HIGH DESERT POWER PROJECT LLC

www.HIGHDESERTPOWER.com

25 APR 2001

April 16, 2001

Mr. Steve Munro
Compliance Project Manager
California Energy Commission MS -2000
1516 Ninth Street
Sacramento, CA 95814

DOCKET
97-AFC-1C
DATE APR 16 2001
RECD. JUN 27 2001

SUBJECT: High Desert Power Project
Docket No. 97-AFC-1,
Post Certification Amendment

Dear Mr. Munro:

Pursuant to Title 20 CCR Chapter 5, Section 1769(a)(1), High Desert Power Project, LLC, (HDPP), as supervisory agent for High Desert Power Trust, Ltd., is submitting for your consideration the attached Petition for Modification: Transfer of Transmission Line Ownership to Southern California Edison.

Because the proposed modifications do not result in any environmental impacts, HDPP believes that the petition falls within CEC's new expedited 7-day review process.

If you have any questions, please contact me at (949) 856-1361 or Kenny Stein at (410) 230-4753.

Sincerely,

Thomas Barnett
Vice President
High Desert Power Project, LLC

cc (w/ attachment)	Project File	Kenneth Stein
	Andrew Welch	Neal Parece
cc (w/o attachment)	Terrell Gault	Shirley Pearson

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HIGH DESERT
POWER PROJECT LLC
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PETITION FOR MODIFICATION: TRANSFER OF TRANSMISSION LINE OWNERSHIP TO SOUTHERN CALIFORNIA EDISON

Prepared for

High Desert Power Project, LLC
111 SW Market Place, Suite 200
Baltimore, Maryland 21202-7110

For Submittal to

California Energy Commission
Energy Facilities Siting and
Environmental Protection Division
1516 9th Street
Sacramento, California 95814-5512

Prepared by

URS Corporation
111 SW Columbia, Suite 900
Portland, Oregon 97201

April 2001

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1.0 SUMMARY

High Desert Power Project, LLC (HDPP), in its own capacity as holder of the California Energy Commission Certification and as supervisory agent to High Desert Power Trust, Ltd., is filing this petition to modify the Commission Decision for the High Desert Power Project (Docket 97-AFC-1) as follows:

- Transfer ownership of the project's transmission line (T-line) from High Desert Power Trust, Ltd., to Southern California Edison (SCE), and transfer responsibility for the design, construction and operation of the T-line from HDPP, as supervisory agent for High Desert Power Trust, Ltd., to SCE; and

- Modify certain Conditions of Certification to reflect that SCE will own, design, construct and operate the T-Line.

Change in Entity that will Own, Design, Construct and Operate the T-line. Since the Commission Decision was approved, HDPP and the High Desert Power Trust, Ltd., have entered into contract negotiations with SCE that will allow SCE to own, design, construct and operate the 7.2-mile T-line between the HDPP project site and the Victor Substation. SCE, as owner of the T-line, will be under the authority of the California Public Utilities Commission (CPUC).

Changes in Conditions of Certification. To reflect SCE as the entity that will own, design, construct and operate the T-line, this petition requests changes to Conditions of Certification in the areas of Transmission Systems Engineering (TSE) and Transmission Line Safety and Nuisance (TLSN). After review of these conditions by the CEC and SCE, mutual agreement was reached on how they should be modified. Those changes are defined in Section 3.0.

The above changes have been evaluated for compliance with all Conditions of Certification and applicable LORS and for potential impacts in the following areas: visual resources, biological resources, cultural resources, paleontological resources and traffic. The proposed changes have no potential to effect the other technical areas analyzed in the Commission Decision. HDPP has determined that no significant environmental impacts would occur from the modifications described herein and that all applicable laws, ordinances, regulations and standards (LORS) will be met.

2.1 Change in Entity that Will Own, Design, Construct and Operate the T-line

The transmission facilities proposed to interconnect the High Dessert Power Project with the existing transmissions system consist of: 1) a 230 kV project switchyard; 2) a single–circuit 230 kV line from the project switchyard to the Victor Substation; and 3) additions at the Victor Substation. For increased reliability, SCE will put 6 1590 thousand circular mil conductors on each pole and operate the single circuit line with parallel phases.

Ownership of the T-line would transfer from High Desert Power Trust, Ltd., to SCE. Responsibility for designing, constructing and operating the T-line will transfer from High Desert Power Project, LLC (HDPP), as supervisory agent to High Desert Power Trust, Ltd., to SCE. The project switchyard will remain under the control of HDPP.

The line will be approximately 7.8 miles in length. As shown in CEC Application for Certification (AFC) Figure 3.5-9, the line will exit the project switchyard and generally parallel the proposed route of El Evado Road in a southeasterly direction for approximately 1.8 miles. It will then parallel the Intermountain Power Project DC line in a southerly direction for approximately 0.7 miles at which point it will cross under LADWP's two 500 kV lines between Victorville and Adelanto and under the DC line. It will continue in a southerly direction for approximately 0.6 miles where it will cross under LADWP's Victorville-Rinaldi 500 kV line. Approximately 0.2 miles south of this crossing, the line will intersect SCE's Victor 115 kV line and will parallel this line in a southwesterly direction to the Victor Substation for a distance of approximately 3.9 miles. The right-of-way width will vary from 100-120 feet depending of the type of transmission structure utilized and the span length. The proposed line will likely utilize a combination of lattice steel structures and steel poles. Assuming an average span length from pole-to-pole of 700-800 feet, approximately 50 structures will be required for the Project T-line to the Victor Substation.

An upgrade to the Victor Substation will be required to handle the additional line coming from the HDPP plant. The design, procurement, and construction at the substation will be undertaken by SCE under the agreement providing for the interconnection.

HDPP and High Desert Power Trust, Ltd., are negotiating a contract with SCE to transfer ownership of the project's T-line from High Desert Power Trust, Ltd. to SCE, and responsibility for the design, construction and operation of the T-line from HDPP, as supervisory agent for High Desert Power Trust, Ltd., to SCE.

2.2 Change in Conditions of Certification

The following summarizes the agreement between the SCE and the staff of the CEC regarding changes to the Conditions of Certification that Commission staff believes would be appropriate once SCE acquires ownership of the T-line and responsibility for designing, construction and operating the T-line (additional language shown with double underline, deleted language shown with strikeout). In addition, a correction has been made to the length of the proposed line and a change in the number and size of planned conductors to be used in the line. The necessity for each of these changes is presented in Section 3.0.

TRANSMISSION SYSTEM ENGINEERING

TSE-1 The project owner shall ensure that the design, construction and operation of the proposed transmission facilities will conform to requirements 1a through 1h listed below. The substitution of CPM approved "equivalent" equipment and equivalent switchyard configurations is acceptable.

a. The project 230 kilovolt switchyard shall include a breaker-and-a-half breaker and bus configuration.

b. Breakers and bus shall be sized to comply with a short circuit analysis.

c. An approximately 7.~~2~~8 mile single circuit 230 kilovolt line using lattice or steel pole construction with two ~~954~~ 1,590 thousand circular mil conductors ~~(or larger)~~ per phase position (twin bundles) shall be constructed to the Victor 230 kilovolt substation.

d. Termination facilities at the Victor 230 kilovolt substation shall comply with applicable Cal ISO and Edison interconnection standards (CPUC Rule 21 and Cal ISO Tariff).

e. The HDPP shall be included in the existing Edison remedial action schemes and new remedial action schemes shall be developed in coordination with Edison and the Cal ISO to meet Edison's Transmission Planning Criteria and Guidelines and the WSCC and NERC Reliability criteria and Planning standards.

f. The transmission facilities shall meet or exceed the requirements of CPUC GO-95; and

g. Outlet line crossings and areas where the outlet line parallels other transmission or distribution facilities shall be coordinated with the transmission line owner and comply with the owner's standards. The outlet line shall cross under existing extra high voltage transmission lines. Sufficient separation shall be maintained

between the outlet line and the Adelanto-Intermountain 500 kV DC line to reduce the risk of the common mode outage of both lines.

h. Recommendations contained in the HDPP Facilities study shall be followed by the project owner/operator.

Verification: At least sixty (60) days prior to start of construction of transmission facilities, the project owner shall submit for approval to the CPM electrical one-line diagrams signed and sealed by a registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements 1a through 1h above. Substitution of equipment and substation configurations shall be identified and justified by the project owner for CPM approval.

TSE-3 The project owner shall be responsible for the inspection of the transmission facilities during ~~and after~~ project construction ~~and any subsequent CPM-approved changes thereto,~~ to ensure conformance with CPUC GO-95 and CPUC Rule No. 21 and these conditions. In case of non-conformance, the project owner shall inform the CPM in writing within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after synchronization of the project, the project owner shall transmit to the CPM an engineering description(s), one-line drawings of the "as-built" facilities, and the results of the short circuit study signed and sealed by a registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95, CPUC Rule No. 21 and these conditions shall be concurrently provided.

TRANSMISSION LINE SAFETY AND NUISANCE

TLSN-1 The project owner shall construct the proposed transmission line according to requirements of GO-95 and applicable requirements of Title 8, section 2700 et seq., of the California Code of Regulations.

Verification: Thirty days before start of transmission line construction, the project owner shall submit to the Commission's Compliance Project Manager (CPM) a letter from a California-registered electrical engineer affirming that the proposed transmission line will be constructed according to requirements of ~~GO-95 and Title 8, section 2700 et seq. of the California Code of Regulations~~ the condition.

TLSN-2 ~~The project owner shall make every reasonable effort necessary to identify and correct, on a case-specific basis, all complaints of interference with radio or television signals from operation of the transmission line and related facilities. In addition to any transmission line repairs, the relevant corrective actions shall include,~~

~~but not be limited to, adjusting or modifying receivers, adjusting, repairing, replacing or adding antennas, antenna signal amplifiers, filters or lead-in cables.~~

~~The project owner shall maintain written records, for a period of five (5) years, of complaints of radio and television interference attributable to operation together with the corrective action taken in response to each complaint. All complaints shall be recorded to include notations on the corrective action taken. Complaints not leading to a specific action or for which there was no resolution should be noted and explained. The record shall be signed by the project owner and also the complainant, if possible, to indicate concurrence with the corrective action or agreement with the justification for a lack of action.~~

~~Verification: All reports of line-related complaints shall be summarized and included in the Annual Compliance Report to the CPM~~ [Delete]

TLSN-~~3~~2 The project owner shall ~~engage~~ utilize a qualified ~~consultant~~ individual or individuals to measure the strengths of the T-line electric and magnetic fields ~~before beginning construction and~~ after the ~~line is energized~~ start of plant operation. Measurements should be made at representative points along the line, to verify the design assumptions relative to field strengths. The areas to be measured should include the facility substation and any residences near the right-of-way.

Verification: ~~The project owner shall file a copy of the first set of pre-project measurements with the CPM at least 30 days before the start of construction.~~ The post-project measurement shall be filed with the CPM within ~~30~~ 60 days after the ~~day the line is energized~~ start of plant operation.

TLSN-~~4~~3 The project owner shall ensure that the transmission line right-of-way is kept free of combustible waste material, as required under the provisions of Section 4292 of the Public Resources Code and Title 14, Section 1250 of the California Code of Regulations, "Fire Prevention Standards for Electric Utilities," unless exempted from this requirement under these sections.

Verification: Within 60 days after the start of plant operations, ~~T~~the project owner shall provide a ~~summary of inspection results and any fire prevention activities along the right-of way, in the Annual Compliance Report to the CPM~~ letter to the CPM stating that it will follow the guidelines of the California Department of Forestry and Fire Prevention's *Power Line Fire Prevention Field Guide* with regard to combustible materials.

~~**TLSN-5** The project owner shall send a letter to all owners of property within or outside the right-of-way at least sixty (60) days prior to first transmission of electricity.~~

~~Protocol: The letter shall include the following:~~

- ~~a discussion of the nature and operation of a transmission line;~~
- ~~a discussion of the project owner's responsibility for grounding existing fences, gates, and other large permanent objects located within the right-of-way regardless of ownership;~~
- ~~a discussion of the property owner's responsibility to notify the project owner whenever the property owner adds or installs a metallic object which will require grounding, as noted above; and~~
- ~~a statement recommending against adding fuel to motor vehicles or other mechanical equipment underneath the line.~~

~~Verification: The project owner shall submit the proposed letter to the CPM for review and approval thirty (30) days prior to mailing it to the property owners, and shall maintain a record of correspondence (notification and responses) related to this requirement in a compliance file. The project owner shall notify the CPM in the first Monthly Compliance Report that the letters were mailed and that copies are on file.~~

~~**TLSN-6** The project owner shall ensure the grounding of any ungrounded permanent metallic objects within the right-of-way, regardless of ownership. Such objects shall include fences, gates, and other large objects. These objects shall be grounded according to procedures specified in the National Electrical Safety Code.~~

~~In the event of a refusal by the property owner to permit such grounding, the owner/operator shall so notify the CPM. Such notification shall include, when possible, the property owner's written objection. Upon receipt of such notice, the CPM may waive the requirement for grounding of the object involved.~~

~~Verification: At least ten (10) days before the line is energized, the project owner shall transmit to the CPM a letter confirming compliance with this condition~~.

3.1 Change in Entity that will Own, Design, Construct and Operate the T-line

The proposed change in the entity that will own, design, construct and operate the T-line is required because of evolving business arrangements between HDPP, High Desert Power Trust, Ltd., and SCE, and the parties' desire that SCE own, design, construct and operate the T-line from the Victor Substation to the plant site. The change in number of conductors provides a more reliable design. The change will not change the route of the transmission line.

3.2 Changes in Conditions of Certification

The changes in Conditions of Certification are needed to reflect SCE as the entity that will own, design, construct and operate the T-line and were agreed to between the CEC and SCE. The rationale for each change is presented below.

- **Rationale for changes to TSE-1:** Building the transmission line as a double circuit facility but operated as a single circuit will provide the HDPP with a more reliable system design.

- **Rationale for changes to TSE-3:** SCE is required per CPUC rules to assure conformance with GO-95, and compliance with GO-95 after construction is required by CPUC requirements. Commission requirements would not change during project construction. However, it would be unnecessary for the Energy Commission to exercise overlapping jurisdiction after construction is completed and require redundant compliance reporting. This is reinforced by the fact that the CPUC has constitutional authority over the transmission system to assure ongoing safety and reliability.

- **Rational for changes to TLSN-1:** Most of the requirements of Title 8, section 2700 et seq., do not apply to public utilities under CPUC jurisdiction. This change is to clarify that SCE will be subject only to those requirements that are applicable.

- **Rationale for deletion of TLSN-2:** There are no residences near enough to the T-line to experience any radio or television interference from the electrical field or gap type sources.

- **Rationale for changes to TLSN-3:** There is no need to measure electric and magnetic fields before T-line construction because there are no existing sources in the right-of-way to produce these fields.

- **Rationale for changes to TLSN-4:** The change in the condition is a clarification of the intent of the condition. The change in the verification is to eliminate an annual reporting requirement. The requirement to provide a letter to the CPM stating that the project owner will follow the *Power Line Prevention Field Guide* makes it unnecessary for the project owner to submit annual reports on fire inspection results and fire prevention activities.

- **Rationale for deletion of TLSN-5:** The notice requirements and other requirements of TLSN-5 are not necessary because there are no fences, residences, or large metallic objects near the transmission line right-of-way. Also, CPUC rules regarding grounding will apply during T-line operation, and no additional requirements are necessary.

- **Rationale for deletion of TLSN-6:** The requirements of TLSN-5 are not necessary because there are no fences, residences, or large metallic objects near the transmission line right-of-way. Also, CPUC rules regarding grounding will apply during T-line operation, and no additional requirements are necessary.

The Commission Decision did not refer to SCE as the entity that would own, design, construct and operate the T-line. Negotiations with SCE did not begin until after certification. Consequently, the change in the entity that will own, design, construct and operate the T-line and the change in relevant conditions of certification are based on new information that was not known during the certification proceedings.

The changes addressed in this petition have been evaluated for compliance with Conditions of Certification and applicable LORS and for potential impacts in the following areas: visual resources, biological resources, cultural resources, paleontological resources and traffic and transportation. The changes have no potential to effect other technical areas analyzed in the Commission Decision such as air quality, public health, soil & water resources, noise, socioeconomics, land use, waste management, and hazardous materials handling.

5.1 Visual Resources

Because the changes do not involve any changes in project design or construction, the changes do not have a significant impact on visual resources. A clarification of condition VIS-1 is that the requirements regarding color treatment of the project do not apply to the T-line. The location of all T-line construction staging and material storage areas as defined in VIS-4 and the location of the T-line poles in VIS-5 will be done in accordance with the protocol of the conditions. The number of conductors per pole will not affect compliance with the visual resources conditions.

5.2 Biological Resources

Because the changes do not involve any changes in project design, construction or operation, the changes do not have a significant impact on biological resources. A clarification of condition BIO-6 is that SCE is responsible for complying with the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP), written by HDPP, as it applies to the transmission line corridor, and for supplementing the BRMIMP as necessary to meet CEC requirements. SCE will be solely responsible for compliance with all biological resources conditions of certification as they apply to the T-line.

5.3 Cultural Resources

Because the changes do not involve any changes in project design, construction or operation, the changes do not have a significant impact on cultural resources. A clarification of condition CUL-5 is that the Cultural Resources Monitoring and Mitigation Plan (CRMMP) for this project, written by HDPP, does not include any plan requirements for the transmission line corridor. As project owner of the transmission line, SCE will write and submit to the CPM a CRMMP for the T-line corridor from the Victor Substation to the HDPP plant. SCE will be solely responsible for compliance with all cultural resources conditions of certification as they apply to the T-line.

5.4 Paleontological Resources

Because the changes do not involve any changes in project design, construction or operation, the changes do not have a significant impact on paleontological resources. A clarification of condition PAL-5 is that the Paleontological Resources Monitoring and Mitigation Plan (PRMMP) for this project, written by HDPP, does will not include any plan requirements for the transmission line corridor. As project owner of the transmission line, SCE will write and submit to the CPM a PRMMP for the T-line corridor from the Victor Substation to the HDPP plant. SCE will be solely responsible for compliance with all paleontological resources conditions of certification as they apply to the T-line.

5.5 Traffic and Transportation

Because the changes do not involve any changes in project design, construction or operation, the changes do not have a significant impact on traffic and transportation. A clarification of condition TRANS-6 is that the construction traffic control plant and implementation program developed by HDPP will not include requirements for traffic involved with the T-line construction. HDPP will coordinate the plant's traffic control program with SCE's construction traffic plan for the T-line to minimize impacts. SCE will be solely responsible for compliance with all traffic and transportation conditions of certification as they apply to the T-line.

6.0 COMPLIANCE WITH LAWS, ORDINANCES, REGULATION AND STANDARDS (LORS)

Because the change in the entity that will own, design, construct and operate the T-line does not represent any significant new environmental impacts or changes to design elements subject to local requirements, the proposed changes will not impact the facility's ability to comply with all applicable LORS, listed in Appendix A of the Final Commission Decision.

7.0 EFFECTS ON PUBLIC

Because the proposed changes will not affect the designated route or the manner in which the line is constructed, the public will not be affected.

8.0 LIST OF PROPERTY OWNERS

The proposed changes will not affect the list of property owners adjacent to the T-line that is attached in Appendix B.

9.0 POTENTIAL EFFECTS ON PROPERTY OWNERS

The proposed changes will have no effect on nearby property owners because there will be no change in the T-line route.

10.0 POTENTIAL EFFECTS ON PARTIES IN THE APPLICATION PROCEEDINGS

The proposed changes will have no adverse effect on any parties in the application proceedings.

As demonstrated above, there is no potential for the requested changes to negatively impact the environment. In addition, the changes will not affect compliance with applicable LORS. Accordingly, HDPP, as supervisory agent to High Desert Power Trust, Ltd., requests that the Commission approves the proposed modifications and file a statement that it has made such a determination with the commission docket, pursuant to 20 CCR Section 1769 (a)(2).

Appendix A: Draft Order

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512

STATE OF CALIFORNIA
State Energy Resources
Conservation and Development Commission

In the Matter of:	)	Docket No. 97-AFC-1C
	)	Order No. xx-xxxx-xx
High Desert Power Project, LLC's	)	
HIGH DESERT POWER PROJECT	)	ORDER APPROVING Amendment
	)	To Transfer Ownership of Transmission
	)	Line to Southern California Edison

High Desert Power Project, LLC (HDPP), in its own capacity as holder of the California Energy Commission Certification and as supervisory agent to High Desert Power Trust, Ltd., has submitted a petition to amend the Energy Commission Decision for its High Desert Power Project (Docket No. 97-AFC-1C) located in Victorville. The petition requests that the Commission approve a transfer of ownership and responsibility for construction and operation of the project's transmission line (T-line) that runs from the Victor substation to the HDPP plant site. Ownership of the T-line will transfer from High Desert Power Trust, Ltd., to Southern California Edison (SCE). Responsibility for construction and operation of the T-line will transfer from HDPP, as supervisory agent for High Desert Power Trust, Ltd., to SCE. HDPP will retain possession of the Commission Certification and responsibility for construction and operation of the power plant and all other linears associated with the project. The petition also requests the amendment of certain Conditions of Certification to reflect SCE 's ownership of the T-line and the authority of the California Utilities Commission's (CPUC) over SCE. In addition, the petition requests a correction be made to the length of the proposed line and a change in the number and size of planned conductors to be used in the line.

The Commission approves HDPP's proposed amendments in accordance with Title 20, Section 1769 (a) (3) of the California Code of Regulations.

COMMISSION FINDINGS

Based on staff's analysis, the Commission concludes that the proposed changes will not result in any significant impact to public health and safety, or the environment. The Commission finds that:

1. There will be no potential for significant environmental impacts associated with the proposed changes.

2. The project will remain in compliance with all applicable laws, ordinances, regulations and standards, subject to the provisions of the Public Resources Code section 25525.

ORDER

It should be noted that in the following modified Conditions of Certification and in all other sections of the Commission Decision that apply to the T-line, the "project owner" of the T-line will be Southern California Edison (SCE), and SCE shall be solely responsible for compliance with all conditions of certification with regard to the ownership, design, construction and operation of the transmission line from the Victor substation to the project site. HDPP and High Desert Power Trust, Ltd. shall not have any responsibility for compliance with any CEC Conditions of Certification that apply to the T-line.

The Commission hereby adopts the following changes to the High Desert Power Project Decision Conditions of Certification (new language double underlined, deletions struck out).

Modified Transmission System Engineering Conditions

TSE-1 The project owner shall ensure that the design, construction and operation of the proposed transmission facilities will conform to requirements 1a through 1h listed below. The substitution of CPM approved "equivalent" equipment and equivalent switchyard configurations is acceptable.

a. The project 230 kilovolt switchyard shall include a breaker-and-a-half breaker and bus configuration.

b. Breakers and bus shall be sized to comply with a short circuit analysis.

c. An approximately 7.~~2~~8 mile single circuit 230 kilovolt line using lattice or steel pole construction with two ~~954~~ 1,590 thousand circular mil conductors ~~(or larger)~~ per phase position (twin bundles) shall be constructed to the Victor 230 kilovolt substation.

d. Termination facilities at the Victor 230 kilovolt substation shall comply with applicable Cal ISO and Edison interconnection standards (CPUC Rule 21 and Cal ISO Tariff).

e. The HDPP shall be included in the existing Edison remedial action schemes and new remedial action schemes shall be developed in coordination with Edison and the Cal ISO to meet Edison's Transmission Planning Criteria and Guidelines and the WSCC and NERC Reliability criteria and Planning standards.

f. The transmission facilities shall meet or exceed the requirements of CPUC GO-95; and

g. Outlet line crossings and areas where the outlet line parallels other transmission or distribution facilities shall be coordinated with the transmission line owner and comply with the owner's standards. The outlet line shall cross under existing extra high voltage transmission lines. Sufficient separation shall be maintained between the outlet line and the Adelanto-Intermountain 500 kV DC line to reduce the risk of the common mode outage of both lines.

h. Recommendations contained in the HDPP Facilities study shall be followed by the project owner/operator.

Verification: At least sixty (60) days prior to start of construction of transmission facilities, the project owner shall submit for approval to the CPM electrical one-line diagrams signed and sealed by a registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements 1a through 1h above. Substitution of equipment and substation configurations shall be identified and justified by the project owner for CPM approval.

TSE-3 The project owner shall be responsible for the inspection of the transmission facilities during ~~and after~~ project construction ~~and any subsequent CPM-approved changes thereto,~~ to ensure conformance with CPUC GO-95 and CPUC Rule No. 21 and these conditions. In case of non-conformance, the project owner shall inform the CPM in writing within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after synchronization of the project, the project owner shall transmit to the CPM an engineering description(s), one-line drawings of the "as-built" facilities, and the results of the short circuit study signed and sealed by a registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95, CPUC Rule No. 21 and these conditions shall be concurrently provided.

Modified Transmission Line Safety and Nuisance Conditions

TLSN-1 The project owner shall construct the proposed transmission line according to requirements of GO-95 and applicable requirements of Title 8, section 2700 et seq., of the California Code of Regulations.

Verification: Thirty days before start of transmission line construction, the project owner shall submit to the Commission's Compliance Project Manager (CPM) a letter from a California-registered electrical engineer affirming that the proposed transmission line will be constructed according to requirements of ~~GO-95 and Title 8, section 2700 et seq. of the California Code of Regulations~~ the condition.

TLSN-2 ~~The project owner shall make every reasonable effort necessary to identify and correct, on a case-specific basis, all complaints of interference with radio or television signals from operation of the transmission line and related facilities. In addition to any transmission line repairs, the relevant corrective actions shall include, but not be limited to, adjusting or modifying receivers, adjusting, repairing, replacing or adding antennas, antenna signal amplifiers, filters or lead-in cables.~~

~~The project owner shall maintain written records, for a period of five (5) years, of complaints of radio and television interference attributable to operation together with the corrective action taken in response to each complaint. All complaints shall be recorded to include notations on the corrective action taken. Complaints not leading to a specific action or for which there was no resolution should be noted and explained. The record shall be signed by the project owner and also the complainant, if possible, to indicate concurrence with the corrective action or agreement with the justification for a lack of action.~~

~~**Verification:** All reports of line-related complaints shall be summarized and included in the Annual Compliance Report to the CPM.~~

TLSN-~~3~~2 The project owner shall ~~engage~~ utilize a qualified ~~consultant~~ individual or individuals to measure the strengths of the T-line electric and magnetic fields ~~before beginning construction and~~ after the ~~line is energized~~ start of plant operation. Measurements should be made at representative points along the line, to verify the design assumptions relative to field strengths. The areas to be measured should include the facility substation and any residences near the right-of-way.

Verification: ~~The project owner shall file a copy of the first set of pre-project measurements with the CPM at least 30 days before the start of construction.~~ The post-project measurement shall be filed with the CPM within ~~30~~ 60 days after the ~~day the line is energized~~ start of plant operation.

TLSN-~~4~~3 The project owner shall ensure that the transmission line right-of-way is kept free of combustible waste material, as required under the provisions of Section 4292 of the Public Resources Code and Title 14, Section 1250 of the California Code of Regulations, "Fire Prevention Standards for Electric Utilities," unless exempted from this requirement under these sections.

Verification: Within 60 days after the start of plant operations, ~~T~~the transmission line project owner shall provide a ~~summary of inspection results and any fire prevention activities along the right-of way, in the Annual Compliance Report to the CPM~~ letter to the CPM stating that it will follow the guidelines of the California Department of Forestry and Fire Prevention's *Power Line Fire Prevention Field Guide* with regard to combustible materials.

~~**TLSN-5** The project owner shall send a letter to all owners of property within or outside the right-of-way at least sixty (60) days prior to first transmission of electricity.~~

~~Protocol: The letter shall include the following:~~

- ~~a discussion of the nature and operation of a transmission line;~~
- ~~a discussion of the project owner's responsibility for grounding existing fences, gates, and other large permanent objects located within the right-of-way regardless of ownership;~~
- ~~a discussion of the property owner's responsibility to notify the project owner whenever the property owner adds or installs a metallic object which will require grounding, as noted above; and~~
- ~~a statement recommending against adding fuel to motor vehicles or other mechanical equipment underneath the line.~~

~~**Verification:** The project owner shall submit the proposed letter to the CPM for review and approval thirty (30) days prior to mailing it to the property owners, and shall maintain a record of correspondence (notification and responses) related to this requirement in a compliance file. The project owner shall notify the CPM in the first Monthly Compliance Report that the letters were mailed and that copies are on file.~~

~~**TLSN-6** The project owner shall ensure the grounding of any ungrounded permanent metallic objects within the right-of-way, regardless of ownership. Such objects shall include fences, gates, and other large objects. These objects shall be grounded according to procedures specified in the National Electrical Safety Code.~~

~~In the event of a refusal by the property owner to permit such grounding, the owner/operator shall so notify the CPM. Such notification shall include, when possible, the property owner's written objection. Upon receipt of such notice, the CPM may waive the requirement for grounding of the object involved.~~

~~**Verification:** At least ten (10) days before the line is energized, the project owner shall transmit to the CPM a letter confirming compliance with this condition~~.

IT IS SO ORDERED.

STATE OF CALIFORNIA
ENERGY RESOURCES
CONSERVATION AND
DEVELOPMENT COMMISSION

DATE

WILLIAM J. KEESE, Chairman

Appendix B

HIGH DESERT ELECTRIC TRANSMISSION LINE LIST REVISED February 8, 1999				
20010	468-231-02	VICTOR VALLEY ECONIMIC DEVELOPMENT	18374 REDINESS VICTORVILLE, CA 92394	
20020	468-231-06	VICTOR VALLEY ECONIMIC DEVELOPMENT	18374 REDINESS VICTORVILLE, CA 92394	
20030	468-231-22	AARON J. SHWAYDER	100 S FAIRFAX STREET DENVER, CO 80246	
20040	468-261-52	VIOLET B. BALDOCK TR	16488 CABRILLO DRIVE VICTORVILLE, CA 92394	
20050	468-261-63	CITY OF ADELANTO	P. O BOX 10 ADELANTO, CA 92301	
20060	472-161-26	SAINT MARY DESERT VALLEY HOSPITAL	HIGHWAY 18 APPLE VALLEY, CA 92307	
20070	472-161-25	INTERMOUNTAIN POWER AGENCY	P O BOX 51111 LOS ANGELES,CA 90051	
20080	472-161-27	SAINT MARY DESERT VALLEY HOSPITAL	HIGHWAY 18 APPLE VALLEY, CA 92307	
20090	472-161-40	AIRPORT ANNEX LLC	131 BRITTON AVENUE ATHERTON, CA 94027	
20095	472-161-41	AIRPORT ANNEX LLC	131 BRITTON AVENUE ATHERTON, CA 94027	
20100	472-161-11	UNITED STATES OF AMERICA		
20110	472-151-04	UNTIED STATES OF AMERICA		
20120	472-151-20	CITY OF LOS ANGELES	P. O. BOX 51111 LOS ANGELS, CA 90051	
20130	472-151-31	CITY OF LOS ANGELES	P. O. BOX 51111 LOS ANGELS, CA 90051	

20140	472-151-18	MONIR M. AWADA	6914 OTIS AVEUNE BELL, CA 90201	
20150	472-151-35	VIRGIL D. KVASNICKA	1235 BAYLOR DRIVE COLORADO SPRINGS, CO 80909	
20160	472-151-54	ALLEN C. FIGERT	3201 ARGONAUT MINE ROAD GREENWOOD, CA 95635	
20170	472-151-51	AMIRAGHA EMRANI	1317 SALTAIR AVENUE LOS ANGELES, CA 90025	
20180	472-151-52	EDWARD W. BRIGHT	1271 LAS VISTILLAS LAKE SAN MARCOS, CA 92069	
20190	472-151-50	INA WYN COLEMAN	8728 ST IVES DRIVE LOS ANGELES, CA 90069	
20200	472-151-65	EDWARD W. BRIGHT	1271 LAS VISTILLAS LAKE SAN MARCOS, CA 92069	
20210	472-151-63	KUO HUA LEE	2062 ALMOND AVENUE ONTARIO, CA 91762	
20220	472-151-62	CITY OF LOS ANGELES	P.O. BOX 51111 LOS ANGELES, CA 90051	
20230	472-151-64	CITY OF LOS ANGELES	P.O. BOX 51111 LOS ANGELES, CA 90051	
20240		OFF LINE		
20250		OFF LINE		
20260		OFF LINE		
20270		OFF LINE		
20280		OFF LINE		

20290		OFF LINE		
20300	394-011-11	CITY OF LOS ANGELES	P O BOX 51111 LOS ANGELES, CA 90051	
20310	394-011-16	INLAND EMPIRE	801 PARK CENTER DRIVE #325 SANTA ANA, CA 92807	
20320	394-011-14	INLAND EMPIRE	801 PARK CENTER DRIVE #325 SANTA ANA, CA 92807	
20330	394-161-06	WILLIAKM D. AND DIANE PRIOR	3328 CALIFORNIA STREET COSTA MESA, CA 92626	
20340	394-161-05	JACK FINKELSTEIN	2651 WALKER LEE DRIVE LOS ALAMITOS, CA 90720	
20350	394-161-20	MOHAMED O. BELLIL	11800 THUNDERBIRD AVE NORTHRIDGE, CA 91326	
20360	394-161-25	NICOLAS KELEMAN	102 RUE DES FUSILLES 59650 VILLENEUVE D'ASCQ FRANCE 00001	
20370	394-161-11	LILLIAN W. ROACH	P O BOX 2191 APPLE VALLEY, CA 92307	
20380	394-161-30	TO PHAM	638 E. LENNOX CT BREA, CA 92821	
20390	394-161-28	TO PHAM	638 E. LENNOX CT BREA, CA 92821	
20400	455-052-41	GERALD E. HANSOOM	2461 SARBONNE DRIVE OCEANSIDE, CA 92054	
20410	455-053-52	CAESAR GIOVANNINI	8114 E. WOOD DRIVE SCOTTSDALE, AZ 85260	

20420	455-053-51	CAESAR GIOVANNINI	8114 E. WOOD DRIVE SCOTTSDALE, AZ 85260	
20430	455-053-21	DLA DEVELOPMENT	11770 E. WARNER SUITE #208 FOUNTAIN VALLEY, CA 92708	
20440	455-053-23	TOKOYO NOZAKI	21062 NANDINA RD APPLE VALLEY, CA 92308	
20450	455-053-57	TO QUANG PHAM	638 E. LENNOX COURT BREA, CA 92621	
20460	455-053-67	ELI W. HARE	223 VIRGINIA STREET D EL SEGUNDO, CA 90245	
20470	455-053-56	TO QUANG PHAM	638 E. LENNOX CT BREA, CA 92621	
20480	455-053-55	TO QUANG PHAM	638 E. LENNOX COURT BREA, CA 92621	
20490	455-053-61	JAMES SCHOEMANN	351 DAY STREET SAN FRANCISCO, CA 94131	
20500	455-053-60	JAMES SCHOEMANN	351 DAY STREET SAN FRANCISCO, CA 94131	
20510	455-053-83	CARL P. COLEMAN	2533 N. CARSON ST 4039 CARSON CITY, NV. 89706	
20520	455-053-85	MOON SUK HAN	26205 GOLADA MISSION VIEJO, CA 92692	
20530	455-861-32	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	

20540	455-861-40	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20550	455-861-39	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20560	455-861-38	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20570	455-861-41	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20580	455-861-08	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20590	455-861-09	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20600	455-861-10	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20610	455-861-11	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20620	455-861-06	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20630	455-861-05	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20640	455-861-04	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20650	455-042-61	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	

20660	455-042-60	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20670	455-042-59	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20680	455-042-58	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20690	455-042-57	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20700	455-042-56	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20710	455-042-55	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20720	455-042-54	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20730	455-042-53	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20740	455-042-52	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20750	455-042-51	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20760	455-042-50	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20770	455-042-49	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	

20780	455-042-48	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20790	455-042-47	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20800	455-042-46	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20810	455-064-23	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20820	455-064-22	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20830	455-014-83	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20840	455-014-82	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20850	455-014-81	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20860	455-014-80	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20870	455-014-79	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20880	455-014-68	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20890	455-014-69	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	

20900	455-014-70	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20910	455-014-66	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20920	455-014-65	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20930	455-014-64	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20940	455-014-63	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20950	455-014-62	RADNOR/SUNLAND/ VICTORVILLE PARTNERSHIP	9255 TOWNE CENTRE DR STE 100 SAN DIEGO, CA 92121	
20960	3104-011-12	LAUREL M. DICICCO TR	14916 CHOLAME RD VICTORVILLE, CA 92392	
20970	3104-011-13	LAUREL M. DICICCO TR	14916 CHOLAME RD VICTORVILLE, CA 92392	
20980	3104-021-01	AGC PARTNERSHIP	2158 DURFEE AVE EL MONTE, CA 91733	
20990	3104-021-05	VICTORVILLE INVESTORS SIX LLC	990 HIGHLAND DR STE 320 SOLANA BEACH, CA 92075	
21000	3104-071-02	PAJARITO LIMITED PARTNERSHIP	719 OAK STONE WAY ANAHEIM, CA 92806	
21010	3104-071-01	PAJARITO LIMITED PARTNERSHIP	719 OAK STONE WAY ANAHEIM, CA 92806	

21020	3104-081-01	PAJARITO LIMITED PARTNERSHIP	719 OAK STONE WAY ANAHEIM, CA 92806	
21030	3103-311-02	GEORGE J. MIYASAKO TR	P.O. BOX 1515 ONTARIO, CA 91762	
21040	3103-591-11	BEVERLY J. SCOTT	P.O. BOX 459 YUCCA VALLEY, CA 92286	
21050	3103-591-12	ROBERT & WINIFRED MC GEE TR	4273 VINTON AVE. CULVER CITY, CA 90232	
21060	3103-591-13	MARY MILLS	4183 BALDWIN AVE. CULVER CITY, CA 90232	
21070	3103-591-08	VIKING RUN	1081 CAMINO DEL RIO SOUTH #225 SAN DIEGO, CA 92108	
21080	3103-591-10	EIGHTH STREET PROFESSIONAL BUILDING	3465 MALITO BONITA, CA 91902	
21090	3103-591-09	THUY Q. PHAM	5380 AVENITA DE MICHELLE YROBA LINDA, CA 92877	
21100	3103-601-06	CHARLES M. COURT	2652 LANTZ ROAD BEARERCREEK, OHIO 45385	
21110	3103-601-07	JOHN SCOTT WATSON	21 TAHQUITZ CT. CAMARILLO. CA. 93012	
21120	3103-601-08	MARK LANGLEY	P.O. BOX 820 PORT HADLOCK, WA 98339-0820	
21130	3103-601-05	DRA LAND	P.O. BOX 931 WESTMINSTER, CA 92684	

21140	3103-611-01	SOUTHERN CALIFORNIA EDISON		

Appendix C

EMF Field Management Plan

for the

High Desert Power Project 230kV

Transmission Line

Brian C. Thorson, EMF Specialist
Southern California Edison Company
March 30th, 2001

Acknowledgments

Several individuals contributed to the development of this Field Management Plan. Gary Swyter, Transmission Engineer, Dave Barriera and Deborah Jones of T/D Project Management, Jon Sirugo, and Ann Almonte of Edison's Public Affairs Department. Thanks to all for their timely and invaluable support.

Table of Contents

I. Purpose of Document

EMF field management plans are prepared for all new and upgraded electric utility transmission and substation facilities in accordance with the California Public Utility Commission's decision[1] to implement no-cost and low-cost[2] methods to reduce power frequency magnetic fields from new electric utility facilities. This document is intended to provide an overview of the proposed transmission/substation project and the EMF design considerations applied to it. A brief review of the pertinent science, policies, and design considerations are also provided.

II. Introduction to EMF

Electric and magnetic fields occur from a variety of energy sources that are electrical in nature. These energy sources and their associated electric and magnetic fields have been described and categorized within the electromagnetic spectrum. The spectrum in Figure 1 is organized by the frequency at which the electrical polarity of an energy source changes or oscillates with respect to time (in seconds). The frequency of an electric or magnetic field is expressed as Hertz (Hz). For instance, the earth's magnetic field does not change at any appreciable rate and is considered static. This lies at the extreme low end of the electromagnetic spectrum at zero Hz. At the opposite end of the electromagnetic spectrum are the gamma rays. These fields have an extremely high frequency (10^{21}) and a tremendous amount of energy. This is called ionizing radiation because this energy can ionize molecules. The spectrum includes; visible light, microwaves, radio waves, and electricity.

The electricity we use each day is generated, transmitted, and distributed at a constant frequency of 60 Hz, also referred to as "power frequency". The unit of measure for electrical power is Watts. Watts can be described as a product of electrical voltage and flow of charge (current or amperage). Power-frequency electric and magnetic fields are referred to as EMF. These fields are the focus of this document.

III. EMF Characteristics

Voltage or electrical pressure on any energized conductor exerts a force field known as an electric field. This electric field is measured in units of Volts per meter (V/m) and is dependent on the amount of charge. Therefore, a conductor energized at a higher level will have a higher electric field associated with it. Electric fields interact with other neighboring positive or negative charges to cause attracting or repelling forces. Like fields

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[1]California Public Utilities Commission, Interim EMF Opinion Decision 93-11-013.

[2] Decision 93-11-013 defines low-cost to be in the range of 4 percent of the total cost of a budgeted project.

repel whereas unlike fields attract. The strength of this field rapidly decreases with distance from the source, just like the heat and light of a candle falls off with distance. The electric field can easily be shielded. Electric fields from an overhead power line can be shielded by trees, fences, buildings, and most other structures. The electric field from buried power lines will be shielded by the earth. The strength of the electric field from a power line depends on the voltage level, the distance away from the line, and design of the system.

The use of electricity causes electric charges to flow as electric current. Magnetic fields are created by the current on a conductor. The unit of measure of magnetic fields is milliGauss (mG). The strength of magnetic fields diminishes quickly as you move away from the source, just like the electric field. However, the magnetic field is much more difficult to shield than electric fields. Trees, buildings, or the earth do not shield magnetic fields. Magnetic fields interact with neighboring magnetic fields and the resultant field depends on the magnitude and direction of each magnetic field source, i.e. currents. All Edison facilities contain multiple currents on circuits and depending on their arrangement can increase or decrease the strength of the magnetic field. Therefore, consideration of the direction and magnitude of the current and the configuration of conductors on poles or underground can be used to design facilities with reduced magnetic fields.

Power frequency electric fields and magnetic fields from electric utility facilities act independently of one another and are considered separately. Each field can be calculated and/or measured for power line facilities. This document will focus on power frequency electric and magnetic fields associated with the utility facilities of the proposed project.

IV. Science, Public Health, and Policy

During recent years, questions have been raised about the possible health effects of power frequency EMF. Scientific communities have been unable to determine if EMF causes health effects or to establish any standard level of exposure that is known to be harmful.[3] Current scientific research focuses on exposure to magnetic fields rather than electric fields. This document also focuses on the magnetic fields.

Because disease prevention may involve setting standards that limit exposures or emissions, public health brings science into the policy arena. One of the most important principles of public health policy is to make sure that resources are spent where they will do the most good, rather than being wasted on a minor risk while major tasks go unaddressed.[4] Typically, when public health and policy makers set exposure standards, they focus on the first health effects identified: the acute effects of high-level exposure.

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[3]Sahl J.D., Murdock B.S. *Electric and Magnetic Fields and Human Health: a Review of the Issues and the Science*. Southern California Edison Company, 1995.

[4]Sahl J.D., Murdock B.S. *Electric and Magnetic Fields and Human Health: a Review of the Issues and the Science*. Southern California Edison Company, 1995.

Setting standards for low-level exposures can be difficult and controversial, especially when the risks are uncertain and unproven, and the benefits of the proposed standards are intangible.[5]

So far, research on EMF effects on human health has not found sufficient evidence to link EMF exposure to the risk of cancer or other disease. Accordingly, the CPUC decision 93-11-013 states in its conclusions of law: "It is not appropriate to adopt any specific numerical standard in association with EMFs until we have a firm scientific basis for adopting any particular value". If even the highest risk estimates reported in some of the literature are real, the individual risk is likely to be small, particularly compared to other health risks and compared to the benefits we derive from electric power. As a result, public policies that address the EMF question will have to be extremely flexible and to offer a self-correcting interaction between scientific research and policy making. Using such a model, we can respond appropriately as we learn more about the EMF issue.[6]

Recently, the National Academy of Sciences (NAS) issued a report finding that there is no clear, convincing evidence to show that residential exposures to electric and magnetic fields (EMF) are a threat to human health. The NAS is a private, non-profit society of distinguished scholars that advises the federal government on scientific and technical issues.[7]

The Southern California Edison Company is aware that the public's concerns about the EMF issue are widespread and sincere. We recognize and take seriously our responsibilities to help resolve these concerns. Realizing that we need to better understand electric and magnetic fields and respond to the current uncertainty, we believe Edison's responsibilities are to:

- Provide balanced, accurate information derived from all sources to our employees, customers and regulators, including providing EMF measurements and consultation to our customers upon request.
- Support research to resolve the unanswered scientific questions.
- Conduct research to develop and evaluate engineering designs for reducing fields from electric facilities.

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[5]Nair I. Scientific uncertainty, risk assessment, and standard setting. In: *Electricity and Magnetism in Biology and Medicine*; M. Blank (editor). San Francisco: San Francisco Press, 1993

[6]Sahl J.D., Bernstein B.B. *Developing Policy in an Uncertain World: A Framework for Approaching the EMF Issue*. (draft document).

[7]*National Academy of Sciences (NAS). Possible Health effects of exposure to residential electric and magnetic fields. October 1996.*

- Take reasonable, low-cost steps to minimize field exposures from new facilities and continue to consult and advise our customers with respect to existing facilities.

- Research and evaluate occupational health implications and provide employees who work near energized equipment with timely, accurate information about field exposures in their work environment.

- Encourage agencies like the California Department of Health Services (CDHS), California Public Utilities Commission (CPUC), and other appropriate state and federal governmental bodies to provide reasonable uniform regulatory guidance.

The CPUC interim decision[8] includes developing design guidelines for utilities to use in reducing EMF from new and upgraded facilities at no and low-cost, developing public information and research programs directed by the CDHS, and offering free measurement services for homes and businesses. Financial support by utilities for the $65 million Federal EMF Research Program was also authorized.

V. EMF Design Considerations

The strength of fields at various distances from power line facilities can be calculated. The use of computer programs can expedite the performance of calculations needed to estimate the value of the electric and magnetic fields at any given point within or around a substation, transmission system, or distribution system. Edison developed two computer programs to model fields. The *FIELDS* program models EMF from overhead and underground lines. *3-D Fields* models EMF from three-dimensional components such as substations. The *Fields* program was used to assess fields from this proposed project. By utilizing these programs, designers can determine the best phasing and construction configuration for reducing EMF at no and low-cost.

The methods described here to reduce magnetic fields may lower electric fields as well. The focus of the design considerations implemented for this project is on methods to reduce the magnetic field.

Edison identified methods to reduce magnetic fields unique to our facilities and incorporated these techniques into the "EMF Design Guidelines for New Electrical Facilities: Transmission, Substation, Distribution" manual[9]. Using these guidelines, no and low-cost measures to reduce fields will be implemented wherever available and practical in accordance with CPUC decision 93-11-013. The criteria will be based on the following recommendations and assumptions:

8 California Public Utilities Commission, Order Instituting Investigation (OII) Decision 93-11-013, dated November 2, 1993.

9 EMF Design Guidelines for New Electrical Facilities: Transmission, Substation, Distribution, Southern California Edison Company, Spring 1994

- Determine the number and size of the areas that need to be considered for EMF reduction.

- Prioritize these areas starting with schools/day-care centers as top priority.

- Cost of reduction technique(s) incorporated in the design will determine the number of areas that can be mitigated along the route of the project.

- Total cost of mitigation should not exceed 4 percent of the total cost of the project.

- The solution selected should not jeopardize the reliability nor downgrade the operating characteristics of the system. It should not create a hazard to maintenance personnel nor to the public in general.

- The research department should be contacted periodically for the latest advancements in methods of reducing EMF.

If it is not possible to route/reroute around areas of EMF concern, then the following steps should be considered:

- Selection of the proper phasing arrangement is usually the most effective way to reduce fields for two circuits on the same structure or two or more circuits on the same right-of-way, for practically no, or minimal, cost.

- The split-phase or bundling of additional conductors is a technique that can be explored if only one circuit exists on the route.

- The phasing arrangement selected should be reviewed by System Operations to determine impact of net-through unbalance on the system when dealing with bulk-power circuits.

If only one or two areas of a transmission line project need to be mitigated, other effective methods may be considered to reduce EMF provided that costs do not exceed 4 percent of the overall cost.

- These methods would include: a) Raising the height of the line for several spans b) Buying additional right-of-way to increase width of side boards c) Selecting a more compact, balanced-type configuration.

- For a wood-pole sub-transmission project, the most cost-effective procedure may be raising the pole height or selecting a compact, balanced configuration.

The selection of a particular poletop configuration for new lines and rebuilds should be based on which configuration offers the most economy and still meets the necessary requirements. In addition, existing conditions and future system requirements must also be considered.

When installing electrical facilities which involve both Distribution (< 50kV) and Transmission (> 50kV), the following guidelines should be followed:

- When overbuilding (or underbuilding) existing facilities, determine the phasing on the existing circuits and then phase the new circuit or circuits accordingly. In most cases this proves to be a very satisfactory method for minimizing fields.

- New construction involving both Distribution and Transmission facilities requires that they get together and agree on the phasing and construction configuration. The same considerations shall apply when joint construction is used between different utilities.

- Where new or reworked sub-transmission facilities are being considered on the same structures with distribution circuits, the most effective field reduction measures may be those applied to the distribution circuits. Where common structures are involved, the 4-percent cost for field-reduction measures may be applied to any of the involved circuits.

VI. The High Desert Power Project 230kV Transmission Line Project:

A. Project Description

Southern California Edison (SCE) proposes to construct a 230,000 Volt (230kV) transmission line connecting the planned High Desert Power Project LLC (HDPP) generation facility switchyard with SCE's Victor Substation in San Bernardino County. The HDPP plant will be built on a 25 acre site, on the east side of Southern California International Airport (SCIA), formerly George Air Force Base, in the northwest corner of the City of Victorville, California (Figures 2,3). This line is needed to transmit 867 megawatts (867MW) of new electric generation to the Southern California power grid. Planned operating date for the line is July 1st, 2002.

B. Transmission Line, Route, and Surrounding Land Use Description

1. Base Case Line Description:

The proposed HDPP to Victor Substation transmission line will leave the generating plant on the east side and run southeast parallel to El Evado Road for about 1.7 miles. It will then turn south and parallel the Intermountain Power Project (IPP) DC line for about one (1.0) mile and then cross under the IPP line and two Los Angeles Department of Water and Power (LADWP) Victorville-Adelanto 500kV lines. The line will continue south for another 0.4 miles and cross under the LADWP Victorville-Rinaldi 500kV line, and again for 0.2 miles where it will enter an existing SCE utility corridor. The line will turn to the southwest parallel to SCE 33kV and 115kV lines for 4.0 miles to Victor Substation (Figure 3).

The planned new transmission line will be built as a double circuit facility but will be a single circuit. Two types of structures will be employed. Tubular steel poles will be used for approximately 1.8 miles from the generating station to 0.3 miles north of Turner Road. Steel lattice towers will carry the line the rest of the route to Victor substation. Two 1,590,000 circular mil (1590 kcmil) conductors per phase position (twin bundle) will be supported by 230kV polymer insulators in "V-string" suspension on the poles and "I-string" suspension on the towers. The top, middle, and bottom phases will be paralleled across the structures to form one 230kV line. The base case design calls for 120-ft. tubular steel poles and 138-ft. towers, both with a shield wire overhead for thunder storm protection (Figures 4 and 5).

SCE utilizes several types of wiring configurations for its 230 kV transmission lines. The V-string suspension insulator configuration was selected for the steel pole section to restrict insulator movement and reduce conductor swing in the strong wind conditions so common to the high desert region. This design was selected to meet right-of-way space constraints. The V-string design also permits more compact conductor placement for

EMF reduction purposes, and permits small line angles to be turned with little or no extra cost. I-string suspension insulator design was chosen for the towers because of existing SCE approved tower design standards.

The specified maximum mid-span line sag will be 30 feet for the steel poles and 55 feet for the towers, at 130 degrees Fahrenheit under maximum load conditions. These line sag values will be subtracted from the conductor heights at point of support on the poles and the resulting conductor heights used in the magnetic field models. These calculated values will result in minimum ground clearances across flat terrain of approximately 30 feet.

The transmission line will be designed and operated to comply with all federal, state and local regulations, applicable safety codes, and SCE design standards. The 1590 kcmil conductors have a thermal loading capacity of 1615 Amps. The anticipated load on the new 230kV line is approximately 2200 Amps per phase, or 550 Amps per conductor.

2. Base Case Line Data:

Line Length:	7.3 Miles
Voltage:	230,000 Volts (230kV)
Maximum Anticipated Load Current:	2200 Amps per phase (550 Amps per Conductor)
Structure(s):	120-foot tubular steel poles 138-foot steel lattice towers
Span Length:	800 Feet (poles)
Insulators:	230kV Polymer Suspension Poles - 'V-String' config. Towers – "I-string" config.
Conductors:	1590 kcmil ACSR "Lapwing" (1615 Amps Maximum)
Conductor Placement Configuration:	Vertical configuration
Minimum Vertical Ground Clearance:	30 feet (30' and 55' sags)

3. Base Case Project Cost:

Overhead Transmission Line:	$ 9,000,000
R.O.W. / Easement / Franchise Costs:	$ 3,736,000
Total Base Case Costs:	$ 12,736,000
4% of Base Case:	$ 509,440

4. Base Case Line Route Description:

The proposed new 230kV transmission line will carry approximately 867MW from the HDPP generating plant for 7.3 miles, first to the southeast, then south, then southwest, to SCE's Victor Substation. See paragraph B.1. above for detailed route description.

5. Base Case Land Use Description Along Line Route:

The property adjacent to the proposed line is about 95 percent undeveloped land with some commercial property near the airport. The majority of the area is rural. Some residential development can be seen from the line route at a distance exceeding three hundred (300) feet. No schools or daycare centers border the proposed route.

C. Magnetic Field Modeling Assumptions

Computer-generated models were used to evaluate the magnetic field characteristics of the existing lines, the proposed base case construction, and various magnetic field reduction alternatives. Several possible construction methods were modeled and considered. The models applicable to this project are found in the Appendix. Engineering assumptions for the computer models are as follows.

The 2200 Amp maximum anticipated load current was based on an assumption of 867MW output power from the HDPP generation plant. This current value was used to model the 60Hz AC magnetic field strength in the vicinity of the proposed 230kV line. Current on this line will flow out of the HDPP switchyard and into Victor Substation. Shield conductors, ground wires and neutrals are treated as de-energized conductors with zero current flow. Phase balance is assumed in the energized circuits. Energized circuits included in the magnetic field models are listed in Chart A below.

Circuit	Load
HDPP-Victor 230kV Line	2200 Amps

Chart A: Energized Circuits Considered In Magnetic Field Models

The proposed base case conductor spacings at point of support on poles are shown in Figures 4 and 5. Conductor heights and spacings used in the magnetic field models include specified line sags for the 230kV conductors. Magnetic field strength is calculated at a height of three feet above ground.

The models assume flat terrain conditions between poles. Because uneven terrain may actually be found at some locations along the proposed line route, mid-span conductor heights above ground will actually be inconsistent and varied. Accordingly, the results in the magnetic field models are for comparison of construction methods only and cannot be assumed to represent actual milligauss (mG) levels found at any particular point along the line route. In addition, because of the numerous and complex variables that affect magnetic field strength, SCE makes no guarantee or representation that magnetic field levels presented in this document will reflect the actual measured values once construction of the proposed line is completed.

Calculations of resultant magnetic field are expressed in units of milliGauss (mG), and represent the product of both horizontal and vertical fields. These values of magnetic field strength are consistent with those indicated by gaussmeters commonly used to measure magnetic fields. Computer models of the base case, typical, and other construction options can be found in the Appendix at the end of this report.

D. No-Cost Field Reduction Measures to be Implemented:

1. Typical 230kV Construction:

A typical 230kV line construction method employs vertical conductor configuration and I-string suspension insulators. Construction details are shown in Figure 6. The magnetic field model results for Vertical I-String design are:

Typical Single-Circuit Vertical 230kV Line on I-string Suspension Insulators (HDESTYPI.FLD)

Magnetic field 3 feet above ground under the specified line sag:	= 277	mG
Magnetic field 3 feet above ground 50 feet perpendicular to line	= 107	mG

2. Base Case:

The Base Case design for the proposed new facilities was arrived at using SCE standard construction methods and hardware that comply with all applicable safety, reliability and regulatory guidelines. SCE Transmission Engineers and Planners have been using EMF reducing hardware and methods as standard construction practices for several years now. Accordingly, no-cost EMF reduction techniques are often already incorporated in the base case construction. Applicable no-cost measures in the base case are as follows.

Split Phasing was identified as a no-cost measure applicable to this project. Base case design for the HDPP-Victor 230kV Line calls for the total current to be split and transmitted on both sides of the support structures in a double-circuit conductor configuration. The phases would be parallel across the structures in an ABC-ABC top-to-bottom arrangement. The resulting line would look like a double circuit line, but the current on each conductor would be reduced to ½ the total value per phase. The tubular steel poles will employ V-string suspension, and the steel lattice towers will use I-String suspension. The magnetic field model results for triangle configuration with V-String insulators are:

The (proposed) HDPP-Victor 230kV Line on 120-ft. Tubular Steel Poles with V-String Suspension Insulators, Split-Phased (HDESBASB.FLD)

Magnetic field 3 feet above ground under the specified line sag:	= 224 mG
Magnetic field 3 feet above ground 50 feet perpendicular to line	= 104 mG

The preceding models show a decrease in magnetic field strength of 19% under the line sag for the proposed base case construction versus the typical construction . No-cost measures in the base case include **split-phasing.** The tubular steel pole section was used in the preceding comparison because it represents the worst-case. The Base Case design further minimizes magnetic fields by utilizing the most direct line route. Construction details are shown in Figure 4. No further No-Cost field reduction measures have been identified for this project.

E. Priority Areas Where Low Cost Measures Are To Be Applied

In keeping with the intent of the CPUC order on low-cost measures, areas such as schools and daycare centers would be given higher priority in determining where low-cost field management measures would be applied.

The developed property adjacent to the proposed line is approximately 5 percent commercial or industrial, and no residential development borders the line route. Residential development can be seen from the proposed line route separated by at least 300 feet. No schools or daycare centers are adjacent to the proposed line. Future residential development may eventually border the right-of-way, but is not currently underway. Because future development along the new line route is difficult to anticipate, low-cost field reduction measures will be considered that can be applied equally along the entire route.

F. Low Cost Field Reduction Considerations:

Reverse Phasing was identified as a possible low cost field reduction technique for this project. Other techniques were not selected because:

- Increased conductor height is not an aesthetically desirable option because the proposed design includes poles over 100 feet tall, and proximity to an airport presents FAA height restrictions.
- Increasing easement width along this route is not possible since the proposed line will have to fit into an existing transmission corridor with other lines.
- Shielding is not applicable to this project.
- Current Reduction is not applicable to this project.
- Undergrounding the 230kV conductors along the line route would not be a low cost option.

1. Field Reduction Alternative #1: Reverse Phasing

This alternative considers the effect of splitting the current and placing three conductors on opposite sides of the pole. The phases would be reversed (ABC-CBA top-to-bottom) for field cancellation. The resulting line would look like a double circuit line, but the current on each conductor would be reduced to ½ the total value per phase. This technique would require additional non-standard transposition structures at both ends of the line. Labor costs for installation would also be higher. The effect of this alternative on magnetic fields and project cost is presented below. Construction details are shown in Figure 7. Magnetic field models for all alternatives are included in the Appendix.

Reverse Phasing (HDESREVP.FLD)

Magnetic field 3 feet above ground under the specified line sag	= 122 mG
Magnetic field 3 feet above ground 50 feet perpendicular to line	= 30.3 mG
Percent Field Reduction under line sag vs. Base Case	= 45%
Cost of this Field Reduction Alternative	= $577,000
Percent of Total Project Cost	= 4.53 %

No other low-cost alternatives were identified for this project.

G. Field Reduction Alternatives Selected:

No low-cost magnetic field reducing techniques were selected for this transmission line project. A significant (19%) field reducing design technique was implemented in the base case construction as compared with a standard 230kV line construction method. See section 'D' above.

H. Field Reduction Alternatives Not Selected:

Field Reduction Alternative # 1: Reverse Phasing - Although the use of reverse-phasing decreases magnetic field levels by a significant amount (45 percent), the cost of this option

is prohibitive. Special non-standard transposition structures would add significant cost to the project. Together with added installation labor charges, this alternative exceeds the 4% guideline. Alternative #2 is not a low-cost option and is, therefore, not recommended for implementation.

1. Total Cost for Field Reduction Alternative(s) not selected = $577,000
   Alternative # 2 cost as a percentage of project costs = 4.53 %
   Alternative # 2 field reduction vs. Base Case = 45 %

Table A: Detailed FMP Consideration Matrix

EMF Considerations:	*Rationale:*	*% of Base Case Cost:*
Distance		
• Right-of-Way Width	Increasing easement width along this route is not applicable because the proposed line must fit inside an existing right-of-way with limited space.	N/A
• Conductor Height	Not applicable to this project (Poles are already 100' tall)	N/A
• Facility placement relative to occupied areas	Alternate facility placement would not result in lower human exposure.	N/A
Conductor Configuration		
• More compact and symmetrical conductor arrangement	Not applicable to this project	N/A
Phase Arrangement		
• Phase conductor placement relative to other circuits resulting in magnetic field cancellation.	Field Reduction Alternative #1 – not a low-cost option	4.5%
Current Reduction		
• Increase Voltage	Not applicable to this project	N/A
• Change in load flow	Not applicable to this project	N/A
Split Phasing	Base Case	No-Cost

Table A: Detailed FMP Consideration Matrix (continued)

Shielding and Active Cancellation	Not Applicable to this project.	N/A
Undergrounding • Install underground conductors • Duct bank cable configuration • Increase depth	Not Applicable to this project. This would not be a low-cost option.	N/A N/A N/A

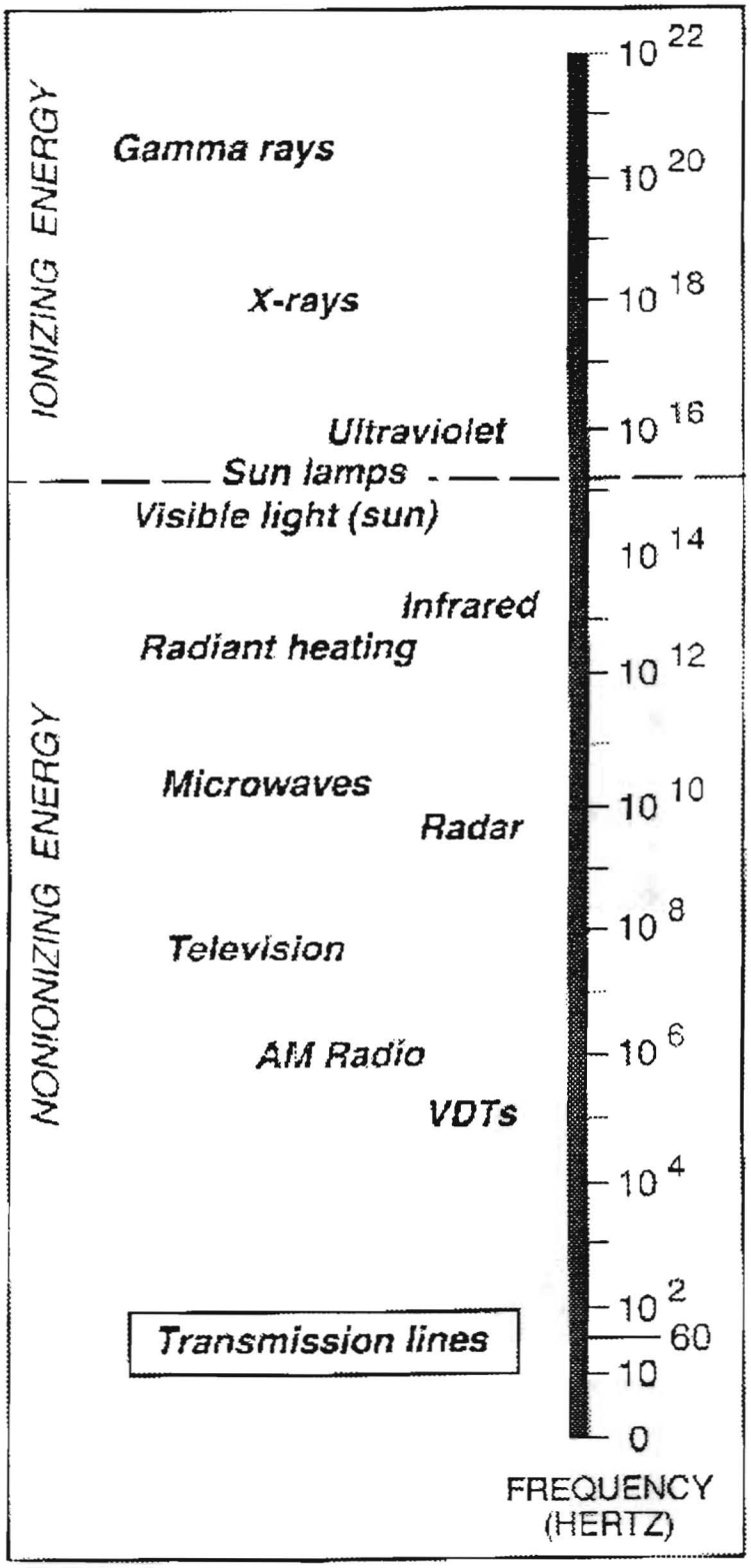


Figure 1: Electromagnetic Frequency Spectrum

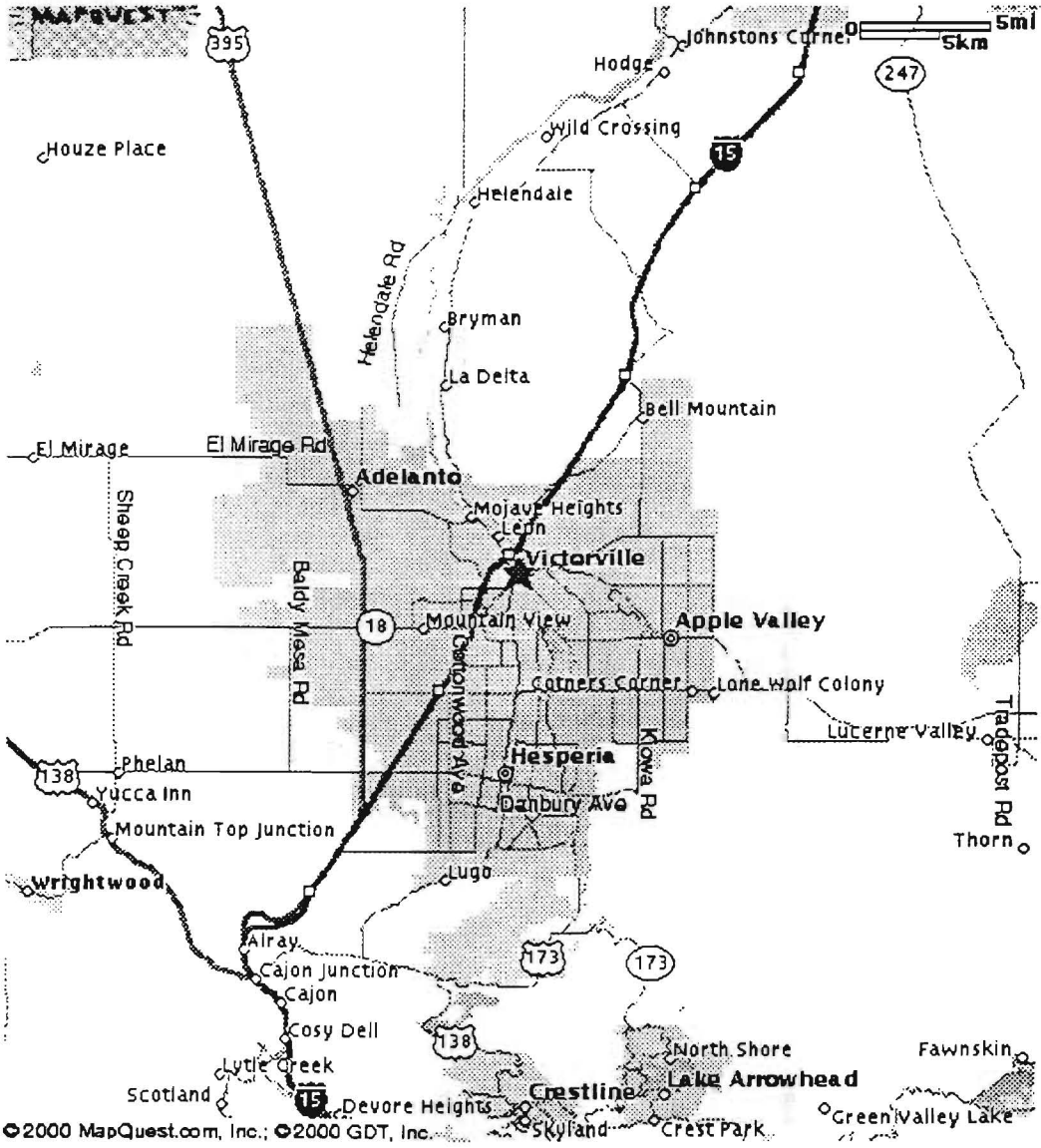


Figure 2: Regional Map of Project Area

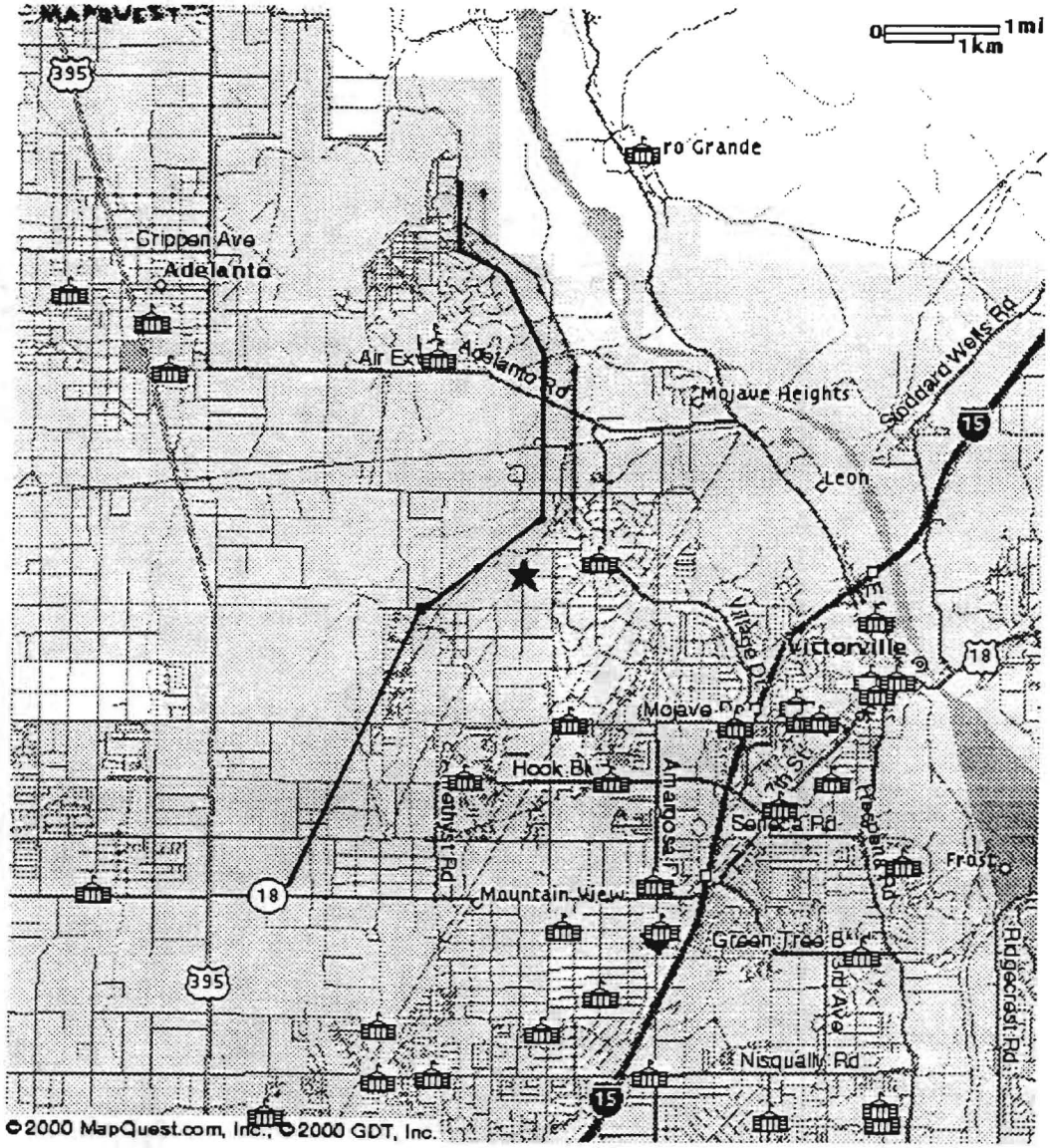
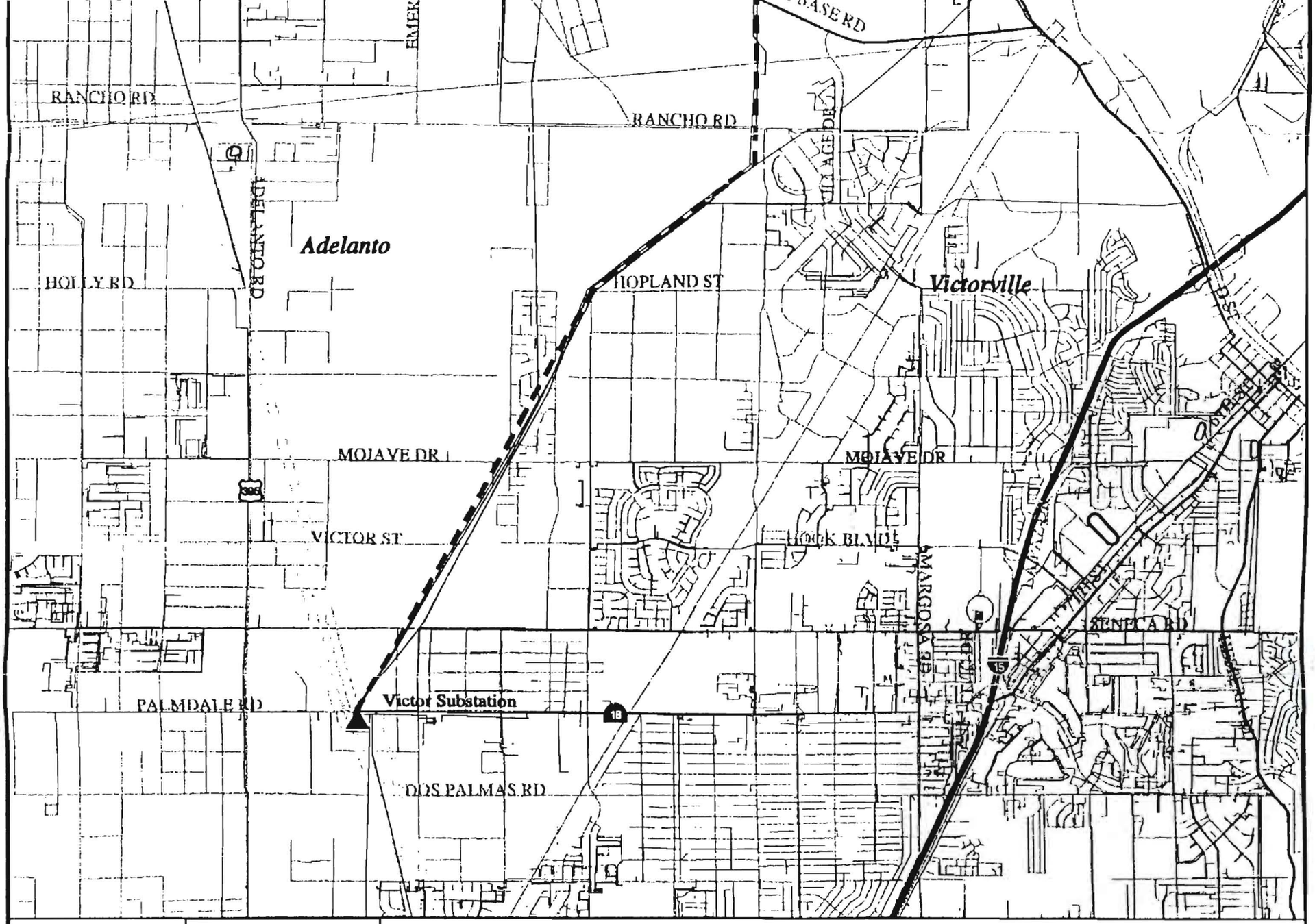


Figure 3: Project Route Map



N

Legend:

0 1 2 3 4 Miles

High Desert Power Project
Facilities Study

Date: July 16, 1999

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

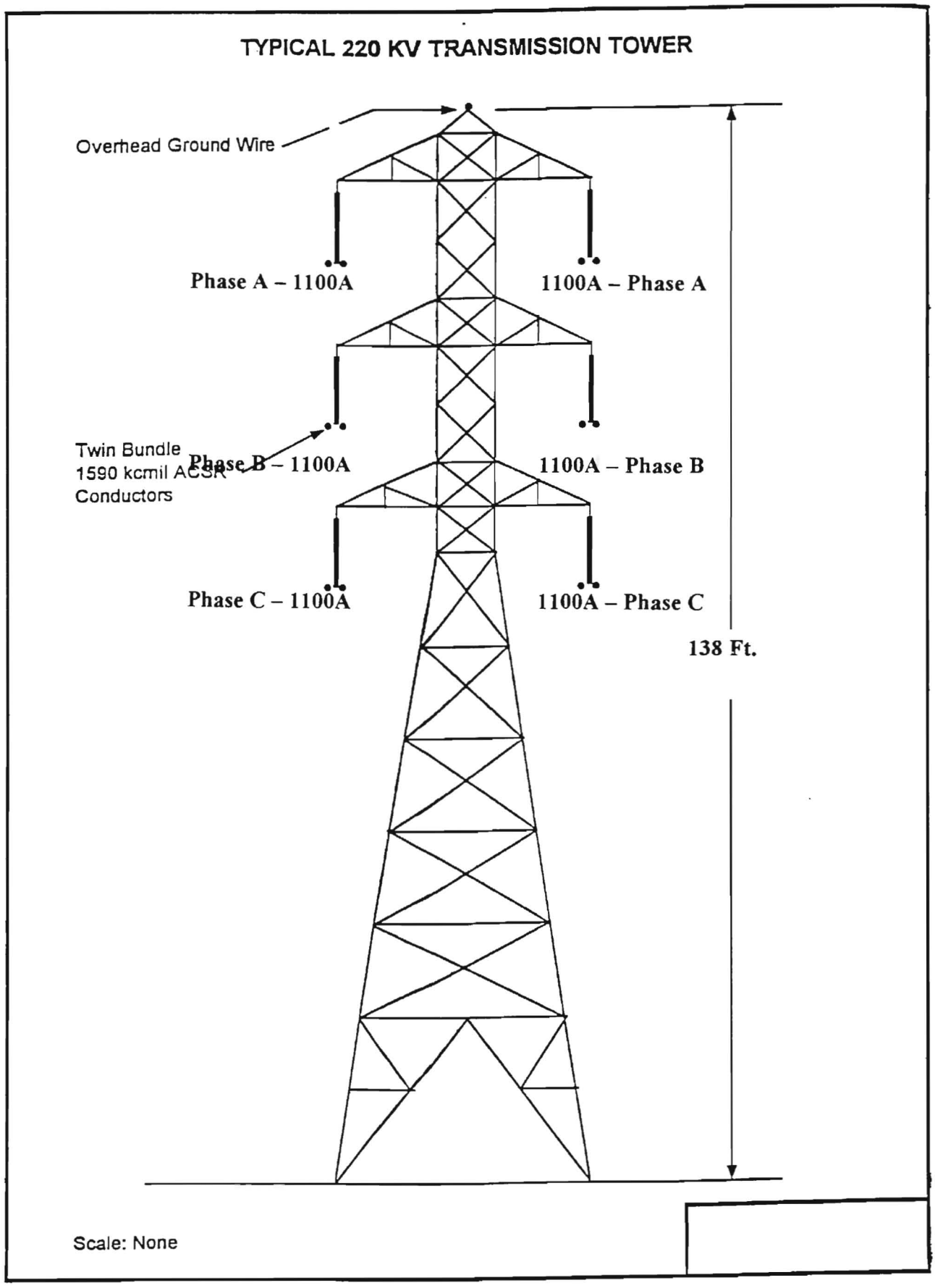


Figure 4: Base Case A Construction Details

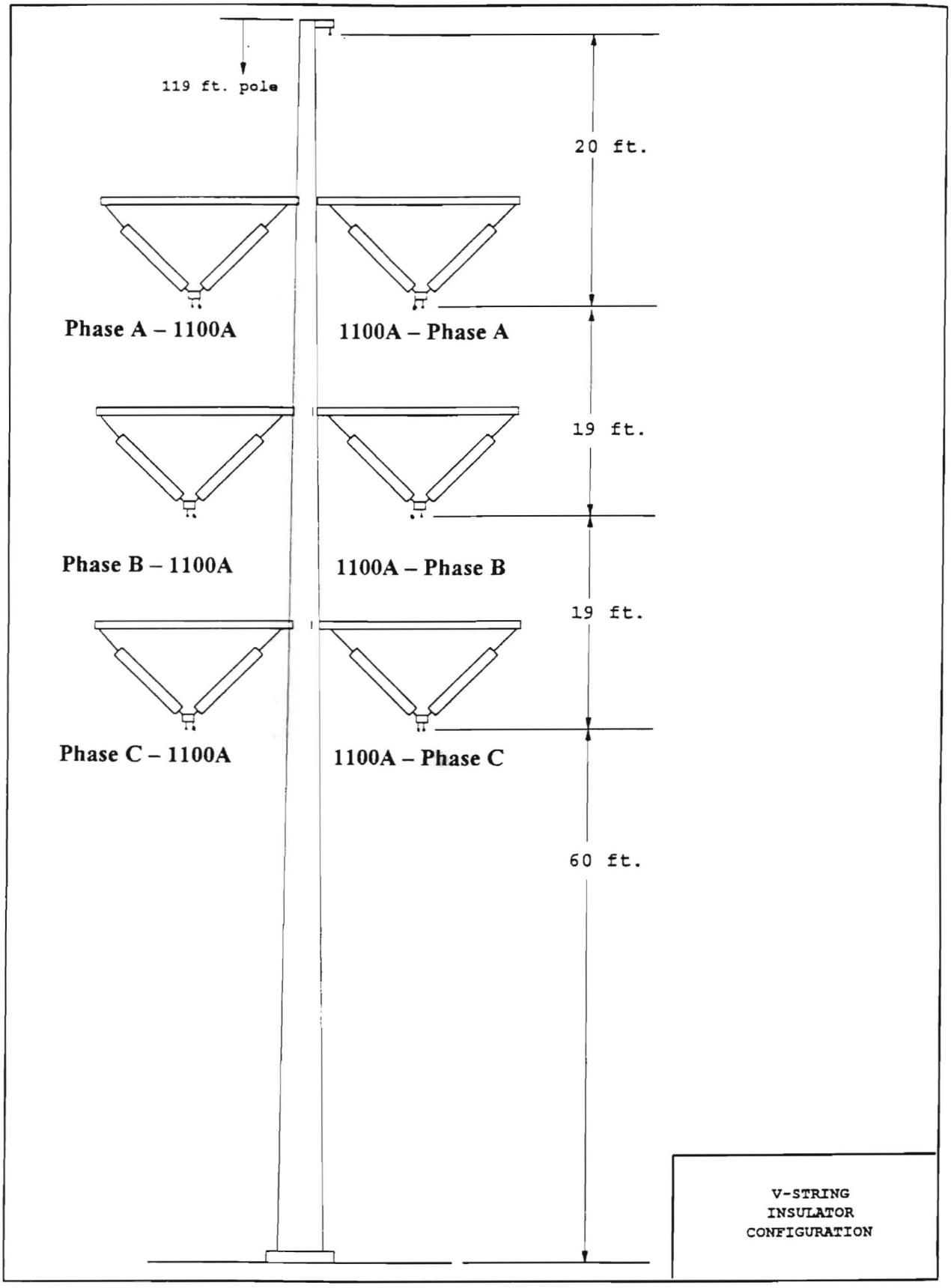


Figure 5: Base Case B Construction Details

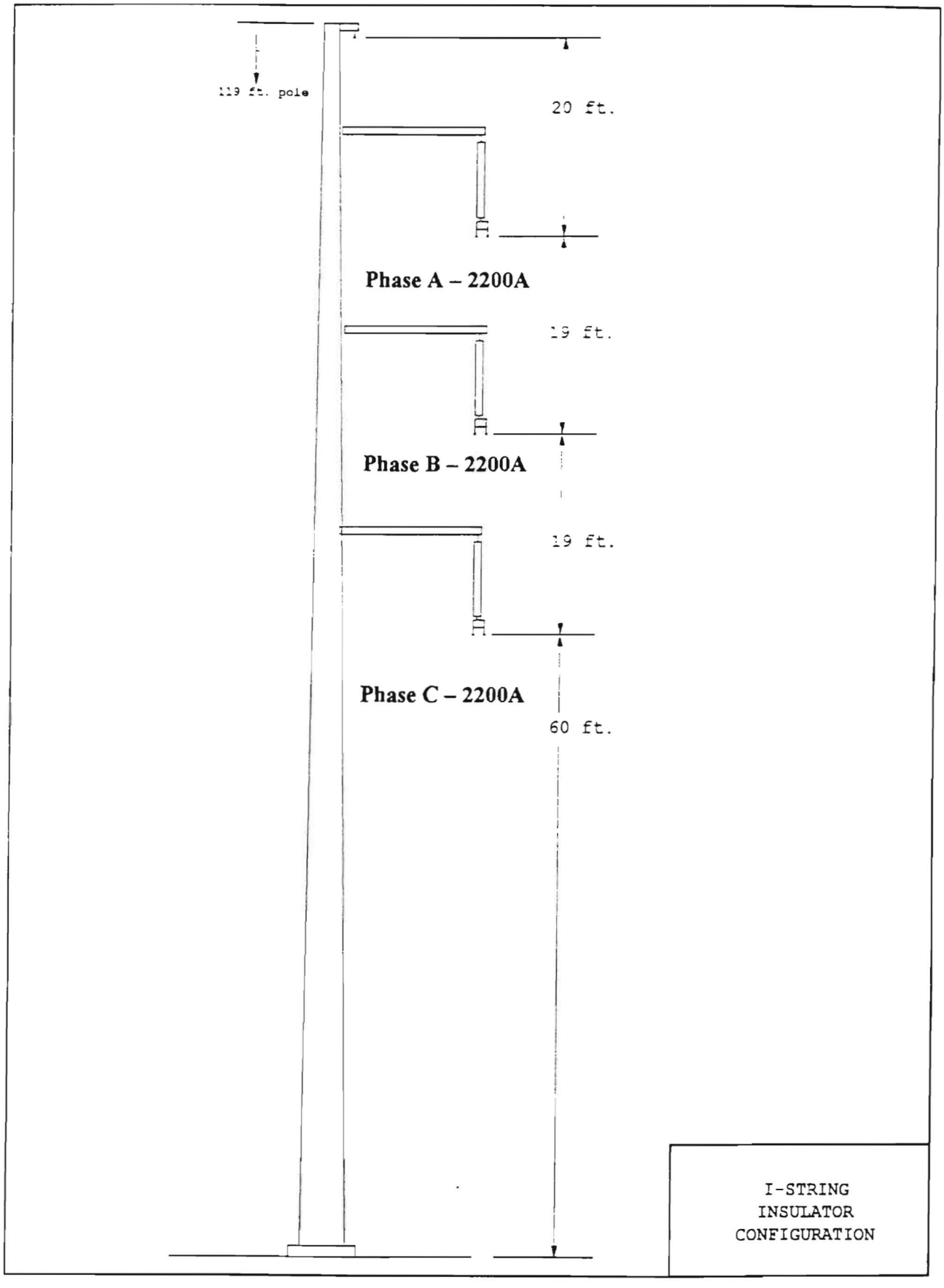


Figure 6: Typical 230kV Construction Details

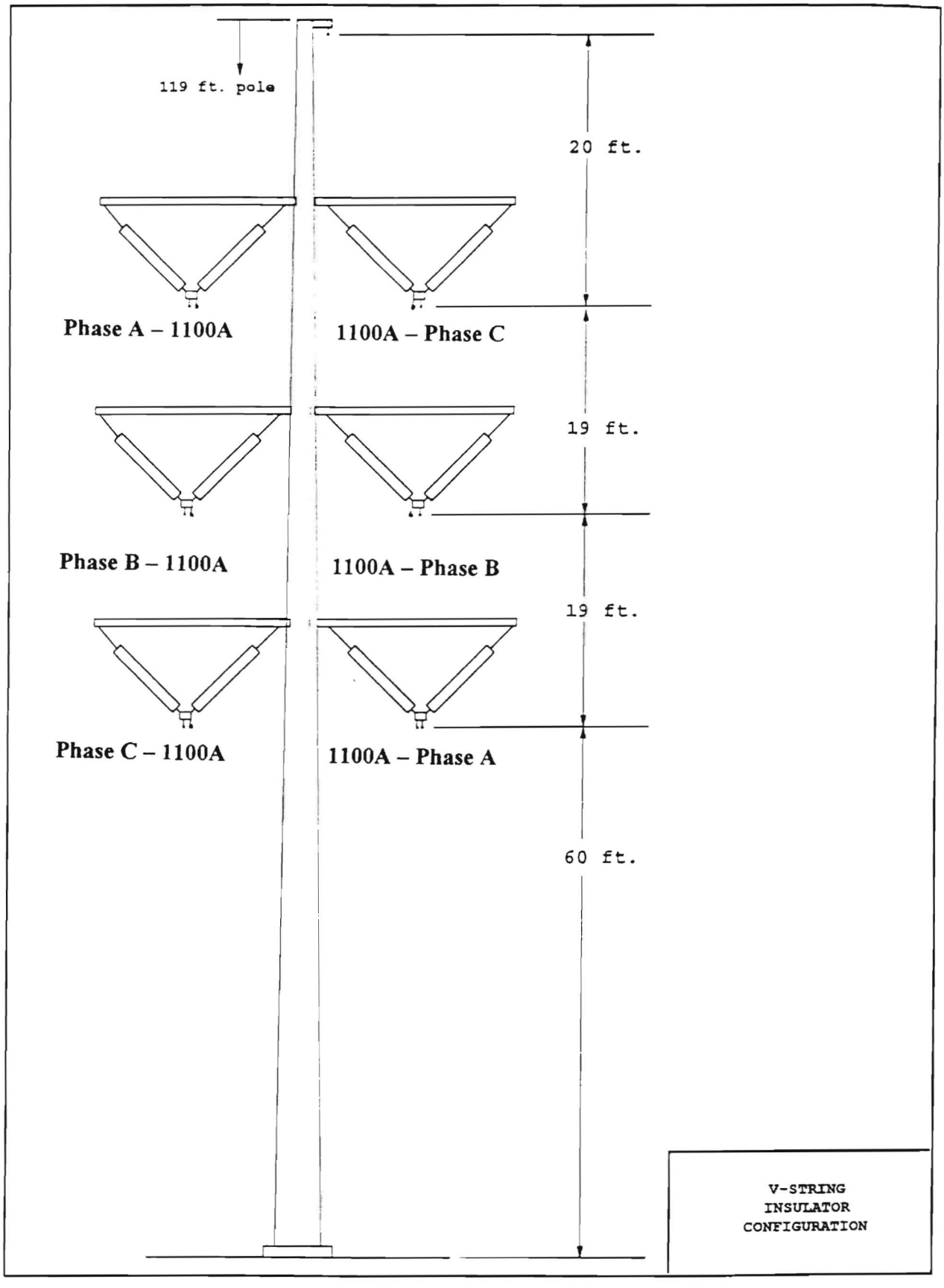
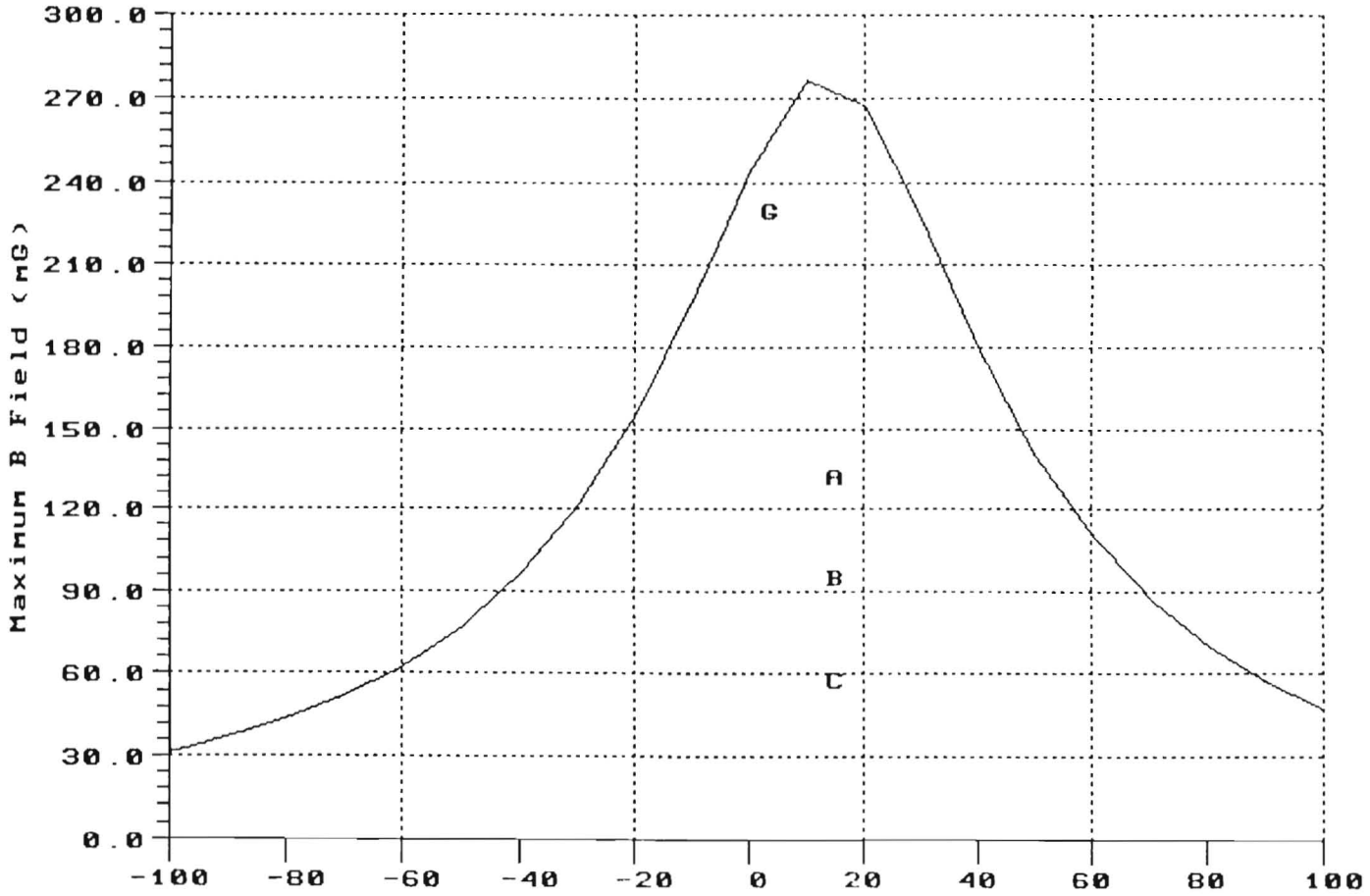


Figure 7: Field Reduction Alt. #1 – Reverse Phasing

Appendix:

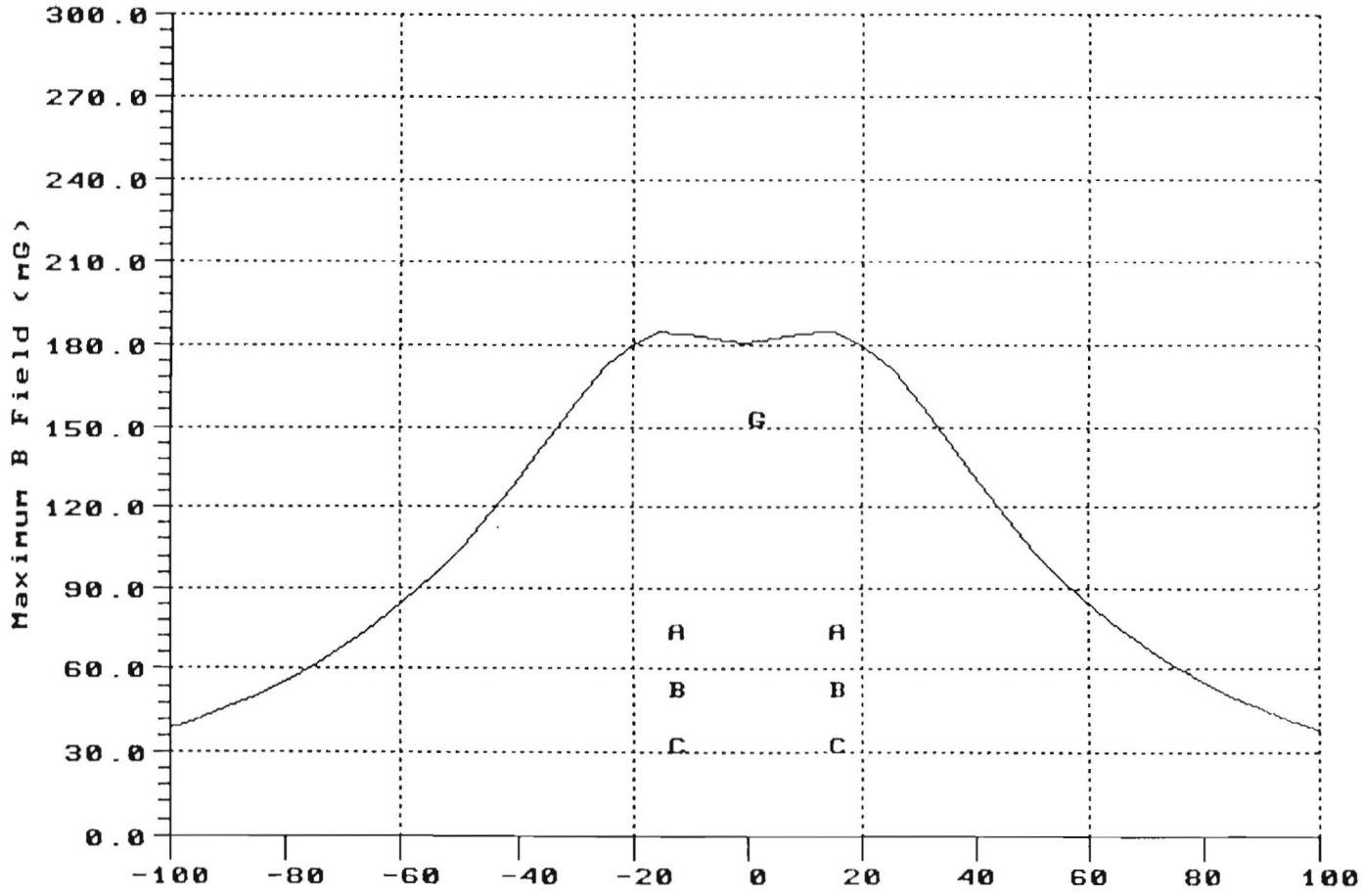
Magnetic Field Analysis

HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
TYPICAL: Single-Circuit Vertical I-String Configuration
MAGNETIC FIELD PROFILE



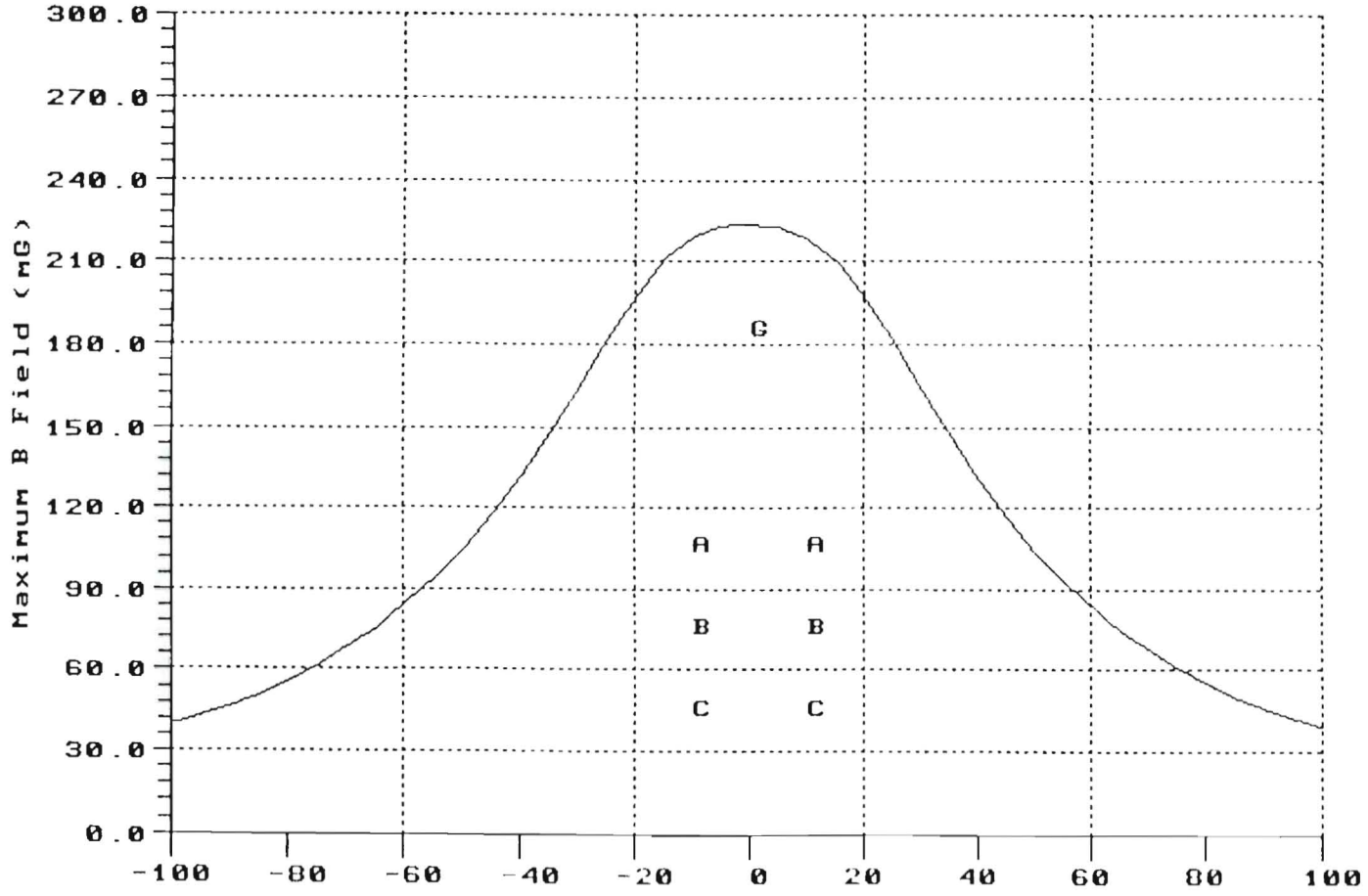
File: HDESTYPI.FLD

HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
BASE CASE A: Double Vert. Tower I-String, Split Phased
MAGNETIC FIELD PROFILE



File: HDESBASA.FLD Distance From Reference (Feet)

HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
BASE CASE B: Double Vert. Poles V-String, Split Phased
MAGNETIC FIELD PROFILE



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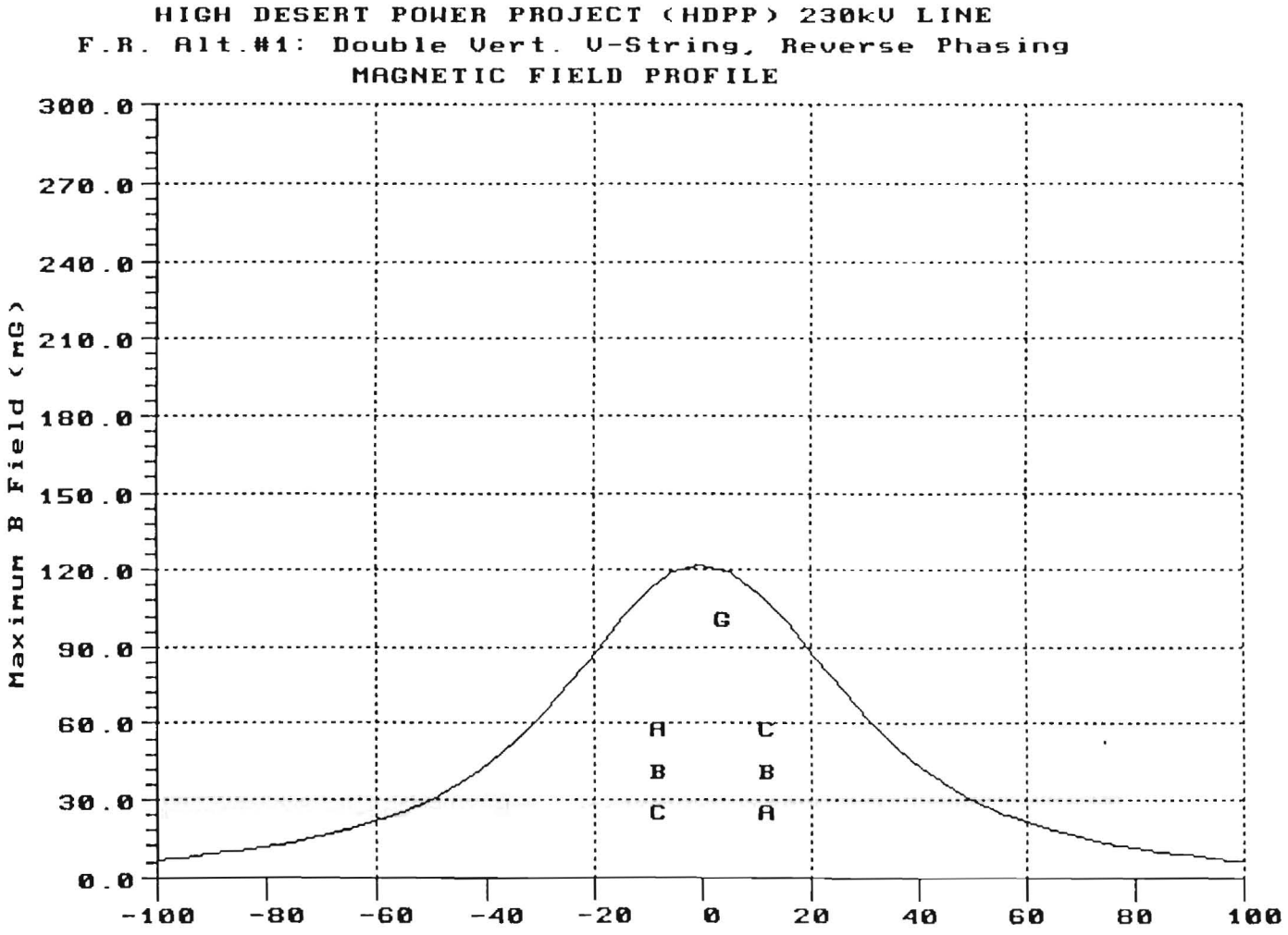
HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
F.R. Alt.#1: Double Vert. V-String, Reverse Phasing
MAGNETIC FIELD PROFILE
Maximum B Field (mG)
300.0
270.0
240.0
210.0
180.0
150.0
120.0
90.0
60.0
30.0
0.0
-100
-80
-60
-40
-20
0
20
40
60
80
100
G
A
B
C
C
B
A
File: HDESREVP.FLD
Distance From Reference (Feet)

Typical Construction Magnetic Field Models

Main Title: HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
Subtitle: TYPICAL: Single-Circuit Vertical I-String Configuration
Input File: HDESTYPI.FLD
Frequency (Hertz): 60
Soil Resistivity (Ohm-meter): 100
Maximum Horizontal Distance From Reference (ft): 100
Step Size (ft): 10
Height For Field Calculation (ft): 3
Left Coordinate of Right of Way (ft): 100
Right Coordinate of Right of Way (ft): 100

Phase Conductor Data

Number of Phases (<=25): 3

Phase ID No.	Phase ID Name	Phase Coordinates Horz(ft)	Phase Coordinates Vert(ft)	SubConds. Per Bundle	Cond. Diam. (in.)	Bund. Diam. (in.)	Phase-Phase kV	Phase Curr. (Amp)	Phase Angle (deg)
1	A	13.00	68.00	1	1.00	1.00	230.00	2200.00	0.00
2	B	13.00	49.00	1	1.00	1.00	230.00	2200.00	120.00
3	C	13.00	30.00	1	1.00	1.00	230.00	2200.00	240.00

Ground Wire Data

Number of Ground Wires (<=10): 1

Ground Wire No.	Ground Wire Name	Ground Wire Coordinates Horz(ft)	Ground Wire Coordinates Vert(ft)	GW Diam. (in.)	GW Curr. (Amp)	GW Phase Angle (deg)
1	G	1.50	118.00	1.00	0.00	0.00

Input File: HDESTYPI.FLD

HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
TYPICAL: Single-Circuit Vertical I-String Configuration

MAGNETIC FIELD VALUES

DISTANCE (Feet)	B Horz (mG)	B Vert (mG)	B Product (mG)	B Max (mG)
-100.00	22.954	21.562	31.493	31.385
-95.00	24.086	24.000	34.002	33.877
-90.00	25.235	26.791	36.804	36.661
-85.00	26.380	29.995	39.945	39.779
-80.00	27.491	33.681	43.476	43.283
-75.00	28.524	37.934	47.461	47.237
-70.00	29.414	42.849	51.973	51.711
-65.00	30.075	48.538	57.100	56.794
-60.00	30.385	55.128	62.947	62.590
-55.00	30.178	62.760	69.638	69.221
-50.00	29.231	71.583	77.321	76.834
-45.00	27.266	81.742	86.170	85.605
-40.00	23.981	93.355	96.386	95.735
-35.00	19.312	106.462	108.199	107.459
-30.00	14.916	120.945	121.861	121.035
-25.00	18.501	136.373	137.622	136.725
-20.00	34.779	151.751	155.685	154.749
-15.00	61.214	165.130	176.111	175.188
-10.00	97.421	173.098	198.629	197.794
-5.00	142.827	170.409	222.348	221.682
0.00	193.811	150.484	245.374	244.941
5.00	241.538	108.062	264.609	264.416
10.00	272.686	44.259	276.254	276.225
15.00	275.776	29.752	277.376	277.363
20.00	249.547	96.803	267.665	267.513
25.00	204.001	143.892	249.642	249.259
30.00	152.776	168.016	227.091	226.467
35.00	105.821	173.612	203.321	202.513
40.00	67.670	167.297	180.464	179.552
45.00	39.291	154.671	159.584	158.645
50.00	20.836	139.498	141.046	140.137
55.00	14.639	123.976	124.838	123.996
60.00	18.283	109.257	110.776	110.018
65.00	23.149	95.858	98.613	97.944
70.00	26.723	83.946	88.097	87.515
75.00	28.929	73.504	78.992	78.490
80.00	30.055	64.425	71.091	70.659
85.00	30.391	56.566	64.214	63.845
90.00	30.170	49.779	58.208	57.893
95.00	29.568	43.921	52.946	52.676
100.00	28.715	38.860	48.319	48.087

Base Case
Magnetic Field Models

Main Title: HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
Subtitle: BASE CASE A: Double Vert. Tower I-String, Split Phased
Input File: HDESBASA.FLD
Frequency (Hertz): 60
Soil Resistivity (Ohm-meter): 100
Maximum Horizontal Distance From Reference (ft): 100
Step Size (ft): 5
Height For Field Calculation (ft): 3
Left Coordinate of Right of Way (ft): 0
Right Coordinate of Right of Way (ft): 0

Phase Conductor Data

Number of Phases (<=25): 6

Phase ID No.	Phase ID Name	Phase Coordinates Horz(ft)	Phase Coordinates Vert(ft)	SubConds. Per Bundle	Cond. Diam. (in.)	Bund. Diam. (in.)	Phase-Phase kV	Phase Curr. (Amp)	Phase Angle (deg)
1	A	-14.00	67.00	1	1.00	1.00	230.00	1100.00	0.00
2	B	-14.00	48.50	1	1.00	1.00	230.00	1100.00	120.00
3	C	-14.00	30.00	1	1.00	1.00	230.00	1100.00	240.00
4	A	14.00	67.00	1	1.00	1.00	230.00	1100.00	0.00
5	B	14.00	48.50	1	1.00	1.00	230.00	1100.00	120.00
6	C	14.00	30.00	1	1.00	1.00	230.00	1100.00	240.00

Ground Wire Data

Number of Ground Wires (<=10): 1

Ground Wire No.	Ground Wire Name	Ground Wire Coordinates Horz(ft)	Ground Wire Coordinates Vert(ft)	GW Diam. (in.)	GW Curr. (Amp)	GW Phase Angle (deg)
1	G	0.00	138.00	1.00	0.00	0.00

Input File: HDESBASA.FLD

HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
BASE CASE A: Double Vert. Tower I-String, Split Phased

MAGNETIC FIELD VALUES

DISTANCE (Feet)	B Horz (mG)	B Vert (mG)	B Product (mG)	B Max (mG)
-100.00	25.432	29.627	39.046	38.890
-95.00	26.407	33.339	42.530	42.349
-90.00	27.257	37.626	46.462	46.252
-85.00	27.904	42.583	50.911	50.668
-80.00	28.234	48.316	55.961	55.679
-75.00	28.092	54.940	61.705	61.380
-70.00	27.266	62.571	68.254	67.880
-65.00	25.478	71.311	75.726	75.300
-60.00	22.396	81.219	84.250	83.772
-55.00	17.770	92.255	93.951	93.425
-50.00	12.402	104.188	104.924	104.364
-45.00	13.263	116.440	117.193	116.622
-40.00	26.770	127.854	130.626	130.079
-35.00	48.536	136.425	144.802	144.324
-30.00	76.516	139.192	158.837	158.472
-25.00	108.203	132.766	171.274	171.047
-20.00	138.795	115.064	180.288	180.185
-15.00	162.335	87.711	184.516	184.489
-10.00	175.457	56.335	184.279	184.276
-5.00	180.027	26.661	181.991	181.991
0.00	180.754	0.000	180.754	180.754
5.00	180.027	26.661	181.991	181.991
10.00	175.457	56.335	184.279	184.276
15.00	162.335	87.711	184.516	184.489
20.00	138.795	115.064	180.288	180.185
25.00	108.203	132.766	171.274	171.047
30.00	76.516	139.192	158.837	158.472
35.00	48.536	136.425	144.802	144.324
40.00	26.770	127.854	130.626	130.079
45.00	13.263	116.440	117.193	116.622
50.00	12.402	104.188	104.924	104.364
55.00	17.770	92.255	93.951	93.425
60.00	22.396	81.219	84.250	83.772
65.00	25.478	71.311	75.726	75.300
70.00	27.266	62.571	68.254	67.880
75.00	28.092	54.940	61.705	61.380
80.00	28.234	48.316	55.961	55.679
85.00	27.904	42.583	50.911	50.668
90.00	27.257	37.626	46.462	46.252
95.00	26.407	33.339	42.530	42.349
100.00	25.432	29.627	39.046	38.890

Main Title: HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
Subtitle: BASE CASE B: Double Vert. Poles V-String, Split Phased
Input File: HDESBASB.FLD
Frequency (Hertz): 60
Soil Resistivity (Ohm-meter): 100
Maximum Horizontal Distance From Reference (ft): 100
Step Size (ft): 5
Height For Field Calculation (ft): 3
Left Coordinate of Right of Way (ft): 0
Right Coordinate of Right of Way (ft): 0

Phase Conductor Data

Number of Phases (<=25): 6

Phase ID No.	Phase ID Name	Phase Coordinates Horz(ft)	Phase Coordinates Vert(ft)	SubConds. Per Bundle	Cond. Diam. (in.)	Bund. Diam. (in.)	Phase-Phase kV	Phase Curr. (Amp)	Phase Angle (deg)
1	A	-10.00	68.00	1	1.00	1.00	230.00	1100.00	0.00
2	B	-10.00	49.00	1	1.00	1.00	230.00	1100.00	120.00
3	C	-10.00	30.00	1	1.00	1.00	230.00	1100.00	240.00
4	A	10.00	68.00	1	1.00	1.00	230.00	1100.00	0.00
5	B	10.00	49.00	1	1.00	1.00	230.00	1100.00	120.00
6	C	10.00	30.00	1	1.00	1.00	230.00	1100.00	240.00

Ground Wire Data

Number of Ground Wires (<=10): 1

Ground Wire No.	Ground Wire Name	Ground Wire Coordinates Horz(ft)	Ground Wire Coordinates Vert(ft)	GW Diam. (in.)	GW Curr. (Amp)	GW Phase Angle (deg)
1	G	0.00	118.00	1.00	0.00	0.00

Input File: HDESBASB.FLD

HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
BASE CASE B: Double Vert. Poles V-String, Split Phased

MAGNETIC FIELD VALUES

DISTANCE (Feet)	B Horz (mG)	B Vert (mG)	B Product (mG)	B Max (mG)
-100.00	25.867	29.570	39.287	39.125
-95.00	26.913	33.209	42.745	42.558
-90.00	27.864	37.405	46.643	46.426
-85.00	28.652	42.252	51.051	50.798
-80.00	29.182	47.855	56.051	55.758
-75.00	29.321	54.334	61.740	61.400
-70.00	28.890	61.813	68.231	67.837
-65.00	27.648	70.420	75.653	75.199
-60.00	25.295	80.260	84.152	83.634
-55.00	21.529	91.384	93.886	93.302
-50.00	16.412	103.724	105.014	104.371
-45.00	12.760	116.980	117.674	116.984
-40.00	19.772	130.437	131.927	131.217
-35.00	38.012	142.700	147.676	146.987
-30.00	64.390	151.391	164.515	163.898
-25.00	97.648	153.059	181.555	181.063
-20.00	135.101	143.824	197.326	196.990
-15.00	171.502	121.249	210.034	209.849
-10.00	200.493	86.586	218.390	218.317
-5.00	218.000	44.582	222.512	222.495
0.00	223.636	0.000	223.636	223.636
5.00	218.000	44.582	222.512	222.495
10.00	200.493	86.586	218.390	218.317
15.00	171.502	121.249	210.034	209.849
20.00	135.101	143.824	197.326	196.990
25.00	97.648	153.059	181.555	181.063
30.00	64.390	151.391	164.515	163.898
35.00	38.012	142.700	147.676	146.987
40.00	19.772	130.437	131.927	131.217
45.00	12.760	116.980	117.674	116.984
50.00	16.412	103.724	105.014	104.371
55.00	21.529	91.384	93.886	93.302
60.00	25.295	80.260	84.152	83.634
65.00	27.648	70.420	75.653	75.199
70.00	28.890	61.813	68.231	67.837
75.00	29.321	54.334	61.740	61.400
80.00	29.182	47.855	56.051	55.758
85.00	28.652	42.252	51.051	50.798
90.00	27.864	37.405	46.643	46.426
95.00	26.913	33.209	42.745	42.558
100.00	25.867	29.570	39.287	39.125

Field Reduction Alternative #1
Magnetic Field Models

Main Title: HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
Subtitle: F.R. Alt.#1: Double Vert. V-String, Reverse Phasing
Input File: HDESREVP.FLD
Frequency (Hertz): 60
Soil Resistivity (Ohm-meter): 100
Maximum Horizontal Distance From Reference (ft): 100
Step Size (ft): 5
Height For Field Calculation (ft): 3
Left Coordinate of Right of Way (ft): 0
Right Coordinate of Right of Way (ft): 0

Phase Conductor Data

Number of Phases (<=25): 6

Phase ID No.	Phase ID Name	Phase Coordinates Horz(ft)	Phase Coordinates Vert(ft)	SubConds. Per Bundle	Cond. Diam. (in.)	Bund. Diam. (in.)	Phase-Phase kV	Phase Curr. (Amp)	Phase Angle (deg)
1	A1	-10.00	68.00	1	1.00	1.00	230.00	1100.00	0.00
2	B1	-10.00	49.00	1	1.00	1.00	230.00	1100.00	120.00
3	C1	-10.00	30.00	1	1.00	1.00	230.00	1100.00	240.00
4	C1	10.00	68.00	1	1.00	1.00	230.00	1100.00	240.00
5	B1	10.00	49.00	1	1.00	1.00	230.00	1100.00	120.00
6	A1	10.00	30.00	1	1.00	1.00	230.00	1100.00	0.00

Ground Wire Data

Number of Ground Wires (<=10): 1

Ground Wire No.	Ground Wire Name	Ground Wire Coordinates Horz(ft)	Ground Wire Coordinates Vert(ft)	GW Diam. (in.)	GW Curr. (Amp)	GW Phase Angle (deg)
1	G	2.00	118.00	1.00	0.00	0.00

Input File: HDESREVP.FLD

HIGH DESERT POWER PROJECT (HDPP) 230kV LINE
F.R. Alt.#1: Double Vert. V-String, Reverse Phasing

MAGNETIC FIELD VALUES

DISTANCE (Feet)	B Horz (mG)	B Vert (mG)	B Product (mG)	B Max (mG)
-100.00	4.369	6.677	7.979	6.931
-95.00	4.826	7.649	9.044	7.854
-90.00	5.361	8.790	10.295	8.939
-85.00	5.997	10.131	11.773	10.221
-80.00	6.772	11.708	13.525	11.744
-75.00	7.742	13.560	15.614	13.562
-70.00	8.989	15.729	18.117	15.747
-65.00	10.640	18.253	21.128	18.385
-60.00	12.875	21.156	24.766	21.589
-55.00	15.956	24.426	29.176	25.498
-50.00	20.243	27.977	34.533	30.289
-45.00	26.209	31.581	41.040	36.169
-40.00	34.408	34.768	48.915	43.376
-35.00	45.322	36.759	58.355	52.141
-30.00	58.965	36.698	69.452	62.608
-25.00	74.075	35.281	82.048	74.684
-20.00	87.083	39.254	95.521	87.812
-15.00	91.909	57.918	108.636	100.788
-10.00	82.625	86.586	119.683	111.868
-5.00	60.107	111.887	127.010	119.295
0.00	43.899	121.899	129.562	121.899
5.00	60.107	111.887	127.010	119.295
10.00	82.625	86.586	119.683	111.868
15.00	91.909	57.918	108.636	100.788
20.00	87.083	39.254	95.521	87.812
25.00	74.075	35.281	82.048	74.684
30.00	58.965	36.698	69.452	62.608
35.00	45.322	36.759	58.355	52.141
40.00	34.408	34.768	48.915	43.376
45.00	26.209	31.581	41.040	36.169
50.00	20.243	27.977	34.533	30.289
55.00	15.956	24.426	29.176	25.498
60.00	12.875	21.156	24.766	21.588
65.00	10.640	18.253	21.128	18.385
70.00	8.989	15.729	18.117	15.747
75.00	7.742	13.560	15.614	13.562
80.00	6.772	11.708	13.525	11.744
85.00	5.997	10.131	11.773	10.221
90.00	5.361	8.790	10.295	8.939
95.00	4.826	7.649	9.044	7.854
100.00	4.369	6.677	7.979	6.931