
# Filing Receipt

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|---|---|---|
| **APPLICATION OF ONCOR ELECTRIC DELIVERY COMPANY LLC TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE RAMHORN HILL TO DUNHAM 345 KV TRANSMISSION LINE IN DENTON AND WISE COUNTIES** | **§** | **BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS** |

# ONCOR'S NOTICE OF ERRATA

## I. INTRODUCTION

On June 8, 2023, Oncor Electric Delivery Company LLC ("Oncor") filed an application ("Application") to amend its certificate of convenience and necessity for the Ramhorn Hill-Dunham 345 kV transmission line project. Oncor filed 19 attachments to the Application, including Attachment No. 1, *Environmental Assessment and Alternative Route Analysis for the Proposed Ramhorn Hill Switch—Dunham Switch 345 kV Transmission Line Project in Denton and Wise Counties* ("Environmental Assessment"), and Attachment No. 3, *Cost Estimates*, among others. With the Application, Oncor filed the direct testimonies of its witnesses, Mr. Russell J. Marusak, Ms. Brenda J. Perkins, Ms. Amy L. Zapletal, and Mr. Harsh Naik. Oncor has identified errors in Attachment Nos. 1 and 3 to the Application, as well as in the direct testimonies of Mr. Marusak, Ms. Perkins, and Ms. Zapletal. These are described below, with errata provided as Attachments 1-6 hereto.

## II. ERRATA

1. *Application Attachment No. 1 (Environmental Assessment)*

The Environmental Assessment includes Table 7-3 (Appendix E), *Environmental Data for Alternative Link Evaluation*, which evaluates each filed link based on numerous environmental and land-use characteristics. Oncor identified certain incorrect data values in Table 7-3, in the row titled *Estimated length of right-of-way within foreground visual zone of park/recreational areas*. This did ***not*** affect Oncor's tabulation of environmental and land-use data for the alternative routes, which is provided in Table 7-2 (Appendix E) of the Environmental Assessment. Oncor's errata to Table 7-3 is provided as Attachment 1.

2. *Application Attachment No. 3 (Cost Estimates)*

Oncor discovered an error in the formulas used to tabulate estimated costs, which affected the cost estimates reported for certain filed routes. Attachment 2 is the errata to Application Attachment No. 3. Additionally, several of Oncor's filings in this docket relied on data from Application Attachment No. 3. Corrected copies of these filings are attached. The affected filings include:

- Direct Testimony of Brenda J. Perkins and Exhibit BJP-5 (Attachment 3);
- Direct Testimony of Amy L. Zapletal (Attachment 4); and
- Oncor's Response to Edgar Brent Watkins and Mary Ann Livengood's RFI Set 1, Question Nos. 1-04, 1-08(b), 1-09(b), 1-10(b), and 1-14(b)(ii) (Attachment 5).

3. *Direct Testimony of Russell J. Marusak*

Page 22, lines 19-21, of Mr. Marusak's direct testimony transposes references to Table 7-1 and Table 7-2. This is corrected in Attachment 6.

## III. CONCLUSION

Oncor respectfully requests that the Administrative Law Judges and all parties take notice of the above-described errata, the attached corrections, and the updated data provided therein.

Respectfully submitted,

By: */s/ Jared M. Jones*

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**ATTORNEYS FOR ONCOR ELECTRIC DELIVERY COMPANY LLC**

## CERTIFICATE OF SERVICE

I hereby certify that, pursuant to SOAH Order No. 2 filed in this docket, a copy of the foregoing has been filed with the Commission, served on all parties of record via the PUC Interchange, and served on all parties from whom action is required via email, on this the 28th day of August, 2023.

*/s/ Michele Gibson*

**APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION**

| ALTERNATIVE LINK NUMBER | A0 | A1 | A3 | A4 | A6 | A7 | B1 | B2 | B4 | B5 | B61 | B62 | B7 | B8 | C1 | C21 | C22 | C23 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of alternative link | 403 | 837 | 222 | 2,287 | 2,374 | 1,531 | 3,067 | 2,830 | 3,099 | 3,312 | 794 | 803 | 2,489 | 277 | 2,084 | 2,930 | 3,181 | 2,647 | 4,252 | 1,438 |
| Length of link parallel to existing electric transmission lines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 803 | 0 | 0 | 2,084 | 2,340 | 1,922 | 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 | 0 | 0 |
| Length of link parallel to existing public roads/highways | 0 | 0 | 0 | 0 | 954 | 1,531 | 0 | 0 | 0 | 3,312 | 0 | 0 | 0 | 0 | 0 | 283 | 0 | 0 | 780 | 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 | 2,611 | 0 |
| Length of link parallel to apparent property boundaries | 0 | 0 | 222 | 0 | 1,449 | 1,531 | 1,215 | 1,067 | 0 | 3,312 | 0 | 0 | 2,489 | 0 | 0 | 283 | 714 | 0 | 780 | 0 |
| Total length of link parallel to existing compatible rights-of-way | 0 | 0 | 222 | 0 | 1,449 | 1,531 | 1,215 | 1,067 | 0 | 3,312 | 0 | 803 | 2,489 | 0 | 2,084 | 2,623 | 2,636 | 0 | 708 | 0 |
| Number of habitable structures within 500 feet of the link centerline (2) | 1 | 3 | 1 | 2 | 5 | 0 | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 1 | 35 | 6 |
| Number of parks or recreational areas within 1,000 feet of the link centerline (3) | 0 | **3** | **3** | 0 | **3** | 1 | 1 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 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 | 0 | 0 |
| Length of link through commercial/industrial areas | 29 | 89 | 0 | 0 | 31 | 52 | 370 | 477 | 1,110 | 580 | 149 | 0 | 430 | 182 | 0 | 343 | 428 | 16 | 111 | 0 |
| Length of the link across cropland/hay meadow | 0 | 0 | 0 | 1,543 | 0 | 247 | 1,204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length across rangeland pasture | 145 | 632 | 154 | 276 | 819 | 288 | 995 | 1,092 | 1,289 | 2,478 | 645 | 747 | 1,667 | 95 | 2,084 | 2,586 | 2,451 | 2,505 | 3,946 | 1,264 |
| 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 | 0 | 0 |
| Length of link across upland woodlands | 230 | 116 | 68 | 468 | 1,525 | 945 | 446 | 1,262 | 700 | 254 | 0 | 56 | 392 | 0 | 0 | 0 | 301 | 126 | 196 | 122 |
| Length of link across riparian areas | 0 | 0 | 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 | 0 | 0 |
| Number of stream crossings by the link | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 0 | 0 |
| Length across lakes or ponds (open waters) | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 |
| 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 | 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 | 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 | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the link centerline | 1 | 0 | 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 | 0 | 0 | 0 | 430 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 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 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 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 | 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 | 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 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Number of U.S. or State Highway crossings by the link | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 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 | 1 | 1 | 1 | 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 | 2 | 0 | 6 | 3,067 | 2,404 | 3,099 | 3,312 | 794 | 803 | 2,489 | 277 | 2,084 | 2,930 | 1,165 | 2,647 | 4,252 | 1,438 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 403 | 837 | 222 | 2,287 | 2,374 | 1,531 | 3,067 | 2,830 | 3,099 | ~~3,312~~2,565 | 794 | ~~803~~440 | ~~2,489~~908 | 277 | ~~2,084~~0 | ~~2,930~~0 | ~~3,181~~0 | ~~2,647~~0 | 4,252 | ~~1,438~~0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

**APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION**

| ALTERNATIVE LINK NUMBER | C5 | C6 | C7 | C8 | C9 | E1 | E2 | E3 | E5 | E6 | E7 | E8 | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of alternative link | 1,503 | 2,629 | 2,237 | 1,353 | 1,041 | 282 | 1,115 | 713 | 4,449 | 5,483 | 3,109 | 2,972 | 2,503 | 942 | 2,673 | 3,673 | 575 | 2,967 | 3,103 | 1,160 |
| 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 | 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 | 0 | 0 |
| Length of link parallel to existing public roads/highways | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,109 | 0 | 2,503 | 942 | 839 | 0 | 0 | 2,307 | 1,709 | 0 |
| Length of link parallel to pipelines (1) | 1,295 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,476 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of link parallel to apparent property boundaries | 0 | 0 | 0 | 0 | 170 | 0 | 1,115 | 713 | 0 | 594 | 2,966 | 964 | 2,503 | 942 | 839 | 2,659 | 0 | 2,307 | 1,709 | 0 |
| Total length of link parallel to existing compatible rights-of-way | 0 | 0 | 0 | 0 | 170 | 0 | 1,115 | 713 | 0 | 594 | 3,109 | 964 | 2,503 | 942 | 839 | 2,659 | 0 | 2,307 | 1,709 | 0 |
| Number of habitable structures within 500 feet of the link centerline (2) | 24 | 13 | 1 | 22 | 17 | 1 | 1 | 8 | 50 | 3 | **1** | 81 | 2 | 15 | 55 | 0 | 0 | 0 | 0 | 0 |
| Number of parks or recreational areas within 1,000 feet of the link centerline (3) | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of the link across parks/recreational areas | 0 | 0 | 0 | 502 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of link through commercial/industrial areas | 139 | 220 | 340 | 382 | 157 | 175 | 0 | 0 | 57 | 255 | 127 | 159 | 0 | 60 | 0 | 389 | 165 | 0 | 468 | 695 |
| Length of the link across cropland/hay meadow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,354 | 118 | 780 | 0 | 0 | 636 | 705 | 90 |
| Length across rangeland pasture | 1,229 | 1,270 | 1,004 | 330 | 714 | 82 | 897 | 657 | 1,236 | 3,276 | 2,855 | 2,408 | 987 | 652 | 1,893 | 2,726 | 324 | 2,331 | 1,930 | 297 |
| 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 | 0 | 0 |
| Length of link across upland woodlands | 96 | 853 | 445 | 81 | 88 | 25 | 219 | 56 | 1,094 | 1,740 | 126 | 405 | 0 | 112 | 0 | 558 | 0 | 0 | 0 | 60 |
| Length of link across riparian areas | 0 | 244 | 411 | 508 | 52 | 0 | 0 | 0 | 1,842 | 53 | 0 | 0 | 12 | 0 | 0 | 0 | 86 | 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 | 0 | 0 |
| Number of stream crossings by the link | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Length of link parallel to streams (within 100 feet) | 0 | 0 | 0 | 0 | 350 | 0 | 0 | 0 | 709 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 308 | 428 | 0 | 0 |
| Length across lakes or ponds (open waters) | 39 | 42 | 41 | 51 | 30 | 0 | 0 | 0 | 220 | 159 | 0 | 0 | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 18 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 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 | 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 | 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 | 0 | 0 |
| Length of link across areas of high archaeological/historical site potential | 0 | 2,263 | 1,468 | 692 | 1,041 | 0 | 0 | 0 | 3,627 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 575 | 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 | 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 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | **1** | 0 | 0 | **1** | **1** |
| 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 | 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 | 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 | 0 | 0 | 0 | 0 |
| Number of U.S. or State Highway crossings by the link | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 3 | 0 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the link | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 1,138 | 2,629 | 2,237 | 179 | 1,041 | 282 | 1,115 | 713 | 67 | 5,483 | 3,109 | 2,972 | 2,503 | 942 | 2,673 | 3,068 | 575 | 2,967 | 3,103 | 1,160 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | ~~1,503~~1, | 2,629 | 2,237 | 1,353 | 1,041 | 282 | 1,115 | 713 | 4,449 | ~~5,483~~2, | ~~3,109~~1, | ~~2,972~~2, | ~~2,503~~4 | ~~942~~0 | ~~2,673~~1, | ~~3,673~~2, | 575 | ~~2,967~~1, | ~~3,103~~1 | ~~1,160~~0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

## APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION

| | 473 | | | | | | | | | 352 | 942 | 615 | 83 | | 651 | 458 | | 734 | 50 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| ALTERNATIVE LINK NUMBER | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | H1 | H2 | H3 | H41 | H42 | H5 | H6 | H8 | H9 | I11 | I12 | I2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of alternative link | 1,277 | 8,434 | 5,928 | 7,480 | 8,128 | 2,637 | 2,851 | 3,332 | 1,617 | 4,845 | 4,866 | 4,680 | 1,914 | 5,330 | 5,329 | 5,616 | 2,121 | 1,114 | 23,395 | 1,630 |
| 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 | 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 | 0 | 0 |
| Length of link parallel to existing public roads/highways | 617 | 4,149 | 0 | 0 | 3,133 | 0 | 0 | 0 | 0 | 0 | 882 | 0 | 0 | 0 | 0 | 609 | 0 | 0 | 6,713 | 0 |
| Length of link parallel to pipelines [1] | 0 | 2,253 | 0 | 0 | 1,862 | 0 | 0 | 0 | 1,617 | 0 | 999 | 0 | 0 | 2,764 | 1,577 | 1,680 | 0 | 0 | 5,055 | 431 |
| Length of link parallel to apparent property boundaries | 617 | 6,755 | 713 | 3,403 | 3,133 | 2,637 | 2,677 | 0 | 519 | 0 | 2,686 | 0 | 0 | 0 | 0 | 609 | 0 | 498 | 10,711 | 1,630 |
| Total length of link parallel to existing compatible rights-of-way | 617 | 6,755 | 713 | 3,403 | 3,133 | 2,637 | 2,677 | 0 | 519 | 0 | 2,686 | 0 | 0 | 0 | 0 | 609 | 0 | 498 | 10,711 | 1,630 |
| Number of habitable structures within 500 feet of the link centerline [2] | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 5 | 1 | 0 | 71 | 0 |
| Number of parks or recreational areas within 1,000 feet of the link centerline [3] | 0 | 1 | 2 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 4 | 0 |
| Length of the link across parks/recreational areas | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,062 | 1,509 | 0 | 0 | 0 | 2,099 | 0 |
| Length of link through commercial/industrial areas | 0 | 472 | 505 | 342 | 42 | 0 | 97 | 39 | 0 | 2,892 | 527 | 25 | 0 | 112 | 220 | 73 | 26 | 83 | 7,249 | 0 |
| Length of the link across cropland/hay meadow | 0 | 990 | 841 | 1,294 | 1,766 | 0 | 74 | 737 | 0 | 0 | 0 | 1,045 | 1,845 | 817 | 2,303 | 509 | 17 | 274 | 3,889 | 0 |
| Length across rangeland pasture | 555 | 1,257 | 2,131 | 4,886 | 5,773 | 256 | 1,368 | 1,872 | 218 | 1,609 | 1,487 | 91 | 69 | 859 | 1,508 | 4,278 | 1,689 | 657 | 6,836 | 1,384 |
| 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 | 0 | 0 |
| Length of link across upland woodlands | 649 | 1,503 | 339 | 870 | 442 | 69 | 1,036 | 683 | 30 | 253 | 1,876 | 0 | 0 | 958 | 473 | 409 | 327 | 101 | 1,773 | 246 |
| Length of link across riparian areas | 73 | 3,547 | 1,956 | 0 | 0 | 1,797 | 253 | 0 | 1,369 | 91 | 679 | 3,345 | 0 | 2,262 | 660 | 0 | 62 | 0 | 3,337 | 0 |
| Length of link across potential wetlands | 0 | 393 | 0 | 0 | 0 | 404 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 224 | 80 | 0 | 0 | 0 | 0 | 0 |
| Number of stream crossings by the link | 0 | 2 | 3 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 2 | 4 | 1 | 1 | 0 | 5 | 0 |
| Length of link parallel to streams (within 100 feet) | 0 | 0 | 0 | 0 | 381 | 0 | 0 | 0 | 0 | 0 | 514 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 504 | 0 |
| Length across lakes or ponds (open waters) | 0 | 273 | 155 | 89 | 105 | 111 | 23 | 0 | 0 | 0 | 297 | 174 | 0 | 97 | 85 | 346 | 0 | 0 | 311 | 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 | 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 | 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 | 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 | 0 | 0 |
| Length of link across areas of high archaeological/historical site potential | 1,277 | 8,434 | 5,928 | 329 | 1,316 | 2,637 | 1,565 | 0 | 1,617 | 145 | 4,866 | 4,680 | 1,914 | 3,032 | 3,203 | 0 | 2,121 | 0 | 9,711 | 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 | 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 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the link centerline | 0 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 1 | 1 |
| Number of heliports located within 5,000 feet of the link centerline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 2 |
| 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 | 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 | 0 | 0 | 3 | 0 |
| Number of U.S. or State Highway crossings by the link | 0 | 3 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 0 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 1,277 | 7,481 | 3,129 | 3,164 | 2,148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,716 | 4,396 | 0 | 0 | 15,260 | 0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

## APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 1,277 | 8,434 | 5,928 | ~~7,480~~5,255 | ~~8,128~~1,841 | 2,637 | 2,851 | 3,332 | 1,617 | ~~4,845~~2,220 | ~~4,866~~3,080 | 4,680 | ~~1,014~~1,812 | 5,330 | 5,329 | ~~5,616~~2,479 | ~~2,121~~2,027 | ~~1,114~~0 | ~~23,395~~9,965 | ~~1,630~~0 |

| ALTERNATIVE LINK NUMBER | I31 | I32 | I4 | I5 | I6 | I7 | I8 | I9 | J1 | J21 | J22 | J3 | J4 | J5 | J6 | K1 | K21 | K22 | K61 | K62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of alternative link | 3,664 | 2,902 | 3,562 | 6,552 | 743 | 2,761 | 2,309 | 2,823 | 1,342 | 1,599 | 13,416 | 6,431 | 11,869 | 966 | 3,325 | 5,119 | 1,575 | 2,198 | 5,092 | 1,856 |
| 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 | 0 | 0 |
| Length of link parallel to railroads | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5,514 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of link parallel to existing public roads/highways | 1,216 | 0 | 0 | 0 | 743 | 0 | 505 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of link parallel to pipelines (1) | 0 | 0 | 0 | 940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 560 | 0 | 0 | 0 | 0 | 612 | 0 | 0 | 1,856 |
| Length of link parallel to apparent property boundaries | 3,141 | 2,902 | 0 | 0 | 743 | 2,314 | 1,865 | 2,117 | 0 | 0 | 5,143 | 2,812 | 0 | 0 | 3,325 | 342 | 0 | 0 | 0 | 0 |
| Total length of link parallel to existing compatible rights-of-way | 3,141 | 2,902 | 0 | 0 | 743 | 2,314 | 1,865 | 2,117 | 0 | 0 | 5,143 | 2,812 | 0 | 0 | 3,325 | 342 | 0 | 0 | 0 | 0 |
| Number of habitable structures within 500 feet of the link centerline (2) | 2 | 0 | 0 | 1 | 1 | 3 | 3 | 0 | 0 | 0 | 128 | 62 | 103 | 0 | 0 | 7 | 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 | 4 | 1 | 1 | 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 | 281 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of link through commercial/industrial areas | 0 | 0 | 0 | 144 | 0 | 344 | 633 | 167 | 72 | 12 | 3,867 | 62 | 612 | 0 | 0 | 102 | 18 | 14 | 38 | 13 |
| Length of the link across cropland/hay meadow | 3,646 | 1,569 | 2,998 | 1,640 | 0 | 0 | 0 | 330 | 131 | 996 | 3,028 | 1,256 | 774 | 0 | 1,170 | 173 | 0 | 0 | 2,917 | 999 |
| Length across rangeland pasture | 0 | 687 | 278 | 3,954 | 642 | 2,247 | 1,581 | 905 | 682 | 414 | 5,244 | 4,376 | 4,174 | 0 | 127 | 3,218 | 853 | 2,165 | 1,299 | 533 |
| 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 | 0 | 0 |
| Length of link across upland woodlands | 18 | 139 | 30 | 643 | 101 | 85 | 0 | 435 | 56 | 122 | 1,230 | 297 | 2,279 | 92 | 0 | 1,557 | 225 | 19 | 427 | 310 |
| Length of link across riparian areas | 0 | 485 | 241 | 0 | 0 | 75 | 82 | 987 | 368 | 31 | 46 | 54 | 3,359 | 813 | 2,004 | 54 | 359 | 0 | 412 | 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 | 0 | 0 |
| Number of stream crossings by the link | 0 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 3 | 2 | 2 | 0 | 2 | 1 |
| Length of link parallel to streams (within 100 feet) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 695 | 2,276 | 0 | 0 | 0 | 0 | 0 | 889 | 0 |
| Length across lakes or ponds (open waters) | 0 | 24 | 15 | 170 | 0 | 10 | 12 | 0 | 33 | 24 | 0 | 386 | 672 | 61 | 24 | 15 | 120 | 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 | 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 | 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 | 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 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of link across areas of high archaeological/historical site potential | 0 | 2,902 | 3,562 | 0 | 743 | 2,761 | 2,309 | 2,823 | 1,342 | 1,599 | 1,089 | 2,970 | 11,869 | 966 | 3,325 | 0 | 1,575 | 0 | 5,092 | 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 | 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 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 0 | 1 | 1 | 1 | 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 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 4 | 3 | 3 | 3 | 1 | 2 | 2 | 2 |
| Number of heliports located within 5,000 feet of the link centerline | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 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 | 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 | 1 | 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 | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 2 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State | 0 | 1,994 | 1,781 | 2,579 | 743 | 2,761 | 2,309 | 0 | 1,342 | 1,599 | 5,736 | 1,474 | 5,672 | 0 | 817 | 0 | 0 | 0 | 0 | 0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

## APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION

| Highways | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | ~~3,664~~0 | ~~2,902~~0 | ~~3,562~~0 | ~~6,552~~0 | ~~743~~0 | ~~2,761~~1 5 | ~~2,309~~1, 867 | ~~2,823~~6 47 | ~~1,342~~0 | ~~1,599~~0 | ~~13,416~~ 8,458 | ~~6,431~~3, 097 | ~~11,869~~ 10,874 | 966 | 3,325 | ~~5,119~~0 | ~~1,575~~0 | ~~2,198~~0 | ~~5,092~~0 | ~~1,856~~0 |

| ALTERNATIVE LINK NUMBER | L1 | L2 | L3 | L4 | L5 | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | O1 | O2 | O3 | O5 | O6 | O7 | O8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of alternative link | 4,836 | 1,783 | 3,519 | 2,729 | 3,794 | 8,472 | 2,407 | 20,104 | 18,213 | 16,882 | 7,503 | 8,372 | 10,811 | 3,589 | 5,219 | 2,015 | 5,186 | 1,849 | 6,639 | 5,441 |
| 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 | 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 | 0 | 0 |
| Length of link parallel to existing public roads/highways | 0 | 0 | 1,165 | 1,511 | 0 | 1,900 | 0 | 0 | 1,105 | 0 | 1,370 | 0 | 0 | 0 | 0 | 0 | 1,720 | 0 | 0 | 0 |
| Length of link parallel to pipelines (1) | 2,894 | 0 | 0 | 0 | 1,173 | 4,223 | 0 | 0 | 3,651 | 1,804 | 1,432 | 6,584 | 0 | 0 | 0 | 0 | 1,714 | 1,332 | 6,006 | 4,302 |
| Length of link parallel to apparent property boundaries | 0 | 0 | 1,165 | 1,511 | 2,622 | 1,900 | 0 | 0 | 4,990 | 0 | 0 | 0 | 0 | 0 | 1,794 | 0 | 2,773 | 0 | 0 | 0 |
| Total length of link parallel to existing compatible rights-of-way | 0 | 0 | 1,165 | 1,511 | 2,622 | 1,900 | 0 | 0 | 4,990 | 0 | 1,370 | 0 | 0 | 0 | 1,794 | 0 | 4,493 | 0 | 0 | 0 |
| Number of habitable structures within 500 feet of the link centerline (2) | 7 | 2 | 0 | 0 | 5 | 3 | 0 | 0 | 19 | 0 | 2 | 5 | 13 | 0 | 0 | 0 | 42 | 0 | 4 | 13 |
| Number of parks or recreational areas within 1,000 feet of the link centerline (3) | 2 | 0 | 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 | 0 | 0 |
| Length of link through commercial/industrial areas | 340 | 65 | 22 | 118 | 42 | 299 | 70 | 147 | 526 | 198 | 160 | 27 | 113 | 134 | 124 | 60 | 81 | 80 | 182 | 0 |
| Length of the link across cropland/hay meadow | 0 | 0 | 1,677 | 2,299 | 3,408 | 4,446 | 0 | 0 | 1,499 | 1,722 | 1,332 | 2,229 | 7,058 | 2,804 | 2,453 | 1,620 | 1,439 | 0 | 1,535 | 3,909 |
| Length across rangeland pasture | 1,838 | 1,642 | 1,433 | 236 | 240 | 1,752 | 2,253 | 18,929 | 13,718 | 8,024 | 5,452 | 5,317 | 3,084 | 543 | 2,202 | 254 | 3,506 | 1,759 | 4,321 | 1,001 |
| 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 | 0 | 0 |
| Length of link across upland woodlands | 440 | 76 | 24 | 75 | 104 | 1,100 | 84 | 1,028 | 1,867 | 2,284 | 558 | 36 | 327 | 21 | 149 | 0 | 141 | 9 | 32 | 35 |
| Length of link across riparian areas | 2,135 | 0 | 64 | 0 | 0 | 821 | 0 | 0 | 429 | 4,518 | 0 | 716 | 229 | 48 | 247 | 82 | 0 | 0 | 135 | 301 |
| Length of link across potential wetlands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 194 |
| Number of stream crossings by the link | 1 | 0 | 1 | 0 | 1 | 2 | 0 | 3 | 4 | 4 | 1 | 2 | 4 | 1 | 1 | 0 | 2 | 0 | 2 | 2 |
| 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 | 0 | 0 |
| Length across lakes or ponds (open waters) | 84 | 0 | 298 | 0 | 0 | 53 | 0 | 0 | 173 | 136 | 0 | 46 | 0 | 39 | 43 | 0 | 19 | 0 | 436 | 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 | 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 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the link | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of link across areas of high archaeological/historical site potential | 4,836 | 1,783 | 3,519 | 0 | 0 | 8,472 | 0 | 1,358 | 3,034 | 16,882 | 0 | 8,372 | 670 | 271 | 593 | 100 | 0 | 0 | 3,243 | 650 |
| 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 | 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 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 2 | 3 | 0 | 0 | 1 | 3 |
| 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 | 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 | 0 | 0 |
| Number of FM, microwave, and other electronic installations within 2,000 feet of the link centerline | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 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 | 2 | 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 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 3 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

## APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 0 | 0 | 0 | 0 | 0 | 6,773 | 522 | 0 | 0 | 16,882 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 662 | 0 | 0 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 4,836 | ~~1,783~~ 4 87 | ~~3,519~~ 2, 389 | ~~2,729~~ 0 | ~~3,794~~ 0 | ~~8,472~~ 0 | ~~2,407~~ 0 | ~~20,104~~ 0 | ~~18,213~~ 0 | ~~16,882~~ 0 | ~~7,503~~ 2, 546 | ~~8,372~~ 0 | ~~10,811~~ 0 | ~~3,589~~ 6 | ~~5,219~~ 0 | ~~2,015~~ 0 | ~~5,186~~ 4 68 | 1,849 | ~~6,639~~ 0 | ~~5,441~~ 0 |

| ALTERNATIVE LINK NUMBER | P1 | P3 | P4 | P5 | P6 | P7 | Q1 | Q2 | Q5 | R1 | R2 | R3 | R4 | R5 | R6 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of alternative link | 6,815 | 4,424 | 3,497 | 1,315 | 2,223 | 1,877 | 5,363 | 2,981 | 11,089 | 6,844 | 3,314 | 4,063 | 4,969 | 5,848 | 5,948 | 6,145 | 6,181 | 3,718 | 2,708 | 3,738 |
| 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 | 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 | 0 | 0 |
| Length of link parallel to existing public roads/highways | 0 | 2,253 | 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) | 375 | 2,060 | 2,287 | 1,315 | 2,223 | 1,877 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 845 | 0 | 622 | 0 | 0 | 0 |
| Length of link parallel to apparent property boundaries | 1,368 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,096 | 0 | 0 | 0 | 3,469 | 1,773 | 1,821 | 1,227 | 1,570 | 2,540 | 0 | 3,738 |
| Total length of link parallel to existing compatible rights-of-way | 1,368 | 2,253 | 0 | 0 | 0 | 0 | 0 | 0 | 3,096 | 0 | 0 | 0 | 3,469 | 1,773 | 1,821 | 1,227 | 1,570 | 2,540 | 0 | 3,738 |
| Number of habitable structures within 500 feet of the link centerline (2) | 116 | 0 | 81 | 4 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 9 | 1 | 0 | 1 |
| Number of parks or recreational areas within 1,000 feet of the link centerline (3) | 1 | 0 | 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 | 0 | 0 |
| Length of link through commercial/industrial areas | 519 | 129 | 33 | 24 | 0 | 0 | 53 | 112 | 212 | 324 | 60 | 0 | 16 | 33 | 32 | 87 | 17 | 0 | 31 | 0 |
| Length of the link across cropland/hay meadow | 0 | 0 | 0 | 0 | 0 | 0 | 3,434 | 1,186 | 4,513 | 332 | 721 | 0 | 0 | 0 | 2,499 | 0 | 2,556 | 0 | 0 | 468 |
| Length across rangeland pasture | 5,239 | 4,280 | 3,464 | 1,223 | 2,051 | 1,877 | 1,799 | 1,682 | 5,231 | 5,123 | 2,336 | 3,981 | 4,953 | 5,674 | 2,354 | 4,579 | 3,316 | 1,709 | 1,857 | 898 |
| 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 | 0 | 0 |
| Length of link across upland woodlands | 723 | 15 | 0 | 39 | 103 | 0 | 14 | 0 | 339 | 249 | 105 | 82 | 0 | 86 | 649 | 464 | 215 | 1,345 | 820 | 1,799 |
| Length of link across riparian areas | 182 | 0 | 0 | 29 | 69 | 0 | 49 | 0 | 754 | 495 | 69 | 0 | 0 | 36 | 349 | 366 | 47 | 586 | 0 | 535 |
| Length of link across potential wetlands | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 268 | 0 | 0 | 0 | 0 | 0 | 625 | 0 | 0 | 0 | 0 |
| Number of stream crossings by the link | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 2 | 2 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| 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 | 0 | 0 |
| Length across lakes or ponds (open waters) | 23 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 40 | 53 | 23 | 0 | 0 | 18 | 64 | 24 | 31 | 77 | 0 | 39 |
| 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 | 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 | 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 | 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 | 0 | 0 |
| Length of link across areas of high archaeological/historical site potential | 1,661 | 517 | 0 | 1,315 | 2,223 | 0 | 900 | 0 | 929 | 2,452 | 3,314 | 0 | 0 | 1,050 | 3,245 | 1,556 | 656 | 1,452 | 2,708 | 2,157 |
| 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 | 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 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 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 | 1 | 2 | 1 | 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 | 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 | 0 | 0 |
| Number of FM, microwave, and other electronic installations within 2,000 feet of the link centerline | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

## APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of Farm to Market (F.M.), county roads, or other street crossings by the link | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 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 | 6,815 | 0 | 2,222 | 0 | 0 | 0 | 0 | 0 | 0 | 6,844 | 19 | 0 | 0 | 0 | 5,948 | 0 | 0 | 0 | 0 | 0 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 6,815 | ~~4,424~~2 90 | 3,497 | ~~1,315~~2 0 | ~~2,223~~0 | ~~1,877~~0 | ~~5,363~~0 | ~~2,984~~0 | ~~11,089~~ 0 | ~~6,844~~2 78 | ~~3,314~~0 | ~~4,063~~0 | ~~4,969~~0 | ~~5,848~~0 | ~~5,948~~0 | ~~6,145~~3 6 | ~~6,181~~0 | ~~3,718~~0 | ~~2,708~~0 | ~~3,738~~0 |

| ALTERNATIVE LINK NUMBER | T1 | T2 | T3 | T4 | T5 | U1 | U2 | U3 | V1 | V2 | V3 | V4 | W1 | W3 | W4 | W5 | W6 | W7 | X | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of alternative link | 5,452 | 10,631 | 7,992 | 7,801 | 2,756 | 6,969 | 3,438 | 1,896 | 4,261 | 9,114 | 3,545 | 585 | 2,969 | 7,419 | 7,590 | 3,214 | 2,800 | 1,617 | 1,365 | 600 |
| 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 | 0 | 0 |
| Length of link parallel to railroads | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4,261 | 0 | 0 | 0 | 0 | 0 | 0 | 2,435 | 0 | 0 | 0 | 0 |
| Length of link parallel to existing public roads/highways | 0 | 0 | 1,093 | 0 | 0 | 0 | 0 | 0 | 1,449 | 0 | 0 | 0 | 0 | 0 | 5,490 | 605 | 0 | 0 | 0 | 0 |
| Length of link parallel to pipelines (1) | 0 | 0 | 1,093 | 0 | 535 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,844 | 0 | 0 | 0 | 0 |
| Length of link parallel to apparent property boundaries | 0 | 0 | 4,074 | 0 | 1,140 | 0 | 1,365 | 1,300 | 4,261 | 0 | 0 | 0 | 0 | 0 | 4,087 | 605 | 0 | 0 | 0 | 0 |
| Total length of link parallel to existing compatible rights-of-way | 0 | 0 | 4,074 | 0 | 1,140 | 0 | 1,365 | 1,300 | 4,261 | 0 | 0 | 0 | 0 | 0 | 5,490 | 605 | 0 | 0 | 0 | 0 |
| Number of habitable structures within 500 feet of the link centerline (2) | 0 | 6 | 0 | 0 | 0 | 6 | 4 | 3 | 5 | 2 | 2 | 0 | 1 | 4 | 2 | 12 | 0 | 1 | 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 | 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 | 0 | 0 |
| Length of link through commercial/industrial areas | 39 | 143 | 92 | 24 | 0 | 245 | 62 | 0 | 123 | 750 | 636 | 0 | 976 | 79 | 1,031 | 782 | 0 | 66 | 11 | 0 |
| Length of the link across cropland/hay meadow | 3,462 | 1,186 | 2,933 | 1,672 | 2,087 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length across rangeland pasture | 1,234 | 7,954 | 3,276 | 2,482 | 195 | 6,078 | 2,585 | 1,884 | 2,889 | 7,470 | 2,698 | 353 | 1,545 | 6,635 | 6,143 | 2,019 | 2,478 | 1,552 | 1,154 | 600 |
| 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 | 0 | 0 |
| Length of link across upland woodlands | 112 | 505 | 1,340 | 610 | 474 | 645 | 377 | 12 | 795 | 632 | 210 | 232 | 386 | 601 | 415 | 413 | 67 | 0 | 92 | 0 |
| Length of link across riparian areas | 497 | 799 | 333 | 2,859 | 0 | 0 | 415 | 0 | 0 | 249 | 0 | 0 | 45 | 0 | 0 | 0 | 255 | 0 | 107 | 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 | 0 | 0 |
| Number of stream crossings by the link | 1 | 4 | 1 | 3 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Length of link parallel to streams (within 100 feet) | 0 | 0 | 1,944 | 0 | 0 | 0 | 0 | 0 | 0 | 656 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length across lakes or ponds (open waters) | 108 | 44 | 18 | 154 | 0 | 0 | 0 | 0 | 453 | 14 | 0 | 0 | 0 | 103 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 3 | 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 | 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 | 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 | 0 | 0 |
| Length of link across areas of high archaeological/historical site potential | 742 | 3,128 | 4,648 | 7,801 | 0 | 0 | 1,289 | 0 | 0 | 1,626 | 0 | 585 | 669 | 0 | 0 | 0 | 1,545 | 0 | 407 | 600 |
| 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 | 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 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| 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 | 0 | 0 |
| Number of heliports located within 5,000 feet of the link centerline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 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 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

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(3) Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

**APPENDIX E - TABLE 7-3. ENVIRONMENTAL DATA FOR ALTERNATIVE LINK EVALUATION**

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of U.S. or State Highway crossings by the link | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 4 | 4 | 0 | 7 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the link | 1 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 0 | 0 | 0 | 2,806 | 1,889 | 5,231 | 166 | 1,540 | 3,860 | 6,042 | 3,545 | 585 | 2,969 | 5,070 | 7,590 | 3,214 | 1,272 | 1,617 | 1,365 | 23 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | ~~5,452~~0 | ~~10,631~~ 0 | ~~7,992~~0 | ~~7,801~~0 | ~~2,756~~0 | ~~6,969~~0 | ~~3,438~~0 | ~~1,896~~0 | ~~4,261~~0 | ~~9,114~~4, 212 | ~~3,545~~0 | ~~585~~0 | ~~2,969~~0 | ~~7,419~~0 | ~~7,590~~4, 046 | ~~3,214~~2, 235 | ~~2,800~~0 | ~~1,617~~7 43 | ~~1,365~~0 | ~~600~~0 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 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.

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES (REVISED)**

| | Route 1 | Route 3 | Route 5 | Route 10 | Route 11 | Route 13 | Route 14 | Route 15 | Route 16 | Route 18 | Route 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Right-of-way and Land Acquisition | $ 53,245,000 | $ 97,122,000 | $ 95,344,000 | $ 62,694,000 | $ 63,270,000 | $ 61,035,000 | $ 61,504,000 | $ 62,374,000 | $ 60,596,000 | $ 60,609,000 | $ 51,473,000 |
| Engineering and Design (Utility) – REVISED | ~~$ 316,000~~ 325,000 | $ 316,000 | $ 315,000 | ~~$ 310,000~~ 314,000 | ~~$ 310,000~~ 314,000 | ~~$ 314,000~~ 315,000 | ~~$ 322,000~~ 323,000 | ~~$ 305,000~~ 306,000 | ~~$ 304,000~~ 305,000 | ~~$ 321,000~~ 322,000 | ~~$ 313,000~~ 332,000 |
| Engineering and Design (Contract) | $ 6,001,000 | $ 5,890,000 | $ 5,877,000 | $ 5,902,000 | $ 5,912,000 | $ 5,896,000 | $ 5,978,000 | $ 5,796,000 | $ 5,783,000 | $ 5,973,000 | $ 6,092,000 |
| Procurement of Material and Equipment (including stores) – REVISED | ~~$ 57,637,000~~ 57,676,000 | $ 57,131,000 | $ 55,995,000 | ~~$ 61,274,000~~ 61,298,000 | ~~$ 61,933,000~~ 61,957,000 | ~~$ 57,425,000~~ 57,438,000 | ~~$ 58,756,000~~ 58,769,000 | ~~$ 57,505,000~~ 57,518,000 | ~~$ 56,369,000~~ 56,382,000 | ~~$ 59,351,000~~ 59,364,000 | ~~$ 61,279,000~~ 61,354,000 |
| Construction of Facilities (Utility) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| Construction of Facilities (Contract) – REVISED | ~~$ 50,630,000~~ 52,454,000 | $ 52,227,000 | $ 51,139,000 | ~~$ 54,431,000~~ 55,518,000 | ~~$ 55,153,000~~ 56,240,000 | ~~$ 51,798,000~~ 52,408,000 | ~~$ 53,003,000~~ 53,610,000 | ~~$ 51,850,000~~ 52,460,000 | ~~$ 50,762,000~~ 51,372,000 | ~~$ 53,500,000~~ 54,107,000 | ~~$ 52,183,000~~ 55,582,000 |
| Other (all costs not included in the above categories) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| **Estimated Total Transmission Line Cost** – REVISED | ~~$ 167,829,000~~ 169,701,000 | **$ 212,686,000** | **$ 208,670,000** | ~~$ 184,611,000~~ 185,726,000 | ~~$ 186,578,000~~ 187,693,000 | ~~$ 176,468,000~~ 177,092,000 | ~~$ 179,563,000~~ 180,184,000 | ~~$ 177,820,000~~ 178,454,000 | ~~$ 172,814,000~~ 174,438,000 | ~~$ 179,754,000~~ 180,375,000 | ~~$ 171,240,000~~ 174,833,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** – REVISED | ~~$ 242,687,000~~ 244,559,000 | **$ 287,544,000** | **$ 283,528,000** | ~~$ 259,469,000~~ 260,584,000 | ~~$ 261,436,000~~ 262,551,000 | ~~$ 251,326,000~~ 251,950,000 | ~~$ 254,421,000~~ 255,042,000 | ~~$ 252,688,000~~ 253,312,000 | ~~$ 248,672,000~~ 249,296,000 | ~~$ 254,612,000~~ 255,233,000 | ~~$ 246,198,000~~ 249,691,000 |

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES (REVISED)**

| | Route 22 | Route 23 | Route 24 | Route 25 | Route 26 | Route 28 | Route 29 | Route 33 | Route 36 | Route 41 | Route 42 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Right-of-way and Land Acquisition | $ 62,290,000 | $ 61,878,000 | $ 63,217,000 | $ 61,439,000 | $ 62,014,000 | $ 93,211,000 | $ 52,143,000 | $ 61,025,000 | $ 57,234,000 | $ 56,386,000 | $ 55,190,000 |
| Engineering and Design (Utility) – REVISED | ~~$ 317,000~~ 318,000 | ~~$ 307,000~~ 316,000 | ~~$ 298,000~~ 307,000 | ~~$ 297,000~~ 306,000 | ~~$ 297,000~~ 306,000 | ~~$ 320,000~~ 321,000 | ~~$ 307,000~~ 332,000 | ~~$ 326,000~~ 343,000 | ~~$ 312,000~~ 316,000 | ~~$ 304,000~~ 323,000 | ~~$ 296,000~~ 315,000 |
| Engineering and Design (Contract) | $ 5,946,000 | $ 5,925,000 | $ 5,825,000 | $ 5,812,000 | $ 5,822,000 | $ 5,931,000 | $ 6,052,000 | $ 6,183,000 | $ 5,890,000 | $ 5,982,000 | $ 5,889,000 |
| Procurement of Material and Equipment (including stores) – REVISED | ~~$ 60,474,000~~ 60,487,000 | ~~$ 60,758,000~~ 60,802,000 | ~~$ 60,838,000~~ 60,882,000 | ~~$ 59,702,000~~ 59,746,000 | ~~$ 60,361,000~~ 60,405,000 | ~~$ 56,360,000~~ 56,373,000 | ~~$ 57,661,000~~ 57,753,000 | ~~$ 64,424,000~~ 64,475,000 | ~~$ 57,617,000~~ 57,641,000 | ~~$ 59,718,000~~ 59,786,000 | ~~$ 57,647,000~~ 57,715,000 |
| Construction of Facilities (Utility) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| Construction of Facilities (Contract) – REVISED | ~~$ 54,399,000~~ 55,009,000 | ~~$ 53,265,000~~ 55,329,000 | ~~$ 53,317,000~~ 55,381,000 | ~~$ 52,229,000~~ 54,293,000 | ~~$ 52,951,000~~ 55,015,000 | ~~$ 50,846,000~~ 51,456,000 | ~~$ 48,418,000~~ 52,520,000 | ~~$ 55,577,000~~ 57,908,000 | ~~$ 51,173,000~~ 52,260,000 | ~~$ 51,009,000~~ 54,073,000 | ~~$ 49,288,000~~ 52,352,000 |
| Other (all costs not included in the above categories) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| **Estimated Total Transmission Line Cost** – REVISED | ~~$ 182,426,000~~ 184,050,000 | ~~$ 182,122,000~~ 184,250,000 | ~~$ 182,495,000~~ 185,612,000 | ~~$ 179,479,000~~ 181,596,000 | ~~$ 181,445,000~~ 183,562,000 | ~~$ 206,668,000~~ 207,292,000 | ~~$ 164,581,000~~ 168,800,000 | ~~$ 187,525,000~~ 189,934,000 | ~~$ 172,226,000~~ 173,341,000 | ~~$ 173,399,000~~ 176,550,000 | ~~$ 168,210,000~~ 171,461,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** – REVISED | ~~$ 258,284,000~~ 258,908,000 | ~~$ 256,991,000~~ 259,108,000 | ~~$ 258,353,000~~ 260,470,000 | ~~$ 254,327,000~~ 256,454,000 | ~~$ 256,303,000~~ 258,420,000 | ~~$ 281,526,000~~ 282,150,000 | ~~$ 239,439,000~~ 243,658,000 | ~~$ 262,383,000~~ 264,792,000 | ~~$ 247,084,000~~ 248,199,000 | ~~$ 248,257,000~~ 251,408,000 | ~~$ 243,068,000~~ 246,319,000 |

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES (REVISED)**

| | Route 43 | Route 44 | Route 54 | Route 58 | Route 61 | Route 63 | Route 65 | Route 67 | Route 68 | Route 69 | Route 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Right-of-way and Land Acquisition | $ 62,759,000 | $ 64,098,000 | $ 55,627,000 | $ 64,941,000 | $ 63,323,000 | $ 65,944,000 | $ 55,270,000 | $ 53,190,000 | $ 56,778,000 | $ 56,623,000 | $ 68,802,000 |
| Engineering and Design (Utility) – REVISED | ~~$ 310,000~~ 319,000 | ~~$ 301,000~~ 310,000 | ~~$ 321,000~~ 324,000 | ~~$ 295,000~~ 311,000 | ~~$ 304,000~~ 308,000 | ~~$ 258,000~~ 310,000 | ~~$ 305,000~~ 324,000 | ~~$ 321,000~~ 331,000 | ~~$ 332,000~~ 340,000 | ~~$ 341,000~~ 348,000 | ~~$ 317,000~~ 340,000 |
| Engineering and Design (Contract) | $ 5,934,000 | $ 5,834,000 | $ 6,008,000 | $ 5,863,000 | $ 5,821,000 | $ 5,863,000 | $ 6,001,000 | $ 6,051,000 | $ 6,120,000 | $ 6,215,000 | $ 6,174,000 |
| Procurement of Material and Equipment (including stores) – REVISED | ~~$ 58,138,000~~ 58,187,000 | ~~$ 58,218,000~~ 58,262,000 | ~~$ 63,260,000~~ 63,278,000 | ~~$ 61,575,000~~ 61,626,000 | ~~$ 57,771,000~~ 57,795,000 | ~~$ 62,131,000~~ 62,295,000 | ~~$ 57,629,000~~ 57,697,000 | ~~$ 58,643,000~~ 58,678,000 | ~~$ 58,478,000~~ 58,537,000 | ~~$ 60,909,000~~ 60,936,000 | ~~$ 64,752,000~~ 64,828,000 |
| Construction of Facilities (Utility) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| Construction of Facilities (Contract) – REVISED | ~~$ 50,782,000~~ 52,846,000 | ~~$ 50,834,000~~ 52,898,000 | ~~$ 56,022,000~~ 56,838,000 | ~~$ 53,535,000~~ 55,819,000 | ~~$ 51,465,000~~ 52,552,000 | ~~$ 49,083,000~~ 56,561,000 | ~~$ 49,370,000~~ 52,434,000 | ~~$ 51,827,000~~ 53,399,000 | ~~$ 50,726,000~~ 53,297,000 | ~~$ 54,157,000~~ 55,388,000 | ~~$ 55,183,000~~ 58,625,000 |
| Other (all costs not included in the above categories) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| **Estimated Total Transmission Line Cost** – REVISED | ~~$ 177,922,000~~ 180,040,000 | ~~$ 179,285,000~~ 181,402,000 | ~~$ 181,238,000~~ 182,075,000 | ~~$ 186,209,000~~ 188,560,000 | ~~$ 178,684,000~~ 179,799,000 | ~~$ 182,279,000~~ 190,973,000 | ~~$ 168,575,000~~ 171,726,000 | ~~$ 170,032,000~~ 171,649,000 | ~~$ 172,434,000~~ 175,072,000 | ~~$ 178,245,000~~ 179,510,000 | ~~$ 195,228,000~~ 198,769,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** – REVISED | ~~$ 252,781,000~~ 254,898,000 | ~~$ 254,143,000~~ 256,260,000 | ~~$ 256,096,000~~ 256,933,000 | ~~$ 261,067,000~~ 263,418,000 | ~~$ 253,542,000~~ 254,657,000 | ~~$ 258,137,000~~ 265,831,000 | ~~$ 243,433,000~~ 246,584,000 | ~~$ 244,890,000~~ 246,507,000 | ~~$ 247,292,000~~ 249,930,000 | ~~$ 253,103,000~~ 254,368,000 | ~~$ 270,086,000~~ 273,627,000 |

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES (REVISED)**

| | Route 71 | Route 72 | Route 78 | Route 86 | Route 87 | Route 92 | Route 94 | Route 96 | Route 103 | Route 108 | Route 116 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Right-of-way and Land Acquisition | $ 58,172,000 | $ 54,607,000 | $ 63,735,000 | $ 56,551,000 | $ 64,120,000 | $ 58,993,000 | $ 53,158,000 | $ 52,485,000 | $ 53,040,000 | $ 55,502,000 | $ 59,962,000 |
| Engineering and Design (Utility) – REVISED | ~~$ 322,000~~ 339,000 | ~~$ 306,000~~ 325,000 | ~~$ 305,000~~ 306,000 | ~~$ 308,000~~ 315,000 | ~~$ 308,000~~ 319,000 | ~~$ 335,000~~ 349,000 | ~~$ 304,000~~ 321,000 | ~~$ 311,000~~ 318,000 | ~~$ 303,000~~ 320,000 | ~~$ 337,000~~ 341,000 | ~~$ 335,000~~ 344,000 |
| Engineering and Design (Contract) | $ 6,161,000 | $ 6,015,000 | $ 5,810,000 | $ 5,903,000 | $ 5,948,000 | $ 6,274,000 | $ 5,980,000 | $ 5,945,000 | $ 5,963,000 | $ 6,200,000 | $ 6,221,000 |
| Procurement of Material and Equipment (including stores) – REVISED | ~~$ 62,394,000~~ 63,454,000 | ~~$ 58,281,000~~ 58,449,000 | ~~$ 58,278,000~~ 58,291,000 | ~~$ 58,456,000~~ 58,488,000 | ~~$ 58,916,000~~ 58,955,000 | ~~$ 65,737,000~~ 65,790,000 | ~~$ 58,970,000~~ 59,030,000 | ~~$ 57,488,000~~ 57,520,000 | ~~$ 58,405,000~~ 58,465,000 | ~~$ 62,429,000~~ 62,456,000 | ~~$ 64,527,000~~ 64,568,000 |
| Construction of Facilities (Utility) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| Construction of Facilities (Contract) – REVISED | ~~$ 54,429,000~~ 57,117,000 | ~~$ 50,025,000~~ 53,089,000 | ~~$ 52,488,000~~ 53,095,000 | ~~$ 51,520,000~~ 52,987,000 | ~~$ 51,730,000~~ 53,481,000 | ~~$ 56,647,000~~ 58,999,000 | ~~$ 50,755,000~~ 53,443,000 | ~~$ 50,597,000~~ 52,064,000 | ~~$ 50,234,000~~ 52,922,000 | ~~$ 55,123,000~~ 56,333,000 | ~~$ 56,285,000~~ 58,207,000 |
| Other (all costs not included in the above categories) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| **Estimated Total Transmission Line Cost** – REVISED | ~~$ 182,478,000~~ 185,243,000 | ~~$ 169,324,000~~ 172,485,000 | ~~$ 180,616,000~~ 181,237,000 | ~~$ 172,728,000~~ 174,244,000 | ~~$ 181,022,000~~ 182,823,000 | ~~$ 187,986,000~~ 190,405,000 | ~~$ 169,167,000~~ 171,932,000 | ~~$ 166,826,000~~ 168,332,000 | ~~$ 167,945,000~~ 170,710,000 | ~~$ 179,593,000~~ 180,832,000 | ~~$ 187,220,000~~ 189,302,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** – REVISED | ~~$ 257,336,000~~ 260,101,000 | ~~$ 244,182,000~~ 247,343,000 | ~~$ 255,474,000~~ 256,095,000 | ~~$ 247,586,000~~ 249,102,000 | ~~$ 255,880,000~~ 257,681,000 | ~~$ 262,844,000~~ 265,263,000 | ~~$ 244,025,000~~ 246,790,000 | ~~$ 241,684,000~~ 243,190,000 | ~~$ 242,802,000~~ 245,568,000 | ~~$ 254,449,000~~ 255,690,000 | ~~$ 262,078,000~~ 264,160,000 |

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES (REVISED)**

| | Route 117 | Route 119 | Route 130 | Route 132 | Route 137 | Route 138 | Route 142 | Route 143 | Route 146 | Route 154 | Route 164 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Right-of-way and Land Acquisition | $ 103,261,000 | $ 101,003,000 | $ 56,895,000 | $ 58,980,000 | $ 61,986,000 | $ 59,941,000 | $ 50,005,000 | $ 49,295,000 | $ 49,765,000 | $ 64,101,000 | $ 76,654,000 |
| Engineering and Design (Utility) – REVISED | ~~$ 341,000~~ 346,000 | ~~$ 330,000~~ 341,000 | ~~$ 331,000~~ 340,000 | ~~$ 336,000~~ 343,000 | ~~$ 315,000~~ 324,000 | ~~$ 300,000~~ 323,000 | ~~$ 326,000~~ 336,000 | ~~$ 326,000~~ 336,000 | ~~$ 338,000~~ 342,000 | ~~$ 345,000~~ 349,000 | ~~$ 331,000~~ 332,000 |
| Engineering and Design (Contract) | $ 6,271,000 | $ 6,190,000 | $ 6,170,000 | $ 6,211,000 | $ 6,008,000 | $ 6,007,000 | $ 6,137,000 | $ 6,140,000 | $ 6,206,000 | $ 6,287,000 | $ 6,099,000 |
| Procurement of Material and Equipment (including stores) – REVISED | ~~$ 67,661,000~~ 67,687,000 | ~~$ 62,508,000~~ 62,546,000 | ~~$ 61,876,000~~ 61,917,000 | ~~$ 63,014,000~~ 63,041,000 | ~~$ 61,764,000~~ 61,805,000 | ~~$ 61,817,000~~ 61,879,000 | ~~$ 59,433,000~~ 59,468,000 | ~~$ 59,659,000~~ 59,694,000 | ~~$ 61,529,000~~ 61,556,000 | ~~$ 67,960,000~~ 67,987,000 | ~~$ 60,150,000~~ 60,163,000 |
| Construction of Facilities (Utility) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| Construction of Facilities (Contract) – REVISED | ~~$ 59,889,000~~ 61,037,000 | ~~$ 54,960,000~~ 56,680,000 | ~~$ 53,901,000~~ 55,823,000 | ~~$ 55,562,000~~ 56,789,000 | ~~$ 53,641,000~~ 55,563,000 | ~~$ 52,787,000~~ 55,655,000 | ~~$ 52,506,000~~ 54,078,000 | ~~$ 52,672,000~~ 54,244,000 | ~~$ 54,512,000~~ 55,722,000 | ~~$ 59,525,000~~ 60,735,000 | ~~$ 54,006,000~~ 54,616,000 |
| Other (all costs not included in the above categories) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| **Estimated Total Transmission Line Cost** – REVISED | ~~$ 237,422,000~~ 238,602,000 | ~~$ 224,991,000~~ 226,760,000 | ~~$ 179,173,000~~ 181,145,000 | ~~$ 184,103,000~~ 185,364,000 | ~~$ 183,714,000~~ 185,686,000 | ~~$ 180,852,000~~ 183,805,000 | ~~$ 168,407,000~~ 170,024,000 | ~~$ 168,092,000~~ 169,709,000 | ~~$ 172,250,000~~ 173,591,000 | ~~$ 198,218,000~~ 199,459,000 | ~~$ 197,240,000~~ 197,864,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** – REVISED | ~~$ 312,281,000~~ 313,460,000 | ~~$ 299,849,000~~ 301,618,000 | ~~$ 254,031,000~~ 256,003,000 | ~~$ 258,961,000~~ 260,222,000 | ~~$ 258,572,000~~ 260,544,000 | ~~$ 255,710,000~~ 258,663,000 | ~~$ 243,265,000~~ 244,882,000 | ~~$ 242,950,000~~ 244,567,000 | ~~$ 247,108,000~~ 248,449,000 | ~~$ 273,076,000~~ 274,317,000 | ~~$ 272,098,000~~ 272,722,000 |

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES (REVISED)**

| | Route 170 | Route 175 | Route 176 | Route 178 | Route 179 | Route 184 | Route 185 | Route 186 | Route 187 | Route 191 | Route 192 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Right-of-way and Land Acquisition | $ 52,474,000 | $ 57,137,000 | $ 56,134,000 | $ 62,026,000 | $ 56,996,000 | $ 60,016,000 | $ 60,606,000 | $ 58,955,000 | $ 61,040,000 | $ 51,386,000 | $ 51,962,000 |
| Engineering and Design (Utility) – REVISED | ~~$ 333,000~~ 337,000 | ~~$ 339,000~~ 343,000 | ~~$ 341,000~~ 345,000 | ~~$ 327,000~~ 348,000 | ~~$ 309,000~~ 332,000 | ~~$ 323,000~~ 341,000 | ~~$ 323,000~~ 341,000 | ~~$ 312,000~~ 333,000 | ~~$ 332,000~~ 336,000 | ~~$ 305,000~~ 324,000 | ~~$ 305,000~~ 324,000 |
| Engineering and Design (Contract) | $ 6,180,000 | $ 6,210,000 | $ 6,235,000 | $ 6,271,000 | $ 6,099,000 | $ 6,211,000 | $ 6,197,000 | $ 6,118,000 | $ 6,159,000 | $ 6,014,000 | $ 6,024,000 |
| Procurement of Material and Equipment (including stores) – REVISED | ~~$ 64,754,000~~ 64,781,000 | ~~$ 64,933,000~~ 64,955,000 | ~~$ 65,121,000~~ 65,143,000 | ~~$ 67,822,000~~ 67,902,000 | ~~$ 60,597,000~~ 60,673,000 | ~~$ 66,033,000~~ 66,100,000 | ~~$ 65,144,000~~ 65,211,000 | ~~$ 64,361,000~~ 64,441,000 | ~~$ 65,538,000~~ 65,565,000 | ~~$ 58,836,000~~ 58,914,000 | ~~$ 59,495,000~~ 59,573,000 |
| Construction of Facilities (Utility) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| Construction of Facilities (Contract) – REVISED | ~~$ 57,133,000~~ 58,343,000 | ~~$ 57,344,000~~ 58,343,000 | ~~$ 57,669,000~~ 58,668,000 | ~~$ 57,213,000~~ 60,669,000 | ~~$ 51,207,000~~ 54,649,000 | ~~$ 56,155,000~~ 59,254,000 | ~~$ 55,382,000~~ 58,481,000 | ~~$ 54,232,000~~ 57,688,000 | ~~$ 57,444,000~~ 58,654,000 | ~~$ 49,624,000~~ 53,044,000 | ~~$ 50,346,000~~ 53,766,000 |
| Other (all costs not included in the above categories) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| **Estimated Total Transmission Line Cost** – REVISED | ~~$ 180,874,000~~ 182,115,000 | ~~$ 185,963,000~~ 186,988,000 | ~~$ 185,500,000~~ 186,525,000 | ~~$ 192,659,000~~ 197,216,000 | ~~$ 175,208,000~~ 178,749,000 | ~~$ 188,738,000~~ 191,922,000 | ~~$ 187,652,000~~ 190,836,000 | ~~$ 182,978,000~~ 187,535,000 | ~~$ 190,512,000~~ 191,754,000 | ~~$ 166,165,000~~ 169,682,000 | ~~$ 168,122,000~~ 171,649,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** – REVISED | ~~$ 255,732,000~~ 256,973,000 | ~~$ 260,821,000~~ 261,846,000 | ~~$ 260,358,000~~ 261,383,000 | ~~$ 268,517,000~~ 272,074,000 | ~~$ 250,066,000~~ 253,607,000 | ~~$ 263,596,000~~ 266,780,000 | ~~$ 262,510,000~~ 265,694,000 | ~~$ 258,826,000~~ 262,393,000 | ~~$ 265,271,000~~ 266,612,000 | ~~$ 241,023,000~~ 244,540,000 | ~~$ 242,990,000~~ 246,507,000 |

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES (REVISED)**

| | Route 199 | Route 200 | Route 207 | Route 216 | Route 217 | Route 218 | Route 219 | Route 221 |
|---|---|---|---|---|---|---|---|---|
| Right-of-way and Land Acquisition | $ 61,425,000 | $ 60,986,000 | $ 55,580,000 | $ 64,817,000 | $ 55,434,000 | $ 57,473,000 | $ 50,410,000 | $ 55,667,000 |
| Engineering and Design (Utility) – REVISED | ~~$ 316,000~~ 317,000 | ~~$ 306,000~~ 307,000 | ~~$ 310,000~~ 317,000 | ~~$ 345,000~~ 354,000 | ~~$ 320,000~~ 324,000 | ~~$ 319,000~~ 323,000 | ~~$ 316,000~~ 321,000 | ~~$ 319,000~~ 323,000 |
| Engineering and Design (Contract) | $ 5,934,000 | $ 5,821,000 | $ 5,927,000 | $ 6,328,000 | $ 6,019,000 | $ 6,008,000 | $ 5,986,000 | $ 6,014,000 |
| Procurement of Material and Equipment (including stores) – REVISED | ~~$ 60,271,000~~ 60,284,000 | ~~$ 59,215,000~~ 59,228,000 | ~~$ 60,529,000~~ 60,561,000 | ~~$ 70,009,000~~ 70,050,000 | ~~$ 61,577,000~~ 61,599,000 | ~~$ 60,794,000~~ 60,816,000 | ~~$ 59,955,000~~ 59,981,000 | ~~$ 63,308,000~~ 63,330,000 |
| Construction of Facilities (Utility) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| Construction of Facilities (Contract) – REVISED | ~~$ 54,220,000~~ 54,827,000 | ~~$ 53,184,000~~ 53,791,000 | ~~$ 53,304,000~~ 54,771,000 | ~~$ 60,625,000~~ 62,547,000 | ~~$ 54,243,000~~ 55,242,000 | ~~$ 52,758,000~~ 54,757,000 | ~~$ 52,902,000~~ 54,051,000 | ~~$ 55,882,000~~ 56,881,000 |
| Other (all costs not included in the above categories) | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 |
| **Estimated Total Transmission Line Cost** – REVISED | ~~$ 182,166,000~~ 182,787,000 | ~~$ 179,512,000~~ 180,133,000 | ~~$ 175,650,000~~ 177,156,000 | ~~$ 202,124,000~~ 204,096,000 | ~~$ 177,592,000~~ 178,618,000 | ~~$ 178,252,000~~ 179,377,000 | ~~$ 169,570,000~~ 170,749,000 | ~~$ 181,190,000~~ 182,215,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** – REVISED | ~~$ 257,024,000~~ 257,645,000 | ~~$ 254,370,000~~ 254,991,000 | ~~$ 250,508,000~~ 252,014,000 | ~~$ 276,982,000~~ 278,954,000 | ~~$ 252,451,000~~ 253,476,000 | ~~$ 253,110,000~~ 254,235,000 | ~~$ 244,428,000~~ 245,607,000 | ~~$ 256,048,000~~ 257,073,000 |

**PUC DOCKET NO. 55067**

**DIRECT TESTIMONY**
**OF BRENDA J. PERKINS, WITNESS FOR**
**ONCOR ELECTRIC DELIVERY COMPANY LLC**


| | | |
|---|---|---|
| I. | POSITION AND QUALIFICATIONS | 2 |
| II. | PURPOSE OF TESTIMONY | 3 |
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|---|---|
| Exhibit BJP-1 | Resume of Brenda J. Perkins |
| Exhibit BJP-2 | Texas Utilities Code § 37.056 |
| Exhibit BJP-3 | 16 Texas Administrative Code § 22.52 |
| Exhibit BJP-4 | 16 Texas Administrative Code § 25.101 |
| Exhibit BJP-5 | Routing Memorandum |
| Exhibit BJP-6 | Area Development Map |

# DIRECT TESTIMONY OF BRENDA J. PERKINS

## I. POSITION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND ADDRESS.

A. My name is Brenda J. Perkins. I am a self-employed consultant for Oncor Electric Delivery Company LLC ("Oncor") with the role of CCN Project Manager, Sr. My business address is 777 Main Street, Suite 1311-12, Fort Worth, Texas 76102.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL QUALIFICATIONS.

A. I graduated from the University of Texas at Arlington with a Bachelor of Science in Civil Engineering in 1981. I am a registered professional engineer in Texas (certificate number 59883). I first worked as an engineering intern before graduation, then as a civil engineer after graduation, for Texas Power and Light Company ("TP&L") in its Transmission Engineering department. My work assignments included providing engineering design and project management during the construction of transmission lines.

In 1986, I resigned from TP&L to become a stay-at-home mother for ten years. During this ten-year period, I briefly worked part-time for Anchor Metals, Inc. and Meyer Industries analyzing and designing tubular steel poles and steel lattice towers for transmission line structures. In 1996, I formed my corporation, BJ Perkins Corporation, and have been an engineering consultant for Oncor on numerous transmission line projects. I have provided project support for the routing, engineering, and right-of-way acquisition of numerous Competitive Renewable Energy Zone ("CREZ") projects. Recently, I have provided project support for the routing of numerous non-CREZ transmission projects. My educational and professional qualifications are outlined in Exhibit BJP-1, attached hereto.

Q: HAVE YOU EVER SUBMITTED TESTIMONY BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS ("COMMISSION")?

A: Yes. I provided testimony in Docket Nos. 37408, 37529, 37530, 38324, 38517, 38677, 42087, 42583, 47368, 47808, 48095, 48785, 48909, 49151, 49302, 49723, 50410, 52455, 53053, and 54733.

## II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my direct testimony is to address certain aspects of Oncor's proposed Ramhorn Hill-Dunham 345 kV transmission line project (the "Proposed Transmission Line Project") on behalf of Oncor, including:

- the public participation meetings;
- routing considerations, including selection of the route that best meets the factors set forth in Texas Utilities Code § 37.056 and the Commission's rules, and the other alternative routes included in Oncor's Standard Application for a Certificate of Convenience and Necessity ("CCN") for a Proposed Transmission Line (the "Application");
- the adequacy and geographic diversity of Oncor's filed routes; and
- notice provided pursuant to Commission rules.

The statements and opinions expressed in this testimony are based on my: (1) previously described industry experience in the evaluation of transmission line routes; (2) independent review and evaluation of the data included in the *Environmental Assessment and Routing Study for the Proposed Ramhorn Hill Switch to Dunham Switch 345 kV Transmission Line Project in Denton and Wise Counties, Texas* ("Environmental Assessment"), prepared by Halff Associates, Inc. ("Halff") and included as Attachment No. 1 to the Application; (3) discussions with Oncor personnel; (4) discussions with Halff personnel who participated in the development of the Environmental Assessment; (5) interactions at the public participation meetings; (6) observations of the project area during reconnaissance investigations; (7) understanding of Texas Utilities Code § 37.056 and 16

Texas Administrative Code ("TAC") §§ 22.52 and 25.101 (attached hereto as Exhibits BJP-2, BJP-3 and BJP-4, respectively); and other factors.

In addition to the testimony offered herein, I sponsor Oncor's responses to Question Nos. 17-19 and 21-29 in the Application filed in this docket, as well as Attachment Nos. 7-17 to the Application. The facts and statements set forth in those responses and attachments are true and correct. The Application and its attachments, as may be amended and/or supplemented, will be offered into evidence by Oncor at the hearing on the merits.

## III. PUBLIC PARTICIPATION MEETINGS

Q. DID ONCOR HOLD A PUBLIC PARTICIPATION MEETING FOR THE PROPOSED TRANSMISSION LINE PROJECT PRIOR TO FILING THE APPLICATION?

A. Yes. Oncor hosted two public open house meetings prior to filing this CCN Application. Oncor, Halff representatives, and personnel from Integra Realty Resources ("Integra"), Oncor's property abstracting contractor for the Proposed Transmission Line Project, attended these meetings. The meetings occurred on December 7 and 8, 2022, from 4:00 to 7:00 p.m. at the Marriott Hotel & Golf Club at Champions Circle in Fort Worth, Texas.

Q. WHAT WAS THE PURPOSE OF THE PUBLIC PARTICIPATION MEETINGS?

A. The purpose of the meetings was to, among other things, solicit comments and input from residents, landowners, public officials, and other interested parties concerning the Proposed Transmission Line Project, the preliminary alternative route links, and the overall transmission line certification process and schedule. Such meetings ensure that the values and concerns of the public are adequately identified and considered. Additionally, Oncor utilized the public meeting process to provide information about the Proposed Transmission Line Project, including the purpose, need, routing, potential benefits, and impacts.

Q. HOW DID ONCOR PROVIDE NOTICE OF THE PUBLIC PARTICIPATION MEETINGS?

A. Oncor mailed 2,068 individual written notices by first class mail to all owners of property within 500 feet of the proposed route centerlines for the Proposed Transmission Line Project. Given the accuracy limitations of appraisal district data and aerial photography, notice was intentionally over-inclusive and was provided to properties crossed by or within 520 feet of the proposed route centerlines. The public participation meeting notice was also sent by email to the Department of Defense Siting Clearinghouse. A representative copy of the public participation meeting notice mailed to property owners is located in Appendix B of the Environmental Assessment.

Q. WAS ANY OTHER FORM OF NOTICE USED TO ADVERTISE THE PUBLIC PARTICIPATION MEETINGS?

A. Yes. Oncor published notice of the public participation meetings on November 26 and 27, 2022, in the *Denton Record Chronicle* and on November 23, 2022, in the *Wise County Messenger*, newspapers having general circulation in Denton and Wise Counties, respectively. This notice announced the location, time, and purpose of the meetings. A representative copy of the newspaper notices for the public participation meetings can be found in Appendix B of the Environmental Assessment.

Q. PLEASE EXPLAIN THE PUBLIC PARTICIPATION MEETING PROCESS.

A. Oncor held the public participation meetings in an informal, open-house format with information stations relating to various aspects of the project's development. Oncor provided packets of information containing frequently asked questions and the responses to those questions, a map showing the location of the preliminary alternative route links, and a questionnaire for interested parties to fill out.

Each station also had exhibits, maps, aerial photography, and/or other information describing certain aspects of the Proposed Transmission Line Project and was staffed by representatives of Oncor, Halff, and/or

Integra. For example, the various stations included information regarding the CCN process, a discussion of the need for the project, property ownership information, preliminary alternative route links and routing constraints, and environmental and engineering considerations.

The various exhibit areas were arranged to provide attendees with a sequential approach to the information presented as well as the freedom to visit each of the exhibits in any order they wished and to spend as much time as desired at each station. An area was also set aside with tables and chairs to allow attendees an opportunity to complete questionnaires in close proximity to the exhibits. Other resources, such as a GIS (Geographic Information System) mapping tool, were readily available to provide further information on issues that warranted additional discussion or clarification.

The information station format was used because it is Oncor's experience that this format allows attendees to learn about the project in a relaxed manner, to focus on issues of most interest to attendees, and to ask questions of Oncor representatives with knowledge of the various topics presented. Furthermore, this format facilitates more interaction with those attendees who might have been hesitant to participate in a speaker-audience format. This format has been successfully used by Oncor in many CCN proceedings.

Q. HAS ONCOR COMPLIED WITH 16 TAC § 22.52(a)(4) CONCERNING PUBLIC MEETING REQUIREMENTS?

A. Yes. Oncor's public participation meetings satisfied all the requirements set forth in 16 TAC § 22.52(a)(4).

Q. HAVE ONCOR'S OUTREACH EFFORTS CEASED WITH THE PUBLIC PARTICIPATION MEETINGS?

A. No. Even after the public participation meetings, Oncor continued to engage with property owners, municipalities, and state officials to provide notice, solicit feedback, and encourage participation.

Q. PRIOR TO FILING THE APPLICATION, DID ONCOR HAVE FORMAL OR INFORMAL CONTACT WITH DEVELOPERS ABOUT THE PROJECT?

A. Yes, in light of rapid commercial and residential growth experienced in and around the study area—including large residential subdivisions, master planned communities, and commercial and industrial developments—Oncor had formal and/or informal contacts with several developers during routing development, prior to the Application's filing. Oncor met with the following developers regarding the Proposed Transmission Line Project before the Application was filed:

- Hillwood Property and Hillwood Communities (associated with the Treeline, Speedway North, Northlake 1171, Corral City, Harvest Commercial/Residential, and Pecan Square developments);
- DHL Supply Chain (USA) (associated with the DHL Northlake Logistics Center development);
- PMB Capital Investments (associated with Rolling V Ranch);
- GRBK Edgewood LLC and GBTM Sendera LLC d/b/a Green Brick Partners (associated with the Sendera Ranch community);
- Bloomfield Homes (associated with the Timberbrook Master Planned Community); and
- other developers.

Oncor discussed the Proposed Transmission Line Project with these developers in an effort to: (1) provide notice of the project; (2) obtain feedback concerning preliminary routing; (3) ascertain the location, status, and pace of planned development in the study area; and (4) encourage participation in the proceeding after the Application's filing. Oncor also met with BNSF Railway Company, which owns a large rail yard in the study area, for the same purpose.

Oncor sought to discuss the Proposed Transmission Line Project with developers because of the swift development occurring in and around the study area. Oncor attempted to understand where new developments

were planned to potentially mitigate the impact that a route might have on these areas. Section 6.0 of the Environmental Assessment and Routing Study provides additional details regarding additions and modifications of alternative route links.

## IV. ROUTE SELECTION

Q. DID YOU SELECT ALTERNATIVE ROUTES TO BE FILED WITH THE APPLICATION?

A. Yes. As discussed in the response to Question No. 17 of the Application, I selected Route 179 as the route that best meets the requirements of the Texas Utilities Code and the Commission's Substantive Rules. I also selected 73 alternative routes in addition to Route 179 for inclusion in the Application. Additional information concerning my analysis of Route 179 and the other filed alternative routes is contained in a memorandum I prepared, which is included as Attachment No. 7 to the Application and as Exhibit BJP-5 to my direct testimony.

Q. PLEASE DESCRIBE SOME OF THE KEY ATTRIBUTES OF THE 74 FILED ROUTES.

A. Each of the 74 filed routes complies with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code and 16 TAC § 25.101, including the Commission's policy of prudent avoidance, and were developed in compliance with 16 TAC § 22.52(a)(4). The filed routes provide geographic diversity and an adequate number of alternative routes to conduct a proper evaluation. In addition, each of the filed routes were judged feasible from an engineering perspective, based on presently known conditions and constraints, although as Oncor witness Mr. Russell J. Marusak testifies, rapid development is creating new constraints and reducing the available vacant land on which to route the Proposed Transmission Line Project. All 74 filed routes meet all of the statutory and regulatory requirements and are acceptable to Oncor, though as I discuss below, Route 179 remains the route that best meets the applicable routing factors.

Q. WHY DID YOU SELECT ROUTE 179 AS THE "BEST-MEETS" ROUTE?

A. My selection of Route 179, which consists of links A0-A4-B1-B61-B62-C1-C21-C23-C7-E2-E1-E6-G1-G3-H41-H42-H8-I8-J3-K1-L5-L4-L3-L2-M1-M2-M3-R4-V2-Z, is based on the criteria established in Texas Utilities Code §37.056(c)(4)(A)-(D), 16 TAC § 25.101, including the Commission's policy of prudent avoidance, the Commission's CCN application form, the information provided to me by Oncor witness Ms. Amy L. Zapletal regarding cost estimates and engineering constraints, the information included in the Environmental Assessment, and my personal reconnaissance of the study area. As presented in the Application, I also recommend that the Commission consider the 73 additional alternative routes as potential alternatives to Route 179. All of the routes included in the Application comply with the routing requirements of Texas Utilities Code §37.056(c)(4)(A)-(D) and 16 TAC § 25.101.

Q. PLEASE EXPLAIN THE BASIS FOR YOUR SELECTION OF ROUTE 179.

A. Halff provided me with information on 221 preliminary alternative routes in the Environmental Assessment. After analyzing those 221 preliminary alternative routes, I recommended filing 74 of those routes with the Application for the Commission's consideration. In addition to geographic differences, the more significant differences between the 74 filed routes are route lengths, costs, and number of habitable structures within 500 feet. Route lengths for the filed routes range from approximately 19.9 miles to approximately 22.9 miles. The estimated transmission line costs for the filed routes range from approximately ~~$164,581,000~~$168,332,000 to ~~$237,423,000~~$238,602,000. The number of habitable structures within 500 feet of the filed routes ranges from 93 to 400.

Given the balance of the factors, I selected Route 179 as the route that best meets the requirements of Texas Utilities Code §37.056(c)(4)(A)-(D) and 16 TAC § 25.101. Specifically, this route:

- is approximately 21.8 miles long, which is approximately 1.9 miles longer than the shortest filed route and 1.1 miles shorter than the longest alternative route;
- has an estimated cost of ~~$175,208,000~~$178,749,000, which is approximately ~~35.5%~~33.5% less than the most expensive alternative route and approximately ~~6.5%~~6.2% more than the least expensive alternative route; and
- has 97 habitable structures within 500 feet of its centerline, which is only four more than the lowest number of habitable structures within 500 feet of an alternative route's centerline and 303 less than the highest number of habitable structures within 500 feet of an alternative route's centerline.

In addition, Route 179 was judged to be feasible from an engineering perspective based on currently known conditions without the benefit of on-the-ground surveys.

Q. HOW HAS YOUR OPINION ON ROUTE 179 EVOLVED IN THE WEEKS SINCE YOU SELECTED IT AS THE ROUTE BEST MEETING THE APPLICABLE ROUTING FACTORS?

A. As stated previously in my testimony, the rapid development in the study area is causing a reduction in available vacant land through which the Proposed Transmission Line Project could be routed. Attached hereto as Exhibit BJP-6 is an aerial map showing development in the study area and highlighting developments that are in progress and for which Oncor received information from developers following the public meeting. Route 179 makes reasonable efforts to avoid these areas while taking into consideration costs and the Commission's policy of prudent avoidance. The rapid expansion of development in the study area weighs heavily on my view of the alternative routes, and it is another reason why Route 179 best meets the applicable routing factors.

Q. DOES ROUTE 179 COMPLY WITH TEXAS UTILITIES CODE § 37.056(c)(4)(A)-(D) AND 16 TAC §25.101(b)(3)(B)?

A. Yes. Route 179 does not significantly impact community values, recreational and park areas, historical and aesthetic values, or the environmental integrity of the area traversed by the Proposed Transmission Line Project. Route 179 limits exposures to electric and magnetic fields that can be avoided with reasonable investments of money and effort and gives adequate consideration to the utilization and paralleling of existing compatible corridors. Route 179 does not significantly impact communication facilities, airports or heliports, cropland irrigated by traveling irrigation systems, or known cultural resource sites. The proposed route is routed to the extent reasonable to moderate the impact on the affected community and directly affected landowners.

Q. WHAT IS YOUR BASIS FOR RECOMMENDING THAT THE COMMISSION CONSIDER THE OTHER 73 ALTERNATIVE ROUTES FILED WITH THE APPLICATION?

A. Each of the 73 other alternative routes filed with the Application also comply with the provisions of Texas Utilities Code § 37.056(c) and 16 TAC § 25.101. In addition, they provide geographic diversity and an adequate number of alternative routes to conduct a proper evaluation.

Q. ARE YOU FAMILIAR WITH THE COMMISSION'S "POLICY OF PRUDENT AVOIDANCE"?

A. Yes, I am.

Q. BRIEFLY DESCRIBE YOUR UNDERSTANDING OF THE COMMISSION'S POLICY OF PRUDENT AVOIDANCE.

A. 16 TAC § 25.101 defines prudent avoidance as "the limiting of exposures to electric and magnetic fields that can be avoided with reasonable investments of money and effort." My understanding of the Commission's policy of prudent avoidance is that the process of routing a proposed transmission line should include consideration of routing options that will

reasonably avoid population centers and other locations where people gather. This does not mean that a proposed transmission line must avoid habitable structures at all costs, but that reasonable alternatives should be considered.

Q. DO THE PROPOSED ROUTING ALTERNATIVES ADHERE TO THE COMMISSION'S POLICY OF PRUDENT AVOIDANCE?

A. Yes, all of the 74 alternative routes proposed in the Application comply with the Commission's policy of prudent avoidance.

## V. ADEQUACY OF ROUTES

Q. DOES THE APPLICATION ADEQUATELY CONTAIN AN ADEQUATE NUMBER OF ALTERNATIVE ROUTES TO CONDUCT A PROPER EVALUATION?

A. Yes. Visual inspection of Figures 3-1A, 3-1B, 3-1C, and 3-1D in the Environmental Assessment shows the nature of the project area. Within this area, Oncor's Application includes 74 reasonably differentiated and geographically diverse alternative routes that are reasonably forward-progressing given the area constraints and are consistent with the provisions of the Texas Utilities Code and the Commission's Substantive Rules.

Based on my experience, my visual inspection of the area on reconnaissance visits, and my detailed review and evaluation of the data presented in the Environmental Assessment, the Application contains an adequate number of alternative routes to conduct a proper evaluation. Thus, the adequacy of the routing options provided by Oncor in its Application is demonstrated both by the number of options presented to the Commission and the geographic diversity present among these options. Further, given the physical constraints—particularly in the south and east of the study area—it is unlikely that routes of lower cost or more consistent rule compatibility could be identified outside of those presented in the Application.

Q. WERE ALL PRELIMINARY ALTERNATIVE LINKS DEVELOPED BY HALFF UTILIZED IN YOUR SELECTION OF ALTERNATIVE ROUTES?.

A. Yes.

## VI. NOTICE

Q. WILL ONCOR PROVIDE NOTICE OF THE FILING OF THIS APPLICATION AS REQUIRED BY THE COMMISSION'S PROCEDURAL RULES?

A. Yes. Public notice of the Application will be published in the *Denton Record Chronicle*, a paper of general circulation in Denton County, Texas, and in the *Wise County Messenger*, a paper of general circulation in Wise County, Texas. A publishers' affidavit attesting to the publication of this notice will be attached to an affidavit from Oncor attesting to the provision of newspaper notice.

On the date the Application is filed with the Commission, Oncor will also provide notice in the following ways:

- mail written notice of the Application (in the form required by the Commission) to each landowner of record, based on a review of current county property tax rolls, that would be directly affected (as defined in 16 TAC § 22.52(a)(3)) by the Commission's approval of the Application on one or more of the proposed routes;
- mail written notice of the Application to the county judge and commissioners of Denton County and Wise County, the only counties where any portion of the requested facilities will be located;
- mail written notice of the Application to the mayor and city council members of the towns of Argyle, Bartonville, Corral City, DISH, Double Oak, Flower Mound, Northlake, Trophy Club, and Westlake, and the cities of Aurora, Denton, Fort Worth, Haslet, Justin, Keller, New Fairview, Newark, Rhome, Southlake, and Roanoke, the only municipalities within five (5) miles of the requested facilities;

- mail written notice of the Application to Brazos Electric Power Cooperative, Denton Municipal Electric d/b/a CoServ Electric, Texas Municipal Power Agency, Tri-County Electric Cooperative, and Wise County Electric Cooperative, the only neighboring utilities providing electric service within a five (5) mile radius of the proposed route;
- mail courtesy written notice of the Application to certain pipeline owners and operators. A representative copy of the notice is included as an Attachment No. 15 to the Application;
- e-mail and mail written notice of the Application to the Department of Defense Siting Clearinghouse at the email and physical addresses contained in the Application;
- mail a copy of the Application and its attachments to the Office of Public Utility Counsel; and
- mail a copy of the Environmental Assessment to the Texas Parks and Wildlife Department within seven days of the Application's filing.

Q. DID ONCOR PROVIDE ANY NOTICES OF THE FILING OF THE APPLICATION IN ADDITION TO THE NOTICES REQUIRED BY THE COMMISSION'S PROCEDURAL RULES?

A. Yes. In the form required by the Commission, Oncor mailed written notice of the Application to each landowner of record, according to current county tax rolls, of property within 520 feet of the centerline of all filed routes, irrespective of whether a habitable structure was located on such properties. Oncor was intentionally over-inclusive in mailing written notice of the Application to landowners. Additionally, Oncor mailed courtesy notices to the Permian Basin Petroleum Association, Texas Oil and Gas Association, Texas Pipeline Association, and owners/operators of pipelines located in the study area.

Q. WILL ONCOR'S PROVISION OF NOTICE FOR THE PROPOSED TRANSMISSION LINE PROJECT COMPLY WITH 16 TAC § 22.52?

A. Yes. Oncor will file affidavits in the docket attesting to the provision of notice in compliance with 16 TAC § 22.52.

## VII. CONCLUSION

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

## AFFIDAVIT

**STATE OF TEXAS** §
§
**COUNTY OF TARRANT** §

**BEFORE ME,** the undersigned authority, on this day personally appeared Brenda J. Perkins who, having been placed under oath by me, did depose as follows:

My name is Brenda J. Perkins. I am of legal age and a resident of the State of Texas. The foregoing testimony and exhibits offered by me are true and correct, and the opinions stated therein are, to the best of my knowledge and belief, accurate, true and correct.

_____
Brenda J. Perkins

**SUBSCRIBED AND SWORN TO BEFORE ME** on this _____ day of August, 2023.

_____
Notary Public, State of Texas

My Commission Expires:

_____

# Office Memorandum

**Date:** May 30, 2023

**To:** File

**From:** Brenda J. Perkins

**Subject:** Alternative Routes Evaluation: Ramhorn Hill-Dunham 345 kV Transmission Line Project

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This memorandum discusses my evaluation of routing alternatives for Oncor Electric Delivery Company LLC's ("Oncor's") proposed Ramhorn Hill-Dunham 345 kV Transmission Line Project ("Proposed Transmission Line Project"). In addition to the recommendation for a route that best meets the requirements of the Texas Utilities Code and the Substantive Rules of the Public Utility Commission of Texas ("Commission"), I also selected alternative routes to be filed with this CCN Application.

The goal of this process is to provide the Commission with an adequate number of alternative routes to conduct a proper evaluation. These alternative routes provide good geographic diversity while complying with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, Commission Procedural Rule 22.52(a)(4), and Commission Substantive Rule 25.101(b)(3)(B), including the Commission's policy of prudent avoidance.

My recommendations are based on my reconnaissance and observations of the project area, my independent review of the data included in the *Environmental Assessment and Alternative Route Analysis for Oncor Electric Delivery Company LLC's Proposed Ramhorn Hill Switch-Dunham Switch 345 kV Transmission Line Project in Denton and Wise Counties, Texas* ("Environmental Assessment and Routing Study"), prepared by Halff Associates, Inc. ("Halff"), my discussions with Halff personnel, my discussions with Oncor personnel, my participation in the public participation meeting process, my review of correspondence related to the Proposed Transmission Line Project, my understanding of other input that Oncor received from interested parties, and other information. My recommendation incorporates consideration of engineering feasibility, the estimated cost of alternative routes, construction limitations, and other information.

Halff documented its efforts to identify potential preliminary alternative routes for the Proposed Transmission Line Project in Section 4.0 of the Environmental Assessment and Routing Study. After Halff completed the initial data gathering and constraints mapping process, they identified preliminary alternative route links on recent aerial photography obtained from NearMap (available through Halff's subscription service). These preliminary alternative route links were selected considering the location of existing corridors, apparent property boundaries and routing constraints. Some of the routing constraints within the study area are: United States Army Corp of Engineers ("USACE") owned recreational and environmentally sensitive land; many major highways where 90-degree roadway crossings by transmission lines are required by the Texas Department of Transportation; oil and gas facilities; existing and developing residential and commercial areas; aircraft landing facilities; as well as other constraints. Numerous preliminary

alternative route links were identified by Halff, prior to the public participation meetings, that when combined, formed many preliminary alternative routes to connect the proposed Ramhorn Hill Switch to the proposed Dunham Switch. The preliminary alternative route links evaluated by Halff and presented at the public participation meetings are depicted in Figures 6-1 through 6-8 located in Appendix C of the Environmental Assessment and Routing Study, along with the alternative route link deletions, additions and modifications that were made following the public participation meetings. The modified preliminary alternative route links are discussed in detail in Section 6.0 of the Environmental Assessment and Routing Study and are briefly summarized below.

In general, links were modified where possible to address public comments and routing constraints identified after additional field investigations. Following the preliminary alternative route link revisions, a total of 140 alternative route links were adopted. Halff identified several hundred thousand alternative routes using these route links. Through an iterative process that considered route length, constraints data, input from public meetings, and information from local, state, and federal officials, Halff and Oncor reduced the total number of route combinations to a smaller subset of geographically diverse and forward progressing alternative routes that were further evaluated, as discussed in Section 7.0 of the Environmental Assessment and Routing Study. A total of 221 alternative routes were selected for further analysis as provided in Table 7-2 in Appendix E of the Environmental Assessment and Routing Study.

Each of the 221 preliminary alternative routes identified possesses both positive and negative comparative attributes. I considered these attributes to select a set of geographically diverse routing alternatives to be filed as a part of this Application. Each alternative route complies with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code and the Commission's Substantive Rule 25.101, including the Commission's policy of prudent avoidance.

Below, I discuss the alternative routes that I selected to be filed with the Application. The alternative routes can be grouped in many different ways; one approach is the grouping of alternative routes into geographic corridors. I grouped the alternative routes into six different geographic corridors using State Highway ("SH") 114 as the division between north and south corridor designation. These six corridors are identified as the: (1) north corridor using Link M8; (2) north corridor using Link M7; (3) north corridor using Link M6; (4) south corridor using Link M5; (5) south corridor using Link M4; and (6) south corridor using Link M3 (*see* map attached to this Memorandum for these alternative route link locations). All alternative routes cross several major highways due to the location of this project's endpoints being on opposite sides of these highways: United States Highway ("US") 377, Interstate Highway ("IH") 35W, Farm to Market ("FM") 156, SH 114, and US 287/81.

I selected 74 geographically diverse alternative routes to be filed with the CCN Application to allow for an adequate number of alternative routes to conduct a proper evaluation. The links that comprise these alternative routes are presented in Table 1, attached to this Memorandum. Table 2, attached to this Memorandum, presents quantifiable environmental data on the 74 alternative routes filed as a part of the CCN Application. The filed alternative routes use each of the 140 alternative links in at least one route.

I then presented these 74 alternative routes to Oncor's engineer overseeing this project, Ms. Amy Zapletal, for consideration of engineering feasibility, construction limitations, and alternative route cost estimates. Below is a discussion of each of the six geographic corridors and the alternative routes selected for filing within each corridor.

The north corridor routes containing Link M8 ("Link M8 Corridor Routes") vary in length from approximately 20.8 to 22.5 miles. Transmission line costs for Link M8 Corridor Routes range from ~~$166,165,000~~ $168,332,000 to ~~$178,245,000~~ $179,510,000. Link M8 Corridor Routes contain the greatest number of habitable structures within 500 feet of the route centerline with numbers varying from 188 to 400. The 11 alternatives filed in the Application from the Link M8 Corridor Routes include Alternative Routes 1, 65, 67, 68, 69, 72, 96, 142, 143, 191 and 192.

The north corridor routes containing Link M7 ("Link M7 Corridor Routes") vary in length from approximately 20.5 to 22.5 miles. Transmission line costs for Link M7 Corridor Routes range from ~~$167,945,000~~ $170,710,000 to ~~$188,738,000~~ $191,922,000. Link M7 Corridor Routes vary in the number of habitable structures within 500 feet of the route centerline from 108 to 327. The 17 alternatives filed in the Application from the Link M7 Corridor Routes include Alternative Routes 41, 42, 54, 71, 86, 94, 103, 138, 175, 176, 184, 185, 207, 217, 218, 219 and 221.

The north corridor routes using Link M6 ("Link M6 Corridor Routes") include the longest filed route (Route 216) with routes within this corridor varying in length from approximately 20.4 to 22.9 miles. Transmission line costs for Link M6 Corridor Routes range from ~~$171,340,000~~ $174,833,000 to ~~$237,423,000~~ $238,602,000. Link M6 Corridor Routes vary in the number of habitable structures within 500 feet of the route centerline from 145 to 364. The 12 alternatives filed in the Application from the Link M6 Corridor Routes include Alternative Routes 10, 11, 19, 33, 92, 117, 154, 170, 178, 186, 187 and 216.

The south corridor routes containing Link M5 ("Link M5 Corridor Routes") contain the shortest filed route (Route 16) with route lengths varying from approximately 19.9 to 22.5 miles. Transmission line costs for Link M5 Corridor Routes range from ~~$172,350,000~~ $173,591,000 to $208,670,000. Link M5 Corridor Routes vary in the number of habitable structures within 500 feet of the route centerline from 132 to 271. The 9 alternatives filed in the Application from the Link M5 Corridor Routes include Alternative Routes 5, 16, 25, 26, 28, 61, 108, 146, and 200.

The south corridor routes using Link M4 ("Link M4 Corridor Routes") vary in length from approximately 20.0 to 22.2 miles. Transmission line costs for Link M4 Corridor Routes range from ~~$172,226,000~~ $173,341,000 to $212,686,000. Link M4 Corridor Routes vary in the number of habitable structures within 500 feet of the route centerline from 151 to 266. The 10 alternatives filed in the Application from the Link M4 Corridor Routes include Alternative Routes 3, 15, 24, 36, 44, 58, 63, 70, 78 and 137.

The south corridor routes using Link M3 ("Link M3 Corridor Routes") vary in length from approximately 20.6 to 22.5 miles. Transmission line costs for Link M3 Corridor Routes range from ~~$164,581,000~~ $168,800,000 to ~~$224,991,000~~ $226,760,000. Link M3 Corridor Routes contain the least number of habitable structures within 500 feet of the route centerline with numbers varying from 93 to 205. The 15 alternatives filed in the Application from the Link M3 Corridor Routes include Alternative Routes 13, 14, 18, 22, 23, 29, 43, 87, 116, 119, 130, 132, 164, 179 and 199.

After analyzing each of the 74 routes within the six geographic corridors, I selected Route 179 of the Link M3 Corridor Routes as the route that best meets the requirements of Texas Utilities Code Section 37.056 (c)(4)(A)-(D) and the Commission Substantive Rule 25.101(b)(3)(B). Route 179 is comprised of Links A0-A4-B1-B61-B62-C1-C21-C23-C7-E2-E1-E6-G1-G3-H41-H42-H8-I8-J3-K1-L5-L4-L3-L2-M1-M2-M3-R4-V2-Z.

Some of the significant factors which led to the selection of Route 179 include the following:

- The length of Route 179 is approximately 21.8 miles, which is only 1.9 miles longer than the shortest among all the filed routes (Route 16) and approximately 1.1 miles shorter than the longest alternative route included in the Application (Route 216 is the longest at approximately 22.9 miles);
- The transmission line estimated cost for Route 179 is ~~$175,208,000~~ $178,749,000, which is approximately ~~6.5%~~ 6.2% more than the least expensive alternative route (Route ~~29~~ 96 estimated at ~~$164,581,000~~ $168,332,000) and is approximately ~~35.5%~~ 33.5% less than the most expensive alternative route (Route 117 estimated at ~~$237,423,000~~ $238,602,000);
- There are 97 habitable structures within 500 feet of the centerline of Route 179, which is only four more than the route with the least number (95 for Route 164) and 303 less than the route with the highest number (400 for Route 192);
- Route 179 parallels existing compatible corridors for 23% of its length (including apparent property boundaries). Route 117 possesses the highest percentage parallel to existing corridors (40%), but is longer in route length (22.7 miles) and has a higher number of habitable structures within 500 feet its centerline (263). Route 221 had the lowest percentage (17%) parallel to existing corridors;
- Route 179 has 4,607 feet of its route through commercial/industrial areas. Route lengths through commercial/industrial areas varied from 4,085 feet (Route 219) to 14,702 feet (Route 117);
- Route 179 crosses 20,248 feet of cropland/hay meadow and crosses 71,051 feet of rangeland pasture. Route lengths crossing cropland/hay meadow varied from 12,347 feet (Route 164) to 36,231 feet (Route 69). Route lengths crossing rangeland pasture varied from 46,458 feet (Route 26) to 76,318 feet (Route 187);
- Route 179 crosses 10,126 feet of upland woodlands and has 7,162 feet of its route through riparian areas. Route 26 has the greatest length (15,960 feet) of its route across upland woodlands and Route 28 has the greatest length (15,718 feet) of its route across riparian areas. The Link M5 Corridor Routes contain the greatest length across upland woodlands and riparian areas which are associated with the floodplain of Elizabeth Creek;
- Route 179 has no length of its route across potential wetlands (57 of the filed routes cross potential wetlands, with Routes 92 and 218 having the highest crossing length of 849 feet);
- Route 179 has 27 streams crossed by its centerline (the greatest number of streams crossed within the filed routes is 33);
- The length of Route 179 that is parallel to streams (within 100 feet) is 1,351 feet (the greatest amount of route length parallel to streams within the filed routes is 5,108 feet);

- Route 179 has 1,704 feet of its route across lakes or ponds (open waters). Route 185 has the greatest length (2,080 feet) across lakes or ponds of the filed routes;
- Route 179 has one known rare/unique plant location within the route right-of-way. Nine of the filed routes have four known rare/unique plant locations within the route right-of-way;
- Route 179 has one recorded cultural resource site crossed by its centerline (34 of the filed routes have one recorded cultural resource site crossed by their centerline);
- Route 179 has three recorded cultural resource sites within 1,000 feet of its centerline (all filed routes have at least one recorded cultural resource site within 1,000 feet of their centerline and two of the filed routes have five recorded cultural resource sites within 1,000 feet of their centerline);
- Route 179 has three FAA-registered airports with a runway greater than 3,200 feet within 20,000 feet of the centerline along its entire length (all filed routes have at least three FAA-registered airports with a runway greater than 3,200 feet within 20,00 feet of their centerline, with some filed routes having four);
- Route 179 has four FAA-registered airports with no runway greater than 3,200 feet within 10,000 feet of the centerline along its entire length (three of the filed routes have six FAA-registered airports with no runway greater than 3,200 feet within 10,000 feet of their centerline);
- Route 179 has two heliports located within 5,000 feet of its centerline (the range of heliports within 5,000 feet of the filed route centerlines is one to three);
- Route 179 has two electronic installations within 2,000 feet of its centerline (the range in electronic installations within 2,000 feet of the filed route centerlines is 0 to 6);
- Route 179 crosses nineteen U.S. or State Highways along its entire length (the greatest number of U.S. or State Highways crossings is twenty);
- Route 179 crosses eleven FM, county roads or other streets along its entire length (the greatest number of FM, county roads or other street crossings is fourteen); and
- Route 179 has been judged to be feasible from an engineering perspective based on currently known conditions, without the benefit of on-the-ground and subsurface surveys, and there are no currently identifiable engineering constraints that impact this alternative route that cannot be addressed with additional consideration by Oncor during the engineering and construction process.

Additional information concerning the issues addressed in this memorandum can be found in the Environmental Assessment and Routing Study, included as Attachment No. 1 to the CCN Application.

After considering all of the parameters and issues as discussed in this memo, I selected Route 179 as the alternative route that best meets the requirements of the Texas Utilities Code and the Commission's Substantive Rules.

TABLE 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 1 | 3 | 5 | 10 | 11 | 13 | 14 |
|---|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 111,751 | 108,960 | 108,537 | 107,966 | 108,190 | 108,924 | 111,501 |
| Length of alternative route (miles) | 21.2 | 20.6 | 20.6 | 20.4 | 20.5 | 20.6 | 21.1 |
| Length of route parallel to existing electric transmission lines | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route parallel to railroads | 0 | 0 | 0 | 5,514 | 5,514 | 9,775 | 5,514 |
| Length of route parallel to existing public roads/highways | 6,399 | 18,576 | 17,471 | 13,164 | 13,164 | 13,422 | 11,973 |
| Length of route parallel to pipelines[1] | 14,491 | 20,687 | 18,840 | 12,611 | 13,456 | 11,981 | 11,981 |
| Length of route parallel to apparent property boundaries | 20,181 | 34,445 | 29,455 | 32,172 | 33,585 | 34,587 | 29,931 |
| Total length of route parallel to existing compatible rights-of-way | 20,181 | 34,445 | 29,455 | 35,263 | 36,675 | 34,587 | 29,931 |
| Number of habitable structures within 500 feet of the route centerline[2] | 188 | 151 | 132 | 348 | 352 | 193 | 191 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 7 | 8 | 8 | 5 | 5 | 4 | 4 |
| Length of the route across parks/recreational areas | 3,343 | 2,110 | 2,110 | 12 | 12 | 12 | 12 |
| Length of route through commercial/industrial areas | 4,442 | 14,410 | 14,072 | 11,359 | 11,360 | 10,757 | 10,651 |
| Length of the route across cropland/hay meadow | 22,786 | 13,846 | 14,791 | 16,078 | 17,856 | 16,701 | 16,701 |
| Length across rangeland pasture | 59,773 | 55,809 | 50,198 | 60,596 | 57,524 | 60,399 | 64,096 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 13,402 | 12,571 | 13,010 | 10,920 | 11,755 | 12,043 | 11,427 |
| Length of route across riparian areas | 9,245 | 10,765 | 14,923 | 7,456 | 8,113 | 7,493 | 7,530 |
| Length of route across potential wetlands | 224 | 393 | 393 | 790 | 790 | 393 | 393 |
| Number of stream crossings by the route | 28 | 19 | 21 | 19 | 19 | 16 | 16 |
| Length of route parallel to streams (within 100 feet) | 3,901 | 504 | 504 | 0 | 0 | 0 | 0 |
| Length across lakes or ponds (open waters) | 1,879 | 1,165 | 1,150 | 768 | 792 | 1,139 | 704 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 | 3 | 2 | 2 | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 37,497 | 42,191 | 59,354 | 32,394 | 32,563 | 33,746 | 34,797 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 | 3 | 4 | 4 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 5 | 1 | 1 | 1 | 1 | 1 | 1 |
| Number of heliports located within 5,000 feet of the route centerline | 1 | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 1 | 6 | 6 | 3 | 3 | 3 | 3 |
| Number of U.S. or State Highway crossings by the route | 17 | 16 | 16 | 16 | 16 | 16 | 16 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 9 | 13 | 11 | 9 | 10 | 8 | 8 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 42,489 | 56,026 | 72,406 | 55,542 | 61,637 | 50,817 | 48,497 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 42,567 | 45,051 | 45,051 | 55,500 | 55,500 | 43,544 | 43,544 |
| Estimated transmission line cost | ~~$ 167,829,000~~ 169,701,000 | $ 212,686,000 | $ 208,670,000 | ~~$ 184,611,000~~ 185,726,000 | ~~$ 186,578,000~~ 187,693,000 | ~~$ 176,468,000~~ 177,092,000 | ~~$ 179,563,000~~ 180,184,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 15 | 16 |
|---|---|---|
| Length of alternative route (feet) | 105,547 | 105,124 |
| Length of alternative route (miles) | 20.0 | 19.9 |
| Length of route parallel to existing electric transmission lines | 0 | 0 |
| Length of route parallel to railroads | 5,514 | 5,514 |
| Length of route parallel to existing public roads/highways | 13,079 | 11,973 |
| Length of route parallel to pipelines[1] | 15,633 | 13,785 |
| Length of route parallel to apparent property boundaries | 34,920 | 29,931 |
| Total length of route parallel to existing compatible rights-of-way | 34,920 | 29,931 |
| Number of habitable structures within 500 feet of the route centerline[2] | 210 | 191 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 4 | 4 |
| Length of the route across parks/recreational areas | 12 | 12 |
| Length of route through commercial/industrial areas | 11,029 | 10,691 |
| Length of the route across cropland/hay meadow | 18,200 | 19,144 |
| Length across rangeland pasture | 54,905 | 49,294 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 12,184 | 12,622 |
| Length of route across riparian areas | 7,959 | 12,117 |
| Length of route across potential wetlands | 393 | 393 |
| Number of stream crossings by the route | 17 | 19 |
| Length of route parallel to streams (within 100 feet) | 0 | 0 |
| Length across lakes or ponds (open waters) | 878 | 863 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 1 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 36,472 | 53,635 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 1 | 1 |
| Number of heliports located within 5,000 feet of the route centerline | 3 | 3 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 4 | 4 |
| Number of U.S. or State Highway crossings by the route | 16 | 16 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 10 | 8 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 48,497 | 64,876 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 43,544 | 43,544 |
| Estimated transmission line cost | ~~$ 177,830,000~~ 178,454,000 | ~~$ 173,814,000~~ 174,438,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 18 | 19 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 111,183 | 114,265 | 110,345 | 109,621 | 106,244 | 105,821 |
| Length of alternative route (miles) | 21.1 | 21.6 | 20.9 | 20.8 | 20.1 | 20.0 |
| Length of route parallel to existing electric transmission lines | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route parallel to railroads | 9,775 | 0 | 5,514 | 9,775 | 5,514 | 5,514 |
| Length of route parallel to existing public roads/highways | 13,422 | 10,475 | 9,616 | 11,065 | 10,721 | 9,616 |
| Length of route parallel to pipelines[1] | 11,981 | 13,868 | 11,981 | 11,981 | 15,633 | 13,785 |
| Length of route parallel to apparent property boundaries | 31,685 | 22,421 | 28,537 | 32,798 | 33,131 | 28,141 |
| Total length of route parallel to existing compatible rights-of-way | 31,685 | 25,511 | 28,537 | 32,798 | 33,131 | 28,141 |
| Number of habitable structures within 500 feet of the route centerline[2] | 193 | 320 | 197 | 200 | 217 | 198 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 4 | 9 | 5 | 5 | 5 | 5 |
| Length of the route across parks/recreational areas | 12 | 3,343 | 12 | 12 | 12 | 12 |
| Length of route through commercial/industrial areas | 10,769 | 5,282 | 11,504 | 11,514 | 11,787 | 11,449 |
| Length of the route across cropland/hay meadow | 19,126 | 20,377 | 13,953 | 13,953 | 15,453 | 16,397 |
| Length across rangeland pasture | 60,404 | 62,432 | 62,164 | 60,635 | 55,141 | 49,530 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 12,056 | 13,108 | 13,940 | 14,545 | 14,686 | 15,125 |
| Length of route across riparian areas | 7,281 | 10,631 | 7,742 | 7,493 | 7,959 | 12,117 |
| Length of route across potential wetlands | 393 | 621 | 393 | 393 | 393 | 393 |
| Number of stream crossings by the route | 16 | 29 | 19 | 17 | 18 | 20 |
| Length of route parallel to streams (within 100 feet) | 0 | 3,165 | 656 | 0 | 0 | 0 |
| Length across lakes or ponds (open waters) | 1,154 | 1,814 | 649 | 1,088 | 826 | 811 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 | 1 | 1 | 1 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 0 | 1 | 1 | 1 | 1 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 4 | 3 | 3 | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 36,005 | 48,534 | 35,217 | 34,176 | 36,902 | 54,065 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 4 | 3 | 3 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 1 | 5 | 1 | 1 | 1 | 1 |
| Number of heliports located within 5,000 feet of the route centerline | 3 | 1 | 3 | 3 | 3 | 3 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 3 | 2 | 4 | 3 | 4 | 4 |
| Number of U.S. or State Highway crossings by the route | 16 | 19 | 16 | 16 | 16 | 16 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 8 | 8 | 10 | 9 | 11 | 9 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 52,203 | 49,132 | 47,992 | 49,940 | 47,620 | 63,999 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 43,544 | 59,890 | 49,200 | 44,988 | 44,988 | 44,988 |
| Estimated transmission line cost | ~~$ 179,754,000~~ 180,375,000 | ~~$ 171,340,000~~ 174,833,000 | ~~$ 183,426,000~~ 184,050,000 | ~~$ 182,133,000~~ 184,250,000 | ~~$ 183,495,000~~ 185,612,000 | ~~$ 179,479,000~~ 181,596,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 26 | 28 | 29 |
|---|---|---|---|
| Length of alternative route (feet) | 106,045 | 110,319 | 114,320 |
| Length of alternative route (miles) | 20.1 | 20.9 | 21.7 |
| Length of route parallel to existing electric transmission lines | 0 | 0 | 0 |
| Length of route parallel to railroads | 5,514 | 0 | 0 |
| Length of route parallel to existing public roads/highways | 9,616 | 14,204 | 10,672 |
| Length of route parallel to pipelines[1] | 14,630 | 18,017 | 10,506 |
| Length of route parallel to apparent property boundaries | 29,554 | 30,367 | 28,240 |
| Total length of route parallel to existing compatible rights-of-way | 29,554 | 30,367 | 28,240 |
| Number of habitable structures within 500 feet of the route centerline[2] | 202 | 133 | 131 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 5 | 9 | 3 |
| Length of the route across parks/recreational areas | 12 | 2,099 | 0 |
| Length of route through commercial/industrial areas | 11,450 | 11,740 | 5,249 |
| Length of the route across cropland/hay meadow | 18,174 | 14,642 | 18,489 |
| Length across rangeland pasture | 46,458 | 52,592 | 69,551 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 |
| Length of route across upland woodlands | 15,960 | 13,784 | 12,740 |
| Length of route across riparian areas | 12,774 | 15,718 | 6,125 |
| Length of route across potential wetlands | 393 | 404 | 404 |
| Number of stream crossings by the route | 20 | 25 | 27 |
| Length of route parallel to streams (within 100 feet) | 0 | 1,018 | 1,865 |
| Length across lakes or ponds (open waters) | 835 | 1,440 | 1,763 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 1 | 1 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 54,234 | 64,206 | 39,609 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 1 | 2 | 4 |
| Number of heliports located within 5,000 feet of the route centerline | 3 | 3 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 4 | 6 | 3 |
| Number of U.S. or State Highway crossings by the route | 16 | 19 | 19 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 10 | 10 | 10 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 70,095 | 68,054 | 43,149 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 44,988 | 46,042 | 42,806 |
| Estimated transmission line cost | ~~$ 181,445,000~~ 183,562,000 | ~~$ 206,668,000~~ 207,292,000 | ~~$ 164,581,000~~ 168,800,000 |

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(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 33 | 36 | 41 | 42 | 43 | 44 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 116,619 | 108,375 | 110,686 | 108,034 | 109,788 | 106,411 |
| Length of alternative route (miles) | 22.1 | 20.5 | 21.0 | 20.5 | 20.8 | 20.2 |
| Length of route parallel to existing electric transmission lines | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route parallel to railroads | 0 | 0 | 2,435 | 0 | 9,775 | 5,514 |
| Length of route parallel to existing public roads/highways | 19,333 | 11,504 | 7,940 | 7,335 | 9,410 | 9,067 |
| Length of route parallel to pipelines[1] | 12,545 | 13,898 | 22,956 | 21,112 | 11,409 | 15,060 |
| Length of route parallel to apparent property boundaries | 26,245 | 28,120 | 24,374 | 23,769 | 23,357 | 23,690 |
| Total length of route parallel to existing compatible rights-of-way | 32,991 | 28,120 | 24,374 | 23,769 | 23,357 | 23,690 |
| Number of habitable structures within 500 feet of the route centerline[2] | 183 | 155 | 168 | 158 | 197 | 214 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 3 | 3 | 3 | 3 | 5 | 5 |
| Length of the route across parks/recreational areas | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route through commercial/industrial areas | 6,015 | 4,958 | 4,730 | 4,507 | 7,998 | 8,270 |
| Length of the route across cropland/hay meadow | 20,260 | 21,747 | 20,443 | 20,443 | 15,589 | 17,089 |
| Length across rangeland pasture | 67,061 | 61,268 | 63,880 | 61,854 | 64,498 | 59,004 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 11,491 | 11,307 | 11,836 | 11,541 | 11,058 | 11,199 |
| Length of route across riparian areas | 9,331 | 7,211 | 7,866 | 7,759 | 9,071 | 9,537 |
| Length of route across potential wetlands | 625 | 0 | 0 | 0 | 0 | 0 |
| Number of stream crossings by the route | 28 | 25 | 26 | 25 | 20 | 21 |
| Length of route parallel to streams (within 100 feet) | 695 | 695 | 695 | 695 | 0 | 0 |
| Length across lakes or ponds (open waters) | 1,836 | 1,883 | 1,930 | 1,930 | 1,574 | 1,312 |
| Number of known rare/unique plant locations within the right-of-way | 4 | 1 | 1 | 1 | 1 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 1 | 0 | 0 | 1 | 1 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 2 | 3 | 1 | 1 | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 42,802 | 40,385 | 40,653 | 40,246 | 38,472 | 41,197 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 4 | 3 | 4 | 4 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 4 | 4 | 4 | 4 | 2 | 2 |
| Number of heliports located within 5,000 feet of the route centerline | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 3 | 3 | 1 | 1 | 3 | 4 |
| Number of U.S. or State Highway crossings by the route | 20 | 19 | 19 | 19 | 19 | 19 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 8 | 11 | 9 | 10 | 7 | 9 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 48,563 | 44,594 | 45,348 | 42,697 | 52,551 | 50,232 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 49,997 | 41,848 | 41,950 | 38,973 | 47,790 | 47,790 |
| Estimated transmission line cost | ~~$ 187,535,000~~ 189,934,000 | ~~$ 172,226,000~~ 173,341,000 | ~~$ 173,399,000~~ 176,550,000 | ~~$ 168,310,000~~ 171,461,000 | ~~$ 177,923,000~~ 180,040,000 | ~~$ 179,285,000~~ 181,402,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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.

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TABLE 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 54 | 58 |
|---|---|---|
| Length of alternative route (feet) | 111,219 | 107,108 |
| Length of alternative route (miles) | 21.1 | 20.3 |
| Length of route parallel to existing electric transmission lines | 0 | 0 |
| Length of route parallel to railroads | 0 | 5,514 |
| Length of route parallel to existing public roads/highways | 8,950 | 6,709 |
| Length of route parallel to pipelines[1] | 19,983 | 15,060 |
| Length of route parallel to apparent property boundaries | 21,050 | 21,901 |
| Total length of route parallel to existing compatible rights-of-way | 25,023 | 21,901 |
| Number of habitable structures within 500 feet of the route centerline[2] | 267 | 221 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 4 | 6 |
| Length of the route across parks/recreational areas | 0 | 0 |
| Length of route through commercial/industrial areas | 5,547 | 9,028 |
| Length of the route across cropland/hay meadow | 18,902 | 14,341 |
| Length across rangeland pasture | 66,496 | 59,240 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 11,265 | 13,701 |
| Length of route across riparian areas | 7,255 | 9,537 |
| Length of route across potential wetlands | 268 | 0 |
| Number of stream crossings by the route | 29 | 22 |
| Length of route parallel to streams (within 100 feet) | 695 | 0 |
| Length across lakes or ponds (open waters) | 1,486 | 1,261 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 1 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 1 | 3 |
| Length of route across areas of high archaeological/historical site potential | 40,248 | 41,627 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 4 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 4 | 2 |
| Number of heliports located within 5,000 feet of the route centerline | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 1 | 4 |
| Number of U.S. or State Highway crossings by the route | 19 | 19 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 10 | 10 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 45,508 | 49,355 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 44,976 | 49,233 |
| Estimated transmission line cost | ~~$ 181,238,000~~ $ 182,075,000 | ~~$ 186,209,000~~ $ 188,560,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 61 | 63 | 65 | 67 | 68 | 69 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 106,109 | 107,230 | 111,587 | 113,673 | 115,997 | 118,810 |
| Length of alternative route (miles) | 20.1 | 20.3 | 21.1 | 21.5 | 22.0 | 22.5 |
| Length of route parallel to existing electric transmission lines | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route parallel to railroads | 5,514 | 5,514 | 0 | 0 | 0 | 0 |
| Length of route parallel to existing public roads/highways | 17,585 | 16,333 | 12,011 | 8,982 | 14,472 | 15,565 |
| Length of route parallel to pipelines[1] | 13,785 | 15,633 | 14,491 | 12,787 | 10,823 | 11,916 |
| Length of route parallel to apparent property boundaries | 34,805 | 38,005 | 25,055 | 20,232 | 21,779 | 25,853 |
| Total length of route parallel to existing compatible rights-of-way | 34,948 | 38,148 | 25,198 | 20,376 | 23,326 | 27,400 |
| Number of habitable structures within 500 feet of the route centerline[2] | 191 | 217 | 188 | 252 | 240 | 234 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 4 | 5 | 7 | 7 | 7 | 7 |
| Length of the route across parks/recreational areas | 12 | 12 | 3,343 | 3,343 | 3,343 | 3,343 |
| Length of route through commercial/industrial areas | 10,903 | 11,998 | 4,324 | 4,304 | 5,699 | 5,687 |
| Length of the route across cropland/hay meadow | 20,499 | 16,807 | 24,140 | 29,210 | 31,022 | 36,231 |
| Length across rangeland pasture | 50,266 | 56,113 | 60,097 | 57,538 | 57,509 | 54,065 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 11,034 | 13,098 | 11,813 | 11,792 | 10,365 | 11,313 |
| Length of route across riparian areas | 12,162 | 8,004 | 9,118 | 9,157 | 9,766 | 9,797 |
| Length of route across potential wetlands | 393 | 393 | 224 | 418 | 418 | 418 |
| Number of stream crossings by the route | 19 | 18 | 28 | 26 | 29 | 27 |
| Length of route parallel to streams (within 100 feet) | 308 | 308 | 3,593 | 3,165 | 3,165 | 5,108 |
| Length across lakes or ponds (open waters) | 854 | 817 | 1,870 | 1,254 | 1,216 | 1,298 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 | 1 | 1 | 4 | 4 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 1 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 | 3 | 3 | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 54,210 | 37,476 | 36,923 | 34,737 | 32,866 | 35,128 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 1 | 1 | 5 | 6 | 6 | 6 |
| Number of heliports located within 5,000 feet of the route centerline | 3 | 3 | 1 | 1 | 1 | 1 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 4 | 4 | 1 | 1 | 4 | 4 |
| Number of U.S. or State Highway crossings by the route | 19 | 19 | 18 | 18 | 19 | 19 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 8 | 11 | 9 | 11 | 11 | 10 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 65,862 | 48,605 | 42,325 | 40,470 | 45,418 | 45,418 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 44,474 | 45,917 | 42,347 | 41,782 | 46,571 | 46,571 |
| Estimated transmission line cost | ~~$ 179,684,000~~ $ 179,799,000 | ~~$ 183,279,000~~ $ 190,973,000 | ~~$ 168,575,000~~ $ 171,726,000 | ~~$ 170,032,000~~ $ 171,649,000 | ~~$ 172,434,000~~ $ 175,072,000 | ~~$ 178,245,000~~ $ 179,510,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 70 | 71 |
|---|---|---|
| Length of alternative route (feet) | 117,115 | 116,232 |
| Length of alternative route (miles) | 22.2 | 22.0 |
| Length of route parallel to existing electric transmission lines | 0 | 0 |
| Length of route parallel to railroads | 5,514 | 0 |
| Length of route parallel to existing public roads/highways | 18,182 | 13,918 |
| Length of route parallel to pipelines[1] | 19,686 | 22,740 |
| Length of route parallel to apparent property boundaries | 31,354 | 32,718 |
| Total length of route parallel to existing compatible rights-of-way | 31,498 | 34,121 |
| Number of habitable structures within 500 feet of the route centerline[2] | 266 | 146 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 5 | 4 |
| Length of the route across parks/recreational areas | 3,062 | 0 |
| Length of route through commercial/industrial areas | 8,534 | 6,004 |
| Length of the route across cropland/hay meadow | 18,299 | 25,947 |
| Length across rangeland pasture | 70,487 | 61,783 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 11,236 | 12,592 |
| Length of route across riparian areas | 7,248 | 7,946 |
| Length of route across potential wetlands | 224 | 0 |
| Number of stream crossings by the route | 21 | 27 |
| Length of route parallel to streams (within 100 feet) | 381 | 2,639 |
| Length across lakes or ponds (open waters) | 1,088 | 1,960 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 4 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 1 |
| Length of route across areas of high archaeological/historical site potential | 34,833 | 41,883 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 3 | 4 |
| Number of heliports located within 5,000 feet of the route centerline | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 4 | 3 |
| Number of U.S. or State Highway crossings by the route | 18 | 20 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 9 | 9 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 52,600 | 50,088 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 49,262 | 44,767 |
| Estimated transmission line cost | ~~$ 195,228,000~~ 198,769,000 | ~~$ 182,478,000~~ 185,243,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 72 | 78 | 86 | 87 | 92 | 94 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 112,248 | 106,044 | 108,531 | 110,285 | 119,760 | 111,175 |
| Length of alternative route (miles) | 21.3 | 20.1 | 20.6 | 20.9 | 22.7 | 21.1 |
| Length of route parallel to existing electric transmission lines | 803 | 803 | 803 | 803 | 7,149 | 7,149 |
| Length of route parallel to railroads | 0 | 5,514 | 0 | 9,775 | 0 | 0 |
| Length of route parallel to existing public roads/highways | 3,087 | 9,767 | 4,023 | 6,099 | 14,631 | 2,633 |
| Length of route parallel to pipelines[1] | 14,491 | 15,633 | 21,112 | 11,409 | 11,069 | 19,636 |
| Length of route parallel to apparent property boundaries | 19,358 | 34,097 | 22,946 | 22,534 | 21,316 | 18,840 |
| Total length of route parallel to existing compatible rights-of-way | 20,161 | 34,900 | 23,749 | 23,337 | 35,211 | 25,989 |
| Number of habitable structures within 500 feet of the route centerline[2] | 188 | 210 | 158 | 197 | 319 | 294 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 7 | 4 | 3 | 5 | 9 | 9 |
| Length of the route across parks/recreational areas | 3,343 | 12 | 0 | 0 | 3,844 | 3,844 |
| Length of route through commercial/industrial areas | 4,259 | 10,846 | 4,324 | 7,815 | 6,084 | 4,576 |
| Length of the route across cropland/hay meadow | 22,786 | 18,200 | 20,443 | 15,589 | 18,429 | 18,612 |
| Length across rangeland pasture | 60,259 | 55,390 | 62,339 | 64,984 | 69,710 | 64,503 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 13,596 | 12,379 | 11,735 | 11,252 | 12,130 | 12,179 |
| Length of route across riparian areas | 9,245 | 7,959 | 7,759 | 9,071 | 10,878 | 9,306 |
| Length of route across potential wetlands | 224 | 393 | 0 | 0 | 849 | 224 |
| Number of stream crossings by the route | 28 | 17 | 25 | 20 | 28 | 25 |
| Length of route parallel to streams (within 100 feet) | 3,901 | 0 | 695 | 0 | 2,627 | 2,627 |
| Length across lakes or ponds (open waters) | 1,879 | 878 | 1,930 | 1,574 | 1,681 | 1,775 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 | 1 | 1 | 3 | 0 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 1 | 0 | 1 | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 | 1 | 3 | 4 | 3 |
| Length of route across areas of high archaeological/historical site potential | 37,497 | 36,472 | 40,246 | 38,472 | 40,966 | 38,410 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 | 4 | 3 | 4 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 5 | 1 | 4 | 2 | 5 | 5 |
| Number of heliports located within 5,000 feet of the route centerline | 1 | 3 | 2 | 2 | 1 | 1 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 1 | 4 | 1 | 3 | 2 | 0 |
| Number of U.S. or State Highway crossings by the route | 17 | 16 | 19 | 19 | 15 | 14 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 9 | 10 | 10 | 7 | 10 | 12 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 42,986 | 48,994 | 43,194 | 53,048 | 43,501 | 37,635 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 41,866 | 42,843 | 38,272 | 47,088 | 51,799 | 40,775 |
| Estimated transmission line cost | ~~$ 169,334,000~~ 172,485,000 | ~~$ 180,616,000~~ 181,237,000 | ~~$ 172,738,000~~ 174,244,000 | ~~$ 181,022,000~~ 182,823,000 | ~~$ 187,986,000~~ 190,405,000 | ~~$ 169,167,000~~ 171,932,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 96 | 103 |
|---|---|---|
| Length of alternative route (feet) | 110,086 | 110,806 |
| Length of alternative route (miles) | 20.8 | 21.0 |
| Length of route parallel to existing electric transmission lines | 7,149 | 7,149 |
| Length of route parallel to railroads | 0 | 0 |
| Length of route parallel to existing public roads/highways | 1,122 | 2,633 |
| Length of route parallel to pipelines[1] | 11,880 | 21,492 |
| Length of route parallel to apparent property boundaries | 16,159 | 18,497 |
| Total length of route parallel to existing compatible rights-of-way | 23,308 | 25,646 |
| Number of habitable structures within 500 feet of the route centerline[2] | 290 | 287 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 9 | 9 |
| Length of the route across parks/recreational areas | 3,844 | 3,844 |
| Length of route through commercial/industrial areas | 4,547 | 4,512 |
| Length of the route across cropland/hay meadow | 22,930 | 22,354 |
| Length across rangeland pasture | 59,912 | 60,952 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 11,292 | 11,341 |
| Length of route across riparian areas | 9,423 | 9,663 |
| Length of route across potential wetlands | 224 | 224 |
| Number of stream crossings by the route | 27 | 26 |
| Length of route parallel to streams (within 100 feet) | 3,515 | 3,515 |
| Length across lakes or ponds (open waters) | 1,758 | 1,761 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 0 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 36,393 | 43,501 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 5 | 5 |
| Number of heliports located within 5,000 feet of the route centerline | 1 | 1 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 0 | 0 |
| Number of U.S. or State Highway crossings by the route | 14 | 14 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 11 | 10 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 37,635 | 37,635 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 40,775 | 40,775 |
| Estimated transmission line cost | ~~$ 166,826,000~~ 168,332,000 | ~~$ 167,945,000~~ 170,710,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 108 | 116 | 117 | 119 | 130 | 132 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 118,176 | 119,030 | 119,593 | 118,138 | 117,544 | 118,739 |
| Length of alternative route (miles) | 22.4 | 22.5 | 22.7 | 22.4 | 22.3 | 22.5 |
| Length of route parallel to existing electric transmission lines | 7,149 | 7,149 | 7,149 | 7,149 | 7,149 | 7,149 |
| Length of route parallel to railroads | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route parallel to existing public roads/highways | 10,540 | 14,457 | 20,551 | 17,107 | 10,308 | 10,546 |
| Length of route parallel to pipelines[1] | 12,438 | 11,764 | 18,253 | 14,425 | 7,894 | 7,894 |
| Length of route parallel to apparent property boundaries | 19,641 | 33,055 | 34,922 | 30,347 | 29,131 | 30,324 |
| Total length of route parallel to existing compatible rights-of-way | 26,791 | 40,204 | 47,414 | 37,496 | 36,281 | 37,473 |
| Number of habitable structures within 500 feet of the route centerline[2] | 271 | 203 | 263 | 205 | 204 | 204 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 9 | 5 | 11 | 11 | 6 | 6 |
| Length of the route across parks/recreational areas | 3,844 | 513 | 2,612 | 2,612 | 502 | 502 |
| Length of route through commercial/industrial areas | 4,897 | 5,709 | 14,702 | 14,526 | 5,743 | 5,454 |
| Length of the route across cropland/hay meadow | 22,775 | 20,110 | 14,700 | 13,820 | 19,961 | 19,961 |
| Length across rangeland pasture | 62,995 | 71,502 | 66,109 | 67,864 | 72,415 | 73,723 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 12,639 | 11,867 | 11,656 | 9,817 | 10,742 | 10,928 |
| Length of route across riparian areas | 12,916 | 7,650 | 10,957 | 10,698 | 6,487 | 6,480 |
| Length of route across potential wetlands | 224 | 393 | 393 | 393 | 404 | 404 |
| Number of stream crossings by the route | 26 | 25 | 22 | 19 | 28 | 28 |
| Length of route parallel to streams (within 100 feet) | 3,007 | 2,524 | 1,162 | 1,162 | 2,524 | 2,524 |
| Length across lakes or ponds (open waters) | 1,729 | 1,800 | 1,076 | 1,020 | 1,792 | 1,790 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 1 | 0 | 1 | 1 | 1 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 5 | 3 | 2 | 3 | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 56,699 | 41,140 | 38,525 | 40,561 | 39,654 | 40,849 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 | 4 | 3 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 5 | 3 | 1 | 1 | 4 | 4 |
| Number of heliports located within 5,000 feet of the route centerline | 1 | 2 | 3 | 3 | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 2 | 2 | 3 | 4 | 2 | 2 |
| Number of U.S. or State Highway crossings by the route | 14 | 15 | 15 | 15 | 18 | 18 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 11 | 12 | 14 | 13 | 12 | 12 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 57,999 | 47,535 | 54,164 | 56,061 | 43,183 | 44,378 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 43,718 | 44,215 | 48,277 | 44,974 | 42,729 | 40,877 |
| Estimated transmission line cost | ~~$ 179,591,000~~ 180,832,000 | ~~$ 187,330,000~~ 189,302,000 | ~~$ 237,423,000~~ 238,602,000 | ~~$ 224,991,000~~ 226,760,000 | ~~$ 179,173,000~~ 181,145,000 | ~~$ 184,103,000~~ 185,364,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 137 | 138 |
|---|---|---|
| Length of alternative route (feet) | 111,599 | 111,258 |
| Length of alternative route (miles) | 21.1 | 21.1 |
| Length of route parallel to existing electric transmission lines | 7,149 | 7,149 |
| Length of route parallel to railroads | 0 | 0 |
| Length of route parallel to existing public roads/highways | 11,141 | 6,971 |
| Length of route parallel to pipelines[1] | 11,287 | 18,501 |
| Length of route parallel to apparent property boundaries | 29,012 | 24,660 |
| Total length of route parallel to existing compatible rights-of-way | 36,161 | 31,809 |
| Number of habitable structures within 500 feet of the route centerline[2] | 228 | 231 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 6 | 6 |
| Length of the route across parks/recreational areas | 502 | 502 |
| Length of route through commercial/industrial areas | 5,453 | 5,002 |
| Length of the route across cropland/hay meadow | 23,220 | 21,916 |
| Length across rangeland pasture | 64,132 | 64,718 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 9,310 | 9,543 |
| Length of route across riparian areas | 7,573 | 8,121 |
| Length of route across potential wetlands | 0 | 0 |
| Number of stream crossings by the route | 26 | 26 |
| Length of route parallel to streams (within 100 feet) | 1,354 | 1,354 |
| Length across lakes or ponds (open waters) | 1,912 | 1,959 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 0 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 1 |
| Length of route across areas of high archaeological/historical site potential | 40,430 | 40,291 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 4 | 4 |
| Number of heliports located within 5,000 feet of the route centerline | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 2 | 0 |
| Number of U.S. or State Highway crossings by the route | 18 | 18 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 13 | 12 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 44,629 | 42,731 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 41,771 | 38,895 |
| Estimated transmission line cost | ~~$ 183,714,000~~ 185,686,000 | ~~$ 180,852,000~~ 183,805,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 142 | 143 | 146 | 154 | 164 | 170 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 116,653 | 116,661 | 118,637 | 119,463 | 115,482 | 116,686 |
| Length of alternative route (miles) | 22.1 | 22.1 | 22.5 | 22.6 | 21.9 | 22.1 |
| Length of route parallel to existing electric transmission lines | 7,149 | 7,149 | 5,227 | 5,227 | 5,227 | 5,227 |
| Length of route parallel to railroads | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route parallel to existing public roads/highways | 3,416 | 3,416 | 7,992 | 21,136 | 13,662 | 6,667 |
| Length of route parallel to pipelines[1] | 15,031 | 16,218 | 16,209 | 9,933 | 14,425 | 11,257 |
| Length of route parallel to apparent property boundaries | 19,899 | 16,575 | 17,903 | 28,426 | 27,158 | 19,728 |
| Total length of route parallel to existing compatible rights-of-way | 27,048 | 23,724 | 23,131 | 40,543 | 32,385 | 28,046 |
| Number of habitable structures within 500 feet of the route centerline[2] | 223 | 220 | 200 | 145 | 93 | 282 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 9 | 9 | 8 | 4 | 9 | 10 |
| Length of the route across parks/recreational areas | 2,292 | 3,844 | 3,844 | 0 | 2,110 | 3,343 |
| Length of route through commercial/industrial areas | 5,180 | 5,112 | 4,981 | 5,808 | 14,059 | 5,213 |
| Length of the route across cropland/hay meadow | 25,369 | 23,449 | 21,379 | 21,614 | 12,347 | 20,377 |
| Length across rangeland pasture | 60,818 | 61,915 | 61,591 | 70,628 | 65,592 | 65,192 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 11,597 | 12,766 | 13,779 | 9,418 | 11,390 | 12,673 |
| Length of route across riparian areas | 11,615 | 11,213 | 14,706 | 9,543 | 10,715 | 10,798 |
| Length of route across potential wetlands | 80 | 224 | 224 | 625 | 393 | 621 |
| Number of stream crossings by the route | 33 | 28 | 28 | 29 | 21 | 30 |
| Length of route parallel to streams (within 100 feet) | 4,255 | 4,255 | 3,366 | 1,003 | 1,160 | 3,165 |
| Length across lakes or ponds (open waters) | 1,994 | 1,982 | 1,977 | 1,826 | 986 | 1,812 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 0 | 0 | 3 | 1 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 0 | 1 | 0 | 1 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 | 5 | 2 | 3 | 4 |
| Length of route across areas of high archaeological/historical site potential | 43,461 | 39,966 | 59,285 | 42,582 | 39,711 | 47,739 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 | 3 | 4 | 3 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 5 | 5 | 5 | 4 | 1 | 5 |
| Number of heliports located within 5,000 feet of the route centerline | 1 | 1 | 1 | 2 | 3 | 1 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 0 | 0 | 2 | 2 | 5 | 1 |
| Number of U.S. or State Highway crossings by the route | 14 | 14 | 14 | 19 | 16 | 19 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 10 | 10 | 10 | 9 | 13 | 9 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 37,760 | 34,227 | 55,123 | 51,406 | 58,820 | 51,553 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 42,285 | 42,292 | 46,108 | 49,671 | 48,571 | 59,198 |
| Estimated transmission line cost | ~~$ 168,407,000~~ $ 170,024,000 | ~~$ 168,092,000~~ $ 169,709,000 | ~~$ 172,350,000~~ $ 173,591,000 | ~~$ 198,218,000~~ $ 199,459,000 | ~~$ 197,240,000~~ $ 197,864,000 | ~~$ 180,874,000~~ $ 182,115,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 175 | 176 |
|---|---|---|
| Length of alternative route (feet) | 117,796 | 118,808 |
| Length of alternative route (miles) | 22.3 | 22.5 |
| Length of route parallel to existing electric transmission lines | 5,227 | 5,227 |
| Length of route parallel to railroads | 0 | 0 |
| Length of route parallel to existing public roads/highways | 8,407 | 2,917 |
| Length of route parallel to pipelines[1] | 17,761 | 17,761 |
| Length of route parallel to apparent property boundaries | 24,005 | 19,918 |
| Total length of route parallel to existing compatible rights-of-way | 30,635 | 25,145 |
| Number of habitable structures within 500 feet of the route centerline[2] | 108 | 110 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 4 | 4 |
| Length of the route across parks/recreational areas | 0 | 0 |
| Length of route through commercial/industrial areas | 5,841 | 4,823 |
| Length of the route across cropland/hay meadow | 21,747 | 21,747 |
| Length across rangeland pasture | 64,757 | 66,174 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 12,035 | 12,288 |
| Length of route across riparian areas | 11,511 | 11,766 |
| Length of route across potential wetlands | 0 | 0 |
| Number of stream crossings by the route | 30 | 31 |
| Length of route parallel to streams (within 100 feet) | 695 | 695 |
| Length across lakes or ponds (open waters) | 1,906 | 2,010 |
| Number of known rare/unique plant locations within the right-of-way | 4 | 4 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 1 | 1 |
| Length of route across areas of high archaeological/historical site potential | 47,949 | 49,495 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 4 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 4 | 4 |
| Number of heliports located within 5,000 feet of the route centerline | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 2 | 2 |
| Number of U.S. or State Highway crossings by the route | 20 | 20 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 9 | 8 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 49,167 | 46,301 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 39,426 | 34,637 |
| Estimated transmission line cost | ~~$ 185,963,000~~ 186,988,000 | ~~$ 185,500,000~~ 186,525,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 178 | 179 | 184 | 185 | 186 | 187 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 119,040 | 114,898 | 117,406 | 117,146 | 114,792 | 115,987 |
| Length of alternative route (miles) | 22.5 | 21.8 | 22.2 | 22.2 | 21.7 | 22.0 |
| Length of route parallel to existing electric transmission lines | 5,227 | 5,227 | 5,227 | 5,227 | 5,227 | 5,227 |
| Length of route parallel to railroads | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route parallel to existing public roads/highways | 15,524 | 6,591 | 10,348 | 9,255 | 8,003 | 8,241 |
| Length of route parallel to pipelines[1] | 9,933 | 7,636 | 20,129 | 18,501 | 11,029 | 11,029 |
| Length of route parallel to apparent property boundaries | 23,552 | 20,834 | 30,101 | 23,690 | 25,558 | 26,751 |
| Total length of route parallel to existing compatible rights-of-way | 35,525 | 26,061 | 36,732 | 30,321 | 33,876 | 35,068 |
| Number of habitable structures within 500 feet of the route centerline[2] | 145 | 97 | 112 | 112 | 364 | 364 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 4 | 4 | 4 | 4 | 4 | 4 |
| Length of the route across parks/recreational areas | 0 | 0 | 0 | 0 | 3,062 | 3,062 |
| Length of route through commercial/industrial areas | 5,946 | 4,607 | 5,351 | 5,314 | 4,897 | 4,608 |
| Length of the route across cropland/hay meadow | 20,260 | 20,248 | 25,947 | 22,131 | 18,802 | 18,802 |
| Length across rangeland pasture | 69,820 | 71,051 | 63,875 | 65,553 | 75,009 | 76,318 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 11,056 | 10,126 | 12,388 | 11,551 | 9,345 | 9,530 |
| Length of route across riparian areas | 9,498 | 7,162 | 7,939 | 10,516 | 4,586 | 4,579 |
| Length of route across potential wetlands | 625 | 0 | 0 | 0 | 621 | 621 |
| Number of stream crossings by the route | 29 | 27 | 27 | 29 | 29 | 29 |
| Length of route parallel to streams (within 100 feet) | 695 | 1,351 | 2,639 | 695 | 695 | 695 |
| Length across lakes or ponds (open waters) | 1,835 | 1,704 | 1,906 | 2,080 | 1,532 | 1,529 |
| Number of known rare/unique plant locations within the right-of-way | 4 | 1 | 4 | 4 | 0 | 0 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 1 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 2 | 3 | 1 | 1 | 2 | 2 |
| Length of route across areas of high archaeological/historical site potential | 42,007 | 37,905 | 43,078 | 48,235 | 28,161 | 29,356 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 4 | 3 | 4 | 4 | 4 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 4 | 4 | 4 | 4 | 5 | 5 |
| Number of heliports located within 5,000 feet of the route centerline | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 2 | 2 | 2 | 2 | 1 | 1 |
| Number of U.S. or State Highway crossings by the route | 20 | 19 | 20 | 20 | 14 | 14 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 9 | 11 | 9 | 9 | 11 | 11 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 50,984 | 47,388 | 51,262 | 52,179 | 52,296 | 53,491 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 49,305 | 45,369 | 41,218 | 41,218 | 54,223 | 52,371 |
| Estimated transmission line cost | ~~$ 193,659,000~~ 197,216,000 | ~~$ 175,208,000~~ 178,749,000 | ~~$ 188,738,000~~ 191,922,000 | ~~$ 187,652,000~~ 190,836,000 | ~~$ 183,978,000~~ 187,535,000 | ~~$ 190,513,000~~ 191,754,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 191 | 192 |
|---|---|---|
| Length of alternative route (feet) | 112,023 | 112,247 |
| Length of alternative route (miles) | 21.2 | 21.3 |
| Length of route parallel to existing electric transmission lines | 5,227 | 5,227 |
| Length of route parallel to railroads | 0 | 0 |
| Length of route parallel to existing public roads/highways | 2,842 | 2,842 |
| Length of route parallel to pipelines[1] | 6,796 | 7,641 |
| Length of route parallel to apparent property boundaries | 16,426 | 17,839 |
| Total length of route parallel to existing compatible rights-of-way | 23,374 | 24,786 |
| Number of habitable structures within 500 feet of the route centerline[2] | 396 | 400 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 8 | 8 |
| Length of the route across parks/recreational areas | 3,343 | 3,343 |
| Length of route through commercial/industrial areas | 4,632 | 4,633 |
| Length of the route across cropland/hay meadow | 24,135 | 25,913 |
| Length across rangeland pasture | 63,019 | 59,947 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 9,345 | 10,180 |
| Length of route across riparian areas | 8,923 | 9,580 |
| Length of route across potential wetlands | 621 | 621 |
| Number of stream crossings by the route | 30 | 30 |
| Length of route parallel to streams (within 100 feet) | 3,165 | 3,165 |
| Length across lakes or ponds (open waters) | 1,349 | 1,372 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 0 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 |
| Length of route across areas of high archaeological/historical site potential | 35,529 | 35,698 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 5 | 5 |
| Number of heliports located within 5,000 feet of the route centerline | 1 | 1 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 1 | 1 |
| Number of U.S. or State Highway crossings by the route | 14 | 14 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 10 | 11 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 49,788 | 55,883 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 50,212 | 50,212 |
| Estimated transmission line cost | ~~$ 166,165,000~~ 169,682,000 | ~~$ 168,132,000~~ 171,649,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 199 | 200 | 207 | 216 | 217 | 218 |
|---|---|---|---|---|---|---|
| Length of alternative route (feet) | 110,007 | 106,206 | 109,117 | 120,969 | 112,061 | 111,817 |
| Length of alternative route (miles) | 20.8 | 20.1 | 20.7 | 22.9 | 21.2 | 21.2 |
| Length of route parallel to existing electric transmission lines | 0 | 0 | 0 | 0 | 5,227 | 5,227 |
| Length of route parallel to railroads | 9,775 | 5,514 | 0 | 0 | 0 | 0 |
| Length of route parallel to existing public roads/highways | 11,642 | 10,193 | 5,554 | 20,997 | 3,748 | 3,748 |
| Length of route parallel to pipelines[1] | 11,981 | 13,785 | 21,112 | 12,545 | 26,468 | 24,181 |
| Length of route parallel to apparent property boundaries | 32,658 | 28,002 | 21,840 | 28,844 | 20,252 | 21,070 |
| Total length of route parallel to existing compatible rights-of-way | 32,658 | 28,002 | 21,840 | 35,590 | 25,480 | 26,298 |
| Number of habitable structures within 500 feet of the route centerline[2] | 195 | 193 | 160 | 261 | 293 | 226 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 4 | 4 | 3 | 4 | 3 | 3 |
| Length of the route across parks/recreational areas | 12 | 12 | 0 | 0 | 3,062 | 3,062 |
| Length of route through commercial/industrial areas | 11,447 | 11,381 | 5,197 | 6,952 | 4,236 | 4,211 |
| Length of the route across cropland/hay meadow | 15,743 | 18,187 | 19,486 | 20,775 | 18,117 | 17,065 |
| Length across rangeland pasture | 59,594 | 48,489 | 61,049 | 69,006 | 74,231 | 72,731 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Length of route across upland woodlands | 14,250 | 14,829 | 13,747 | 12,241 | 8,022 | 9,888 |
| Length of route across riparian areas | 7,493 | 12,117 | 7,759 | 9,543 | 5,289 | 5,468 |
| Length of route across potential wetlands | 393 | 393 | 0 | 625 | 492 | 849 |
| Number of stream crossings by the route | 17 | 20 | 26 | 30 | 29 | 27 |
| Length of route parallel to streams (within 100 feet) | 0 | 0 | 695 | 1,003 | 695 | 695 |
| Length across lakes or ponds (open waters) | 1,088 | 811 | 1,879 | 1,826 | 1,674 | 1,605 |
| Number of known rare/unique plant locations within the right-of-way | 1 | 1 | 1 | 3 | 0 | 0 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 1 | 1 | 0 | 0 | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 3 | 1 | 2 | 1 | 1 |
| Length of route across areas of high archaeological/historical site potential | 33,746 | 53,635 | 40,246 | 42,582 | 36,350 | 35,086 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 3 | 3 | 4 | 4 | 4 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 1 | 1 | 4 | 4 | 5 | 5 |
| Number of heliports located within 5,000 feet of the route centerline | 3 | 3 | 2 | 2 | 2 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 3 | 4 | 1 | 3 | 0 | 0 |
| Number of U.S. or State Highway crossings by the route | 16 | 16 | 19 | 19 | 14 | 14 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 9 | 9 | 11 | 10 | 10 | 11 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 49,947 | 64,007 | 41,827 | 50,960 | 47,041 | 43,353 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 45,373 | 45,373 | 40,802 | 53,467 | 43,188 | 39,448 |
| Estimated transmission line cost | ~~$ 182,166,000~~ 182,787,000 | ~~$ 179,512,000~~ 180,133,000 | ~~$ 175,650,000~~ 177,156,000 | ~~$ 202,124,000~~ 204,096,000 | ~~$ 177,593,000~~ 178,618,000 | ~~$ 178,352,000~~ 179,377,000 |

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(1) Not included in length of route 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.

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TABLE 2. ENVIRONMENTAL DATA FOR FILED ROUTES IN THE CCN APPLICATION
RAMHORN HILL-DUNHAM 345 kV TRANSMISSION LINE PROJECT

| Alternative Route Number | 219 | 221 |
|---|---|---|
| Length of alternative route (feet) | 111,226 | 111,588 |
| Length of alternative route (miles) | 21.1 | 21.1 |
| Length of route parallel to existing electric transmission lines | 5,227 | 0 |
| Length of route parallel to railroads | 0 | 0 |
| Length of route parallel to existing public roads/highways | 2,633 | 5,554 |
| Length of route parallel to pipelines[1] | 24,840 | 26,316 |
| Length of route parallel to apparent property boundaries | 14,966 | 19,253 |
| Total length of route parallel to existing compatible rights-of-way | 20,193 | 19,253 |
| Number of habitable structures within 500 feet of the route centerline[2] | 327 | 220 |
| Number of parks or recreational areas within 1,000 feet of the route centerline[3] | 7 | 4 |
| Length of the route across parks/recreational areas | 3,343 | 0 |
| Length of route through commercial/industrial areas | 4,085 | 5,612 |
| Length of the route across cropland/hay meadow | 17,110 | 17,983 |
| Length across rangeland pasture | 69,499 | 67,352 |
| Length of route across agricultural cropland with mobile irrigation systems | 0 | 0 |
| Length of route across upland woodlands | 9,511 | 10,881 |
| Length of route across riparian areas | 8,808 | 7,578 |
| Length of route across potential wetlands | 492 | 268 |
| Number of stream crossings by the route | 27 | 29 |
| Length of route parallel to streams (within 100 feet) | 2,276 | 695 |
| Length across lakes or ponds (open waters) | 1,721 | 1,914 |
| Number of known rare/unique plant locations within the right-of-way | 0 | 1 |
| Length of route through known habitat of endangered or threatened species | 0 | 0 |
| Number of recorded cultural resource sites crossed by the route | 0 | 0 |
| Number of recorded cultural resources within 1,000 feet of the route centerline | 3 | 1 |
| Length of route across areas of high archaeological/historical site potential | 42,395 | 43,701 |
| Number of private airstrips within 10,000 feet of the route centerline | 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 | 4 | 4 |
| Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline | 5 | 4 |
| Number of heliports located within 5,000 feet of the route centerline | 1 | 2 |
| Number of commercial AM radio transmitters located within 10,000 feet of the route centerline | 0 | 0 |
| Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline | 0 | 1 |
| Number of U.S. or State Highway crossings by the route | 14 | 19 |
| Number of Farm to Market (F.M.), county roads, or other street crossings by the route | 10 | 11 |
| Estimated length of right-of-way within foreground visual zone of U.S. and State Highways | 44,534 | 47,958 |
| Estimated length of right-of-way within foreground visual zone of park/recreational areas | 44,592 | 45,602 |
| Estimated transmission line cost | ~~$ 169,570,000~~ 170,749,000 | ~~$ 181,190,000~~ 182,215,000 |

NOTES: All length measurements are in feet. Measurements for many of the environmental criteria 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 7.8 inches) horizontal accuracy to true ground location.

(1) Not included in length of route 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.

**PUC DOCKET NO. 55067**

**DIRECT TESTIMONY**
**OF AMY L. ZAPLETAL, P.E., WITNESS FOR**
**ONCOR ELECTRIC DELIVERY COMPANY LLC**

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| | |
|---|---|
| Exhibit ALZ-1 | Resume of Amy L. Zapletal |
| Exhibit ALZ-2 | Map of Potential USACE Crossings Evaluated |
| Exhibit ALZ-3 | Map of Engineering Constraints (I-35W and SH 114) |
| Exhibit ALZ-4 | Engineering Analysis (I-35W and SH 114) |

# DIRECT TESTIMONY OF AMY L. ZAPLETAL, P.E.

## I. POSITION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, EMPLOYMENT POSITION, AND BUSINESS ADDRESS.

A. My name is Amy L. Zapletal. I am employed as a Project Manager Senior in the Transmission Engineering Right-of-Way group at Oncor Electric Delivery Company LLC ("Oncor"). My business address is 777 Main St., Suite 707, Fort Worth, Texas 76102.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL QUALIFICATIONS.

A. I have served as the lead Oncor engineer responsible for the design, development and execution of the Ramhorn Hill-Dunham 345 kV transmission line project ("Proposed Transmission Line Project"). I have been employed at Oncor as a Project Manager Senior since June of 2021. Prior to my employment at Oncor, my professional experience was dedicated to project management and utility district engineering consulting services. I am a licensed professional engineer in the State of Texas (License No. 94680). I received a Bachelor of Science degree in civil engineering from Texas A&M University in 2000. My educational and professional qualifications are more fully presented in my resume, which is attached hereto as Exhibit ALZ-1.

Q. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS ("COMMISSION")?

A. Yes. I previously submitted testimony in Docket No. 54733.

## II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my direct testimony is to introduce, support, describe, and sponsor the project schedule, financing, and cost estimates included in Oncor's Standard Application for a Certificate of Convenience and Necessity ("CCN") for a Proposed Transmission Line filed in this docket (the "Application"). My testimony will also introduce, support, sponsor, and

describe the structure and conductor selection; station construction; neighboring utilities and political subdivisions; known engineering constraints; project permitting; and generation impacts associated with the Proposed Transmission Line Project.

I sponsor Oncor's responses to Application Question Nos. 1-13 and 20. The Application, as it may be amended and/or supplemented, will be offered into evidence by Oncor at the hearing on the merits. My direct testimony was prepared by me or under my direct supervision. The facts and statements set forth in the portions of the Application that I sponsor are true and correct to the best of my knowledge.

## III. DESCRIPTION OF PROPOSED TRANSMISSION LINE PROJECT

Q. PLEASE GENERALLY DESCRIBE THE PROPOSED TRANSMISSION LINE PROJECT.

A. The Proposed Transmission Line Project is part of the overall Roanoke Area Upgrades Project, which ERCOT endorsed as critical to the reliability of the ERCOT grid. The Proposed Transmission Line Project includes constructing a new 20- to 23-mile, double-circuit 345 kV transmission line connecting the proposed Dunham Switch, located in Denton County, to the proposed Ramhorn Hill Switch, located in Wise County. The transmission line is proposed to be built on triple-circuit capable monopole structures with two 345 kV circuits initially installed and a vacant circuit position to allow for the future addition of a 138 kV underbuild. Both 345 kV switching stations will be constructed in a 12-breaker, breaker-and-a-half arrangement and will tap into the existing 345 kV transmission system in the northwestern Dallas-Fort Worth Metroplex.

The Proposed Transmission Line Project will be designed and constructed to meet or exceed the specifications and/or criteria set forth in the latest edition of the National Electrical Safety Code ("NESC"), the statutes of the State of Texas, the Commission's rules, and Oncor's standard design practices.

Q. WILL NEW PERMANENT RIGHT-OF-WAY ("ROW") BE REQUIRED FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. Yes. The Proposed Transmission Line Project will require a standard ROW width of approximately 100 feet, although additional ROW width may be required in certain areas to address engineering constraints.

## IV. PROJECT SCHEDULE AND FINANCING

Q. WHAT IS THE CURRENT SCHEDULE FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. The schedule for the Proposed Transmission Line Project was developed based on a 180-day approval timeline due to its designation by ERCOT as critical to reliability. The following schedule is premised on Commission approval of the Proposed Transmission Line Project by December 2023:

| Description | Start | Completion |
|---|---|---|
| ROW and Land Acquisition | December 2023 | December 2024 |
| Engineering and Design | January 2024 | October 2024 |
| Material and Equipment Procurement | February 2024 | October 2024 |
| Construction of Facilities | December 2024 | December 2025 |
| Energize Facilities | December 2025 | December 2025 |

Q. HOW WILL THE PROPOSED TRANSMISSION LINE PROJECT BE FINANCED?

A. As explained in the Application, Oncor proposes to finance the facilities included in the Proposed Transmission Line Project with a combination of debt and equity in compliance with its authorized capital structure, which is similar to the means used for previous construction projects. Oncor plans to utilize internally generated funds (equity) and proceeds received from the issuance of securities. Oncor will typically obtain short-term borrowings as needed for interim financing of its construction expenditures in excess of funds generated internally. These borrowings are then repaid through the issuance of long-term debt securities, the types and amounts of which are as of yet undetermined. Oncor is the sole applicant for the Proposed

Transmission Line Project, and therefore no other party will be reimbursed for any portion of this project.

## V. STRUCTURE AND CONDUCTOR SELECTION

Q. WHAT STRUCTURES DID ONCOR SELECT FOR CONSTRUCTION OF THE PROPOSED TRANSMISSION LINE PROJECT?

A. Oncor will construct the Proposed Transmission Line Project primarily on steel monopoles with a typical structure height of 120-175 feet. After evaluating numerous factors relating to the study area, including but not limited to span length between structures, construction and maintenance issues, commodity and labor costs, impacts to affected landowners, and constraints in the study area, Oncor affirmed the use of this structure for the Proposed Transmission Line Project. A typical triple-circuit, 345 kV tangent monopole with two circuits in place is shown in Figure 1-2 in the *Environmental Assessment and Alternative Route Analysis for the Proposed Ramhorn Hill Switch to Dunham Switch 345 kV Transmission Line Project in Denton and Wise Counties, Texas* ("Environmental Assessment"), which is included as Attachment No. 1 to the Application. Section 1.3 of the Environmental Assessment also discusses Oncor's selected structure type.

Q. WHY IS ONCOR PROPOSING THE USE OF TRIPLE-CIRCUIT CAPABLE STRUCTURES WITH A VACANT CIRCUIT POSITION?

A. This proposal is consistent with ERCOT's endorsement for the project, which calls for a double-circuit 345 kV transmission line on triple-circuit capable structures to allow for the future installation of a 138 kV circuit. This design will allow Oncor to address future growth in the project area without the need to acquire additional ROW. Given that the materials and installation costs for triple-circuit capable structures are only 20-25% greater than the costs for double-circuit capable structures, the incremental cost impact of triple-circuit capable construction is minimal compared with

the costs that would be incurred to construct an entirely new 138 kV transmission line in the project area in the future.

Q. WHAT CONDUCTOR DOES ONCOR PROPOSE TO USE FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. The 345 kV circuits will be installed using bundled 1926.9 kcmil aluminum conductor steel supported, trapezoidal-shaped wire ("ACSS/TW"). The normal peak operating current rating for this conductor is approximately 5,138 amperes, and the line capacity is 3,070 megavolt-amperes ("MVA").

Q. IS ONCOR'S CHOSEN CONDUCTOR THE MOST COST-EFFECTIVE AND RELIABLE OPTION FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. Yes. ERCOT's independent review required that this line be constructed with normal and emergency ratings of at least 2,987 MVA. Using a smaller conductor, such as bundled 959 ACSS/TW conductor, would not produce the necessary capacity rating. Considering this ERCOT requirement for the Proposed Transmission Line Project, it is both prudent and necessary to install the bundled 1926.9 kcmil ACSS/TW conductor, which is Oncor's standard conductor for 345 kV transmission lines.

## VI. STATION CONSTRUCTION

Q. WILL ANY STATION WORK BE REQUIRED FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. Yes. The Proposed Transmission Line Project will include establishing a new Ramhorn Hill Switch station in Wise County and a new Dunham Switch station in Denton County. The switching stations will be constructed entirely on Oncor's fee-owned property.

Q. PLEASE DESCRIBE THE PROPOSED RAMHORN HILL SWITCH STATION.

A. The proposed Ramhorn Hill Switch station will be a 345 kV switching station, initially designed in a 12-breaker, breaker-and-a-half arrangement, and will serve as the western endpoint for the Ramhorn Hill-Dunham

transmission line. It will be located approximately two miles south of the intersection of U.S. Highway 287 and State Highway ("SH") 114, near the City of Rhome, Texas. The preliminary designed dimensions are approximately 700 feet by 750 feet. A diagram showing the approximate dimensions and proposed layout of the Ramhorn Hill Switch station is included in Attachment No. 2 to the Application.

Q. WHAT FACILITIES AND EQUIPMENT WILL MAKE UP THE PROPOSED RAMHORN HILL SWITCH STATION?

A. New facilities and equipment at the Ramhorn Hill Switch station will include aluminum tubular bussing and a static mast for lightning protection. Each 345 kV circuit entering the station will have associated A-frame dead-end structures, capacitively coupled voltage transformers, line traps, circuit breakers, disconnect switches, and associated support structures. A control center will house relay panels, a Supervisory Control and Data Acquisition ("SCADA") system, and controls for the switchyard equipment. The station is not currently planned to serve load or otherwise transform power to distribution voltage, so it is not designed to accommodate power transformers.

Q. WILL THE PROPOSED RAMHORN HILL SWITCH STATION INCLUDE CAPACITY FOR EXPANSION?

A. Yes. Capacity will be available for additional circuits in the future, including the future 138 kV circuit planned for this line, with incremental modifications to the station. Additionally, the proposed Ramhorn Hill Switch station site could ultimately be expanded to accommodate an 18-breaker 345 kV ring bus arrangement, a potential 138 kV switchyard that can accommodate up to 18 breakers in a breaker-and-a-half arrangement, 345/138 kV autotransformers, and a load serving distribution substation.

Q. PLEASE DESCRIBE THE PROPOSED DUNHAM SWITCH STATION.

A. The proposed Dunham Switch station will be a 345 kV switching station, initially designed in a 12-breaker, breaker-and-a-half arrangement, and will

serve as the eastern endpoint for the Ramhorn Hill-Dunham transmission line. It will be located approximately 1.4 miles southeast of the intersection of U.S. Highway 377 and Farm-to-Market Road ("FM") 1171 (regionally known as Cross Timbers Road), in the Town of Flower Mound, Texas. The preliminary designed dimensions of the Dunham Switch station are approximately 700 feet by 600 feet. A diagram showing the approximate dimensions and proposed layout of the Dunham Switch station is included in Attachment No. 2 to the Application.

Q. WHAT FACILITIES AND EQUIPMENT WILL MAKE UP THE PROPOSED DUNHAM SWITCH STATION?

A. New facilities and equipment at the Dunham Switch station will include aluminum tubular bussing and a static mast for lightning protection. Each 345 kV circuit entering the station will have associated A-frame dead-end structures, capacitively coupled voltage transformers, line traps, circuit breakers, disconnect switches, and associated support structures. A control center will house relay panels, SCADA system, and controls for the switchyard equipment. The station is not currently planned to serve load or otherwise transform power to distribution voltage, so it is not designed to accommodate power transformers.

Q. WILL THE PROPOSED DUNHAM SWITCH STATION INCLUDE CAPACITY FOR EXPANSION?

A. Yes. Capacity will be available for additional circuits in the future, including the future 138 kV circuit planned for this line, with incremental modifications to the station. Additionally, the proposed Dunham Switch station site could ultimately be expanded to accommodate an 18-breaker, 345 kV ring bus arrangement, a potential 138 kV switchyard that can accommodate up to 18 breakers in a breaker-and-a-half arrangement, 345/138 kV autotransformers, and a load serving distribution substation.

Q. WHY IS IT IMPORTANT TO BUILD EACH OF THESE NEW STATIONS WITH EXPANSION CAPABILITY?

A. This area of Texas is developing rapidly. This means both that available land will become harder to obtain and that electric demand will continue to grow, increasing the need for load-serving infrastructure. The expansion capability of these sites will allow Oncor to grow and expand its facilities incrementally as needed to meet the needs of the community and the ERCOT grid.

## VII. NEIGHBORING UTILITIES AND POLITICAL SUBDIVISIONS

Q. ARE ANY OTHER ELECTRIC UTILITIES INVOLVED WITH THE PROPOSED TRANSMISSION LINE PROJECT?

A. No. Oncor is the sole applicant for the Proposed Transmission Line Project and will construct the transmission line and related station facilities.

Q. PLEASE IDENTIFY THE POLITICAL SUBDIVISIONS IN WHICH THE PROPOSED TRANSMISSION LINE PROJECT WILL BE LOCATED.

A. Depending on the route selected by the Commission, the Proposed Transmission Line Project may pass through portions of the City of Justin, City of Fort Worth, City of New Fairview, and City of Rhome. All filed routes will pass through the Town of Flower Mound and the Town of Northlake.

## VIII. COST ESTIMATES

Q. WHAT ARE THE ESTIMATED COSTS OF THE TRANSMISSION LINE WORK FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. As detailed in Attachment No. 3 to the Application, I estimate that transmission line costs to construct the Proposed Transmission Line Project, excluding station costs, will range from approximately ~~$164,581,000~~$168,332,000 to approximately ~~$237,423,000~~$238,602,000, depending on the route selected by the Commission.

Q. WHAT ARE THE ESTIMATED COSTS OF THE STATION FACILITIES ASSOCIATED WITH THE PROPOSED TRANSMISSION LINE PROJECT?

A. There are approximately $74,858,000 in estimated station costs associated with the Proposed Transmission Line Project. This includes approximately

$33,510,000 for the proposed Ramhorn Hill Switch station and approximately $41,348,000 for the proposed Dunham Switch station.

PLEASE PROVIDE A BREAKDOWN OF ONCOR'S ESTIMATED STATION COSTS FOR RAMHORN HILL SWITCH STATION.

Oncor's estimated station costs for the proposed Ramhorn Hill Switch station include approximately: $8,810,000 for ROW and land acquisition; $500,000 for contract engineering and design, including ground surveying, geotechnical services, and station engineering consulting services; $11,570,000 for material procurement, which includes the costs of all the equipment described above, including stores; $250,000 for Oncor construction costs, which covers Oncor's costs associated with operations commissioning and internal field construction coordinators; and $12,380,000 for contract labor and construction, which includes the costs for construction contractors, conducting surveys, grading the station site, placing foundations, installing equipment, and installing the electrical ground grid.

PLEASE PROVIDE A BREAKDOWN OF ONCOR'S ESTIMATED STATION COSTS FOR DUNHAM SWITCH STATION.

Oncor's estimated station costs for the proposed Dunham Switch station include approximately: $16,648,000 for ROW and land acquisition; $500,000 for contract engineering and design, including ground surveying, geotechnical services, and station engineering consulting services; $11,570,000 for material procurement, which included the cost of all the equipment described above, including stores; $250,000 for Oncor construction, which covers Oncor's costs associated with operations commissioning and internal field construction coordinators; and $12,380,000 for contract labor and construction, which includes the costs for construction contractors, conducting surveys, grading the station site, placing foundations, installing equipment, and installing the electrical ground grid.

## IX. ENGINEERING CONSTRAINTS

Q. WHAT ARE SOME EXAMPLES OF ENGINEERING CONSTRAINTS?

A. Examples of engineering constraints may include but are not limited to: existing residential development; oil, gas, or water wells; flood-prone areas; pipeline ROWs; highway crossings; uneven or unstable terrain; unfavorable soil conditions; and bodies of water.

Q. ARE THERE ANY KNOWN ENGINEERING CONSTRAINTS ASSOCIATED WITH THE PROPOSED ROUTE FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. Yes. However, at this time, the proposed routing alternatives do not present any known engineering constraints that cannot be resolved with additional consideration by Oncor during the design and construction phases following approval of the Proposed Transmission Line Project. There may exist unknown engineering constraints that would require further adjustments if discovered through the survey process.

Q. PLEASE DESCRIBE THE KNOWN ENGINEERING CONSTRAINTS.

A. The study area for the Proposed Transmission Line Project includes numerous engineering constraints including major highways and thoroughfares; aircraft landing facilities; pipelines and oil and gas pads; and pockets of dense residential, industrial, and commercial development, which are particularly prevalent in the southern portion of the study area. This area of north Texas is growing rapidly, and multiple developers have informed Oncor of plans for sizeable future development in areas traversed by routing alternatives for the Proposed Transmission Line Project, which will likely give rise to new constraints throughout the CCN approval, engineering and design, ROW acquisition, and construction phases of the project. Finally, the study area includes recreational and environmentally sensitive property owned and managed by the United States Army Corps of Engineers ("USACE").

While the USACE property does not, on its own, constitute an engineering constraint, crossings of the USACE property are governed by the Federal Non-Recreational Outgrant Policy ("Outgrant Policy"), which severely restricts potential crossings. In developing routing alternatives for the Proposed Transmission Line Project, Oncor coordinated closely with the USACE, state and federal legislators, and local officials to identify potential routes across the USACE property while taking into account the engineering constraints associated with any potential crossings. The Outgrant Policy and Oncor's coordination with the USACE are addressed more fully in the direct testimony of Oncor witness Mr. Russell J. Marusak.

Q. DO ANY OF ONCOR'S PROPOSED ROUTES CROSS PROPERTY OWNED BY THE USACE?

A. The USACE property is federal land and can only be crossed with USACE permission, which has not been granted. Among the links filed in the Application, only Link G2 would make a short, aerial crossing of the USACE property near Interstate Highway 35W ("I-35W") and Denton Creek. The USACE has indicated that it is amenable to this crossing.

In coordination with Oncor's routing consultant, Halff Associates, Inc. ("Halff"), Oncor evaluated the possibility of crossing the USACE property using: (1) Link G2 to span I-35W and the USACE property at the northernmost point of Utility Corridor 15; (2) an overhead crossing outside of the USACE-established designated utility corridors ("Utility Corridors") in the northern portion of the USACE property, near the Trailwood subdivision; (3) an underground crossing in the same general location as (2); (4) crossings using one of the five designated utility corridors established in the Master Plan; (5) an overhead crossing using an existing Trinity River Authority ("TRA") easement; and (6) overhead crossings outside of the designated utility corridors in the southern portion of the USACE near SH 114. The locations of these alternatives are shown in Exhibit ALZ-2. Oncor's analysis, feedback from the USACE, and the presence of

numerous engineering, routing, and planning constraints associated with these crossings led to the conclusion that these options would not provide feasible routing opportunities.

My direct testimony will address the engineering constraints associated with these potential crossings. Oncor identified engineering constraints specifically associated with three of the Utility Corridors, the TRA easement corridor, and the proposed underground crossing. Additionally, all of the USACE crossings using the Utility Corridors, the TRA easement corridor, or the southern crossings would force the routing for the Proposed Transmission Line Project through the same general area southwest of the USACE property, which contains numerous engineering constraints that severely restrict Oncor's routing options. My direct testimony will address these constraints as well. The routing constraints associated with each potential crossing are addressed more fully in Mr. Marusak's direct testimony. Oncor witness Mr. Harsh Naik addresses the planning constraints.

Q. WHAT WERE THE RESULTS OF ONCOR'S ANALYSIS OF POTENTIAL CROSSINGS OF THE USACE PROPERTY USING THE UTILITY CORRIDORS?

A. Oncor identified engineering constraints in several of the Utility Corridors, as well as constraints in the area southwest of the USACE property that are even more restrictive and render the use of the Utility Corridors infeasible from an engineering perspective. I will address the corridor-specific constraints before addressing the more general constraints that impact multiple corridors.

**Utility Corridor 11**

Utility Corridor 11 is 100 feet wide and is occupied by two existing transmission lines—an Oncor/Texas Municipal Power Agency double-circuit 345 kV transmission line and a Brazos Electric Power Cooperative double circuit 138 kV transmission line. It is also paralleled and partially

occupied by U.S. Highway 377. The Master Plan does not permit this corridor to be expanded beyond 100 feet, including the space occupied by the road. These constraints make it impossible to maintain the 100-foot ROW required for the Proposed Transmission Line Project without clearing substantial portions of the Environmentally Sensitive Area outside of the designated utility corridor.

A 100-foot ROW is essential for the Proposed Transmission Line Project in order to provide sufficient space to maintain NESC clearances and prevent conductor blowout (i.e., horizontal displacement) leading to contact with objects outside the ROW, which could lead to conductor failure, arcing, or fires. Maintaining an appropriate buffer is especially important here, given the pervasive woody vegetation throughout the USACE property.

The Master Plan restricts future use of this corridor to subsurface boring, meaning no overhead facilities may be installed. Even if Oncor could obtain a categorical exclusion to this restriction, locating seven overhead transmission circuits in such close proximity would create planning and reliability concerns, which are addressed more fully in Mr. Naik's direct testimony.

**Utility Corridor 12**

Utility Corridor 12 is 70 feet wide and is occupied by a road and existing underground utilities. The Master Plan provides that the width of this corridor may not exceed 70 feet, including the space occupied by the road. Thus, this corridor is too narrow for the Proposed Transmission Line Project given the ROW requirements for the transmission line. The Master Plan restricts future use of this corridor to subsurface boring, meaning no overhead facilities may be installed.

**Utility Corridor 15**

Utility Corridor 15 is 140 feet wide and is occupied by I-35W and an existing CoServ distribution line. This corridor is restricted to the existing

road ROW and may not exceed 70 feet from the center of the road. The Master Plan restricts future use of this corridor to subsurface boring, meaning no overhead facilities may be installed. The proximity of I-35W to this corridor presents a unique engineering constraint, in that the width of the highway for much of the corridor's length challenges the maximum span length for the Proposed Transmission Line Project. Although, as explained above, Link G2 would make a short crossing through Utility Corridor 15 to cross I-35W where the highway is narrower and where the crossing would satisfy Texas Department of Transportation ("TxDOT)" regulations.

Any other use of any of the designated utility corridors would force the routing for the Proposed Transmission Line Project into the area southwest of the USACE property. This area contains numerous engineering constraints, which are addressed more fully below. In conjunction with the corridor-specific constraints, those constraints render the use of the designated utility corridors infeasible.

Q. WHAT WERE THE RESULTS OF ONCOR'S ANALYSIS OF CROSSING THE USACE PROPERTY USING THE TRA EASEMENT CORRIDOR?

A. The use of the TRA easement corridor is not feasible from an engineering standpoint. The TRA easement is 60 feet wide and contains 16-, 30-, and 42-inch-wide underground pipelines within that space. The easement width and the spacing of the existing pipelines do not allow sufficient space for Oncor to install structure foundations or to maintain the 100-foot ROW required for this project. Structures for this project generally require foundations approximately 12 to 15 feet in diameter. In flood-prone areas like the USACE property, which surrounds Grapevine Lake, larger foundations may be required to properly anchor and support the structures. The size of the foundations required will ultimately depend on the soil composition and depth of the water table, which are currently unknown.

Like the designated utility corridors, the TRA easement corridor would lead the Proposed Transmission Line Project into the heavily

congested area southwest of the USACE property. As discussed above, Oncor cannot route the Proposed Transmission Line Project through this area due to the numerous engineering constraints.

Q. PLEASE DESCRIBE THE ENGINEERING CONSTRAINTS SOUTHWEST OF THE USACE PROPERTY THAT RENDER A CROSSING INFEASIBLE.

A. The area bounded by the USACE property to the north and east, SH 114 to the south, and I-35W to the west, contains numerous engineering constraints that severely limit Oncor's ability to construct, operate, and maintain the Proposed Transmission Line Project. These constraints are shown in the map included as Exhibit ALZ-3 to my direct testimony. This area lies just north of the City of Fort Worth, northeast of Alliance Airport, and east of the Texas Motor Speedway. Within this area are a commercial and industrial park; densely packed residential subdivisions; a mobile home park; numerous oil, gas, and water pipelines; and existing transmission and distribution lines.

To identify potential pathways through this area, Oncor conducted on-the-ground reconnaissance and reviewed aerial imagery and publicly available platting information. These efforts resulted in an engineering analysis, which is included as Exhibit ALZ-4 to my direct testimony. Oncor's analysis identified a number of specific engineering constraints that are incompatible with Oncor's construction, operation, and maintenance of the Proposed Transmission Line Project, including:

- buildings with narrow setbacks from existing roads, utilities, and other buildings;
- multiple active transportation/logistics operations, including truck court parking, loading areas, and emergency access/fire lanes;
- an interconnected storm sewer system with drainage channels, inlets, and underground pipes;
- an elevated water storage tank owned by the Town of Northlake;
- private above-ground water storage tanks;

- underground and above-ground gas pipelines;
- overhead distribution lines;
- streetlighting systems; and
- security fencing separating properties.

Construction of the Proposed Transmission Line Project will require a consistent 100-foot-wide ROW, structure foundations 12-15 feet in diameter, and approximately 45,000 square feet of contiguous working space at each turning structure to set the structures and pull conductor. Even where at least 100 feet of space exists between buildings to accommodate the ROW and prevent blowout, few areas have space for Oncor to establish a temporary construction easement or maneuver the equipment required to set foundations and string conductor. What space does exist between buildings and roadways is often occupied by existing utilities.

Oncor could not identify a path through the area southwest of the USACE property that would provide the space needed to construct, operate, and maintain the Proposed Transmission Line Project. Even if Oncor could identify a theoretically feasible route, the heavy vehicle traffic in this area and customer outages that would be required would hinder construction efforts. Additionally, even if Oncor could construct a route through this area, access issues resulting from the presence of drainage areas, energized transmission/distribution corridors, transportation/logistics operations, and security fencing would create operational and maintenance challenges that could impair the reliability of the transmission line. For all of these reasons, this area is not a feasible location through which to route the Proposed Transmission Line Project.

Q. PLEASE DESCRIBE ONCOR'S ANALYSIS CONCERNING A POTENTIAL UNDERGROUND CROSSING OF THE USACE PROPERTY.

A. At the request of various municipalities, Oncor conducted an analysis of what would be required to construct a portion of the Proposed Transmission

Line Project underground. This analysis was intended to potentially facilitate an approximately 0.2-mile underground crossing in the far north of the USACE property. This area is adjacent to the Trailwood subdivision in Flower Mound, near Northwest Regional Airport. Oncor's analysis uncovered no evidence that a 5,000-ampere transmission line such as the Proposed Transmission Line Project can be built underground. To Oncor's knowledge, no underground lines of this ampacity have been built in the United States, so the constraints and operational issues associated with such construction are not fully understood.

Q. WHAT WOULD BE REQUIRED TO CONSTRUCT A PORTION OF THE PROPOSED TRANSMISSION LINE UNDERGROUND, ASSUMING IT COULD BE DONE?

A. Assuming a section of the line could be built underground, doing so would require, at minimum:

- a 150- to 180-foot-wide dedicated easement (compared with 100 feet for overhead);
- permanent access roads across USACE property and right of entry for surveying, construction, inspection, and maintenance;
- permanent, concrete-encased duct banks, including four parallel duct banks per 345 kV circuit (eight total) and one duct bank for the 138 kV circuit;
- six underground cable-splice vaults per mile, each with a maintained access point; and
- a 3-acre transition station at both ends of the underground section.

Q. HOW WOULD UNDERGROUND CONSTRUCTION IMPACT THE COST OF THE PROPOSED TRANSMISSION LINE PROJECT?

A. The cost of underground construction for this project would be a minimum of $100-110 million per mile (not including the future underground

installation of a 138 kV circuit). Additionally, each 3-acre transition station would cost approximately $5-7 million.

Q. HOW ELSE WOULD UNDERGROUND CONSTRUCTION IMPACT THE PROPOSED TRANSMISSION LINE PROJECT?

A. The design and construction of an underground segment would extend the Proposed Transmission Line Project's in-service timeline to at least four years after CCN approval, compared with approximately two years for overhead. Access challenges associated with crossing USACE property and accessing underground circuits could also potentially cause reliability issues.

Environmental impacts would be greater for underground construction due to the additional ROW required for the transmission line and transition stations; the crossing of an Environmentally Sensitive Area; and the trenching, boring, and/or horizontal directional drilling required for underground construction. Importantly, the USACE indicated that it will not grant permission for permanent access roads, trenching, or crossing Environmentally Sensitive Areas, any of which would definitively render this option infeasible.

Q. DID ONCOR EVALUATE ANY OTHER ENGINEERING CONSTRAINTS?

A. Yes. The presence of 35 aircraft landing facilities in and around the study area is a unique engineering constraint that Oncor factored into the routing for the Proposed Transmission Line Project. To ensure that all of the proposed links are constructible in light of Federal Aviation Administration ("FAA") regulations and notice requirements, Oncor conducted a study of preliminary structure heights and ROW requirements for links in proximity to an airport or heliport, including use of the FAA's Obstruction Evaluation/Airport Airspace Analysis Notice Criteria Tool, which evaluates proposed structures based on preliminary heights, locations, proximity to

airports, and other factors to determine if they might trigger the FAA's notice requirements.

Based on this study, Oncor determined that potential structure heights necessary to maintain a standard 100-foot ROW width would be constructible. If, after final design of the Commission's approved route is submitted for FAA review, the FAA determines that structure heights do not comply, Oncor may utilize shorter non-standard steel monopole structures and/or acquire additional ROW width in order to comply with FAA clearance requirements.

## X. PROJECT PERMITTING

Q. WILL ANY PERMITS BE REQUIRED FOR THE PROPOSED TRANSMISSION LINE PROJECT IN ADDITION TO THE CCN SOUGHT IN THIS PROCEEDING?

A. Yes, assuming that the Commission approves the Application, it is likely that additional permits will be necessary to construct the Proposed Transmission Line Project. Following approval, and prior to construction, Oncor will acquire all necessary permits/approvals and make all required notifications. If required, Oncor will prepare a Storm Water Pollution Prevention Plan and submit a Notice of Intent to the Texas Commission on Environmental Quality under the Texas Pollutant Discharge Elimination System program. A cultural resources survey plan will be developed with the Texas Historical Commission for the approved project. Consultation with the USACE will occur following Commission approval of the Application to determine appropriate permit requirements, including consultation under Section 404 of the Clean Water Act and/or Section 10 permit criteria, as necessary. Consultation with the U.S. Fish and Wildlife Service will occur following Commission approval of the Application to determine appropriate requirements under the Endangered Species Act, if necessary. Oncor will coordinate with the Texas Department of Transportation regarding any

crossings of interstate and state highways and of state-maintained roadways.

Q. IS ANY PART OF THE PROPOSED TRANSMISSION FACILITIES LOCATED WITHIN THE COASTAL MANAGEMENT PROGRAM BOUNDARY AS DEFINED IN 31 TEXAS ADMINISTRATIVE CODE § 25.102(A)?

A. No. The Proposed Transmission Line Project is entirely outside the coastal management program boundary.

## XI. GENERATION IMPACTS

Q. DOES ONCOR EXPECT ANY GENERATOR TO BE PRECLUDED OR LIMITED FROM GENERATING OR DELIVERING ELECTRICITY TO THE ERCOT GRID DUE TO CONSTRUCTION OF THE PROPOSED TRANSMISSION LINE PROJECT, OR THAT ONCOR'S CONSTRUCTION WILL ADVERSELY AFFECT THE RELIABILITY OF THE ERCOT SYSTEM?

A. No, Oncor does not anticipate that construction of the Proposed Transmission Line Project will preclude or limit a generator from generating or delivering power, or adversely affect the reliability of the ERCOT system. As further discussed in Mr. Naik's direct testimony, the Proposed Transmission Line Project is critical to supporting the reliability of the ERCOT transmission system and will address reliability issues that may otherwise limit the generation or delivery of electricity on the ERCOT grid.

## XII. CONCLUSION

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

## AFFIDAVIT

**STATE OF TEXAS** §
§
**COUNTY OF _____** §

**BEFORE ME,** the undersigned authority, on this day personally appeared Amy L. Zapletal who, having been placed under oath by me, did depose as follows:

"My name is Amy L. Zapletal. I am of legal age and a resident of the State of Texas. The foregoing testimony and exhibit offered by me are true and correct, and the opinions stated therein are, to the best of my knowledge and belief, accurate, true and correct."

_____
Amy L. Zapletal

**SUBSCRIBED AND SWORN TO BEFORE ME** on this ____ day of August, 2023.

_____
Notary Public, State of Texas

My Commission Expires

_____

# ATTACHMENT 5

# ONCOR'S RESPONSE TO WATKINS / LIVENGOOD'S

# RFI SET NO. 1, QUESTION NO. 1-04

# HIGHLY SENSITIVE

# PROTECTED MATERIAL

# FILED UNDER SEAL

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES - REVISED**
***Watkins RFI Set 1 ~~Response*~~ Response - REVISED***

| | Watkins RFI 1-8(b) | Watkins RFI 1-9(b) | Watkins RFI 1-10(b) |
|---|---|---|---|
| | **Route 179-A** | **Route 179-B** | **Route 179-C** |
| Right-of-way and Land Acquisition | $ 56,587,000 | $ 57,055,000 | $ 56,135,000 |
| Engineering and Design (Utility) - REVISED | $ ~~307,000~~ 330,000 | $ ~~315,000~~ 338,000 | $ ~~297,000~~ 320,000 |
| Engineering and Design (Contract) | $ 6,078,000 | $ 6,160,000 | $ 5,965,000 |
| Procurement of Material and Equipment (including stores) - REVISED | $ ~~60,912,000~~ 60,988,000 | $ ~~62,243,000~~ 62,319,000 | $ ~~59,856,000~~ 59,932,000 |
| Construction of Facilities (Utility) | $ - | $ - | $ - |
| Construction of Facilities (Contract) - REVISED | $ ~~51,527,000~~ 54,969,000 | $ ~~52,729,000~~ 56,171,000 | $ ~~50,491,000~~ 53,933,000 |
| Other (all costs not included in the above categories) | $ - | $ - | $ - |
| **Estimated Total Transmission Line Cost** - REVISED | **$** ~~175,411,000~~ 178,952,000 | **$** ~~178,502,000~~ 182,043,000 | **$** ~~172,744,000~~ 176,285,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** - REVISED | **$** ~~250,269,000~~ 253,810,000 | **$** ~~253,360,000~~ 256,901,000 | **$** ~~247,602,000~~ 251,143,000 |

Note: Proposed Route 179-A addressed in Watkins RFI 1-8(b) [Column B] and Route 179R addressed in Watkins RFI 1-14(b)(ii) [Column K] are composed of identical segments.

**PROPOSED RAMHORN HILL SW - DUNHAM SW 345 kV TRANSMISSION LINE PROJECT**
**ATTACHMENT NO. 3 - COST ESTIMATES - REVISED**
***Watkins RFI Set 1 ~~Response*~~ Response - REVISED***

| | Watkins RFI 1-14(b)(ii) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Route 22R** | **Route 29R** | **Route 116R** | **Route 130R** | **Route 132R** | **Route 164R** | **Route 179R** |
| Right-of-way and Land Acquisition | $ 61,619,000 | $ 51,540,000 | $ 57,844,000 | $ 54,800,000 | $ 56,878,000 | $ 76,244,000 | $ 56,587,000 |
| Engineering and Design (Utility) - REVISED | ~~$ 307,000~~ 316,000 | ~~$ 319,000~~ 330,000 | ~~$ 333,000~~ 342,000 | ~~$ 329,000~~ 338,000 | ~~$ 334,000~~ 341,000 | ~~$ 321,000~~ 330,000 | ~~$ 307,000~~ 330,000 |
| Engineering and Design (Contract) | $ 5,925,000 | $ 6,031,000 | $ 6,200,000 | $ 6,149,000 | $ 6,190,000 | $ 6,078,000 | $ 6,078,000 |
| Procurement of Material and Equipment (including stores) - REVISED | ~~$ 60,758,000~~ 60,802,000 | ~~$ 58,029,000~~ 58,068,000 | ~~$ 64,842,000~~ 64,883,000 | ~~$ 62,191,000~~ 62,232,000 | ~~$ 63,329,000~~ 63,356,000 | ~~$ 60,434,000~~ 60,478,000 | ~~$ 60,912,000~~ 60,988,000 |
| Construction of Facilities (Utility) | $ - | $ - | $ - | $ - | $ - | $ - | $ - |
| Construction of Facilities (Contract) - REVISED | ~~$ 53,265,000~~ 55,329,000 | ~~$ 51,089,000~~ 52,840,000 | ~~$ 56,605,000~~ 58,527,000 | ~~$ 54,221,000~~ 56,143,000 | ~~$ 55,882,000~~ 57,109,000 | ~~$ 52,872,000~~ 54,936,000 | ~~$ 51,527,000~~ 54,969,000 |
| Other (all costs not included in the above categories) | $ - | $ - | $ - | $ - | $ - | $ - | $ - |
| **Estimated Total Transmission Line Cost** - REVISED | ~~$ 181,874,000~~ 183,991,000 | ~~$ 167,008,000~~ 168,809,000 | ~~$ 185,824,000~~ 187,796,000 | ~~$ 177,690,000~~ 179,662,000 | ~~$ 182,613,000~~ 183,874,000 | ~~$ 195,949,000~~ 198,066,000 | ~~$ 175,411,000~~ 178,952,000 |
| Estimated Oncor Substation Facilities Cost | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 | $ 74,858,000 |
| **Estimated Total Project Cost** - REVISED | ~~$ 256,732,000~~ 258,849,000 | ~~$ 241,866,000~~ 243,667,000 | ~~$ 260,682,000~~ 262,654,000 | ~~$ 252,548,000~~ 254,520,000 | ~~$ 257,471,000~~ 258,732,000 | ~~$ 270,807,000~~ 272,924,000 | ~~$ 250,269,000~~ 253,810,000 |

Note: Proposed Route 179-A addressed in Watkins RFI 1-8(b) [Column B] and Route 179R addressed in Watkins RFI 1-14(b)(ii) [Column K] are composed of identical segments.

**PUC DOCKET NO. 55067**

**DIRECT TESTIMONY**
**OF RUSSELL J. MARUSAK, WITNESS FOR**
**ONCOR ELECTRIC DELIVERY COMPANY LLC**

I. POSITION AND QUALIFICATIONS ..... 2

II. PURPOSE OF TESTIMONY ..... 3

III. ENVIRONMENTAL ASSESSMENT ..... 3

IV. PUBLIC INVOLVEMENT ..... 11

V. USACE CROSSING ANALYSIS ..... 14

VI. EVALUATION OF THE PROPOSED ROUTING ALTERNATIVES ..... 22

VII. CONCLUSION ..... 25

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| Exhibit RJM-1 | Resume of Russell J. Marusak |
| Exhibit RJM-2 | Texas Utilities Code § 37.056 |
| Exhibit RJM-3 | 16 Texas Administrative Code § 25.101 |
| Exhibit RJM-4 | USACE Outgrant Policy |
| Exhibit RJM-5 | Potential USACE Crossings Evaluated |
| Exhibit RJM-6 | USACE Letter Regarding Krum West-Anna 345 KV Transmission Line Project (Docket No. 38597) |

# DIRECT TESTIMONY OF RUSSELL J. MARUSAK

## I. POSITION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND ADDRESS:

A. My name is Russell J. Marusak. I am employed by Halff, an engineering consulting firm. I hold the position of Senior Project Manager. My business address is 1201 North Bowser Road, Richardson, Texas 75081.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL QUALIFICATIONS.

A. Since 1998, when I was first employed as an environmental consultant, I have provided environmental planning and consulting services for electric transmission line projects, transportation projects, land development projects, and other linear projects, including natural gas, sewer, and water pipelines. I have managed or provided technical support for numerous routing and environmental impact analyses for 138 kV and 345 kV transmission line projects in Texas since 2002. For example, I managed three environmental assessments and routing studies for Oncor 345 kV transmission line projects that were included in the Competitive Renewable Energy Zone ("CREZ") initiative of the Public Utility Commission of Texas ("Commission")—Docket Nos. 37408, 38140, and 38597—ranging in length from 40 to 160 miles. Since CREZ, I have managed numerous routing and environmental impact analyses for multiple 345 and 138 kV transmission lines. Currently, I am managing the environmental assessment and routing study for the proposed Ramhorn Hill-Dunham 345 kV transmission line project in Denton and Wise counties ("Proposed Transmission Line Project"). My educational and professional qualifications are more fully presented in Exhibit RJM-1 attached hereto.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE COMMISSION?

A. Yes, I previously provided testimony in Commission Docket Nos. 37408, 38140, 38597, 47368, 48095, 48785, 49302, 49723, 51737, 53053, and 54733.

## II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to introduce, support, sponsor, and describe the *Environmental Assessment and Routing Study for the Proposed Ramhorn Hill Switch to Dunham Switch 345 kV Transmission Line Project in Denton and Wise Counties, Texas* ("Environmental Assessment") prepared by Halff at the request of Oncor. The Environmental Assessment is included as Attachment No. 1 to Oncor's Standard Application for a Certificate of Convenience and Necessity ("CCN") for a Proposed Transmission Line (the "Application"). The Application, as it may be amended and/or supplemented, will be offered into evidence by Oncor at the hearing on the merits. The facts and statements contained in the Environmental Assessment, which I am sponsoring, are true and correct to the best of my knowledge.

## III. ENVIRONMENTAL ASSESSMENT

Q. WHY DID HALFF PREPARE THE ENVIRONMENTAL ASSESSMENT?

A. Oncor retained Halff to prepare the Environmental Assessment for the Proposed Transmission Line Project. My responsibilities included oversight and participation in all elements of the preparation of the Environmental Assessment from baseline data acquisition to development of the alternative routes.

Q. WAS ANYONE OTHER THAN YOU INVOLVED IN THE ENVIRONMENTAL ASSESSMENT PROCESS?

A. Yes. Halff assembled a team of professionals with expertise in different environmental and land use disciplines, including soils, physiography, geology, water resources, terrestrial and wetland ecology, community values and resources, aesthetics, cultural resources, and mapping, among others (the "Halff Project Team"), all of whom were involved in data acquisition, routing analysis, and environmental assessment for the Proposed Transmission Line Project. Section 8.0 of the Environmental

Assessment presents a list of the primary preparers of the document.

Q. WHAT DOES THE ENVIRONMENTAL ASSESSMENT ADDRESS?

A. The Environmental Assessment provides a detailed description of the data gathered and analyzed by Halff with respect to the Proposed Transmission Line Project, the project area, and the routing procedures and methodology Halff utilized to delineate and evaluate alternative routes.

Q. PLEASE DESCRIBE THE OBJECTIVES OF THE ENVIRONMENTAL ASSESSMENT.

A. The objectives of the Environmental Assessment were to identify and evaluate the alternative routes for the Proposed Transmission Line Project. Halff's approach involved a series of tasks designed to address: (1) the requirements of Texas Utilities Code § 37.056(c)(4)(A)-(D); (2) the requirements of 16 Texas Administrative Code ("TAC") § 25.101(b)(3)(B), including the Commission's policy of prudent avoidance; (3) CCN application form requirements (including but not limited to Question Nos. 9-10 and 17-29); and (4) Oncor's routing policies. The tasks included scoping and study area delineation, data collection, constraints mapping, preliminary alternative route identification, participation in public participation meetings, modification/addition of alternative route links following the public participation meetings, and alternative route development. True and correct copies of Texas Utilities Code § 37.056 and 16 TAC § 25.101 are attached to my direct testimony as Exhibits RJM-2 and RJM-3, respectively.

Q. PLEASE EXPLAIN HOW THE STUDY AREA WAS DELINEATED FOR THE PROPOSED TRANSMISSION LINE PROJECT.

A. To identify preliminary alternative routes for the Proposed Transmission Line Project, Halff first delineated a study area, gathered data regarding the study area, and mapped constraints within the study area.

The study area for the Proposed Transmission Line Project must encompass the endpoints for the Proposed Transmission Line Project, the

proposed Ramhorn Hill Switch and the proposed Dunham Switch—and include an area large enough that a reasonable number of forward-progressing, geographically diverse routes could be identified. The purpose of the study area is to establish boundaries and limits for the information gathering process (i.e., the identification of environmental and land use constraints). Figures 3-1A, 3-1B, 3-1C, and 3-1D (Appendix H) of the Environmental Assessment depict the study area delineated by Halff.

Halff reviewed United States Geological Survey ("USGS") topographic maps and aerial photography to develop the study area boundary for the Proposed Transmission Line Project. Halff located and depicted the project endpoints on the maps and identified major features in the study area, such as Grapevine Lake, Interstate Highway 35W ("I-35W"), State Highway ("SH") 114, United States Highway ("US") 377, Farm-to-Market Road ("FM") 1171, FM 407, FM 156, numerous municipalities, numerous airports, the Texas Motor Speedway, existing transmission infrastructure, and other features. The study area is rectangular in shape and encompasses approximately 149.6 square miles, with the longer axes extending approximately 17.6 miles east to west and the shorter axes extending approximately 8.5 miles north to south. The study area is centered to the north of the project's endpoints due to dense urban development south of the project's endpoints in southern Denton County and northern Tarrant County, which severely limits the routing opportunities in the far southern portion of the study area.

Q. HOW DID HALFF IDENTIFY ENVIRONMENTAL AND LAND USE CONSTRAINTS IN THE STUDY AREA?

A. Once the study area boundary was identified, Halff initiated a variety of data collection activities. One of the first such activities was the development of a list of officials to be mailed a consultation letter requesting information on constraints that might impact the Proposed Transmission Line Project. Halff mailed out consultation letters beginning in September 2022. The purpose

of the letters was to inform the various officials and agencies about the Proposed Transmission Line Project and to give those officials and agencies the opportunity to provide any information they had regarding the project and/or general project area. In response, Halff and Oncor received information from various public officials and agencies. The consultation letters and related correspondence are included as Appendix A to the Environmental Assessment.

Among other things, data collection activities also consisted of a review of: (1) files and records of various regulatory agency databases; (2) published literature; and (3) a variety of maps, including recent aerial photography, seamless topographical maps from the USGS, Texas Department of Transportation maps, county highway maps, U.S. Fish & Wildlife Service National Wetlands Inventory maps, and county appraisal district land parcel boundary maps. During the course of the data collection activities, Halff personnel also conducted reconnaissance surveys of the study area on September 4, November 23, and December 7-8, 2022, as well as on January 14, February 16, March 4, and April 25, 2023, to confirm research findings and identify constraints that were not previously noted. The data collection effort began in the early stages of the Proposed Transmission Line Project's planning and continued until the completion of the Environmental Assessment.

Q. HOW DID HALFF USE THE DATA COLLECTED THROUGH THIS PROCESS?

A. Information gathered during data collection was used to develop an environmental and land use constraints map, which is included as Figures 3-1A, 3-1B, 3-1C, and 3-1D (Appendix H) of the Environmental Assessment. These figures depict the environmental and land use constraints identified by Halff through the data collection process and field investigations. In this context, constraints are land use or landscape features that may affect or be affected by the location of a transmission line.

The goal of this approach is to identify areas where constraints are absent or fewer, or those areas with a lower likelihood of containing existing natural or human resources that could be affected by a transmission line.

Q. DID HALFF ENCOUNTER ANY ROUTING CHALLENGES UNIQUE TO THIS STUDY AREA?

A. Yes. This study area contains pockets of dense urban and suburban development, which is expanding rapidly—even relative to the general growth and development occurring throughout the state. The study area also contains a substantial amount of environmentally sensitive land owned by the United States Army Corps of Engineers ("USACE").

Existing constraints in the study area include two major highways (I-35W and SH 114); several other major thoroughfares (US 377, FM 407, FM 1171, and FM 156); numerous residential communities and master-planned subdivisions; many commercial, industrial, and recreational facilities; oil & gas pipelines, electric transmission lines, and other utility infrastructure; the Texas Motor Speedway; Alliance Airport; and a BNSF Railway Company Intermodal rail yard. These facilities are major drivers for the development and growth this area is experiencing. Several municipalities are interspersed throughout the study area, including the towns of Argyle, Bartonville, Flower Mound, and Northlake, as well as the cities of Justin, New Fairview, and Rhome. Including Alliance Airport, there are 35 aircraft landing facilities located in and adjacent to the study area. These facilities create unique challenges due to Federal Aviation Administration regulations and notification requirements regarding the location of structures within airport glideslopes.

In addition to these existing constraints, vacant land in the study area is rapidly developing for new commercial, industrial, and residential uses. During the preparation of the Environmental Assessment, Oncor was contacted by numerous developers to inform Oncor of new developments at various stages of planning, including some that have already begun

grading and/or construction as of the time of the Application's filing. Where possible, Halff modified the preliminary alternative links to accommodate these developments; but due to the sheer volume of new construction, some overlap with development plans is unavoidable. The direct testimony of Oncor witness Mr. Harsh Naik provides additional details regarding the rapid development in this area from an electrical planning perspective and how it relates to the critical reliability need for the Proposed Transmission Line Project. The rapid pace of new development will likely continue to introduce new constraints throughout the CCN approval, right-of-way ("ROW") acquisition, design, and construction processes.

Finally, the southeastern portion of the study area near the proposed Dunham Switch includes approximately 3,250 acres of land owned and managed by the USACE. Federal regulations severely restrict construction of new transmission lines on this property. Most of the USACE property is designated as Environmentally Sensitive Area ("ESA"), signifying areas where scientific, ecological, cultural, and aesthetic features exist, and which are designated as such to protect sensitive habitats or cultural resources.

Oncor cannot cross the USACE property without approval from the federal government. Due to regulations and restrictions on use of the USACE property, even if the Commission approved a route crossing the USACE property, Oncor would be required to seek and obtain federal approval from the USACE for the crossing. This could take several years post CCN-approval, and the USACE could still deny the crossing at its discretion. With certain exceptions, unless there is a direct benefit to the federal government, the USACE will only grant such a crossing if there are "no viable alternatives." Thus, while Halff coordinated closely with USACE representatives, municipal officials, and state and federal legislators regarding a potential crossing of the USACE property, Oncor cannot affirmatively state that a route crossing the USACE property would be

permitted or constructible. Moreover, USACE representatives directly informed Oncor that certain USACE crossings will not be approved.

Q. WHAT PROCESS DID HALFF UTILIZE TO IDENTIFY THE PRELIMINARY ALTERNATIVE ROUTES FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. Given that a number of potential routes could be drawn to connect the termination points, the constraints mapping process was used in selecting and refining possible alternative routes. Upon completion of the initial data collection activities and constraints mapping process, the next step in the routing process was to identify preliminary alternative links to connect the endpoints for the Proposed Transmission Line Project. Halff identified numerous preliminary alternative links forming over 600,000 theoretical routes. As discussed later in my testimony, Halff, in consultation with Oncor and with input from local landowners, officials, and agencies, refined the number and location of potential alternative links and routes for the Proposed Transmission Line Project. Ultimately, Halff provided 221 alternative routes for Oncor's consideration.

In identifying preliminary alternative links, Halff considered a variety of information, including, among other things: (1) input received from correspondence with agencies, local officials, and the public; (2) results from the visual reconnaissance surveys of the study area; (3) reviews of aerial photography; (4) findings of publicly available data collection activities; (5) the environmental and land use constraints map; (6) apparent property boundaries; (7) existing compatible corridors; and (8) locations of existing developments. Section 4.0 of the Environmental Assessment discusses Halff's identification of the preliminary alternative route links for the Proposed Transmission Line Project.

Q. DID HALFF CONSIDER OTHER ENDPOINTS FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. Yes. Halff evaluated three other potential locations for the proposed Dunham Switch. As explained Mr. Naik's direct testimony, the options for locating the Dunham Switch were limited because the Dunham Switch must tap into the existing Lewisville-Krum West/Roanoke 345 kV transmission lines. These transmission lines extend northeast from Oncor's existing Roanoke Switch, located approximately 2.5 miles south of the intersection of I-35W and SH 114. Thus, the other locations Halff evaluated for the Dunham Switch were all adjacent to the existing transmission lines and northeast of the site Oncor ultimately selected for the Dunham Switch. The purpose of evaluating potential alternate endpoints was to discern whether they might provide superior routing options or a greater range of routing opportunities. However, due to the location of the Lewisville-Krum West/Roanoke transmission lines relative to existing development in the study area and the USACE property, the alternative endpoints would only have extended the length of the transmission line without providing superior routing options or a greater range of routing opportunities. Therefore, Oncor chose to proceed with the Dunham Switch location proposed in the Application.

Q. DID HALFF CONSIDER ANY ALTERNATIVE ENDPOINT LOCATIONS THAT WERE SOUTHWEST OF THE PROPOSED DUNHAM SWITCH LOCATION?

A. No. The presence of the USACE property and dense urban development to its southwest do not provide any feasible routing opportunities that Oncor could use to reach the Ramhorn Hill Switch or to tap into the existing Lewisville-Krum West/Roanoke transmission lines.

Q. DID HALFF SOLICIT INFORMATION FROM THE TEXAS PARKS AND WILDLIFE DEPARTMENT ("TPWD") AS PRELIMINARY ALTERNATIVE LINKS WERE DEVELOPED?

A. Yes, in identifying and evaluating the preliminary alternative links, one of the agencies that Halff solicited information from was TPWD. Halff

requested that TPWD provide environmental and land use constraints information regarding threatened/endangered species, wetlands, or other areas of special interest to TPWD within the project study area. Appendix A of the Environmental Assessment includes Halff's letter to TPWD requesting information concerning the Proposed Transmission Line Project.

Q. PLEASE DESCRIBE THE TPWD CORRESPONDENCE RECEIVED BY HALFF IN RESPONSE TO HALFF'S REQUEST FOR INFORMATION.

A. Halff received a letter from TPWD that, among other things, described the Proposed Transmission Line Project, discussed certain state and federal laws and regulations (e.g., the Endangered Species Act), and provided comments and recommendations. TPWD recommended using existing facilities wherever possible and minimizing transmission line length. Where new construction is required, TPWD recommended paralleling existing linear infrastructure and utility ROW to minimize habitat fragmentation.

Q. HOW DOES HALFF RESPOND TO TPWD'S RECOMMENDATIONS?

A. Halff appreciates TPWD's input and takes its mission to protect the State's parks and wildlife for the citizens of Texas very seriously. Many of TPWD's recommendations for the project are already part of Halff's standard practice. To the extent that Halff's standard practice does not fully incorporate TPWD's recommendations, Halff believes that it generally accomplishes TPWD's goals while considering other factors, including but not limited to Texas Utilities Code § 37.056 and the Commission's substantive rules, which TPWD does not consider.

## IV. PUBLIC INVOLVEMENT

Q. PLEASE DESCRIBE THE PUBLIC INVOLVEMENT PROGRAM UTILIZED FOR THE PROPOSED TRANSMISSION LINE PROJECT.

A. In addition to the consultation with local officials and departments and local, state, and federal regulatory agencies, the public involvement program included two public participation meetings and a review of information received from interested parties. The purpose of consulting with public

officials and other interested parties was to provide those parties with information regarding the process of transmission line routing and to get input from those parties regarding proposed projects or other land use constraints that could have an impact on the potential alternative routes.

The purpose of the public participation meetings, which were held on December 7 and 8, 2022, was to: (1) solicit comments and input from residents, landowners, public officials, and other interested parties concerning the Proposed Transmission Line Project, the preliminary alternative route links, and the overall transmission line routing process; (2) promote a better understanding of the Proposed Transmission Line Project, including the purpose, need, potential benefits, potential impacts, and the CCN certification process; (3) inform the public regarding the routing process, schedule, and decision-making process; and (4) gather information about the values and concerns of the public and community leaders. The figures found in Appendix B of the Environmental Assessment depict the location of the preliminary alternative route links as presented at the public participation meeting.

The public involvement program also included consultation and solicitation of information from local officials and various state and federal agencies in order to give such officials and agencies the opportunity to provide Halff with any information they had regarding the project and/or project area. Information received from the public involvement program was considered and incorporated into Halff's evaluation of the Proposed Transmission Line Project, routes, and alternative route links.

Q. PLEASE DESCRIBE THE TYPES OF FEEDBACK RECEIVED AT THE PUBLIC PARTICIPATION MEETINGS.

A. Feedback from the public participation meetings occurred in two primary ways. First, one-on-one conversations with personnel from Halff and Oncor, as well as personnel from Oncor's property abstracting contractor, Integra Realty Resources ("Integra"), allowed Oncor and its representatives

to receive information regarding interests and comments about the project. During the one-on-one conversations, attendees were able to provide comments and clarifications regarding structures and features depicted on the large aerial photographs displayed at the public participation meetings. Attendees were encouraged to locate and mark particular features of interest on the aerial exhibits and at the Geographic Information System (GIS) computer stations. In that manner, Halff gained insight into particular features of the study area as well as a sense of those values important to the communities potentially impacted by the Proposed Transmission Line Project.

Second, in addition to the opportunities for real-time feedback, each attendee at a public participation meeting received a questionnaire that solicited comments on the Proposed Transmission Line Project. Oncor and Halff received 27 questionnaires at the December 7th public meeting and 44 questionnaires at the December 8th public meeting. Additionally, Oncor and Halff received thousands of questionnaires and/or comments submitted after the meeting in lieu of a questionnaire. These comments were considered and factored into Halff's evaluation of the alternative routes. Additional details on the public participation meeting process are provided in the direct testimony of Oncor witness Ms. Brenda J. Perkins.

Q. WHAT GENERAL ISSUES WERE RAISED IN THE PUBLIC COMMENTS?

A. Generally, comments tended to express a preference to avoid particular features and locations in the study area, including schools, churches, airports, neighborhoods, and commercial developments. Oncor received numerous comments from residents of Northlake and Argyle expressing a preference that the Proposed Transmission Line Project avoid those communities altogether. A substantial number of commenters expressed a preference for minimizing the length of the Proposed Transmission Line Project. Other commenters expressed concerns regarding property values, health and safety, and impacts to aesthetics, natural resources, and

existing land uses. Finally, a number of commenters expressed a preference for the Proposed Transmission Line Project to cross the USACE-owned property located southwest of the Dunham Switch. The public comments received are addressed in more detail in Section 5.0 of the Environmental Assessment.

Q. WHAT MODIFICATIONS DID HALFF MAKE TO THE PROPOSED ROUTING ALTERNATIVES FOLLOWING THE PUBLIC INVOLVEMENT PROGRAM?

A. Based on information gathered through the public participation meeting, coordination with local, state, and federal officials, recommendations from development representatives, and site visits of the study area following the public participation meeting to verify the status of potential developments, Halff further evaluated the constraints in the study area and modified, deleted and added several alternative route links as a result. These changes were intended to, among other things: (1) accommodate existing habitable structures, habitable structures currently being constructed, and other known active and/or planned development within the study area; (2) parallel property boundaries; (2) avoid a pond associated with nearby oil and gas facilities; (3) provide additional or more direct pathways through the study area; (4) eliminate redundant links; and (5) eliminate a group of links in the northern portion of the study area.

Section 6.0 of the Environmental Assessment and Routing Study discusses the alternative route link modifications, additions, and deletions in more detail, and Appendix C contains map figures illustrating these changes.

## V. USACE CROSSING ANALYSIS

Q. WHAT IS THE PROCESS FOR OBTAINING APPROVAL TO CROSS USACE LAND?

A. Transmission line crossings of USACE-owned and -managed property are governed by the Federal Non-Recreational Outgrant Policy ("Outgrant

Policy"). As stated in that policy, the two rationales for granting such a crossing are: (1) there is no viable alternative to the activity or structure being located on the USACE land or waters, or (2) there is a direct benefit to the federal government. "Viable alternatives" in the Outgrant Policy are defined as "[o]ther lands and/or waters (not under Corps management) that can meet the intended objective of the request." Viability is determined without consideration to cost factors or the perceived availability or underutilization of USACE lands or waters. This means that a crossing of USACE property will not be granted if any feasible alternative route exists that does not require crossing USACE property. A copy of the Outgrant Policy is included as Exhibit RJM-4 to my direct testimony.

The Outgrant Policy also recommends that USACE lake offices establish designated utility corridors in Project Master Plans to serve as the preferred location for future outgrants, such as easements for transmission lines, and that crossings should utilize these corridors where they exist. There are 20 designated utility corridors associated with Grapevine Lake, five of which (Utility Corridors 11-15) were evaluated for the routing of the Proposed Transmission Line Project. The USACE has adopted specific restrictions on the use of each designated utility corridor, including restrictions on corridor width, installation of overhead facilities, and construction processes.

USACE approval of any route across USACE lands is subject to provisions of the National Environmental Policy Act ("NEPA"). Proposed actions generally consistent with allowances in the in the Grapevine Lake Master Plan ("Master Plan"), such as a transmission line route using an existing utility corridor as defined in the Master Plan, subject to the established restrictions and without modification, may qualify for a categorical exclusion.

In contrast, a transmission line route that would substantially modify a designated utility corridor or the restrictions for its use, or that would occur

outside of a designated corridor, depending on scope of impacts, would be subject to NEPA evaluation through either an environmental assessment or environmental impact statement, either of which would entail additional interagency coordination and public notice. Per correspondence with the USACE, the best-case timeline for an environmental assessment NEPA review would be a minimum of six to eight months. However, a standard and more realistic timeline is closer to one to two years, after which the USACE could grant or deny the crossing at its discretion.

Q. IN YOUR TIME AT HALFF, HAVE YOU MANAGED OR SUPPORTED PROJECTS THAT HAVE REQUIRED COORDINATION WITH THE USACE REGARDING THE NON-RECREATIONAL OUTGRANT PROCESS?

A. Yes.

Q. PLEASE CITE PROJECT EXAMPLES THAT LEND TO YOUR UNDERSTANDING OF THE NON-RECREATIONAL OUTGRANT PROCESS?

A. As noted in Exhibit RJM-1, I managed the Environmental Assessment for Oncor's Krum West-Anna 345 kV transmission line project. On that project, Halff and Oncor determined early in the routing process that crossing the USACE-owned Greenbelt corridor between Ray Roberts Lake and Lewisville Lake would provide more direct and shorter routes connecting the project endpoints. Under the provisions of the Outgrant Policy, Halff met early with the USACE to explore ways to cross USACE lands. Through this collaborative effort, preliminary alternative route links were developed and an NEPA environmental assessment was prepared to document the analysis of several alternatives. One alternative involved rebuilding an existing Oncor transmission line and co-locating it with the proposed line, entirely within the existing 100-foot Oncor easement.

After ten months of coordination and considering multiple alternatives, the USACE deemed that the re-build option was a viable

alternative that had the least impact to USACE lands. The USACE discontinued review of the other potential alternatives that would cross federal lands outside of the existing utility easement and did not publish the environmental assessment. A letter to Oncor explaining USACE's decision to discontinue evaluation of the other alternatives for that project is included as Exhibit RJM-6 to my direct testimony.

Another example is the Park Boulevard Extension project which is a linear transportation project proposed by Collin County. I provided technical support in preparing the Preliminary Information Document ("PID") and Detailed Information Report ("DIR") as part of the formal outgrant request. Formal initiation of the process began in 2014 with the PID, which evaluated project alternatives and environmental impacts. Upon USACE review of the PID, it was determined that processing the outgrant could continue. Schematic designs and more detailed environmental analyses were conducted for Collin County's preferred alternative and, after multiple draft submittals, the final DIR was completed in 2018. The USACE issued easement documents in October 2018 for approximately 0.75 net acre for those portions of the project on USACE property. In other words, in that case, it took approximately four years for the USACE to approve a 0.75-acre outgrant.

Q. PLEASE DESCRIBE HALFF'S COORDINATION WITH THE USACE REGARDING POTENTIAL CROSSINGS FOR THE PROPOSED TRANSMISSION LINE PROJECT.

A. As part of its agency outreach, Halff coordinated directly with the USACE Grapevine Lake Office to verify USACE's application of the Outgrant Policy. In consideration of the Outgrant Policy and guidance from the lake office, Halff's development of preliminary links first sought viable alternatives that did not cross USACE lands. Additionally, Halff and Oncor held numerous meetings with USACE representatives and various local, state, and federal officials to address specific potential crossings.