3.1 OVERVIEW OF PROPOSED PROJECT

This section provides a detailed description of Southern California Edison's (SCE) Tehachapi Renewable Transmission Project (TRTP), which includes a series of new and upgraded high-voltage electric transmission lines (T/L) and substations to deliver electricity from new wind farms in eastern Kern County, California, to the Los Angeles Basin (Figure 3.1-1). The section begins with an overview (Section 3.1) of the major project components, which have been divided into 11 segments for purposes of analysis. Section 3.2 describes each of these components in detail, including the proposed transmission facilities, substation facilities, and information technology facilities. Sections 3.3 through 3.9 then describe the construction elements of the project, including anticipated T/L and substation construction methods, construction schedule and workforce, estimates of land disturbance and waste generation. The approvals, authorizations, and permits that may be required to construct the proposed TRTP are identified in Appendix M.

The purpose of the proposed TRTP is to provide the electrical facilities necessary to integrate levels of new wind generation in excess of 700 megawatts (MW) and up to approximately 4,500 MW in the Tehachapi Wind Resource Area (TWRA). The proposed Project's major components include:

- Two new single-circuit 220 kilovolt (kV) transmission lines traveling approximately 4 miles over new right-of-way (R-O-W) from the Cottonwind Substation to the proposed new Whirlwind Substation (Segment 4).
- A new single-circuit 500 kV transmission line, initially energized to 220 kV, traveling approximately 16 miles over new R-O-W from the proposed new Whirlwind Substation to the existing Antelope Substation (Segment 4).
- A rebuild of approximately 18 miles of the existing Antelope – Vincent 220 kV T/L and the existing Antelope – Mesa 220 kV T/L to 500 kV standards over existing R-O-W between the existing Antelope Substation and the existing Vincent Substation (Segment 5).
- A rebuild of approximately 32 miles of existing 220 kV transmission line to 500 kV standards from existing Vincent Substation to the southern boundary of the Angeles National Forest (ANF). This segment includes the rebuild of approximately 27 miles of the existing Antelope – Mesa 220 kV T/L and approximately 5 miles of the existing Rio Hondo – Vincent 220 No. 2 T/L (Segment 6).
- A rebuild of approximately 16 miles of existing 220 kV transmission line to 500 kV standards from the southern boundary of the ANF to the existing Mesa Substation. This segment would replace the existing Antelope – Mesa 220 kV T/L (Segment 7).

- A rebuild of approximately 33 miles of existing 220 kV transmission line to 500 kV standards from a point approximately 2 miles east of the existing Mesa Substation (the “San Gabriel Junction”) to the existing Mira Loma Substation. This segment would also include the rebuild of approximately 7 miles of the existing Chino – Mira Loma No. 1 line from single-circuit to double-circuit 220 kV structures (Segment 8).
- Whirlwind Substation, a new 500/220 kV substation located approximately 4 to 5 miles south of the Cottonwind Substation near the intersection of 170th Street and Holiday Avenue in Kern County near the TWRA (Segment 9).
- Upgrade of the existing Antelope, Vincent, Mesa, Gould, and Mira Loma Substations to accommodate new transmission line construction and system compensation elements (Segment 9).
- A new 500 kV transmission line traveling approximately 17 miles over new R-O-W between the Windhub[1] Substation and the proposed new Whirlwind Substation (Segment 10).
- A rebuild of approximately 19 miles of existing 220 kV transmission line to 500 kV standards between the existing Vincent and Gould Substations. This segment would also include the addition of a new 220 kV circuit on the vacant side of the existing double-circuit structures of the Eagle Rock – Mesa 220 kV T/L, between the existing Gould Substation and the existing Mesa Substation (Segment 11).
- Installation of associated telecommunications infrastructure.

These major components have been separated into eight distinct segments. Under separate application to the CPUC, SCE has previously requested approval for Segments 1, 2, and 3 of the Antelope Transmission Project, which would also enhance transmission and related infrastructure serving the TWRA. Consequently, the delineation of major components for the TRTP begins with Segment 4. Segments 4 through 8, as well as Segments 10 and 11 of the TRTP are transmission facilities, while Segment 9 addresses the addition and upgrade of substation facilities. A summary of the proposed TRTP’s components by segment is provided in Table 3.1-1.

The general location of the transmission and substation facilities that are proposed as part of the TRTP are shown on Figure 3.1-1. More detailed information regarding the proposed routing of each transmission segment and the associated substation work is provided on the Detailed Project Location Maps (Figures P.1-1 through P.1-2) and on existing and future

[1] The Windhub Substation was included as “Substation One” in SCE’s proposed Antelope Transmission Project Segments 2 and 3 application (A.04-12-008) (D.07-03-045) submitted to the California Public Utilities Commission for approval in December 2004. The application was amended in September 2005.

TABLE 3.1-1
SUMMARY OF PROPOSED PROJECT COMPONENTS BY SEGMENT, TEHACHAPI RENEWABLE TRANSMISSION PROJECT (TRTP)

Overall Project Construction

- Proposed construction duration of 55 months (estimated to begin in April 2009 and end in November 2013)
- Transmission facility construction generally scheduled for Monday through Friday, 7:00 a.m. to 5:00 p.m.; when extended hours would require a variance, it would be acquired
- Substation construction generally scheduled for Monday through Friday, 7:00 a.m. to 5:00 p.m.; when extended hours would require a variance, it would be acquired
- Workforce ranging in size from 10 to 300 persons, with daily average workforce of approximately 75 persons
- Disturbance of approximately 1,444 acres, with restoration of approximately 1,297 acres, resulting in permanent land disturbance of approximately 147 acres

Segment 4: Whirlwind 500/220 kV Transmission Line Elements

- Initiates at the Cottonwind Substation and ends at the existing Antelope Substation
- Construct two new parallel 4-mile single-circuit 220 kV transmission lines between the Cottonwind Substation and the proposed new Whirlwind Substation
- Construct new 16-mile single-circuit 500 kV Antelope – Whirlwind 500 kV T/L
- All construction within new 200-foot-wide R-O-W (20 miles)
- Erect approximately 165 new transmission structures, including:
  - 88 single-circuit 220 kV LSTs
  - 77 single-circuit 500 kV LSTs
- Would require approximately 34 new pulling locations, 34 tensioner locations, and 19 new splicing locations

Segment 5: Antelope – Vincent No. 2 500 kV Transmission Line

- Initiates at the existing Antelope Substation and ends at the existing Vincent Substation
- Remove the existing Antelope – Vincent 220 kV T/L and the existing Antelope – Mesa 220 kV T/L
- Construct new 18-mile single-circuit Antelope – Vincent No. 2 500 kV T/L
- All construction in existing 200-foot-wide R-O-W (18 miles)
- Erect approximately 67 new transmission structures, including:
  - 67 single-circuit 500 kV LSTs
- Would require approximately 14 new pulling locations, 16 tensioner locations, and 7 new splicing locations

Segment 6: Section of New Replacement Rio Hondo – Vincent No. 2 500 kV (initially energized at 220 kV) Transmission Line and Section of New Mira Loma – Vincent 500 kV Transmission Line

- *Editors Note: For brevity, Segment 6 is named “New Replacement Rio Hondo – Vincent No. 2 500 kV T/L” in other sections of this PEA document*
- Initiates at the existing Vincent Substation and ends at the southern boundary of the ANF
- Remove 5 miles of the existing Rio Hondo - Vincent No. 2 220 kV T/L between Vincent Substation and the “crossover” span

TABLE 3.1-1 (CONTINUED)
SUMMARY OF PROPOSED PROJECT COMPONENTS BY SEGMENT
TEHACHAPI RENEWABLE TRANSMISSION PROJECT (TRTP)

- Construct new 27-mile single-circuit Rio Hondo – Vincent No. 2 500 kV T/L (initially energized at 220 kV)
- Construct new 5-mile single-circuit Mira Loma – Vincent 500 kV T/L from the Vincent Substation to the “crossover” span
- Eliminate the existing crossing of the Rio Hondo – Vincent No. 2 220 kV T/L over the Antelope – Mesa 220 kV T/L
- All construction in existing 200- to 400-foot-wide R-O-W (32 miles)
- Erect approximately 140 new transmission structures, including:
  - 2 single-circuit 220 kV LSTs
  - 30 single-circuit 500 kV TSPs
  - 104 single-circuit 500 kV LSTs
  - 4 three-pole dead-end 500 kV structures
- Would require approximately 16 new pulling locations, 16 tensioner locations, and 16 new splicing locations

Segment 7: Section of New Replacement Rio Hondo – Vincent No. 2 500 kV Transmission Line (initially energized at 220 kV) and Section of New Mira Loma – Vincent 500 kV Transmission Line

- *Editors Note: For brevity, Segment 7 is named “New Mira Loma – Vincent 500 kV T/L” in other sections of this PEA document*
- Initiates at the southern boundary of the ANF and ends at the existing Mesa Substation
- Remove and replace existing 220 kV structures with 500 kV structures
- Remove 16 miles of the existing Antelope – Mesa 220 kV T/L between the southern boundary of the ANF and the Mesa Substation
- Construct new 16-mile 500 kV double-circuit transmission line to include the Rio Hondo – Vincent No. 2 500 kV T/L (initially energized at 220 kV) and the Mira Loma – Vincent 500 kV T/L
- Connect the new Rio Hondo – Vincent No. 2 500 kV T/L (initially energized at 220 kV) into the Rio Hondo Substation
- Relocate several existing 66 kV subtransmission lines between the existing Rio Hondo Substation and the existing Mesa Substation
- All construction in existing 200- to 250-foot-wide R-O-W (16 miles)
- Erect approximately 81 new transmission structures, including:
  - 1 double-circuit 220 kV LST
  - 2 double-circuit 500 kV TSPs
  - 2 single-circuit 500 kV LSTs
  - 76 double-circuit 500 kV LSTs
- Erect approximately 150 new double-circuit 66 kV subtransmission LWSPs and TSPs
- Would require approximately 16 new pulling locations, 16 tensioner locations, and 16 new splicing locations

TABLE 3.1-1 (CONTINUED)
SUMMARY OF PROPOSED PROJECT COMPONENTS BY SEGMENT
TEHACHAPI RENEWABLE TRANSMISSION PROJECT (TRTP)

Segment 8: Section of New Mira Loma – Vincent 500 kV Transmission Line

- *Editors Note: For brevity, Segment 8 is named "New Mira Loma – Vincent 500 kV T/L" in other sections of this PEA document*
- Initiates near the Mesa Substation and ends at the Mira Loma Substation
- Remove various 220 kV T/L structures between the existing Mesa Substation and the existing Mira Loma Substation
- Construct approximately 33 miles of new single- and double-circuit 500 kV T/L to include approximately 33 miles of the new Mira Loma – Vincent 500 kV T/L
- Construct approximately 7 miles of new double-circuit 220 kV T/L from the Chino Substation to the Mira Loma Substation
- Relocate several existing 66 kV subtransmission lines in the area of the existing Mesa Substation and the existing Chino Substation
- Most construction in existing 150- to 250-foot-wide R-O-W (30 miles); additional construction in new 100-foot-wide R-O-W (3 miles); additional construction in new 240-foot-wide R-O-W (< 1 mile); additional construction in new 150-foot-wide R-O-W (< 1 mile)
  - Rose Hills Cemetery R-O-W relocation (existing: 200-foot-wide; future: 240-foot-wide)
  - Hacienda Heights R-O-W expansion (existing: 150-foot-wide; future: 250-foot-wide)
  - Fullerton Road new R-O-W (existing: none; future: 100-foot-wide)
  - Ontario R-O-W expansion (existing: 100-foot-wide; future: 250-foot-wide)
- Erect approximately 226 new transmission structures, including:
  - 2 single-circuit 220 kV LSTs
  - 57 double-circuit 220 kV LSTs
  - 3 single-circuit 500 kV LSTs
  - 92 double-circuit 500 kV LSTs
  - 2 single-circuit 220 kV TSPs
  - 11 double-circuit 220 kV TSPs
  - 5 three-pole dead-end 220 kV structures
  - 4 single-circuit 500 kV TSPs
  - 50 double-circuit 500 kV TSPs
- Erect new double-circuit 66 kV subtransmission LWSPs
- Would require approximately 33 new pulling locations, 33 tensioner locations, and 33 new splicing locations

Segment 9: Substation Facilities

- Construct new Whirlwind Substation; activity would require acquisition of new substation property between approximately 102 to 113 acres

TABLE 3.1-1 (CONTINUED)
SUMMARY OF PROPOSED PROJECT COMPONENTS BY SEGMENT
TEHACHAPI RENEWABLE TRANSMISSION PROJECT (TRTP)

- Expand and upgrade existing Antelope and Vincent Substations to accommodate new 500 kV and 220 kV equipment; activity would require acquisition of additional substation property – approximately 18 acres for Antelope upgrade and approximately 0.2 acre for Vincent upgrade; Vincent expansion would disturb approximately 18 acres
- Upgrade existing Mesa and Gould Substations to accommodate new 220 kV equipment
- Upgrade existing Mira Loma Substation to accommodate new 500 kV equipment

Segment 10: New Whirlwind – Windhub 500 kV Transmission Line

- Initiates at the Windhub Substation and ends at the proposed new Whirlwind Substation
- Construct new 17-mile single-circuit Windhub – Whirlwind 500 kV T/L
- All construction (17 miles) within new 330-foot-wide R-O-W
- Erect approximately 96 new transmission structures, including:
  - 96 single-circuit 500 kV LSTs
- Would require approximately 16 new pulling locations, 16 tensioner locations, and 7 new splicing locations

Segment 11: New Mesa – Vincent (via Gould) 500/220 kV Transmission Line

- Initiates at the existing Vincent Substation and ends at the existing Mesa Substation
- Remove 4 miles of the existing Vincent – Pardee No. 1 220 kV T/L
- Remove 15 miles of the existing Eagle Rock – Pardee 220 kV T/L
- Construct new 19-mile 500 kV single-circuit T/L between Vincent and Gould Substations (initially energized at 220 kV)
- String 18 miles of new 220 kV conductor on the vacant side of the double-circuit structures of the Eagle Rock - Mesa 220 kV T/L
- Most construction would take place within existing 200- to over 400-foot-wide R-O-W (19 miles); additional R-O-W width of approximately 250 feet would be required on the west side of the existing R-O-W near Gould Substation (for up to 3 miles)
- Erect approximately 76 new transmission structures, including:
  - 2 single-circuit 220 kV poles
  - 7 single-circuit 220 kV LSTs
  - 67 single-circuit 500 kV LSTs
- Would require approximately 12 new pulling locations, 15 tensioner locations, and 5 new splicing locations

Note: Mileages are approximate.

R-O-W cross sections (Figures P.1-3 and P.1-71a) included in Appendix P1. Also provided in this Appendix, are a series of aerial photographs that depict the proposed transmission segments and substation locations (Figures P.1-72 through P.1-73).

Please note that estimated segment mileage and acreage included in the Project Description and associated documents may vary for the following reasons: 1) the description summaries rely on engineered distances that accommodate line mileage variations due to topography and other elements that affect transmission segment length; 2) numbers submitted in this Application are based on preliminary engineering; and 3) numbers may also vary due to rounding differences. Proposed transmission line structure type, height,[2] and location is based on preliminary engineering and may be subject to change based on final engineering. Proposed transmission structures, substation block diagrams, and construction activities are shown in additional figures at the end of this section (Figures 3.2-1 through 3.3-10). Detailed information regarding project construction activities is provided in additional tables (Tables 3.3-1 through 3.3-8 and Tables 3.4-1 through 3.8-14) included in Appendix P2.

3.2 PROPOSED PROJECT

3.2.1 Segment 4: Whirlwind 500/220 kV Transmission Line Elements

Segment 4 consists of two new transmission line segments. The first segment is approximately 4 miles of two new 220 kV transmission lines between the proposed Cottonwind Substation[3] and the proposed new Whirlwind Substation. The second segment is approximately 16 miles of new 500 kV transmission line between the proposed new Whirlwind Substation and the existing Antelope Substation. Construction for both segments would be within a new R-O-W approximately 200 feet wide.

3.2.1.1 Cottonwind – Whirlwind 220 kV Transmission Lines

3.2.1.1.1 Overview. This portion of Segment 4 would connect the proposed Cottonwind Substation with the proposed new 500/220 kV Whirlwind Substation with two new 4-mile single-circuit, 220 kV transmission lines. Construction would take place within a new, approximately 200-foot-wide, R-O-W parallel to the east side of the existing Antelope - Magunden No. 1 220 kV T/L (see Figure P.1-2, Sheets 3-4).

3.2.1.1.2 T/L Facilities. The proposed 220 kV line segment would be constructed as two circuits on two adjacent single-circuit structures. These structures would be self-supported lattice steel towers (LSTs). It is estimated 88 LSTs would be used on this segment. Each tower would support two shield wires and one circuit, consisting of a bundle of two (or “2B”)

---

[2] Structure height ranges provided in this document may be exceeded as necessary based on final engineering.

[3] The Cottonwind Substation is currently undergoing environmental review by the County of Kern in conjunction with a proposed wind farm development.

1590 kcmil[4] aluminum conductors, steel reinforced (ACSR) at each phase position. I-string insulator assemblies are proposed for all suspension structures, and dead-end assemblies with jumpers are proposed at each dead-end structure.

3.2.1.1.3 Substation Facilities. Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.1.1.4 Information Technology (IT) Facilities. Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.1.1.5 T/L Engineering Plan.

***Routing*.** The proposed 220 kV line segments parallel the east side of the existing Antelope - Magunden No. 1 220 kV T/L between the Cottonwind Substation (see Figure P.1-2, Sheet 3; S4 milepost [MP] 0) and the proposed new Whirlwind Substation (see Figure P.1-2, Sheet 4, S4 MP 4).

***Structures*.** The proposed 220 kV line segment would use 220 kV structures as follows:

- 220 kV structures:
  - Four-legged single-circuit LSTs (Figure 3.2-1)

It is estimated 88 LSTs would be used on this segment. The single-circuit 220 kV LSTs would be dulled galvanized steel and would range in height between 90 feet and 120 feet. The new transmission line would be constructed as two circuits on two adjacent single-circuit structures.

***Conductor*.** The new 220 kV T/L would be strung with 2B-1590 kcmil ACSR with nonspecular finish. Approximately 300,000 feet of new conductor would be strung on this segment.

***Insulators*.** The tangent 220 kV insulator assemblies have a single polymer insulator, I-string configuration. Angle and dead-end assemblies include two polymer insulators in parallel.

***Overhead Ground Wires*.** The overhead ground wires would be located on the peaks of the transmission structures. The 220 kV structures would have two overhead ground wires. One overhead ground wire would be approximately 0.5 inch in diameter; the other ground wire

---

4 "kcmil" is an abbreviation for 1,000 circular mils, which is a unit of area that describes the size of the conductor to be used.

would contain optical fibers for communications and line protection and would be approximately 11/16 inch in diameter.

3.2.1.2 Antelope – Whirlwind Single-Circuit 500 kV Transmission Line

3.2.1.2.1 Overview. This portion of Segment 4 would connect the proposed new Whirlwind Substation to SCE's existing Antelope Substation with a new, approximately 16-mile, single-circuit 500 kV transmission line. Construction would occur in a new, approximately 200-foot-wide, R-O-W that generally parallels the western side of the existing R-O-W of the Midway – Vincent No. 3 500 kV T/L (see Figure P.1-2, Sheets 4-6).

3.2.1.2.2 T/L Facilities. The proposed single-circuit 500 kV line would be constructed on self-supported LSTs. It is estimated that 77 structures would be used on this segment. The towers would support two shield wires and one circuit, consisting of 2B-2156 kcmil ACSR conductors at each phase position. V-string insulator assemblies are proposed for all suspension structures, and dead-end assemblies with jumpers are proposed at each dead-end structure.

3.2.1.2.3 Substation Facilities. Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.1.2.4 Information Technology (IT) Facilities. Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.1.2.5 T/L Engineering Plan.

***Routing*.** The proposed 500 kV line segment generally parallels the west side of the existing Midway – Vincent No. 3 500 kV T/L between the proposed new Whirlwind Substation (see Figure P.1-2, Sheet 4; S4 MP 4) and the existing Antelope Substation (see Figure P.1-2, Sheet 6; S4 MP 19.6). Near the Antelope Substation, the line extends west from the substation along the south side of W Avenue J-8 for approximately 1.5 miles, and then turns north at S4 MP 17.9 for approximately 2 miles along the east side of 110th Street W to meet the Midway – Vincent No. 3 500 kV T/L at S4 MP 15.8.

***Structures*.** The proposed single-circuit 500 kV line would be constructed on 500 kV structures as follows:

- 500 kV structures (line construction):
  - Four-legged single-circuit LSTs (Figure 3.2-2)

It is estimated that 77 LSTs would be used on this segment. The LSTs would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 500 kV LSTs would range in heights between 113 feet and 188 feet.

***Conductor*.** The proposed Segment 4 500 kV T/L would be strung with 2B-2156 kcmil ACSR with nonspecular finish. Approximately 488,000 feet of conductor would be strung.

***Insulators*.** The tangent and angle 500 kV insulator assemblies would consist of two strings of insulators in the form of a "V." Each leg of the "V" assembly would contain one or two one-piece gray polymer insulators, depending on the load. On dead-end structures, the insulators would be arranged in a "barrel" configuration consisting of four polymer insulators.

***Overhead Ground Wires*.** The overhead ground wires would be located on the peaks of the transmission structures. The 500 kV structures would have two overhead ground wires. One overhead ground wire would be approximately 0.5 inch in diameter; the other ground wire would contain optical fibers for communications and line protection and would be approximately 11/16 inch in diameter.

3.2.2 Segment 5: Antelope – Vincent No. 2 500 kV Transmission Line

3.2.2.1 Overview

Segment 5 consists of the construction of approximately 18 miles of new single-circuit 500 kV transmission line between SCE's existing Antelope Substation and SCE's existing Vincent Substation. This line, which would initially be energized at 220 kV, would be built next to an identical existing 500 kV line and would replace two 220 kV lines that would be removed. Construction would occur within the existing R-O-W (see Figure P.1-2, Sheets 7-9).

3.2.2.2 T/L Facilities

The approximately 18 miles of new T/L would use 2B-2156 kcmil ACSR on LSTs. It is currently estimated that approximately 67 new 500 kV LSTs would be installed in the existing R-O-W. The single-circuit LSTs would range in height between 113 feet and 188 feet.

To make the initial connection of the new Antelope – Vincent No. 2 500 kV T/L to the Vincent Substation 220 kV switchrack, the remaining 1 mile of the Antelope – Vincent 220 kV T/L would be used. This T/L would use 2B-1590 kcmil ACSR on single-circuit 220 kV LSTs.

3.2.2.3 Substation Facilities

Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.2.4 Information Technology (IT) Facilities

Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.2.5 T/L Engineering Plan

3.2.2.5.1 Routing. Segment 5 includes the removal of the existing Antelope – Vincent 220 kV T/L and the Antelope – Mesa 220 kV T/L from the existing Antelope Substation to a location just north of the existing Vincent Substation, at S5 MP 16.9. Once the existing lines are removed, Segment 5 would be built in the existing R-O-W.

The new transmission line would be built within the existing, 200-foot-wide, Antelope - Vincent 220 kV and Antelope – Mesa 220 kV R-O-W. The new 500 kV transmission line would follow the same route. At S5 MP 16.9, the new T/L would use the remainder of the Antelope – Vincent 220 kV T/L that was not removed to complete the 220 kV connection to the 220 kV bus at Vincent Substation.

This existing R-O-W mostly parallels both the existing Midway – Vincent No. 3 500 kV T/L and Segment 2 of the future Antelope – Vincent 500 kV T/L. To minimize 500 kV crossings, at S5 MP 1.7, S5 MP 9.8, S5 MP 11, and S5 MP 16.5, the new transmission line would be cutover to the existing Midway – Vincent No. 3 500 kV and/or the future Antelope – Vincent No. 1 500 kV T/L. At S5 MP 15.8, the new transmission line would cross over the Los Angeles Department of Water and Power (LADWP) Adelanto – Rinaldi 500 kV T/L and Victorville – Rinaldi 500 kV T/Ls. The proposed line would cross Highway 14 at S5 MP 16.6.

3.2.2.5.2 Structures. It is currently anticipated that the Segment 5 would utilize 500 kV structures, as follows:

- 500 kV structures (line construction):
    - Four-legged single-circuit LSTs (refer to Figure 3.2-2)

It is currently estimated that approximately 67 single-circuit 500 kV LSTs would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 500 kV LSTs would range in heights between 113 feet and 188 feet.

3.2.2.5.3 __Conductor__. The proposed Segment 5 500 kV T/L would be strung with 2B-2156 kcmil ACSR with nonspecular finish. Approximately 533,000 feet of conductor would be strung. The 220 kV connection to the Vincent Substation would be strung with approximately 32,000 feet of 2B-1590 kcmil ACSR with nonspecular finish.

3.2.2.5.4 __Insulators__. The tangent and angle 500 kV insulator assemblies would consist of two strings of insulators in the form of a "V." Each leg of the "V" assembly would contain one or two one-piece gray polymer insulators, depending on the load. On dead-end structures, the insulators would be arranged in a "barrel" configuration consisting of four polymer insulators.

3.2.2.5.5 __Overhead Ground Wires__. The overhead ground wires would be located on the peaks of the transmission structures. The 500 kV structures would have two overhead ground wires. One overhead ground wire would be approximately 0.5 inch in diameter; the other ground wire would contain optical fibers for communications and line protection and would be approximately 11/16 inch in diameter.

3.2.3 Segment 6: Section of New Replacement Rio Hondo – Vincent No. 2 500 kV Transmission Line and Section of New Mira Loma – Vincent 500 kV Transmission Line (New Replacement Rio Hondo – Vincent No. 2 500 kV Transmission Line)

3.2.3.1 __Overview__

Segment 6 consists of the construction of a total of approximately 32 miles of single-circuit 500 kV T/L on existing R-O-W from the Vincent Substation to the southern boundary of the ANF. Approximately 27 miles of Segment 6 would involve the rebuild of the existing Antelope – Mesa 220 kV T/L with 500 kV single-circuit structures from the Vincent Substation to the southern boundary of the ANF. This line would initially be energized at 220 kV (see Figure P.1-2, Sheets 9-14).

Approximately 5 miles of Segment 6 would involve the rebuild of the existing Rio Hondo – Vincent No. 2 220 kV T/L with 500 kV single-circuit structures from the Vincent Substation (S6 MP 0) to the existing "crossover" span (located approximately 5 miles south of Vincent Substation; S6 MP 5). The existing crossing of the Rio Hondo – Vincent No. 2 220 kV T/L over the Antelope – Mesa 220 kV T/L would be eliminated (see Figure P.1-2, Sheets 9-10).

The completed project would result in two roughly parallel circuits constructed to 500 kV standards on existing R-O-W from the Vincent Substation to the southern boundary of the ANF. The easterly circuit would be the new Rio Hondo – Vincent No. 2 500 kV T/L and the westerly circuit would become a section of the new Mira Loma – Vincent 500 kV T/L.

3.2.3.2 T/L Facilities

The approximately 27 miles of new transmission line would use 2B-2156 kcmil ACSR with a nonspecular finish on single-circuit tubular steel poles (TSPs) and single-circuit LSTs. It is currently estimated that approximately 15 new dulled galvanized TSPs, 96 new dulled galvanized 500 kV LSTs, and 2 new dulled galvanized 220 kV LSTs would be installed in the existing R-O-W. The TSPs would range in height between 75 feet and 200 feet. The single-circuit LSTs would range in height between 85 feet and 193 feet.

The remaining approximately 5 miles of new transmission line would also use 2B-2156 kcmil ACSR with a nonspecular finish on single-circuit TSPs and single-circuit LSTs. It is currently estimated that approximately 15 new dulled galvanized TSPs, and 7 new dulled galvanized 500 kV LSTs would be installed in the existing R-O-W. The TSPs would range in height between 75 feet and 200 feet. The single-circuit LSTs would range in height between 100 feet and 175 feet.

3.2.3.3 Substation Facilities

Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.3.4 Information Technology (IT) Facilities

Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.3.5 T/L Engineering Plan

3.2.3.5.1 Routing. No new R-O-W is required for Segment 6 of the project. The existing R-O-W for the Rio Hondo – Vincent No. 2 220 kV T/L and the Antelope – Mesa 220 kV T/L would be used for the new circuits.

The new Rio Hondo – Vincent No. 2 500 kV T/L portion of Segment 6 begins at the Vincent Substation (S6 MP 0) and follows the alignment of the existing Rio Hondo – Vincent No. 2 220 kV T/L to the existing "crossover" span at S7 MP 5, where the current Rio Hondo – Vincent No. 2 220 kV circuit swaps position with the existing Antelope – Mesa 220 kV circuit. Following construction of Segment 6, the "crossover" span would be eliminated.

From the "crossover" span location, the new Rio Hondo – Vincent No. 2 500 kV T/L would follow the Antelope – Mesa 220 kV T/L alignment to the southern boundary of the ANF (See Figure P.1-2; Sheet 14; S6 MP 26.9).

The new Rio Hondo – Vincent No. 2 500 kV T/L would be constructed to 500 kV standards, but would initially be operated at 220 kV. The existing 220 kV structures on the Rio Hondo – Vincent No. 2 T/L and the Antelope – Mesa 220 kV T/L would be removed and replaced with 500 kV structures located adjacent to the existing structures. Rebuilding the Rio Hondo – Vincent No. 2 220 kV T/L to 500 kV standards would require inserting one additional 220 kV structure and replacing a second 220 kV structure on the adjacent Rio Hondo – Vincent No. 1 220 kV T/L.

The Mira Loma – Vincent 500 kV T/L portion of Segment 6 begins at the Vincent Substation and follows the alignment of the existing Antelope – Mesa 220 kV T/L to the existing "crossover" span.

At the "crossover" span, the new Mira Loma – Vincent 500 kV T/L would connect into the existing Rio Hondo – Vincent No. 2 220 kV T/L alignment and follow this alignment to the southern boundary of the ANF. The existing Rio Hondo – Vincent No. 2 220 kV T/L, from the "crossover" span to the southern boundary of the ANF, is currently constructed to 500 kV standards with 500 kV structures. Therefore, construction activities are not required for the new Mira Loma – Vincent 500 kV T/L from the "crossover" span to the southern boundary of the ANF.

The existing 220 kV structures on the Antelope – Mesa 220 kV T/L would be removed and replaced with 500 kV structures located approximately adjacent to the existing structures.

3.2.3.5.2 <u>Structures.</u> It is currently anticipated that Segment 6 would utilize a combination of 500 kV and 220 kV structures, as follows:

- 500 kV structures (line construction):
  - Four-legged single-circuit LSTs (refer to Figure 3.2-2)
  - Single-circuit TSPs (Figure 3.2-3)
  - Three-pole dead-end structures
- 220 kV structures (for adjacent Rio Hondo – Vincent No. 1 220 kV T/L):
  - Four-legged single-circuit LSTs (refer to Figure 3.2-1)

It is currently estimated that approximately 104 single-circuit 500 kV LSTs would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 500 kV LSTs would range in heights between 85 feet and 193 feet. The two single-circuit 220 kV LSTs would range in heights between 90 feet and 120 feet.

Approximately 30 single-circuit TSPs would be constructed of dulled galvanized steel and would range in heights between 75 feet and 200 feet.

It is currently estimated that the total number of three-pole dead-end structures for Segment 6 would be approximately four 500 kV structures. These structures would range in height between 75 and 80 feet.

3.2.3.5.3 Conductor. The two sections of transmission line would be strung with 2B-2156 kcmil ACSR with nonspecular finish. Approximately 1,008,000 feet of conductor would be strung.

3.2.3.5.4 Insulators. The tangent and angle 500 kV insulator assemblies would consist of two strings of insulators in the form of a "V." Each leg of the "V" assembly would contain one or two one-piece gray polymer insulators, depending on the load. On dead-end structures, the insulators would be arranged in a "barrel" configuration consisting of four polymer insulators.

3.2.3.5.5 Overhead Ground Wires. The overhead ground wires would be located on the peaks of the transmission structures. The 500 kV structures would have two overhead ground wires. One overhead ground wire would be approximately 0.5 inch in diameter; the other ground wire would contain optical fibers for communications and line protection and would be approximately 11/16 inch in diameter.

3.2.4 Segment 7: Section of New Replacement Rio Hondo – Vincent No. 2 500 kV Transmission Line and Section of New Mira Loma – Vincent 500 kV Transmission Line (New Mira Loma – Vincent 500 kV Transmission Line)

3.2.4.1 Overview

Segment 7 consists of the construction of approximately 16 miles of single- and double-circuit 500 kV transmission lines on existing R-O-W from the boundary of the ANF, near the City of Duarte, south to SCE's existing Rio Hondo Substation in the City of Irwindale, and then continuing southwest across the San Gabriel Valley to SCE's existing Mesa Substation in the Monterey Park/Montebello area (see Figure P.1-2, Sheets 14-17). The existing Antelope – Mesa 220 kV T/L would be rebuilt with 500 kV single- and double-circuit structures from the southern boundary of the ANF to the Mesa Substation, a total of approximately 16 miles. In addition, to accommodate the 500 kV construction, various lower-voltage subtransmission lines between the Rio Hondo and Mesa Substations would be relocated mostly within the existing R-O-W.

Segment 7 of the project would result in two parallel T/L circuits, primarily on double-circuit structures, constructed to 500 kV standards on existing R-O-W from the southern boundary of the ANF to the Mesa Substation. From the southern boundary of the ANF to the Rio Hondo Substation, the east circuit would be the final section of the new Rio Hondo - Vincent No. 2 500 kV line. The west circuit would be a section of the new Mira Loma – Vincent 500 kV T/L.

From the Rio Hondo Substation to the “San Gabriel Junction” (located approximately 2 miles east of the Mesa Substation; S7 MP 13.7), the Mira Loma – Vincent 500 kV T/L would continue on the west circuit until it almost reaches the junction. At this point, the new Mira Loma – Vincent 500 kV line would leave the Antelope – Mesa 220 kV T/L alignment and crossover to the existing Chino – Mesa 220 kV T/L alignment on the north side of the tower between Mesa Substation and Chino Substation. The crossover point would be the beginning of the Segment 8 (8A) section of the new Mira Loma – Vincent 500 kV T/L (see Figure P.1-2, Sheet 17). The new Mira Loma – Vincent 500 kV T/L would occupy the north circuit on new double-circuit LSTs that would be constructed as part of Segment 8.

On the final portion of Segment 7 from the “San Gabriel Junction” west to the Mesa Substation, SCE would remove and replace the existing 220 kV structures on the Antelope – Mesa 220 kV T/L with new double-circuit 500 kV LSTs, located approximately adjacent to the existing structures. T/L Facilities

3.2.4.1.1 New Rio Hondo – Vincent No. 2 500 kV T/L. Approximately 5 miles of new T/L would use 2B-2156 kcmil ACSR with nonspecular finish on TSPs and single-circuit and double-circuit LSTs. It is currently estimated that approximately 2 new dulled galvanized double-circuit 500 kV TSPs, 2 new dulled galvanized single-circuit 500 kV LSTs, 1 new dulled galvanized double-circuit 220 kV LST, and 19 new dulled galvanized double-circuit 500 kV LSTs would be installed in the existing R-O-W. The TSPs would range in height between 195 feet and 200 feet. The single-circuit LSTs would range in height between 113 feet and 175 feet. The double-circuit LSTs would range in height between 168 feet and 220 feet.

3.2.4.1.2 Mira Loma – Vincent 500 kV T/L. Approximately 11 miles of new T/L would use 2B-2156 kcmil ACSR with nonspecular finish on double-circuit LSTs. It is currently estimated that approximately 57 new dulled galvanized 500 kV LSTs would be installed in the existing R-O-W. The double-circuit LSTs would range in height between 147 feet and 262 feet.

3.2.4.2 Substation Facilities

Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.4.3 Information Technology (IT) Facilities

Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.4.4 T/L Engineering Plan

3.2.4.4.1 Routing.

***New Rio Hondo – Vincent No. 2 500 kV T/L*.** The new Rio Hondo – Vincent No. 2 500 kV T/L portion of Segment 7 begins at the southern boundary of the ANF and follows the alignment of the existing Antelope – Mesa 220 kV T/L for one span, to a new single-circuit 500 kV LST. At this structure, the new Rio Hondo – Vincent No. 2 500 kV T/L continues on the existing Antelope – Mesa 220 kV T/L alignment, to a new double-circuit 500 kV LST.

The new Rio Hondo – Vincent No. 2 500 kV T/L follows the alignment of the existing Antelope – Mesa 220 kV T/L for approximately 5 miles and would be connected into the Rio Hondo Substation at S7 MP 5. The new Mira Loma – Vincent 500 kV T/L circuit would occupy the second position on these double-circuit LSTs.

***Mira Loma – Vincent 500 kV T/L*.** The Mira Loma – Vincent 500 kV T/L portion of Segment 7 begins at the southern boundary of the ANF and would follow the alignment of the existing Rio Hondo – Vincent No. 2 220 kV T/L for two spans, to an existing single-circuit 500 kV LST and a new single-circuit 500 kV LST. At the next structure to the south, the Mira Loma – Vincent 500 kV T/L is joined by the new Rio Hondo – Vincent No. 2 500 kV T/L on the existing Antelope – Mesa 220 kV T/L alignment. From this point, the Mira Loma – Vincent 500 kV T/L would follow the existing Antelope – Mesa 220 kV T/L alignment as a double-circuit with the new Rio Hondo – Vincent No. 2 500 kV T/L to a point adjacent to Rio Hondo Substation at S7 MP 5. This section is a total of approximately 5 miles.

From the Rio Hondo Substation, the Mira Loma – Vincent 500 kV T/L would follow the existing Antelope – Mesa 220 kV T/L alignment as a double-circuit to the “San Gabriel Junction” at S7 MP 13.7. Continuing along the alignment of the existing Antelope – Mesa 220 kV T/L, double-circuit 500 kV LSTs would be constructed from the “San Gabriel Junction” into the Mesa Substation at S7 MP 15.8. This section is a total of approximately 11 miles.

At the “San Gabriel Junction,” the alignment of the Chino – Mesa 220 kV T/L, Center - Mesa 220 kV T/L, and Mesa – Walnut 220 kV T/L splits from the alignment of the Mesa – Rio Hondo 220 kV T/L, Laguna Bell-Rio Hondo 220 kV T/L, and Antelope – Mesa 220 kV T/L.

At the "San Gabriel Junction," the new Mira Loma – Vincent 500 kV T/L would leave the Antelope – Mesa 220 kV T/L alignment and connect into the existing Chino – Mesa 220 kV T/L alignment. This location would be the beginning of Segment 8 (8A).

The existing 220 kV structures on the Antelope – Mesa 220 kV T/L would be removed and replaced with double-circuit 500 kV LSTs, located approximately adjacent to the existing structures.

***66 kV Subtransmission Relocation/Removal*.** As part of Segment 7, approximately 45 existing double-circuit 66 kV subtransmission line LSTs would be relocated/removed to the edge of the existing R-O-W or undergrounded. The double-circuit 66 kV LSTs on the Rio Hondo – Bradbury 66 kV T/L, adjacent to the existing Antelope – Mesa 220 kV T/L alignment, would be removed beginning with the first structure north of Arrow Highway at S7 MP 4.4 to the angle structure just outside of the Mesa Substation at S7 MP 15.8. The double-circuit 66 kV lattice towers on the Rio Hondo – Amador 66 kV T/L and Mesa – Rio Hondo – Amador – Jose 66 kV T/L, adjacent to the existing Antelope – Mesa 220 kV T/L alignment, would be removed beginning with the first structure just outside of the Mesa Substation at S7 MP 15.8, to a point approximately 1.2 miles north of the Pomona Freeway at S7 MP 9.9. Several more double-circuit 66 kV LSTs on the Rio Hondo – Amador 66 kV T/L and Mesa – Rio Hondo – Amador – Jose 66 kV T/L, adjacent to the existing Antelope - Mesa 220 kV T/L alignment, would be replaced beginning with the third structure north of the Pomona Freeway (S7 MP 11) to the "San Gabriel Junction" (S7 MP 13.7). Also, two other double-circuit 66 kV LSTs outside of the Mesa Substation would be removed.

3.2.4.4.2 Structures. It is currently anticipated that new construction for Segment 7 would use a combination of 500 kV, 220 kV, and 66 kV structures, as follows:

- 500 kV structures (line construction):
  - Four-legged single-circuit LSTs (refer to Figure 3.2-2)
  - Double-circuit TSPs (refer to Figure 3.2-4)
  - Four-legged double-circuit LSTs (refer to Figure 3.2-5)
- 220 kV structures (for adjacent Rio Hondo – Vincent No. 1 220 kV T/L):
  - Four-legged double-circuit LSTs (refer to Figure 3.2-6)
- 66 kV structures (for subtransmission relocation):
  - Double-circuit light-weight steel poles (LWSPs; refer to Figure 3.2-7)
  - Double-circuit TSPs (refer to Figure 3.2-8)

It is currently estimated that the total number of LSTs for Segment 7 would be approximately one double-circuit 220 kV LST, three single-circuit 500 kV LSTs, and 76 double-circuit LSTs constructed of dulled galvanized lattice steel angle members connected by steel bolts. The double-circuit 220 kV LSTs would have a height of 185 feet. The single-circuit 500 kV LSTs would have heights between 113 feet and 175 feet. The double-circuit 500 kV LSTs would range in heights between 147 feet and 262 feet.

It is also estimated that two TSPs would be used for construction of Segment 7. These TSPs would be double-circuit 500 kV structures, constructed of dulled galvanized steel, and would range in height between 195 feet and 200 feet.

In addition, the replacement of portions of SCE's existing 66 kV subtransmission system would result in removal of approximately 45 double-circuit 66 kV LSTs and replacement with approximately 150 double-circuit 66 kV LWSPs and TSPs.

3.2.4.4.3 Conductor. The two sections of the proposed Segment 7 500 kV T/L would be strung with approximately 84,500 feet per circuit of 2B-2156 kcmil ACSR with nonspecular finish. A total of approximately 1,014,000 feet of conductor would be strung.

3.2.4.4.4 Insulators. The tangent and angle 500 kV insulator assemblies would consist of two strings of insulators in the form of a "V." Each leg of the "V" assembly would contain one or two one-piece gray polymer insulators, depending on the load. On dead-end structures, the insulators would be arranged in a "barrel" configuration consisting of four polymer insulators.

3.2.4.4.5 Overhead Ground Wires. The overhead ground wires would be located on the peaks of the transmission structures. The 500 kV structures would have two overhead ground wires. One overhead ground wire would be approximately 0.5 inch in diameter; the other ground wire would contain optical fibers for communications and line protection and would be approximately 11/16 inch in diameter.

3.2.5 Segment 8: Section of New Mira Loma – Vincent 500 kV Transmission Line (New Mira Loma – Vincent 500 kV Transmission Line)

3.2.5.1 Overview

Segment 8, which has three subsegments 8A, 8B and 8C, consists of the construction of approximately 33 miles of single- and double-circuit 500 kV T/L from the "San Gabriel Junction" (2 miles east of the Mesa Substation) to the Mira Loma Substation (see Figure P.1-2, Sheets 17 and 22-25). This segment would be a replacement of an existing single-circuit 220 kV line that runs from the San Gabriel Junction to SCE's existing Chino Substation area to SCE's existing Mira Loma Substation. Existing R-O-W would be used for this segment, except where approximately 3 miles of new R-O-W would be required to accommodate new construction in several locations along the proposed route. Also as part of this segment, various subtransmission and distribution lines in the Mesa Substation and Chino Substation areas would require relocation within the existing R-O-W.

3.2.5.2 T/L Facilities

Segment 8, which has three subsegments: 8A, 8B, and 8C, consists of the construction of approximately 33 miles of single- and double-circuit 500 kV T/L from the "San Gabriel Junction" (2 miles east of the Mesa Substation) to the Mira Loma Substation.

Subsegment 8A consists of the following:

- Rebuilding the existing Chino – Mesa 220 kV T/L (not currently energized) with 500 kV double-circuit structures from the "San Gabriel Junction" to a point approximately 0.5 mile west of the Chino Substation, a total of approximately 25 miles (see Figure P.1-2, Sheets 17 and 22-24). From the Chino Substation at S8A MP 28.4 to a point approximately 0.75-mile west of the Mira Loma Substation at S8A MP 34, the existing Chino – Mira Loma No. 2 220 kV T/L and Chino – Mira Loma No. 3 220 kV T/L would be rebuilt with 500 kV double-circuit structures, for a total of approximately 5 miles (the north circuit would be energized as the Mira Loma – Vincent 500 kV T/L). From this point (S8A MP 34), 500 kV single-circuit structures would be built parallel to the existing Chino – Mira Loma No. 1 220 kV T/L and the existing Lugo – Serrano 500 kV T/L into the Mira Loma Substation at S8A MP 35.2, a total of 1.2 miles (see Figure P.1-2, Sheet 25).

- The following subtransmission lines would be rearranged to accommodate the proposed 500 kV circuit:

    - Nine 66 kV LSTs would be removed and replaced with approximately 41 LWSPs, beginning at "San Gabriel Junction," and continuing for 1.5 miles along the south side of the existing R-O-W.
    - Beginning 0.5 miles west of Chino Substation (S8A MP 28), three spans of the existing Chino – Soquel 66 kV T/L (currently placed on 220 kV construction) would be rebuilt with 500 kV double-circuit structures to the Chino Substation.
    - Multiple 66 kV lines in the vicinity of the Chino Substation from 500 feet west of Central Avenue (S8A MP 27.7) to Magnolia Avenue (S8A MP 28.7) would be placed underground to make room for the new double-circuit structures.

Subsegment 8B consists of the following:

- Rebuilding the Chino – Mira Loma No. 1 220 kV T/L from the Chino Substation (S8B MP 0) to the Mira Loma Substation (S8B MP 6.8) with 220 kV double-circuit structures to accommodate the Chino – Mira Loma No. 1 220 kV and Chino – Mira Loma No. 2 220 kV T/Ls, for a total of approximately 7 miles (see Figure P.1-2, Sheet 25).

Subsegment 8C consists of the following:

- Energizing the south circuit of the rebuilt Chino – Mira Loma No. 2 and No. 3 220 kV T/Ls as the new 220 kV Chino – Mira Loma No. 3 T/L (see Figure P.1-2, Sheet 25). The new 220 kV Chino – Mira Loma No. 3 T/L would occupy the south circuit on the new double-circuit 500 kV LSTs between the Chino Substation (S8C MP 0) and the Mira Loma Substation (S8C MP 6.4). The north circuit would be the new Mira Loma – Vincent 500 kV T/L.

The completed project would result in two parallel circuits on double-circuit structures, constructed to 500 kV standards, primarily on existing R-O-W from the "San Gabriel Junction" to the Chino Substation. On this section, the northerly circuit would be the proposed new Mira Loma – Vincent 500 kV line.

From the Chino Substation to the Mira Loma Substation, there would be approximately 5 miles of two parallel circuits on double-circuit structures, and approximately 1.2 miles of one circuit on single-circuit structures, both constructed to 500 kV standards, primarily on existing R-O-W. On the double-circuit section, the north circuit would be the proposed Mira Loma – Vincent 500 kV line and the south circuit would be the Chino – Mira Loma No. 3 220 kV line. The single-circuit section would accommodate only the proposed Mira Loma – Vincent 500 kV line.

The two sections of the proposed Segment 8 500 kV transmission line would be strung with approximately 175,500 feet per circuit of 2B-2156 kcmil ACSR with nonspecular finish. The section of the proposed Segment 8 220 kV transmission line would be strung with approximately 37,800 feet per circuit of 2B-1590 kcmil ACSR with nonspecular finish.

3.2.5.3 Substation Facilities

Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.5.4 Information Technology (IT) Facilities

Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.5.5 T/L Engineering Plan

3.2.5.5.1 Routing.

Mira Loma – Vincent 500 kV T/L. At the "San Gabriel Junction" at S8A MP 2.2, the double-circuit 220 kV LSTs of the existing Laguna Bell – Rio Hondo 220 kV T/L and Mesa - Rio Hondo 220 kV T/L, and the 220 kV LSTs of the existing Mesa – Walnut 220 kV T/L and Center – Mesa 220 kV T/L, would be removed and replaced with one shorter, double-circuit 220 kV three-pole steel dead-end structure (see Figure 3.2-8) to facilitate crossing underneath the new Mira Loma – Vincent 500 kV T/L. The 66 kV span located 300 feet to the west of these double-circuit 220 kV LSTs at approximately S8A MP 2 would be installed underground to allow for this reconfiguration.

In the first span east of the "San Gabriel Junction," one additional double-circuit 220 kV LST would be installed in the Mesa – Walnut 220 kV T/L and Center – Mesa 220 kV T/L to maintain clearances to the new adjacent 500 kV T/L.

On the west side of the San Gabriel River Freeway at S8A MP 3.3, the LADWP double-circuit Victorville – Century No. 1 and No. 2 287 kV T/L would be reconfigured and lowered by removing one existing LST and installing two, 220 kV three-pole steel dead-end structures. Also, on the west side of the San Gabriel River Freeway, the two single-circuit LSTs of the Mesa – Walnut 220 kV T/L and Center – Mesa 220 kV T/L (M9-T3 and M9-T3A) would be replaced with one taller, double-circuit 220 kV LST to facilitate the reconfiguration of the LADWP 287 kV line.

In the second span east of Workman Mill Road at S8A MP 4.7, one additional double-circuit LST would be installed in the Mesa – Walnut 220 kV T/L and Center – Olinda 220 kV T/L to maintain clearances to the new adjacent 500 kV T/L.

Approximately 1 mile of the existing double-circuit Mesa – Walnut 220 kV T/L and Center – Olinda 220 kV T/L, across the Rose Hills Memorial Cemetery, would be rerouted along with the new Mira Loma – Vincent 500 kV T/L along the northern boundary of the Rose Hills Memorial Cemetery property, approximately between S8A MPs 6 and 7. Five existing double-circuit LSTs on the Mesa – Walnut 220 kV T/L and Mesa – Olinda 220 kV T/L would be removed and eight new 220 kV double-circuit LSTs installed. A new 240-foot-wide R-O-W would be acquired from Rose Hills Memorial Cemetery and the existing approximately 200-foot-wide, 1-mile-long R-O-W that crosses the Rose Hills Memorial Cemetery would be abandoned.

In three locations east of the Rose Hills Memorial Cemetery, additional 220 kV double-circuit LSTs would be installed in the Mesa – Walnut 220 kV T/L and Center – Olinda 220 kV T/L to maintain clearances to the new adjacent 500 kV T/L.

At Fullerton Road (S8A MP 13.5), the Mira Loma – Walnut 220 kV T/L, Olinda – Walnut 220 kV T/L, Center – Olinda 220 kV T/L, and Mira Loma – Olinda 220 kV T/L circuits would be reconfigured to minimize the height of the new Mira Loma – Vincent 500 kV T/L when it crosses the 220 kV circuits. Three new double-circuit 220 kV LSTs, west of Fullerton Road, would be installed to take the Olinda – Walnut 220 kV T/L and Olinda – Center 220 kV T/L circuits underneath the new Mira Loma – Vincent 500 kV T/L. The three double-circuit 220 kV LSTs and two spans of the Olinda – Walnut 220 kV T/L and Center – Olinda 220 kV T/L circuits, across Fullerton Road, would be removed. One double-circuit 220 kV LST tap structure on the Mira Loma – Walnut 220 kV T/L and Mira Loma – Olinda 220 kV T/L, east of Fullerton Road, would be removed and replaced with one shorter, double-circuit 220 kV LST tap structure to facilitate the Olinda – Mira Loma 220 kV T/L crossing underneath the new Mira Loma – Vincent 500 kV T/L.

In two locations east of Fullerton Road, additional double – circuit 220 kV LSTs would be installed in the Mira Loma – Walnut 220 kV T/L and Mira Loma – Olinda 220 kV T/L to maintain clearances to the new adjacent 500 kV T/L.

At the location where the Mira Loma – Walnut 220 kV T/L and Mira Loma – Olinda 220 kV T/L circuits cross under the new Mira Loma – Vincent 500 kV T/L, one 220 kV double-circuit LST would be replaced with two double-circuit 220 kV three-pole steel pole dead-end structures to facilitate crossing underneath the new Mira Loma – Vincent 500 kV T/L. Directly east of the Chino Substation, the new Mira Loma – Vincent 500 kV T/L joins the alignment of the Chino – Mira Loma No. 3 220 kV T/L on double-circuit LSTs constructed to 500 kV standards.

Directly east of the Chino Substation, two new double-circuit 220 kV TSPs would be installed on the Chino – San Onofre 220 kV T/L and Chino – Serrano 220 kV T/L to facilitate crossing underneath the new Mira Loma – Vincent 500 kV T/L. At this same location, two new single-circuit LSTs would be installed on the Chino – Mira Loma No. 3 220 kV T/L to facilitate crossing underneath the new Mira Loma – Vincent 500 kV T/L and then transition up to attach to the new Mira Loma – Vincent 500 kV T/L and Chino – Mira Loma No. 3 double-circuit 500 kV LSTs.

***Chino – Mira Loma No. 1 220 kV and Chino – Mira Loma No. 2 220 kV*.** The Chino – Mira Loma No. 1 220 kV and Chino – Mira Loma No. 2 220 kV T/L portions of Segment 8 (8B) begin at the Chino Substation and follow the existing Chino – Mira Loma No. 1 220 kV T/L alignment as a double-circuit to the Mira Loma Substation (see Figure P.1-2, Sheet 25). This section is a total of approximately 7 miles.

The existing single- and double-circuit 220 kV LSTs on the Chino – Mira Loma No. 1 220 kV T/L would be removed and replaced with double-circuit 220 kV LSTs located approximately adjacent to the existing structures.

66 kV Subtransmission Relocation**.** At S8A MP 2.2 at the "San Gabriel Junction," the double-circuit 220 kV structures of the existing Laguna Bell – Rio Hondo 220 kV T/L and Mesa – Rio Hondo 220 kV T/L and the existing Mesa – Walnut 220 kV T/L and Center – Mesa 220 kV T/L would be removed and replaced with shorter, double-circuit 220 kV three-pole steel dead-end structures to facilitate crossing underneath the new Mira Loma – Vincent 500 kV T/L. One 66 kV double-circuit span, located 300 feet to the west of these double-circuit 220 kV structures, would be installed underground for approximately 400 feet to allow for this reconfiguration.

On the east side of the San Gabriel River Freeway at approximately S8A MP 4.5, two double-circuit lattice towers on the Center – Mesa 220 kV T/L and Center – Olinda 220 kV T/L would be replaced with shorter lattice towers to accommodate the over crossing of the new Mira Loma – Vincent 500 kV T/L. One double-circuit 66 kV span, located 250 feet to the east of these double-circuit 220 kV structures, would be installed underground for approximately 250 feet to allow for this reconfiguration.

West of the Chino Substation and south of Edison Avenue, the single-circuit 220 kV lattice towers on the Chino – Soquel 66 kV T/L would be removed from south of Eucalyptus Avenue to the Chino Substation between approximately S8A MP 26.9 to S8A MP 28.1. A total of seven single-circuit 220 kV lattice towers would be replaced with 14 LWSPs to facilitate the Chino – Soquel 66 kV T/L. The remaining line section would be converted to underground for approximately 4,000 feet, from 500 feet west of Central Avenue (S8A MP 27.7) to the rack at the Chino Substation, to make room for the new Mira Loma – Vincent 500 kV T/L.

All existing 66 kV lines on Edison Avenue, from 500 feet west of Central Avenue to 100 feet east of Magnolia Avenue (S8A MP 28.7), would be converted to underground (approximately 5,500 feet) into the rack at the Chino Substation.

3.2.5.5.2 Structures. It is currently anticipated that Segment 8 (8A, 8B, 8C) would use a combination of 500 kV, 220 kV, and 66 kV structures, as follows:

- 500 kV structures (line construction):
  - Four-legged double-circuit LSTs (refer to Figure 3.2-5)
  - Four-legged single-circuit LSTs (refer to Figure 3.2-2)

- Double-circuit TSPs (refer to Figure 3.2-4)
- Single-circuit TSPs (refer to Figure 3.2-3)

- 220 kV structures (for adjacent Mesa – Walnut 220 kV T/L, Center – Mesa 220 kV T/L, Mesa – Walnut 220 kV T/L, and Mesa – Olinda 220 kV T/L, and crossing Center – Mesa 220 kV T/L and Center – Olinda 220 kV T/L and crossing Mira Loma – Walnut 220 kV T/L, Olinda – Walnut 220 kV T/L, Chino – Mira Loma No. 1 220 kV T/L, and Chino – Mira Loma No. 2 220 kV T/L):

  - Four-legged double-circuit LSTs (refer to Figure 3.2-6)
  - Four-legged single-circuit LSTs (refer to Figure 3.2-1)
  - Double-circuit TSPs (refer to Figure 3.2-10)
  - Single-circuit TSPs (refer to Figure 3.2-11)
  - Three-pole dead-end structures (refer to Figure 3.2-8)

- 66 kV structures

  - Double-circuit LWSPs (refer to Figure 3.2-9)

It is currently estimated that the total number of LSTs for Segment 8 would be approximately two single-circuit 220 kV LSTs, 57 double-circuit 220 kV LSTs, three single-circuit 500 kV LSTs, and 92 double-circuit 500 kV LSTs, constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 220 kV LSTs would have heights of 65 feet and 75 feet. The double-circuit 220 kV LSTs would range in heights between 113 feet and 180 feet. The single-circuit 500 kV LSTs would range in heights between 128 feet and 149 feet. The double-circuit 500 kV LSTs would range in heights between 147 feet and 255 feet.

It is currently estimated that the total number of TSPs for Segment 8 would be approximately two single-circuit 220 kV TSPs, 11 double-circuit 220 kV TSPs, four single-circuit 500 kV TSPs, and 50 double-circuit 500 kV TSPs, constructed of dulled galvanized steel. The single-circuit 220 kV TSPs would have heights of 85 feet and 95 feet. The double-circuit 220 kV TSPs would range in height between 75 feet and 115 feet. The single-circuit 500 kV TSPs would range in height between 120 feet and 170 feet. The double-circuit 500 kV TSPs would range in height between 150 feet and 195 feet.

It is currently estimated that the total number of three-pole dead-end structures for Segment 8 would be approximately five 220 kV structures. These structures would range in height between 75 and 110 feet.

It is currently estimated that the total number of LWSPs for Segment 8 would be approximately 14 double-circuit 66 kV structures.

3.2.5.5.3 Conductor. The two sections of the proposed Segment 8 500 kV transmission line would be strung with approximately 175,500 feet per circuit of 2B-2156 kcmil ACSR with nonspecular finish. A total of approximately 2,106,000 feet of conductor would be strung.

The section of the proposed Segment 8 220 kV transmission line would be strung with approximately 37,800 feet per circuit of 2B-1590 kcmil ACSR with nonspecular finish. A total of approximately 4,536,000 feet of conductor would be strung.

3.2.5.5.4 Insulators. The tangent and angle 500 kV insulator assemblies would consist of two strings of insulators in the form of a "V." Each leg of the "V" assembly would contain one or two one-piece gray polymer insulators, depending on the load. On dead-end structures, the insulators would be arranged in a "barrel" configuration consisting of four polymer insulators.

3.2.5.5.5 Overhead Ground Wires. The overhead ground wires would be located on the peaks of the transmission structures. The 500 kV structures would have two overhead ground wires. One overhead ground wire would be approximately 0.5 inch in diameter; the other ground wire would contain optical fibers for communications and line protection and would be approximately 11/16 inch in diameter.

3.2.6 Segment 9: Substation Facilities

3.2.6.1 Whirlwind Substation

3.2.6.1.1 Overview. Whirlwind Substation[5] would be a new 500/220 kV substation located approximately 4 to 5 miles south of the Cottonwind Substation near the intersection of 170th Street and Holiday Avenue, in Kern County, near the TWRA (Figure 3.2-12). SCE is evaluating three alternative sites (A, B, and C) for placement of the Whirlwind Substation, as depicted on Figure P.1-2, Sheet 4. Facilities associated with the proposed new substation (e.g., the substation pad and access road) would represent a permanent land disturbance between 65 and 67 acres. These facilities would be within a larger land area acquired by SCE to accommodate the new substation. It is estimated Alternative Site A would require acquisition of approximately 113 acres; Alternative Site B would require acquisition of approximately 102 acres; and Alternative Site C (proposed Project) would require acquisition

[5] Whirlwind Substation is also referred to as "Substation Five" or "Substation 5" in other associated documents.

of approximately 106 acres. Additional description of the Whirlwind site alternatives is provided in Section 2.0.

3.2.6.1.2 Major Equipment and Structures. The proposed new Whirlwind Substation would include a 500 kV switchyard and a 220 kV switchyard to accommodate connection to area transmission lines. Major equipment would include transformers, buses, circuit breakers, capacitor banks, conductor, and other associated equipment. Details regarding the specific equipment to be installed at the Whirlwind substation are provided in Appendix P. Low-decibel equipment would be used, as available and applicable to the project; final selection would occur during final design.

The 500 kV switchyard would be designed to terminate the Midway – Whirlwind 500 kV T/L in a double breaker configuration, as well as the Vincent – Whirlwind 500 kV T/L and the No. 1AA transformer bank leads in a breaker-and-a-half configuration.

The 500 kV switchyard would also accommodate termination of the new Antelope – Whirlwind 500 kV T/L in a double breaker configuration and the new Whirlwind – Windhub 500 kV T/L in a double-breaker configuration.

The 220 kV switchyard would be designed to accommodate the termination of the proposed new Cottonwind – Whirlwind No. 1 T/L and Cottonwind – Whirlwind No. 2 T/L, as well as the installation of two 220 kV 79.2 Megavolt-Amps Reactive (MVAR) capacitor banks.

3.2.6.1.3 Substation Light and Power. The Whirlwind Substation's light and power system would be designed per the latest standards, with a primary and a back-up power source, as well as an emergency system provided by an onsite, approximately 250 kW, diesel generator.

The primary power source would be the 13.8 kV tertiary bus of the new 1AA transformer bank and its related 500 kVA, three-phase transformer bank.

The secondary power source for the Whirlwind Substation would be a new 12 kV line and its related 500 kVA, three-phase transformer bank.

Adequate lighting would be provided for the new 500 kV and 220 kV switchyards as well as the new transformer and capacitor bank areas. In addition, single-phase and three-phase alternating current (AC) power outlets and test facilities would be installed within the new transformer bank and switchyard area.

Under normal operating conditions, the substation would not be illuminated at night. Lighting would be used only when required for maintenance outages or emergency repairs occurring at night. The lighting would consist of high-pressure sodium lights located in the switchyards, around the transformer banks, and in areas of the yard where operating and maintenance activities may take place during evening hours. Maintenance lights would be controlled by a manual switch and would normally be in the "off" position. The lights would be directed downward, and shielded to reduce glare outside the facility.

3.2.6.1.4 Protection. Adequate protective relaying equipment for the new 500 kV and 220 kV lines, transformer, and capacitor banks would be installed in the new Mechanical Electrical Equipment Room (MEER) per latest protection requirements.

3.2.6.1.5 Substation Ground Grid. SCE would install a new grounding grid using 350 kcmil ACSR for the new 500 kV and 220 kV switchyard areas. All new 500 and 220 kV equipment would be grounded to the new grid using 350 kcmil ACSR. The final ground grid design would be determined after a grounding study is performed. The station ground grid would be extended outside of the station's fence and main gates and for the required distances to provide safety to personnel.

3.2.6.1.6 MEER. The new Whirlwind Substation would include a MEER. The room would be equipped with air conditioning and would house the following equipment:

- Battery charger
- Batteries
- Light and power panel
- AC distribution panel
- Direct current (DC) distribution panel
- Circuit breaker control switches
- All required remote control, automation equipment
- All required protective relay equipment
- IT/Telecommunication equipment

3.2.6.2 Antelope Substation

3.2.6.2.1 Overview. The Antelope Substation portion of Segment 9 requires the upgrade of Antelope Substation (see Figure P.1-2, Sheet 6) with additional 500 kV equipment. The proposed expansion to 500 kV of the Antelope Substation has been licensed and was addressed in the Proponent's Environmental Assessment (PEA) submitted to support the Antelope Transmission Project, Segment 1. The exceptions to the licensing were the installation of a 200 MVAR Static VAR Compensator (SVC) and two 500 kV, 150 MVAR each, shunt capacitor banks. The new equipment would be installed in an area of approximately 12 acres. SCE would acquire approximately 18 acres of additional land at the substation site to accommodate the additional new construction at the Antelope Substation (Figure 3.2-13).

3.2.6.2.2 Major Equipment and Structures. Major equipment and structures proposed for installation at the Antelope Substation would include two 500 kV, 150 MVAR each capacitor banks (No. 1 and No. 2), and a new 500 kV SVC. Detailed information regarding the equipment associated with this installation is provided in Appendix P. Low-decibel equipment would be used as available and applicable to the project; final selection would occur during final design.

3.2.6.2.3 Substation Light and Power. No upgrade to the substation's existing power system will be required. Additional lighting would be provided for the new 500 kV SVC and shunt capacitor banks. Under normal operating conditions, the substation would not be illuminated at night. Lighting would be used only when required for maintenance outages or emergency repairs occurring at night. The lighting would consist of high-pressure sodium lights located in the switchyards, around the transformer banks, and in areas of the yard where operating and maintenance activities may take place during evening hours. Maintenance lights would be controlled by a manual switch and would normally be in the "off" position. The lights would be directed downward, and shielded to reduce glare outside the facility.

3.2.6.2.4 Substation Ground Grid Extension. A new underground grid would be installed in the entire extended substation area and would extend 3 feet beyond the perimeter fence. Grid conductor would be 350 kcmil soft drawn copper with 50-foot maximum spacing (25-foot spacing at grid edge).

3.2.6.2.5 MEER. A new MEER for the SVC would be installed in the expanded area and would house protective relays, controls, and medium voltage equipment. Shunt capacitor bank protective relaying equipment would be installed in the existing 500 kV MEER.

3.2.6.3 Vincent Substation

3.2.6.3.1 Overview. Segment 9 includes upgrade of the existing 500/220 kV Vincent Substation with new equipment to accommodate new transmission connections (see Figure P.1-2, Sheet 9 and Figure 3.2-14). This new equipment would necessitate two separate extensions of existing switchyards. At the southwestern corner of the facility, the south 220 kV bus extension would require an addition to the existing limits of the graded pad. A retaining wall would be constructed and back-filled to match the existing site grade. The 500 kV switchyard would be extended to the west by approximately 880 feet, where extensive new grading would be required (this activity is discussed in detail in

Section 3.3.2.3). The 500 kV substation expansion would be on existing SCE-fee owned property. The 220 kV switchyard expansion would require approximately 0.2 acre of new property acquisition, and would disturb approximately 18 acres.

3.2.6.3.2 Major Equipment and Structures. The 500 kV switchrack in the existing Vincent Substation 500 kV switchyard would be expanded by four line positions with double or breaker-and-a-half arrangement in order to terminate the following:

- Antelope – Vincent No. 1 500 kV T/L
- Antelope – Vincent No. 2 500 kV T/L
- Mira Loma – Vincent 500 kV T/L
- Other major equipment: two 500 kV 200 MVAR shunt capacitor banks and one 500 kV 600 MVAR SVC

In addition, the 220 kV switchyard would be upgraded and expanded. Detailed information regarding the equipment that would be installed at the Vincent Substation is provided in Appendix P. Low-decibel equipment would be used as available and applicable to the project; final selection would occur during final design.

3.2.6.3.3 Substation Light and Power. The existing station power and lighting system, including the substation's emergency generator, would be replaced and relocated within the expanded substation yard. Detailed information on the equipment that would be installed is provided in Appendix P.

Under normal operating conditions, the substation would not be illuminated at night. Lighting would be used only when required for maintenance outages or emergency repairs occurring at night. The lighting would consist of high-pressure sodium lights located in the switchyards, around the transformer banks, and in areas of the yard where operating and maintenance activities may take place during evening hours. Maintenance lights would be controlled by a manual switch and would normally be in the "off" position. The lights would be directed downward, and shielded to reduce glare outside the facility.

3.2.6.3.4 Substation Ground Grid Extension. A new ground grid would be installed in the entire extended substation area and tied to the existing grid conductors. The new ground grid would extend 3 feet beyond perimeter fence. Grid conductor would be 350 kcmil soft drawn copper with 50-foot maximum spacing (25-foot spacing at grid edge).

3.2.6.3.5 Control House Expansion. The Vincent Substation expansion would also require construction of a new 60-foot by 72-foot block wall control house attached to the existing control house. This expansion would have below-grade vault space and a tunnel between the outdoor cable trench and the vault for cable routing. The expansion would be equipped with dual air conditioning equipment to house lighting and power panels, AC/DC panels, and circuit-breaker control switches. Additional information regarding equipment at the control house is provided in Appendix P.

3.2.6.4 Mesa Substation

3.2.6.4.1 Overview. The Mesa Substation portion of Segment 9 includes upgrade of the existing 220 kV switchyard at the Mesa Substation with additional equipment to accommodate the connection of the new Mesa – Vincent No. 2 220 kV T/L, which is part of Segment 11 (see Figure P.1-2, Sheet 17). All upgrades at the Mesa Substation would take place within the existing fence line.

3.2.6.4.2 Major Equipment and Structures. Within the existing 220 kV switchyard at the Mesa Substation, work would be performed at existing 220 kV Line Positions 11 and 12 to terminate the new Mesa – Vincent No. 2 220 kV T/L, which is part of Segment 11. Detailed information regarding the new equipment that would be installed at the Mesa Substation is provided in Appendix P. Low-decibel equipment would be used as available and applicable to the project; final selection would occur during final design.

3.2.6.4.3 Substation Light and Power. No upgrade to the substation's existing power or lighting system would be required as part of the proposed Project. Under normal operating conditions, the substation would not be illuminated at night. Lighting would be used only when required for maintenance outages or emergency repairs occurring at night. The lighting would consist of high-pressure sodium lights located in the switchyards, around the transformer banks, and in areas of the yard where operating and maintenance activities may take place during evening hours. Maintenance lights would be controlled by a manual switch and would normally be in the "off" position. The lights would be directed downward, and shielded to reduce glare outside the facility.

3.2.6.4.4 Substation Ground Grid Extension. As the existing substation yard boundaries would not be modified under the proposed Project, no extension of the substation ground grid is required.

3.2.6.4.5 MEER. The MEER activities would include installation of all required protective relays for the new Mesa – Vincent No. 2 220 kV T/L.

3.2.6.5 Gould Substation

3.2.6.5.1 Overview. The Gould Substation portion of Segment 11 includes upgrade of the existing 220 kV switchyard to accommodate the connection of the new Eagle Rock – Gould 220 kV T/L as well as the 220kV connections of the existing transformer banks to double breaker positions (see Figure P.1-2, Sheet 19). All upgrades at the Gould Substation would take place within the existing fence line.

3.2.6.5.2 Major Equipment and Structures. Within the existing 220 kV switchyard at the Gould Substation, equipment would be installed in the existing 220 kV switchyard to terminate the new Eagle Rock – Gould 220 kV T/L. Detailed information regarding the equipment that would be installed at the Gould Substation is included in Appendix P. Low-decibel equipment would be used as available and applicable to the project; final selection would occur during final design.

3.2.6.5.3 Substation Light and Power. No upgrade to the substation's existing power system would be required as part of the proposed Project. New lighting would be provided for the new 220 kV bus extension area. Under normal operating conditions, the substation would not be illuminated at night. Lighting would be used only when required for maintenance outages or emergency repairs occurring at night. The lighting would consist of high-pressure sodium lights located in the switchyards, around the transformer banks, and in areas of the yard where operating and maintenance activities may take place during evening hours. Maintenance lights would be controlled by a manual switch and would normally be in the "off" position. The lights would be directed downward, and shielded to reduce glare outside the facility.

3.2.6.5.4 Substation Ground Grid Extension. As the existing substation yard boundaries would not be modified under the proposed Project, no extension of the substation ground grid is required.

3.2.6.5.5 MEER. The MEER activities would include installation of all required protective relays for the new Eagle Rock – Gould 220 kV T/L. The MEER activities would also include installation of all required protective relays for the new 220 kV transformer banks circuit breakers.

3.2.6.6 Mira Loma Substation

3.2.6.6.1 Overview. The Mira Loma Substation portion of Segment 9 would include the construction of a new 500 kV position to terminate new Mira Loma – Vincent 500kv T/L, as described under Segment 8 (see Figure P.1-2, Sheet 25). All work would take place within the existing Mira Loma fence line.

3.2.6.6.2 Major Equipment and Structures. New equipment would be installed at existing 500 kV Line Position 2X to terminate the new Mira Loma – Vincent 500 kV T/L. Detailed information regarding the equipment that would be installed at the Mira Loma Substation is provided in Appendix P. Low-decibel equipment would be used as available and applicable to the project; final selection would occur during final design.

3.2.6.6.3 Substation Light and Power. No upgrade to the substation's existing power or lighting system would be required as part of the proposed Project. Under normal operating conditions, the substation would not be illuminated at night. Lighting would be used only when required for maintenance outages or emergency repairs occurring at night. The lighting would consist of high-pressure sodium lights located in the switchyards, around the transformer banks, and in areas of the yard where operating and maintenance activities may take place during evening hours. Maintenance lights would be controlled by a manual switch and would normally be in the "off" position. The lights would be directed downward, and shielded to reduce glare outside the facility.

3.2.6.6.4 Substation Ground Grid Extension. As the existing substation yard boundaries would not be modified under the proposed Project, no extension of the substation ground grid is required.

3.2.6.6.5 MEER. The MEER scope of work would include installation of all required protective relays for the new Mira Loma – Vincent 500 kV T/L on Line Position No. 2X.

3.2.7 Segment 10: New Whirlwind – Windhub 500 kV Transmission Line

3.2.7.1 Overview

Segment 10 of the project is a new approximately 17-mile single-circuit 500 kV transmission line needed to enable the interconnection of potential wind generation to the SCE grid (see Figure P.1-2, Sheets 1-4). The new single-circuit line would be built on new R-O-W to be acquired on private land. The width of the new R-O-W would be 330 feet. SCE has developed two route alternatives (Alternative Segments 10A and 10B) for a portion of Segment 10 (See Figure P.1-2, Sheets 2-4).

3.2.7.2 T/L Facilities

Segment 10 consists of the construction of one new single-circuit 500 kV transmission line on an approximately 17-mile R-O-W between the new Whirlwind and Windhub Substations. The line would be constructed on new R-O-W to be acquired by SCE.

The new transmission line would use 2B-2156 kcmil ACSR on single-circuit LSTs. It is currently estimated that approximately 96 new 500 kV LSTs would be installed in the new R-O-W. The single-circuit LSTs would range in height between 94 feet and 172 feet.

3.2.7.3 Substation Facilities

Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.7.4 Information Technology (IT) Facilities

Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.7.5 T/L Engineering Plan

3.2.7.5.1 Routing. Acquisition of a new R-O-W over private land would be required for the entire approximately 17-mile-long transmission line route. The R-O-W would be 330 feet wide.

The proposed new 500 kV line would exit the south side of the Windhub Substation on 500 kV single-circuit LSTs. At S10 MP 0.3, the line would turn to the southwest for approximately 4 miles, to S10 MP 4.5.

At S10 MP 4.5, the line would turn west for 0.4 mile to S10 MP 4.8, and then turn south for approximately 3 miles to S10 MP 7.4. At S10 MP 7.4, the line would turn southwest and parallel the south side of Petroleum Road for approximately 9 miles to S10 MP 15.8, which is the intersection of Rosamond Boulevard and North 170th Street. The line would then turn south for 0.9 mile to S10 MP 16.8, where it would enter the east side of the proposed new Whirlwind Substation.

In addition to the above routing, there are two routing alternatives for sections of this proposed new transmission line: Alternative Segment 10A and Alternative Segment 10B. Proposed Alternative Segment 10A would mostly parallel the existing Los Angeles Aqueduct and access roads. It would begin at S10 MP 7 of the proposed route. The route mostly follows a west-southwest alignment until S10 MP 6.3, where it turns southwest. At S10 MP 7.5, the route turns south and parallels 170th Street West. At S10 MP 9.6, the route realigns with S10 MP 15.8 of the proposed route.

Proposed Alternative Segment 10B would be an alternative alignment of Alternative Segment 10A. It would begin at S10 MP 2.3 of Alternative Segment 10A. It would head on a west alignment for approximately 4 miles. At S10 MP 3.4, it would turn south along the assumed 160th Street West (not yet designated street). At S10 MP 5, the route would realign with S10 MP 6 of Alternative Segment 10A.

Additional descriptions of the Segment 10 route alternatives are provided in Section 2.0.

3.2.7.5.2 Structures. It is currently anticipated that Segment 10 would utilize single-circuit 500 kV structures as follows:

- 500 kV structures:

- Four-legged single-circuit LSTs (refer to Figure 3.2-2)

Approximately 96 single-circuit 500 kV LSTs would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 500 kV LSTs would range in heights between 94 feet and 172 feet.

It is currently anticipated that the approximately 18-mile-long Alternative Segment 10A would utilize single-circuit 500 kV structures as follows:

- 500 kV structures:
  - Four-legged single-circuit LSTs (refer to Figure 3.2-2)

Approximately 101 single-circuit 500 kV LSTs would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 500 kV LSTs would range in heights between 94 feet and 172 feet.

It is currently anticipated that the approximately 19-mile-long Alternative Segment 10B would utilize single-circuit 500 kV structures as follows:

- 500 kV structures:
  - Four-legged single-circuit LSTs (refer to Figure 3.2-2)

Approximately 109 single-circuit 500 kV LSTs would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 500 kV LSTs would range in heights between 94 feet and 172 feet.

3.2.7.5.3 Conductor. The proposed Segment 10 500 kV transmission line would be strung with 2B-2156 kcmil ACSR with nonspecular finish. Approximately 525,000 feet of conductor would be installed.

The proposed Segment 10A 500 kV transmission line would be strung with 2B-2156 kcmil ACSR with nonspecular finish. Approximately 551,000 feet of conductor would be installed.

The proposed Segment 10B 500 kV transmission line would be strung with 2B-2156 kcmil ACSR with nonspecular finish. Approximately 593,000 feet of conductor would be installed.

3.2.7.5.4 Insulators. The tangent and angle 500 kV insulator assemblies would consist of two strings of insulators in the form of a “V.” Each leg of the “V” assembly would contain one or two one-piece gray polymer insulators, depending on the mechanical load. On dead-end structures, the insulators would be arranged in a “barrel” configuration consisting of four polymer insulators.

3.2.7.5.5 Overhead Ground Wires. The overhead ground wires would be located on the peaks of the transmission structures. The 500 kV structures would support two overhead ground wires. One overhead ground wire would be approximately 0.5 inch in diameter; the other ground wire would contain optical fibers for communications and line protection, and would be approximately 11/16 inch in diameter.

3.2.8 Segment 11: New Mesa – Vincent (via Gould) 500/220 kV Transmission Line

3.2.8.1 Overview

Segment 11 would replace approximately 19 miles of existing single-circuit 220 kV transmission line between SCE's existing Vincent Substation and Gould Substation (in La Cañada Flintridge) with a new approximately 19-mile single-circuit 500 kV transmission line (See Figure P.1-2, Sheets 9-11, 18-21, and 17). This line would initially be energized at 220 kV. In addition, SCE proposes to install a second, approximately 18-mile 220 kV transmission line on the currently empty side of the transmission towers that extend from the Gould Substation property to the Mesa Substation in Monterey Park. Segment 11 construction would use existing R-O-W, but would require additional expanded R-O-W for approximately 3 miles north of Gould Substation on the west side of the existing corridor (see Figure P.1-2, Sheet 19; S11 MP 15.7 through 18.7).

3.2.8.2 T/L Facilities

3.2.8.2.1 220 kV T/L Scope. Approximately 18 miles of 220 kV transmission conductor would be strung on the vacant side of an existing double-circuit LST line now carrying the Eagle Rock – Mesa 220 kV T/L. The 220 kV T/L would use 2B-1590 kcmil ACSR on an existing, empty position of these double-circuit LSTs. The existing double-circuit LSTs range in height between 100 feet and 160 feet. It is currently estimated that three new 220 kV TSPs would be required in the existing R-O-W; two new structures would be located near Gould Substation to carry the line around the substation and one new structure would be located adjacent to Goodrich Substation to allow the new line to pass over/under the existing 220 kV loop into the Goodrich Substation.

3.2.8.2.2 500 kV T/L Scope. The 500 kV portion of the project (initially energized at 220 kV) would require the removal of approximately 4 miles of the existing Vincent – Pardee No. 1 220 kV T/L between Vincent Substation and S11 MP 3.6. In addition, the project would require the removal of an additional approximately 15 miles of the existing Eagle Rock – Pardee 220 kV T/L from S11 MP 3.9 to the Gould Substation.

Once the existing lines are removed, the new 500 kV LSTs would be built primarily in the existing R-O-W. Due to a narrowing of the existing 220 kV corridor in the approximately

3 miles immediately north of the Gould Substation, additional R-O-W width of approximately 250 feet would need to be acquired to the west of the existing corridor.

3.2.8.3 Substation Facilities

Information regarding the substation facilities included in the TRTP is presented under Segment 9.

3.2.8.4 Information Technology (IT) Facilities

Information regarding the IT facilities included in the TRTP is presented in Section 3.2.9.

3.2.8.5 T/L Engineering Plan

3.2.8.5.1 Routing.

***Vincent to Gould*.** The new transmission line would be built within the existing and new R-O-W (between approximately 200 feet to over 400 feet wide) proceeding southward from the Vincent Substation. After the LSTs supporting the Pardee – Vincent No. 1 220 kV T/L and the Eagle Rock – Pardee 220 kV T/L are removed (a total of approximately 19 miles), the new Gould – Vincent 500 kV T/L would be built following the same route with towers in approximately the same locations.0

The Pardee – Vincent No. 1 220 kV T/L would be routed over to an existing set of single-circuit towers. Up to three new LSTs would be required to route the line to the existing set of towers and maintain the circuit into Vincent Substation.

The northern portion of the Eagle Rock – Pardee 220 kV T/L would be routed north into the Vincent Substation, using a second set of idle towers, and the southern portion of the Eagle Rock – Pardee 220 kV T/L would be routed into the Gould Substation. Both of these reroutes would require two or three new LSTs.

The new 500 kV transmission line facilities would cross over/under several SCE 220 kV T/Ls and the LADWP Victorville – Toluca No. 1 500 kV T/L at S11 MP 2.5.

In addition, the proposed line would cross Highway 2 at several places along the route.

***Gould to Mesa*.** Two new 220 kV transmission line structures would be installed on the north and east sides of Gould Substation (see Figure P.1-2, Sheet 19) to connect the new Gould – Mesa 220 kV T/L into the northern position (currently empty) of the double-circuit 220 kV LSTs supporting the existing Eagle Rock – Mesa 220 kV T/L. From the Gould Substation south to the Mesa Substation, this empty circuit position would be used to add 2B-1590 kcmil ACSR. Once the corridor turns south, this position is on the east side of the double-circuit tower. Outside of Goodrich Substation, one existing structure will be replaced to accommodate the routing of the new circuit south to Mesa Substation.

3.2.8.5.2 Structures. It is currently anticipated that Segment 11 would construct a combination of 500 kV and 220 kV structures, as follows:

- 500 kV structures:
  - Four-legged single-circuit LSTs (refer to Figure 3.2-2)
- 220 kV structures:
  - Four-legged single-circuit LSTs (refer to Figure 3.2-1)
  - Single-circuit poles (refer to Figure 3.2-11)

It is estimated that approximately 67 single-circuit 500 kV LSTs would be installed between the Vincent and Gould Substations. These towers would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. These single-circuit 500 kV LSTs would range in height between 100 feet and 220 feet. It is estimated that approximately seven single-circuit 220 kV LSTs would be installed. These towers would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 220 kV LSTs would range in height between 120 feet and 160 feet. Additionally, approximately two single-circuit 220 kV poles would be installed. The single-circuit poles would be up to 120 feet in height.

3.2.8.5.3 Conductor. The proposed Segment 11 500 kV T/L would be strung with 2B-2156 kcmil ACSR with nonspecular finish. Approximately 615,000 feet of 2156 kcmil ACSR would be strung. The proposed Segment 11 220 kV T/L would be strung with approximately 580,000 feet of 2B-1590 kcmil ACSR with nonspecular finish.

3.2.8.5.4 Insulators. The tangent and small angle 500 kV insulator assemblies would consist of two insulators in the form of a “V.” Each leg of the “V” assembly would contain one or two one-piece gray polymer insulators, depending on the load. On dead-end and large angle structures, the insulators would be arranged in a “barrel” configuration consisting of four polymer insulators.

The tangent 220 kV insulator assemblies have a single polymer insulator, I-string configuration. Angle and dead-end assemblies include two polymer insulators in parallel.

3.2.8.5.5 Overhead Ground Wires. The overhead ground wires would be located on the peaks of the transmission structures. The 500 kV structures would have two overhead ground wires. One overhead ground wire would be 0.5 inch diameter steel; the other ground wire would contain optical fibers for communications and line protection and would be approximately 11/16 inch in diameter.

3.2.9 Information Technology (IT) Facilities

The proposed TRTP would require installation of IT facilities as part of all segments. For Segment 9, telecommunications infrastructure would be installed to support operation of the new Whirlwind Substation, as well as to protect new transmission line facilities from electrical faults. The new circuits would include fault protection, supervisory control and data acquisition (SCADA), telephone, and if necessary, remedial action scheme (RAS).

For transmission segments, optical ground wire (OPGW) would be installed as part of all new transmission line construction along the length of the TRTP. OPGW is a specialized form of overhead ground wire (OHGW) that contains optical fiber strands within a central core, surrounded by the steel strands of the ground wire. It would be installed at the tops of transmission line towers in the same manner as conventional OHGW during transmission line construction. As described in previous sections, the OPGW would be approximately 11/16 inch in diameter. Construction requirements and activities associated with these IT facilities are described in Section 3.3.

The planned demolition and reconstruction of 220 kV transmission lines in portions of TRTP Segments 6, 7, 8 and 11 would jeopardize SCE telecommunications optical fiber cable that is in service on those segments. This optical fiber cable is wrapped on the OHGW now installed at the top of the structures that are slated for demolition.

To maintain continuity of service for the lightwave (LW) systems (and their subordinate circuits) presently transported on strands within the jeopardized optical fiber cables, alternative routes must be developed. One or more of the following reroute measures described below would be adopted. In each case, the strategy would be to have the optical fiber reroute constructed and placed in service before demolition started on the transmission lines.

- Move the LW systems to other existing optical fiber cables, on other routes, that are not impacted by demolition and rebuild plans.
- Create a new route on the same R-O-W by wrapping new optical fiber cable on the OHGW for an adjacent T/L that is not slated for demolition.
- Create a new route on the same R-O-W by stringing a different type of optical fiber cable on an adjacent T/L that is not slated for demolition. This method would consist of attaching all-dielectric-self-supporting (ADSS) fiber cable to the LST on the adjacent T/L. The ADSS would be installed lower than the bottom conductor(s) on the towers. This method could require inter-setting of additional poles to support the ADSS along the

R-O-W if the span distances between the LSTs were greater than could be accommodated with available ADSS technology.

- Build new optical fiber cables on entirely different routes. This method would identify routes with existing T/L structures that would be suitable for attaching fiber cable.
- Construct an underground conduit segment and relocate the optical fiber cable within the new conduit to avoid planned T/L tower demolition. This method would only be practical for short distances on existing R-O-W, where only one or two spans of wrapped fiber are in jeopardy.

Final decisions regarding the optimal strategies for ensuring service continuity for LW systems would be decided during the Project's final engineering phase.

3.3 CONSTRUCTION PLAN

3.3.1 Transmission Line Construction

Construction activities for the TRTP would include establishment of marshalling yards for staging of materials and equipment, and development of access roads and spur roads to reach construction sites. Following this, or in parallel, crews would remove existing transmission lines as specified for Segments 5 through 8 and Segment 11, and also begin installation of new transmission towers. New tower construction would include clearing of footing locations, installation of foundations, tower assembly, and tower erection. After towers are in place, crews would proceed with stringing of conductor and overhead ground wires. Construction would be completed with clean-up of construction sites and demobilization of personnel and equipment. The exact construction methods employed and the sequence with which construction tasks occur would be dependent on final engineering, contract award, conditions of permits, and contractor preference.

In general, construction efforts would occur in accordance with accepted construction industry standards. Construction activities generally would be scheduled during daylight hours (7:00 a.m. to 5:00 p.m.), Monday through Friday. When different hours or days are necessary, SCE would obtain variances, as necessary, from the jurisdiction in which the work would take place. All materials associated with construction efforts would be delivered by truck or helicopter to established marshalling yards. Delivery activities requiring major street use would be scheduled to occur during off-peak traffic hours.

The following sections provide more detailed information about the construction tasks that would be associated with transmission line construction for the TRTP.

3.3.1.1 Marshalling Yards

Marshalling yards would be used to stage equipment and materials during construction. Materials and equipment typically staged at these yards would include, but would not be limited to, tower steel bundles, tubular steel poles, spur angles, palletized bolts, rebar, wire reels, insulators and hardware, heavy equipment, light trucks, construction trailers, and portable sanitation facilities. Also, material that would be removed from existing transmission lines during re-build efforts associated with Segments 5 through 8 and Segment 11, such as conductor, steel, concrete, and other debris, would be temporarily stored in marshalling yards as it awaits salvage, recycling, or disposal.

This project would include several primary marshalling yards that would be selected based on accessibility to construction locations and proximity to transmission line and substation access roads. Where possible, predisturbed areas would be used. Once sites for primary yards are proposed, biological and cultural resource reviews would be conducted before final site selection. An area up to 5 acres in size would be required for each primary marshalling yard. In addition to construction materials and equipment these yards may contain trash and recycle bins. Preparation of the primary yards would include the application of road base, installation of perimeter fencing, and implementation of Storm Water Pollution Prevention Plan (SWPPP) best management practices.

In addition to the primary yards, secondary marshalling yards would be established for short-term utilization near construction sites. Where possible, the secondary yards would be sited in areas of previous disturbance along the construction corridors. Final siting of these yards would depend upon availability of appropriately zoned property that is suitable for this purpose. The number and size of the secondary marshalling yards would be dependent upon a detailed R-O-W inspection and would take into account, where practical, suggestions by the successful bidder for the work. Typically, an area approximately 1 to 3 acres would be required. Once sites for secondary yards are proposed, biological and cultural resource reviews would be conducted before final site selection. Preparation of the secondary yards would include installation of perimeter fencing, and implementation of SWPPP best management practices. Application of road base may also occur, depending on existing ground conditions at the yard site.

3.3.1.2 Access Roads and Spur Roads

Transmission line roads are classified into two groups: access roads and spur roads. Access roads are through roads that run between tower sites along an R-O-W and serve as the main transportation route along line R-O-Ws. Spur roads are roads that lead from line access roads and terminate at one or more tower sites.

This project includes construction on both existing R-O-W and new R-O-W. Where construction would take place on existing R-O-W, it is assumed that most of the existing access roads as well as spur roads would be used. However, it is also assumed that rehabilitation work would be necessary in some locations for existing roads to accommodate construction activities. This work may include:

- Re-grading and repair of existing access and spur roads. These roads would be cleared of vegetation, blade-graded to remove potholes, ruts, and other surface irregularities, and re-compacted to provide a smooth and dense riding surface capable of supporting heavy construction equipment. The graded road would have a minimum drivable width of 12 feet and preferably a shoulder width of an additional 2 feet. Refer to Figure 3.3-1 for a typical road cross section.
- Drainage structures such as wet crossings, water bars, overside drains and pipe culverts (see Figures 3.3-2 through 3.3-4) would be installed to allow for construction traffic usage, as well as prevent road damage due to uncontrolled water flow.
- Slides, washouts, and other slope failures would be repaired and stabilized by installing retaining walls (see Figure 3.3-5) or other means necessary to prevent future failures. The type of structure to be used would be based on specific site conditions.

Where construction would take place in new R-O-W, which is particularly applicable to Segments 4 and 10, new access and spur roads would be necessary to access the transmission line structure locations.

Similar to rehabilitation of existing roads, all new road alignments would first be cleared and grubbed of vegetation. Roads would be blade-graded to remove potholes, ruts, and other surface irregularities, and re-compacted to provide a smooth and dense riding surface capable of supporting heavy construction equipment. The graded road would have a minimum drivable width of 12 feet (preferably with 2 feet of shoulder on either side). In addition, drainage structures (e.g., wet crossings, water bars, overside drains, pipe culverts, and energy dissipaters [see Figures 3.3-2 through 3.3-4]) would be installed along spur and access roads to allow for construction equipment usage as well as to prevent erosion from uncontrolled water flow. Slides, washouts, and other slope failures would be repaired and stabilized along the roads by installing retaining walls (see Figure 3.3-5) or other means necessary to prevent future failures. The type of mechanically stabilized earth-retaining structure to be used would be based on site-specific conditions.

It is anticipated that most of the roads constructed to accommodate new construction would be left in place to facilitate future access for operations and maintenance purposes. Gates would be installed where required at fenced property lines to restrict general and recreational vehicular access to road R-O-Ws.

Construction roads across areas that are not required for future maintenance access would be removed and restored after construction is completed. An example of this type of road would be a road constructed to provide access to a splice location during wire-stringing operations. Splice locations are used to remove temporary pulling splices and install permanent splices once the conductor is strung through the stringing travelers located on transmission structures. Access roads to splice locations are sometimes required when a splice location is not accessible from an access or spur road.

3.3.1.3 Removal of Existing Wire, Structures, and Footings

Construction of several segments of the TRTP (Segments 5 through 8, and Segment 11) would require the removal of existing transmission line. Transmission line equipment to be removed includes existing 220 kV and 66 kV towers and poles and associated hardware (i.e., insulators, vibration dampeners, suspension clamps, ground wire clamps, shackles, links, nuts, bolts, washers, cotters pins, insulator weights, and bond wires), as well as the transmission line primary conductor and ground wire.

SCE proposes to remove the existing 220 kV and 66 kV LSTs through the following activities:

- **Grading:** Existing access routes would be used to reach tower sites, but some rehabilitation work on these routes may be necessary before removal activities begin. In addition, grading may be necessary to establish crane pads for tower removal.
- **Removal Crane:** For each LST, a crane pad of approximately 50 feet by 50 feet would be cleared of vegetation and graded (if the ground is not level) to allow a removal crane to be setup at a distance of 60 feet from the LSTs center line. The crane rail would be located transversely from the LST locations.
- **Footing Removal:** The existing LST footing would be removed to a depth of 2 feet. Holes would be filled and compressed to 90 percent compaction, and then the area would be smoothed to match surrounding grade.
- **Steel Removal:** To remove the steel, crews would drive a light duty truck to each footing area. No hazards would remain following tower removal.
- **Helicopter Use:** In the event that there are no existing access roads, contractors would hike in to the tower locations. Approximately one or two small helicopters would be used to transport equipment to tower sites for conductor and associated hardware removal (Figure 3.3-7). A large, heavy lift helicopter would be used for removal of the existing 220 kV towers. It is estimated that the small helicopter would generally operate up to 8 hours per day, Monday through Friday, while the large helicopter would operate approximately 6 to 8 hours per day. The operating area of the helicopters would be

limited to helicopter staging areas (such as Fox Field or Rio Hondo Substation), material and equipment yards, and positions along the utility corridors that have previously been used for this purpose and SCE has determined are safe locations for landing.

SCE proposes to remove the existing 220 kV and 66 kV conductor wire through the following activities:

- **Wire Pulling Locations:** Wire-pulling locations are an estimated 200 feet by 200 feet (0.92 acre) in size and would be sited no more than every 15,000 feet along the utility corridor, and would include dead-end towers and turning points. It is anticipated that the same locations for installation of the 500 kV lines would be used for removal of existing lines. Wire-pulling equipment would be placed intermittently along utility corridors.
- **Breakaway Reels:** The old conductor wire would be wound onto "breakaway" reels as it is removed.
- **Pulling Cable**: A 3/8-inch pulling cable would replace the old conductor as it is pulled out, thereby allowing complete control of the conductor during its removal. The 3/8-inch line would then be removed under controlled conditions to minimize ground disturbance, and all wire-pulling equipment would be removed.
- **Conductor Disposal:** The conductor would be transported to a marshalling yard where it would be prepared for recycling.

Waste disposal and recycling activities that would be associated with removal of transmission line are discussed in Section 3.8.

3.3.1.4 Tower and Pole Construction

3.3.1.4.1 Site Preparation. Where possible, the construction of new LSTs and TSPs would occur on former tower sites. Where new pads are necessary, each pad location would first be graded and/or cleared to provide a reasonably level and vegetation-free surface for footing construction. Sites would be graded such that water would run toward the direction of the natural drainage. In addition, drainage would be designed to prevent ponding and erosive water flows that could cause damage to the tower footings. The graded area would be compacted to at least 90 percent relative density, and would be capable of supporting heavy vehicular traffic.

An area of approximately 0.001 acre would be required for the single footing needed for each TSP and approximately 0.003 acre would be required to accommodate the four footings needed for each LST.

In mountainous areas, benching may be required to provide access for footing construction, assembly, erection, and wire-stringing activities during line construction. Benching is a technique in which a tracked earth-moving vehicle excavates a terraced access to LST excavations in extremely steep and rugged terrain. It would be used minimally and for two purposes:

- To help ensure the safety of personnel during construction activities
- To control costs in situations where potentially hazardous, manual excavations would be required

3.3.1.4.2 Foundations. Structure foundations would typically be drilled concrete piers. New lattice steel towers would be constructed on four drilled pier concrete footings, while each tubular steel pole would be constructed on a single drilled pier concrete footing. The foundation process would start with the auguring of the holes for each tower or pole. The holes would be bored using truck or track-mounted excavators with various diameter augers to match diameter requirements of the foundation sizes. Lattice steel structures typically require an excavated hole of 3 to 6 feet in diameter and 15 to 30 feet deep. Tubular steel poles typically require an excavated hole of up to 10 feet in diameter and 60 feet deep. On average each foundation for an LST or TSP would project above the ground approximately 3 feet.

Following excavation of the foundation holes, reinforcing steel and stub angles would be installed and the concrete would then be placed. Steel reinforced cages and stub angles would be assembled at laydown yards and delivered to each structure location by flatbed truck. Typical lattice towers would require 15 to 20 cubic yards of concrete delivered to each structure location for tangent structures, 25 to 30 cubic yards for angle towers, and 100 cubic yards for dead-end towers. Typical tubular steel poles would require up to 100 cubic yards of concrete at each structure location.

Footing work would be completed using standard "poured-in-place" augured excavation techniques. At the time of construction, elevations would be established, rebar cages set, spur angles and concrete placed, and survey positioning would be verified. Concrete samples would be drawn at time of pour and tested to ensure engineered strengths were achieved. Typically, on regular terrain, under ideal circumstances, a single footing crew could be expected to excavate, place steel cages and stub angles, and pour in place concrete for one complete LST every 2 days. A foundation set for each LST would include four footings. The single foundation for a TSP can typically be completed in 3 days. A normally specified SCE concrete mix typically takes approximately 20 working days to cure to an engineered strength. This strength is verified by controlled testing of sampled concrete. Once this strength has been achieved, crews would be permitted to commence erection of steel.

Conventional construction techniques would generally be used as described above for new footing installation. In certain cases, equipment and material may be deposited at structure sites using helicopters or by workers on foot, and crews may prepare the footings using hand labor assisted by hydraulic or pneumatic equipment, or other methods.

3.3.1.4.3 Tower and Pole Assembly. LSTs would be assembled at laydown areas at each site, and then erected and bolted to the foundations. Tower assembly would begin with the hauling and stacking bundles of steel at tower location per engineering drawing requirements. This activity requires use of several tractors with 40-foot floats and an onsite loader. After steel is delivered and stacked, crews would proceed with assembly of leg extensions, body panels, boxed sections and the bridges. The steel work would be completed by a combined erection and torquing crew with a lattice boom crane. The construction crew may opt to install insulators and wire rollers (travelers) at this time. Figure 3.3-6 provides a representation of this construction process. Ground disturbance would generally be limited to the laydown areas, which would typically occupy an area of 200 feet by 200 feet (0.92 acre).

For TSPs, steel work would consist of hauling the TSPs in sections to their designated sites using semi-trucks with 40-foot trailers and rough terrain cranes. Due to the size of the TSPs, each pole would require at least two trucks. At the site, the poles would be set on the foundations once the proper cure time for the concrete had been attained. The poles could either be assembled into a complete structure or set one piece at a time by stacking them together. This would depend largely on the terrain and available equipment. Stacking the poles one piece at a time would cause the least amount of ground disturbance. Laydown areas would be established for the assembly process and would generally occupy an area of 200 feet by 200 feet (0.92 acre) at each location.

3.3.1.4.4 Tower and Pole Erection. Where road access is available to tower sites, assembled tower sections would be lifted into place with a minimum 80-ton all-terrain or rough terrain crane that would move along the R-O-W for structure erection purposes.

On Segments 6, 7 and 11 of the TRTP, there would be structure sites located greater than 50 feet from the nearest road. Therefore, it is anticipated that a helicopter may be used for installation of new 500 kV LSTs or TSPs.

Use of helicopters for installation eliminates land disturbance associated with crane pads, structure laydown areas, and the trucks and tractors used for steel delivery to structure sites. Figure 3.3-7 shows how helicopters are used to assemble structure components. All construction work in remote work sites would be completed by hand with the assistance of portable compressors, portable hydraulic accumulators, and portable concrete mixers that would be flown into the tower sites. The use of helicopters for the erection of LSTs or TSPs would be in accordance with SCE specifications and would be similar to methods detailed in

IEEE 951-1966, Guide to the Assembly and Erection of Metal Transmission Structures, Section 9, Helicopter Methods of Construction. During helicopter operations, public access to defined areas would be restricted. Temporary road closures, traffic detours, and posted notices and signs would be used to restrict public access to construction areas.

The operations area of the helicopters would be limited to helicopter staging areas such as Fox Field and Rio Hondo Substation and positions near construction locations that have previously been used for this purpose and are considered safe locations for landing. Final siting of staging areas for the TRTP would be conducted with the input of the helicopter contractor, and affected private landowners and land management agencies. The size of each staging area would be dependent upon the size and number of towers to be installed. Staging areas would likely change as work progresses.

Helicopter fueling would occur at staging areas or at a local airport (e.g., Fox Field) using the helicopter contractor's fuel truck, would be supervised by the helicopter fuel service provider, and SWPPP measures would be followed, as applicable. The helicopter and fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

3.3.1.5 Wire-stringing Operations

Wire-stringing includes all activities associated with the installation of conductors onto the LSTs and TSPs. This activity includes the installation of primary conductor and ground wire, vibration dampeners, weights, spacers, and suspension and dead-end hardware assemblies. Insulators and stringing sheaves (rollers or travelers) are attached as part of the wire-stringing activity if the work is a part of a reconductoring effort; otherwise they are typically attached during the steel erection process. Wire-stringing activities would be conducted in accordance with SCE specifications, which is similar to process methods detailed in IEEE Standard 524-1992, Guide to the Installation of Overhead Transmission Line Conductors. A standard wire-stringing plan includes a sequenced program of events starting with determination of wire pulls and wire pull equipment set-up positions. Advanced planning by supervision determines circuit outages, pulling times, and safety protocols needed for ensuring that safe and quick installation of wire is accomplished.

Typically, wire pulls occur every 15,000 feet on flat terrain and every 9,000 feet in mountainous terrain. Wire splices typically occur every 4,500 feet. "Wire pulls" are the length of any given continuous wire installation process between two selected points along the line. Wire pulls are selected, where possible, based on availability of dead-end LSTs at the ends of each pull, geometry of the line as affected by points of inflection, terrain, and suitability of stringing and splicing equipment setups. In some cases, it may be preferable to select an equipment setup position between two suspension towers. Anchor rods would then be installed to provide dead-ending capability for wire sagging purposes, and also to provide a convenient splicing area.

To ensure the safety of workers and the public, safety devices such as traveling grounds, guard structures, and radio-equipped public safety roving vehicles and linemen would be in place prior to the initiation of wire-stringing activities. Guard structure use is discussed in detail in Section 3.3.1.7.

The following four steps describe the wire installation activities proposed by SCE:

- **Step 1: Sock Line; Threading:** A helicopter would fly a lightweight sock line from tower to tower, which would be threaded through the wire rollers in order to engage a cam-lock device that would secure the pulling sock in the roller. This threading process would continue between all towers through the rollers of a particular set of spans selected for a conductor pull.
- **Step 2: Pulling**: The sock line would be used to pull in the conductor pulling cable. The conductor pulling cable would be attached to the conductor using a special swivel joint to prevent damage to the wire and to allow the wire to rotate freely to prevent complications from twisting as the conductor unwinds off the reel. A piece of hardware known as a running board would be installed to properly feed the conductor into the roller; this device keeps the bundle conductor from wrapping during installation.
- **Step 3: Splicing, Sagging, and Dead-ending:** After the conductor is pulled in, all mid-span splicing would be performed. Once the splicing has been completed, the conductor would be sagged to proper tension and dead-ended to towers.
- **Step 4: Clipping-in, Spacers:** After conductor is dead-ended, the conductors would be attached to all tangent towers; a process called clipping in. Once this is complete, spacers would be attached between the bundled conductors of each phase to keep uniform separation between each conductor.

As noted above, the threading step of wire installation would require helicopter use. While only one small helicopter is needed, two helicopters may be used to shorten the time for this phase. On average, each helicopter would operate 4 hours per day during stringing operations. The operations area of the small helicopter would be limited to helicopter staging areas such as Fox Field and Rio Hondo Substation and positions along the utility corridor that have previously been used for this purpose and are considered safe locations for landing. Final siting of staging areas for the TRTP would be conducted with the input of the helicopter contractor, and affected private landowners and land management agencies. The size of each staging area would be dependent upon the size and number of towers to be removed and installed. Staging areas would likely change as work progresses along the transmission lines.

Helicopter fueling would occur at staging areas or at a local airport (e.g., Fox Field) using the helicopter contractor's fuel truck, and would be supervised by the helicopter fuel service provider. The helicopter and fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

3.3.1.6 Pulling and Splicing Locations

The dimensions of the area needed for the stringing setups associated with wire installation are variable and depends upon terrain. On average, however, pulling and splicing equipment set-up sites require an area of 200 feet by 200 feet (0.92 acre); however, crews can work from within a slightly smaller area when space is limited. These locations require level areas to allow for maneuvering of the equipment. When possible, pulling and splicing locations would be located on existing level areas and existing roads to minimize the need for grading and cleanup. Stringing set-up locations on USFS land that would be located outside the established utility corridor would be authorized under a temporary Special Use Permit as necessary.

Each pulling location would include one puller positioned at one end and one tensioner and wire reel stand truck positioned at the other end. Specialized support equipment such as skidders and wire crimping equipment would be strategically positioned to support the operations The pulling and splicing set-up locations would be used to remove temporary pulling splices and install permanent splices once the conductor is strung through the rollers located on each tower, and are necessary as the permanent splices that join the conductor together cannot travel through the rollers. For stringing equipment that cannot be positioned at either side of a dead-end transmission tower, field snubs (i.e., anchoring and dead-end hardware) would be temporarily installed to sag conductor wire to the correct tension.

The puller, tensioner, and splicing set-up locations associated with the TRTP are anticipated to disturb a total of approximately 317 acres. These disturbances would be temporary and the land would be restored to its previous condition following completion of pulling and splicing activities. Estimates of the land disturbance associated with this activity for each segment are provided in Tables 3.3-1 through 3.3-8.

3.3.1.7 Guard Structure Installation

Guard poles or guard structures may be installed at transportation, flood control, and utility crossings. Guard structures may also be installed at other locations such as parks or near residences. These are temporary facilities designed to stop the travel of a conductor should it momentarily drop below a conventional stringing height, and are removed after conductors are installed. If required, temporary netting (see Figures 3.3-8 and 3.3-9) would be installed to protect some types of under-built infrastructure. In some cases, guard structures can be specially equipped boom type trucks with heavy outriggers. Typical guard structures (see Figure 3.3-9) are standard wood poles, 60 to 80 feet tall, arranged in such a manner as to arrest the travel of conductor should it momentarily drop below a conventional stringing height. Depending on the width of the line being constructed, the number of guard poles installed on either side of a crossing would be between 2 and 4.

Public agencies differ on their policies for guard structures and their preferred methods for public safety. For highway and open channel aqueduct crossings, SCE would work closely with the applicable jurisdiction to secure the necessary permits to string conductor across the applicable infrastructure. For major roadway crossings, typically one of the following four methods is employed to protect the public:

- Erection of a highway net guard structure system
- Detour of all traffic off of the highway at the crossing position
- Implementation of a controlled continuous traffic break while stringing operations are performed
- Establishment of special line trucks with extension booms onto the highway deck at strategic positions

Based on a review of the number of road crossings that would be needed along the currently proposed TRTP transmission routes, SCE has estimated that approximately 684 guard structures would be installed to facilitate TRTP construction. Approximately 157 acres of temporary land disturbance would be created by guard pole construction if it is estimated that each guard pole would disturb a land surface area of 50 feet by 100 feet and two guard structures would be used at each crossing. Tables 3.3-1 through 3-.3-8 provide initial estimated land disturbance that would be associated with guard pole installation for each segment. Please note that these estimates are preliminary as the types of guard structures that would be required for crossings and the number of crossings necessary for each segment would be field verified upon completion of final design.

3.3.1.8 66 kV Subtransmission Underground Construction

As part of Segment 8, short section of existing 66 kV subtransmission line would be converted to underground to accommodate construction of new 500 kV facilities. The location of these sections are described in Section 3.2.5.1.5. To convert the overhead lines to underground, a backhoe would be used to excavate a trench approximately 20 inches wide by 5 feet deep. This substructure would consist of six concrete encased PVC conduits. Each substructure would contain two subtransmission circuits. Each segment would be equipped with at least two concrete vaults, approximately 10 feet wide by 20 feet long for the purpose of splicing cable segments. An excavator would be used to prepare vault locations.

Approximately one month would be necessary to complete the construction activities associated with installation of each underground segment.

3.3.2 Substation Construction

Substation construction would include construction of one new substation, significant upgrades to two substations (including substation yard expansions), and equipment additions to three substations. In general, construction efforts would occur in accordance with accepted construction industry standards. Work generally would be scheduled during daylight hours (7:00 a.m. to 5:00 p.m.), Monday through Friday. When different hours or days are necessary, SCE would obtain variances, as necessary, from the jurisdiction in which the work would take place. All materials associated with construction efforts would be delivered by truck to the individual substation sites. Delivery activities requiring major street use would be scheduled to occur during off-peak traffic hours.

Construction of new substations and substation expansions would require earthwork activities. Construction sites would first be cleared of vegetation and loose rock and then graded to provide a level surface. Soils generated from the grading activities would be tested to determine if contamination is present before removal for disposal. During grading operations, dust would be controlled by measures outlined in the SWPPP.

Installation of new equipment and structures at each substation would also require earthwork activity. This earthwork would include the excavations needed to support installation of new foundations and trenches within the existing substation pad. Soil from these excavations would be redistributed on substation property.

Construction debris from activities at each substation site would be placed in appropriate onsite containers and periodically disposed of per applicable regulations. Waste management is addressed in more detail in Section 3.8. The following sections describe the site-specific construction activities that would be associated with the various substations that are part of the proposed TRTP.

3.3.2.1 Whirlwind Substation

The Whirlwind Substation would be a new 500/220 kV substation located near the TWRA in Kern County. SCE is evaluating three alternative sites (A, B, and C [proposed]) for placement of the Whirlwind Substation; all are near the intersection of 170th Street and Holiday Avenue as depicted on the Detailed Project Location Map in Appendix P. Additional description of the Whirlwind site alternatives is provided in Section 2.0.

Most activities supporting construction of the Whirlwind Substation would be common to all three alternative sites, although there would be some variation in the amounts of total disturbance required based on the pad configuration on each site and road access to each site. Land disturbance estimates for Alternative Sites A, B, and C are shown below in Table 3.3-9.

TABLE 3.3-9
ESTIMATES OF LAND DISTURBANCE
WHIRLWIND SUBSTATION ALTERNATIVE SITES

	Alternative Site A		Alternative Site B		Alternative Site C (Proposed Project)	
Element	Dimensions	Area of Disturbance (acres)	Dimensions	Area of Disturbance (acres)	Dimensions	Area of Disturbance (acres)
Substation Pad		56.0		56.0		56.0
Side Slope Grading		8.0		8.0		8.0
Primary Access Road	40 feet x 750 feet	0.7	40 feet x 800 feet	0.7	40 feet x 800 feet	0.7
Secondary Access Road	30 feet x 1,200 feet	0.8	30 feet x 350 feet	0.2	30 feet x 440 feet	0.3
Holiday Avenue Paved Access			30 feet x 2,500 feet	1.7		
Total Estimated		66.0		67.0		65.0

3.3.2.1.1 <u>Grading and Earthwork</u>. The following elements of site preparation would be required for Whirlwind Substation:

- Grade the entire 56-acre substation pad
- Grade the cut and fill side slopes to blend the existing terrain with the new pad
- Grade and install the substation access roads
- Install approximately 6,400 feet of 8-foot-high chain link perimeter fence with barbed wire surrounding the entire substation pad and two 24-foot-wide double drive gates

The proposed grading scheme would establish a high point at the northern end of the substation pad and slope down at a 1.0 to 1.5 percent slope towards the southern end of the pad. This down-slope would result in an elevation change of between 19 and 28 feet. During final engineering, a slope percentage would be selected that results in the least amount of earth movement while meeting the physical requirements of the substation, which would be no greater than 2 percent.

Prior to the start of grading, the entire area to be graded would be stripped of all organic matter and loose rocks. Any waste material encountered would be removed as required by the environmental and geotechnical investigations. Waste collected from these stripping operations would be tested for contamination.

Alternative Site A would be located on previously disturbed land. For the purposes of determining environmental impacts, an average of 2 inches of stripping is anticipated over the entire substation site resulting in an estimated quantity of 15,000 cubic yards of soil mixed with small stones and organic matter that would need to be transported from the site and disposed of at an appropriate waste disposal facility.

Alternative Site B would be located on previously undisturbed land. For the purposes of determining environmental impacts, an average of 3 inches of stripping is anticipated over the entire substation site resulting in an estimated quantity of 24,000 cubic yards of soil mixed with small stones and organic matter that would need to be transported from the site and disposed of at an appropriate waste disposal facility.

Alternative Site C (proposed Project) would be located partly on previously disturbed and plowed land and partly on native terrain. The average natural slope ranges between 1 and 3 percent across the proposed site. For the purposes of determining environmental impacts, an average 2 inches of ground surface of stripping is anticipated over the entire substation site resulting in an estimated quantity of 15,000 cubic yards of soil mixed with small stones and organic matter that would need to be transported from the site and disposed at an appropriate waste disposal facility.

Once the surface has been cleared, the grading operations would begin. An estimated 100,000 cubic yards of soil would be cut from higher elevations and relocated to the lower elevations as fill. A portion of the cut soil would be used to form a protective earthen barrier along the upslope boundaries to prevent surface storm water runoff from entering the substation. If excessive cut or fill would result, minor alterations to the site elevation and/or slopes might be needed in an attempt to achieve and overall balance. Should it prove impossible or impractical to balance the earthwork quantities, it would be necessary to either export excess soil or import new fill soil. During grading operations, dust would be controlled by measures outlined in the SWPPP.

3.3.2.1.2 Foundation Excavation. Approximately 380 foundations of various sizes would be constructed throughout the substation pad to support equipment and steel structures. In addition, a network of partially buried concrete trenches, approximately 2,700 feet in total length, would be installed. Excavations of these foundations and trenches would commence following the completion of grading and other yard improvements, and would continue for several weeks. The estimated total volume of soil that would need to be excavated for foundation and trenches is 2,400 cubic yards, and would be spread on a portion of the substation property.

3.3.2.1.3 <u>Drainage</u>. The site drainage would be developed during final engineering design to control surface runoff. Typical drainage improvements would consist of concrete swales, ditches, and culverts. Surface runoff from existing upslope areas would be modified to direct the flow around the substation facility. Surface runoff would be mitigated as needed through the use of earthen berms and energy dissipation devices, such as filter cloths, slope drains, and riprap placed near drain openings. All of these methods are designed to minimize the velocity of surface water runoff and protect the landscape from erosion.

In compliance with the CWA, site construction activities would be consistent with National Pollutant Discharge Elimination System (NPDES) program requirements, which would include development of an SWPPP for the site before construction commences. The SWPPP would focus on implementation of Best Management Practices and other actions during construction to protect the quality of waters near the construction site.

3.3.2.1.4 <u>Access</u>. The primary facility access to Alternative Site A would be a new 30-foot-wide, 750-foot-long asphalt concrete paved road with 5-foot-wide compacted dirt shoulders connecting 170th Street West to a gate located in the north perimeter fence. A secondary access would be provided by a new 20-foot-wide, 1,200-foot-long asphalt concrete paved road with 5-foot-wide compacted dirt shoulders connecting 170th Street West to a gate located in the west perimeter fence.

The primary facility access at Alternative Site B would be a new 30-foot-wide, 800-foot-long asphalt concrete road with 5-foot-wide compacted dirt shoulders connecting to 170th Street West. Secondary access would be provided by a new 20-foot-wide by 350-foot-long asphalt concrete paved road with 5-foot-wide compacted dirt shoulders connecting to the existing unimproved Holiday Avenue to the south through gates located in the substation south perimeter fence. In order to provide an all season access to the substation, it would be necessary to pave a 30-foot-wide, 2,500-foot-long access road though the northern half of the Holiday Avenue R-O-W as noted in Table 3.3-9.

The primary facility access to Alternative Site C (proposed Project) would be a new 30-foot-wide, 800-foot-long asphalt concrete paved road with 5-foot-wide compacted dirt shoulders connecting 170th Street West to a gate located north of center in the east perimeter fence. A secondary access would be provided by a new 20-foot-wide, 440-foot-long asphalt concrete paved road with 5-foot-wide compacted dirt shoulders connecting 170th Street West to a gate located near the south end of the east perimeter fence.

3.3.2.1.5 <u>Paving</u>. Asphalt concrete paving would be applied to the facility access road and to all designated internal driveways over an aggregate base material and a properly compacted sub-grade, as recommended by the results of geotechnical investigation at the site.

3.3.2.1.6 Rock Surfacing. Those areas within the substation perimeter that were not paved or covered with concrete foundations or trenches would be surfaced with a 4-inch layer of untreated, ¾-inch nominal crushed rock. The rock would be applied to the finished grade surface after all grading and below grade construction has been completed.

3.3.2.1.7 Spill Prevention Control and Countermeasures (SPCC) Plan. An SPCC plan would be required for the Whirlwind Substation. Under U.S. Environmental Protection Agency (EPA) CWA regulations, the owner of a substation facility is required to implement an SPCC plan if the facility meets the following three criteria: 1) the facility is not related to transportation; 2) the oil containing equipment at the facility has an aggregate of at least 1,320 gallons (only considering containers that are 55 gallons or more) or an underground oil storage capacity of at least 42,000 gallons; and 3) there is a reasonable expectation of discharge into or upon navigable waters of the United States or adjoining shorelines. In addition, regulations by the State of California independently require that an SPCC plan be implemented for any facility with an aboveground oil storage capacity of at least 10,000 gallons. The total storage capacity of the oil containing equipment of the interconnection facilities at the Whirlwind Substation exceeds 1,320 gallons; therefore it would trigger the threshold for the EPA requirement for an SPCC plan. SCE would proceed with preparation of an SPCC plan in accordance with state and federal requirements.

3.3.2.1.8 Storm Water Pollution Prevention Plan (SWPPP). During construction, measures would be in place to ensure that contaminants are not discharged from the site. An SWPPP would be developed that would define areas where hazardous materials would be stored; where trash would be placed; where rolling equipment would be parked, fueled and serviced; and where construction materials, such as reinforcing bars and structural steel members, would be stored. Erosion control during grading of the unfinished site and during subsequent construction would be in place and monitored as specified by the SWPPP. One or more basins would be established to capture silt and other materials that might otherwise be carried from the site by rainwater surface runoff. Site improvements at the Whirlwind Substation would result in impervious areas from all concrete foundations used for equipment and structures, the concrete foundation for the MEER, and asphalt and concrete driveways. Management of drainage from these areas would be addressed in the facility drainage plan.

3.3.2.1.9 Perimeter Security. The proposed substation would be enclosed by perimeter gates and fencing. Perimeter chain link fencing would conform to the requirements for electrical substations and have a minimum height of 8 feet above the adjacent finished grade to the outside of the substation. All perimeter fences and gates would be fitted with barbed wire.

3.3.2.2 Antelope Substation

3.3.2.2.1 Earthwork Activities. Earthwork activities proposed for the Antelope Substation to accommodate the new SVC and shunt capacitors would include an expansion to the south and east sides of the 500 kV switchyard. Prior to the start of grading, the entire area to be graded would be stripped of all organic matter and loose rocks. Any waste material encountered would be removed as required by the environmental and geotechnical investigations. Waste collected from these stripping operations would be tested for contamination. Once the surface has been cleared, the grading operations would begin. An estimated 5,000 cubic yards of soil would be cut from the higher elevation and placed as fill over the lower elevation to match the existing 500 kV switchyard elevation. During grading operations, dust would be controlled by measures outlined in the SWPPP.

3.3.2.2.2 Foundation Excavation. Approximately 100 foundations of various sizes would be constructed throughout the substation pad to support equipment and steel structures. In addition, a network of partially buried concrete trenches approximately 200 feet in total length would be installed. Excavations of these foundations and trenches would commence following the completion of grading and other yard improvements, and would continue for several weeks. The estimated total volume of soil that would be excavated for foundation and trenches is 1,800 cubic yards, and would be spread on a portion of the substation property.

3.3.2.2.3 Drainage. The site drainage would be developed during final engineering design to control surface runoff. Typical drainage improvements would consist of concrete swales, ditches, and culverts. Surface runoff from existing upslope areas would be modified to direct the flow around the substation facility. Surface runoff would be mitigated as needed through the use of earthen berms and energy dissipation devices, such as filter cloths, slope drains, and riprap placed near drain openings. All of these methods are designed to minimize the velocity of surface water runoff and protect the landscape from erosion.

In compliance with the CWA, site construction activities would be consistent with NPDES program requirements, which would include development of an SWPPP for the site before construction commences. The SWPPP would focus on implementation of Best Management Practices and other actions during construction to protect the quality of waters near the construction site.

3.3.2.2.4 Access. Once the 500 kV area grading has been completed and properly secured, that portion of the original substation fencing would be removed allowing for vehicular access into the expanded area at designated access points.

3.3.2.2.5 Rock Surfacing. Those areas within the substation perimeter that were not paved or covered with concrete foundations or trenches would be surfaced with a 4-inch layer of untreated, ¾-inch nominal crushed run rock. The rock would be applied to the finished grade surface after all grading and below grade construction has been completed.

3.3.2.2.6 SPCC Plan. SCE has an existing SPCC Plan for the Antelope Substation. This SPCC Plan would be revised as necessary to encompass the new regulated equipment at the substation site**.**

3.3.2.2.7 Storm Water Pollution Prevention Plan (SWPPP). During construction, measures would be in place to ensure that contaminants are not discharged from the site. An SWPPP would be developed that would define areas where hazardous materials would be stored; where trash would be placed; where rolling equipment would be parked, fueled and serviced; and where construction materials, such as reinforcing bars and structural steel members, would be stored. Erosion control during grading of the unfinished site and during subsequent construction would be in place and monitored as specified by the SWPPP. Site improvements at the Antelope Substation would result in impervious areas from all concrete foundations used for equipment and structures. Management of drainage from these areas would be addressed in the facility drainage plan.

3.3.2.2.8 Fencing. New fencing would enclose the 500 kV switchyard expansion. Approximately 2,400 feet of new 8-foot-high chain link fence with barbed wire would enclose the outer perimeter. One new 20-foot double-drive chain link gate would be located along the northern perimeter for access to adjacent transmission line areas. After the new fencing has been installed and security measures are in place, approximately 700 feet of the existing substation fence would be removed.

3.3.2.3 Vincent Substation

3.3.2.3.1 Earthwork Activities. For the Vincent Substation expansion, the proposed 220 kV switchyard expansion would require grading beyond the edge of a sharp drop-off. To significantly limit the quantity of earthwork that would be needed to extend the area, a retaining wall would be constructed. The wall would measure approximately 150 feet long, and vary in height between 1-foot-high at each end to approximately 13-feet-high near the center. The area between the wall and the existing substation pad would be back-filled with clean fill material that would be brought up to the level of the existing substation pad surface. The backfilled area would require an estimated quantity of 2,000 cubic yards of soil. The final wall design and the actual quantity of soil required would be calculated during final engineering.

In addition, at the Vincent Substation the proposed expansion of the 500 kV switchyard would require an area approximately 680 feet wide by approximately 1,120 feet, including an 880-foot-long expansion beyond the existing substation fenced area, and would comprise approximately 18 acres. To limit the quantity of earthwork in this area, construction would use a terraced approach where a portion of the new construction would be on the existing substation pad measuring 680 feet by 250 feet, comprising approximately 4 acres, and the remaining portion would be a lower terrace measuring 680 feet by 870 feet, comprising approximately 14 acres, extending to the west. The new terrace would be approximately 20 feet lower in elevation than the existing substation graded pad. And estimated 72,000 cubic yards of soil would be cut from higher elevations and relocated to the lower elevations as fill to provide a level pad with a slope between 1 and 2 percent.

A minor re-routing of the existing substation access driveway would be required to accommodate an expansion of the existing substation control house. Additional equipment expansion would occur in a previously graded portion of the northeast corner of the substation property, outside the existing perimeter fence.

3.3.2.3.2 Foundation Excavation. Approximately 200 foundations of various sizes would be constructed throughout the substation pad to support equipment and steel structures. In addition, a network of partially buried concrete trenches approximately 4,000 feet in total length would be installed. Excavations of these foundations and trenches would commence following the completion of grading and other yard improvements, and would continue for several weeks. The estimated total volume of soil that would be excavated for foundation and trenches is 4,000 cubic yards, and would be spread on a portion of the substation property.

3.3.2.3.3 Drainage. The existing drainage improvements at the 220 kV-area expansion would be removed and re-routed to clear the expansion area, reconnecting to the existing system beyond the new expansion area.

At the new expanded 500 kV switchyard area, the site drainage would be developed during final engineering design to control surface runoff. Typical drainage improvements would consist of concrete swales, ditches, and culverts. Surface runoff from existing upslope areas would be modified to direct the flow around the substation facility. Surface runoff would be mitigated as needed through the use of earthen berms and energy dissipation devices, such as filter cloths, slope drains, and riprap placed near drain openings. All of these methods are designed to minimize the velocity of surface water runoff and protect the landscape from erosion.

In compliance with the CWA, site construction activities would be consistent with NPDES program requirements, which would include development of an SWPPP for the site before construction commences. The SWPPP would focus on implementation of Best Management Practices and other actions during construction to protect the quality of waters near the construction site.

3.3.2.3.4 <u>Access</u>. Once the 500 kV area grading has been completed and properly secured, that portion of the original substation fencing would be removed allowing for vehicular access into the expanded area at designated access points.

3.3.2.3.5 <u>Rock Surfacing</u>. Those areas within the substation perimeter that were not paved or covered with concrete foundations or trenches would be surfaced with a 4-inch layer of untreated, ¾-inch nominal crushed run rock. The rock would be applied to the finished grade surface after all grading and below grade construction has been completed.

3.3.2.3.6 <u>SPCC Plan</u>. SCE has an existing SPCC Plan for the Vincent Substation. This SPCC Plan would be revised as necessary to encompass the new regulated equipment at the substation site.

3.3.2.3.7 <u>Storm Water Pollution Prevention Plan (SWPPP)</u>. During construction, measures would be in place to ensure that contaminants are not discharged from the site. An SWPPP would be developed that would define areas where hazardous materials would be stored; where trash would be placed; where rolling equipment would be parked, fueled and serviced; and where construction materials, such as reinforcing bars and structural steel members, would be stored. Erosion control during grading of the unfinished site and during subsequent construction would be in place and monitored as specified by the SWPPP. One or more basins would be established to capture silt and other materials that might otherwise be carried from the site by rainwater surface runoff. Site improvements at the Vincent Substation would result in impervious areas from all concrete foundations used for equipment and structures and the concrete foundation for the MEER. Management of drainage from these areas would be addressed in the facility drainage plan.

3.3.2.3.8 <u>Fencing</u>. A 200-foot portion of the existing perimeter fence in the 220 kV area would be removed and replaced by 250 feet of new fencing located near the top of the new retaining wall. No new gates would be located in this area.

New fencing would enclose the 500 kV switchyard expansion. Approximately 2,400 feet of new 8-foot-high chain link fence with barbed wire would enclose the outer perimeter. One new 20-foot double-drive chain link gate would be located along the northern perimeter for access to adjacent transmission line areas. After the new fencing has been installed and security measures are in place, approximately 1,500 feet of the existing substation fence would be removed.

To enclose the new equipment in the substation's northeast corner, the removal of approximately 580 feet of chain link fencing and the placing of approximately 1,120 feet of new chain link fencing would be required. This new fencing would also incorporate the changes at the substation access driveway which would include a new electrically operated gate.

3.3.2.4 Mesa Substation

Activities necessary to upgrade the Mesa Substation would occur within the existing fenced substation yard. Material delivery would use the existing substation access road and would be during daylight hours. Approximately 12 new foundations for 220 kV circuit breakers and disconnect switches would be constructed. The estimated total volume of soil that would be excavated for the foundations is 15 cubic yards, and would be spread on a portion of the substation property.

3.3.2.5 Gould Substation

Activities necessary to upgrade the Gould Substation would occur within the existing fenced substation yard. Material delivery would use the existing substation access road and would be during daylight hours. Approximately 14 foundations of various sizes would be constructed throughout the substation pad to support equipment and steel structures. In addition, a network of partially buried concrete trenches approximately 135 feet in total length would be installed. The estimated total volume of soil that would be excavated for foundation and trenches is 100 cubic yards, and would be spread on a portion of the substation property.

3.3.2.6 Mira Loma Substation

Activities necessary to upgrade the Mira Loma Substation would occur within the existing fenced substation yard. Material delivery would use the existing substation access road and would be during daylight hours. Approximately 64 foundations of various sizes would be constructed throughout the substation pad to support equipment and steel structures. No new cable trenches would be required. The estimated total volume of soil that would be excavated for foundations is 175 cubic yards, and would be spread on a portion of the substation property.

3.3.3 IT Facility Construction

New OPGW or optical fiber is typically installed in continuous segments of 5,000 feet or less, depending upon various factors including line direction, inclination, and accessibility. Following placement of fiber on the OHGW, the strands in each segment are spliced together to form a continuous length from one end of a transmission line to the other. Splices occur near the foot of transmission towers, and may be identified by the metal enclosures (3 feet by 3 feet by 1 foot) that are mounted on the tower legs some distance above the ground. At a splice tower, the fiber cables are routed down a tower leg and into the bottom of the metal enclosure where the splice case is placed. On the last tower at each end of a transmission line, the overhead fiber is spliced to another section of fiber cable that runs in underground conduit from the tower into the communication room inside the adjacent substation.

Splicing activities are conducted by dedicated crews. Typically activities are conducted by two crews per each segment, with three persons in each crew. Each crew is also accompanied by a foreman. Both crews and foremen use pickup trucks for transport of materials along transmission line segments. All materials are carried in vehicles; therefore, no marshalling yards are needed to support OPGW installation. Crews typically complete four splices per 8-hour work period.

3.4 GEOTECHNICAL ACTIVITIES

After a proposed Project is approved, a series of geotechnical studies would be conducted. These studies would provide a description of the general surface and geological conditions, which would influence the final locations and construction methods of the tower footings. Dependent upon T/L length and location, borings would typically occur at least every 2 to 5 miles in similar conditions and a boring would be performed where conditions change. Where the T/L is in an existing R-O-W, previous geotechnical reports would be utilized and sample borings would be performed to verify given conditions. Appropriate laboratory tests would be conducted from the soil samples taken from the borings for site specific conditions.

One concern for towers and poles located in mountainous and rough terrain is that they may be subject to slope instability such as slides. Geotechnical engineers would evaluate and analyze specific site and soil conditions to make recommendations for the footing design. Included in this evaluation are determinations of slope stability and related grading drainage issues. Structure sites that are determined by a geotechnical engineer to be especially susceptible for potential slope failures would usually require stabilization measures. With proper engineering methods, such as using deep piles, tie-backs, and anchoring design, slope stability problems can usually be avoided. In general, tower site selections would be made to avoid known landslides and unstable slope areas.

The geotechnical studies for substations would be conducted prior to grading and analyzed by a professional, licensed Geotechnical Engineer or Geologist to determine the condition of the soil. Borings of sufficient quantity to adequately gather variations in the site soils would be conducted and sample cores removed for laboratory testing. The type of soil, moisture content, depth of the water table, resistivity, and contamination are typical of the items tested for. If contaminants are encountered, special studies and remediation measures would be implemented by qualified professionals.

The results of the geotechnical study would be applied as needed by the various engineering disciplines during the course of final engineering.

3.5 REAL ESTATE AND RIGHT-OF-WAY (R-O-W)

SCE generally purchases easements from property owners for transmission lines and acquires property ownership for substation sites. SCE would pay fair market value for those easement rights, based upon a value determined by a certified appraiser. SCE has the right of eminent domain to acquire necessary property rights for its transmission and substation projects. SCE would exercise that right if unable to reach an agreement with a property owner to purchase the land or easement rights.

3.6 CONSTRUCTION EQUIPMENT AND WORKFORCE

Construction equipment and workforce needs would vary according to the scope of each segment. Estimated equipment and workforce needs for each of the transmission line elements of the proposed TRTP are provided in Tables 3.4-1 through 3.4-8. Estimated equipment and workforce needs for the substation elements of the proposed TRTP are provided in Tables 3.4-9 through 3.4-14 and 3.4-15, respectively.

3.7 LAND DISTURBANCE DURING CONSTRUCTION

Land disturbance would be associated with the construction activities that are part of the TRTP. Some disturbance would be temporary in nature, such as disturbance associated with the laydown areas and crane pads associated with tower assembly and erection, and the land would be restored following construction. Other disturbance would be permanent in nature, as the land would remain in a designated use following completion of construction. Examples of permanent disturbance would be tower footings and access roads.

As noted in Section 3.3.1, Tables 3.3-1 through 3.3-8 summarize both the temporary and permanent land disturbance that would be estimated to occur for the transmission line construction associated with the TRTP. The transmission line portion of the proposed Project would temporarily disturb a total of approximately 1,297 acres and result in permanent disturbance to a total of approximately 147 acres. Earth-disturbing activities would occur along new access and spur roads, and at each foundation installation site. During grading and/or excavation activities, placement of rebar cages, stub angle steel, and placement of concrete, soil and vegetation may be disturbed by both multi-axle auger trucks, multi-axle concrete trucks, and pedestrian activity. In some circumstances, benching of small areas around the tower footing sites may be required. Typically, the ground would be augured to create a hole, rebar cages and stub angle steel would be placed, and concrete would be poured. In exceptionally rugged terrain, footing excavations may be performed entirely by hand using hand-operated power tools.

Assembly of TSPs and LSTs typically would require a laydown area of approximately 200 feet by 200 feet (approximately 0.92 acre). In locations where the terrain in the laydown area is already reasonably level (for example, at an existing tower location), only vegetation removal would occur to prepare the site for construction. In locations where a level surface is not present (for example, a new tower site), both vegetation clearing and grading would be necessary to prepare the laydown area for construction.

Erection of new LSTs may also require establishment of a crane pad to allow an erection crane to set up 60 feet from the centerline of each LST. The crane pad would be located transversely from each applicable LST location. In most cases, this crane pad would be located within the laydown area used for LST assembly. If a separate pad is required, it would occupy an area of approximately 50 feet by 50 feet (approximately 0.06 acre). The pad would be cleared of vegetation and also graded as necessary to provide a level surface for crane operation.

Additional excavations may be required at conductor pulling, tensioning, and splicing locations in order to string conductor safely. Pulling and tensioning activities in particular require level areas to accommodate maneuvering of large equipment. The volume of earth excavated at pulling, tensioning and splicing sites would be determined by final engineering and the successful bidder, but preliminary estimates of disturbance are provided Section 3.3.1.6 and in Tables 3.3-1 through 3.3-8.

As noted in Section 3.3.2, construction of the new Whirlwind Substation would create a new permanent land disturbance associated with establishment of the new substation yard and access roads. Permanent disturbance associated with the new substation yard is estimated to be approximately 64 acres (i.e., the substation pad plus side slope grading), while disturbance for the substation's access road would be approximately 2.8 acres or less depending upon which alternative site is chosen for construction. Additional description of the Whirlwind site alternatives is provided in Section 2.0.

Also, upgrades to the existing Antelope and Vincent substations would require earthwork activity outside the existing established yard areas to facilitate yard expansions. Total permanent land disturbance associated with expansion of the Antelope Substation is estimated to be 12 acres; total permanent land disturbance associated with expansion of the Vincent Substation is estimated to be 18 acres. Equipment additions to the existing Mesa, Gould, and Mira Loma Substations would not require earthwork outside of the existing, fenced substation yard, but some land disturbance would occur as a result from activities such as foundation and trench installation.

3.8 HAZARDOUS MATERIALS USAGE AND WASTE GENERATION

Construction of the proposed Project would require limited use of hazardous materials, including fuel, lubricants, and cleaning solvents. All hazardous materials would be stored, handled, and used in accordance with applicable regulations, including the construction phase SWPPP(s) for the transmission line segments and substation components.

Construction of the proposed Project would result in the generation of various waste materials. Summaries of estimated waste generation for each transmission line segment are presented in Tables 3.8-1 through 3.8-8. Summaries of estimated waste generation for substation-related construction activities are presented in Tables 3.8-9 through 3.8-14. These tables also include estimates of project construction waste that would be reused, recycled, or disposed.

Recyclable or salvageable items would be handled by construction crews processing those materials into roll-off boxes. Salvageable items (i.e., conductor, steel, and hardware) would be received, sorted, and baled, and then sold through available markets. Items to be recycled include 100 percent of the steel from LSTs (i.e., towers, nuts, bolts, and washers), 100 percent of the conductor wire, and 100 percent of the hardware (i.e., shackles, clevises, yoke plates, links, or other connectors used to support conductor). Sanitation waste (i.e., human-generated waste) would be recycled according to sanitation waste management practices.

For waste materials that cannot be reused or recycled, the following waste management facilities are located in the vicinity of the project, and may be used for the disposal of construction waste:

- **Hazardous waste:** Clean Harbors Buttonwillow, Clean Harbors Los Angeles
- **Non-hazardous waste:** Filter Recycling, TPS Technologies, Crosby and Overton, Demenno Kerdoon
- **Non-regulated municipal type waste:** Chiquita Canyon Landfill, Sunshine Canyon Landfill, Simi Valley Landfill, Lopez Canyon Landfill, Bradley Landfill

3.9 CONSTRUCTION SCHEDULE

Construction activities for the transmission segments of the proposed TRTP are planned to begin concurrently in April 2009. For segments that include line removal, construction would begin with removal of existing lines and then proceed to construction of new lines. Construction activities for the substation facilities included in Segment 9 are scheduled to begin in February 2010. Total length of the construction schedule is currently estimated at approximately 1,210 days, or about 55 months. The initial project schedule is provided in Table 3.9-1.

TABLE 3.9-1
PROPOSED TRTP CONSTRUCTION SCHEDULE

TRTP Segment	Duration[1]	Start	Finish
Segment 4 – Whirlwind 500/220 kV Transmission Elements	24 Months	April 2009	April 2011
Segment 5 – Antelope – Vincent No. 2 500 kV Transmission Line	21 Months	July 2009	April 2011
Segment 6 – New Replacement Rio Hondo – Vincent No. 2 Transmission Line	36 Months	April 2009	April 2012
Segment 7 – New Mira Loma – Vincent 500 kV Transmission Line	31 Months	April 2009	November 2011
Segment 8 – New Mira Loma – Vincent 500 kV Transmission Line	36 Months	April 2009	April 2012
Segment 9 – Substation Facilities	45 Months	February 2010	November 2013
• Whirlwind Substation	13 Months	July 2010	August 2011
• Antelope Substation	45 Months	February 2010	November 2013
• Vincent Substation	45 Months	February 2010	November 2013
• Other Substations	25 Months	October 2011	November 2013
Segment 10 – New Whirlwind – Windhub 500 kV Transmission Line	8 Months	February 2011	October 2011
Segment 11 – New Mesa – Vincent (via Gould) 500/220 kV Transmission Line	19 Months	April 2012	November 2013

[1] Duration based on estimated number of work days to complete the project. Work days are generally Monday through Friday from 7:00 a.m. to 5:00 p.m.

This page left intentionally blank.