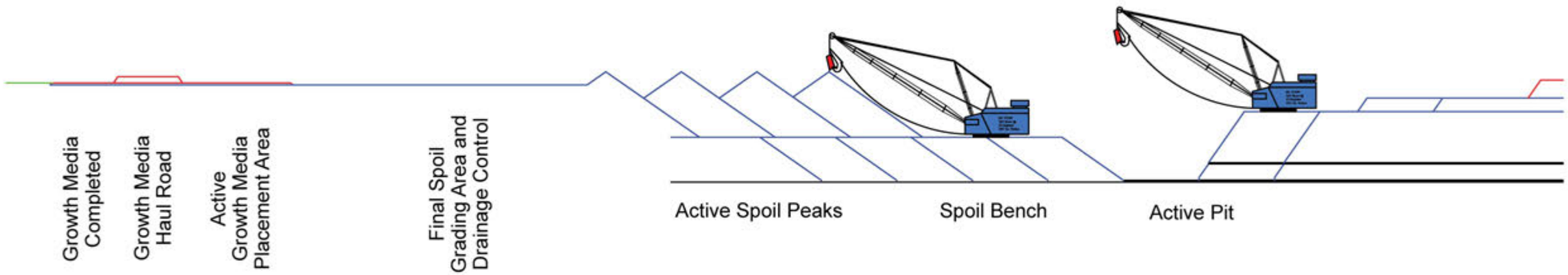
2.2.4.3 Typical Closure and Reclamation

Reclamation would be initiated following excavation of the initial mining area and would continue concurrently with mining operations throughout the life of a mine and through final closure. The short-term reclamation goal for a typical mine includes the establishment of a vegetative cover to provide for soil stabilization and erosion control. The long-term reclamation goals for a typical mine include establishing a sustainable vegetative cover that would promote the identified post-mining land uses, returning the disturbed areas to productive post-mining land uses equal to or better than pre-mining conditions, and maintaining appropriate drainage patterns and water quality and quantity.

Reclamation would be conducted in accordance with the mine-specific reclamation plans that would be developed in support of each mine's required RCT permit, with the following exception. Reclamation of streams and wetlands would be conducted in accordance with USACE Fort Worth District permit criteria and would be incorporated as features within the RCT post-mine land use categories. Specific reclamation and revegetation plans for disturbance areas located outside of waters of the U.S. ultimately would be at the direction of individual landowners (i.e., per landowner agreements).

The RCT-required reclamation plans would be developed in accordance with Sections 12.145 through 12.154 of the Texas Coal Mining Regulations. Mine-specific reclamation success programs also would be established and conducted, with revegetation success determined in accordance with RCT's Procedures and Standards for Determining Revegetation Success on Surface-Mined Lands in Texas (RCT, Surface Mining and Reclamation Division 2006) and Sections 12.395 and 12.399 of the Texas Coal Mining Regulations. The RCT guidance document describes procedures and standards for determining revegetation success on reclaimed surface mined lands in Texas, including the vegetation evaluation process, evaluation and measurement methods, and success standards for the nine RCT-designated post-mine land uses (pastureland, cropland, grazing land, forestry, fish and wildlife habitat, residential, industrial/commercial, recreation, and undeveloped). In accordance with these requirements, reclamation plans for a typical mine would include rough and final grading and growth media replacement procedures, drainage reconstruction and sediment control procedures, plant species lists for the various RCT-designated post-mine land uses, seeding and planting techniques, and the monitoring and evaluation criteria that would be used to determine reclamation success.

Waters of the U.S. (including wetlands) impacted by mining and mining-related activities would be reconstructed in locations as stipulated by the USACE Fort Worth District in future mine-specific Section 404 or Section 10 permits. Reconstruction typically would be achieved through creation, restoration, or enhancement techniques as would be outlined in a mine-specific Conceptual Mitigation Plan that would be developed and submitted in accordance with the requirements of the USACE's Section 404 permitting process. The reconstructed, restored, and/or enhanced streams, open water, and wetland resources would need to meet the USACE's criteria for waters of the U.S or other established



Distance from the active pit to growth media placement will vary due to ongoing spoil grading and growth media placement operations.

Figure 2-1 Typical Mine Sequence

performance metrics. Following the release from a mine's Section 404 reclamation performance bond, the reclaimed waters of the U.S., including wetlands, designated as compensatory mitigation would be protected by a long-term site protection instrument (e.g., a conservation easement).

After the coal or lignite has been removed from a mine pit and the pit backfilled with overburden and interburden, the peaks of the backfilled material (spoil) would be leveled and graded to approximate original contour in compliance with RCT coal mining regulations and approved plans. Selective handling and placement of overburden and interburden materials during backfilling, as needed, would provide for redistribution of suitable growth media (a minimum of 4 feet) over the regraded surface. The general sequence of mining and reclamation activities is shown in **Figure 2-1**. The typical lag that would occur between the time mining commences for a given pit and the completion of rough leveling to approximate original contour, placement of suitable growth media, and seeding and planting would be approximately 2 to 5 years. Overall reclamation activities in a given area, including normal husbandry, may continue for approximately 10 to 15 years. The ability of reclaimed land to support the approved post-mining land uses would be evaluated in accordance with the RCT's revegetation success criteria and USACE approved compensatory mitigation success criteria.

Rough and Final Grading

Following selective placement, as needed, of overburden and interburden in each pit, rough grading would be completed using mobile equipment to create a land surface with elevations and drainage patterns that would approximate, to the extent practical, the pre-mine topography. The rough-graded site subsequently would be surveyed to identify areas requiring additional grading to meet surface water control, land form, and approximate original contour. Regraded areas would be scarified or otherwise treated to minimize erosion, eliminate surface slippage, and promote root penetration. Depending on the planned post-mining land use in a given area, a suitable plant growth media or salvaged prime farmland soils would be distributed (to a minimum depth of 4 feet). Final grading and installation of erosion control structures subsequently would be completed.

Prime Farmland Soil and Growth Media Replacement

Suitable growth media (suitable overburden then topsoil where salvaged separately) or prime farmland soils (subsoil then topsoil) would be spread over graded disturbance areas to a minimum depth of 4 feet as discussed in the Rough and Final Grading subsection above, with the prime farmland soils placed in areas where the post-mining land use is designated as cropland. When impractical to promptly redistribute growth media or prime farmland soils on rough graded areas, the materials would be stockpiled for future use. The stockpiled materials would be stabilized by interim seeding with a rapid-growing annual or perennial cover during the first normal period of favorable planting conditions. Once growth media replacement has been completed, the upper 4 feet of soil would be tested for suitability as outlined in the RCT-required soil testing plan. Suitability would be determined based on a comparison of the test results with RCT-approved post-mine soil performance standards. If suitable plant growth media is present, the area would be permanently revegetated during the next available growing season, with a temporary vegetative cover used in the interim to control erosion, as needed. If the soil does not meet all of the criteria for suitability, topsoil substitutes and amendments would be used to construct a suitable plant growth media, as appropriate. If areas are identified that do not have suitable plant growth media present in the top 4 feet of material, the unsuitable material either would be covered with suitable material or it would be excavated and hauled to an adjacent pit for burial and replaced with suitable material.

Post-mining Topography

The post-mining topography would be consistent with mine-specific reclamation goals and post-mining land uses and would approximate the general nature of the pre-mining topography and blend into the surrounding topography.

Drainage Reconstruction and Sediment Control

Drainage patterns would be re-established in the reconstructed landscape prior to placement of suitable growth media. To the extent possible, drainage channels would be constructed to approximate pre-mining conditions and configured to ensure that ephemeral drainages upgradient of the mined area connect with the new drainage system, including re-established waters of the U.S. Temporary erosion controls would be installed to provide surface stabilization and erosion control in the post-mining landscape, until vegetation has been re-established. Permanent erosion control measures (e.g., rock check dams, in-channel grade control structures such as cross-vanes and/or other natural stream channel design methods) also would be installed, as required.

Some of the constructed sediment control ponds may be retained as permanent structures following the completion of mining to achieve post-mining land uses. Sediment control ponds not required to achieve post-mining land uses would be removed once their respective watershed areas have been revegetated, the vegetation requirements have been met, and the surface water drainage meets applicable state and federal water quality criteria. Following removal of an impoundment, the area would be recontoured to provide appropriate drainage and blend with the surrounding topography and subsequently revegetated. Surface water diversions also would be regraded and revegetated when no longer needed.

Additional permanent ponds would be constructed on the reclaimed surface as needed to achieve post-mining land uses. The additional ponds would be constructed incrementally throughout the life of a mine as mining and reclamation operations advance. Pond design plans would be submitted to RCT for approval prior to construction.

Storm water runoff from the reclaimed area would be routed through sediment control ponds and ultimately discharged through final discharge outfalls. Post-mining discharges through these outfalls would be monitored in accordance with mine-specific TPDES permit requirements. When runoff quality meets TPDES requirements without treatment, discharge outfalls would be removed.

Revegetation

Seed Mixes and Woody Species Plantings

Species selection for use in revegetation would be based on the reclamation stage, site-specific conditions, and proven success capabilities of the plant species selected, as well as contractual agreements with landowners. The mine-specific species lists, as required by RCT, would be used to develop seed mixes specific to post-mining land uses and would contain a complement of grasses and forbs as applicable to the post-mine land use. Seed application rates would vary based on planting method, species, and region. Tree and shrub seedlings also would be used to achieve specific post-mining land uses. Plant species (herbaceous and woody) proposed for use in locations designated for fish and wildlife habitat and undeveloped land in the post-mine setting typically would be selected in coordination with the NRCS, USACE, USFWS, TPWD, and RCT.

The establishment of a temporary vegetative cover and/or mulching would be used, as needed, for stabilization of disturbance areas when conditions for establishment of permanent vegetation are not favorable or practical. Selection and establishment of a temporary cover would be coordinated with the planned establishment of a permanent cover to ensure compatibility.

Seeding and Planting Techniques

Seeding of prepared seed beds would be accomplished using various methods and equipment, depending on topographic features and soil characteristics. A combination of broadcast seeding, drill seeding, hydro-mulching, and/or other conventional means would be used for application of seed mixes, depending on season and site conditions.

Drill seeding equipment with depth control bands would be used for seed application on level to gently sloping areas where coarse fragment content would allow drilling operations. Planting would follow the contour of the land, where possible. A no-till planter equipped with coulters, disc openers, and packer wheels would be used on appropriate sites to plant into standing cover crops. This method may be used to establish permanent cover without conventional seedbed preparation.

Broadcast seeding would be used on steep or rocky areas where drill seeding would not be practical. Broadcast seeding methods that may be used include tractor equipment fitted with seed boxes, hydroseeding, tractor hand seeding, and/or hand cyclone seeders. Where broadcast seeding is used, the seed bed would be prepared by shallow ripping or dozer tracking parallel to slope contours in order to provide microsites for seed germination and to control runoff. Where possible, seeded areas would be chained, harrowed, or cultipacked to cover the seed or, alternately, covered with mulch.

Establishment of grass species that do not produce viable seed normally would be accomplished with a sprig (stolon) planter. Dormant sprigs typically would be covered with up to 3 inches of soil. Green sprigs would not be covered as deeply and normally would be partially exposed.

Tree and shrub seedlings would be planted mechanically or by hand. Bare rootstock, plugs, and containerized seedlings would be used, as appropriate.

A suitable mulch may be used to aid in moisture conservation, promote germination, and/or enhance soil stabilization. Mulching techniques would vary depending on season, slope gradient, soil moisture conditions, and planned permanent vegetation. Mulching techniques would include mechanical incorporation of existing plant residue into the top few inches of soil or application of certified weed-free straw or hay. Where straw or hay is applied, the material would be secured by a mechanical crimper or chemical tackifier, as needed. Alternately, where a temporary cover has been established to minimize exposure of disturbance areas to erosion, perennial species may be directly planted into the area, with the remaining stubble serving as mulch and erosion control until the permanent vegetation becomes established.

Irrigation

The need for irrigation of revegetated areas would be determined on a mine-specific basis. Irrigation may be used in areas requiring enhanced stabilization or to extend the season for initial vegetation establishment if drought conditions exist.

Seedbed Amendments

The preparation of a suitable seedbed for temporary or permanent revegetation would include, as needed, the application of fertilizer or soil amendments. Growth media soil samples would be collected and analyzed by standard soil testing procedures to identify fertilizer and soil amendment requirements needed to support the post-mining land uses and attain the required productivity levels.

Pesticide Applications

Pesticides would be used, as required, to control insect damage and invasion of noxious weed or invasive plant species. All pesticides would be applied under the supervision of a certified applicator. The use, application, and disposal of pesticides would be conducted in accordance with all applicable federal and state regulations.

Restoration of Waters of the U.S., Including Wetlands

As a special condition of any Section 404 permit approved for future surface coal or lignite mining operations, the USACE Fort Worth District would require successful implementation of mitigation measures for waters of the U.S., including wetlands, in accordance with the District's proposed

regulatory framework (see Section 2.2.1) and current Section 404 mitigation guidelines (see Section 2.1.2). Future project-specific mitigation would be described in the Conceptual Mitigation Plan that would need to be developed and submitted to the USACE Fort Worth District in support of the Section 404 permit application. A Conceptual Mitigation Plan typically would present the proposed direct and compensatory mitigation ratios for reclamation of waters of the U.S., including wetlands. It also typically would outline the conceptual plans for creation, restoration, and enhancement of streams and wetlands; present lists of proposed plant species that would be used in reclamation; outline the success criteria and performance standards; and discuss the monitoring, financial assurances, and site protection (e.g., conservation easement) for the stream and wetland areas reclaimed as compensatory mitigation. In order to fully compensate for unavoidable aquatic functions lost as a result of permitted actions, the USACE typically requires in kind mitigation for each aquatic resource type. Detailed stream design information would be submitted for USACE Fort Worth District and resource agency review prior to construction of mitigation streams. The information would include but not be limited to plan, profile, and dimension measurements based on appropriate regional hydrographic and geomorphological data and successful as-built streams/systems on and/or near the respective mitigation site.

Final Pit Reclamation

As described in the Overburden and Interburden Removal subsection under Section 2.2.4.2, Typical Operations Phase, sequential backfilling and reclamation would be conducted throughout the life of a mine as the pit advances. The backfilled pit areas would be revegetated in accordance with the requirements of the specified post-mining land uses. The final mine pit(s) may be backfilled and reclaimed or allowed to fill with water, depending on the designated post-mining land use. Alternately, a series of smaller end lakes may be constructed along drainages in the reclaimed landscape of the final pit(s).

Main Haul Roads and Transportation Corridor Reclamation

Following the completion of mining, the main haul roads and transportation corridor would be reclaimed, except where required for long-term monitoring and management purposes or where retained and modified for public access (based on prior authorizations and agreements). Where main haul roads and transportation corridors are removed, all culverts would be removed and either reused or disposed of off site. If bottom ash is used as a road surfacing material, the material would be salvaged and disposed of in accordance with TCEQ and RCT requirements, including placement in pit backfill areas at a minimum depth of 4 feet or disposal at a Class III waste disposal site. Fill material used to construct the haul road and riprap used for reinforcement to control erosion would be removed and either used in reclamation or sold. The disturbance area subsequently would be reseeded and/or replanted in accordance with the requirements of the specified post-mining land uses.

Reclamation of Ancillary Facilities and Disposition of Equipment

Ancillary facilities in areas designated for industrial/commercial post-mining land use may be retained for industrial use, with prior authorization. Closure of all other ancillary facilities and disposition of equipment would be conducted in accordance with applicable federal, state, and local regulations. Ancillary structures (e.g., buildings, conveyors) would be dismantled and removed from the site. Concrete foundations and pads would be broken up, either buried in place or hauled to a pit, and covered with suitable growth media or prime farmland soils (a minimum of 4 feet), as applicable. Revegetation would be completed in accordance with the requirements of the post-mining land uses. All equipment would be transported off site. Transmission lines and substations would be dismantled and removed from the site, rerouted, or retained, as would be determined by the power company.

Following the completion of mining, any remaining coal or lignite in temporary storage areas would be loaded and transported to the truck dump area at the coal/lignite handling facilities. The disturbance areas subsequently would be ripped to relieve compaction and reclaimed in accordance with the post-mining land uses.

Roads

Haul roads and access roads would be removed, except where required for long-term monitoring and management purposes or where retained and modified, as needed, for public access (based on prior authorizations and agreements). Where roads are removed, the road surfacing material would be salvaged for reuse or buried under a minimum of 4 feet of suitable growth media. If bottom ash is used as a road surfacing material, the material would be salvaged and disposed of in accordance with TCEQ and RCT requirements as discussed in the Main Haul Roads and Transportation Corridor Reclamation subsection above. The road disturbance areas subsequently would be scarified, recontoured to blend with the surrounding topography and the natural drainage patterns, and revegetated in accordance with the requirements of the specified post-mining land use.

Fuels and Lubricants

Following the completion of mining and reclamation, materials not consumed on-site would be returned to the supplier or shipped to a licensed recycler, as appropriate. In addition, all storage tanks for these materials would be removed and disposed of in accordance with all applicable federal, state, and local laws and regulations.

Following the completion of mining and reclamation, any remaining solid waste would be transported to and disposed of at a licensed Class III disposal facility.

Fencing and Site Security

Mining areas undergoing reclamation would be fenced, as necessary, to control public access and/or to facilitate revegetation.

Monitoring Wells

Groundwater wells used for monitoring purposes would be plugged in accordance with TAC 1001, 1002, and 1009 when no longer in use. Wells completed above the mine floor elevation within a mining block would be removed during pit excavation. Wells completed below the mine floor elevation would be plugged with a cement-bentonite grout as regulations require.

Sediment Control Ponds

Sediment control ponds would be retained in the post-mining landscape to the extent possible, pending final agreements with landowners and final RCT approval. Alternately, the sediment control pond embankments would be removed and appropriate drainage re-established. The disturbance area subsequently would be reseeded and/or replanted in accordance with the requirements of the specified post-mining land uses.

Monitoring of the Reclaimed Site

A mine-specific reclamation success program would be established and conducted in coordination with appropriate jurisdictional agencies throughout the mine life. Revegetation success would be determined in accordance with RCT's 2014 *Procedures and Standards for Determining Revegetation Success on Surface-Mined Lands in Texas* and Sections 12.395 and 12.399 of the Texas Coal Mining Regulations. Revegetation success would be monitored through evaluation of percent ground cover, tree densities, and productivity, as applicable, in relation to the site-specific post-mining land use. The program then would examine, review, and determine the effectiveness of the reclamation efforts to achieve proposed standards of reclamation success. Based on the results of the evaluation, reclamation techniques would be refined, as needed, to ensure reclamation objectives would be achieved. RCT criteria for determination of reclamation success by post-mining land use are presented below. Mitigation success criteria, as would be specified in the mine-specific Section 404 permits that may be issued by the USACE Fort Worth District in the future, also are discussed below.

Pastureland and Grazing Land

Under the RCT regulations for pastureland and grazing land, the success of ground cover establishment of revegetated mine disturbance areas is compared either to the ground cover of an approved reference area or to approved technical standards. When reference areas are used, the ground cover of the revegetated land must be 90 percent of the reference area with a 90 percent statistical confidence. Alternately, ground cover must achieve at least 90 percent of the ground cover technical standards established by the NRCS, which require 95 percent cover for sod-forming grasses and 90 percent cover for bunchgrasses for areas with annual precipitation greater than 26 inches, or 90 percent cover for sod-forming grasses and 80 percent cover for bunchgrasses for areas with annual precipitation less than or equal to 26 inches. Productivity is required to reach or exceed 90 percent of a reference area or 90 percent of site-specific technical standards developed by the NRCS at the request of the applicant. For areas with annual precipitation of greater than 26 inches, ground cover and productivity need to meet or exceed the approved standards any 2 of the first 5 years, with the exception of the first year. For areas with annual precipitation of less than or equal to 26 inches, ground cover and productivity need to meet or exceed the approved standards in at least the last 2 consecutive years of the first 10 years. Production may be measured through a combination of whole-field hay harvest methods and/or grazing use records.

Cropland

Under the RCT regulations for non-prime farmland soils, sufficient ground cover is to be maintained to control erosion until crop production begins, with the Revised Universal Soil Loss Equation (RUSLE) used to estimate erosion potential. Productivity is required to reach or exceed 90 percent of a reference area or 90 percent of site-specific technical standards developed by the NRCS at the request of the applicant. For areas with annual precipitation of greater than 26 inches, ground cover and productivity need to meet or exceed the approved standards any 2 of the first 5 years, with the exception of the first year. For areas with annual precipitation of less than or equal to 26 inches, ground cover and productivity need to meet or exceed the approved standards in at least the last 2 consecutive years of the first 10 years. Production is to be measured based on whole-field harvest as compared to approve productivity standards specifically developed for a particular crop and growing season.

For prime farmland soils, sufficient ground cover is to be maintained to control erosion until crop production begins, with the RUSLE used to estimate erosion potential. Productivity is required to meet 100 percent of the reference crop yield technical standards developed by the NRCS at the request of the applicant. Measurement of productivity is required to be initiated within 10 years after the completion of soil replacement. For areas with annual precipitation of greater than 26 inches, crop production must meet or exceed the approved standards in any of the first 5 years, with the exception of the first year. For areas with annual precipitation of less than or equal to 26 inches, crop production needs to meet or exceed the approved standards in at least the last 2 consecutive years of the first 10 years. Reference crop yields are compared to average yields for specific prime farmland soil series. Average yields are determined in consultation with the NRCS.

Forestry

Under the RCT regulations for the forestry land use type, performance standards for both vegetative ground cover and tree stocking rates must be achieved. Ground cover is required to meet or exceed 90 percent of a reference area or 90 percent of the technical standard of 78 percent. Tree species are required to meet or exceed 90 percent of a site-specific technical standard developed by the applicant in coordination with the Texas Forest Service. Ground cover and tree composition measurements also are required, with a minimum of 75 percent of the ground cover to comprise permit-approved species that support the post-mining land use and up to 25 percent of the ground cover to comprise desirable invader species (i.e., RCT-approved species for the designated post-mining land use that are allowed to naturally recolonize the disturbance area). Ground cover must meet or exceed the success standards during the growing season of the last year of reclamation responsibility. At the end of reclamation

responsibility, at least 80 percent of the healthy tree stems are to have been in place for 60 percent of the reclamation period.

Fish and Wildlife Habitat

Under the RCT regulations for fish and wildlife habitat, ground cover (i.e., herbaceous species) in general wildlife habitat is required to meet or exceed 90 percent of the technical standard of 78 percent. For early successional habitat, including quail grassland, the groundcover is required to meet or exceed 90 percent of the technical standard of 63 percent. In areas where the wildlife habitat type is planned for tree and shrub species restoration, site-specific technical standards are developed by the applicant in consultation with the TPWD. For general wildlife habitat, woody species stocking rates are required to meet or exceed 90 percent of the identified technical standard. For early successional habitat, including quail grassland mottes (i.e., thicket of shrubs or small stand of trees on a prairie), woody species stocking rates are required to meet or exceed the identified technical standards. The RCT regulations relative to herbaceous and woody species composition measurements and end of reclamation responsibility goals are the same as described above for the forestry land use type.

Fish and wildlife habitat also would be provided through mitigation of waters of the U.S., including wetlands, which would be reclaimed in accordance with an applicant's Section 404 Permit requirements. See the Developed Water Resources subsection below relative to aquatic habitat.

Residential Land

Under the RCT regulations for the residential land use type, sufficient ground cover is to be maintained to control erosion, with RUSLE used to estimate the erosion potential. Woody species are required to meet or exceed 90 percent of a site-specific technical standard developed by the applicant in coordination with the Texas Parks and Wildlife. Woody species composition monitoring, where applicable, and end of reclamation responsibility goals are the same as described above for the forestry land use type.

Industrial/Commercial

Under the RCT regulations for the industrial/commercial land use type, sufficient ground cover is to be maintained to control erosion, with RUSLE used to estimate the erosion potential. If woody species stocking is to be implemented, these plantings would be required to meet or exceed 90 percent of a site-specific technical standard developed by the applicant in coordination with the Texas Parks and Wildlife. Woody species composition monitoring, where applicable, and end of reclamation responsibility goals are the same as described above for the forestry land use type.

Recreation

Under the RCT regulations for the recreation land use type, sufficient ground cover is to be maintained to control erosion, with RUSLE used to estimate the erosion potential. If woody species stocking is to be implemented, these plantings would be required to meet or exceed 90 percent of a site-specific technical standard developed by the applicant in coordination with the TPWD. Woody species composition monitoring, where applicable, and end of reclamation responsibility goals are the same as described above for the forestry land use type.

Undeveloped Land

The undeveloped land category includes those areas for which long-term management goals and uses have not been identified. These areas would be planted with native grasses, shrubs, and trees. Per the RCT regulations, ground cover must meet or exceed 90 percent of the ground cover technical standards. The technical standards for areas with annual precipitation of greater than 26 inches are 95 percent cover for sod-forming grasses and 90 percent cover for bunchgrasses. For areas with annual precipitation less than or equal to 26 inches, the technical standards are 90 percent cover for

sod-forming grasses and 80 percent cover for bunchgrasses. For areas predominately reclaimed with woody species, the technical standard for ground cover is 78 percent. As per the RCT regulations for the fish and wildlife habitat type, woody species stocking rates are required to meet or exceed 90 percent of the identified technical standard developed by the applicant in coordination with the TPWD. The RCT regulations relative to herbaceous and woody species composition measurements and end of reclamation responsibility goals are the same as described above for the forestry land use type.

Developed Water Resources

An applicant in coordination with the USACE would identify and inventory appropriate waters of the U.S. (including wetlands) reference sites for use in evaluating reclamation success for developed water resources. The reference sites, as well as aquatic resource creation and/or restoration mitigation ratios, would be specific to an applicant's Section 404 permit requirements.

2.2.5 Typical Environmental Protection Measures

Presented below are the typical environmental protection measures implemented by surface coal and lignite mines to minimize potential environmental impacts associated with mine development. These measures include typical permit requirements of the various federal and state agencies with jurisdiction over surface coal and lignite mining operations and additional BMPs implemented by the mines as standard operating procedures.

2.2.5.1 Geology, Paleontology, and Mineral Resources

- As required by RCT regulations, mine spoils would be regraded to approximate original contours prior to being revegetated.

2.2.5.2 Water Resources (groundwater, surface water, and waters of the U.S., including wetlands)

- During mining and following completion of reclamation, water supply would be replaced if water supply wells are adversely impacted by mining operations
- Spoils would be selectively placed in backfill areas to ensure that naturally occurring acid- or toxic-forming materials are 4 feet or greater below the final grade.
- Temporary and permanent erosion control measures (e.g., check dams, riprap, mulch) would be installed incrementally throughout the life of a mine in advance of ground-disturbing activities and as part of reclamation.
- Surface water control features (e.g., storm water diversions, sediment control ponds, BMPs) would be constructed or installed in advance of ground-disturbing activities.
- Designs for intermittent and perennial stream diversions, where needed, would be approved by RCT prior to installation.
- Water discharged from sediment control ponds would be monitored in accordance with TPDES permit requirements to control the quality of the discharge. Treatment systems (e.g., chemical additives or use of flocculants) would be used, as needed, to ensure compliance with permit requirements.
- To the extent possible, pre-mine stream drainage configurations would be retained, and slopes similar to pre mine conditions would be achieved when practical during reclamation, to facilitate stream-flow regimes consistent with pre-mining rates.
- Potential impacts to water quality would be minimized through implementation of mine-specific state-required SPCC Plan; Storm Water Pollution Prevention Plan (SWPPP); and Emergency Response Plan.

- Waters of the U.S., including wetlands, directly impacted by mining would be reconstructed through creation, restoration, or enhancement as outlined in the mine-specific Conceptual Mitigation Plan, which would be developed in accordance with the requirements of the USACE. Incrementally, as areas become ready for reconstruction of waters of the U.S, specific detailed plans would be reviewed and approved by the USACE, prior to implementation.

2.2.5.3 Soils

- Potential impacts to soils would be minimized by limiting the acreage of mining disturbance at any given time and prompt revegetation of disturbance areas in accordance with the mine-specific Reclamation Plan (as required by RCT) and Conceptual Mitigation Plan for waters of the U.S., including wetlands (as required by USACE).
- Selective materials handling and testing would be implemented to ensure placement of suitable growth media in the upper 4 feet of the reclaimed spoil material.
- Soils in prime farmland areas would be salvaged, stockpiled, if needed, and replaced to a minimum depth of 4 feet.
- Growth media and prime farmland stockpiles to be left in place more than 30 days would be graded and seeded with a temporary crop cover. BMPs (e.g., silt fences, straw bales, berms, ditches), as needed, and signage would be installed.
- Replaced growth media would be tested to ensure no acid- or toxic-forming materials are present in the upper 4 feet of the regraded spoils.
- To minimize erosion, rills and gullies in final graded areas would be filled, graded, or otherwise stabilized as soon as field conditions allow. The area subsequently would be reseeded or replanted during the first favorable planting period.
- Fertilizer and other soil amendments would be used, as needed, to ensure successful re-establishment of vegetation.

2.2.5.4 Vegetation (including threatened and endangered species)

- Potential impacts to vegetation would be minimized by limiting the acreage of mining disturbance at any given time and prompt revegetation of disturbance areas in accordance with the mine-specific Reclamation Plan (as required by RCT) and Conceptual Mitigation Plan for waters of the U.S., including wetlands (as required by USACE).
- Permanent revegetation would be initiated during the first favorable planting period. During periods unfavorable for re-establishment of permanent vegetation, a temporary crop cover would be established.
- Permanent ponds, where included in the reclaimed landscape, would be designed to promote propagation of aquatic and wetland vegetation.

2.2.5.5 Fish and Wildlife Resources (including threatened and endangered species)

- Potential impacts to fish and wildlife species would be minimized by limiting the acreage of mining disturbance at any given time, limiting disturbance (to the extent possible) within high-value habitat, and prompt revegetation of disturbance areas in accordance with the mine-specific Reclamation Plan (as required by RCT) and Conceptual Mitigation Plan for waters of the U.S., including wetlands (as required by USACE).
- A Fish and Wildlife Plan (as required by RCT) would be developed and implemented to minimize impacts to fish and wildlife species and aquatic communities, including special status species. A typical plan would provide for the restoration, enhancement, and maintenance of natural riparian habitats associated with streams, lakes, and other wetland areas. In addition, protection

measures for special status species and species of special concern would be included, as applicable.

- Permanent ponds, where included in the reclaimed landscape, would be designed to promote propagation of aquatic and wetland habitats.
- To minimize potential power line- or transmission line-related impacts to raptor species (i.e., collision and electrocution), these facilities would be designed and constructed in accordance with guidelines presented in Reducing Avian Collisions with Power Lines (Avian Power Line Interaction Committee [APLIC] 2012) and Suggested Practices for Avian Protection on Power Lines (APLIC 2006).
- Potential impacts to breeding and nesting migratory bird species would be minimized through the avoidance of rookeries and raptor nest sites during the breeding season, to the extent possible. Also, to the extent possible, clearing operations would be conducted during non-breeding periods to avoid the peak migratory bird breeding season.
- To minimize impacts to threatened and endangered species, employee awareness training would be conducted, as applicable.

2.2.5.6 Cultural Resources

- Cultural resource surveys, report preparation, and review of reports by regulatory agencies (including THC) would be completed in advance of ground-disturbing activities to provide time for implementation of THC-approved mitigation or avoidance measures for any identified National Register of Historic Places (NRHP)-eligible sites prior to disturbance.
- No cultural resource sites would be disturbed unless and until written authorization to proceed has been obtained from the THC, USACE, and RCT.
- If previously unknown archaeological sites or potential human remains are discovered during construction, construction activities in the vicinity would cease, THC would be notified, and the site would be protected until THC could evaluate the nature of the discovery and issued a notice to proceed.

2.2.5.7 Air Quality

- Fugitive dust emissions from haul roads would be controlled by the application of water sprays, chemical dust suppressants, and routine maintenance and/or slow-curing liquid asphalt as allowed by TCEQ. Other controls would include proper loading of haul trucks (i.e., not over-loading) to prevent spillage, prompt removal of coal/lignite, rock, or soil from roads; compaction of unpaved roads, as needed; and restriction of travel of unauthorized vehicles on other than established roads.
- Fugitive dust emissions from disturbance areas would be controlled by minimizing the acreage of coal or lignite mining disturbance at any given time, prompt revegetation of regraded lands, and restricting fugitive dust causing activities during periods of air stagnation as required by the jurisdictional agencies.
- Particulate emissions related to potential coal/lignite combustion would be minimized by promptly extinguishing areas of burning or smoldering coal/lignite and conducting periodic inspections for burning areas whenever the potential for spontaneous combustion is high.

2.2.5.8 Land Use and Recreation

- Land uses would be reclaimed to the pre-mine land use, except when an alternative land use is approved by the RCT.

- Lands would be reclaimed to the proper level of management, as applicable for the land use.
- Landowners' plans would be considered and landowners consulted should alternative post-mine land uses be included in the reclamation plan under the RCT permit.

2.2.5.9 Social and Economic Values

- No typical measures.

2.2.5.10 Transportation

- Alternate public and landowner access would be provided prior to closure of a road.

2.2.5.11 Noise and Visual Resources

- No typical measures.

2.2.5.12 Hazardous Materials

- Flammable fluids (e.g., gasoline or diesel fuel) or other materials (e.g., oil, grease, anti-freeze, solvents) classified as toxic or hazardous by TCEQ and other applicable regulatory authorities would be registered, transported, stored, labeled, handled, and disposed of in accordance with applicable regulatory requirements.
- Potential impacts in the event of a spill would be minimized through implementation of the mine-specific state required SPCC Plan and Emergency Response Plan.

2.2.5.13 Public Health

- No typical measures.

2.2.5.14 Environmental Justice

- No typical measures.

2.3 No Action Alternative

Under the No Action Alternative, the USACE Fort Worth District's proposed regulatory framework as discussed in Section 2.2.1, Proposed USACE Fort Worth District Regulatory Framework for Surface Coal and Lignite Mines in Texas, would not be implemented. Alternately, the existing regulatory framework described in Section 2.1.1, Evolution of Current USACE Fort Worth District Regulatory Framework, would continue to be used in responding to potential future requests for authorization of surface coal/lignite mine expansion areas or satellite mines in Texas. The existing USACE Fort Worth District Section 404 mitigation guidelines as discussed in Section 2.1.2, Evolution of Current USACE Fort Worth District Section 404 Mitigation Guidelines, would continue to be implemented under the No Action Alternative (same as under the Proposed Action).

Categories for future NEPA tiering or supplementation (as described in Section 2.2.2) would not be established under the No Action Alternative. However, as part of the permit evaluation process associated with potential Section 404/10 permit authorizations for future surface coal/lignite mines, the USACE Fort Worth District would be required to comply with the regulatory requirements of NEPA in evaluating the potential impacts of an action. In accordance with the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508), the NEPA analyses for future surface coal/lignite mines that may be proposed within the study areas would be able to tier from this REIS analysis, as appropriate.

The development of a typical surface coal or lignite mine under the No Action Alternative would be the same as described in Section 2.2.4, Description of a Typical Surface Coal and Lignite Mine, with the following exception. The USACE Fort Worth District would require any future surface coal or lignite mine for which a Section 404/10 permit may be approved to commit to successful implementation of mitigation measures for waters of the U.S., including wetlands, in accordance with the District's current regulatory framework and Section 404 mitigation guidelines as discussed in Sections 2.1.1 and 2.1.2, respectively.

2.4 Past, Present, and Reasonably Foreseeable Future Actions

Cumulative impacts are the combination of the individual effects of multiple actions over time in a defined area or region. The individual effects may be minor when considered separately, but may be major or significant when considered in combination. Resource-specific cumulative effects analyses are required under NEPA to disclose a proposed project's contribution to cumulative impacts resulting from other past, present, and reasonably foreseeable future actions (RFFAs). To support the cumulative effects analyses, any past and present actions and RFFAs that may affect the same resources and overlap temporally and spatially with the anticipated impacts of a proposed project need to be identified and a brief description of each action incorporated into the NEPA document, where possible. Descriptions may include the type of project, location, and extent of surface disturbance. This information is used in conjunction with the results of the environmental consequences analyses for analyzing the potential cumulative impacts within defined resource-specific cumulative effects study areas (CESAs).

The actions that are relevant to the cumulative effects analyses for this REIS are those that resulted or would result in surface disturbance in the CESAs, because those actions affected or would affect resources in a manner similar to those activities analyzed under the Proposed Action and No Action alternatives. In addition to surface coal or lignite mines, these actions may include residential, commercial, and industrial structures and facilities associated with cities and towns, roads, oil and gas development, power plants, reservoirs, renewable energy projects, and water supply projects. While the types and extent of actions and land uses within each CESA vary, there also are similarities in that they all include lignite mining, power generation facilities, USACE-permitted Section 404 activities, public water supplies and reservoirs, and oil and gas operations.

For purposes of this REIS, resource-specific CESA boundaries were delineated for each of the six study areas. The acreage of each of the resource-specific CESAs and the rationale used in delineating their boundaries are presented in the cumulative effects analyses discussions in Chapter 3.0. An overall summary of the identified past and present actions and RFFAs and the associated acreage of disturbance within the maximum extent of the CESAs is presented below.

2.4.1 Past and Present Actions

Past and present actions contribute to the current resource conditions within each CESA. **Figure 2-2** displays the maximum extent of the combined resource CESAs delineated for each study area. The maximum CESA boundary encompasses a total of approximately 24,811,170 acres, of which approximately 1,456,940 acres were identified as having surface disturbance resulting from past and present actions. Existing surface disturbance within the combined CESA was identified using selected categories from the spatial data prepared for the Texas Ecological Systems Classification Project (TPWD 2014e), actions for which USACE Section 404 permits have been issued, as well as the boundaries of existing mines, reservoirs, and landfills. The selected categories used to identify existing disturbance from the TPWD dataset include federal and state highway ROWs and urban areas. The location and general distribution of past and present surface disturbance within the maximum extent of each study area-specific CESA are shown on **Figures 2-3** through **2-8**.

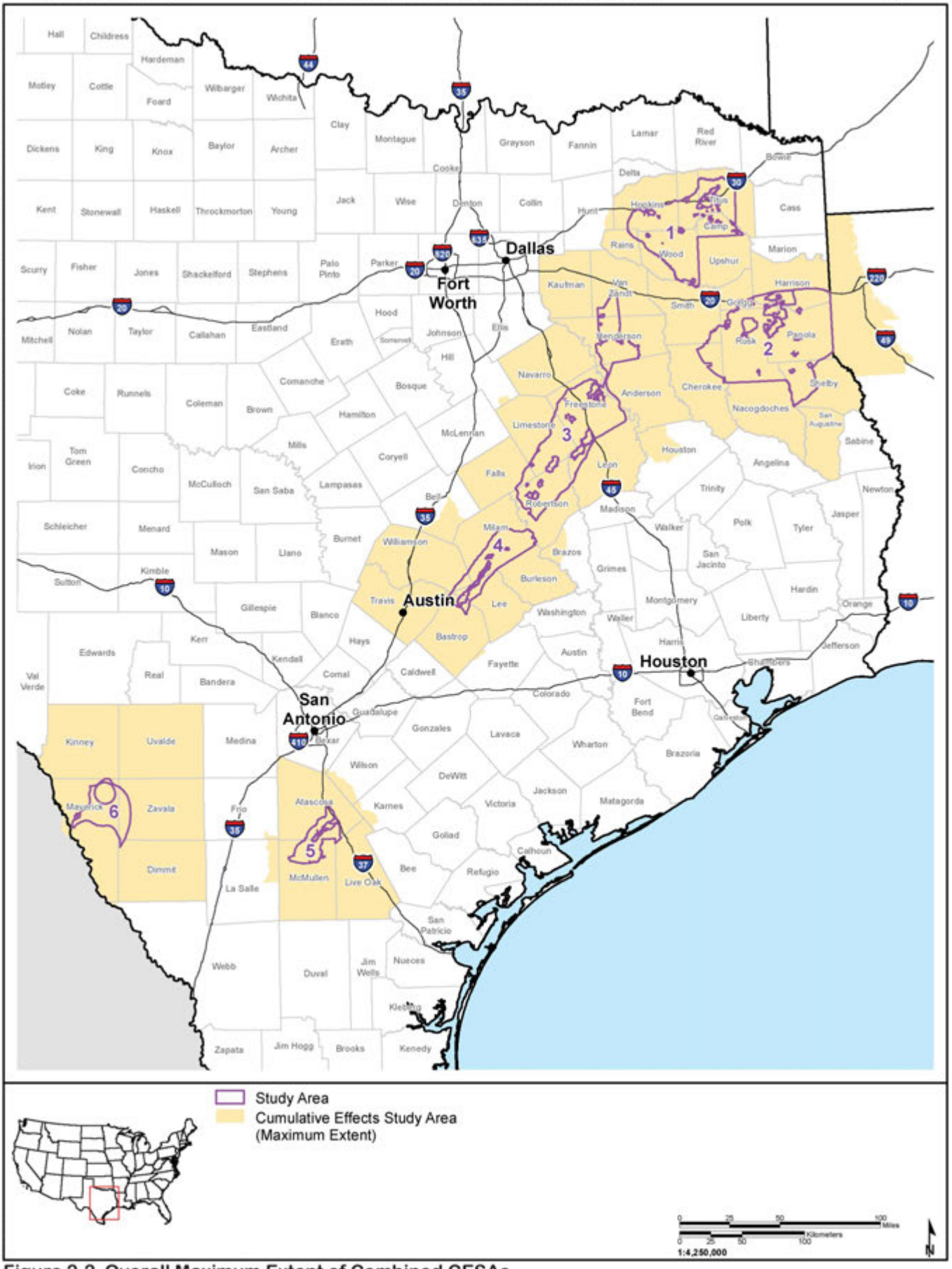


Figure 2-2 Overall Maximum Extent of Combined CESAs

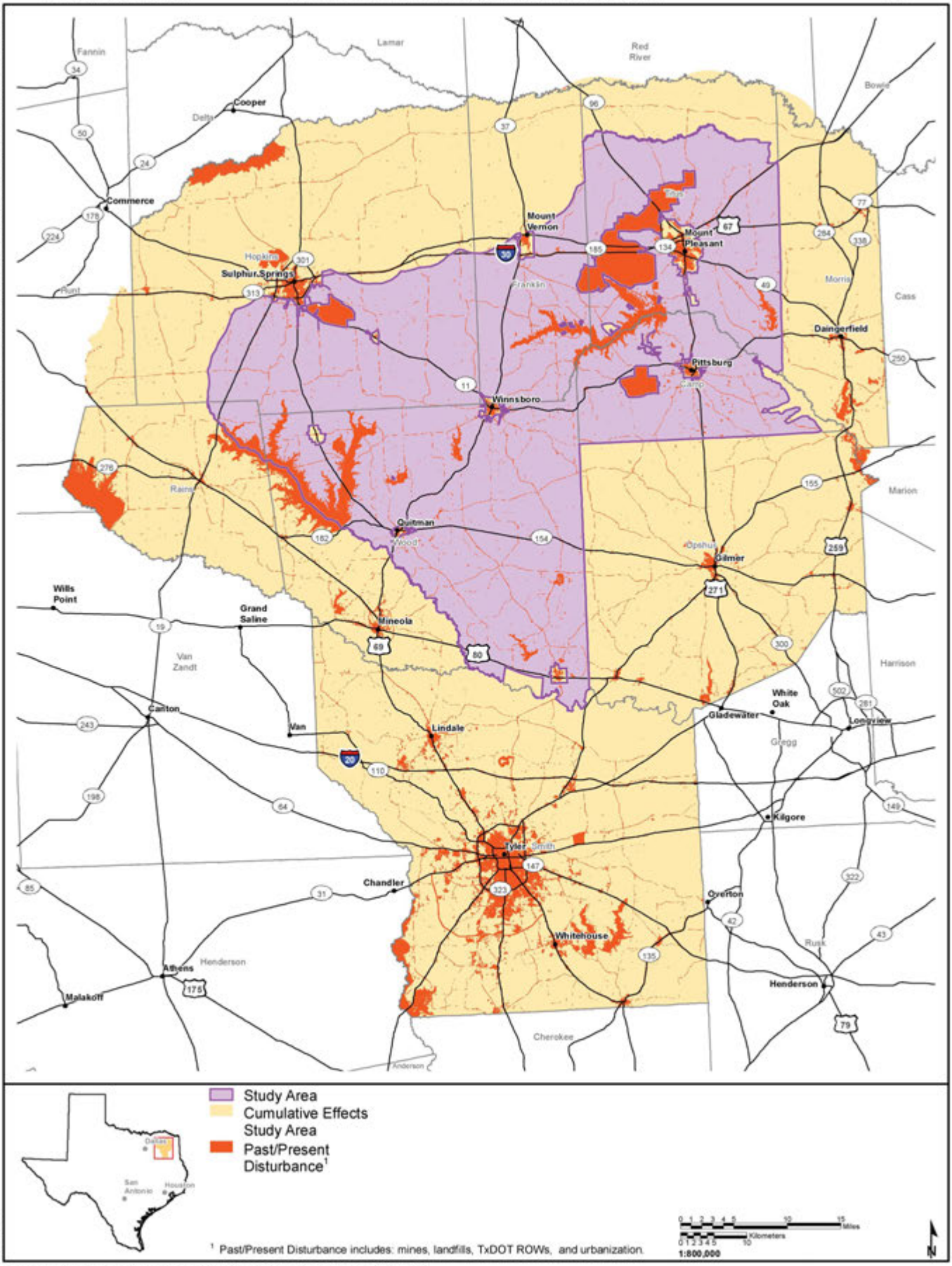


Figure 2-3 Maximum Extent of Study Area 1 CESA

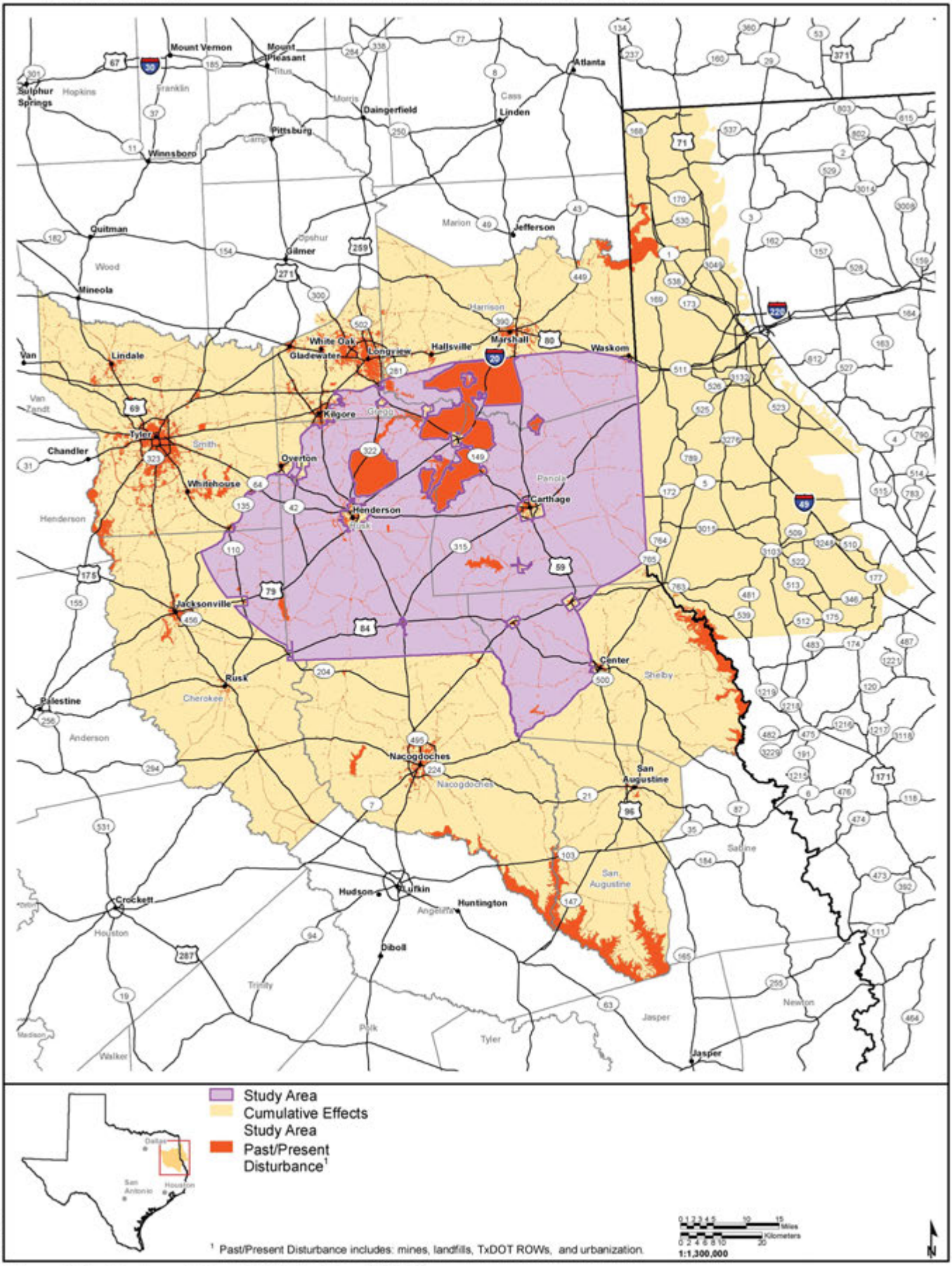


Figure 2-4 Maximum Extent of Study Area 2 CESA

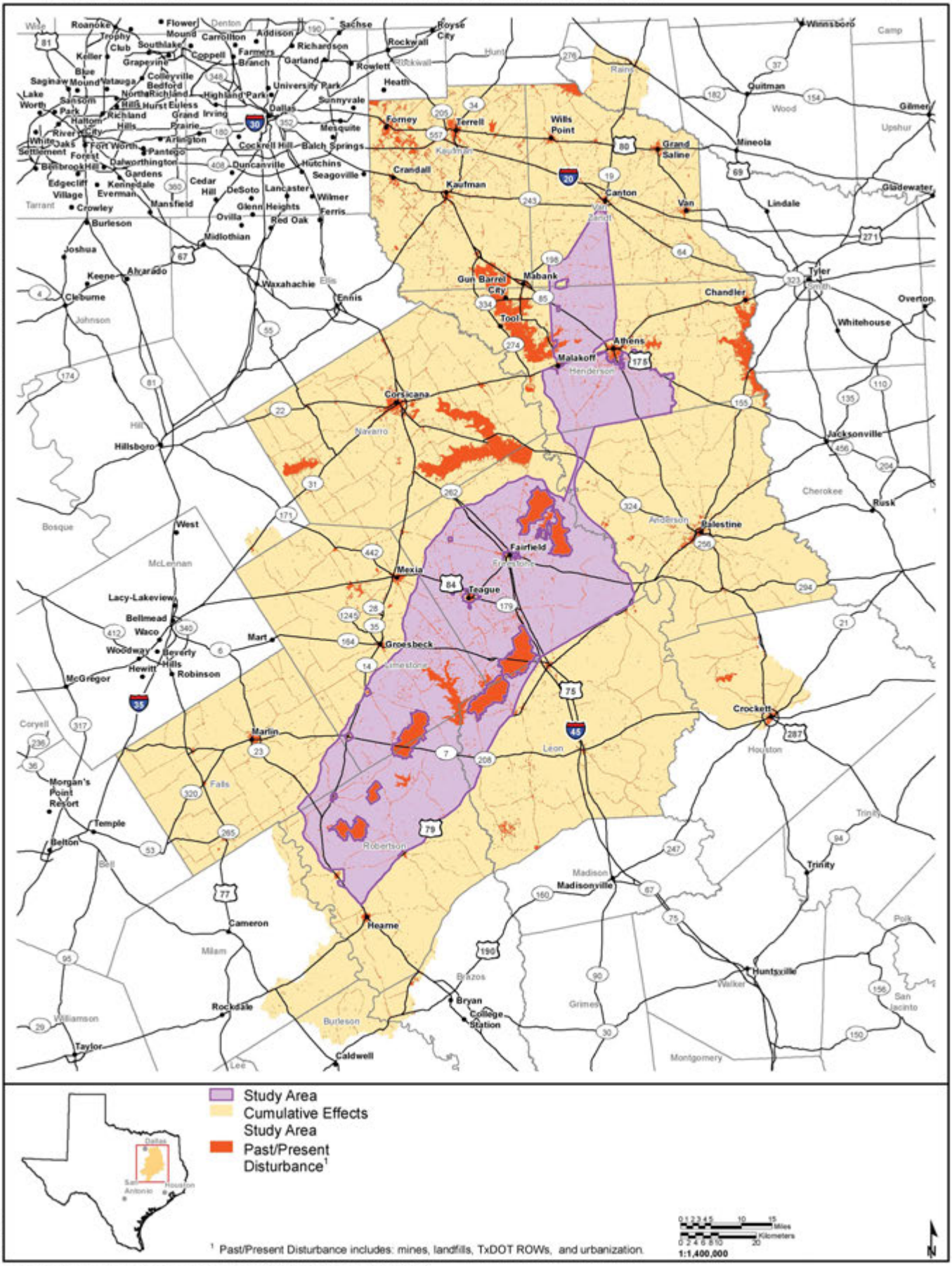


Figure 2-5 Maximum Extent of Study Area 3 CESA

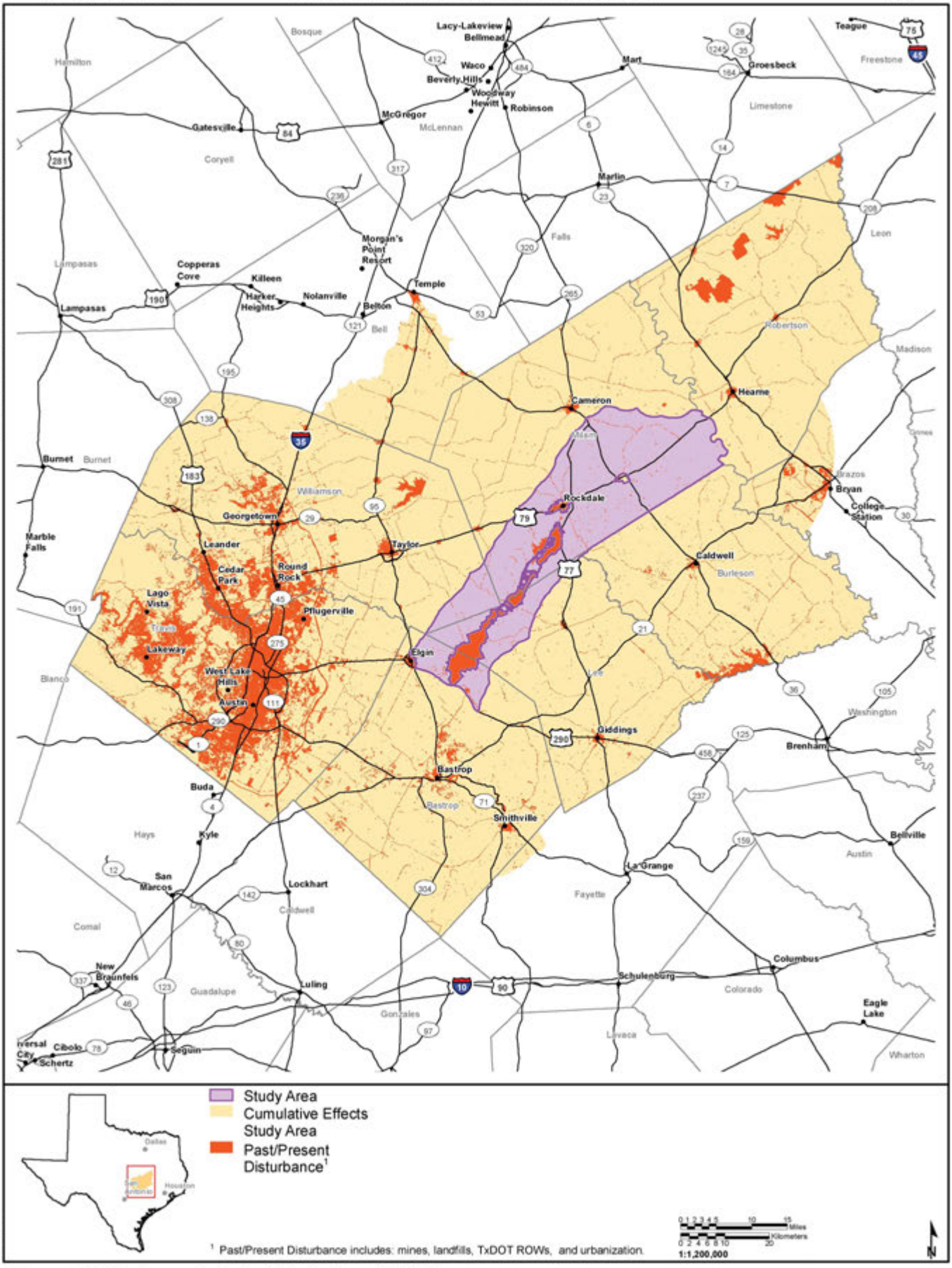


Figure 2-6 Maximum Extent of Study Area 4 CESA

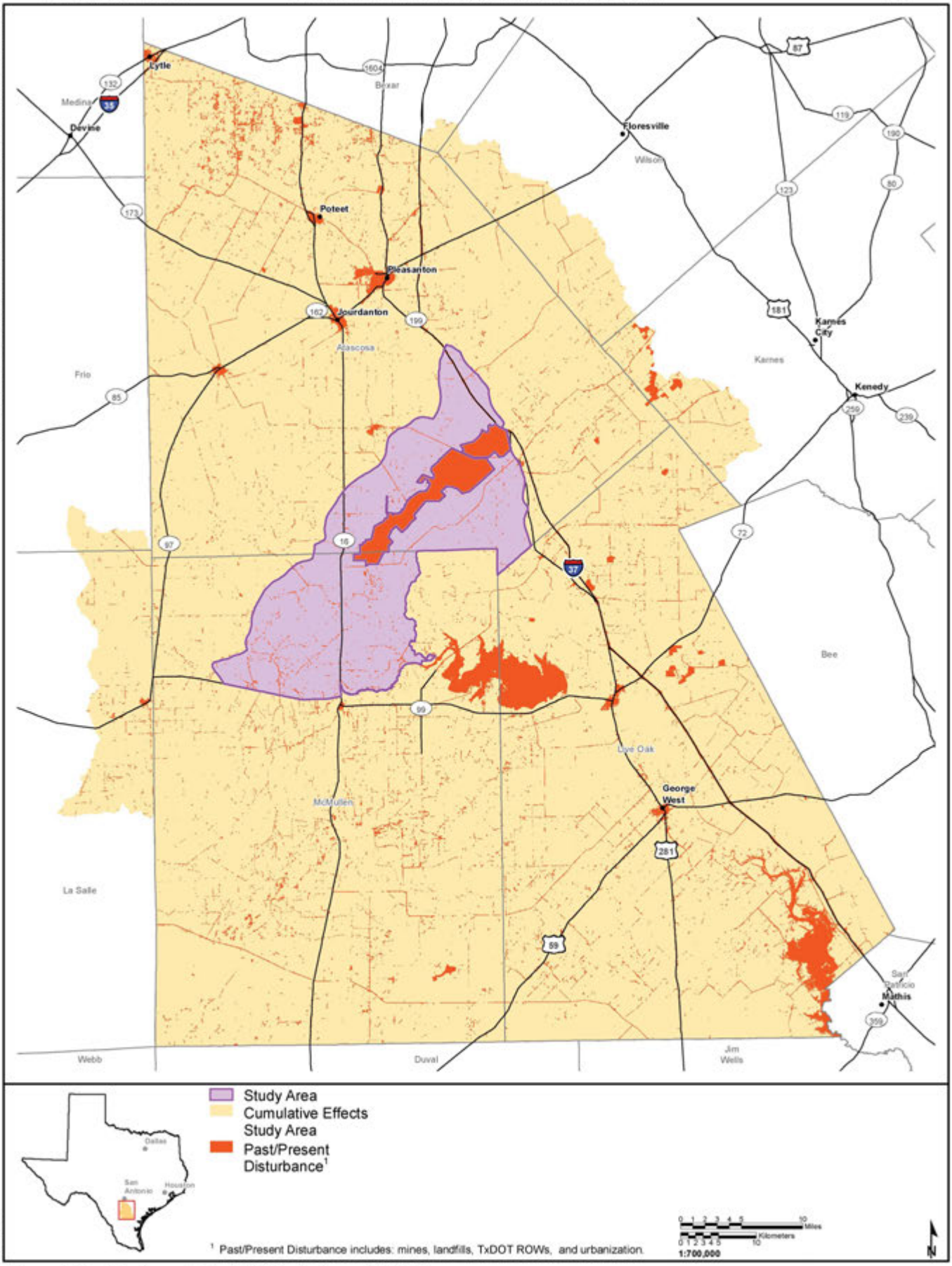


Figure 2-7 Maximum Extent of Study Area 5 CESA

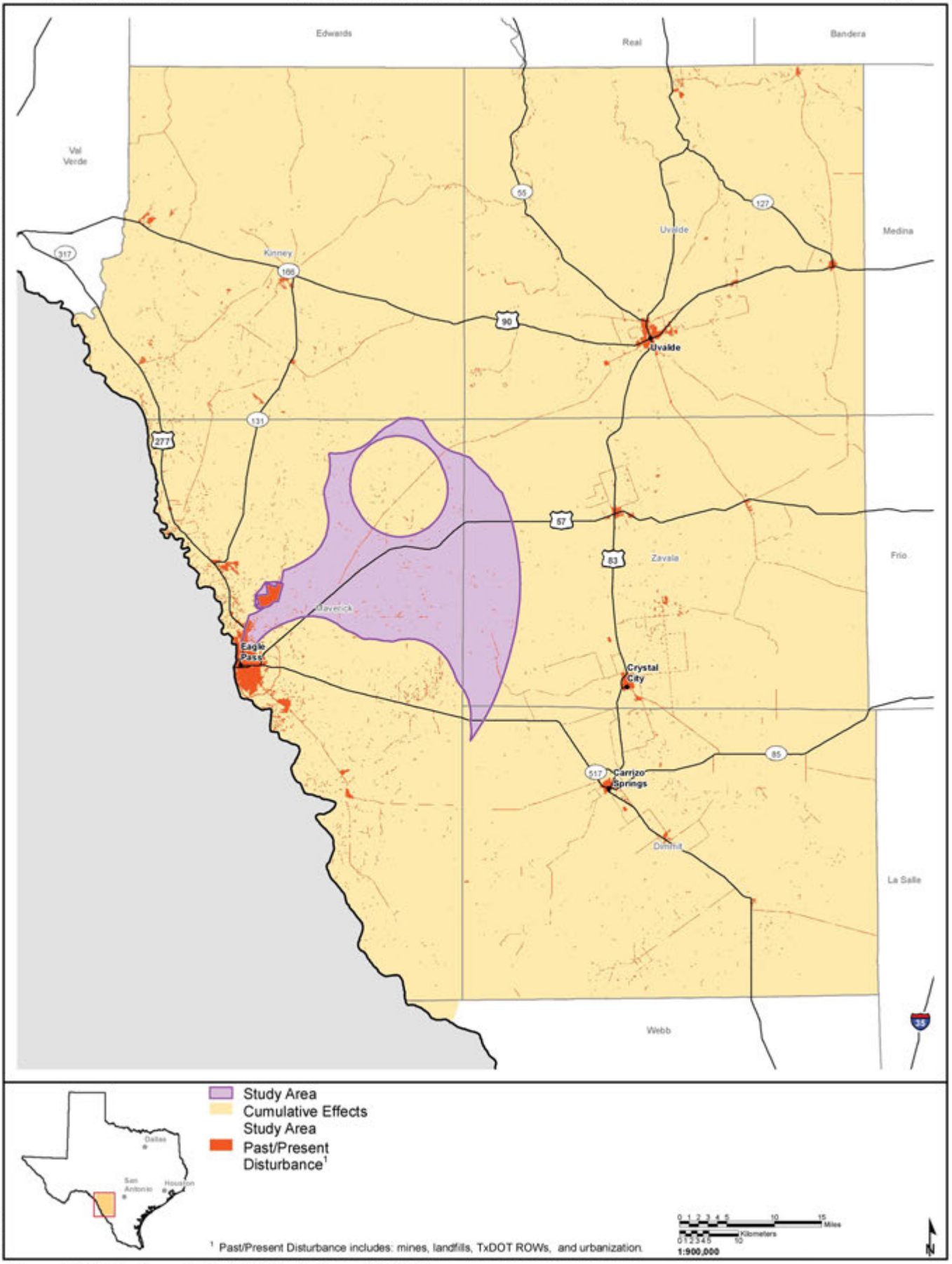


Figure 2-8 Maximum Extent of Study Area 6 CESA

Table 2-8 includes information about past and present surface coal and lignite mines within each study area. The table includes the information that is relevant to consider when analyzing cumulative effects, including the extent of surface disturbance, end date for the life-of-mine, and number of employees.

The types of known surface-disturbing projects that have contributed to the total acreage of past and present surface disturbance within each CESA are identified in **Table 2-9**. The surface disturbance associated with each project type is presented as a percentage of the total area of each CESA in order to enable a relative comparison of the types of activities that have contributed to the existing surface disturbance in each CESA. For example, while there are landfills in each CESA, CESA 4 has the most landfill-related disturbance and CESA 6 has the least; all CESAs have some oil and gas development, but CESA 2 has the most oil and gas-related disturbance.

Table 2-8 Past and Present Surface Coal and Lignite Mines by Study Area

Study Area	Mine Name[1]	RCT Permit #	Company	Authorized Disturbance (acres)	Life-of-mine[2] (end date)	Number of Employees
1	Monticello Thermo Mine	5F	Luminant Mining Company, LLC	4,508	2020	22
	Thermo A1	56	Luminant Mining Company, LLC	286	2020	Part of Monticello Thermo (5F) complex
	Monticello Winfield Mine	34E	Luminant Mining Company, LLC	26,337	2020	136
	Leesburg Mine	51	Luminant Mining Company, LLC	4,517	Not open: 15-year life span	—
2	Martin Lake Mine (Includes Beckville and Tatum)	4K	Luminant Mining Company, LLC	30,907	2025	359
	Martin Lake AIV South	53	Luminant Mining Company, LLC	2,310	2017	Part of Martin Lake (4K) complex
	Darco Mine [T]	29C	Norit Americas, Inc.	510	2014[3]	0
	South Hallsville No. 1 Mine	33H	Sabine Mining Company	44,408	2027	0
	Oak Hill Mine	46C	Luminant Mining Company, LLC	26,016	2030	289
	Rusk Mine	55	Sabine Mining Company	20,380	2041	273
	Marshall Mine	57	Marshall Mining Company	132	2043	40
2	Marshall Mine Expansion	59	Marshall Mining Company	2,500	2043	40
	Martin Lake Liberty Mine	58	Luminant Mining Company, LLC	3,866	2025	Part of Martin Lake (4K) complex

Table 2-8 Past and Present Surface Coal and Lignite Mines by Study Area

Study Area	Mine Name[1]	RCT Permit #	Company	Authorized Disturbance (acres)	Life-of-mine[2] (end date)	Number of Employees
3	Big Brown Mine	3E	Luminant Mining Company, LLC	12,908	2017	214
	Gibbons Creek Mine [R]	26D	Texas Municipal Power Agency	11,001	NA[4]	0
	Gibbons Creek IV Mine	38D	Texas Municipal Power Agency	3,900	NA[4]	0
	Calvert Mine	27G	Walnut Creek Mining Company	8,670	2031	103
	Jewett Mine	32F	Texas Westmoreland Coal Company	21,531	2026	319
	Jewett Area E/F	47A	Texas Westmoreland Coal Company	9,343	2027	Part of Jewett Mine (32F)
	Bremond Mine	49A	Luminant Mining Company, LLC	3,371	Not open: 10-year life span	—
	Kosse Mine	50A	Luminant Mining Company, LLC	15,043	2025	330
	Turlington Mine (continuation of Big Brown)	54	Luminant Mining Company, LLC	10,395	2025	Part of Big Brown Mine (3E)
4	Sandow Mine [R]	1F	Alcoa, Inc.	10,730	2007	0
	Three Oaks Mine	48C	Luminant Mining Company, LLC	15,811	2035	294
5	San Miguel Mine	11F	San Miguel Electric Cooperative, Inc.	16,004	2026	174
	San Miguel Mine Area C	52A	San Miguel Electric Cooperative, Inc.	4,444	2023	Part of San Miguel (11F) complex
6	Eagle Pass Mine	42B	Dos Repúblicas Coal Partnership	2,701	2021	16

[1] [R] = In final reclamation; [T] = RCT permit terminated.

[2] Based on current assumptions. Life-of-mine is the period of operations.

[3] RCT permit terminated April 22, 2014.

[4] Final reclamation completed.

Table 2-9 Types of Projects Contributing to Past and Present Surface Disturbance by CESA

Project Type	Percent of Maximum CESA Boundary Disturbed by Project Type					
	CESA 1	CESA 2	CESA 3	CESA 4	CESA 5	CESA 6
Landfill	17	32	9	40	2	<1
Mine	12	43	27	27	8	1
Pipeline	9	39	26	26	12	8
Petroleum Refinery or Terminal	27	33	13	33	13	0
Public Water Supply	10	8	46	46	2	12
Reservoir	22	35	31	31	8	<1
Wells (Oil/Gas)	11	39	22	11	14	9
Section 404 Permits (USACE)						
Energy Generation	3	81	13	2	3	<1
Mitigation	27	40	13	40	0	0
Other	7	83	5	7	<1	<1
Structure and Development	4	58	8	32	1	<1
Transportation	39	53	14	12	1	1
Power Generation Facilities						
Biomass	0	33	0	67	0	0
Coal	17	33	33	33	8	0
Hydro	0	0	0	67	0	33
Natural Gas	5	36	18	45	0	0
Solar	0	0	0	9	0	0
Wind	0	0	0	50	0	50
Wood	0	5	0	0	0	0

Notes: Percentages were calculated based on the total number, acreage, or length of each project type within the CESA compared to the total acreage for the combined CESAs. For this reason, the percentages for each project type may total more than 100 percent when each column is summed due to overlapping CESA boundaries. Where a project type is located within an overlapping area, it is counted more than once. This enables a comparable summary for each CESA.

2.4.2 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions are those actions that have formal plans or for which permitting is in progress at the time this REIS was developed. It is assumed that current activities, such as livestock grazing, agriculture, dispersed recreation, and other existing land uses, would continue into the foreseeable future. The only other known RFFAs include some highway improvements planned by TxDOT, new water supply developments, and the projections of new surface disturbance for potential future surface coal or lignite mine expansion areas or satellite mines shown in **Table 2-3**.

Within the next 10 to 15 years, the following surface-disturbing actions are projected:

- CESA 1—111 miles of state highway construction; 11 public water supply projects; up to 13,500 acres of disturbance for future surface coal or lignite mine expansion areas or satellite mines
- CESA 2—98 miles of state highway construction; 8 public water supply projects; up to 50,200 acres of disturbance for future surface coal or lignite mine expansion areas or satellite mines
- CESA 3—117 miles of state highway construction; 16 public water supply projects; up to 50,600 acres of disturbance for future surface coal or lignite mine expansion areas or satellite mines
- CESA 4—470 miles of state highway construction; 28 public water supply projects; up to 9,800 acres of disturbance for future surface coal or lignite mine expansion areas or satellite mines
- CESA 5—10 miles of state highway construction; up to 9,500 acres of disturbance for future surface coal or lignite mine expansion areas or satellite mines
- CESA 6—46 miles of state highway construction; 7 public water supply projects; up to 12,000 acres of disturbance for future surface coal or lignite mine expansion areas or satellite mines

2.5 Comparison Analysis of Alternatives

Table 2-10 provides a summary of the key direct and indirect impacts for each resource analyzed as well as additional recommended monitoring and mitigation identified as a result of the impact analysis. Detailed descriptions of impacts are presented for each alternative under each resource in Chapter 3.0. The summarized impacts assume the implementation of typical environmental protection measures as identified in Section 2.2.5 and the environmental protection measures associated with applicable state and federal permits. However, it is not assumed that the recommended mitigation measures would be implemented. Implementation of the recommended mitigation measures identified in Chapter 3.0 potentially would reduce impacts beyond that described in this table. Impacts are referred to as “short-term” if they would occur during typical mine construction, operations, and closure/final reclamation or “long-term” if they would persist beyond closure/final reclamation.

The construction, operation, and closure/final reclamation activities and mine components of a typical surface coal or lignite mine expansion area or satellite mine were used to facilitate the impact analysis for this REIS. The need for additional mitigation may be identified during the project-specific NEPA review that would be conducted at the time future mine expansion areas or satellite mines are proposed.

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Geology/Minerals/Paleontology			
Modification of topography	Topography would be altered by the removal of overburden and coal or lignite on approximately 158,600 acres. Effects would be minimized through regrading to approximate original contour.	Same as the Proposed Action.	• No monitoring or mitigation is recommended for geology, paleontological, or mineral resources.
Removal of coal and lignite resources making it unavailable in the future	Permanent removal of an estimated 35 million tons of coal or lignite annually.	Same as the Proposed Action.	
Access to oil and gas resources	Access to oil and gas resources would be precluded or limited during active mining unless horizontal drilling were implemented.	Same as the Proposed Action.	
Damage to fossils	Mining may directly damage or destroy common fossils; however, the potential for impact to significant fossils is low.	Same as the Proposed Action.	
Water Resources			
Groundwater			
Drawdown of aquifers	Maximum extent of projected mine-related 5-foot groundwater drawdown contour as a result of dewatering and depressurization would vary across the study areas, ranging from a high of 15 miles in Study Area 4 to zero in Study Area 6. Mine-related groundwater pumping impacts for future mines would be confined to the portion of the affected aquifers within a mine-related groundwater drawdown area, until mining ends and groundwater levels recover.	Same as the Proposed Action.	• No monitoring or mitigation measures are recommended.

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Groundwater quantity	The effects on other groundwater uses would vary depending on the extent of required mine depressurizion and dewatering. Impacts would be confined to the portion of the affected aquifers within a mine-related groundwater drawdown area until mining ends and groundwater levels recover. In accordance with RCT requirements, water supply would be replaced if water supply wells are impacted by mining operations.	Same as the Proposed Action.	
Groundwater quality	Groundwater quality in mine pit backfill areas may have elevated levels of salinity; however, impacts to groundwater due to increased salinity would be minimal in all study areas.	Same as the Proposed Action.	
Surface Water			
Removal of surface water features[1]	Direct effects to surface water features from mining would vary by study area. It is estimated that the occurrence of streams within future mining areas would range from a high of approximately 56 miles of perennial streams and 187 miles of intermittent streams potentially in Study Area 2 to a low of approximately 0.3 mile of perennial streams and 82 miles of intermittent streams in Study Area 6. A currently unquantifiable portion of these streams may be impacted by future mining activities if during future mine-specific permitting: 1) a waiver is granted by RCT (per Section 12.355 under the Texas Coal Mining Regulations) and 2) the proposed disturbance represents the least environmentally damaging practicable alternative in accordance with the USACE's Section 404(b)(1) guidelines.	Same as the Proposed Action.	• No monitoring beyond that required by jurisdictional agencies is recommended for surface water; no mitigation is recommended.

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Flow effects from watershed modifications	Changes to flow patterns and increased storm water runoff from bare ground may alter stream flows. Compliance with federal and state regulations would minimize flow increases from disturbed areas.	Same as the Proposed Action.	
Surface water quality	Surface water runoff from disturbed areas would contain increased turbidity and possibly higher concentrations of salinity and other contaminants. These adverse impacts to would be largely confined to the future mine permit areas. Impacts would be minimized through compliance with RCT and USACE Fort Worth District permit requirements. The potential for acid-forming constituents or other geochemical weathering products to affect surface water quality would be avoided by compliance with RCT regulations. The regulations require analysis of overburden and underburden through appropriate acid-base accounting or other assessments. Selective handling plans and follow-up testing would be developed and implemented to ensure that acid- or toxic-forming material are not placed in the upper 4 feet of the backfill profile.	Generally similar to the Proposed Action. Restrictions on impacts would not be applied for smaller mine expansion areas and satellite mines (0.5 to 10 acres), which could allow greater surface water-related impacts in some areas. The resource benefits from concentrating regulatory efforts and specific mitigation on future mine expansion areas or satellite mines with greater potential for surface water impacts would not occur.	
Waters of the U.S., including wetlands			
Impacts to waters of the U.S., including wetlands	Assuming that the acreage of waters of the U.S., including wetlands, projected to be impacted by future mining would be proportional to the size of the study area and the projected acreage that would be mined in each area, most of the wetlands projected to be impacted would be palustrine because this type covers the largest acreage within the study areas. It is estimated that the acreage of wetlands projected to be impacted would range from approximately 3,655 acres in Study Area 2 to 110 acres in Study Area 5.	Same as the Proposed Action.	• No additional monitoring or mitigation beyond that currently required by the USACE Fort Worth District is recommended.

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Soils and Reclamation			
Impacts to soil resources	Direct incremental disturbance of soil resources may cause associated increased erosion, alteration of soil structure, and reduction in soil productivity. Implementation of erosion control measures, soil and suitable growth media salvage, and a mine-specific reclamation plan would minimize the impacts. The projected acreage of soils anticipated to be affected equates to the amount of surface disturbance projected in each study area (see **Table 2-3**).	Same as the Proposed Action.	• Rough and final grading should occur when the soils are dry to minimize soil compaction during reclamation. • Compacted surface or subsurface soils should be treated for compaction by deep ripping or subsoiling, prior to revegetation efforts.
Vegetation (including special status species)			
Impacts to vegetation	Up to 158,600 acres of vegetation or approximately 3.6 percent of the 4,379,400 acres within all study areas is projected to be disturbed by future mining, ranging from 1.5 percent of the acreage in Study Area 1 to 9.9 percent in Study Area 6. There would be a long-term loss of woody species and short-term loss of herbaceous species following reclamation. Implementation of compensatory mitigation plans would minimize impacts to vegetation in each study area.	Same as the Proposed Action.	• Conduct special status plant species surveys in areas of potentially suitable habitat prior to ground-disturbing activities is recommended. • Development of appropriate mitigation and monitoring in coordination with USFWS and TPWD, as applicable, to minimize impacts to identified special status plant species is recommended. • Where possible, surface disturbance should be at least 100 feet from any non-jurisdictional wetland or riparian area, with a vegetation buffer maintained. • Prior to ground disturbance, select plant species (e.g., pitcher-plant) may be relocated to suitable habitat in coordination with the appropriate jurisdictional agency.
Establishment of noxious weeds or invasive plants	Surface disturbance from future mining would increase the potential for the spread and establishment of noxious weeds or invasive plant species,	Same as the Proposed Action.	
Impacts to special status plant species (i.e., species afforded protection under federal and state laws)	Surface disturbance in Study Areas 2, 3, 4, and 6 may affect populations or habitat for the six federal or state listed plant species, but adverse impacts would be minimized through consultation with USFWS under the ESA and compliance with state laws and regulations.	Same as the Proposed Action.	

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Fish and Wildlife Resources (including special status species)			
Terrestrial Wildlife			
Loss or alteration of terrestrial habitats	Direct impacts would include habitat loss and alteration, habitat fragmentation, wildlife displacement, and wildlife mortality. Indirect impacts would include effects related to increased noise, light, and human presence. Long-term impacts would include permanent changes to, or loss of, habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success. Even with successful reclamation, the habitats would be altered for a long time period, particularly woody-species dominated habitats. Larger species displaced during mining would return following reclamation as long as suitable habitat is re-established. The regional carrying capacity for birds may be reduced by the incremental loss of available nest and roost sites depending on the species affected and the site-specific conditions.	Same as the Proposed Action.	• If vegetation clearing activities should be required during the migratory bird breeding season (March through July), pre-construction breeding bird surveys would be conducted prior to these activities. • If active nests are located or other evidence of nesting is observed, appropriate protection measures should be implemented, including the establishment of buffer areas and constraint periods, until the young have fledged and dispersed from the nest area. • If interior least tern nesting activity is observed in mine-related disturbance areas, appropriate buffer areas and constraint periods would be implemented in coordination with the jurisdictional agencies. • For the protection of wildlife and special status species, dark-sky lighting should be installed that is fully shielded.
Changes in wetland and riparian habitat	Resident and migratory bird species and reptiles would be affected by an incremental reduction in available habitat where directly removed or where impacted by mine-related groundwater drawdown. Mine discharges to surface water channels may increase flows downstream and could support additional riparian areas or wetlands that could be used by terrestrial species during active mining operations.	Same as the Proposed Action.	
Effects on special status wildlife species populations and habitat (i.e., species afforded protection under federal and state laws)	Potential impacts to special status species including 14 bird species, 4 mammal species, and 7 reptile species are anticipated to be minor as long as field surveys and mitigation or avoidance measures are completed in advance of ground-disturbing activities. Potential types of impacts would parallel those described above for general wildlife species.	Same as the Proposed Action.	

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Fisheries and Other Aquatic Biological Resources			
Loss or alteration of aquatic habitat	Surface disturbance of streams that are ecologically important to fisheries and aquatic habitat is expected to occur during mine-related activities. Compliance with state and federal permit requirements would minimize long-term impacts, but disturbance of habitat would occur where streams cannot be avoided by surface mining operations. The impacts would vary by study area, based on the projected maximum acreage of surface disturbance and the amount of perennial streams. Flow reductions resulting from mine-related groundwater drawdown and stream flow increases due to mine water discharge may alter aquatic habitat near active mines.	Same as the Proposed Action.	• If direct disturbance occurs in a waterbody with invasive aquatic species, all vehicles and equipment would be cleaned and dried prior to working in adjacent drainages. • Avoid important spawning or nursery areas for special status fish species. • Where there is potential habitat, conduct special status mussel species surveys within the proposed disturbance areas. Relocate to similar habitat if disturbance cannot be avoided. • Avoid mining-related construction and operations in designated critical habitat for Houston toad in Study Area 4.
Effects of water quality changes	Surface water quality may be affected due to surface disturbance within or near waterbodies that may increase sedimentation and turbidity. Off site impacts on aquatic habitat from mining operations would be minimized through compliance with federal and state permit requirements, such as erosion controls and storm water management.	Same as the Proposed Action.	
Effects on special status aquatic species and habitat (i.e., species afforded protection under federal and state laws)	Changes in water flow and quality and the disturbance of perennial streams, contributing drainages, and upstream watersheds may result in adverse impacts to habitat important to listed species. Impacts would vary depending on the location of future mine expansion areas or satellite mines in relation to the rivers and perennial streams containing habitat for federal and state listed species.	Same as the Proposed Action.	

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Cultural Resources			
Direct impacts to cultural resources	Historic properties representing numerous cultures, both historic and prehistoric, occur in each study area. Mining-related disturbance would alter archaeological stratigraphy that provides context for buried historic properties, if present. Surface disturbance may modify cultural landscapes, and historic structures and buried archaeological sites may be adversely affected by earth-moving and vibrations from mining activities. Adverse impacts to NRHP-eligible sites would be minimized through survey and documentation in advance of surface disturbance and avoidance or mitigation as determined by the USACE Fort Worth District and THC.	Same as the Proposed Action.	• Monitoring of mine-related construction activities (i.e., new surface disturbance) conducted by knowledgeable professionals to avoid recorded NRHP-eligible or state protected cultural resources and minimize damage to previously unknown sites. • Each mining company would educate on site mine personnel as to the sensitive and confidential nature of cultural resources and implement a strict policy against illegal collection.
Potential impacts to previously undiscovered significant sites	Previously unidentified sites could be discovered during construction and operations. Implementation of committed measures to protect a site until it can be evaluated by the THC potentially would minimize impacts.	Same as the Proposed Action.	
Potential indirect impacts to cultural resources	Potential indirect impacts to NRHP-eligible sites within and outside a mine area may result from increased runoff or water discharge. Implementation of surface water controls and erosion control measures would minimize these effects. Other possible indirect adverse impacts would include illegal collection, inadvertent damage, and vandalism associated with increased access and human presence.	Same as the Proposed Action.	

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Air Quality			
Potential exceedence of ambient air quality standards	There would be temporary air quality impacts due to increases in local fugitive dust levels. Concentrations of criteria pollutants generated from mining-related activities would not exceed National Ambient Air Quality Standards (NAAQS).	Same as the Proposed Action.	• No additional monitoring or mitigation measures are recommended.
Greenhouse gas emissions	Potential contribution to manmade global climate effects would be immeasurably small.	Same as the Proposed Action.	
Land Use and Recreation			
Impacts to urban growth	Development of future mine expansion areas or satellite mines could delay adjacent urban growth until areas are mined and successfully reclaimed, depending on the proposed location of a future mine area in relation to urban areas.	Same as the Proposed Action.	• Accidental damage to property or infrastructure, as a result of mining activities, would be reported to landowners or the appropriate authorities immediately, and the mine operator would be responsible for repair or replacement.
Impacts to agricultural uses	Agricultural uses would not be available in mine-related disturbance areas until reclamation is completed.	Same as the Proposed Action.	
Impacts to industrial uses	The primary industrial land use in the study areas is oil and gas development. Access to new oil and gas resources may be restricted during active mining. Gathering lines, access roads, and other facilities and associated infrastructure may need to be relocated to allow for mining operations.	Same as the Proposed Action.	

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Impacts to availability of dispersed recreational uses	Potential future mining locations temporarily would be inaccessible while mining operations progress through an area and reclamation is completed. Mine construction and operation could disturb recreationists on lands outside of the mine area. Potential impacts would be related to mine-related noise and ground vibrations, fugitive dust emissions, increased human presence, and the visual intrusion of mine equipment and components where solitude and remote experiences are desired. Mining operations may cause game and aquatic species to relocate, changing the experience for hunters and fishers in some areas.	Same as the Proposed Action.	
Social and Economic Values			
Population and housing changes	No measureable effects to population are anticipated.	Same as the Proposed Action.	No monitoring or mitigation measures are recommended.
Employment and income change	No substantial changes to employment or income patterns are anticipated, with the possible exception of a beneficial impact on the high unemployment rate in Study Area 6. There may be a minor shift in income and employment from one county to another within each study area depending on future mine locations. There would be a temporary increase of contract construction workers at the start of mine development.	Same as the Proposed Action.	
Changes to local public finances	Little or no change in public finance is anticipated. Future mine expansion areas and satellite mines would extend the taxable revenue for a longer time period and may move into and out of taxing jurisdictions.	Same as the Proposed Action.	
Impacts on public education	Little or no change in tax payments to schools would result.	Same as the Proposed Action.	

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Impacts on residences	Potential future surface coal and lignite mine expansion areas and satellite mines may result in resident displacement, depending on the location of mining operations. Displacement would continue for the life of the disturbance and reclamation.	Same as the Proposed Action.	
Transportation			
Changes to roadways	Limited to no increase in traffic would be anticipated, with the possible exception of temporary increases during mine construction. Mine-related traffic may use different public roadways depending on the location of future mine expansion areas or satellite mines in relation to existing operations. No change in level of service (LOS) on affected roadways is anticipated.	Same as the Proposed Action.	No monitoring or mitigation measures are recommended.
Road closures	Short-term delays may occur where roads are temporarily affected by bridge or overpass construction to accommodate mining. County and local roads within future mine disturbance areas would be closed incrementally by the jurisdictional agency in advance of mine operations; alternate public and landowner access routes would be provided prior to road closures.	Same as the Proposed Action.	
Changes to railroads	Effects on rail transportation would be expected to be minimal.	Same as the Proposed Action.	

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Noise			
Change in ambient noise levels	Mining-related noise levels would be temporary and transitory. Impacts at any specific location would depend on the distance between mining activities and sensitive receptors, the intervening terrain, and the in-pit operating depth of the equipment.	Same as the Proposed Action.	• Noise generation in the vicinity of sensitive receptors should be minimized by restricting the simultaneous operation of noise producing equipment. • All motorized equipment should be fitted with properly functioning mufflers. • Mine planning should include berms and other noise barriers when operating at or near the surface in the vicinity of sensitive receptors.
Visual Resources			
Effects to visual landscape	Existing landscape character would be changed from the time of initial clearing until reclamation is successfully completed. The extent of the impact would vary depending on how visible the mining operations are, as determined by the terrain, height and type of vegetation, and location of sensitive viewers. Although lights used to light the pit areas would be shielded and aimed downward, consistent with safety and MSHA regulations, there would be an overall increase in ambient light levels in the mining area.	Same as the Proposed Action.	• Visual screening should be employed near the permit boundary where there are nearby potentially sensitive public viewpoints. Existing vegetation should be preserved and augmented and groves of trees should be retained where possible to provide visual buffers.

Table 2-10 Summary of Direct and Indirect Impacts by Resource or Impact Issue and Recommended Monitoring and Mitigation

Resource/Impact Issue	Proposed Action Alternative	No Action Alternative	Recommended Monitoring and Mitigation Measures
Hazardous Materials and Solid Waste			
Hazardous materials transport and usage	No general increase in hazardous materials transport or usage; duration of hazardous materials transport would be extended up to 30 years, based on the typical life of mine.	Same as the Proposed Action.	• Develop a protocol for handling contaminated sites to ensure protection of workers and to minimize potential environmental impacts.
Spill of hazardous materials during transport	Small probability of a spill or release during the life of a mine. The greatest potential impacts would occur if a spill occurred in proximity to a major river. Implementation of SPCC Plan and Emergency Response Plan would minimize potential impacts of an on site spill or release.	Same as the Proposed Action.	
Generation of hazardous and solid wastes	Hazardous and solid wastes would be stored, used, and disposed of in accordance with current regulations.	Same as the Proposed Action.	
Public Health			
Impact to health of local populations	No adverse public health impacts are anticipated due to water quality, air quality, noise, or lighting effects.	Same as the Proposed Action.	No monitoring or mitigation measures are recommended.
Environmental Justice			
Potential disproportionate effects to low-income or minority populations	No disproportionate effects to low income or minority populations are anticipated.	Same as the Proposed Action.	No monitoring or mitigation measures are recommended.

[1] National Hydrography Dataset (NHD) data lump ephemeral streams with intermittent streams.