TEXAS GENERAL LAND OFFICE
COMMISSIONER DAWN BUCKINGHAM, M.D.

April 15, 2024

Jody Urbanovsky
Halff Associate, Inc.
1201 North Bowser Road
Richardson, TX 75081-2275

Re: Oncor Electric Delivery Company's proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

Dear Mr. Urbanovsky:

On behalf of Commissioner Buckingham, I would like to thank you for your letter concerning the above- referenced project.

Using your map depicting the project's study area, it does not appear that the General Land Office will have any environmental issues or land use constraints at this time.

When a final route for this proposed project has been determined, please contact me and we can assess the route to determine if the project will cross any streambeds or Permanent School Fund (PSF) land that would require an easement from our agency.

In the interim, if you would like to speak to me further about this project, I can be reached by email at jeff.burroughs@glo.texas.gov or by phone at (512) 463-7845.

Again, thank you for your inquiry.

Sincerely,

Jeff Burroughs
Manager, Right-of-Way Department
Leasing Operations

Received on

APR 17 2024

Halff

1700 North Congress Avenue, Austin, Texas 78701-1495
P.O. Box 12873, Austin, Texas 78711-2873
512-463-5001 glo.texas.gov

halff

April 5, 2024

Mr. Edward Lengel
Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78701

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

Dear Mr. Lengel:

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345 kilovolt (kV) transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Please refer to the attached map depicting the study area.

Halff is preparing an Environmental Assessment (EA) and Alternative Route Analysis to support Oncor's application for a Certificate of Convenience and Necessity (CCN) from the Public Utility Commission of Texas (PUC). Halff is currently gathering data on the existing environment and identifying environmental and land use constraints within the study area that will be used in the creation of an environmental and land use constraints map. Halff will identify potential alternative routes that consider environmental and land use constraints.

Halff is requesting that your agency/office provide information concerning environmental and land use constraints or other issues of interest to your agency/office within the study area. Your comments will be an important consideration in the assessment of potential impacts. Upon certification for the proposed project, Oncor will determine the need for other approvals and/or permits. If your jurisdiction has approvals and/or permits that would apply to this project, please identify them in response to this inquiry. If permits are required from your office, Oncor will contact your office following route certification.

Thank you for your assistance with this proposed transmission line project. If you have any questions or require additional information, please contact me at (214) 346-6357. Electronic data or responses may also be shared at jurbanovsky@halff.com. Your earliest reply will be appreciated.

Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

From: noreply@thc.state.tx.us
Sent: Thursday, May 9, 2024 9:20 AM
To: Jody Urbanovsky; reviews@thc.state.tx.us
Subject: Oncor-Reiter Switch to Tesoro Switch

TEXAS HISTORICAL COMMISSION
real places telling real stories

Re: Project Review under the Antiquities Code of Texas
THC Tracking #202409490
Date: 05/09/2024
Oncor-Reiter Switch to Tesoro Switch
Loop 338-FM3503 to HW20 to Loop 338

Description: Build a 345kV transmission line between Reiter Switch in Ector County to Tesoro Switch in Midland County.

Dear Jody Urbanovsky:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the Executive Director of the Texas Historical Commission (THC), pursuant to review under the Antiquities Code of Texas.

The review staff, led by Caitlin Brashear and Drew Sitters, has completed its review and has made the following determinations based on the information submitted for review:

Archeology Comments

- An archeological survey is required. You may obtain lists of archeologists in Texas through the Council of Texas Archeologists and the Register of Professional Archaeologists. Please note that other qualified archeologists not included on these lists may be used. If this work will occur on land owned or controlled by a state agency or political subdivision of the state, a Texas Antiquities Permit must be obtained from this office prior to initiation of fieldwork. All fieldwork should meet the Archeological Survey Standards for Texas. A report of investigations is required and should meet the Council of Texas Archeologists Guidelines for Cultural Resources Management Reports and the Texas Administrative Code. In addition, any state-owned buildings 50 years old or older that are located on the tract should be documented with photographs and included in the report.

Shapefiles of the area surveyed must be submitted via the tab on eTrac with submission of the draft report to facilitate review and make project information available through the Texas Archeological Sites Atlas. For questions on how to submit these please visit our video training series at: https://www.youtube.com/playlist?list=PLONbbv2pt4cog5t6mCqZVaEAx3d0MkgQC

We have the following comments: While only one site, 41EC7, has been recorded within the proposed Study Area, the majority of the Study Area has never been formally surveyed for archeological resources. Furthermore, the proposed Study Area is bisected by Monahans Draw, which would have attracted both indigenous and historic occupation as evidenced by archeological sites previously recorded along its banks. Therefore, the potential for the proposed transmission line to affect unrecorded cultural resources within the project area is moderate to high and an archeological survey is warranted for those portions of the project that remain undisturbed. Archeological survey methods should emphasize a thorough inspection of the ground surface along transects spaced no greater than 10 meters apart. Shovel testing should be reserved for those areas where there exists the potential for buried deposits, in areas where ground surface visibility is poor, and within the vicinity of cultural material, such as sites or isolated finds. When historic sites are encountered, the Texas Historical Commission's Guidance for Studying Late 19th-Century and Early 20th-Century Sites must be followed, which includes conducting deed research to identify the individual(s) associated with recorded historic-age resource(s).

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: caitlin.brashear@thc.texas.gov, drew.sitters@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

for Bradford Patterson
Chief Deputy State Historic Preservation Officer

Please do not respond to this email.

halff

April 5, 2024 Transmitted via Email: whab@tpwd.texas.gov

Habitat Assessment Biologist
Texas Parks and Wildlife Department
Habitat Assessment Program
4200 Smith School Road
Austin, Texas 78744

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

To Whom It May Concern:

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345 kilovolt (kV) transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Please refer to the attached map depicting the study area.

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Halff is requesting that your agency/office provide information concerning environmental and land use constraints or other issues of interest to your agency/office within the study area. Your comments will be an important consideration in the assessment of potential impacts. Upon certification for the proposed project, Oncor will determine the need for other approvals and/or permits. If your jurisdiction has approvals and/or permits that would apply to this project, please identify them in response to this inquiry. If permits are required from your office, Oncor will contact your office following route certification.

Thank you for your assistance with this proposed transmission line project. If you have any questions or require additional information, please contact me at (214) 346-6357. Electronic data or responses may also be shared at jurbanovsky@halff.com. Your earliest reply will be appreciated.

Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

From: WHAB <WHAB@tpwd.texas.gov>
Sent: Friday, April 5, 2024 8:34 AM
To: Jody Urbanovsky
Cc: WHAB
Subject: TPWD has received your project review request

Follow Up Flag: Follow up
Flag Status: Flagged

This is an automated message to inform you that the Wildlife Habitat Assessment (WHAB) program has received your email. Please note that responses to requests for project review generally take **approximately 45 days** to complete, and project schedules should accommodate the review timeline. Responses may be delayed due to workload and lack of staff. If you wish to speak to the biologist who will review your project, please visit https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/habitat_assessment/media/whab-map-2020.jpg for a staff directory by area of responsibility. Thank you.

From: Richard Hanson <Richard.Hanson@tpwd.texas.gov>
Sent: Wednesday, May 15, 2024 10:19 AM
To: Jody Urbanovsky
Subject: Oncor Reiter-Tesoro 345 kV Transmission Line Project
Attachments: WL52202-ReiterTesoro-TransLine-345kV-EctorMidlandCo-C-05-15-2024.pdf

Hi Jody,

Attached is the TPWD comment letter on the Reiter to Tesoro project.

Rick Hanson

Environmental Review Biologist

Ecological & Environmental Planning Program

Texas Parks & Wildlife Department

(806) 761-4930 ext. 4936

May 15, 2024

Mr. Jody Urbanovsky
Halff
1201 N. Bowser Road
Richardson, TX 75081

RE: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345-kV Transmission Line Project in Ector and Midland Counties, Texas

Dear Mr. Urbanovsky:

Texas Parks and Wildlife Department (TPWD) has received the preliminary information request regarding the proposed transmission line project referenced above. TPWD staff has reviewed the information provided and offers the following comments concerning this project.

Please be aware that a written response to a TPWD recommendation or informational comment received by a state governmental agency may be required by state law. For further guidance, see the Texas Parks and Wildlife Code (PWC) section 12.0011. We are providing input on this proposed project to facilitate incorporation of voluntary measures during construction, operation, and maintenance that may assist the project proponent in minimizing impacts to the state's natural resources. For tracking purposes, please refer to TPWD project number 52202 in any return correspondence regarding this project.

Project Description

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345-kilovolt transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Halff is preparing an Environmental Assessment (EA) and Alternative Route Analysis to support Oncor's application for a Certificate of Convenience and Necessity from the Public Utility Commission of Texas.

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.texas.gov

Federal Laws

Clean Water Act

Section 404 of the Clean Water Act establishes a federal program to regulate the discharge of dredged and fill material into the waters of the U.S., including wetlands. The U.S. Army Corps of Engineers (USACE) and the Environmental Protection Agency are responsible for regulating water resources under this act. Both isolated and jurisdictional wetlands provide habitat for wildlife and help protect water quality.

> **Recommendation:** If the proposed project would impact waterways or associated wetlands, TPWD recommends consulting with the USACE for potential impacts to waters of the U.S. including jurisdictional determinations, delineations, and mitigation. All waterways and associated floodplains, riparian corridors, playa lakes, springs, and wetlands provide valuable wildlife habitat and should be protected to the maximum extent possible. Natural buffers contiguous to any wetlands or aquatic systems should remain undisturbed to preserve wildlife cover, food sources, and travel corridors. Erosion control and sediment runoff control measures should be installed prior to construction and maintained until disturbed areas are permanently revegetated using site specific native vegetation. Measures should be properly installed to effectively minimize the amount of sediment and other debris from entering the waterway.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits taking, attempting to take, capturing, killing, selling, purchasing, possessing, transporting, and importing of migratory birds, their eggs, parts, or nests, except when specifically authorized by the Department of the Interior. This protection applies to most native bird species, including ground nesting species. The U.S. Fish and Wildlife Service Southwest Region Migratory Bird Office can be contacted for more information on potential impacts to migratory birds.

Potential impacts to migratory birds may occur during site preparation and grading activities through the disturbance of existing vegetation (grass, trees, and shrubs) and bare ground that may be occupied by active bird nests.

Recommendation: TPWD recommends excluding vegetation clearing activities during the general bird nesting season, March 15 through September 15, to avoid adverse impacts to birds. If clearing vegetation during the migratory bird nesting season is unavoidable, TPWD recommends surveying the area proposed for disturbance to ensure that no nests with eggs or young will be disturbed by construction. Nest surveys should be conducted not more than five days prior to clearing activities to maximize detection of active nests. TPWD generally recommends a 100-foot radius buffer of vegetation remain around active nests until the eggs have hatched and the young have fledged; however, the size of the buffer zone depends on various factors and can be coordinated with the local or regional USFWS office.

The potential exists for birds to collide with power lines and associated guy wires and static lines. Bird fatalities can also occur due to electrocution if perching birds simultaneously contact energized and grounded structures.

Recommendation: TPWD recommends routing transmission lines to avoid crossing riparian areas, wetlands, and open water habitat, to the extent feasible. TPWD recommends crossing streams in a perpendicular manner and avoiding placement of lines parallel to streams and their associated wooded corridors. Where lines cross or are located near creeks, drainages, wetlands, and lakes, TPWD recommends line markers be installed at the crossings or closest points to the drainages to reduce potential bird collisions. TPWD recommends bird collision and electrocution risks be considered during project routing and design and recommends incorporating design features that will minimize those risks.

State Laws

Parks and Wildlife Code – Chapter 64, Birds

PWC Section 64.002, regarding protection of nongame birds, provides that no person may catch, kill, injure, pursue, or possess a bird that is not a game bird. PWC Section 64.003, regarding destroying nests or eggs, provides that, no person may destroy or take the nests, eggs, or young and any wild game bird, wild bird, or wild fowl.

Recommendation: Please review the *Federal Law: Migratory Bird Treaty Act* section above for recommendations as they are also applicable for PWC Chapter 64 compliance.

Parks and Wildlife Code, Section 68.015

PWC Section 68.015 regulates state listed threatened and endangered animal species. The capture, trap, take, or killing of state listed threatened and endangered animal species is unlawful unless expressly authorized under a permit issued by USFWS or TPWD. A copy of *TPWD Guidelines for Protection of State Listed Species*, which includes a list of penalties for take of species, can be found on the TPWD website. State listed species may only be handled by persons with appropriate authorization from the TPWD Wildlife Permits Office. For more information, please contact the Wildlife Permits Office at (512) 389-4647.

Texas horned lizard (*Phrynosoma cornutum*)

The state listed threatened Texas horned lizard can be found in open, arid, and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush, or scrubby trees. If present in the project area, the Texas horned lizard could be impacted by ground disturbing construction activities. Horned lizards may hibernate on site in the loose soils a few inches below ground during the cool months from September/October to March/April. Construction in these areas could harm hibernating lizards. Horned lizards are active above ground when temperatures exceed 75 degrees Fahrenheit. If horned lizards (nesting, gravid females, newborn young, lethargic from cool temperatures or hibernation) cannot move away from noise and approaching construction equipment in time, they could be affected by construction activities.

Recommendation: TPWD recommends surveying the study area for suitable habitat for this species. During construction TPWD recommends avoiding disturbance of the Texas horned lizard, its burrows, and colonies of its primary food source, the harvester ant (*Pogonomyrmex* sp.). TPWD recommends a permitted biological monitor be present during construction to relocate Texas horned lizards, if found. If the presence of a biological monitor during construction is not feasible, Texas horned lizards observed during construction should be allowed to safely leave the site.

A mixture of cover, food sources, and open ground is important to the Texas horned lizard and harvester ant. Disturbed areas within suitable habitat for the Texas horned lizard should be re-vegetated with site-specific native, patchy vegetation rather than sod-forming grasses.

Species of Concern/Special Features

In addition to state and federally protected species, TPWD tracks species considered to be Species of Greatest Conservation Need (SGCN) that, due to limited distributions or declining populations, face threat of extirpation or extinction but currently lack the legal protections given to threatened or endangered species. Special landscape features, natural plant communities, and SGCN are rare resources for which TPWD actively promotes conservation, and TPWD considers it important to minimize impacts to such resources to reduce the likelihood of endangerment and preclude the need to list SGCN as threatened or endangered in the future. These species and communities are tracked in the Texas Natural Diversity Database (TXNDD). The most current and accurate TXNDD data can be requested from the TXNDD website. To aid in the scientific knowledge of a species' status and current range, TPWD encourages reporting encounters of protected and rare species using the submit data instructions found on the TXNDD website.

The SGCN, plateau spot-tailed earless lizard *(Holbrookia lacerata)* has been documented in the study area in the TXNDD. This species is known to inhabit moderately open prairie-bushland, as well as flat areas free of vegetation or other obstructions, including disturbed areas.

> **Recommendation:** TPWD recommends avoiding impacts to this species if found on site.

The SGCN, black-tailed prairie dog *(Cynomys ludovicianus)* has been documented in the study area in the TXNDD.

Black-tailed prairie dog colonies provide habitat for other SGCN, such as the western burrowing owl (*Athene cunicularia hypugaea)*, mountain plover *(Charadrius montanus)*, and western rattlesnake *(Crotalus viridis)*, as well as many other wildlife species.

> **Recommendation:** TPWD recommends surveying the study area for prairie dog colonies and the species that depend on them. If prairie dog colonies are found in the study area, TPWD recommends avoiding these areas during siting and construction of the transmission line.

Please note that the absence of TXNDD information in the proximity does not imply that a species is absent from the study area. Given the small proportion of public versus private land in Texas, the TXNDD does not include a representative

inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare and protected species, data from the TXNDD does not provide a definitive statement as to the presence, absence or condition of special species, natural communities, or other significant features within your project area. This data is not inclusive and cannot be used as presence/absence or substituted for on-the-ground surveys.

Recommendation: TPWD recommends reviewing the Rare, Threatened, and Endangered Species of Texas online application for Ector and Midland Counties and including a discussion and evaluation of potential impacts to SGCN (in addition to state listed and federally listed species) in the EA for this project.

Determining the actual presence of a species in an area depends on many variables including daily and seasonal activity cycles, environmental activity cues, preferred habitat, transiency, and population density (both wildlife and human). The absence of a species can only be established with repeated negative observations and consideration of all factors contributing to the lack of detectable presence.

Recommendation: TPWD recommends providing information prior to construction to educate personnel of the potential occurrence of state listed species and SGCN within the project area, and the relevant rules and regulations that protect plants, fish, and wildlife. If encountered during construction, measures should be taken to avoid impacting wildlife.

Monarch Conservation Plan

Significant declines in the population of migrating monarch butterflies (*Danaus plexippus*) have led to widespread concern about this species and the long-term persistence of the North American monarch migration. Augmenting larval feeding and adult nectaring opportunities is part of an international conservation effort for the monarch.

Recommendation: For disturbed sites within the monarch migration corridor, TPWD recommends revegetation efforts include planting or seeding native milkweed (*Asclepias* spp) and nectar plants as funding and seed availability allow.

Vegetation

The TPWD Landscape Ecology Program has developed an interactive mapping application, the Texas Ecosystem Analytical Mapper (TEAM), to assist wildlife biologists, land managers, naturalists, planners, and conservationists in understanding Texas habitats and to integrate vegetation data with land management and resource planning of all types. For more information on TEAM please visit the TPWD Landscape Ecology Program website.

Recommendation: TPWD recommends that the removal of native vegetation during construction be minimized to the extent feasible. Unavoidable removal of vegetation should be mitigated by revegetating disturbed areas with site specific plant species where feasible. The replacement of native plants will help control erosion, provide habitat for wildlife, and provide native species an opportunity to compete with undesirable, non-native, invasive plant species.

General Construction Recommendations

TPWD would like to provide the following general construction recommendations to assist in project planning.

Recommendation: Where new construction is the only feasible option, TPWD recommends routing new transmission and distribution lines along existing roads, pipelines, transmission lines, or right-of-way (ROW) and easements to reduce habitat fragmentation. By utilizing previously disturbed, existing utility corridors, county roads and highway ROWs, adverse impacts to fish and wildlife resources would be reduced by avoiding and minimizing the impacts to undisturbed habitats.

During construction, TPWD recommends observing slow (25 miles per hour, or less) speed limits within the project area. Reduced speed limits would allow personnel to see wildlife in the vehicle path and avoid wildlife injury or death.

TPWD recommends the judicious use and placement of sediment control fence to exclude wildlife from the construction area. In many cases sediment control fence placement for the purposes of controlling erosion and protecting water quality can be modified minimally to also provide the benefit of excluding wildlife access to active construction areas. The exclusion fence should be buried at least six inches and be at least 24 inches high. The exclusion fence should be maintained during active construction and only be removed after the construction is completed. Construction personnel should be encouraged to

examine the inside of the exclusion area daily to determine if any wildlife species have been trapped inside the active construction area and provide safe egress opportunities prior to initiation of daily construction activities.

Where trenching or other excavation is involved in construction, TPWD recommends that contractors keep trenching and excavation, and backfilling crews close together to minimize the number of trenches or excavation areas left open at any given time during construction. TPWD recommends that any open trenches or excavation areas be covered overnight and inspected every morning to ensure no wildlife species have been trapped. Trenches left open for more than two daylight hours should be inspected for the presence of trapped wildlife prior to backfilling. If trenches and excavation areas cannot be backfilled the day of initial excavation, then escape ramps should be installed at least every 90 meters (approximately 295 feet). Escape ramps can be short lateral trenches or wooden planks sloping to the surface at an angle less than 45 degrees (1:1).

For soil stabilization and revegetation of disturbed areas within the proposed project area, TPWD recommends erosion and seed and mulch stabilization materials that avoid entanglement hazards to snakes and other wildlife species. Because the mesh found in many erosion control blankets or mats pose an entanglement hazard to wildlife, TPWD recommends the use of no-till drilling, hydromulching, or hydroseeding rather than erosion control blankets or mats due to a reduced risk to wildlife. If erosion control blankets or mats are used, the product should contain no netting or contain loosely woven, natural fiber netting in which the mesh design allows the threads to move, therefore allowing expansion of the mesh openings. Plastic mesh matting and hydromulch containing microplastics should be avoided.

Conservation Easements

A conservation easement is a legal agreement between a landowner and a land trust or governmental agency that permanently limits uses of the land (including future fragmentation) to protect and conserve the land's natural values such as fertile soils, mature trees, and wildlife habitat. Lands with conservation easements protect existing wildlife habitat from future fragmentation and therefore have greater environmental integrity than comparable lands without conservation easements. Potential fragmentation of wildlife habitat from transmission line construction on properties where conservation agreements serve to protect the state's natural resources now and in the future is of concern to TPWD.

Recommendation: TPWD recommends properties protected by conservation easements be identified in the constraints analysis and avoided during development of alternative routes. Data sources for the location of these properties include, but are not limited to, online databases such as the Protected Areas Database and the National Conservation Easement Database, as well as available county records. If properties protected by conservation easements would be affected, TPWD recommends the length of routes through these properties be included in any accounting of alternative route impacts.

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

I appreciate the opportunity to provide preliminary input on potential impacts related to this project and I look forward to reviewing the EA. Please contact me at Richard.Hanson@tpwd.texas.gov or (806) 761-4930 ext. 4936 if you have any questions.

Sincerely,

Rick Hanson

Rick Hanson
Ecological and Environmental Planning Program
Wildlife Division

RH: 52202

halff

April 5, 2024

Mr. Ben Wilde
Field Representative
Texas State Soil and Water Conservation Board - Area 2
1509 W Wall Street, Suite 106
Midland, Texas 79701

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

Dear Mr. Wilde:

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345 kilovolt (kV) transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Please refer to the attached map depicting the study area.

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Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

halff

April 5, 2024

Mr. Lee Huntoon, Manager
Panhandle/West Texas Region 1
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

Dear Mr. Huntoon:

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345 kilovolt (kV) transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Please refer to the attached map depicting the study area.

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Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

halff

April 5, 2024 Transmitted via Email: CESWF-Permits@usace.army.mil

Ms. Jennifer Walker, Chief
U.S. Army Corps of Engineers
Evaluation Branch Regulatory Division
P.O. Box 17300
Fort Worth, Texas 76102

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

Dear Ms. Walker:

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345 kilovolt (kV) transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Please refer to the attached map depicting the study area.

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Thank you for your assistance with this proposed transmission line project. If you have any questions or require additional information, please contact me at (214) 346-6357. Electronic data or responses may also be shared at jurbanovsky@halff.com. Your earliest reply will be appreciated.

Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

From: CESWF-Permits@usace.army.mil
Sent: Friday, April 5, 2024 11:24 AM
To: Jody Urbanovsky
Subject: RE: Reiter -- Tesoro 345 kV Transmission Line Project (Ector/Midland County, Texas)

Follow Up Flag: Follow up
Flag Status: Flagged

Mr. Urbanovsky,

Please use the link below to review our FOIA process and submit your request with regards to

obtaining information for any known deed restricted mitigation areas.

https://www.swf.usace.army.mil/Missions/Regulatory/Freedom-of-Information-Act-FOIA/

Natasha Gray
Legal Instruments Examiner
Regulatory Division
U.S. Army Corps of Engineers
819 Taylor Street, Rm 3A37
Fort Worth, Texas 76102
Phone: 817-886-1461
Email: natasha.a.gray@usace.army.mil

Please do not mail hard copy documents to Regulatory staff or office, unless specifically requested. For further details on corresponding with us, please view our Electronic Application Submittals special public notice at:
https://www.swf.usace.army.mil/Portals/47/docs/regulatory/publicnotices/2020/PublicNoticeElectronicApplications.pdf?ver=2019-11-21-123723-627

USACE Fort Worth District Regulatory Division Website http://www.swf.usace.army.mil/Missions/Regulatory.aspx

Please assist us in better serving you by completing the survey at the following website:
https://regulatory.ops.usace.army.mil/customer-service-survey/

From: Jody Urbanovsky <jurbanovsky@halff.com>
Sent: Friday, April 5, 2024 8:24 AM
To: CESWF-Permits@usace.army.mil
Subject: [Non-DoD Source] Reiter -- Tesoro 345 kV Transmission Line Project (Ector/Midland County, Texas)

Greetings,
The attached letter is a standard agency coordination letter for the referenced project that is generally directed to the attention of leadership positions within each agency. In addition to the standard response received from the USACE which outlines directions for submitting pre-construction notifications, what is most helpful from the USACE would be the location of any known deed restricted mitigation areas in the vicinity of the attached study area. Thanks for your consideration.
-Jody

Jody Urbanovsky
Project Manager

Halff
O: 214.346.6357
E: jurbanovsky@halff.com[1]

We improve lives and communities
by turning ideas into reality.

From: Gray, Natasha A CIV USARMY CESWF (USA) <Natasha.A.Gray@usace.army.mil>
Sent: Monday, April 8, 2024 4:44 PM
To: Jody Urbanovsky
Cc: Eckert, Annabelle N CIV USARMY CESWF (USA)
Subject: SWF-2024-00190 (Reiter Switch to Tesoro Switch 345 kV Transmission Line)

Dear Mr. Urbanovsky:

Thank you for your letter received April 5, 2024, concerning a proposal for the construction of a 345kV transmission line located in Ector and Midland Counties, Texas. The project has been assigned Project Number SWF-2024-00190, please include this number in all future correspondence concerning this project.

Ms. Annabelle Eckert has been assigned as the regulatory project manager for your request and will be evaluating it as expeditiously as possible.

You may be contacted for additional information about your request. For your information, please refer to the Fort Worth District Regulatory Division homepage at http://www.swf.usace.army.mil/Missions/regulatory and particularly guidance on submittals at https://swf-apps.usace.army.mil/pubdata/environ/regulatory/introduction/submital.pdf and mitigation at https://www.swf.usace.army.mil/Missions/Regulatory/Permitting/Mitigation that may help you supplement your current request or prepare future requests.

If you have any questions about the evaluation of your submittal or would like to request a copy of one of the documents referenced above, please refer to our website at http://www.swf.usace.army.mil/Missions/Regulatory or contact Ms. Annabelle Eckert by telephone 817-886-1009, or by email annabelle.n.eckert@usace.army.mil, and refer to your assigned project number. Please note that it is unlawful to start work without a Department of the Army permit if one is required.

Please help the regulatory program improve its service by completing the survey on the following website: http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey

Brandon W. Mobley
Chief, Regulatory Division

Please do not mail hard copy documents to Regulatory staff or office, unless specifically requested. For further details on corresponding with us, please view our Electronic Application Submittals special public notice at:
https://www.swf.usace.army.mil/Portals/47/docs/regulatory/publicnotices/2020/PublicNoticeElectronicApplications.pdf?ver=2019-11-21-123723-627

USACE Fort Worth District Regulatory Division Website
http://www.swf.usace.army.mil/Missions/Regulatory.aspx

Please assist us in better serving you by completing the survey at the following website:
https://regulatory.ops.usace.army.mil/customer-service-survey/

From: Eckert, Annabelle N CIV USARMY CESWF (USA) <Annabelle.N.Eckert@usace.army.mil>
Sent: Tuesday, April 9, 2024 3:42 PM
To: Jody Urbanovsky
Subject: RE: SWF-2024-00190 (Reiter Switch to Tesoro Switch 345 kV Transmission Line)

Categories: Blue Category

Hello Ms. Urbanovsky,

Thank you for your letter received April 5, 2024, concerning a proposal for the construction of a 345Kv transmission line located in Ector and Midland Counties, Texas. The project has been assigned Project Number SWF-2024-00162, please include this number in all future correspondence concerning this project.

We have reviewed this project in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Under Section 404, the U. S. Army Corps of Engineers (USACE) regulates the discharge of dredged and fill material into waters of the United States (WOTUS), including wetlands. Our responsibility under Section 10 is to regulate any work in, or affecting, navigable WOTUS. Any such discharge or work would require a Department of the Army (DA) permit or authorization of a permit.

Based on the information available to us potential waters of the U.S. (WOTUS) would be crossed as part of the utility line removal and rebuild; however, we are unable to determine whether a DA permit or permit authorization would be required because we do not have specific enough project information to discern if a discharge of dredged or fill material would occur within WOTUS. For us to continue our evaluation of the proposed project **please provide the following**, where applicable:

1. Detailed project description, map(s), and / or KMZ showing the specific location(s) of construction activities, and water features (e.g., river, stream, wetland, pond, etc.). Please make sure to include the locations of all soil disturbing activities within the project boundary (e.g., laydown areas, temporary access roads, etc.)
2. Please include whether a discharge of dredged or fill material would occur within a water feature or whether the water feature would be avoided, e.g., by spanning
3. For each potential project location in a WOTUS or water feature, provide the following site-specific information when applicable:
    1. Map showing the footprint of all construction activities and project boundary.
    2. Latitude and longitude coordinates in decimal degrees, county / parish, waterway name,
    3. Ecological characterization of the project location (i.e., stream type, wetland type, other type of water feature) including the NWI classification and soil series,
    4. Dimensions of the ordinary high-water mark (OHWM),

5. Proposed method of construction (e.g., open trench, HDD, span structure, culvert, etc.),
6. Type(s) and amount (in cubic yardage) of dredged / fill material proposed to be discharged below the OHWM / within wetland boundary,
7. Acreages of proposed temporary and permanent impacts to WOTUS,
8. Dimensions of proposed crossing(s), typical cross-section, and water spanning.
9. Dimensions of temporary / permanent rights-of-way.

If a discharge of dredged or fill material is not proposed to occur within WOTUS, then the Regulatory Division can issue a no-permit required letter at the request of the applicant.

Additional information, including more detailed data for a jurisdictional determination might be required to complete our evaluation of your project. We encourage you to consult with a qualified specialist (biologist, ecologist, or other specialist qualified in jurisdictional determinations) that is familiar with the Great Plains Regional Supplement to the 1987 USACE Wetlands Delineation Manual and the USACE Regulatory Program (33 CFR Parts 320-331).

Please consider the potential effects of the proposed action on cultural resources (RE: Section 106 of the National Historic Preservation Act) and federally listed threatened and endangered (T&E) species in your planning efforts. For additional information about T&E species, please contact the U. S. Fish and Wildlife Service (Arlington Field Office, Austin Field Office, Clear Lake Field Office).

We encourage you to avoid and minimize adverse impacts to streams, wetlands, and other WOTUS in planning this project. We gladly will oblige a pre-application meeting from the applicant to discuss project specifics and answer questions regarding our processes. Please note that it is unlawful to start work without a DA permit when one is required.

For more information on the USACE Regulatory Program, please reference the Fort Worth District Regulatory Branch:

1. Electronic submittal process,
2. General permits (NWPs / RGPs), and
3. Application submittal forms (e.g., pre-application meeting request) and templates.

If you have any questions about the evaluation of your submittal, please contact me at your convenience.

Very Respectfully,

Annabelle Eckert
Project Manager
US Army Corps of Engineers

Fort Worth District CESWF-RDE
819 Taylor Street, Room 3A37
Fort Worth, Texas 76102-0300
Cell: 817.319.9859
Office: 817.886.1009
Annabelle.N.Eckert@USACE.Army.Mil

halff

April 5, 2024

Mr. Leo Carrillo, Natural Resource Manager
U.S. Department of Agriculture – Midland Service Center
The Permian Building
1509 West Wall Street, Suite 106
Midland, Texas 79701

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

Dear Mr. Carrillo:

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345 kilovolt (kV) transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Please refer to the attached map depicting the study area.

Halff is preparing an Environmental Assessment (EA) and Alternative Route Analysis to support Oncor's application for a Certificate of Convenience and Necessity (CCN) from the Public Utility Commission of Texas (PUC). Halff is currently gathering data on the existing environment and identifying environmental and land use constraints within the study area that will be used in the creation of an environmental and land use constraints map. Halff will identify potential alternative routes that consider environmental and land use constraints.

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Thank you for your assistance with this proposed transmission line project. If you have any questions or require additional information, please contact me at (214) 346-6357. Electronic data or responses may also be shared at jurbanovsky@halff.com. Your earliest reply will be appreciated.

Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

halff

April 5, 2024

Transmitted via Email: osd.dod-siting-clearinghouse@mail.mil
Certified Mail: 7021 1970 0001 0920 7996

U.S. Department of Defense
Military Aviation and Installation Assurance Siting Clearinghouse
3400 Defense Pentagon, Room 5C646
Washington, DC 20301

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

To Whom It May Concern:

Oncor Electric Delivery Company LLC (Oncor) proposes to build a 345 kilovolt (kV) transmission line between Oncor's Reiter Switch in Ector County, Texas, and Oncor's Tesoro Switch in Midland County, Texas. The Reiter Switch property is located approximately 1.2 miles north of the intersection of Loop 338 and Farm-to-Market Road 3503. The Tesoro Switch property is located approximately 1.5 miles southeast of the intersection of Interstate Highway 20 and Loop 338 near Odessa, Texas. Please refer to the attached map depicting the study area.

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Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

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Tracking Number:

70211970000109207996

Copy **Add to Informed Delivery (https://informeddelivery.usps.com/)**

Latest Update

Your item was picked up at a postal facility at 7:13 am on April 11, 2024 in WASHINGTON, DC 20310.

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USPS Tracking Plus®

Delivered

Delivered, Individual Picked Up at Postal Facility
WASHINGTON, DC 20310
April 11, 2024, 7:13 am

Available for Pickup
GOVERNMENT MAILS ANNEX
3300 V ST
WASHINGTON DC 20018-1528
April 11, 2024, 5:43 am

Arrived at Post Office
WASHINGTON, DC 20018
April 11, 2024, 5:28 am

In Transit to Next Facility
April 10, 2024

Arrived at USPS Regional Facility
COPPELL TX DISTRIBUTION CENTER
April 5, 2024, 8:44 pm

Tracking information obtained from www.USPS.com on May 16, 2024
https://tools.usps.com/go/TrackConfirmAction?qtc_tLabels1=70211970000109207996

From: OSD Pentagon OUSD A-S Mailbox ASD EIE-RP-SC <osd.pentagon.ousd-a-s.mbx.asd-eie-rp-sc@mail.mil>
Sent: Friday, April 5, 2024 11:07 AM
To: Jody Urbanovsky
Cc: OSD Pentagon OUSD A-S Mailbox ASD EIE-RP-SC
Subject: RE: Reiter -- Tesoro 345 kV Transmission Line Project (Ector/Midland County, Texas)

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon Mr. Urbanovsky,

Your Informal Review request for the Reiter Switch to Tesoro Switch 345 kV Transmission Line Project has been received. We will begin processing the request shortly.

Thank you for the opportunity to review the project.

Very Respectfully,

The Clearinghouse
Military Aviation and Installation Assurance Siting Clearinghouse
Office of the Assistant Secretary of Defense (Energy, Installations and Environment)
Email: osd.pentagon.ousd-a-s.mbx.asd-eie-rp-sc@mail.mil

From: Jody Urbanovsky <jurbanovsky@halff.com>
Sent: Friday, April 5, 2024 9:24 AM
To: OSD Pentagon OUSD A-S Mailbox ASD EIE-RP-SC <osd.pentagon.ousd-a-s.mbx.asd-eie-rp-sc@mail.mil>
Subject: Reiter -- Tesoro 345 kV Transmission Line Project (Ector/Midland County, Texas)

To whom it may concern,
Please see the attached formal letter and study area map for the referenced transmission line project in Ector/Midland County, Texas. The current plans for this transmission line project include lattice tower construction with structure heights ranging from 120-180 feet. Please also see the attached GIS shapefile for the project study area. A hard copy of the attached letter with the study area map has been sent by certified mail consistent to Oncor Electric Delivery company protocols. If you have any questions, please don't hesitate to let me know. Thanks, and have a great day.
-Jody

Jody Urbanovsky
Project Manager

Halff
O: 214.346.6357
E: jurbanovsky@halff.com

We improve lives and communities
by turning ideas into reality.

From: Townes, Daniel W CTR OSD OUSD A-S (USA) <daniel.w.townes.ctr@mail.mil>
Sent: Monday, May 20, 2024 7:59 AM
To: Jody Urbanovsky <jurbanovsky@halff.com>
Cc: Beard, Robbin E CIV OSD OUSD A-S (USA) <robbin.e.beard.civ@mail.mil>
Subject: Response Letter for the Reiter Switch to Tesoro Switch 345 kV Transmission Line Project

Good morning Mr. Urbanovsky,

Attached is the Informal Review Response Letter for the Reiter Switch to Tesoro Switch 345 kV Transmission Line Project.

Thank you for the opportunity to review your project.

Respectfully,

Dan Townes
Military Aviation and Installation Assurance Siting Clearinghouse
Office of the Assistant Secretary of Defense (Energy, Installations and Environment)
Desk: 571-372-8414 *(limited access)*
NIPR: daniel.w.townes.ctr@mail.mil

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

ENERGY, INSTALLATIONS
AND ENVIRONMENT

May 20, 2024

Jody Urbanovsky
Halff
1201 N. Bowser Road
Richardson, TX 75081

Dear Mr. Urbanovsky,

As requested, the Military Aviation and Installation Assurance Siting Clearinghouse coordinated within the Department of Defense (DoD) an informal review of the Reiter Switch to Tesoro Switch 345 kV Transmission Line Project. The results of our review indicated that the transmission line project, located in Ector and Midland Counties, Texas, as proposed, will have minimal impact on military operations conducted in the area.

Please note that this informal review by the DoD Military Aviation and Installation Assurance Siting Clearinghouse does not constitute an action under 49 United States Code Section 44718 and that the DoD is not bound by the conclusion arrived at under this informal review. To expedite our review in the Obstruction Evaluation Airport Airspace Analysis (OE/AAA) process, please add the project number 2024-04-T-DEV-04 in the comments section of the filing. If you have any questions, please contact me at robbin.e.beard.civ@mail.mil.

Sincerely,

Robbin Beard
Deputy Director
Military Aviation and Installation
Assurance Siting Clearinghouse

halff

April 5, 2024

Field Biologist
U.S. Fish and Wildlife Service
Ecological Services Field Office
1505 Ferguson Lane
Austin, Texas 78754

Re: Oncor Electric Delivery Company LLC's Proposed Reiter Switch to Tesoro Switch 345 kV Transmission Line Project in Ector and Midland Counties, Texas

To Whom It May Concern:

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Sincerely,
Halff

Jody Urbanovsky

Mr. Jody Urbanovsky, Project Manager

Attachment – Map of the Project Study Area

Appendix B

Link Composition of Alternative Routes

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APPENDIX B

Table 5-1. Link Composition of Alternative Routes

Route	Link Sequence	Miles
1	A-B4-D3-E4-F5-H5-I5-I6-**J**	4.43
2	A-B4-D3-E4-F5-G5-H6-I6-J	4.35
3	A-B4-D3-E4-F5-G5-G6-G7-H7-J	4.29
4	A-B4-D3-E4-E5-F6-F8-F9-H7-J	4.28
5	A-B4-D3-E4-E5-F6-F7-G7-H7-J	4.22
6	A-B4-D3-E4-E5-E6-F9-H7-J	4.24
7	A-B4-D3-F4-G4-H5-I5-I6-J	4.42
8	A-B4-D3-F4-G4-G5-H6-I6-J	4.34
9	A-B4-D3-F4-G4-G5-G6-G7-H7-J	4.28
10	A-B4-D3-F4-H4-I4-I5-I6-J	4.43
11	A-A1-B2-D1-F2-G2-H3-I3-I4-I5-I6-J	4.69
12	A-A1-B2-D1-F2-G2-G3-G4-H5-I5-I6-J	4.75
13	A-A1-B2-D1-F2-G2-G3-G4-G5-H6-I6-J	4.66
14	A-A1-B2-D1-F2-G2-G3-G4-G5-G6-G7-H7-J	4.61
15	A-A1-B2-D1-F2-G2-G3-H4-I4-I5-I6-J	4.75
16	A-A1-B2-D1-F2-H2-I2-I3-I4-I5-I6-J	4.74
17	A-A1-B2-C1-C2-D3-E4-F5-H5-I5-I6-J	4.43
18	A-A1-B2-C1-C2-D3-E4-F5-G5-H6-I6-J	4.35
19	A-A1-B2-C1-C2-D3-E4-F5-G5-G6-G7-H7-J	4.30
20	A-A1-B2-C1-C2-D3-E4-E5-F6-F8-F9-H7-J	4.28
21	A-A1-B2-C1-C2-D3-E4-E5-F6-F7-G7-H7-J	4.23
22	A-A1-B2-C1-C2-D3-E4-E5-E6-F9-H7-J	4.24
23	A-A1-B2-C1-C2-D3-F4-G4-H5-I5-I6-J	4.43
24	A-A1-B2-C1-C2-D3-F4-G4-G5-H6-I6-J	4.34
25	A-A1-B2-C1-C2-D3-F4-G4-G5-G6-G7-H7-J	4.29
26	A-A1-B2-C1-C2-D3-F4-H4-I4-I5-I6-J	4.44
27	A-A1-B2-C1-D2-F3-H3-I3-I4-I5-I6-J	4.38
28	A-A1-B2-C1-D2-F3-G3-G4-H5-I5-I6-J	4.44
29	A-A1-B2-C1-D2-F3-G3-G4-G5-H6-I6-J	4.35
30	A-A1-B2-C1-D2-F3-G3-G4-G5-G6-G7-H7-J	4.30
31	A-A1-B2-C1-D2-F3-G3-H4-I4-I5-I6-J	4.44
32	A-A1-B2-C1-D2-E3-E4-F5-H5-I5-I6-J	4.43
33	A-A1-B2-C1-D2-E3-E4-F5-G5-H6-I6-J	4.35
34	A-A1-B2-C1-D2-E3-E4-F5-G5-G6-G7-H7-J	4.29
35	A-A1-B2-C1-D2-E3-E4-E5-F6-F8-F9-H7-J	4.28
36	A-A1-B2-C1-D2-E3-E4-E5-F6-F7-G7-H7-J	4.22
37	A-A1-B2-C1-D2-E3-E4-E5-E6-F9-H7-J	4.24
38	A-A1-B2-C1-D2-E3-F4-G4-H5-I5-I6-J	4.43
39	A-A1-B2-C1-D2-E3-F4-G4-G5-H6-I6-J	4.34
40	A-A1-B2-C1-D2-E3-F4-G4-G5-G6-G7-H7-J	4.29
41	A-A1-B2-C1-D2-E3-F4-H4-I4-I5-I6-J	4.44
42	A-B3-C2-D3-E4-F5-H5-I5-I6-J	4.26
43	A-B3-C2-D3-E4-F5-G5-H6-I6-J	4.17
44	A-B3-C2-D3-E4-F5-G5-G6-G7-H7-J	4.12
45	A-B3-C2-D3-E4-E5-F6-F8-F9-H7-J	4.11
46	A-B3-C2-D3-E4-E5-F6-F7-G7-H7-J	4.05
47	A-B3-C2-D3-E4-E5-E6-F9-H7-J	4.07
48	A-B3-C2-D3-F4-G4-H5-I5-I6-J	4.25
49	A-B3-C2-D3-F4-G4-G5-H6-I6-J	4.17
50	A-B3-C2-D3-F4-G4-G5-G6-G7-H7-J	4.11
51	A-B3-C2-D3-F4-H4-I4-I5-I6-J	4.26

Table 5-1. Link Composition of Alternative Routes – Continued

Route	Link Sequence	Miles
52	A-B3-D2-F3-H3-I3-I4-I5-I6-J	4.20
53	A-B3-D2-F3-G3-G4-H5-I5-I6-J	4.26
54	A-B3-D2-F3-G3-G4-G5-H6-I6-J	4.18
55	A-B3-D2-F3-G3-G4-G5-G6-G7-H7-J	4.12
56	A-B3-D2-F3-G3-H4-I4-I5-I6-J	4.27
57	A-B3-D2-E3-E4-F5-H5-I5-I6-J	4.26
58	A-B3-D2-E3-E4-F5-G5-H6-I6-J	4.17
59	A-B3-D2-E3-E4-F5-G5-G6-G7-H7-J	4.12
60	A-B3-D2-E3-E4-E5-F6-F8-F9-H7-J	4.11
61	A-B3-D2-E3-E4-E5-F6-F7-G7-H7-J	4.05
62	A-B3-D2-E3-E4-E5-E6-F9-H7-J	4.06
63	A-B3-D2-E3-F4-G4-H5-I5-I6-J	4.25
64	A-B3-D2-E3-F4-G4-G5-H6-I6-J	4.17
65	A-B3-D2-E3-F4-G4-G5-G6-G7-H7-J	4.11
66	A-B3-D2-E3-F4-H4-I4-I5-I6-J	4.26
67	A-B0-B1-E0-F1-H1-I1-I2-I3-I4-I5-I6-J	5.06
68	A-B0-B1-E0-F1-G1-G2-H3-I3-I4-I5-I6-J	5.01
69	A-B0-B1-E0-F1-G1-G2-G3-G4-H5-I5-I6-J	5.07
70	A-B0-B1-E0-F1-G1-G2-G3-G4-G5-H6-I6-J	4.99
71	A-B0-B1-E0-F1-G1-G2-G3-G4-G5-G6-G7-H7-J	4.93
72	A-B0-B1-E0-F1-G1-G2-G3-H4-I4-I5-I6-J	5.08
73	A-B0-B1-E0-F1-G1-H2-I2-I3-I4-I5-I6-J	5.06
74	A-B0-B1-E0-E1-F2-G2-H3-I3-I4-I5-I6-J	4.87
75	A-B0-B1-E0-E1-F2-G2-G3-G4-H5-I5-I6-J	4.93
76	A-B0-B1-E0-E1-F2-G2-G3-G4-G5-H6-I6-J	4.85
77	A-B0-B1-E0-E1-F2-G2-G3-G4-G5-G6-G7-H7-J	4.79
78	A-B0-B1-E0-E1-F2-G2-G3-H4-I4-I5-I6-J	4.94
79	A-B0-B1-E0-E1-F2-H2-I2-I3-I4-I5-I6-J	4.92
80	A-B0-B1-E0-E1-E2-F3-H3-I3-I4-I5-I6-J	4.87
81	A-B0-B1-E0-E1-E2-F3-G3-G4-H5-I5-I6-J	4.93
82	A-B0-B1-E0-E1-E2-F3-G3-G4-G5-H6-I6-J	4.85
83	A-B0-B1-E0-E1-E2-F3-G3-G4-G5-G6-G7-H7-J	4.79
84	A-B0-B1-E0-E1-E2-F3-G3-H4-I4-I5-I6-J	4.94
85	A-B0-B1-E0-E1-E2-E3-E4-F5-H5-I5-I6-J	4.93
86	A-B0-B1-E0-E1-E2-E3-E4-F5-G5-H6-I6-J	4.84
87	A-B0-B1-E0-E1-E2-E3-E4-F5-G5-G6-G7-H7-J	4.79
88	A-B0-B1-E0-E1-E2-E3-E4-E5-F6-F8-F9-H7-J	4.78
89	A-B0-B1-E0-E1-E2-E3-E4-E5-F6-F7-G7-H7-J	4.72
90	A-B0-B1-E0-E1-E2-E3-E4-E5-E6-F9-H7-J	4.73
91	A-B0-B1-E0-E1-E2-E3-F4-G4-H5-I5-I6-J	4.92
92	A-B0-B1-E0-E1-E2-E3-F4-G4-G5-H6-I6-J	4.84
93	A-B0-B1-E0-E1-E2-E3-F4-G4-G5-G6-G7-H7-J	4.78
94	A-B0-B1-E0-E1-E2-E3-F4-H4-I4-I5-I6-J	4.93
95	A-A1-A2-A4-E0-F1-H1-I1-I2-I3-I4-I5-I6-J	5.27
96	A-A1-A2-A4-E0-F1-G1-G2-H3-I3-I4-I5-I6-J	5.22
97	A-A1-A2-A4-E0-F1-G1-G2-G3-G4-H5-I5-I6-J	5.28
98	A-A1-A2-A4-E0-F1-G1-G2-G3-G4-G5-H6-I6-J	5.19
99	A-A1-A2-A4-E0-F1-G1-G2-G3-G4-G5-G6-G7-H7-J	5.14
100	A-A1-A2-A4-E0-F1-G1-G2-G3-H4-I4-I5-I6-J	5.28
101	A-A1-A2-A4-E0-F1-G1-H2-I2-I3-I4-I5-I6-J	5.27
102	A-A1-A2-A4-E0-E1-F2-G2-H3-I3-I4-I5-I6-J	5.08

Table 5-1. Link Composition of Alternative Routes – Continued

Route	Link Sequence	Miles
103	A-A1-A2-A4-E0-E1-F2-G2-G3-G4-H5-I5-I6-J	5.14
104	A-A1-A2-A4-E0-E1-F2-G2-G3-G4-G5-H6-I6-J	5.05
105	A-A1-A2-A4-E0-E1-F2-G2-G3-G4-G5-G6-G7-H7-J	5.00
106	A-A1-A2-A4-E0-E1-F2-G2-G3-H4-I4-I5-I6-J	5.15
107	A-A1-A2-A4-E0-E1-F2-H2-I2-I3-I4-I5-I6-J	5.13
108	A-A1-A2-A4-E0-E1-E2-F3-H3-I3-I4-I5-I6-J	5.08
109	A-A1-A2-A4-E0-E1-E2-F3-G3-G4-H5-I5-I6-J	5.14
110	A-A1-A2-A4-E0-E1-E2-F3-G3-G4-G5-H6-I6-J	5.05
111	A-A1-A2-A4-E0-E1-E2-F3-G3-G4-G5-G6-G7-H7-J	5.00
112	A-A1-A2-A4-E0-E1-E2-F3-G3-H4-I4-I5-I6-J	5.15
113	A-A1-A2-A4-E0-E1-E2-E3-E4-F5-H5-I5-I6-J	5.13
114	A-A1-A2-A4-E0-E1-E2-E3-E4-F5-G5-H6-I6-J	5.05
115	A-A1-A2-A4-E0-E1-E2-E3-E4-F5-G5-G6-G7-H7-J	4.99
116	A-A1-A2-A4-E0-E1-E2-E3-E4-E5-F6-F8-F9-H7-J	4.98
117	A-A1-A2-A4-E0-E1-E2-E3-E4-E5-F6-F7-G7-H7-J	4.93
118	A-A1-A2-A4-E0-E1-E2-E3-E4-E5-E6-F9-H7-J	4.94
119	A-A1-A2-A4-E0-E1-E2-E3-F4-G4-H5-I5-I6-J	5.13
120	A-A1-A2-A4-E0-E1-E2-E3-F4-G4-G5-H6-I6-J	5.04
121	A-A1-A2-A4-E0-E1-E2-E3-F4-G4-G5-G6-G7-H7-J	4.99
122	A-A1-A2-A4-E0-E1-E2-E3-F4-H4-I4-I5-I6-J	5.14
123	A-B0-A3-A4-E0-F1-H1-I1-I2-I3-I4-I5-I6-J	5.23
124	A-B0-A3-A4-E0-F1-G1-G2-H3-I3-I4-I5-I6-J	5.18
125	A-B0-A3-A4-E0-F1-G1-G2-G3-G4-H5-I5-I6-J	5.23
126	A-B0-A3-A4-E0-F1-G1-G2-G3-G4-G5-H6-I6-J	5.15
127	A-B0-A3-A4-E0-F1-G1-G2-G3-G4-G5-G6-G7-H7-J	5.10
128	A-B0-A3-A4-E0-F1-G1-G2-G3-H4-I4-I5-I6-J	5.24
129	A-B0-A3-A4-E0-F1-G1-H2-I2-I3-I4-I5-I6-J	5.23
130	A-B0-A3-A4-E0-E1-F2-G2-H3-I3-I4-I5-I6-J	5.04
131	A-B0-A3-A4-E0-E1-F2-G2-G3-G4-H5-I5-I6-J	5.09
132	A-B0-A3-A4-E0-E1-F2-G2-G3-G4-G5-H6-I6-J	5.01
133	A-B0-A3-A4-E0-E1-F2-G2-G3-G4-G5-G6-G7-H7-J	4.96
134	A-B0-A3-A4-E0-E1-F2-G2-G3-H4-I4-I5-I6-J	5.10
135	A-B0-A3-A4-E0-E1-F2-H2-I2-I3-I4-I5-I6-J	5.09
136	A-B0-A3-A4-E0-E1-E2-F3-H3-I3-I4-I5-I6-J	5.04
137	A-B0-A3-A4-E0-E1-E2-F3-G3-G4-H5-I5-I6-J	5.09
138	A-B0-A3-A4-E0-E1-E2-F3-G3-G4-G5-H6-I6-J	5.01
139	A-B0-A3-A4-E0-E1-E2-F3-G3-G4-G5-G6-G7-H7-J	4.96
140	A-B0-A3-A4-E0-E1-E2-F3-G3-H4-I4-I5-I6-J	5.10
141	A-B0-A3-A4-E0-E1-E2-E3-E4-F5-H5-I5-I6-J	5.09
142	A-B0-A3-A4-E0-E1-E2-E3-E4-F5-G5-H6-I6-J	5.01
143	A-B0-A3-A4-E0-E1-E2-E3-E4-F5-G5-G6-G7-H7-J	4.95
144	A-B0-A3-A4-E0-E1-E2-E3-E4-E5-F6-F8-F9-H7-J	4.94
145	A-B0-A3-A4-E0-E1-E2-E3-E4-E5-F6-F7-G7-H7-J	4.88
146	A-B0-A3-A4-E0-E1-E2-E3-E4-E5-E6-F9-H7-J	4.90
147	A-B0-A3-A4-E0-E1-E2-E3-F4-G4-H5-I5-I6-J	5.09
148	A-B0-A3-A4-E0-E1-E2-E3-F4-G4-G5-H6-I6-J	5.00
149	A-B0-A3-A4-E0-E1-E2-E3-F4-G4-G5-G6-G7-H7-J	4.95
150	A-B0-A3-A4-E0-E1-E2-E3-F4-H4-I4-I5-I6-J	5.09

[END OF TABLE]

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Appendix C

Alternative Route Environmental Data

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Table 5-2. Environmental Data for Alternative Route Evaluation

Alternative Route Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Length of alternative route	23,385	22,942	22,653	22,597	22,284	22,366	23,353	22,910	22,621	23,399	24,753	25,055	24,612	24,323	25,101	25,017	23,411
Length of route parallel to existing electric transmission lines	796	3,076	2,308	6,993	6,419	4,180	796	3,076	2,308	796	796	796	3,076	2,308	796	796	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	5,895	6,506	6,506	5,895	5,895	5,895	8,675	9,286	9,286	5,895	7,986	12,247	12,857	12,857	9,467	8,159	5,137
Length of route within existing Oncor easement or fee-owned property	2,379	2,379	2,379	2,379	2,379	2,379	2,379	2,379	2,379	2,379	1,666	1,666	1,666	1,666	1,666	1,666	1,666
Total length of route parallel to existing compatible rights-of-way	8,274	11,164	10,396	14,471	13,896	11,658	11,054	13,944	13,176	8,274	9,652	13,913	16,803	16,035	11,133	9,825	6,803
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	1,781	2,032	2,061	2,398	1,933	2,327	1,784	2,036	2,065	1,941	1,847	1,813	2,065	2,094	1,970	1,923	1,791
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	21,604	20,910	20,592	20,199	20,351	20,040	21,569	20,874	20,556	21,458	22,905	23,241	22,546	22,229	23,131	23,094	21,620
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	5,508	5,800	4,673	4,849	3,696	4,849	5,065	5,356	4,230	5,193	4,125	4,445	4,737	3,610	4,573	4,554	8,243
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	8,095	8,095	8,095	10,284	10,284	11,303	5,281	5,281	5,281	5,281	5,614	5,614	5,614	5,614	5,614	5,614	11,657
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Length of alternative route	22,968	22,680	22,624	22,310	22,393	23,379	22,936	22,648	23,426	23,121	23,423	22,980	22,691	23,469	23,407	22,964	22,675
Length of route parallel to existing electric transmission lines	3,076	2,308	6,993	6,419	4,180	796	3,076	2,308	796	796	796	3,076	2,308	796	796	3,076	2,308
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	5,747	5,747	5,137	5,137	5,137	7,917	8,527	8,527	5,137	2,433	6,695	7,305	7,305	3,915	2,433	3,044	3,044
Length of route within existing Oncor easement or fee-owned property	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,666
Total length of route parallel to existing compatible rights-of-way	9,693	8,925	13,000	12,425	10,187	9,583	12,473	11,705	6,803	4,099	8,361	11,251	10,482	5,581	4,099	6,989	6,221
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	2,043	2,072	2,409	1,943	2,337	1,795	2,047	2,076	1,952	1,788	1,754	2,006	2,035	1,911	1,816	2,068	2,097
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	20,925	20,608	20,215	20,367	20,055	21,585	20,890	20,572	21,474	21,333	21,669	20,974	20,657	21,559	21,591	20,896	20,578
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	8,534	7,408	7,584	6,430	7,584	7,799	8,090	6,964	7,927	5,473	5,793	6,085	4,958	5,921	6,899	7,190	6,064
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	11,657	11,657	13,846	13,846	14,865	8,842	8,842	8,842	8,842	7,380	7,380	7,380	7,380	7,380	11,652	11,652	11,652
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Length of alternative route	22,619	22,306	22,388	23,375	22,932	22,643	23,421	22,483	22,040	21,751	21,696	21,382	21,464	22,451	22,008	21,720	22,497
Length of route parallel to existing electric transmission lines	6,993	6,419	4,180	796	3,076	2,308	796	796	3,076	2,308	6,993	6,419	4,180	796	3,076	2,308	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	2,433	2,433	2,433	5,213	5,824	5,824	2,433	2,704	3,314	3,314	2,704	2,704	2,704	5,483	6,094	6,094	2,704
Length of route within existing Oncor easement or fee-owned property	1,666	1,666	1,666	1,666	1,666	1,666	1,666	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713
Total length of route parallel to existing compatible rights-of-way	10,296	9,722	7,483	6,879	9,769	9,001	4,099	4,417	7,307	6,539	10,614	10,039	7,801	7,197	10,087	9,319	4,417
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	2,434	1,968	2,362	1,820	2,072	2,101	1,977	1,826	2,078	2,107	2,444	1,978	2,372	1,830	2,082	2,111	1,987
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	20,186	20,337	20,026	21,555	20,860	20,542	21,444	20,657	19,962	19,645	19,252	19,404	19,092	20,621	19,927	19,609	20,511
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	6,240	5,086	6,240	6,455	6,747	5,620	6,583	7,314	7,606	6,479	6,655	5,502	6,655	6,871	7,162	6,036	6,999
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	13,841	13,841	14,861	8,838	8,838	8,838	8,838	9,808	9,808	9,808	11,997	11,997	13,016	6,994	6,994	6,994	6,994
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
Length of alternative route	22,193	22,495	22,052	21,763	22,541	22,478	22,035	21,747	21,691	21,378	21,460	22,447	22,004	21,715	22,493	26,722	26,463
Length of route parallel to existing electric transmission lines	796	796	3,076	2,308	796	796	3,076	2,308	6,993	6,419	4,180	796	3,076	2,308	796	796	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	0	4,261	4,872	4,872	1,481	0	610	610	0	0	0	2,780	3,390	3,390	0	0	3,934
Length of route within existing Oncor easement or fee-owned property	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,705	1,705
Total length of route parallel to existing compatible rights-of-way	1,713	5,975	8,864	8,096	3,195	1,713	4,603	3,835	7,910	7,336	5,097	4,493	7,383	6,615	1,713	1,705	5,639
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	1,823	1,789	2,041	2,070	1,946	1,851	2,103	2,132	2,469	2,003	2,397	1,855	2,107	2,136	2,012	1,748	1,698
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	20,370	20,706	20,011	19,693	20,595	20,627	19,933	19,615	19,222	19,374	19,063	20,592	19,897	19,579	20,481	24,974	24,765
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	4,545	4,865	5,157	4,030	4,993	5,971	6,262	5,136	5,312	4,158	5,312	5,527	5,818	4,692	5,655	7,498	6,588
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	5,531	5,531	5,531	5,531	5,531	9,803	9,803	9,803	11,993	11,993	13,012	6,989	6,989	6,989	6,989	5,468	5,468
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Length of alternative route	26,765	26,322	26,033	26,811	26,727	25,726	26,028	25,585	25,297	26,075	25,990	25,729	26,030	25,588	25,299	26,077	26,014
Length of route parallel to existing electric transmission lines	796	3,076	2,308	796	796	796	796	3,076	2,308	796	796	796	796	3,076	2,308	796	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	8,196	8,806	8,806	5,416	4,108	6,821	11,082	11,693	11,693	8,302	6,995	0	4,261	4,872	4,872	1,481	0
Length of route within existing Oncor easement or fee-owned property	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705
Total length of route parallel to existing compatible rights-of-way	9,900	12,790	12,022	7,120	5,812	8,526	12,787	15,677	14,909	10,007	8,699	1,705	5,966	8,856	8,088	3,186	1,705
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	1,664	1,916	1,945	1,821	1,774	1,733	1,698	1,950	1,979	1,855	1,808	1,631	1,597	1,849	1,878	1,754	1,659
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	25,100	24,406	24,088	24,990	24,953	23,994	24,330	23,635	23,317	24,219	24,182	24,097	24,433	23,738	23,421	24,322	24,355
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	6,908	7,200	6,073	7,036	7,018	6,090	6,410	6,701	5,575	6,538	6,519	6,090	6,410	6,701	5,575	6,538	7,515
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	5,468	5,468	5,468	5,468	5,468	6,698	6,698	6,698	6,698	6,698	6,698	10,096	10,096	10,096	10,096	10,096	14,369
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
Length of alternative route	25,571	25,282	25,227	24,913	24,995	25,982	25,539	25,251	26,028	27,813	27,554	27,856	27,413	27,124	27,902	27,818	26,818
Length of route parallel to existing electric transmission lines	3,076	2,308	6,993	6,419	4,180	796	3,076	2,308	796	796	796	796	3,076	2,308	796	796	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	610	610	0	0	0	2,780	3,390	3,390	0	1,729	5,663	9,924	10,535	10,535	7,144	5,836	8,550
Length of route within existing Oncor easement or fee-owned property	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	1,705	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315
Total length of route parallel to existing compatible rights-of-way	4,595	3,826	7,902	7,327	5,089	4,485	7,374	6,606	1,705	5,043	8,978	13,239	16,129	15,361	10,459	9,151	11,864
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	1,911	1,940	2,277	1,812	2,206	1,663	1,915	1,944	1,820	1,748	1,698	1,664	1,916	1,945	1,821	1,774	1,733
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	23,660	23,342	22,949	23,101	22,790	24,319	23,624	23,306	24,208	26,065	25,856	26,192	25,497	25,179	26,081	26,044	25,085
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	7,807	6,680	6,856	5,703	6,856	7,072	7,363	6,237	7,200	8,589	7,679	7,999	8,291	7,164	8,127	8,109	7,181
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	14,369	14,369	16,558	16,558	17,577	11,555	11,555	11,555	11,555	5,865	5,865	5,865	5,865	5,865	5,865	5,865	7,095
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
Length of alternative route	27,119	26,676	26,388	27,166	27,082	26,820	27,122	26,679	26,390	27,168	27,105	26,662	26,373	26,318	26,004	26,087	27,073
Length of route parallel to existing electric transmission lines	796	3,076	2,308	796	796	796	796	3,076	2,308	796	796	3,076	2,308	6,993	6,419	4,180	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	12,811	13,421	13,421	10,031	8,723	1,729	5,990	6,600	6,600	3,210	1,729	2,339	2,339	1,729	1,729	1,729	4,508
Length of route within existing Oncor easement or fee-owned property	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315	3,315
Total length of route parallel to existing compatible rights-of-way	16,126	19,016	18,247	13,346	12,038	5,043	9,305	12,194	11,426	6,525	5,043	7,933	7,165	11,240	16,126	19,016	18,247
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	1,698	1,950	1,979	1,855	1,808	1,631	1,597	1,849	1,878	1,754	1,659	1,911	1,940	2,277	1,812	2,206	1,663
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	25,421	24,726	24,409	25,310	25,273	25,188	25,524	24,829	24,512	25,414	25,446	24,751	24,433	24,041	24,192	23,881	25,410
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	7,501	7,792	6,666	7,629	7,610	7,181	7,501	7,792	6,666	7,629	8,606	8,898	7,771	7,947	6,794	7,947	8,163
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	7,095	7,095	7,095	7,095	7,095	10,493	10,493	10,493	10,493	10,493	14,766	14,766	14,766	16,955	16,955	17,974	11,952
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

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[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
Length of alternative route	26,630	26,342	27,120	27,592	27,333	27,635	27,192	26,903	27,681	27,597	26,597	26,898	26,455	26,167	26,945	26,861	26,599
Length of route parallel to existing electric transmission lines	3,076	2,308	796	796	796	796	3,076	2,308	796	796	796	796	3,076	2,308	796	796	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	5,119	5,119	1,729	921	4,856	9,117	9,727	9,727	6,337	5,029	7,743	12,004	12,614	12,614	9,224	7,916	921
Length of route within existing Oncor easement or fee-owned property	3,315	3,315	3,315	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706
Total length of route parallel to existing compatible rights-of-way	10,713	9,945	5,043	3,627	7,562	11,823	14,713	13,945	9,043	7,735	10,448	14,710	17,600	16,832	11,930	10,622	3,627
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	1,915	1,944	1,820	1,748	1,698	1,664	1,916	1,945	1,821	1,774	1,733	1,698	1,950	1,979	1,855	1,808	1,631
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	24,715	24,397	25,299	25,844	25,635	25,971	25,276	24,958	25,860	25,823	24,864	25,200	24,505	24,188	25,089	25,052	24,967
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	8,454	7,328	8,291	8,368	7,458	7,778	8,070	6,943	7,906	7,888	6,960	7,280	7,571	6,445	7,408	7,389	6,960
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	11,952	11,952	11,952	5,865	5,865	5,865	5,865	5,865	5,865	5,865	7,095	7,095	7,095	7,095	7,095	7,095	10,493
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

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[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-2. Environmental Data for Alternative Route Evaluation – Continued

Alternative Route Number	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Length of alternative route	26,901	26,458	26,169	26,947	26,884	26,441	26,152	26,097	25,783	25,866	26,852	26,409	26,121	26,899
Length of route parallel to existing electric transmission lines	796	3,076	2,308	796	796	3,076	2,308	6,993	6,419	4,180	796	3,076	2,308	796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to apparent property boundaries	5,183	5,793	5,793	2,403	921	1,532	1,532	921	921	921	3,701	4,312	4,312	921
Length of route within existing Oncor easement or fee-owned property	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706
Total length of route parallel to existing compatible rights-of-way	7,889	10,778	10,010	5,109	3,627	6,517	5,749	9,824	9,250	7,011	6,407	9,297	8,529	3,627
Number of habitable structures within 500 feet of the route centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the route centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	1,597	1,849	1,878	1,754	1,659	1,911	1,940	2,277	1,812	2,206	1,663	1,915	1,944	1,820
Length of the route across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	25,303	24,608	24,291	25,193	25,225	24,530	24,212	23,820	23,971	23,660	25,189	24,494	24,176	25,078
Length of route across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of route across areas of high archaeological/historical site potential	7,280	7,571	6,445	7,408	8,385	8,677	7,550	7,726	6,573	7,726	7,942	8,233	7,107	8,070
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Number of U.S. or State Highway crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Farm to Market (F.M.), county roads, or other street crossings by the route	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	10,493	10,493	10,493	10,493	14,766	14,766	14,766	16,955	16,955	17,974	11,952	11,952	11,952	11,952
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[END OF TABLE]

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in route of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

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Table 5-3. Environmental Data for Alternative Route Link Evaluation

Alternative Link Number	A	A1	A2	A3	A4	B0	B1	B2	B3	B4	C1	C2	D1	D2	D3	E0	E1	E2
Length of alternative link	625	138	807	142	3,645	583	2,917	2,662	3,220	5,575	1,348	1,453	2,560	2,229	2,235	1,265	1,569	2,651
Length of link parallel to existing electric transmission lines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to apparent property boundaries	0	0	807	0	921	0	0	1,164	0	4,564	1,269	1,372	0	0	1,332	0	0	0
Length of link within existing Oncor easement or fee-owned property	138	807	80	921	256	0	80	265	930	0	0	0	0	0	0	0	0	138
Total length of link parallel to existing compatible rights-of-way	138	1,614	80	1,843	256	0	1,244	265	5,494	1,269	1,372	0	0	1,332	0	0	0	138
Number of habitable structures within 500 feet of the link centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the link centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the link across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link through commercial/industrial areas	0	0	0	0	0	0	0	113	222	176	73	0	211	247	234	111	98	68
Length of the link across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	625	138	807	142	3,645	583	2,917	2,548	2,998	5,398	1,275	1,453	2,350	1,982	2,001	1,154	1,472	2,582
Length of link across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across areas of high archaeological/historical site potential	625	138	807	142	3,645	583	2,917	2,662	3,220	2,010	1,348	596	0	0	748	1,265	0	0
Number of private airstrips within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1		0	0
Number of U.S. or State Highway crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Number of Farm to Market (F.M.), county roads, or other street crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	0	0	0	0	2,929	0	2,532	1,723	1,223	963	1,348	1,453	2,560	2,229	2,235	1,265	1,569	2,651
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in length of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

Table 5-3. Environmental Data for Alternative Route Link Evaluation – Continued

Alternative Link Number	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	F7	F8	F9	G1	G2	G3	G4	G5
Length of alternative link	1,454	2,818	2,229	4,369	5,465	4,483	4,444	4,423	4,417	2,813	1,298	1,787	1,873	1,324	2,610	1,481	2,780	610
Length of link parallel to existing electric transmission lines	0	0	0	0	0	0	0	0	0	2,813	1,298	0	1,873	0	0	0	0	0
Length of link parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to apparent property boundaries	0	0	0	0	0	4,211	0	0	0	0	0	0	0	1,324	2,610	1,481	2,780	610
Length of link within existing Oncor easement or fee-owned property	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total length of link parallel to existing compatible rights-of-way	0	0	0	0	0	4,211	0	0	0	2,813	1,298	0	1,873	1,324	2,610	1,481	2,780	610
Number of habitable structures within 500 feet of the link centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the link centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the link across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link through commercial/industrial areas	12	297	208	164	231	167	129	200	147	147	36	88	515	0	132	17	247	21
Length of the link across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	1,442	2,521	2,022	4,205	5,234	4,316	4,315	4,223	4,271	2,666	1,262	1,698	1,358	1,324	2,478	1,465	2,533	589
Length of link across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across areas of high archaeological/historical site potential	0	128	0	0	499	0	0	662	978	0	0	0	1,339	0	0	0	0	0
Number of private airstrips within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the link centerline	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Number of U.S. or State Highway crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Farm to Market (F.M.), county roads, or other street crossings by the link	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	1,454	2,818	2,229	3,059	1,671	1,331	2,079	2,083	2,080	2,040	0	0	0	0	0	0	0	0
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

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Table 5-3. Environmental Data for Alternative Route Link Evaluation – Continued

Alternative Link Number	G6	G7	H1	H2	H3	H4	H5	H6	H7	I1	I2	I3	I4	I5	I6	J
Length of alternative link	1,682	2,048	2,737	2,783	2,913	2,872	2,802	3,619	1,736	1,366	3,003	1,093	2,756	1,870	2,135	908
Length of link parallel to existing electric transmission lines	0	0	0	0	0	0	0	2,279	1,511	0	0	0	0	0	0	796
Length of link parallel to railroads	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to existing public roads/highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to pipelines[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to apparent property boundaries	0	0	0	2,783	0	0	0	0	0	0	0	0	0	0	0	0
Length of link within existing Oncor easement or fee-owned property	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	823
Total length of link parallel to existing compatible rights-of-way	0	0	0	2,783	0	0	0	2,279	1,511	0	0	0	0	0	0	823
Number of habitable structures within 500 feet of the link centerline[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of parks or recreational areas within 1,000 feet of the link centerline[3]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of the link across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link through commercial/industrial areas	351	102	181	207	176	282	129	401	202	0	177	0	251	41	225	531
Length of the link across cropland/hay meadow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across rangeland pasture	1,330	1,946	2,556	2,576	2,737	2,590	2,672	3,218	1,534	1,366	2,826	1,093	2,504	1,829	1,910	376
Length of link across agricultural cropland with mobile irrigation systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across upland woodlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across riparian areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across potential wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of stream crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link parallel to streams (within 100 feet)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length across lakes or ponds (open waters)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of known rare/unique plant locations within the right-of-way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link through known habitat of endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resource sites crossed by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length of link across areas of high archaeological/historical site potential	0	185	480	0	261	709	581	1,312	0	0	690	0	0	440	0	0
Number of private airstrips within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the link centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of U.S. or State Highway crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Farm to Market (F.M.), county roads, or other street crossings by the link	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[END OF TABLE]

NOTES: All length measurements are in feet. Measurements for many of the environmental factors were obtained from mosaics of ortho-rectified images (NearMap, 2023), whose capture process utilizes global positioning system and precise point positioning technologies to achieve sub-meter (or approximately 2.2-7.8 inches) horizontal accuracy to true ground location.

Caution should be exercised when combining link-based values to form cumulative path values. Distance-based features (e.g., within 1,000 feet) may be over-represented for routes that contain multiple links in proximity to the same feature. Simple addition of link values may result in certain variables being counted multiple times.

[1]Not included in length of link parallel to existing compatible rights-of-way.
[2]Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools.
[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

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Appendix D

Environmental and Land Use Constraints Map

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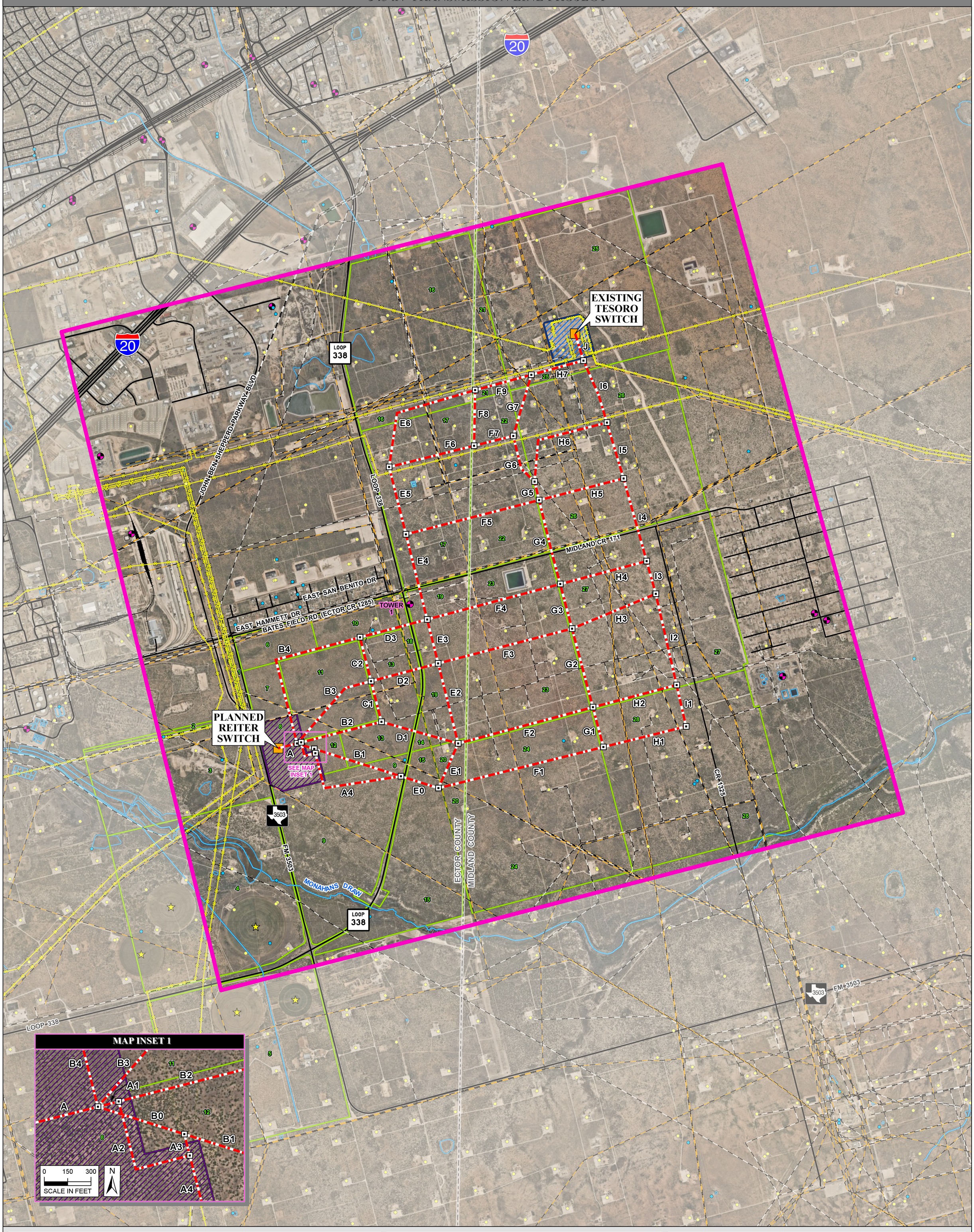
FIGURE 3-1
ENVIRONMENTAL AND LAND USE CONSTRAINTS MAP
REITER SWITCH -- TESORO SWITCH
345 kV TRANSMISSION LINE PROJECT



MAP FEATURES

- STUDY AREA BOUNDARY
- PROJECT ENDPOINT
- NODE BETWEEN ADJACENT ROUTE LINKS
- PRELIMINARY ALTERNATIVE ROUTE LINK
- COUNTY BOUNDARY
- TRACT NUMBER AND BOUNDARY
- REITER SWITCH FEE OWNED PROPERTY
- TESORO SWITCH PERPETUAL EASEMENT
- PARK / RECREATIONAL AREA*
- RAILROAD
- PUBLIC ROAD
- EXISTING TRANSMISSION LINE
- PIPELINE 8" OR GREATER
- PIPELINE LESS THAN 8"
- RIVER / STREAM / AQUATIC FEATURE
- HABITABLE STRUCTURE* (WITHIN 520 FEET OF ROUTE)
- RAILROAD COMMISSION WELL DATA
- TEXAS WATER DEVELOPMENT BOARD GROUNDWATER WELL DATA
- AIRPORT / AIRSTRIP*
- HELIPORT*
- HISTORICAL MARKER*
- TRAVELING IRRIGATION
- NATIONAL REGISTER OF HISTORIC PLACES SITE*
- CEMETERY*
- COMMUNICATION TOWER
- SCHOOL*

Notes:

1. Some legend symbols are enlarged for easier identification.
2. Aerial photography is from the most recent available database (NearMap, 2023).
3. Sensitive cultural resource data are not shown on this map as these data are not to be reproduced, distributed, or released to the public.
4. Data are for display purposes only. All features and boundaries have been approximated based on information gathered from review of public resources and from field reconnaissance. Railroad Commission of Texas GIS data was last updated on May 30, 2024.
5. This map contains county tax office and appraisal district data. Property data prepared by Integra Realty Resources with route location furnished by Halff Environmental Team. The county boundary line within the study area is marked as a tract boundary to reflect the associated county tax records for the purpose of parcel numbering within this map.
6. Legend items indicated by (*) represent features that were researched, verified, and recorded but are otherwise beyond the map extents, and cannot be located on the map.

Date Plotted: 7/8/2024

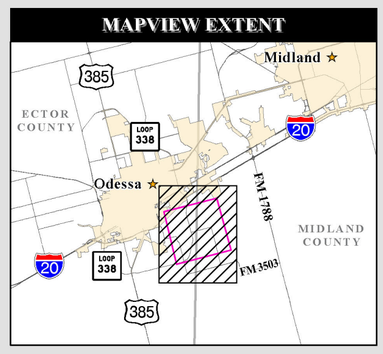
Date Revised: 7/8/2024

N W E S

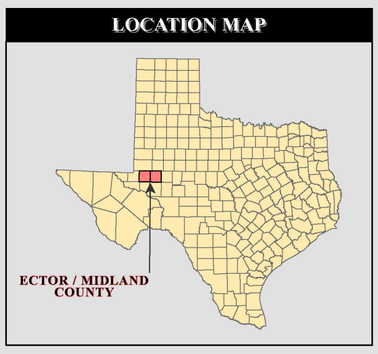
0 1,500 3,000
SCALE IN FEET

0 0.25 0.5
SCALE IN MILES

MAPVIEW EXTENT



LOCATION MAP

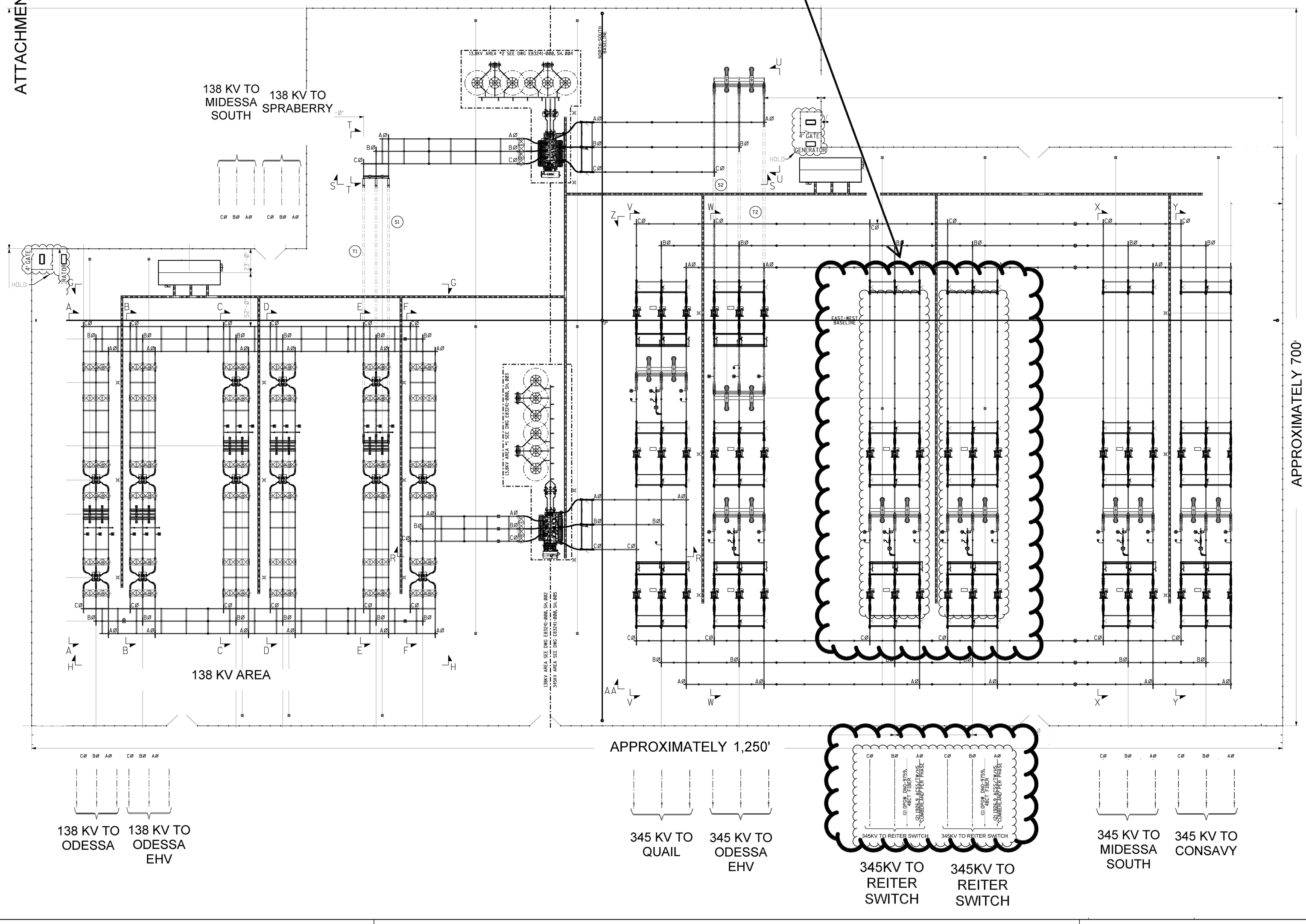


SHEET NO. 001

ATTACHMENT NO. 2A

PROPOSED REITER SWITCH - TESORO SWITCH 345 KV TRANSMISSION LINE CONNECTION

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES



CD

ONCOR

TRANSMISSION ENGINEERING

REVISION DESCRIPTION	WORK CENTER	REGION	W.A.	NO.	DATE
				W.A.	APP.
					APP.
					APP.
					APP.
					ENG.
					CH.
					DRWN. BY/CD

STD NO. | VER. | DATE | DRAWN. CH. | APP. | APP.

LIST OF DRAWINGS

UNIT ID

SCALE

TESORO SWITCH
PRELIMINARY EQUIPMENT LAYOUT

E
SHEET NO.

FOLD

SHEET NO.

ATTACHMENT NO. 2B

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION
PURPOSES

CD

ONCOR

TRANSMISSION ENGINEERING

REVISION DESCRIPTION	DATE	DRAWN	CH.	APP.	APP.

STD NO.	VER.	DATE

WORK CENTER	W.A.	REGION	W.A.

SCALE	UNIT ID	DWN.	CH.	ENG.	APP.	APP.
NTS						

REITER SWITCH
PRELIMINARY EQUIPMENT LAYOUT

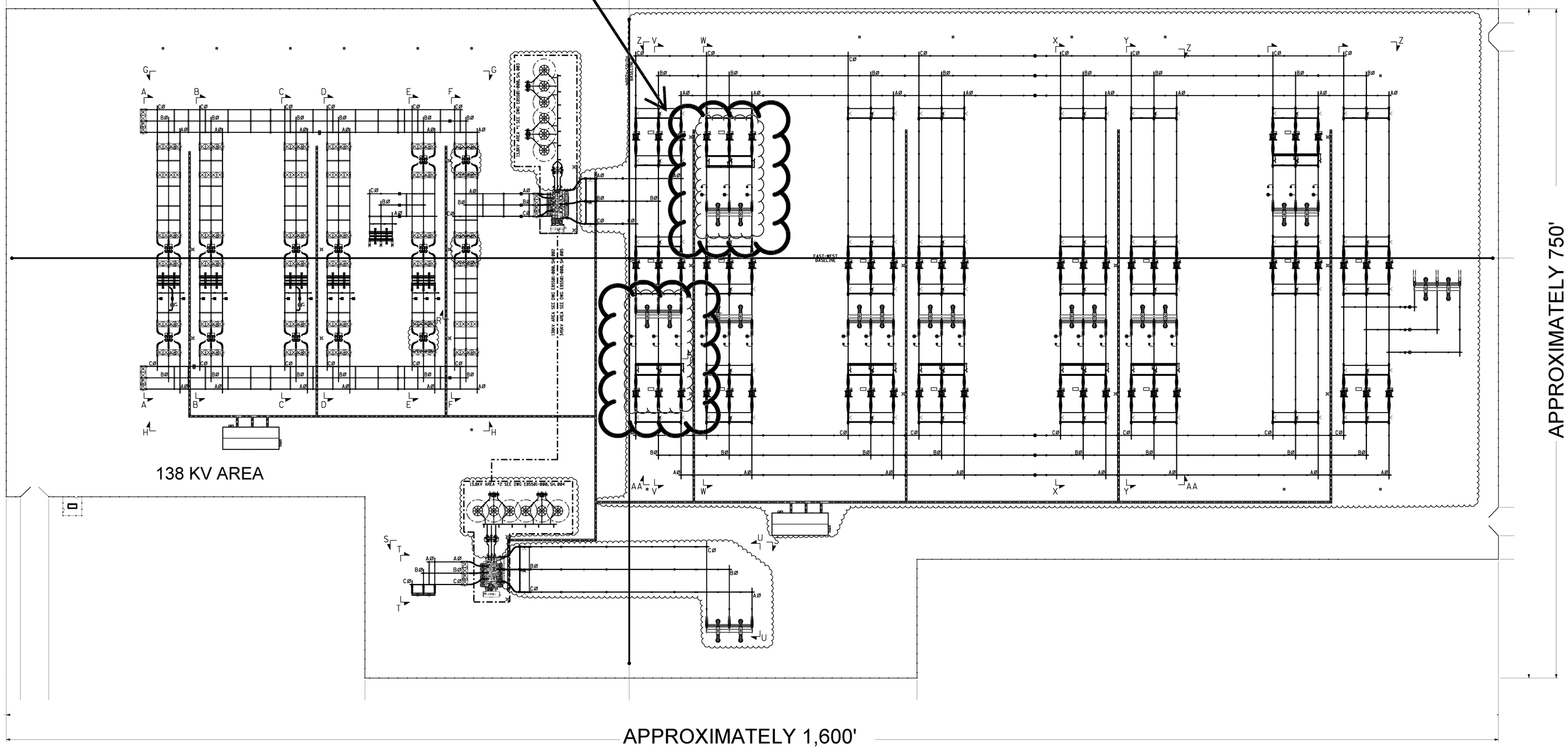
E

SHEET NO.

PROPOSED REITER SWITCH - TESORO SWITCH 345 KV TRANSMISSION LINE CONNECTION

345 KV TO TESORO

345 KV TO TESORO



138 KV TO ODESSA EHV

138 KV TO ODESSA EHV

138 KV TO MOSS SW

138 KV TO WOLF SW

138 KV TO BARR RANCH

345 KV TO ODESSA EHV

345 KV TO ODESSA EHV

345 KV TO MOSS SW

345 KV TO WOLF SW

FOLD

...ITCH ESTABLISHMENT\CADD - 345kV Station\Working\Physical\85550\000.dgn
PLOTTED BY : dmtebbit
DATE PLOTTED : 5/17/2024

PROPOSED REITER SWITCH - TESORO SWITCH 345 KV TRANSMISSION LINE PROJECT
ATTACHMENT NO. 3 - COST ESTIMATES

	Route 1	Route 4	Route 5	Route 6	Route 7	Route 10	Route 13	Route 14
Right-of-way and Land Acquisition	$ 1,444,000	$ 1,420,000	$ 1,410,000	$ 1,413,000	$ 1,443,000	$ 1,444,000	$ 1,441,000	$ 1,550,000
Engineering and Design (Utility)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Engineering and Design (Contract)	$ 1,287,000	$ 1,279,000	$ 1,275,000	$ 1,273,000	$ 1,287,000	$ 1,287,000	$ 1,315,000	$ 1,315,000
Procurement of Material and Equipment (including stores)	$ 5,719,000	$ 6,003,000	$ 6,036,000	$ 5,683,000	$ 5,718,000	$ 5,286,000	$ 7,284,000	$ 7,627,000
Construction of Facilities (Utility)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Construction of Facilities (Contract)	$ 11,068,000	$ 11,888,000	$ 11,944,000	$ 11,236,000	$ 11,066,000	$ 10,098,000	$ 14,301,000	$ 15,099,000
Other (all costs not included in the above categories)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Estimated Total Transmission Line Cost	**$ 19,518,000**	**$ 20,590,000**	**$ 20,665,000**	**$ 19,605,000**	**$ 19,514,000**	**$ 18,115,000**	**$ 24,341,000**	**$ 25,591,000**
Estimated Oncor Substation Facilities Cost	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000
Estimated Total Project Cost	**$ 24,943,000**	**$ 26,015,000**	**$ 26,090,000**	**$ 25,030,000**	**$ 24,939,000**	**$ 23,540,000**	**$ 29,766,000**	**$ 31,016,000**

PROPOSED REITER SWITCH - TESORO SWITCH 345 KV TRANSMISSION LINE PROJECT
ATTACHMENT NO. 3 - COST ESTIMATES

	Route 15	Route 27	Route 46	Route 50	Route 52	Route 53	Route 61	Route 65
Right-of-way and Land Acquisition	$ 1,456,000	$ 1,347,000	$ 1,475,000	$ 1,603,000	$ 1,348,000	$ 1,357,000	$ 1,323,000	$ 1,451,000
Engineering and Design (Utility)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Engineering and Design (Contract)	$ 1,320,000	$ 1,288,000	$ 1,262,000	$ 1,269,000	$ 1,267,000	$ 1,274,000	$ 1,262,000	$ 1,269,000
Procurement of Material and Equipment (including stores)	$ 6,890,000	$ 6,106,000	$ 6,538,000	$ 6,959,000	$ 5,249,000	$ 5,788,000	$ 6,104,000	$ 6,958,000
Construction of Facilities (Utility)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Construction of Facilities (Contract)	$ 13,437,000	$ 11,874,000	$ 13,116,000	$ 13,905,000	$ 10,129,000	$ 11,270,000	$ 12,145,000	$ 13,904,000
Other (all costs not included in the above categories)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Estimated Total Transmission Line Cost	**$ 23,103,000**	**$ 20,615,000**	**$ 22,391,000**	**$ 23,736,000**	**$ 17,993,000**	**$ 19,689,000**	**$ 20,834,000**	**$ 23,582,000**
Estimated Oncor Substation Facilities Cost	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000
Estimated Total Project Cost	**$ 28,528,000**	**$ 26,040,000**	**$ 27,816,000**	**$ 29,161,000**	**$ 23,418,000**	**$ 25,114,000**	**$ 26,259,000**	**$ 29,007,000**

PROPOSED REITER SWITCH - TESORO SWITCH 345 KV TRANSMISSION LINE PROJECT
ATTACHMENT NO. 3 - COST ESTIMATES

	Route 66	Route 73	Route 88	Route 106	Route 123
Right-of-way and Land Acquisition	$ 1,357,000	$ 1,360,000	$ 1,371,000	$ 1,503,000	$ 1,468,000
Engineering and Design (Utility)	$ -	$ -	$ -	$ -	$ -
Engineering and Design (Contract)	$ 1,274,000	$ 1,341,000	$ 1,325,000	$ 1,353,000	$ 1,354,000
Procurement of Material and Equipment (including stores)	$ 5,788,000	$ 7,186,000	$ 7,447,000	$ 8,708,000	$ 7,609,000
Construction of Facilities (Utility)	$ -	$ -	$ -	$ -	$ -
Construction of Facilities (Contract)	$ 11,270,000	$ 13,954,000	$ 14,732,000	$ 17,230,000	$ 14,826,000
Other (all costs not included in the above categories)	$ -	$ -	$ -	$ -	$ -
Estimated Total Transmission Line Cost	**$ 19,689,000**	**$ 23,841,000**	**$ 24,875,000**	**$ 28,794,000**	**$ 25,257,000**
Estimated Oncor Substation Facilities Cost	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000	$ 5,425,000
Estimated Total Project Cost	**$ 25,114,000**	**$ 29,266,000**	**$ 30,300,000**	**$ 34,219,000**	**$ 30,682,000**

ERCOT Permian Basin Load Interconnection Study

Final

December 2021

ATTACHMENT NO. 4

Document Revisions

Date	Version	Description	Author(s)
December 8, 2021	1.0	Final	Ying Li
		Reviewed by	Sun Wook Kang, Shun Hsien (Fred) Huang

Executive Summary

ERCOT, with extensive review and input by the affected Transmission Service Providers (TSPs) and stakeholders, performed the Permian Basin Load Interconnection Study and identified transmission upgrades, especially long lead time transmission upgrades, necessary to reliably serve the existing and projected oil and gas loads in the Permian Basin area. This report describes the identified potential reliability needs and details of the transmission upgrades to meet the electric demand driven by the oil and natural gas industry and the associated economic expansion in the Permian Basin area. The Permian Basin area includes the Delaware Basin, Midland Basin, and Central Basin Platforms which covers most of the counties in the Far West Weather Zone plus five adjacent counties in the West Weather Zone.

The Far West Weather Zone has experienced an average annual peak demand growth rate of approximately 12% from 2016 to 2021 due to significant growth in oil and natural gas industry demand. This growth rate is the highest of any weather zone in the ERCOT region. Due to the short-term planning horizons of the oil and gas industry resulting in lack of long-term load commitments, ensuring that necessary transmission improvements are in place in time to accommodate the rapid oil and gas development continues to be a challenge. As part of the efforts to address the challenge, several transmission upgrades, including the Far West Texas Project (FWTP), the Far West Texas Dynamic Reactive Devices (DRD) Project, and the Far West Texas Project 2 (FWTP2) have been completed in recent years. In addition, ERCOT completed the Delaware Basin Load Integration Study[1] in December 2019 and developed the roadmap involving major new 345-kV lines to improve load serving capability to import power into the Delaware Basin area. The Stage 1 upgrade in the roadmap was endorsed in June 2021 and is expected to be complete in 2023.

Given the challenges associated with the rapid load growth in the Permian Basin area, TSPs serving the Permian Basin area have also made significant efforts to better understand the underlying dynamics of oil and gas development throughout the region. This effort led to the completion of a customer demand study by IHS Markit, which provides an in-depth analysis of the oil and gas industry and provides more granular and detailed electricity demand forecast in the Permian Basin area through 2030. According to the IHS Markit study report[2] published in April 2020, the electricity needs of the Permian Basin is projected to be nearly double by 2030 compared to 2019, based on a detailed examination of the key drivers underlying power demand associated with recent and ongoing growth of oil and gas activities in the Midland Basin, Delaware Basin, Central Basin Platform, and Fringe regions of the Permian Basin. ERCOT and the TSPs relevant to the area reviewed the demand forecast from the IHS Markit study and deemed that the forecast is reasonable and appropriate to be used for the local transmission/load interconnection study of the Permian Basin area.

As a result, ERCOT with significant support from the relevant TSPs performed steady state analyses utilizing the demand forecast through 2030 (8,450 MW in 2025 and 9,970 MW in 2030) and identified a set of transmission improvements to connect and reliably serve the projected oil and gas loads in the Permian Basin area. As summarized in Section 5 of this report, ERCOT identified both preferred and placeholder transmission upgrades. If the preferred upgrades identified in this study are submitted to Regional Planning Group (RPG) for review, ERCOT may use this study report as part of ERCOT Independent Review. The placeholder projects may require further review. Table E.1 lists the details of the preferred upgrades identified in this study. The total cost of the preferred transmission upgrades is estimated to be approximately $1.5 Billion. Capital cost estimates of each transmission upgrade

[1] https://www.ercot.com/gridinfo/planning
[2] https://www.ercot.com/files/docs/2020/11/27/27706_ERCOT_Letter_to_Commissioners_-_Follow-up_Status_Update_on_Permian....pdf

were provided by the TSPs relevant to each upgrade. ERCOT used the cost estimates provided by the TSPs to calculate total project cost estimates for various projects.

Table E.1 Preferred Reliability Upgrades

Project ID	Preferred Transmission Upgrades (Note: Assumed ratings can be found in Section 6)	Year of Study Case with Reliability Need Starting to Appear	Approximate Cost Estimate ($M)
1	Rebuild existing Morgan Creek – Tonkawa 345-kV line using double-circuit capable structures and add a 2nd circuit	2025	100.58
2	Rebuild existing Midland East – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit	2025	196.47
2	Rebuild existing Morgan Creek – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit	2030	
2	Rebuild existing Midland East – Midland County NW 345-kV line using double-circuit capable structures and add a 2nd circuit	2025	
3	Upgrade existing Morgan Creek – Longshore 345-kV line	2030	393.88
3	Upgrade existing Morgan Creek – Longshore Fly 345-kV line	2025	
3	Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers; Loop existing Longshore – Midessa South 345-kV line into Consavvy and upgrade Longshore – Consavvy 345-kV line; Loop existing South Midland – Pronghorn 138-kV line and Midland East – Spraberry 138-kV line into Consavvy	2025	
3	Upgrade Consavvy – Midessa South 345-kV line	2025	
3	Upgrade existing Longshore Fly – Quail 345-kV line	2025	
3	Loop existing Grelton – Odessa EHV 345-kV line into Consavvy	2025	
3	Upgrade existing Midessa South – Odessa EHV 345-kV line	2025	
3	Upgrade existing Quail – Odessa EHV 345-kV line	2025	
3	Upgrade existing Midessa South 345/138-kV transformer and add a 2nd Midessa South 345/138-kV transformer	2025	
18	Add Verhalen – New Load 90108 138-kV line	2025	6.60
24	Establish a new IH20 345-kV Substation and install two new 345/138-kV transformers	2030	65.55
24	Loop existing Solstice – Sand Lake 345-kV double-circuit line at the new IH20 345-kV Substation	2030	
25	Establish a new 345/138-kV Reiter Substation with two new 345/138-kV transformers; Establish a new 345-kV Quail East Substation; Add a new Quail East – Reiter 345-kV double-circuit line	2025	104.65
31	Add Quarry Field – New Load 90004 138-kV line	2025	80.23
31	Add New Load 90004 – New Load 90007 – New Load 90015 – New Load 90066 – Keystone 138-kV line	2025	
31	Add capacitor bank (90 Mvar) at new load bus 90004	2025	
33	Add ONC90005_TAP – New Load 90005 138-kV line	2025	67.25
33	Add New Load 90005 – New Load 90111 – New Load 90023 - New Load 90012 138-kV line	2025	

33	Add capacitor bank (90 Mvar) at new load bus 90012	2025	
34	Add New Load 90012 – New Load 90021 138-kV line	2030	29.6
35	Add Faulkner – New Load 90038 – New Load 90021 138-kV line	2025	33.8
35	Add capacitor bank (90 Mvar) at new load bus 90021	2030	
36	Add Faulkner – New Load 90108 138-kV line	2030	17.55
42	Add Bearkat – North McCamey 345-kV double-circuit line (Stage 2 upgrade)	2030	392.41
42	Add North McCamey – Sand Lake 345-kV double-circuit line (Stage 2 upgrade)	2030	

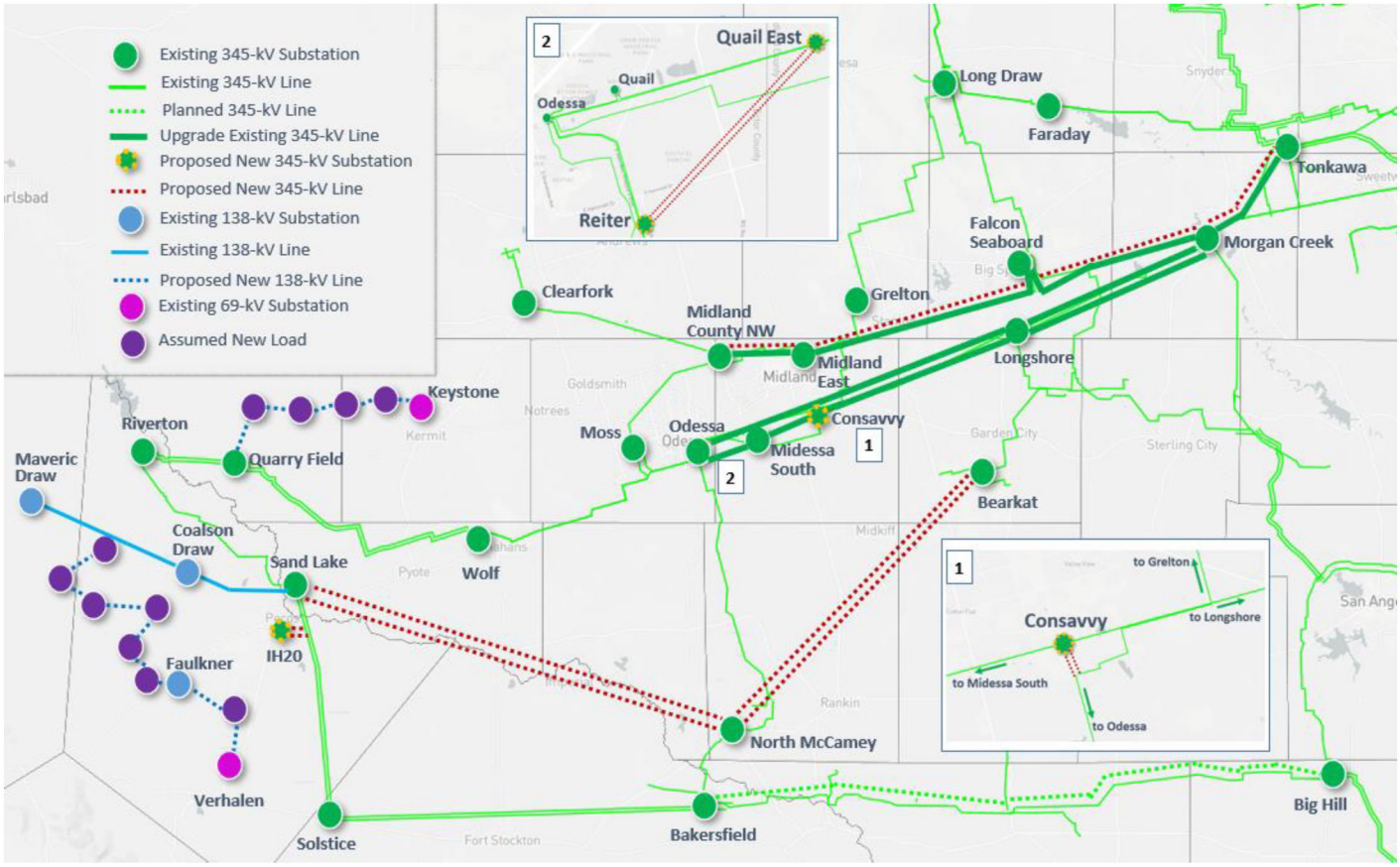


Figure E.1 Preferred Reliability Upgrades for 2030

Table of Contents

1. Introduction

Over the past several years, the Far West Weather Zone, which includes the Delaware Basin, Midland Basin, and Central Basin Platform, has experienced an average annual peak demand growth rate of approximately 12% from 2016 to 2021 due to significant growth in oil and natural gas industry demand. Figure 1.1 shows the primary oil basin resources in the Permian area.

Ensuring that necessary transmission improvements are in place in time to accommodate the rapid oil and gas development in the Permian Basin area has been and will continue to be a significant challenge for both transmission planning and system operations. The challenge originates from fundamental difference in planning horizons between major transmission improvement and oil and gas development. Due to the nature of the oil and gas industry, it is extremely difficult to accurately forecast their electricity demand more than one to two years. On the other hand, transmission improvements, which include planning studies, routing analysis, regulatory approvals, route acquisition, design, and construction, generally can take up to six years. Because of lack of long-term load commitments from the oil and gas industry, transmission planning studies are able to accurately identify system needs only for one to two years in advance, which is not sufficient to plan and construct new transmission improvements for the rapid and significant load growth in the Permian Basin area.

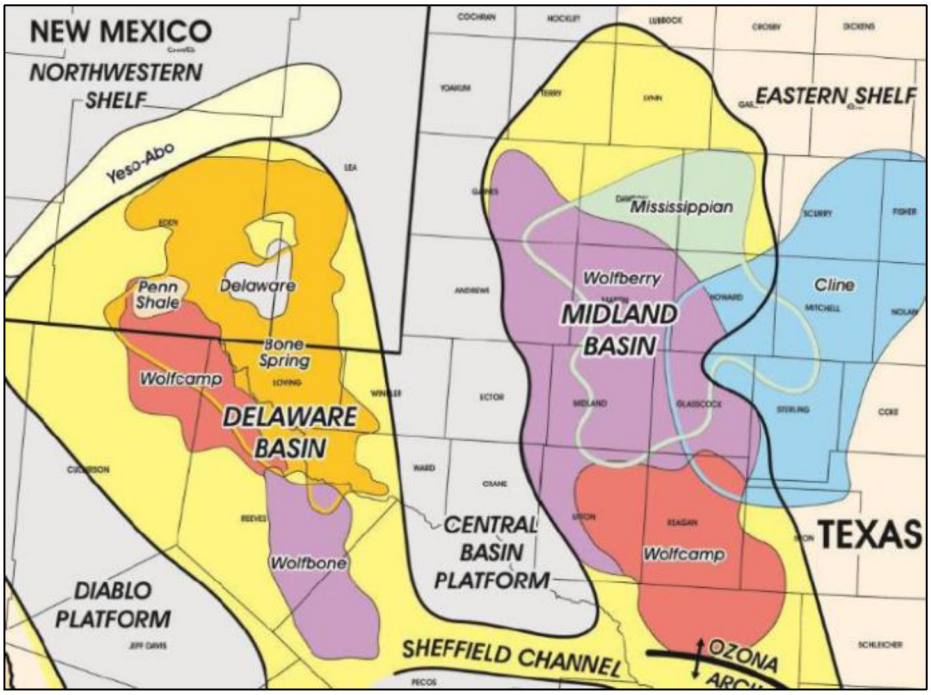


Figure 1.1 Map of Tectonic Subdivision of the Permian Basin[3]

As part of the efforts to address the challenge, several transmission upgrades, including the Far West Texas Project (FWTP), the Far West Texas Dynamic Reactive Devices (DRD) Project, and the Far West Texas Project 2 (FWTP2) have been completed in recent years to accommodate the significant and rapid load growth and address the transmission needs in the Delaware Basin area. In December 2019, ERCOT completed the Delaware Basin Load Integration Study to identify potential long lead

[3] https://www.oilandgas360.com/ngl-energy-partners-adds-water-sources-for-oil-gas-operators-in-the-permian/

time transmission improvements (i.e., new 345-kV transmission lines) to accommodate the rapid oil and gas development. The study developed a roadmap involving major new 345-kV lines to improve the capability to import power into the Delaware Basin area using a higher-than-forecasted (i.e. conceptual plus planned) load growth in the Delaware Basin area. The conceptual loads assumed in the Delaware Basin Load Integration Study were provided by the TSPs in the area based on the surveys of their high-use oil and gas customers. The Stage 1 upgrade in the roadmap was endorsed in June 2021 and is expected to be complete in 2023.

The TSPs serving the load in the Permian Basin area have also made significant efforts to better understand the underlying dynamics of oil and gas development throughout the region. This effort led to the completion of a customer demand study by IHS Markit, which provides an in-depth analysis of the oil and gas industry and provides an electricity demand forecast in the Permian area through 2030. According to the IHS Markit study report, the demand forecast was based on geology and resource assessment, industry intelligence, oil and gas expertise, commercial considerations, translations of historical and forecasted oil and gas activities into electric load demands in every single square mile in the Permian Basin area.

ERCOT and the TSPs relevant to the area reviewed the demand forecast projected in the IHS Markit study and deemed that the forecast is reasonable and appropriate to be used for the local transmission/load interconnection study of the Permian Basin area. More details of the projected demand forecast from the IHS Markit study can be found in Section 2.2 of this report. ERCOT with significant support from the relevant TSPs completed this Permian Basin Load Interconnection Study in 2021 utilizing the demand forecast from the IHS Markit study to identify the reliability challenges and a set of transmission improvements to connect and reliably serve the existing and projected oil and gas loads in the Permian Basin. This report describes the study assumptions, methodology and the results of ERCOT's assessment.

ERCOT also reviewed the historical oil and gas activities and load growth in the Far West region. As shown in Figure 1.2, the oil rig count data showed that the oil and gas drilling activities in the Permian Basin area have been increasing since July 2020 although the activities temporarily declined in early 2020 due to COVID-19 and international oil markets. Figure 1.3 shows the historical peak demand in the Far West Weather Zone which also indicates the resumed rapid load growth in the area.

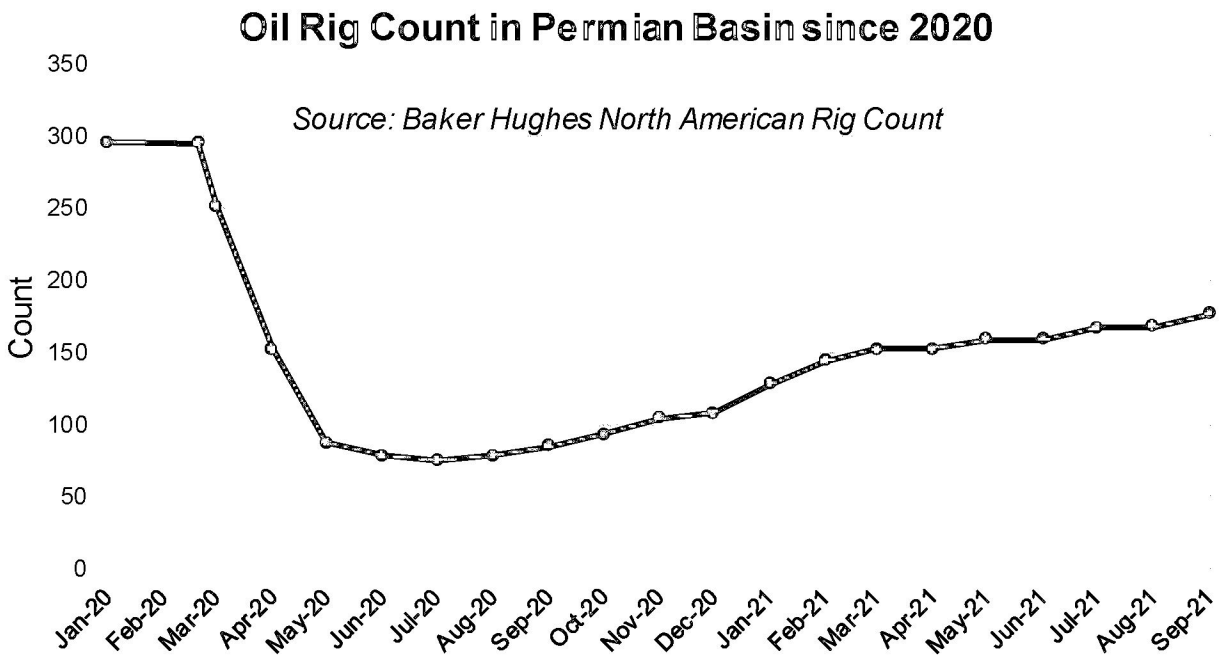


Figure 1.2 Oil Rig Counts in Permian Basin

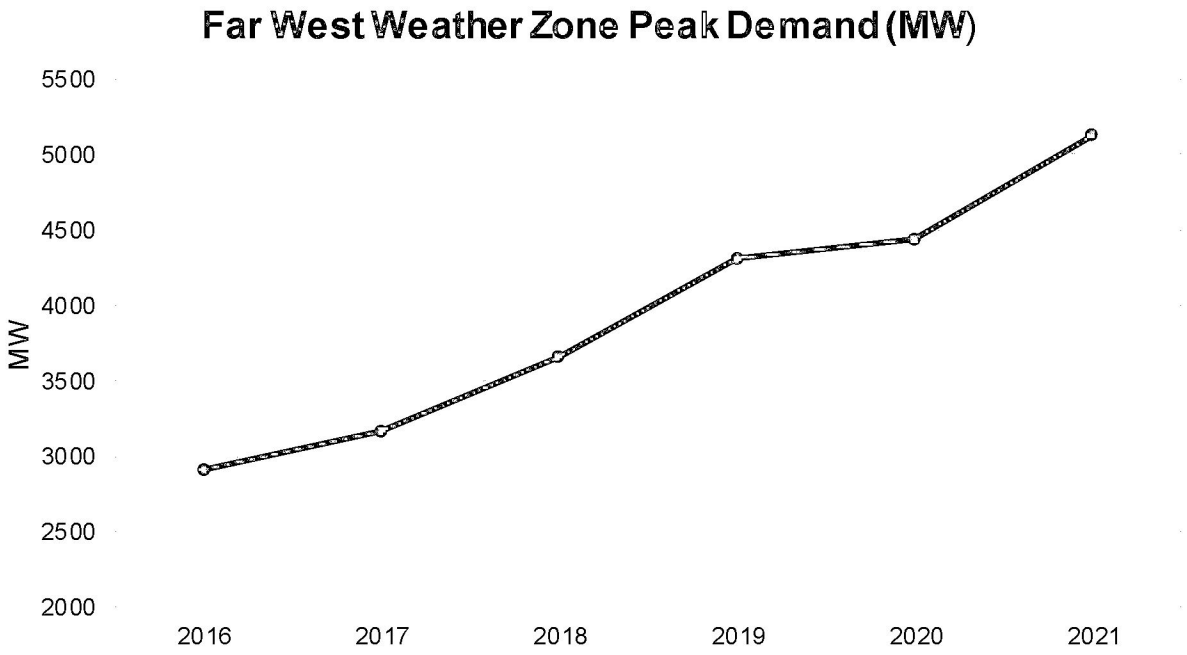


Figure 1.3 Far West Weather Zone Historical Peak Demand

2. Study Assumptions and Methodology

This section describes study assumptions and methodology employed in the Permian Basin Load Interconnection Study.

2.1. Study Area

The Permian Basin area spans most of the counties in the Far West Weather Zone plus five adjacent counties in the West Weather Zone. Table 2.1 shows the counties included in the study area in this study.

Table 2.1 Counties in the Study Area

County	Weather Zone
Andrews	Far West
Borden	Far West
Crane	Far West
Crockett	Far West
Culberson	Far West
Dawson	Far West
Ector	Far West
Glasscock	Far West
Howard	Far West
Irion	West
Loving	Far West
Martin	Far West
Midland	Far West
Mitchell	West
Pecos	Far West
Reagan	Far West
Reeves	Far West
Schleicher	West
Scurry	West
Sterling	West
Upton	Far West
Ward	Far West
Winkler	Far West

2.2. Study Assumption

2.2.1. Reliability Case

The following starting case was used to develop study cases for year 2025 and 2030 in the study:

- The 2025 West/Far West (WFW) summer peak case[4] from the 2020 RTP (posted in October 2020 in the ERCOT MIS site)

[4] https://mis.ercot.com/secure/data-products/grid/regional-planning?id=PG7-173-M

2.2.2. Study Case Loads

The IHS Markit study provides an in-depth analysis of the oil and gas industry and provides an electricity demand forecast in the Permian Basin area through 2030.

As described in Section 1, ERCOT and the TSPs relevant to the area reviewed the demand forecast from the IHS Markit study and deemed that the forecast is reasonable and appropriate to be used in this study. The TSPs made a joint effort and mapped the granular load forecast data to the substation level. The substation level load includes the load connecting to the existing substations and the projected new loads that require new interconnections to the existing transmission grid. Figure 2.1 and Figure 2.2 show the geographic locations of the projected new loads for the year 2025 and 2030.

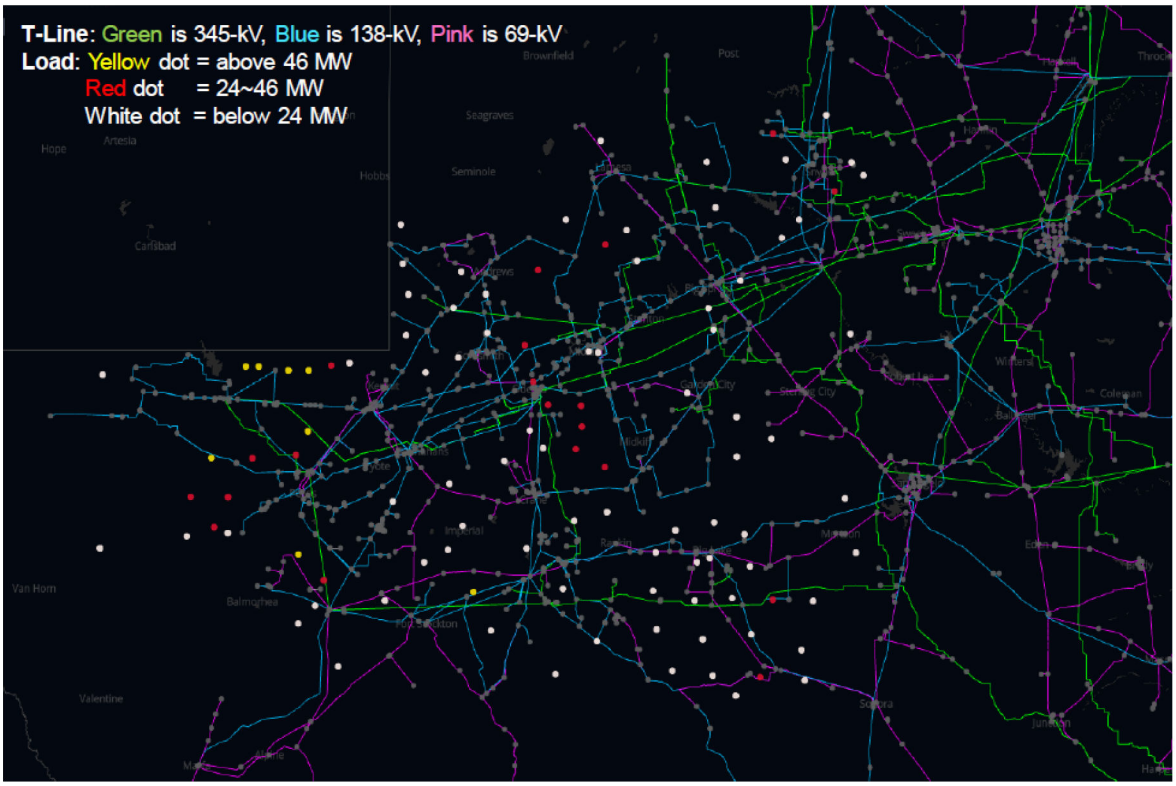


Figure 2.1 Approximate Locations of Projected New Loads for Year 2025

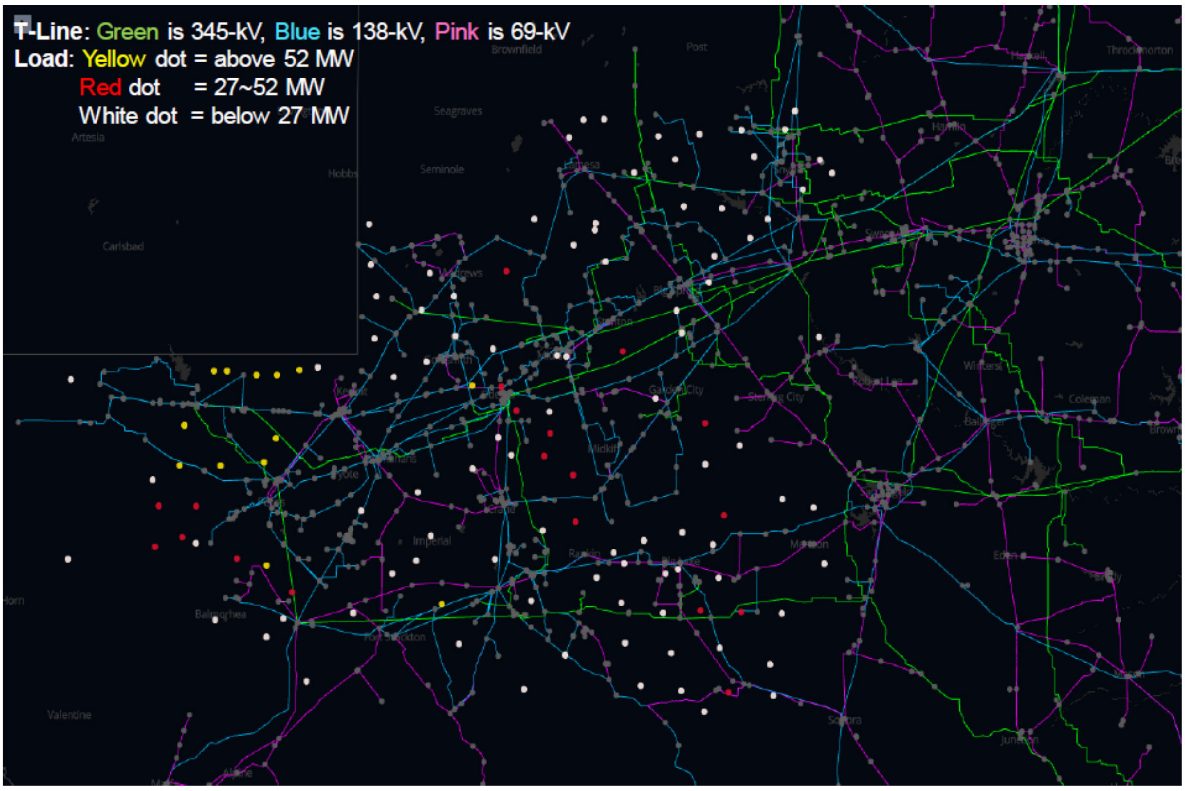


Figure 2.2 Approximate Locations of Projected New Loads for Year 2030

The load in the Permian Basin area in the starting case was updated with the substation level load derived from the demand forecast in the IHS Markit study to develop the study base case. Certain placeholder transmission interconnection projects were assumed to connect the projected new loads into the study base case. Table 2.2 summarizes the load level modeled in this Permian Basin Load Interconnection Study compared to the load in the 2020 RTP case.

Table 2.2 Permian Basin Load Projection for Year 2025 and 2030 in the Study

Permian Basin Load	IHS Load Forecast (MW)		2020 RTP (MW)
	2025 Load	2030 Load	2025 Load
Total Load at Existing Substations	6,601	7,402	8,343
Total Load Requiring New Transmission Interconnections	1,850	2,568	n/a
Total Load	**8,450**	**9,970**	**8,343**

Table 2.3 shows the load projection by the locations in the study base cases.

Table 2.3 IHS Load Projection by Locations for Year 2025 and 2030

Area	2025 Load (MW)	2030 Load (MW)
Delaware Basin	3,789	4,898
Far West (Excluded Delaware Basin)	4,128	4,533
West (Included Five Counties)	532	539
Total	**8,450**	**9,970**

The reactive consumption of the projected new oil and gas load was assumed based on historical operational performance of existing oil and gas load in the Permian Basin area. Based on the review of the historical performance and inputs from the relevant TSPs, 0.97 power factor was used in this study for the projected new oil and gas loads. For the loads at the existing substations, the power factors were assumed the same as in the 2020 RTP case.

2.2.3. Transmission Topology

All RPG-approved Tier 1, 2, and 3 and all Tier 4 transmission projects expected to be in-service within the study area by the respective years were added to the corresponding study base cases based on the review of the ERCOT Transmission Project Information and Tracking (TPIT) report posted in October 2020. During the study, additional transmission projects expected to be in-service within the study area were also added to the study base cases based on the review of the June 2021 TPIT report. Table 2.4 lists the transmission projects added to the study base cases.

Table 2.4 Transmission Additions for Year 2025 and 2030

ERCOT Project #	Project Title	Projected In-Service Date (Month/Year)	Planning Charter Tier
54255	Rebuild Rio Pecos – Lynx Ckt 2 (1926 ACSS)	Dec-20	Tier 4
55372	Conversion of TNMP Gomez to 138-kV service.	Dec-20	Tier 4
57173	TNMP Soaptree Switching Station	Dec-20	Tier 4
52311	Add Gardendale 345-kV Switch	Dec-20	Tier 4
52295	Natural Dam 138-kV Switch	May-21	Tier 4
57797	Athey: Build 138-kV Station	Sep-21	Tier 4
55367	Wolfcamp: Build 138-kV box bay	Nov-21	Tier 4
52322	Establish Courtney Creek Switch	Dec-21	Tier 4
58540	Rebuild 16th St – Soaptree	Dec-21	Tier 4
6719	Twelvemile Substation Addition	Sep-22	Tier 4
55470	Bison to Ozona: Rebuild 69-kV line	Nov-22	Tier 4
51788	Amos Creek Circuit Breaker Addition	Nov-20	Tier 4
52464	Alamito Creek to Ft. Davis: Rebuild 69-kV line	May-23	Tier 4
60489	Adds Leon Creek Switching Station and Tarbush Tie	Sep-21	Tier 4
60491	Rebuild 16th Street-Airport with 1926 ACSS	Mar-22	Tier 4
59402	Add Midland East Switch 345/138-kV Autotransformer #2	Dec-22	Tier 3
62728	Wink – Shifting Sands 69-kV Line Conversion to 138-kV	May-22	Tier 4
63491, 63493, 63495, 63497	Bakersfield to Big Hill 345-kV Second Circuit Addition Project	Summer 2023	Tier 2

ERCOT also included the Stage 2 upgrade (adding a new Bearkat – North McCamey – Sand Lake 345-kV double-circuit line) identified in the Delaware Basin Load Integration Study in the 2030 study case since the load level in the Delaware Base area in the 2030 study case exceeded the trigger point of the Stage 2 upgrade as shown in Table 2.5. It indicates the need of a new transmission import path to the Delaware Basin area in the 2030 study case. More details about the Stage 2 upgrade were described in Section 4.3.

Table 2.5 Delaware Basin Transmission Upgrade Roadmap

Stage	Estimated Delaware Basin Load Level (MW)	Upgrade Element	Trigger
1	3,052	Add a second circuit on the existing Big Hill – Bakersfield 345-kV line	Import Needs
2	4,022	A new Bearkat – North McCamey – Sand Lake 345-kV double-circuit line	Import Needs
3	4,582	A new Riverton – Owl Hills 345-kV single-circuit line	Culberson Loop Needs
4	5,032	Riverton – Sand Lake 138-kV to 345-kV conversion and a new Riverton - Sand Lake 138-kV line	Culberson Loop Needs
5	5,422	A new Faraday – Lamesa – Clearfork – Riverton 345-kV double-circuit line	Import Needs

2.2.4. Generation

Planned generators in the West and Far West Weather Zones that met Planning Guide Section 6.9(1) requirements for inclusion in the base cases were added to the study cases based on the 2020 December Generation Interconnection Status (GIS) report posted on January 4, 2021. The added generators are listed in Table 2.6.

Table 2.6 Added Generators for Year 2025 and 2030

GINR	Project Name	County	Projected COD	Fuel	Capacity (MW)
17INR0052	Horse13 CallD Repower	Taylor	12/31/2020	WIND	44
17INR0061	Capricorn IV Repower	Sterling	12/31/2020	WIND	9
18INR0079	Woodward I Repower	Pecos	12/31/2020	WIND	0
19INR0121	Galloway Solar	Concho	10/01/2021	SOLAR	250
20INR0046	Maverick Creek II W	Concho	03/23/2021	WIND	118.8
21INR0357	SP TX-12B BESS	Upton	10/31/2021	STORAGE	22.68
21INR0365	Bat Cave Energy Storage	Mason	06/01/2021	STORAGE	100.49
21INR0431	Galloway 2 Solar	Concho	04/01/2022	SOLAR	110
21INR0449	Panther Creek III Repower	Howard	02/02/2021	WIND	15.96

Solar generation in the study area was assumed to be offline to represent a stressed system condition since the oil and natural gas loads are assumed to operate as constant loads throughout the day and night. The dispatch of Energy Storage Resource (ESR) and wind generation as well as solar generation outside of the study area were consistent with the 2020 RTP methodology. Generation retired, indefinitely mothballed, or to be decommissioned was turned off if it was not already offline in the case.

2.2.5. Capital Cost Estimates

Capital cost estimates of each transmission upgrade identified in this study were provided by the TSPs relevant to each upgrade. ERCOT used the cost estimates provided by the TSPs to calculate total project cost estimates for various projects. For new transmission lines requiring new rights of way, ERCOT assumed a routing adder of 20% to the straight distance between two end points.

2.3. Study Methodology

The existing transmission system in some local area was not sufficient to serve the assumed load, especially with the new load interconnections in the Delaware Basin area. In fact, the voltage instability issues were identified in the initial 2025 and 2030 study cases under system intact (i.e., N-0) conditions. The following local transmission upgrade was identified to address the voltage instability issues and applied to the study cases during the case development. This upgrade was assumed in-service during the reliability need analysis.

- Convert existing Barrilla Loop to 138-kV: Barrilla – Hoefs Road – Verhalen – Cherry Creek – Saragosa 69-kV line to 138-kV

ERCOT evaluated various transmission upgrade options and identified a set of transmission upgrades to address the reliability criteria violations in the study area. These transmission upgrades were then categorized as ERCOT preferred upgrades or placeholder upgrades.

Various transmission load interconnection upgrades were considered to connect the projected new loads in Figure 2.3. For example, a radial line from the nearest substation was considered as placeholder to connect the relatively smaller loads (e.g., white dots). For most of the bigger loads (e.g., red and yellow dots), the transmission interconnections were initially modeled based on the inputs from the TSPs as the placeholder. For Area 1, further detailed analysis was performed as described below.

Among the new loads in Figure 2.3, ERCOT and the relevant TSPs focused relatively more on Area 1 in the Delaware Basin area to identify proper local transmission load interconnection projects based on the following considerations:

- A large amount of projected new loads (e.g., red and yellow dots) are concentrated in Area 1 compared to other areas. Area 1 is in the Delaware Basin area which is the most profitable area for the oil and gas development in the Permian Basin according to the IHS Markit study report.
- Compared to other areas in the Permian Basin, Area 1 has limited existing transmission infrastructures.

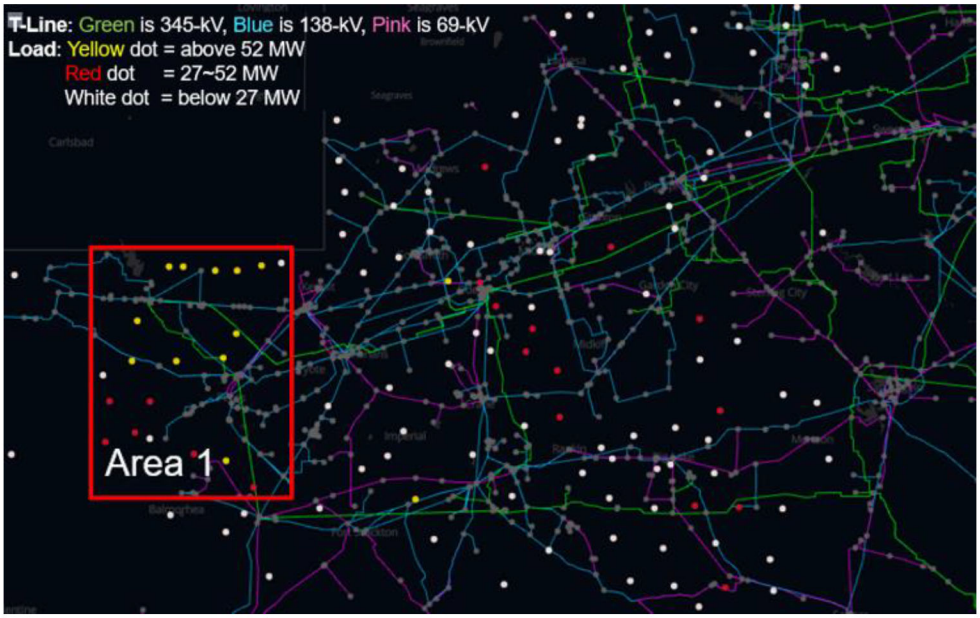


Figure 2.3 Focused Area for New Transmission Interconnection

2.3.1. Tools

ERCOT utilized the following software tool in this study:

- PowerWorld Simulator version 21 was used for SCOPF and steady state contingency and voltage stability analysis

2.3.2. Contingencies

All the NERC P1, P2-1, and P7 contingencies in the West and Far West Weather Zones were evaluated for the AC power flow analyses. ERCOT also evaluated G-1+N-1 and X-1+N-1 contingencies in the study area.

For the G-1+N-1 analyses, the following generator outages were considered to represent the anticipated significant G-1 conditions in the study area:

- Permian Basin all five units (340 MW)
- Odessa Combined Cycle Train 1 (497 MW)

For the X-1+N-1 analyses, the following 345/138-kV transformers were considered to represent the anticipated significant X-1 conditions for the study area:

- Riverton 345/138-kV transformer 1
- Sand Lake 345/138-kV transformer 1
- Wolf 345/138-kV transformer 1
- Quarry Field 345/138-kV transformer 1
- Solstice 345/138-kV transformer 1
- Odessa EHV 345/138-kV transformer 1

2.3.3. Criteria

The reliability assessment was performed based on NERC Reliability Standard TPL-001-4, ERCOT Nodal Protocol and Planning Criteria.

3. Reliability Need

The 2025 and 2030 study base cases were evaluated to determine if system improvements would be necessary to meet the projected demand forecast in the Permian Basin area. The reliability assessment results revealed that both thermal overloads and voltage instability would occur without system improvements. Table 3.1 summarizes the reliability analysis results under N-0, N-1, G-1+N-1, and X-1+N-1 contingencies for the 2025 and 2030 study base cases. No cascading issues were identified in this study. More details of the reliability analysis results were described in the subsequent sections. Transmission upgrades were identified in Section 4 to address these reliability criteria violations.

Table 3.1 Summary of the Reliability Violations

Reliability Needs	2025 Case	2030 Case
Number of Unsolvable Contingencies	2	17
Transmission Line Overloads	~ 196 miles of 345-kV line ~ 347 miles of 138-kV line ~ 127 miles of 69-kV line	~ 269 miles of 345-kV line ~ 366 miles of 138-kV line ~ 177 miles of 69-kV line
Transformer Overloads	Three 345/138-kV transformers Four 138/69-kV transformers	Seven 345/138-kV transformers Six 138/69-kV transformers

3.1. Reliability Needs Inside Delaware Basin Area

The Delaware Basin area mainly includes six counties in Far West Weather Zone: Culberson, Loving, Pecos, Reeves, Ward, and Winkler. The total loads in the Delaware Basin area in the study base cases are 3,789 MW and 4,898 MW in 2025 and 2030 respectively.

Several transmission upgrades, including both the 345-kV and 138-kV upgrades, have been completed in recent years to accommodate the rapid load growth in the Delaware Basin area. The newly built 345-kV lines, Odessa EHV/Moss – Wolf – Quarry Field – Riverton – Sand lake – Solstice – Bakersfield recommended in FWTP and FWTP2, extended the extra high voltage transmission system in the Far West to the Delaware Basin area and formed a loop to serve the underlying system. These 345-kV lines are connected to the 138-kV transmission facilities distributing power flows through the newly added Wolf, Quarry Field, Riverton, Sand Lake, and Solstice 345/138-kV transformers. These 345-kV upgrades together with other 138-kV upgrades such as the Horseshoe Springs Switch – Riverton Switch 138-kV Second Circuit Project and the Ward/Winkler Transmission Improvement Project are sufficient to meet projected near-term load forecast in the Delaware Basin area. However, with the IHS projected load level up to 2030 in this study, the existing transmission system in the Delaware Basin area could experience significant reliability criteria violations without additional transmission upgrades.

The reliability study results showed that there is no unsolvable contingency in the 2025 case, but ten unsolvable contingencies in the 2030 case. Besides the unsolvable consistencies, thermal overloads were also observed in the Delaware Basin area as shown in Table 3.2.

Table 3.2 Summary of the Reliability Violations Inside Delaware Basin Area

Reliability Needs	2025 Case	2030 Case
Number of Unsolvable Contingencies	0	10
Transmission Line Overloads	~ 18 miles of 138-kV line ~ 7 miles of 69-kV line	~ 20 miles of 138-kV line ~ 29 miles of 69-kV line
Transformer Overloads	none	Four 345/138-kV transformers Two 138/69-kV transformers

The following sections describe the details of the thermal violations in those six counties in the Delaware Basin area.

3.1.1. Reliability Needs in Culberson, Loving, and Winkler Counties

The existing transmission overloads in Culberson, Loving, and Winkler Counties were all occurred in the 2030 case as shown in Table 3.3.

Table 3.3 Thermal Overloads in Culberson, Loving, and Winkler Counties

Overloaded Element	Limiting Contingency	Percent Overload	
		2025	2030
Wink – California Tnp 69-kV line	Base Case	< 100	123.7
Wink Tnp 138/69-kV transformer 1	Wink Tnp 138/69-kV transformer 2	< 100	106.5
Wink Tnp 138/69-kV transformer 2	Wink Tnp 138/69-kV transformer 1	< 100	106.5
Riverton 345/138-kV transformer 1	Quarry Field 345/138-kV transformer 1 + Riverton 345/138-kV transformer 2	< 100	104.2
Riverton 345/138-kV transformer 2	Quarry Field 345/138-kV transformer 1 + Riverton 345/138-kV transformer 1	< 100	104.0

3.1.2. Reliability Needs in Reeves and Ward Counties

Reeves County has the highest load projection in the study area, 1,430 MW in 2025 and 1,824 MW in 2030. With the projected load level in the 2030 case, both thermal overloads and voltage instability issues were observed in this area. Table 3.4 lists the thermal overloads.

Table 3.4 Thermal Overloads in Reeves and Ward Counties

Overloaded Element	Limiting Contingency	Percent Overload	
		2025	2030
Caymus TNP – Gas Pad 138-kV line	Base Case	< 100	130.7
Sand Lake – Cochise TNP 138-kV ckt 1	Sand Lake – Cochise TNP 138-kV ckt 2	< 100	109.7
Sand Lake – Cochise TNP 138-kV ckt 2	Sand Lake – Cochise TNP 138-kV ckt 1	< 100	109.7
Sand Lake 345/138-kV transformer 2	Sand Lake 345/138-kV transformer 1	< 100	105.8
Sand Lake 345/138-kV transformer 1	Sand Lake 345/138-kV transformer 2	< 100	105.5

3.1.3. Reliability Needs in Pecos County

All the identified reliability needs in Pecos County are all related to the thermal overloads of the existing 69-kV and 138-kV lines. Table 3.5 lists the thermal overloads in Pecos County.

Table 3.5 Thermal Overloads in Pecos County

Overloaded Element	Limiting Contingency	Percent Overload	
		2025	2030
Fort Stockton – Leon Creek TNP 138-kV line	Lynx – Tombstone 138-kV line	125.4	125.8
Wolfcamp Tap – Coyanosa 69-kV line	Base Case	101.4	121
Wolfcamp – Coyanosa 69-kV line	Base Case	101.4	121
Wolfcamp Tap – Courtney Creek 69-kV line	Base Case	< 100	119.9
16th Street – Fort Stockton TNP 69-kV line	Base Case	108.1	109.4
Yucca – Royalty 69-kV line	Base Case	< 100	103.8
Lynx – Tombstone 138-kV line	Base Case	100.0	101.1

3.2. Reliability Needs Outside Delaware Basin Area

The reliability needs outside of the Delaware Basin area are mainly divided into the following three regions:

- Dawson, Borden, and Scurry Counties
- Ector, Midland, Howard, and Mitchell Counties
- Upton, Reagan, and Irion Counties.

Table 3.6 summarizes the reliability violations outside of the Delaware Basin area.

Table 3.6 Summary of the Reliability Violations Outside Delaware Basin Area

Reliability Needs	2025 Case	2030 Case
Number of Unsolvable Contingencies	2	7
Transmission Line Overloads	~ 196 miles of 345-kV line ~ 329 miles of 138-kV line ~ 120 miles of 69-kV line	~ 269 miles of 345-kV line ~ 346 miles of 138-kV line ~ 148 miles of 69-kV line
Transformer Overloads	Three 345/138-kV transformers Four 138/69-kV transformers	Three 345/138-kV transformers Four 138/69-kV transformers

The following sections describe the details of thermal violations outside of the Delaware Basin area.

3.2.1. Reliability Needs in Dawson, Borden, and Scurry Counties

The existing 138-kV transmission systems in Dawson, Borden, and Scurry Counties are relatively old and have low normal and emergency ratings. The power flow from the Willow Valley 345-kV source goes through the 138-kV transmission system to serve the load in the area, causing the thermal overloads shown in Table 3.7.

Table 3.7 Thermal Overloads in Dawson, Borden, and Scurry Counties

Overloaded Element	Limiting Contingency	Percent Overload	
		2025	2030
Lamesa – Jim Payne – Dawson – Alkali Lake 138-kV line	Vealmoor – Long Draw 345-kV line	110.2	131.0
Scurry – Kndrsacrc – Knapp 138-kV line	Scurry County South – Long Draw/Faraday 345-kV double-circuit line	109.3	124.7
Lamesa – Key Sub – Gail Sub – Willow Valley Switch 138-kV line	Base Case	128.8	117.3
Knapp – Bluff Creek Switch – Exxon Sharon Ridge 138-kV line	Scurry County South – Long Draw/Faraday 345-kV double-circuit line	< 100	109.2
Deep Creek Sub – Sacroc 138-kV line	Odessa Combined Cycle Train 1 + Dermott – Scurry County South 345-kV double-circuit line	< 100	104.9
Howard Switch – Vealmoor 138-kV line	Odessa Combined Cycle Train 1 + Buzzard Draw – Koch Tap 138-kV line	< 100	102.9

3.2.2. Reliability Needs in Ector, Midland, Howard, and Mitchell Counties

The Morgan Creek – Odessa EHV 345-kV path includes the existing Morgan Creek – Longshore – Quail/Odessa EHV 345-kV double-circuit line and the Morgan Creek – Falcon Seaboard – Midland East – Midland County NW 345-kV single-circuit line. The Morgan Creek – Odessa EHV 345-kV path

is one of the major backbone transmission systems in the area, and the path is connected to a number of 138-kV transmission facilities distributing power flows through multiple 345/138-kV transformers located along the path. In addition, since the newly built FWTP and FWTP2 extended the 345-kV transmission lines from Moss and Odessa EHV to the Delaware Basin area, more power is expected to flow through the Morgan Creek – Odessa EHV 345-kV path toward the newly built 345-kV lines as the load in the Delaware Basin area continues to grow.

The study results indicated that the existing system can no longer reliably serve the projected demand in the area without upgrading the existing 345-kV lines along the path. Table 3.8 lists the 345-kV level thermal overload issues along the Morgan Creek – Odessa EHV path. Table 3.9 shows the summary of the thermal overloads of the 138-kV and 69-kV systems in the area.

Table 3.8 345-kV Thermal Overloads on the Morgan Creek – Odessa EHV Path

Overloaded Element	Limiting Contingency	Percent Overload	
		2025	2030
Morgan Creek – Tonkawa 345-kV line	Morgan Creek – Champion Creek/Bitter Creek 345-kV double-circuit line	115.0	164.2
Consavvy – Midessa South 345-kV line	Quail – Odessa EHV 345-kV line	129.0	127.0
Quail – Odessa EHV 345-kV line	Consavvy – Midessa South 345-kV line	124.8	122.8
Morgan Creek – Longshore 345-kV line	Bakersfield – Cedar Canyon 345-kV double-circuit line	< 100	122.5
Midland East – Falcon Seaboard 345-kV line	Morgan Creek – Longshore – Consavvy 345-kV double-circuit line	109.3	121.2
Consavvy 345/138-kV transformer	Consavvy – Midessa South/Quail 345-kV double-circuit line	124.2	119.2
Odessa EHV 345/138-kV transformer 2	Odessa EHV – Moss/Wolf 345-kV double-circuit line	112.8	116.1
Morgan Creek – Falcon Seaboard 345-kV line	Morgan Creek – Longshore – Consavvy 345-kV double-circuit line	< 100	106.6
Longshore Fly – Consavvy 345-kV line	Permian Basin Five Units + Big Hill – Schneeman Draw 345-kV double-circuit line	101.4	106.2
Longshore – Consavvy 345-kV line	Odessa Combined Cycle Train 1 + Bakersfield – Cedar Canyon 345-kV double-circuit line	115.5	104.8
Midessa South 345/138-kV transformer	Odessa Combined Cycle Train 1 + Consavvy – Quail & Odessa EHV – Midessa South 345-kV double-circuit line	101.2	104.8
Morgan Creek – Longshore Fly 345-kV line	Odessa Combined Cycle Train 1 + Bakersfield – Cedar Canyon 345-kV double-circuit line (2025); Morgan Creek – Longshore 345-kV line (2030)	105.4	101.8
Midessa South – Odessa EHV 345-kV line	Quail – Odessa EHV 345-kV line	104.0	101.1

Table 3.9 138-kV and 69-kV Thermal Overloads in Ector, Midland, Howard, and Mitchell Counties

Overloaded Element	Limiting Contingency	Percent Overload	
		2025	2030
Stanton East – Spraberry 69-kV line	Spraberry 138/69-kV transformer	152.0	165.3
Midkiff 138/69-kV transformer	Spraberry 138/69-kV transformer	117.6	136.3
China Grove – Getty Tap 138-kV line	Vealmoor – Long Draw 345-kV line	105.4	116.4
General Tire Switch – Edwards Tap – Judkins 138-kV line	Permian Basin Five Units + Wolf – Moss/Odessa EHV 345-kV double-circuit line	112.3	110.0
Morgan Creek – McDonald 138-kV line	Base Case	119.6	109.0
Sterling City – Sterling County 69-kV line	Bakersfield – Cedar Canyon 345-kV double-circuit line	< 100	108.4
Odessa EHV – Yarbrough Sub – Wolf 138-kV line	Permian Basin Five Units + Wolf – Moss/Odessa EHV 345-kV double-circuit line	115.8	107.7
Getty Tap – Big Spring 138-kV line	Vealmoor – Long Draw 345-kV line	< 100	106.7
Odessa North – Odessa 138-kV line	Permian Basin Five Units + Odessa EHV – Moss/Wolf 345-kV double-circuit line	108.0	106.5
Stanton East 138/69-kV transformer	Spraberry 138/69-kV transformer	100.1	106.2
Spraberry 138/69-kV transformer	Midkiff – Reagan Shell Tap 69-kV line	105.9	105.8
Odessa EHV – Big Three Odessa Tap – Odessa Southwest 138-kV line	Odessa EHV – Moss/Wolf 345-kV double-circuit line	104.7	105.1

3.2.3. Reliability Needs in Upton, Reagan, and Irion Counties

The study results indicated that some of the existing 69-kV and 138-kV lines are no longer able to reliably serve the projected demand even under the N-0 contingency condition. Table 3.10 summarizes the thermal overloads in this area.

Table 3.10 Thermal Overloads in Upton, Reagan, and Irion Counties

Overloaded Element	Limiting Contingency	Percent Overload	
		2025	2030
Big Lake – Barnhart 69-kV line	Barnhart – Cassava 69-kV line	< 100	129.6
Rio Pecos – McCamey – Rankin4 69-kV line	Base Case	116.0	126.4
Cassava – San Angelo Mathis Field 69-kV line	Bakersfield – Cedar Canyon 345-kV double-circuit line	105.4	120.9
Rio Pecos 138/69-kV transformer 1	Rio Pecos 138/69-kV transformer 2	100.4	110.4
Jerry – Big Lake 138-kV line	Odessa Combined Cycle Train 1 + Big Hill – Schneeman Draw 345-kV double-circuit line	< 100	106.3
Twin Buttes – Hargrove – Pumpjack – Jerry 138-kV line	Bakersfield – Cedar Canyon 345-kV double-circuit line (2025); Base Case (2030)	128.5	104.0

4. Project Evaluation

Multiple transmission projects were evaluated in this section to address the reliability violations identified in Section 3.

4.1. Transmission Upgrades Inside Delaware Basin Area

The transmission upgrades inside the Delaware Basin area are divided into the following three areas:

- Culberson, Loving, and Winkler Counties
- Reeves and Ward Counties
- Pecos County

4.1.1. Culberson, Loving, and Winkler Counties

The conversion of the TNMP Wink – California – Wickett 69-kV line to 138-kV was identified to address the overloads of the Wink - California Tnp 69-kV line and Wink Tnp 138/69-kV transformers in the 2030 study case under NERC P0 and P1 contingencies. More details of the reliability needs are available in Table 3.3.

The four new loads #4, #7, #15, and #66 (total of 233 MW in 2030) shown in Figure 4.1 need new connections to the existing transmission grid. ERCOT evaluated the following two options to interconnect these new loads into the system.

- Option A: Add new 138-kV lines to connect the new loads #4, #7, #15, and #66 to 138-kV Kyle Ranch Substation
- Option B: Add new 138-kV lines to connect the new loads #4, #7, #15, and #66 to 138-kV Quarry Field Substation, and connect new load #66 to Keystone Substation to form a 138-kV loop

Connecting the new load #4 to Kyle Ranch (~ 4 miles) in Option A has a shorter distance compared to connecting it to Quarry Field (~ 10 miles) in Option B. However, Option A is expected to result in negative impact on the loading of the Riverton 345/138-kV transformer 2. The loading on the existing Riverton 345/138-kV transformer 2 is expected to be close to its emergency rating under the critical G-1+N-1 contingency condition in Option A. Therefore, ERCOT recommends Option B, shown in Figure 4.1, as the preferred option to connect the new loads in Loving and Winkler Counties.

According to the June 2021 TPIT report, the existing Keystone 69-kV Substation conversion to 138-kV in Option B is scheduled to be in-service by summer 2022 as part of the Tier 4 project TPIT # 62728: Wink - Shifting Sands (i.e., Keystone) 69-kV line conversion to 138-kV.

In summary, the following two transmission upgrades were identified in Culberson, Loving, and Winkler Counties.

- Convert existing TNMP Wink – California – Wickett 69-kV line to 138-kV (identified in 2030 study case)
- Add new 138-kV lines to connect the new loads #4, #7, #15, and #66 to 138-kV Quarry Field Substation, and then connect new load #66 to Keystone Substation to form a 138-kV loop (identified in 2025 study case)

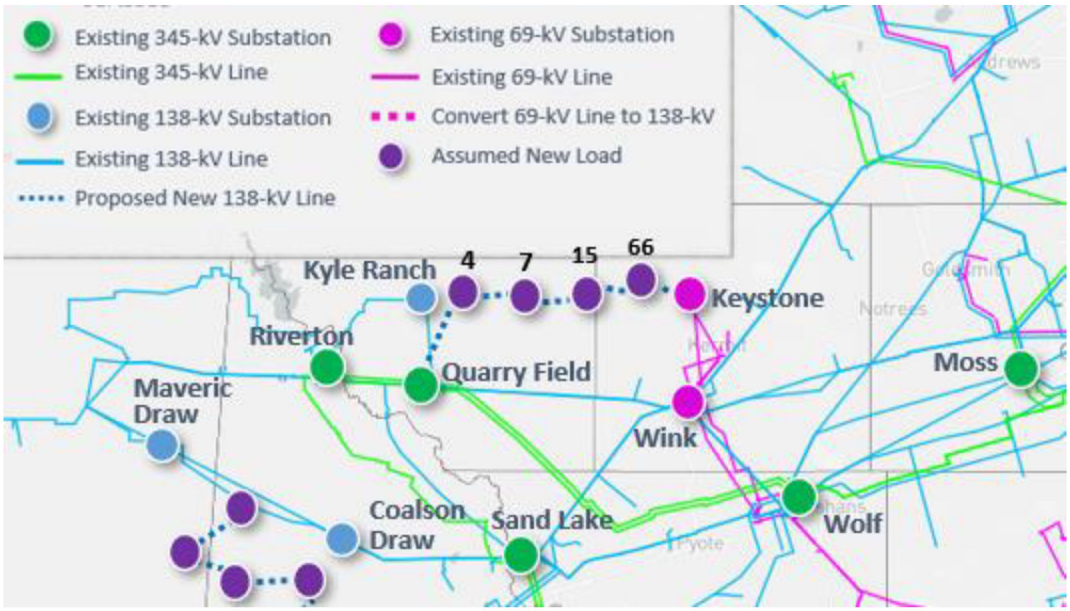


Figure 4.1 Loving and Winkler County Transmission Interconnection

4.1.2. Reeves and Ward Counties

Reeves County has the highest load projection in the study area, 1,430 MW in 2025 and 1,824 MW in 2030. Among these total load projections, 362 MW in 2025 and 566 MW in 2030 are related to new loads requiring new connections to the existing transmission grid. In addition to the new load connection projects, upgrades associated with existing transmission facilities were also identified to address the reliability needs in Reeves and Ward Counties listed in Section 3.1.2.

4.1.2.1 New Load Connection Projects

Figures 4.2 and 4.3 show the transmission interconnections to the new loads in 2025 and 2030. There are seven new loads in Reeves County which need connections to the existing transmission grid in 2030 as shown in Figure 4.3.

Below are the identified new 138-kV transmission lines to interconnect these new loads into the system in 2025:

- Tap a new 138-kV station on existing Coalson Draw – Maveric Draw 138-kV line, about 7.3 miles away from Coalson Draw
- Add new 138-kV lines to connect the new loads #5, #111, #23, and #12 to the new station on the Coalson Draw – Maveric Draw 138-kV line
- Add new 138-kV lines to connect the new loads #38 and #21 to Faulkner Substation

In 2030, the following additional new transmission lines are needed to form a 138-kV loop to reliably serve the projected load in this area:

- Add a new 138-kV line to connect the new load #108 to Verhalen Substation. This new load appears in 2030
- Add a new 138-kV line to connect the new loads #12 and #21 to form a 138-kV loop in 2030
- Add a new 138-kV line to connect the new load #108 to Faulkner to form a 138-kV loop in 2030

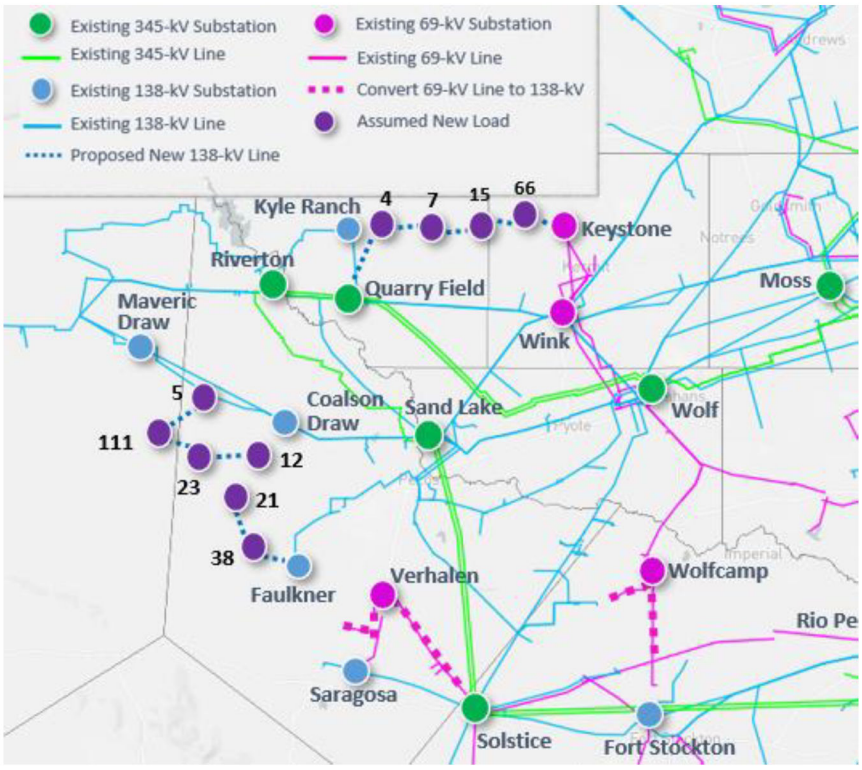


Figure 4.2 Reeves County Transmission Interconnection in 2025

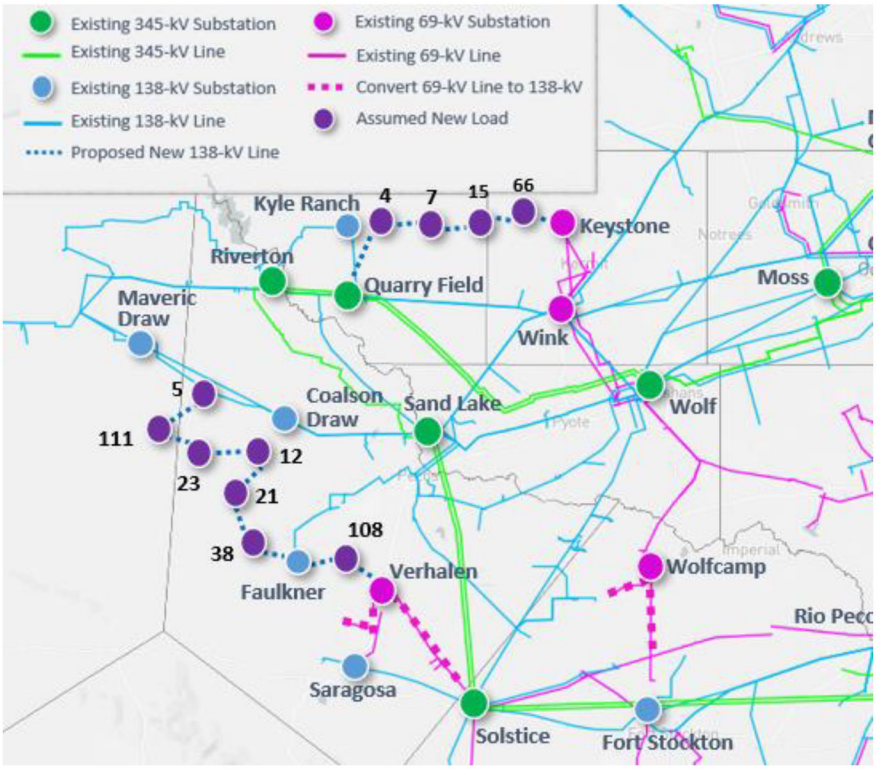


Figure 4.3 Reeves County Transmission Interconnection in 2030

4.1.2.2 Upgrades Associated with Existing Transmission Facilities

The conversion of the Barrilla Loop to 138-kV was identified to address the voltage instability issues in Reeves County.

As shown in Table 3.4 in Section 3, thermal overloads of the Sand Lake 345/138-kV transformers and Sand Lake – Cochise 138-kV double-circuit line were observed in the 2030 case under NERC P1 (N-1) contingencies. The overloads of the Sand Lake 345-kV transformers are substantially higher under the critical X-1+N-1 contingency conditions. This indicates that additional 345/138-kV transformation capacity is needed in this area to serve the projected load. ERCOT tested the following three options that involve looping the existing Solstice – Sand Lake 345-kV line into the 138-kV system with two new 345/138-kV transformers near the existing IH20 138-kV Substation to address the reliability needs.

- Option A: Loop Solstice – Sand Lake 345-kV double-circuit line at IH20 Substation
- Option B: Loop Solstice – Sand Lake 345-kV double-circuit line at Collie Field Substation
- Option C: Loop Solstice – Sand Lake 345-kV double-circuit line at Saddleback Substation

Option A resolves all the violations without any additional upgrades. Option A also has more 138-kV outlets compared to Option B and Option C.

Option B and Option C also resolve the violations but need additional upgrades. Option B needs to upgrade additional 2.95 miles of existing 138-kV line from Collie Field Tap to IH20. Option C needs to upgrade additional 4.88 miles of existing 138-kV line from Saddleback to IH20.

Based on the comparison, ERCOT recommends Option A as the preferred option to address the reliability need in the area.

Details of the identified transmission upgrades associated with the existing transmission facilities in Reeves and Ward Counties are described below:

- Convert existing Barrilla Loop to 138-kV: Barrilla – Hoefs Road – Verhalen – Cherry Creek – Saragosa 69-kV line to 138-kV (identified in 2025 study case)
- Establish a new IH20 345-kV Substation and install two new 345/138-kV transformers and loop the existing Solstice – Sand Lake 345-kV double-circuit line into the new IH20 Substation (identified in 2030 study case)
- Terminal equipment upgrade associated with existing Caymus TNP - Gas Pad 138-kV line (identified in 2030 study case)

4.1.3. Pecos County

All the identified reliability issues in Pecos County are related to the thermal overloads of the existing 69-kV and 138-kV lines. The following transmission upgrades were identified in the 2025 study case to address the reliability needs in Table 3.5:

- Convert existing Yucca – Wolfcamp – Courtney Creek 69-kV line to 138-kV
- Upgrade existing Lynx – Tombstone – Fort Stockton138-kV line
- Upgrade existing Fort Stockton – Leon Creek 138-kV line
- Upgrade existing 16th Street – Fort Stockton TNP 69-kV line

4.2. Transmission Upgrades Outside Delaware Basin Area

The transmission upgrades outside of the Delaware Basin area are mainly in three areas:

- Dawson, Borden, and Scurry Counties

- Ector, Midland, Howard, and Mitchell Counties
- Upton, Reagan, and Irion Counties

4.2.1. Dawson, Borden, and Scurry Counties

As shown in Table 3.7, thermal overloads were observed in Dawson, Borden, and Scurry Counties, and the following transmission upgrades were identified to address the reliability needs:

- Upgrade existing Sacroc – Deep Creek Sub – Snydrs 138-kV line (identified in 2030 study case)
- Upgrade existing Scurry – Kndrsacrc – Knapp 138-kV line (identified in 2025 study case)
- Upgrade existing Knapp – Bluff Creek Switch – Willow Valley Switch 138-kV line (identified in 2030 study case)
- Upgrade existing Lamesa - Key Sub – Gail Sub – Willow Valley Switch 138-kV line (identified in 2025 study case)
- Upgrade existing Lamesa – Jim Payne – Dawson – Alkali Lake 138-kV line (identified in 2025 study case)

4.2.2. Ector, Midland, Howard, and Mitchell Counties

Majority of the thermal overloads, especially the 345-kV transmission level, were occurred in Ector, Midland, Howard, and Mitchell Counties. This section describes the details of the transmission upgrades identified to address the reliability needs in this area.

4.2.2.1 345-kV Transmission Upgrades

The following transmission upgrades were identified in 2025 study case and recommended by ERCOT.

- Upgrade #1: Rebuild existing Morgan Creek – Tonkawa 345-kV line using double-circuit capable structures and add a 2nd circuit
- Upgrade #2: Rebuild existing Morgan Creek – Falcon Seaboard – Midland East – Midland County NW 345-kV line using double-circuit capable structures and add a 2nd circuit
- Upgrade #3: Upgrade existing Morgan Creek – Longshore – Odessa EHV 345-kV double-circuit line
- Upgrade #4: Establish a new 345/138-kV substation at Consavvy with two new transformers; Loop existing Longshore – Midessa South 345-kV line into Consavvy; Loop existing Grelton – Odessa EHV 345-kV line into Consavvy; Loop existing South Midland – Pronghorn 138-kV line and Midland East – Spraberry 138-kV line into Consavvy
- Upgrade #5: Upgrade existing Midessa South 345/138-kV transformer and add a 2nd Midessa South 345/138-kV transformer
- Upgrade #6: Establish a new 345/138-kV substation at Reiter (~ 3 miles south of Odessa EHV 345-kV Substation) with two new transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter; Establish a new 345-kV substation at Quail East (~ 2.5 miles east of Quail 345-kV Substation), and loop existing Odessa EHV – Midessa South 345-kV and Quail – Longshore Fly 345-kV line into Quail East; Add a new Quail East - Reiter 345-kV double-circuit line (~ 2.5 miles)

Among the six upgrades, Upgrades #1, #2, #3, and #5 are the upgrades of existing transmission facilities to address some of the reliability needs identified in Table 3.8. Upgrades #4, #5, and #6 are

related to adding new transmission facilities to address the remaining reliability needs in Table 3.8. Details of Upgrades #4 and #6 including option evaluations were discussed below.

Upgrade #4 is needed to serve the load in Midland County. As shown in Table 3.8, under certain P7 contingency related to the segment of the Morgan Creek – Longshore – Odessa EHV 345-kV double-circuit line, all the flow from the Morgan Creek to Odessa EHV path redirected to Consavvy resulted in the overload of the Consavvy 345/138-kV transformer. Several options were evaluated to address the reliability need, and the performance of each option was compared in Table 4.1.

Table 4.1 Options to Address Consavvy Transformer Overload

Option	Option Description	Percent Loading	
		2025	2030
Option 1	Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers; Loop existing Longshore – Midessa South 345-kV line into Consavvy	102.7	89.3
Option 2	Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers; Loop existing Longshore – Midessa South 345-kV line into Consavvy; Loop existing Grelton – Odessa EHV 345-kV line into Consavvy	78.7	76.7
Option 3	Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers; Loop existing Longshore – Midessa South and Longshore Fly – Quail 345-kV double-circuit line into Consavvy; Loop existing Grelton – Odessa EHV 345-kV line into Consavvy	92.2	93.3

As shown in Table 4.1, Option 2 adds a new Consavvy 345-kV source to serve the load in Midland County while relieving the overload on the Consavvy transformer under X-1+N-1 contingency condition of one Consavvy 345/138-kV transformer and the related P7 contingency. Based on the study results, ERCOT recommends Option 2 as the preferred solution.

Odessa EHV 345/138-kV transformer 2 is overloaded in both 2025 and 2030 cases. According to the TSP, upgrading the existing Odessa EHV transformer or adding additional transformer at Odessa EHV are not feasible options due to the space constraints and based on TSP's practice. As such, four transmission upgrade options were evaluated to address this overload issue. The details of the options and performance were compared in Table 4.2.

Table 4.2 Options to Address Odessa EHV Transformer 2 Overload

Option	Option Description	Percent Loading	
		2025	2030
Option 1	Add a new Midessa South – Moss 345-kV single-circuit line (~20 miles)	96.1	98.1
Option 2	Establish a new 345/138-kV substation at Reiter with two new 345/138-kV transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter; Establish a new 345/138-kV substation at Quail East with two new 345/138-kV transformers, and loop existing Odessa EHV – Midessa South 345-kV and Quail – Longshore Fly 345-kV double-circuit line into Quail East; Add a new Quail East – Reiter 345-kV double-circuit line (~2.5 miles)	64.8	64.7
Option 3	Establish a new 345/138-kV substation at Reiter with two new 345/138-kV transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter;	80.4	80.6

	Establish a new 345-kV substation at Quail East, and loop existing Odessa EHV – Midessa South 345-kV and Quail – Longshore Fly 345-kV double-circuit line into Quail East; Add a new Quail East – Reiter 345-kV double-circuit line (~2.5 miles)		
Option 4	Establish a new 345/138-kV substation at Reiter with two new 345/138-kV transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter; Add a new Reiter – Midessa South 345-kV double-circuit line (~6 miles)	89.5	91.7

The study results showed that Options 2 and 3 performed better than Options 1 and 4. Option 3 is less costly than Option 2 since Option 3 does not require the new 138-kV Quail East Substation and two new 345/138-kV transformers. As such, ERCOT recommends Option 3 as the preferred upgrade.

4.2.2.2 138-kV and 69-kV Transmission Upgrades

Besides the 345-kV level upgrades, the following 138-kV and 69-kV transmission upgrades were identified to address the reliability needs in Table 3.9:

- Upgrade existing China Grove – Getty Tap 138-kV line (identified in 2025 study case)
- Upgrade existing Getty Tap – Big Spring 138-kV line (identified in 2020 study case)
- Upgrade existing Morgan Creek – McDonald 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa EHV – Big Three Odessa Tap – Odessa Southwest 138-kV line (identified in 2025 study case)
- Upgrade existing Sterling City – Sterling County 69-kV line (identified in 2030 study case)
- Convert existing Spraberry – Midkiff 69-kV line to 138-kV (identified in 2025 study case)
- Upgrade existing Salt Flat – Pronghorn – Consavvy 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa EHV – Rexall – General Tire Switch – Edwards Tap – Judkins – Sandhills Tap – Wolf 138-kV line (identified in 2025 study case)
- Upgrade existing Moss – Wolf 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa North – Odessa 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa EHV – Yarbrough Sub – Wolf 138-kV line (identified in 2025 study case)
- Upgrade existing Holt – Scharbauer POI 138-kV line (identified in 2025 study case)

4.2.3. Upton, Reagan, and Irion County Projects

The following transmission upgrades were identified in the 2025 study case to address the reliability needs in Table 3.10.

- Upgrade existing Twin Buttes – Hargrove – Pumpjack – Big Lake 138-kV line
- Convert existing Rio Pecos – Big Lake 69-kV line to 138-kV
- Convert existing Big Lake – San Angelo Concho 69-kV line to 138-kV

Since the new loads in Upton, Reagan, and Irion Counties are relatively smaller and sparse compared to other loads in the Delaware Basin or Midland area, these transmission upgrades are considered as placeholders. Further review of these upgrades will be required if submitted for RPG review.

4.3. Stage 2 Upgrade

ERCOT completed the Delaware Basin Load Integration Study in December 2019 and identified a roadmap of preferred system upgrades to meet future demand growth in the Delaware Basin area and improve the capability to import power into the Delaware Basin area. The roadmap involves five stages of the long lead time 345-kV upgrades as shown in Table 2.5. Among the upgrades, the Stage 1 upgrade which adds a second circuit on the existing Big Hill – Bakersfield 345-kV line was endorsed by ERCOT in June 2021 and is expected to be implemented in 2023.

As described in Section 2.2.3, the load level associated with the Delaware Base area in the 2030 study case is expected to exceed the trigger point of the Stage 2 upgrade (i.e., a new Bearkat – North McCamey – Sand Lake 345-kV double-circuit line). Although ERCOT conducted the detailed analysis of the need for the Stage 2 upgrade in the Delaware Basin Load Integration Study, ERCOT performed additional analysis in this Permian Basin Load Interconnection Study to reconfirm the need for the Stage 2 upgrade. The additional analysis was performed using the 2030 study case without the Stage 2 upgrade, and the results showed voltage instability under multiple P7 contingencies (i.e., N-1 conditions).

As described in Sections 4, 5, and 6 of the Delaware Basin Load Integration Study, ERCOT evaluated a number of import path options as alternatives to the Stage 2 upgrade, including a new Faraday – Lamesa – Clearfork – Riverton 345-kV double-circuit line (i.e., the Stage 5 upgrade). Due to more mileages of new rights-of-way and higher project costs of those alternatives, ERCOT proposed the addition of a new Bearkat – North McCamey – Sand Lake 345-kV double-circuit line as the Stage 2 upgrade in the Delaware Basin Load Integration Study.

Based on the results of the Delaware Basin Load Integration Study and this Permian Basin Load Interconnection Study, ERCOT recommends the Stage 2 upgrade as a new transmission import path to the Delaware Basin area in the 2030 study case:

- Stage 2 upgrade: add a new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line (~164 miles), with the minimum normal and emergency rating of at least 2564 MVA

5. Summary of the Transmission Upgrades

As discussed in Section 4, various transmission upgrades were developed to address the reliability criteria violations identified in the Permian Basin Load Interconnection Study. The long lead time transmission upgrades (e.g., RPG Tier 1 and Tier 2 projects) and the new load connections in the Delaware Basin area which form a 138-kV loop are considered as preferred projects. The remaining transmission upgrades are considered as placeholder projects and may require further review. The placeholder projects include the transmission upgrades that are expected to be potential RPG Tier 3 and Tier 4 projects as well as the transmission upgrades in Upton, Reagan, and Irion Counties which are at the border of the Permian Basin study area. Table 5.1 summarizes the transmission upgrades identified in this study. The total cost of the preferred transmission upgrades is estimated to be approximately $1.5 Billion.

Table 5.1 Summary of the Identified Transmission Upgrades in 2025 and 2030

Reliability Upgrades	Unit	Project Consideration
New 345-kV Line	~ 295 miles	Preferred
Existing 345-kV Line Upgrade	~ 211 miles	Preferred
New 345-kV Substation	4	Preferred
New 345/138-kV Transformer	7	Preferred
New 138-kV Line	~ 128 miles	Preferred
Existing 138-kV Line Upgrade	~ 449 miles	Placeholder
69-kV line to 138-kV Conversion	~ 313 miles	Placeholder
Reactive Support Need	~ 400 MVAR	Placeholder

Table 5.2 lists the details of the preferred transmission upgrades identified in this study. Figures 5.1 and 5.2 show the maps of the preferred reliability upgrades identified in the 2025 and 2030 cases.

Table 5.2 List of the Preferred Transmission Upgrades

Project ID	Preferred Transmission Upgrades	Assumed Rate A/B (MVA) in Study Case	Year of Study Case with Reliability Need Starting to Appear	Approximate Cost Estimate ($M)
1	Rebuild existing Morgan Creek – Tonkawa 345-kV line using double-circuit capable structures and add a 2nd circuit	2988/2988	2025	100.58
2	Rebuild existing Midland East – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit	1792/1792	2025	196.47
2	Rebuild existing Morgan Creek – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit	1792/1792	2030	
2	Rebuild existing Midland East – Midland County NW 345-kV line using double-circuit capable structures and add a 2nd circuit	1792/1792	2025	
3	Upgrade existing Morgan Creek – Longshore 345-kV line	1792/1792	2030	393.88
3	Upgrade existing Morgan Creek – Longshore Fly 345-kV line	1792/1792	2025	
3	Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers; Loop existing Longshore – Midessa South 345-kV line into Consavvy and upgrade Longshore – Consavvy line;	1792/1792	2025	

	Loop existing South Midland – Pronghorn 138-kV line and Midland East – Spraberry 138-kV line into Consavvy			
3	Upgrade Consavvy – Midessa South 345-kV line	1792/1792	2025	
3	Upgrade existing Longshore Fly – Quail 345-kV line	1792/1792	2025	
3	Loop existing Grelton – Odessa EHV 345-kV line into Consavvy	1723/1723	2025	
3	Upgrade existing Midessa South – Odessa EHV 345-kV line	1792/1792	2025	
3	Upgrade existing Quail – Odessa EHV 345-kV line	1792/1792	2025	
3	Upgrade existing Midessa South 345/138-kV transformer and add a 2nd Midessa South 345/138-kV transformer	600/600	2025	
18	Add Verhalen – New Load 90108 138-kV line	483/ 483	2025	6.60
24	Establish a new IH20 345-kV Substation and install two new 345/138-kV transformers	700/750	2030	65.55
24	Loop existing Solstice – Sand Lake 345-kV double-circuit line at the new IH20 345-kV Substation	2988/2988	2030	
25	Establish a new 345/138-kV Reiter Substation with two new 345/138-kV transformers; Establish a new 345-kV Quail East Substation; Add a new Quail East – Reiter 345-kV double-circuit line	2988/2988	2025	104.65
31	Add Quarry Field – New Load 90004 138-kV line	614/614	2025	80.23
31	Add New Load 90004 – New Load 90007 – New Load 90015 – New Load 90066 – Keystone 138-kV line	614/614	2025	
31	Add capacitor bank (90 Mvar) at new load bus 90004		2025	
33	Add ONC90005_TAP – New Load 90005 138-kV line	617/617	2025	67.25
33	Add New Load 90005 – New Load 90111 – New Load 90023 – New Load 90012 138-kV line	614/614	2025	
33	Add capacitor bank (90 Mvar) at new load bus 90012		2025	
34	Add New Load 90012 – New Load 90021 138-kV line	617/617	2030	29.6
35	Add Faulkner – New Load 90038 – New Load 90021 138-kV line	617/617	2025	33.8
35	Add capacitor bank (90 Mvar) at new load bus 90021		2030	
36	Add Faulkner – New Load 90108 138-kV line	617/617	2030	17.55
42	Add Bearkat – North McCamey 345-kV double-circuit line	2564/2564	2030	392.41
42	Add North McCamey – Sand Lake 345-kV double-circuit line	2564/2564	2030	

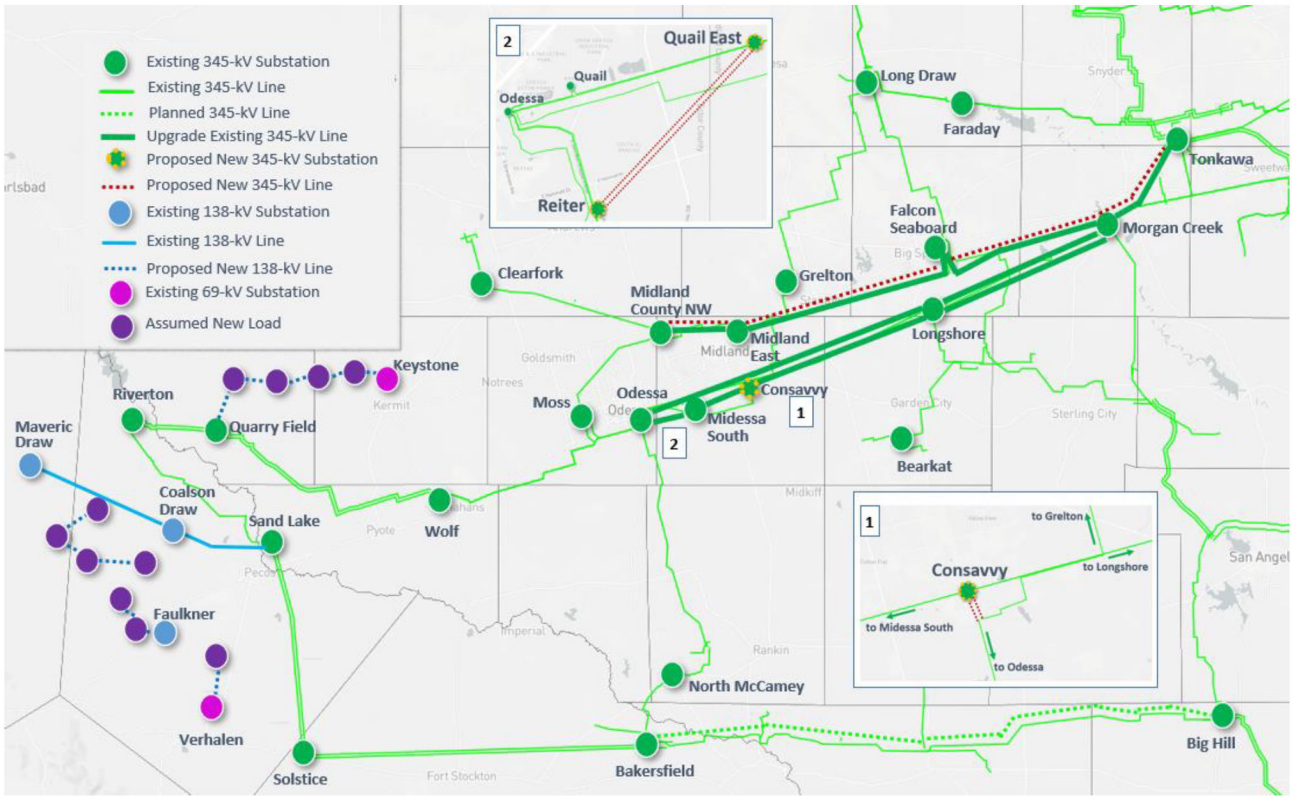


Figure 5.1 Preferred Reliability Upgrades for 2025

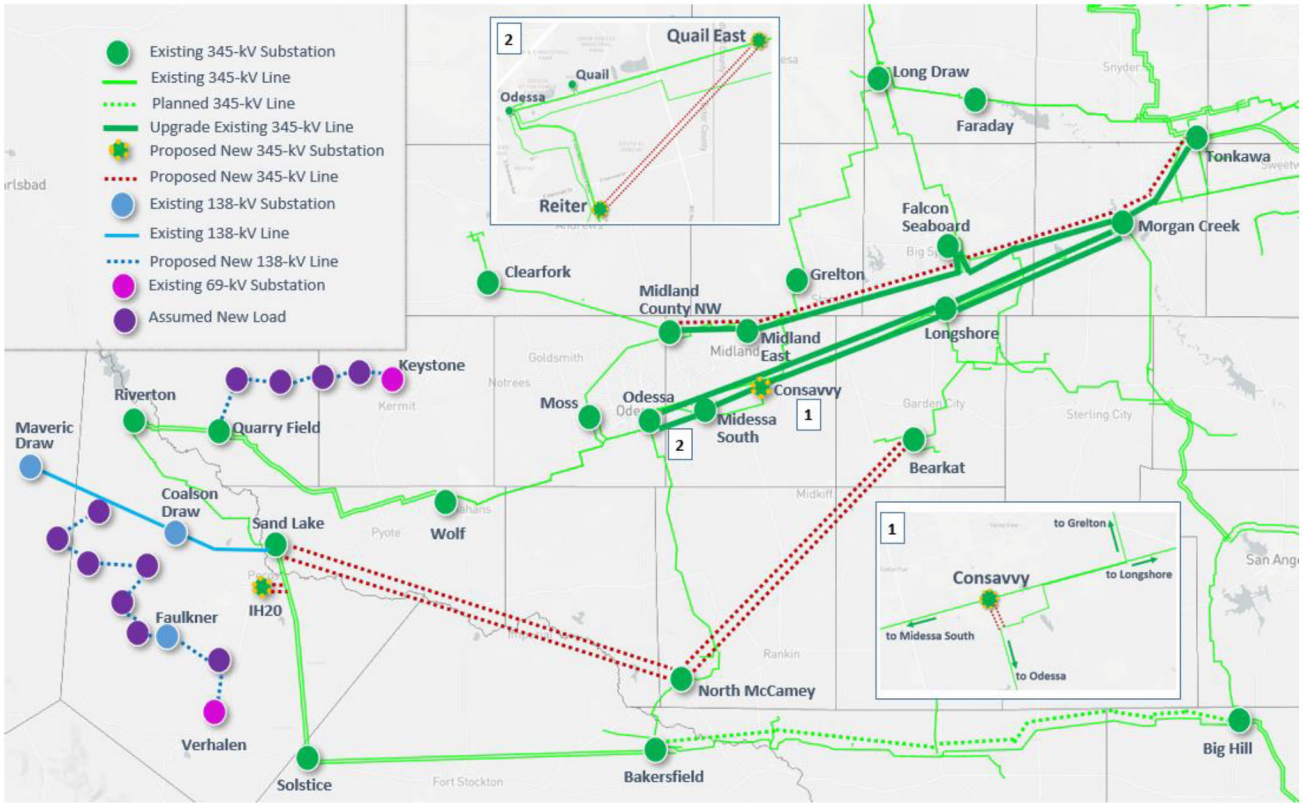


Figure 5.2 Preferred Reliability Upgrades for 2030

Table 5.3 lists the placeholder transmission upgrades identified in this study.

Table 5.3 List of the Placeholder Transmission Upgrades

Project ID	Placeholder Transmission Upgrades	Year of Study Case with Reliability Need Starting to Appear	Approximate Cost Estimate ($M)
4	Upgrade existing Sacroc – Deep Creek Sub – Snydrs 138-kV line	2030	24.23
5	Upgrade existing Scurry – Kndrsacrc – Knapp 138-kV line	2025	19.44
6	Upgrade existing Knapp – Bluff Creek Switch 138-kV line	2030	46.02
6	Upgrade existing Bluff Creek Switch – Willow Valley Switch 138-kV line	2030	
7	Upgrade exisitng Lamesa – Key Sub – Gail Sub – Willow Valley Switch 138-kV line	2025	45.09
8	Upgrade existing Lamesa – Jim Payne – Dawson – Alkali Lake 138-kV line	2025	28.98
9	Upgrade existing China Grove – Getty Tap 138-kV line	2025	56.86
10	Upgrade existing Getty Tap – Big Spring 138-kV line	2030	20.63
11	Upgrade existing Morgan Creek – McDonald 138-kV line	2025	46.66
12	Upgrade existing Odessa EHV – Big Three Odessa Tap – Odessa Southwest 138-kV line	2025	21.16
13	Upgrade existing Lynx – Tombstone – Fort Stockton 138-kV line	2025	38.60
14	Upgrade existing Fort Stockton – Leon Creek 138-kV line	2025	3.58
15	Upgrade existing Twin Buttes – Hargrove – Pumpjack – Big Lake 138-kV line	2025	65.05
16	Upgrade existing Sterling City – Sterling County 69-kV line	2030	2.48
17	Upgrade existing 16th Street – Fort Stockton TNP 69-kV line	2025	0.75
18	Convert existing Barrilla Loop 69-kV line to 138-kV	2025	46.81
18	Add Verhalen – New Load 90008 138-kV line	2025	
18	Add Hoefs Road – New Load 90026 138-kV line	2025	
18	Add capacitor bank (90 Mvar) at new load bus 90008	2025	
19	Convert existing Yucca – Wolfcamp – Courtney Creek 69-kV line to 138-kV	2025	75.50
20	Convert existing Big Lake – San Angelo Concho 69-kV line to 138-kV	2025	61.24
21	Convert existing Rio Pecos – Big Lake 69-kV line to 138-kV	2025	114.00
22	Convert existing Spraberry – Midkiff 69-kV line to 138-kV	2025	6.84
23	Convert existing TNMP Wink – California – Wickett 69-kV to 138-kV	2030	14.46
26	Upgrade existing Odessa EHV – Rexall – General Tire Switch – Edwards Tap – Judkins – Sandhills Tap – Wolf 138-kV line	2025	62.74
27	Upgrade existing Moss – Wolf 138-kV line	2025	39.30
28	Upgrade existing Odessa North – Odessa 138-kV line	2025	15.76

29	Upgrade existing Odessa EHV – Yarbrough Sub – Wolf 138-kV line	2025	63.11
30	Upgrade existing Holt – Scharbauer POI 138-kV line	2025	10.46
32	Add Kyle Ranch – New Load 90001 – New Load 90006 138-kV line	2025	3.97
35	Add New Load 90021 - New Load 90032 138-kV line	2025	17.0
37	Add ONC90002_TAP – New Load 90002 138-kV line	2025	18.37
37	Add capacitor bank (24 Mvar) at new load bus 90002	2030	
38	Add Three Mile Draw Switch – New Load 90106 138-kV line	2030	13.54
39	Add ONC90009_TAP – New Load 90009 138-kV line	2025	14.53
41	Increase the capacitor bank at bus 1323 to 18.4 Mvar from 9.2 Mvar	2030	0.50
44	Upgrade existing Salt Flat – Pronghorn – Consavvy 138-kV line	2025	15.70
45	Terminal equipment upgrade for existing Caymus TNP – Gas Pad 138-kV line	2030	0.50

6. Conclusion

The purpose of this Permian Basin Load Interconnection Study was to identify transmission upgrades that are necessary to connect projected oil and gas loads in the Permian Basin area.

This study identified a list of the transmission upgrades, including both the preferred and placeholder projects, required by 2025 and 2030 to address the identified reliability criteria violations in the study area.

The preferred projects may be endorsed by ERCOT based on the results of this Permian Basin Load Interconnection Study if they are submitted for RPG review. The total cost of the preferred transmission upgrades is estimated to be approximately $1.5 Billion. The placeholder projects are expected to require further analysis if submitted for RPG review.

7. Appendix

7.1. Appendix A: Reliability Violations	Appendix A - Reliability Violations
7.2. Appendix B: List of All Transmission Upgrades and Corresponding Reliability Need	Appendix B - List of All Transmission Up
7.3. Appendix C: Maps of All Transmission Upgrades	Appendix C - Maps of All Transmission U

WEST TEXAS 345 KV INFRASTRUCTURE REBUILD PROJECT

ERCOT RPG Submittal
November 3, 2023

ONCOR®

ATTACHMENT NO. 5

Table of Contents

Executive Summary

The need to expand and rebuild Oncor's transmission facilities in West Texas is being driven by load growth, load integration requests, and the need to rebuild aging facilities. The aging facilities in this area need extensive upgrades and modifications to meet surging customer load and current planning and design standards. This project addresses the need to expand and further reinforce the transmission system in West Texas.

The need for this project is derived from the recommendations in ERCOT's Permian Basin Load Interconnection Study – Final Update presentation, presented by ERCOT at the October 15, 2021 Regional Planning Group (RPG) meeting. The Permian Basin Load Interconnection (PBLI) Study was performed by ERCOT with input from affected Transmission Service Providers (TSPs) and other RPG stakeholders. The final PBLI study report was published by ERCOT on December 8, 2021. The study identified transmission reliability needs resulting from continued expansion of the oil and natural gas industry in the Permian Basin area. In the PBLI Study, ERCOT identified a set of 'Preferred' and a set of 'Placeholder' transmission upgrade projects, with the understanding that ERCOT could use the PBLI Study as part of ERCOT's Independent Review of a 'Preferred' RPG Project. This RPG Project presents and provides the justification for many of the ERCOT designated 'Preferred' transmission upgrades in the PBLI Study in this single submittal. This Proposed RPG Project includes components of ERCOT's 'Preferred' Project IDs 1, 2, 3, and 25, with each of the applicable Project ID components being modeled in the analysis. Some of the components of the ERCOT 'Preferred' Projects list have already been submitted and approved by ERCOT and the RPG, (see the Introduction section of this Proposed RPG Project).

An integral part of this Proposed RPG Project is the reconfiguration of the Morgan Creek Switch and the rebuild of the 345 kV Lines from Morgan Creek – Tonkawa, Morgan Creek – Midland County Northwest, and Morgan Creek – Odessa EHV. The Morgan Creek Switch property is currently shared between Oncor and Vistra. Due to the size of the proposed Morgan Creek Switch rebuild, the land constraints necessary to rebuild the switch, and the routing constraints with the existing property, Morgan Creek Switch will need to be broken up into two separate switch stations (Ranger Camp and Cattleman 345/138 kV Switches) to accommodate the 345 kV, 138 kV, and 69 kV facilities and a third station (Morgan Creek 138 kV Switch) to be rebuilt to interconnect the existing Morgan Creek generation. The 345 kV lines from Morgan Creek to Tonkawa, Morgan Creek to Midland County Northwest, and Morgan Creek to Odessa EHV will each need to be rebuilt with newer structures and higher ampacity conductor.

Oncor is proposing a Tier 1 project that will consist of the following elements:

- Establish the new Ranger Camp 345/138/69 kV Switch, approximately 1.0 mile north of the existing Morgan Creek 345/138 kV Switch, including two 600 MVA, 345/138 kV autotransformers, and one 177 MVA, 138/69 kV autotransformer. The Ranger Camp 345/138/69 kV Switch will initially be installed with (1) a 14-breaker, 345 kV, breaker-and-a-half bus arrangement, (2) a 16-breaker, 138 kV, breaker-and-a-half bus arrangement, and 3) a 2-breaker, 69 kV, single bus arrangement. All terminal and associated equipment will meet or exceed 5000 A for 345 kV, 3200 A for 138 kV and 2000 A for 69 kV;
    - Connect the existing 69 kV lines into the new Ranger Camp Switch:
        - Morgan Creek – Colorado City 69 kV Line (normal and emergency rating of 81 MVA)
        - Morgan Creek – Big Spring 69 kV Line (normal and emergency rating of 62 MVA)