3. Alternative Descriptions and Determinations

3.1 Introduction

The alternatives presented in this section range from minor routing adjustments to SCE's proposed route, to entirely different transmission line routes for some segments of the proposed alignment, to alternate system voltages and system designs. Section 3.2 addresses design variations to the proposed Project/Action. Section 3.3 discusses alternatives that would be routed along a new corridor or an existing corridor, other than the proposed corridors. Finally, transmission system alternatives are evaluated in Section 3.3. The No Project/Action Alternative, because it must be considered in an EIR/EIS, is not discussed herein. All figures referenced in the discussion below are provided at the end of this report.

After initial screening, a potential alternative was eliminated from full evaluation if it: (1) was unable to meet the primary project purpose and fulfill the project need; (2) proved to be infeasible or would not meet reliability criteria; or (3) did not have the ability to reduce or avoid impacts of the proposed Project/Action without creating other impacts of its own. The alternatives that have been determined to meet the CEQA/NEPA alternatives screening criteria have been retained for full analysis in the EIR/EIS.

A summary table is provided at the end of the analysis of each alternative considered in the alternatives screening process. This table provides an "at a glance" summary of the CEQA/NEPA criteria considered, as discussed above. The first three boxes along the top of the table answer the question of whether or not the proposed alternative: (1) meets the Project purpose; (2) is feasible; and (3) meets CAISO/NERC/WECC reliability requirements. If the alternative does NOT meet the Project purpose, is NOT feasible, and/or does NOT meet reliability requirements, the appropriate box will have a designation of "No" and the alternative is immediately eliminated from further consideration, as these are fundamental criteria to meet for an alternative to be considered "reasonable". Explanations and supporting information for these determinations are provided in the second row of the summary table. The third row of the summary table provides a side-by-side summary comparison of the environmental advantages and disadvantages of the proposed alternative. The last row of the table provides the conclusion of whether or not to retain the alternative for further analysis in the EIR/EIS or to eliminate from further analysis.

3.2 Design Variations to the Proposed Project/Action

Each of the following alternatives is located within or along the proposed alignment which traverses from the Windhub Substation in southern Kern County to the Mira Loma Substation in San Bernardino County. The discussions below explain the reasons for elimination or retention for full analysis for each potential alternative.

3.2.1 Whirlwind Substation Site A Alternative

Alternative Description

The Whirlwind Substation would be a new 500/220-kV facility located in Kern County, approximately 4.5 miles south of the proposed Cottonwind Substation. The facility would include a 500-kV switchyard and a 220-kV switchyard in order to connect T/Ls in Segments 4 and 10. Alternative Site A for the Whirlwind Substation was considered by SCE in its PEA (RA Retained 6), and would be located on the east side of Segment 4, south of Rosamond Boulevard and east of 170th Street West, as shown in Figure

3.2-1. The site for this alternative consists of approximately 113 acres of previously disturbed land. Grading to prepare the site for the new substation is estimated to result in 15,000 cubic yards of soil mixed with small stones and organic matter. The permanent land disturbance associated with Whirlwind Substation Site A would be approximately 66 acres. It should also be noted that this site has been proposed for an aquifer recharge facility.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints. Therefore, this alternative would accomplish the Project purpose.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This alternative substation site would be located on previously disturbed land, which would reduce potential biological impacts, and near proposed wind generation projects, thereby minimizing routing distances.

Environmental Disadvantages

This alternative substation would be located on 113 acres and would result in an additional 7 acres of permanent disturbance in comparison to the proposed Project/Action. Soil stability issues could be a concern considering an aquifer recharge facility has been proposed for this site.

Alternative Conclusion

ELIMINATED. This alternative would meet the purpose and need of the TRTP, would be feasible, and would meet CAISO/NERC/WECC reliability requirements. However, the alternative substation site would require additional land over the proposed Whirlwind Substation site resulting in greater construction impacts and the permanent loss of more land. There is an additional concern regarding soil stability as this is a proposed site for an aquifer recharge facility. Overall, this alternative offers no environmental advantage over the proposed Project/Action without creating greater impacts of its own, and is substantially similar to the proposed Project/Action. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

Whirlwind Substation Site A Alternative	Meets Project Purpose? Yes[1]	Feasible? Yes[2]	Meets Reliability Criteria? Yes[3]
Explanations: [1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would be designed to meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints. [2] This alternative would be feasible. [3] Meets CAISO/NERC/WECC requirements. Requires crossing of existing 220-kV T/Ls, decreasing overall reliability.			
Environmental Advantages • Located on 113 acres of previously disturbed land, which would reduce potential biological impacts • Located between Cottonwind and Antelope Substations near proposed wind generation projects, thereby minimizing routing distances		**Environmental Disadvantages** • Soil stability issues could be a concern as an aquifer recharge facility is proposed for this site • Greater permanent land disturbance than the proposed Whirlwind Substation site	
Conclusion: Eliminate from further analysis. This alternative offers no environmental advantage over the proposed Project/Action and is substantially similar to the proposed Project/Action.			

3.2.2 Whirlwind Substation Site B Alternative

Alternative Description

The Whirlwind Substation would be a new 500/220-kV facility located in Kern County, approximately 4.5 miles south of the proposed Cottonwind Substation. The facility would include a 500-kV switchyard and a 220-kV switchyard in order to connect T/Ls in Segments 4 and 10. Alternative Site B for the Whirlwind Substation was considered by SCE in its PEA (RA Retained 6), and would be located west of 170th Street West, on the west side of Segment 4, south of Rosamond Boulevard, as shown in Figure 3.2-1. The site for this alternative consists of approximately 102 acres of previously undisturbed land. Grading to prepare the site for the new substation is estimated to result in 24,000 cubic yards of soil mixed with small stones and organic matter. The permanent land disturbance associated with Whirlwind Substation Site B would be approximately 67 acres.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This alternative substation site would be located nearby proposed wind generation projects, minimizing routing distances.

Environmental Disadvantages

This alternative substation site would be located on previously undisturbed land, thereby increasing potential biological impacts, and would require grading of an additional 9,000 cubic yards of soil in comparison to the proposed Project/Action, which would increase air quality impacts during construction.

Alternative Conclusion

ELIMINATED. This alternative would meet the purpose and need of the TRTP, would be feasible, and would meet CAISO/NERC/WECC reliability requirements. However, the alternative substation site would be located on previously undisturbed land and would require additional acreage resulting in additional construction impacts (air quality and biology) and the permanent loss of additional land. Overall, this alternative offers no environmental advantage over the proposed Project/Action without creating greater impacts of its own, and is substantially similar to the proposed Project/Action. Therefore, the Whirlwind Substation Site B Alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Whirlwind Substation Site B Alternative</td><td>Meets Project Purpose?
Yes[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would be designed to meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints.
[2] This alternative would be feasible.
[3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Located between Cottonwind and Antelope Substations near proposed wind generation projects, thereby minimizing routing distances</td><td colspan="2">Environmental Disadvantages
• Located on 102 acres of previously undisturbed land, increasing potential for biological impacts
• Grading of the site would result in an estimated quantity of 24,000 cubic yards of soil mixed with small stones and organic matter versus 15,000 cubic yards for the proposed Project/Action</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis. This alternative offers no environmental advantage over the proposed Project/Action, and is substantially similar to the proposed Project/Action.</td></tr>
</table>

3.2.3 Upgrade Transmission through the ANF in Segment 6 Only Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 3, Option 6/11A). as shown in Figure 3.2-2, the proposed improvements within Segment 6 for this alternative would include replacing one existing 220-kV T/L with a 500-kV T/L and constructing a new 500-kV T/L either to the east or west of the existing T/Ls in the designated utility corridor through the ANF between the Vincent Substation and the City of Duarte, and widening of the existing ROW to accommodate the new T/Ls. A new approximately 8-mile, 200-foot-wide east-west corridor along the southern boundary of the ANF would need to be established to allow one of the new 500-kV T/Ls (Mesa-Vincent No. 2 500/220-kV T/L) to connect into the southern portion of Segment 11 near Gould Substation. As proposed for Segment 11, this circuit would be completed by stringing an existing vacant tower position from the Gould Substation area to the Mesa Substation. This alternative would be approximately 9 miles longer than the proposed Segment 11 between Antelope Substation and Gould Substation.

Implementation of this alternative would result in a total of four T/Ls from the Vincent Substation to the southern boundary of the ANF in the City of Duarte along Segment 6. This would include three 500-kV

T/Ls (Rio Hondo-Vincent No. 2, Mesa-Vincent No. 2, and Mira Loma-Vincent) and one existing 220-kV T/L (Rio Hondo-Vincent No. 1). The two existing 220-kV T/Ls within Segment 11 (Mesa-Vincent and Eagle Rock-Pardee) would remain and continue to operate as under current conditions.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would meet the purpose and need of the TRTP by allowing for the interconnection of new wind generation resources in the TWRA, meeting projected load growth in the Antelope Valley, and addressing the South of Lugo transmission constraints, although not necessarily to the extent to which the proposed Project/Action would meet these objectives and only when operated reliably. Incorporating the proposed upgrades, which under the proposed Project/Action would be split between Segments 6 and 11, into only Segment 6, would compromise system reliability (see "Feasibility" discussion below). As such, this alternative would only partially fulfill the Project objectives/purpose and need.

Feasibility

No feasibility issues have been identified.

Reliability

This alternative would locate four lines (three 500-kV and one 220-kV) in Segment 6 while maintaining the existing 220-kV lines in Segment 11. The increased number of T/Ls in Segment 6 would likely subject the lines to common mode failure. Under such a condition, power flow studies determined that a total of 3,800 MW would flow on the four T/Ls in Segment 6, as summarized in Table 3.2-1 below. This amount of power flow would need to be carried by the remaining T/Ls under outage conditions within Segment 6. Of this total flow, approximately 60 percent would be transmitted toward the Rio Hondo and Mesa load centers while the remaining 40 percent would be transmitted to the Mira Loma area.

Table 3.2-1. Heavy Summer Power Flow on T/Ls Located in Segment 6 and 11 Under the "Upgrade Transmission Through the ANF in Segment 6 Only" Alternative

Transmission Line	Segment	Amp Rating	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	6	2480	2088	802	84.2%
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	6	3230	2053	784	63.6%
Mesa-Vincent No. 2 500-kV partially built to 500-kV	6	3230	1563	598	48.4%
Mira Loma-Vincent 500-kV	6	3950	1807	1616	45.7%
Existing Mesa-Vincent 220-kV	11	2480	2127	816	85.8%
Existing Eagle Rock-Pardee220-kV	11	1240	633	246	51.0%

A simultaneous outage condition of the three lines in Segment 6 that would connect the Vincent Substation to the Rio Hondo and Mesa Substations would result in loading the remaining T/L that connect the Vincent Substation to the Mesa Substation, located in Segment 11, beyond the available thermal capacity. Under such an outage condition, the existing Mesa-Vincent 220-kV T/L would load up to 150 percent of its maximum normal conductor rating which is well over the maximum 115 percent long-term emergency and 133 percent short-term emergency capabilities. If, in addition to the loss of these three lines in Segment 6, the Mira Loma-Vincent 500-kV T/L were subjected to the same outage condition associated with the same common mode failure risk factor, loading on the existing Mesa-Vincent 220-kV T/L would exceed 170 percent of its maximum normal conductor rating. A summary of the power flow study results is provided below in Table 3.2-2.

Implementing a Special Protection System (SPS) which trips TWRA generation would not provide for an adequate solution to mitigate the identified thermal overload problem. The amount of generation tripping required to reduce the thermal overload to within limits would exceed the maximum 1,400 MW tripping limits associated with the use of a SPS. Under such a condition, tripping 1,417 MW resulted in reducing the identified thermal overload by 17 percent from 170 percent to 153 percent. Extrapolating the overload reduction indicates that over 3,100 MW of generation tripping would be required to reduce the identified thermal overload to within SCE's short-term emergency limits. To further reduce the overload to within SCE's long-term emergency rating, over 3,750 MW of generation tripping would be required.

Consequently, routing both proposed upgrades (Segment 6 and 11) within Segment 6 would compromise system reliability and would not meet the required CAISO/NERC/WECC Planning Standards.

Table 3.2-2. Summary of Power Flow on Transmission Located in Segment 6 and Segment 11 Under Outage of Facilities Located in Segment 11

Transmission Line	Amp Rating	Loss of Three Transmission Lines			Loss of Four Transmission Lines		
		Amp	MW	Percent	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	2480	0	0	0	0	0	0
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	3230	0	0	0	0	0	0
Mesa-Vincent No. 2 500-kV partially built to 500-kV	3230	0	0	0	0	0	0
Mira Loma-Vincent 500-kV	3950	2217	1933	56.1%	0	0	0
Existing Mesa-Vincent 220-kV	2480	3726	1370	150.2%	4223	1483	170.3%
Existing Eagle Rock-Pardee 220-kV	1240	911	345	73.5%	1012	372	81.6%

Environmental Advantages

For this alternative, construction activities within the ANF along Segment 11 under the proposed Project/Action would not occur. As a result, air quality, noise, traffic, and visual impacts (among others) in the ANF along Segment 11 would be reduced; however, most of these impacts would be shifted to Segment 6.

Environmental Disadvantages

The need to establish a new 200-foot-wide east-west corridor between the Cities of Duarte and Altadena (south of Gould Substation) would result in additional impacts to air quality, biology, noise, traffic, and visual resources, and would create the need to traverse through densely populated urban areas resulting in greater land use impacts than the proposed Project/Action. In addition, the new corridor would parallel the Sierra Madre Fault presenting potential geotechnical issues that could compromise system reliability. Although this alternative would reduce the construction-related impacts associated with the upgrades to Segment 11, as discussed above, it would be 9 miles longer than the proposed route, and would require new access roads and spur roads along the new east-west corridor. Therefore, impacts would not be expected to be substantially reduced in comparison to the proposed Project/Action.

Alternative Conclusion

ELIMINATED. While this alternative would partially meet the project purpose and need, and would be technically feasible, system reliability would be compromised and would not meet the required

CAISO/NERC/WECC Planning Standards resulting in a legally infeasible alternative. Additionally, the amount of new corridor and access roads required would increase the potential for air quality, biology, land use, noise, traffic and visual resource impacts. Overall, this alternative would not substantially lessen any significant impacts of the proposed Project/Action without creating greater impacts of its own. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Upgrade Transmission through ANF in Segment 6 Only Alternative</td><td>Meets Project Purpose?
Partially[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
No[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, reliability would be a concern (see #3 below). This alternative would be designed to meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints when operating reliably.
[2] This alternative would be feasible.
[3] Does not meet CAISO/NERC/WECC requirements. Collocates multiple transmission lines in a common corridor (three 500-kV T/Ls and one 220-kV T/L), which compromises overall system reliability. A simultaneous outage condition of the T/Ls in Segment 6 would result in loading the T/Ls in Segment 11 beyond the available thermal capability. Implementing a Special Protection System (SPS) which trips TWRA generation would not provide for an adequate solution to mitigate the identified thermal overload problem, as it would exceed the maximum 1,400 MW tripping limits of the SPS.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Avoids any upgrades and associated environmental impacts in Segment 11 within the ANF</td><td colspan="2">Environmental Disadvantages
• Need to establish a new east-west T/L corridor between Duarte and Altadena (south of Gould Substation) resulting in additional environmental impacts (air quality, biological resources, land use, noise, traffic, visual)
• East-west corridor would parallel the Sierra Madre Fault (geotechnical issues)
• Potential land use conflict in establishing new east-west corridor outside of the ANF
• Longer alignment (35 versus 26 miles for proposed route)</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.2.4 Upgrade Transmission through ANF in Segment 11 Only Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 3, Option 6/11B). As shown in Figure 3.2-3, the proposed improvements within Segment 11 for this alternative would include replacing one existing 220-kV T/L with a 500-kV T/L and constructing a new 500-kV T/L either to the east or west of the existing T/Ls in the utility corridor through the ANF between the Vincent Substation and La Cañada Flintridge (Gould Substation), and widening of the existing ROW to accommodate the new T/Ls. A new 200-foot-wide east-west corridor along the southern boundary of the ANF would need to be established between the cities of La Cañada Flintridge (Gould Substation) and Duarte to allow one of the new 500-kV T/Ls (Mira Loma-Vincent 500-kV T/L) to connect to the northern end of Segment 7. This alternative would be approximately 7 miles longer than the proposed route for Segment 6.

As part of this alternative, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed as this line segment would be disconnected. Upgrades between the City of Duarte and Mesa Substation (Segment 7), between the Mesa Substation and Mira Loma Substation (Segment 8), and between the Gould Substation area and Mesa Substation (southern portion of Segment 11) would continue to occur as proposed under this alternative.

Implementation of this alternative would result in a total of three T/Ls from the Vincent Substation to the southern boundary of the ANF in La Cañada Flintridge along Segment 11; this would include two new 500-kV T/Ls (Mesa-Vincent No. 2 and Mira Loma-Vincent) and one existing 220-kV T/L (Eagle Rock-Pardee). The remaining T/Ls within Segment 6 (Rio Hondo-Vincent No. 1 220-kV and Rio Hondo-Vincent No. 2 220/500-kV) would remain and continue to operate as under current conditions.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints; however, this alternative would be slightly less effective than the proposed Project/Action in addressing the South of Lugo transmission constraints due to the longer route.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

For this alternative, construction activities within the ANF along Segment 6 under the proposed Project/Action would not occur, with the exception of the removal of the Antelope-Mesa 220-kV T/L. As a result, air quality, noise, traffic, and visual impacts in the ANF along Segment 6 would be reduced; however, most of these impacts would simply shift to Segment 11.

Environmental Disadvantages

The need to establish a new 200-foot-wide east-west corridor between La Cañada Flintridge (Gould Substation) and the City of Duarte would result in additional impacts to air quality, biology, noise, traffic, and visual resources, as well as traverse through densely populated urban areas resulting in greater land use impacts than the proposed Project/Action. In addition, the new corridor would parallel the Sierra Madre Fault presenting potential geotechnical issues. Although this alternative would reduce the construction-related impacts associated with the upgrades to Segment 6, as discussed above, it would require the removal of the Antelope-Mesa 220-kV T/L, as this T/L segment would be disconnected, would be seven miles longer than the proposed route, and would require new access roads and spur roads along the new east-west corridor. Therefore, impacts would not be expected to be substantially reduced in comparison to the proposed Project/Action.

Alternative Conclusion

ELIMINATED. While this alternative would meet the project purpose and need, and would be feasible, this alternative would require establishment of a new east-west corridor. The amount of new corridor and access roads required would increase the potential for air quality, biological, land use, noise, traffic, and visual resource impacts. Overall, this alternative would not substantially lessen any significant impacts of the proposed Project/Action without creating greater impacts of its own. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><th>Upgrade Transmission through ANF in Segment 11 Only Alternative</th><th>Meets Project Purpose?
Yes[1]</th><th>Feasible?
Yes[2]</th><th>Meets Reliability Criteria?
Yes[3]</th></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would be designed to meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints.
[2] This alternative would be feasible.
[3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Avoids upgrades and associated environmental impacts in Segment 6 within the ANF, although the Antelope-Mesa 220-kV T/L would be removed, as this T/L segment would be disconnected</td><td colspan="2">Environmental Disadvantages
• Need to establish a new east-west T/L corridor between La Cañada Flintridge and Duarte resulting in additional environmental impacts (air quality, biological resources, land use, noise, traffic, visual)
• East-west corridor would parallel the Sierra Madre Fault (geotechnical issues)
• Potential land use conflict in establishing new east-west corridor outside of the ANF
• Longer alignment (34 vs. 27 miles for proposed route)</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.2.5 Reduced Upgrades in Segment 6 Alternative

Alternative Description

This alternative was developed by the EIR/EIS team as a hybrid to the alternatives proposed by SCE (RA Eliminated 3, Options 6/11A and 6/11B) where upgrades through the ANF would occur within either Segment 6 or 11. These alternatives are discussed in Section 3.2.3 and 3.2.4. As shown in Figure 3.2-4, north of the crossover span (S6 MP 4.8) in Segment 6, this alternative would maintain the existing Rio-Hondo No. 2 220-kV T/L without any upgrades, and rebuild the existing Antelope-Mesa 220-kV T/L as the new Mira Loma-Vincent 500-kV T/L. At the crossover span, the Vincent- Rio Hondo No. 2 220-kV T/L would connect into the Antelope-Mesa 220-kV T/L, and the new Mira Loma-Vincent 500-kV T/L would connect into the existing Rio Hondo-Vincent No. 2 T/L, which is already built to 500-kV standards.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

South of the crossover span this alternative would leave the Antelope-Mesa 220-kV T/L in place. This T/L represents a weak link or choke point within the existing transmission system, as under normal operating conditions this T/L overloads. As a result, this would interfere with the objective of reliably transmitting 4,500 MW from the TWRA and would not address the South of Lugo transmission constraints. As such, this alternative does not meet the objectives/purpose or need of the TRTP.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would not comply with CAISO, NERC, and WECC requirements, as it would leave the Antelope-Mesa 220-kV T/L in place, which represents a choke point within the existing transmission system and would therefore not provide for a reliable system.

Environmental Advantages

In comparison to the proposed Project/Action, this alternative would eliminate the addition of one new 500-kV T/L in Segment 6. As such, the environmental impacts associated with the removal of the existing 220-kV T/L and the construction of a new 500-kV T/L would not occur. Furthermore, long-term visual impacts would be reduced as fewer T/Ls would traverse the ANF along Segment 6.

Environmental Disadvantages

Not upgrading the Antelope-Mesa 220-kV T/L along the entire length of Segment 6 would immediately limit the ability of the system to accommodate the additional generation from the TWRA. As such, new infrastructure would be required, which may include re-building the existing 220-kV T/L to 500-kV as currently proposed or building future upgrades in parallel, requiring additional ROW width, or elsewhere, requiring entirely new ROW. These additional upgrades to the system would result in additional environmental impacts.

Alternative Conclusion

ELIMINATED. This alternative would reduce the number of new 500-kV T/Ls within the ANF along Segment 6 from two to one, thereby reducing construction impacts (air quality, noise, traffic) and long-term visual impacts within the ANF. However, the Antelope-Mesa 220-kV T/L would not be upgraded as part of this alternative, which would immediately limit the ability of the system to accommodate the additional generation from the TWRA and would not address South of Lugo transmission constraints. As such, this alternative does not meet the objectives/purpose or need of the TRTP and has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Reduced Upgrades in Segment 6 Alternative</td><td>Meets Project Purpose?
Partially[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
No[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would not provide for the reliable transmission of up to 4,500 MW from the TWRA and would not address South of Lugo transmission constraints. It would meet projected load growth in the Antelope Valley.
[2] This alternative would be feasible.
[3] This alternative would leave a choke point in the transmission system which would result in overloading of the existing Antelope-Mesa 220-kV T/L under normal operations. As such, the reliability of the system would be in jeopardy.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Limits upgrades in Segment 6 to the first approximately 4.8 miles between Vincent Substation and the crossover span
• Impacts associated with the removal of the existing 220-kV T/L and the construction of a new 500-kV T/Ls would not occur.
• Long-term visual impacts would be reduced as fewer T/Ls would traverse the ANF along Segment 6.</td><td colspan="2">Environmental Disadvantages
• 220-kV lines would need to be rebuilt to 500-kV standards at some point in the future
• Not upgrading the Antelope-Mesa 220-kV T/L along the entire length of Segment 6 would immediately limit the ability of the system to accommodate the additional generation from the TWRA.
• New infrastructure would be required resulting in additional environmental impacts</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.2.6 Co-Locate All SCE T/Ls in Either Segment 6 or 11 Across the ANF Alternative

Alternative Description

This alternative considered by SCE in its PEA (RA Eliminated 3, Option 6/11C). It would include removing all existing transmission facilities within Segment 6 and rebuilding them in Segment 11, or vice versa. For the case where the transmission facilities would all be located in Segment 11 (Option A), one 220-kV T/L in Segment 11 would be replaced with one 500-kV T/L; one 220-kV T/L in Segment 6 would be removed and replaced with one 500-kV T/L located in Segment 11; and the two remaining 220-kV T/Ls in Segment 6 would be relocated to Segment 11 either east or west of the existing T/Ls. To accommodate the new transmission facilities in Segment 11, the ROW through the ANF would need to be expanded. Additionally, a new 200- to 420-foot-wide east-west corridor paralleling the southern boundary of the ANF would need to be established between the cities of La Cañada Flintridge (Gould Substation) and Duarte to allow one of the new 500-kV T/Ls (Mira Loma-Vincent 500-kV T/L) and the two existing 220-kV T/Ls to connect to the northern end of Segment 7. The alignment for Option A would be similar to that shown in Figure 3.2-3.

For the case where the transmission facilities would all be located in Segment 6 (Option B), one 220-kV T/L in Segment 6 would be replaced with one 500-kV T/L; one 220-kV T/L in Segment 11 would be removed and replaced with one 500-kV T/L located in Segment 6; and the one remaining 220-kV T/L in Segment 11 would be relocated to Segment 6 either east or west of the existing T/Ls. To accommodate the new transmission facilities in Segment 6, the ROW through the ANF would need to be expanded. Additionally, a new 200- to 420-foot-wide east-west corridor along the southern boundary of the ANF would need to be established between the cities of Duarte and La Cañada Flintridge (Gould Substation) to allow one of the new 500-kV T/Ls (Mesa-Vincent 500-kV T/L) and the one existing 220-kV T/L to connect to Segment 11. The alignment for Option B would be similar to that shown in Figure 3.2-2.

Implementation of this alternative would result in a total of five T/Ls (two 220-kV lines and three 500-kV lines) being located in a single corridor through the ANF, either in Segment 6 or 11. Assuming all transmission facilities are within Segment 11, the alternative would be approximately 34 miles longer than the proposed route for Segments 6 and 11. Assuming all transmission facilities are within Segment 6, this alternative would be approximately 27 miles longer than the proposed route for Segments 6 and 11.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would meet the purpose and need of the TRTP by allowing for the interconnection of new wind generation resources in the TWRA, meeting projected load growth in the Antelope Valley, and addressing the South of Lugo transmission constraints, when operated reliably. However, routing proposed upgrades within the same corridor would seriously compromise system reliability (see "Feasibility" discussion below). Therefore, this alternative would only partially fulfill the project purpose and need.

Feasibility

No feasibility issues have been identified.

Reliability

Co-locating multiple T/Ls currently located in different designated utility corridors through the ANF eliminates the geographic diversity which allows SCE's transmission system to meet the required CAISO/NERC/WECC Planning Standards. By locating all facilities into one corridor, the risk exposure for simultaneous loss of multiple transmission facilities is substantially increased. Such a system design would be inconsistent with the CAISO/NERC/WECC Planning Standards requiring SCE to plan, design, and construct the interconnected transmission system in a manner that maintains the ability of the electric systems to supply the aggregate electrical demand and energy requirements of their customers at all times taking into account scheduled and reasonably expected unscheduled outages of system elements.

Environmental Advantages

Under this alternative, the proposed transmission upgrades within either Segment 6 or 11 would not occur, which would eliminate impacts associated with the construction, operation and maintenance of the proposed Project/Action within one of these corridors. Furthermore, depending on which corridor is chosen, the existing T/Ls located in the other corridor would be removed, which while this would result in impacts during construction, would provide for a long-term reduction in visual impacts within the ANF.

Environmental Disadvantages

Implementation of this alternative would require approximately 34 or more additional miles of T/L than required for the proposed Project/Action and require a new 200- to 420-foot-wide east-west corridor paralleling the southern boundary of the ANF between the cities of Duarte and La Cañada Flintridge (Gould Substation), which would result in greater impacts to air quality, biology, land use, noise, traffic, and visual resources than the proposed Project/Action. The east-west corridor would also parallel the Sierra Madre Fault resulting in potential geotechnical issues. This alternative would also require deconstruction of approximately 27 miles of existing T/Ls in Segment 6 if the T/Ls are moved to Segment 11, and approximately 18 miles in Segment 11 if the T/Ls are moved to Segment 6. These activities would result in greater construction impacts than the proposed Project/Action.

Alternative Conclusion

ELIMINATED. While this alternative would partially meet the project purpose and need, and would be feasible, system reliability would be compromised and would not meet the required CAISO/NERC/WECC Planning Standards. In addition, this alternative would require substantially more construction and deconstruction than the proposed Project/Action, resulting in greater air quality, biology, land use, noise, traffic, and visual resource impacts. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

Co-Locate All SCE T/Ls in Either Segment 6 or 11 Across the ANF Alternative	**Meets Project Purpose?** Partially[1]	**Feasible?** Yes[2]	**Meets Reliability Criteria?** No[3]
Explanations: [1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however reliability would be a concern (see #3 below). This alternative would be designed to meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints when operating reliably. [2] This alternative would be feasible. [3] Does not meet CAISO/NERC/WECC requirements. Collocates multiple transmission lines in a common corridor (three 500-kV T/Ls and two 220-kV T/L), which compromises overall system reliability.			
Environmental Advantages • Avoids any upgrades and associated environmental impacts in either Segment 6 or 11 within the ANF • Reduces long-term visual impacts in Segment 6 or 11, with the removal of existing infrastructure		**Environmental Disadvantages** • Requires deconstruction of approximately 27 miles of existing T/Ls in Segment 6 or 18 miles in Segment 11 • Need to establish a new east-west T/L corridor between Duarte and La Cañada Flintridge (Gould Substation) resulting in additional environmental impacts (air quality, biological resources, land use, noise, traffic, visual) • East-west corridor would parallel the Sierra Madre Fault (geotechnical issues) • Longer alignment than proposed route – 34 miles (All T/Ls in Segment 6) or 27 miles (All T/Ls in Segment 11)	
Conclusion: Eliminate from Further Analysis			

3.2.7 Reduced Number of 220-kV T/Ls in the ANF Alternative

Alternative Description

This alternative would provide similar upgrades to the proposed Project/Action, but would reduce the number of 220-kV T/Ls through the ANF along Segment 6 and 11 as a means to reduce the visual "clutter" within the ANF. Figure 3.2-5 provides a sketch of the components of this alternative, which are described below.

In Segment 6, north of the crossover span (S6 MP 4.8), this alternative rebuild the Antelope-Mesa 220-kV T/L and the Rio Hondo-Vincent No. 2 220-kV T/L with 500-kV single-circuit structures, same as the proposed Project/Action. South of the crossover span, this alternative would rebuild the Antelope-Mesa 220-kV T/L as the upgraded Rio Hondo-Vincent No. 2 500-kV T/L and the new Mira Loma-Vincent 500-kV T/L would connect into and use the existing 500-kV single-circuit towers of the existing Rio Hondo-Vincent No. 2 T/L (same as the proposed Project/Action). Unlike the proposed Project/Action, the existing Rio Hondo-Vincent No.1 220-kV T/L, which would otherwise be untouched, would be removed.

In Segment 11, this alternative would build the new Mesa-Vincent No. 1 500-kV T/L in place of the Vincent-Pardee No. 1 220-kV T/L (for first ~4 miles) and the Eagle Rock-Pardee 220-kV T/L (for the remaining ~15 miles), same as the proposed Project/Action. In addition, the existing Mesa-Vincent No. 1 220-kV T/L would be removed along the entire length of Segment 11 (from Vincent Substation to Mesa Substation), which would otherwise be untouched under the proposed Project/Action.

For the southern portion of Segment 11 (south of Gould Substation), this alternative would design the system for 500 kV, where the proposed Project/Action would string the new Mesa-Vincent 220-kV T/L on the currently empty position of the existing 220-kV double-circuit towers. For this alternative, the ROW south of the ANF would be reconfigured to accommodate a new 500-kV T/L. Currently, the ROW south of Gould Substation has two double-circuit 220-kV towers accommodating three 220-kV T/Ls

(Mesa-Vincent No. 1, Eagle Rock-Mesa and Gould-Goodrich). For this alternative, one set of existing double-circuit 220-kV towers would be removed and the second set would be reconfigured to accommodate the existing Eagle Rock-Mesa and Gould-Goodrich 220-kV T/Ls (Mesa-Vincent No. 1 would be removed as noted above). New 500-kV single-circuit structures would be added (in place of the double-circuit 220-kV towers) to accommodate the new Mesa-Vincent 500-kV T/L.

The three 500-kV T/Ls (Mira Loma-Vincent, Rio Hondo-Vincent No. 2, and Mesa-Vincent No. 1) under this alternative would be operated at 500-kV, which would allow for additional capacity in the system to respond to the loss the Rio Hondo-Vincent No.1 220-kV T/L (in Segment 6) and the Mesa-Vincent No.1 220-kV T/L (in Segment 11). As such, substation upgrades to accommodate 500-kV buses and transformers would be required at both the Rio Hondo Substation and the Mesa Substation.

South of Rio Hondo Substation (Segment 7) and east of Mesa Substation (Segment 8), upgrades would be the same as the proposed Project/Action.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would require upgrades at both the Rio Hondo Substation and the Mesa Substation in order to allow for operation of the new T/Ls at 500 kV. The estimated time frame for completion of the upgrades at these substations, which would occur within the existing substation boundaries, is a minimum of 4 to 5 years. As such, the integration of new wind generation in the TWRA would be delayed well beyond the California Renewables Portfolio Standard deadline of 2010. If this alternative were to consider initial operation of the new Rio Hondo-Vincent No. 2 and Mesa-Vincent No. 1 500-kV T/Ls at 220 kV, which would eliminate the need to upgrade the Rio Hondo and Mesa Substations, the alternative would not provide the intended capacity (up to 4,500 MW), due to the loss of the 220-kV T/Ls in Segments 6 and 11. In addition, the overall reduction of 220-kV lines within the system would decrease capacity and potentially overload the system. As a result, this would interfere with the objective of reliably transmitting 4,500 MW from the TWRA and would not fully address the South of Lugo transmission constraints. This alternative, however, would meet the projected load growth in the Antelope Valley, as upgrades north of Vincent Substation would be identical to the proposed Project/Action.

Feasibility

Without further evaluation, it is difficult to determine the feasibility issues associated with this alternative, both from a construction standpoint as well as power flow/reliability standpoint (see "Reliability" discussion below). Specifically, south of Gould Substation along Segment 11, the reconfiguration of the T/Ls to accommodate new 500-kV single-circuit structures, considering the limited space available within the current ROW and that expansion of the ROW is not possible without condemnation (houses are built right up to the edge of the ROW), would need to be assessed.

Reliability

For the case where the two 500-kV T/Ls within Segment 6 (Mira Loma-Vincent and Rio Hondo-Vincent No. 2) experience a common outage condition, according to SCE the transmission system would likely experience problems (failures) elsewhere, as there would no longer be 220-kV T/Ls through the ANF to use to redirect the power flow. A complete power flow analysis would need to be conducted by SCE to verify the reliability issues associated with this alternative.

Environmental Advantages

The reduction of 220-kV T/Ls within Segments 6 and 11 would reduce the visual "clutter" within the ANF as well as provide the potential to reduce the width of these T/L corridors in the ANF, thereby decreasing potential biology and land use impacts.

Environmental Disadvantages

This alternative would result in greater construction impacts (air quality, noise, and traffic) as a result of additional activities to remove the Rio Hondo-Vincent No. 1 220-kV T/L in Segment 6 and the Mesa-Vincent No. 1 220-kV T/L in Segment 11. South of Gould Substation along Segment 11, upgrading the system to accommodate new single-circuit 500-kV structures would result in substantially greater impacts (air quality, noise, traffic, and visual) than the stringing activities that would occur under the proposed Project/Action. Upgrades at the existing Rio Hondo and Mesa Substations to accommodate 500-kV buses and transformers would also result in greater construction impacts than the proposed Project/Action, which would require limited work at these substations.

Alternative Conclusion

ELIMINATED. While this alternative would have the potential to reduce long-term visual impacts within Segments 6 and 11 in the ANF, it would not provide for the integration of new wind generation in the TWRA by 2010, and as such would not comply with the California Renewables Portfolio Standard. In addition, a reduction of 220-kV lines through the ANF would decrease capacity and potentially overload the system. As a result, this would interfere with the objective of reliably transmitting 4,500 MW from the TWRA and would not address the South of Lugo transmission constraints. As such, this alternative does not substantially meet the objectives/purpose and need of the TRTP. In addition, this alternative would result in greater construction impacts in the ANF (Segments 6 and 11), along Segment 11 (south of Gould Substation), as well as at the Rio Hondo and Mesa Substations. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

Reduced Number of 220-kV T/Ls in the ANF Alternative	Meets Project Purpose?	Feasible?	Meets Reliability Criteria?
	Partially[1]	Yes[2]	No[3]

Explanations:

[1] Upgrades at Rio Hondo Substation and Mesa Substation would take a minimum of 4 to 5 years, which would prevent compliance with the Renewables Portfolio Standard deadline of 2010. In addition, a reduction of 220-kV lines through the ANF would decrease capacity and potentially overload the system, which would interfere with the objective of reliably transmitting 4,500 MW from the TWRA and would not fully address the South of Lugo transmission constraints. This alternative, however, would meet the projected load growth in the Antelope Valley, as upgrades north of Vincent Substation would be identical to the proposed Project/Action.

[2] This alternative appears to be technically feasible; however additional analysis is needed to ensure the feasibility of construction, specifically south of Gould Substation along Segment 11.

[3] Elimination of 220-kV lines in Segments 6 and 11 would reduce capacity and potentially overload the system. A power flow analysis would need to be conducted to further understand the effect of this alternative on overall system power flow to ensure compliance with CAISO/NERC/WECC requirements.

Environmental Advantages	Environmental Disadvantages
• Reduces the amount of visual "clutter" within the ANF along both Segments 6 and 11 by reducing the number of 220-kV T/Ls by one in each corridor • Provides the potential to reduce the width of the T/L corridors in the ANF, thereby decreasing potential biology and land use impacts	• Greater construction impacts (air quality, noise, and traffic) as a result of additional activities to remove 220-kV T/Ls in Segment 6 and 11 that would otherwise be untouched under the proposed Project/Action • Upgrading Segment 11 south of Gould Substation to accommodate new single-circuit 500-kV structures would result in substantially greater impacts (air quality, noise, traffic, and visual) than the stringing activities that would occur under the proposed Project/Action • Upgrades at Rio Hondo and Mesa Substations would result in greater construction impacts than the proposed Project/Action, which would require limited upgrades
Conclusion: Eliminate from Further Analysis	

3.2.8 Minimize 500-kV Upgrades Alternative

Alternative Description

As part to SCE's proposed Project/Action, Segments 6, 7 and 11 would initially be energized to 220 kV for an undetermined length of time; however, the T/Ls would be designed and built to 500-kV standards in order to prepare for the future need of transferring up to 4,500 MW from the TWRA. This alternative would construct these portions of the TRTP to 220-kV standards, thereby minimizing the number of 500-kV upgrades required, as shown in Figure 3.2-6.

Under this alternative, the following changes to the proposed Project/Action would occur:

- Segment 6: The proposed new Rio Hondo-Vincent No. 2 500-kV T/L would not be built and instead the existing Rio Hondo-Vincent No. 2 220-kV T/L, north of the crossover span, and the existing Antelope-Mesa 220-kV T/L, south of the crossover span, would be removed and rebuilt with new higher capacity conductor. Use of the existing 220-kV towers would not be possible as they are not sufficiently strong enough to accommodate the new conductor. Upgrades to create the new Mira Loma-Vincent 500-kV T/L and the elimination of the crossover span would be the same as the proposed Project/Action.
- Segment 7: From the southern boundary of the ANF to Rio Hondo Substation, the Rio Hondo-Vincent No. 2 T/L would be re-conductored on the existing 220-kV double-circuit towers. South of Rio Hondo Substation, upgrades would be the same as the proposed Project/Action.
- Segment 11: The existing 220-kV structures of the Vincent-Pardee No. 1 220-kV T/L (first approximately 4 miles south of Vincent Substation) and the Eagle Rock-Pardee 220-kV T/L (last approximately 15 miles through the ANF) would be removed and rebuilt as a new 220-kV T/L with new higher capacity conductor, rather than as a new 500-kV T/L. Use of the existing 220-kV towers would not be possible as they are not sufficiently strong enough to accommodate the new conductor.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

While this alternative would allow for the reliable interconnection and integration of new wind generation in the TWRA, not all planned or expected projects (up to 4,500 MW) would be accommodated within the transmission system, as final operation at 500 kV, which would allow for the full capacity, would not be achievable without additional, extensive upgrades involving the tear down and removal of 220-kV structures or the placement of new 500-kV structures elsewhere. As a result of the reduce capacity within the system associated with this alternative, it would not fully meet projected load growth in the Antelope Valley, or address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO/NERC/WECC requirements; however, reliability would become as issue as power generation within the TWRA increases to meet the expected 4,500 MW.

Environmental Advantages

Construction of 220-kV structures rather than 500-kV structures would result in a slight reduction in visual impacts, as 220-kV structures are shorter and less bulky than 500-kV structures. Additionally, as a result of using lower voltage towers, for those areas where the ROW may need to be widened or new ROW obtained, the width would be reduced thereby reducing potential land use impacts. Smaller pads would also be constructed for the 220-kV structures compared to 500-kV tower pads, resulting in slightly reduced construction air quality and biology impacts.

Within Segment 6 and the portion of Segment 11 through the ANF, removing and rebuilding of the existing 220-kV structures would result in basically the same environmental impacts as rebuilding with 500-kV structures, except for the reduction in long-term visual impacts. Within Segment 7, between the southern boundary of the ANF and Rio Hondo Substation, construction activities would include re-conductoring of the Rio Hondo-Vincent No. 2 220-kV T/L and replacing the existing Antelope-Mesa 220-kV T/L (on single-circuit 220-kV LSTs) with 500-kV single-circuit structures, unlike the proposed Project/Action which would require double-circuit 500-kV structures. As such, long-term visual impacts along this portion of Segment 7 would be reduced in comparison to the proposed Project/Action.

Environmental Disadvantages

Installation of infrastructure at 220 kV would not accommodate the full generation potential of 4,500 MW in the TWRA. As such, new infrastructure would be required in the future, which may mean re-building the T/Ls to 500 kV as load increases; however the CAISO may not allow the 220-kV T/Ls to be taken out of service at a later date due to system loading, which would require the future upgrades to be built in parallel, requiring additional ROW width, or built elsewhere, requiring entirely new ROW. These additional upgrades to the system would result in additional environmental impacts, which would exceed those associated with the proposed Project/Action. Furthermore, upgrading the system with new 220-kV conductor would not necessarily reduce the environmental impacts associated with construction, as the structures in Segments 6 and 11, would still need to be removed and replaced with new structures due to the design limitations (mechanical strength, conductor clearances, etc.) of the existing structures.

Alternative Conclusion

ELIMINATED. While this alternative would provide capacity to allow for the transmission of wind power from the TWRA, it would not accommodate the full 4,500 MW of wind generation currently being planned or expected in the future. Additional upgrades to the system, directly resulting from installation of a system that may meet initial needs for additional capacity, but does not adequately provide for future transmission needs, would eliminate any positive reduction in environmental impacts that this alternative may offer compared to the proposed Project/Action. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Minimize 500-kV Upgrades Alternative</td><td>Meets Project Purpose?
Partially[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of new wind generation resources in the TWRA; however, it would not allow for the integration of the full 4,500 MW as the majority of the system would not be designed to allow for future increases in voltage operation from 220 kV to 500 kV. Furthermore, this alternative would not fully meet projected load growth in the Antelope Valley, or address South of Lugo transmission constraints.
[2] This alternative would be feasible.
[3] Meets CAISO/NERC/WECC requirements; however, reliability would become as issue as power generation within the TWRA increases to meet the expected 4,500 MW.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Constructs a new 220-kV line rather than a 500-kV line in Segment 5 thereby reducing visual impacts that would result from installation of larger, taller 500-kV structures
• Replaces 220-kV structures in Segments 6 and 11 with new structures and conductor, thereby reducing visual impacts that would result from installation of larger, taller 500-kV structures</td><td colspan="2">Environmental Disadvantages
• 220-kV lines would need to be rebuilt to 500-kV standards at some point in the future
• CAISO may not allow the 220-kV T/Ls to be taken out of service at a later date, which would require the future upgrades to be built in parallel or elsewhere, requiring new ROW
• Existing 220-kV structures in Segments 6 and 11 through the ANF would still need to be replaced to allow for the use of new conductor resulting in similar environmental impacts as identified for the proposed Project/Action</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.2.9 Segments 6 and 11 Double-Circuit Structures Alternative

Alternative Description

This alternative would remove from Segment 6 two existing 220-kV T/Ls north of the crossover span (S6 MP 5.0) and an existing 220-kV T/L and 500-kV T/L south of the crossover span, and replace them with a new double-circuit 500-kV T/L to accommodate the new Rio Hondo-Vincent No. 2 500-kV T/L and the new Mira Loma-Vincent 500-kV T/L, as shown in Figure 3.2-7. In addition, this alternative would remove from Segment 11 two existing 220-kV T/Ls between the Vincent Substation and La Cañada Flintridge (Gould Substation) and replace them with a new double-circuit 500-kV T/L to accommodate the new Mesa-Vincent No. 1 and No. 2 500-kV T/Ls (initially energized at 220 kV). Implementation of this alternative would result in one existing 220-kV T/L (on single-circuit structures) and two new 500-kV T/Ls (on double-circuit structures) within Segment 6, and two new 500-kV T/Ls (on double-circuit structures) within Segment 11.

Approximately 40 additional double-circuit structures would be required within Segment 6, and approximately 20 additional double-circuit structures would be required within Segment 11 at intermediate locations generally due to the severe topography and weather conditions within the ANF (SCE, 2008d – Q03). The route may also need to be moved outside of the existing ROW as the double-circuit towers would not be able to span the same valleys, which currently range from 2,000 to 3,900 feet, due to structure capacity limitations (SCE, 2008d – Q03). Furthermore, due to the heavy weight of the double-circuit towers (120,000 to 200,000 lbs) helicopter construction is not feasible (SCE, 2008d – Q03).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to interconnect and integrate up to 4,500 MW of new wind generation in the TWRA; however, due to the need to create a new non-standard design for the double-circuit towers (see "Feasibility" and "Reliability" discussions below), which would take approximately 30 to 40 months to complete (SCE, 2008c – DR#5-01), SCE would not have the upgrades in Segments 6 and 11 completed in time to meet the California Renewables Portfolio Standard of 20 percent renewable energy by 2010. Once in place, this alternative would meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

Use of double-circuit structures at elevations above 3,000 feet, where ice loading and wind loading is a concern, would require the use of a non-standard SCE structure design, as described in the "Reliability" discussion below. Development of a new structure design and full-scale testing to ensure reliability is expected to take up to 27 months (SCE, 2008a). The breakdown of design and testing activities that would need to take place include: 1) Design including, but not limited to development of a) loading criteria for weather and ice conditions, b) crossarm configurations, c) tower testing requirements (5 to 7 moths); 2) Tower Test Preparation including, but not limited to solicitation and awarding of bids for tower supply and testing, fabricator design, SCE review and approval of design (9 to 11 months); and 3) Full Scale Tower Testing assuming three different tower types to be tested, plus one tower failure requiring re-test (6 to 9 months) (SCE, 2008a). The overall time frame from start of development to start of delivery would be 30 to 40 months (SCE, 2008c – DR#5-01). Completion of the design and testing activities described above does not guarantee a feasible design. If at any point the tower testing results in the designs failing, SCE would have to re-design the structures or modify the initial designs and once again complete the tower testing activities. This process would repeat until a reliable structure design meeting all loading criteria endures full scale testing without failure.

Reliability

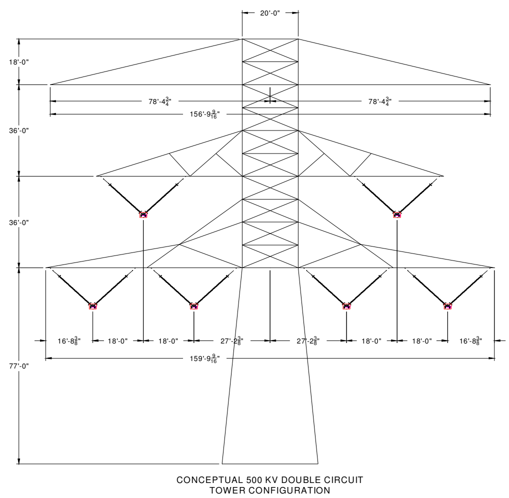
CPUC General Order No. 95 (GO95) prescribes transmission line design requirements for heavy loading conditions (i.e., where the elevation exceeds 3,000 feet where ice is likely to form), such as the ANF (Segments 6 and 11). In particular, GO95 requires that such design assume a minimum of one-half inch radial ice load on all conductors, weighing 57 pounds per cubic foot, in combination with a horizontal wind load assumption of a minimum 6 pounds per square foot. In addition to the ice loading design assumptions, a non-ice loading analysis is required that assumes a horizontal wind load of a minimum 8 pounds per square foot wind (SCE, 2008c – DR#5-01). GO95 also allows for more stringent requirements to be utilized if necessary.

Utilities based outside of California utilize the National Electric Safety Code (NESC) as the basis of their transmission design criteria, rather than the GO95 criteria used in California; therefore, the T/L and tower design practices of other utilities are not directly applicable to the site conditions and electrical requirements for the TRTP (SCE, 2008c – DR#5-01). In addition, each utility has company-specific operating and maintenance requirements, transmission design criteria, weather conditions, and reliability criteria that influence details of specific tower designs. Utilities across the United States also utilize a variety of conductor types and configurations. These items have a great influence on the tower designs with respect to conductor clearances and tower loading capacity. Finally, some NESC criteria may be less stringent than that required by GO95 and vice-versa. In either case, NESC and GO95 are minimum design criteria. In addition to these minimum requirements, SCE has adopted criteria that are specifically applicable to the SCE system and SCE's operating practices.

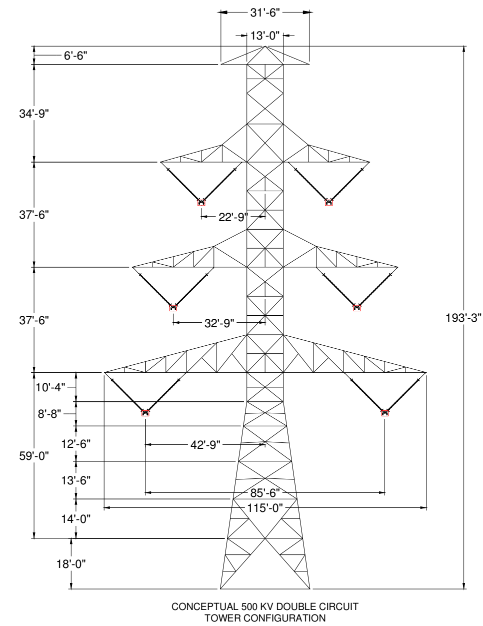
SCE's existing double-circuit 500-kV tower design, which places the three conductor phases of each circuit into a vertical configuration, would negatively affect reliability when used at high elevations or in ice prone areas, such as the ANF (Segments 6 and 11), as the vertical conductor configuration places the phases in a position whereby vertical displacement of one phase may bring it into unacceptably close proximity to the phases above or below it (SCE, 2008c – DR#5-01). This displacement can be caused by two processes: (1) more ice may form on a phase relative to the phases below it, causing it to sag down into a lower phase; or (2) ice may accumulate on all phases equally, where as the ice sheds off each phase independently, the phases are prone to "jumping" vertically and could lead to a flashover caused by an electrical contact with the phase above it (SCE, 2008c – DR#5-01). While both processes are possible, the second is more likely to occur and lead to circuit outages which would affect reliability (SCE, 2008c – DR#5-01). To address this concern, a new double-circuit structure family (likely consisting of three different tower types) would need to be developed for this alternative for use at high elevations (SCE, 2008c – DR#5-01). The design would need to provide for offsetting the vertical conductor phases. Two possible double-circuit tower configurations are provided below (Tower A and B – Hypothetical). The overall time frame for designing a new double-circuit family of structures for TRTP would be approximately 30 to 40 months, including 8 months for transmission design and weather studies, and 26 to 36 months to develop the tower concept, bid, design, test, and start delivering the towers (SCE, 2008c – DR#5-01).

As noted above, a weather study would be required to formulate the basis for the new double-circuit towers. SCE has not conducted a recent weather study for the specific design of Segments 6 and 11. This would normally occur prior to final design. The amount of ice loading would be identified in the weather study. This would determine what ice loading above the code minimum of one-half inch radial ice should be considered in the design. In addition, the potential ice densities would be identified. The weather studies would take approximately 3 months to perform (SCE, 2008c – DR#5-01).

While specific/current weather data pertaining to the lines in Segments 6 and 11 has not been obtained, an initial review of potential ice formation associated with TRTP Segments 6 and 11 was conducted by Joseph Catalano, a senior consulting scientist (meteorologist) to SCE. Mr. Catalano estimated that under certain weather conditions, the amount of ice formation that can be expected in the forest areas of Segments 6 and 11 could reach one and one-half (1.5) inches of radial ice on the conductors and ground wires with an ice density of 56 pounds per cubic foot of ice (SCE, 2008c – DR#5-01). This estimated ice loading is substantially greater than the assumed GO95 minimum of one-half (0.5) inches of radial ice formation (SCE, 2008c – DR#5-01). As such, the design of the new double-circuit 500-kV towers would need to sustain ice loadings that far exceed the minimum requirements, further increasing the difficulty of creating a tower design that would be reliable under such conditions.



Tower A (Hypothetical)
This is an alternate double-circuit tower that spreads the circuit in a manner that eliminates the vertical aligned conductor concern in ice areas. Additional ROW width would be required to accommodate the wide spread of the bottom phase, as well as avoid interference with adjacent transmission lines.
Source: SCE, 2008c – DR#5-01



Tower B (Hypothetical)
This is an alternate double-circuit tower that spreads the circuits in a manner that eliminates the vertical aligned conductor concern in ice areas. Following acceptable design, fabrication, and testing, this type of structure could be utilized in ice areas.
Source: SCE, 2008c – DR#5-01

Placement of two 500-kV T/Ls on a double-circuit structure would result in a less reliable design than the proposed Project/Action, where the 500-kV T/Ls would be placed on separate single-circuit structures, as the failure of a structure would end up taking out two T/Ls rather than only one. Such a failure is potentially greater within the ANF due to the extreme weather conditions that occur at elevations above 3,000 feet, as well as conditions such as fires followed by rains which increases the potential for landslides. A statistical determination was completed by SCE which estimated that an outage would involve both circuits on a double-circuit structure approximately 80 percent of the time, whereas for two or more single-circuit lines located in the same ROW the chance that another circuit would also be involved in an outage was estimated to be approximately 15 to 30 percent of the time (SCE, 2008d – Q02).

Environmental Advantages

Implementation of this alternative in Segment 6 would result in one existing 220-kV T/L (on single-circuit structures) and two 500-kV T/Ls (on double-circuit structures), thereby reducing the overall number of parallel structures from three to two. In Segment 11, this alternative would result in two 500-kV T/Ls (on double-circuit structures), thereby reducing the overall number of parallel structures from two to one. By reducing the number of structures within the ANF, the visual "clutter" would be reduced as would the long-term footprint of the transmission infrastructure within the ANF. In addition, the amount of permanent land disturbance and associated biological impacts would be reduced compared to the proposed Project/Action.

Environmental Disadvantages

Installation of double-circuit 500-kV structures within the ANF along Segments 6 and 11 would result in the placement of bulkier, taller (depending on terrain) structures, which would result in potentially greater visual impacts. For example, within Segment 6, having two 500-kV single-circuit structures placed in parallel, per the proposed Project/Action design, would provide for some symmetry in the design along the Segment 6 corridor, whereas this alternative would place bulkier, taller double-circuit 500-kV structures next to an existing single-circuit 220-kV T/L. Furthermore, taller structures would increase the potential for skylined conditions, which presents the greatest visual contrast to viewers, as well as results in greater potential for fire safety issues, as helicopters used during wildland fire fighting would need to avoid these structures.

Greater visual, biological, and cultural impacts may result due to the need for approximately 60 additional double-circuit structures within Segments 6 and 11 at intermediate locations and the potential need to place towers outside of the existing ROW, as the double-circuit towers would not be able to span the valleys. In addition, fire safety issues may increase as it may be necessary to locate the new towers along ridge tops to circumvent the large valleys that occur in the project area along Segments 6 and 11, which currently result in long spans ranging from 2,000 to 3,900 feet (SCE, 2008d – Q03).

The new double-circuit transmission towers would need to be designed with a strength capacity that allows the towers to be placed adjacent to or in close proximity to existing towers in the ROW (SCE, 2008c – DR#5-01). If such a tower cannot be designed (i.e., the new towers are not strong enough to have equivalent spans), potential line design problems would result. First, the resultant shorter conductor span lengths would require the placement of additional new towers in locations somewhere near the mid-span of the adjacent lines. This could cause clearance problems with the adjacent existing lines during high wind conditions that may be only be mitigated by adding additional new towers to the existing adjacent lines, which would increase the potential for environmental impacts including air quality, biology, and cultural resources. Second, if the new tower locations are not near existing towers, additional access roads may need to be built to provide access to the new towers, again increasing the potential for impacts within the ANF.

Furthermore, while the proposed Project/Action allows for the erection of T/L structures utilizing helicopter construction erection of double-circuit towers by helicopter is not feasible (SCE, 2008d – Q03). The weight of double-circuit 500-kV suspension towers could range from 120,000 to 200,000 (SCE, 2008d – Q03). The estimated weight that would be possible to be lifted by a helicopter is limited to approximately 8,000 to 12,000 pounds in high elevation areas (SCE, 2008c – DR#5-01). Consequently, since helicopter construction is not viable, this alternative would result in greater biology, visual, and cultural impacts, due to the need for additional access roads, for those structures that would otherwise be constructed by helicopter under the proposed Project/Action. Removing the existing single-circuit 500-kV structures in Segment 6 from the crossover span to the southern boundary of the ANF, as well as an additional single-circuit 220-kV T/L in Segment 11, which would otherwise be untouched under the proposed Project/Action, would also result in increased air quality, biology, noise, and traffic impacts during construction.

Alternative Conclusion

ELIMINATED. While this alternative would generally meet the objectives/purpose and need of the TRTP, with the exception of meeting the deadline imposed by the California Renewables Portfolio Standard (2010), and would have the potential to reduce the visual "clutter" and long-term footprint of the transmission infrastructure within the ANF along Segments 6 and 11, a new double-circuit structure family would need to be developed that is designed for use at high elevations (above 3,000 feet) and in ice prone areas. These new towers would be bulkier and taller (depending on terrain) than the proposed single-circuit 500-kV towers, and would result in a greater potential for skylined conditions; would require additional towers, as the double-circuit towers would not be able to span the existing valleys along the current alignment, and in fact may require the placement of towers outside of the existing ROW to circumvent the large valleys that occur along Segments 6 and 11; fire safety issues may increase as it may be necessary to locate the new towers along ridge tops to circumvent the large valleys; may result in the need for even more additional towers along the existing adjacent lines for clearance purposes; are not feasible to construct by helicopter, resulting in the need for additional access roads which may result in greater biology, visual, and cultural impacts; and would result in increased air quality, biology, noise and traffic impacts associated with the removal of the existing 220-kV structures that would otherwise be untouched under the proposed Project/Action. Furthermore, placement of two 500-kV T/Ls on a double-circuit structure would result in a less reliable design than the proposed Project/Action, where the 500-kV T/Ls would be placed on separate single-circuit structures, as the failure of a structure would end up taking out two T/Ls rather than only one. Such a failure is potentially greater within the ANF due to the extreme weather conditions that occur at elevations above 3,000 feet, as well as conditions such as fires followed by rains which increases the potential for landslides. Due to both the issues surrounding the reliability of this alternative and the potential for substantially greater environmental impacts (both long-term and short-term), this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Segments 6 and 11 Double-Circuit Structures Alternative</td><td>Meets Project Purpose?
Partially[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints; however, due to the need for non-standard structures at elevations above 3,000 feet within Segments 6 and 11, the Project schedule would not be met and as a result the California Renewables Portfolio Standard of 20 percent renewable energy by 2010 would not be met.
[2] This alternative appears to be feasible. A non-standard design for double-circuit 500-kV structures would need to be developed and tested.
[3] Meets CAISO/NERC/WECC requirements. Standard SCE double-circuit structures are impacted by ice loading and wind loading at high elevations (>3,000 feet), which would occur within Segments 6 and 11. The reliability of a non-standard design for double-circuit 500-kV structures is unknown. The potential to lose two T/Ls resulting from the failure of a single tower in an area prone to extreme weather conditions, as well as conditions such as fires followed by rains which increases the potential for landslides, would substantially degrade the preconceived reliability of the system.</td></tr>
<tr><td colspan="2">Environmental Advantages
• ROW width through the ANF along Segments 6 and 11 would potentially be reduced, thereby allowing for revegetation of those portions of the ROW which would no longer be in use
• Visual “clutter” and long-term footprint of transmission infrastructure within the ANF would be reduced</td><td colspan="2">Environmental Disadvantages
• Larger, taller (over 200-feet) double-circuit 500-kV structures would result in potentially greater visual impacts in Segment 6 than having two single-circuit 500-kV structures placed in parallel due to the lack of symmetry and increased potential for skylined conditions
• Requires approximately 60 additional towers due to severe topography and weather conditions in the ANF
• May require additional towers along existing adjacent lines for clearance
• May require re-routing outside of the existing ROW to circumvent large valleys which currently have long spans resulting in potentially greater visual, biological, and cultural impacts
• May result in the placement of towers at ridge top locations resulting in greater fire safety impacts
• Not feasible to construct double-circuit towers by helicopter thereby requiring additional access roads and the associated environmental</td></tr>
</table>

	impacts • Additional environmental impacts (AQ, noise, biological resources) associated with removing another 500-kV T/L from Segment 6 and an additional 220-kV T/L in Segment 11, which would otherwise be unaffected by the proposed Project/Action
Conclusion: Eliminated from Further Analysis	

3.2.10 Segments 7/8A Single-Circuit 500-kV Structures Alternative

Alternative Description

This alternative was considered by SCE in its PEA (Technology Alternative 5). The proposed Project/Action would replace the existing 220-kV structures with 500-kV double-circuit structures through Segments 7 and 8A, which would allow the Mira Loma-Vincent 500-kV T/L to be configured as a split-phase for EMF reduction purposes. The double-circuit configuration would also allow for the potential to add another 500-kV T/L to these structures at some point in the future, thereby avoiding the future need to tear down and rebuild these structures (assuming the ISO would allow them to be taken out of service) or build new structures placed in parallel or in new ROW. This alternative would instead replace the 220-kV structures with single-circuit 500-kV structures between Rio Hondo Substation and Chino Substation in Segments 7 and 8A.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. However, as designed, it would not provide for the same amount of transmission capacity as the proposed Project and therefore is not comparable. This alternative would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

The existing ROW within Segments 7 and 8A varies between 200 and 250 feet, and is currently occupied by multiple 66-kV and 220-kV T/Ls. The minimum ROW width required for single-circuit 500-kV LST structures is typically 200 feet, while double-circuit 500-kV LST structures only require a width of 150 to 180 feet (SCE, 2008b – DR#4: Q4-49). This is a result of the fact that the electrical conductors in SCE's single-circuit 500-kV LSTs are configured horizontally, whereas on the double-circuit 500-kV LSTs the conductors are stacked vertically. Consequently, the installation of single-circuit instead of double-circuit 500-kV LST structures would require a greater ROW width, which in combination with the existing T/Ls could not be accommodated within the existing ROW (SCE, 2008b – DR#4: Q4-49). As such, use of single-circuit 500-kV structures would require expansion of the existing ROW; however this is not a viable option along most of Segment 7 as the existing ROW is bounded by the San Gabriel Rivers to the west and the 605 Freeway to the east (SCE, 2008b – DR#4: Q4-49). Therefore, this alternative would not be feasible.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

Use of 500-kV single-circuit rather than double-circuit structures would substantially reduce the structure heights and associated visual impacts. For example, in Segment 7 the 500-kV double-circuit LSTs would be 147 to 262 feet tall, whereas the 500-kV single-circuit LSTs would be 113 to 175 feet tall (difference of 34 to 87 feet). Similarly, the 500-kV double-circuit TSPs would be 195 to 200 feet tall, whereas the 500-kV single-circuit TSPs would be 120 to 170 feet tall (difference of 30 to 75 feet). In Segment 8, the 500-kV double-circuit LSTs would be 147 to 255 feet tall, whereas the 500-kV single-circuit LSTs would be 128 to 149 feet tall (difference of 19 to 106 feet). Similarly, the 500-kV double-circuit TSPs would be 150-195 feet tall, whereas the 500-kV single-circuit TSPs would be 120 to 170 feet tall (difference of 25 to 30 feet).

Environmental Disadvantages

This alternative would not allow for a split-phase configuration of the new T/L between Rio Hondo Substation and Chino Substation for EMF reduction, or provide space for the future addition of a second 500-kV T/L on these structures if and when one is determined to be required (e.g., when generation in the TWRA exceeds 4,500 MW). At that time, the 500-kV single-circuit structures may need to be removed and replaced with 500-kV double-circuit structures (assuming the ISO will allow these structures to be taken out of service), or new structures placed in parallel or in new ROW, which would result in increased air quality, biology, noise, traffic, and visual impacts.

Alternative Conclusion

ELIMINATED. While this alternative would meet the objectives/purpose and need of the TRTP, the existing ROW would not be able to accommodate the new single-circuit 500-kV LST structures and could not be expanded due to existing infrastructure (San Gabriel River and the 605 Freeway) which would render this alternative infeasible. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Segments 7/8A Single-Circuit 500-kV Structures Alternative</td><td>Meets Project Purpose?
Yes[1]</td><td>Feasible?
Nos[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA; however, the overall capacity provided would not be comparable to the proposed Project. It would meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.
[2] This alternative would require expansion of the ROW, which is not viable within Segment 7 due to existing infrastructure. Therefore, this alternative would not be feasible.
[3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Placement of single-circuit 500-kV structures within Segment 7, south of Rio Hondo Substation, and Segment 8A, to Chino Substation would reduce visual impacts associated with the proposed double-circuit 500-kV structures.</td><td colspan="2">Environmental Disadvantages
• Would not facilitate the possibility of adding a second 500-kV T/L if and when one is determined to be required (e.g., when generation in the TWRA exceeds 4,500 MW), which would result in tearing down and rebuilding double-circuit structures sometime in the future and the associated environmental impacts (air quality, biology, noise, traffic, visual)
• Would not allow for a split-phased configuration</td></tr>
<tr><td colspan="4">Conclusion: Eliminated from Further Analysis</td></tr>
</table>

3.2.11 Partial Underground Alternative

For this alternative, a portion of the proposed Project would be installed underground. Below is a discussion of the various underground technologies available. The most detailed information is provided the technologies and construction methods that are best suited for the proposed TRTP T/L segments. A description of underground construction methods for both cut/cover trenching and boring techniques is also provided. Locations where underground construction has been considered are discussed and assessed per the alternatives screening methodology described in Section 2.2.

Underground Transmission Technologies – Feasibility/Reliability

Similar to overhead transmission lines, underground transmission can utilize either High Voltage Alternating Current (HVAC) or High Voltage Direct Current (HVDC) technology. The primary differences in the construction of these two technologies are that HVDC would consist of two DC conductor positions, referred to as "Poles," instead of three AC conductor positions, referred to as "Phases", and as such an HVDC underground transmission line would utilize two-thirds the number of cables necessary for an HVAC system. However, HVDC would require AC to DC converter stations at each end of an underground transmission segment for use on the Project (TRTP).

Technological developments within the last decade have made HVDC transmission more economically feasible and advantageous. Conventional HVDC utilizes Current-Source Converters (CSC) to rectify or invert the power from AC to DC and back to AC. New technology uses what is known as Voltage-Source Converters (VSC). Typically using the VSC technology results in a much reduced converter station size when compared to conventional CSC systems. This generation of technology is referred to as "HVDC Light" or "HVDC Plus."

To date this HVDC "Light or Plus" technology has seen limited application for power transfer levels up to about 1,000 MW and 150 kV DC. Therefore, for the power transfer levels and voltage required for the TRTP, the Project would need to utilize conventional CSC converters. The conventional CSC stations required at each end of the HVDC line would house the HVDC equipment in large buildings with open air AC line terminal equipment. The converter stations are estimated to encompass an area approximately 2,000 feet by 1,200 feet with structures and buildings 75 to 90 feet tall. A typical HVDC line and conventional CSC stations are depicted in Figures 3.2-8 through 3.2-10. Due to the greater long-term impacts associated with these large converter stations (i.e., visually more obtrusive and greater permanent land disturbance), which far exceed the area needed for the transition stations required with use of underground HVAC technology (130 to 150 feet high and approximately 75 feet by 150 feet for a single-circuit 500-kV T/L and 75 feet by 250 feet for a double-circuit 500-kV T/L), HVAC would be the preferred technology for TRTP. Applicable HVAC cable technologies are discussed below.

The cable technologies currently available for 500-kV underground T/Ls (HVAC) include the following: high-pressure fluid-filled cables (HPFF); self-contained fluid-filled cables (SCFF); solid dielectric (XLPE) cables; and gas-insulated lines (GIL). The application of the SCFF cable type within the United States has largely been limited to the 115/138-kV range, with only a few miles at 220 kV installed commercially. As such, SCFF has been eliminated as a potential technology for this alternative. HPFF cable systems range from 69 to 345 kV and have been in commercial operation for over 35 years. HPFF cable systems with rated system voltages up to and including 765 kV are commercially available and have passed long-term qualification tests; however, due to its potential to release of dielectric insulating fluid into the environment it has also been eliminated as a potential technology for this alternative. The remaining technologies under consideration include solid dielectric (XLPE) transmission cables and gas-insulated lines (GIL), which are discussed further below.

XLPE. Underground transmission XLPE cable has been available for system voltages up to 138 kV since the early 1970s; however, there was a lack of widespread acceptance in the United States because of reliability problems associated with the first generation of cable and accessories for some of the initial installations. Today, XLPE systems have begun to have installations with long enough service life to increase utility confidence in their reliability. Recent years have seen substantial improvement in XLPE systems and acceptance and adoption for higher transmission voltages. Currently, the number of 220-kV solid dielectric cable installations in the United States is increasing with approximately 50 circuit miles in service.

Utility acceptance in the United States for XLPE has grown relatively rapidly (over the about the last 5 years) for use at 220 kV and 345 kV. For example, a California utility proposed a project using over 12 miles of 220-kV XLPE underground transmission in September 2002 and a New England utility is presently constructing a 345-kV line which includes 2.1 miles of XLPE underground transmission cable with a second phase of the project proposed with a 5.5-mile XLPE alternative segment. Internationally, a number of XLPE systems up to 420 kV have been installed including a 13.75-mile and 6.25-mile direct buried loop in Copenhagen, Denmark, which was completed in 1997. The first long-distance 500-kV XLPE lines were installed in Tokyo, Japan, in 2000. This XLPE system is two circuits (with a third planned) and was installed in a cable tunnel and in ducts beneath bridges for 25 miles. As only one 500-kV XLPE system has been installed in the world, and was specially installed in a cable tunnel (and ducts), XLPE technology has scant operating history that can serve as a basis for demonstrating reliability at this voltage. However, XLPE cable has been successfully installed and operated for long lengths at lower voltages and has been shown to be technically feasible for a 500-kV installation since the fundamental technology is the same. Use of XLPE cable would require superior quality control during manufacturing, as a key reliability factor for the cables is the purity of the XLPE insulating material. In addition, during installation of the XLPE cable, special skills and proprietary equipment associated with the cable supplier may be required for cable splicing (joining of two segments in a splicing vault).

GIL. GIL underground transmission system technology has primarily been used in applications where high power transfer is required over short distances, such as short dips in overhead lines, relatively short connections within substations, or for get-aways to overhead lines. Relatively short lengths (i.e., less than 1,000 feet) of the 100 percent SF6 compressed-gas underground transmission lines have been installed in the United States, Japan, and European countries for several decades. The system voltages for these installations have been up to 765 kV.

The initial use of GIL technology for a long length of transmission line was placed into service in 1975 and consists of approximately 2,300 feet of 420-kV line in a tunnel. In 1998, a 275-kV GIL system was installed in a tunnel with other utilities in Nagoya, Japan for two miles and is the longest GIL installation to date. The first commercial application of second generation GIL technology, using a lower SF6 gas percentage due to greenhouse gas concerns, was the construction of a "dip" in an existing 400-kV overhead transmission line in Geneva, Switzerland in 2000. A short single-phase segment of GIL was constructed as a direct-buried line as a test section to evaluate construction methods and issues related to expansion and contraction. There are a number of concerns related to the susceptibility of direct-buried lines to "dig-ins" by other construction in the area of the line and the difficulty of locating, excavating and repairing a direct-buried GIL. Another particularly challenging issue for assembly of a direct-buried GIL would be creating a dust-controlled environment to avoid particle pollution of the insulating gas. Because

GIL has not been installed for long lengths as a direct-buried line, utilities remain hesitant to accept the feasibility of this technology. As such, construction of GIL technology within tunnels would be the preferred methodology.

Other Considerations Associated with Underground Transmission Technologies

In addition to the reliability issues associated with the use of newer underground technologies, such as XLPE and GIL, where operating histories are limited, as discussed above, the following are other potential issues that may impact reliability and must be taken into consideration when designing an underground transmission line.

Seismic Considerations. Underground transmission lines are more at risk for damage from earthquakes and landslides than overhead lines. A seismic event or landslide could expose the underground line to potential fault rupture, local ground cracking, and groundshaking, which could damage the underground line and result in it not being able to transmit power. As such, serious reliability concerns would exist, which would challenge the feasibility of underground construction near an active fault zone and in areas with known landslides and unstable slopes. The occurrence of one of these events after construction could substantially increase the required operation and maintenance activities associated with the underground lines.

Slope Considerations. Placing underground cables (XLPE) in a duct bank with a slope for any significant distance is of concern as there is a risk of movement of the cable down slope due to either gravity or contraction and expansion effects. While there are no hard and fast specific guidelines on slope limitations, and free-laying cables have been placed on slopes that range from five to eight percent for relatively short distances (less than 500 feet), cable grappling or retention systems would need to be considered if the cable slope is in excess of five percent for distances greater than 500 feet. Significant cable slopes with cable retention systems are rarely used due to the potential for the attachments to introduce physical, electrical, and thermal stress points that can result in cable failures. There are no slope limitations for underground GIL since it can be fabricated to accommodate bends in the line. Furthermore, due to the rigid nature of the bus conductor and enclosure tube, GIL can be installed in vertical runs.

Construction Disturbance. At 500 kV, matching the current carrying capacity of overhead conductors with XLPE cables often requires multiple underground cables for each phase of the transmission line. This can mean that multiple underground ductbanks need to be constructed for a single 500-kV line. This would require an 85-foot-wide continuous construction zone for a single-circuit 500-kV system with overhead to underground transition stations at each end on a 2 to 3 acre graded and fenced site. GIL can achieve a much higher capacity through use of a solid bus conductor meaning that at 500 kV each phase requires a single 2.5 foot diameter enclosure. The GIL enclosures are placed in an underground tunnel that is approximately 12 feet wide and 15 feet tall or a 16-foot-diameter circular tunnel. Constructing a GIL tunnel using cut and cover techniques requires a 55-foot-wide continuous construction zone for a single-circuit 500-kV system with overhead to underground transition stations at each end on an approximate 0.25-acre graded and fenced site.

Cost. As a result of the considerable construction activities associated with undergrounding T/Ls, the associated costs are substantially greater than the cost of installing overhead transmission lines. For XLPE the cost is approximately 10 times more expensive, and for GIL the cost is approximately 10 to 15 times more expensive than overhead construction. In 2008 dollars, the direct cost to SCE to install double-circuit overhead transmission lines has been estimated at $7.3 million per mile, whereas the cost of undergrounding a double-circuit transmission line utilizing GIL technology is on the order of $77 to $102 million per mile (assumes GIL is $16 million per mile per circuit, life support systems are $5 to $10 million per mile, and tunnel work is approximately $40 to $60 million per mile) (SCE, 2008c – DR#5: Q5-12). The cost of undergrounding the transmission line could be a major consideration for decision makers and may result in a socioeconomic impact as these costs would be passed on to the rate payers.

Underground Transmission Technology Feasibility/Reliability Conclusion

Underground transmission using XLPE, while technically feasible, is not suitable in areas of moderate to steep terrain. Underground transmission using GIL is also feasible but, unlike XLPE, can be installed in areas of moderate to steep terrain. Both XLPE and GIL technologies would not be appropriate in areas where soil conditions would not be conducive to excavation activities, such as bedrock, in areas that are constrained (too narrow) to accommodate a construction spread, or where adequate access is not available to accommodate the large construction equipment needed for excavation, installation and transport of materials (helicopter construction is not possible). Considering the scant operating history for XLPE at 500 kV that can serve as a basis for demonstrating reliability at this voltage, the greater limitations associated with how and where XLPE cable systems can be constructed, and the lesser construction disturbance for GIL, the most appropriate underground technology identified for the Partial Underground Alternative would be GIL.

Components of Underground Gas-Insulated Systems

The main components of high-voltage underground gas-insulated systems are transition stations at each end of the underground line (see Figures 3.2-11 through 3.2-13), where the overhead line is connected to the underground bus; the underground rigid bus; the bus enclosure tube; insulating gas within the enclosure tubes and a tunnel to hold the enclosure tubes. The transition stations, which allow for the transfer of the T/Ls from overhead to underground and vice versa, would be approximately 130 to 150 feet high and require a footprint of approximately 75 feet by 150 feet (~0.25 acre) for a single-circuit 500-kV T/L and 75 feet by 250 feet (~0.5 acre) for a double-circuit 500-kV T/L.

The components of a typical high-voltage gas-insulated line (GIL) are discussed below and are shown in Figures 3.2-14 and 3.2-15.

Bus. The bus acts as the conductor and is a rigid metallic tube which is energized at the circuit voltage and which carries the load current. Typically, the bus conductors for GIL are aluminum. For a 500-kV line, the bus is estimated to be approximately 8-inches in diameter. Due to the high current carrying capacity of a GIL for a 500-kV underground T/L, a GIL system would use a single bus and enclosure tube for each phase.

Insulation. Insulation isolates the energized bus from the enclosure tube which is at electrical ground. For GIL, the insulation has two components. First, the bus conductor is supported within the enclosure tube on solid dielectric insulators. Second, the air is removed from the enclosure tube and replaced with a mixture of insulating gases. New generation GIL uses a mixture of insulating gases and for a 500-kV line this mixture would consist of 40 percent Nitrogen (N_2) and 60 percent Sulfur Hexafluoride (SF6).

Enclosure Pipe. The enclosure pipe consists of a 30-inch diameter grounded aluminum pipe that can be installed above ground on periodic supports or below grade in a tunnel. The enclosure pipe for a GIL is separated into gas compartments approximately 4,000 feet long and the insulating gas is pressurized to 50 to 60 pounds per square inch (psi).

Disconnecting Units. Disconnecting units are used to separate the GIL enclosure pipes into gas compartments and to connect high-voltage testing equipment for commissioning the GIL. Disconnecting units would be required approximately every 4,000 feet and would be installed in the line in the underground tunnel. If necessary, compensation units to accommodate for thermal expansion of the enclosure pipe would also be located as bellow sections of the GIL enclosure.

Underground Tunnel. The GIL would be housed in an underground tunnel which would be constructed of precast concrete sections. Either a rectangular or circular tunnel cross-section can be utilized. The tunnel would include a rack support system to support the GIL enclosures. Once completed, access to the underground tunnel would be from each end. Since the tunnel would be considered a confined work space the tunnel would need to include a positive ventilation system for worker safety and lighting. The ventilation system is typically mounted at the top of the tunnel and requires periodic air intake or exhaust shafts that are visible above grade.

GIL Operating Principles. A GIL has electrical behavior similar to an overhead line. Because of the large cross-section of the conductor, GILs have low electrical losses. GILs also have low capacitive load, thereby avoiding the cable charging and reactive VAR (volt-amperes reactive or reactive power) issues associated with underground cables, such as XLPE.

Construction Methods for Gas-Insulated Systems

A GIL can be installed in underground tunnels constructed by cut/cover trenching methods, with pipe jacking at intersections to avoid existing infrastructure, and/or tunnel boring methods. The GIL can be installed in concrete-covered trenches, tunnels, or directly buried. Each construction method is discussed further below.

Cut/Cover Tunnel Method

In order to build an underground 12-foot wide by 15-foot tall tunnel (rectangular configuration), as shown in Fig 3.2-12, using cut/cover methods, a continuous trench approximately 15-feet wide and 18-feet deep would need to be excavated. The tunnel would be constructed in the trench and backfill placed to cover the tunnel. The active work area for installation of a single- or double-circuit 500-kV T/L would be approximately 55-feet wide (Figure 3.2-16), including a 15-foot wide all-weather access road, a 15-foot wide equipment work area, 15-foot wide trench and an approximately 10-foot wide area where excavated spoils would be stored before use as backfill. Superfluous spoils would be hauled offsite to an appropriate waste facility. These dimensions have been approximated based on information provided by GIL manufacturers and extrapolated by transmission engineers to determine the installation requirements for application at 500 kV. To avoid disruption of existing infrastructure, pipe jacking methods would be completed at major street crossings, flood control channels, or to avoid existing utilities (see discussion on “Jacking Method” below). In areas of steep/hilly terrain where trenching and access issues would generally render installation by cut/cover methods impractical or infeasible, tunnel boring would be applicable (see discussion on “Tunnel Boring Method” below).

In general, the process for the cut/cover construction method consists of site preparation, excavation and shoring, concrete tunnel construction, trench backfilling, site restoration and GIL installation. Work would be phased in work areas, typically between 800 and 1,000 feet in length. Construction usually progresses along the alignment with the maximum length of open trench at one time being approximately 500 feet. The following is a description of the phases of construction for cut/cover construction.

Site Preparation. For work occurring within roadways, traffic control plans would be prepared to detour and delineate the traffic lanes around the work areas. The existing pavement along the alignment would be cut with a concrete saw and then removed using jackhammers, pavement breakers, and loaders. Other similar equipment may be used. The pavement would then be removed from the project site and recycled, processed and reused as a backfill material, or disposed of at an appropriate facility. For undeveloped lands, vegetation would be removed prior to excavation.

Trench Excavation and Shoring. A trench is excavated along the alignment using backhoes, excavators, or other types of excavation equipment. The excavated soil may be temporarily stockpiled in single rows adjacent to the trenches with excess material hauled off-site. As the trench is excavated, the trench walls are supported, or shored, typically with hydraulic jacks or trench boxes. Steel or wood sheeting between H-beams (e.g., beam and plate) may also be used for shoring. Other similar shoring methods may be utilized to support the excavation as the final tunnel box is constructed. If construction occurs in areas with high groundwater, the groundwater would be removed prior to and during the excavation of trenches, usually by pumping it from dewatering wells that have been drilled along the alignment to maintain the local water table below the base of the excavation. The extracted groundwater would first be treated for sediment and any contaminant removal, before being hauled from the site or discharged to the storm drain system under a National Pollutant Discharge Elimination System (NPDES) permit issued by the Regional Water Quality Control Board.

Concrete Tunnel Construction and Backfilling. Once the trench has been excavated and shored, tunnel construction begins. Pre-cast tunnel sections would be placed into the trench, joined together and backfill placed to totally cover the tunnel. The rate at which tunnel may be installed in a single day varies, but is estimated to be approximately 200 feet per day for the proposed Project. Not more than 500 feet of trench, or the amount of the trench that can be backfilled in one day, may be under construction at any given time.

GIL Installation. After the tunnel is complete the GIL is installed in segments. Each GIL segment would be moved into the tunnel with cranes or other loading equipment, mechanically pushed, carried, or hauled into the proper position within the tunnel, and placed on supports. The joints of adjoining segments are welded as placement occurs. The air is then pumped out of the enclosure sections and replaced with insulating gases.

Site Restoration. Any portion of the roadway damaged as a result of construction activities would be repaved and restored in accordance with all applicable standards. Once the pavement has been restored, traffic delineation (restriping) would also be restored. For natural areas restoration would include re-establishing vegetation.

Pipe Jacking Method

Pipe-jacking is utilized for relatively short distances to avoid the disruption of other facilities such as flood control channels and major roadways. Although installation using pipe jacking techniques avoids the continuous surface disruption common to open-trench construction, some surface disruption is unavoidable because jacking and receiving pits are required. The pit sizes for jacking would be 25 to 30 feet wide by 30 to 40 feet long and 30 or more feet deep depending upon the obstacle being crossed.

Pipe-jacking is an operation in which a steel casing/pipe is pushed into undisturbed soil by a horizontal, hydraulic jacking system while at the same time the soil ahead of the steel casing is being excavated and brought out through the steel casing. A vertical excavation or pit is made at each end of the section where pipe-jacking is to be used with the jacking equipment utilized for this operation placed in one of these pits (jacking pit). As excavation occurs, the pits are shored utilizing a beam and plate (steel I-beam and wood planks), or a braced shoring system The casing and excavation is advanced until the casing emerges in the receiving pit where the leading edge is then removed with the remainder of the casing remaining in place to hold open the excavated area. The GIL tunnel section is then placed inside the casing. See Figure 3.2-17.

The five primary phases for pipe-jacking are site preparation, excavation and shoring of the jacking and receiving pits, casing/tunnel installation, GIL installation, and site restoration.

Site Preparation. For the pit areas the site preparation would be the same as for the cut/cover method.

Casing/Tunnel Installation. Once the jacking and receiving pits are constructed and shored, a horizontal hydraulic jack is placed at the bottom of the jacking pit. The steel casing is lowered into the pit with a crane and placed on the jack. A simple cutting shield is placed in front of the pipe segment to cut through the soil more easily. As the jack pushes the steel casing and cutting shield into the soil, soil is removed from within the lead casing with an auger or boring machine, either by hand or on a conveyor. Once the segment has been pushed into the soil, a new segment is lowered, set in place, and welded to the casing that has been pushed. Installation of the steel casing is expected to progress at approximately 40 feet per day for auger-bored jacked casing. Once the casing has been installed, the concrete tunnel section is constructed within the space created by the steel casing.

GIL Installation. After the tunnel is complete the GIL installation would proceed and is the same as for a tunnel constructed by cut/cover methods.

Site Restoration. After completion of the tunnel installation along the jacking location, the shoring system is disassembled as the pits are backfilled, the soil compacted and the ground surface is restored.

Tunnel Boring Method

For tunneling applications involving a double-circuit 500-kV T/L, an approximately 16-foot diameter circular tunnel would be constructed to contain the GIL enclosure pipes, disconnecting units, etc., requiring a boring of approximately 18 to 20 feet in diameter. Installation of the GIL system utilizing the tunnel boring method would require the establishment of a large laydown and construction area (~2 to 3 acres) at the initial access point or portal. A tunnel boring machine (TBM) would be utilized to create the tunnel, with portals on either end, which would be maintained (with access) for the life of the Project. Other equipment associated with tunneling would include cranes, loaders, tunnel locomotives, muck and material cars. Access roads would need to be established to allow for transport of large equipment and materials to the construction laydown and portal sites. These access roads would need to be wide, have limited gradient (10 to 15 percent maximum grade), and have gradual turns such that transportation of equipment and materials would not become hazardous.

Tunnel boring within flat terrain and within urban areas is often completed utilizing vertical shafts for access at each end of a straight tunnel section. Tunnel boring involves underground boring through the ground between two or more shafts with a tunnel boring machine. Tunneling consists of the excavation of vertical shafts, horizontal or inclined straight-line boring to remove the soil between shafts, installation of the concrete tunnel lining, and site restoration (Figure 3.2-18).

Shaft Excavation and Shoring. Two or more shafts are constructed as described previously for pipe-jacking. However, for tunnel boring the shaft excavation may be longer and deeper than for pipe jacking.

Tunnel Excavation. Large diameter tunnels are excavated using a tunnel boring machine (TBM). For tunneling below the groundwater level without dewatering, pressurized-face TBMs are used to stabilize the tunnel face and prevent water from entering the tunnel. One of two basic types of TBMs may be used: (1) Slurry Pressure Balance (SPB) TBM or (2) Earth Pressure Balance (EPB) TBM.

Excavation by SPB machine supports the tunnel face using a pressurized bentonite slurry mix within the cutter head. The slurry and excavated muck mixture is pumped through slurry lines from the tunnel face, back through the completed tunnel, and then up to the surface work area to a separation plant equipped with a shaker and cyclone to separate sand, gravel, and silt from the slurry. The slurry is recycled back into the system and the sand, gravel, and silts are transported to appropriate disposal sites. SPB machines can also be fitted with a stone crusher in the cutter head to allow tunneling through soils with intermittent cobbles and boulders.

Excavation by EPB machine supports the tunnel face by pneumatically pressurizing the excavated soil (muck) within a chamber behind the cutter head. Muck is removed from the chamber by a screw conveyor and then transported out of the tunnel by means of a conveyor belt and/or muck cars on rails.

As the boring machine proceeds the concrete tunnel sections are put into place until a fully supported tunnel has been constructed. The tunnel sections would consist of 16-foot diameter precast concrete sections. For a water-tight tunnel, where the tunnel is below the water table, the annular space on the exterior of the tunnel may be filled with cement grout.

Site Restoration. After completion of the boring along the tunneling alignment the TBM is removed, the shoring system is disassembled as the shafts are backfilled, the soil compacted and the ground surface restored.

GIL Installation. The GIL system installation would be the same for a bored tunnel as for a cut and cover tunnel.

A recent example of tunnel boring utilizing the shaft approach that is of similar diameter to the proposed Project is a large water pipeline project currently being proposed by the Los Angeles Department of Water and Power (LADWP) as part of the River Supply Conduit Improvement – Upper Reach Project. This project involves the installation of approximately 31,300 linear feet (approximately 6 miles) of 78-inch (6.5-foot) diameter welded steel underground pipeline. As currently proposed, installation of the Upper Reach pipeline would be accomplished by a combination of open-trench excavations, jacking, and tunneling. In general for the Upper Reach pipeline, deep sections of pipe would be tunneled (Segment UR1 – 24 to 40 feet below ground surface (bgs); Segment UR2 – 30 to 33 feet bgs; Segment UR3 – 40 feet to 60 feet bgs) and street intersections would be jacked or tunneled. The shaft sizes for tunneling would be about 45 feet in diameter. The pit sizes for jacking would be 12 to 18 feet wide by 20 to 60 feet long and 15 to 55 feet deep. The longest single segment of tunneling for the Upper Reach pipeline would occur within the City of Burbank beginning at Burbank Blvd. and Clybourn Avenue and proceeding southeast to Johnny Carson Park, just north of the Los Angeles River (approximately 2.4 miles).To provide an example of the types of construction impacts, activities, and equipment needed to construct a tunnel utilizing the portal approach, photos from a tunnel boring construction project of similar diameter to what would be required for the Partial Underground Alternative are provided below (see Photos 1 through 6). These photos are from the Metropolitan Water District's Inland Feeder Project, which consists of two 19-foot diameter tunnels (Arrowhead East and West) through the San Bernardino Mountains (MWD, 2005). The Arrowhead East Tunnel stretches from the Strawberry Creek Portal (west of Waterman Canyon) to the City Creek Portal (near Highland) (Neufeld, 2007). The Arrowhead West

Tunnel starts at Waterman Canyon Portal and emerges at the Devil Canyon Portal (Neufeld, 2007). Lasers were used to navigate the two custom-built, 400-foot long TBMs along their routes through the two tunnels totaling 11 miles (MWD, 2005). Tunneling is expected to be completed in 2008, with the tunnel lining and other work to be completed in 2009. The Inland Feeder Project has been ongoing since 2002 (crews arrived on site in August 2002) (Neufeld, 2007).

As discussed above, the tunnel project displayed in Photos 1 through 6 is occurring within the San Bernardino National Forest, where steep/hilly terrain and the need to reduce environmental impacts associated with the installation of a water pipeline through the forest ultimately resulted in the decision to place the new water pipelines within a tunnel.

Photo 1: Assembly of the tunnel boring machine at the Strawberry Creek Portal.
Source: Neufeld, 2007

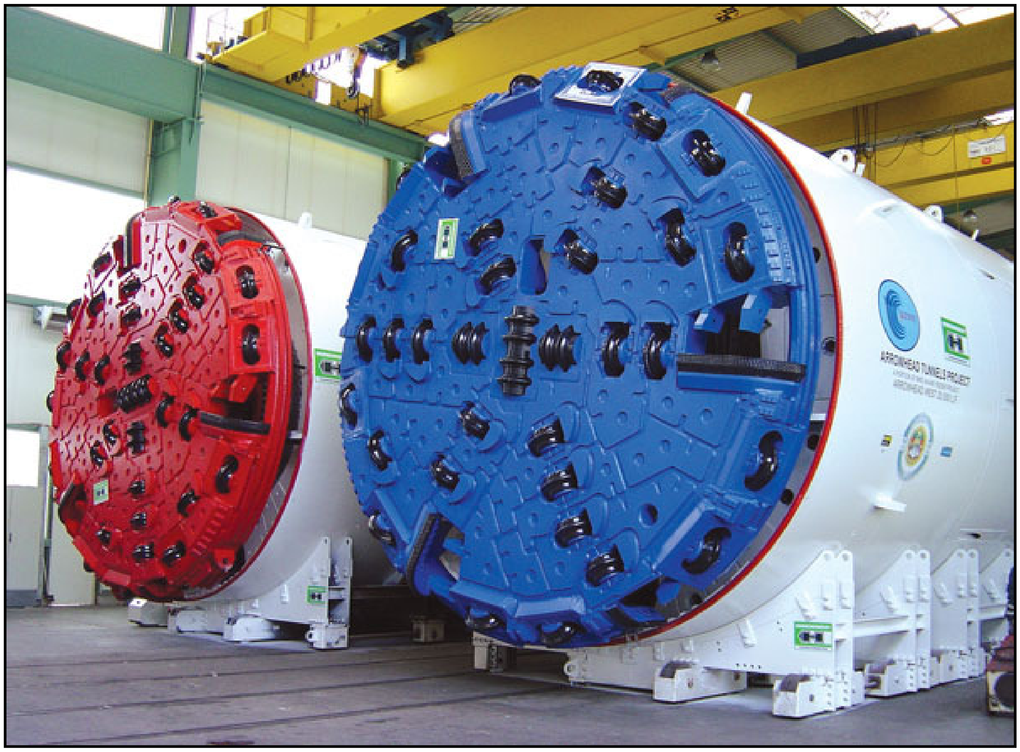


Photo 2: The two 8-million dollar, 19-foot 1-inch tunnel boring machines (TBMs) (manufactured in Germany). Source: Neufeld, 2007.

Photo 3 (Left): A 3900 Manitowoc Crane and a 300-ton Hydraulic Liebherr Crane were used to lift the front section of the tunnel boring machine.

Photo 4 (Right): One section of the tunnel boring machine being transported to the Strawberry Creek Portal on the newly constructed project-specific access road.
Source: Neufeld, 2007.

Photo 5: Strawberry Tunnel exit (City Creek Portal). Source: LetsGetNuts.com, 2008.

Photo 6: Rail car engine at Strawberry Portal. Source: LetsGetNuts.com, 2008.

Alternative Description

This alternative would utilize underground construction in place of the proposed overhead line construction following generally the same routes as the proposed Project/Action. New underground facilities would replace existing aboveground facilities, and transition stations would be required at each end of an underground segment to transfer the T/Ls from overheard to underground and vice versa.

Locations where underground construction was considered to reduce potentially significant visual and fire suppression impacts, as requested by the public and agencies during the scoping period, included the ANF, Segment 5 (north of State Route 14), and portions of Puente Hills and Chino Hills. Field surveys of these areas were conducted on December 13-14, 2007, to determine the suitability of these various locations for underground installation. Certain necessary aspects of underground construction would reduce the viability and/or environmental advantages of particular locations, such as the need for upgraded access roads for large construction equipment and materials delivery, sufficient ROW width, slope and seismic considerations, extent of installation due to technical and feasibility issues, availability of land for transition stations, etc.

Angeles National Forest

Within the ANF, particular locations of high visibility to the public, particularly from local roadways, were identified as possible locations for underground construction to reduce visual impacts. Two areas were identified within the ANF as candidate locations. The first location is where the T/L (Segment 6) crosses the Angeles Crest Highway (Highway 2), which is a Forest Service Scenic Byway and State Scenic Highway. The other location is also within Segment 6, where the T/L would traverse along the ridgeline and result in a skylined condition.

Segment 6 – Near Highway 2

For the area along Highway 2 in Segment 6, under-ground construction was considered beginning some-where near S6 MP 17.0 and the Shortcut Picnic Grounds and along Upper Big Tujunga Canyon Road north of Highway 2 to approximately S6 MP 14.0. South of Highway 2 (S6 MP 16.8) the topography was found to be very hilly with steep, jagged valleys between hilltops and dense forest vegetation (see Photo 7). A suitable location for a transition station (assuming cut/cover trenching), which would need to occupy a level area of approximately 0.25 acres (75-feet by 150-feet) for a single-circuit 500-kV transition station, or a tunnel boring laydown and construction area (assuming the use of tunnel boring), which would need to occupy a level area of approximately 2 to 3 acres, south of the Highway 2 was difficult to identify due to the lack of accessibility and rugged terrain. Based on site reconnaissance, a review of aerial photography, and topographic information for the area south of Highway 2, a potential location for a transition station and/or tunnel boring laydown/construction area would be near S6 MP 17.7 (see Photo 8). This location was chosen because the topography of the area would block views from Highway 2, and existing roads would be available for access to the site; although these roads would need to be upgraded and additional roads created to reach the proposed transition station and/or boring laydown/construction area.

Underground construction within this type of terrain would require upgrading existing narrow access

Photo 7: Looking south from Angeles Crest Highway along Segment 6 (S6 MP 16.8).

roads, creating new roads to allow for large construction equipment and vehicles to access the construction zones, as well as cut and fill to create a level pad for the transition station, construction lay-down areas, and portals. Construction zones for cut/cover trenching as opposed to tunneling boring would differ greatly; however, in either case large areas of existing vegetation would need to be cleared during construction to provide the necessary work areas.

For installations using a cut/cover tunneling methodology, placement of the T/Ls underground would increase the potential for erosion both during construction and after, which would likely result in very difficult restoration and recovery of the vegetation in the area leading to long-term scarring of the landscape. Furthermore, vegetation which results in deeply rooted systems, such as would be the case with the forest vegetation in this area (i.e., trees), would not be allowed above the underground infrastructure. Consequently, the area would remain altered and scarred for the lifetime of the Project.

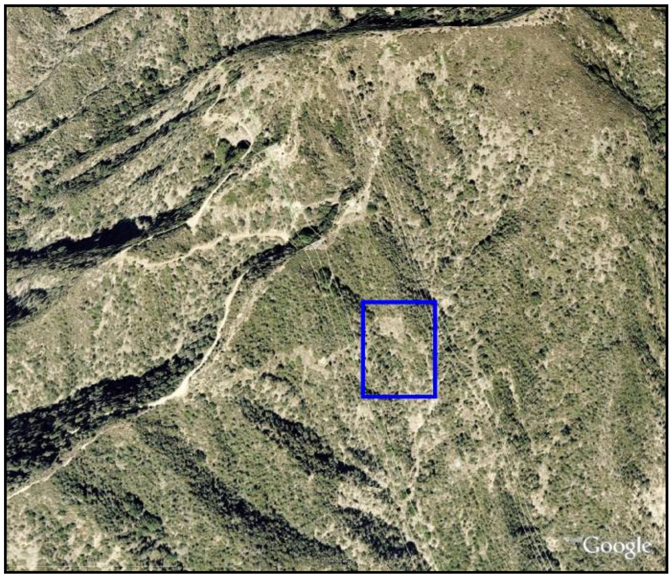


Photo 8: Aerial (oriented north) of potential tunnel boring construction laydown and portal location (near S6 MP 17.7). Source: Google Earth.

Alternatively, tunnel boring could be completed in this area, which would reduce the overall scaring along the T/L alignment; however, in the area of the entrance/exit portals, large areas (~2 to 3 acres) would need to be cleared and graded to provide a level area for construction laydown and staging (see Photo 1) and roadways would need to be created and maintained for construction vehicle and equipment access (see Photo 4), which would remain for the lifetime of the Project to allow access to the tunnel portal. Some revegetation would be possible; however, it would be limited so as to not prevent access for operations and maintenance activities.

Another issue to consider with tunneling would be potential impacts to groundwater resources, and areas of fractured igneous and metamorphic bedrock. Historic tunnel construction in this same setting throughout southern California has had significant impacts on local groundwater resources. As with the Arrowhead Tunnels Project, limits would be placed on groundwater inflows into the tunnels prior to the start of construction. The maximum permissible groundwater inflow would be determined through an assessment of the local hydrogeologic setting and identified groundwater resources in the area such as springs, stream base flow, riparian areas, water rights, and lowering of water levels in local supply wells. If the local conditions are determined to be sensitive to groundwater loss during and after construction, the actual types or methods used to control groundwater inflow would be specified in the construction documents. The contractor would be responsible to implement one or more of the measures to maintain inflow below the specified maximum and may be required to stop work and implement additional measures to reduce the inflow to acceptable levels. Groundwater control measures include grouting in highly fractured areas prior to construction, probing and high-pressure grouting ahead of the tunnel face, and installation of temporary and permanent water-tight liners. In addition, groundwater inflow to the tunnel would require a water treatment and disposal program in accordance with a project-specific NPDES permit.

Immediately north of Highway 2 along Upper Big Tujunga Canyon Road the topography is less severe and potentially would provide for a more suitable location for underground construction; however, dense forest vegetation occurs along the Project T/L alignment (see Photo 9), which would result in noticeable long-term scarring of the landscape as a result of underground construction utilizing cut/cover trenching construction techniques and the need to limit deeply rooted vegetation (i.e., trees) above the trenches. In addition, the proposed T/L would cross Big Tujunga Creek at approximately S6 MP 16.3, as well as several other ephemeral drainages, which would be an obstacle to underground trenching along this portion of the alignment which could result in a hydrology issue. Pipe jacking construction methods could be employed for such crossings, although a tunnel crossing of Big Tujunga Creek would require a vertical separation to achieve minimum cover above the tunnel crown and likely encounter significant groundwater inflows.

Photo 9: Looking south from Upper Big Tujunga Canyon Road towards Angeles Crest Highway (S6 MP 16.3).

To minimize impacts to the existing vegetation, the potential exists to place the underground T/L within Upper Big Tujunga Canyon Road north of Highway 2 utilizing cut/cover traditional trenching techniques. As described above under "Cut/Cover Tunnel Method", placement of the T/L within the existing road would require a work area width of approximately 55 feet for installation of a single-circuit 500-kV T/L. Upper Big Tujunga Canyon Road in this area is a two-lane road approximately 20 to 30 feet wide. As such, widening of this existing road would be required to accommodate the new underground 500-kV T/L. Widening of the existing road would require extensive engineering and construction work, which may include cutting into existing hillsides or filling in areas that would otherwise result in a drop-off down a hillside. Figure 3.2-19 depicts the area and construction method considered within Segment 6 in the vicinity of Highway 2 for this alternative.

Utilizing a combination of tunnel boring and cut/cover traditional trenching would result the following surface disruption:

- An initial tunnel portal (Photo 1) and transition station near S6 MP 17.7 (Photo 8), which would require a level area of approximately 2 to 3 acres;
- A tunnel shaft/portal outlet near S6 MP 16.0 (Photo 10), which would have an approximate diameter of 75 feet (based on a 45 foot diameter shaft for a 12-foot diameter pipe casing);

Photo 10: Aerial (oriented north) of potential shaft location where construction would switch from tunnel boring to cut/cover trench tunneling within Upper Big Tujunga Canyon Road (near S6 MP 16.0). Source: Google Earth.

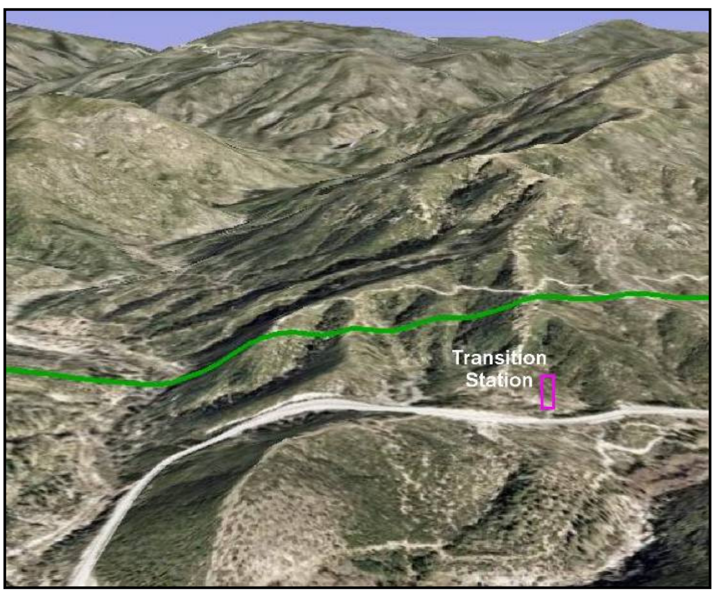


Photo 11: Aerial (oriented northeast) of potential northern transition station location near S6 MP 14.0. Source: Google Earth.

- Widening of Upper Big Tujunga Canyon Road to 55 feet (Photo 4 and Figure 3.2-16), as it is currently only 20 to 30 feet wide; and
- A transition station near S6 MP 14 (Photo 11), which would require an area of approximately 75 feet by 150 feet (~0.25 acres) to accommodate the single-circuit 500-kV T/L.

Based on the above surface disruption, undergrounding with the ANF would not meet the Forest Service objective of minimizing impacts within the Forest.

After consideration of (1) the extensive area required for constructing tunnel portals, shafts, and transition stations, (2) the need to substantially upgrade existing access roads and construct new access roads, (3) substantial traffic impacts that would result from the closure of Upper Big Tujunga Canyon Road during construction, (4) potential groundwater issues, and (5) considering that two of the existing three T/Ls (one single-circuit 220 kV and one single-circuit 500 kV) within the area would remain aboveground resulting in limited visual benefits, underground construction within the ANF near Highway 2 was eliminated from further consideration.

Segments 6 and 7 – Along the Ridgeline

Underground construction was also considered along the end of Segment 6 and the beginning of Segment 7 where the T/L would traverse a ridgeline as it exits the ANF and enters the City of Duarte, resulting in a skylined condition. Underground construction along this portion of the TRTP would result in a transition from overhead to underground at approximately S6 MP 25.6, continuing underground through the end of Segment 6 (S6 MP 27.0) and transitioning back to overhead along Segment 7 at approximately S7 MP 0.8, in the foothills bordering the City of Duarte. The total underground length would be approximately 2.2 miles. This alternative would remove the proposed T/L from skyline views, particularly in the City of Duarte and Van Tassel Canyon along the Angeles Forest Highway, which provides access to the ANF from the Los Angeles basin. As proposed by SCE, this portion of the Project would involve replacing the existing Antelope – Mesa 220-kV T/L with the new Rio Hondo – Vincent No. 2 500-kV T/L on LSTs, adjacent to the new Mira Loma – Vincent 500-kV T/L. As such, there are existing transmission structures in the corridor that are currently skylined and would continue to be skylined following construction of the Project; undergrounding this portion of the T/L would not remove existing T/L infrastructure from skylined conditions.

Under this alternative, the T/L would transition to underground on the north side of the ridge which runs in an east-west direction along the southern border of the ANF (see Photo 12), and would transition back to overhead on the south side of this ridge (see Photo 13), in the foothills bordering the City of Duarte. A permanent transition station and boring portal would be required in each of these locations, in addition to construction laydown areas of approximately 2 to 3 acres, which would be cut into the hills on either side of the ridge.

In addition, paved access roads would be required to provide permanent access to each of the boring portals and transition stations. In the ANF, access to the transition station at S6 MP 25.6 would require the cutting of an access road into the hillsides between the Angeles Forest Highway and the transition station. Due to the mountainous topography of this area and the size of vehicles and equipment involved with underground construction, it is expected that switchback roads would be necessary and would include cutting, filling, grading, and paving activities. In Duarte, the transition station would be located near existing roadways along residential streets, and although it is not expected that extensive road construction would be required, some new roads and improvements to existing roads would be necessary to ensure access to the transition station site. Permanent visual scarring would occur at each transition station site, resulting from the installation of the construction laydown/portal area (~2 to 3 acres), transition stations, and the cutting of new roadways, which is expected to be particularly extensive in the ANF.

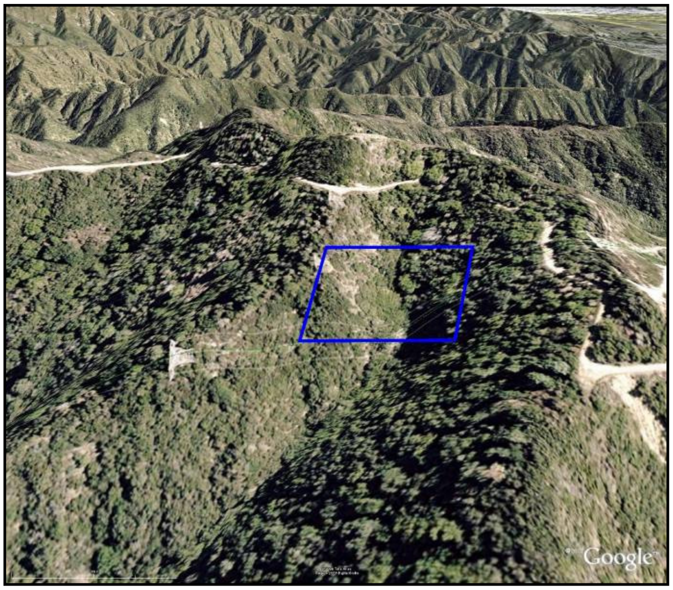


Photo 12: Aerial (oriented west) of potential northern portal and transition station location (near S6 MP 25.6).
Source: Google Earth.

Photo 13: Aerial looking north at potential southern portal and transition station location in Duarte (near S7 MP 0.8). Source: Google Earth.

As previously described, one of the primary purposes of underground alternatives is to remove visual impacts associated with T/L infrastructure. Although this alternative would remove just over two miles of the proposed T/L from skylined conditions, it would not remove existing T/L infrastructure from the skyline and it would further introduce substantial visual impacts through hillside cutting and grading activities associated with underground infrastructure requirements. Therefore, after consideration of (1) the extensive area required for constructing portals (boring) and transition stations, (2) the need to construct new hillside access roads, and (3) undergrounding this portion of the T/L would not remove existing infrastructure from skylined conditions, underground construction of this portion of Segment 6 (S6 MP 25.6 – 27.0) and Segment 7 (S7 MP 0.0 – 0.8) was eliminated from further consideration.

Segment 5 – Pleasant Valley

The area north of Vincent Substation (Pleasant Valley) along Segment 5 was identified by the public as another potential location for underground construction. The terrain within this area is moderately hilly with a mild grade, whereby cut/cover trenching would be an appropriate method for underground construction. A new 500-kV T/L is proposed along this segment. Within this area there are currently two 500-kV T/L on LSTs, two 220-kV T/Ls on LSTs, and one 220-kV T/L on TSPs (see Photo 14). In addition, the new Antelope–Vincent 500-kV T/L (Segment 2) has been approved for construction within this corridor. While the topography of the area would allow for transition stations and the placement of the new T/L underground, the visual improvement would be very limited due to the existing and already approved aboveground infrastructure in this area that would remain aboveground (three 500-kV T/Ls and one 220-kV T/L). As a result, undergrounding in this area would provide very little benefit compared to existing conditions. Therefore, underground construction in this area was not pursued further.

Photo 14: Looking northwest from Soledad Pass along Segment 5 (S5 MP 16.8) at Pleasant Valley.

Segment 8 – Puente Hills

Within Puente Hills, underground construction was considered along Powder Canyon beginning near Fullerton Road (S8A MP 13.5) and proceeding west approximately two miles toward Hacienda Heights. This area was identified because it traverses the Puente Hills Landfill Native Habitat Preservation Authority lands where there is high desirability to keep the landscape in as natural a condition as possible. Within this area, cut/cover trenching was initially considered; however, due to the terrain, tunnel boring may be a more appropriate method and would limit the surface disruption associated with cut/cover trenching. Potential locations for the eastern transition station and portal (assuming tunnel boring method) would include an undeveloped area west of Fullerton Road, behind the existing water tanks (see Photo

15), although it would be highly visible from Fullerton Road, or the first knob west of the existing water tanks (see Photo 16), which again would be highly visible. The western transition station, assuming cut/cover trenching, would likely need to be placed somewhere west of Punta Del Este Drive (S8A MP 11.3), as the terrain results in a sheer drop-off on either side of the knoll in this area (see Photo 17). If the tunnel boring method is applied, a potential portal, based on the topography of the area, would be just east of Colima Road (~S8A MP 9.8) where there is undeveloped land that is generally flat (see Photo 18).

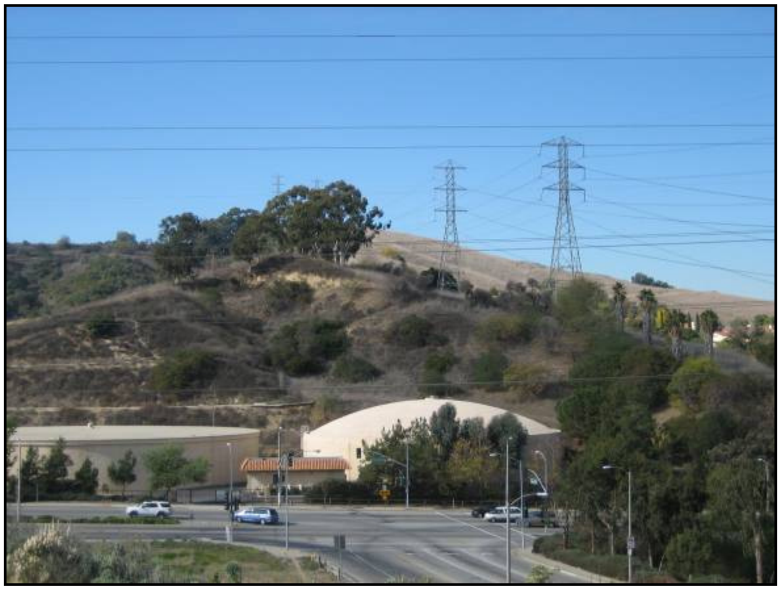


Photo 15: Looking west from Pathfinder County Park (S8A MP 13.7) towards Fullerton Road and Powder Canyon.

Photo 16: Looking north towards Powder Canyon at first knob west of the water tanks and Fullerton Road.

Photo 17: Looking east from Punta del Este Drive in Hacienda Heights (S8A MP 11.3).

Photo 18: Aerial (oriented north) of potential portal exit location east of Colima Road in Hacienda Heights, accessible from Skyline Drive (~S8A MP 9.8). The blue line indicates the proposed T/L route paralleling existing 220-kV T/Ls. Source: Google Earth

Through Powder Canyon, the terrain is fairly hilly and several valleys would need to be traversed by the underground T/L, which assuming cut/cover trenching would likely result in very difficult restoration and recovery of the vegetation in the area. The existing narrow dirt roads would also limit the ability of construction equipment to access the site. Application of tunnel boring would reduce the surface disruption associated with cut/cover trenching; however, large construction laydown and portal areas would be required, which would be highly visible from Fullerton Road on the east end and Colima Road on the west end and the neighborhoods which surround these areas. In either case (cut/cover trenching or tunnel boring), the placement of the new T/L underground would result in limited visual improvement due to the existing aboveground infrastructure in this area, which consists of two existing 220-kV T/Ls. Therefore, under-ground construction in this area was not further pursued.

Segment 8 – Chino Hills

Chino Hills was another area identified for underground construction, as requested by the community, and due to the high visibility of the proposed T/L which would be placed adjacent to a large concentration of existing and proposed homes. Potential locations for transition stations are identified in Figure 3.2-20. The westernmost transition station would be located in an area just west of the dead-end of Eucalyptus Avenue (~S8A MP 21.9). A new housing development, Pine Valley Estates, is currently under construction in this area; however, the residential lots are planned to be on the east-facing slope overlooking the golf course and Carbon Canyon Road. The remainder of the property would remain largely in open space. The open space area to the west, generally within the existing ROW or potentially offset from the existing ROW due to topography, is recommended as a possible location for a transition station (see Photo 19).

Photo 19: Looking southwest from the west end of Eucalyptus Avenue (S8A MP 22.0) at potential western-most transition station location.

Proceeding east from this westernmost point, the terrain consists generally of rolling hills and flatter terrain. Another potential transition station (see Photo 20 – Transition Station Alt. 1) for the west side of the underground segment is located approximately one mile east on Eucalyptus Avenue just west of Coral Ridge Park (near the intersection of Eucalyptus Avenue and Avenida Cabrillo). A transition station in this location would be highly visible from both the street and by the residences overlooking this site, far more so than west of the dead-end of Eucalyptus Avenue; therefore, this site was not carried forward for further analysis.

Two possible locations were identified for an eastern transition station, one located west of Highway 71 along Pipeline Avenue and the other east of Highway 71. The first is an undeveloped area under the existing transmission lines situated between the Chino Hills Car Wash and the Little Chino Creek flood control channel (see Photo 21). Only the 150-foot wide ROW is available in this area and may even require encroaching upon or utilizing the existing parking lot or the adjacent car wash, which may actually be within SCE's existing ROW. It is possible that an area slightly farther to the east (approximately 0.3 mile) on the east side of State Highway 71, within the existing ROW paralleling Corporate Center Avenue west of Ramona Avenue, may provide for a larger area in which to place a transition station (Transition Station Alt. 2 – Photo 22). However, based on preliminary geologic information, several inactive earthquake faults and one potentially active earthquake fault (Chino-Central Avenue) have been identified in the project area. Available documents show that general location of the Chino Fault as being generally west of the 71 Freeway, with the northerly most extension ending south of Chino Hills Parkway, near Bird Farm Road. A graphical extension of the known fault trace appears to pass between the two potential easterly transition station locations, where the existing ROW crosses the 71 Freeway. Because Transition Station Alt. 2 is east of the assumed extension of the Chino Fault, it is not considered a viable location for transitioning the 500-kV T/L underground considering that a 500-kV circuit should not be placed underground in a tunnel crossed by an earthquake fault; therefore, this site was not carried forward for further analysis (SCE, 2008c – DR#5: Q5-11).

Photo 20: Aerial of alternate western transition station location next to Coral Ridge Park (S8A MP 22.9). Source: Google Earth.

Assuming that the areas identified for the eastern and western transition stations would be feasible, underground construction along this portion of Segment 8A through Chino Hills would reduce potentially significant and unavoidable visual impacts in this area. The existing aboveground infrastructure, which consists of a single-circuit 220-kV T/L on LST structures, would be removed and the new double-circuit 500-kV T/L would be placed underground within SCE's existing T/L corridor utilizing a combination of cut/cover trenching and jacking. Therefore, based on the above discussion, the Partial Underground Alternative would consist of (and be limited to) an approximately 4-mile underground segment between approximately S8A MP 21.9 and 25.8 utilizing GIL technology.

Photo 21: Looking west along alignment at Pipeline Avenue at potential eastern transition station location (S8A MP 25.5).

Photo 22: Aerial (oriented north) of alternate eastern transition station location on the east side of State Highway 71 (S8A MP 25.8). Source: Google Earth.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA; however, the timeframe for construction of the underground portions would be considerably longer than overhead construction, which may extend construction activities beyond the California Renewables Portfolio Standard initial deadline of 2010. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

As discussed above under "Underground Technology Feasibility/Reliability Conclusion", the most appropriate underground technology for the Partial Underground Alternative would be GIL. GIL is considered feasible at 500 kV.

Environmental Advantages

Under the proposed Project/Action, overhead T/Ls would be built from Windhub Substation in southern Kern County to the Mira Loma Substation in Ontario, San Bernardino County, creating potentially significant visual impacts along the T/L alignment. For the Partial Underground Alternative, the new T/Ls would be constructed underground through Chino Hills, which would reduce significant visual impacts.

Environmental Disadvantages

Construction of the Partial Underground Alternative through Chino Hills would require substantially more construction activity than overhead construction, and greater ground disturbance than overhead construction. For GIL installation utilizing cut/cover trenching, an approximately 55-foot-wide construction zone would be required, as well as an area approximately 75 feet by 250 feet (~0.5 acres) on either end for the double-circuit 500-kV T/L transition stations.

Overhead T/L construction would result in construction disturbance primarily at individual structure sites along the alignment, whereas underground construction and trenching would involve much greater ground disturbance and construction-related impacts (traffic, air quality and dust, and noise). There is also a greater potential to encounter contaminated soils and buried cultural resources, and to impact biological resources due to the greater amount of ground disturbance. Furthermore, the proposed underground alignment through Chino Hills crosses and runs parallel to Little Chino Creek for a distance of approximately 1,400 feet and 2,700 feet depending on the termination point west or east of State Highway 71, respectively. The unlined channel likely supports a local shallow groundwater regime recharged by constant urban runoff. Underground construction in this area would require a dewatering program and compliance with a project-specific NPDES permit for disposal of the treated groundwater. Quality of the groundwater is unknown but may contain residual pesticides and herbicides related to the historic agricultural activities. A long jack and bore crossing of State Highway 71 would also likely encounter groundwater and require dewatering of the jacking and receiving pits.

Before the trench for underground T/Ls may be installed, vegetation must be cleared and terrain must be leveled by grading and filling, in order to accommodate the required construction equipment, along the entire length of the corridor (i.e., similar to pipeline construction). Such construction is much more difficult and results in much more land disturbance than overhead lines, where the land that needs to be kept free of vegetation for overhead lines is usually limited to the area around each tower (plus vegetation management below each tower).

Whenever possible, existing roads would be utilized to minimize new access road construction. In undisturbed areas, vegetation must be cleared prior to beginning underground construction. Access roads must be created or improved to handle large construction vehicles and trucks hauling precast tunnel sections. Due to the size of the equipment and the extent of construction activities, helicopter construction is not viable for underground construction.

The installation of an underground T/L would likely require more time and/or resources than construction of an equivalent length of overhead line because of the work required for excavating trenches and/or tunneling, constructing the tunnel, and welding the enclosure pipes. Construction could also be substantially extended due to restrictions on the times of the year available for construction, which are required to limit the impacts on the environment or due to winter weather.

While in operation, the land above the underground T/Ls must remain free from secondary surface development, including overhead T/Ls, in order to accommodate operation and maintenance activities. Only restricted vegetation would be permitted above the underground route throughout the life of the Project/Action. Scarring along the alignment would result from the installation of underground infrastructure resulting in potential visual impacts, especially in areas where vegetation is forested and/or dense.

It should also be noted that the maintenance of underground T/Ls is more difficult than overhead lines because when a problem occurs underground the process to repair or replace a GIL segment would cause circuit restoration to take much longer than with overhead transmission lines.

The primary disadvantages of GIL systems are:

- Relatively high cost;
- Environmental concerns about releases of SF6 gas to the environment;
- A very high amount of field assembly work is required;
- Less flexibility in avoiding other underground obstacles;
- System reliability is sensitive to contaminants introduced during field assembly; and
- Large construction work zones (55-feet wide) and transition stations (75 feet by 150 feet for single-circuit 500-kV system and 75 feet by 250 feet for a double-circuit 500-kV system).

Alternative Conclusion

RETAIN FOR FURTHER ANALYSIS. While the Partial Underground Alternative would generally meet the objectives/purpose and need of the TRTP, with the exception of not meeting the California Renewables Portfolio target of 2010, construction activities would cause substantially more environmental impacts than the proposed Project/Action, specifically to biological resources, buried cultural resources, air quality, and geology and soils (erosion). However, these impacts would be short-term in nature and would be offset by the long-term benefits of reduced visual impacts through Chino Hills. The GIL underground technology is considered feasible and would allow for underground installations within steep terrain, would require less buried infrastructure, and would require substantially smaller transition stations than XLPE, thereby reducing both land disturbance and visual impacts compared to XLPE. As such, GIL technology is the preferred technology for this alternative. Because the Partial Underground Alternative meets the objectives/purpose and need of the TRTP, is feasible, and has the potential to reduce potentially significant visual impacts of the proposed Project/Action in Chino Hills, it has been retained for further consideration in the EIR/EIS.

SUMMARY

Partial Underground Alternative – Chino Hills	**Meets Project Purpose?** Partially[1]	**Feasible?** Yes[2]	**Meets Reliability Criteria?** Yes[3]
Explanations: [1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints; however, the additional construction activities associated with underground construction would prevent compliance with the Renewables Portfolio Standard deadline of 2010. [2] This alternative would be feasible. [3] Meets CAISO/NERC/WECC requirements. The reliability of GIL technology at the distances and voltages considered for this alternative is unknown as no data exists.			
Environmental Advantages • Placement of the T/Ls underground along Segment 8A through Chino Hills would reduce potentially significant visual impacts associated with the proposed Project		**Environmental Disadvantages** • Greater impacts to air quality, biological resources (removal of vegetation), traffic, noise, and geology/soils (erosion) would result from the substantially increased construction activity and ground disturbance required for continuous trenching to install underground T/Ls • Increased potential to encounter contaminated soils and buried cultural resources due to the increased excavation and ground disturbance for underground construction • Restricted vegetation on lands above underground tunnels resulting in permanent impacts to biological resources	
Conclusion: Retain for Further Analysis			

3.2.12 Partial Composite Core Conductor Alternative

Alternative Description

This alternative was considered by SCE in its PEA (Technology Alternative 1). It would replace existing conductors with lightweight composite core wrapped with high-performance, trapezoid-shaped aluminum alloy wires (i.e., composite core conductor) for the purpose of increasing capacity (up to 50 percent). The conductor would be replaced on existing 220-kV single-circuit structures between the Vincent Substation and the Mesa Substation, and between the Mesa Substation and the Chino Substation, adding new structures as necessary along the proposed routes in Segments 6, 7, 8, and 11.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, the amount of generation would be restricted as this new technology can only provide an increase in capacity of up to 50 percent over conventional conductors with similar mechanical properties. Furthermore, use of composite core conductor would not support the identified 4,500 MW of new wind generation anticipated from the TWRA, and would only partially address South of Lugo transmission constraints. While the use of composite core conductor would not allow for the full integration of the expected wind generation resources in the TWRA, it is anticipated that use of composite core conductor would generally meet the projected load growth in the Antelope Valley.

Feasibility

The U.S. Department of Energy Technical Review Committee on Composite Core Conductors has deemed several composite core conductors as a "commercial product". As such, this alternative would be feasible.

Reliability

Implementation of this alternative would comply with CAISO/NERC/WECC requirements; however, reliability would become as issue as power generation within the TWRA increases to meet the expected 4,500 MW. Furthermore, composite core conductor is a new technology, which is not supported by sufficient field experience and, therefore, the long-term reliability is unknown

Environmental Advantages

Installation of composite core conductor on existing 220-kV single-circuit structures between Vincent Substation and Mesa Substation (Segments 11, 6, and 7) and between Mesa Substation and Chino Substation (Segment 8), and only constructing new structures as necessary, would reduce air quality, biology, noise, and visual impacts associated with the removal of existing 220-kV structures and installation of new bulkier, taller 500-kV structures as required for the proposed Project/Action. For those areas where existing structures would need to be replaced, the new 220-kV structures would be shorter and of less mass than the 500-kV structures. Therefore, visual impacts associated with this alternative would be reduced; however, air quality, biology, and noise impacts would essentially be the same as the proposed Project/Action.

Environmental Disadvantages

To provide the greatest system capacity (and capability) using composite core conductor, the system would need to be designed for ultimate operation at 500 kV, as the amount of increased system transmission capability on a 220 kV voltage level would be limited by other existing 220 kV transmission elements between the Vincent and Pardee Substations and the L.A. Basin. Existing structures south of the Vincent Substation within the ANF (Segments 6 and 11) and between the Mesa and Chino Substations (Segments 7 and 8), however, would not be able to support the weight of the composite core conductor that would be needed to provide for the required capacity increase.

This determination was made by SCE by evaluating the use of composite core conductors utilizing design wind criteria and applying the resulting design requirements for mechanical loads and composite conductor weights to the existing structures. SCE's evaluation determined that the existing structures would fail under the new weight and certain wind conditions. It was also determined that resulting conductor sag would not meet the minimum CPUC General Order-95 line clearance requirements (vertical clearance from ground). In addition, the existing structures would not allow SCE to operate the T/Ls between the Vincent Substation and the Mira Loma Substation (Segments 6, 7, 8, and 11) at 500 kV because the existing structures, as designed, do not provide adequate spacing for operation at 500 kV (horizontal clearance between phases). Consequently, the existing structures within Segments 6, 7, 8, and 11 would need to be replaced to provide sufficient mechanical strength and adequate clearances for ultimate operation at 500 kV. Therefore, the environmental advantages of using composite core conductor associated with the use of existing structures would be eliminated. As such, construction impacts to air quality, biology, and noise would essentially be the same as the proposed Project/Action.

Alternative Conclusion

ELIMINATED. While this alternative at face value would provide an opportunity to increase the system capacity between Vincent Substation and Mira Loma Substation with minimal upgrades to existing infrastructure, upon further inspection not only would it limit the overall system capacity, such that the objectives/purpose and need of the TRTP are not fully met, but would in fact require upgrades of the existing transmission structures resulting in environmental impacts that are substantially the same as the proposed Project/Action, with the exception of reduced visual impacts associated with the installation of 220-kV structures versus 500-kV structures. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

Partial Composite Core Conductor Alternative	**Meets Project Purpose?** Partially[1]	**Feasible?** Yes[2]	**Meets Reliability Criteria?** Yes[3]
Explanations: [1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, the amount of generation would be limited and would not support the identified 4,500 MW anticipated from the TWRA. Furthermore, use of existing structures would not allow for future increase in voltage operation from 220 kV to 500 kV. This alternative would only partially address South of Lugo transmission constraints, as the upgrades south of Vincent Substation would limit the capacity of the system. Projected load growth in the Antelope Valley would generally be met. [2] This alternative would be feasible. [3] Meets CAISO/NERC/WECC requirements; however, reliability would become as issue as power generation within the TWRA increases to meet the expected 4,500 MW. Composite core conductor is a new, unproven technology with unknown life-cycle performance; therefore, its reliability in long-term use is unknown.			
Environmental Advantages • Reduces visual impacts as a result of not installing bulkier, taller 500-kV structures between Vincent Substation and Mesa Substation, and between Mesa Substation and Chino Substations		**Environmental Disadvantages** • Existing structures would not be able to support the composite core conductor to provide the required capacity increase and would need to be replaced resulting in similar environmental impacts similar to the proposed Project/Action	
Conclusion: Eliminate from Further Analysis			

3.3 Alternate Corridors

3.3.1 Segment 10A Route Alternative

Alternative Description

This alternative route was considered by SCE in its PEA (RA Retained 7). It would provide for an alternate alignment for siting a new 500-kV T/L between the Windhub Substation and the proposed new Whirlwind Substation in Segment 10. The route for this alternative would initially follow the proposed route for Segment 10 which would begin from the south side of Windhub Substation heading southwest for approximately 3.4 miles, then turn south for approximately 3.6 miles. As shown in Figure 3.3-1, Segment 10A would deviate from the proposed route beginning at S10 MP 7.0 (Alternative Segment 10A MP 0.0), and would proceed within a new 330-foot-wide ROW and travel in a southwest direction paralleling the Los Angeles Aqueduct for approximately 6.3 miles before turning south-southwest paralleling an existing transmission corridor for approximately 1.3 miles (S10A MP 6.3 to 7.6). At this point, the alignment would turn south along 170th Street West for the remaining 2.0 miles. At Alternative Segment 10A MP 9.6, the alternative route would realign with the proposed route (S10 MP 15.8). The overall Segment 10A route from Windhub Substation to Whirlwind Substation would be 17.6 miles long, as opposed to the proposed route which would be 16.8 miles long (additional 0.8 mile).

Approximately 101 500-kV single-circuit LSTs would be constructed along Segment 10A between the Windhub and Whirlwind Substations, as opposed to 96 LSTs for the proposed Project/Action. The height of the 500-kV single-circuit LSTs would range from 94 feet to 172 feet. The Segment 10A 500-kV T/L would be strung with 2B-2156 kcmil ACSR with nonspecular finish, and include the installation of approximately 551,000 feet of conductor, whereas the proposed Segment 10 would require 525,000 feet of conductor (additional 26,000 feet).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

The re-routed portion of the ROW mostly parallels the Los Angeles Aqueduct thereby allowing use of existing access roads, which would reduce associated construction impacts such as air quality, noise, and visual impacts.

Environmental Disadvantages

The proposed alternative route is slightly longer (18 versus 16.8 miles) and would therefore result in increased impacts to air quality, biology, noise, and visual impacts compared to the proposed Project/Action.

Alternative Conclusion

ELIMINATED. This alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would parallel the Los Angeles Aqueduct which has existing access roads resulting in a reduction of associated air quality, noise, and visual impacts. However, this minor savings would be offset by the longer route required. As such, this alternative would not offer any substantial or noticeable improvement over the proposed Project/Action and has therefore been eliminated from further consideration.

SUMMARY

Segment 10A Route Alternative	Meets Project Purpose? Yes[1]	Feasible? Yes[2]	Meets Reliability Criteria? Yes[3]
Explanations: [1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints. [2] This alternative would be feasible. [3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.			
Environmental Advantages		**Environmental Disadvantages**	
• Parallels Los Angeles Aqueduct for a short distance allowing for use of existing access roads thereby reducing construction impacts (air quality, noise, visual)		• Longer route (18 vs. 16.8 miles for proposed Segment 10) resulting in potentially greater air quality, biology, noise, and visual impacts	
Conclusion: Eliminate from Further Analysis. This alternative offers no environmental advantage over the proposed Project/Action without introducing equivalent disadvantages, and is substantially similar to the proposed Project/Action.			

3.3.2 Segment 10B Route Alternative

Alternative Description

This alternative route was considered by SCE in its PEA (RA Retained 7). It would provide for an alternate alignment for siting a new 500-kV T/L between the Windhub Substation and the proposed new Whirlwind Substation in Segment 10. The route for this alternative would initially follow the proposed route for Segment 10 which would begin from the south side of the Windhub Substation heading southwest for approximately 3.4 miles, then turn south for approximately 3.6 miles. As shown in Figure 3.3-1, Segment 10B would deviate from the proposed route beginning at S10 MP 7.0 (Alternative Segment 10B MP 0.0), and would proceed within a new 330-foot-wide ROW and travel in a southwest direction paralleling the Los Angeles Aqueduct for approximately 2.3 miles. This portion of the alignment is the same as the Segment 10A Route Alternative described above. At this point, Segment 10B would turn west for approximately 3.4 miles, crossing over the Los Angeles Aqueduct, and then turn south for 1.6 miles along the assumed 160th Street West, which is not yet a designated street, again crossing the Los Angeles Aqueduct. The route would continue southwest for approximately 1.6 miles, paralleling an existing transmission corridor, then turn south along 170th Street West for the remaining 2.0 miles. At Alternative Segment 10B MP 10.9, the alternative route would realign with the proposed route (S10 MP 15.8). The overall Segment 10B route from Windhub Substation to Whirlwind Substation would be 18.9 miles long, as opposed to the proposed route which would be 16.8 miles long (additional 2.1 miles).

Approximately 109 500-kV single-circuit LSTs would be constructed along Segment 10B between Windhub and Whirlwind Substations, as opposed to 96 LSTs for the proposed Project/Action. The height of the 500-kV single-circuit LSTs would range from 94 feet to 172 feet. The proposed Segment 10A 500-kV T/L would be strung with 2B-2156 kcmil ACSR with nonspecular finish, and include the installation of approximately 593,000 feet of conductor, whereas the proposed Segment 10 would require 525,000 feet of conductor (additional 65,000 feet).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

The re-routed portion of the ROW would parallel the Los Angeles Aqueduct for a short distance (approximately 2.3 miles), thereby allowing use of existing access roads and reducing associated construction impacts such as air quality, noise, and visual impacts. In addition, this alternative route would place the new T/L behind existing homesteads, unlike the proposed Project/Action where the T/L would traverse in front of the homesteads, which would reduce potential visual impacts.

Environmental Disadvantages

The proposed alternative route is slightly longer (18.9 versus 16.8 miles) and would therefore result in increased impacts to air quality, biology, noise, and visual impacts compared to the proposed Project/Action.

Alternative Conclusion

ELIMINATED. This alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would provide for some potential reduction in visual impacts by moving the T/L behind existing homesteads. However, this minor savings would be offset by the longer route required, which would result in greater air quality, biology, noise and visual impacts. As such, this alternative would not offer any substantial or noticeable improvement over the proposed Project/Action and has therefore been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Segment 10B Route Alternative</td><td>Meets Project Purpose?
Yes[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints.
[2] This alternative would be feasible.
[3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Parallels Los Angeles Aqueduct for a short distance allowing for use of existing access roads thereby reducing construction impacts (air quality, noise, visual)
• Re-routed portion of ROW would go behind homesteads located along the proposed Project/Action route</td><td colspan="2">Environmental Disadvantages
• Longer route (18.9 vs. 16.8 miles for proposed Seg. 10) resulting in potentially greater air quality, biology, noise, and visual impacts</td></tr>
<tr><td colspan="4">Conclusion: Eliminate From Further Analysis. This alternative offers no environmental advantage over the proposed Project/Action without introducing equivalent disadvantages, and is substantially similar to the proposed Project/Action.</td></tr>
</table>

3.3.3 Windhub Substation to Cottonwind Substation to Whirlwind Station Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 7). As shown in Figure 3.3-2, it would route a new 500-kV T/L from the Windhub Substation southwest along the foothills of the Tehachapi Mountain Range to the Cottonwind Substation, rather than directly to the Whirlwind Substation. A new approximately 25-mile, 200-foot-wide corridor along the southern margin of the foothills of the Tehachapi Mountain Range, including access and spur roads, would be required to accommodate the new 500-kV T/L. From the Cottonwind Substation, the new 500-kV T/L would continue southeast to the Whirlwind Substation adjacent to existing ROW. A 150-foot expansion of the existing ROW, as well as new spur roads, would be required along this portion of the alignment to accommodate the new 500-kV T/L. This alternative would be approximately 12 miles longer than the proposed Segment 10.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, due to the routing of the new T/L alignment along the foothills of the Tehachapi Mountain Range between the Windhub Substation and the Cottonwind Substation, it could potentially interfere with wind generation projects planned in the area. As such, the 4,500 MW of identified wind generation within the TWRA may not be fully realized. While the full capacity of the TWRA may not be achieved, implementation of this alternative would accommodate the projected load growth in the Antelope Valley and address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

The proposed Project/Action would establish a new approximately 16.8-mile T/L corridor between the Windhub Substation and the Whirlwind Substation. As part of this alternative, the new 500-kV T/L would be placed adjacent to existing ROW between the Cottonwind Substation and the Whirlwind Substation, which would reduce access road requirements and associated impacts. However, a new approximately 25-mile T/L corridor would be required between the Windhub Substation and the Cottonwind Substation (see "Environmental Disadvantages" below).

Environmental Disadvantages

While this alternative would place a portion of the new 500-kV T/L adjacent to existing ROW between the Cottonwind Substation and the Whirlwind Substation, a new approximately 25-mile, 200-foot-wide T/L corridor would need to be established along the foothills of the Tehachapi Mountain Range between the Windhub Substation and the Cottonwind Substation. New access roads and spur roads would need to be established along this corridor, resulting in greater environmental impacts (air quality, noise, and visual resources) than the proposed Segment 10. Furthermore, construction along the foothills as opposed to the valley floor would be more difficult and potentially increase water quality impacts (there are many arroyos in this area) and erosion potential during construction.

Alternative Conclusion

ELIMINATED. While this alternative would place a portion of the new 500-kV T/L adjacent to existing ROW, the need for a new approximately 25-mile, 200-foot-wide T/L corridor along the foothills of the Tehachapi Mountain Range between the Windhub Substation and the Cottonwind Substation would result in greater environmental impacts than the proposed Project/Action. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Windhub Substation to Cottonwind Substation to Whirlwind Substation Alternative</td><td>Meets Project Purpose?
Partially[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, due to its location it could potentially interfere with wind generation projects planned in the area such that the full 4,500 MW may not be realized. It would accommodate the projected load growth in the Antelope Valley and address South of Lugo transmission constraints.
[2] This alternative would be feasible.
[3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Would place the new T/L adjacent to existing ROW for a short distance, which would reduce access road requirements and associated impacts</td><td colspan="2">Environmental Disadvantages
• New ROW and access roads would be needed to establish the east-west portion of this alternative, crossing the foothills of the Tehachapi Range resulting in greater environmental impacts (air quality, noise, visual)
• Construction along the foothills versus the valley floor would be more difficult and have the potential to interfere with arroyos in the area</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.3.4 Whirlwind Substation to Antelope Substation Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 1). It would establish a new utility corridor between the proposed Whirlwind Substation and the existing Antelope Substation in Segment 4 as shown in Figure 3.3-3. The new utility corridor would be at a distance of at least 2,000 feet from either the east or west side of the existing utility corridor. The width of the new corridor would be at least 200 feet, and the establishment of new access and spur roads would be required.

The west side route would result in locating the new 500-kV T/L closer to or through the Antelope Valley California Poppy Reserve and/or the Arthur B. Ripley Desert Woodland State Park than the proposed Segment 4. The east side route would result in placement of the new 500-kV T/L through existing or planned development areas. The western alignment would be approximately 15 miles long and the eastern alignment would be approximately 17 miles long, whereas the proposed Segment 4 between Whirlwind Substation and Antelope Substation would be approximately 16 miles long.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints. Furthermore, it would improve system reliability beyond that of the proposed Project/Action by eliminating the risk of simultaneous outage of T/Ls contained within a common corridor, specifically within Segment 4.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This alternative does not result in any substantial environmental advantage as compared to the proposed Project/Action.

Environmental Disadvantages

Not only would this alternative be slightly longer than the proposed Segment 4, but it would require a new 200-foot-wide corridor between the existing Antelope Substation and the proposed Whirlwind Substation. Furthermore, placing the new T/L at least 2,000 feet to the west of the existing T/L corridor would move the line closer to the Antelope Valley California Poppy Reserve, a California State Park, which would have the potential to result in greater biology and visual impacts. Placing the new T/L at least 2,000 feet to the east of the existing T/L corridor would potentially interfere with existing and planned development in the Antelope Valley resulting in additional land use impacts. Establishment of a new T/L corridor with new access roads and spur roads would result in greater air quality, biology, land use, noise, and visual impacts compared to the proposed Project/Action.

Alternative Conclusion

ELIMINATED. While this alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would improve the system reliability beyond that of the proposed Project/Action, it would require the establishment of a new T/L corridor and would result in a slightly longer alignment. The new corridor and access roads required would increase the potential for air quality, biology, land use, noise, and visual resource impacts. As such, this alternative would not substantially lessen any significant impacts associated with the proposed Project/Action without creating greater impacts of its own. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

Whirlwind Substation to Antelope Substation Alternative	Meets Project Purpose?	Feasible?	Meets Reliability Criteria?
	Yes[1]	Yes[2]	Yes[3]
Explanations: [1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA. In fact, it would improve the system reliability by eliminating the risk of simultaneous outage of T/Ls contained within a common corridor. It would also accommodate the projected load growth in the Antelope Valley and address South of Lugo transmission constraints. [2] This alternative would be feasible. [3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.			
Environmental Advantages • None identified		**Environmental Disadvantages** • Would require the establishment of a separate new corridor (200-feet wide) with access roads and spur roads, resulting in greater environmental impacts (air quality, biology, land use, noise, visual) • Placing the new T/L at least 2,000 feet to the west of the existing T/L corridor would move the line closer to the Antelope Valley California Poppy Reserve, a California State Park, which would have the potential to result in greater biology and visual impacts • Placing the new T/L at least 2,000 feet to the east of the existing T/L corridor would potentially interfere with existing and planned development in the Antelope Valley	
Conclusion: Eliminate from Further Analysis			

3.3.5 Antelope Substation to Vincent Substation Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 2). It would establish a new corridor between the Antelope Substation and the Vincent Substation in Segment 5, as shown in Figure 3.3-4. The new utility corridor would be at a distance of at least 2,000 feet from either the east or west side of the existing utility corridor. The width of the new corridor would be at least 200 feet, and the establishment of new access and spur roads would be required.

The west side route would result in the construction of approximately 19 miles of new 500-kV T/L, while the east side route would result in construction of approximately 18 miles of new 500-kV T/L. Either route would result in placement of the new 500-kV T/L through existing or planned development areas.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints. Furthermore, it would improve system reliability beyond that of the proposed Project/Action by eliminating the risk of simultaneous outage of T/Ls contained within a common corridor, specifically within Segment 5.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This alternative does not result in any substantial environmental advantage as compared to the proposed Project/Action.

Environmental Disadvantages

Not only would this alternative be slightly longer than the proposed Segment 5, but it would require a new 200-foot-wide corridor between Antelope Substation and Vincent Substation. Furthermore, placing the new T/L at least 2,000 feet to the west or east of the existing T/L corridor would potentially interfere with existing and planned development in the Antelope Valley resulting in additional land use impacts. Establishment of a new T/L corridor with new access roads and spur roads would result in greater air quality, biology, land use, noise, and visual impacts compared to the proposed Project/Action.

Alternative Conclusion

ELIMINATED. While this alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would improve the system reliability beyond that of the proposed Project/Action, it would require the establishment of a new T/L corridor and would result in a slightly longer alignment. The new corridor and access roads required would increase the potential for air quality, biology, land use, noise, and visual resource impacts. As such, this alternative would not substantially lessen any significant impacts associated with the proposed Project/Action without creating greater impacts of its own. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

Antelope Substation to Vincent Substation Alternative	**Meets Project Purpose?** Yes[1]	**Feasible?** Yes[2]	**Meets Reliability Criteria?** Yes[3]
Explanations: [1] This alternative would allow for the reliable interconnection of up to 4,500 MW of new wind generation resources in the TWRA. In fact, it would improve the system reliability by eliminating the risk of simultaneous outage of T/Ls contained within a common corridor. It would also accommodate the projected load growth in the Antelope Valley and address South of Lugo transmission constraints. [2] This alternative would be feasible. [3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.			
Environmental Advantages • None identified		**Environmental Disadvantages** • Would require the establishment of a separate new corridor (200-feet wide) with access roads and spur roads, resulting in greater environmental impacts (air quality, noise, visual) • Placing the new T/L at least 2,000 feet to the west or east of the existing T/L corridor would potentially interfere with existing and planned development in the Antelope Valley	
Conclusion: Eliminate from Further Analysis			

3.3.6 Use of the LADWP Transmission Corridor through the ANF Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 3, Option 6/11D). It would establish two new 500-kV T/Ls in one of two existing LADWP utility corridors, which would be expanded to accommodate the new lines, as shown in Figure 3.3-5. The two new 500-kV transmission lines could be located east or west or both east and west of the existing utility corridor. The northern LADWP corridor currently contains two 500-kV T/Ls, whereas the southern LADWP corridor contains one 500-kV T/L.

For the northern corridor (Option A), the two new 500-kV T/Ls would be installed within the existing LADWP utility corridor beginning at the Antelope Substation and continuing southwest through the ANF, Santa Clarita, unincorporated areas, and continue to SCE's Sylmar Substation located near the intersection of State Highway 14 and Interstate 5. A new 300-foot-wide east-west corridor paralleling the southern boundary of the ANF would need to be established to allow for one of the new 500-kV T/Ls to connect into the southern portion of Segment 11 near Gould Substation and for the other 500-kV T/L to connect into Segment 7 in the City of Duarte. This route would be approximately 62 miles longer than the proposed Segments 6 and 11.

For the southern corridor (Option B), the two new 500-kV T/Ls would be installed within the existing LADWP utility corridor beginning at the Vincent Substation and continuing southwest through the ANF, exiting the ANF in the Tujunga Valley near the Hansen Flood Control Basin. A new 300-foot-wide east-west corridor paralleling the southern boundary of the ANF would need to be established to allow for one of the new 500-kV T/Ls to connect into the southern portion of Segment 11 near Gould Substation and for the other 500-kV T/L to connect into Segment 7 in the City of Duarte. This route would be approximately 45 miles longer than the proposed Segments 6 and 11.

As part of this alternative (Option A or B), the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed as this line segment would be disconnected. Upgrades between the City of Duarte and Mesa Substation (Segment 7), between the Mesa Substation and Mira Loma Substation (Segment 8), and between the Gould Substation area and Mesa Substation (southern portion of Segment 11) would continue to occur, same as the proposed Project/Action.

Implementation of this alternative would result in two existing T/Ls in the ANF in Segment 6 (one 500-kV and one 220-kV) and two existing 220-kV T/Ls in the ANF in Segment 11, in addition to two new 500-kV T/Ls being added in one of two existing designated corridors through the ANF with existing LADWP transmission infrastructure.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, the longer routes identified under this alternative would compromise system reliability (see "Feasibility" discussion below). Consequently, this alternative would not allow for the interconnection of the full 4,500 MWs of wind generation, which is one of the primary objectives of the TRTP, and may not adequately improve the South of Lugo transmission constraints. It would, however, be expected to accommodate the projected load growth in the Antelope Valley.

Feasibility

No feasibility issues have been identified.

Reliability

Option A or B of this alternative would increase the distance of the two new 500-kV T/Ls by approximately 62 and 45 miles, respectively. The increased distance of these two T/Ls would increase the corresponding electrical impedance or resistance and thus would result in a less efficient use of the new transmission facilities. Consequently, the additional power flow would be carried by the existing T/Ls south of Vincent Substation as summarized in Table 3.3-1.

Table 3.3-1. Proposed Project/Action versus Use of LADWP Corridor through the ANF Alternative – Summary of Power Flow on Transmission South of Vincent

Transmission Line	Amp Rating	Proposed Project/Action			Use of LADWP Corridor through the ANF		
		Amp	MW	Percent	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	2480	2055	789	82.9%	2259	865	91.1%
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	3230	2030	776	62.8%	2221	845	68.8%
Mira Loma-Vincent 500-kV	3950	1800	1610	45.6%	1519	1359	38.5%
Mesa-Vincent No. 2 500-kV partially built to 500-kV	3230	1985	759	61.5%	1162	443	36.0%
Existing Mesa-Vincent 220-kV	2480	2103	807	84.8%	2377	910	95.8%

As shown in Table 3.3-1, loading on the existing Rio Hondo-Vincent No. 1 220-kV and Mesa-Vincent 220-kV T/Ls in increased by approximately 10 and 11 percent respectively when compared to the proposed transmission routing. This increase in power flow under base case conditions would result in a corresponding increase under outage conditions.

Evaluation of single outage conditions, as shown in Table 3.3-2, reveals that the existing Rio Hondo-Vincent No. 1 220-kV T/L loads in excess of its maximum long-term emergency limit of 2850 amps, the maximum overload capability for single outage conditions, under loss of the Rio Hondo-Vincent No. 2 500-kV T/L (energized at 220 kV). Consequently, this alternative would compromise system reliability and would not meet required CAISO/NERC/WECC Planning Standards.

Table 3.3-2. Proposed Project/Action versus Use of LADWP Corridor through the ANF Alternative – Summary of Power Flow on Transmission South of Vincent Under Outage Condition

Transmission Line	Amp Rating	Proposed Project/Action			Use of LADWP Corridor through the ANF		
		Amp	MW	Percent	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	2850	2705	1024	94.9%	3014	1139	105.8%
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	3710	0	0	0	0	0	0
Mira Loma-Vincent 500-kV	4540	1884	1673	41.5%	1599	1423	35.2%
Mesa-Vincent No. 2 500-kV partially built to 500-kV	3710	2275	859	61.3%	1282	485	34.6%
Existing Mesa-Vincent 220-kV	2850	2410	915	84.6%	2766	1049	97.1%

Environmental Advantages

Placement of the new 500-kV T/Ls one of the two existing LADWP corridors would eliminate the need to construct new T/Ls within Segments 6 and 11 through the ANF. In addition, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed, which would reduce the long-term visual "clutter" within the ANF.

Environmental Disadvantages

While this alternative would reduce the environmental impacts within Segments 6 and 11 through the ANF, which as proposed would occur within existing T/L corridors (no widening required), this alternative would require the widening of an existing LADWP corridor to accommodate the new 500-kV T/Ls, and depending on which one is used, may also be located within the ANF. This alternative would also require the establishment of a new 300-foot-wide corridor between the exit point of the LADWP corridor and Gould Substation and the City of Duarte, which would traverse through densely populated urban areas resulting in greater land use impacts than the proposed route. Furthermore, the longer routes identified under this alternative would result in potentially greater air quality, biology, noise, and visual impacts.

Alternative Conclusion

ELIMINATED. While this alternative would have the potential to reduce impacts within Segments 6 and 11 through the ANF, it would not fully meet the objectives/purpose and need of the TRTP, would compromise system reliability, and therefore would not meet CAISO/NERC/WECC requirements. Furthermore, it would result in a longer alignment which may also traverse the ANF (depending on which LADWP corridor is used) and result in greater air quality, biology, land use, noise, and visual impacts. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Use LADWP Transmission Corridor Through the ANF Alternative</td><td>Meets Project Purpose?
Partially[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
No[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, it could inhibit full integration of up to 4,500 MW (see #3 below). Furthermore, this alternative may not adequately improve the South of Lugo transmission constraints. It would be expected to generally accommodate the projected load growth in the Antelope Valley.
[2] This alternative would be feasible.
[3] The increased distance of the T/Ls would increase the corresponding electrical impedance and thus result in additional power flow being carried by the existing T/Ls south of Vincent Substation. This increase in power flow under base case conditions results in a corresponding increase under outage conditions. Evaluation of single outage conditions (i.e., loss of Rio Hondo-Vincent No. 2 500-kV T/L [energized at 220 kV]) reveals that the existing Rio Hondo-Vincent No. 1 220-kV T/L loads in excess of its maximum long-term emergency limit (by 5.8%). Therefore, this alternative would compromise system reliability and would therefore not meet CAISO/NERC/WECC requirements.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Eliminates construction in Segments 6 and 11 through the ANF
• Removes the existing Antelope-Mesa 220-kV T/L in Segment 6, which would reduce visual “clutter”</td><td colspan="2">Environmental Disadvantages
• Would require widening the existing LADWP corridor, which may be located with the ANF (Northern).
• Would require establishing a new corridor (300-feet wide) between the exit point of the LADWP corridor and Gould Substation and the City of Duarte in densely populated urban areas resulting in greater land use impacts
• Longer route than proposed Segments 6 and 11 resulting in potentially greater air quality, biology, noise, and visual impacts: Northern route (starting at Antelope Substation) would be approximately 62 miles longer, Southern route (starting at Vincent Substation) would be approximately 45 miles longer</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.3.7 New SCE Corridor Across the ANF Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 3, Option 6/11E). As shown in Figure 3.3-6, this alternative would locate two new 500-kV T/Ls in a new 300-foot-wide corridor beginning at the Vincent Substation and continuing in a southeast direction through the ANF, turning south and continuing between the San Gabriel Wilderness Area and the Sheep Mountain Wilderness Area generally following State Highway 39 through the ANF. The new corridor would exit the southern boundary of the ANF in the City of Azusa or City of Glendora. A new 300-foot-wide east-west corridor would be required from where the T/Ls exit the ANF to the City of Duarte to connect into Segment 7, and a 200-foot-wide east-west corridor between the City of Duarte and to a point south of the Gould Substation to connect into the southern portion of Segment 11. This route would be approximately 26 miles longer than the proposed Segments 6 and 11.

As part of this alternative, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed as this line segment would be disconnected. Upgrades between the City of Duarte and Mesa Substation (Segment 7), between the Mesa Substation and Mira Loma Substation (Segment 8), and between the Gould Substation area and Mesa Substation (southern portion of Segment 11) would continue to occur, same as the proposed Project/Action.

Implementation of this alternative would result in two existing T/Ls in the ANF in Segment 6 (one 500-kV and one 220-kV) and two existing 220-kV T/Ls in the ANF in Segment 11, in addition to two new 500-kV T/Ls in a new corridor through the ANF and continuing west from the southern boundary of the ANF to a point south of Gould Substation.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, the longer route identified under this alternative would compromise system reliability (see "Feasibility" discussion below). Consequently, this alternative would not allow for the interconnection of the full 4,500 MWs of wind generation, which is one of the primary objectives of the TRTP, and may not adequately improve the South of Lugo transmission constraints. It would, however, be expected to accommodate the projected load growth in the Antelope Valley.

Feasibility

No feasibility issues have been identified.

Reliability

This alternative would increase the distance of the two new 500-kV T/Ls by approximately 26 miles. The increased distance of these two T/Ls would increase the corresponding electrical impedance or resistance and thus results in less efficient use of the new transmission facilities. Consequently, the additional power flow would be carried by the existing T/Ls south of the Vincent Substation as summarized in Table 3.3-3.

Table 3.3-3. Proposed Project/Action versus New SCE Corridor Across the ANF Alternative – Summary of Power Flow on Transmission South of Vincent

Transmission Line	Amp Rating	Proposed Project/Action			New SCE Corridor Across the ANF		
		Amp	MW	Percent	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	2480	2055	789	82.9%	2209	845	89.1%
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	3230	2030	776	62.8%	2171	826	62.8%
Mira Loma-Vincent 500-kV	3950	1800	1610	45.6%	1662	1485	42.1%
Mesa-Vincent No. 2 500-kV partially built to 500-kV	3230	1985	759	61.5%	1105	422	34.2%
Existing Mesa-Vincent 220-kV	2480	2103	807	84.8%	2316	886	93.4%

As shown in Table 3.3-3, loading on the existing Rio Hondo-Vincent No. 1 220-kV and Mesa-Vincent 220-kV T/Ls would increase by approximately 6 and 8 percent respectively when compared to the proposed transmission routing. This increase in power flow under base case conditions would result in a corresponding increase under outage conditions.

Evaluation of single outage conditions, as shown in Table 3.3-4, reveals that the existing Rio Hondo-Vincent No. 1 220-kV T/L would load in excess of its maximum long-term emergency limit of 2850 amps, the maximum overload capability for single outage conditions, with the loss of the Rio Hondo-Vincent No. 2 500-kV T/L (energized at 220-kV). Consequently, this alternative would compromise system reliability and would not meet required CAISO/NERC/WECC Planning Standards.

Table 3.3-4. Proposed Project/Action versus New SCE Corridor Across the ANF Alternative – Summary of Power Flow on Transmission South of Vincent Under Outage Condition

Transmission Line	Amp Rating	Proposed Project/Action			New SCE Corridor Across the ANF		
		Amp	MW	Percent	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	2850	2705	1024	94.9%	2935	1104	103.0%
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	3710	0	0	0	0	0	0
Mira Loma-Vincent 500-kV	4540	1884	1673	41.5%	1749	1550	38.5%
Mesa-Vincent No. 2 500-kV partially built to 500-kV	3710	2275	859	61.3%	1280	481	34.5%
Existing Mesa-Vincent 220-kV	2850	2410	915	84.6%	2681	1012	94.1%

Environmental Advantages

Placement of the new 500-kV T/Ls in a new corridor through the ANF would eliminate the need to construct new T/Ls within Segments 6 and 11 through the ANF. In addition, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed, which would reduce the long-term visual "clutter" within Segment 6.

Environmental Disadvantages

While this alternative would reduce the environmental impacts within Segments 6 and 11 through the ANF, which as proposed would occur within existing T/L corridors (no widening required), this alternative would require the establishment of a new 300-foot-wide corridor to accommodate the new 500-kV T/Ls through the ANF. This alternative would also require the establishment of a new 200-foot-wide corridor between the City of Duarte and Gould Substation, which would traverse through densely populated urban areas resulting in greater land use impacts than the proposed Project/Action.

Furthermore, the longer route identified under this alternative would result in potentially greater air quality, biology, noise, and visual impacts.

Alternative Conclusion

ELIMINATED. While this alternative would have the potential to reduce impacts within Segments 6 and 11 through the ANF, it would not fully meet the objectives/purpose and need of the TRTP, would compromise system reliability, and therefore would not meet CAISO/NERC/WECC requirements. Furthermore, it would result in a longer alignment which would also traverse the ANF and result in greater air quality, biology, land use, noise, and visual impacts. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>New SCE Corridor Across the ANF Alternative</td><td>Meets Project Purpose?
Partially[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
No[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, it could inhibit full integration of up to 4,500 MW (see #3 below). Furthermore, this alternative may not adequately improve the South of Lugo transmission constraints. It would be expected to generally accommodate the projected load growth in the Antelope Valley.
[2] This alternative would be feasible.
[3] The increased distance of the T/Ls would increase the corresponding electrical impedance and thus result in additional power flow being carried by the existing T/Ls between the Vincent, Rio Hondo, and Mesa Substations. This increase in power flow under base case conditions results in a corresponding increase under outage conditions. Evaluation of single outage conditions (i.e., loss of Rio Hondo-Vincent No. 2 500-kV T/L [energized at 220 kV]) reveals that the existing Rio Hondo-Vincent No. 1 220-kV T/L loads in excess of its maximum long-term emergency limit (by 3%). Therefore, this alternative would compromise system reliability and would therefore not meet CAISO/NERC/WECC requirements.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Eliminates construction in Segments 6 and 11 through the ANF
• Removes the existing Antelope-Mesa 220-kV T/L in Segment 6, which would reduce visual “clutter”</td><td colspan="2">Environmental Disadvantages
• Would require establishing a new ROW (300-feet wide) within a new utility corridor through the ANF
• Would require establishing a new 300-foot-wide ROW between the exit point of the ANF and the City of Duarte and a new 200-foot-wide corridor between the City of Duarte and a point south of Gould Substation through densely populated urban areas resulting in greater land use impacts
• Longer route than proposed Segments 6 and 11 (approximately 26 miles longer) resulting in potentially greater air quality, biology, noise, and visual impacts</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.3.8 New Corridor Along Highway 14 Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 4). As shown in Figure 3.3-7, this alternative would locate two new 500-kV T/Ls in a new 300-foot-wide corridor beginning at the Vincent Substation and continuing west adjacent to State Highway 14 (outside of the ANF) to the Rinaldi Substation area (near the interchange of the I-5 and Highway 210). At this point, the new 500-kV T/Ls would turn and continue east in a new 300-foot-wide east-west corridor to La Cañada Flintridge (Gould Substation) to connect into the southern portion of Segment 11 and on to the City of Duarte to connect into Segment 7. This route would be approximately 42 miles longer than the proposed Segments 6 and 11.

As part of this alternative, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed as this line segment would be disconnected. Upgrades between the City of Duarte and Mesa Substation (Segment 7), between the Mesa Substation and Mira Loma Substation (Segment 8), and between the Gould Substation area and Mesa Substation (southern portion of Segment 11) would continue to occur, same as the proposed Project/Action.

Implementation of this alternative would result in two existing T/Ls in the ANF in Segment 6 (one 500-kV and one 220-kV) and two existing 220-kV T/Ls in the ANF in Segment 11, in addition to two new 500-kV T/Ls in a new corridor outside of the ANF between Vincent Substation and the City of Duarte.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, the longer route identified under this alternative would compromise system reliability (see "Feasibility" discussion below). Consequently, this alternative would not allow for the interconnection of the full 4,500 MWs of wind generation, which is one of the primary objectives of the TRTP, and may not adequately improve the South of Lugo transmission constraints. It would, however, be expected to accommodate the projected load growth in the Antelope Valley.

Feasibility

No feasibility issues have been identified.

Reliability

This alternative would increase the distance of the two new 500-kV T/Ls by approximately 42 miles. The increased distance of these two T/Ls would increase the corresponding electrical impedance and thus results in less efficient use of the new transmission facilities. Consequently, the additional power flow would be carried by the existing T/Ls south of the Vincent Substation as summarized in Table 3.3-5.

Table 3.3-5. Proposed Project/Action versus New Corridor Along Highway 14 Alternative – Summary of Power Flow on Transmission South of Vincent

Transmission Line	Amp Rating	Proposed Project/Action			New Corridor Along Highway 14		
		Amp	MW	Percent	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	2480	2055	789	82.9%	2237	854	90.2%
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	3230	2030	776	62.8%	2200	835	68.1%
Mira Loma-Vincent 500-kV	3950	1800	1610	45.6%	1123	1221	28.4%
Mesa-Vincent No. 2 500-kV partially built to 500-kV	3230	1985	759	61.5%	1364	428	42.2%
Existing Mesa-Vincent 220-kV	2480	2103	807	84.8%	2352	898	94.8%

As shown in Table 3.3-5, loading on the existing Rio Hondo-Vincent No. 1 220-kV and Mesa-Vincent 220-kV T/Ls in increased by approximately 7 and 10 percent respectively when compared to the proposed transmission routing. This increase in power flow under base case conditions would result in a corresponding increase under outage conditions.

Evaluation of single outage conditions, as shown in Table 3.3-6, reveals that the existing Rio Hondo-Vincent No. 1 220-kV T/L loads in excess of its maximum long-term emergency limit of 2850 amps, the maximum overload capability for single outage conditions, under loss of the Rio Hondo-Vincent No. 2 500-kV T/L (energized at 220 kV). Consequently, this alternative would compromise system reliability and would not meet required CAISO/NERC/WECC Planning Standards.

Environmental Advantages

Placement of the new 500-kV T/Ls in a new corridor along Highway 14 would eliminate the need to construct new T/Ls within Segments 6 and 11 through the ANF. In addition, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed, which would reduce the long-term visual "clutter" within Segment 6.

Table 3.3-6. Proposed Project/Action versus New Corridor Along Highway 14 Alternative – Summary of Power Flow on Transmission South of Vincent Under Outage Condition

Transmission Line	Amp Rating	Proposed Project/Action			New Corridor Along Highway 14		
		Amp	MW	Percent	Amp	MW	Percent
Rio Hondo-Vincent No. 1 220-kV	2850	2705	1024	94.9%	2935	1118	104.4%
Rio Hondo-Vincent No. 2 500-kV energized at 220-kV	3710	0	0	0	0	0	0
Mira Loma-Vincent 500-kV	4540	1884	1673	41.5%	1437	1277	31.7%
Mesa-Vincent No. 2 500-kV partially built to 500-kV	3710	2275	859	61.3%	1300	489	34.5%
Existing Mesa-Vincent 220-kV	2850	2410	915	84.6%	2724	1028	95.6%

Environmental Disadvantages

While this alternative would reduce the environmental impacts within Segments 6 and 11 through the ANF, which as proposed would occur within existing T/L corridors (no widening required), this alternative would require the establishment of a new 300-foot-wide corridor to accommodate the new 500-kV T/Ls between the Vincent Substation and the Rinaldi Substation area (near the interchange of Interstate 5 and Highway 210). This alternative would also require the establishment of a new 300-foot-wide corridor between the Rinaldi Substation area to the City of Duarte, which would traverse through densely populated urban areas resulting in greater land use impacts than the proposed Project/Action. Furthermore, the longer route identified under this alternative would result in potentially greater air quality, biology, noise, and visual impacts.

Alternative Conclusion

ELIMINATED. While this alternative would have the potential to reduce impacts within Segments 6 and 11 through the ANF, it would not fully meet the objectives/purpose and need of the TRTP, would compromise system reliability, and therefore would not meet CAISO/NERC/WECC requirements. Furthermore, it would result in a longer alignment requiring the establishment of substantial new ROW resulting in greater air quality, biology, land use, noise, and visual impacts. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

New Corridor Along Highway 14 Alternative	Meets Project Purpose? Partially[1]	Feasible? Yes[2]	Meets Reliability Criteria? No[3]
Explanations: [1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, it could inhibit full integration of up to 4,500 MW (see #3 below). Furthermore, this alternative may not adequately improve the South of Lugo transmission constraints. It would be expected to generally accommodate the projected load growth in the Antelope Valley. [2] This alternative would be feasible. [3] The increased distance of the T/Ls would increase the corresponding electrical impedance and thus result in additional power flow being carried by the existing T/Ls between the Vincent and Rio Hondo Substations and between the Vincent and Mesa Substations. This increase in power flow under base case conditions results in a corresponding increase under outage conditions. Evaluation of single outage conditions (i.e., loss of Rio Hondo-Vincent No. 2 500-kV T/L [energized at 220 kV]) reveals that the existing Rio Hondo-Vincent No. 1 220-kV T/L loads in excess of its maximum long-term emergency limit (by 4.4%). Therefore, this alternative would compromise system reliability and would therefore not meet CAISO/NERC/WECC requirements.			
Environmental Advantages • Eliminates construction in Segments 6 and 11 through the ANF • Removes the existing Antelope-Mesa 220-kV T/L in Segment 6, which would reduce visual "clutter"		**Environmental Disadvantages** • Would require establishing a new ROW (300-feet wide) between the Vincent Substation and the Rinaldi Substation area (near the interchange of Interstate 5 and Highway 210) and from the Rinaldi Substation area to the City of Duarte through densely populated urban areas resulting in greater land use impacts • Longer route than proposed Segments 6 and 11 (approximately 42 miles longer) resulting in potentially greater air quality, biology, noise, and visual impacts	
Conclusion: Eliminate from Further Analysis			

3.3.9 New Corridor Through the Cajon Pass Alternative

Alternative Description

This alternative was considered by SCE in its PEA (RA Eliminated 5). As shown in Figure 3.3-8, this alternative would route a new 500-kV T/L (Mira Loma-Vincent 500-kV T/L) in a new corridor beginning at Vincent Substation and continuing east towards Lugo Substation, located in Hesperia, then turn south and continue through the Cajon Pass within the San Bernardino National Forest (SBNF) to the cities of Fontana and Rialto. From this point, approximately 18 miles of existing ROW would be utilized to complete the T/L route to Mira Loma Substation. This route would be approximately 10 miles longer than the proposed Segments 6, 7 and 8.

As part of this alternative, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed as this line segment would be disconnected. While this alternative would eliminate construction of the proposed Mira Loma-Vincent 500-kV T/L from Vincent Substation to the southern boundary of the ANF (Segment 6), from the southern boundary of the ANF to the Mesa Substation (Segment 7) and from the San Gabriel Junction to the Mira Loma Substation (Segment 8A), upgrades in Segments 6, 7, 8B, 8C, and 11 would be required. In Segment 6, between the Vincent Substation and the crossover span, the Antelope-Mesa 220-kV T/L would be rebuilt with 500-kV single-circuit structures to complete the Rio Hondo-Vincent No. 2 500-kV T/L. In Segment 7, from the southern boundary of the ANF to the Rio Hondo Substation, the Antelope-Mesa 220-kV T/L would be rebuilt with 500-kV single-circuit structures to accommodate the new Rio Hondo-Vincent No. 2 500-kV T/L. No construction would occur in Segment 7 between Rio Hondo Substation and Mesa Substation. Upgrades in Segment 8 (8B and 8C) would be limited to rebuilding Chino-Mira Loma No. 1, 2, and 3 between Chino Substation and Mira Loma Substation.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would allow for the interconnection of new wind generation resources in the TWRA; however, it would inhibit the full integration of the 4,500 MW of currently planned or expected wind generation due to reliability issues (see "Feasibility" discussion below). Furthermore, it would not improve the South of Lugo transmission constraints. It would, however, be expected to accommodate the projected load growth in the Antelope Valley.

Feasibility

No feasibility issues have been identified.

Reliability

Locating multiple transmission lines in a common corridor increases the potential to compromise overall system reliability if the risk factors of common mode outages are high. In the case of the Cajon Pass, the major significant risk factors are forest fires. History has demonstrated that forest fires are a very real risk factor affecting multiple transmission lines in a common corridor on an annual basis. As an example, all three existing 500-kV T/Ls located in the Cajon Pass were lost due to a forest fire during the heavy load demand period in 2002. Locating the new 500-kV T/L within the same general location of the three existing 500-kV T/Ls traveling from the Victorville area to the Mira Loma area (the Cajon Pass) would expose the new T/L to the same forest fire hazard that has historically occurred on an annual basis when these T/Ls are heavily loaded.

A special protection system (SPS) is already in place to shed a significant amount of SCE system load under outages of the existing Lugo-Mira Loma 500-kV T/Ls. Adding a fourth line in this high risk corridor and increasing power flow transfers would result in severe thermal and voltage stability problems that cannot be mitigated with the use of an SPS. Because of the high risk of forest fires in this common corridor during times of high loading of these transmission lines and the corresponding impact associated with simultaneous outage of 500-kV T/Ls, such limitations would render the new T/L effectively useless in increasing system capabilities until new 500-kV T/Ls in different corridors are constructed.

Consequently, this alternative would require the implementation of a complex SPS, which would not be practical or feasible; therefore, it would not comply with CAISO/NERC/WECC requirements.

Environmental Advantages

Placement of the new 500-kV T/Ls in a new corridor through the Cajon Pass would eliminate the need to construct new T/Ls within Segments 6 and 11 through the ANF. In addition, the existing Antelope-Mesa 220-kV T/L in Segment 6 would be removed, which would reduce the long-term visual "clutter" within Segment 6.

Environmental Disadvantages

While this alternative would reduce the environmental impacts within Segments 6 and 11 through the ANF, which as proposed would occur within existing T/L corridors (no widening required), this alternative would require the establishment of a new 300-foot-wide corridor to accommodate the new 500-kV T/L from the Vincent Substation to the Lugo Substation and then south through the Cajon Pass, which would traverse through the SBNF, to the Cities of Fontana and Rialto. Furthermore, the longer route identified under this alternative would result in potentially greater air quality, biology, noise, and visual impacts.

Alternative Conclusion

ELIMINATED. While this alternative would have the potential to reduce impacts within Segments 6 and 11 through the ANF, it would not fully meet the objectives/purpose and need of the TRTP or comply with CAISO/NERC/WECC requirements. Furthermore, this alternative would result in a longer alignment requiring the establishment of substantial new ROW through the SBNF resulting in greater air quality, biology, noise, and visual impacts. Since this alternative does not fully meet the objectives/purpose and need of the TRTP, does not comply with reliability requirements, and would result in greater environmental impacts, it has been eliminated from further consideration.

SUMMARY

New Corridor Through Cajon Pass Alternative	**Meets Project Purpose?** Partially[1]	**Feasible?** No[2]	**Meets Reliability Criteria?** No[3]
Explanations: [1] This alternative would not result in sufficient system capability to interconnect and deliver up to 4,500 MW of generation resources from the TWRA (see #3 below), and would not improve the South of Lugo transmission constraints. It would, however, be expected to generally accommodate the projected load growth in the Antelope Valley. [2] This alternative would be feasible. [3] Implementation of a complex SPS would be required, which would not be practical or feasible. Therefore it would not comply with CAISO/NERC/WECC requirements.			
Environmental Advantages • Eliminates construction in Segments 6 and 11 through the ANF • Removes the existing Antelope-Mesa 220-kV T/L in Segment 6, which would reduce visual “clutter”		**Environmental Disadvantages** • Would require establishing a new ROW (300-feet wide) from the Vincent Substation to the Lugo Substation and then south through the Cajon Pass, through the San Bernardino National Forest (SBNF), to the Cities of Fontana and Rialto • Longer route than proposed Project/Action (approximately 10 miles longer) and would impact the SBNF resulting in potentially greater air quality, biology, noise, and visual impacts	
Conclusion: Eliminate from Further Analysis			

3.3.10 West Lancaster Alternative

Alternative Description

This alternative was suggested by members of the public prior to the scoping period. It would re-route the new 500-kV T/L in Segment 4 along 115th Street West rather than 110th Street West, as shown in Figure 3.3-9. The West Lancaster Alternative would deviate from the proposed route at approximately S4 MP 14.9, where the new 500-kV T/L would turn south down 115th Street West for approximately 2.9 miles and turn east for approximately 0.5 mile, rejoining the proposed route at S4 MP 17.9. This re-route would increase the overall distance of Segment 4 by approximately 0.4 mile; however, the number of overall structures would decrease by one due to greater spacing between structures compared to the proposed Project/Action (SCE, 2008b: DR#4 – Q4-02).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

The new T/L would be placed along 115th Street West in undeveloped area instead of through development thereby minimizing disturbance to current residences or access to properties located along the paved 110th Street West. As such, land use impacts and visual impacts would be reduced.

Environmental Disadvantages

This alternative would be slightly longer (~0.4 mile) within a new corridor, thereby slightly increasing potential impacts to air quality, biology, noise, and traffic impacts during construction.

Alternative Conclusion

RETAINED FOR FURTHER ANALYSIS. This alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would avoid current residences and access to properties that would otherwise be impacted by the proposed route. These reductions would outweigh the slight increase in construction impacts associated with the incremental increase in route length. Therefore, this alternative has been retained for further analysis in the EIR/EIS.

SUMMARY

<table>
<tr><td>West Lancaster Alternative</td><td>Meets Project Purpose?
Yes[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints.
[2] This alternative would be feasible.
[3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• The new T/L would be placed along 115th Street West, rather than 110th Street West, where the T/L would be placed between developed areas, minimizing disturbance to current residences and access to properties located along the paved 110th Street West</td><td colspan="2">Environmental Disadvantages
• Would result in a slightly longer alignment (~0.4 mile) within new ROW, thereby increasing air quality, biology, noise, and traffic impacts</td></tr>
<tr><td colspan="4">Conclusion: Retain for Further Analysis</td></tr>
</table>

3.3.11 Chino Hills Route A Alternative

Alternative Description

This alternative was suggested by the City of Chino Hills during the scoping period. This represents a refinement on the Chino Hills State Park alternatives considered by SCE in its PEA (RA Eliminated 6, Options 1 and 2). As shown in Figure 3.3-10, this alternative would deviate from the proposed Project/Action beginning about two miles east of State Route 57 (approximately S8A MP 19.2), where the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L and the existing un-energized Chino-Mesa T/L (both in the same corridor as that of Segment 8A) separate from one another. At that point, the new Mira Loma-Vincent 500-kV T/L would turn southeast, remaining parallel and south of the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L for approximately 6.2 miles, traversing Los Angeles, Orange, and San Bernardino Counties, including approximately 2.3 miles of Chino Hills State Park (CHSP or park) (SCE, 2008b – DR#4: Q4-14). Along this portion of the alignment, approximately 150 feet of additional ROW would be required to accommodate the new 500-kV double-circuit structures.

At the junction of the existing Walnut/Olinda-Mira Loma 220-kV T/Ls and the existing Serrano-Mira Loma and Serrano-Rancho Vista 500-kV T/Ls, the new Mira Loma-Vincent 500-kV T/L would terminate into a new 500-kV gas-insulated switching station. The existing 500-kV T/Ls would be looped into the new switching station, which would be a minimum of 4 to 5 acres in size, assuming the use of gas-insulated technology, or as much as 11 to 12 acres for air-insulated technology, allowing for power to be transferred along the existing 500-kV T/Ls to Mira Loma Substation. For the switching station utilizing gas-insulated technology, a lower profile would result. The building would be approximately 42-feet high and the dead-end structures on either side of the building would be approximately 65-feet high (SCE, 2008c – DR#5-07). The entire system would be enclosed in a sheet metal building, which would require an air conditioning system (SCE, 2008c – DR#5-07). For an open-air switching station, standard traditional equipment and components would be utilized; however, a higher station profile would result. The two buses would be approximately 360-feet long and 65-feet high, and the six dead-end structures would each be approximately 108-feet high (SCE, 2008c – DR#5-07).

From the point of deviation (S8A MP 19.2) to the new switching station, approximately 20 to 22 new double-circuit 500-kV structures would be required, of which approximately 8 to 10 structures would be within CHSP (SCE, 2008b – DR#4: Q4-11). In addition, approximately 6 new single-circuit 500-kV structures would be required to loop the existing 500-kV T/Ls into the switching station (SCE, 2008b – DR#4: Q4-11).

As a result of this alternative, no upgrades would occur in Segment 8A between S8A MP 19.2 and 35.2 (16 miles) through Chino Hills, Chino, and Ontario. Upgrades to the existing Chino-Mira Loma No. 1, 2, and 3 220-kV T/Ls in Segments 8B and 8C would also not occur (SCE, 2008b – DR#4: Q4-13). Consequently, approximately 78 double-circuit 500-kV structures (18 LSTs and 60 TSPs) and approximately 40 double-circuit 220-kV structures (associated with the re-build of Chino-Mira Loma No. 3) would be eliminated from Segment 8 (SCE, 2008b – DR#4: Q4-12).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

This alternative is feasible; however, it would not be consistent with the CHSP General Plan, which makes its legal feasibility dependent on approval of a General Plan amendment by the California Parks and Recreation Commission.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This routing alternative avoids proximity of the T/L to existing residences of the City of Chino Hills. Implementation of this alternative would eliminate construction of approximately 16 miles of 500-kV structures along Segment 8A beginning at approximately S8A MP 19.2 and ending at Mira Loma Substation (S8A MP 35.2), as well as eliminate construction in Segments 8B and 8C between Chino Substation and Mira Loma Substation. Air quality and biology impacts during construction as well as long-term visual impacts through Chino Hills, Chino, and Ontario would be reduced compared to the proposed Project/Action as a result.

Specific to this alternative (not part of the proposed Project), use of gas-insulted technology for the switching station versus open-air technology would result in a lower profile and would impact less land (4 to 5 acres vs. 11 to 12 acres), which would reduce potential visual and land use impacts associated with the new switching station.

Environmental Disadvantages

CHSP is a “premier natural open-space area in the hills of Santa Ana Canyon near Riverside” (CSP, 2007). The Park is an important link in the Puente-Chino Hills biological corridor, and offers sixty miles of trails and fire roads providing opportunities for viewing wildlife and native plants (CSP, 2007). While this alternative would place the new 500-kV T/L parallel to existing T/Ls within CHSP, it would require widening of the existing ROW for approximately 6.2 miles, of which 2.3 miles would be through the Park, by 150 feet to accommodate the new 500-kV T/L. The need for expanded ROW would result in greater biological impacts compared to the proposed route, where construction between S8A MP19.2 and 35.2 would occur within existing ROW, with the exception of approximately 0.45 miles of new ROW west of Mira Loma Substation. The establishment of a new switching station within CHSP would further increase biological impacts and impacts to CHSP. The switching station location for this alternative would require extensive grading and would adversely affect a riparian habitat area. The addition of new 500-kV structures and a switching station within CHSP would also result in substantial long-term visual impacts as well as impacts on recreational use of the Park. The addition of new infrastructure within CHSP would also result in potentially significant land use impacts, as this alternative would be inconsistent with the

CHSP General Plan, and would therefore require the approval of a General Plan amendment by the California Parks and Recreation Commission.

Alternative Conclusion

RETAINED FOR FURTHER ANALYSIS. This alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would have the potential to reduce construction impacts (air quality and biology) and long-term visual impacts to the residences of Chino Hills, Chino, and Ontario as a result of shortening the overall route by approximately 9.8 miles. While impacts would be shifted to CHSP, the proposed 500-kV T/L would parallel existing T/Ls through the park and the switching station would be placed near the existing infrastructure within the park. Furthermore, the use of gas-insulated technology for the switching station would allow it to be built with a profile that minimizes potential visual impacts within the park. Therefore, this alternative has been retained for further analysis in the EIR/EIS.

SUMMARY

<table>
<tr><td>Chino Hills Route A Alternative</td><td>Meets Project Purpose?
Yes[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints.
[2] This alternative is feasible; however, it would be inconsistent with the CHSP General Plan which makes its legal feasibility dependent on approval of a General Plan amendment by the California Parks and Recreation Commission.
[3] Meets CAISO/NERC/WECC requirements.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Avoids proximity to existing residents in the City of Chino Hills
• Eliminates construction of approximately 16 miles of 500-kV structures along Segment 8A from S8A MP19.2 to Mira Loma Substation through Chino Hills, Chino, and Ontario reducing air quality, biology, noise, and visual impacts
• Eliminates construction in Segments 8B and 8C between Chino and Mira Loma Substations</td><td colspan="2">Environmental Disadvantages
• Would place approximately 6.2 miles of new 500-kV T/L within new ROW (expand ROW by 150 feet), including 2.3 miles within CHSP potentially increasing biology, recreational, and visual impacts
• Would require a new 500-kV switching station within CHSP potentially increasing biology, recreational, and visual impacts
• Switching station location would require extensive grading and would adversely affect a riparian habitat area
• Would be inconsistent with the CHSP General Plan and therefore have potentially significant land use impacts</td></tr>
<tr><td colspan="4">Conclusion: Retained for Further Analysis</td></tr>
</table>

3.3.12 Chino Hills Route B Alternative

Alternative Description

This alternative was suggested by the City of Chino Hills. This represents a refinement to the Chino Hills Route A Alternative. As shown in Figure 3.3-11, this alternative would deviate from the proposed Project/Action beginning about two miles east of State Route 57 (approximately S8A MP 19.2), where the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L and the existing un-energized Chino-Mesa T/L (both in the same corridor as that of Segment 8A) separate from one another. At that point, the new Mira Loma-Vincent 500-kV T/L would turn southeast, remaining parallel and north of the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L for approximately 3.9 miles, traversing Los Angeles, Orange, and San Bernardino Counties. The alternative route would then enter CHSP, continuing to parallel the existing 220-kV double-circuit T/L for approximately 4.3 miles, at which point the new

Mira Loma-Vincent 500-kV T/L would exit the east side of CHSP. The new T/L would continue parallel to the existing 220-kV double-circuit T/L for another approximately 0.4 mile outside of CHSP before turning south, crossing the existing T/Ls, to terminate at a new 500-kV switching station located just south of the existing 500-kV T/Ls. Approximately 150 feet of additional ROW would be required to accommodate the new 500-kV double-circuit structures along the re-routed portion of this alternative (SCE, 2008b – DR#4: Q4-24).

The existing 500-kV T/Ls located in this area would be looped into the new switching station, which would be a minimum of 4 to 5 acres in size, assuming the use of gas-insulated technology, or as much as 11 to 12 acres for air-insulated technology, allowing for power to be transferred along the existing 500-kV T/Ls to Mira Loma Substation. For the switching station utilizing gas-insulated technology, a lower profile would result. The building would be approximately 42-feet high and the dead-end structures on either side of the building would be approximately 65-feet high (SCE, 2008c – DR#5-07). The entire system would be enclosed in a sheet metal building, which would require an air conditioning system (SCE, 2008c – DR#5-07). For an open-air switching station, standard traditional equipment and components would be utilized; however, a higher station profile would result. The two buses would be approximately 360-feet long and 65-feet high, and the six dead-end structures would each be approximately 108-feet high (SCE, 2008c – DR#5-07).

From the point of deviation (S8A MP 19.2) to the new switching station, approximately 27 new double-circuit 500-kV structures would be required, of which approximately 13 to 15 structures would be within CHSP (SCE, 2008b – DR#4: Q4-23 Update 2). In addition, approximately 6 new single-circuit and 2 new double-circuit 500-kV structures would be required outside of CHSP to loop the existing 500-kV T/Ls into the switching station (SCE, 2008b – DR#4: Q4-23).

As a result of this alternative, no upgrades would occur in Segment 8A between S8A MP 19.2 and 35.2 (16 miles) through Chino Hills, Chino, and Ontario. Upgrades to the existing Chino-Mira Loma No. 1, 2, and 3 220-kV T/Ls in Segments 8B and 8C would also not occur (SCE, 2008b – DR#4: Q4-13). Consequently, approximately 78 double-circuit 500-kV structures (18 LSTs and 60 TSPs) and approximately 40 double-circuit 220-kV structures (associated with the re-build of Chino-Mira Loma No. 3) would be eliminated from Segment 8 (SCE, 2008b – DR#4: Q4-12).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

This alternative is feasible; however, it would not be consistent with the CHSP General Plan, which makes its implementation dependent on approval of a General Plan amendment by the California Parks and Recreation Commission.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This routing alternative avoids proximity of the T/L to existing residences of the City of Chino Hills. Implementation of this alternative would eliminate construction of approximately 16 miles of 500-kV structures along Segment 8A beginning at approximately S8A MP 19.2 and ending at Mira Loma Substation (S8A MP 35.2) , as well as eliminate construction in Segments 8B and 8C between Chino Substation and Mira Loma Substation. Air quality and biology impacts during construction as well as long-term visual impacts through Chino Hills, Chino, and Ontario would be reduced compared to the proposed Project/Action as a result.

Specific to this alternative (not part of the proposed Project), use of gas-insulted technology for the switching station versus open-air technology would result in a lower profile and would impact less land (4 to 5 acres vs. 11 to 12 acres), which would reduce potential visual and land use impacts associated with the new switching station.

Environmental Disadvantages

CHSP is a "premier natural open-space area in the hills of Santa Ana Canyon near Riverside" (CSP, 2007). The Park is a critical link in the Puente-Chino Hills biological corridor, and offers sixty miles of trails and fire roads providing opportunities for viewing wildlife and native plants (CSP, 2007). While this alternative would place the new 500-kV T/L parallel to existing T/Ls within CHSP, it would require widening of the existing ROW for approximately 8.6 miles, of which 4.3 miles would be through the Park, by 150 feet to accommodate the new 500-kV T/L. The need for expanded ROW would result in greater biological impacts compared to the proposed route, where construction between S8A MP19.2 and 35.2 would occur within existing ROW, with the exception of approximately 0.45 miles of new ROW west of Mira Loma Substation. This alternative would also require the establishment of a new switching station east of CHSP, further increasing biological impacts. The addition of new 500-kV structures within CHSP and a new switching station (outside of CHSP) would also result in substantial long-term visual impacts and as well as impacts to the recreational use of the Park. The addition of new infrastructure within CHSP would also result in potentially significant land use impacts, as this alternative it would not be consistent with the CHSP General Plan, and would therefore require the approval of a General Plan amendment by the California Parks and Recreation Commission.

Alternative Conclusion

RETAINED FOR FURTHER ANALYSIS. This alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would have the potential to reduce construction impacts (air quality and biology) and long-term visual impacts to the residences of Chino Hills, Chino, and Ontario as a result of shortening the overall route by approximately 7.4 miles. While impacts would be shifted to CHSP, the proposed 500-kV T/L would parallel existing T/Ls through the park and the switching station would be placed near the existing infrastructure just east of the park. Furthermore, the use gas insulated technology for the switching station would allow it to be built with a profile that closely blends with the surrounding environment, minimizing potential visual impacts. Therefore, this alternative has been retained for further analysis in the EIR/EIS.

SUMMARY

<table>
<tr><td>Chino Hills Route B Alternative</td><td>Meets Project Purpose?
Yes[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the reliable interconnection of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints.
[2] This alternative is feasible; however, it would not be consistent with the CHSP General Plan, which makes its legal feasibility dependent on approval of a General Plan amendment by the California Parks and Recreation Commission.
[3] Meets CAISO/NERC/WECC requirements.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Avoids proximity to existing residents in the City of Chino Hills
• Eliminates construction of approximately 16 miles of 500-kV structures along Segment 8A from S8A MP19.2 to Mira Loma Substation through Chino Hills, Chino, and Ontario reducing air quality, biology, noise, and visual impacts
• Eliminates construction in Segments 8B and 8C between Chino and Mira Loma Substations</td><td colspan="2">Environmental Disadvantages
• Would place approximately 8.6 miles of new 500-kV T/L within new ROW (expand ROW by 150 feet), including 4.3 miles within CHSP, potentially increasing biology, recreational, and visual impacts
• Would require a new 500-kV switching station (outside of CHSP) potentially increasing biology, land use, and visual impacts
• Would be inconsistent with the CHSP General Plan and therefore have potentially significant land use impacts</td></tr>
<tr><td colspan="4">Conclusion: Retained for Further Analysis</td></tr>
</table>

3.3.13 Chino Hills Route C Alternative

Alternative Description

This alternative was suggested by the City of Chino Hills. This represents a refinement to the Chino Hills Route A Alternative based on discussions between Chino Hills, CHSP, SCE, and the CPUC. The route through CHSP has been modified to circumvent Raptor Ridge, which would minimize potential visual impacts and design complications associated with crossing Raptor Ridge, and would avoid crossing the Raptor Ridge Trail (SCE, 2008c – DR#5: Q5-05). As shown in Figure 3.3-12, this alternative would deviate from the proposed Project/Action beginning about two miles east of State Route 57 (approximately S8A MP 19.2), where the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L and the existing un-energized Chino-Mesa T/L (both in the same corridor as that of Segment 8A) separate from one another. At that point, the new Mira Loma-Vincent 500-kV T/L would turn southeast, and remain parallel and south of the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L up to the CHSP boundary (approximately 3.9 miles). Along this portion of the alignment, approximately 150 feet of additional ROW would be required to accommodate the new 500-kV double-circuit structures. At this point, the alternative route would turn east along a new approximately 300-foot-wide ROW for approximately 1.6 miles, which would remain just north of the CHSP boundary, to a new 500-kV switching station (SCE, 2008b – DR#4: Q4-34 and Q4-37). Approximately 30 double-circuit 500-kV LSTs would be required for this approximately 5.5-mile re-route to the new switching station (SCE, 2008b – DR#4: Q4-35).

The two existing 500-kV single-circuit T/Ls located within CHSP would be re-routed to allow them to loop into the new switching station, which would be a minimum of 4 to 5 acres in size, assuming the use of gas-insulated technology, or as much as 11 to 12 acres for air-insulated technology, allowing for power to be transferred along the existing 500-kV T/Ls to Mira Loma Substation. For the switching station utilizing gas-insulated technology, a lower profile would result. The building would be approximately 42-

feet high and the dead-end structures on either side of the building would be approximately 65-feet high (SCE, 2008c – DR#5-07). The entire system would be enclosed in a sheet metal building, which would require an air conditioning system (SCE, 2008c – DR#5-07). For an open-air switching station, standard traditional equipment and components would be utilized; however, a higher station profile would result. The two buses would be approximately 360-feet long and 65-feet high, and the six dead-end structures would each be approximately 108-feet high (SCE, 2008c – DR#5-07).

Approximately 3.0 miles of new ROW within CHSP would be required to re-route the existing 500-kV T/Ls in and out of the new switching station. The new north-south re-route into the switching station (1.5 miles) would require an approximately 330-foot wide ROW to accommodate the two 500-kV single-circuit structures. The new east-west re-route beginning at the switching station and proceeding north and east around raptor ridge (1.9 mile, of which 0.4 mile is outside of CHSP) would require an approximately 480-foot wide ROW to accommodate the two 500-kV single-circuit structures and the re-routed 220-kV double-circuit structures (discussed below) (SCE, 2008b – DR#4: Q4-37). To complete the two re-routes of the 500-kV T/Ls (approximately 3.4-miles) would require approximately 24 new single-circuit 500-kV LSTs (20 within CHSP and 4 outside CHSP) (SCE, 2008b – DR#4: Q4-35). In addition, approximately 15 LSTs (12 of which are within CHSP) of the existing single-circuit 500-kV T/Ls would be removed (2.5 miles) (SCE, 2008b – DR#4: Q4-36).

A portion of the existing 220-kV T/Ls within CHSP would also be re-routed as part of this alternative. Beginning just west of the CHSP boundary (outside of CHSP), the existing 220-kV double-circuit structures would be re-routed to parallel the new 500-kV double-circuit structures along the northern boundary of CHSP to the new switching station (1.6 miles). As noted above, the new ROW in this area would be approximately 300-feet wide, to accommodate the 500-kV double-circuit and 220-kV double-circuit structures (SCE, 2008b – DR#4: Q4-37). The 220-kV T/Ls would continue past the switching station, paralleling the re-routed 500-kV T/Ls for approximately 0.4 mile to the boundary of CHSP. At this point, the re-routed 220-kV and 500-kV T/Ls would enter CHSP for approximately 1.5 mile to reconnect with the existing 220-kV and 500-kV structures. As noted above, the new ROW in this area would be approximately 480-feet wide. To complete the approximately 3.5 mile 220-kV re-route, approximately 20 to 25 new double-circuit 220-kV LSTs would be required (6-8 within CHSP and 14-17 outside CHSP) (SCE, 2008b – DR#4: Q4-34). In addition, approximately 10 to 12 existing 220-kV double-circuit LSTs within CHSP and 2 to 4 outside CHSP would be removed (3.2 miles) (SCE, 2008b – DR#4: Q4-33 Update 2).

As a result of this alternative, no upgrades would occur in Segment 8A between S8A MP 19.2 and 35.2 (16 miles) through Chino Hills, Chino, and Ontario. Upgrades to the existing Chino-Mira Loma No. 1, 2, and 3 220-kV T/Ls in Segments 8B and 8C would also not occur (SCE, 2008b – DR#4: Q4-13). Consequently, approximately 78 double-circuit 500-kV structures (18 LSTs and 70 TSPs) and approximately 40 double-circuit 220-kV structures (associated with the re-build of Chino-Mira Loma No. 3) would be eliminated from Segment 8 (SCE, 2008b – DR#4: Q4-12).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

This alternative is feasible; however, it would not be consistent with the CHSP General Plan, which makes its legal feasibility dependent on approval of a General Plan amendment by the California Parks and Recreation Commission.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This routing alternative avoids proximity of the T/L to existing residences of the City of Chino Hills. Implementation of this alternative would eliminate construction of approximately 16 miles of 500-kV structures along Segment 8A beginning at approximately S8A MP 19.2 and ending at Mira Loma Substation (S8A MP 35.2), as well as eliminate construction in Segments 8B and 8C between Chino Substation and Mira Loma Substation. Air quality and biology impacts during construction as well as long-term visual impacts through Chino Hills, Chino, and Ontario would be reduced compared to the proposed Project/Action as a result. Furthermore, re-routing of the existing 220-kV T/Ls outside of CHSP would result in a net decrease of 1.7 miles of 220-kV T/Ls traversing the park, which would therefore reduce visual and recreational impacts within CHSP compared to baseline environmental conditions. Re-routing these 220-kV T/Ls would also reduce existing T/L impacts on the Water Canyon Preserve within CHSP.

Specific to this alternative (not part of the proposed Project), use of gas-insulted technology for the switching station versus open-air technology would result in a lower profile and would impact less land (4 to 5 acres vs. 11 to 12 acres), which would reduce potential visual and land use impacts associated with the new switching station.

Environmental Disadvantages

While this alternative would place the new 500-kV T/L parallel to existing T/Ls, it would require widening of approximately 3.9 miles of the existing ROW by 150 feet to accommodate the new 500-kV T/L. In addition, approximately 1.6 miles of new 300-foot-wide ROW outside of CHSP would be required to connect into the new switching station, as well as 1.9 miles (1.5 miles within CHSP and 0.4 mile outside CHSP) of new 480-foot to re-route the 220-kV and 500-kV T/Ls from the new switching station, around raptor ridge, to reconnect with the existing T/Ls located in CHSP. Re-routing of the existing 500-kV T/Ls would result in a net *increase* of 0.5 mile of 500-kV T/L within CHSP, although as noted above (Environmental Advantages) the re-routing of the existing 220-kV T/Ls would result in a net *decrease* of 1.7 miles of 220-kV T/L within CHSP. Overall, this alternative would require the establishment of approximately 8.9 miles of new/expanded ROW. The need for expanded/new ROW would result in greater biological impacts compared to the proposed route, where construction between S8A MP 19.2 and 35.2 would occur within existing ROW, with the exception of approximately 0.45 miles of new ROW west of Mira Loma Substation.

This alternative would also require the establishment of a new switching station just west of CHSP, further increasing biological impacts. The area where the switching station is proposed has been identified as an area of potential contamination, which has resulted from activities that previously occurred on the

Aerojet property to the north. The past activities on the Aerojet property, which is currently listed as a Resource Conservation and Recovery Act (RCRA) facility with on-going cleanup, included the open-burn/detonation of waste ordnance. These activities have resulted in radioactive material, such as uranium, tear gas residue, rocket fuel (perchlorate), and fragments of exploded and unexploded ordnance, which projected radially out from the open-burn/detonation area. Sweeps of these radial impact areas using geophysical methods have identified ordnance fragments at distances as far as 2,200 feet and within CHSP. Consequently, the Aerojet property and surrounding properties, including areas of CHSP, are under corrective action investigation and cleanup as required by the Department of Toxic Substance Control (DTSC). As such, this site could be contaminated resulting in potentially significant hazards and hazardous materials impacts. The addition of new infrastructure within CHSP would also result in potentially significant land use impacts, as this alternative would not be consistent with the CHSP General Plan, and would therefore require the approval of a General Plan amendment by the California Parks and Recreation Commission.

Alternative Conclusion

RETAINED FOR FURTHER ANALYSIS. This alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would have the potential to reduce construction impacts (air quality and biology) and long-term visual impacts to the residences of Chino Hills, Chino, and Ontario as a result of shortening the overall route. Furthermore, re-routing of the existing 220-kV T/L results in a net decrease of 1.7 miles of 220-kV T/L within CHSP and reduces existing T/L impacts on the Water Canyon Preserve within CHSP. Therefore, this alternative has been retained for further analysis in the EIR/EIS.

SUMMARY

Chino Hills Route C Alternative	**Meets Project Purpose?** Yes[1]	**Feasible?** Yes[2]	**Meets Reliability Criteria?** Yes[3]
Explanations: [1] This alternative would allow for the reliable interconnection of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints. [2] This alternative would be feasible; however, it would not be consistent with the CHSP General Plan, which makes its legal feasibility dependent on approval of a General Plan amendment by the California Parks and Recreation Commission. [3] Meets CAISO/NERC/WECC requirements.			
Environmental Advantages • Avoids proximity to existing residents in the City of Chino Hills • Eliminates construction of approximately 16 miles of 500-kV structures along Segment 8A from S8A MP19.2 to Mira Loma Substation through Chino Hills, Chino, and Ontario reducing air quality, biology, noise, and visual impacts • Eliminates construction in Segments 8B and 8C between Chino and Mira Loma Substations • Re-routing existing 220-kV T/Ls outside of CHSP would result in a net decrease of 1.7 miles of 220-kV T/Ls traversing the park, thereby reducing visual and recreational impacts within CHSP compared to baseline environmental conditions		**Environmental Disadvantages** • Would require approximately 8.9 miles of new ROW, including 3.0 miles of new ROW within CHSP potentially increasing biology, recreational, and visual impacts • Re-routing existing 500-kV T/Ls outside of CHSP would result in a net increase of 0.5 miles of 500-kV T/Ls traversing the park, thereby increasing visual and recreational impacts within CHSP compared to baseline environmental conditions • Would require a new 500-kV switching station outside of CHSP potentially increasing biology, land use, and visual impacts • The switching station and re-routed T/Ls would be located on potentially contaminated land that could result in potentially significant hazards and hazardous materials impacts • Would be inconsistent with the CHSP General Plan and therefore have potentially significant land use impacts	
Conclusion: Retain for Further Analysis			

3.3.14 Chino Hills Route D Alternative

Alternative Description

This alternative was suggested by the City of Chino Hills. This represents a refinement to the Chino Hills Route A Alternative. As shown in Figure 3.3-13, this alternative would deviate from the proposed Project/Action beginning about two miles east of State Route 57 (approximately S8A MP 19.2), where the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L and the existing un-energized Chino-Mesa T/L (both in the same corridor as that of Segment 8A) separate from one another. At that point, the new Mira Loma-Vincent 500-kV T/L would turn southeast, remaining parallel and north of the existing Walnut/Olinda-Mira Loma 220-kV double-circuit T/L for approximately 3.9 miles, up to the CHSP boundary, traversing Los Angeles, Orange, and San Bernardino Counties. Along this portion of the alignment, approximately 150-feet of additional ROW would be required to accommodate the new 500-kV double-circuit structures (SCE 2008b – DR#4: Q4-45). At this point, the new Mira Loma-Vincent 500-kV T/L would turn east within a new 200-foot-wide ROW and follow the northern boundary of CHSP for approximately 4.0 miles to just east of Bane Canyon. At this point the alignment would turn southeast, traversing the northeast corner of CHSP for approximately 1.3 miles, at which point the new 500-kV T/L would turn northeast again parallel and north of the existing T/Ls for approximately 0.4 mile (outside CHSP) before terminating at a new 500-kV switching station located outside of CHSP, just south of the existing 500-kV T/Ls. The existing 500-kV T/Ls located in this area would be looped into the new switching station, which would require approximately 6 single-circuit and 2 double-circuit 500-kV structures (SCE, 2008b – DR#4: Q4-44 Update 2). For this approximately 9.6-mile re-route, approximately 35 to 37 new double-circuit 500-kV structures would be required, of which approximately 4 to 6 would be within CHSP (SCE, 2008b – DR#4: Q4-44 Update 2).

The new switching station would be a minimum of 4 to 5 acres in size, assuming the use of gas-insulated technology, or as much as 11 to 12 acres for air-insulated technology, allowing for power to be transferred along the existing 500-kV transmission lines to Mira Loma Substation. For the switching station utilizing gas-insulated technology, a lower profile would result. The building would be approximately 42-feet high and the dead-end structures on either side of the building would be approximately 65-feet high (SCE, 2008c – DR#5-07). The entire system would be enclosed in a sheet metal building, which would require an air conditioning system (SCE, 2008c – DR#5-07). For an open-air switching station, standard traditional equipment and components would be utilized; however, a higher station profile would result. The two buses would be approximately 360-feet long and 65-feet high, and the six dead-end structures would each be approximately 108-feet high (SCE, 2008c – DR#5-07).

As a result of this alternative, no upgrades would occur in Segment 8A between S8A MP 19.2 and 35.2 (16 miles) through Chino Hills, Chino, and Ontario. Upgrades to the existing Chino-Mira Loma No. 1, 2, and 3 220-kV T/Ls in Segments 8B and 8C would also not occur (SCE, 2008b – DR#4: Q4-13). Consequently, approximately 78 double-circuit 500-kV structures (18 LSTs and 60 TSPs) and approximately 40 double-circuit 220-kV structures (associated with the re-build of Chino-Mira Loma No. 3) would be eliminated from Segment 8 (SCE, 2008b – DR#4: Q4-12).

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

This routing alternative eliminates the proximity of the T/L to most of the existing residences in the City of Chino Hills. Implementation of this alternative would eliminate construction of approximately 16 miles of 500-kV structures along Segment 8A beginning at approximately S8A MP 19.2 and ending at Mira Loma Substation (S8A MP 35.2), as well as eliminate construction in Segments 8B and 8C between Chino Substation and Mira Loma Substation. Air quality and biology impacts during construction as well as long-term visual impacts through Chino Hills, Chino, and Ontario would be reduced compared to the proposed Project/Action as a result.

Specific to this alternative (not part of the proposed Project), use of gas-insulted technology for the switching station versus open-air technology would result in a lower profile and would impact less land (4 to 5 acres vs. 11 to 12 acres), which would reduce potential visual and land use impacts associated with the new switching station.

Environmental Disadvantages

While this alternative would place the new 500-kV T/L parallel to existing T/Ls, it would require widening of approximately 3.9 miles of the existing ROW by 150 feet to accommodate the new 500-kV T/L. In addition, approximately 5.7 miles of new 200-foot-wide ROW (1.3 miles within CHSP and 4.4 miles outside CHSP) would be required to connect into the new switching station. The need for expanded/new ROW would result in greater biological impacts compared to the proposed route, where construction between S8A MP 19.2 and 35.2 would occur within existing ROW, with the exception of approximately 0.45 miles of new ROW west of Mira Loma Substation. This alternative would also require the establishment of a new switching station east of CHSP, further increasing biological impacts.

The addition of new 500-kV structures within and in the vicinity of CHSP and a new switching station in the vicinity of CHSP would have the potential to result in substantial long-term visual impacts both to CHSP and to the residents of the City of Chino Hills, as this new infrastructure would be located within several hundred feet of existing residences of the City of Chino Hills and in close proximity to an approved housing development (TT15989). In addition, the new infrastructure within CHSP would result in potentially significant land use impacts, as this alternative would not be consistent with the CHSP General Plan, and would therefore require the approval of a General Plan amendment by the California Parks and Recreation Commission. Furthermore, the portion of the T/L re-route along the northern border of CHSP would be located on land identified as an area of potential contamination. The past activities on the Aerojet property located to the north, which is currently listed as a Resource Conservation and Recovery Act (RCRA) facility with on-going cleanup, included the open-burn/detonation of waste ordnance. These activities have resulted in radioactive material, such as uranium, tear gas residue, rocket fuel (perchlorate), and fragments of exploded and unexploded ordnance, which projected radially out from the open-burn/detonation area. Sweeps of these radial impact areas using geophysical methods have identified ordnance fragments at distances as far as 2,200 feet and within CHSP. Consequently, the Aerojet property and surrounding properties, including areas of CHSP, are under corrective action investigation and cleanup as required by the Department of Toxic Substance Control (DTSC). As such, this area could be contaminated resulting in potentially significant hazards and hazardous materials impacts.

Alternative Conclusion

RETAINED FOR FURTHER ANALYSIS. This alternative would meet the objectives/purpose and need of the TRTP, would be feasible, and would have the potential to reduce construction impacts (air quality and biology) and long-term visual impacts to the residences of Chino Hills, Chino, and Ontario as a result of shortening the overall route by approximately 6.4 miles. Of the four Chino Hills routing alternatives (Routes A to D), Route D would result in the least amount of new double-circuit 500-kV T/L within CHSP (1.3 miles). Therefore, this alternative has been retained for further analysis in the EIR/EIS.

SUMMARY

Chino Hills Route D Alternative	**Meets Project Purpose?** Yes[1]	**Feasible?** Yes[2]	**Meets Reliability Criteria?** Yes[3]
Explanations: [1] This alternative would allow for the reliable interconnection of new wind generation resources in the TWRA, would meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints. [2] This alternative would be feasible. [3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.			
Environmental Advantages • Avoids proximity to <u>most</u> existing residents in the City of Chino Hills • Eliminates construction of approximately 16 miles of 500-kV structures along Segment 8A from S8A MP19.2 to Mira Loma Substation through Chino Hills, Chino, and Ontario reducing air quality, biology, noise, and visual impacts • Eliminates construction in Segments 8B and 8C between Chino and Mira Loma Substations		**Environmental Disadvantages** • Would require approximately 9.6 miles of new ROW, including 1.3 miles of new ROW within CHSP (3.9 miles expanded ROW by 150 feet and 5.7 miles new 200-foot-wide ROW) potentially increasing biology, recreational, and visual impacts • T/L would be located within several hundred feet of about 25 existing residences of the City of Chino Hills and in close proximity to an approved housing development (TT15989) • Would require a new 500-kV switching station outside of CHSP potentially increasing biology, land use, and visual impacts • The re-routed T/L would be located on potentially contaminated land that could result in potentially significant hazards and hazardous materials impacts • Would be inconsistent with the CHSP General Plan and therefore have potentially significant land use impacts	
Conclusion: Retain for Further Analysis			

3.3.15 San Gabriel Valley New Corridor Alternative

Alternative Description

This alternative would differ from the proposed Project/Action within Segments 7 and 8a only. Under the proposed Project/Action, Segment 7 would begin at the southern boundary of the ANF, where the new Rio Hondo-Vincent No. 2 500-kV T/L and the new Mira Loma-Vincent 500-kV T/L would proceed south within the existing T/L corridor to the Rio Hondo and Mira Loma Substations, respectively. Under this alternative, the new Rio Hondo-Vincent No. 2 T/L would follow the existing Antelope-Mesa alignment and terminate at the Rio Hondo Substation, same as the proposed Project/Action. However, unlike the proposed Project/Action, the existing Antelope-Mesa 220-kV T/L would be removed and replaced with single-circuit 500-kV structures rather than double-circuit 500-kV structures. Double-circuit 500-kV structures would not be required between the southern boundary of the ANF and the Rio Hondo Substation as the new Mira Loma-Vincent 500-kV T/L would no longer follow the Antelope-Mesa alignment south of the ANF.

As shown in Figure 3.3-14, the new Mira Loma-Vincent 500-kV T/L would instead proceed east upon leaving the ANF, along the foothills of the San Gabriel Mountains, between the southern border of the ANF and the cities of Azusa, Glendora, San Dimas, La Verne, Claremont, Upland, and Rancho Cucamonga. This alternative route would skirt along the foothills within a new approximately 200-foot wide ROW for approximately 20 miles. The new Mira Loma-Vincent 500-kV T/L would turn south at Blanchard Street in Rancho Cucamonga, and would continue south within the existing Lugo-Serrano transmission corridor, which parallels Day Creek. The new Mira Loma-Vincent 500-kV T/L would stay within this existing corridor for approximately 10 miles before terminating at Mira Loma Substation.

Under this alternative, no construction activities would occur between Rio Hondo Substation and Chino Substation within Segments 7 and 8a. The existing Antelope-Mesa 220-kV T/L between Rio Hondo Substation and Mesa Substation would be left in place.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility

No feasibility issues have been identified.

Reliability

Implementation of this alternative would comply with CAISO, NERC, and WECC requirements.

Environmental Advantages

For this alternative, construction activities between Rio Hondo Substation and Chino Substation within Segments 7 and 8a would not occur. As a result, air quality, noise, traffic, and visual impacts in these areas would be eliminated. Construction and operational impacts within several environmentally sensitive areas, including the Puente Hills, would be avoided. Additionally, this alternative would address visual as well as public health and safety concerns raised by the public during the scoping period by eliminating the need to upgrade the transmission network through densely populated residential areas within the City of Chino Hills.

Environmental Disadvantages

The need to establish a new 200-foot-wide east-west corridor for more than 20 miles along the foothills of the San Gabriel Mountains would result in additional impacts to air quality, biology, noise, traffic, and visual resources. In addition, the new corridor would parallel the Sierra Madre Fault, presenting potential geotechnical issues. Although this alternative would reduce the construction-related impacts associated with the upgrades in Segments 7 and 8a along the proposed route, the creation of a new transmission corridor would require new access roads and spur roads along steep terrain. Construction on steep terrain creates a high potential for erosion, and would likely require extensive grading and earth-moving activities. Access to the new transmission corridor would be very difficult in some of the steep canyons that would be traversed by this alternative route, and construction could require extensive use of helicopters, thus increasing air quality and noise impacts. In addition, by skirting the southern boundary of the ANF, this alternative route would pass by several foothill communities, and may require the acquisition of private property and/or residences in order to complete the new transmission corridor. Therefore, the impacts associated with this alternative are expected to be greater in comparison to the proposed Project/Action.

Alternative Conclusion

ELIMINATED. While this alternative would meet the project objectives/purpose and need, and would be feasible, this alternative would require establishment of more than 20 miles of new east-west corridor along the foothills of the San Gabriel Mountains. The amount of new corridor and access roads required would increase the potential for air quality, biological, land use, noise, traffic, and visual resource impacts. Overall, this alternative would not substantially lessen any significant impacts of the proposed Project/Action without creating greater impacts of its own. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>San Gabriel Valley New Corridor Alternative</td><td>Meets Project Purpose?
Yes[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would allow for the interconnection of up to 4,500 MW of new wind generation resources in the TWRA, would be designed to meet projected load growth in the Antelope Valley, and would address South of Lugo transmission constraints.
[2] This alternative would be feasible.
[3] Meets CAISO/NERC/WECC requirements. No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• Avoids environmental impacts associated with construction and operation of a 500-kV T/L along Segments 7 and 8a between the Rio Hondo Substation and Chino Substation</td><td colspan="2">Environmental Disadvantages
• Need to establish a new east-west T/L corridor (200-feet wide) for 20 miles along the foothills of the San Gabriel Mountains between Duarte and Rancho Cucamonga, resulting in additional environmental impacts (air quality, biological resources, land use, noise, traffic, visual)
• East-west corridor would parallel the Sierra Madre Fault (geotechnical issues)
• Potential need to acquire private property and/or residences resulting in additional land use impacts</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
</table>

3.4 System Alternatives

3.4.1 Transmission Lines to Midway Substation Alternative

Alternative Description

This system alternative was suggested by SCE in its PEA (System Alternative 1). This alternative would construct a new 500-kV T/L from Whirlwind Substation northwest to Midway Substation located near

Bakersfield, as shown in Figure 3.4-1. The new 500-kV T/L would be located within a new ROW paralleling the existing transmission corridor (Midway-Vincent) between Whirlwind Substation and Midway Substation (approximately 76 miles). As a result of this alternative, upgrades within the approximately 16 miles between Whirlwind Substation and Antelope Substation (Segment 4) would not occur; however, the proposed upgrades for Segments 5 through 11 would continue to be required. This alternative would be approximately 76 miles longer than the proposed route.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

This alternative would allow for the interconnection of new wind generation resources in the TWRA; however the power would enter PG&E's system rather than SCE's system, which would likely result in the need for additional upgrades to the PG&E system to maintain system reliability. Furthermore, this alternative would only provide a minimal benefit to load growth in the Antelope Valley, as the new wind generation would not connect into Antelope Substation. South of Lugo transmission constraints would be addressed by this alternative, as upgrades would continue to occur south of Antelope Substation (Segments 5 through 11).

Feasibility

No feasibility issues have been identified.

Reliability

As noted above the reliability of the PG&E system would need to be evaluated to ensure compliance with CAISO, NERC, and WECC requirements.

Environmental Advantages

Implementation of this alternative would eliminate the need for construction between the Antelope Substation and the Whirlwind Substation, which would reduce air quality, biology, noise, traffic and visual impacts, among others, along this approximately 16-mile segment.

Environmental Disadvantages

As part of this alternative, upgrades within Segments 5 through 11 would continue to be required, same as the proposed Project/Action. In addition, approximately 76 miles of new ROW would need to be established between the Whirlwind and Midway Substations, resulting in increased air quality, biology, land use, noise, and visual impacts.

Alternative Conclusion

ELIMINATED. Not only would this alternative require approximately 76 miles of new ROW between the Whirlwind and Midway Substations, versus the 16 miles of new ROW between the Whirlwind and Antelope Substations required under the proposed Project/Action, but would also likely result in the need for extensive additional upgrades (undefined) within the PG&E system. As such, the environmental disadvantages of this alternative far outweigh the environmental advantages. Therefore, this alternative has been eliminated from further consideration.

SUMMARY

Transmission Lines to Midway Substation Alternative	Meets Project Purpose? Partially[1]	Feasible? Yes[2]	Meets Reliability Criteria? Unknown[3]
Explanations: [1] This alternative would allow for the interconnection of new wind generation resources in the TWRA; however the power would enter the PG&E system rather than SCE's system. Furthermore, this alternative would only provide a minimal benefit to load growth in the Antelope Valley, as the new wind generation would not connect into Antelope Substation. South of Lugo transmission constraints would be addressed by this alternative. [2] This alternative would be feasible. [3] Reliability of the PG&E system would need to be evaluated to ensure compliance with CAISO/NERC/WECC requirements.			
Environmental Advantages • Eliminates construction between Antelope and Whirlwind Substations (approximately 16 miles)		**Environmental Disadvantages** • Upgrades in Segments 5 through 11 would continue to be required • Longer than proposed route (approximately 76 miles) and within new ROW, resulting in greater air quality, biology, land use, noise, and visual impacts	
Conclusion: Eliminate from Further Analysis			

3.4.2 Non-Transmission System Alternative

Alternative Description

This system alternative was suggested by SCE in its PEA (System Alternative 2). It would include the development of in-basin generation, such as new gas, solar, and/or geothermal power plants, instead of interconnecting generation from the TWRA. In addition, demand-side management and energy efficient programs would be implemented.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need

Under Sections 210 and 212 of the Federal Power Act (16 U.S.C. §824[i] and [k]) and Sections 3.2 and 5.7 of the CAISO Tariff, SCE is obligated to interconnect and integrate power generation facilities into its electrical system. Numerous applications have been submitted by generation developers requesting interconnection with the TWRA. Because SCE is obligated to interconnect generation as requested, non-transmission system alternatives would not fulfill this requirement, nor would they eliminate the need to provide the electrical facilities necessary to integrate up to 4,500 MW of new wind generation in the TWRA. Furthermore, use of in-basin generation and demand-side management and energy efficient programs would not necessarily meet projected load growth in the Antelope Valley or address the South of Lugo transmission constraints, which have been an ongoing source of reliability concern for the Los Angeles Basin. As such, this alternative would not meet the basic objectives/purpose and need of the TRTP.

Feasibility

This alternative would be feasible, although new sources of in-basin generation would need to be identified, evaluated, and built.

Reliability

No reliability issues have been identified.

Environmental Advantages

Upgrades would continue to be required to integrate up to 4,500 MW of new wind generation in the TWRA. As such, this alternative does not appear to offer any substantial or notable environmental advantages.

Environmental Disadvantages

New sources of in-basin generation would result in site-specific impacts associated with the construction and installation of new gas, solar, and/or geothermal power plants, which would result in air quality, biology, land use, noise, traffic, and visual impacts, among others. Transmission upgrades may also be required to integrate these sources into the transmission system.

Alternative Conclusion

ELIMINATED. Because this alternative does not meet the basic objectives/purpose and need of the TRTP, it has been eliminated from further consideration.

SUMMARY

<table>
<tr><td>Non-Transmission System Alternative</td><td>Meets Project Purpose?
No[1]</td><td>Feasible?
Yes[2]</td><td>Meets Reliability Criteria?
Yes[3]</td></tr>
<tr><td colspan="4">Explanations:
[1] This alternative would not interconnect new wind generation resources in the TWRA, would not necessarily meet projected load growth in the Antelope Valley or address South of Lugo transmission constraints.
[2] This alternative would be feasible, although new sources of in-basin generation would need to be identified, evaluated, and built.
[3] No reliability issues identified.</td></tr>
<tr><td colspan="2">Environmental Advantages
• No substantial or notable environmental advantages identified. Upgrades would continue to be required to integrate up to 4,500 MW of new wind generation in the TWRA.</td><td colspan="2">Environmental Disadvantages
• New sources of in-basin generation would result in site-specific impacts associated with the construction and installation of new gas, solar, and/or geothermal power plants, which would result in air quality, biology, land use, noise, traffic, and visual impacts, among others.
• Transmission upgrades may also be required to integrate these sources into the transmission system.</td></tr>
<tr><td colspan="4">Conclusion: Eliminate from Further Analysis</td></tr>
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