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SOAH DOCKET NO. 473-21-0247
PUC DOCKET NO. 51023

APPLICATION OF THE CITY OF SAN ANTONIO TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE SCENIC LOOP 138-KV TRANSMISSION LINE IN BEXAR COUNTY	BEFORE THE STATE OF OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS OF

BRIAN C. ANDREWS

ON BEHALF OF

LISA CHANDLER,

CLINTON R. CHANDLER,

AND

CHIP AND PAMELA PUTNAM

BRUBAKER & ASSOCIATES, INC.

February 19, 2021

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Affidavit of Brian C. Andrews

State of Missouri)
) **SS**
County of Saint Louis)

Brian C. Andrews, being first duly sworn, on his oath states:

1. My name is Brian C. Andrews. I am an Associate with Brubaker & Associates, Inc., 16690 Swingley Ridge Road, Suite 140, Chesterfield, Missouri 63017. I have been retained by Lisa Chandler, Clinton R. Chandler, and Chip and Pamela Putnam to testify in this proceeding on their behalf.

2. Attached hereto and made a part hereof for all purposes are my direct testimony and exhibits which were prepared in written form for introduction into evidence in Public Utility Commission of Texas Docket No. 51023.

3. I hereby swear and affirm that the testimony and exhibits are true and correct and that they show the matters and things that they purport to show.

Brian C. Andrews

Subscribed and sworn to before me this 19th day of February, 2021.

MARIA E. DECKER
Notary Public - Notary Seal
STATE OF MISSOURI
St. Louis City
My Commission Expires: May 5, 2021
Commission # 13706793

Notary Public

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Direct Testimony of Brian C. Andrews

I. Introduction

Q PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A Brian C. Andrews. My business address is 16690 Swingley Ridge Road, Suite 140, Chesterfield, Missouri 63017.

Q PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A I received a Bachelor of Science in Electrical Engineering from the Washington University in St. Louis/University of Missouri-St. Louis Joint Engineering Program. I also received a Master of Science in Applied Economics from Georgia Southern University. I have attended training seminars on several topics including, but not limited to, cost estimation for transmission projects and transmission line siting. I am a certified Engineer Intern in the State of Missouri.

As an Associate at BAI, and as a Senior Consultant, Consultant, Associate Consultant, and Assistant Engineer before that, I have been involved in a variety of regulated and competitive electric service issues. These include, but are not limited to, transmission planning, transmission line routing, and transmission line cost

estimation. I have experience with power flow models, analysis of electromagnetic field issues, and transmission line routing and cost analyses. I also have experience with the modeling tools and approaches used to evaluate these issues with various programs such as Microsoft Excel, PSS/E, MatLab, ArcGIS, Google Earth and The United States Department of Energy / Bonneville Power Administration's Corona and Field Effects ("CAFE") Program. My background is further detailed in Appendix A to my testimony.

Q HAVE YOU PREVIOUSLY FILED TESTIMONY BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS ("PUCT" OR "COMMISSION") ON TRANSMISSION-RELATED MATTERS IN GENERAL AND IN CERTIFICATE OF CONVENIENCE AND NECESSITY ("CCN") PROCEEDINGS?

A Yes, I filed expert testimony in PUCT Docket Nos. 44837, 45866, 46234, 48625, 48629, 49523, 50545, 50410, 50812, and 50830. I also provided consulting and technical support for my colleague, Mr. James R. Dauphinais, for his transmission line routing testimony and exhibits filed in PUCT Docket Nos. 40728, 41606, 42087, 43599, 43878, 44547, and 46429. My involvement in those proceedings included reviewing the applicant's application and exhibits, analyzing the routing criteria and Geographical Information System ("GIS") data of the routes, identifying modifications to improve the routing factor performance of filed routes, reviewing and analyzing cost estimates of proposed routes, providing insight and recommendations for testimony, and creating exhibits for Mr. Dauphinais. I provided similar support for Mr. Dauphinais' testimony filed in transmission line CCN proceedings in Illinois, Michigan, and Alberta.

Q ON WHOSE BEHALF ARE YOU APPEARING IN THIS PROCEEDING?

A I am testifying on behalf of Lisa Chandler, Clinton R. Chandler, and Chip and Pamela Putnam.

Q HOW ARE YOUR CLIENTS AFFECTED BY THE PROPOSED PROJECT?

A As shown in Application Attachment 6 (Amended), my clients would be affected by Segment 40. Lisa Chandler's residence (Map ID 5) is located 128 feet from Segment 40. Ms. Chandler owns tract numbers A-141, A-160, A-161, A-163, and B-028. Tract B-028 is closer to Segment 46b. Clinton R. Chandler owns tract number A-145, which contains two habitable structures, identified on the maps as numbers 3 and 4. Habitable structure number 3 is located 141 feet from Segment 40 and habitable structure number 4 is located 194 feet from Segment 40. Chip and Pamela Putnam own tracts A-144 and A-168, which contains habitable structures numbers 1 and 2. Habitable structure number 1 is located 267 feet from Segment 40. Habitable structure number 2 is located 220 feet from Segment 40.

Q WHAT IS THE SUBJECT MATTER OF YOUR TESTIMONY?

A My testimony addresses the route alternatives offered in the Application ("Application") of the City of San Antonio ("CPS Energy" or "Company") for the proposed Scenic Loop 138-kV Transmission Line Project ("Proposed Project"). I present the results of my routing analysis performed on the routes in the Company's Application and Amended Application. I also introduce a new route, Route AA2, consisting of noticed route segments.

My silence regarding any issue should not be taken as an endorsement of any position taken by CPS Energy in its Application or direct testimony in this proceeding.

Q WHAT MATERIALS DID YOU REVIEW PRIOR TO THE PREPARATION OF YOUR DIRECT TESTIMONY?

A I reviewed CPS Energy's Application, Amended Application, exhibits, direct testimony, and responses to Requests For Information ("RFIs"). This included a thorough review of the Environmental Assessment and Alternative Route Analysis ("EA") conducted by POWER Engineers ("POWER"), which is Attachment 1 to the Application. I also conducted a detailed desktop review of the GIS data and reviewed the Intervenor Maps and Primary Segments Maps.

Q WILL YOU SUMMARIZE YOUR CONCLUSIONS?

A Based upon my consideration of the Commission's routing factors, I conclude Route AA2 best addresses the requirements of PURA and the PUCT Substantive Rules. This route best balances the routing factors. It is the fourth least expensive route, having an estimated cost of $39.05 million. However, this cost estimate does not reflect the 20 percent discount on Right-of-Way ("ROW") acquisition costs that Toutant Ranch, Ltd., Pinson Interests Ltd. LLP, and Crighton Development Co. (collectively "Developers") have agreed to on Segments 42a, 46a, and 49a, nor does it reflect the fact that Developers have agreed their proposed segment modifications would not result in any net increase relative to the original segments and Developers would donate additional ROW to ensure the modifications cause no increased cost. Developers proposed the alignments of Segments 42a, 46a, and 49a in locations where Developers will accept the transmission line on land they own. This concession on the ROW acquisition cost will reduce the cost of Route AA2 below the $39.05 million

CPS Energy has estimated by approximately $105 thousand.[1] The concession of no net increase should further reduce the final cost of Route AA2. Route AA2 has a relatively moderate number of habitable structures within 300 feet, with 30. Route AA2 also has relatively moderate impact on modeled 3-Moderate High and 4-High Quality Golden-cheeked warbler habitat. The ALJs should recommend, and the Commission should approve, Route AA2 for the Proposed Project.

II. Route Selection Factors

Q WHAT FACTORS DOES THE COMMISSION CONSIDER IN THE APPROVAL OF A TRANSMISSION LINE ROUTE?

A The Commission considers, holistically, all the factors in Section 37.056(c)(4)(A-D) of the Texas Utilities Code, Commission Substantive Rule 25.101, and the Commission's policy of prudent avoidance related to electric and magnetic fields. Other guidance comes from past Commission decisions. The circumstances involved in individual transmission line cases vary, so the applicability of precedent depends on the similarity of prior cases to the issues at hand and whether there is any new or different information related to the issues that was not available to the Commission at the time the precedent was established. Finally, additional factors are part of the overall environmental assessment typically included with each application.

[1]Developers claim as much as two miles of the route on Segments 42a, 46a, and 49a would be on their properties, they have agreed to a 20 percent discount relative to CPS Energy's estimate of $0.50/ square foot of ROW. 2 miles x 5,280 ft/mile x 100' wide ROW x $0.50/sq ft x 20% = $105,600.

Q SHOULD GREATER WEIGHT BE PLACED ON CERTAIN FACTORS VERSUS OTHERS?

A Yes. For example, the Commission in its Final Order in Docket No. 30168, *Application of TXU Delivery Company to Amend a Certificate of Convenience and Necessity ("CCN") for a Proposed Transmission Line within Jack, Wise and Benton Counties, Texas*, noted that it has emphasized two factors in deciding the routing of transmission lines: the cost of the line and its impact on habitable structures (Final Order at 2). The Commission also found in Docket No. 30168 that the ALJs placed too much emphasis on recreational and park areas, historical values, and environmental issues (*Id.*). This said, in other transmission line routing proceedings (*e.g.,* Docket Nos. 37464, 38230, and 38354), the Commission has not selected the route that had the least number of habitable structures affected when another route had better performance regarding paralleling existing compatible ROW (including property boundaries). In Docket 47808, the Commission approved a route that was neither least cost nor least impactful to habitable structures, stating, "The Commission selects modified route 39 over modified route 125 based on a preference to parallel an existing transmission line and for aesthetic purposes to avoid a scenic roadway that is appreciated as such by the community."[2]

Another point of emphasis is in Commission Substantive Rule 25.101(b)(3)(B). This section of the rule emphasizes the paralleling of compatible ROW (including property boundaries) and conforming to the Commission's policy of prudent avoidance of electric and magnetic fields. Regarding property boundaries, the Commission in Docket No. 43599, *Application of LCRA TSC Transmission Services Corporation to*

[2]Final Order in Docket No. 47808 at page 1, (Jan. 18, 2019).

amend its CCN for the Proposed Blumenthal Substation and 138-kV Transmission Line, concluded that the term "property lines" in Commission Substantive Rule 25.101(b)(3)(B)(iii) refers to the property boundaries of a landowner's total contiguous area of land; the term does not refer to tax-parcel lines. It also is important to recognize that, all else being equal, paralleling existing transmission lines (particularly of equal or greater size and visibility) reduces the incremental impact on the community and landowners compared to paralleling other compatible rights-of-way that do not include transmission towers or similar infrastructure.[3]

Finally, although some categories of data tabulated in the Environmental Assessment can be routing factors, they deserve less weight than other factors required by statute and rule. For example, being in the "foreground visual zone" of state and U.S. highways may not necessarily be a detriment unless the affected state and U.S. highways are widely recognized as scenic routes, highways, or byways. A high number in the category of foreground visual zone of highways can be a good factor, as it indicates that a route may be more compliant with the routing criteria by following highways, which are generally considered compatible corridors.

Q WHEN WEIGHING THE FACTORS TO BE CONSIDERED, IS IT POSSIBLE THAT SUBSTANTIALLY BETTER PERFORMANCE WITH RESPECT TO ONE FACTOR CAN ULTIMATELY OUTWEIGH INFERIOR PERFORMANCE WITH RESPECT TO ANOTHER FACTOR?

A Yes. A hypothetical example of this would be when one route impacts a relatively small number of habitable structures but parallels a small amount of the available existing compatible ROW. In such a circumstance, it may be appropriate to select a route that

[3]None of the routes presented in the CPS Application parallel existing transmission lines.

impacts more habitable structures if that route also outperforms other routes in its paralleling of existing compatible ROW.

Q CAN UNIQUE CIRCUMSTANCES NOT READILY CAPTURED IN ROUTING FACTORS MODIFY THE SELECTION OF A TRANSMISSION LINE ROUTE?

A Yes. I can offer three examples of such unique circumstances. First, in Docket No. 38290, *Application of Sharyland Utilities, LP to Amend its CCN for the Proposed Hereford to White Deer 345-kV CREZ Transmission Line,* the iconic beauty and engineering challenges of Palo Duro Canyon, with higher habitable structure counts on another route that avoided Palo Duro Canyon, led the Commission to select a more expensive route for the transmission line proposed in that proceeding.

In Docket No. 38354, *Application of LCRA TSC Transmission Services Corporation to Amend its CCN for the Proposed McCamey D to Kendall to Gillespie 345-kV CREZ Transmission Line,* the Commission found the well-developed Interstate Highway 10 corridor was a more compatible ROW for paralleling purposes than the alternative paralleling opportunities available in the Texas Hill Country. This led the Commission to select a route with higher habitable structure counts and cost more than other alternative routes

Last, in Docket No. 38597, *Application of Oncor Electric Delivery Company LLC to Amend its CCN for the Proposed Krum to West Anna 345-kV CREZ Transmission Line,* the adverse impact on community values[4] of crossing the Greenbelt multi-use trail

[4]The Commission has previously defined "community values" as: [A] shared appreciation of an area or other natural or human resource by a national, regional, or local community. Adverse effects upon community values consist of those aspects of a proposed project that would significantly alter the use, enjoyment, or intrinsic value attached to an important area or resource by a community. *Application of AEP Transmission Services Corporation to Amend its Certificate of Convenience and Necessity for a 345-kilovolt Double-circuit Line in Caldwell, Guadalupe, Hays, Travis and Williamson Counties, Texas,* Docket No. 33978, Order at FoF 118 (Oct. 10, 2008).

system, along with both the routing factor performance and the large size of the structures required to cross the Greenbelt in the only location allowed by the U.S. Army Corps of Engineers, led the Commission to select a route that was significantly longer and had much more length not paralleling existing compatible ROW (including property boundaries) compared to alternative routes.

These three examples show it is important to consider not just the statutory routing factors and the Commission's rules, but also any significant unique circumstances that may not be captured within those routing factors.

Q ARE THERE UNIQUE CIRCUMSTANCES IN THIS PROCEEDING?

A Yes. There is significant active residential property development within the study area. Some developers of properties worked closely with CPS Energy to propose amended segment alignments in locations where the developers will accept the transmission line on their land. These developers also agreed to provide the ROW easement on their properties at a 20 percent discount to CPS Energy's estimated cost for ROW.[5] One developer also agreed to donate 2,059 feet of the easement required on Segment 42a. This is a unique circumstance and presents a routing opportunity for the Proposed Project. From a policy perspective, this collaboration between a utility proposing to build a transmission line and the owners of property directly affected by the transmission line should be viewed favorably and encouraged for future CCN proceedings.

[5]Toutant Ranch, Ltd., Pinson Interests Ltd. LLP, and Crighton Development Co.`s Statement on Route Adequacy and Request for Approval of Proposed Agreed Amendments to CPS Energy`s Application filed on November 24, 2020.

Q HAVE YOU ESTIMATED THE VALUE OF THE 20 PERCENT DISCOUNT ON THE EASEMENT THAT THE DEVELOPERS HAVE AGREED TO PROVIDE ON SEGMENTS 42A, 46A, AND 49A?

A Yes. The developers claim as much as two miles of the route on Segments 42a, 46a, and 49a would be on their properties, they have agreed to a 20 percent discount relative to CPS Energy's estimate of $0.50 per square foot of ROW. I estimate this discount to be as much as $105,600.[6]

Q PLEASE ELABORATE ON THE DONATED ROW ON SEGMENT 42A.

A The owner of the property agreed to donate 2,059 feet of the ROW along segment 42a, if the PUC orders the Proposed Project to be located on this segment.[7] The savings from this donated land is reflected in the CPS Energy cost estimates.

Q ARE THERE ROUTING FACTORS IN THIS PROCEEDING THAT ARE NOT USEFUL FOR DETERMINING THE ROUTE THAT BEST MEETS THE REQUIREMENTS OF PURA AND THE PUCT SUBSTANTIVE RULES?

A Yes. When there is little or no adverse impact for the route alternatives for a particular routing factor, then that routing factor does not provide useful information for determining the route that best meets the requirements of PURA and the PUC Substantive Rules. In this proceeding, several routing factors have little to no adverse impact on any routes. The statements below are based on the routing factor data in the EA.

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[6] 2 miles x 5,280 ft/mile x 100' wide ROW x $0.50/sq ft x 20% = $105,600.
[7] Direct Testimony of Scott Lyssy at page 6, lines 27-29.

In the routing factor tables in Table 4-1 in the Amended EA, there are several criteria with a value of zero for the 31 filed routes and the one additional route I identified. These factors are:

- Length of route utilizing existing electric facility ROW (transmission);
- Length of ROW parallel and adjacent to existing transmission line ROW;
- Length of the route across parks/recreational areas;
- Number of additional parks/recreational areas within 1,000 feet of the route centerline;
- Length of ROW across cropland;
- Length of route across land irrigated by traveling systems (rolling or pivot type);
- Length of route across conservation easements and/or mitigation banks (Special Management Area);
- Length of route across gravel pits, mines, or quarries;
- Length of ROW parallel and adjacent to pipelines;
- Number of pipeline crossings;
- Number of electric transmission line crossings;
- Number of IH, US, and state highway crossings;
- Number of Farm-to-Market (FM) or Ranch-to-Market (RM) road crossings;
- Number of FAA registered airports (runways <3,200 feet) within 10,000 feet of the route centerline;
- Number of private airstrips within 10,000 feet of the ROW centerline and substation site;
- Number of heliports within 5,000 feet of the ROW centerline and substation site;
- Number of commercial Amplitude Modulation (AM) radio transmitters within 10,000 feet of the route centerline;
- Number of oil and gas wells within 200 feet of the route centerline;

- Estimated length of ROW within foreground visual zone of IH, US and state highways;
- Estimated length of ROW within foreground visual zone of FM/RM roads;
- Estimated length of route within foreground visual zone of parks/recreational areas;
- Length of ROW across bottomland/riparian woodlands;
- Length of route across NWI mapped wetlands;
- Length of route across critical habitat of federally listed endangered or threatened species; and
- Length of ROW across open water (lakes, ponds).

Given there is no variance between the 32 routes, these 25 criteria are not helpful in this proceeding to determine the route that best meets the requirements of PURA and the PUCT Substantive Rules.

III. CPS Energy's Filed Routes, Best Addresses Route, and TPWD Recommendation

Q PLEASE DESCRIBE CPS ENERGY'S PROPOSED ROUTES.

A CPS Energy originally filed 29 routes for the Proposed Project using a combination of 49 noticed route segments. The Amended Application expands the number of routes to 31 alternative routes. The western end of the Proposed Project will be one of six possible tap points on the existing Ranchtown to Menger Creek 138 kV transmission line. The eastern end of the Proposed Project will be the proposed CPS Energy Scenic Loop substation located at one of seven possible locations, all in Bexar County. Figure 1 shows the locations of these seven possible locations.

Figure 1

Q DID CPS ENERGY IDENTIFY THE ROUTE THAT BEST ADDRESSES THE REQUIREMENTS OF PURA AND THE PUC SUBSTANTIVE RULES?

A In CPS Energy's original application, it identified Route Z as the route of the originally-proposed 29 routes that best addresses the requirements of PURA and the PUCT Substantive Rules. Below are the bullet points from the Application that provide the rationale for selecting Route Z:

- Has the lowest estimated cost of any of the 29 alternative routes at $38,330,469;
- Is the shortest of any of the 29 alternative routes at 4.58 miles in length;
- Has a relatively high percentage of ROW parallel and adjacent to existing roadways and apparent property lines at 69 percent (which is within 14 percent of the highest percentage for any route at 83 percent);

- Utilizes Substation Site 7, which will allow for greater shielding of the substation from public roadways;
- Has the second shortest length across upland woodland/brushland at 3.59 acres (compared to 3.41 acres for the lowest);
- Has a moderate area of ROW across golden-cheeked warbler modeled habitat designated as a 3-Moderate High and 4-High Quality at 9.47 acres;
- Has a moderate number of habitable structures within 300 feet of the route centerline at 30; and
- Utilizes Segment 42, which has approximately 2,059 feet of ROW that the landowner has agreed to donate to CPS Energy if a route utilizing Segment 42 is approved by the Commission (approximately 8.51 percent of Route Z).

(Application, pages 29-30)

Q IS ROUTE Z STILL A ROUTE ALTERNATIVE?

A No. CPS Energy filed an amended Application on December 23, 2020. The Amended Application does not include Route Z as an alternative route. It does, however, include Route Z1, which is similar to Route Z, but for the use of Segments 42a 46a, and 46b (instead of Segments 42 and 46), which were included with the Amendment.

Q DID CPS ENERGY IDENTIFY THE ROUTE THAT BEST ADDRESSES THE REQUIREMENTS OF PURA AND THE PUCT SUBSTANTIVE RULES IN ITS AMENDED APPLICATION?

A No.

Q PLEASE UPDATE THE BULLET POINTS CPS PROVIDED FOR ROUTE Z, WITH ROUTE Z1'S ROUTING FACTORS.

A Route Z1 has the following:

- Has the second lowest estimated cost of any of the 31[8] alternative routes at $38,474,771;
- Is the shortest of any of the 31 alternative routes at 4.53 miles in length;
- Has a relatively high percentage of ROW parallel and adjacent to existing roadways and apparent property lines at 68 percent (which is within 18 percent of the highest percentage for any route at 83 percent);
- Utilizes Substation Site 7, which will allow for greater shielding of the substation from public roadways;
- Has the fourth shortest length across upland woodland/brushland at 3.60 acres (compared to 3.12 acres for the lowest);
- Has a moderate area of ROW across golden-cheeked warbler modeled habitat designated as a 3-Moderate High and 4-High Quality at 11.12 acres;
- Has a moderate number of habitable structures within 300 feet of the route centerline at 30; and
- Utilizes Segment 42a, which has approximately 2,059 feet of ROW that the landowner has agreed to donate to CPS Energy if a route utilizing Segment 42a is approved by the Commission.

Q DID TEXAS PARKS AND WILDLIFE DEPARTMENT ("TPWD") SUBMIT A LETTER WITH ITS RECOMMENDATIONS AND COMMENTS ABOUT THE PROJECT?

A Yes. TPWD evaluated the 29 routes proposed in CPS Energy's original Application. TPWD stated Alternative Route AA appeared to be the route that causes the least adverse impacts to natural resources.

Q DID TPWD STATE WHY IT RECOMMENDED ROUTE AA?

A. Yes. The TPWD letter stated TPWD selected Route AA as its recommended route primarily because it:

[8]CPS Energy originally filed 29 routes, there were 31 filed with the Amended Application.

- is the fourth shortest route of the 29 alternative routes, at 4.77 miles (Route Z is the shortest at 4.58 miles);
- is the fourth shortest route across upland woodlands/bushlands; at 3.77 miles (Route Z is the shortest at 3.59);
- has a relatively high percentage of ROW parallel to other existing ROW at 39% (Route Y has the highest percentage at 58%, Route T has the lowest at 9%);
- is tied with Route J as having the fifth least amount of area of ROW across golden-cheeked warbler modeled habitat designated as 3-Moderate High and 4-High Quality, at 7.39 acres; and
- is located almost entirely in Karst Zone 5, defined as cavernous and non-cavernous areas that do not contain endangered karst invertebrate species. Approximately 650 feet of the west end of the 4.77-mile long route occurs in Karst Zone 3, defined as areas that probably do not contain endangered karst species.

(TPWD letter, PUC Interchange Item 343, page 3.)

Q IS ROUTE AA STILL A ROUTE ALTERNATIVE?

A No. In the Application Amendment CPS Energy filed on December 23, 2020, Route AA is not included as an alternative. The Application Amendment does, however, include Route AA1, which is similar to Route AA, but for the use of Segment 46a which was included with the Amendment. The Amendment removed portions of the original segments 42 and 49. Previously, Segment 42 directly connected to Segment 49. With the Amendment, Segments 46a or 46 are needed to connect Segments 42a and 49a.

Q DID TPWD PROVIDE AN UPDATED RECOMMENDATION AFTER CPS ENERGY AMENDED ITS APPLICATION?

A No, however, Routes AA1 and AA2 would be the routes most similar to the original Route AA.

IV. Route Comparison

Q WHAT ROUTES DID YOU REVIEW?

A I reviewed the 31 proposed routes CPS Energy filed in its Application and Amendment, and one additional route, Route AA2. This included a detailed review of the EA, the routing factors for each route, a desktop review of the study area via the GIS data and aerial photography, and a review of the intervenor maps.

Q WHAT IS ROUTE AA2?

A Route AA2 consists of these segments; Substation Site 7-54-20-36-42a-46a-49a. This route is identical to Route AA1, except it utilizes Segment 46a instead of 46. It is identical to Route Z1 except that it utilizes Segment 49a instead of 46b. I identified Route AA2 while looking at aerial photography of CPS Energy's proposed routes and requested route data information through discovery, Lisa Chandler's first RFI to CPS Energy.

Q PLEASE EXPLAIN HOW YOU PROCEEDED WITH YOUR REVIEW.

A I started by assembling route factor data from CPS Energy for all 32 identified routes. That data was contained in Table 4-1 Amended of the EA and in response to discovery. Exhibit BCA-1 presents the routing factors for these 32 routes. Exhibit BCA-1 also presents the cost estimates from CPS Energy and my calculated factors for the distance *not* parallel to various types of linear features. As I have done in past proceedings before the Commission, I use the distance *not* parallel to linear features to evaluate paralleling performance.

Q PLEASE EXPLAIN WHY YOU USE THE LENGTH OF A ROUTE *NOT* PARALLEL TO LINEAR FEATURES TO EVALUATE PARALLELING PERFORMANCE.

A Using the length of a route paralleling a ROW or the percentage of the total length of a route paralleling a ROW can be misleading because the alternative routes under consideration may have different lengths. For example, if we had a route of 200 miles that paralleled existing transmission lines for 50 percent of its length and another alternative route of 100 miles that paralleled existing transmission lines for only 25 percent of its length, it would not be appropriate to say the 200 mile line outperforms the 100 mile line regarding paralleling existing transmission lines because the 200 mile route would have 100 miles of length that does not parallel existing transmission lines while the 100 mile route would have only 75 miles of length that does not parallel existing transmission lines. By measuring existing ROW paralleling performance by miles that do *not* parallel that ROW, total line length is removed from the measure and, instead, the focus is appropriately placed on minimizing the number of new transmission line route miles that do not parallel the particular ROW in question. The Administrative Law Judges in Docket No. 38597 endorsed the merit of this approach.[9]

Q WHY DO YOU NOT INCLUDE THE LENGTH OF A ROUTE ON YOUR COMPARISON?

A In my experience, the Commission has not emphasized length in its routing decisions. The data on the length of a line not paralleling compatible ROW provides a way to measure the new impact of the transmission line and not just the raw number of the length of the line. Also, the cost of a route largely reflects the length of a route.

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[9] *Application of Oncor Electric Delivery LLC to Amend a Certificate of Convenience and Necessity for the Krum West to Anna 345-kV CREZ Transmission Line in Collin, Cooke, Denton, and Grayson Counties, Texas*, Docket No. 38597, PFD at 46 (February 9, 2011).

Q HAVING ASSEMBLED ROUTING FACTOR DATA FOR THESE 32 ROUTES YOU EVALUATED, HOW DID YOU PROCEED?

A In Exhibit BCA-2, I present an evaluation of the 32 routes based on comparing the relative performance of each route regarding (1) habitable structure counts, (2) estimated total cost, (3) paralleling of existing ROW (roads, railways, canals, etc.), (4) paralleling of all compatible ROW (including apparent property boundaries), (5) length across upland woodlands/brushlands, (6) length across areas of high archeological site potential, and (7) area of ROW across Golden-cheeked warbler modeled habitat designated as 3-Moderate High or 4-High Quality. In my experience, the Commission has put significant weight upon those factors in its routing decisions.[10]

I graded each of the proposed routes for each routing factor as being relatively superior in performance (color coded green); relatively moderate in performance (color coded yellow) or relatively poor in performance (color coded red).

In Exhibit BCA-2, I defined superior relative performance as performance falling between: (i) best performance, and (ii) one-third of difference in performance between the best and worst performance. I defined moderate relative performance as performance falling between: (i) one-third of the difference between best and worst performance, and (ii) two-thirds of the difference between best and worst performance. I defined poor relative performance as performance falling between: (i) two-thirds of the difference between best and worst performance, and (ii) worst performance. For example, if the best performance for a particular factor was 0 miles and the worst performance was 100 miles, superior performance for that factor would run from 0 to

[10] I typically would include length not parallel to existing transmission lines; however, none of the routes parallel existing transmission lines.

33 miles, moderate performance for that factor would run from 34 miles to 66 miles, and poor performance would run from 67 miles to 100 miles.

Q WHAT ARE YOUR INITIAL OBSERVATIONS FROM YOUR RELATIVE ROUTING FACTOR EVALUATION?

A My first observation is there is no single route with relatively superior performance in all seven factors. There is, however, a route that has relatively superior performance in six of the factors in Exhibit BCA-2, Route BB. This route has 24 habitable structures within 300 feet, which is four times more than the route with the fewest. Route BB has an estimated cost of $42.74 million, which is $4.5 million or 12 percent more expensive than the least expensive route. Route BB has the highest impact of any route alternative on modeled Golden-cheeked warbler habitat.

My second observation is five routes have an estimated cost under $40 million. The cost estimates range from $38.3 million to $56.2 million. The five routes with an estimated cost under $40 million are Z1, AA1, AA2, DD, and EE. These five routes have relatively superior or moderate performance in all factors in Exhibit BCA-2 and have 30 or 31 habitable structures within 300 feet of the route centerline.

My third observation is that three routes, Routes P, Q1 and R1 have relatively low numbers of habitable structures within 300 feet of the route centerline, with 12, 6 and 7 respectively. Route Q1 is tied for the lowest number of habitable structures within 300 feet of the route centerline with 6, Route P has 12, and Route R1 has 7. The range of habitable structures for all routes is 6 to 69. Route Q1 has an estimated cost of $45.9 million, which is $7.6 million or 20 percent more expensive than the least expensive route. Routes P and R1 have estimated costs of approximately

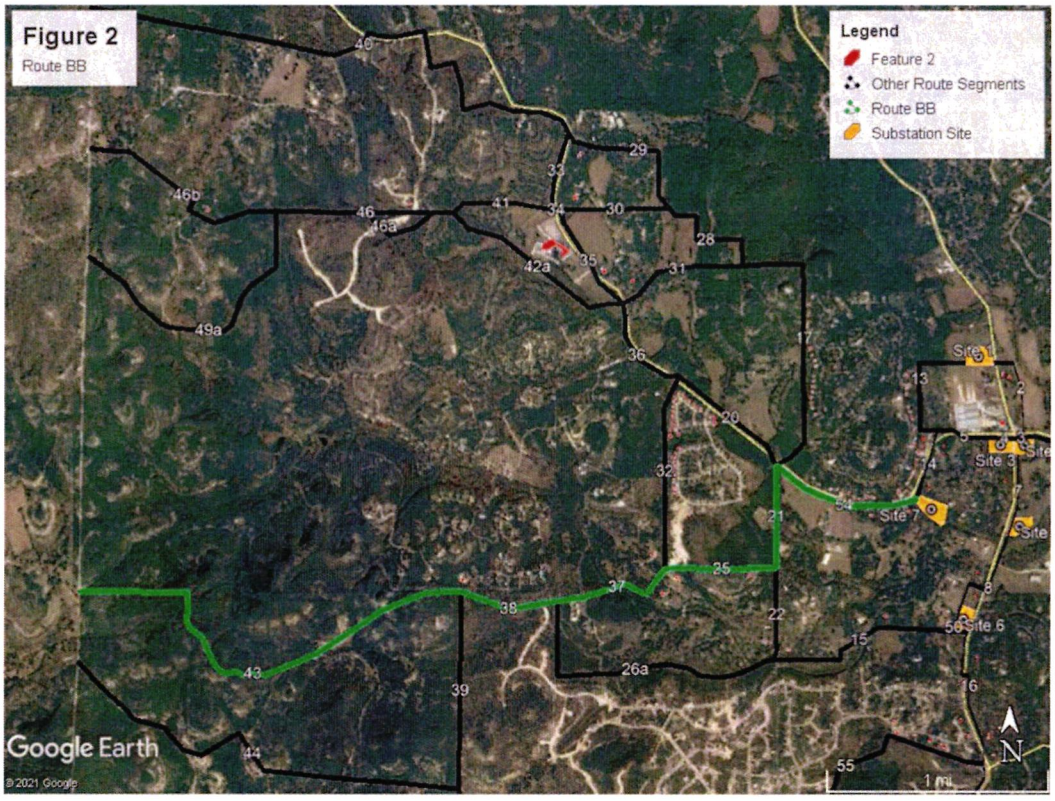
$43.5 million, which is $5.2 million or 14 percent more expensive than the least expensive route.

I evaluate the nine routes I discussed above next in my testimony.

Q PLEASE DESCRIBE ROUTE BB.

A Route BB utilizes Substation Site 7 and consists of the following route Segments: 54-21-25-37-38-43. This route has 24 habitable structures within 300 feet of the route centerline and has an estimated cost of $42.74 million. Figure 2 below presents Route BB using Google Earth and GIS data obtained from CPS Energy.

Figure 2



Q DOES ROUTE BB BEST ADDRESS THE REQUIREMENTS OF PURA AND THE PUCT SUBSTANTIVE RULES?

A No. While Route BB does have relatively superior performance across six routing factors in Exhibit BCA-2, it does not best address the requirements of PURA and the PUCT Substantive Rules. This route has an estimated cost that is $4.5 million or 12 percent more expensive than the least expensive route (Route AA1) and only improves upon the number of habitable structures by six, relative to the route most similar to CPS Energy's original "best meets" route. Route BB has 24 habitable structures versus Route Z1, which has 30. Route BB has 25.08 acres across modeled 3-Moderate High or 4-High Quality habitat of the Golden-cheeked warbler. Route BB is the second worst performing route for the Golden-cheeked warbler factor.

Q PLEASE DESCRIBE ROUTES P, Q1, AND R1.

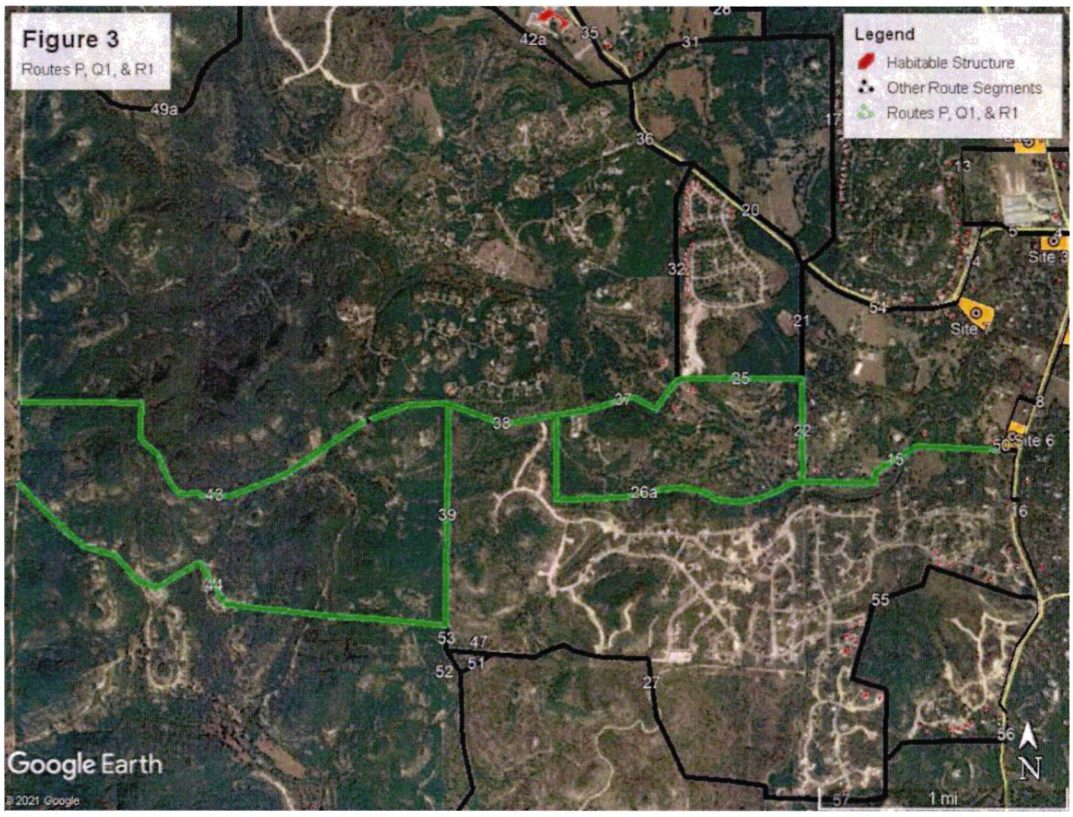
A Routes P, Q1 and R1 are similar as they begin at Substation Site 6. Routes P and R1, both end with Segment 43. Route Q1 ends with Segment 44.

These three routes consist of the following Segments:

- Route P – 50-15-22-25-37-38-43
- Route Q1 – 50-15-26a-38-39-44
- Route R1 – 50-15-26a-38-39-44

These routes and the segments they utilize are presented below in Figure 3.

Figure 3



Routes P, Q1, and R1 have relatively superior performance in the number of habitable structures within 300 feet, with 12, 6 and 7 respectively. However, Route Q1 has moderate performance only with respect to cost, with an estimated cost of $45.9 million or 20 percent more expensive than the least expensive route. Routes P and R1 have relatively superior performance regarding cost, with Route P having an estimated total cost of $43.41 million and Route R1 having an estimated cost of $43.52 million. The costs of these two routes are approximately $5.2 million or 14 percent more expensive than the least expensive route. I believe a 20 percent or even a 14 percent increase to the cost of a proposed route cannot be justified in this

proceeding. Like Route BB, I conclude the Commission should not approve these three routes for the proposed project.

Q DID YOU CONSIDER OTHER FACTORS FOR RECOMMENDING AGAINST ROUTES P, R1 AND BB?

A Yes. I also considered the impact on modeled Golden-cheeked warbler habitat. The ROW for Route P would go across 25.11 acres of modeled 3-Moderate High or 4-High Quality habitat. This is the most of any proposed route. Similarly, Route BB goes across 25.08 acres and Route R1 across 19.03 acres. This is modeled habitat, but this species is listed as endangered by both the TPWD and the United States Fish and Wildlife Service and care should be taken to minimize potential impact to this endangered species.

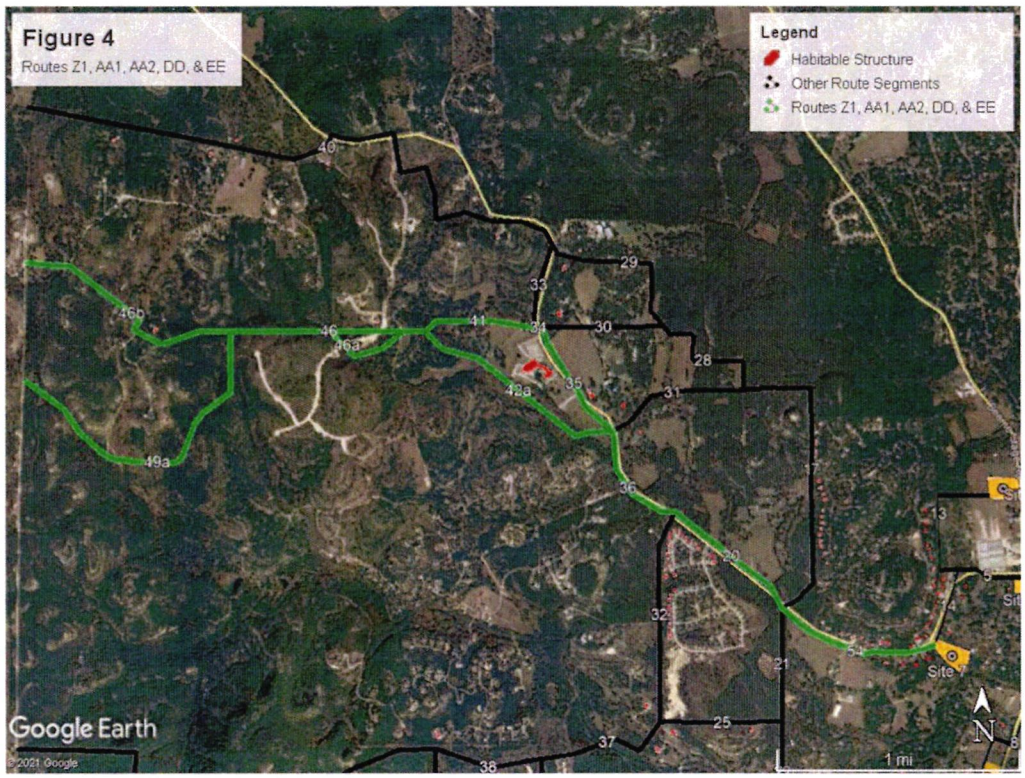
Q PLEASE DISCUSS THE REMAINING FIVE ROUTES FROM YOUR LIST OF NINE.

A These five routes are Z1, AA1, AA2, DD, and EE. They are similar routes that all use Substation Site 7 and tie in to the existing transmission line using either Segment 46b or 49a. The routes on this short list consist of these segments:

- Route Z1 – 54-20-36-42a-46a-46b
- Route AA1 - 54-20-36-42a-46-49a
- Route AA2 - 54-20-36-42a-46a-49a
- Route DD – 54-20-36-35-34-41-46a-46b
- Route EE – 54-20-36-35-41-46a-49a

All five of these proposed routes have an estimated cost that is less than $40 million. Figure 4 shows the segments these five routes utilize.

Figure 4



Besides having cost estimates of below $40 million, these five routes have relatively superior or relatively moderate performance in all routing factors in Exhibit BCA-2 with no relatively poor performing factors.[11] They have 30 or 31 habitable structures within 300 feet of the route centerline. With estimated costs ranging from $38.29 million to $39.76 million, these are the five least costly routes. These five routes have lengths not parallel to existing ROW ranging from 2.87 to 3.04 miles. Regarding the length across upland woodlands and brushlands, they range from 3.12 miles to 3.81 miles. These five routes affect between 9.60 and 11.81 acres of modeled Golden-cheeked warbler habitat. Given the similarity of the segments comprising these

[11]There are 4 other routes that have yellow or green in all factors, D1, I1, J1, and M1. They all have over 40 habitable structures and cost over $42.88 million.

five routes and their routing factor performance, three decisions have to be made to select the best from this group: First, should the route use Segment 42a or Segments 35, 34, and 41? Next, should the route utilize Segment 46 or 46a? Last, should the route utilize Segment 46b or 49a?

Q SHOULD THE PROPOSED PROJECT UTILIZE SEGMENT 42A OR SEGMENTS 35, 34, AND 41?

A The Proposed Project should utilize Segment 42a. First, a portion of ROW along Segment 42a would be donated to CPS Energy if the PUCT approves a route that utilizes that segment. This will reduce ROW acquisition costs of the project and reduce the probability of a condemnation action. Second, Segment 42a would avoid a habitable structure within 300 feet of Segment 35. Last, it appears from the intervenor map and EA that Segment 42a avoids property belonging to the Northside Independent School District and a proposed middle school to be built on Segment 41. For these reasons, Segment 42a should be selected over 35, 34, and 41. Of the five proposed routes I identified as the best route options, only Routes Z1, AA1 and AA2 use Segment 42a. The other two routes use Segments 35, 34 and 41.

Q SHOULD THE PROPOSED PROJECT UTILIZE SEGMENT 46 OR SEGMENTS 46A?

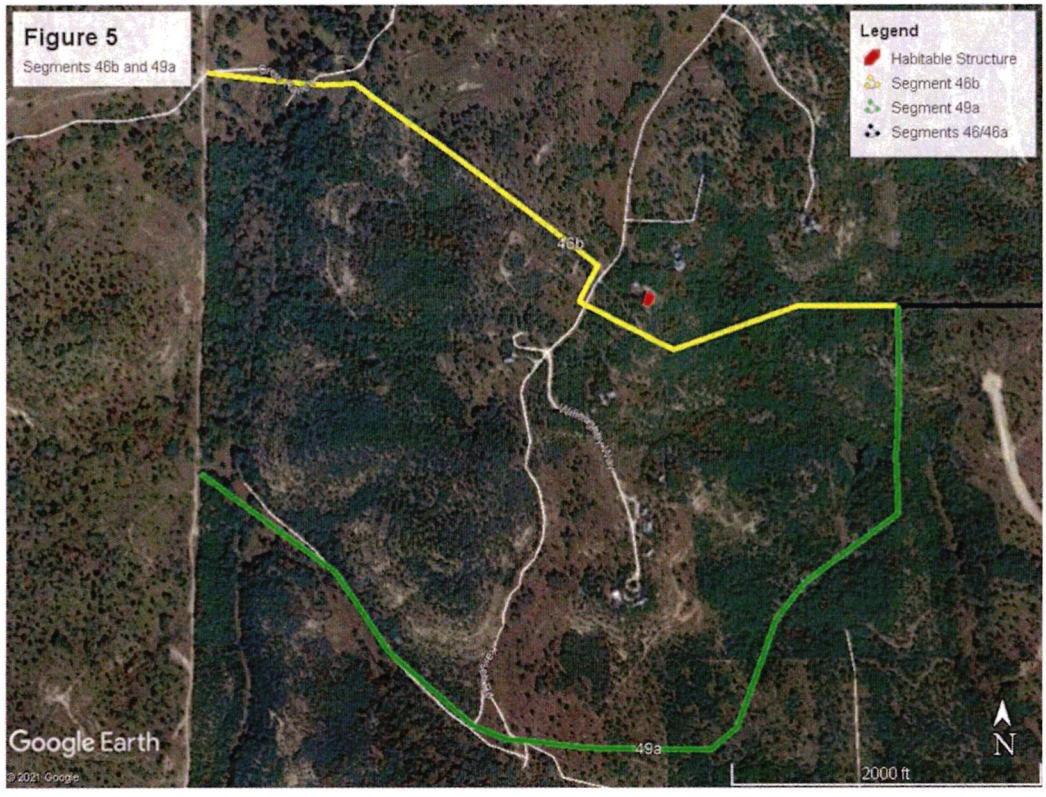
A Segments 46 and 46a are very similar. These segments have the same start and end points. They differ in that Segment 46a has a jog in it that avoids a habitable structure (Map ID 15) that is 174 feet from Segment 46. This can be seen above in Figure 4. Segment 46a was identified in CPS Energy's Application Amendment, which moved Segment 46 further away from the habitable structure. The developers who own property affected by Segment 46a proposed this segment. Segment 46a should be

used rather than Segment 46. Of proposed Routes Z1, AA1 and AA2, only Routes Z1 and AA2 use Segment 46a. Route AA1 uses Segment 46. Further, the developers have agreed that their proposed modifications would not result in any net cost increase. Although this modification adds length and turning structures to avoid a habitable structure, it should not result in any in any increased cost.

Q PLEASE DISCUSS SEGMENTS 46B AND 49A.

A I show these two segments below in Figure 5. Segment 46b is shown in yellow; Segment 49a is green.

Figure 5



Segment 46b and 49a have few differences in their routing factors. Segment 46b has one habitable structure, while Segment 49a has none. Segment 46b is 0.99 miles long, while Segment 49a is 1.35 miles long. They have similar impacts on woodlands and modeled 3-Moderate High or 4-High Quality Golden-cheeked warbler habitat. While conducting my desktop review of these two segments, the elevations of the two segments stood out as a way to differentiate these two segments. In my Exhibit BCA-3, I present the elevation profiles of Segments 46b and 49a. This exhibit presents the elevation of the segment, measured in feet above sea level, as the segment progress west from the existing transmission line to its intersection with Segments 46 and 46a.

The elevations of these two segments are very different. Segment 46b has elevation ranging from 1,541 feet to 1,700 feet, with an average elevation of 1,625 feet. In one 380-foot section of the segment, the elevation changes from 1,588 feet to 1,685 feet. In another section, the elevation is near 1,700 feet for approximately 760 feet. 1,700 feet is nearly the highest elevation in the study area.

Segment 49a has elevation with a small range from 1,514 to 1,599 feet with an average elevation of 1,560 feet. The routing of this segment avoids the higher elevations of Segment 46b and has no abrupt changes in elevation. The peak elevation of Segment 49a is 101 feet lower than the peak elevation of Segment 46b. I expect placing the transmission line at lower elevations would reduce visibility of the line in the area.

The alignment of Segment 46b also would result in the habitable structure (Map ID 16) near it to have at least three transmission line towers within 400 feet of this residence.

Given there are no habitable structures on Segment 49a and it is located at lower elevations, the Proposed Project should utilize Segment 49a instead of Segment

46b. Of proposed Routes Z1 and AA2, only Route AA2 uses Segment 49a. Route Z1 uses Segment 46b.

Q DO YOU HAVE ANY OTHER INFORMATION TO RELAY WITH RESPECT TO SEGMENTS 42A, 46A, AND 49A?

A Yes. In Developers' request to amend CPS Energy's application,[12] which was agreed to by CPS Energy,[13] the Developers stated the following, "Developers have agreed that if the Commission selects a route that involves any of Segments 42a, 46a, or 49a, Developers will forgo the condemnation process and provide all necessary, non-donated ROW across their properties at a 20% discount compared to CPS Energy's assumed cost of ROW." In addition to the ROW to be donated by the Developers along Segment 42a, the Developers have agreed to donate additional ROW as necessary to offset any incremental costs associated with their agreed routing options. Because Developers will accept the transmission line on their properties along these segments and provide the ROW at a discount, it is reasonable to conclude the Commission should route the transmission line on these segments. The Developers state that roughly two miles of the transmission line could be on their property. As I stated previously, I estimate this discount to be approximately $105,600.

[12]Toutant Ranch, Ltd., Pinson Interests Ltd. LLP, and Crighton Development Co.`s Statement on Route Adequacy and Request for Approval of Proposed Agreed Amendments to CPS Energy`s Application filed on November 24, 2020.

[13]CPS Energy`s response to statement on route adequacy and request for approval of agreed amendments to CPS Energy`s application by Toutant Ranch, Ltd., Pinson Interests Ltd. LLP, and Crighton Development Co. filed on November 24, 2020.

Q YOU EARLIER IDENTIFIED THREE DECISIONS TO BE MADE TO SELECT THE BEST ROUTE FROM THE FIVE ROUTES ON YOUR SHORT LIST. FIRST, SHOULD THE ROUTE USE SEGMENT 42A OR SEGMENTS 35, 34, AND 41?

A Segment 42a.

Q NEXT, SHOULD THE ROUTE UTILIZE SEGMENT 46 OR 46A?

A Segment 46a.

Q LAST, SHOULD THE ROUTE UTILIZE SEGMENT 46B OR 49A?

A Segment 49a.

Q WHICH OF THE FIVE ROUTES ON YOUR SHORT LIST UTILIZE SEGMENTS 42A, 46A, AND 49A?

A Only Route AA2 utilizes all three of these segments. Route AA2 consists of the following route segments, starting from Substation Site 7: 54-20-36-42a-46a-49a.

Q PLEASE DISCUSS ROUTE AA2 WITH RESPECT TO THE ROUTING FACTORS YOU PRESENT IN YOUR EXHIBIT BCA-2.

A Route AA2 has relatively superior performance in three factors, and relatively moderate performance in four factors, with no relatively poor performance.

Regarding the number of habitable structures within 300 feet, Route AA2 is in the relatively moderate performance band, with 30 habitable structures. The range in this factor is 6 to 69.

Regarding the estimated total cost of the project, Route AA2 has an estimated cost of $39.05 million. This is in the relatively superior performance band. Route AA2

is the fourth least expensive route. The proposed routes range in cost from $38.3 million to $56.2 million. I note the $39.05 million cost estimate for Route AA2 does not reflect the 20 percent discount on the cost of ROW that that Developers agreed to for Segments 42a, 46b, and 49a, if they are utilized. So, the actual cost for Route AA2 would be expected to be approximately $105,000 less than CPS Energy's $39.05 million estimate.

Regarding the length not parallel existing ROW, Route AA2 has 3.04 miles, which is relatively superior performance. The range in this factor is 2.22 miles to 5.43 miles.

Regarding the length not parallel existing ROW including property lines, Route AA2 has 2.26 miles, which is relatively moderate performance. The range in this factor is 0.97 miles to 3.43 miles.

Regarding the length of ROW across upland woodlands and brushlands, Route AA2 has 3.88 miles, which is relatively superior performance. The range in the factor is 3.12 miles to 6.52 miles.

Regarding the length of the ROW across areas of high archaeological site potential, Route AA2 has relatively moderate performance with 1.0 miles. The range in this factor is 0.00 miles to 2.00 miles.

Regarding the length of ROW across areas of modeled Golden-cheeked warbler habitat designated 3-Moderate High or 4-High Quality, Route AA2 has 11.81 acres, which is relatively moderate performance. The range in this factor is 2.95 acres to 25.11 acres.

Q IS ROUTE AA2 SUPERIOR TO ROUTES P, Q1, R1, AND BB?

A Yes. Routes P, Q1, R1, and BB impact fewer habitable structures than Route AA2, but the impact to 6 to 24 fewer habitable structures comes at an incremental cost of between $3.7 million to $6.9 million. This would be a 9 percent to 18 percent cost increase. Additionally, Routes P, R1 and BB would affect between 19.03 and 25.11 acres of modeled 3-Moderate High or 4-High Quality Golden-cheeked warbler habitat, compared to 11.81 acres on Route AA2. The increased cost or increased potential to impact the habitat of an endangered species is not warranted. Route AA2 is superior to Routes P, Q1, R1, and BB.

Q IS ROUTE AA2 THE ROUTE THAT BEST ADDRESSES THE REQUIREMENTS OF PURA AND THE PUCT SUBSTANTIVE RULES?

A Yes. Route AA2 is the route that best address the requirements of PURA and the PUCT Substantive Rules. This route best balances the routing factors. It is the fourth least expensive route, having an estimated cost of $39.05 million before reflecting the 20 percent discount of ROW acquisition costs that the Developers has agreed to on Segments 42a, 46a, and 49a. As I have discussed, the Developers proposed the alignments of Segments 42a, 46a, and 49a in locations where they will accept the transmission line on land they own. These Developers state that roughly two miles of the transmission line along Segments 42a, 46a, and 49a would be on their property; this is equal to 41 percent of the length of Route AA2. Route AA2 has a relatively moderate number of habitable structures within 300 feet, with 29. Route AA2 also has a relatively moderate impact on modeled 3-Moderate High and 4-High Quality Golden-cheeked warbler habitat. The ALJs should recommend, and the Commission should approve, Route AA2 for the Proposed Project.

Q DID YOU RECHECK ALL OF THE ROUTING FACTORS FOR AA2 TO ENSURE ROUTE AA2 IS THE ROUTE THAT BEST ADDRESSES THE REQUIREMENTS OF PURA AND THE PUCT SUBSTANTIVE RULES?

A Yes. I rechecked all routing factors in Exhibit BCA-1 for Route AA2 to ensure I missed no critical information that would change my conclusion that Route AA2 is the route that best addresses the requirements of PURA and the PUCT Substantive Rule. From the recheck, I found no reason to change my conclusion.

Q DOES THIS CONCLUDE YOUR TESTIMONY?

A Yes, it does.

Qualifications of Brian C. Andrews

Q PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A Brian C. Andrews. My business address is 16690 Swingley Ridge Road, Suite 140, Chesterfield, MO 63017.

Q PLEASE STATE YOUR OCCUPATION.

A I am an Associate with the firm of Brubaker & Associates, Inc. ("BAI"), energy, economic, and regulatory consultants in the field of public utility regulation.

Q PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EMPLOYMENT EXPERIENCE.

A I received a Bachelor of Science Degree in Electrical Engineering from the Washington University in St. Louis/University of Missouri-St. Louis Joint Engineering Program. I have also received a Master of Science Degree in Applied Economics from Georgia Southern University.

I have attended training seminars on multiple topics including class cost of service, depreciation, power risk analysis, production cost modeling, cost estimation for transmission projects, transmission line routing, MISO load serving entity fundamentals, and more.

I am a member and the immediate Past President of the Society of Depreciation Professionals. I have been awarded the designation of Certified Depreciation Professional ("CDP") by the Society of Depreciation Professionals. I am also a certified Engineer Intern in the State of Missouri.

As an Associate at BAI, and as a Senior Consultant, Consultant, Associate Consultant and Assistant Engineer before that, I have been involved with several regulated and competitive electric service issues. These have included book

depreciation, fuel and purchased power cost, transmission planning, transmission line routing, resource planning including renewable portfolio standards compliance, electric price forecasting, class cost of service, power procurement, and rate design. This has involved use of power flow, production cost, cost of service, and various other analyses and models to address these issues, utilizing, but not limited to, various programs such as Strategist, RealTime, PSS/E, MatLab, R Studio, ArcGIS, Excel, and the United States Department of Energy/Bonneville Power Administration's Corona and Field Effects ("CAFÉ") Program. In addition, I have received extensive training on the PLEXOS Integrated Energy Model and the EnCompass Power Planning Software. I have provided testimony on many of these issues before the Public Service Commissions in Arizona, Arkansas, Florida, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Montana, New Mexico, Oklahoma, and Texas.

BAI was formed in April 1995. BAI provides consulting services in the economic, technical, accounting, and financial aspects of public utility rates and in the acquisition of utility and energy services through RFPs and negotiations, in both regulated and unregulated markets. Our clients include large industrial and institutional customers, some utilities and, on occasion, state regulatory agencies. We also prepare special studies and reports, forecasts, surveys, and siting studies, and present seminars on utility-related issues.

In general, we are engaged in energy and regulatory consulting, economic analysis and contract negotiation. In addition to our main office in St. Louis, the firm also has branch offices in Phoenix, Arizona and Corpus Christi, Texas.

405963

Land Use and Environmental Data For Primary Route Evaluation
Primary Alternative Routes

	Evaluation Criteria	A	B1	C1	D1	E	F1	G1	H	I1	J1
Land Use											
1	Length of alternative route (miles)	6 66	6 19	5 77	5 22	6 62	5 66	6 20	6 32	5 03	5 46
2	Number of habitable structures[1] within 300 feet of the route centerline	69	61	48	43	60	12	52	61	43	41
3	Length of ROW using existing transmission line ROW	0	0	0	0	0	0	0	0	0	0
4	Length of ROW parallel and adjacent to existing transmission line ROW	0	0	0	0	0	0	0	0	0	0
5	Length of ROW parallel to other existing ROW (roadways, railways, canals etc)	1 79	1 00	2 43	2 13	2 45	1 48	1 35	1 89	2 01	2 26
6	Length of ROW parallel and adjacent to apparent property lines[2]	3 71	3 19	1 39	1 49	2 54	2 49	1 96	3 20	1 58	0 78
7	Sum of evaluation criteria 4 5, and 6	5 50	4 19	3 82	3 62	4 99	3 97	3 31	5 09	3 59	3 04
8	Percent of evaluation criteria 4 5 and 6	83%	68%	66%	69%	75%	70%	53%	80%	71%	56%
9	Length of ROW across parks/recreational areas[3]	0	0	0	0	0	0	0	0	0	0
10	Number of additional parks/recreational areas[3] within 1 000 feet of ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0
11	Length of ROW across cropland	0	0	0	0	0	0	0	0	0	0
12	Length of ROW across pasture/rangeland	0 61	0 76	1 69	0 77	0 69	0 89	0 65	0 50	0 67	0 67
13	Length of ROW across land irrigated by traveling systems (rolling or pivot type)	0	0	0	0	0	0	0	0	0	0
14	Length of route across conservation easements and/or mitigation banks (Special Management Area)	0	0	0	0	0	0	0	0	0	0
15	Length of route across gravel pits, mines, or quarries	0	0	0	0	0	0	0	0	0	0
16	Length of ROW parallel and adjacent to pipelines[4]	0	0	0	0	0	0	0	0	0	0
17	Number of pipeline crossings[4]	0	0	0	0	0	0	0	0	0	0
18	Number of transmission line crossings	0	0	0	0	0	0	0	0	0	0
19	Number of IH US and state highway crossings	0	0	0	0	0	0	0	0	0	0
20	Number of FM or RM road crossings	0	0	0	0	0	0	0	0	0	0
21	Number of cemeteries within 1 000 feet of the ROW centerline and substation site	0	1	1	1	0	1	1	0	1	1
22	Number of FAA registered airports[5] with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline and substatic	1	1	1	1	1	1	1	1	1	1
23	Number of FAA registered airports[5] having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0
24	Number of private airstrips within 10,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0
25	Number of heliports within 5,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0
26	Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0
27	Number of FM radio transmitters microwave towers, and other electronic installations within 2 000 feet of ROW centerline and substation site	0	0	1	1	0	0	0	0	1	1
28	Number of identifiable existing water wells within 200 feet of the ROW centerline and substation site	6	4	2	3	3	1	4	5	3	3
29	Number of oil and gas wells within 200 feet of the ROW centerline (including dry or plugged wells) and substation site	0	0	0	0	0	0	0	0	0	0
Aesthetics											
30	Estimated length of ROW within foreground visual zone[6] of IH, US and state highways	0	0	0	0	0	0	0	0	0	0
31	Estimated length of ROW within foreground visual zone[6] of FM/RM roads	0	0	0	0	0	0	0	0	0	0
32	Estimated length of ROW within foreground visual zone[6][7] of parks/recreational areas[3]	0	0	0	0	0	0	0	0	0	0
Ecology											
33	Length of ROW across upland woodlands/brushlands	5 27	5 06	3 48	3 94	5 24	4 70	5 10	5 03	3 86	4 20
34	Length of ROW across bottomland/riparian woodlands	0	0	0	0	0	0	0	0	0	0
35	Length of ROW across NWI mapped wetlands	0	0	0	0	0	0	0	0	0	0
36	Length of ROW across critical habitat of federally listed endangered or threatened species	0	0	0	0	0	0	0	0	0	0
37	Area of ROW across golden-cheeked warbler modeled habitat designated as 3-Moderate High and 4-High Quality (acres)[8]	13 88	13 68	10 74	11 12	12 29	19 03	12 78	12 29	8 92	11 81
38	Area of ROW across golden-cheeked warbler modeled habitat designated as 1-Low and 2-Moderate Low Quality (acres)[8]	18 21	17 55	12 08	12 17	15 74	15 04	18 59	16 46	12 93	14 95
39	Length of ROW across open water (lakes, ponds)	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
40	Number of stream and river crossings	3	6	6	8	3	10	7	3	8	9
41	Length of ROW parallel (within 100 feet) to streams or rivers	0 07	0 10	0 00	0 10	0 07	0 15	0 17	0 07	0 10	0 17
42	Length of ROW across Edwards Aquifer Contributing Zone	6 66	6 19	5 77	5 22	6 62	5 66	6 20	6 32	5 03	5 46
43	Length of ROW across FEMA mapped 100-year floodplain	0 13	0 78	0 55	1 03	0 13	0 25	0 75	0 13	1 03	1 00
Cultural Resources											
44	Number of recorded cultural resource sites crossed by ROW	0	0	0	0	0	2	0	0	0	0
45	Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	0	2	2	2	2	12	2	0	2	2
46	Number of NRHP listed properties crossed by ROW	0	0	0	0	0	1	0	0	0	0
47	Number of additional NRHP listed properties within 1,000 feet of ROW centerline	1	2	1	1	1	0	2	1	1	1
48	Length of ROW across areas of high archeological site potential	1 73	2 94	2 89	3 14	1 49	3 10	2 84	1 44	3 24	3 27
	Criteria for Exhibit BCA-2										
49	Total number of habitable structures[1] within 300 feet of ROW centerline (Line 2)	69 0	61 0	48 0	43 0	60 0	12 0	52 0	61 0	43 0	41 0
50	Estimated total cost $ millions (Attachment 3)	54 7	50 6	47 4	43 9	54 5	49 7	51 2	53 6	42 9	44 1
51	Length not parallel existing transmission line ROW (Line 1 Line 3 Line 4)	6 7	6 2	5 8	5 2	6 6	5 7	6 2	6 3	5 0	5 5
52	Length not parallel existing transmission line ROW or Other Existing ROW (Line 51- Line 5)	4 9	5 2	3 3	3 1	4 2	4 2	4 9	4 4	3 0	3 2
53	Length not parallel to all compatible ROW, including Apparent Property Lines (Line 52 - Line 6)	1 2	2 0	2 0	1 6	1 6	1 7	2 9	1 2	1 4	2 4
54	Length of route across upland woodlands (Line 33)	5 3	5 1	3 5	3 9	5 2	4 7	5 1	5 0	3 9	4 2
55	Length of ROW across areas of high archaeological site potential (Line 48)	1 0	2 0	1 0	1 0	1 0	0 0	2 0	1 0	1 0	1 0
56	Area of ROW across golden cheeked warbler modeled habitat designated as 3-Moderate High and 4 High Quality (acres) (Line 37)	13 9	13 7	10 7	11 1	12 3	19 0	12 8	12 3	8 9	11 8

Notes

[1] Single-family and multi family dwellings, and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures churches hospitals nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 300 feet of the centerline of a transmission project of 230-kV or less

[2] Apparent property boundaries created by existing roads, highways or railroad ROWs are not "double counted" in the length of ROW parallel to apparent property boundaries criteria

[3] Defined as parks and recreational areas owned by a governmental body or an organized group club or church within 1 000 feet of the centerline of the project

[4] Only steel pipelines six inches and greater in diameter carrying hydrocarbons were quantified in the pipeline crossing and paralleling calculations

[5] As listed in the Chart Supplement South Central US (FAA 2019b formerly known as the Airport/Facility Directory South Central US) and FAA 2019a

[6] One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double-counted" in the length of ROW within the visual foreground zone of FM roads criteria

[7] One-half mile, unobstructed Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria

[8] From Model C by Diamond et al 2010

All length measurements are shown in miles unless noted otherwise

Source

Land Use and Environmental Data For Primary Route Evaluation
Primary Alternative Routes

	Evaluation Criteria	K	L	M1	N1	O	P	Q1	R1	S	T1	U1
Land Use												
1	Length of alternative route (miles)	5 29	6 91	5 85	5 33	6 83	4 89	5 56	4 76	6 73	5 93	6 36
2	Number of habitable structures[1] within 300 feet of the route centerline	36	35	43	11	29	12	6	7	25	34	6
3	Length of ROW using existing transmission line ROW	0	0	0	0	0	0	0	0	0	0	0
4	Length of ROW parallel and adjacent to existing transmission line ROW	0	0	0	0	0	0	0	0	0	0	0
5	Length of ROW parallel to other existing ROW (roadways, railways canals, etc)	1 86	2 21	2 76	1 15	2 91	0 85	1 39	0 85	2 57	0 51	1 20
6	Length of ROW parallel and adjacent to apparent property lines[2]	1 85	2 18	1 49	2 49	1 30	2 62	2 44	2 21	0 74	3 96	2 54
7	Sum of evaluation criteria 4, 5, and 6	3 71	4 38	4 25	3 64	4 21	3 47	3 83	3 06	3 31	4 46	3 74
8	Percent of evaluation criteria 4, 5 and 6	70%	63%	73%	68%	62%	71%	69%	64%	49%	75%	59%
9	Length of ROW across parks/recreational areas[3]	0	0	0	0	0	0	0	0	0	0	0
10	Number of additional parks/recreational areas[3] within 1 000 feet of ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
11	Length of ROW across cropland	0	0	0	0	0	0	0	0	0	0	0
12	Length of ROW across pasture/rangeland	0 51	0 38	1 09	0 71	0 42	0 36	0 24	0 36	0 08	0 28	0 24
13	Length of ROW across land irrigated by traveling systems (rolling or pivot type)	0	0	0	0	0	0	0	0	0	0	0
14	Length of route across conservation easements and/or mitigation banks (Special Management Area)	0	0	0	0	0	0	0	0	0	0	0
15	Length of route across gravel pits, mines, or quarries	0	0	0	0	0	0	0	0	0	0	0
16	Length of ROW parallel and adjacent to pipelines[4]	0	0	0	0	0	0	0	0	0	0	0
17	Number of pipeline crossings[4]	0	0	0	0	0	0	0	0	0	0	0
18	Number of transmission line crossings	0	0	0	0	0	0	0	0	0	0	0
19	Number of IH, US and state highway crossings	0	0	0	0	0	0	0	0	0	0	0
20	Number of FM or RM road crossings	0	0	0	0	0	0	0	0	0	0	0
21	Number of cemeteries within 1,000 feet of the ROW centerline and substation site	0	0	1	1	0	1	1	1	0	2	1
22	Number of FAA registered airports[5] with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline and substatio	1	1	1	1	1	1	1	1	1	1	1
23	Number of FAA registered airports[5] having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
24	Number of private airstrips within 10,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
25	Number of heliports within 5,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
26	Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
27	Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline and substation site	0	0	1	0	1	0	0	0	1	1	0
28	Number of identifiable existing water wells within 200 feet of the ROW centerline and substation site	3	3	4	1	2	1	1	1	2	3	1
29	Number of oil and gas wells within 200 feet of the ROW centerline (including dry or plugged wells) and substation site	0	0	0	0	0	0	0	0	0	0	0
Aesthetics												
30	Estimated length of ROW within foreground visual zone[6] of IH US and state highways	0	0	0	0	0	0	0	0	0	0	0
31	Estimated length of ROW within foreground visual zone[6] of FM/RM roads	0	0	0	0	0	0	0	0	0	0	0
32	Estimated length of ROW within foreground visual zone[6][7] of parks/recreational areas[3]	0	0	0	0	0	0	0	0	0	0	0
Ecology												
33	Length of ROW across upland woodlands/brushlands	4 40	6 14	4 24	4 56	6 24	4 42	5 27	4 35	6 51	5 46	6 07
34	Length of ROW across bottomland/riparian woodlands	0	0	0	0	0	0	0	0	0	0	0
35	Length of ROW across NWI mapped wetlands	0	0	0	0	0	0	0	0	0	0	0
36	Length of ROW across critical habitat of federally listed endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0
37	Area of ROW across golden-cheeked warbler modeled habitat designated as 3-Moderate High and 4-High Quality (acres)[8]	25 08	14 38	11 12	19 03	2 95	25 11	5 52	19 03	4 77	20 39	8 31
38	Area of ROW across golden-cheeked warbler modeled habitat designated as 1-Low and 2-Moderate Low Quality (acres)[8]	11 65	21 28	12 17	13 33	16 59	12 04	17 59	13 33	18 57	15 87	22 81
39	Length of ROW across open water (lakes, ponds)	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
40	Number of stream and river crossings	4	8	10	9	10	4	11	8	10	8	12
41	Length of ROW parallel (within 100 feet) to streams or rivers	0 26	0 20	0 10	0 15	0 24	0 15	0 21	0 15	0 11	0 10	0 08
42	Length of ROW across Edwards Aquifer Contributing Zone	5 29	6 91	5 85	5 33	6 83	4 89	5 56	4 76	6 73	5 93	6 36
43	Length of ROW across FEMA mapped 100-year floodplain	0 17	0 42	1 49	0 23	0 07	0 09	0 16	0 16	0 24	0 97	0 40
Cultural Resources												
44	Number of recorded cultural resource sites crossed by ROW	0	0	0	2	1	1	2	2	1	1	2
45	Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	0	0	2	12	1	10	12	12	1	12	12
46	Number of NRHP listed properties crossed by ROW	1	1	0	1	1	1	1	1	1	0	1
47	Number of additional NRHP listed properties within 1 000 feet of ROW centerline	0	0	1	0	0	0	0	0	0	1	0
48	Length of ROW across areas of high archeological site potential	2 40	4 55	3 76	2 84	2 94	2 49	3 13	2 65	4 07	3 72	4 77
	Criteria for Exhibit BCA-2											
49	Total number of habitable structures[1] within 300 feet of ROW centerline (Line 2)	36 0	35 0	43 0	11 0	29 0	12 0	6 0	7 0	25 0	34 0	6 0
50	Estimated total cost $ millions (Attachment 3)	46 5	54 1	46 0	46 8	56 2	43 4	45 9	43 5	55 3	47 3	50 6
51	Length not parallel existing transmission line ROW (Line 1 Line 3 - Line 4)	5 3	6 9	5 8	5 3	6 8	4 9	5 6	4 8	6 7	5 9	6 4
52	Length not parallel existing transmission line ROW or Other Existing ROW (Line 51- Line 5)	3 4	4 7	3 1	4 2	3 9	4 0	4 2	3 9	4 2	5 4	5 2
53	Length not parallel to all compatible ROW, including Apparent Property Lines (Line 52 - Line 6)	1 6	2 5	1 6	1 7	2 6	1 4	1 7	1 7	3 4	1 5	2 6
54	Length of route across upland woodlands (Line 33)	4 4	6 1	4 2	4 6	6 2	4 4	5 3	4 4	6 5	5 5	6 1
55	Length of ROW across areas of high archaeological site potential (Line 48)	0 0	0 0	1 0	0 0	0 0	0 0	0 0	0 0	0 0	1 0	0 0
56	Area of ROW across golden cheeked warbler modeled habitat designated as 3 Moderate High and 4 High Quality (acres) (Line 37)	25 1	14 4	11 1	19 0	2 9	25 1	5 5	19 0	4 8	20 4	8 3

Notes

[1] Single-family and multi-family dwellings, and related structures mobile homes apartment buildings, commercial structures, industrial structures, business structures churches hospitals nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 300 feet of the centerline of a transmission project of 230-kV or less

[2] Apparent property boundaries created by existing roads, highways, or railroad ROWs are not "double-counted in the length of ROW parallel to apparent property boundaries criteria

[3] Defined as parks and recreational areas owned by a governmental body or an organized group club or church within 1 000 feet of the centerline of the project

[4] Only steel pipelines six inches and greater in diameter carrying hydrocarbons were quantified in the pipeline crossing and paralleling calculations

[5] As listed in the Chart Supplement South Central US (FAA 2019b formerly known as the Airport/Facility Directory South Central US) and FAA 2019a

[6] One-half mile, unobstructed Lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double-counted in the length of ROW within the visual foreground zone of FM roads criteria

[7] One-half mile unobstructed Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria

[8] From Model C by Diamond et al 2010

All length measurements are shown in miles unless noted otherwise

Source

Land Use and Environmental Data For Primary Route Evaluation
Primary Alternative Routes

	Evaluation Criteria	V	W	X1	Y	Z1	AA1	BB	CC	DD	EE	AA2
Land Use												
1	Length of alternative route (miles)	6 60	6 25	5 34	5 23	4 53	4 82	4 73	5 23	4 64	4 99	4 89
2	Number of habitable structures[1] within 300 feet of the route centerline	31	25	40	39	30	30	24	54	32	31	30
3	Length of ROW using existing transmission line ROW	0	0	0	0	0	0	0	0	0	0	0
4	Length of ROW parallel and adjacent to existing transmission line ROW	0	0	0	0	0	0	0	0	0	0	0
5	Length of ROW parallel to other existing ROW (roadways, railways, canals, etc)	2 60	2 60	0 79	3 01	1 60	1 85	1 45	1 94	1 88	2 13	1 85
6	Length of ROW parallel and adjacent to apparent property lines[2]	2 21	1 03	2 67	1 26	1 49	0 87	1 85	1 90	1 39	0 68	0 74
7	Sum of evaluation criteria 4 5, and 6	4 82	3 63	3 46	4 27	3 09	2 72	3 30	3 84	3 27	2 81	2 59
8	Percent of evaluation criteria 4 5 and 6	73%	58%	65%	82%	68%	56%	70%	73%	70%	56%	53%
9	Length of ROW across parks/recreational areas[3]	0	0	0	0	0	0	0	0	0	0	0
10	Number of additional parks/recreational areas[3] within 1 000 feet of ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
11	Length of ROW across cropland	0	0	0	0	0	0	0	0	0	0	0
12	Length of ROW across pasture/rangeland	0 00	0 08	0 59	0 93	0 54	0 54	0 37	0 62	1 05	1 05	0 54
13	Length of ROW across land irrigated by traveling systems (rolling or pivot type)	0	0	0	0	0	0	0	0	0	0	0
14	Length of route across conservation easements and/or mitigation banks (Special Management Area)	0	0	0	0	0	0	0	0	0	0	0
15	Length of route across gravel pits, mines, or quarries	0	0	0	0	0	0	0	0	0	0	0
16	Length of ROW parallel and adjacent to pipelines[4]	0	0	0	0	0	0	0	0	0	0	0
17	Number of pipeline crossings[4]	0	0	0	0	0	0	0	0	0	0	0
18	Number of transmission line crossings	0	0	0	0	0	0	0	0	0	0	0
19	Number of IH, US and state highway crossings	0	0	0	0	0	0	0	0	0	0	0
20	Number of FM or RM road crossings	0	0	0	0	0	0	0	0	0	0	0
21	Number of cemeteries within 1 000 feet of the ROW centerline and substation site	0	0	0	1	1	1	0	0	1	1	1
22	Number of FAA registered airports[5] with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline and substatio	1	1	1	1	1	1	1	1	1	1	1
23	Number of FAA registered airports[5] having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
24	Number of private airstrips within 10,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
25	Number of heliports within 5,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
26	Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline and substation site	0	0	0	0	0	0	0	0	0	0	0
27	Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline and substation site	1	1	0	1	1	1	0	1	1	1	1
28	Number of identifiable existing water wells within 200 feet of the ROW centerline and substation site	0	2	2	1	2	2	2	2	1	1	2
29	Number of oil and gas wells within 200 feet of the ROW centerline (including dry or plugged wells) and substation site	0	0	0	0	0	0	0	0	0	0	0
Aesthetics												
30	Estimated length of ROW within foreground visual zone[6] of IH, US and state highways	0	0	0	0	0	0	0	0	0	0	0
31	Estimated length of ROW within foreground visual zone[6] of FM/RM roads	0	0	0	0	0	0	0	0	0	0	0
32	Estimated length of ROW within foreground visual zone[6][7] of parks/recreational areas[3]	0	0	0	0	0	0	0	0	0	0	0
Ecology												
33	Length of ROW across upland woodlands/brushlands	6 52	6 03	4 25	3 76	3 60	3 81	4 08	4 27	3 12	3 40	3 88
34	Length of ROW across bottomland/riparian woodlands	0	0	0	0	0	0	0	0	0	0	0
35	Length of ROW across NWI mapped wetlands	0	0	0	0	0	0	0	0	0	0	0
36	Length of ROW across critical habitat of federally listed endangered or threatened species	0	0	0	0	0	0	0	0	0	0	0
37	Area of ROW across golden-cheeked warbler modeled habitat designated as 3-Moderate High and 4-High Quality (acres)[8]	4 28	2 95	11 92	11 12	11 12	9 6	25 08	23 82	10 74	11 43	11 81
38	Area of ROW across golden-cheeked warbler modeled habitat designated as 1-Low and 2-Moderate Low Quality (acres)[8]	18 34	16 59	13 18	12 34	11 02	14 56	10 50	11 35	10 93	13 72	13 8
39	Length of ROW across open water (lakes, ponds)	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
40	Number of stream and river crossings	9	9	3	6	8	9	4	4	6	7	9
41	Length of ROW parallel (within 100 feet) to streams or rivers	0 24	0 24	0 00	0 07	0 10	0 17	0 26	0 15	0 00	0 08	0 17
42	Length of ROW across Edwards Aquifer Contributing Zone	6 60	6 25	5 34	5 23	4 53	4 82	4 73	5 23	4 64	4 99	4 89
43	Length of ROW across FEMA mapped 100-year floodplain	0 00	0 00	0 03	0 38	1 03	1 00	0 17	0 15	0 28	0 25	1 00
Cultural Resources												
44	Number of recorded cultural resource sites crossed by ROW	1	1	0	0	0	0	0	0	0	0	0
45	Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	0	1	2	2	2	2	0	0	2	2	2
46	Number of NRHP listed properties crossed by ROW	1	1	0	0	0	0	1	1	0	0	0
47	Number of additional NRHP listed properties within 1,000 feet of ROW centerline	0	0	1	2	1	1	0	0	1	1	1
48	Length of ROW across areas of high archeological site potential	2 85	2 75	1 44	2 26	3 01	3 35	2 33	2 80	2 34	2 52	3 19
	Criteria for Exhibit BCA-2											
49	Total number of habitable structures[1] within 300 feet of ROW centerline (Line 2)	31 0	25 0	40 0	39 0	30 0	30 0	24 0	54 0	32 0	31 0	30 0
50	Estimated total cost $-millions (Attachment 3)	54 2	52 9	45 5	42 7	38 5	38 3	42 7	43 9	39 0	39 8	39 0
51	Length not parallel existing transmission line ROW (Line 1 - Line 3 - Line 4)	6 6	6 3	5 3	5 2	4 5	4 8	4 7	5 2	4 6	5 0	4 9
52	Length not parallel existing transmission line ROW or Other Existing ROW (Line 51- Line 5)	4 0	3 6	4 5	2 2	2 9	3 0	3 3	3 3	2 8	2 9	3 0
53	Length not parallel to all compatible ROW, including Apparent Property Lines (Line 52 - Line 6)	1 8	2 6	1 9	1 0	1 4	2 1	1 4	1 4	1 4	2 2	2 3
54	Length of route across upland woodlands (Line 33)	6 5	6 0	4 3	3 8	3 6	3 8	4 1	4 3	3 1	3 4	3 9
55	Length of ROW across areas of high archaeological site potential (Line 48)	0 0	0 0	1 0	2 0	1 0	1 0	0 0	0 0	1 0	1 0	1 0
56	Area of ROW across golden-cheeked warbler modeled habitat designated as 3-Moderate High and 4-High Quality (acres) (Line 37)	4 3	2 9	11 9	11 1	11 1	9 6	25 1	23 8	10 7	11 4	11 8

Notes

[1] Single-family and multi-family dwellings, and related structures, mobile homes, apartment buildings, commercial structures, industrial structures business structures, churches hospitals nursing homes schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 300 feet of the centerline of a transmission project of 230-kV or less

[2] Apparent property boundaries created by existing roads highways or railroad ROWs are not "double-counted" in the length of ROW parallel to apparent property boundaries criteria

[3] Defined as parks and recreational areas owned by a governmental body or an organized group club, or church within 1,000 feet of the centerline of the project

[4] Only steel pipelines six inches and greater in diameter carrying hydrocarbons were quantified in the pipeline crossing and paralleling calculations

[5] As listed in the Chart Supplement South Central US (FAA 2019b formerly known as the Airport/Facility Directory South Central US) and FAA 2019a

[6] One-half mile, unobstructed Lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double-counted" in the length of ROW within the visual foreground zone of FM roads criteria

[7] One-half mile unobstructed Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria

[8] From Model C by Diamond et al 2010

All length measurements are shown in miles unless noted otherwise

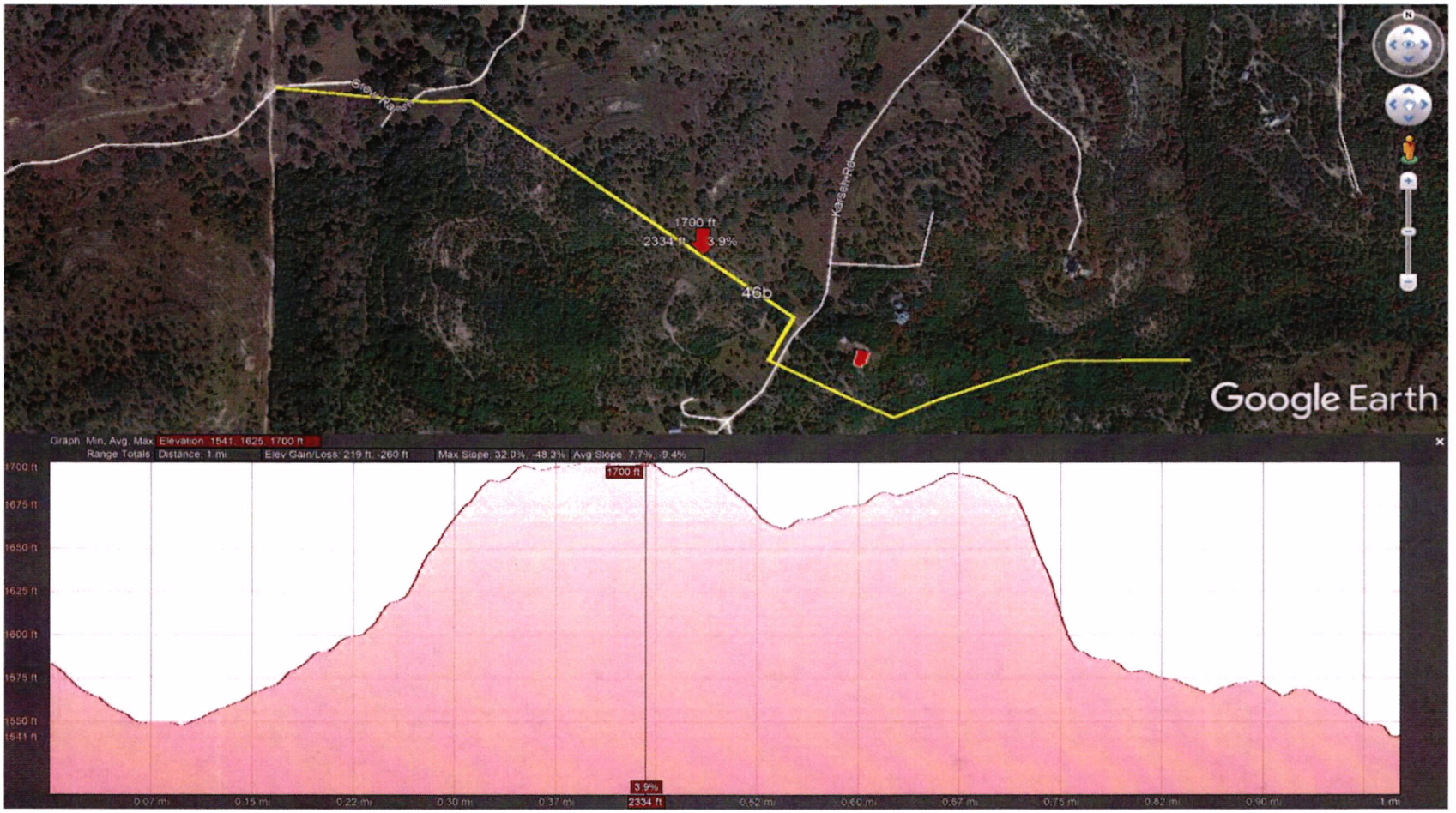
Source Errata to LCRA TSC Application Table 2 & 5-1

Relative Routing Factor Comparison of Route Alternatives

Scenic Loop 138kV Transmisison Line Project

Route	Scenic Loop Sub Site	Total Number of Habitable Structures within 300 feet of ROW Centerline	Estimated Total Cost	Length Not Parallel Existing ROW	Length Not Parallel to all Compatible ROW, Including Apparent Property Lines	Length of ROW across Upland Woodlands/ Brushlands	Length of ROW across Areas of High Archaeological Site Potential	Length of ROW across Areas of Modeled Golden Cheeked Warbler Habitat of Moderate High or High Quality
A	1	69	$ 54.70	4.87	1.16	5.27	1.00	13.88
B1	1	61	$ 50.55	5.19	2.00	5.06	2.00	13.68
C1	1	48	$ 47.37	3.34	1.95	3.48	1.00	10.74
D1	2	43	$ 43.90	3.09	1.60	3.94	1.00	11.12
E	2	60	$ 54.51	4.17	1.63	5.24	1.00	12.29
F1	2	12	$ 49.66	4.18	1.69	4.70	0.00	19.03
G1	3	52	$ 51.22	4.85	2.89	5.10	2.00	12.78
H	3	61	$ 53.62	4.43	1.24	5.03	1.00	12.29
I1	3	43	$ 42.88	3.02	1.44	3.86	1.00	8.92
J1	3	41	$ 44.07	3.20	2.42	4.20	1.00	11.81
K	3	36	$ 46.47	3.43	1.58	4.40	0.00	25.08
L	3	35	$ 54.09	4.70	2.53	6.14	0.00	14.38
M1	4	43	$ 46.04	3.09	1.60	4.24	1.00	11.12
N1	5	11	$ 46.80	4.18	1.69	4.56	0.00	19.03
O	5	29	$ 56.19	3.92	2.62	6.24	0.00	2.95
P	6	12	$ 43.41	4.04	1.42	4.42	0.00	25.11
Q1	6	6	$ 45.89	4.17	1.73	5.27	0.00	5.52
R1	6	7	$ 43.52	3.91	1.70	4.35	0.00	19.03
S	6	25	$ 55.33	4.17	3.43	6.51	0.00	4.77
T1	6	34	$ 47.26	5.43	1.47	5.46	1.00	20.39
U1	6	6	$ 50.56	5.16	2.62	6.07	0.00	8.31
V	6	31	$ 54.17	3.99	1.78	6.52	0.00	4.28
W	6	25	$ 52.87	3.65	2.62	6.03	0.00	2.95
X1	7	40	$ 45.50	4.55	1.87	4.25	1.00	11.92
Y	7	39	$ 42.72	2.22	0.97	3.76	2.00	11.12
Z1	7	30	$ 38.47	2.93	1.44	3.60	1.00	11.12
AA1	7	30	$ 38.29	2.97	2.10	3.81	1.00	9.60
AA2	7	30	$ 39.05	3.04	2.30	3.88	1.00	11.81
BB	7	24	$ 42.74	3.27	1.43	4.08	0.00	25.08
CC	7	54	$ 43.90	3.29	1.39	4.27	0.00	23.82
DD	7	32	$ 39.00	2.76	1.37	3.12	1.00	10.74
EE	7	31	$ 39.76	2.87	2.19	3.40	1.00	11.43
Performance Bands								
Superior		**6**	**38.3**	**2.22**	**0.97**	**3.12**	**0.00**	**2.95**
		27	**44.3**	**3.29**	**1.79**	**4.25**	**0.67**	**10.33**
Moderate		**27**	**44.3**	**3.29**	**1.79**	**4.25**	**0.67**	**10.33**
		48	**50.2**	**4.36**	**2.61**	**5.39**	**1.33**	**17.72**
Poor		**48**	**50.2**	**4.36**	**2.61**	**5.39**	**1.33**	**17.72**
		69	**56.2**	**5.43**	**3.43**	**6.52**	**2.00**	**25.11**

Elevation Profile of Segment 46b



Elevation Profile of Segment 49a