Application Nos.: ____________________

Exhibit No.: ____________________

Witnesses: Various

SOUTHERN CALIFORNIA
EDISON

An *EDISON INTERNATIONAL* Company

(U 338-E)

Southern California Edison Company's [redacted] Tehachapi Renewable Transmission Project (TRTP) -- Appendix B

Before the
Public Utilities Commission of the State of California

Rosemead, California
June 29, 2007

APPENDIX B

FIELD MANAGEMENT PLAN

FOR

TEHACHAPI RENEWABLE TRANSMISSION PROJECT

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AC	alternating current
ACSR	aluminum conductor, steel reinforced
ANF	Angeles National Forest
CPUC	California Public Utilities Commission
DC	direct current
EHC	Environmental Health Criteria
ELF	Extremely Low Frequency
EMF	electric and magnetic fields
FMP	field management plan
Hz	Hertz
kV	Kilovolt
LST	lattice steel tower
mG	milliGauss
MP	Milepost
MVAR	megavolt-amps reactive
MW	Megawatt
R-O-W	right-of-way
T/L	transmission line
TRTP	Tehachapi Renewable Transmission Project
TSP	tubular steel pole
TWRA	Tehachapi Wind Resource Area
VAR	volt ampere reactive
WHO	World Health Organization

I. EXECUTIVE SUMMARY

This document is Southern California Edison Company's (SCE) Field Management Plan (FMP) for the Tehachapi Renewable Transmission Project. 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) T/Ls traveling approximately 4 miles over new right-of-way (R-O-W) from the Cotttonwind Substation to the proposed new Whirlwind Substation (Segment 4).
- A new single-circuit 500 kV T/L, 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 T/L 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 T/L 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 T/L 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 Cotttonwind 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 T/L construction and system compensation elements (Segment 9).
- A new 500 kV T/L 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 T/L 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.

[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.

The "no-cost and low-cost" magnetic field reduction measures that are incorporated into the design of the Proposed Project are summarized in Table 1.

SCE's plan for applying the above no-cost and low-cost magnetic field reduction measures to the Proposed Project is consistent with CPUC's EMF policy and with the direction of leading national and international health agencies. Furthermore, the plan complies with SCE's EMF Design Guidelines[2], and with applicable national and state safety standards for new electric facilities.

2 EMF Design Guidelines, August 2006.

Table 1. No-cost and Low-cost Magnetic Field Reduction Measures Evaluated for the Proposed Tehachapi Renewable Transmission Project

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
4-A	MP 0 (Cottonwind Substation) to MP 5 (Whirlwind Substation)	5,6	• Phase Circuit	• No-Cost	• Yes	
4-B	MP 5 to MP 13.2 and MP 14.8 to MP 15.8	5,6	• Phase Circuit	• No-Cost	• Yes	
4-C	MP 13.2 to MP 14.8	5,6	• Phase Circuit	• No-Cost	• Yes	
4-D	MP 15.8 to MP 19.5 (Antelope Substation)	2,6	• Taller Structures	• Low-Cost	• Yes	
5-A	MP 0 to MP 1.9	6	• Phase Circuit • Circuit Placement	• No-Cost • No-Cost	• Yes • Yes	
5-B	MP 1.9 to MP 4.4	2, 6	• Phase Circuit • Circuit Placement • Taller Structures	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • No	• N/A • N/A • < 15% Field Reduction
5-C	MP 4.4 to MP 8	2,6	• Phase Circuit • Circuit Placement • Taller Structures	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • No	• N/A • N/A • < 15% Field Reduction
5-D	MP 8 to MP 11	2,6	• Phase Circuit • Taller Structures	• No-Cost • Low-Cost	• Yes • Yes	

3 This column shows the mile post (MP) as a reference for location.

4 Land usage codes are as follows: 1) schools, licensed day-cares, and hospitals, 2) residential, 3) commercial/industrial, 4) recreational, 5) agricultural, and 6) undeveloped land.

5 Refer to Appendix B.4 for definitions of magnetic field reduction measures

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
5-E	MP 11 to MP 15.7	2,6	• Phase Circuit • Taller Structures	• No-Cost • Low-Cost	• Yes • No	• N/A • < 15% Field Reduction
5-F	MP 15.7 to MP 17.3	2, 6	• Phase Circuit • Circuit Placement • Taller Structures	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • No	• N/A • N/A • < 15% Field Reduction
5-G	MP 17.3 to MP 17.8 (Vincent Substation)	6	• Phase Circuit	• No-Cost	• Yes	
6-A (with 11-A)	Segment 6: MP 0 to MP 0.6 Segment 11: MP 0 to MP 0.9	2,6	• Circuit Placement • Circuit Phasing • Compact Design • Taller Structures	• No-Cost • No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • No	• N/A • N/A • N/A • < 15% Field Reduction
6-B	MP 0 T5 to MP 4 T3	2,6	• Circuit Phasing • Compact Design • Taller Structures	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • No	• N/A • N/A • < 15% Field Reduction
6-C	MP 5 T1 to MP 6 T4	6	• Circuit Phasing	• No-Cost	• Yes	
6-D	MP 7 T4	2,3	• Circuit Phasing • Taller Structures	• No-Cost • Low-Cost	• Yes • No	• N/A • < 15% Field Reduction
6-E	MP 9 T3 to MP 26 T5	6	• Circuit Phasing	• No-Cost	• Yes	

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
7-A	MP 0 to MP 5 (Rio Hondo Substation)	2,3,6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures • Compact Design	• No-Cost • No-Cost • Low-Cost • No-Cost • No-Cost	• Yes • Yes • Yes • Yes • Yes	
7-B	MP 5 (Rio Hondo Substation) to MP 7.6	3,6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost	• Yes • Yes • Yes • Yes	
7-C	MP 7.6 to MP 11.6	2,3	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost	• Yes • Yes • Yes • Yes	
7-D	MP 11.6 to MP 13	1,2,3	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost	• Yes • Yes • Yes • Yes	
7-E	MP 13 to MP 15.8 (Mesa Substation)	2,3,6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost	• Yes • Yes • Yes • Yes	
8A	MP 2.3 to MP 4.4	2,3,6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • Low-Cost	• Yes • Yes • Yes • No	• N/A • N/A • N/A • < 15% Field Reduction

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
8B	MP 4.4 to MP 9.0	2,3,6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost	• Yes • Yes • Yes • Yes	
8C	MP 9.0 to MP 9.7	2,6	• Circuit Phasing • Double-Circuit Construction • Compact Design • Split-Phasing • Taller Structures • Taller Structures	• No-Cost • No-Cost • No-Cost • Low-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • Yes • Yes • No	• N/A • N/A • N/A • N/A • N/A • Engineering Reasons
8D	MP 9.7 to MP 11.2	2,6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • Yes • No	• N/A • N/A • N/A • N/A • Engineering Reasons
8E	MP 11.2 to MP 13.3	2, 6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • Yes • No	• N/A • N/A • N/A • N/A • Engineering Reasons

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
8F	MP 13.3 to MP 13.5	2	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost	• Yes • Yes • Yes • Yes	
8G	MP 13.5 to MP 19.3	1, 2, 6	• Circuit Phasing • Double-Circuit Construction • Split-Phasing • Re-phase Existing 220 kV Circuit • Taller Structures	• No-Cost • No-Cost • Low-Cost • Low-Cost • No-Cost	• Yes • Yes • Yes • Yes • Yes	
8H	MP 19.3 to MP 22.7	2,6	• Double-Circuit Construction • Split-Phasing • Taller Structures • Taller Structures	• No-Cost • Low-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • No	• N/A • N/A • N/A • Engineering Reasons
8I	MP 22.7 to MP 26.9	1,2,3	• Compact Design • Double-Circuit Construction • Split-Phasing • Taller Structures • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • Yes • No	• N/A • N/A • N/A • N/A • Engineering Reasons
8J	MP 26.9 to MP 27.6	3	• Circuit Phasing • Compact Design • Double-Circuit Construction • Split-Phasing • Taller Structures • Taller Structures	• No-Cost • No-Cost • No-Cost • Low-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • Yes • Yes • Yes	

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
8K	MP 27.6 to MP 28.1 (Chino Substation)	4	• Compact Design • Double-Circuit Construction • Split-Phasing • Undergrounding (existing 66 kV lines) • Circuit Phasing • Taller Structures	• No-Cost • No-Cost • Low-Cost • No-Cost • No-Cost • No-Cost	• Yes • Yes • Yes • Yes • Yes • Yes	
8L	8A MP 28.4 to MP 28.7 8B MP 0 to MP 0.3	3,5	• Circuit Phasing • Circuit Placement • Compact Design • Double-Circuit Construction • Taller Structures	• No-Cost • No-Cost • No-Cost • No-Cost • No-Cost	• Yes • Yes • Yes • Yes • Yes	
8M	8A: MP 28.7 to MP 29.4 8B: MP 0.3 to MP 0.7	2,3,5	• Circuit Phasing • Compact Design • Double-Circuit Construction • Taller Structures	• No-Cost • No-Cost • No-Cost • No-Cost	• Yes • Yes • Yes • Yes	
8N	8A: MP 29.4 to MP 34	1,2,5	• Circuit Phasing • Compact Design • Double-Circuit Construction • Taller Structures • Taller Structures	• No-Cost • No-Cost • No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • Yes • No	• N/A • N/A • N/A • N/A • < 15% Field Reduction
8O	8B: MP 1.0 to MP 5.2	2,5	• Circuit Phasing • Double-Circuit Construction • Taller Structures	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	
8P	8B: MP 5.2 to MP 5.6	2	• Circuit Phasing • Double-Circuit Construction	• No-Cost • No-Cost	• Yes • Yes	

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
8Q	8B: MP 6.0 MP 6.8	2 ,5	• Circuit Phasing • Double-Circuit Construction • Split-Phase Existing 220 kV T/L	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	
8R	8A: MP 34 to MP 34.4 8B: MP 5.6 to MP 6.0	2 (Future) ,5	• Circuit Phasing • Double-Circuit Construction • Compact Design • Taller Structures	• No-Cost • No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • Yes	
8S	8A: MP 34.5 to MP 35.2	2 (Future) ,5	• Circuit Phasing • Compact Design • Taller Structures	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • No	• N/A • N/A • < 15% Reduction
9	• Whirlwind Substation		• Maintain equipment setbacks from property line	• No-Cost	• Yes	
9	• Antelope Substation		• Maintain equipment setbacks from property line	• No-Cost	• Yes	
9	• Vincent Substation		• Maintain equipment setbacks from property line	• No-Cost	• Yes	
9	• Mesa Substation		• Maintain equipment setbacks from property line	• No-Cost	• Yes	
9	• Mira Loma Substation		• Maintain equipment setbacks from property line	• No-Cost	• Yes	
10	MP 0 to MP 16.8	5,6	• Increased R-O-W Width	• No-Cost	• Yes	
11A	Refer to Segment 6A		•	•	•	
11B	MP 0.9 to 2.3	2	• Circuit Phasing • Circuit Placement • Compact Design • Taller Structures	• No-Cost • No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • No	• N/A • N/A • N/A • < 15% reduction at R-O-W edge

Line Segment No.	Location[3]	Adjacent Land Use[4]	MF Reduction Measures Considered[5]	Estimated Cost to Adopt	Measure(s) Adopted? (Yes/No)	Reason(s) if not adopted
11C	MP 2.3 to MP 3.9	2,5,6	• Circuit Phasing • Compact Design • Taller Structures	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	
11D	MP 3.9 to MP 18.7 (Gould Substation)	6	• Circuit Phasing	• No-Cost	• Yes	
11E	MP 18.7 (Gould Substation) to MP 27.2 (Goodrich Substation)	1, 2, 3	• Circuit Phasing (Proposed T/L) • Circuit Placement • Circuit Re-Phasing (Existing T/L)	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	
11F	MP 27.2 (Goodrich Substation) to MP 36.2 (Mesa Substation)	1,2,3	• Circuit Phasing (Proposed T/L) • Circuit Placement • Circuit Re-Phasing (Existing T/L)	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

II. BACKGROUND REGARDING EMF AND PUBLIC HEALTH RESEARCH ON EMF

There are many sources of power frequency[6] electric and magnetic fields, including internal household and building wiring, electrical appliances, and electric power transmission and distribution lines. There have been numerous scientific studies about the potential health effects of EMF. After many years of research, the scientific community has been unable to determine if exposures to EMF cause health hazards. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate.[7]

Many of the questions about possible connections between EMF exposures and specific diseases have been successfully resolved due to an aggressive international research program. However, potentially important public health questions remain about whether there is a link between EMF exposures and certain diseases, including childhood leukemia and a variety of adult diseases (e.g., adult cancers and miscarriages). As a result, some health authorities have identified magnetic field exposures as a possible human carcinogen. As summarized in greater detail below, these conclusions are consistent with the following published reports: the National Institute of Environmental Health Sciences (NIEHS) 1999[8], the National Radiation Protection Board (NRPB) 2001[9], the International Commission on non-Ionizing Radiation Protection (ICNIRP) 2001, the California Department of Health Services (CDHS) 2002[10], and the International Agency for Research on Cancer (IARC) 2002[11].

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6 In U.S., it is 60 Hertz (Hz).

7 CPUC Decision 06-01-042, p. 6, footnote 10

8 National Institute of Environmental Health Sciences' Report on Health Effects from Exposures to Power-Line frequency Electric and Magnetic Fields, NIH Publication No. 99-4493, June 1999.

9 National Radiological Protection Board, Electromagnetic Fields and the Risk of Cancer, Report of an Advisory Group on Non-ionizing Radiation, Chilton, U.K. 2001

10 California Department of Health Services, An Evaluation of the Possible Risks from Electric and Magnetic Fields from Power Lines, Internal Wiring, Electrical Occupations, and Appliances, June 2002.

11 World Health Organization / International Agency for Research on Cancer, IARC Monographs on the evaluation of carcinogenic risks to humans (2002), Non-ionizing radiation, Part 1: Static and extremely low-frequency (ELF) electric and magnetic fields, IARCPress, Lyon, France: International Agency for Research on Cancer, Monograph, vol. 80, p. 338, 2002

The federal government conducted EMF research as a part of a $45-million research program managed by the NIEHS. This program, known as the EMF RAPID (Research and Public Information Dissemination), submitted its final report to the U.S. Congress on June 15, 1999. The report concluded that:

- "The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak."[12]
- "The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard."[13]
- "The NIEHS suggests that the level and strength of evidence supporting ELF-EMF exposure as a human health hazard are insufficient to warrant aggressive regulatory actions; thus, we do not recommend actions such as stringent standards on electric appliances and a national program to bury all transmission and distribution lines. Instead, the evidence suggests passive measures such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. NIEHS suggests that the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards."[14]

In 2001, Britain's NRPB arrived at a similar conclusion:

> "After a wide-ranging and thorough review of scientific research, an independent Advisory Group to the Board of NRPB has concluded that the power frequency electromagnetic fields that exist in the vast majority of homes are not a cause of cancer in general. However, some epidemiological studies do indicate a possible small risk of childhood leukemia associated with exposures to unusually high levels of power frequency magnetic fields."[15]

In 2002, three scientists for CDHS concluded:

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[12] National Institute of Environmental Health Sciences, NIEHS Report on Health Effects from Exposures to Power-Frequency Electric and Magnetic Fields, p. ii, NIH Publication No. 99-4493, 1999

[13] *ibid.*, p. iii

[14] *ibid.*, p. 37 - 38

[15] NRPB, NRPB Advisory Group on Non-ionizing Radiation Power Frequency Electromagnetic Fields and the Risk of Cancer, NRPB Press Release May 2001

"To one degree or another, all three of the [C]DHS scientists are inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's Disease, and miscarriage.

They [CDHS] strongly believe that EMFs do not increase the risk of birth defects, or low birth weight.

They [CDHS] strongly believe that EMFs are not universal carcinogens, since there are a number of cancer types that are not associated with EMF exposure.

To one degree or another they [CDHS] are inclined to believe that EMFs do not cause an increased risk of breast cancer, heart disease, Alzheimer's disease, depression, or symptoms attributed by some to a sensitivity to EMFs. However, all three scientists had judgments that were "close to the dividing line between believing and not believing" that EMFs cause some degree of increased risk of suicide, or

For adult leukemia, two of the scientists are 'close to the dividing line between believing or not believing' and one was 'prone to believe' that EMFs cause some degree of increased risk."[16]

Also in 2002, the World Health Organization's IARC concluded:

"ELF magnetic fields are possibly carcinogenic to humans"[17], based on consistent statistical associations of high-level residential magnetic fields with a doubling of risk of childhood leukemia...Children who are exposed to residential ELF magnetic fields less than 0.4 microTesla (4.0 milliGauss) have no increased risk for leukemia.... In contrast, "no consistent relationship has been seen in studies of childhood brain tumors or cancers at other sites and residential ELF electric and magnetic fields."[18]

In June of 2007, the World Health Organization issued its Environmental Health Criteria (EHC) on extremely low-frequency (ELF) electric and magnetic fields. Conclusions from this EHC include:

"Scientific evidence suggesting that everyday, chronic low-intensity (above 0.3-0.4 μT [3.0-4.0 mG]) power-frequency magnetic field exposure poses a health risk is based on epidemiological studies demonstrating a consistent pattern of increased risk for childhood leukaemia. Uncertainties in the hazard assessment

[16] CDHS, An Evaluation of the Possible Risks From Electric and Magnetic Fields (EMFs) From Power Lines, Internal Wiring, Electrical Occupations and Appliances, p. 3, 2002

[17] IARC, Monographs, Part I, Vol. 80, p. 338

[18] *ibid.*, p. 332 - 334

include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukaemia. In addition, virtually all of the laboratory evidence and mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered casual, but sufficiently strong to remain a concern."[19]

"...there are uncertainties about the existence of chronic effects, because of the limited evidence for a link between exposure to ELF magnetic fields and childhood leukaemia. Therefore, the use of precautionary approaches is warranted..."[20]

"...electrical power brings obvious health, social and economic benefits, and precautionary approaches should not compromise these benefits. Furthermore, given both the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukaemia, and the limited impact on public health if there is a link, the benefits of exposure reduction on health are unclear. Thus, the costs of precautionary measures should be very low."[21]

III. APPLICATION OF THE CPUC'S NO-COST AND LOW-COST EMF POLICY TO THIS PROJECT

Recognizing the scientific uncertainty over the connection between EMF exposures and health effects, the CPUC adopted a policy that addresses public concern over EMF with a combination of education, information, and precaution-based approaches. Specifically, Decision 93-11-013 established a precautionary based no-cost and low-cost EMF policy for California's regulated electric utilities based on recognition that scientific research had not demonstrated that exposures to EMF cause health hazards and that it was inappropriate to set numeric standards that would limit exposure.

In 2006, the CPUC completed its review and update of its EMF Policy in Decision 06-01-042. This decision reaffirmed the finding that state and federal public health regulatory agencies

[19] WHO, Environmental Health Criteria No. 238: Extremely Low Frequency Fields, p. 11, 2007
[20] *ibid.*, p. 12
[21] *ibid.*, p. 13

have not established a direct link between exposure to EMF and human health effects,[22] and the policy direction that (1) use of numeric exposure limits was not appropriate in setting utility design guidelines to address EMF,[23] and (2) existing no-cost and low-cost precautionary-based EMF policy should be continued for proposed electrical facilities. The decision also reaffirmed that EMF concerns brought up during Certificate of Public Convenience and Necessity (CPCN) and Permit to Construct (PTC) proceedings for electric and transmission and substation facilities should be limited to the utility's compliance with the CPUC's low-cost/no-cost policies.[24]

The decision directed regulated utilities to hold a workshop to develop standard approaches for EMF Design Guidelines and such a workshop was held on February 21, 2006. Consistent design guidelines have been developed that describe the routine magnetic field reduction measures that regulated California electric utilities consider for new and upgraded T/L and transmission substation projects. SCE filed its revised EMF Design Guidelines with the CPUC on July 26, 2006.

No-cost and low-cost measures to reduce magnetic fields would be implemented for this project in accordance with SCE's EMF Design Guidelines. In summary, the process of evaluating no-cost and low-cost magnetic field reduction measures and prioritizing within and between land usage classes considers the following:

1. SCE's priority in the design of any electrical facility is public and employee safety. Without exception, design and construction of an electric power system must comply with all applicable federal, state, and local regulations, applicable safety codes, and each electric utility's construction standards. Furthermore,

[22] CPUC Decision 06-01-042, Conclusion of Law No. 5, mimeo. p. 19 ("As discussed in the rulemaking, a direct link between exposure to EMF and human health effects has yet to be proven despite numerous studies including a study ordered by this Commission and conducted by DHS.").

[23] CPUC Decision 06-01-042, mimeo. p. 17 - 18 ("Furthermore, we do not request that utilities include non-routine mitigation measures, or other mitigation measures that are based on numeric values of EMF exposure, in revised design guidelines or apply mitigation measures to reconfigurations or relocations of less than 2,000 feet, the distance under which exemptions apply under GO 131-D. Non-routine mitigation measures should only be considered under unique circumstances.").

[24] CPUC Decision 06-01-042, Conclusion of Law No. 2, ("EMF concerns in future CPCN and PTC proceedings for electric and transmission and substation facilities should be limited to the utility's compliance with the Commission's low-cost/no-cost policies.").

transmission and subtransmission lines and substations must be constructed so that they can operate reliably at their design capacity. Their design must be compatible with other facilities in the area and the cost to construct, operate and maintain the facilities must be reasonable.

2. As a supplement to Step 1, SCE follows the CPUC's direction to undertake no-cost and low-cost magnetic field reduction measures for new and upgraded electrical facilities. Any proposed no-cost and low-cost magnetic field measures, must, however, meet the requirements described in Step 1 above. The CPUC defines no-cost and low-cost measures as follows:

- Low-cost measures, in aggregate, would:
    - Cost in the range of 4 percent of the total project cost.
    - For low cost mitigation, the "EMF reductions will be 15% or greater at the utility R-O-W [right-of-way]..."[25]

The CPUC Decision stated,

> "We direct the utilities to use 4 percent as a benchmark in developing their EMF mitigation guidelines. We will not establish 4 percent as an absolute cap at this time because we do not want to arbitrarily eliminate a potential measure that might be available but costs more than the 4 percent figure. Conversely, the utilities are encouraged to use effective measures that cost less than 4 percent."[26]

3. The CPUC provided further policy direction in Decision 06-01-042, stating that, "[a]lthough equal mitigation for an entire class is a desirable goal, we will not limit the spending of EMF mitigation to zero on the basis that not all class members can benefit."[27] While Decision 06-01-042 directs the utilities to favor

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25 CPUC Decision 06-01-042, p. 10

26 CPUC Decision 93-11-013, § 3.3.2, p.10.

27 CPUC Decision 06-01-042, p. 10

schools, day-care facilities and hospitals over residential areas when applying low-cost magnetic field reduction measures, prioritization within a class can be difficult on a project case-by-case basis because schools, day-care facilities, and hospitals are often integrated into residential areas, and many licensed day-care facilities are housed in private homes, and can be easily moved from one location to another. Therefore, it may be practical for public schools, licensed day-care centers, hospitals, and residential land uses to be grouped together to receive highest prioritization for low-cost magnetic field reduction measures. Commercial and industrial areas may be grouped as a second priority group, followed by recreational and agricultural areas as the third group. Low-cost magnetic field reduction measures will not be considered for undeveloped land, such as open space, state and national parks, and Bureau of Land Management and U.S. Forest Service lands. When spending for low-cost measures would otherwise disallow equitable magnetic field reduction for all areas within a single land-use class, prioritization can be achieved by considering location and/or density of permanently occupied structures on lands adjacent to the projects, as appropriate.

One field reduction technique recommended for portions is the use of taller structures than the proposed design. The height increase for field reduction should not cause structures to be taller than dictated by good engineering practices. If there is a conflict between field reduction recommendations and good engineering practices, good engineering practices should take precedence.

This FMP contains descriptions of various magnetic field models and the calculated results of magnetic field levels based on those models. These calculated results are provided only for purposes of identifying the relative differences in magnetic field levels among various transmission or subtransmission line design alternatives under a specific set of modeling assumptions and determining whether particular design alternatives can achieve magnetic field level reductions of 15 percent or more at the R-O-W edges. The calculated results are not intended to be predictors of the actual magnetic field levels at any given time or at any specific location if and when the project is constructed. This is because magnetic field levels depend upon a variety of variables, including load growth, customer electricity usage, and other factors beyond SCE's control. The CPUC affirmed this in D. 06-01-042 stating:

> "Our [CPUC] review of the modeling methodology provided in the utility [EMF] design guidelines indicates that it accomplishes its purpose, which is to measure the relative differences between alternative mitigation measures. Thus, the modeling indicates relative differences in magnetic field reductions between different transmission line construction methods, but does not measure actual environmental magnetic fields."[28]

Peak load forecasts for the year of construction were used to model the magnetic field created by the existing and proposed T/Ls for this FMP. Peak load data for the year 2011 was used to model 66 kV subtransmission line where available. Refer to Appendix B.2 for the load data. One field reduction measure explored for this project was the use of split-phasing of the proposed 500 kV T/L for portions of Segment 7 and Segment 8 (Refer to Appendix B.4 for a definition of split-phasing). Split-phasing a circuit can impact line impedance and can result in higher current flows on the circuit than if the line was not split-phased. In the case of the proposed Mira Loma-Vincent 500 kV T/L, the peak load forecasted for this line would increase from 1810 Amps to 2200 Amps with split-phasing. Trial models reflecting the load increase due split-phasing for sample sections of the line route were run. The results of one of these models can be found in the Segment 8I field reduction measures section of this FMP. This model demonstrates that even with the load increase split-phasing results in field reductions greater than 15% as compared with the non-split phased scenario. Because the models in this report are not intended to be predictive of actual magnetic fields but are instead used to compare field reduction techniques, the remaining models in this FMP utilize the initial load data and not the split-phased load data.

[28] CPUC Decision 06-01-042, p. 11

The use of split-phasing as field reduction technique will take advantage of there being vacant circuit positions on certain double-circuit T/Ls that allow for split-phasing. For instance, the Mira Loma-Vincent 500 kV T/L for portions of Segment 7 and Segment 8 of the proposed project was initially planned to be built on one circuit position on double-circuit towers with the other circuit position reserved for a future 500 kV T/L. Split-phasing will require that both circuit positions on the double-circuit towers be energized to carry the load of the proposed Mira Loma-Vincent 500 kV T/L. This allows for arrangement of the phases of the Mira Loma 500 kV T/L to reduce magnetic fields. The split-phasing recommended in this FMP is intended to be used until such time when the future circuits on the double-circuit T/Ls are energized. At that time, the split-phasing arrangement will be removed, and the future T/Ls will be phased to reduce magnetic fields.

In regards to the use of taller structures as a low-cost field reduction measures, SCE limited recommended tower height to below 200 feet. It is SCE's Transmission Engineering's common practice to avoid, whenever feasible, the erecting of structures above 200 feet. Under code CFR Title 14 Part 77.13, the Federal Aviation Administration (FAA) mandates any organization/person planning to sponsor any construction or alterations exceeding 200 feet above ground level to file Notice of Proposed Construction or Alteration (Form 7460-1) with the FAA. Due to the potential conflicts that might result from constructing transmission structures taller than 200 feet, Transmission Engineering recommends against such a practice.

Other modeling assumptions and notes include:

- The computer model assumes flat terrain with field calculation made at a height of 3 feet above ground.
- All conductors are assumed to be straight and infinitely long.
- As a conservative assumption, sag for all T/L was based on a conductor temperature of 275° F and a minimum clearance between conductor and earth of 39 to 40 feet for 500 kV T/Ls and 32 feet for 220 kV T/Ls. The average conductor height was assumed to be the minimum conductor to earth clearance

plus 1/3 the difference between minimum clearance and the minimum conductor height at the tower.

- The sag for overhead 66 kV subtransmission lines was assumed to be 10 feet.
- As a conservative assumption, where distances between T/Ls and the edge of R-O-Ws varied, minimum distances between T/Ls and the edge of R-O-Ws were utilized for the computer models where feasible. Additionally, maximum distances between towers in the R-O-W were used when these distances varied along the T/L line route where feasible.
- T/L structures are depicted in the calculated magnetic field graphs and cross-section to facilitate the interpretation of the graphs. However, these drawings are not to scale.

IV. PROJECT DESCRIPTION

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) T/Ls traveling approximately 4 miles over new right-of-way (R-O-W) from the Cotttonwind Substation to the proposed new Whirlwind Substation (Segment 4).
- A new single-circuit 500 kV T/L, 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 T/L 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 T/L 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 T/L 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 Cotttonwind 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 T/L construction and system compensation elements (Segment 9).
- A new 500 kV T/L traveling approximately 17 miles over new R-O-W between the Windhub[29] Substation and the proposed new Whirlwind Substation (Segment 10).

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[29] 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

- A rebuild of approximately 19 miles of existing 220 kV T/L 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.

The total cost of this project is approximately $1.55 billion. Four percent of the proposed project cost is $62 million. SCE engineers added magnetic field reduction measures early in the design phase for this project. The total project cost, therefore, includes "low-cost" magnetic field reduction measures in the proposed designs.

For the purposes of evaluating potential field reduction measures, the proposed project was split-up into the following segments based on power line configuration and phasing.

A. Segment 4

1. Segment 4A: MP 0 (Cotttonwind Substation) to MP 5 (Whirlwind Substation)

Figure 53 and Figure 54 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 4 A. The areas adjacent to Segment 4A are undeveloped or agricultural. No schools are within 350 feet of this section of the proposed line route.

2. Segment 4 B: MP 5 to MP 13.2 and MP 14.8 to MP 15.8

Figure 55 and Figure 56 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 4 B. The adjacent land is either undeveloped or agricultural. No residences are adjacent to the proposed line route. No schools are within 350 feet of this section of the proposed line route.

3. Segment 4 C: MP 13.2 to MP 14.8

Figure 57 and Figure 58 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 4 C. The adjacent land is either undeveloped or agricultural. No residences are adjacent to the proposed line route. No schools are within 350 feet of this section of the proposed line route.

4. Segment 4 D: MP 15.8 to MP 19.5 (Antelope Substation)

Figure 59 in Appendix B.1 depicts the proposed R-O-W configuration for Segment 4 D. There are residences within approximately 300 feet from the proposed T/L R-O-W edges. No schools are within 350 feet of this section of the proposed T/L R-O-W edges.

B. Segment 5

1. Segment 5 A: MP 0 to MP 1.9

Figure 60 and Figure 61 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 5 A. The adjacent land is undeveloped. No schools are within 350 feet of this section of the proposed T/L R-O-W edge.

2. Segment 5 B: MP 1.9 to MP 4.4

Figure 62 and Figure 63 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 5 B. There are residences within approximately 300 feet of the proposed T/L R-O-W edge near MP 2.0. No schools are within 350 feet of this section of the proposed line route.

3. Segment 5 C: MP 4.4 to MP 8.0

Figure 64 and Figure 65 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 5 C. There are residences within approximately 300 feet of the proposed T/L R-O-W edge near MP 8.0. No schools are within 350 feet of this section of the proposed line route.

4. Segment 5 D: MP 8 to MP 11

Figure 66 and Figure 67 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 5 D. Segment 5 D runs through the proposed Ritter Ranch development. No schools are within 350 feet of this section of the proposed line route.

5. Segment 5 E: MP 11 to MP 15.7

Figure 68 and Figure 69 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 5 E. The land adjacent to the proposed line route for Segment 5E is mostly undeveloped with two residences within approximately 300 feet of the Department of Water and Power T/Ls that runs parallel to the south of the proposed T/L R-O-W. No schools are within 350 feet of this section of the proposed line route.

6. Segment 5 F: MP 15.7 to MP 17.3

Figure 70 and Figure 71 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 5 F. There is a residence within approximately 300 feet of the proposed T/L R-O-W edges for this section of the proposed line route. No schools are within 350 feet of this section of the proposed line route.

7. Segment 5 G: MP 17.3 to MP 17.8 (Vincent Substation)

Figure 72 and Figure 73 in Appendix B.1 depict the existing and the proposed R-O-W configurations for Segment 5 G. There are no residences within approximately 300 feet of the proposed T/L R-O-W edges of this section of the proposed line route. No schools are within 350 feet of this section of the proposed line route.

C. Segment 6

1. Segment 6 and 11 A: Segment 6 MP 0 (Vincent Substation) to MP 0.6 and Segment 11 MP 0 to MP 0.9

Figure 74 and Figure 75 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 6 A and 11 A, which run adjacent to each other immediately south of Vincent Substation. There are residences within approximately 300 feet of this section of the proposed line route. No schools are within 350 feet of this section of the proposed line route.

2. Segment 6 B: MP 0 T5 to MP 4 T3

Figure 76, Figure 77, and Figure 78 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 6 B. There are residences within 300 feet of the proposed T/L R-O-W edges of this section of the proposed line route. No schools are within 350 feet of this section of the proposed line route.

3. Segment 6 C: MP 5 T1 to MP 6 T4

Figure 79 and Figure 80 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 6 C. The land adjacent to this section of the line route is undeveloped. No schools are within 350 feet of this section of the proposed line route.

4. Segment 6 D: MP 7 T4

Figure 81 and Figure 82 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 6 D. There is a structure adjacent to this section of the proposed line route at MP 7 T4. No schools are within 350 feet of this section of the proposed line route.

5. **Segment 6 E: MP 9 T3 to MP 26 T5**

Figure 83 and Figure 84 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 6 E. The land adjacent to this section of the proposed line route is forest land. No schools are within 350 of the proposed line route.

D. **Segment 7**

1. **Segment 7A: MP 0 to MP 5 (Rio Hondo Substation)**

Figure 85, Figure 86 and Figure 87 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 7A. A portion of Segment 7A runs through residential areas and commercial/industrial areas in the City of Duarte. There are no schools within 350 ft of the line route.

2. **Segment 7B: MP 5 (Rio Hondo Substation) to MP 7.6**

Figure 88 and Figure 89 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 7 B. Segment 7-B runs parallel to the 605 freeway and the San Gabriel River. There are no residences adjacent to this portion of the line route. There is a new commercial development within 300 feet of the proposed T/L R-O-W edges of this portion of the line route. There are no schools within 350 ft of the line route.

3. **Segment 7C: MP 7.6 to MP 11.6**

Figure 90 and Figure 91 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 7 C. The configuration of the power lines in the R-O-W is the same as Segment 7B except that the existing 220 kV lines in the R-O-W are transposed in the vicinity of Ramona Boulevard in the City of El Monte. There are residential areas in the City of El Monte near the 60 freeway within approximately 300 feet of the west R-O-W edge of the proposed T/L . The proposed T/L R-O-W edges are also within approximately 300 feet of commercial buildings in the City of El Monte in portions of this segment. There are no schools within 350 feet of this section of the proposed line route.

4. Segment 7D: MP 11.6 to MP 13

Figure 92 and Figure 93 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 7 D. There are residences and commercial structures within 300 feet of the proposed T/L R-O-W edges in the City of El Monte in the vicinity of Durfee Boulevard. The playground of South El Monte High School is within 350 feet of the line route, though buildings at this school are much further away.

5. Segment 7E: MP 13 to MP 15.8 (Mesa Substation)

Figure 94 and Figure 95 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 7E. There are residential complex within approximately 300 feet of the proposed T/L R-O-W edges of this section of the proposed line route in the City of Montebello near Paramount Boulevard. Additionally, a horse ranch and accompanying residence is under and adjacent to this section of the line route on San Gabriel Boulevard. A shopping center in Montebello is also located adjacent to portions of this section of the proposed line route.

E. Segment 8

1. Segment 8A: MP 2.3 (the "San Gabriel Junction") to MP 4.4

Figure 96 and Figure 97 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8A. There are scattered structures within approximately 300 feet of the north edge of the R-O-W of the proposed T/L in this segment. No schools are within 350 feet of this section of the proposed line route.

2. Segment 8B: MP 4.4 to MP 9.0

Figure 98 and Figure 99 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 B. There is an industrial area located within approximately 300 feet of the proposed T/L R-O-W edges of this section of the proposed line route near MP 4.4. There is residential area within approximately 300 feet of the north edge of the proposed T/L R-O-W of this section of the proposed line route near MP 9.0. The proposed T/L R-O-W is located on hills adjacent to Rio Hondo College near MP 5.0. No elementary or high schools are within 350 feet of this section of the proposed line route.

3. Segment 8C: MP 9.0 to MP 9.7

Figure 100 and Figure 101 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 C. This section of the line route runs through a residential neighborhood in the City of Hacienda Heights. No schools are within 350 feet of this section of the proposed line route.

4. Segment 8D: MP 9.7 to MP 11.2

Figure 102 and Figure 103 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 D. There are scattered residences adjacent to this section of the proposed line route. No schools are within 350 feet of this section of the proposed line route.

5. Segment 8 E: MP 11.2 to MP 13.3

Figure 104 and Figure 105 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 E. There are scattered residences within approximately 300 feet of the proposed T/L R-O-W edges. No schools are within 350 feet of this section of the proposed line route.

6. <u>Segment 8F: MP 13.3 to MP 13.5</u>

Figure 106 and Figure 107 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 F. There are residences within approximately 300 feet of the proposed T/L R-O-W edges of this section of the proposed line route. No schools are within 350 feet of this section of the proposed line route.

7. <u>Segment 8 G: MP 13.5 to MP 19.3</u>

Figure 108 and Figure 109 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 G. There are scattered residences within approximately 300 feet of the proposed T/L north R-O-W edge of this section of the proposed line route. No elementary or high schools are within 350 feet of the proposed line route. At the intersection of Fullerton Road and the R-O-W for the proposed line (MP 13.5), there is a church with a preschool adjacent to the north edge of the R-O-W for the proposed line.

8. <u>Segment 8H: MP 19.3 to MP 22.7</u>

Figure 110 and Figure 111 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 H. There are residences within approximately 300 feet of the proposed T/L R-O-W edges for portions of the line route. No schools are within 350 feet of this section of the proposed line route.

9. <u>Segment 8I: MP 22.7 to MP 26.9</u>

Figure 112 and Figure 113 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8I. This section of the proposed line route runs through residential neighborhoods and commercial development in the Chino Hills area. No public schools are within 350 feet of the proposed line route. There are preschools located within approximately 300 feet from the R-O-W edge where the line route intersects Pipeline Dr. in Chino Hills.

10. Segment 8J: MP 26.9 to MP 27.6

Figure 114 and Figure 115 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8J. This section of the proposed line route runs through commercial areas. No schools are within 350 feet of this section of the proposed line route.

11. Segment 8 K: MP 27.6 to MP 28.1

Figure 116 and Figure 117 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8K. There is a park east of Central and south of Edison Avenue in the City of Chino that is adjacent and on the R-O-W for this section of the proposed line route. There is a YMCA facility located adjacent to the south edge of the R-O-W in this area. No schools are within 350 feet of this section of the proposed line route.

12. Segment 8 L: 8A MP 28.4 to MP 28.7 and 8B MP 0 to MP 0.3

Figure 118 and Figure 119 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 L. There are commercial and agricultural areas within approximately 300 feet of the proposed T/L R-O-W edges of this section of the proposed line route. No schools are within 350 feet of the proposed line route.

13. Segment 8M : 8A MP 28.7 to MP 29.4 and 8B MP 0.3 to MP 0.7

Figure 120 and Figure 121 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 M. There are residential, commercial and agricultural areas within approximately 300 feet of the proposed T/L R-O-W edges of this section of the line route. No schools are within 350 feet of the proposed line route.

14. Segment 8N : 8A MP 29.4 to MP 34

Figure 122, Figure 123 and Figure 124 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 N. This section of the line route runs through agricultural areas. Some residential areas are within approximately 300 feet of the proposed R-O-W. No public schools are within 350 feet of this section of the proposed line route. There is a church preschool within approximately 300 feet of the proposed T/L R-O-W edges near the corner of Edison Avenue and Euclid Avenue.

15. Segment 8 O: 8B MP 1.0 to MP 5.2

Figure 125 and Figure 126 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 O. This section of the line route runs primarily through agricultural areas with a residential area within approximately 300 feet of the proposed R-O-W edges near MP 5.2. No schools are within 150 feet of this section of the proposed line route.

16. Segment 8P: 8B MP 5.2 to 5.6

Figure 127 and Figure 128 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 P. There are residences within approximately 300 feet of the proposed T/L R-O-W edges of this section of the line route. No schools are within 150 feet of this section of the proposed line route.

17. Segment 8 Q: 8B MP 6 to 6.8 (Mira Loma Substation)

Figure 129 and Figure 130 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 Q. This section of the line route runs through agricultural areas where a future development is planned. No schools are within 150 feet of this section of the proposed line route.

18. Segment 8 R: 8A MP 34 to MP 34.4 and 8B MP 5.6 to 6.0

Figure 131 and Figure 132 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 R. There are residential areas and agricultural areas where a future development is planned within approximately 300 feet of the proposed T/L R-O-W edges of this section of the line route. No schools are within 350 ft of this section of the proposed line route.

19. Segment 8 S: MP 34.5 to MP 35.2 (Mira Loma Substation)

Figure 133 and Figure 134 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 S. This section of the line route runs through agricultural areas where a future development is planned. No schools are within 350 feet of this section of the proposed line route.

F. Segment 9: Substation Components

1. Whirlwind Substation

Whirlwind Substation would be a new 500/220 kV substation located approximately 4 to 5 miles south of the Cotttonwind Substation near the intersection of 170th Street and Holiday Avenue, in Kern County. SCE is evaluating three alternative sites (A, B, and C) for placement of the Whirlwind Substation. Facilities associated with the proposed new substation (e.g., the substation pad and access road) would represent a permanent land disturbance between 66 and 67 acres.

2. Antelope Substation

The Antelope Substation portion of Segment 9 requires the upgrade of Antelope Substation 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, Segments 2 & 3. 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 28 acres of additional land at the substation site to accommodate the additional new construction at the Antelope Substation.

3. Vincent Substation

Segment 9 includes upgrade of the existing 500/220 kV Vincent Substation with new equipment to accommodate new transmission connections. 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. The 500 kV switchyard would be extended to the west by approximately 880 feet. 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.

4. Mesa Substation

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. All upgrades at the Mesa Substation would take place within the existing fence line.

5. Mira Loma Substation

The Mira Loma Substation portion of Segment 9 would include the construction of a new 500 kV position to terminate new Mira Loma-Vincent 500 kV T/L. All work would take place within the existing Mira Loma fence line.

G. Segment 10

Figure 135 in Appendix B.1 depicts the proposed R-O-W configuration for Segment 10. Segment 10 runs adjacent to undeveloped and agricultural lands. No schools are within 350 feet of this section of the proposed line route.

H. Segment 11

1. Segment 11A: MP 0 to MP 0.9

Refer to Segment 6 A for a description of Segment 11 A.

2. Segment 11B: MP 0.9 to MP 2.3

Figure 136 and Figure 137 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 11 B. There are scattered homes within approximately within approximately 300 feet of the proposed T/L R-O-W edges of structure 5 and structure 6. No schools are within 350 feet of this section of the proposed line route.

3. Segment 11C: MP 2.3 to MP 3.9

Figure 138 and Figure 139 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 8 B. There are homes within approximately 300 feet of the proposed T/L R-O-W edges near Aliso Canyon Road. No schools are within 350 feet of this section of the proposed line route.

4. Segment 11D: MP 3.9 to MP 18.7 (Gould Substation)

Figure 140 and Figure 141 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 11 D. This section of the proposed line route runs mainly through undeveloped, forest lands. No schools are within 350 feet of this section of the proposed line route.

5. **Segment 11 E: MP 18.7 (Gould Substation) to MP 27.2 (Goodrich Substation)**

Figure 142 and Figure 143 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 11 E. Segment 11 E runs through residential and commercial/ industrial areas. A private school in the Eaton Canyon area of Pasadena is located within approximately 300 feet of this section of the proposed line route.

6. **Segment 11F: MP 27.2 (Goodrich Substation) to MP 36.2 (Mesa Substation)**

Figure 144 and Figure 145 in Appendix B.1 depict the existing and proposed R-O-W configurations for Segment 11F. Segment 11F runs through residential and commercial/ industrial areas. Willard Elementary School in Pasadena and Elizabeth W. Shuey Elementary School in Rosemead are located adjacent to this section of the proposed line route. Frances E. Willard Elementary in Rosemead and Woodrow Wilson Elementary School in Pasadena are located within approximately 300 feet of the R-O-W.

I. Subtransmission Component

66 kV Subtransmission Relocation/Removal– Segment 7. As part of Segment 7, approximately 45 existing double-circuit 66 kV subtransmission line structures would be relocated/removed to the edge of the existing R-O-W or undergrounded. The double-circuit 66 kV lattice towers 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 to the angle structure just outside of the Mesa Substation. 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, to a point approximately 1.2 miles north of the Pomona Freeway. Several more 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 replaced beginning with the third structure north of the Pomona Freeway to the "San Gabriel Junction." Also, two other double-circuit 66 kV lattice towers outside of the Mesa Substation would be removed.

66 kV Subtransmission Relocation – Segment 8. 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 three-pole steel dead-end structures to facilitate crossing underneath the new Mira Loma-Vincent 500 kV T/L and the future Mesa-Mira Loma 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, 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 double-circuit Mira Loma-Vincent 500 kV circuit and future Mesa-Mira Loma 500 kV circuit. 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. A total of seven single-circuit 220 kV lattice towers would be replaced with 14 light-weight steel poles 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 to the rack at the Chino Substation, to make room for the new Mira Loma-Vincent 500 kV T/L and the future Mesa-Mira Loma 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, would be converted to underground (approximately 5,500 feet) into the rack at the Chino Substation.

V. EVALUATION OF NO-COST AND LOW-COST MAGNETIC FIELD REDUCTION MEASURES FOR PROPOSED TRTP TRANSMISSION PROJECT

A. Segment 4

1. Segment 4A: MP 0 (Cottonwind Substation) to MP 5 (Whirlwind Substation)

No-Cost Field Reduction Measures: The proposed design for Segment 4 A includes the following no-cost field reduction measure:

1. Phase the proposed T/Ls for field reduction

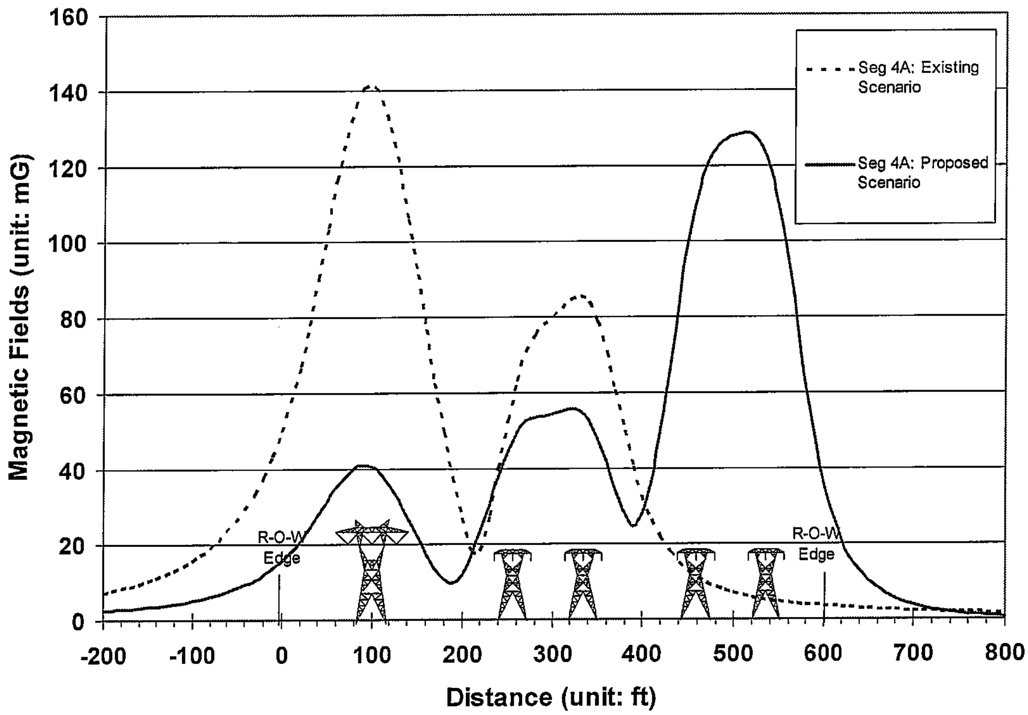
Low-Cost Field Reduction Options: No low-cost field reduction options were investigated for Segment 4 A because the line route runs through undeveloped land.

Magnetic Field Calculations: Table 2 and Figure 1 show the calculated magnetic field levels for existing and proposed scenarios. These calculations were made using the typical 500 kV LST height of 134 feet and the typical 220 kV LST height of 85 feet for the proposed T/Ls for Section 4A.

Table 2
Calculated Magnetic Fields at R-O-W Edges: Segment 4 – Section A

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 4A: Existing Scenario	49.8		3.6	
Seg 4A: Proposed Scenario	15.5	68.9	35.7	Increase

Figure 1
Segment 4 - Section A: Calculated Magnetic Fields



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2. <u>Segment 4 B: MP 5 to MP 13.2 and MP 14.8 to MP 15.8</u>

No-Cost Field Reduction Measures: The proposed design for Segment 4 B includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

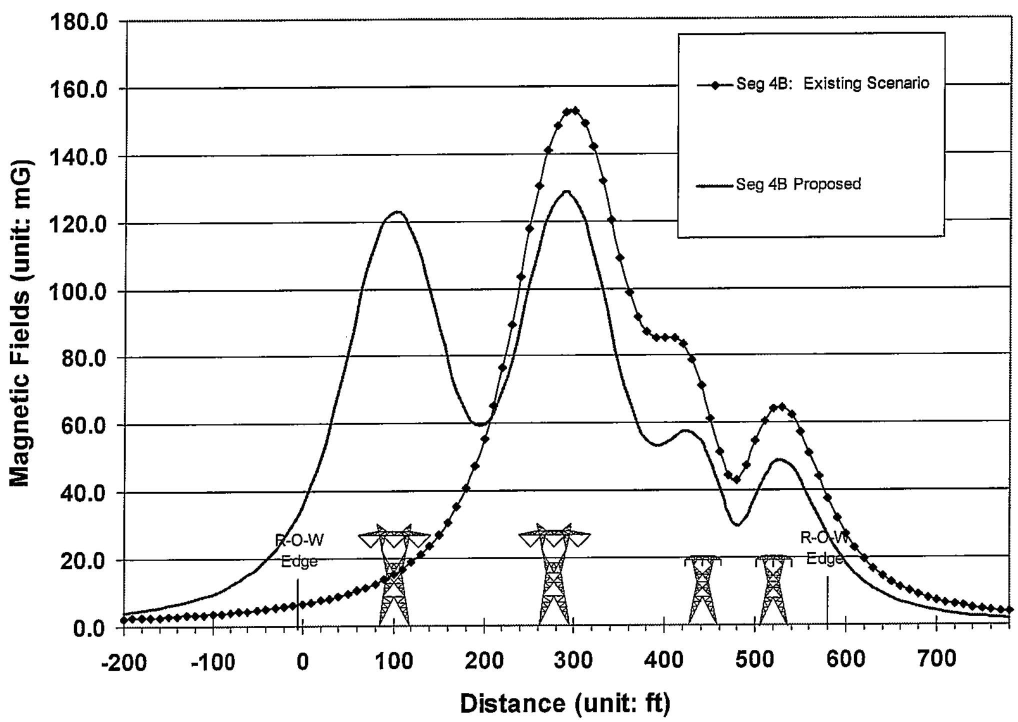
Low-Cost Field Reduction Options: No low-cost field reduction options were investigated for Segment 4 B because the line route runs through undeveloped land.

Magnetic Field Calculations: Table 3 and Figure 2 show the calculated magnetic field levels for existing and proposed scenarios. These calculations were made using the typical 500 kV LST height of 134 feet and the typical 220 kV LST height of 85 feet for the existing T/Ls for Section 4B.

Table 3
Calculated Magnetic Fields at R-O-W Edges: Segment 4 – Section B

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 4B: Existing Scenario	6.6		37.4	
Seg 4B Proposed	35.7	Increase	26.5	29.1

Figure 2
Segment 4 - Section B: Calculated Magnetic Fields



3. Segment 4 C: MP 13.2 to MP 14.8

No-Cost Field Reduction Measures: The proposed design for Segment 4 C includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

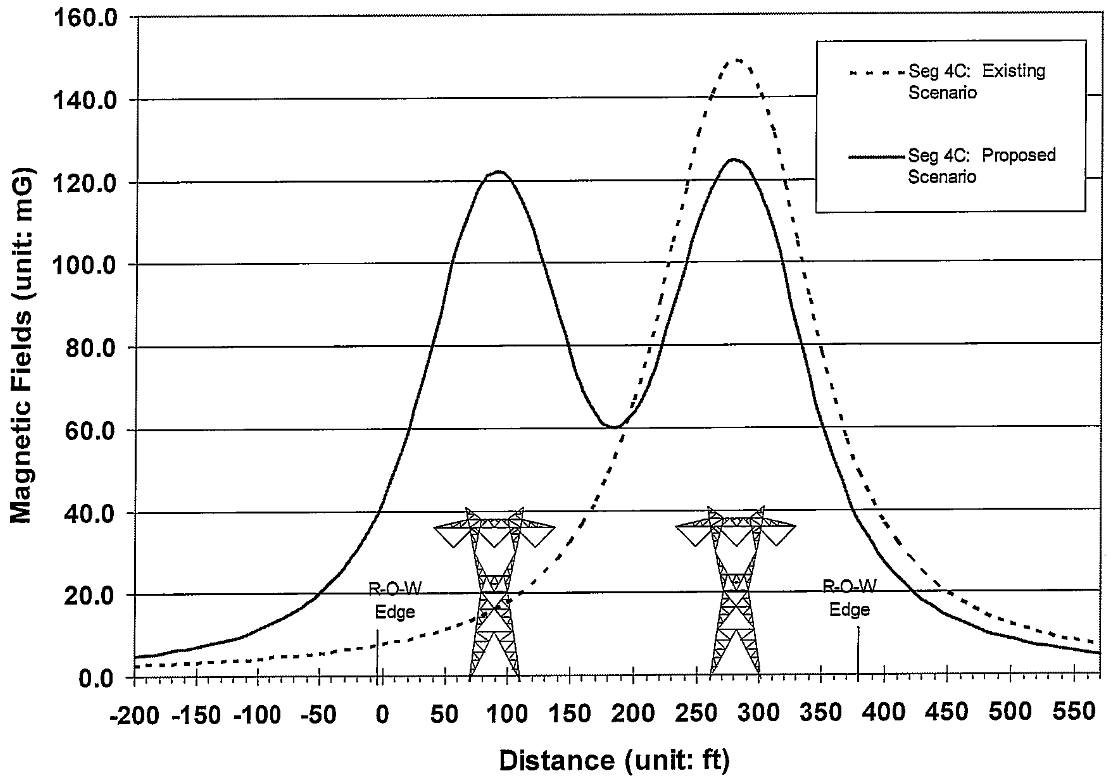
Low-Cost Field Reduction Options: No low-cost field reduction options were investigated for Segment 4 C because the line route runs through undeveloped land.

Magnetic Field Calculations: Table 4 and Figure 3 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV LST height of 134 feet for the proposed T/Ls for Section 4C.

Table 4
Calculated Magnetic Fields at R-O-W Edges: Segment 4 – Section C

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 4C: Existing Scenario	7.7		56.9	
Seg 4C: Proposed Scenario	42.6	Increase	43.6	23.4

Figure 3
Segment 4 - Section C: Calculated Magnetic Fields



4. __Segment 4 D: MP 15.8 to MP 19.5 (Antelope Substation)__

No-Cost Field Reduction Measures: The proposed design for Segment 4 D does not include any no-cost field reduction measures.

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 4 D:

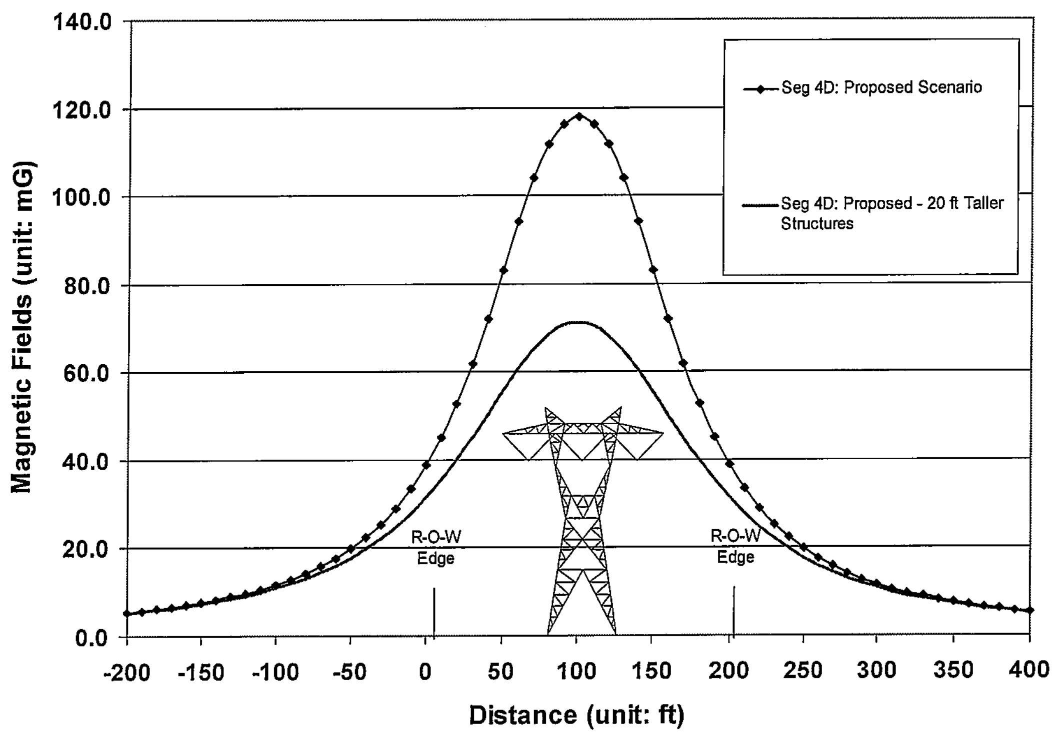
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 5 and Figure 4 show the calculated magnetic field levels for proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV LST height of 134 feet for the proposed T/Ls for Section 4 D.

Table 5
Calculated Magnetic Fields at R-O-W Edges: Segment 4 – Section D

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 4D: Proposed Scenario	38.7		38.7	
Seg 4D: Proposed - 20 ft Taller Structures	31.4	18.9	31.4	18.9

Figure 4
Segment 4 - Section D: Calculated Magnetic Fields



Recommendations for Segment 4 D: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the proposed project design where the line route runs adjacent to existing homes.*

B. Segment 5

1. Segment 5A: MP 0 to MP 1.9

No-Cost Field Reduction Measures: The proposed design for Segment 5 A includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Place the proposed circuit on the inside position of the R-O-W

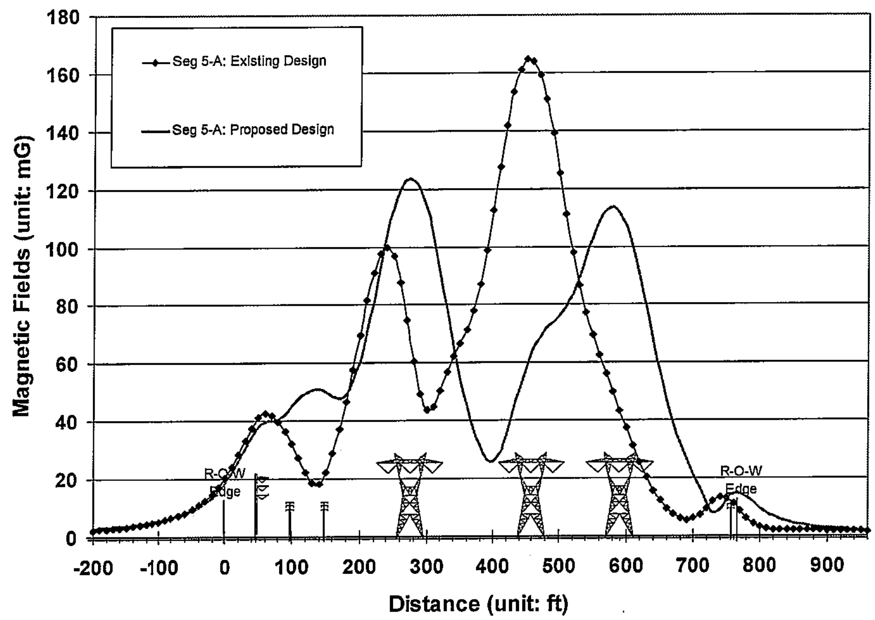
Low-Cost Field Reduction Options: No low-cost field reduction options were investigated for Segment 5A because the line route runs through undeveloped land.

Magnetic Field Calculations: Table 6 and Figure 5 show the calculated magnetic field levels for existing and proposed scenarios.

Table 6
Calculated Magnetic Fields at R-O-W Edges: Segment 5 – Section A

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 5-A: Existing Design	20.3		11.4	
Seg 5-A: Proposed Design	18.7	7.9	14.6	Increase

Figure 5
Segment 5 - Section A: Calculated Magnetic Fields



2. <u>Segment 5 B: MP 1.9 to MP 4.4</u>

No-Cost Field Reduction Measures: The proposed design for Segment 5 B includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Place the proposed circuit on the inside position of the R-O-W

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 5 B:

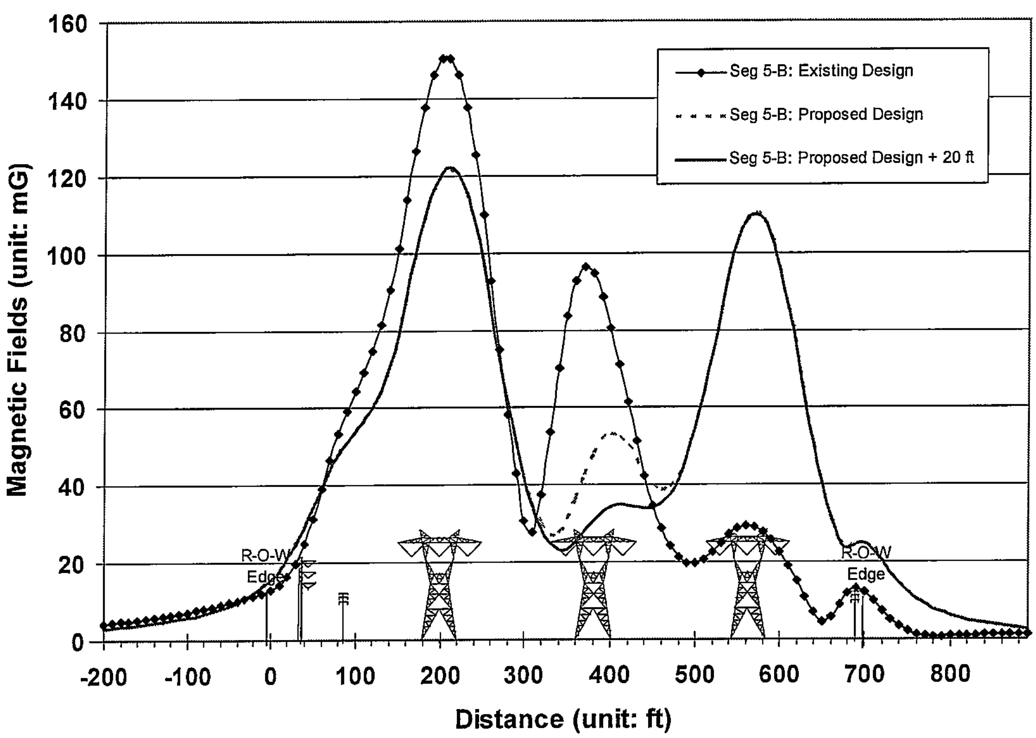
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 7 and Figure 6 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios.

Table 7
Calculated Magnetic Fields at R-O-W Edges: Segment 5 – Section B

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 5-B: Existing Design	12.9		12.7	
Seg 5-B: Proposed Design	15.5	Increase	25.0	Increase
Seg 5-B: Proposed Design + 20 ft	15.5	0	24.9	0.4

Figure 6
Segment 5 - Section B: Calculated Magnetic Fields



Recommendations for Segment 5 B: Field Reduction Option 1 results in calculated field reductions less than 15% at the R-O-W edges. *This low-cost option does not meet the* *minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

3. Segment 5 C: MP 4.4 to MP 8.0

No-Cost Field Reduction Measures: The proposed design for Segment 5 C includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Place the proposed circuit on the inside position of the R-O-W

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 5 C:

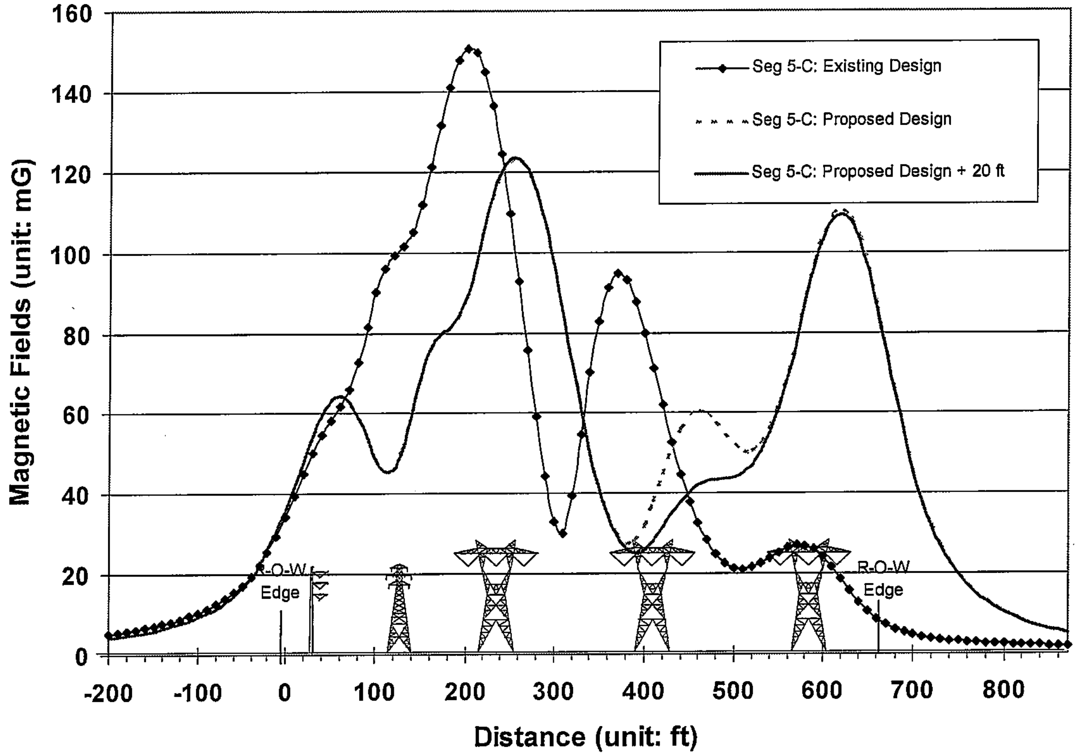
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 8 and Figure 7 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios.

Table 8
Calculated Magnetic Fields at R-O-W Edges: Segment 5 – Section C

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 5-C: Existing Design	34.2		7.1	
Seg 5-C: Proposed Design	35.7	Less than 15% Increase	72.3	Increase
Seg 5-C: Proposed Design + 20 ft	35.7	0	71.8	0.7

Figure 7
Segment 5 - Section C: Calculated Magnetic Fields



Recommendations for Segment 5 C: Field Reduction Option 1 results in calculated field reductions less than 15% at the R-O-W edges. *This low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

4. Segment 5 D: MP 8 to MP 11

No-Cost Field Reduction Measures: The proposed design for Segment 5 D includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 5D:

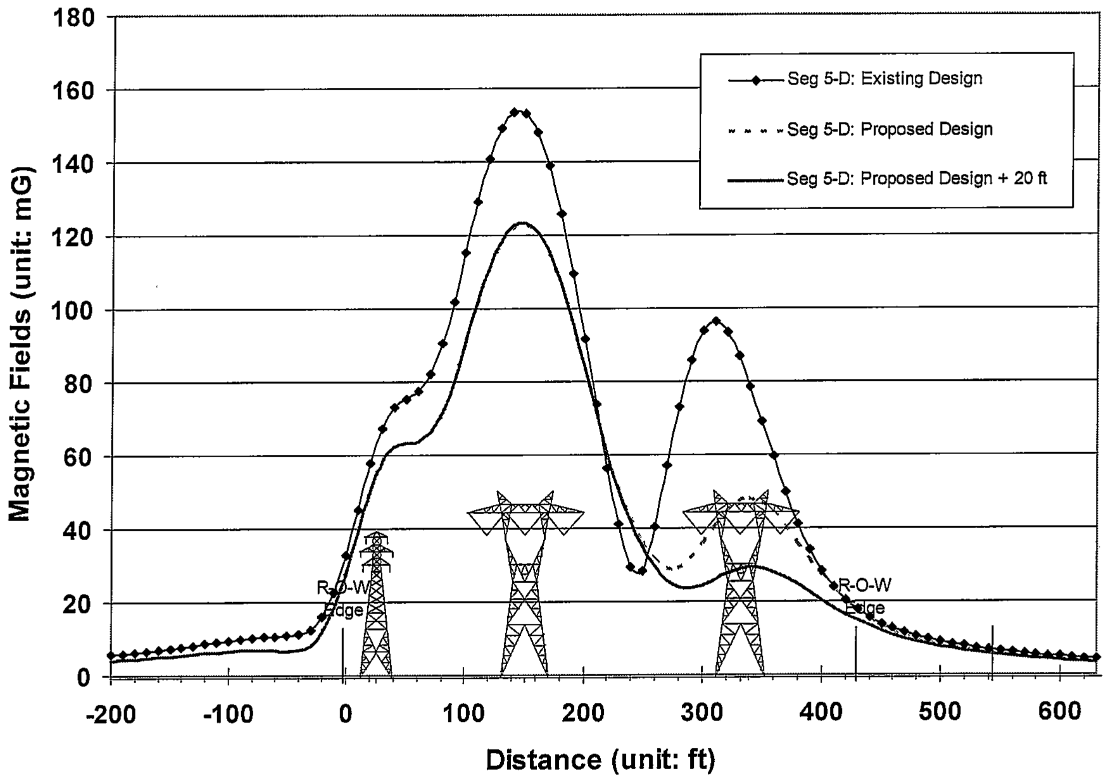
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 9 and Figure 8 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios.

Table 9
Calculated Magnetic Fields at R-O-W Edges: Segment 5 – Section D

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 5-D: Existing Design	32.6		17.7	
Seg 5-D: Proposed Design	27.9	14.4	17.5	1.1
Seg 5-D: Proposed Design + 20 ft	27.8	0.4	14.8	15.4

Figure 8
Segment 5 - Section D: Calculated Magnetic Fields



Recommendations for Segment 5 D: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the proposed project design where homes are adjacent to the right R-O-W edge.*

5. <u>Segment 5 E: MP 11 to MP 15.7</u>

No-Cost Field Reduction Measures: The proposed design for Segment 5 E includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 5 E:

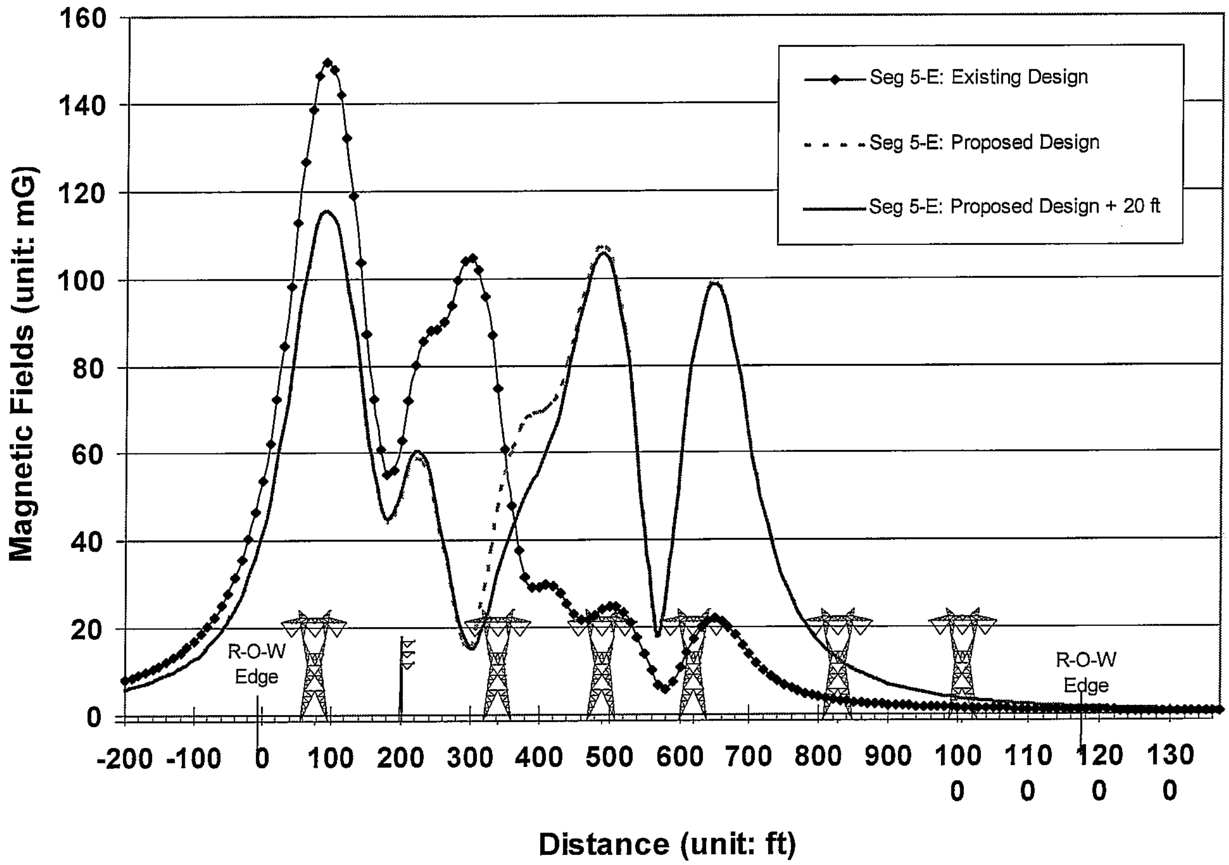
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 10 and Figure 9 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios.

Table 10
Calculated Magnetic Fields at R-O-W Edges: Segment 5 – Section E

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 5-E: Existing Design	53.6		0.9	
Seg 5-E: Proposed Design	41.7	22.2	1.7	Increase
Seg 5-E: Proposed Design + 20 ft	41.7	0	1.7	0.0

Figure 9
Segment 5 - Section E: Calculated Magnetic Fields



Recommendations for Segment 5 E: Field Reduction Option 1 results in calculated field reductions less than 15% at the R-O-W edges. *This low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

6. **Segment 5 F: MP 15.7 to MP 17.3**

No-Cost Field Reduction Measures: The proposed design for Segment 5 F includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Place the proposed circuit on an inside position of the R-O-W

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 5 F:

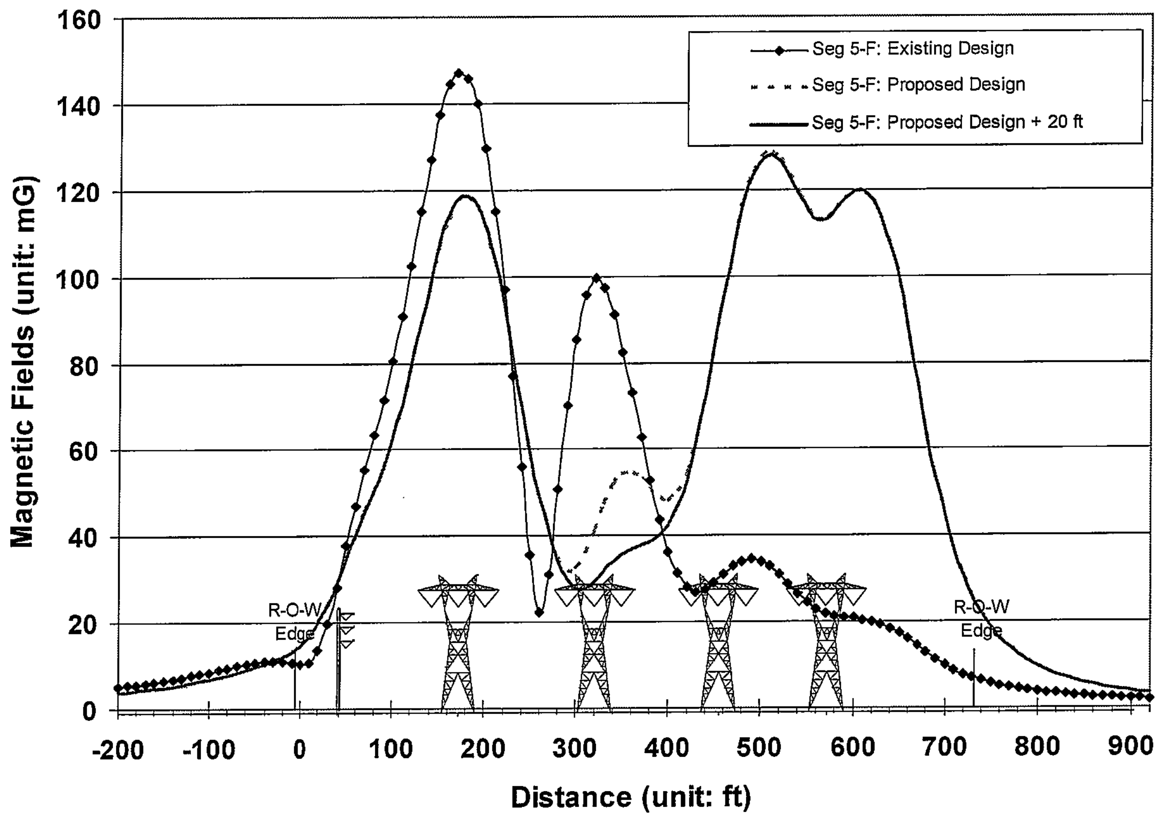
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 11 and Figure 10 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios.

Table 11
Calculated Magnetic Fields at R-O-W Edges: Segment 5 – Section F

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 5-F: Existing Design	10.2		7.4	
Seg 5-F: Proposed Design	14.6	Increase	28.1	Increase
Seg 5-F: Proposed Design + 20 ft	14.6	0	28.2	Less than 15% Increase

Figure 10
Segment 5 - Section F: Calculated Magnetic Fields



Recommendations for Segment 5 F: Field Reduction Option 1 results in calculated field reductions less than 15% at the closest edge of R-O-W. *This low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

7. <u>Segment 5 G: MP 17.3 to MP 17.8 (Vincent Substation)</u>

No-Cost Field Reduction Measures: The proposed design for Segment 5 G includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

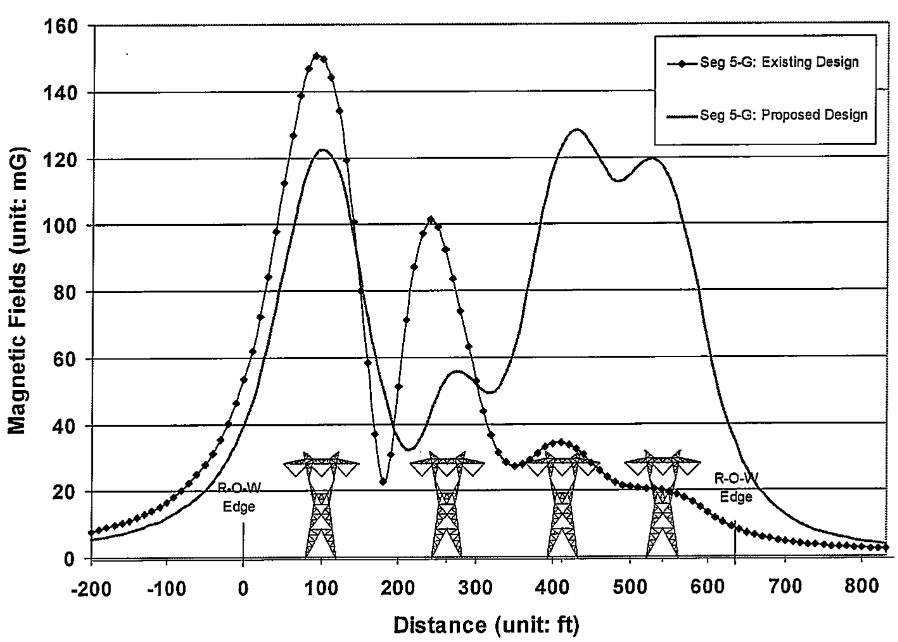
Low-Cost Field Reduction Options: No low-cost field reduction options were investigated for Segment 5G because the line route runs through undeveloped land.

Magnetic Field Calculations: Table 12 and Figure 11 show the calculated magnetic field levels for existing and proposed scenarios.

Table 12
Calculated Magnetic Fields at R-O-W Edges: Segment 5 – Section G

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 5-G: Existing Design	53.4		8.6	
Seg 5-G: Proposed Design	39.6	25.8	33.8	Increase

Figure 11
Segment 5 - Section G: Calculated Magnetic Fields



C. Segment 6

1. Segment 6 A and 11 A: Seg 6 MP 0 (Vincent Substation) to MP 0.6 and Seg.11 MP 0 to MP 0.9

No-Cost Field Reduction Measures: The proposed design for Segment 6A and 11A includes the following no-cost field reduction measures:

1. Place the proposed 500 kV circuits on the inside position of the R-O-W
2. Phase the proposed T/Ls for field reduction
3. Utilize single-circuit TSP construction that reduces conductor spacing and raises conductor height as compared with single-circuit LST construction
4. Utilize single-circuit delta LST construction that reduces conductor spacing and raises conductor height as compared with single-circuit, horizontal LST construction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 6A and 11A:

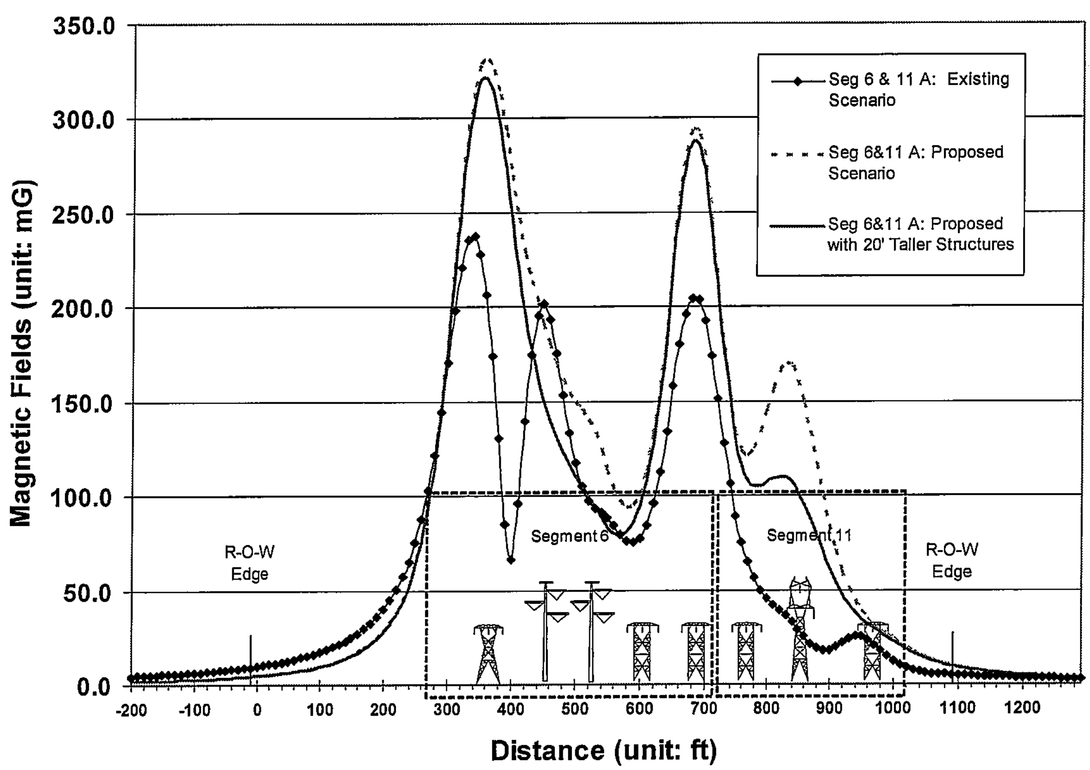
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 13 and Figure 12 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV TSP height in Section 6A of 161 feet and the typical 500 kV Delta LST height in Section 11A of 155 feet.

Table 13
Calculated Magnetic Fields at R-O-W Edges: Segment 6A and 11A

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 6 & 11 A: Existing Scenario	9.7		5.1	
Seg 6&11 A: Proposed Scenario	4.6	52.6	10.1	Increase
Seg 6&11 A: Proposed with 20' Taller Structures	4.5	2.2	9.8	3.0

Figure 12
Segment 6A and 11A: Calculated Magnetic Fields



Recommendations for Segment 6A and 11A: Field Reduction Option 1 does not result in calculated field reductions greater than 15% at the closest edge of R-O-W. *This low-cost option does not meet the minimum field reduction specified by the CPUC EMF* *decisions and is not recommended to be included in the final design of the proposed project.*

2. Segment 6 B: MP 0 T5 to MP 4 T3

No-Cost Field Reduction Measures: The proposed design for Segment 6B includes the following no-cost field reduction measures:

1. Phase the proposed T/Ls for field reduction
2. Utilize single-circuit TSP construction between MP 0 T3 and M3 T1 which reduces conductor spacing and raises conductor height as compared with single-circuit, horizontal LST construction

Low-Cost Field Reduction Options: No low-cost field reduction measures were investigated where LSTs are utilized because the surrounding land is undeveloped. The following low-cost field reduction option was investigated for Segment 6B where TSPs are utilized:

1. Field Reduction Option 1: Utilize 20 foot taller TSPs than were included in the initial project design near residences

Magnetic Field Calculations: Table 14, Table 15, Figure 13, and Figure 14 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV TSP height in Section 6B of 155 feet and the typical 500 kV LST height in Section 6B of 113 feet.

Table 14
Calculated Magnetic Fields at R-O-W Edges: Segment 6 – Section B (TSPs)

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 6B (TSP): Existing Scenario	143.2		48.6	
Seg. 6B (TSP): Proposed Scenario	141.3	1.3	45.0	7.4
Seg. 6B (TSP): Proposed with 20 ft Taller Structures	139.1	1.6	36.4	19.1

Figure 13
Segment 6 - Section B: Calculated Magnetic Fields (TSPs)

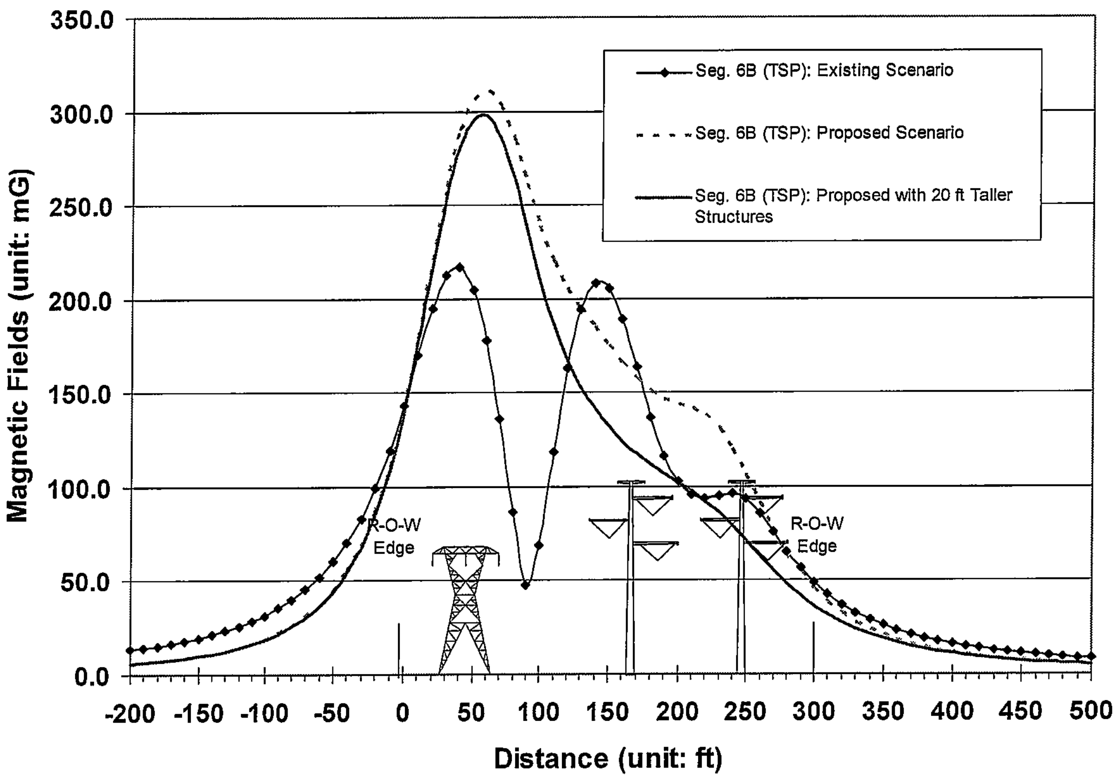
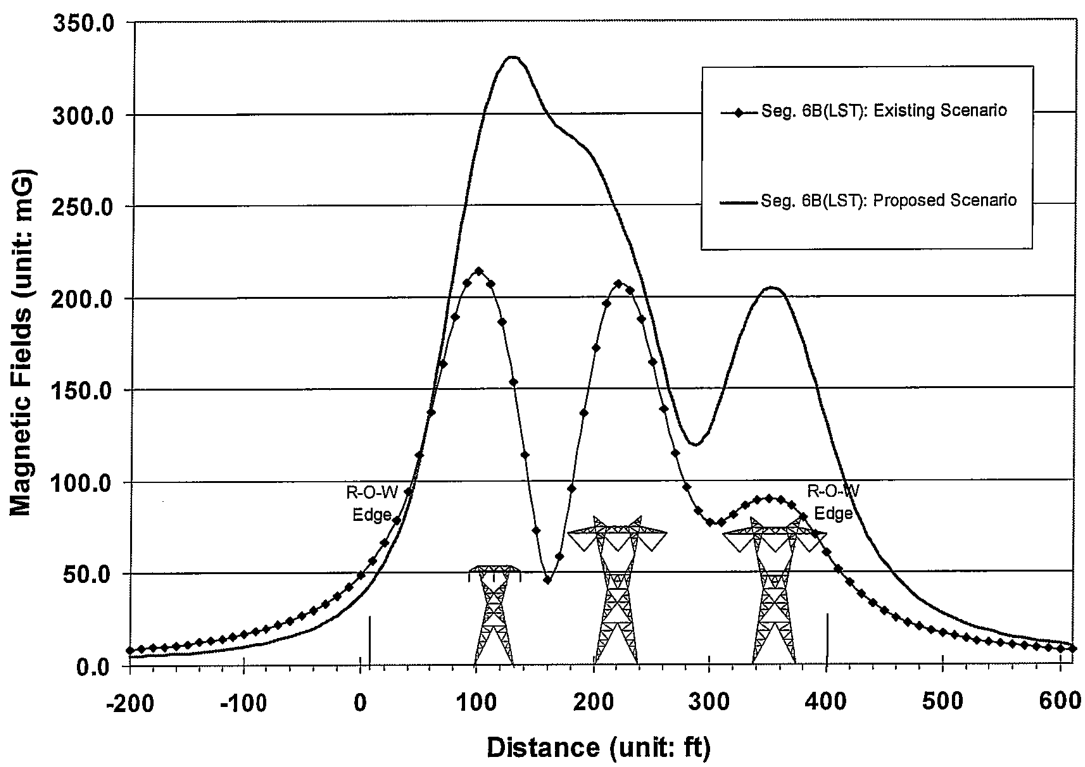


Table 15
Calculated Magnetic Fields at R-O-W Edges: Segment 6 – Section B (LSTs)

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 6B(LST): Existing Scenario	49.2		46.6	
Seg. 6B(LST): Proposed Scenario	37.8	23.2	96.6	Increase

Figure 14
Segment 6 - Section B: Calculated Magnetic Fields (LSTs)



Recommendations for Segment 6B: Field Reduction Option 1 results in calculated field reductions of less than 15% at the left (east) edge of R-O-W where the closest homes are approximately 300 feet away from the R-O-W edge. Field Reduction Option 1 results in calculated field reductions greater than 15% at the right (west) edge of R-O-W where there are no homes adjacent to the R-O-W. *Therefore, this low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

3. Segment 6 C: MP 5 T1 to MP 6 T4

No-Cost Field Reduction Measures: The proposed design for Segment 6C includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

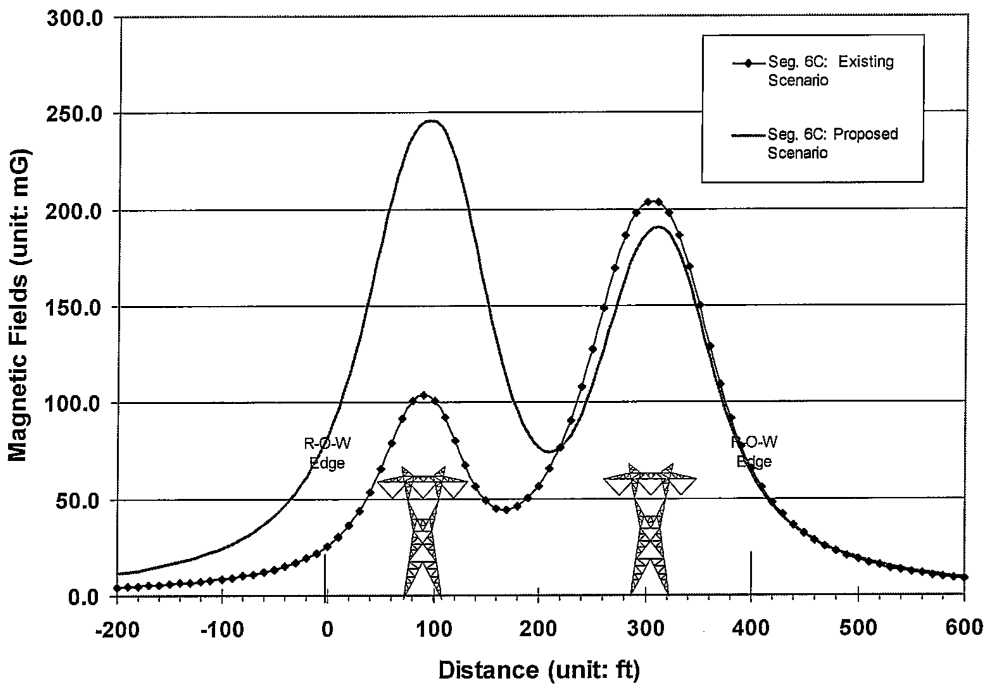
Low-Cost Field Reduction Options: No low-cost field reduction measures were investigated for Segment 6C because the surrounding land is undeveloped.

Magnetic Field Calculations: Table 16 and Figure 15 show the calculated magnetic field levels for existing and proposed scenarios. These calculations were made using the typical 500 kV LST height in Section 6C of 113 feet.

Table 16
Calculated Magnetic Fields at R-O-W Edges: Segment 6 – Section C

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 6C: Existing Scenario	25.7		65.6	
Seg. 6C: Proposed Scenario	82.7	Increase	63.3	3.5

Figure 15
Segment 6 - Section C: Calculated Magnetic Field Levels



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4. Segment 6 D: MP 7 T4

No-Cost Field Reduction Measures: The proposed design for Segment 6D includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 6D:

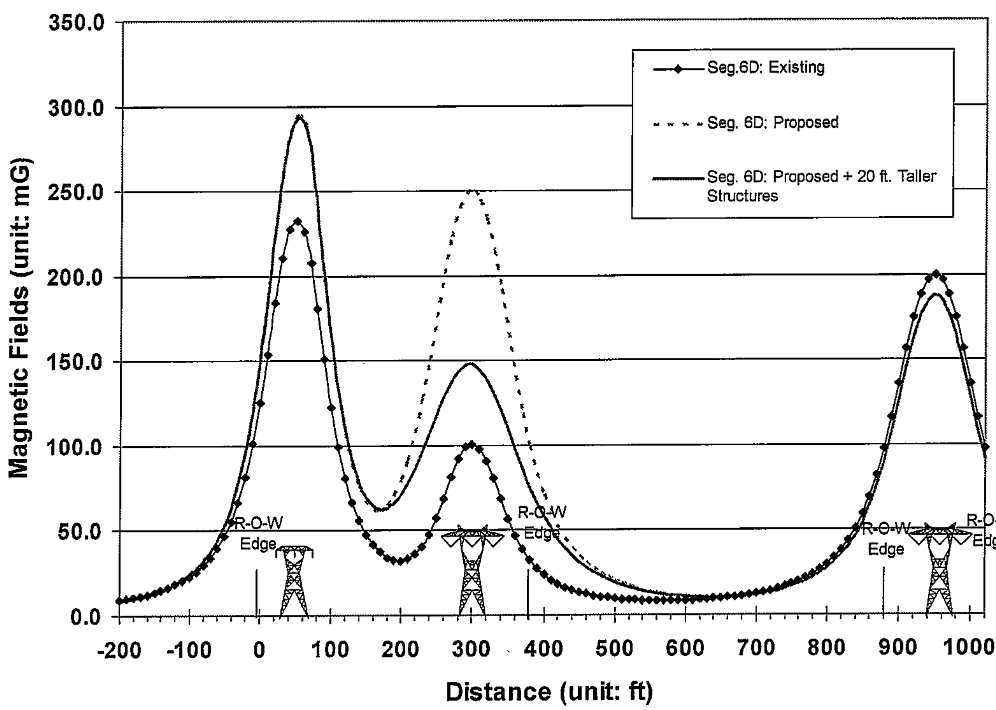
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences.

Magnetic Field Calculations: Table 17 and Figure 16 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV LST height in Section 6D of 116 feet.

Table 17
Calculated Magnetic Fields at R-O-W Edges: Segment 6 – Section D

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg.6D: Existing	125.2		41.1	
Seg. 6D: Proposed	150.6	Increase	38.0	7.5
Seg. 6D: Proposed + 20 ft. Taller Structures	150.2	0.3	37.9	0.3

Figure 16
Segment 6 - Section D: Calculated Magnetic Fields



Recommendations for Segment 6D: Field Reduction Option 1 does not result in calculated field reductions greater than 15% where the nearest structure is located. *Therefore, this low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

5. Segment 6 E: MP 9 T3 to MP 26 T5

No-Cost Field Reduction Measures: The proposed design for Segment 6E includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

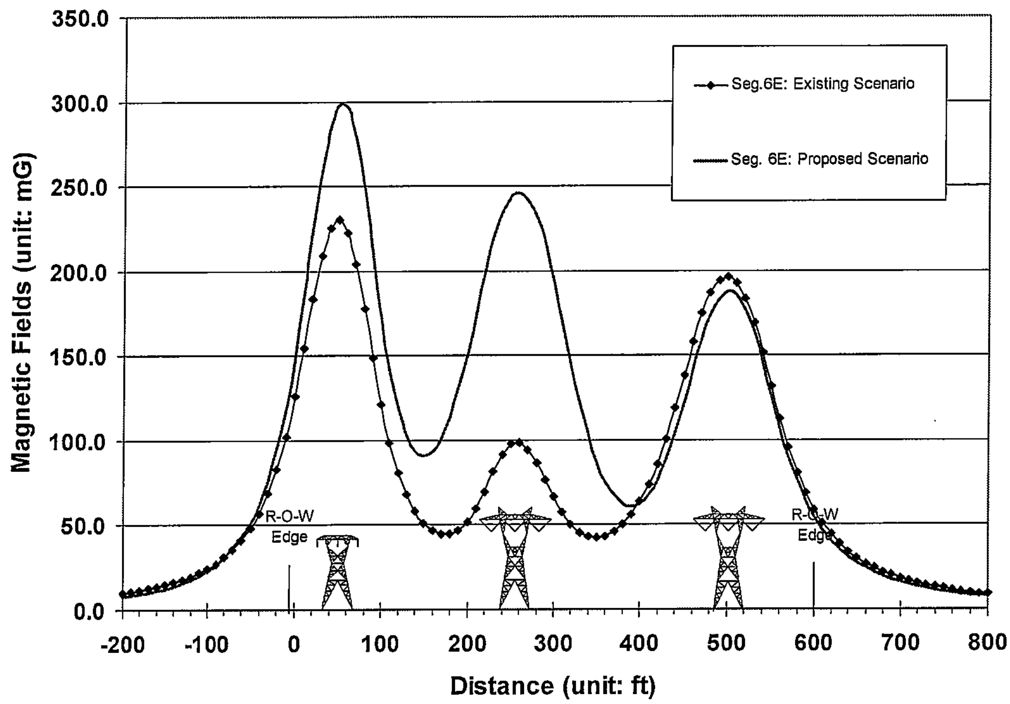
Low-Cost Field Reduction Options: No low-cost field reduction measures were investigated for Segment 6E because the surrounding land is undeveloped.

Magnetic Field Calculations: Table 18 and Figure 17 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV LST height in Section 6E of 116 feet.

Table 18
Calculated Magnetic Fields at R-O-W Edges: Segment 6 – Section E

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg.6E: Existing Scenario	126.0		59.0	
Seg. 6E: Proposed Scenario	149.3	Increase	54.4	7.8

Figure 17
Segment 6 - Section E: Calculated Magnetic Fields



D. Segment 7

1. Segment 7 A: MP 0 to MP 5 (Rio Hondo Substation)

No-Cost Field Reduction Measures: The proposed design for Segment 7A includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L and the relocated Rio Hondo-Vincent #2 220 kV for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. Use 186.5 to 198.5 foot tall LST structures between M 28-T3 and M 29-T2 of the proposed Mira Loma-Vincent 500 kV T/L through commercial/industrial areas.

4. For M 28-T1 and M 28-T2 of the proposed Mira Loma-Vincent 500 kV T/L in residential areas in the City of Duarte, use TSP construction that reduces conductor spacing as compared with LST construction
5. For M 28-T1 and M 28-T2 of the proposed Mira Loma-Vincent 500 kV T/L in residential areas in the City of Duarte, use structures that are 195-200 feet tall

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 7 A:

1. Field Reduction Option 1: Split-phase the existing Rio Hondo-Vincent #1 220 kV T/L from MP 0 to MP 5 (Rio Hondo Substation) for field reduction

Magnetic Field Calculations: Table 19 and Figure 18 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction options scenarios for the proposed 500 kV LST construction. Table 20 and Figure 19 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction options for the proposed 500 kV TSP construction used in residential areas. These calculations were made using the minimum 500 kV LST height in Section 7A of 180 feet and the minimum TSP height in Section 7A of 195 feet.

Table 19
Calculated Magnetic Fields at R-O-W Edges: Segment 7 – Section A (LST)

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 7A: Existing Scenario	42.8		47.9	
Seg. 7A: Proposed Scenario - LST	69.6	Increase	75.6	Increase
Seg. 7A: Proposed LST - Split Phase Exisitng 220 kV Circuit	18.2	73.9	72.7	3.8

Figure 18
Segment 7 - Section A: Calculated Magnetic Fields (LSTs)

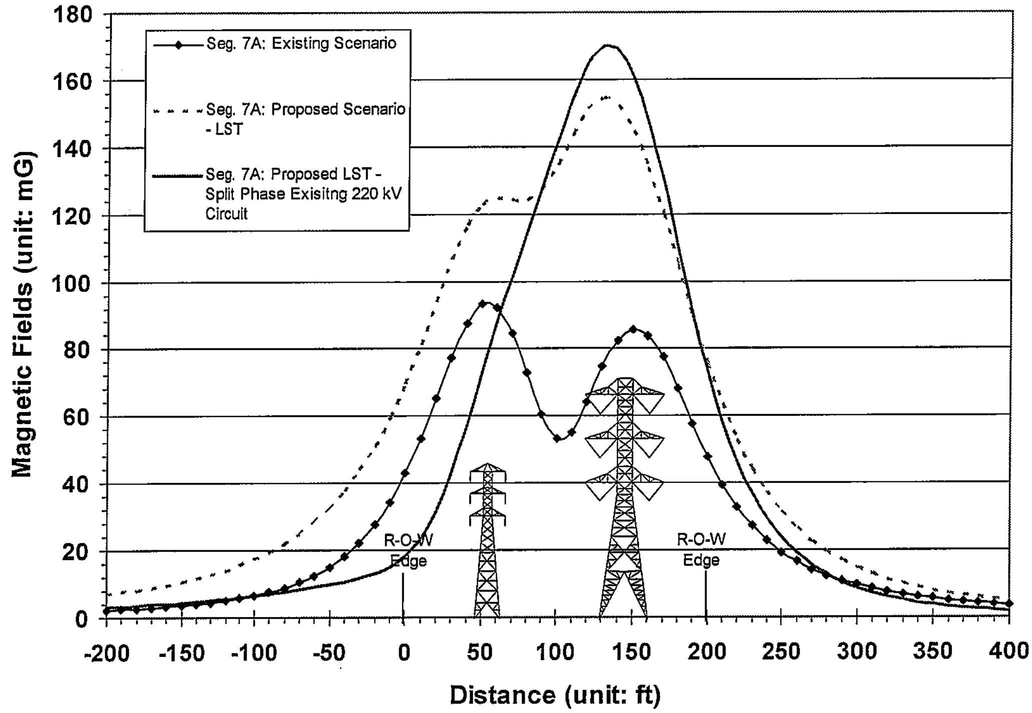
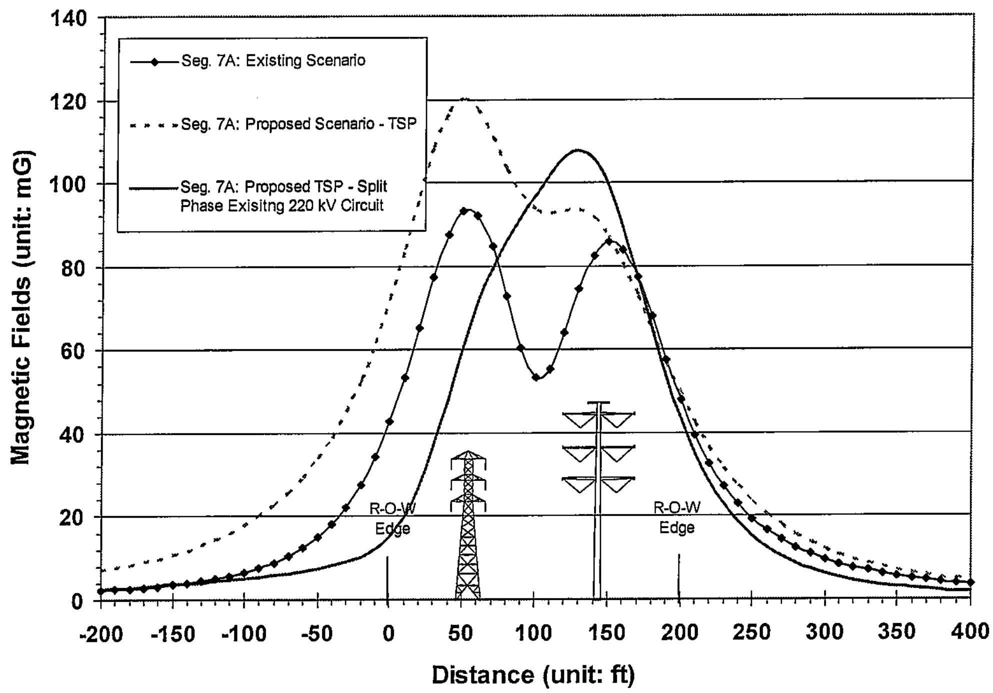


Table 20
Calculated Magnetic Fields at R-O-W Edges: Segment 7 – Section A (TSPs)

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 7A: Existing Scenario	42.8		47.9	
Seg. 7A: Proposed Scenario - TSP	72.2	Increase	49.3	Less than 15% Increase
Seg. 7A: Proposed TSP - Split Phase Exisitng 220 kV Circuit	15.1	79.1	43.5	11.8

Figure 19
Segment 7 - Section A: Calculated Magnetic Fields (TSPs)



Recommendations for Segment 7 A: Field Reduction Option 1 results in calculated field reductions greater than 15% at the both R-O-W edges. *It is recommended that Field Reduction Option 1 be included in the proposed project design.*

2. <u>Segment 7 B: MP 5 (Rio Hondo Substation) to MP 7.6</u>

No-Cost Field Reduction Measures: The proposed design for Segment 7 B includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. Use 500 kV LST of heights up to 261.5 feet for portions of this section of the line route.

4. Phase the relocated 66 kV subtransmission line for field reduction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 7 B:

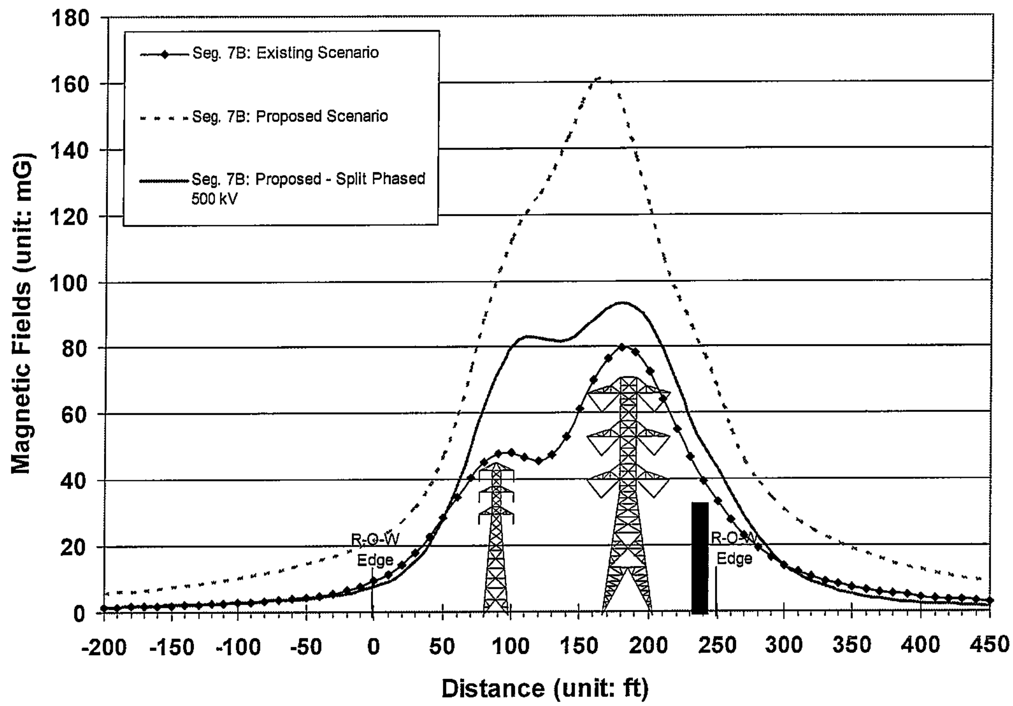
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation

Magnetic Field Calculations: Table 21 and Figure 20 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the minimum 500 kV tower height in Section 7B of 162 feet.

Table 21
Calculated Magnetic Fields at R-O-W Edges: Segment 7 – Section B

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 7B: Existing Scenario	9.4		33.1	
Seg. 7B: Proposed Scenario	21.7	Increase	66.4	Increase
Seg. 7B: Proposed - Split Phased 500 kV	7.5	65.4	43.1	35.1

Figure 20
Segment 7 - Section B: Calculated Magnetic Fields



Recommendations for Segment 7 B: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation.*

3. Segment 7 C: MP 7.6 to MP 11.6

No-Cost Field Reduction Measures: The proposed design for Segment 7 C includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design
3. Phase the relocated 66 kV subtransmission line for field reduction

4. Utilize pole heights for relocated 66 kV subtransmission lines that meet SCE's preferred design criteria
5. For M 37-T4 and M 38-T1 of the proposed Mira Loma-Vincent 500 kV T/L near residential areas in the City of El Monte, use 500 kV LST that are 198 to 198.5 feet tall
6. For M 35-T1 to M35-T3 and M 38-T2 to M38-T3 of the proposed Mira Loma-Vincent 500 kV T/L near commercial/industrial areas in the City of El Monte, use 500 kV LST that are 192 to 198.5 feet tall

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 7 C:

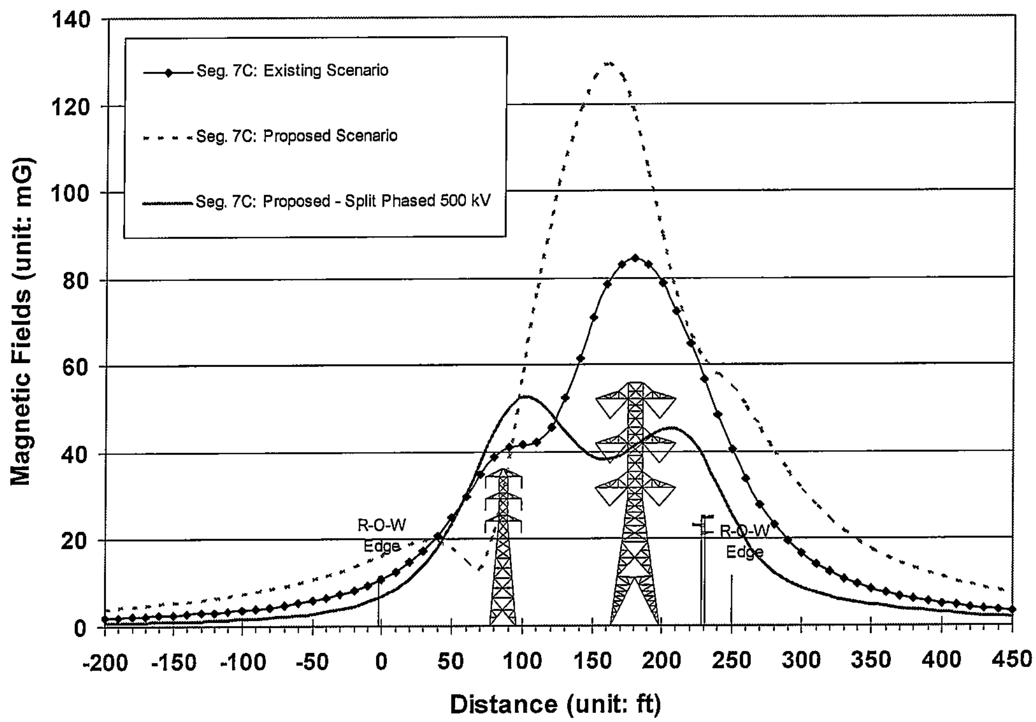
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation

Magnetic Field Calculations: Table 22 and Figure 21 show the calculated magnetic field levels for existing, proposed and proposed with a low-cost field reduction option scenarios. There are residential areas adjacent to the right (west) R-O-W edge for portions of this segment of the proposed T/L route. These calculations were made using the minimum 500 kV tower height in Section 7 C of 177.5 feet.

Table 22
Calculated Magnetic Fields at R-O-W Edges: Segment 7 – Section C

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 7C: Existing Scenario	10.7		40.5	
Seg. 7C: Proposed Scenario	16.2	Increase	54.7	Increase
Seg. 7C: Proposed - Split Phased 500 kV	6.8	58.0	25.6	53.2

Figure 21
Segment 7 - Section C: Calculated Magnetic Fields



Recommendations for Segment 7 C: Field Reduction Option 1 results in calculated field reductions greater than 15% at the both R-O-W edges. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation.*

4. Segment 7 D: MP 11.6 to MP 13

No-Cost Field Reduction Measures: The proposed design for Segment 7 D includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. Phase the relocated 66 kV subtransmission line for field reduction

4. Utilize pole heights for relocated 66 kV subtransmission lines that meet SCE's preferred design criteria
5. For M 39-T1 of the proposed Mira Loma-Vincent 500 kV T/L near the playground areas of South El Monte High School and residential areas in the City of El Monte, use a 500 kV LST that is 195.5 feet tall

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 7 D:

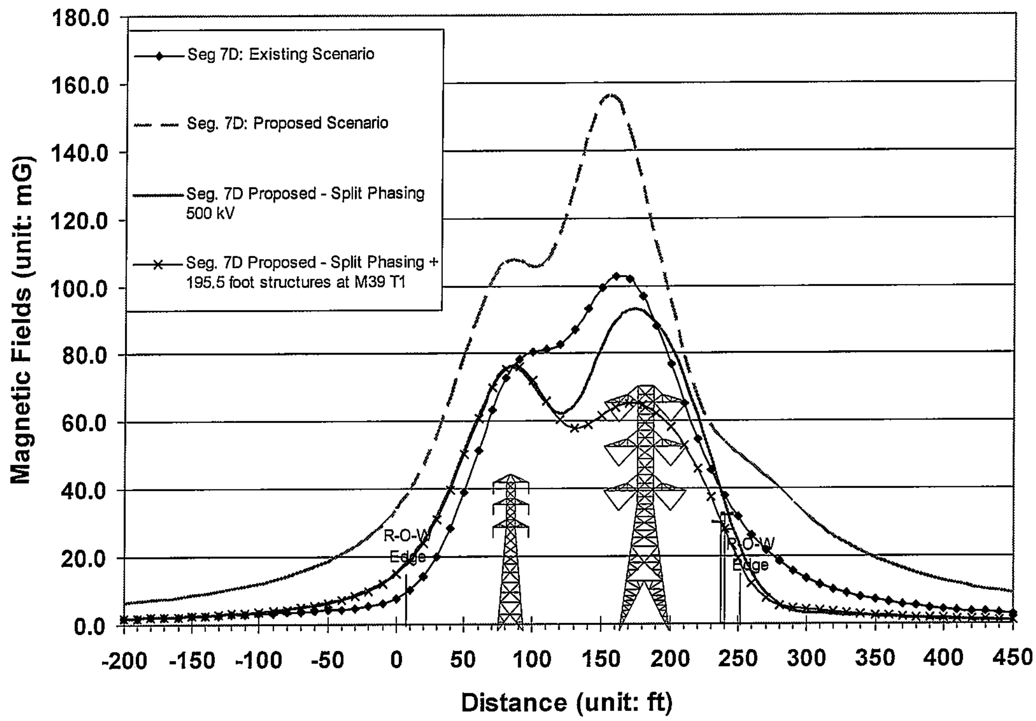
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation

Magnetic Field Calculations: Table 23 and Figure 22 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. Residential areas and South El Monte High School are located near the right (north) R-O-W edge for portions of this segment of the proposed T/L route. These calculations were made using the minimum 500 kV tower height in Section 7 C of 177.5 feet. The use of 195.5 foot tall structures at M39 T1 near residences and the playground of South El Monte High School is also modeled.

Table 23
Calculated Magnetic Fields at R-O-W Edges: Segment 7 – Section D

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 7D: Existing Scenario	7.7		31.5	
Seg. 7D: Proposed Scenario	34.1	Increase	50.2	Increase
Seg. 7D Proposed - Split Phasing 500 kV	15.5	54.5	24.5	51.2
Seg. 7D Proposed - Split Phasing + 195.5 foot structures at M39 T1	14.9	3.9	19.1	22.0

Figure 22
Segment 7 - Section D: Calculated Magnetic Fields



Recommendations for Segment 7 D: Field Reduction Option 1 results in calculated field reductions greater than 15% at the both R-O-W edges. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation.*

5. Segment 7E: Mile 13 to MP 15.8 (Mesa Substation)

No-Cost Field Reduction Measures: The proposed design for Segment 7E includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design

3. For M 41-T5 and M42-T1 of the proposed Mira Loma-Vincent 500 kV T/L near the residential areas close to Paramount Boulevard in the City of Montebello, use 500 kV LSTs that are 198.5 feet tall

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 7E:

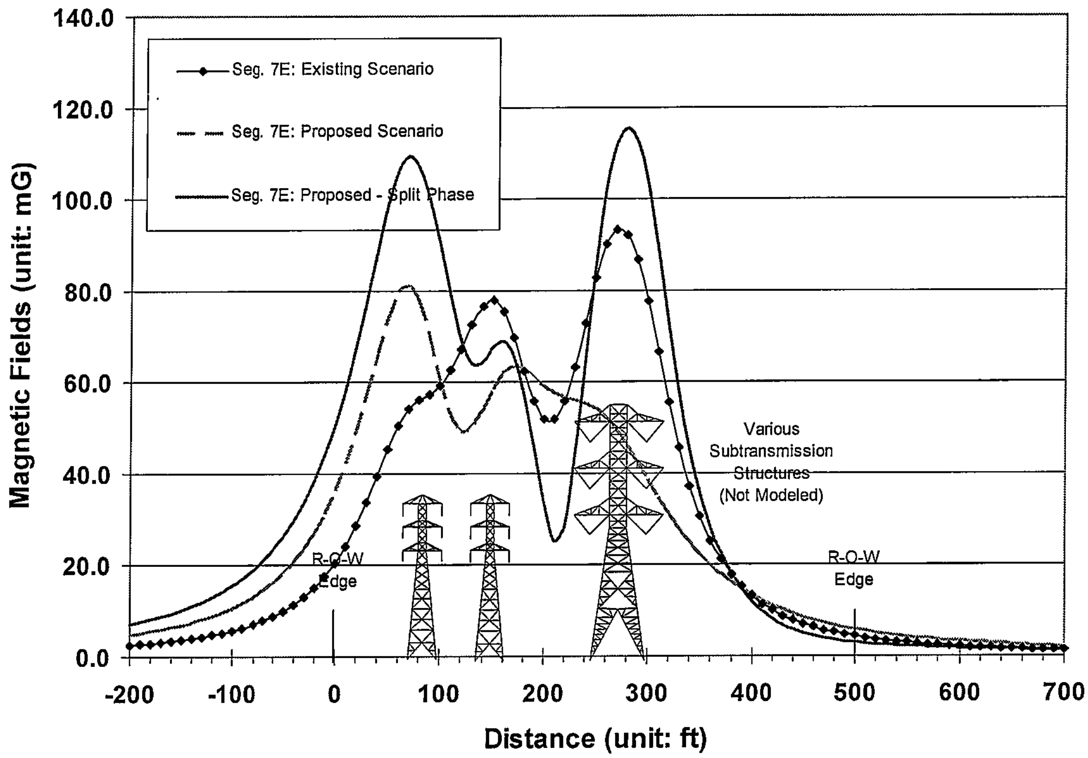
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation

Magnetic Field Calculations: Table 24 and Figure 23 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. There is a residential complex near the right (north) R-O-W edge for portions of this segment of the proposed T/L route near Paramount Boulevard. These calculations were made using the minimum 500 kV tower height in Section 7 C of 147 feet.

Table 24
Calculated Magnetic Fields at R-O-W Edges: Segment 7 – Section E

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 7E: Existing Scenario	20.5		4.4	
Seg. 7E: Proposed Scenario	36.2	Increase	5.9	Increase
Seg. 7E: Proposed - Split Phase	50.9	Increase	3.0	49.2

Figure 23
Segment 7 - Section E: Calculated Magnetic Fields



Recommendations for Segment 7 E: Field Reduction Option 1 results in calculated field reductions greater than 15% at the right edge of R-O-W and calculated field increases at the left edge of R-O-W. *Since Field Reduction Option 1 generally results in calculated field reductions between Rio Hondo Substation and Chino Substation, it is recommended that Field Reduction Option 1 be included in the proposed project design.*

E. Segment 8

1. Segment 8A: MP 2.3 (the "San Gabriel Junction") to MP 4.4

No-Cost Field Reduction Measures: The proposed design for Segment 8 A includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. Phase the relocated 66 kV subtransmission lines for field reduction

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8A:

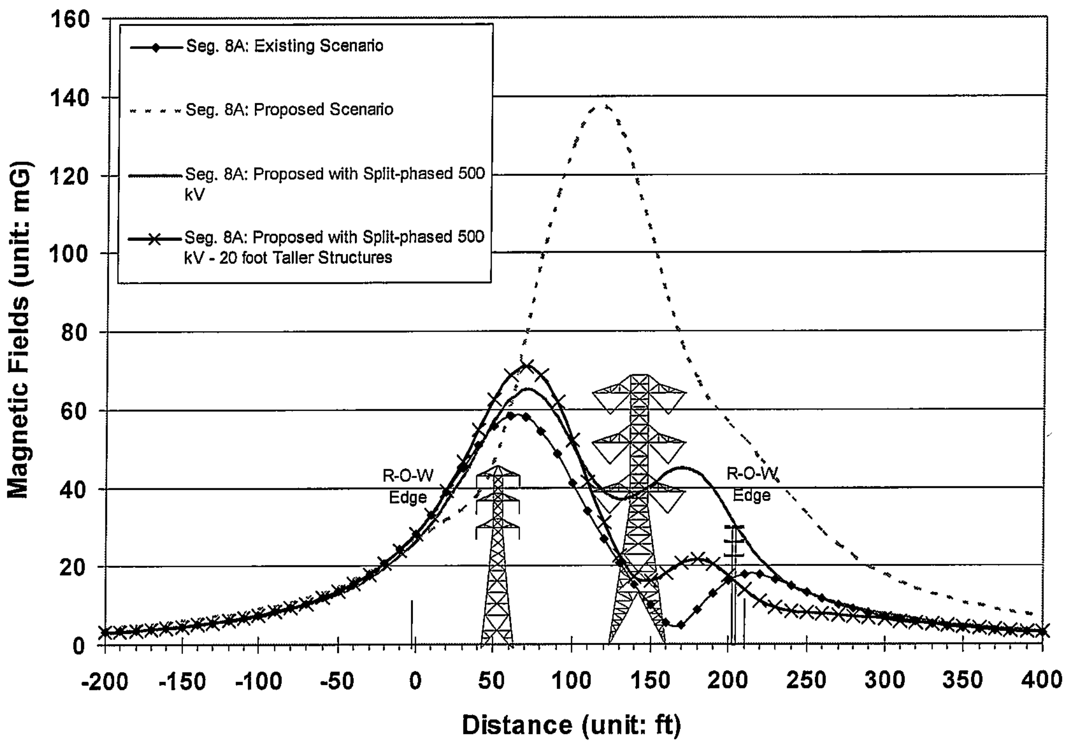
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Utilize 20 foot taller structures than included in the initial project design near residences

Magnetic Field Calculations: Table 25 and Figure 24 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction options scenarios. These calculations were made using the minimum 500 kV tower height in Section 8A of 168 feet.

Table 25
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section A

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8A: Existing Scenario	28.3		17.7	
Seg. 8A: Proposed Scenario	26.5	6.4	51.7	Increase
Seg. 8A: Proposed with Split-phased 500 kV	26.3	0.8	26.9	48.0
Seg. 8A: Proposed with Split-phased 500 kV - 20 foot Taller Structures	28.1	Less than 15% Increase	14.0	48.0

Figure 24
Segment 8 - Section A: Calculated Magnetic Fields



Recommendations for Segment 8 A: Field Reduction Option 1 results in calculated field decreases greater than 15% for Segment 8 A at the right R-O-W edge where there are no residences nearby and field decreases less than 15% at the left R-O-W edge where there are residences nearby. However, for the majority of the Segment 8, split-phasing reduces calculated field levels by greater than 15%. *Therefore, Field Reduction Option 1 is recommended between Rio Hondo Substation and Chino Substation.* Field Reduction Option 2 results in a calculated field reduction greater than 15% at the right edge of R-O-W and a calculated field increase at the left side of R-O-W. *Because there are no residential or commercial areas adjacent to the right side of R-O-W, it is not recommended that Field Reduction Option 2 be included in the proposed project design.*

2. <u>Segment 8B: MP 4.4 to MP 9.0</u>

No-Cost Field Reduction Measures: The proposed design for Segment 8B includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. For M 42-T7 and M43-T7 of the proposed Mira Loma-Vincent 500 kV T/L near the commercial/industrial areas close to the 605 Freeway, use 500 kV LSTs that are 249.5 and 198 feet tall

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8B:

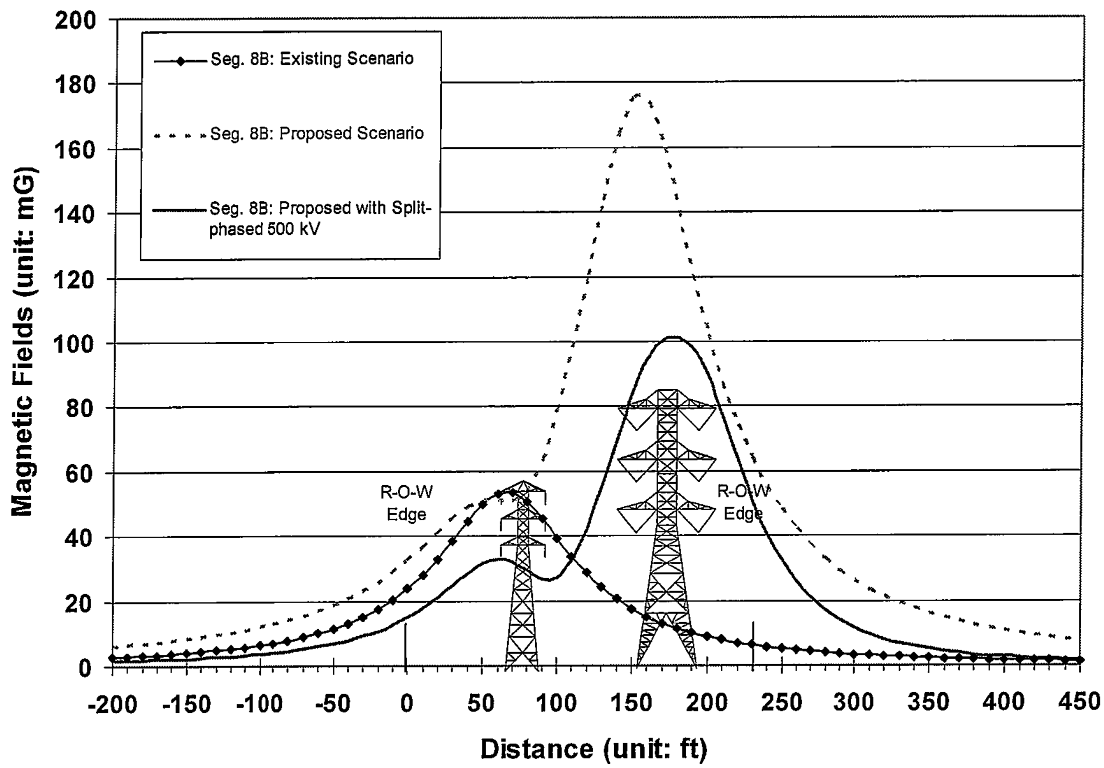
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation

Magnetic Field Calculations: Table 26 and Figure 25 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. Residential areas near MP 9.0 are located within 300 feet of the left (north) R-O-W edge. These calculations were made using the minimum 500 kV tower height in Section 8B of 147 feet.

Table 26
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section B

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8B: Existing Scenario	23.8		5.2	
Seg. 8B: Proposed Scenario	32.4	Increase	48.1	Increase
Seg. 8B: Proposed with Split-phased 500 kV	14.9	54.0	32.2	33.1

Figure 25
Segment 8 - Section B: Calculated Magnetic Fields



Recommendations for Segment 8 B: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field*

Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation.

3. Segment 8C: MP 9.0 to MP 9.7

No-Cost Field Reduction Measures: The proposed design for Segment 8C includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. Utilize TSP construction that reduces conductor spacing as compared with LST construction
4. Use 190 foot TSPs for this section of the proposed line route

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8C

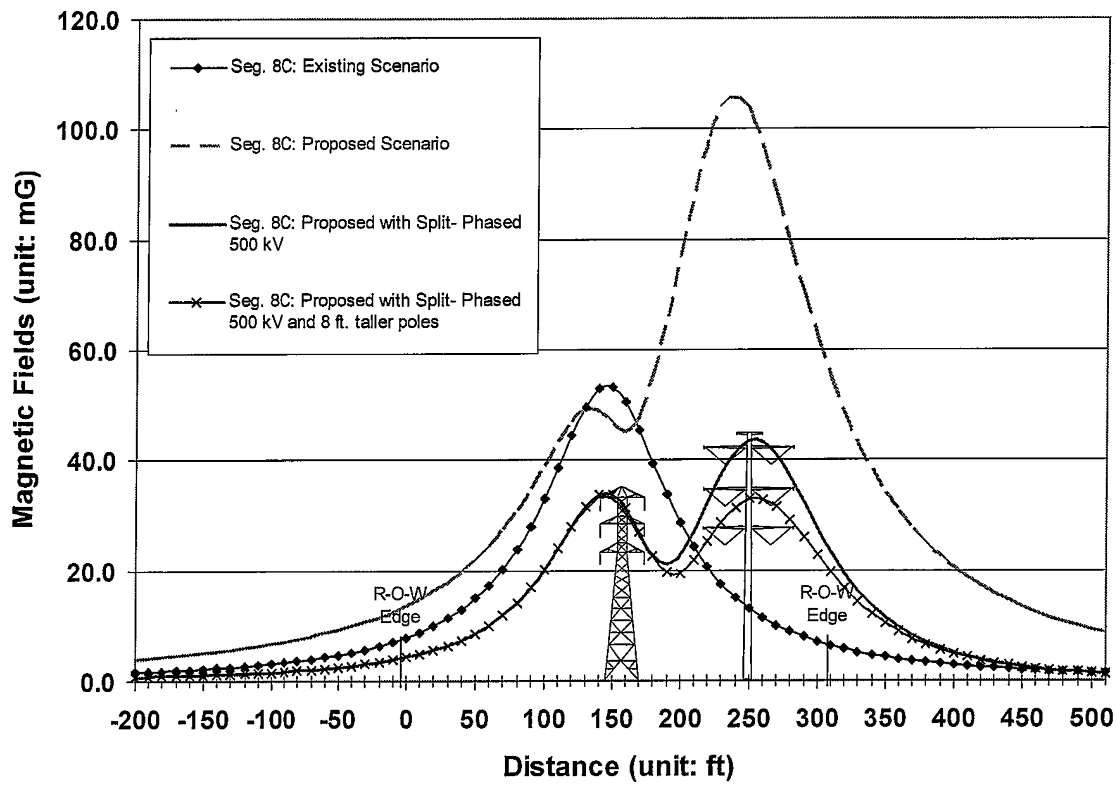
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Utilize 198 foot tall TSPs

Magnetic Field Calculations: Table 27 and Figure 26 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction options scenarios. These calculations were made using the proposed 500 kV tower heights in Section 8C of 190 feet.

Table 27
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section C

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8C: Existing Scenario	7.8		6.3	
Seg. 8C: Proposed Scenario	13.6	Increase	54.5	Increase
Seg. 8C: Proposed with Split- Phased 500 kV	4.3	68.4	23.2	57.4
Seg. 8C: Proposed with Split- Phased 500 kV and 8 ft. taller poles	4.3	0	19.7	15.1

Figure 26
Segment 8 - Section C: Calculated Magnetic Fields



Recommendations for Segment 8 C: Field Reduction Option 1 and 2 result in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo*

Substation and Chino Substation. For engineering reasons, it is not recommended that Field Reduction Option 2 be included in the proposed project design for Segment 8C.

4. Segment 8D: MP 9.7 to MP 11.2

No-Cost Field Reduction Measures: The proposed design for Segment 8 D includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. For M 49-T3 and M 49-T2 of the proposed Mira Loma-Vincent 500 kV T/L near the residential areas, use 500 kV LSTs that are 198 feet tall

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8D:

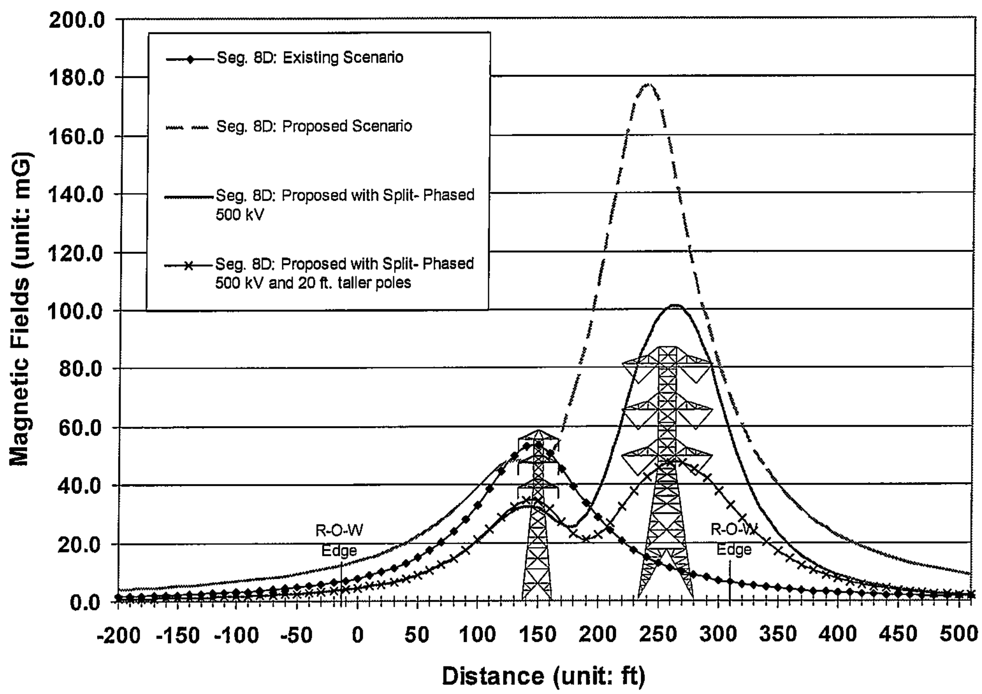
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Utilize 15-20 foot taller structures than were originally planned for M48 T4 and for M49 T1.

Magnetic Field Calculations: Table 28 and Figure 27 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the minimum 500 kV tower height in Section 8D of 147 feet.

Table 28
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section D

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8D: Existing Scenario	7.8		6.3	
Seg. 8D: Proposed Scenario	13.7	Increase	68.8	Increase
Seg. 8D: Proposed with Split- Phased 500 kV	4.5	67.2	56.6	17.7
Seg. 8D: Proposed with Split- Phased 500 kV and 20 ft. taller poles	4.5	0	32.8	42.0

Figure 27
Segment 8 - Section D: Calculated Magnetic Fields



Recommendations for Segment 8D: Field Reduction Option 1 and 2 result in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo*

Substation and Chino Substation. For engineering reasons, it is not recommended that Field Reduction Option 2 be included in the proposed project design for Segment 8D.

5. **Segment 8E: MP 11.2 to MP 13.3**

No-Cost Field Reduction Measures: The proposed design for Segment 8E includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. Utilize LSTs with heights between 190 feet and 213 feet for a majority of the structures in this segment

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8 E:

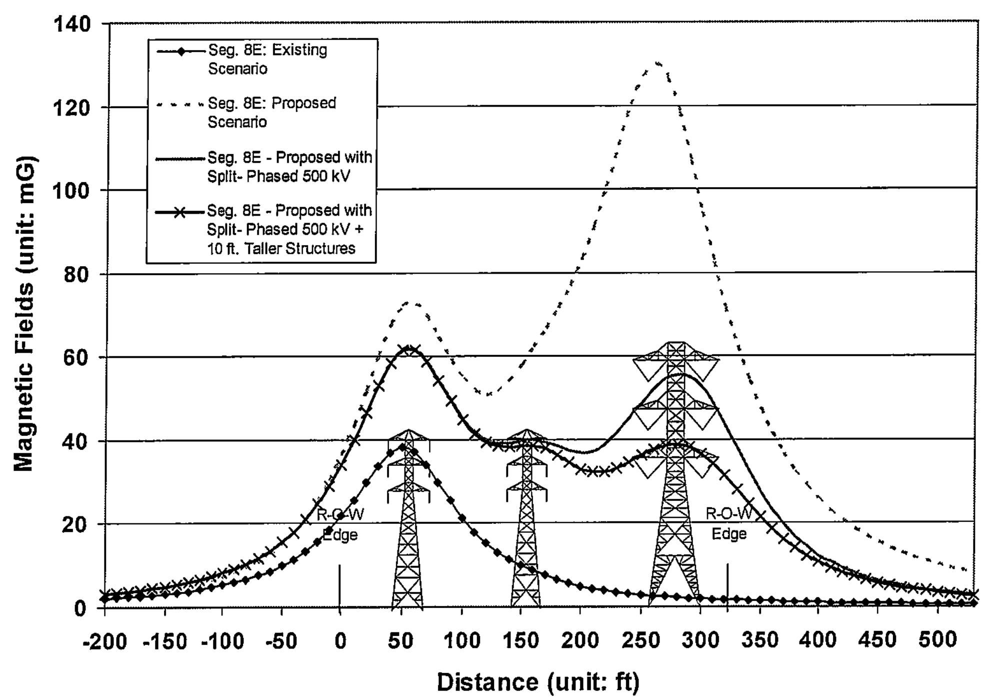
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Use a 10 foot taller LST at M50 T2 (190 feet) where the line route is within approximately 200 feet of a residence

Magnetic Field Calculations: Table 29 and Figure 28 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the minimum 500 kV tower height in Section 8E of 180.5 feet.

Table 29
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section E

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8E: Existing Scenario	21.7		1.6	
Seg. 8E: Proposed Scenario	36.3	Increase	62.3	Increase
Seg. 8E - Proposed with Split- Phased 500 kV	34.0	6.3	38.1	38.8
Seg. 8E - Proposed with Split- Phased 500 kV + 10 ft. Taller Structures	34.1	Less than 15% Increase	28.1	26.2

Figure 28
Segment 8 - Section E: Calculated Magnetic Fields



Recommendations for Segment 8 E: *Both Field Reduction Options 1 and 2 result in calculated field reductions greater than 15% at the closest edge of R-O-W. It is recommended that Field Reduction Option 1 be included in the project design between*

Rio Hondo Substation and Chino Substation. For engineering reasons, it is not recommended that Field Reduction Option 2 be included in the proposed project design for Segment 8E.

6. Segment 8F: MP 13.3 to MP 13.5

No-Cost Field Reduction Measures: The proposed design for Segment 8F includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
3. Utilize LST with a height of 198 for structure M51 T5

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8F:

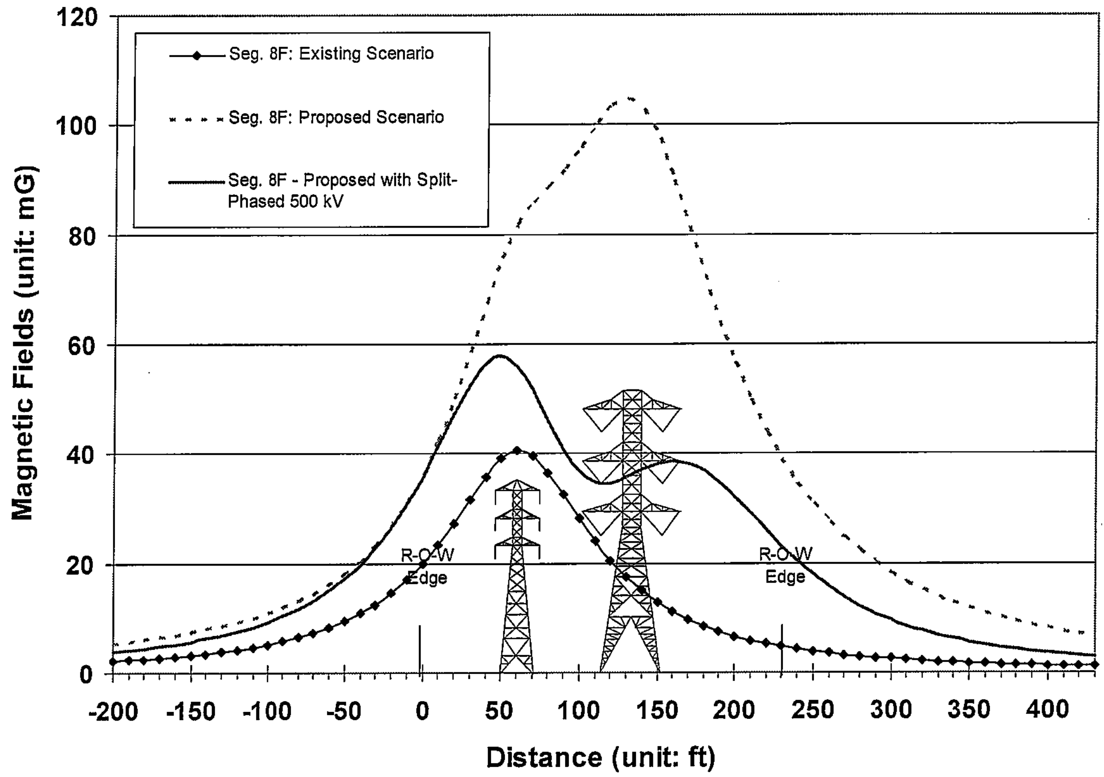
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation

Magnetic Field Calculations: Table 30 and Figure 29 show the calculated magnetic field levels for existing, proposed and proposed with low-cost Field Reduction Option 1 included scenarios. Theses calculations for this section were made using a 500 kV LST tower height of 198 feet.

Table 30
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section F

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8F: Existing Scenario	19.9		4.8	
Seg. 8F: Proposed Scenario	36.0	Increase	38.9	Increase
Seg. 8F - Proposed with Split-Phased 500 kV	35.8	0.6	23.1	40.6

Figure 29
Segment 8 - Section F: Calculated Magnetic Fields



Recommendations for Segment 8F: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation.*

7. <u>Segment 8G: MP 13.5 to MP 19.3</u>

No-Cost Field Reduction Measures: The proposed design for Segment 8G includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design

3. For the LST structure at M52-T1 for the proposed Mira Loma-Vincent 500 kV T/L near a preschool at the intersection of Fullerton Road and Pathfinder Road, use a tower height of 213 feet.

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8G:

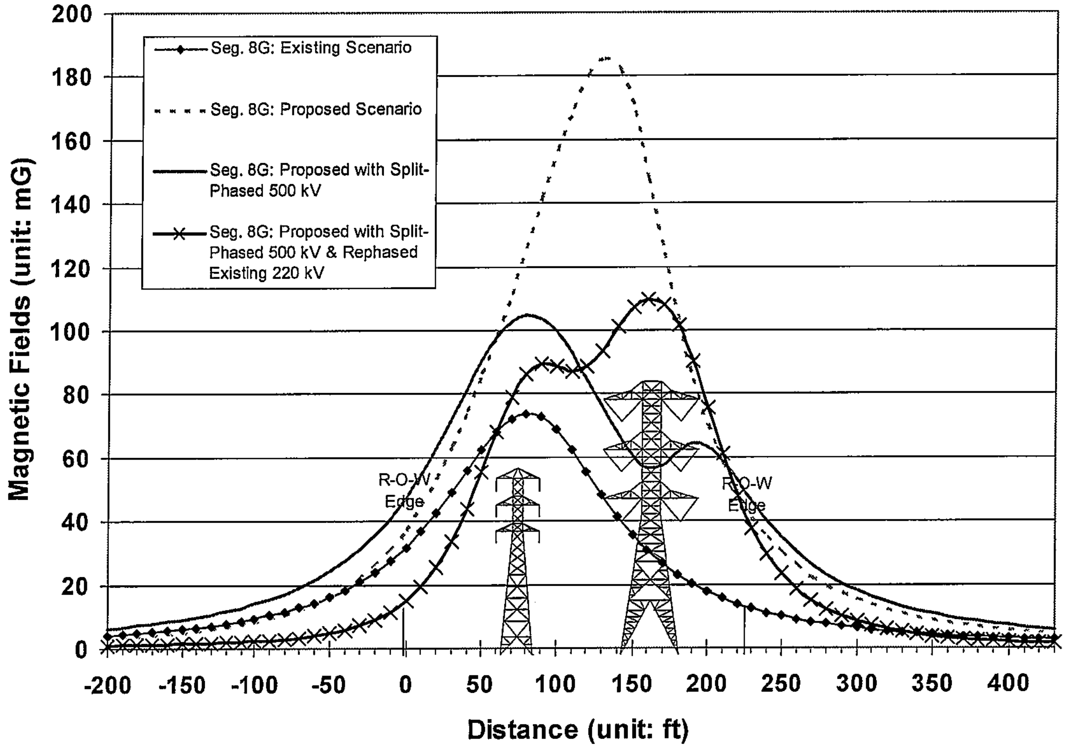
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Re-phase the existing Mira Loma-Olinda 220 kV T/L for field reduction

Magnetic Field Calculations: Table 31 and Figure 30 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction options included scenarios. A preschool at the intersection of Fullerton Road and Pathfinder Road is located near the left (north) R-O-W edge of this segment of the proposed T/L route. The calculations used the minimum 500 kV tower height in Section 8G of 150 feet.

Table 31
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section G

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8G: Existing Scenario	31.7		12.4	
Seg. 8G: Proposed Scenario	37.0	Less than 15% Increase	41.0	Increase
Seg. 8G: Proposed with Split-Phased 500 kV	47.4	Increase	46.0	Less than 15% Increase
Seg. 8G: Proposed with Split-Phased 500 kV & Rephased Existing 220 kV	14.8	68.8	37.5	18.5

Figure 30
Segment 8 - Section G: Calculated Magnetic Fields



Recommendations for Segment 8G: Field Reduction Option 1 and 2 combined together result in calculated field reductions greater than 15% at the left R-O-W edge. *It is recommended that Field Reduction Option 1 and Field Reduction Option 2 be included in the final project design.*

8. Segment 8H: MP 19.3 to MP 22.7

No-Cost Field Reduction Measures: The proposed design for Segment 8H includes the following no-cost field reduction measures:

1. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single circuit design
2. Use of LSTs with heights up to 198.5 feet for portions of the T/L route

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8H:

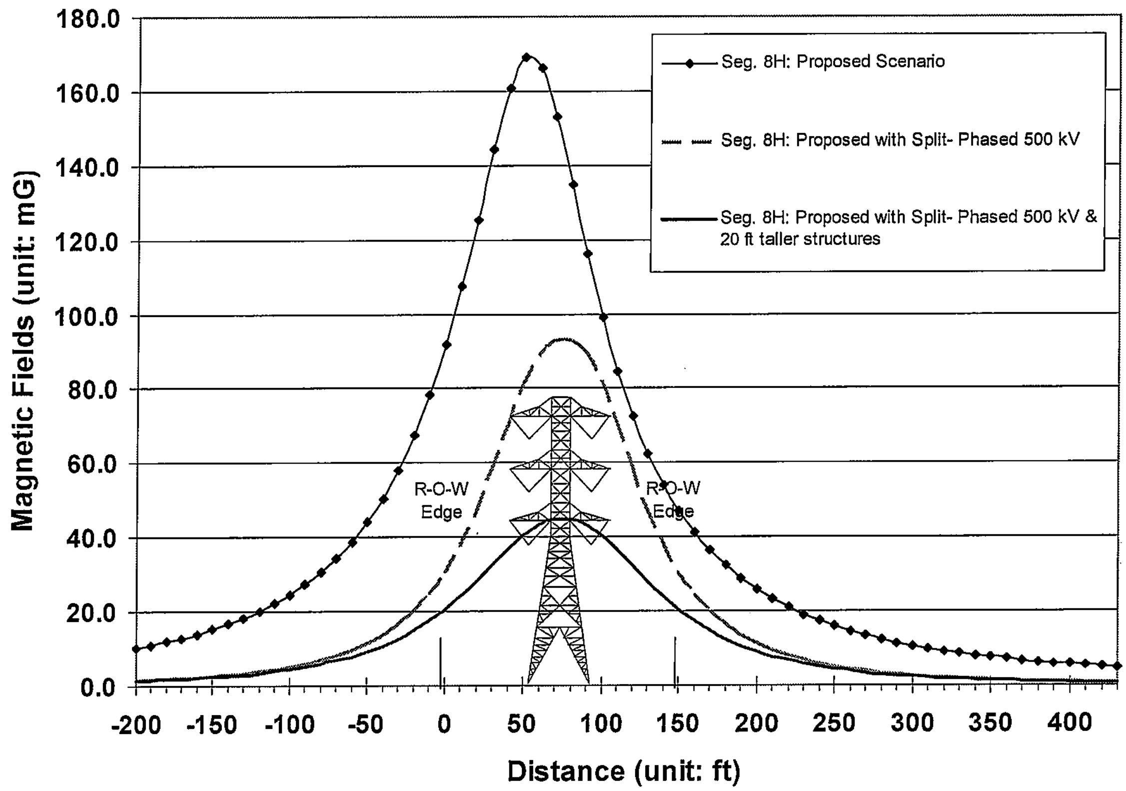
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Utilize 20 foot taller structures than those which were included in the initial project design near residences for MP59-T2 of the proposed Mira Loma-Vincent 500 kV T/L.

Magnetic Field Calculations: Table 32 and Figure 31 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations used the minimum 500 kV tower height in Section 8H of 153.5 feet.

Table 32
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section H

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8H: Proposed Scenario	91.7		19.1	
Seg. 8H: Proposed with Split- Phased 500 kV	30.4	66.8	6.8	64.4
Seg. 8H: Proposed with Split- Phased 500 kV & 20 ft taller structures	20.6	32.2	5.8	14.7

Figure 31
Segment 8 - Section H: Calculated Magnetic Fields



Recommendations for Segment 8H: Field Reduction Option 1 and 2 result in calculated field reductions near or greater than 15% at the edges of R-O-W. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation. For engineering reasons, it is not recommended that Field Reduction Option 2 be included in the proposed project design for Segment 8H.*

9. <u>Segment 8I: MP 22.7 to MP 26.9</u>

No-Cost Field Reduction Measures: The proposed design for Segment 8I includes the following no-cost field reduction measures:

1. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design

2. Utilize TSP construction that reduces conductor spacing as compared with LST construction
3. For a majority of TSPs in this Segment 8I, use pole heights between 190 to 195 feet

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8I:

1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Utilize taller structures than originally planned for TSPs near residences not having pole heights between 190-195 feet at M61-T4, M62-T1, and M62-T2 of the proposed Mira Loma-Vincent 500 kV T/L

Magnetic Field Calculations: Table 33 and Figure 32 show the calculated magnetic field levels for the proposed scenario and the proposed scenario with low-cost field reduction options included. These calculations used the minimum 500 kV TSP height in Section 8I of 150 feet. The existing Chino-Mesa 220 kV T/L has been de-energized for approximately 25 years, so this T/L currently does not create magnetic fields. Therefore, no existing scenario model was created for this section of the line route. However, prior to approximately 25 years ago, the T/L was energized. When energized, it is likely that this T/L behaved like a typical 220 kV T/L creating fields in the range of 20 mG at the edge of R-O-W.

As stated earlier in Section III of this FMP, split-phasing a circuit can impact line impedance and can result in higher current flows on the circuit than if the line was not split-phased. In the case of the proposed Mira Loma-Vincent 500 kV T/L, the peak load forecasted for this line increased from 1810 Amps to 2270 Amps with split-phasing. A model was run to investigate the impact of this load increase on the field reduction effect of split-phasing for Segment 8 I. The results of this model are shown in Table 34 and Figure 33.

Table 33
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section I

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8I: Proposed Scenario	80.2		51.7	
Seg. 8I: Proposed with Split- Phased 500 kV	21.5	73.2	21.5	58.4
Seg. 8I: Proposed with Split Phased & 20 ft. Taller Structures	14.8	31.2	14.8	31.2

Figure 32
Segment 8 - Section I: Calculated Magnetic Fields

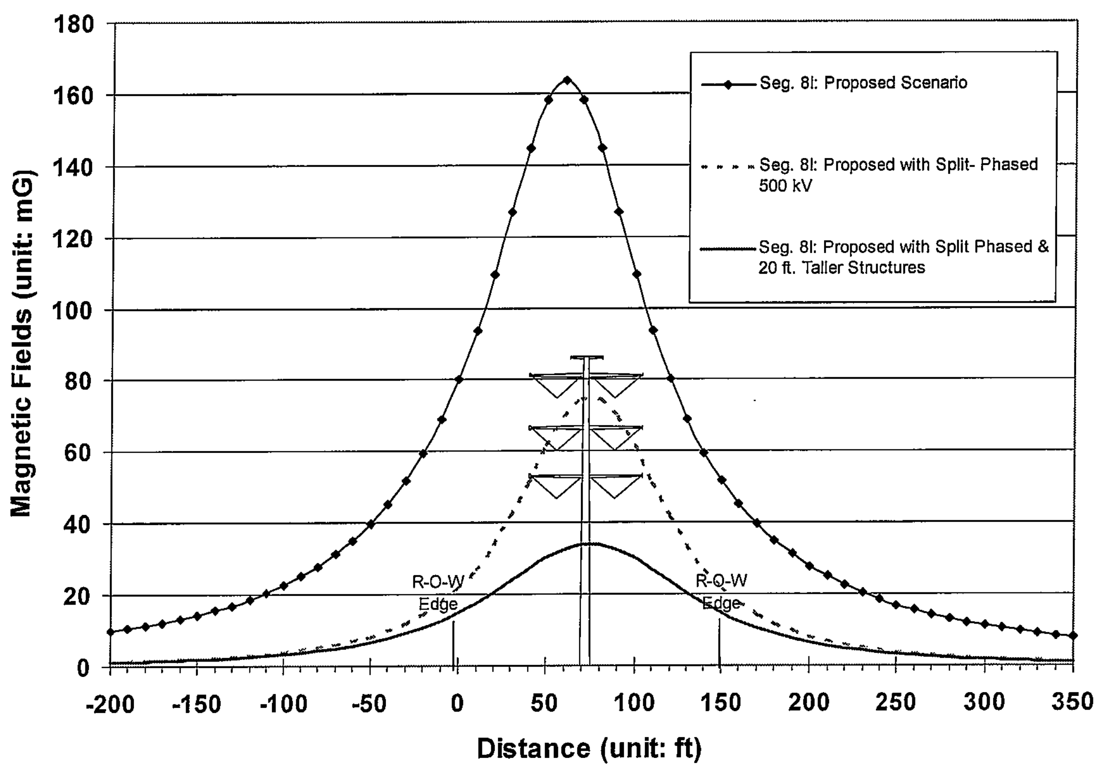
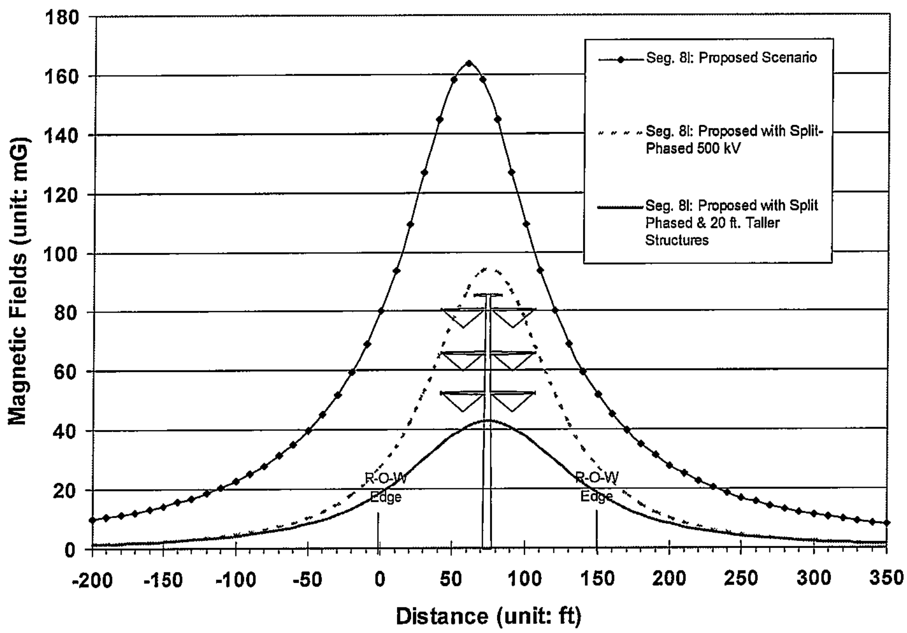


Table 34
Calculated Magnetic Fields at R-O-W Edges Using Increased Load due to Split-Phasing: Segment 8 – Section I

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8I: Proposed Scenario	80.2		51.7	
Seg. 8I: Proposed with Split- Phased 500 kV	27.0	66.3	27.0	47.8
Seg. 8I: Proposed with Split Phased & 20 ft. Taller Structures	18.5	31.5	18.5	31.5

Figure 33
Segment 8 - Section I: Calculated Magnetic Fields Using Increased Load due to Split-Phasing



Recommendations for Segment 8 I: With and without load increases due to split-phasing, Field Reduction Option 1 and 2 result in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation.*

For engineering reasons, it is not recommended that Field Reduction Option 2 be included in the proposed project design for Segment 8I.

10. Segment 8J: MP 26.9 to MP 27.6

No-Cost Field Reduction Measures: The proposed design for Segment 8J includes the following no-cost field reduction measures:

1. Phase the proposed 500 kV T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design
3. Utilize TSP construction that reduces conductor spacing as compared with LST construction
4. Use a TSP with a height of 195 feet at M65 T4 for the proposed Mira Loma-Vincent 500 kV T/L

Low-Cost Field Reduction Options: The following low-cost field reduction options were investigated for Segment 8J:

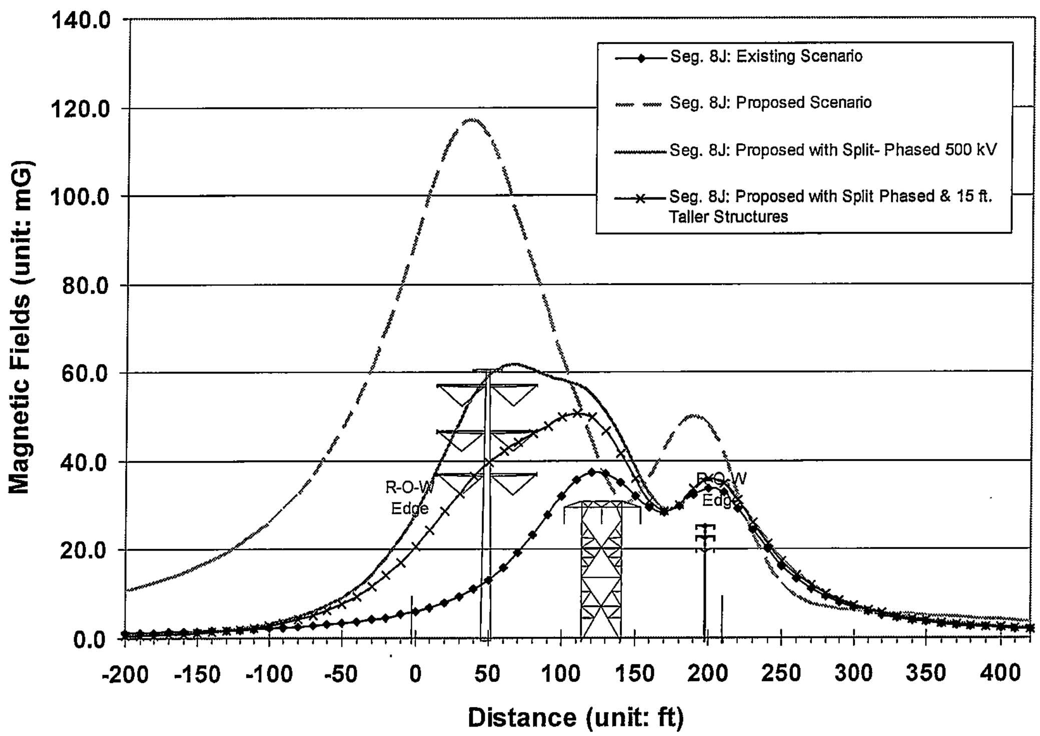
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation
2. Field Reduction Option 2: Utilize 15 foot taller structures (195 feet) than structures originally planned at M65-T5 of the proposed Mira Loma-Vincent 500 kV T/L

Magnetic Field Calculations: Table 35 and Figure 34 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction options scenarios. These calculations used the minimum 500 kV TSP height in Section 8J of 180 feet.

Table 35
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section J

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8J: Existing Scenario	6.0		26.9	
Seg. 8J: Proposed Scenario	91.0	Increase	27.7	Less than 15% Increase
Seg. 8J: Proposed with Split- Phased 500 kV	28.2	69.0	29.0	Less than 15% Increase
Seg. 8J: Proposed with Split Phased & 15 ft. Taller Structures	20.6	27.0	28.6	1.4

Figure 34
Segment 8 - Section J: Calculated Magnetic Fields



Recommendations for Segment 8J: Field Reduction Option 1 and 2 result in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the project design between Rio Hondo*

Substation and Chino Substation and that Field Reduction Option 2 be included in the proposed project design where the proposed line route runs adjacent to commercial areas at M65-T5 of the proposed Mira Loma-Vincent 500 kV T/L.

11. <u>Segment 8K: MP 27.6 to MP 28.1</u>

No-Cost Field Reduction Measures: The proposed design for Segment 8K includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design
3. Utilize TSP construction that reduces conductor spacing as compared with LST construction
4. Utilize 190 to 195 foot tall structures for the proposed 500 kV T/L
5. Underground existing 66 kV subtransmission lines
6. Phase the undergrounded 66 kV subtransmission lines for field reduction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8K:

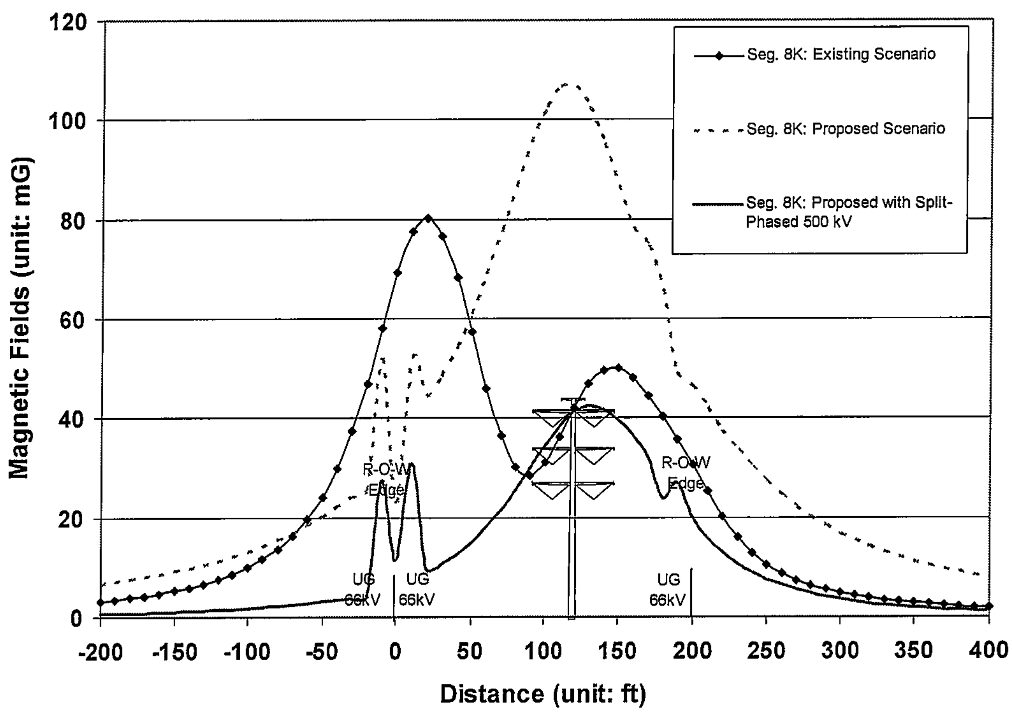
1. Field Reduction Option 1: Split-Phase the proposed Mira Loma-Vincent 500 kV T/L for field reduction from Rio Hondo Substation to Chino Substation

Magnetic Field Calculations: Table 36 and Figure 35 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations used the minimum 500 kV TSP height in Section 8 K of 190 feet.

Table 36
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section K

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8K: Existing Scenario	69.2		30.6	
Seg. 8K: Proposed Scenario	22.8	67.1	46.5	Increase
Seg. 8K: Proposed with Split- Phased 500 kV	11.5	49.6	20.0	57.0

Figure 35
Segment 8 - Section K: Calculated Magnetic Fields



Recommendations for Segment 8K: Field Reduction Option 1 result in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field*

Reduction Option 1 be included in the project design between Rio Hondo Substation and Chino Substation.

12. Segment 8L: 8A MP 28.4 to 8A MP 28.7 (8B MP 0 to 8B MP 0.3)

No-Cost Field Reduction Measures: The proposed design for Segment 8L includes the following no-cost field reduction measures:

1. Phase the proposed T/Ls for field reduction
2. Place the proposed 500 kV T/L on the inside position of the R-O-W
3. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design
4. Utilize TSP construction that reduces conductor spacing as compared with LST construction
5. Utilize 190 foot tall structures for the proposed 500 kV T/L

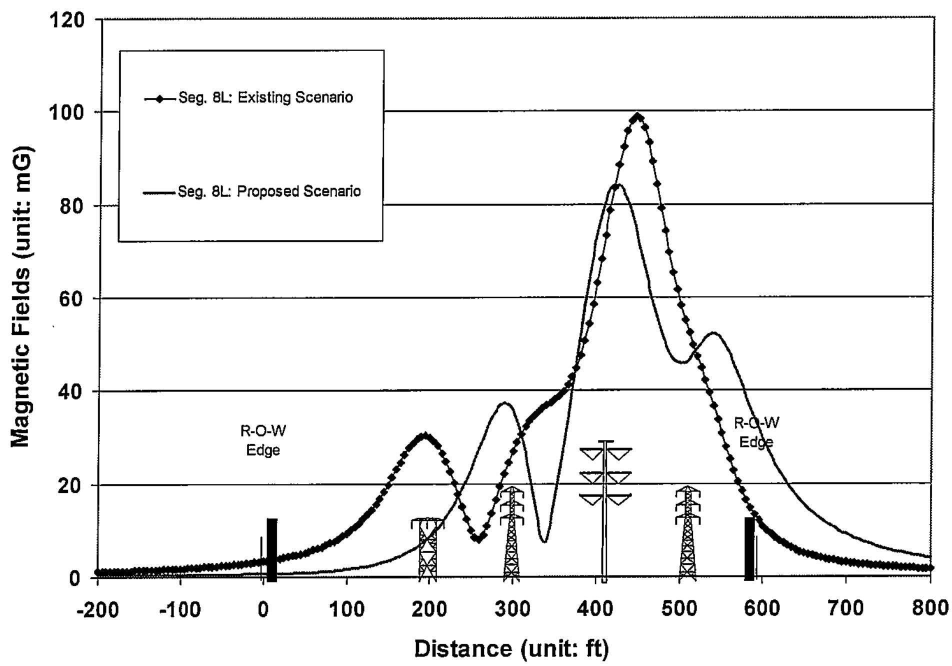
Low-Cost Field Reduction Options: No further field reduction measures were investigated for Segment 8L.

Magnetic Field Calculations: Table 37 and Figure 36 show the calculated magnetic field levels for existing and proposed scenarios. Commercial areas are located near the left (north) R-O-W edge of this segment. These calculations were made using a 500 kV TSP height of 190 feet.

Table 37
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section L

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8L: Existing Scenario	3.3		11.0	
Seg. 8L: Proposed Scenario	0.7	78.8	29.5	Increase

Figure 36
Segment 8-Section L: Calculated Magnetic Fields



13. Segment 8 M: 8A MP 28.7 to 8A MP 29.4 (8B MP 0.3 to 8B MP 0.7)

No-Cost Field Reduction Measures: The proposed design for Segment 8M includes the following no-cost field reduction measures:

1. Phase the proposed T/Ls for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design
3. Utilize TSP construction that reduces conductor spacing as compared with LST construction
4. Utilize 190 foot tall structures for the proposed 500 kV T/L

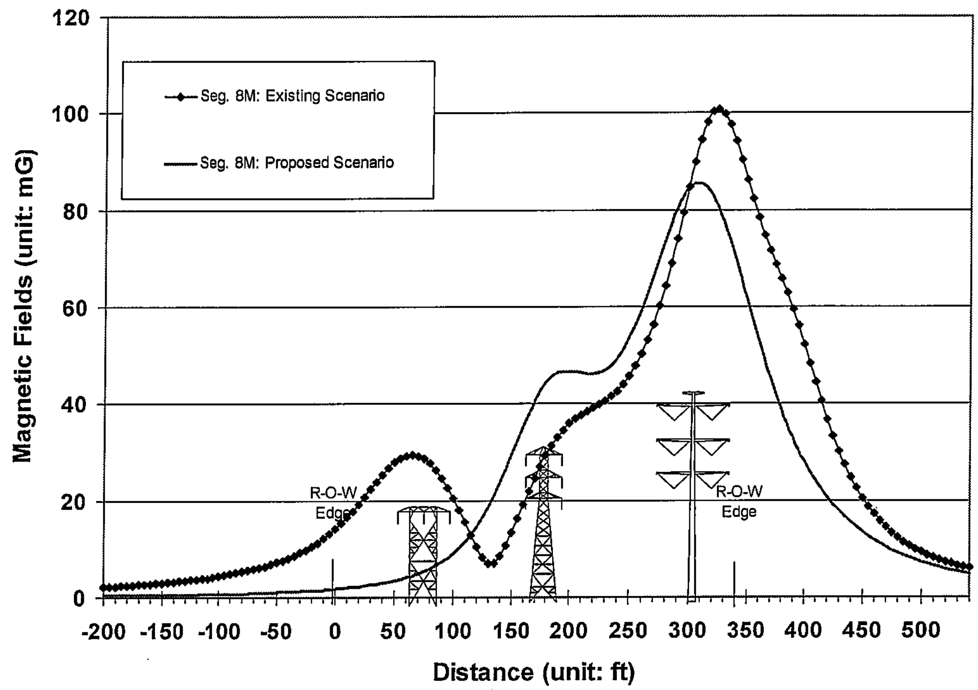
Low-Cost Field Reduction Options: No low-cost field reduction measures were investigated for Segment 8 M.

Magnetic Field Calculations: Table 38 and Figure 37 show the calculated magnetic field levels for existing and proposed scenarios. Residential and commercial areas are located near the left (north) R-O-W edge of this segment. These calculations were made using a 500 kV TSP height of 190 feet.

Table 38
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section M

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8M: Existing Scenario	14.1		94.4	
Seg. 8M: Proposed Scenario	1.8	87.2	69.9	26.0

Figure 37
Segment 8 - Section M: Calculated Magnetic Fields



14. Segment 8 N: 8A MP 29.4 to MP 34

No-Cost Field Reduction Measures: The proposed design for Segment 8N includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Utilize double-circuit 500 kV construction which results in raised conductor height compared with single-circuit design
3. Utilize TSP construction that reduces conductor spacing as compared with LST construction for portions of Segment 8N
4. Use 500 kV structures with heights between 190 and 195 feet near residences for all but one of the 500 kV structures. The exception is a 185 foot TSP at M72-T1 of the proposed Mira Loma-Vincent 500 kV T/L

5. Use a 195 foot TSP where the proposed T/L runs adjacent to a preschool at M68-T2 of the proposed Mira Loma-Vincent 500 kV T/L

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8N:

1. Field Reduction Option 1: Use a 10 foot taller TSP (195 foot) at M72-T1 of the proposed Mira Loma-Vincent 500 kV T/L near residences

Magnetic Field Calculations: Table 39, Table 40, Figure 38, and Figure 39 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. Residences are located near both R-O-W edges for portions of this segment. A preschool at the corner of Euclid Avenue and Edison Avenue is located near the right (south) R-O-W edge where TSP construction is used. These calculations were made using the minimum 500 kV TSP height of 180 feet and the minimum 500 kV LST height of 183 feet for Section N of the proposed line route.

Table 39
Calculated Magnetic Fields at the R-O-W Edge: Segment 8 – Section N (LSTs)

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8N: Existing Scenario	15.2		77.1	
Seg. 8N: Proposed Scenario - LST	27.8	Increase	86.7	Less than 15% Increase

Table 40
Calculated Magnetic Fields at the R-O-W Edge: Segment 8 – Section N (TSPs)

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8N: Existing Scenario	15.2		77.1	
Seg. 8N: Proposed Scenario - TSP	19.4	Increase	64.2	16.7
Seg. 8N: Proposed - TSP with 10 ft Taller Structures	17.0	12.4	49.9	22.3

Figure 38
Segment 8 - Section N: Calculated Magnetic Fields (LSTs)

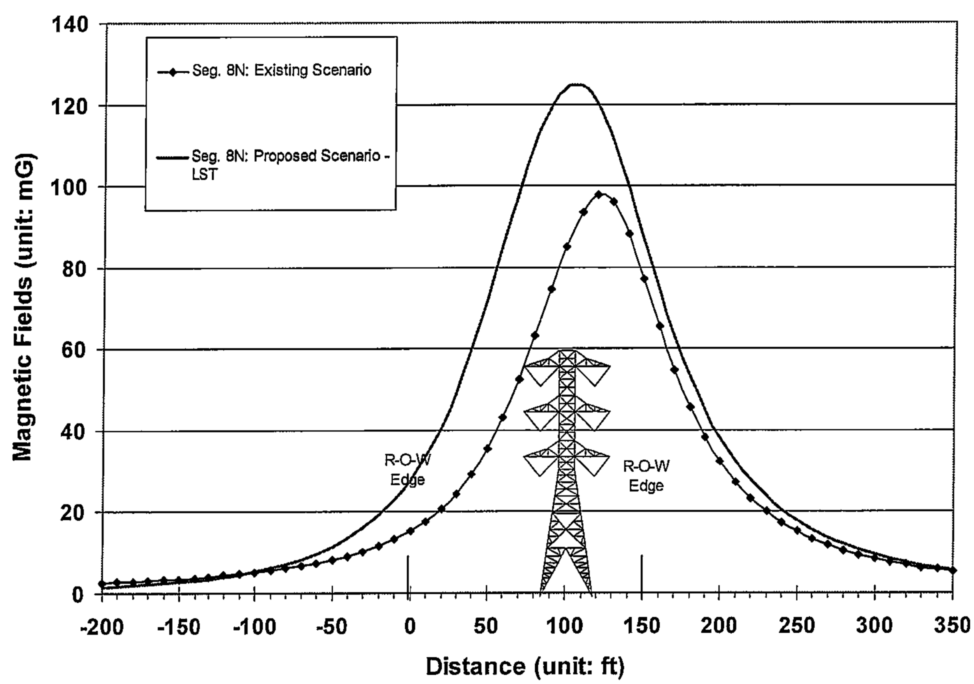
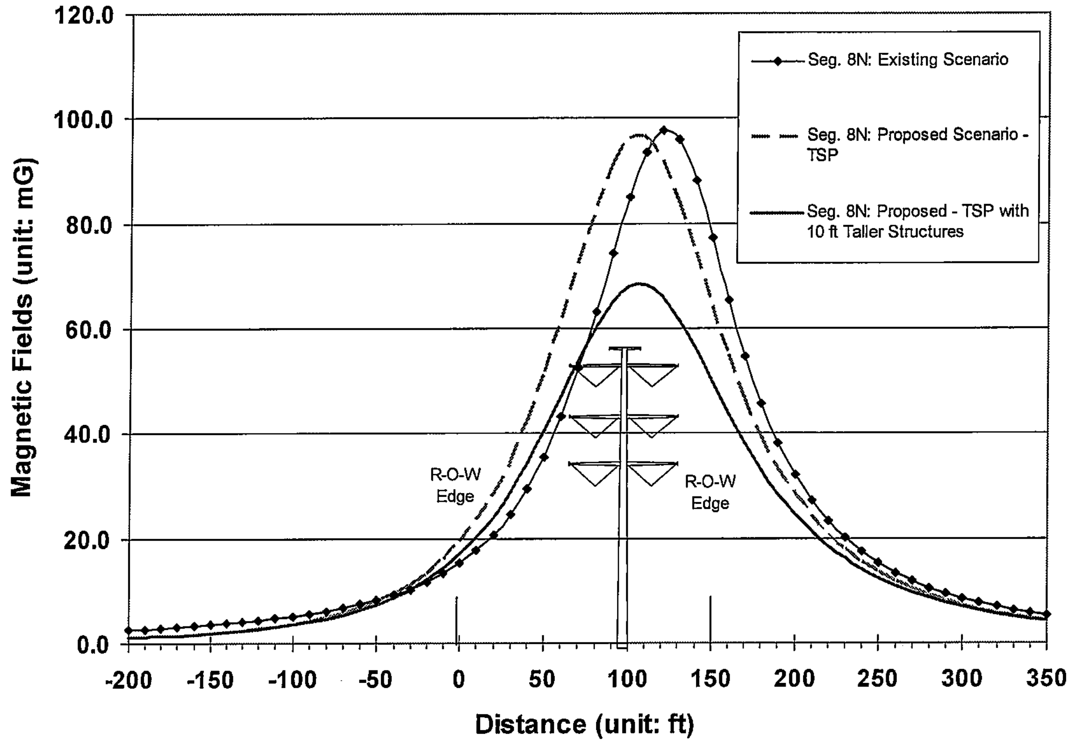


Figure 39
Segment 8 - Section N: Calculated Magnetic Fields (TSPs)



Recommendations for Segment 8N: *Field Reduction Option 1 results in a calculated field reduction less than 15% at the left edge of R-O-W that is closest to residential areas at M72-T1 of the proposed Mira Loma-Vincent 500 kV T/L. This low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

15. Segment 8 O: 8B MP 1.0 to 8B MP 5.2

No-Cost Field Reduction Measures: The proposed design for Segment 8O includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Utilize double-circuit 220 kV construction which increases conductor height as compared with single-circuit construction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8O:

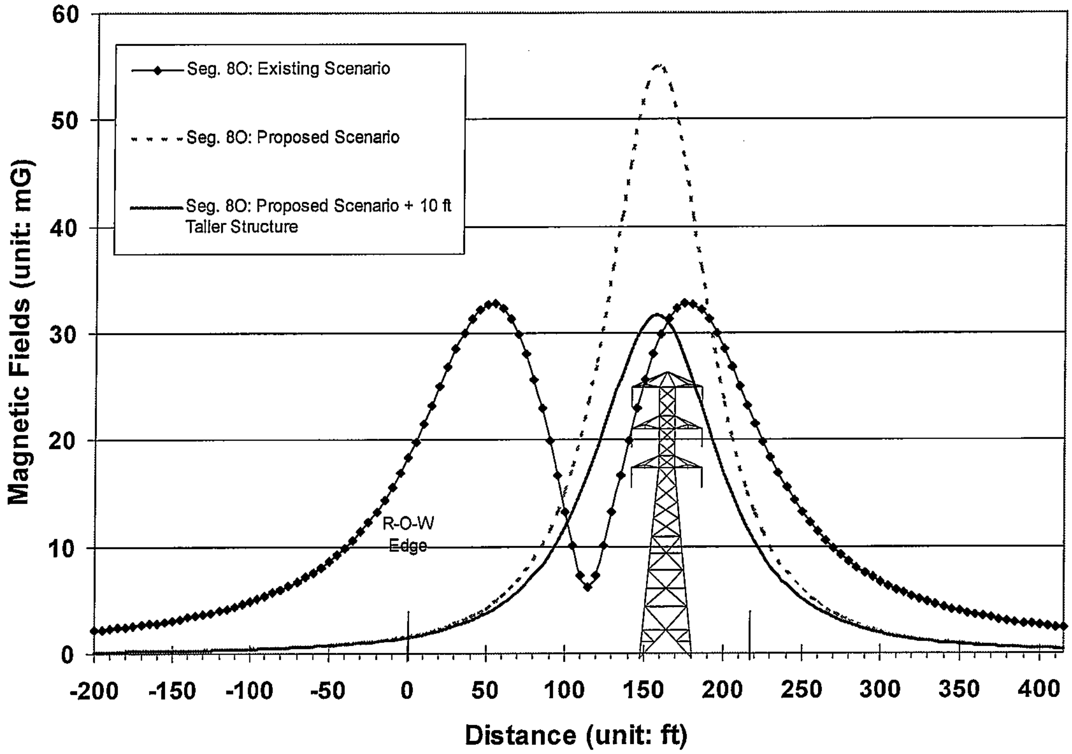
1. Field Reduction Option 1: Use a 10 foot taller structure (153 feet) at M5-T1 of the reconfigured Chino-Mira Loma #1 and #2 220 kV T/L near residences

Magnetic Field Calculations: Table 41 and Figure 40 show the calculated magnetic field levels for existing, proposed, and proposed with field reduction option scenarios.

Table 41
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section O

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8O: Existing Scenario	18.3		23.2	
Seg. 8O: Proposed Scenario	1.6	91.3	15.1	34.9
Seg. 8O: Proposed Scenario + 10 ft Taller Structure	1.5	6.2	11.8	21.9

Figure 40
Segment 8 - Section O: Calculated Magnetic Fields



Recommendations for Segment 8O: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W near residences. *It is recommended that Field Reduction Option 1 be included in the proposed project design.*

16. <u>Segment 8 P: 8B MP 5.2 to 8B MP 5.6</u>

No-Cost Field Reduction Measures: The proposed design for Segment 8P includes the following no-cost field reduction measure:

1. Phasing the proposed T/Ls for field reduction
2. Utilize double-circuit 220 kV construction which results in raised conductor height compared with single-circuit design

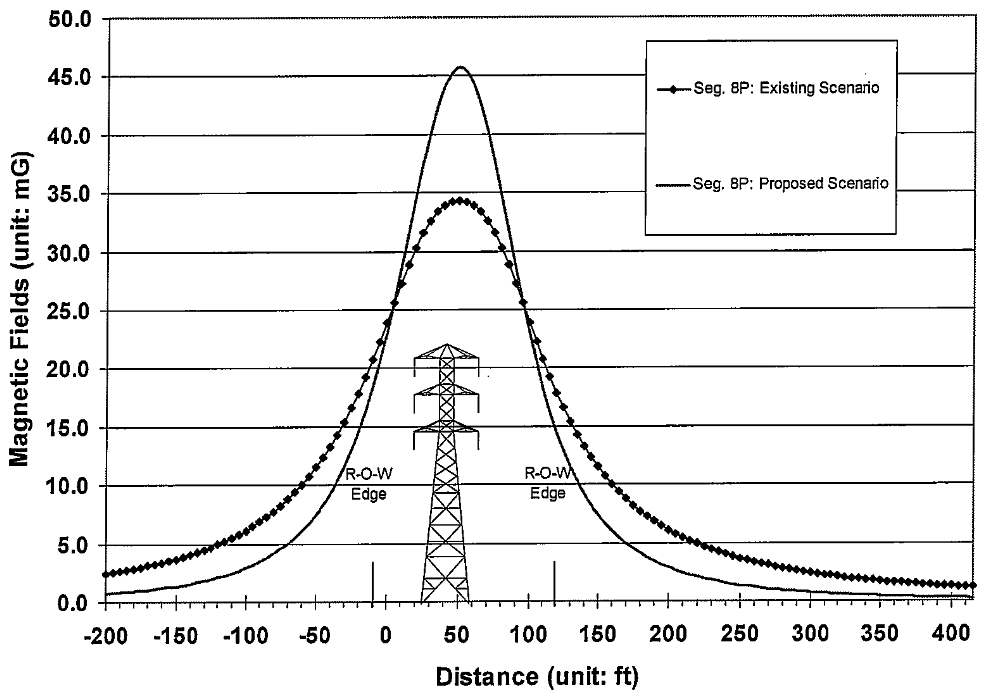
Low-Cost Field Reduction Options: No low-cost field reduction measures were investigated because this section of the proposed T/L will be built primarily on existing structures.

Magnetic Field Calculations: Table 42 and Figure 41 show the calculated magnetic field levels for existing and proposed scenarios.

Table 42
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section P

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8P: Existing Scenario	23.9		5.2	
Seg. 8P: Proposed Scenario	23.0	3.8	2.3	55.8

Figure 41
Segment 8-Section P: Calculated Magnetic Fields



17. **Segment 8Q: 8B MP 6.0 to 8B MP 6.8 (Mira Loma Substation)**

No-Cost Field Reduction Measures: The proposed design for Segment 8Q includes the following no-cost field reduction measures:

1. Utilize double-circuit 220 kV construction which results in raised conductor height compared with single-circuit design
2. Phase the proposed T/Ls for field reduction.

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8Q:

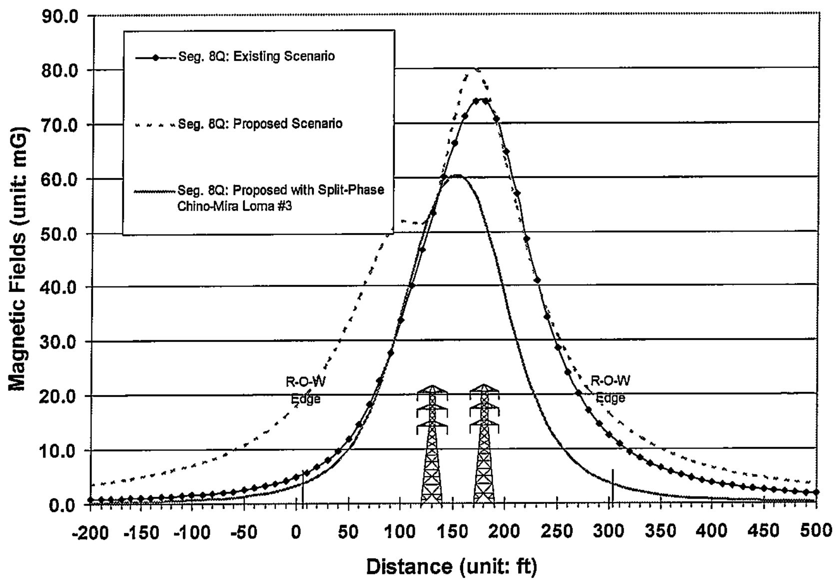
1. Field Reduction Option 1: Split-Phase the Chino-Mira Loma #3 220 kV line for field reduction

Magnetic Field Calculations: Table 43 and Figure 42 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios.

Table 43
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section Q

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8Q: Existing Scenario	4.8		12.6	
Seg. 8Q: Proposed Scenario	18.0	Increase	16.5	Increase
Seg. 8Q: Proposed with Split-Phase Chino-Mira Loma #3	3.2	82.2	3.8	77.0

Figure 42
Segment 8 - Section Q: Calculated Magnetic Fields



Recommendations for Segment 8Q: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the proposed project design.*

18. <u>Segment 8R: 8A: MP 34 to MP 34.4 and 8B: MP 5.6 to 8B MP 6.0</u>

No-Cost Field Reduction Measures: The proposed design for Segment 8M includes the following no-cost field reduction measures:

1. Phase the proposed T/Ls for field reduction

2. Utilize double-circuit 220 kV construction which results in raised conductor height compared with single-circuit design
3. Utilize single-circuit TSP construction that reduces conductor spacing and raises conductor height as compared with single-circuit LST construction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8R:

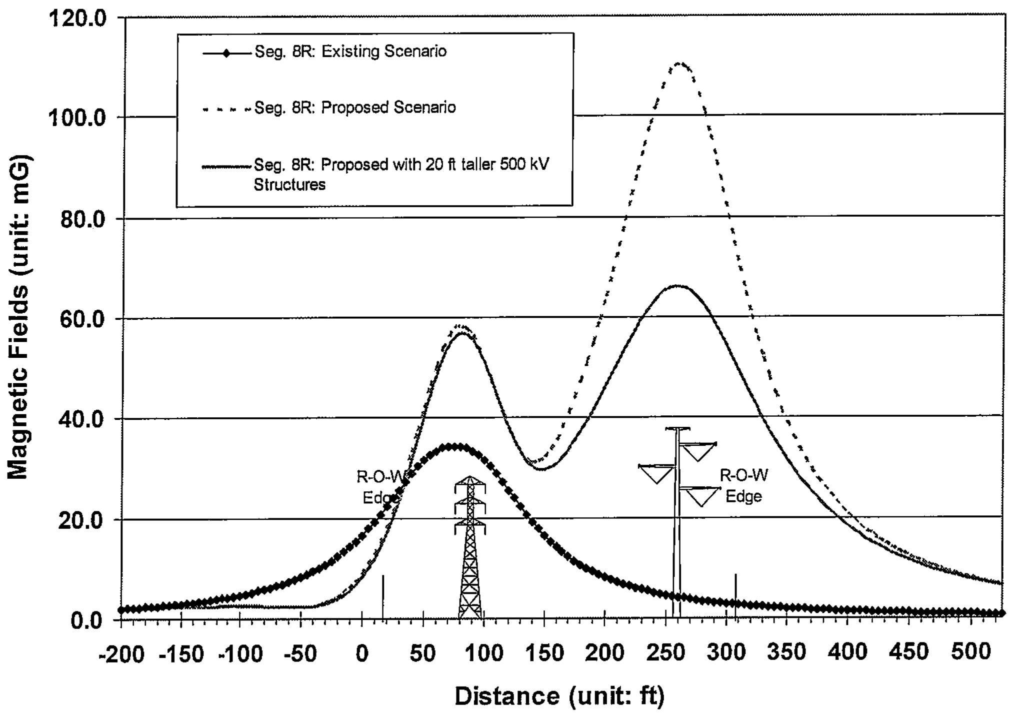
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV poles than the 150 foot pole that was originally planned for the structure at M72-T5

Magnetic Field Calculations: Table 44 and Figure 43 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the minimum 500 kV TSP height of 150 feet for Section 8 R of the proposed line route.

Table 44
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section R

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8R: Existing Scenario	16.6		2.4	
Seg. 8R: Proposed Scenario	8.8	47.0	56.1	Increase
Seg. 8R: Proposed with 20 ft taller 500 kV Structures	8.3	5.7	42.0	25.1

Figure 43
Segment 8 - Section R: Calculated Magnetic Fields



Recommendations for Segment 8 R: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *Because the area adjacent to the right edge of R-O-W is planned for development, it is recommended that Field Reduction Option 1 be included in the proposed project design. Specifically, the TSP at M72-T5 is recommended to be 170 feet tall rather than 150 feet.*

19. Segment 8 S: MP 34.5 to MP 35.2 (Mira Loma Substation)

No-Cost Field Reduction Measures: The proposed design for Segment 8S includes the following no-cost field reduction measures:

1. Phase the proposed T/Ls for field reduction
2. Utilize single-circuit TSP construction that reduces conductor spacing and raises conductor height as compared with single-circuit LST construction

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 8S:

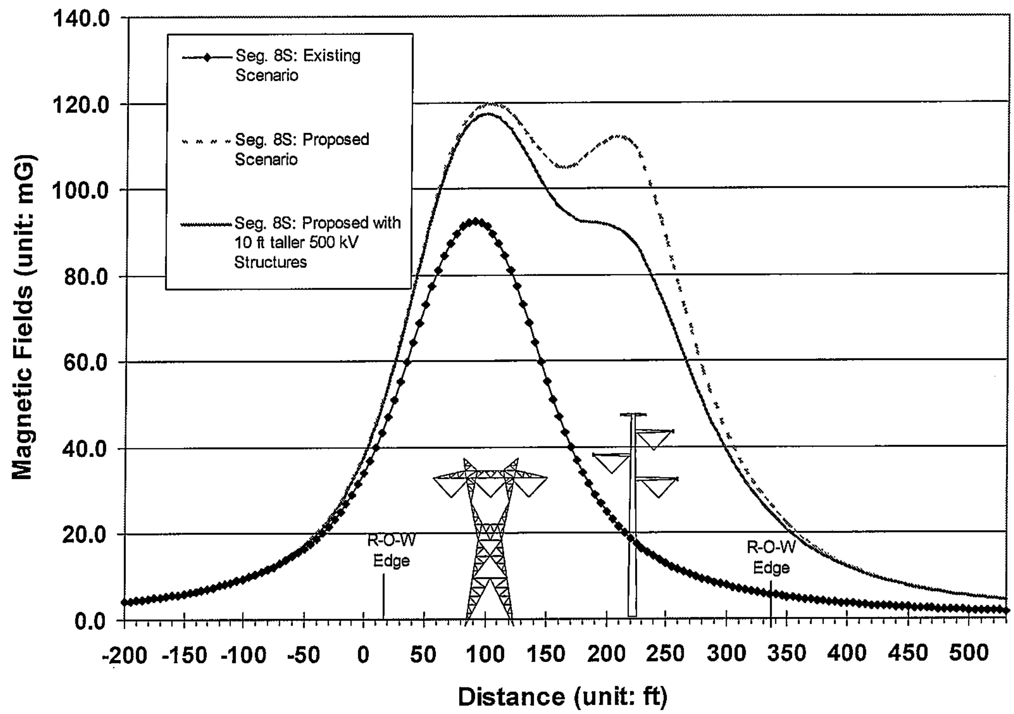
1. Field Reduction Option 1: Utilize 10 foot taller 500 kV poles than originally planned for the 160 foot TSP at M73-T3 to match the taller 170 foot TSP used in Segment 8S

Magnetic Field Calculations: Table 45 and Figure 44 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the minimum 500 kV TSP height of 160 feet for Section 8 S of the proposed line route.

Table 45
Calculated Magnetic Fields at R-O-W Edges: Segment 8 – Section S

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 8S: Existing Scenario	34.0		6.0	
Seg. 8S: Proposed Scenario	38.3	Less than 15% Increase	28.1	Increase
Seg. 8S: Proposed with 10 ft taller 500 kV Structures	37.9	1.0	26.3	6.4

Figure 44
Segment 8 - Section S: Calculated Magnetic Fields



Recommendations for Segment 8S: Field Reduction Option 1 results in calculated field reductions less than 15% at the closest edge of R-O-W. *This low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

F. <u>Segment 9: Substation Components</u>

Generally, magnetic field values along the substation perimeter are low compared to the substation interior because of the distance from the perimeter to the energized equipment. Normally, the highest magnetic field values around the perimeter of a substation result from overhead power lines and underground duct banks entering and leaving the substation, and are not caused by substation equipment. Therefore, the magnetic field reduction measures generally applicable to a substation project are as follows:

- Site selection for a new substation;
- Setback of substation structures and major substation equipment (such as bus, transformers, and underground cable duct banks, etc.) from perimeter;
- Subtransmission lines and distribution lines entering and exiting the substation.

1. Whirlwind Substation

Whirlwind Substation would be a new 500/220 kV substation located approximately 4 to 5 miles south of the Cotttonwind Substation near the intersection of 170th Street and Holiday Avenue, in Kern County, near the TWRA. Table 46 was used to evaluate "no and low-cost" magnetic field reduction options for the proposed Whirlwind Substation.

Table 46. Substation Checklist for Examining No-cost and Low-cost Magnetic Field Reduction Measures for Whirlwind Substation

No.	No-Cost and Low-Cost Magnetic Field Reduction Measures Evaluated for Whirlwind Substation	Measures Adopted? (Yes/No)	Reason(s) if not Adopted
1	Does the substation site meet the CDE's EMF Setback Requirement of 350 feet from 500 kV T/Ls?	Yes	
2	Are 500 kV rated transformer(s) and air core reactors > 50 feet from the substation property line?	Yes	
3	Are 500 kV rated switch-racks, capacitor banks & bus 40 feet (or more) from the substation property line?	Yes	
5	Are 500 kV rated transfer & operating buses configured with the transfer bus facing the nearest property line?	N/A[30]	

2. Antelope Substation

The Antelope Substation portion of Segment 9 requires the upgrade of Antelope Substation with additional 500 kV equipment. Table 47 was used to evaluate "no and low-cost" magnetic field reduction options for the proposed Antelope Substation upgrade.

[30] Whirlwind Substation uses a double-operating bus construcution.

Table 47. Substation Checklist for Examining No-cost and Low-cost Magnetic Field Reduction Measures for Antelope Substation			
No.	**No-Cost and Low-Cost Magnetic Field Reduction Measures Evaluated for Antelope Substation Upgrade**	**Measures Adopted? (Yes/No)**	**Reason(s) if not Adopted**
1	Does the substation site meet the CDE's EMF Setback Requirement of 350 feet from 500 kV T/Ls?	Yes	
2	Are 500 kV rated transformer(s) and air core reactors > 50 feet from the substation property line?	N/A	
3	Are 500 kV rated switch-racks, capacitor banks & bus 40 feet (or more) from the substation property line?	Yes	
5	Are 500 kV rated transfer & operating buses configured with the transfer bus facing the nearest property line?	N/A	

3. Vincent Substation

Segment 9 includes upgrade of the existing 500/220 kV Vincent Substation with new equipment to accommodate new transmission connections. Table 48 was used to evaluate "no and low-cost" magnetic field reduction options for the proposed Vincent Substation upgrade.

Table 48. Substation Checklist for Examining No-cost and Low-cost Magnetic Field Reduction Measures for Vincent Substation			
No.	**No-Cost and Low-Cost Magnetic Field Reduction Measures Evaluated for Vincent Substation Upgrade**	**Measures Adopted? (Yes/No)**	**Reason(s) if not Adopted**
1	Does the substation site meet the CDE's EMF Setback Requirement of 350 feet from 500 kV T/Ls?	Yes	
2	Are 500 kV rated transformer(s) and air core reactors > 50 feet from the substation property line?	N/A	
3	Are 500 kV rated switch-racks, capacitor banks & bus 40 feet (or more) from the substation property line?	Yes	
5	Are 500 kV rated transfer & operating buses configured with the transfer bus facing the nearest property line?	N/A[31]	

[31] The Vincent Substation upgrade will use a double-operating bus configuration.

4. Mesa Substation

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. All upgrades at the Mesa Substation would take place within the existing fence line. Table 49 was used to evaluate "no and low-cost" magnetic field reduction options for the upgrade of Mesa Substation.

Table 49. Substation Checklist for Examining No-cost and Low-cost Magnetic Field Reduction Measures for Mesa Substation

No.	No-Cost and Low-Cost Magnetic Field Reduction Measures Evaluated for Mesa Substation Upgrade	Measures Adopted? (Yes/No)	Reason(s) if not Adopted
1	Does the substation site meet the CDE's EMF Setback Requirement of 150 feet from 220 kV T/Ls?	N/A	
2	Are 220 kV rated transformer(s) and air core reactors > 50 feet from the substation property line?	N/A	
3	Are 220 kV rated switch-racks, capacitor banks & bus 40 feet (or more) from the substation property line?	Yes	
5	Are 220 kV rated transfer & operating buses configured with the transfer bus facing the nearest property line?	N/A	

5. Mira Loma Substation

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. All work would take place within the existing Mira Loma fence line. Table 50 was used to evaluate "no and low-cost" magnetic field reduction options for the proposed Mira Loma Substation upgrades.

Table 50. Substation Checklist for Examining No-cost and Low-cost Magnetic Field Reduction Measures for Mira Loma Substation			
No.	**No-Cost and Low-Cost Magnetic Field Reduction Measures Evaluated for Mira Loma Substation Upgrade**	**Measures Adopted? (Yes/No)**	**Reason(s) if not Adopted**
1	Does the substation site meet the CDE's EMF Setback Requirement of 350 feet from 500 kV T/Ls?	N/A	
2	Are 500 kV rated transformer(s) and air core reactors > 50 feet from the substation property line?	N/A	
3	Are 500 kV rated switch-racks, capacitor banks & bus 40 feet (or more) from the substation property line?	Yes	
5	Are 500 kV rated transfer & operating buses configured with the transfer bus facing the nearest property line?	N/A	

G. Segment 10

No-Cost Field Reduction Measures: The proposed design for Segment 10 includes the following no-cost field reduction measure:

1. Utilize wider R-O-W than is minimum necessary for the proposed T/L

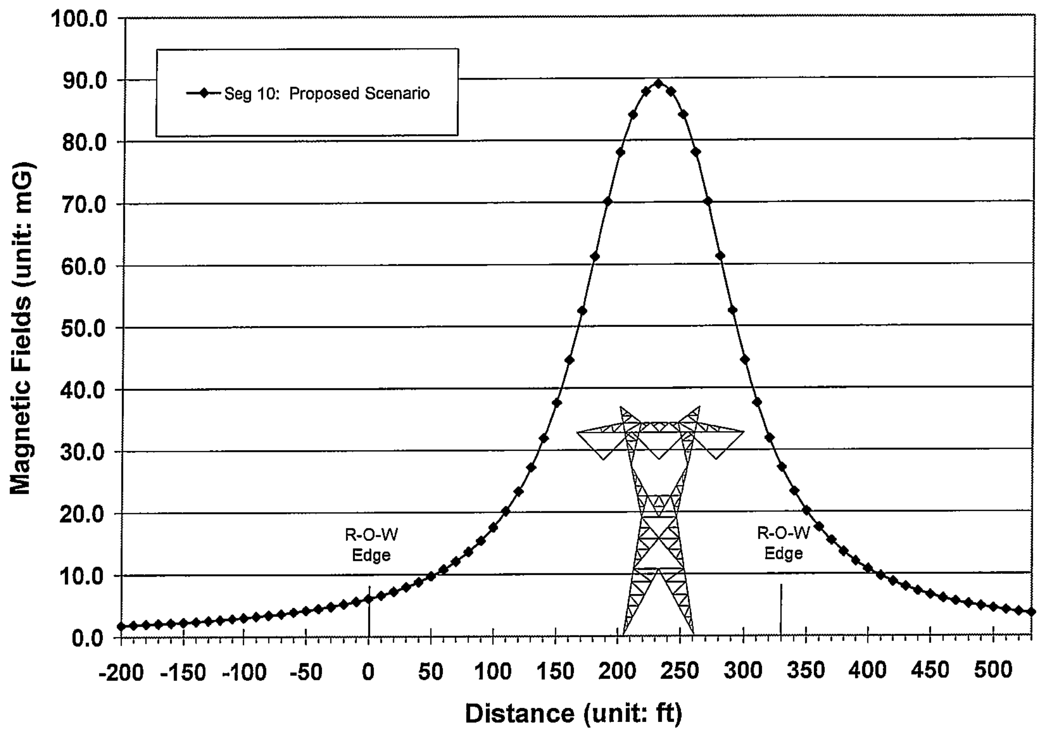
Low-Cost Field Reduction Options: No low-cost field reduction options were investigated for Segment 10 because the line runs through undeveloped lands.

Magnetic Field Calculations: Table 51 and Figure 45 show the calculated magnetic field levels for the proposed scenario. This calculations was made using the typical 500 kV LST height in Segment 10 of 112 feet.

Table 51
Calculated Magnetic Fields at the R-O-W Edges: Segment 10

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 10: Proposed Scenario	6.1		27.2	

Figure 45
Segment 10: Calculated Magnetic Fields



H. Segment 11

1. Segment 11 A: MP 0 (Vincent Substation) to MP 0.9

Refer to Segment 6A.

2. Segment 11 B: MP 0.9 to MP 2.3

No-Cost Field Reduction Measures: The proposed design for Segment 11B includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Place proposed T/L in an inside position within the existing corridor

3. Utilize delta lattice 500 kV structure which is both more compact and taller than conventional horizontal LST design

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 11B:

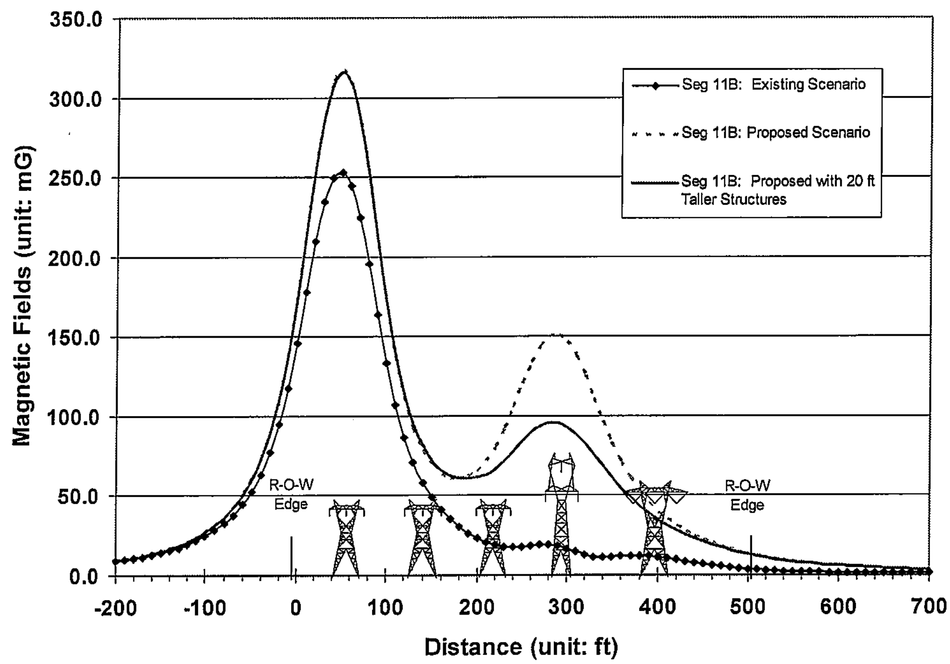
1. Field Reduction Option 1: Utilize 20 foot taller 500 kV structures than included in the initial project design in the vicinity of residences

Magnetic Field Calculations: Table 52 and Figure 46 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV LST height in Segment 11B of 169 feet.

Table 52
Calculated Magnetic Fields at R-O-W Edges: Segment 11 – Section B

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 11B: Existing Scenario	145.8		3.7	
Seg 11B: Proposed Scenario	174.2	Increase	13.8	Increase
Seg 11B: Proposed with 20 ft Taller Structures	173.7	0.3	13.2	4.3

Figure 46
Segment 11 - Section B: Calculated Magnetic Fields



Recommendations for Segment 11B: Field Reduction Option 1 results in calculated field reductions less than 15% at the closest edge of R-O-W. *Therefore, this low-cost option does not meet the minimum field reduction specified by the CPUC EMF decisions and is not recommended to be included in the final design of the proposed project.*

3. **Segment 11 C: MP 2.3 to MP 3.9**

No-Cost Field Reduction Measures: The proposed design for Segment 11C includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Utilize delta lattice 500 kV structure which is both more compact and taller than conventional horizontal LST design

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 11C:

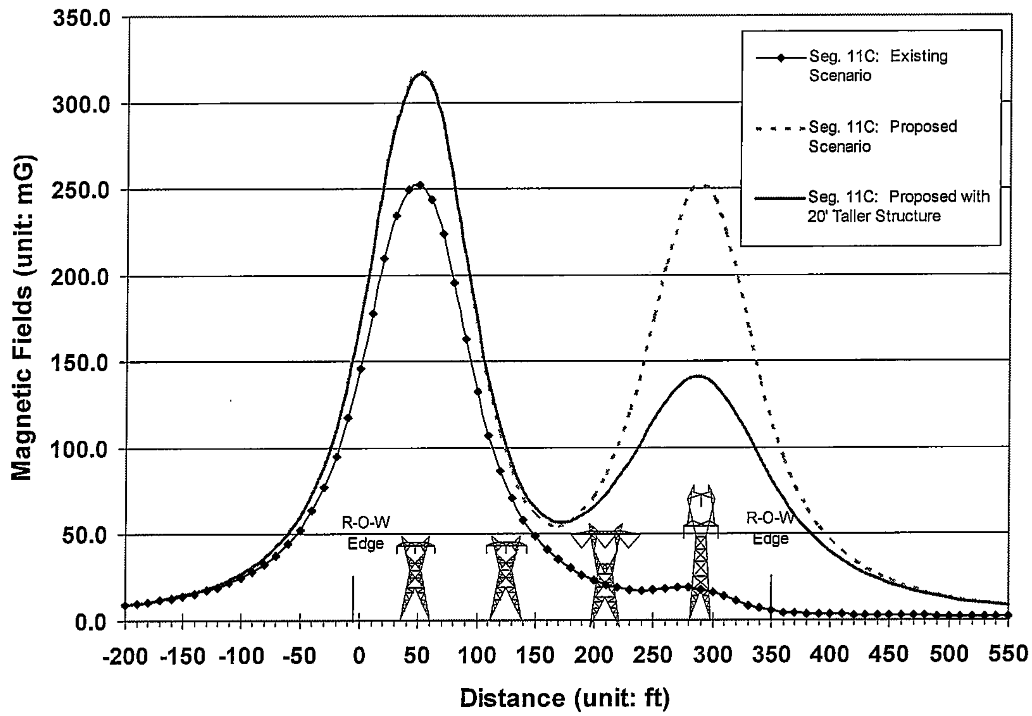
1. Field Reduction Option 1: Utilize a 20 foot taller 500 kV structure (138 feet) than included in the initial project design in the vicinity of residences at Alison Canyon Road

Magnetic Field Calculations: Table 53 and Figure 47 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. These calculations were made using the typical 500 kV LST height in Segment 11C of 181 feet.

Table 53
Calculated Magnetic Fields at R-O-W Edges: Segment 11 – Section C

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg. 11C: Existing Scenario	145.9		5.4	
Seg. 11C: Proposed Scenario	174.7	Increase	113.6	Increase
Seg. 11C: Proposed with 20' Taller Structure	174.0	0.4	81.0	28.7

Figure 47
Segment 11-Section C: Calculated Magnetic Fields



Recommendations for Segment 11C: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the proposed project design where the proposed line runs adjacent to residences.*

4. <u>Segment 11 D: MP 3.9 to MP 18.7 (Gould Substation)</u>

No-Cost Field Reduction Measures: The proposed design for Segment 11D includes the following no-cost field reduction measure:

1. Phase the proposed T/L for field reduction

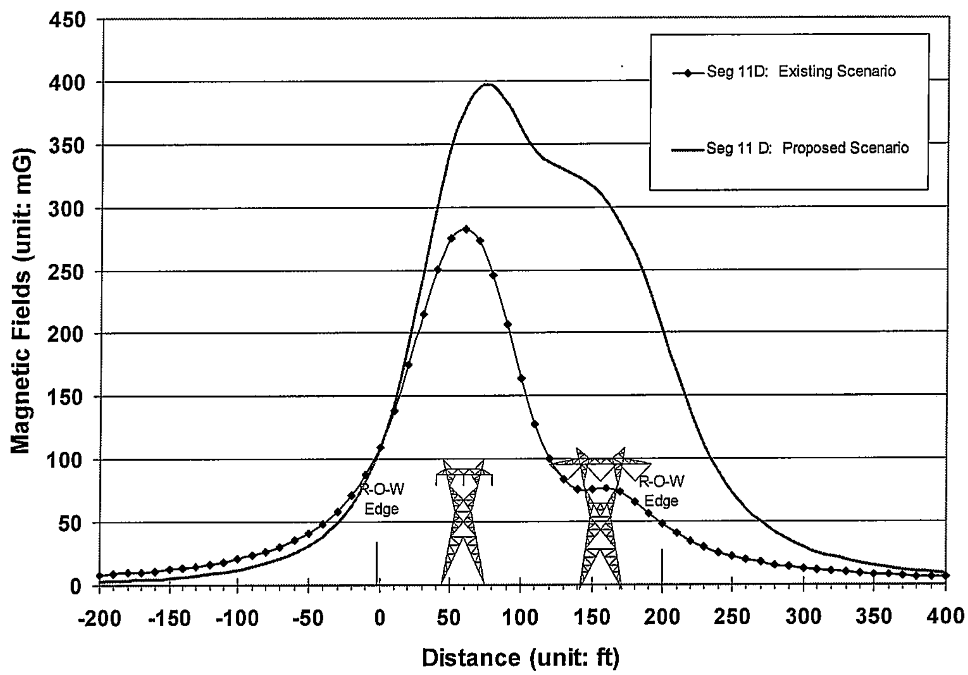
Low-Cost Field Reduction Options: No low-cost field reduction measures were investigated for the section of the proposed line route because land adjacent to the proposed R-O-W is undeveloped, forest land.

Magnetic Field Calculations: Table 54 and Figure 48 show the calculated magnetic field levels for existing and proposed scenarios. These calculations were made using the typical 500 kV LST height in Segment 11D of 121 feet.

Table 54
Calculated Magnetic Fields at R-O-W Edges: Segment 11 – Section D

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 11D: Existing Scenario	109.7		48.2	
Seg 11 D: Proposed Scenario	108.1	1.5	200.4	Increase

Figure 48
Segment 11-Section D: Calculated Magnetic Fields



5. Segment 11E: MP 18.9 (Gould Substation) to MP 27.4 (Goodrich Substation)

No-Cost Field Reduction Measures: The proposed design for Segment 11E includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Place the proposed circuit on the inside position of the R-O-W

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 11E:

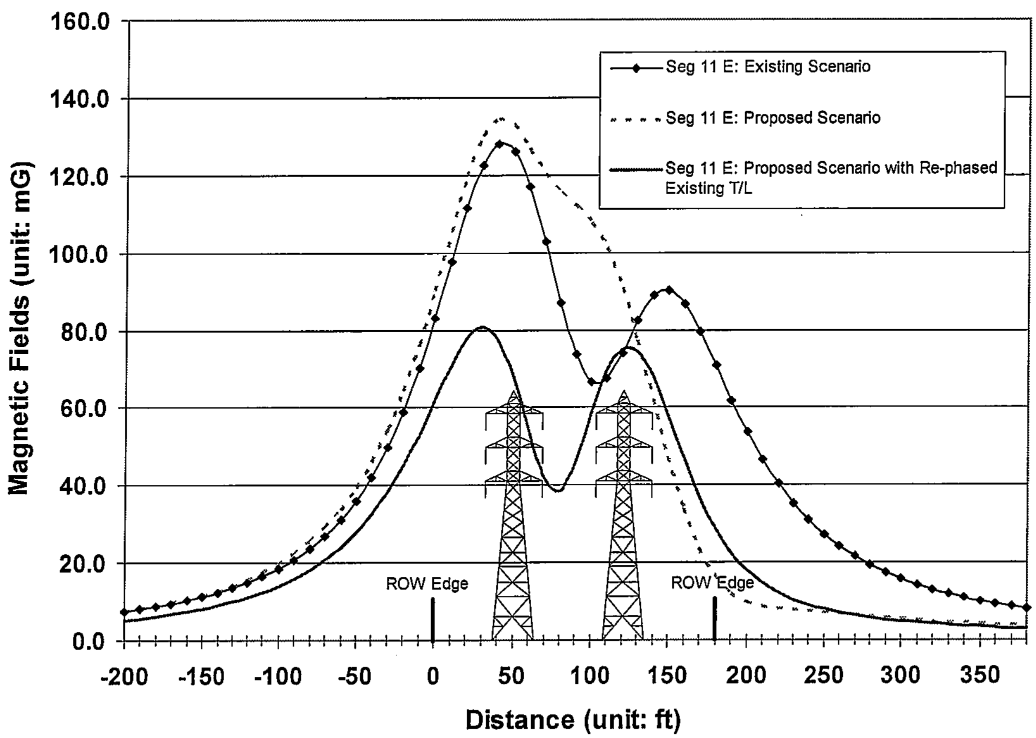
1. Field Reduction Option 1: Re-phase the existing Mesa-Vincent 220 kV T/L for field reduction

Magnetic Field Calculations: Table 55 and Figure 49 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. The private school in Eaton Canyon is located near the left R-O-W edge.

Table 55
Calculated Magnetic Fields at R-O-W Edges: Segment 11 – Section E

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 11 E: Existing Scenario	83.2		70.6	
Seg 11 E: Proposed Scenario	90.2	Less than 15% Increase	16.5	76.6
Seg 11 E: Proposed Scenario with Re-phased Existing T/L	61.6	31.7	28.9	Increase

Figure 49
Segment 11-Section E: Calculated Magnetic Fields



Recommendations for Segment 11E: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the proposed project design.*

6. Segment 11F: MP 27.4 (Goodrich Substation) to MP 36.2 (Mesa Substation)

No-Cost Field Reduction Measures: The proposed design for Segment 11F includes the following no-cost field reduction measures:

1. Phase the proposed T/L for field reduction
2. Place the proposed circuit on the inside of the R-O-W

Low-Cost Field Reduction Options: The following low-cost field reduction option was investigated for Segment 11F:

1. Field Reduction Option 1: Re-phase the existing Mesa-Vincent 220 kV T/L for field reduction

Magnetic Field Calculations: Table 56 and Figure 50 show the calculated magnetic field levels for existing, proposed and proposed with low-cost field reduction option scenarios. Along the line route for Segment 11F, the 66 kV subtransmission lines in the center of the transmission are transposed and change construction. The center lines of the subtransmission lines are located 110 feet away from the edges of the R-O-W, so their influence at the R-O-W edges will be limited. However, due to the fact that the proposed line route runs adjacent to two elementary schools, computer models were run to assess the effectiveness of proposed field reduction techniques near the schools. Table 57 and Figure 51 show the calculated magnetic fields for existing, proposed and proposed with low-cost reduction option scenarios near Elizabeth W. Shuey Elementary School in Rosemead. Shuey Elementary School is located adjacent to the right (west) R-O-W edge. Table 58 and Figure 52 show the calculated magnetic fields for existing, proposed and proposed with low-cost reduction option scenarios near Willard Elementary School in Pasadena. Willard Elementary School is located adjacent to the left (east) R-O-W edge.

Table 56
Calculated Magnetic Fields at R-O-W Edges: Segment 11 – Section F

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 11 F: Existing Scenario	78.9		65.0	
Seg 11 F: Proposed Scenario	90.9	Less than 15% Increase	23.5	63.8
Seg 11 F: Proposed Scenario with Re-phased Existing T/L	69.7	23.3	30.8	Increase

Figure 50
Segment 11-Section F: Calculated Magnetic Fields

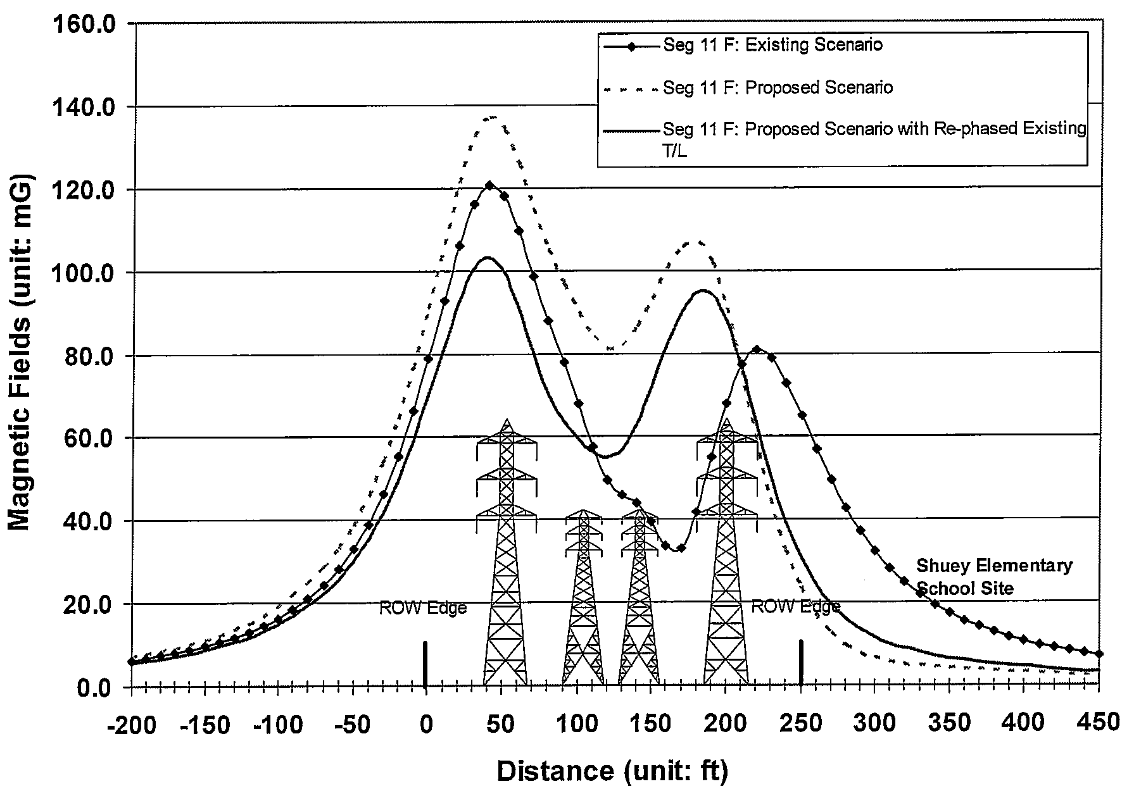


Table 57
Calculated Magnetic Fields at R-O-W Edges: Segment 11 – Section F Near Shuey Elementary School in Rosemead

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 11 F1: Existing Scenario	75.0		63.4	
Seg 11 F1: Proposed Scenario	88.8	Increase	31.0	51.1
Seg 11 F1: Proposed Scenario with Re-phased Existing T/L	69.0	22.3	36.2	Less than 15% Increase

Figure 51
Segment 11-Section F: Calculated Magnetic Fields Near Shuey Elementary School in Rosemead

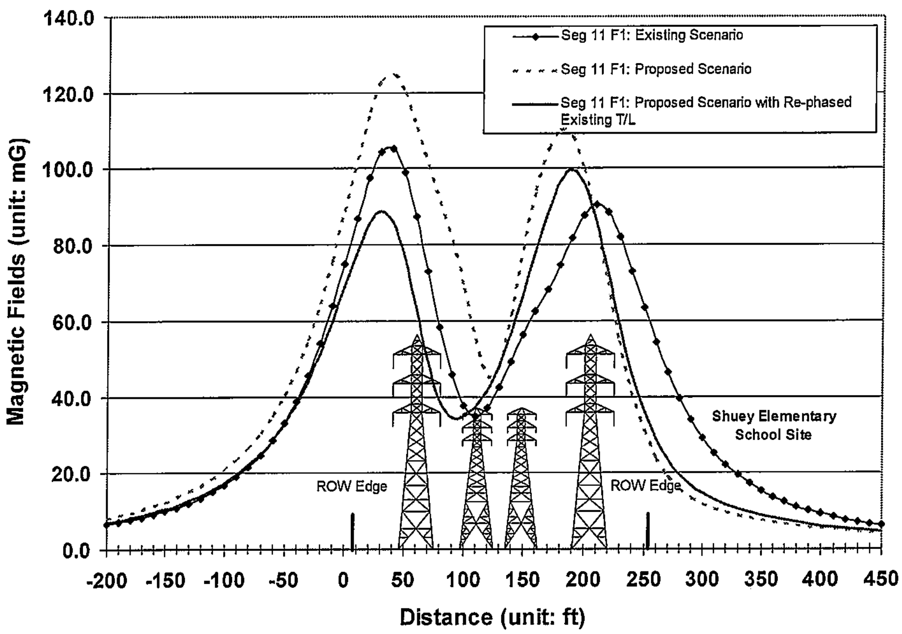
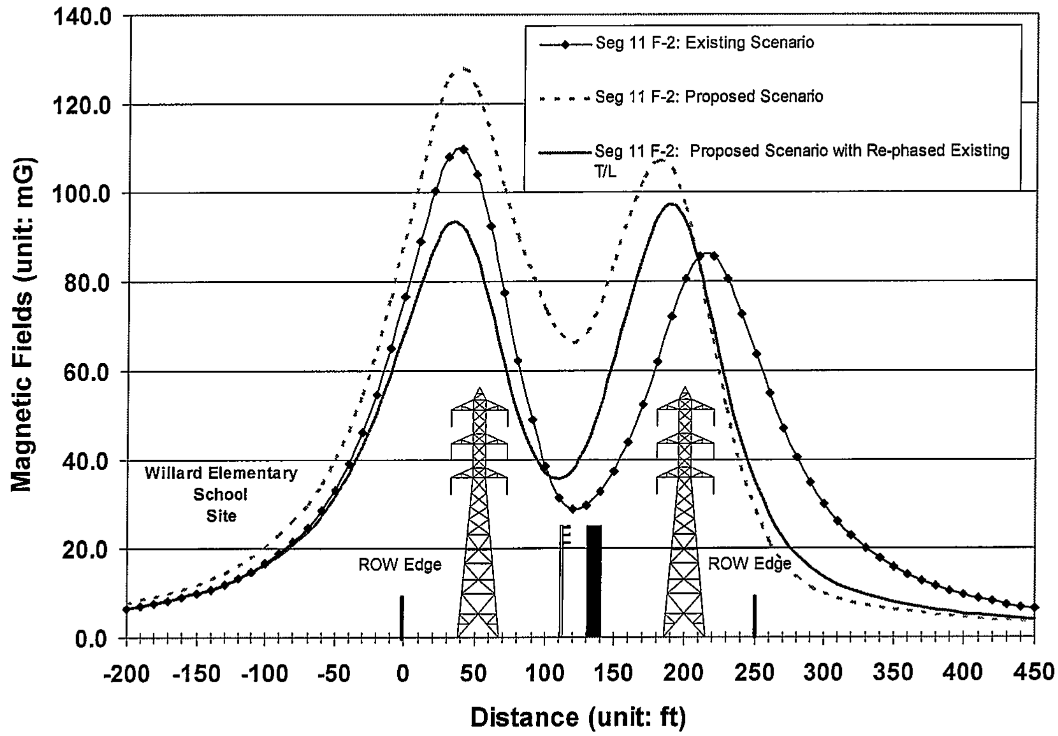


Table 58
Calculated Magnetic Fields at R-O-W Edges: Segment 11 – Section F Near Willard Elementary School in Pasadena

Design Options	Left ROW (mG)	% Reduction	Right ROW (mG)	% Reduction
Seg 11 F-2: Existing Scenario	76.6		63.7	
Seg 11 F-2: Proposed Scenario	89.7	Less than 15% Increase	28.6	55.1
Seg 11 F-2: Proposed Scenario with Re-phased Existing T/L	68.8	23.3	34.8	Increase

Figure 52
Segment 11-Section F: Calculated Magnetic Fields Near Willard Elementary School in Pasadena



Recommendations for Segment 11F: Field Reduction Option 1 results in calculated field reductions greater than 15% at the closest edge of R-O-W. *It is recommended that Field Reduction Option 1 be included in the proposed project design for Segment 11-F.*

I. <u>Subtransmission Components</u>

1. <u>Segment 7</u>

The following no-cost and low-cost field reduction components were included for the relocated subtransmission components:

1. Phasing the relocated 66 kV subtransmission lines for field reduction
2. Utilizing pole heights that meet SCE's preferred design criteria for 66 kV subtransmission lines

Refer to the Segment 7 analysis above for computer models of the relocated subtransmission lines.

2. Segment 8

The following no-cost and low-cost field reduction components were included for the relocated subtransmission components:

1. Phasing the relocated overhead and undergrounded 66 kV subtransmission lines for field reduction
2. Undergrounding portions of the relocated 66 kV subtransmission lines

Refer to the Segment 8A and 8 K analysis above for computer models of the relocated subtransmission lines. No modeling of the relocation and undergrounding work at the "San Gabriel Junction" and at the San Gabriel River Freeway is included in this FMP.

VI. FINAL RECOMMENDATIONS FOR IMPLEMENTING NO-COST AND LOW-COST MAGNETIC FIELD REDUCTION MEASURES

In accordance with the "EMF Design Guidelines", filed with the CPUC in compliance with CPUC Decisions 93-11-013 and 06-01-042, SCE will implement no-cost and low-cost magnetic field reduction measures for this project. The recommended magnetic field reduction measures included in this project design are listed in Table 1 in the Executive Summary.

SCE's plan for applying no-cost and low-cost magnetic field reduction measures for the Proposed Project is consistent with CPUC's EMF policy and with the direction of leading national and international health agencies. Furthermore, the plan complies with SCE's EMF Design Guidelines and with applicable national and state safety standards for new electric facilities.

VII. APPENDIX B.1: CROSS-SECTION DRAWINGS

A. Segment 4

1. Segment 4 A: MP 0 (Cotttonwind Substation) to MP 5

Figure 53
Segment 4-Section A: Existing Scenario (Facing Northwest)

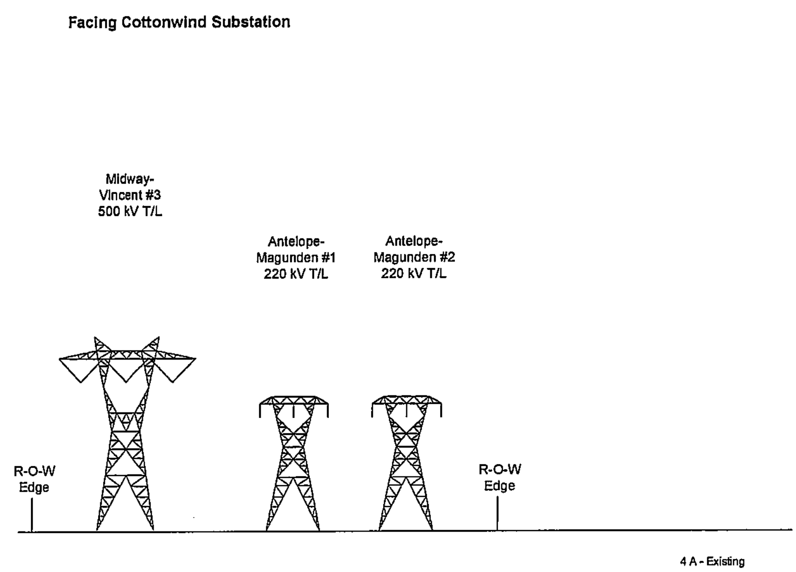
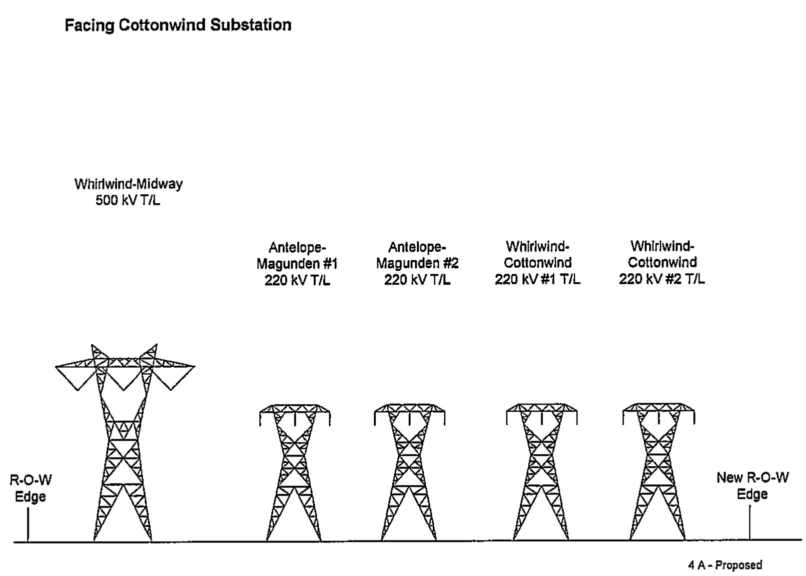


Figure 54
Segment 4-Section A: Proposed Scenario (Facing Northwest)



2. Segment 4 B: MP 5 to MP 13.2 and MP 14.8 to MP 15.8

Figure 55
Segment 4-Section B: Existing Scenario (Facing Northwest)

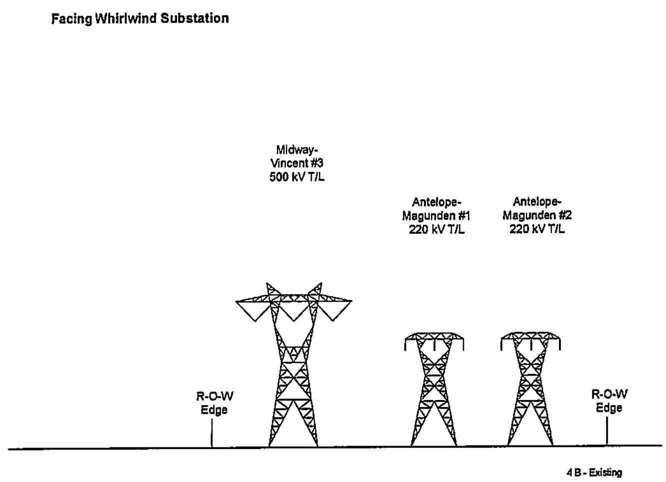
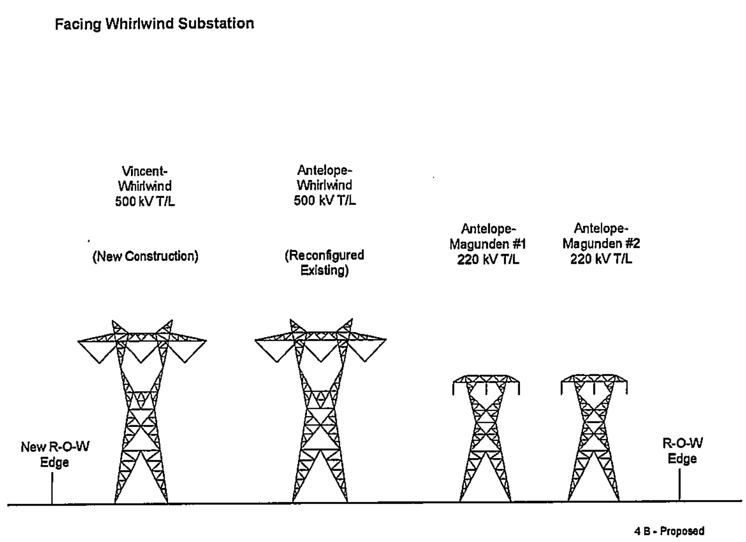


Figure 56
Segment 4-Section B: Proposed Scenario (Facing Northwest)



3. Segment 4 C: MP 13.2 to MP 14.8

Figure 57
Segment 4-Section C: Existing Scenario (Facing Northwest)

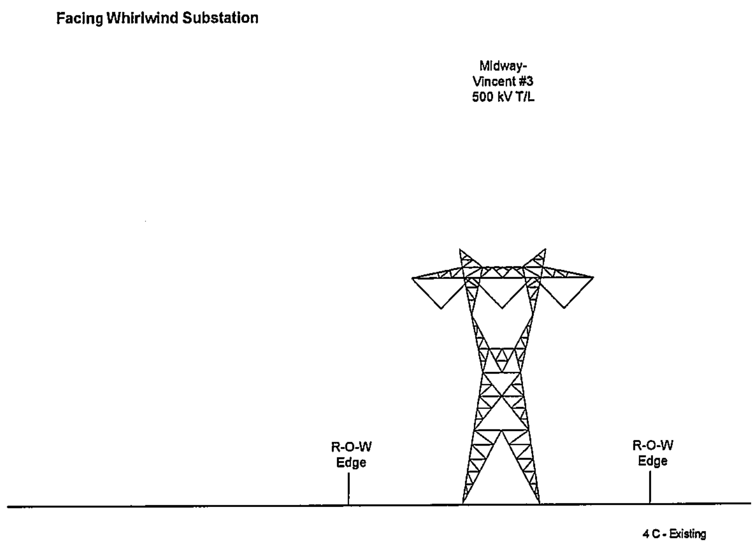
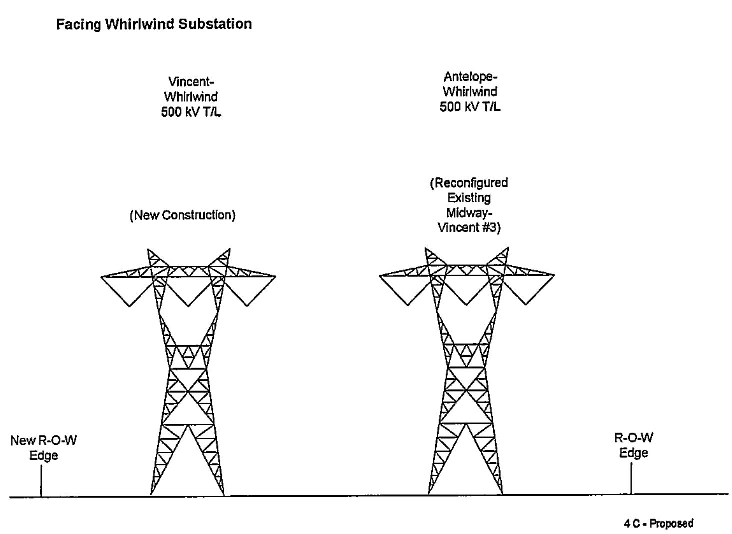
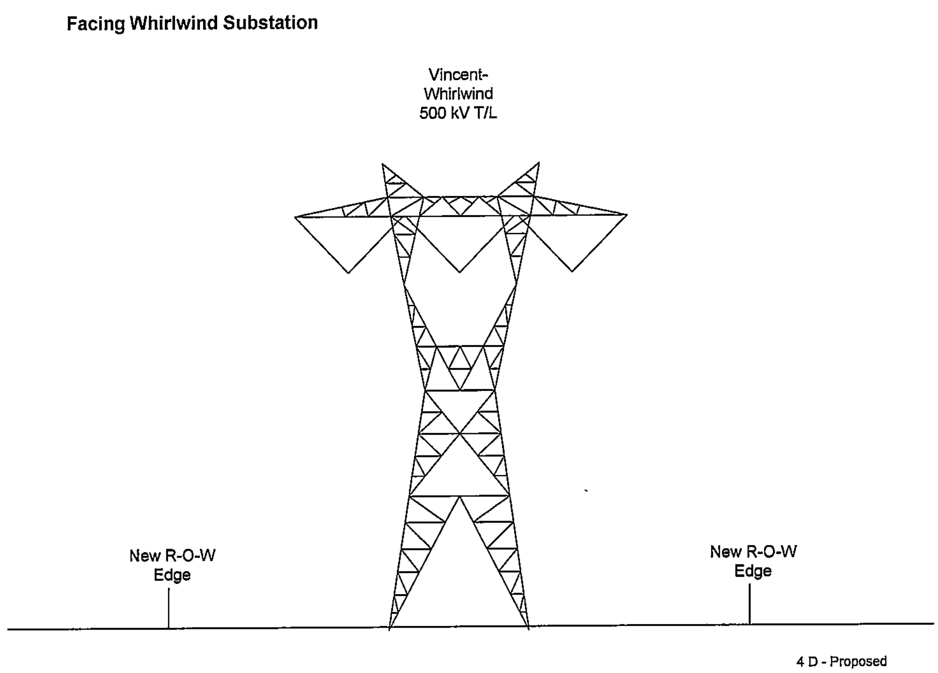


Figure 58
Segment 4-Section C: Proposed Scenario (Facing Northwest)



4. Segment 4 D: MP 15.8 to MP 19.5 (Antelope Substation)

Figure 59
Segment 4-Section D: Proposed Scenario (Facing North)



B. Segment 5:

1. Segment 5 A: MP 0 to MP 1.9

Figure 60
Segment 5-Section A: Existing Scenario (Facing Southeast)

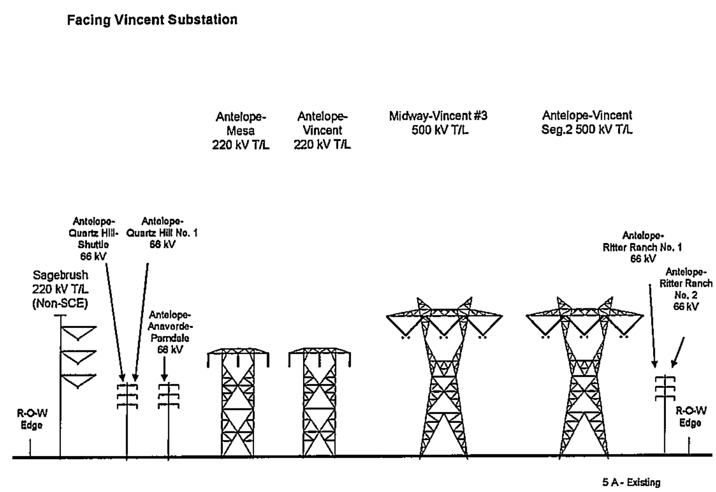
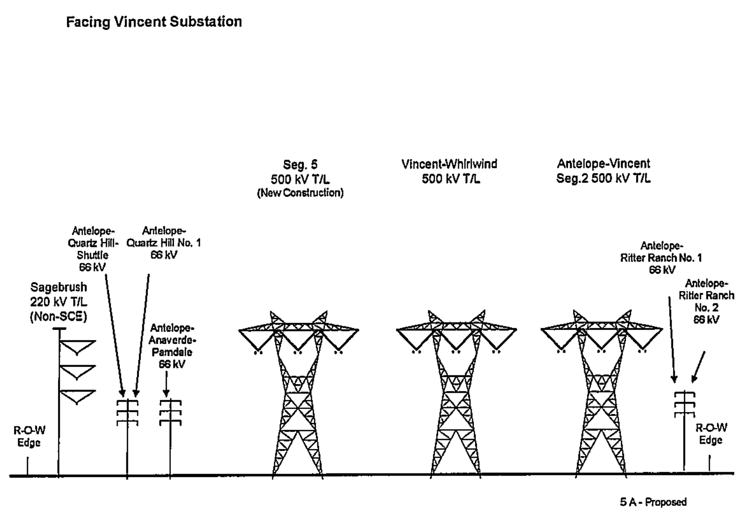


Figure 61
Segment 5-Section A: Proposed Scenario (Facing Southeast)



2. Segment 5 B: MP 1.9 to MP 4.4

Figure 62
Segment 5-Section B: Existing Scenario (Facing Southeast)

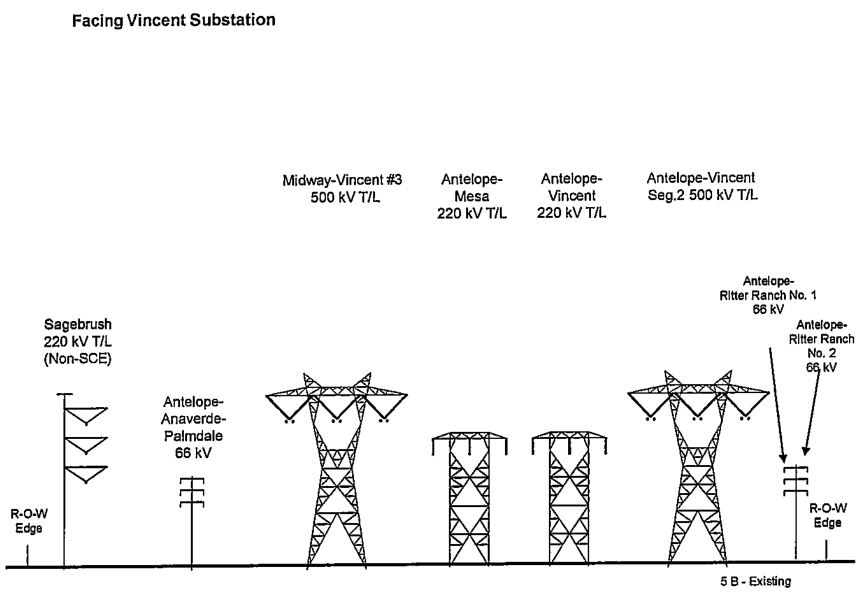
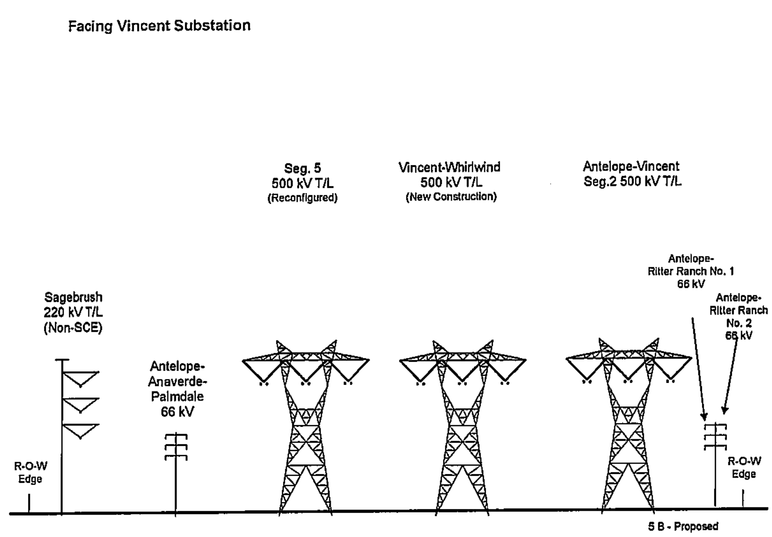


Figure 63
Segment 5-Section B: Proposed Scenario (Facing Southeast)



3. Segment 5 C: MP 4.4 to MP 8.0

Figure 64
Segment 5-Section C: Existing Scenario (Facing Southeast)

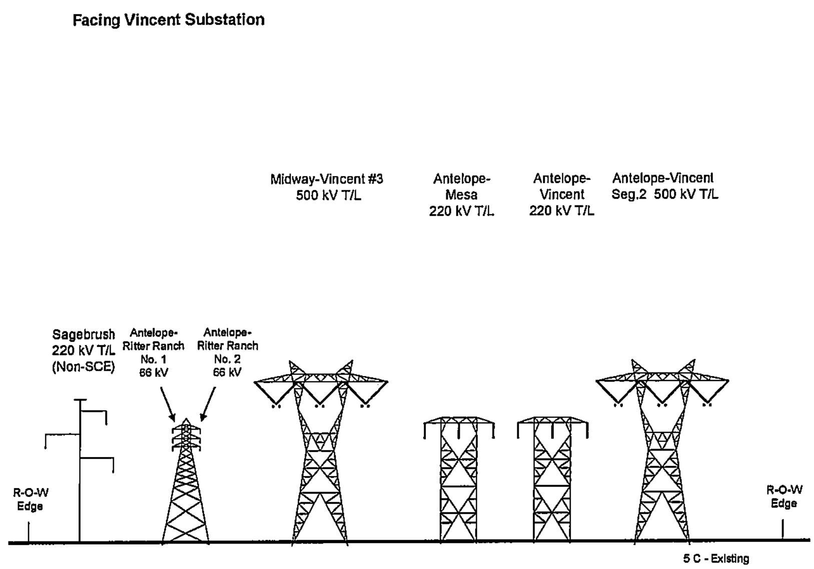
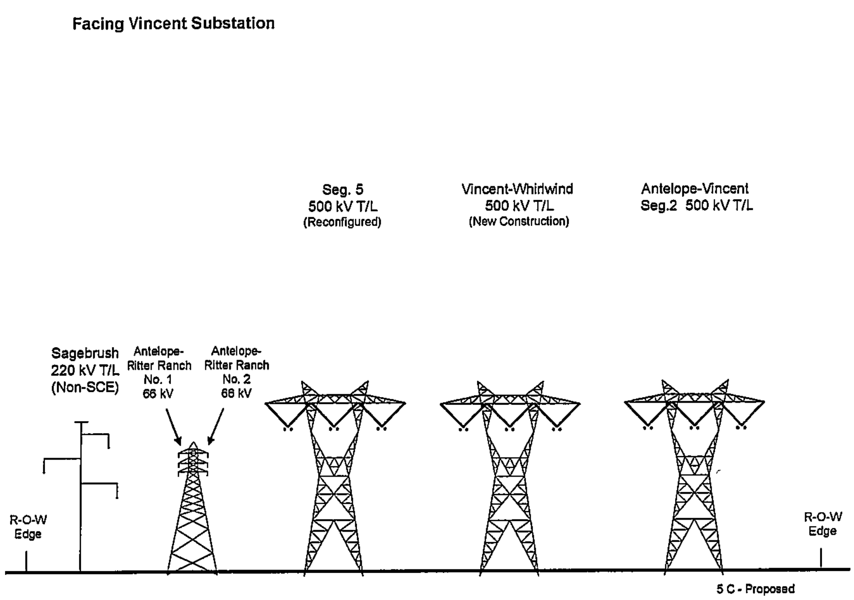


Figure 65
Segment 5-Section C: Proposed Scenario (Facing Southeast)



4. Segment 5 D: MP 8 to MP 11

Figure 66
Segment 5-Section D: Existing Scenario (Facing Southeast)

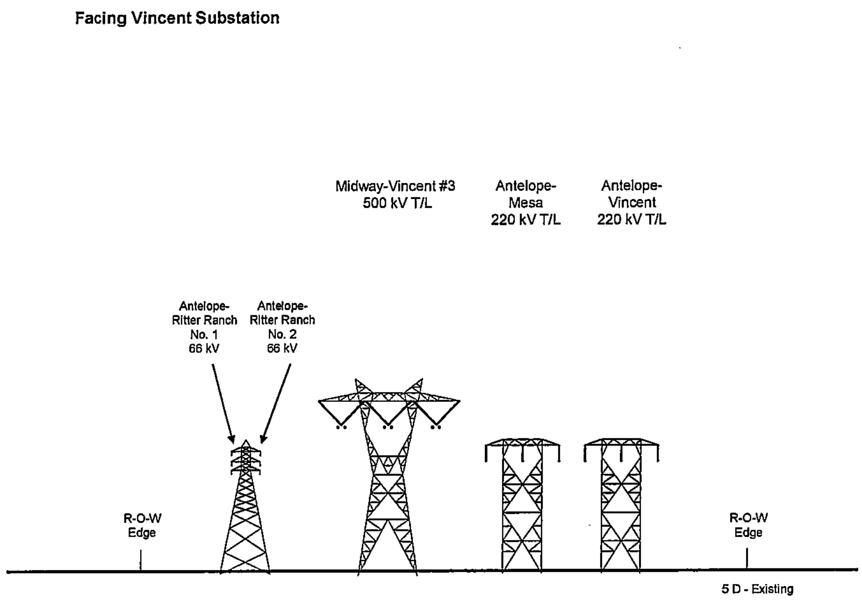
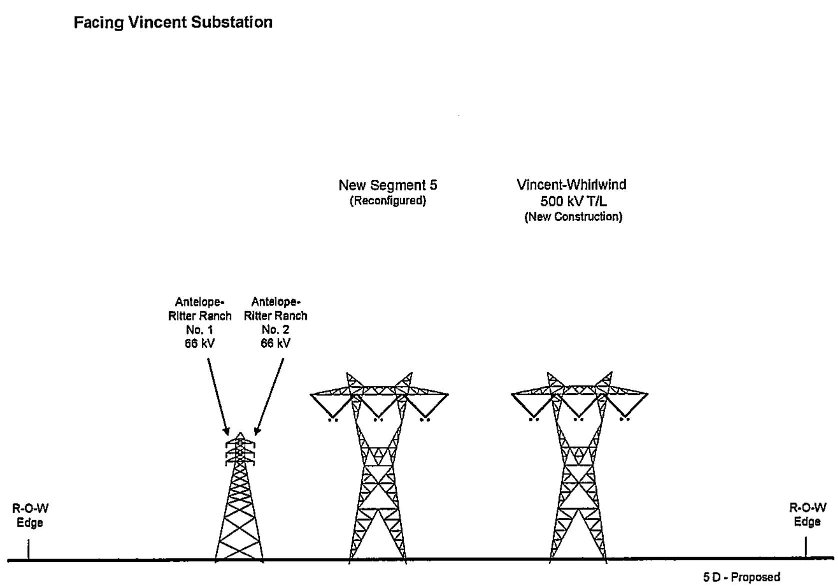


Figure 67
Segment 5 - Section D: Proposed Scenario (Facing Southeast)



5. Segment 5 E: MP 11 to MP 15.7

Figure 68
Segment 5-Section E: Existing Scenario (Facing Southeast)

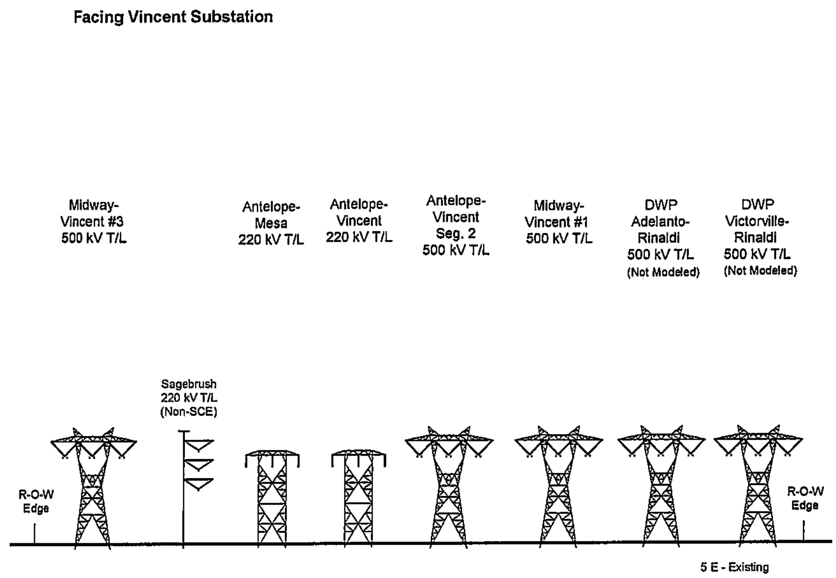
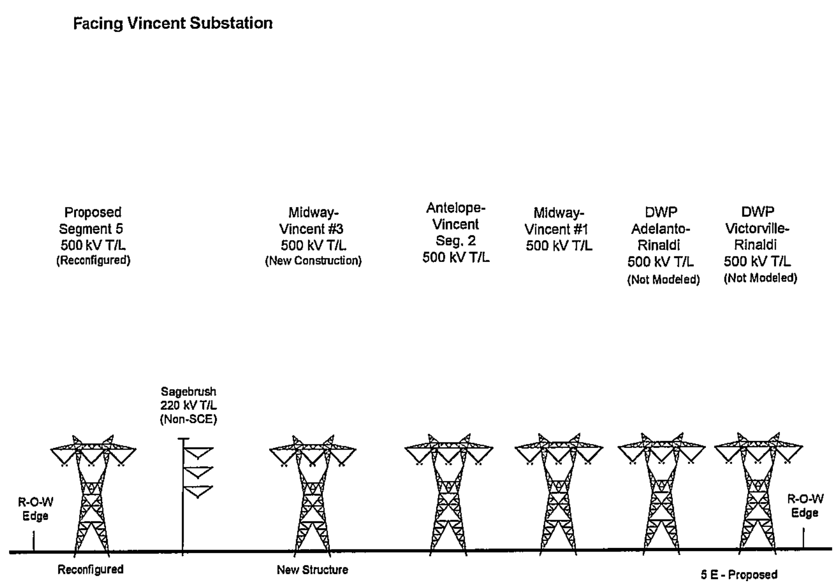


Figure 69
Segment 5-Section E: Proposed Scenario (Facing Southeast)



6. Segment 5 F: MP 15.7 to MP 17.3

Figure 70
Segment 5-Section F: Existing Scenario (Facing Southeast)

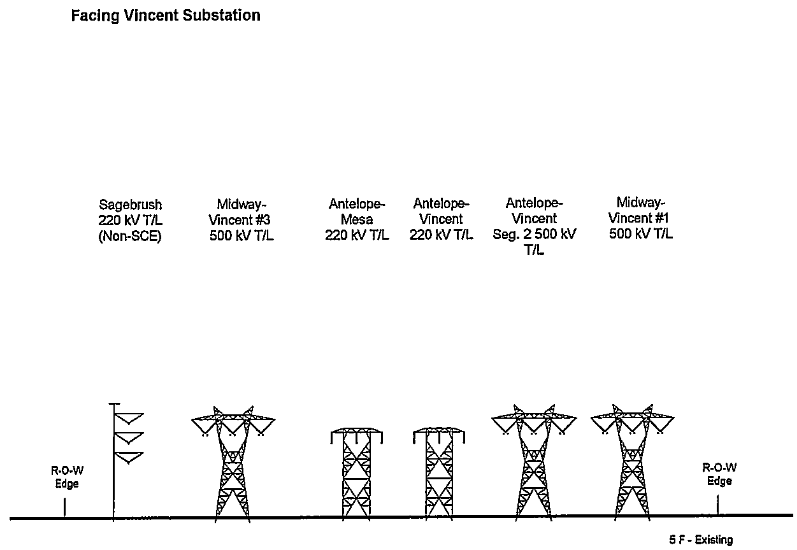
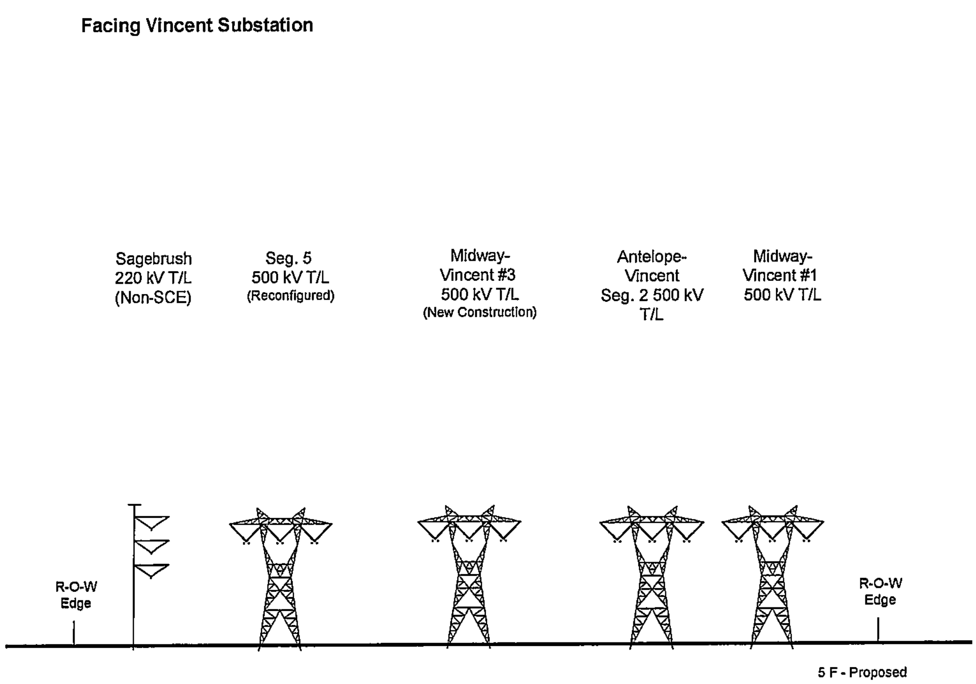


Figure 71
Segment 5-Section F: Proposed Scenario (Facing Southeast)



7. Segment 5 G: MP 17.3 to MP 17.8 (Vincent Substation)

Figure 72
Segment 5 - Section G: Existing Scenario (Facing Southeast)

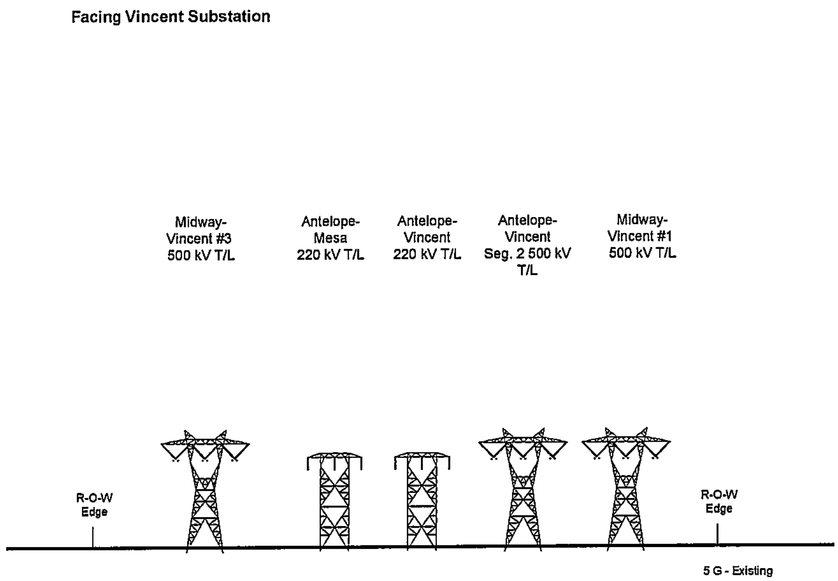
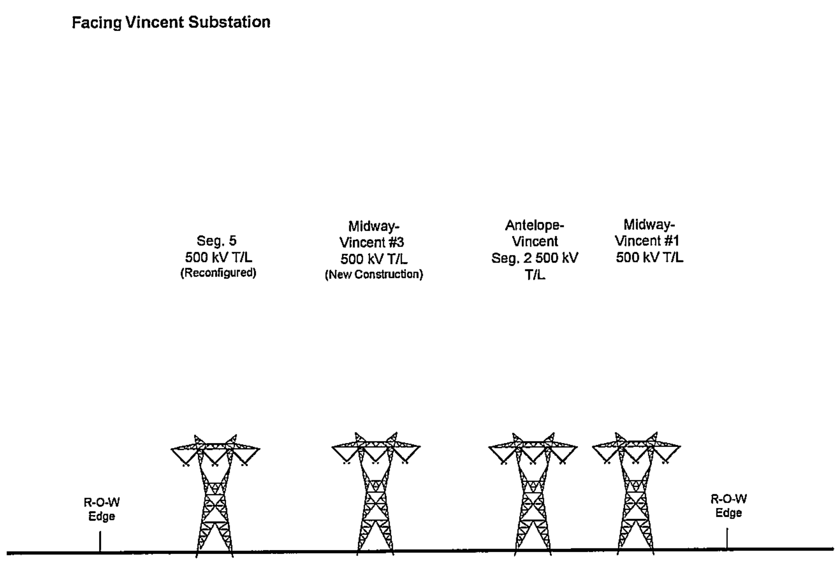


Figure 73
Segment 5 - Section G: Proposed Scenario (Facing Southeast)



C. Segment 6

1. Segment 6 and 11 A: Seg. 6 MP 0 to MP 0.6 and Seg. 11 MP 0 to MP 0.9

Figure 74
Segment 6 and 11 - Section A: Existing Scenario (Facing South)

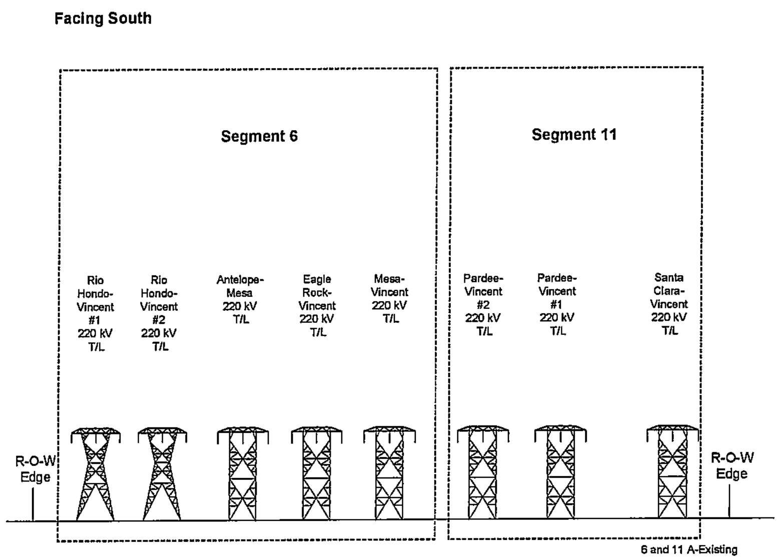
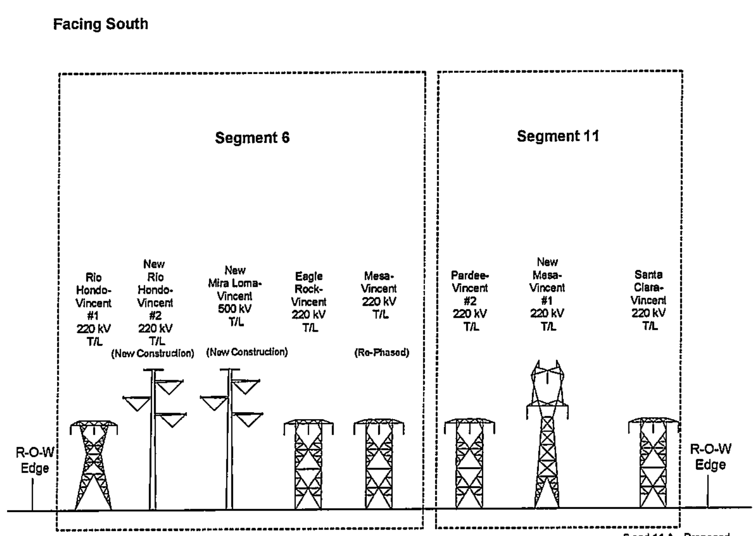


Figure 75
Segment 6 and 11 - Section A: Proposed Scenario (Facing South)



2. Segment 6 B: MP 0 T5 to MP 4 T3

Figure 76
Segment 6 - Section B: Existing Scenario (Facing Southeast)

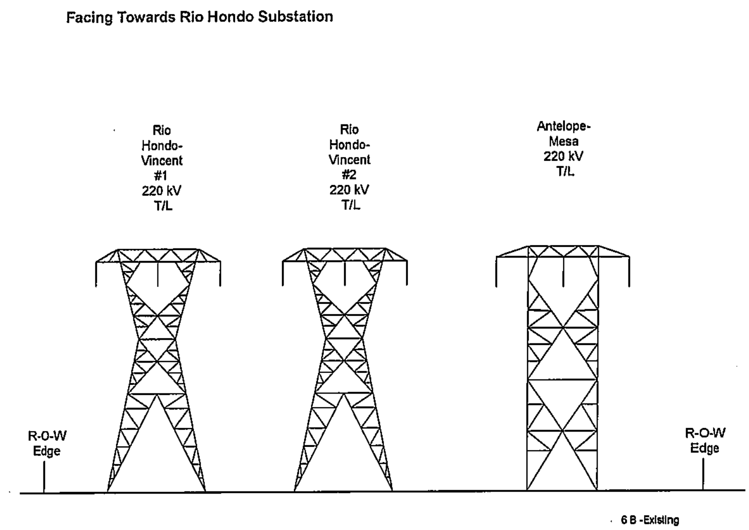


Figure 77
Segment 6 - Section B: Proposed Scenario - TSPs (Facing Southeast)

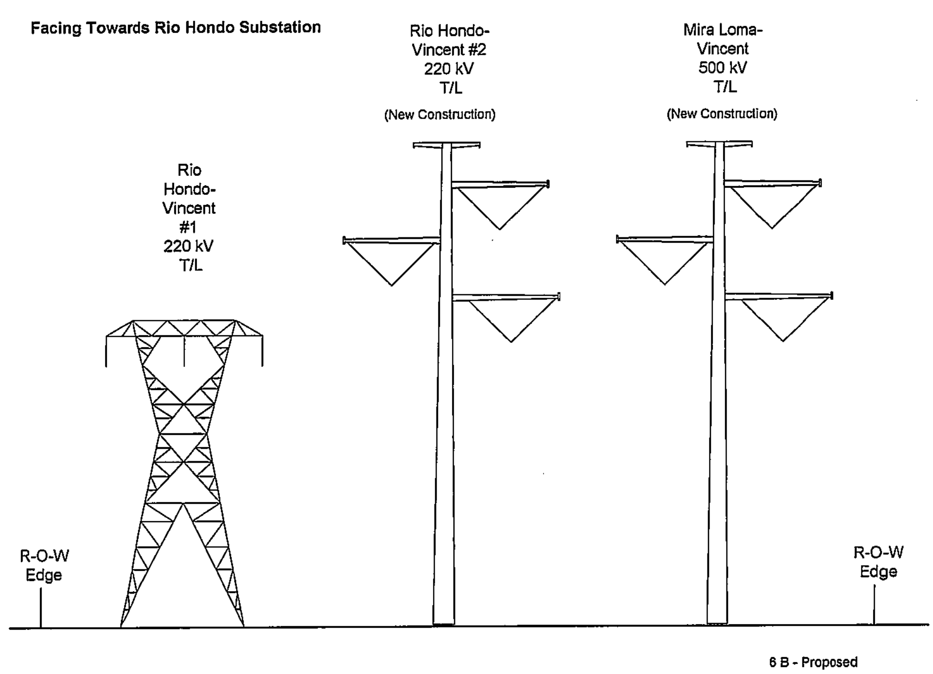
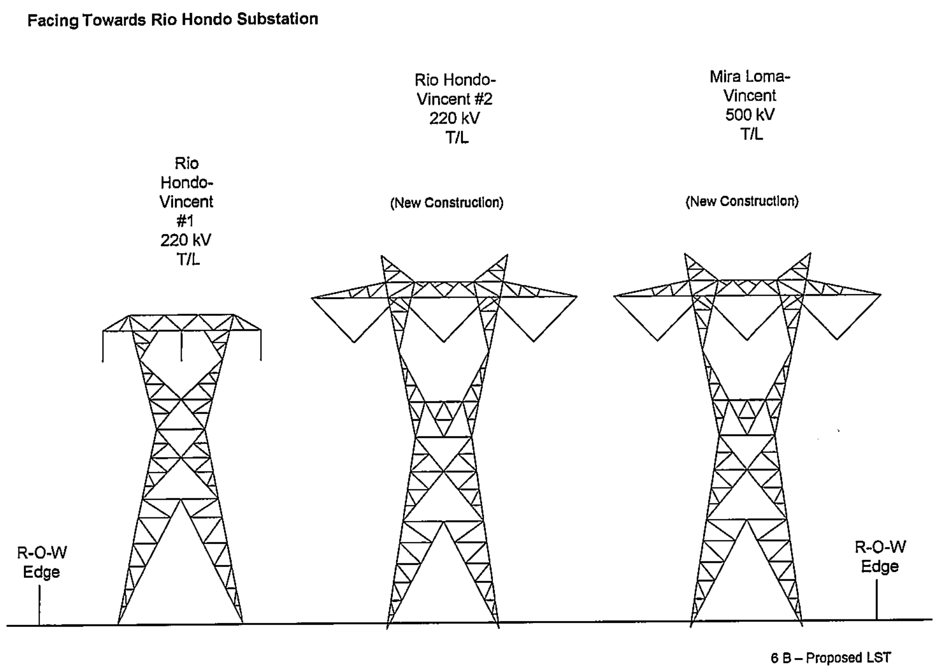


Figure 78
Segment 6 - Section B: Proposed Scenario - LSTs (Facing Southeast)



3. Segment 6 C: MP 5 T1 to MP 6 T4

Figure 79
Segment 6 - Section C: Existing Scenario (Facing Southeast)

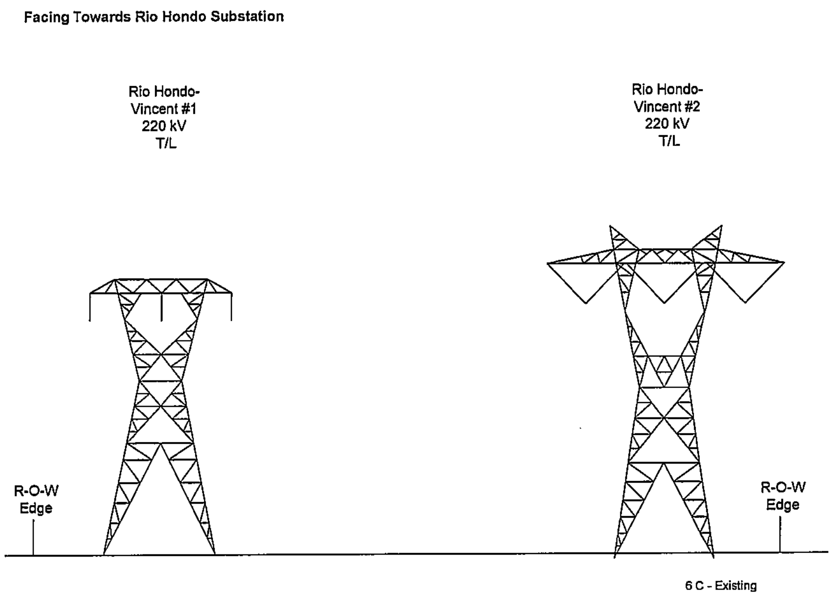
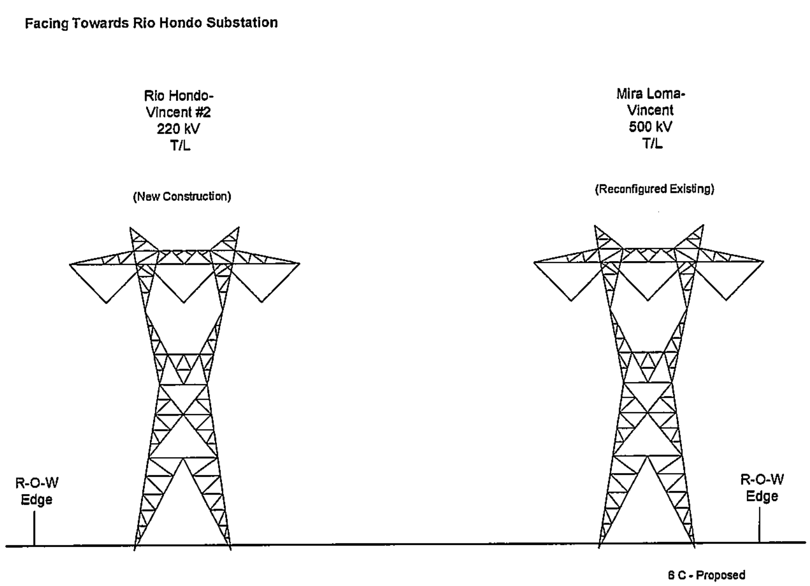


Figure 80
Segment 6 - Section C: Proposed Scenario (Facing Southeast)



4. Segment 6 D: MP 7 T4

Figure 81
Segment 6 - Section D: Existing Scenario (Facing Southeast)

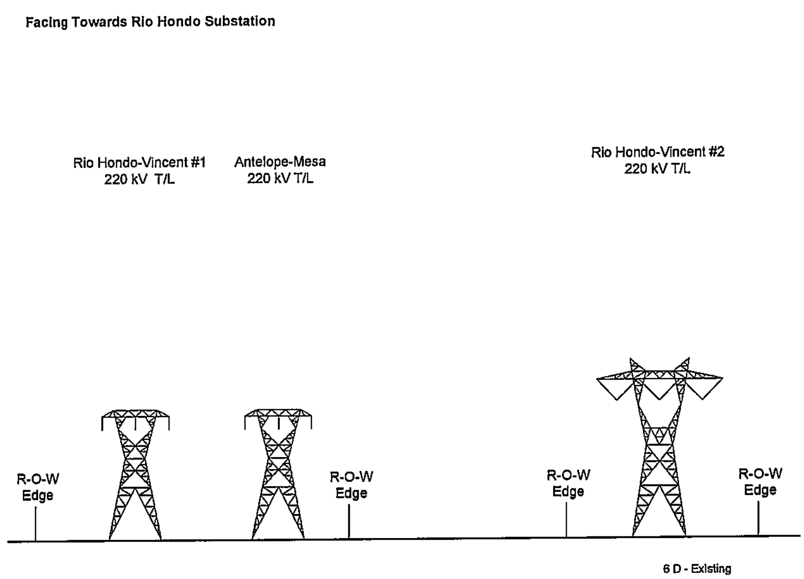
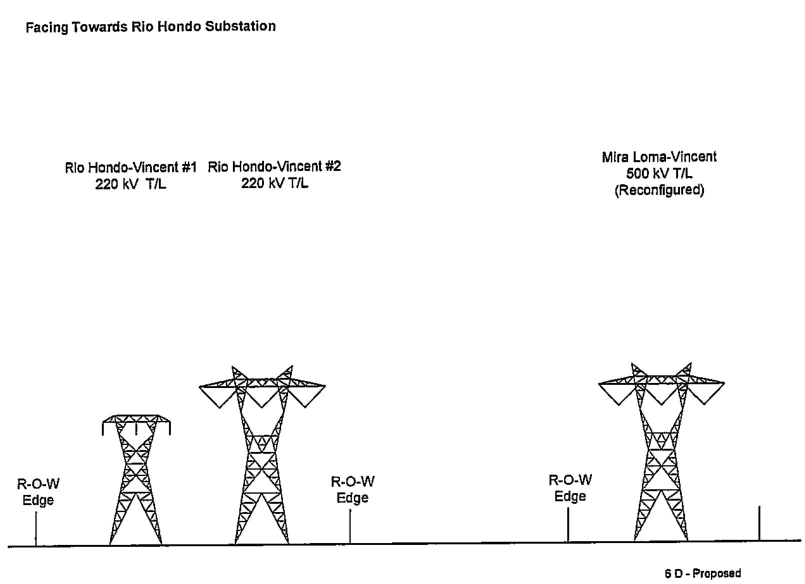


Figure 82
Segment 6 - Section D: Proposed Scenario (Facing Southeast)



5. **<u>Segment 6 E: MP 9 T3 to MP 26 T5</u>**

Figure 83
Segment 6 - Section E: Existing Scenario (Facing South and Southeast)

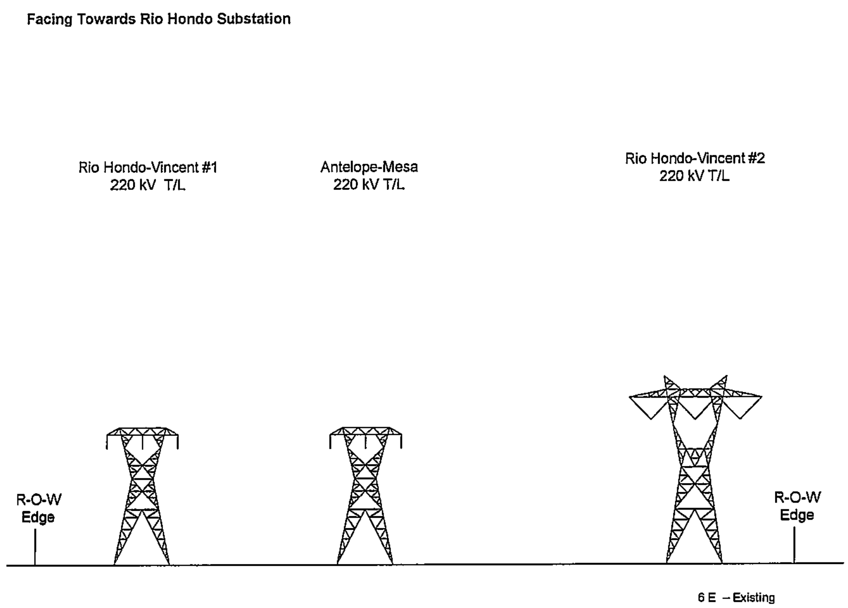
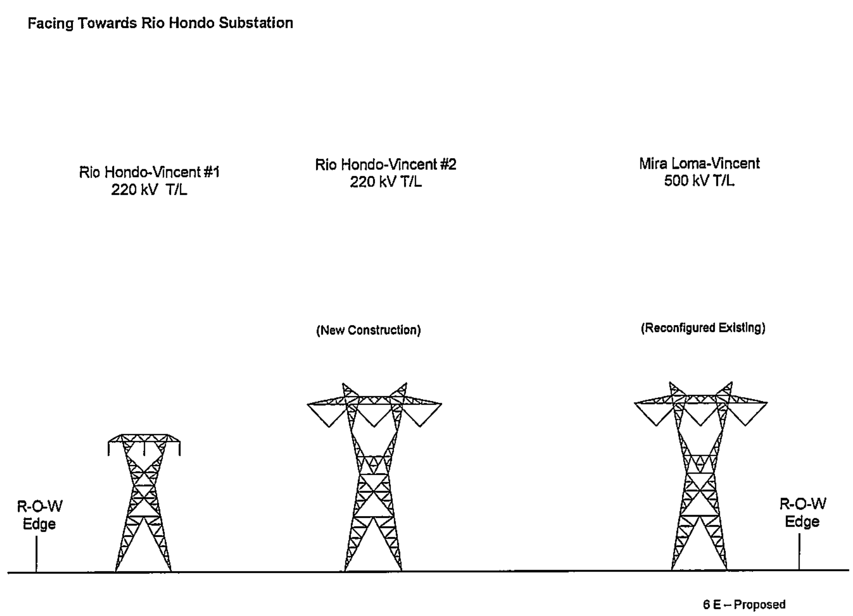


Figure 84
Segment 6 – Section E: Proposed Scenario (Facing South and Southeast)



D. Segment 7

1. Segment 7A: MP 0 to MP 5 (Rio Hondo Substation)

Figure 85
Segment 7-Section A: Existing Scenario (Facing South)

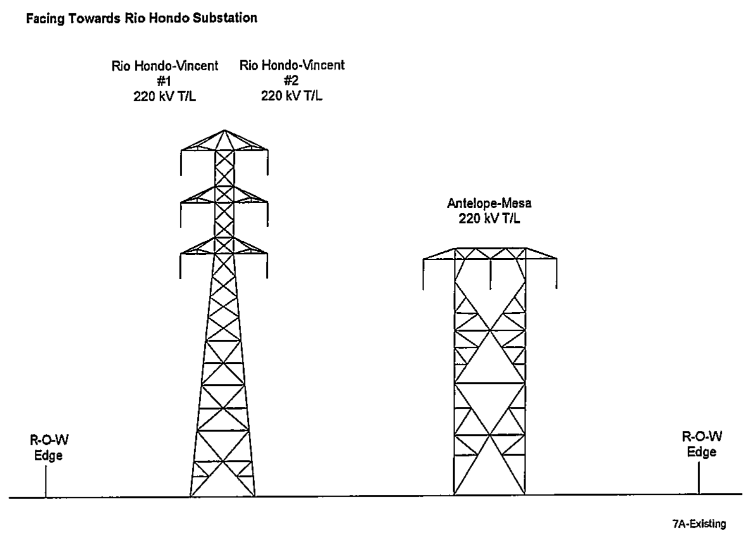


Figure 86
Segment7-Section A: Proposed Scenario – LSTs (Facing South)

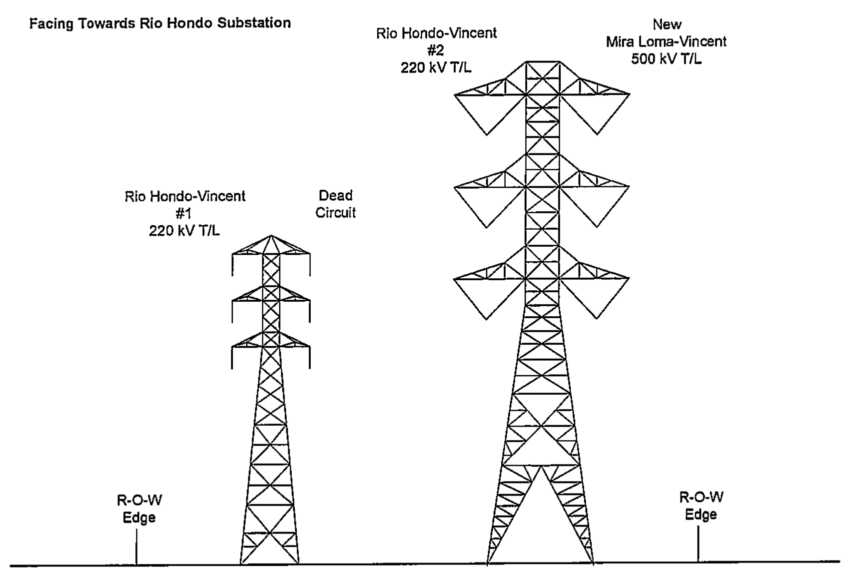
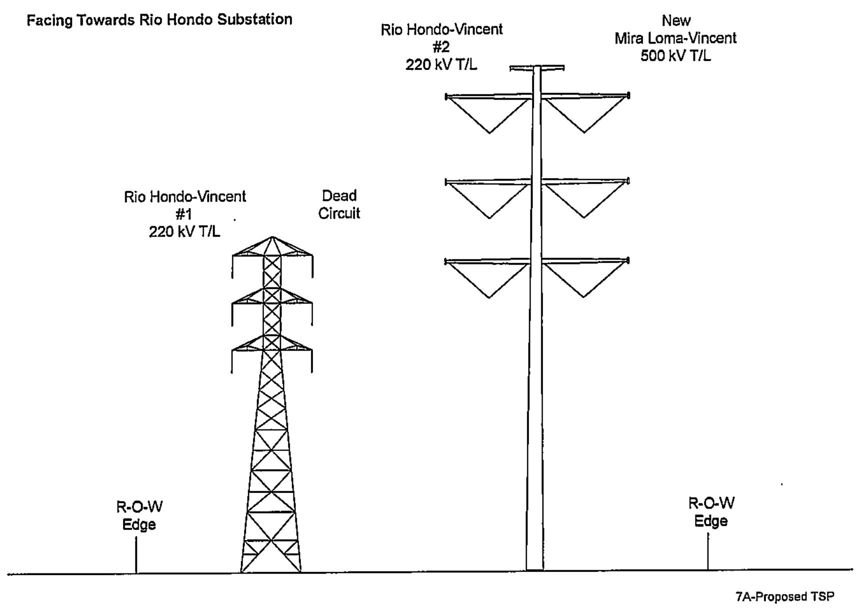


Figure 87
Segment7-Section A: Proposed Scenario – TSPs (Facing South)



2. Segment 7B: MP 5 (Rio Hondo Substation) to MP 7.6

Figure 88
Segment 7-Section B: Existing Scenario (Facing South)

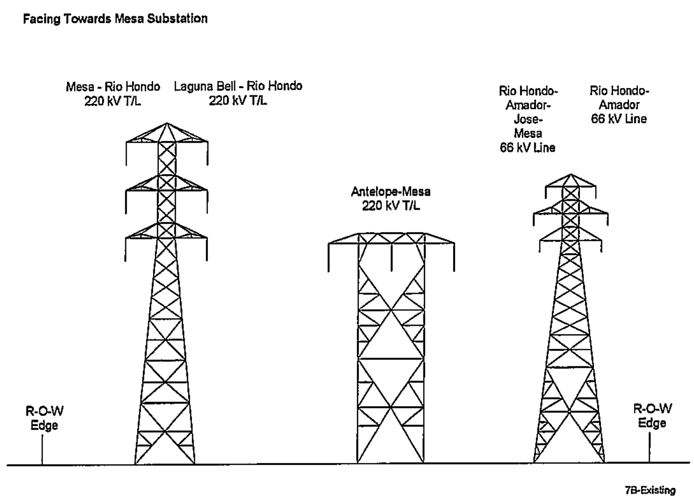
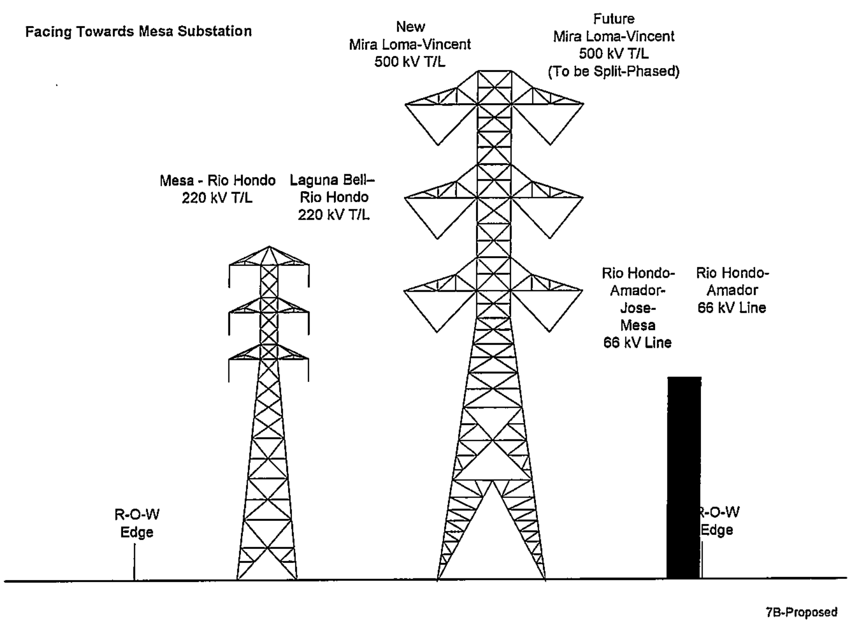


Figure 89
Segment 7-Section B: Proposed Scenario (Facing South)



3. <u>Segment 7C: MP 7.6 to MP 11.6</u>

Figure 90
Segment 7-Section C: Existing Scenario (Facing South)

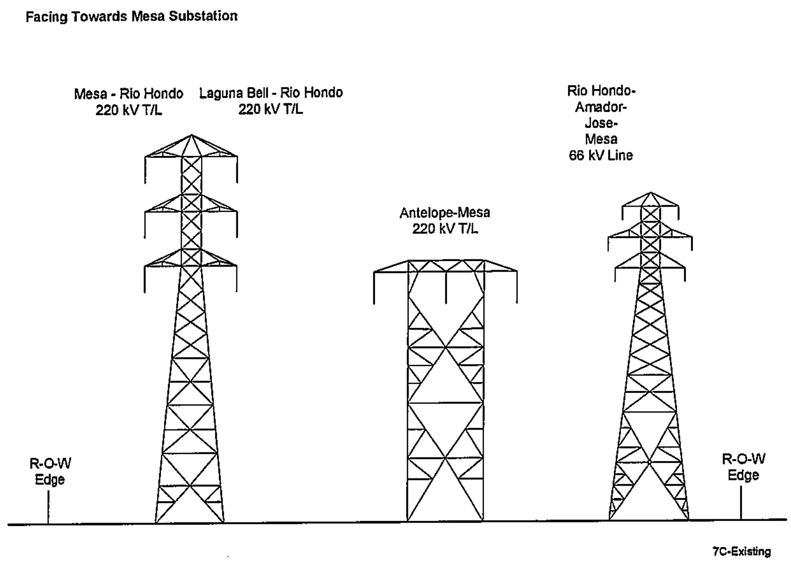
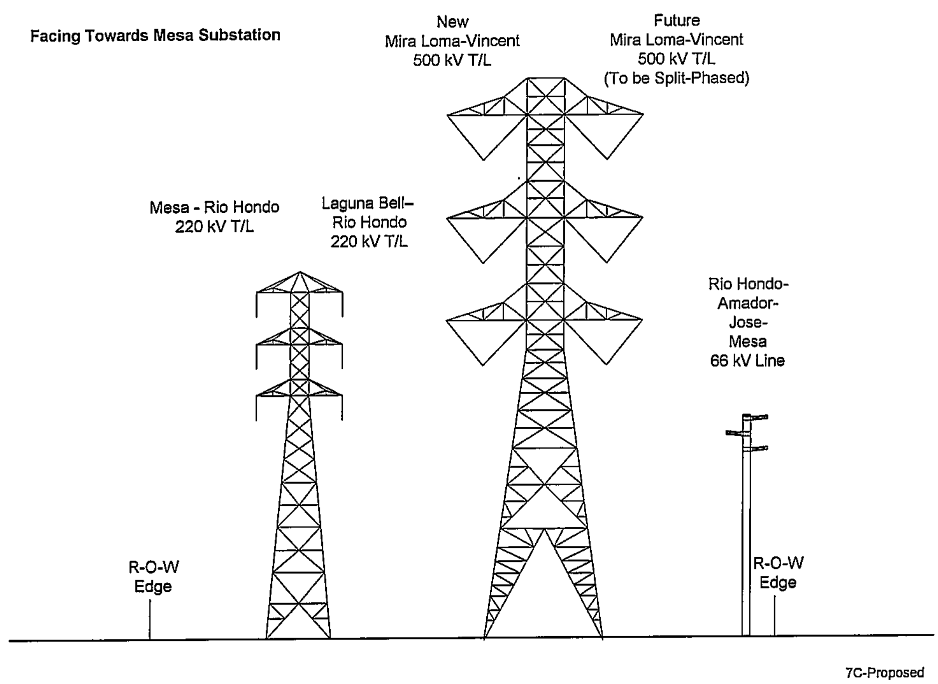


Figure 91
Segment 7-Section C: Proposed Scenario (Facing South)



4. Segment 7D: MP 11.6 to MP 13

Figure 92
Segment 7-Section D: Existing Scenario (Facing West)

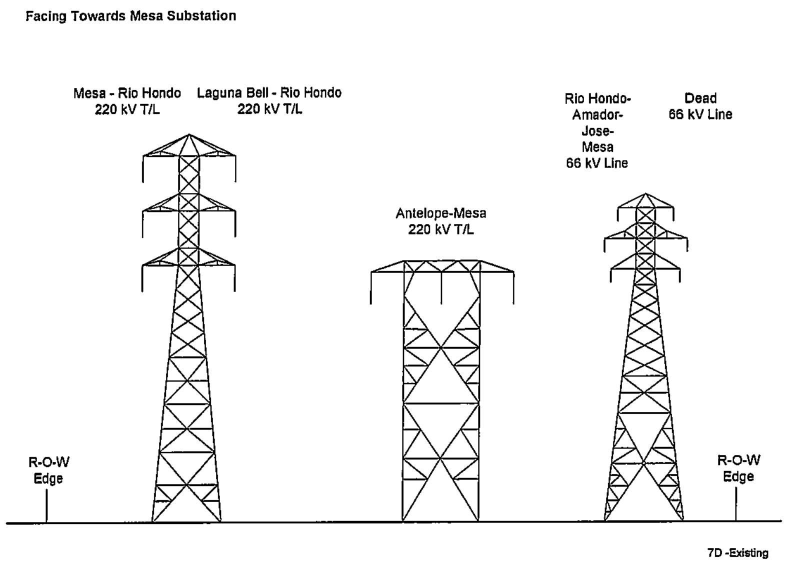
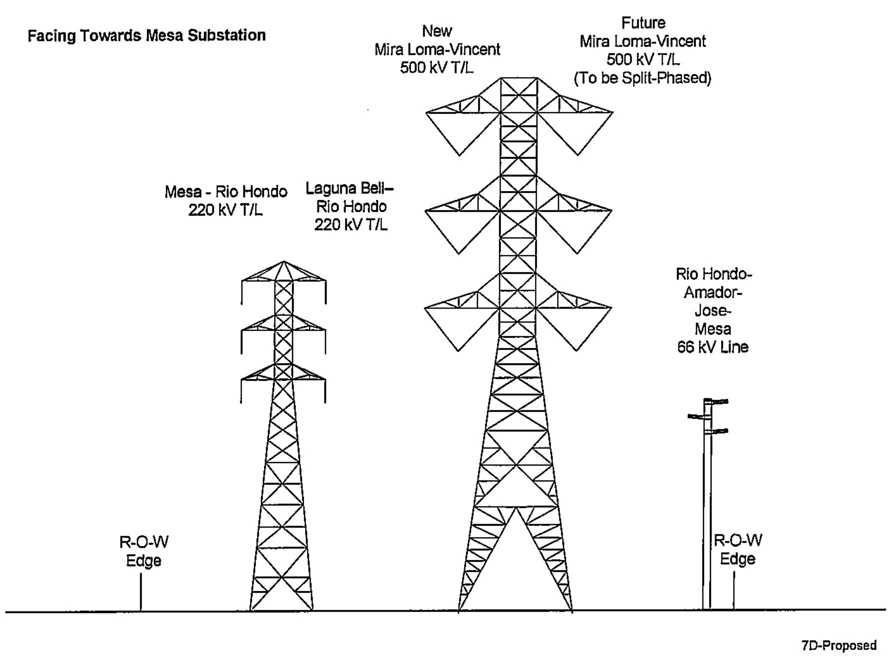


Figure 93
Segment 7-Section D: Proposed Scenario (Facing West)



5. Segment 7E: MP 13 to MP 15.8

Figure 94
Segment 7-Section E: Existing Scenario (Facing West)

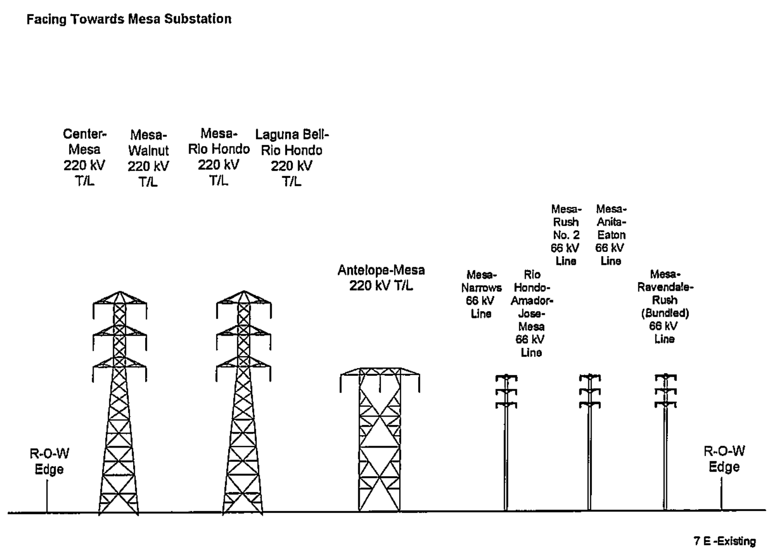
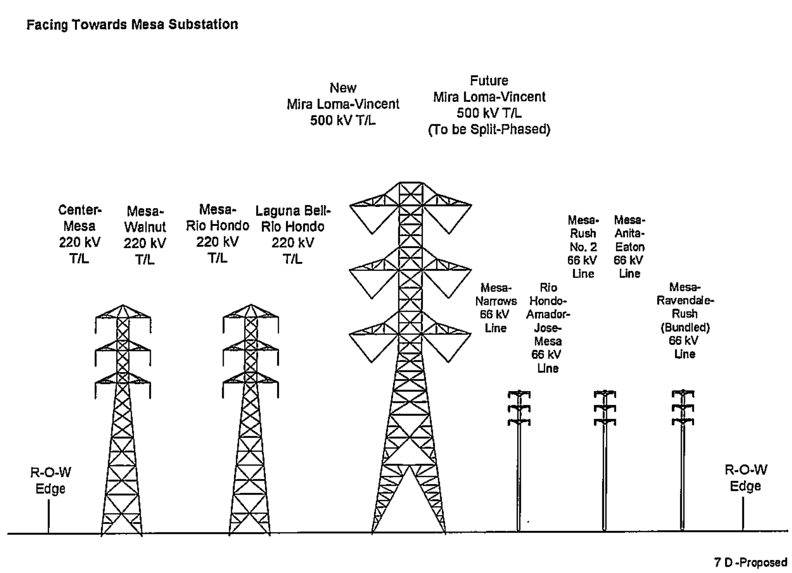


Figure 95
Segment 7-Section E: Proposed Scenario (Facing West)



E. Segment 8

1. Segment 8A: MP 2.3 (the "San Gabriel Junction") to MP 4.4

Figure 96
Segment 8-Section A: Existing Scenario (Facing East)

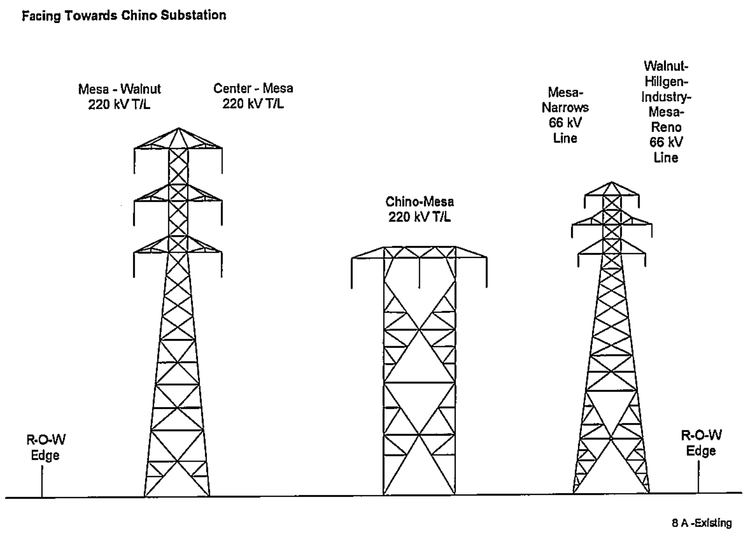
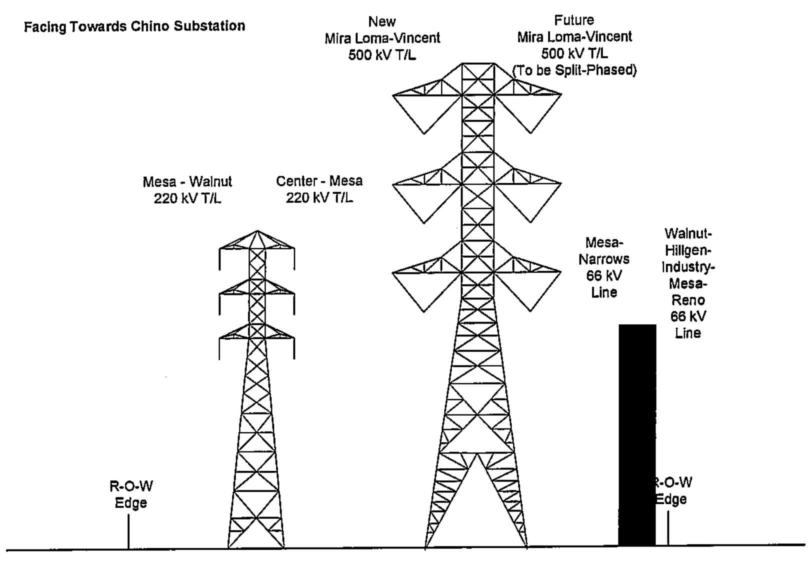


Figure 97
Segment 8-Section A: Proposed Scenario (Facing East)



2. Segment 8B: MP 4.4 to MP 9.0

Figure 98
Segment 8-Section B: Existing Scenario (Facing East and Southeast)

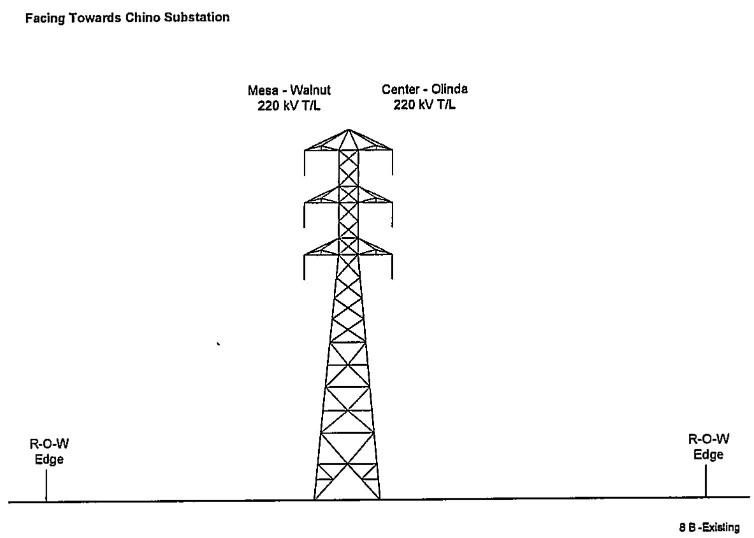
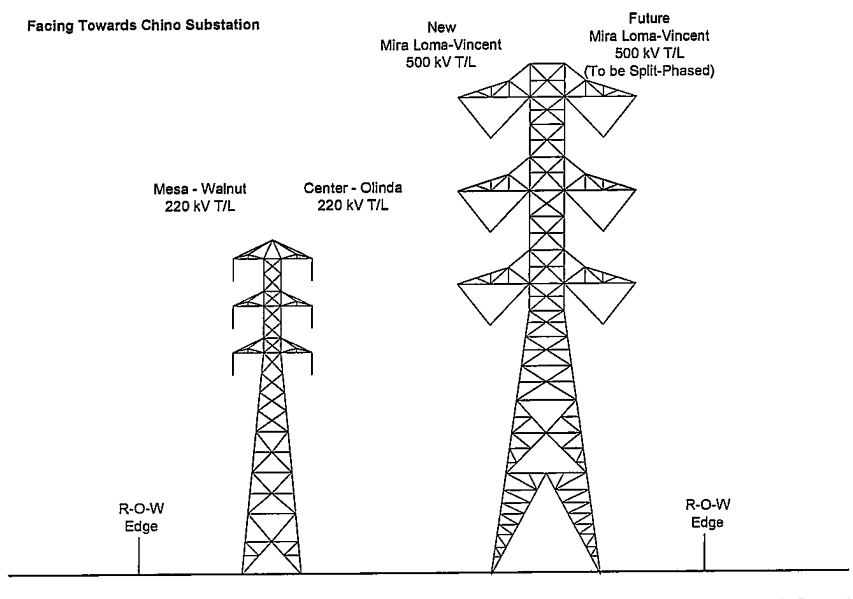


Figure 99
Segment 8-Section B: Proposed Scenario (Facing East and Southeast)



3. Segment 8C: MP 9.0 to MP 9.7

Figure 100
Segment 8-Section C: Existing Scenario (Facing East)

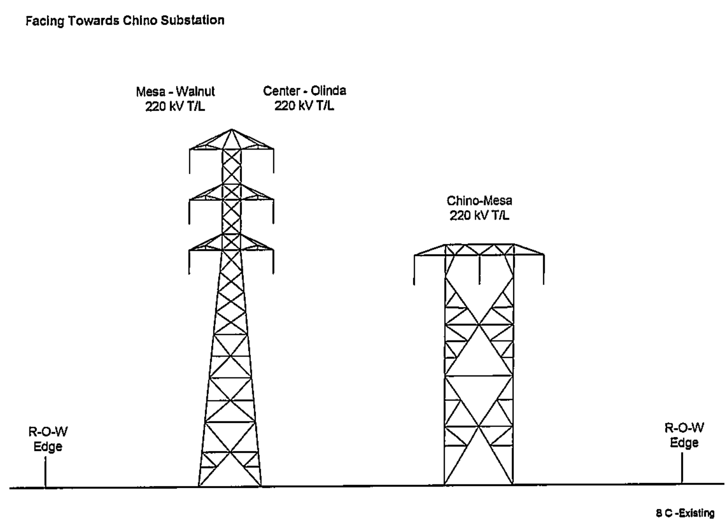
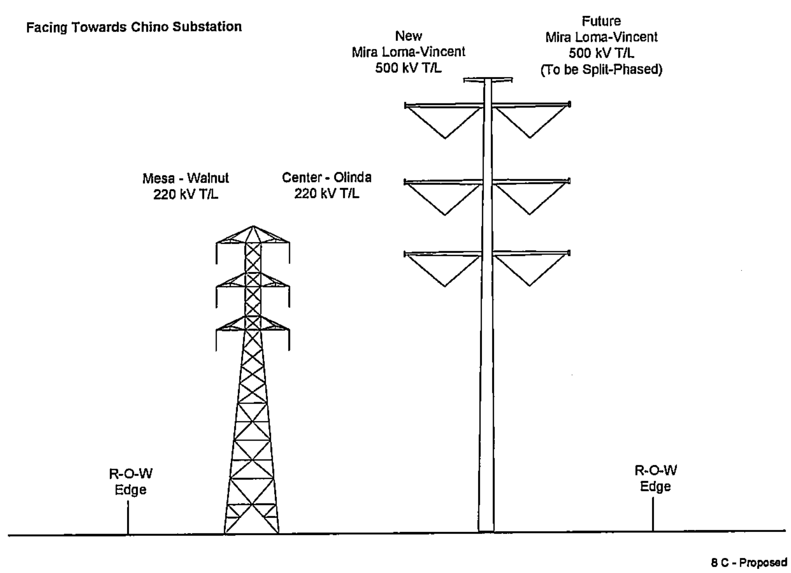


Figure 101
Segment 8-Section C: Proposed Scenario (Facing East)



4. Segment 8D: MP 9.7 to MP 11.2

Figure 102
Segment 8-Section D: Existing Scenario (Facing East)

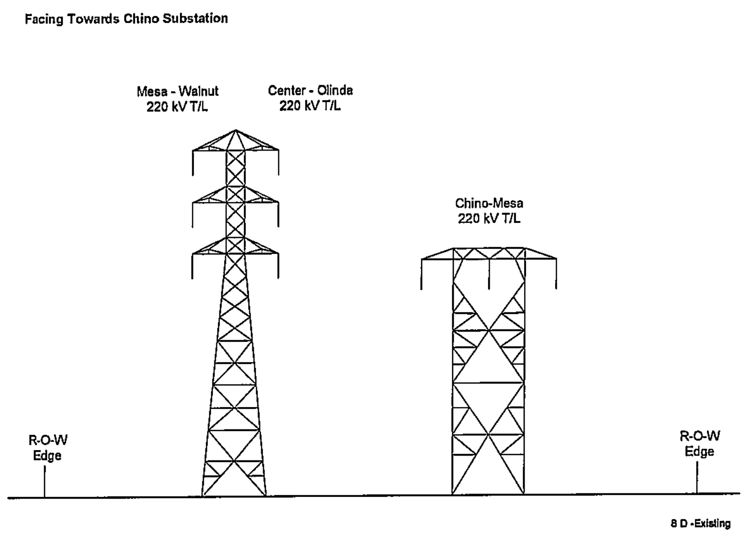
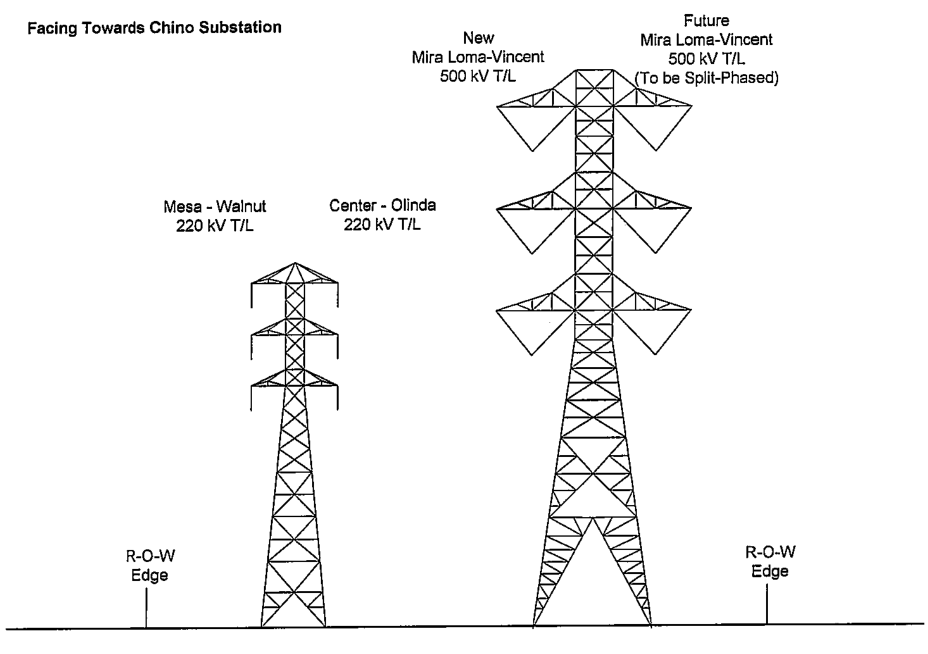


Figure 103
Segment 8-Section D: Proposed Scenario (Facing East)



5. Segment 8 E: MP 11.2 to MP 13.3

Figure 104
Segment 8-Section E: Existing Scenario (Facing East)

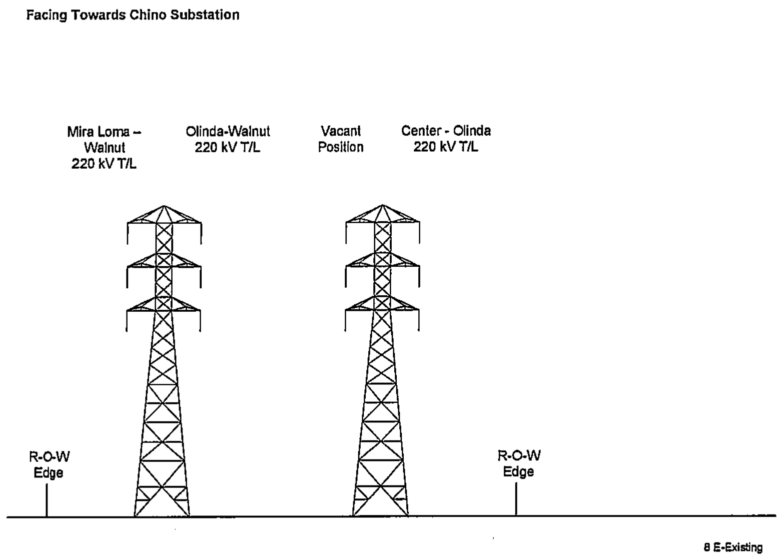
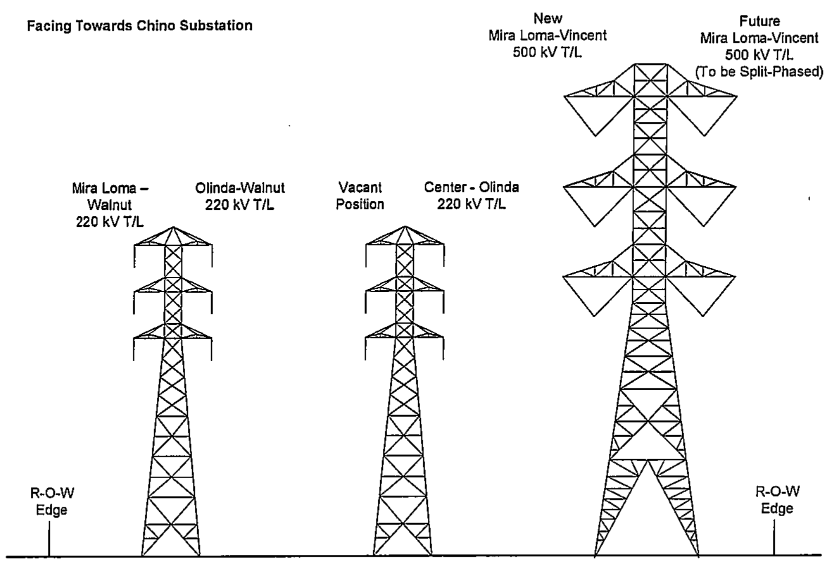


Figure 105
Segment 8-Section E: Proposed Scenario (Facing East)



6. Segment 8F: MP 13.3 to MP 13.5

Figure 106
Segment 8-Section F: Existing Scenario (Facing East)

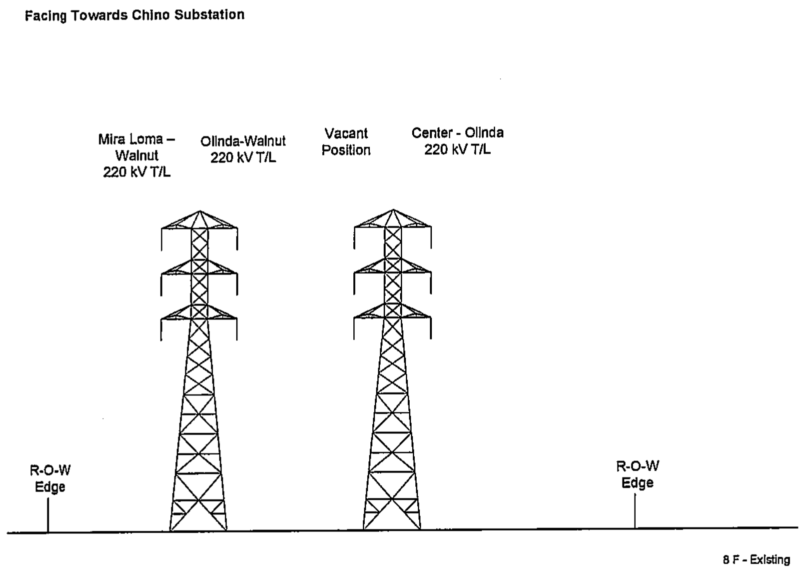
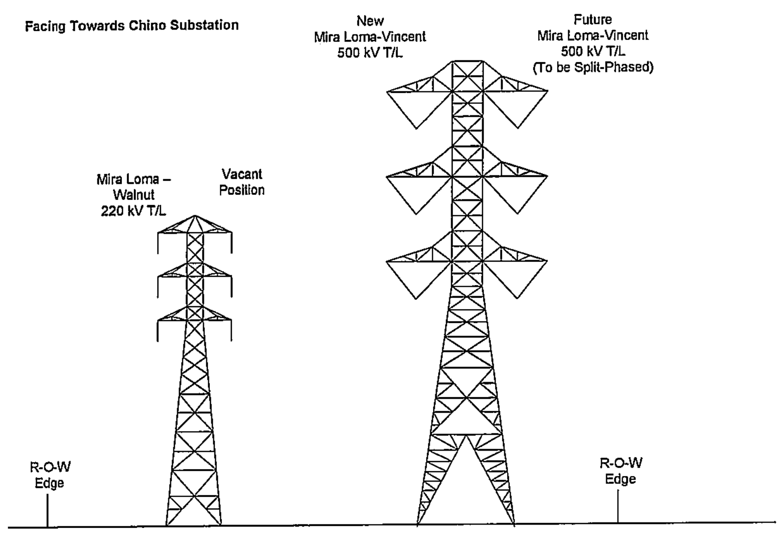


Figure 107
Segment 8-Section F: Proposed Scenario (Facing East)



7. Segment 8 G: MP 13.5 to MP 19.3

Figure 108
Segment 8-Section G: Existing Scenario (Facing East)

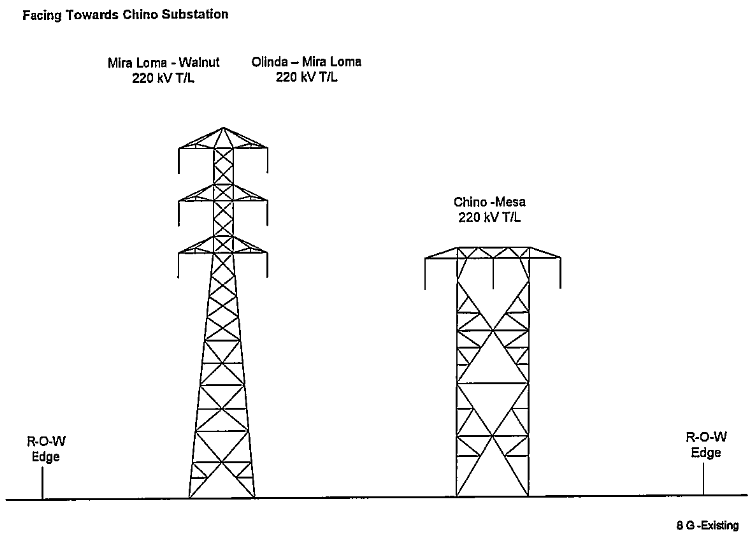
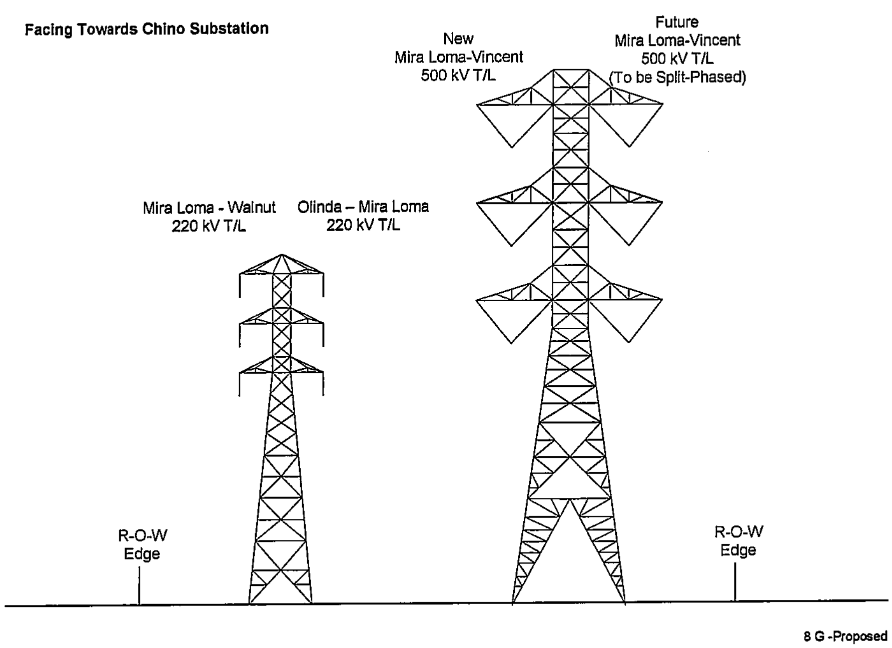


Figure 109
Segment 8-Section G: Proposed Scenario (Facing East)



8. Segment 8H: MP 19.3 to MP 22.7

Figure 110
Segment 8-Section H: Existing Scenario (Facing East)

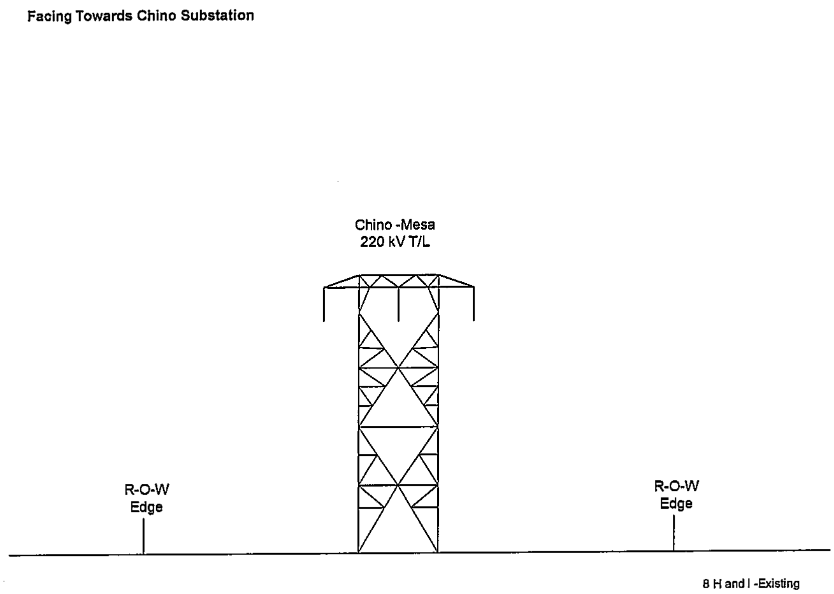
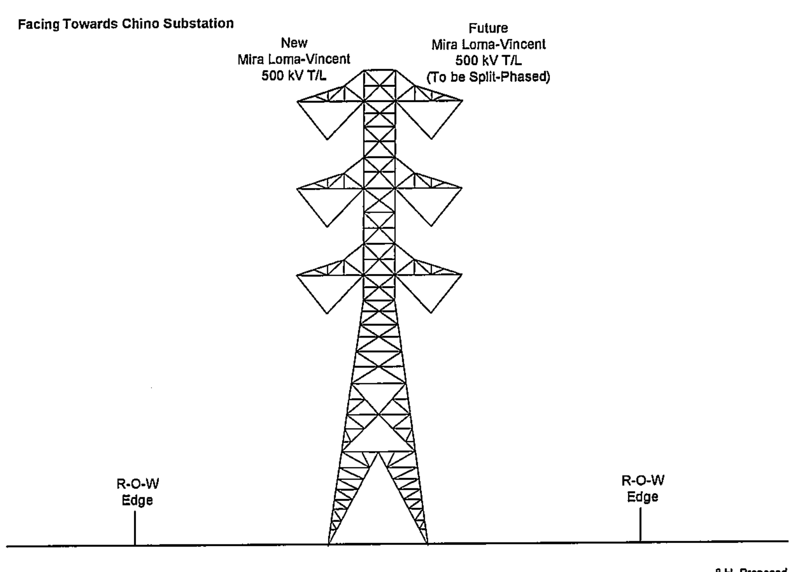


Figure 111
Segment 8-Section H: Proposed Scenario (Facing East)



9. Segment 8I: MP 22.7 to MP 26.9

Figure 112
Segment 8-Section I: Existing Scenario (Facing East)

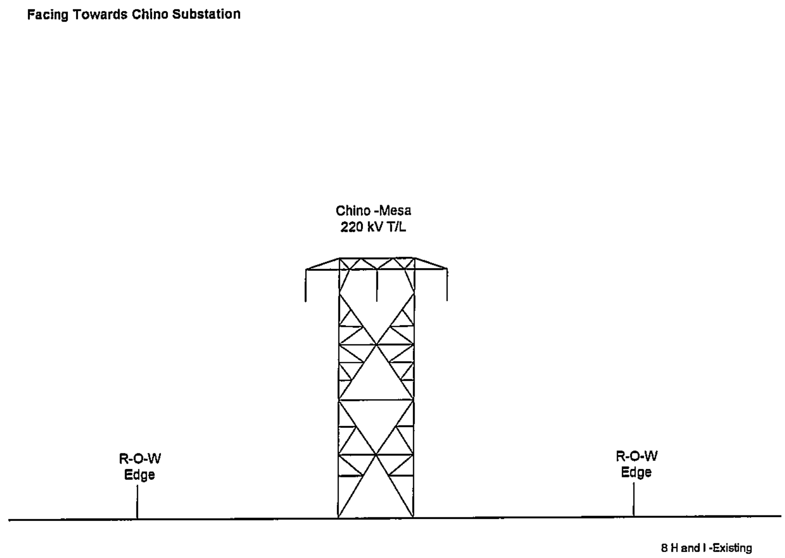
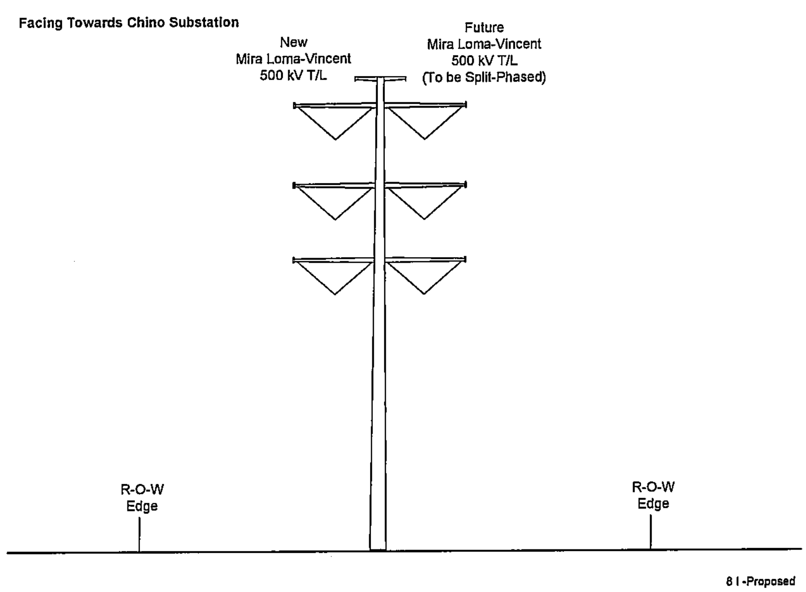


Figure 113
Segment 8-Section I: Proposed Scenario (Facing East)



10. Segment 8J: MP 26.9 to MP 27.6

Figure 114
Segment 8 – Section J: Existing Scenario (Facing North)

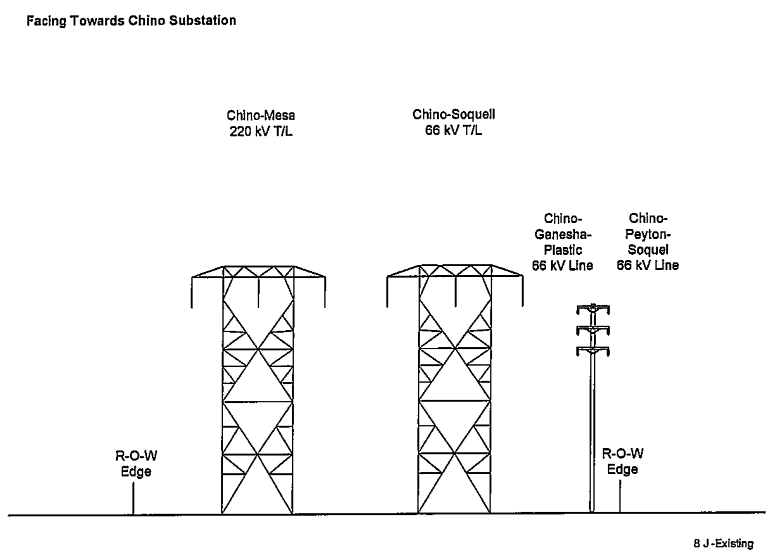
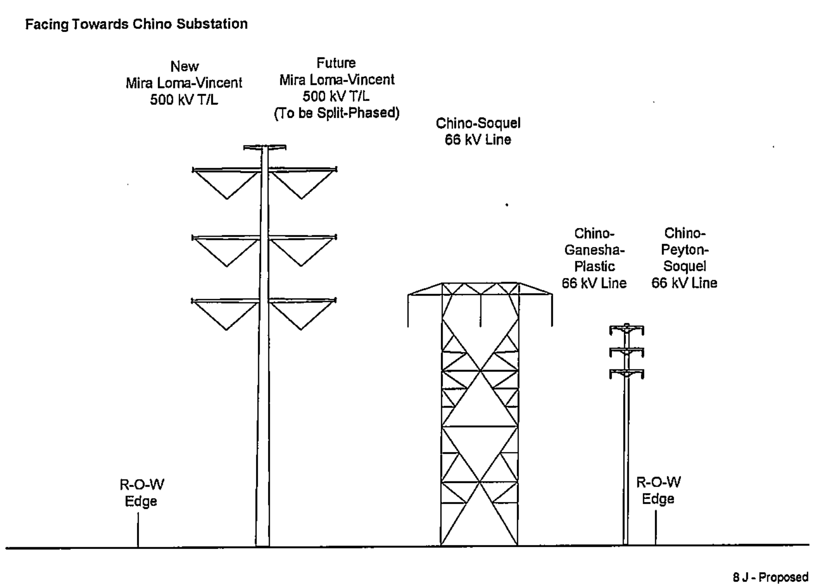


Figure 115
Segment 8-Section J: Proposed Scenario (Facing North)



11. Segment 8 K: MP 27.6 to MP 28.1

Figure 116
Segment 8-Section K: Existing Scenario (Facing East)

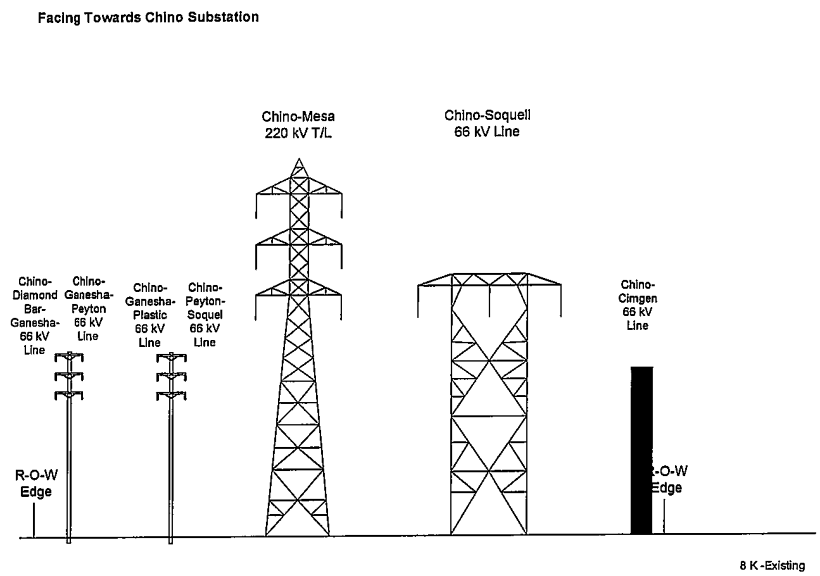
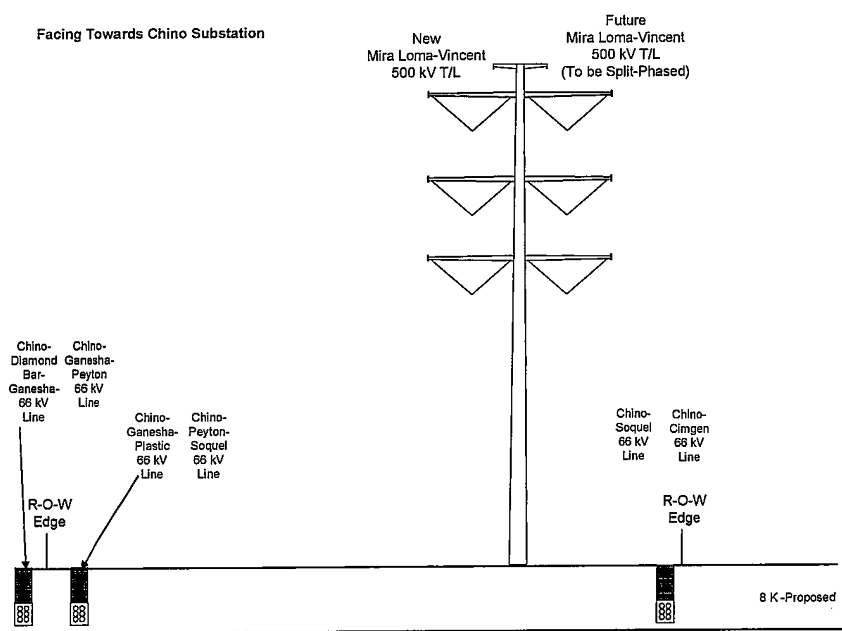


Figure 117
Segment 8-Section K: Proposed Scenario (Facing East)



12. Segment 8 L: 8A MP 28.4 to MP 28.7 and 8B MP 0 to MP 0.3

Figure 118
Segment 8-Section L: Existing Scenario (Facing East)

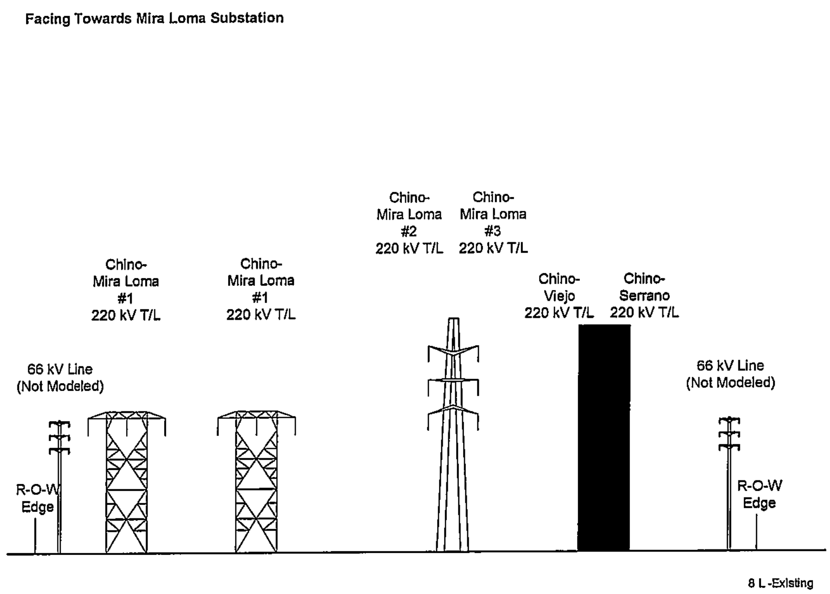
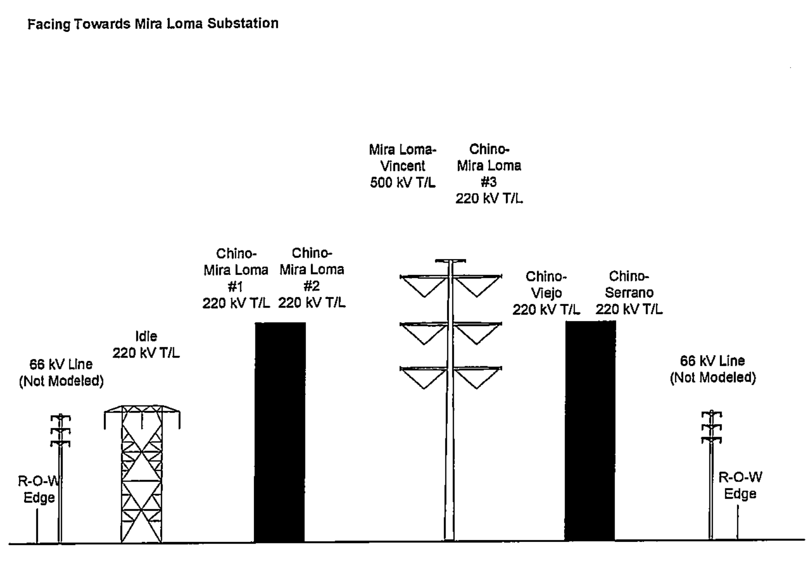


Figure 119
Segment 8-Section L: Proposed Scenario (Facing East)



13. Segment 8M : 8A MP 28.7 to MP 29.4 and 8B MP 0.3 to MP 0.7

Figure 120
Segment 8-Section M: Existing Scenario (Facing East)

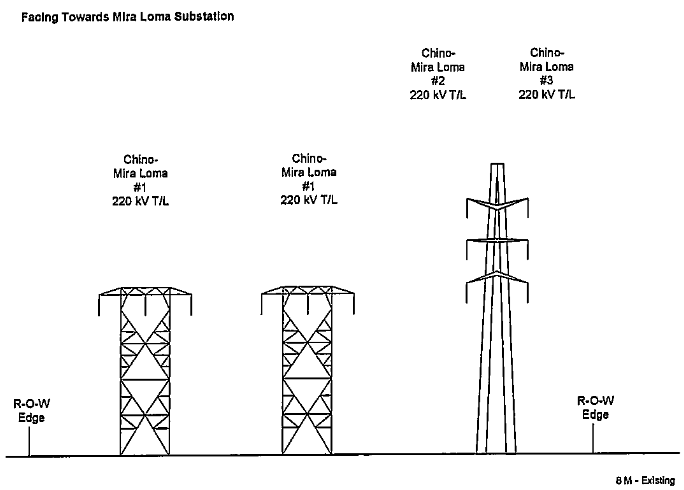
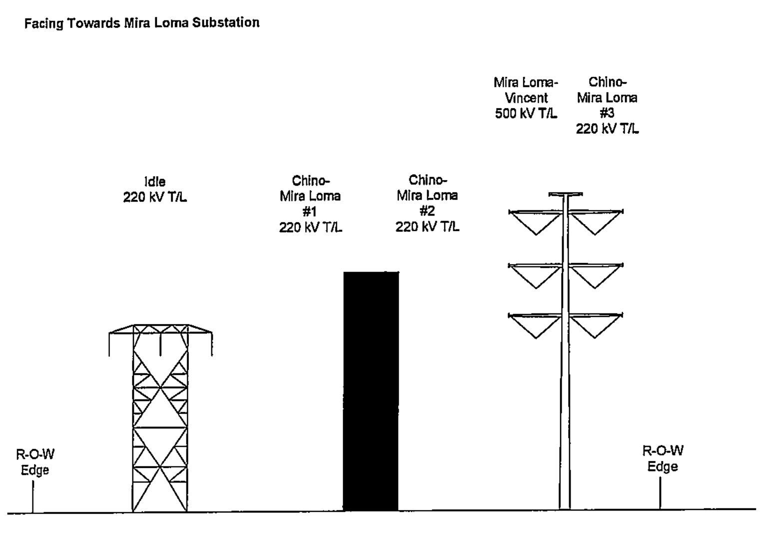


Figure 121
Segment 8-Section M: Proposed Scenario (Facing East)



14. Segment 8N : 8A MP 29.4 to MP 34

Figure 122
Segment 8-Section N: Existing Scenario (Facing East)

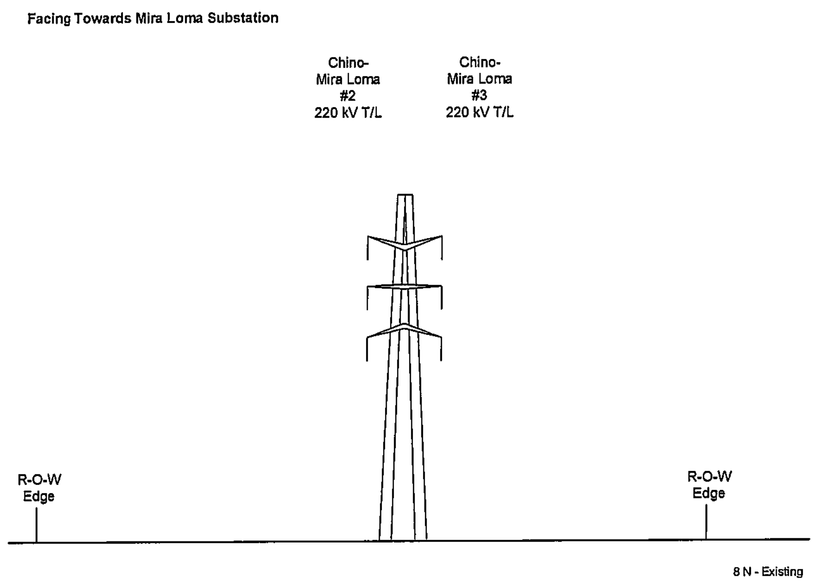


Figure 123
Segment 8-Section N: Proposed Scenario - TSP (Facing East)

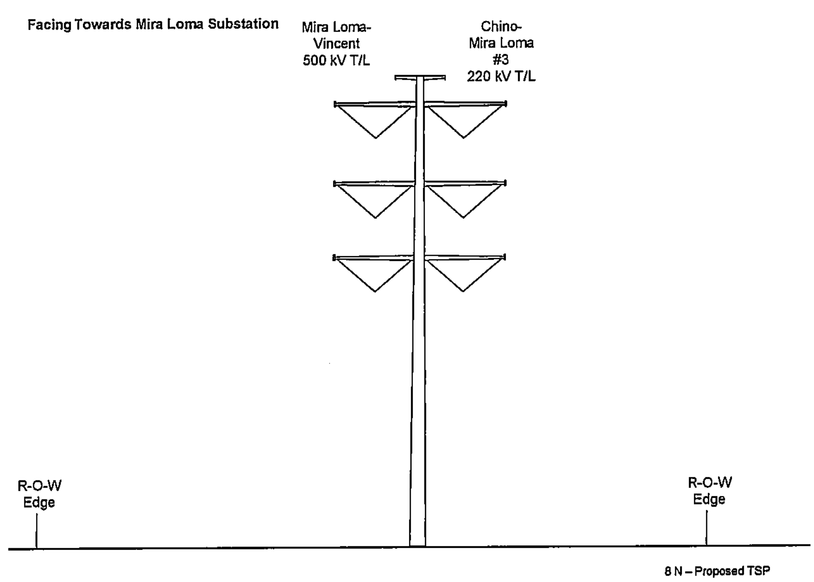
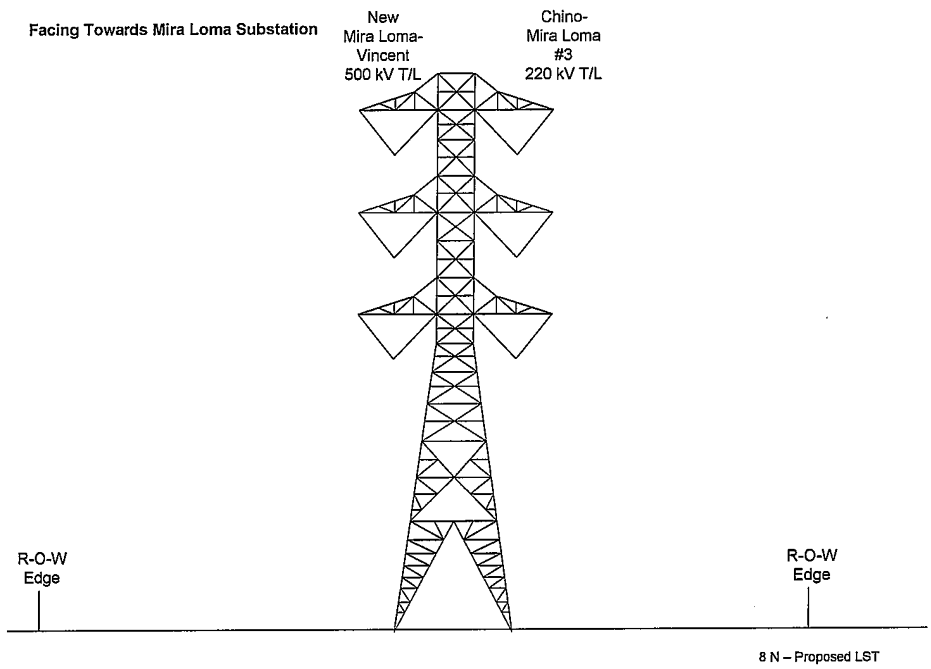


Figure 124
Segment 8-Section N: Proposed Scenario - LST (Facing East)



15. Segment 8O: 8B MP 1.0 to MP 5.2

Figure 125
Segment 8-Section O: Existing Scenario (Facing East)

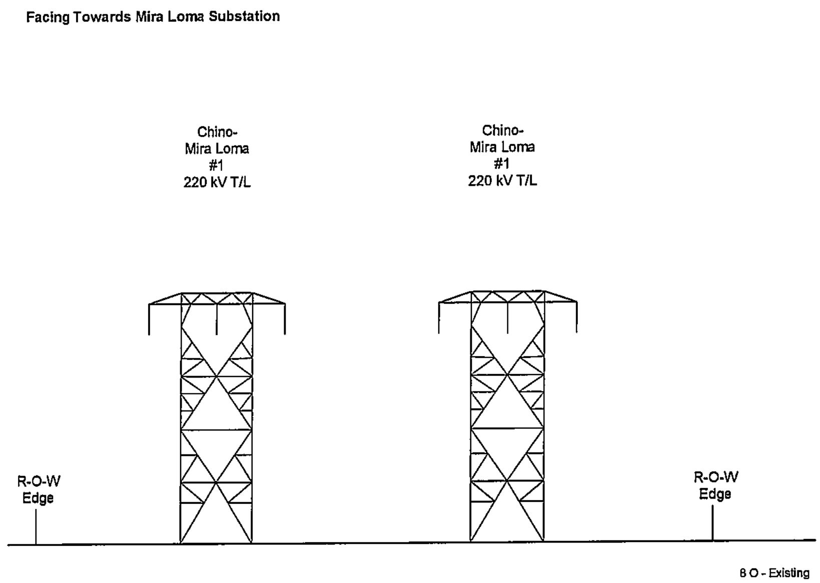
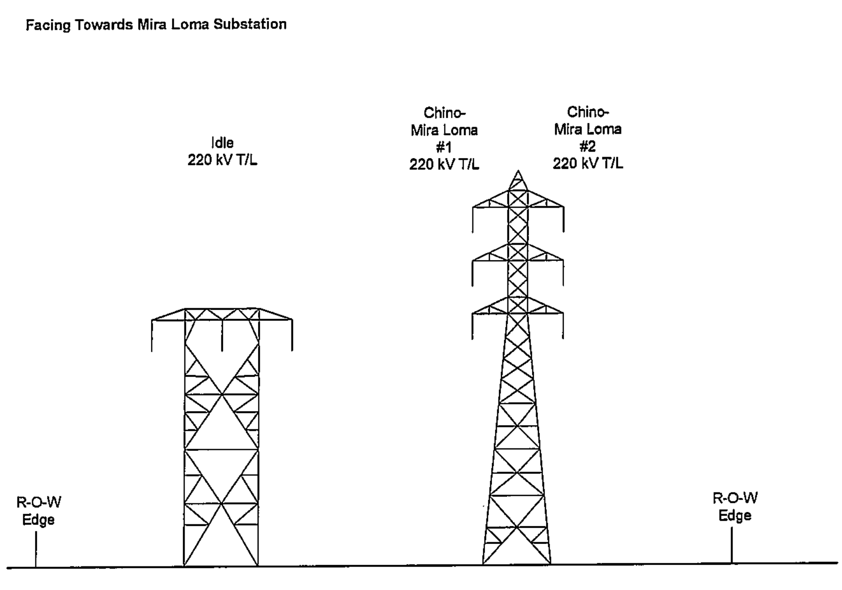


Figure 126
Segment 8-Section O: Proposed Scenario (Facing East)



16. Segment 8P: 8B MP 5.2 to 5.6

Figure 127
Segment 8-Section P: Existing Scenario (Facing East)

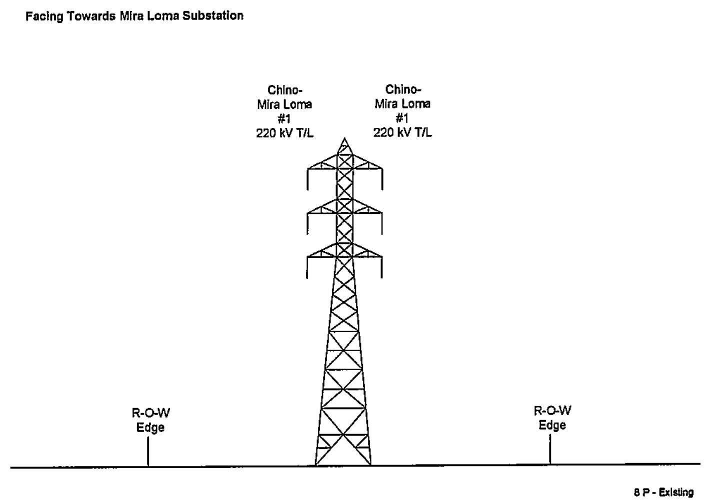
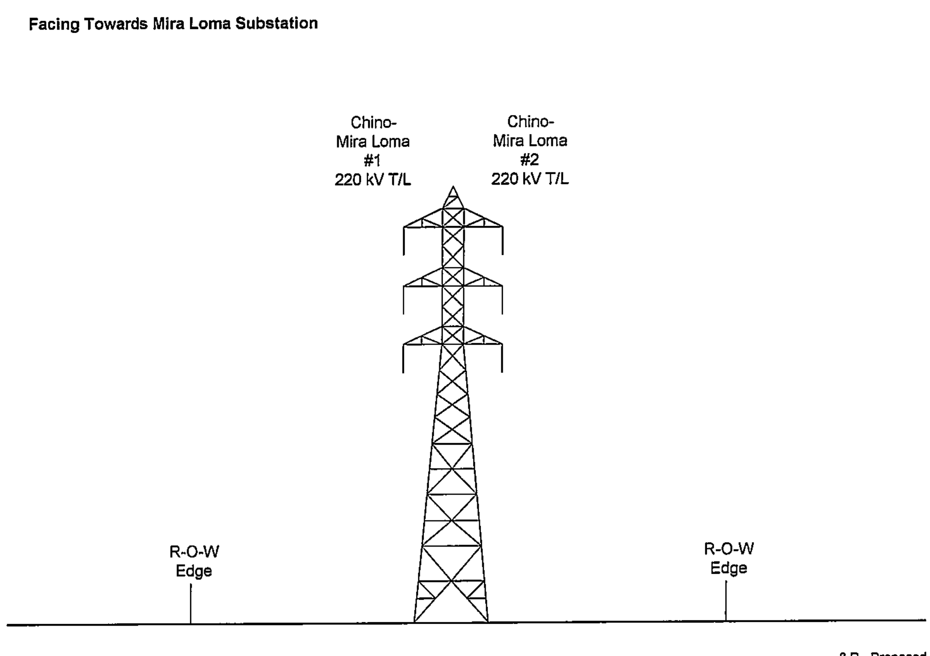


Figure 128
Segment 8-Section P: Proposed Scenario (Facing East)



17. Segment 8 Q: 8B MP 6 to 6.8 (Mira Loma Substation)

Figure 129
Segment 8-Section Q: Existing Scenario (Facing East)

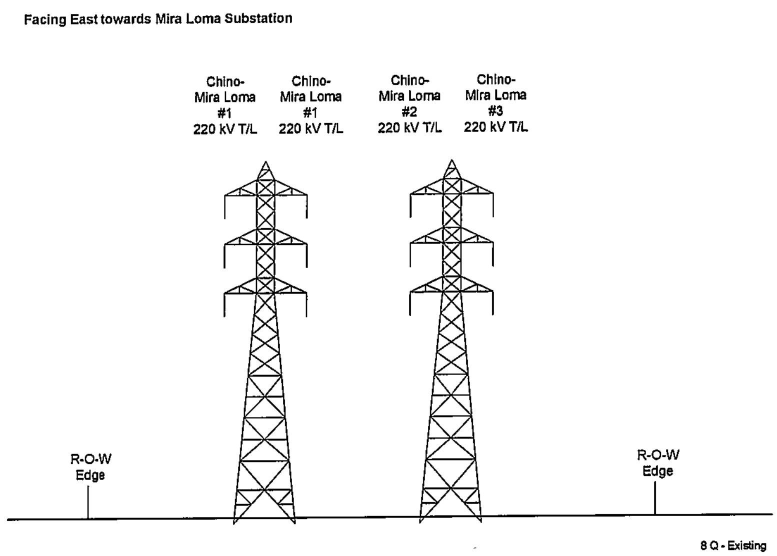
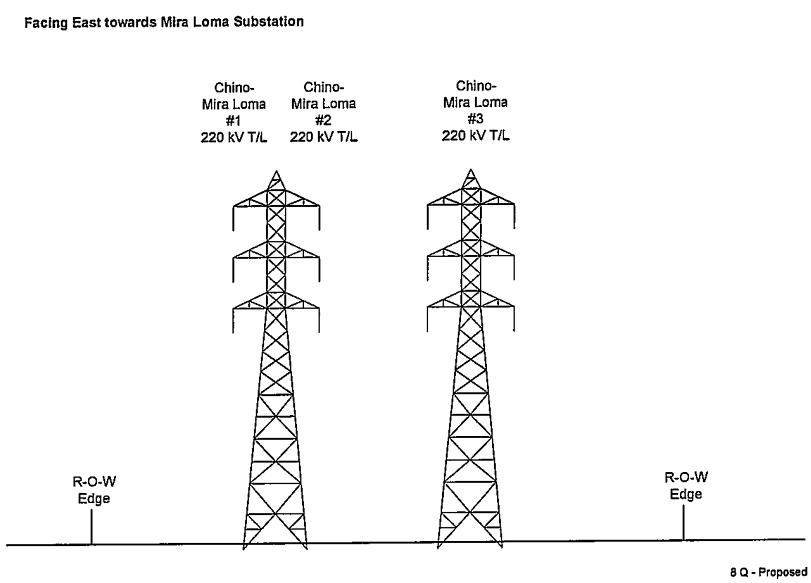


Figure 130
Segment 8-Section Q: Proposed Scenario (Facing East)



18. Segment 8 R: 8A MP 34 to MP 34.4 and 8B MP 5.6 to 6.0

Figure 131
Segment 8-Section R: Existing Scenario (Facing North)

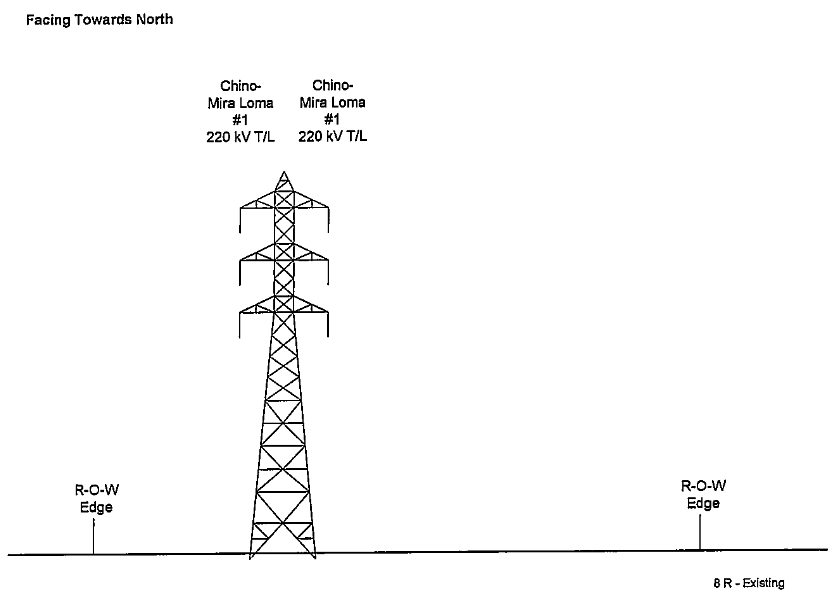
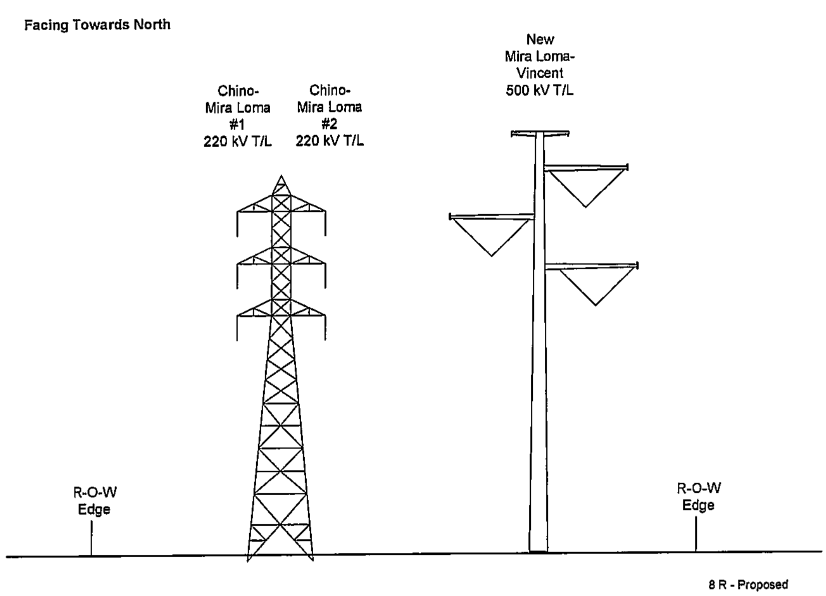


Figure 132
Segment 8-Section R: Proposed Scenario (Facing North)



19. Segment 8 S: MP 34.5 to MP 35.2 (Mira Loma Substation)

Figure 133
Segment 8-Section S: Existing Scenario (Facing East)

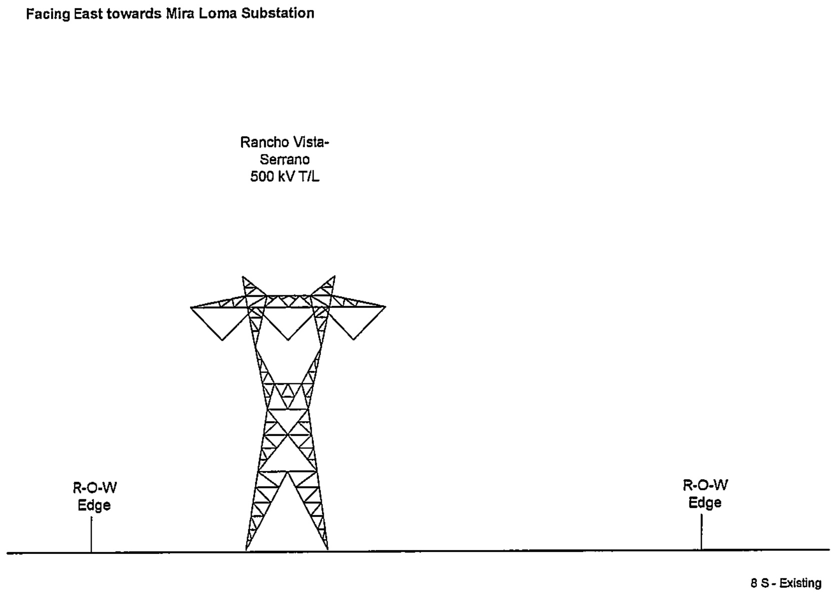
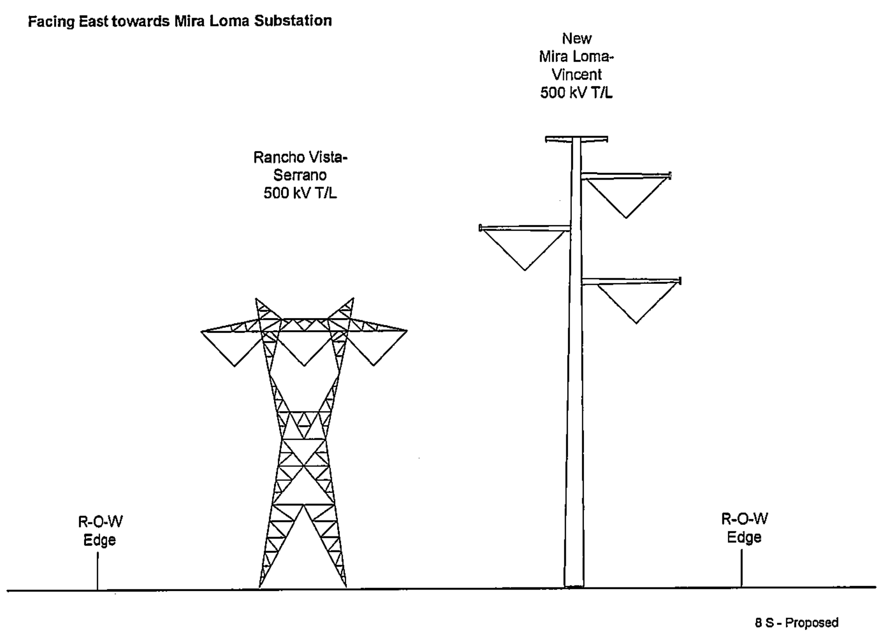
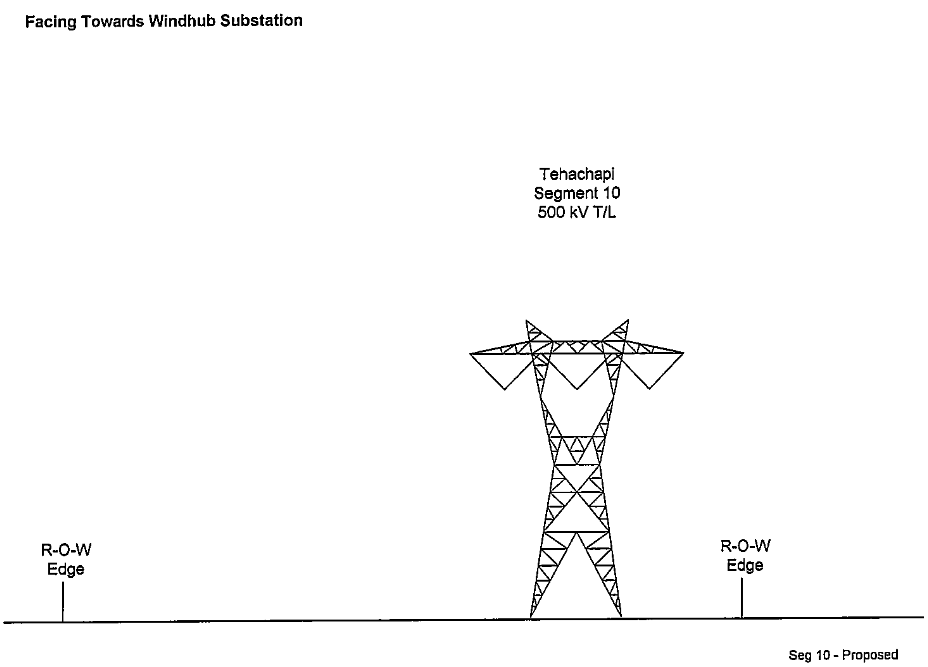


Figure 134
Segment 8-Section S: Proposed Scenario (Facing East)



F. Segment 10

Figure 135
Segment 10: Proposed Scenario (Facing North and Northeast)



G. Segment 11

1. Segment 11A: MP 0.0 to MP 0.9

Refer to Segment 6 A for a diagram of Segment 11 A.

2. Segment 11B: MP 0.9 to MP 2.3

Figure 136
Segment 11 - Section B: Existing Scenario (Facing South)

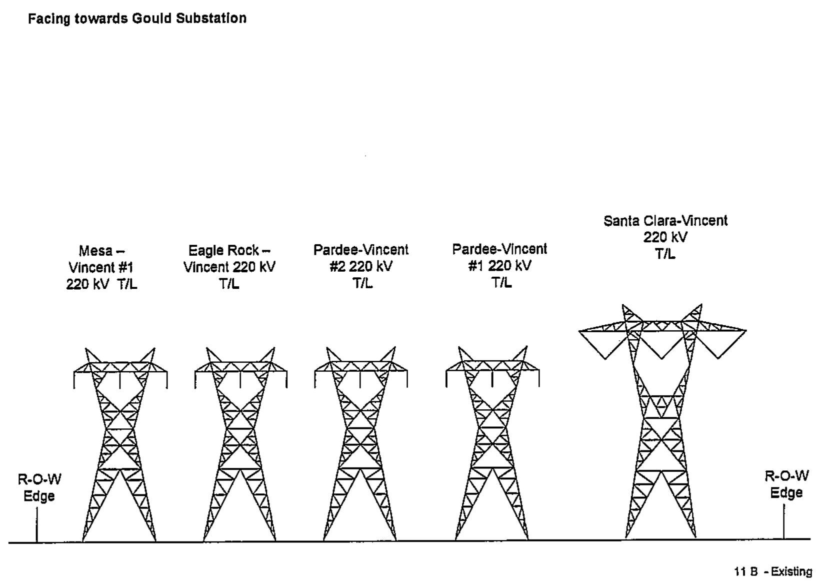
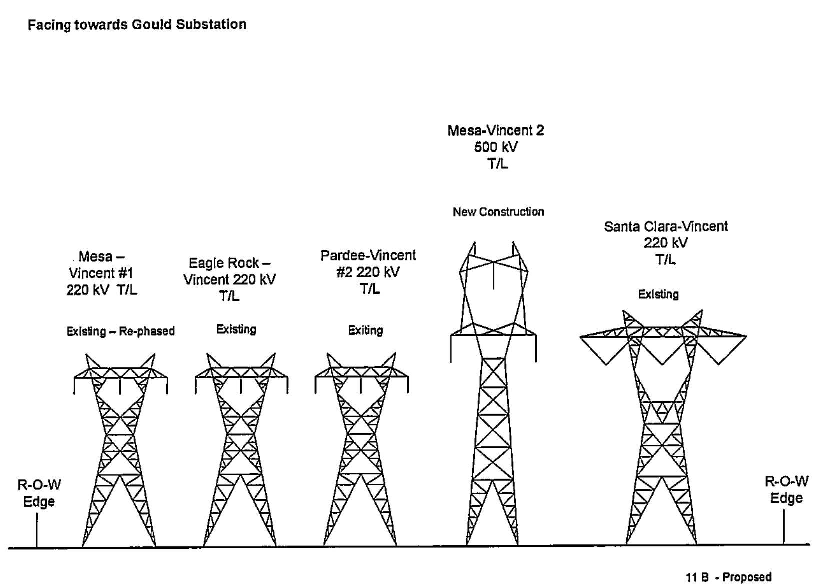


Figure 137
Segment 11 - Section B: Proposed Scenario (Facing South)



3. Segment 11C: MP 2.3 to MP 3.9

Figure 138
Segment 11 – Section C: Existing Scenario (Facing South)

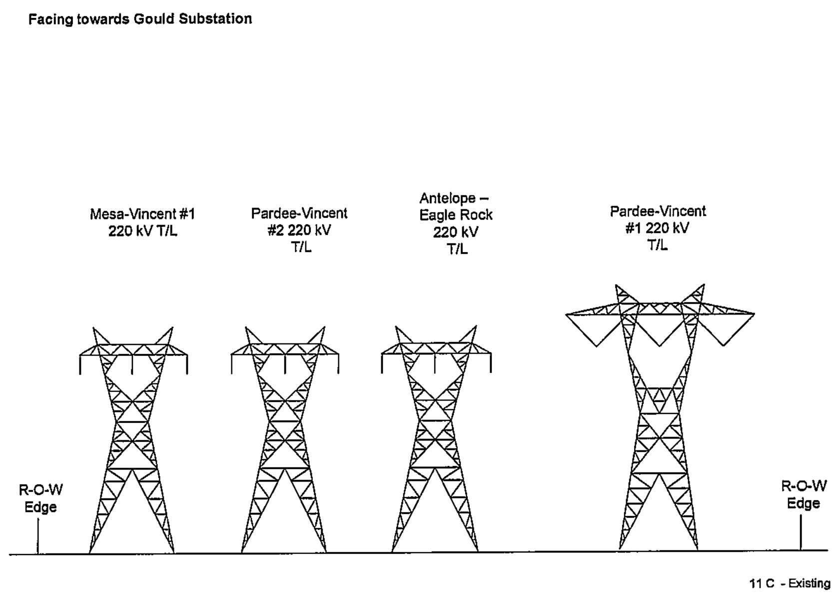
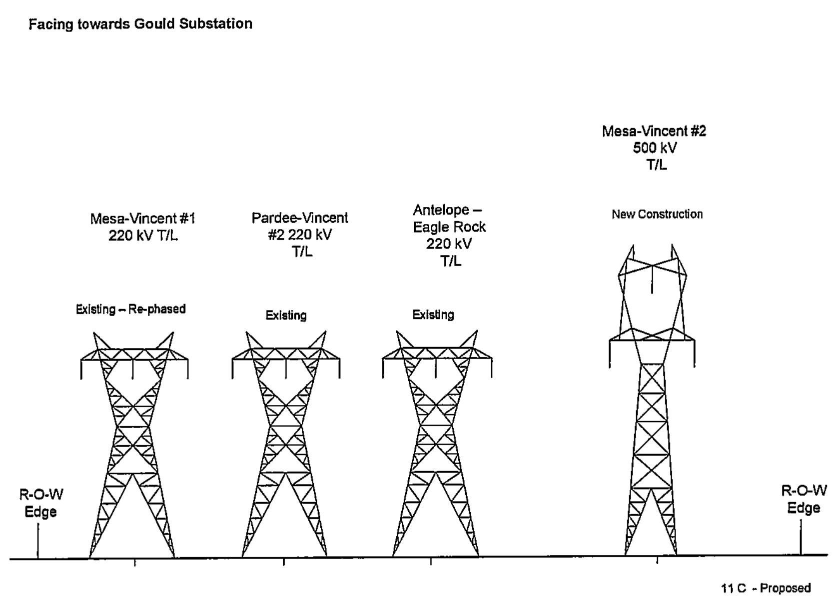


Figure 139
Segment 11 - Section C: Proposed Scenario (Facing South)



4. <u>Segment 11D: MP 3.9 to MP 18.7</u>

Figure 140
Segment 11 - Section D: Existing Scenario (Facing South)

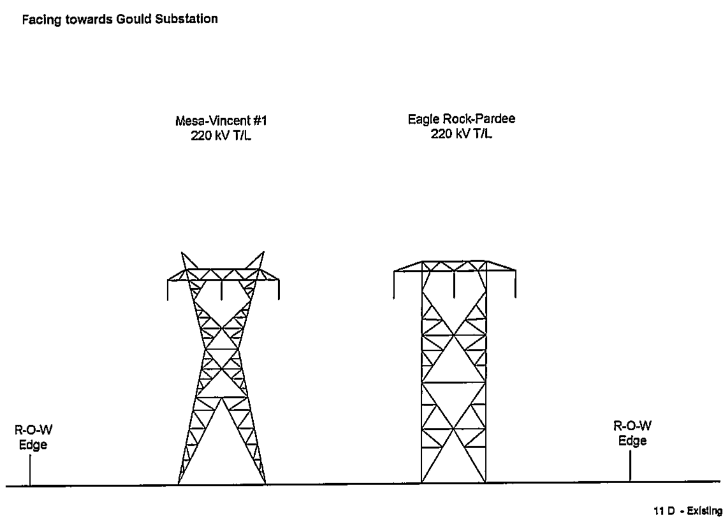
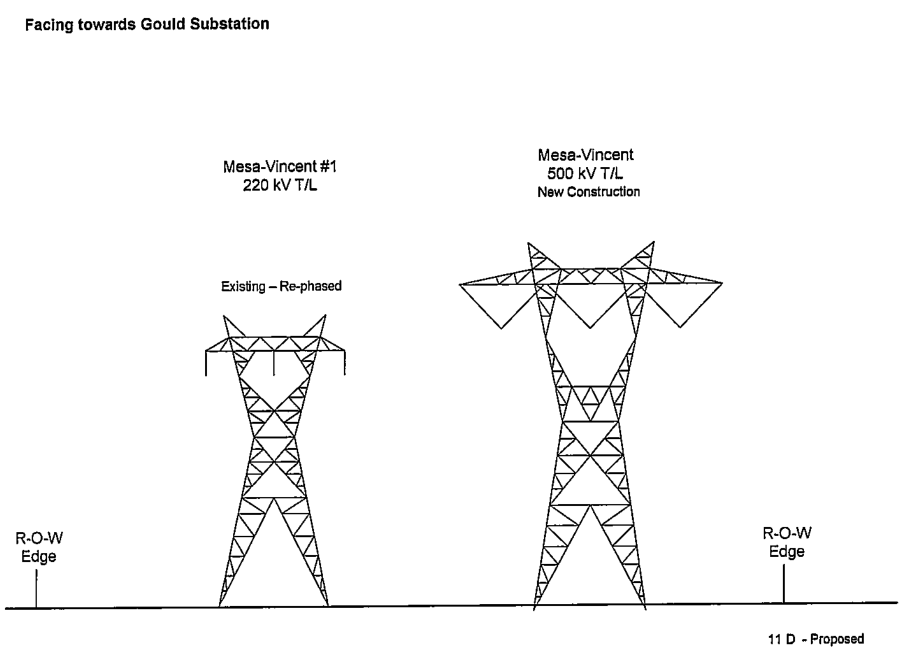


Figure 141
Segment 11 - Section D: Proposed Scenario (Facing South)



5. **<u>Segment 11 E: MP 18.7 (Gould Substation) to MP 27.2 (Goodrich Substation)</u>**

Figure 142
Segment 11-Section E: Existing Scenario (Facing East and South)

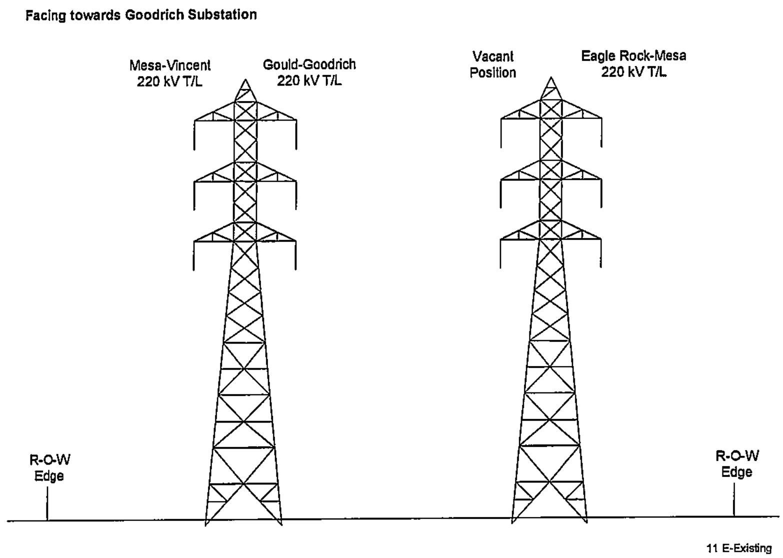
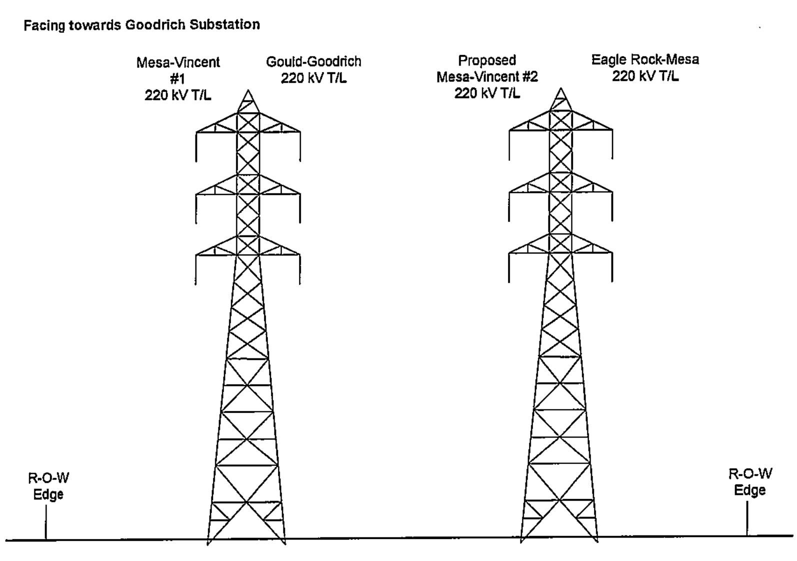


Figure 143
Segment 11-Section E: Proposed Scenario (Facing East and South)



6. Segment 11F: MP 2.7.2 (Goodrich Substation) to MP 36.2 (Mesa Substation)

Figure 144
Segment 11-Section F: Existing Scenario (Facing South)

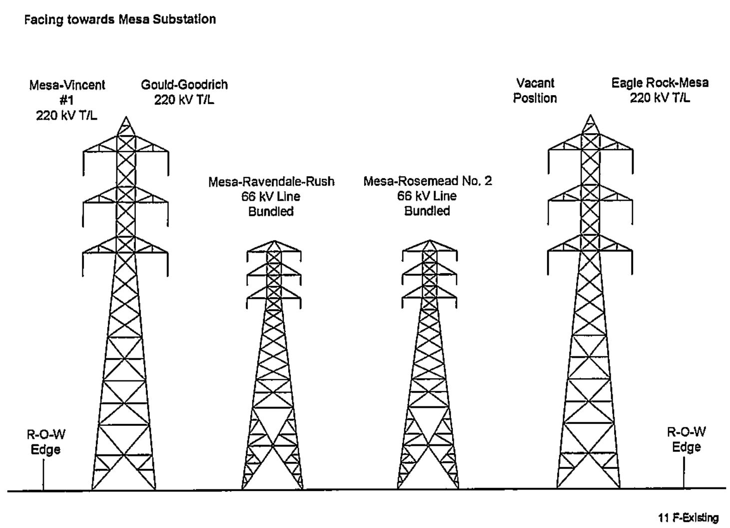
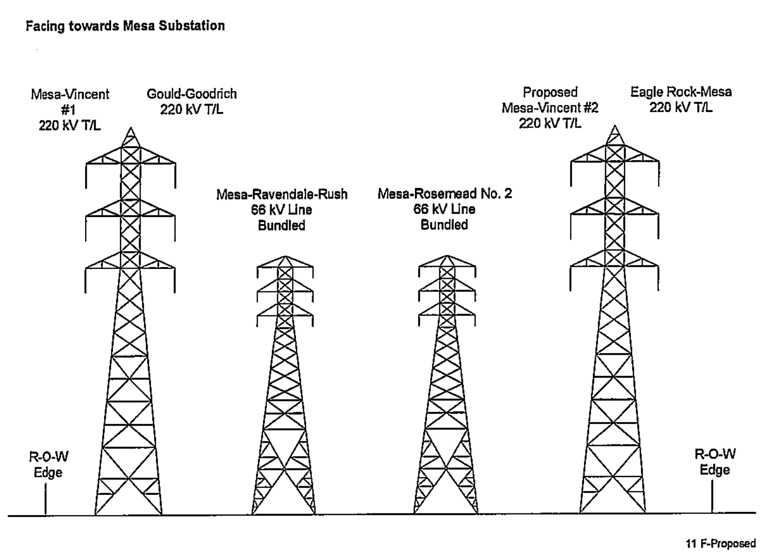


Figure 145
Segment 11-Section F: Proposed Scenario (Facing South)



VIII. APPENDIX B.2: LOAD DATA FOR COMPUTER MODELS

Tehachapi Renewable Transmission Project
Line Flows (amps) with the addition of 4335 MW of Wind

T/L	Associated Project	Without TRTP & Without Gen	With TRTP & With Gen	Direction Flow
Existing Antelope-Mesa 220 kV	Existing	884.9	T/L Removed	To Mesa
Existing Antelope-Vincent 220 kV	Existing	208.9	T/L Removed	To Vincent
Antelope-Pardee 500 kV energized at 230 kV	ATP Segment 1	169.2	1166.7	To Pardee
Antelope-Vincent No.1 500 kV energized at 230 kV	ATP Segment 2	229.7	N/A	To Vincent
Antelope-Vincent No.1 500 kV	TRTP Segment 9	N/A	1120.4	To Vincent
Antelope-Vincent No.2 500 kV	TRTP Segment 5 & 9	N/A	1330.6	To Vincent
Antelope-Magunden No.1 220 kV	Existing	718.4	511.9	To Antelope
Antelope-Magunden No.2 220 kV	Existing	757.8	539.9	To Antelope
Midway-Vincent No.3 500 kV	Existing	1708.5	T/L Reconfigured	To Vincent
Midway-Whirlwind 500 kV Formed by Looping Midway-Vincent No.3 500 kV	TRTP Segment 4	N/A	507.1	To Whirlwind
Vincent-Whirlwind 500 kV Formed by Looping Midway-Vincent No.3 500 kV	TRTP Segment 4	N/A	1355.2	To Vincent
Antelope-Whirlwind 500 kV	TRTP Segment 4	N/A	1324.9	To Antelope
Whirlwind-Cotttonwind No.1 220 kV	TRTP Segment 4	N/A	866.6	To Whirlwind
Whirlwind-Cotttonwind No.2 220 kV	TRTP Segment 4	N/A	866.6	To Whirlwind
Antelope-Windhub 500 kV energized at 230 kV	ATP Segment 3	1379.5 Assumes 550 MW	N/A	To Antelope
Antelope-Windhub 500 kV	TRTP Segment 9	N/A	1657.1	To Antelope
Whirlwind-Windhub 500 kV	TRTP Segment 10	N/A	913.3	To Whirlwind
Rio Hondo-Vincent No.1 220 kV	Existing	1962.9	2411.0	To Rio Hondo

Rio Hondo-Vincent No.2 220 kV	Existing	1940.1	N/A	To Rio Hondo
Replacement Rio Hondo-Vincent No.2 220 kV	TRTP Segment 6	N/A	2382.8	To Rio Hondo
Mesa-Rio Hondo 220 kV	Existing	739.8	846.4	To Mesa
Laguna Bell-Rio Hondo 220 kV	Existing	1194.1	1568.7	To Laguna Bell
Center-Mesa 220 kV	Existing	991.5	1658.6	To Center
Center-Olinda 220 kV	Existing	23.4	539.2	To Olinda
Mesa-Walnut 220 kV	Existing	974.4	806.7	To Walnut
Olinda-Walnut 220 kV	Existing	92.5	124.7	To Walnut
Mira Loma-Walnut 220 kV	Existing	753.2	1279.5	To Walnut
Olinda-Mira Loma 220 kV	Existing	1100.7	1725.9	To Olinda
Rancho Vista-Serrano 500 kV	Existing (Future Arrangement)	992.5	1156.8	To Serrano
Mira Loma-Vincent 500 kV	TRTP Segments 7 & 8	N/A	1810.9	To Mira Loma
Pardee-Vincent 220 kV	Existing	74.8	61.4	To Pardee
Pardee-Eagle Rock 220 kV	Existing	551.2	T/L Reconfigured	To Eagle Rock
Santa Clara-Vincent 220 kV	Existing	158.8	85.4	To Santa Clara
New Pardee-Vincent No.2 220 kV Formed by Terminating Pardee-Eagle Rock 220 kV at Vincent	TRTP Segment 11	N/A	46.7	To Pardee
New Eagle Rock-Gould 220 kV Formed by Terminating Pardee-Eagle Rock 220 kV at Gould	TRTP Segment 11	N/A	518.2	To Gould
New Mesa-Vincent No.2 220 kV Formed by Upgrading portion of Pardee-Eagle Rock 220 kV	TRTP Segment 11	N/A	2302.0	To Mesa
Eagle Rock-Mesa 220 kV	Existing	1605.8	999.2	To Mesa
Gould-Goodrich 220 kV	Existing	1785.2	2233.8	To Goodrich
Goodrich-Laguna Bell	Existing	1190.5	1427.8	Laguna Bell
Mesa-Vincent 220 kV	Existing	2007.1	2445.1	To Mesa

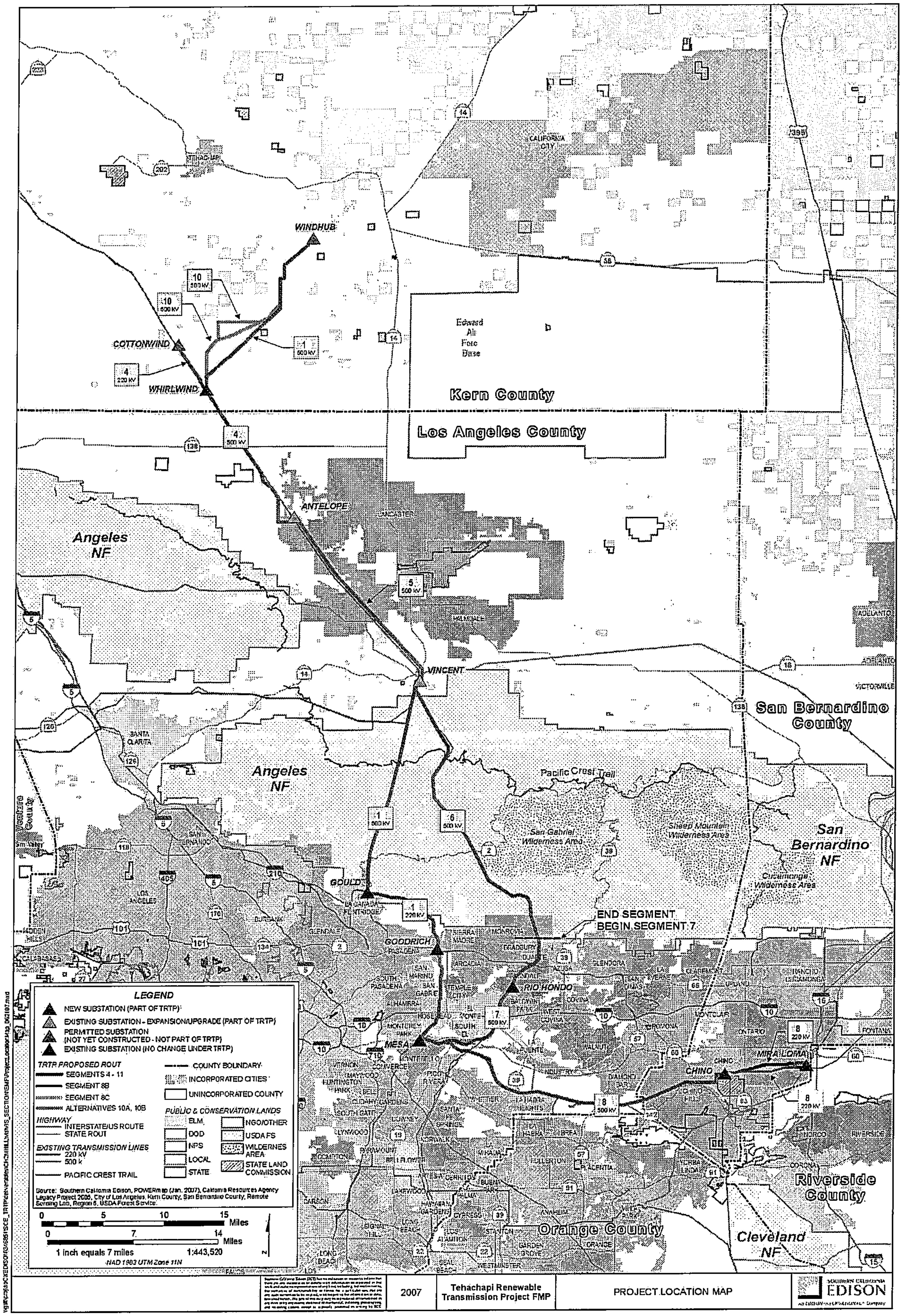
Chino-Mira Loma No.1 220 kV	Existing	772.8	T/L Removed	To Chino
Chino-Mira Loma No.2 220 kV	Existing	613.1	T/L Removed	To Chino
Chino-Mira Loma No.3 220 kV	Existing	1508.5	T/L Removed	To Chino
Chino-Serrano 220 kV	Existing	16.6	520.9	To Serrano
Chino-Viejo 220 kV	Existing	490.4	1050.4	To Viejo
New Chino-Mira Loma (West Bus) No.1 (To be located in vacated Chino-Mira Loma No.3 220 kV ROW)	TRTP Segment 8	N/A	952.5	To Chino
New Chino-Mira Loma (West Bus) No.2 (To be located in vacated Chino-Mira Loma No.3 220 kV R-O-W)	TRTP Segment 8	N/A	952.5	To Chino
New Chino-Mira Loma (East Bus) No.3 (500 kV energized as 220 kV))	TRTP Segment 8	N/A	2110.5	To Chino

66 kV Subtransmission Line Load Data Used in Models

66 kV Line Name	Load (Amps)	Direction
Chino-Soquel	420	To Soquel
Chino-Soquel-Peyton	560	To Soquel
Chino-Ganesha-Plastic	710	To Ganesha
Chino-Ganesha-Peyton	970	To Peyton
Chino-Diamond Bar-Ganesha	890	To Ganesha
Chino-Cimgen	230	To Cimgen
Mesa-Rosemead No. 2	780	To Rosemead

Mesa-Ravendale-Rush	710	To Ravendale
Mesa-Anita-Eaton	260	To Eaton
Eaton-Ravendale	320	To Ravendale
Ravendale-San Gabriel	250	To San Gabriel
Ravendale-Rosemead	330	To Rosemead
Rio Hondo-Amador	760	To Amador
Rio Hondo-Amador-Jose-Mesa	750	To Amador
Walnut-Hillgen-Industry-Mesa-Reno	230	To Mesa
Mesa-Narrows	750	To Narrows
Antelope-Quartz Hill-Shuttle	1392	In same direction as towards Vincent
Antelope-Quartz Hill No. 1	1235	In same direction as towards Vincent
Antelope-Ritter Ranch No. 1	1276	In same direction as towards Vincent
Antelope-Ritter Ranch No.2	1276	In same direction as towards Vincent
Antelope-Anaverde-Palmdale	1076	In same direction as towards Vincent
Additional Non-SCE 220 kV Lines		
220 kV Line Name	**Load (Amps)**	**Direction**
Vincent-Sagebrush 220 kV T/L (Non-SCE)	980	In same direction as towards Vincent

IX. APPENDIX B.3: PROJECT LOCATION MAP


WINDHUB
COTTONWIND
WHIRLWIND
Edward
Air
Force
Base
Kern County
Los Angeles County
ANTELOPE
Angeles
NF
VINCENT
San Bernardino
County
Pacific Crest Trail
San Gabriel Wilderness Area
Sheep Mountain Wilderness Area
San
Bernardino
NF
GOULD
END SEGMENT 7
BEGIN SEGMENT 7
GOODRICH
RIO HONDO
MESA
CHINO
MIRA LOMA
Riverside
County
Orange County
Cleveland
NF
LEGEND
NEW SUBSTATION (PART OF TRTP)
EXISTING SUBSTATION - EXPANSION/UPGRADE (PART OF TRTP)
PERMITTED SUBSTATION (NOT YET CONSTRUCTED - NOT PART OF TRTP)
EXISTING SUBSTATION (NO CHANGE UNDER TRTP)
TRTP PROPOSED ROUT
SEGMENTS 4 - 11
SEGMENT 8B
SEGMENT 8C
ALTERNATIVES 10A, 10B
HIGHWAY
INTERSTATE/US ROUTE
STATE ROUT
EXISTING TRANSMISSION LINES
220 kV
500 k
PACIFIC CREST TRAIL
COUNTY BOUNDARY
INCORPORATED CITIES
UNINCORPORATED COUNTY
PUBLIC & CONSERVATION LANDS
BLM
NGO/OTHER
DOD
USDA FS
NPS
WILDERNESS AREA
LOCAL
STATE LAND COMMISSION
STATE
1 inch equals 7 miles
1:443,520
NAD 1983 UTM Zone 11N
Miles
2007
Tehachapi Renewable Transmission Project FMP
PROJECT LOCATION MAP
EDISON

X. APPENDIX B.4: DEFINITIONS OF MAGNETIC FIELD REDUCTION MEASURES

- **CIRCUIT PHASING (PHASE CIRCUIT)** – Arranging the A, B, and C phases of a new circuit to cancel the fields of existing or other new circuits
- **CIRCUIT PLACEMENT -** Positioning a new circuit within a R-O-W to increase the distance between the circuit and the nearest R-O-W edge
- **CIRCUIT RE-PHASING (RE-PHASE CIRCUIT)** – Re-arranging the A, B, C phases of an existing circuit for field cancellation
- **COMPACT DESIGN** – Use of a power line construction that reduces the distance between the conductors of a circuit allowing for increased field cancellation
- **DOUBLE-CIRCUIT CONSTRUCTION -** Use of double-circuit tower designs that raise conductor heights and compacts conductors (allowing for increased field cancellation) as compared with single-circuit design
- **INCREASED R-O-W WIDTHS -** Use of wider R-O-Ws than required for a proposed line that results in increased distance between the proposed line and the R-O-W edges
- **SPLIT-PHASING (SPLIT-PHASE CIRCUIT) -** Use of double-circuit construction to carry the load of a single circuit in order to phase the circuit for field cancellation. In other words, the load of a circuit which is normally carried on one A, one B, and one C phase is carried by 2 A, 2 B and 2 C phases. These phases are then arranged A-B-C from top to bottom on one side of the double-circuit tower and C-B-A top to bottom (or equivalent) on the other side in order to achieve field cancellation.

- **TALLER STRUCTURES** – Use of taller structures to increase the distance between the conductors of a power line and the R-O-W edges
- **UNDERGROUNDING -** Use of underground construction that reduces the distance between conductors of a circuit and typically results in increased field cancellation as compared with overhead construction