SACRAMENTO MUNICIPAL UTILITY DISTRICT
UPPER AMERICAN RIVER PROJECT
(FERC NO. 2101)

BIRD-POWERLINE ASSOCIATIONS TECHNICAL REPORT

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6.3 Bird/Powerline Associations Study Plan

6.3.1 Pertinent Issue Questions

The bird/powerline associations study addresses Terrestrial Resource Issue Questions:

7(b). "What are the relevant and known factors (limiting and beneficial) affecting special status bird populations in the Project area and how/where are these factors influenced by Project operation and maintenance?"

8. "To what extent do Project-associated power lines comply with established design standards for protection of raptors and other birds from electrocution? To what extent do Project-associated power lines contribute to avian collision mortality?"

21. "What are the Project impacts on special status birds with particular emphasis on Project facilities, operation, maintenance and Project-influenced recreation?"

6.3.2 Background

The UARP transmission and distribution system consists of many miles of electric power lines, utility poles/towers, transformers, and energized hardware that may pose a risk to birds of electrocution or collision mortality. [1] Most native birds in the United States are protected from such "take" by a variety of state and federal laws, including the Migratory Bird Treaty Act, Eagle Protection Act, and state and federal Endangered Species Acts, among others.

A tremendous amount of research has been conducted and the results published on the positive and adverse effects of powerlines on birds. The adverse effects of powerlines and powerline rights-of-way fall into three primary categories: 1) electrocution mortality; 2) collision mortality; and 3) habitat loss, fragmentation, and/or conversion. The positive effects are related primarily to provision of perching and nesting sites, which can extend the breeding range of certain species, increase local densities of populations, and open up new foraging habitat to species that hunt from perches. Right-of-way clearing can also affect raptors, beneficially or adversely depending on the species, by altering the distribution and availability of prey populations. This study focuses on an assessment of the electrocution and collision risks to birds for the Project transmission and distribution system. Rights-of-way effects on vegetation, invasive species, and other resources are discussed primarily in the Rights-of-Way Management Study.

The factors contributing to electrocution and collision mortality are complex and diverse. In general, the following relationships have been established through research: 1) low voltage distribution lines create a greater risk of electrocution than high voltage transmission lines due to greater spacing of conductors and energized hardware; 2) larger birds, especially raptors, are more susceptible to electrocution than smaller birds; 3) flocking birds are more susceptible to collision than solitary birds; and 4) wind, fog, and other inclement weather conditions can increase the risk of collision.

The Edison Electric Institute in collaboration with the Raptor Research Foundation and the Avian Power Line Interaction Committee have developed suggested practices for the protection of raptors (and other birds) on power lines (EEI 1996). These suggested practices provide a basis for determining the level of risk posed by a given powerline along with standards and guidelines for modifying lines to reduce this risk to acceptable limits.

6.3.3 Study Objectives

The objective of the bird/powerline associations study is to determine if and where the UARP electric transmission/distribution system poses a substantial risk of electrocution and/or collision mortality for birds, especially raptors.

[1] Electrical transmission of electricity generated within the UARP includes 69 kV lines (Robbs Peak and Loon Lake powerhouses) and 230 kV lines (all other powerhouses). Some powerhouses (Slab Creek) have station power supplied by outside sources. All electrical transmission and distribution facilities will be assessed.

6.3.4 Study Area and Sampling Sites

The study area consists of all electric transmission and distribution facilities (switchyards, transformers, poles/towers, conductors) associated with the UARP. Field studies will be restricted to those lands where the Licensee has legal access (e.g., ownership/easement rights, public lands) and will not occur on private lands without prior permission from the landowner.

6.3.5 Information Needed From Other Studies

Supporting information will be derived from the Rights-of-Way Management Study and Fuels Management Study. Important information will also be derived from the Licensee's records on bird-caused outages tied to facilities in the study area and published findings of research on bird/powerline associations.

6.3.6 Study Methods and Schedule

The study consists of two components: 1) Review of Licensee's outage records for the UARP electrical system to determine if there is a history of bird-caused outages and, if so, where these outages occurred; and 2) Visual inspection of all electrical facilities within the study area to determine the relative potential for bird electrocution and collision mortality by comparing the existing design against known problem designs and established standards and guidelines for protection of raptors (and other birds). If any problem poles or other facilities are discovered based on these two steps, the configuration will be photographed and the location established by recorded pole/tower numbers. All perched birds or nests on facilities will be recorded.

6.3.7 Analysis

The information obtained from the Licensee's outage records and visual inspection of electric facilities will be evaluated against the standards and guidelines for raptor protection on power lines and the existing body of research available on this subject. The objective of this analysis will be to determine if there is a substantial (i.e., re-occurring mortality at a given location) risk to birds and the need for measures to reduce this risk. Factors to be considered will be levels and locations of past mortality, configuration (e.g., inadequate spacing or insulation) of energized equipment, spatial relationship of facilities to major flight paths, existence of preferred perch/nest sites in "at-risk" locations near energized equipment, etc.

6.3.8 Study Output

Study results will be presented to the Terrestrial Resources Technical Working Group (TWG) and Plenary Group toward the end of 2002. However, the ultimate study output will be a written report that includes the issues addressed, objectives, study area, methods, analysis, results, discussion, and conclusions. The reports will be prepared in a format that allows the information to be inserted directly into the Licensee-prepared Draft Environmental Assessment that will be submitted to FERC with the Licensee's application for a new license.

6.3.9 Preliminary Estimated Study Cost

A preliminary estimated study cost will be prepared after the Plenary Group approves the plan.

6.3.10 TWG and Plenary Group Endorsement

On April 16, 2002 the following entities gave approval to the plan: USFS, BLM and SMUD.

On May 1, 2002 the following participants gave Plenary Group approval to the plan: USFS, BLM, USFWS, Taxpayers of El Dorado County, Friends of El Dorado County, Camp Lotus, El Dorado County Water Agency, El Dorado County, Placer County Water Agency, California Department of Fish and Game, California State Water Resources Control Board, Pacific Gas and Electric and Friends of the River. None of the participants at the meeting said they could not “live with” this study plan.

6.3.11 Literature Cited

EEI (Edison Electric Institute). 1996. Suggested practices for raptor protection on power lines: the state of the art in 1996.

BIRD-POWERLINE ASSOCIATIONS TECHNICAL REPORT

SUMMARY

This technical report compares the existing design specifications of the Upper American River Project electric transmission system with respect to standard and guidelines developed by the Avian Powerline Interaction Committee (APLIC) for the protection of birds from electrocution and collision mortality. The key standard for avoidance of bird electrocutions is to achieve a minimum spacing of 60 inches between energized phases (i.e., energized electrical conductor) or between a phase and a grounding source (APLIC 1996). The key design and siting standards for minimizing risk of collision mortality are removal of overhead ground wires and avoidance of major bird flight paths (APLIC 1994). All support structures used on UARP 230 kV transmission lines greatly exceed the 60-inch minimum spacing guideline. Support structure designs 62DSS, 62DSD, 63DSS, and 63DSD, which are used on the Loon Lake-Union Valley and Loon Lake-Robbs Peak 69 kV transmission lines, have minimum spacing of approximately 54 inches. Some Type H wood pole structures used on the Jones Fork-Union Valley 69 kV line have overhead jumper wires that are inconsistent with APLIC design standards. The Brush Creek 12 kV tap line has several support configurations also inconsistent with APLIC standards. However, no avian mortality due to electrocution or collision has been recorded on the UARP transmission system.

1.0 INTRODUCTION

This technical report is one in a series of reports prepared by Devine Tarbell & Associates, Inc., (DTA) for the Sacramento Municipal Utility District (SMUD) as an appendix to SMUD's application to the Federal Energy Regulatory Commission (FERC) for a new license for the Upper American River Project (UARP or Project). The report addresses bird-powerline associations within the UARP area and includes the following sections:

- **BACKGROUND** – Summarizes the applicable study plan approved by the UARP Relicensing Plenary Group; a brief description of the issue questions addressed, in part, by the study plan; the objectives of the study plan; the study area, and agency information requests. In addition, requests by resource agencies for additions to this technical report are described in this section.
- **METHODS** – A description of the methods used in the study, including a listing of study sites.
- **RESULTS** – A description of the most important data. Copious raw data, photographs, and drawings are provided by request in a separate compact disc (CD) for additional analysis and review by interested parties.
- **ANALYSIS** - An analysis of the results, where appropriate.
- **LITERATURE CITED** – A listing of all literature cited in the report.

This technical report does not include a detailed description of the UARP Alternative Licensing Process (ALP) or of the UARP, which can be found in the following sections of SMUD's application for a new license: The UARP Relicensing Process, Exhibit A (Project Description), Exhibit B (Project Operations), and Exhibit C (Construction).

Also, this technical report does not include a discussion of the effects of the UARP electric transmission system on birds and related environmental resources, nor does the report include a discussion of appropriate protection, mitigation and enhancement (PM&E) measures. An impacts discussion regarding the UARP is included in the applicant-prepared draft environmental assessment (PDEA) document, which is part of SMUD's application for a new license. Development of resource measures will occur in settlement discussions, which will commence in 2004, and will be reported in the PDEA.

2.0 BACKGROUND

2.1 Bird-Powerline Associations Study Plan

Nearly all native, North American bird species are protected from take (i.e., to hunt, capture, kill, harass, or possess) under the federal Migratory Bird Act of 1918, as amended (16 U.S.C. 703-712). Other state and federal laws and regulations that prohibit unauthorized take of birds include the federal Endangered Species Act (16 U.S.C. 1531-1543), the federal Bald and Golden Eagle Protection Act (16 U.S.C. 668-668C), and the California Endangered Species Act. In response to these prohibitions against take of birds and the known potential for bird electrocution or collision mortality to result from contact with electric transmission and distributions systems, the UARP Terrestrial Resources Technical Working Group (TWG) developed the Bird-Powerline Associations Study Plan. The TWG approved this plan on April 16, 2002 and the UARP Relicensing Plenary Group approved the plan on May 1, 2002. The study plan was designed to address, in part, the following issues questions developed by the Plenary Group:

Issue Question 7(b).	What are the relevant and known factors (limiting and beneficial) affecting special status bird populations in the Project area, and how/where are those factors influenced by Project operation and maintenance?
Issue Question 8.	To what extent do Project-associated power lines comply with established design standards for protection of raptors and other birds from electrocution? To what extent do Project-associated power lines contribute to avian collision mortality?
Issue Question 21.	What are the Project impacts on special status birds with particular emphasis on Project facilities, operation, maintenance and Project-influenced recreation?

The objective of the bird-powerline associations study was to determine if and where the UARP electric transmission/distribution system poses a substantial risk of electrocution and/or collision mortality for birds, especially raptors.

The study area consisted of all electric transmission and distribution facilities (switchyards, poles/towers, energized hardware, etc.) associated with the UARP from Loon Lake Powerhouse westward to the Folsom Junction (Figure 2.1-1; Appendix A).

2.2 Agency Requested Information

In a letter dated December 17, 2003 to SMUD, the agencies identified, by study, information they believed they needed to begin settlement discussions with the understanding that additional information might be requested. Information requests pertinent to the Bird-Powerline Associations Study are:

- GIS shape file showing transmission corridors and voltage.
- Possible risk/collision locations.

Figure 2.1-1 (Appendix A) delineates the UARP transmission corridor and line voltages. Engineering drawings for each distinctive transmission and distribution support structure with the system are provided in Appendix B. Representative photos of support structures are provided in Appendix C. A discussion of structures that pose a potential electrocution and/or collision risk to birds is provided in Section 5.0, Analysis.

In a May 13, 2004 letter, the agencies stated in regards to the *Bird-Powerline Associations Technical Report* (February 2004) the following:

- We have reviewed this study report and have no comments on the report. No additional studies are necessary in 2004.

The Terrestrial Resources TWG met on June 7, 2004 to consider "conclusions" relative to bats and to develop recommendations for consideration by the Settlement Negotiations Group. The TWG agreed on the following general conclusions:

1. The Issue Questions and Objectives stated in the Bird-Powerline Associations Study Plan are adequately addressed by the information provided in the *Bird-Powerline Associations Technical Report*.

2. Methods employed were adequate to address Issue Questions and Objectives.

3. There is no known negative effect of UARP transmission and distribution system operations and maintenance activities on birds. There may be potential improvements that can be made relative to wood frame "H" configuration structures and some steel lattice structures as problems are made known or line retrofits are proposed.

4. Major bird migration corridors/flight paths do not occur within the UARP area, nor are transmission lines located in an area that pose a collision threat to birds.

The TWG also developed the following recommendation for consideration by the Settlement Negotiations Group:

SMUD should coordinate with state and federal resource agencies and other interested parties in development of a Bird/Powerline Association Management Plan that considers the following:

1. Wood frame "H" configuration structures and transformer design may have jumper wires that could lead to electrocution of birds. A "carte blanche" retrofit of all configurations that would comply with best management practices for bird protection is not recommended; however, "problem" areas should be addressed as they are made known, or when line retrofits are proposed.

2. A reporting protocol should be developed (via an environmental training program for UARP field personnel) to assess outages in the UARP transmission system. For example, an inspector that follows-up on an outage report should also report the outage to a qualified biologist who can assess if the outage was bird-caused and recommend remedial actions.

3.0 METHODS

3.1 Bird-Powerline Associations Study

SMUD's records of sustained outages on the UARP electrical system were reviewed to determine to what extent bird electrocutions or collisions with electrical conductors were responsible for these outages and where they occurred. In addition, design drawings of the UARP transmission system were compared with known problem designs, established standards and guidelines for protection of raptors (and other birds), and the extensive body of research available on the subject (APLIC 1994, 1996; CEC, 1995, Williams and Colson 1989).

On-site visual inspections of the transmission system were performed to further evaluate the relative potential for bird electrocution and collision mortality based on system design, habitat associations, and direct observation of bird activity. Focused inspections were conducted by helicopter on May 29, 2002 and July 14, 2003, and by automobile on May 14, 2002, January 24, 2003, and May 22, 2003. Incidental inspections of the transmission system were also conducted on several other dates during the performance of terrestrial resource studies. During each inspection, photographs were taken of representative transmission tower configurations and right-of-way habitat conditions.

3.2 Incidental Observations

Biologists engaged in these field surveys also recorded incidental observations of wildlife for purposes of generating a comprehensive species list for the UARP area. Data recorded for each observation generally included: species, date of observation, location, and any remarkable behavior or activity exhibited by the animals observed.

4.0 RESULTS

4.1 Bird-Powerline Associations Study

Although bird-caused outages are documented for the SMUD urban distribution grid, SMUD has no records of bird-caused outages or of avian mortality associated with the UARP transmission

system (SMUD unpublished data, personal communication, L. Maier, SMUD UARP Environmental Coordinator).

The UARP electrical system includes over 300 support structures, eight switchyards and nearly 150 miles of transmission line circuits within approximately 60 linear miles of shared rights-of-way (ROW) (i.e., two or more lines occupying the same linear corridor) between Loon Lake Powerhouse and Folsom Junction. The voltages, approximate length, approximate width of ROW, and support structure design codes used in each transmission line segment are listed in Table 4.1-1. Detailed design specifications for each type of support structure used for the UARP transmission and distribution system are provided in Table 4.1-2. Design drawings for each type of support structure and location maps are included in Appendix B. Representative photographs of the transmission system ROW and support structures are included in Appendix C.

Table 4.1-1. Voltages, approximate length, rights-of-way (ROW) width, and support structure designs within UARP transmission and distribution segments.

Name	Length	ROW Width	Support Structure Designs
Loon Lake/Robbs Peak - 69 kV	7.9 miles	100 ft	Steel Lattice – 60DSS, 61DSS, 60DSD, 61DSD, 62DSS, 63DSS, 62DSD, 63DSD, 2 DSS, 3DSS
Loon Lake/Union Valley - 69 kV	12.4 miles		
Robbs Peak/Union Valley - 69 kV	6.8 miles		
Jones Fork/Union Valley - 69 kV	4.0 miles	200 ft	Wood Pole – Type A1, B1, C1, H
Union Valley/Camino - 230 kV	11.8 miles	200 ft	Steel Lattice - 8DSS, 9DSS, 8DSD, 9DSD
Union Valley/Jaybird – 230 kV	5.9 miles		
Jaybird/White Rock - 230 kV	15.9 miles	200 ft	Steel Lattice – 2DSS, 3DSS, 2DSD, 3DSD, 5DSS
Camino/Lake – 230 kV	31.7 miles (approx. 30 miles to Folsom Jct.)	200 ft	Steel Lattice - 1DSS, 2DSS, 3DSS, 4DSS, 5DSS, 1DSD, 2DSD, 3DSD, 4DSD
Camino/White Rock 230 kV	10.0 miles		
White Rock/Hedge - 230 kV	39.6 miles (approx. 22 miles to Folsom Jct.)		
White Rock/Orangevale 230 kV	31.1 miles (approx. 22 miles to Folsom Jct.)	200 ft	Steel Lattice - 1DSS, 4DSS, 6DSS, 7DSS, 1DSD, 4DSD
Brush Creek Tap Line – 12 kV	1.2 miles	30 ft	Wood Pole

Table 4.1-2. Design specifications of support structures used on the UARP transmission and distribution system.

Design Code	Voltage	Description	Support Structure Material	Maximum Structure Height	Min. Spacing Phase-Phase Phase-Ground	Ground Wire	Number of Structures
A1	69 kV	2-Pole Tangent	Wood	61 ft	10 ft – 6 in	Yes	35
B1	69 kV	2-Pole Angle	Wood	61 ft	10 ft – 6 in	Yes	2
C1	69 kV	2-Pole Angle	Wood	61 ft	10 ft – 6 in	Yes	1
D	69 kV	Single Pole Angle	Wood	61 ft	10 ft – 6 in	Yes	1
G	69 kV	3-Pole Dead End	Wood	61 ft	10 ft – 6 in	Yes	1
H	69 kV	5-Pole Dead End	Wood	61 ft	14 ft – 6 in*	Yes	11
60DSS	69 kV	75 Suspension Tower	Steel Lattice	98 ft – 3 in	~ 5.5 – 6 ft	Yes	23
61DSS	69 kV	75’ Dead End Tower	Steel Lattice	93 ft – 3 in	~. 5.5 – 6 ft	No	
60DSD	69 kV	75’ Dead End Tower	Steel Lattice	97 ft – 11 in	~ 5.5 – 6 ft	Yes	9
61DSD	69 kV	75’ Dead End Tower	Steel Lattice	91 ft – 11 in	~ 5.5 – 6 ft	No	
62DSS	69 kV	75 Suspension Tower	Steel Lattice	98 ft – 3 in	~ 4.5 – 5 ft	Yes	28

Table 4.1-2. Design specifications of support structures used on the UARP transmission and distribution system.							
Design Code	**Voltage**	**Description**	**Support Structure Material**	**Maximum Structure Height**	**Min. Spacing Phase-Phase Phase-Ground**	**Ground Wire**	**Number of Structures**
63DSS	69 kV	75' Suspension Tower	Steel Lattice	93 ft – 3 in	~ 4.5 – 5 ft	No	
62DSD	69 kV	75' Dead End Tower	Steel Lattice	97 ft – 11 in	~ 4.5 – 5 ft	Yes	11
63DSD	69 kV	75' Dead End Tower	Steel Lattice	97 ft – 11 in	~ 4.5 – 5 ft	No	
1DSS	230 kV	65' Suspension Tower	Steel Lattice	114 ft	9 ft	Yes	34
4DSS	230 kV	65' Suspension Tower	Steel Lattice	104 ft	9 ft	No	
1DSD	230 kV	55' Dead End Tower	Steel Lattice	106 ft	9 ft	Yes	9
4DSD	230 kV	55' Dead End Tower	Steel Lattice	94 ft	9 ft	No	
2DSS	230 kV	65' Suspension Tower	Steel Lattice	119 ft	10 ft – 6 in	Yes	90
3DSS	230 kV	65' Suspension Tower	Steel Lattice	107 ft – 1 in	10 ft – 6 in	No	
2DSD	230 kV	55' Dead End Tower	Steel Lattice	109 ft	10 ft – 6 in	Yes	35
3DSD	230 kV	55' Dead End Tower	Steel Lattice	97 ft – 1 in	10 ft – 6 in	No	
5DSS	230 kV	65' Dead End Suspension Tower	Steel Lattice	119 ft	10 ft – 6 in	Yes	4
6DSS	230 kV	75' Light Suspension Tower	Steel Lattice	120 ft	7 ft – 6 in	Yes	2
7DSS	230 kV	75' Light Suspension Tower	Steel Lattice	110 ft	7 ft – 6 in	No	
8DSS	230 kV	65' Suspension Tower	Steel Lattice	119 ft	9 ft	Yes	21
9DSS	230 kV	65' Suspension Tower	Steel Lattice	107 ft	9 ft	No	
8DSD	230 kV	55' Dead End Tower	Steel Lattice	109 ft	9 ft	Yes	12
9DSD	230 kV	55' Dead End Tower	Steel Lattice	97 ft	9 ft	No	
Brush Ck Tap	12 kV	Unavailable	Single Wood Pole	Unavailable	< 24 in	No	Unavailable

* Type "H" Structures used on the Jones Fork-Union Valley 69 kV transmission line have upright insulators supporting energized jumper wires that provide less than 36 inches of separation between the jumper and the grounded cross-arm.

4.2 Incidental Observations

Biologists recorded 140 species of birds and mammals during UARP field studies including this Bird-Powerline Associations Study. These incidental observations are provided in Appendix D.

5.0 ANALYSIS

Extensive research has been conducted on the causes of, and potential solutions to, bird electrocution and collision mortality on electric transmission and distribution systems (APLIC 1994, 1996; CEC 1995; Williams and Colson 1989). This research has prompted state and federal resource agencies working with the electric utility industry to adopt various design and siting standards for avoidance or minimization of bird electrocutions and collisions. The key standard for avoidance of bird electrocutions is to achieve a minimum spacing of 60 inches between energized phases (i.e., energized electrical conductors) or between a phase and a grounding source (APLIC 1996). The key design and siting standards for minimizing risk of collision mortality are removal of overhead ground wires and avoidance of major bird flight paths (APLIC 1994).

5.1 Electrocution Issues and Relationship to UARP

The potential for electrocution of raptors and other large birds is dependent on both biological and electrical/design factors. Avian species that occupy forests, perch or nest primarily on the ground, or are of small size are rarely electrocuted (APLIC 1996). Maximum size (e.g., wingspan, head-to-tail length) is by far the most crucial factor in determining susceptibility of birds to electrocution. Such risk is greatest on lower voltage lines where phase-to-phase or phase-to-ground separation is minimal. Risks increase in weather that hinders flight maneuverability, or when feathers are wet, thereby increasing conductivity.

Immature and sub-adult birds that are less skilled at flying and at landing on power poles are also at greater risk. Other factors that affect susceptibility to electrocution include location and abundance of prey, habitat diversity, wind speed and direction, topography, excreta streams, and proclivity to nest and perch on support structures (APLIC 1996).

The vast majority of electrocutions occur on lower-voltage (e.g., < 69 kV) distribution lines than on higher voltage (e.g., 69 kV or greater) transmission lines. The voltage rating dictates conductor spacing and the clearance required above the ground. In accordance with the National Electrical Safety Code (NESC 1993), both the distance between conductors and the distance that they are hung above ground must be increased as voltages increase. As a result, distribution lines, with lower voltages, have less spacing between conductors and therefore are more likely to electrocute birds. Conversely, the spacing between conductors on transmission lines is generally adequate to preclude electrocution of birds.

5.1.1 UARP Transmission Lines

The UARP transmission system includes both 69 kV and 230 kV line segments. Most of the support structures on the UARP transmission line exceed the minimum 60-inch phase-to-phase or phase-to-ground spacing necessary to prevent electrocution of large birds such as eagles. Four designs (62DSS, 63DSS, 62DSD, and 63DSD) used on 39 structures (12% of all UARP transmission line structures) have spacing between the top conductor and the middle cross-arm that are near the 60-inch threshold (Table 4.1-2). These designs are all located at higher elevations of the UARP along the following 69 kV transmission line segments: Loon Lake–Robbs Peak, Loon Lake–Union Valley, and Robbs Peak–Union Valley (Table 4.1-1). Eleven type “H”, 5-pole dead end structures used on the Jones Fork-Union Valley 69 kV line have adequate phase-to-phase separation (Approx. 14.5 ft) but less than 36 inches of clearance between energized jumper wires and grounded cross-arms. However, no bird electrocutions have been recorded at any of these structures.

5.1.2 Brush Creek Tap Line

The 1.2-mile long Brush Creek 12 kV tap line is a 3-phase line with several different support structure configurations including: 1) transformer poles with extensive energized hardware such as lightning arrestors, fused cutouts, exposed bushings and jumpers; and 2) poles with horizontal cross-arms with two phases on the same side of the cross-arm spaced less than 30 inches apart. Phase-to-phase and phase-to-ground spacing on these configurations is insufficient to prevent

bird electrocution and have been specifically identified as "problem designs" by APLIC (1996). However, no bird electrocutions have been recorded along the Brush Creek tap line.

5.2 Collision Issues and Relationship to UARP

Bird collisions with power lines generally become biologically significant only in very specific localized situations as determined by species, environmental, and powerline design characteristics (APLIC 1994). The most critical biological factor in determining collision potential is the frequency that birds in flight must cross a powerline within their daily use area. For instance, where feeding and nesting/roosting areas for a species are on the same side of a line, encounters are few; when the line bisects the two areas, encounters and risk increase. Other important factors in determining risk of collisions are: species size and maneuverability; height at which a species typically flies; time of day and related light/visibility; presence of distracting lighting at night; adverse weather conditions; local habitat characteristics; and flocking behavior (increasing risk with denser groupings (APLIC 1994)). Finally line placement, orientation, and configuration can influence collisions.

Overhead groundwires are the major engineering factor contributing to the potential for bird collisions with powerlines. Groundwires are generally constructed on the tops of transmission or distribution support structures in areas subject to lightning to protect the lines against outages due to a lightning strike which can result in costly damage to equipment and affect service reliability (APLIC 1994). Although birds seem to recognize and avoid large support structures and conductors, they often collide with the much smaller groundwires, which are only about 0.4-0.5 inches in diameter and can be nearly invisible in dim light. On the UARP transmission system, groundwires exist currently throughout most of the higher elevation segments of the transmission line from Loon Lake Powerhouse to just west of Camino Powerhouse, including the Jones Fork-Union Valley transmission line segment. An isolated segment with groundwires also occurs over an approximate 3.0-mile segment near White Rock Powerhouse. Design drawings showing the locations of groundwires along the UARP transmission line are provided in Appendix B).

6.0 LITERATURE CITED

APLIC (Avian Power Line Interaction Committee). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington, D.C.

APLIC (Avian Power Line Interaction Committee). 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute. Washington, D.C.

CEC (California Energy Commission). 1995. Avian collision and electrocution: an annotated bibliography. 114 pp.

NESC (National Electrical Safety Code). 1993. C2-1993: published by the Institute of Electrical and Electronics Engineers, Inc. and the American National Standards Institute. New York, N.Y. 257 pp.

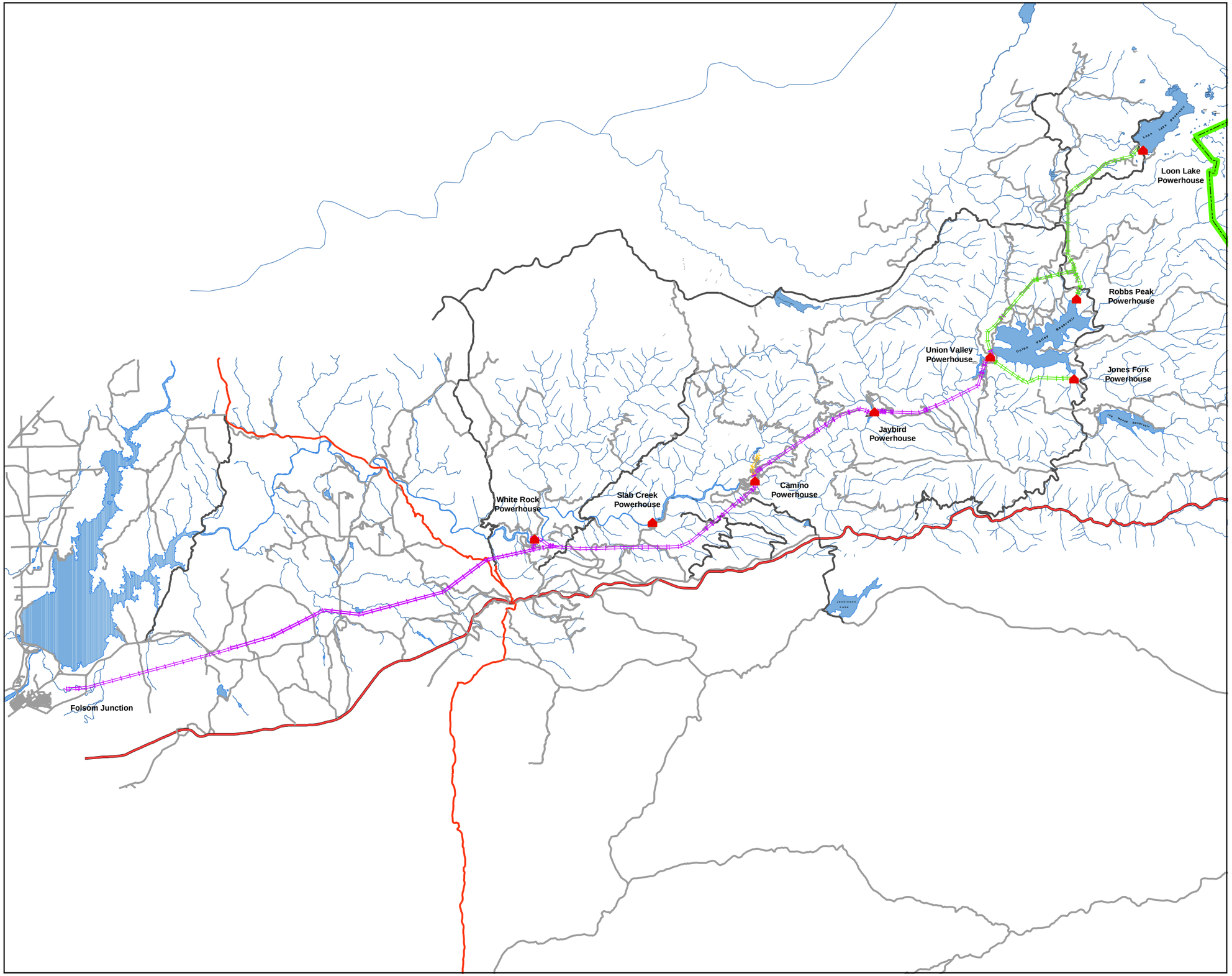
APPENDIX A

FIGURE 2.1-1. UPPER AMERICAN RIVER PROJECT TRANSMISSION SYSTEM

Upper American River Project

SMUD

Figure 2.1-1
UARP Transmission System

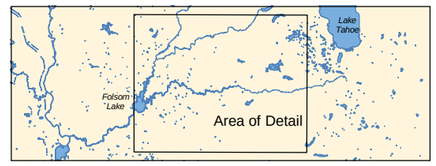


- Divided Highway
- Other Highway
- County Roads
- Other Roads
- Wilderness Boundary

Transmission Line

- 12 KV
- 230 KV
- 69 KV

- Powerhouse



N

SCALE 1:240,000

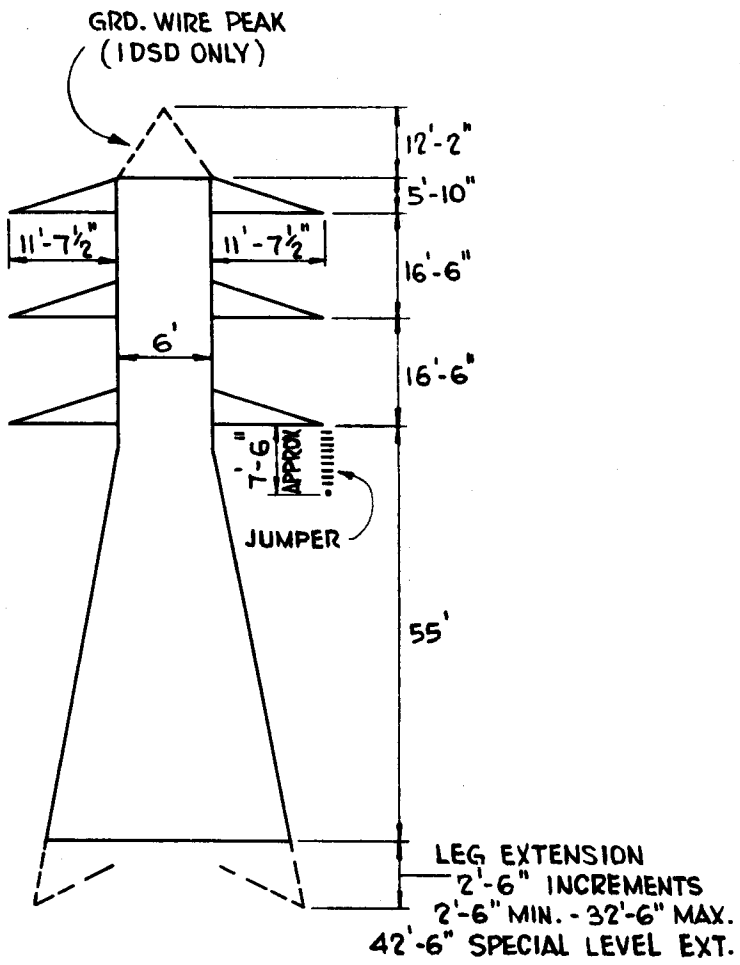
0 2 4 6 8 Miles

Prepared by VESTRA Resources, Inc., Redding. CA. Jan. 26, 2004

APPENDIX B

DESIGN DRAWINGS FOR THE UPPER AMERICAN RIVER PROJECT TRANSMISSION SYSTEM

- Drawing 1DSD-4DSD
- Drawing 1DSS-4DSS
- Drawing 2DSD-3DSD
- Drawing 2DSS-3DSS
- Drawing 2SSD-3SSD
- Drawing 5DSS
- Drawing 60DSD-61DSD
- Drawing 60DSS-61DSS
- Drawing 62DSD-63DSD
- Drawing 62DSS-63DSS
- Drawing 6DSS-7DSS
- Drawing 8DSS-9DSS
- Drawing A1, B1, C1
- Drawing - Brush Creek
- Drawing C-442-600
- Drawing E-432-311
- Drawing – H-Frame
- Drawing – T-line tower numbers and access roads
- Drawing – T-line tower numbers and access roads-2
- Drawing – T-line tower numbers and access roads-3
- Drawing TLO-C2T-D001
- Drawing TLO-C2T-D002
- Drawing TLO-C2T-D003
- Drawing TLOC3SM001
- Drawing TLOC3SM005
- Drawing TLO-S3C-M001-1
- Drawing TLO-S3C-M002-1
- Drawing TLOS3CM003
- Drawing TLO-S3G-M001-1
- Drawing TLO-S3G-M002-1
- Drawing TLO-S3G-M003-1



DESIGN LOAD - POUNDS

		CONDUCTOR *		GRD. WIRE	
		50° ∠	TANGENT	50° ∠	TANGENT
V		1000	1000	300	300
T		2700	1000	1450	450
L		4800	5200	2700	3000
SPECIAL VERTICAL	DOWNWARD	4500	—		2500
	UPWARD	1000	—		—

WEIGHT

Main Tower (4DSD)	-13,431*
Main Tower W/G.W.P. (1 DSD)	-13,851*
Ea. 10' Leg Extension	- 382*
Ea. 32'6" Leg Extension	- 1,267*
Spec. 42'6" Ext. Complete (4 Legs)	- 8,804*

LOCATIONS USED

Camino-Folsom, Folsom-Hedge, Folsom-Elverta T/L, Whiterock-Folsom
HURLEY - ELVERTA, HURLEY - HEDGE

DRAWING NUMBERS

Special 42'6" Level Extension	-M-1377
Structural Design	-M-1095
Erection Diag. Tower Body	-M-1078
Bill of Material Tower Body	-M-1078
Erection Diag. Leg Extension	-M-1076-77
Bill of Material Leg Extension	-M-1076-77
Stub Setting Dim. & Design	-M-981
Footing Design	A-937 & B-320
Stress Analysis	M-715 & M-716

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

Min. W/2'6" Leg Extension - 57'-6"
Max. W/32'6" Leg Extension - 87'-6"

MODIFICATIONS AVAILABLE

3rd Crossarm -
Square (Box) Crossarm - D-629 & M-1080
SWITCH X-ARM - M-1081 & M-3814

MAXIMUM REACTION

Compression	88.4 kips
Uplift	74.8 kips

Loads are tabulated in pounds.

Transverse loads act in one direction for 50° angle tower and in either direction for tangent tower.
The special vertical loads are to be applied independently of other loads.
The dead load of the tower shall be added to the vertical loads shown.
A wind load of 13# P.S.F. acting on 1 1/2 times the projected area of one face of the tower shall be added to the transverse loads shown.
All members shall withstand 1 1/2 times design loads without failure.

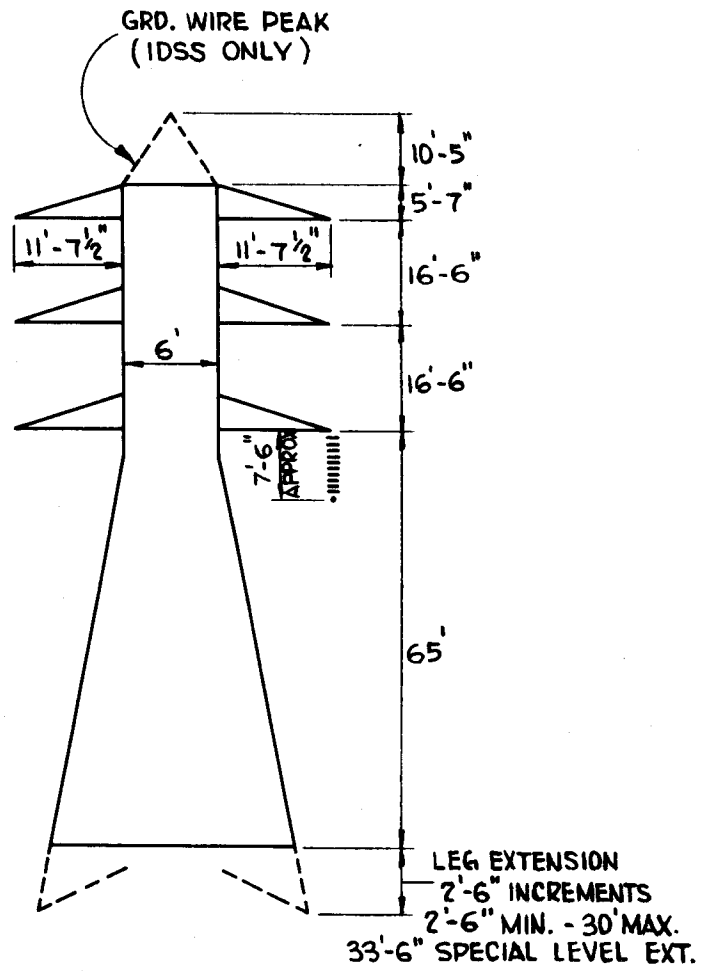
*Each crossarm should be considered as supporting 2 conductors joined at the insulator.
1DSD = 2ϕD2LGϕ5ϕ1
4DSD = 2ϕD2LNϕ504

REV. A - ADDED DWG NO. JK	**INFORMATION SUMMARY**	
DT. 10-26-65 / SC NONE	230KV 1DSD - 4DSD	SACRAMENTO MUNICIPAL UTILITY DISTRICT
DRAWN / APPROVED	55' DEAD END TOWER	345 - A 1495
J. KAKAVAS DR / [signature]		
[signature] CK / [signature]		

ID 2-10-76 TK

~~TLO TRANSMISSION LINE OVERHEAD~~

FORM DE2A SC



DESIGN LOADS - POUNDS

	CONDUCTOR	GRD. WIRE	REMARKS
V	850	250	
T	550	250	
L	4000	3000	
SPECIAL VERT.	4000	2500	DOWNWARD

WEIGHT

Main Tower (4DSS)	-10,445#
Main Tower W/G.W.P. (1DSS)	-10,888#
Ea. 5' Leg Extension	- 120#
Ea. 30' Leg Extension	- 653#
33'6" Level Extension	-

LOCATIONS USED

Camino-Folsom T/L, Folsom-Hedge,
Folsom-Elverta, Whiterock-Folsom

DRAWING NUMBERS

Stress Analysis	-M-718
Structural Design	-M-717
Erec. Diag. Tower Body	-M-1066
Bill of Material Tower Body	-M-1066
Erec. Diag. Leg Extension	-M-1064
Bill of Material Leg Extension	-M-1064
Spec. Level Extension Erec.	-M-1425
Spec. Level Extension Fabri.	-M-1426
Stub Setting Dim. & Design	-M-1334
Footing Design	-A-937 & B-320

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

Min. W/2'6" Leg Extension - 60'-0"
Max. W/30 Leg Extension - 87'-6"

MAXIMUM REACTION

Uplift	31.0 kips
Compression	39.7 kips

The Tower shall support its own weight plus the following loads or combination of loads which give maximum stress to the members:

1. All loads as shown.
2. Any two conductors or any conductor and the ground wire broken.
3. A transverse wind load of 13# per square foot on 1 1/2 times the projected area of one face of the tower shall be added in the transverse direction.

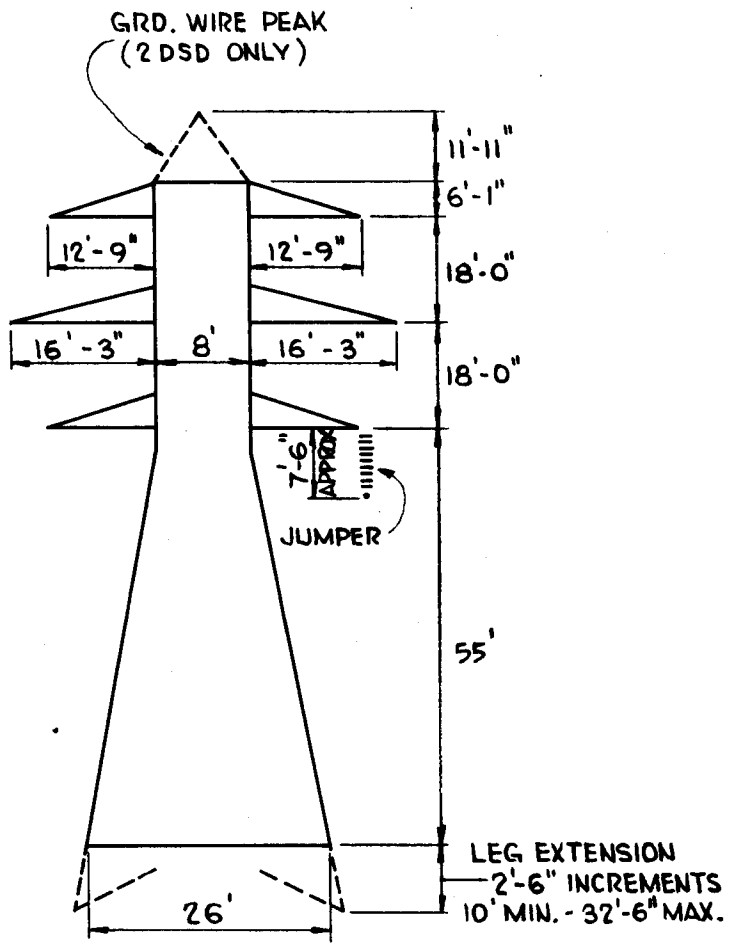
The "Special Vertical" loads are to be applied independently of other loads.
All members shall withstand 1 1/2 times design loads without failure.
Broken wires occur in the same span.
"T" loads act in either direction.
The complete system of forces on one side is removed for a broken wire.

1DSS = 25S2LGΦ4Φ1 4DSS = 25S2LNΦ4Φ4

REV.		INFORMATION SUMMARY	
DT. 10-26-65	SC NONE	230KV 1DSS-4DSS	
DRAWN	APPROVED	65' SUSPENSION TOWER	SACRAMENTO MUNICIPAL UTILITY DISTRICT
J. KAKAVAS DR			342-A1496
DK			

~~TLO TRANSMISSION LINE OVERHEAD~~ ID 2-10-76 TK

FORM DE2A SC



WEIGHT

Main Tower (3 DSD)	- 24,635 #
Main Tower W/G.W.P. (2 DSD)	- 25,140 #
Ea. 10' Leg Extension	- 727 #
Ea. 30' Leg Extension	- 2,181 #

LOCATIONS USED

Camino-Folsom
Camino-Whiterock

DRAWING NUMBERS

Structural Design	- M-1098
Erec. Diag. Tower Body	- M-1002
Bill of Material Tower Body	- M-1003
Erec. Diag. Leg Extension	- M-1004
Bill of Material Leg Extension	- M-1004
Stub Setting Dim. & Design	- M-980 & M-874
Footing Design	- C-290

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

Min. W/10' Leg Extension	- 65'-0"
Max. W/32'6" Leg Extension	- 87'-6"

MAXIMUM LOADS AT TOP OF FOOTING

Compression	176.3 kips
Uplift	153.1 kips

DESIGN LOADS - POUNDS

		CONDUCTOR		GRD. WIRE	
		45° ∠	TANGENT	45° ∠	TANGENT
V		2200	2200	850	850
T		6000	900	2500	600
L		10600	11450	4650	5000
SPECIAL VERTICAL	DOWNWARD	7000	—		5000
	UPWARD	3000	—		—

LOADING CASES

1. All loads on.
2. All conductors and the ground wire broken on the same face of tower.
3. Any number or combination of ground wire and conductors broken on the same face of the tower.

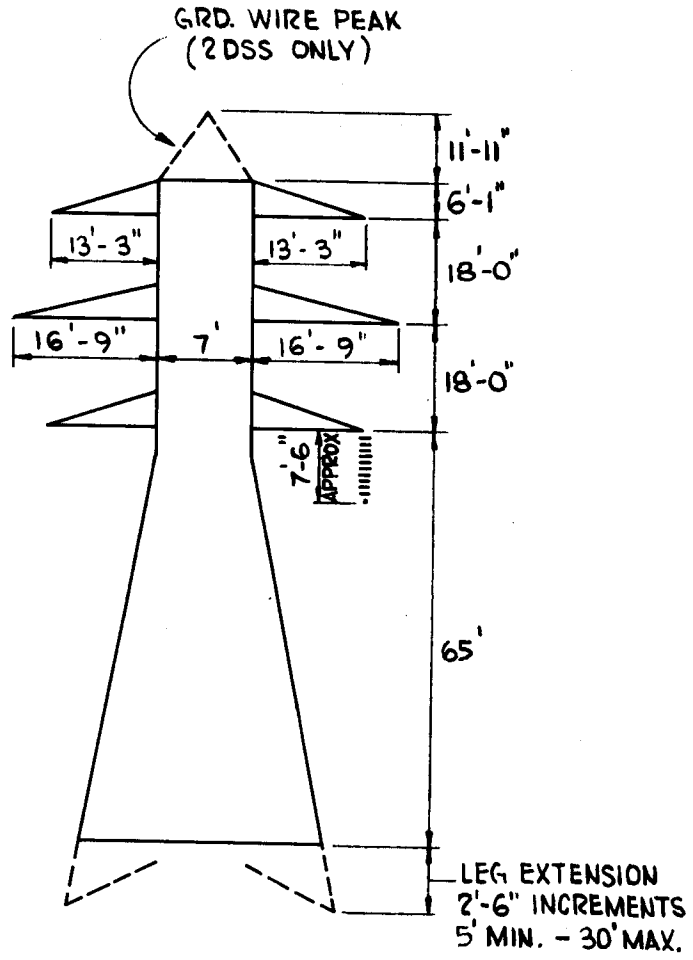
Dead load of the tower shall be added to the vertical loads shown.
A wind load of 10# per square foot acting on 1 1/2 times the projected area of one face of the tower shall be added to the transverse loads shown.
The "Special Vertical" loads are to be applied independently of other loads.
All members shall withstand 1 1/2 times design loads without failure.

2DSD = 25D2LG1104
3DSD = 25D2LN1103

REV. A - ADDED REF No.	INFORMATION SUMMARY	
DT. 10-26-65 SC NONE	230KV 2DSD - 3DSD	SACRAMENTO MUNICIPAL UTILITY DISTRICT
DRAWN J. KAKAVAS DR	55' DEAD END TOWER	346 - A1500
APPROVED CK		

~~TLO TRANSMISSION LINE OVERHEAD~~ ID 2-10-76 TK

FORM OESA 80



WEIGHT

Main Tower (3 DSS)	- 17,636 #
Main Tower W/G.W.P. (2 DSS)	- 18,150 #
Ea. 5' Leg Extension	- 187 #
Ea. 30' Leg Extension	- 961 #

LOCATIONS USED

Camino-Folsom
Camino-Whiterock

DRAWING NUMBERS

Stress Analysis	- M-887-888
Structural Design	- M-1100
Erec. Diag. Tower Body	- M-983
Bill of Material Tower Body	- M-983
Erec. Diag. Leg Extension	- M-984-985
Bill of Material Leg Extension	- M-984-985
Stub Setting Dim. & Design	- M-980 & M-874
Footing Designs	- C-290

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

Min. W/5' Leg Extension - 62'-6"
Max. W/30' Leg Extension - 87-6"

MAXIMUM REACTION

Uplift	46.4 kips
Compression	68.6 kips

DESIGN LOADS - POUNDS

	CONDUCTOR	GRD. WIRE	REMARKS
V	2200	850	
T	950	650	
L	9000	5000	
SPECIAL VERT.	6000	4000	DOWNWARD

The Tower shall support its own weight plus the following loads or combination of loads which give maximum stress to the members:

1. All loads as shown.
2. Any two conductors or any conductor and the ground wire broken.
3. A transverse wind load of 10# per square foot on 1 1/2 times the projected area of one face of the tower shall be added in the transverse direction.

The "Special Vertical" loads are to be applied independently of other loads.
All members shall withstand 1 1/2 times design loads without failure.
Broken wires occur in the same span.
"T" loads act in either direction.
The complete system of forces on one side is removed for a broken wire.

2 DSS = 25S2LGΦ9Φ2
3 DSS = 25S2LNΦ9Φ3

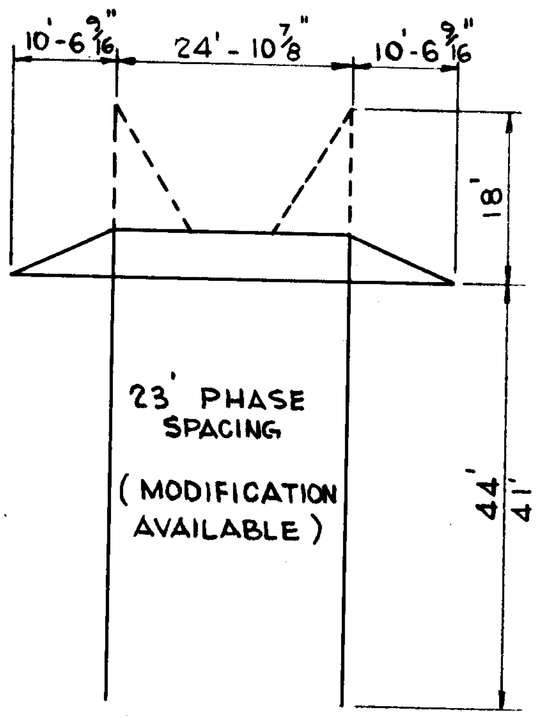
REV. A - ADDED REF No		
DT. 10-26-65	SC NONE	
DRAWN	APPROVED	
J. KAKAVAS DR		SACRAMENTO MUNICIPAL UTILITY DISTRICT
GK		345 - A1499

INFORMATION SUMMARY
230 KV 2DSS - 3DSS
65' SUSPENSION TOWER

~~TLO TRANSMISSION LINE OVERHEAD~~ JR 2-10-76 TK

FORM 0E2A SC

GRD. WIRE PEAK
(2SSD ONLY)



NOTE: DOUBLE GROUND WIRE PEAKS AVAILABLE

WEIGHT

41' 3 SSD Tower without G.W.P. - 6300# APPROX
44' 3 SSD " without G.W.P. - 6700# "
Ground Wire Peak only - 800# "

LOCATIONS USED

Folsom-Hedge
Camino-Folsom
Hedge-PG&E Tap
Hurley Tap

DRAWING NUMBERS

41'& 44' Structural Design - M-636, B-224
Erec. & Bill of Matl. 41' - M-668, M-892
Erec. & Bill of Matl. 44' - M-891
Stub Setting Dimension - M-652, M-895
Stub Assembly - K-243
9' & 11' Stub Angle - K-342, K-343

MODIFICATION AVAILABLE

16' Phase Spacing - M-1148

MAXIMUM REACTION

41' Tower

Compression 48.5 kips
Uplift 43.5 kips

DESIGN LOADS - POUNDS

	CONDUCTOR	GRD. WIRE
V	1000	300
T	1800	500
L	5200	2500
SPEC. VERT. DOWNWARD	4500	2500

The deadend tower shall support its own weight plus the following loads or combinations of loads which give maximum stress to the members:

1. All loads on as shown.
2. All conductors and the ground wire broken on the same face of tower. (The complete system of forces on one side is removed for a broken wire.)
3. Any number or combination of ground wires and conductors broken on the same face of tower.
4. A wind load of 13# per sq. ft. acting on 1 1/2 times the projected area of one face of the tower shall be added in the transverse direction.

The special vertical loads shall be applied independently of the other loads.
All members shall withstand 1 1/2 times the above tabulated Design Loads without failure.

2SSD = 2ƀDILGΦ5Φ2

3SSD = 2ƀDILNΦ5Φ3

REV.
DT. 10-28-65 | SC NONE
DRAWN: J. KAKAVAS DR
APPROVED: J. Wil... Lan...
CK

INFORMATION SUMMARY

230KV 2SSD - 3SSD
41'- 44' S.C. DEADEND TOWER

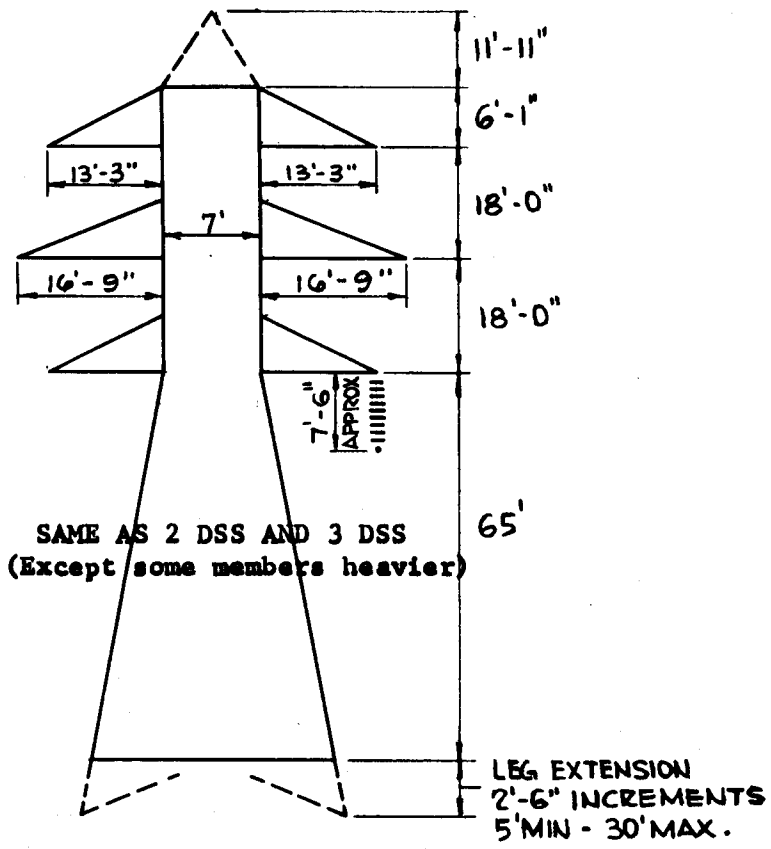
SACRAMENTO MUNICIPAL UTILITY DISTRICT

346 - A1497

ID 2-10-76 TK

FORM OESA SC

TLO TRANSMISSION LINE OVERHEAD



WEIGHT

Main Tower W/G.W.P. - 18,681 #
Ea. 5' Leg Extension - 187 #
Ea. 30' Leg Extension - 962 #

LOCATION USED

Camino-Folsom, Camino-Whiterock

DRAWING NUMBERS

Stress Analysis	-M-1102
Structural Design	-M-1101
Erec. Diag. Tower Body	-M-1026
Bill of Matl. Tower Body	-M-1026
Erec. Diag. Leg Ext.	-M-1027-28
Bill of Matl. Leg Ext.	-M-1027-28
Stub Setting Dim. & Design	-M-979
Footing Design	-C-290

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

SAME AS 2DSS AND 3 DSS

MAXIMUM REACTIVE LOADS

Comp.	78.0 kips
Uplift	57.0 kips

DESIGN LOADS

SAME AS 2 DSS AND 3 DSS

See Dwg. 345-A 1499

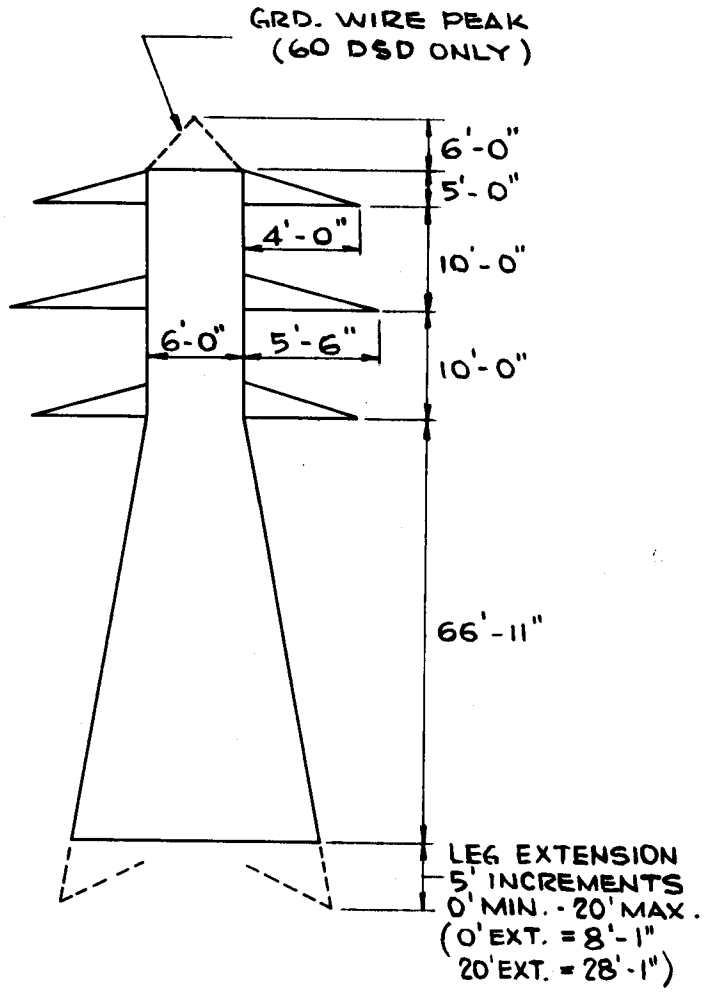
TLO TRANSMISSION LINE OVERHEAD

5 DSS = 2b52LGΦ9Φ5

REV. A - ADDED DWG NO.	INFORMATION SUMMARY	
DT. 10-26-65 SC NONE	230KV 5DSS G.W.P. DEADEND	SACRAMENTO MUNICIPAL UTILITY DISTRICT
DRAWN J. KAKAVAS DR	APPROVED J. Hilz for	65' SUSPENSION TOWER
CK	OK	345 : A 1494

ID 2-10-76 TK

FORM 0E2A SC



WEIGHT

Main Tower (Special-3 x-arms)	- 26,240*
Main Tower w/GWP (60 DSD)	- 20,289
Ea. 0' Leg Extension	- 508
Ea. 20' Leg Extension	- 1,817

LOCATION USED

Robbs Peak-Union Valley

DRAWING NUMBERS

Structural Design	- D-852
Structural Design	- D-851
Erection Diag. Tower Body	- M-1509
Erection Diag. Tower Body(spec)	- M-1521
Erection Diag. Leg Extension	- M-1510
Stub Setting Dim.	- L-742
Stub Setting Dim. (spec.)	- L-743
X-arm Fabrication (spec.-3rd x-arm)	- M-1527
Stress analysis	- D-854
Footing Design	- B-447-449 & B-454

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

Min. Leg Extension	- 75'
Max. W/Leg Extension	- 95'

DESIGN LOADS

A-1342

NOTE: Special Tower has 3rd set of crossarms

DESIGN LOADS (lbs)

	CONDUCTOR		GRD. WIRE	
	40°∠	TAN	40°∠	TAN
V	5,500	1,000	11,250	11,250
T	12,500	12,500	4,950	900
L	15,000	16,000	13,500	14,400

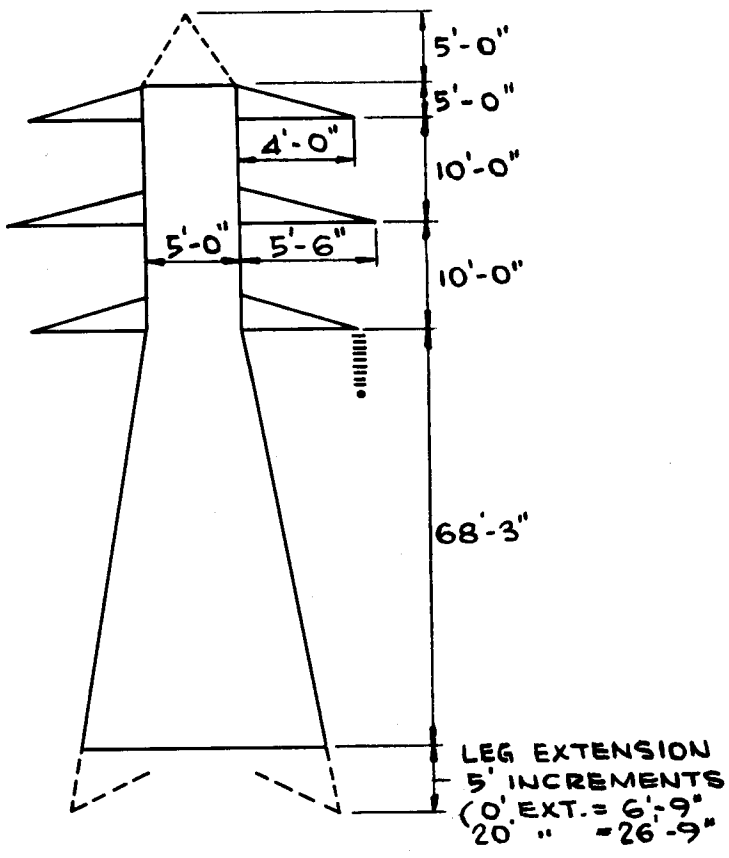
60 DSD = 6ΦD2LG1360
61 DSD = 6ΦD2LN1361

TLO TRANSMISSION LINE OVERHEAD

REV. A 4-81 ADDED LOADS	INFORMATION SUMMARY	
DT. 2-16-67 / SC NONE	69 KV 60 DSD - 61 DSD	SACRAMENTO MUNICIPAL UTILITY DISTRICT
DRAWN / APPROVED	75' DEAD END TOWER	3-[illegible]-A1528
J. KAKAVAS DR		
CK		

JD 2-13-76 TC

FORM DE2A SC



DESIGN LOADS
A-1332

DESIGN LOADS (lbs)		
	CONDUCTOR	GRD. WIRE
V	12,500	11,500
T	400	400
L	11,000	9,900

60 DSS = 6B52LG1360
61 DSS = 6B52LN1361

WEIGHT

Main Tower W/GWP	- 11,647#
Ea. 0' Leg Extension	- 148
Ea. 20' Leg Extension	- 762

LOCATION USED

Robbs Peak-Union Valley

DRAWING NUMBERS

Structural Design	-D-843
Erection Diag. Tower Body	-M-1497
Erection Diag. Leg Extension	-M-1498
Stub Setting Dim.	-L-741
Stress Analysis	-D-844
Footing Design	-B-447-9 & B-454

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

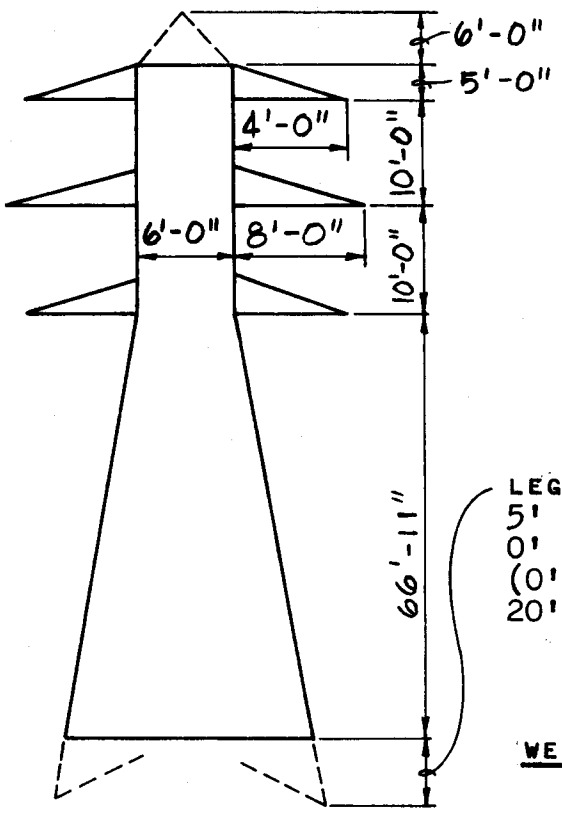
Min. W/O Leg Extension	- 75'
Max. W/Leg Extension	- 95'

TLO TRANSMISSION LINE OVERHEAD

REV. A 4-81 ADDED LOADS JK		INFORMATION SUMMARY
DT. 2-14-67	SC NONE	69 KV 60DSS - 61DSS
DRAWN	APPROVED	75' SUSPENSION TOWER
J. KAKAVAS DR		SACRAMENTO MUNICIPAL UTILITY DISTRICT
CK		A1527

ID 2-13-76 JK

FORM DE2A SC



LEG EXTENSION
5' INCREMENTS
0' MIN-20' MAX
(0' EXT=8'-1"
20' EXT=28'-1")

DESIGN LOADS (lbs)				
	CONDUCTOR		GRD. WIRE	
	40° ∠	TAN	40° ∠	TAN
V	5,500	1,000	11,250	11,250
T	12,500	12,500	4,950	900
L	15,000	16,000	13,500	14,400

WEIGHT

MAIN TOWER W/GWP (62DSD)	-	21,387#
EA. 0' LEG EXTENSION	-	520
EA. 20' LEG EXTENSION	-	1,947

DRAWING NUMBERS

ERECTION DIA. TOWER CAGE(MIDDLE X-ARM)	M-1957
" " " BODY	M-1955
" " " LEG EXTENSION	M-1956
ERECTION DETAILS	
0'-20' LEG EXTENSION	M-1951 TO M-1954
GROUND WIRE PEAK	M-1950
CROSSARMS	M-1948 & M-1949
CAGE	M-1947
PEDESTAL	M-1944 TO M-1946
MODIFIED ARM DETAILS	M-1929
STRESS ANALYSIS	M-1928
MODIFIED DESIGN LOADS	M-1927
STUB SETTING DIMENSIONS	L-742

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

MIN. LEG EXTENSION	-	75'
MAX W/LEG EXTESNION	-	95'

62 DSD = GBD2LG1562
63 DSD = GBD2LN1563

*63DSD IS SAME AS 62DSD LESS O.H.G.W. PEAK

NO.	C.E.	E.G.S.	P.E.	DATE	DESCRIPTION	FILM
A			JK	4-81	ADDED LOADS	✓

REVISIONS

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

SC NONE | DWG. SIZE A
DR. BY HARADA | DATE 2-11-76
CHKD. BY JK | DATE 2-17-76
DESIGN ENGR.

TITLE INFORMATION SUMMARY
69 KV 62DSD-63DSD
75' DEAD END TOWER

LOCATION ROBBS PEAK-UNION VALLEY

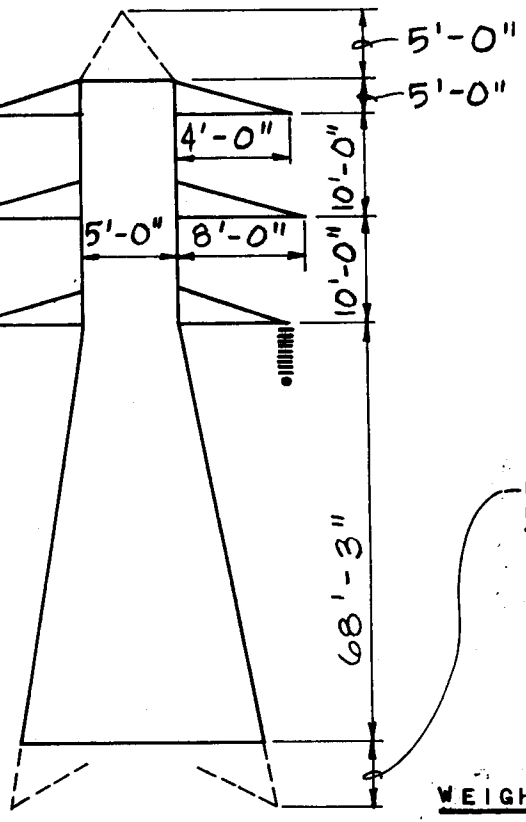
SUPV. ENGR. | PROJ. ENGR. | ENGR. MGR. | RELEASE DATE 2-18-76

INVT. NO.
W.O. NO.
MICROFILM ✓

DWG. NO. A-1914
SHT. NO. of SHTS.
REV. A

ID 2-17-76 TK

TLO TRANSMISSION LINE OVERHEAD



DESIGN LOADS (lbs)		
	CONDUCTOR	GRD WIRE
V	12,500	11,500
T	400	400
L	11,000	9,900

WEIGHT

MAIN TOWER W/GWP (62DSS)	12,432#
EA. 0' LEG EXTENSION	188
EA. 20' LEG EXTENSION	811

DRAWING NUMBERS

ERECTION DIA. TOWER CAGE (MIDDLE X-ARM)	M-1943
" " " BODY	M-1941
" " " LEG EXTENSION	M-1942

ERECTION DETAILS

0'-20' LEG EXTENSION	M-1937 TO M-1940
GROUND WIRE PEAK	M-1936
CROSSARM	M-1934 & M-1935
CAGE	M-1933
PEDESTAL	M-1930 TO M-1922
MODIFIED ARM DETAILS	M-1926
STRESS ANALYSIS	M-1925
MODIFIED DESIGN LOADS	M-1924
STUB SETTING DIMENSIONS	L-741

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

MIN. W/O LEG EXTENSION	- 75'
MAX. W/LEG EXTENSION	- 95'

62 DSS = 6T52LG1162
63 DSS = 6T52LN1163

* 63DSS IS SAME AS 62DSS LESS O.H.G.W. PEAK

NO.	C.E.	E.G.S.	P.E.	DATE	DESCRIPTION	FILM
A			✓	4-81	ADDED LOADS	✓

REVISIONS

SC NONE | DWG. SIZE A
DR. BY HARADA | DATE 2-11-76
CHKD. BY J.K. | DATE 2-17-76
DESIGN ENGR.

TITLE INFORMATION SUMMARY
69KV 62DSS - 63DSS
75' SUSPENSION TOWER

LOCATION ROBBS PEAK-UNION VALLEY

SUPV. ENGR. | PROJ. ENGR. | ENG. MGR. | RELEASE DATE 2-19-76

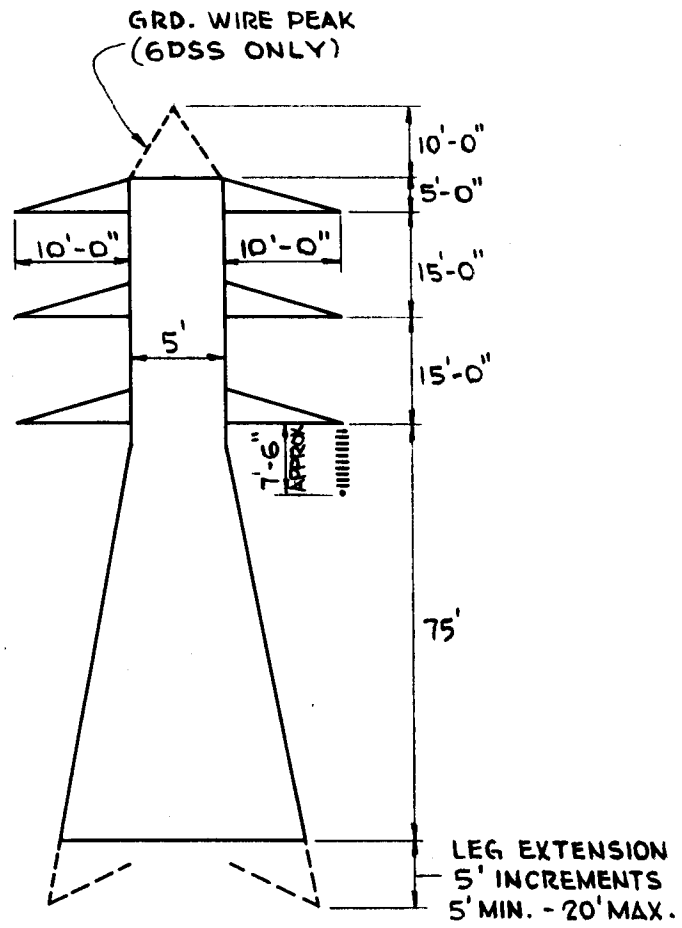
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

INVT. NO.
W.O. NO.
MICROFILM ✓

DWG. NO. A-1915 | REV. A
SHT. NO. of SHTS.

ID 2-17-76 TK

TLO TRANSMISSION LINE OVERHEAD



WEIGHT

Main Tower (7 DSS)	- 8,549 #
Main Tower W/G.W.P. (6 DSS)	- 8,729 #
Ea. 5' Leg Extension	- 304 #
Ea. 20' Leg Extension	- 755 #

LOCATION USED

Folsom-Elverta
Whiterock-Folsom

DRAWING NUMBERS

Stress Tabulation	- C-391
Structural Design	- D-719 & 720
Erec. Diag. Tower Body	- M-1339
Bill of Matl. Tower Body	- M-1339
Erec. Diag. Leg Ext.	- M-1340
Bill of Matl. Leg Ext.	- M-1340
Stub Setting Dim. & Design	- M-1333
Footing Design	- B-399 & 400

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

Min. without Leg Extension	- 67.5'
Max. with Leg Extention	- 87.5'

MAXIMUM REACTIVE FORCE

Comp.	45.2
Ten.	33.8

DESIGN LOADS

LOADING DIRECTION	PER CONDUCTOR	DESIGN CONDITIONS	FACTOR OF SAFETY
V T L	1000 # 1325 # —	NO BROKEN WIRES & 90 M.P.H. WIND	1
V T L	1000 # 500 # 4000 #	BOTH PHASES OF TOP X-ARM BROKEN	1
V T L	1000 # 500 # 4000 #	ONE PHASE BROKEN ON TOP & MIDDLE X-ARM	1

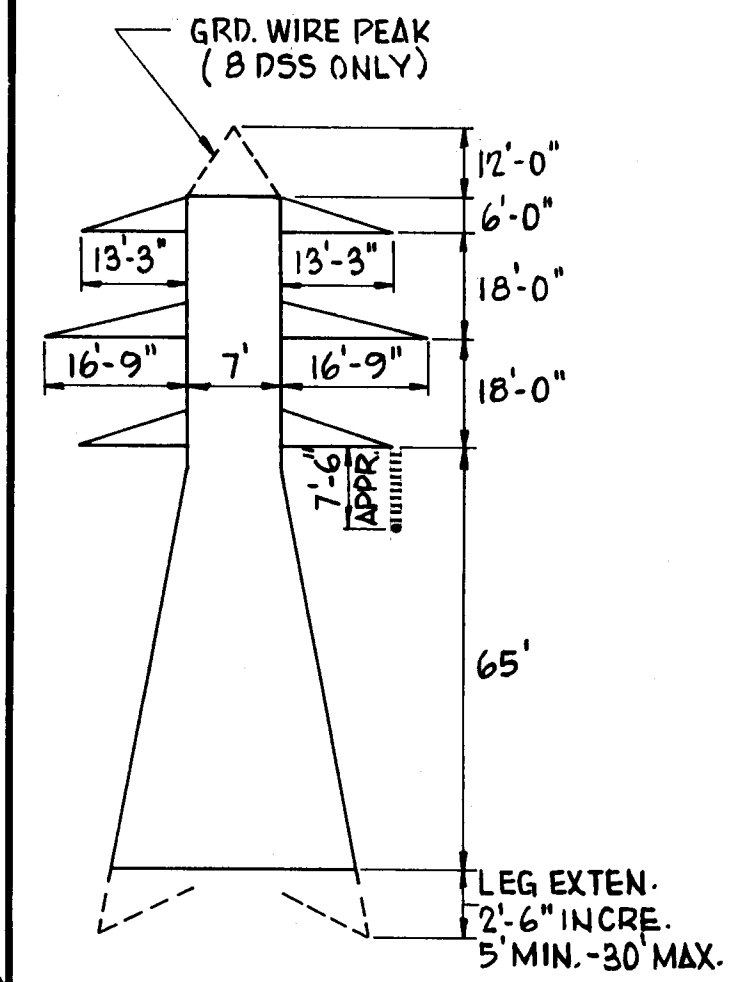
FOR DESIGN NOTES SEE DRAWING D-720.

6DSS = 2ϕS2LGϕ4ϕ6
7DSS = 2ϕS2LNϕ4ϕ7

REV.		INFORMATION SUMMARY	
DT. 10-27-65	SC NONE	230KV 6DSS - 7DSS	
DRAWN	APPROVED	75' LIGHT SUSPENSION TOWER	SACRAMENTO MUNICIPAL UTILITY DISTRICT
J. KAKAVAS DR			342 - A1501
CK			

~~TLO TRANSMISSION LINE OVERHEAD~~ JD 2-10-76 TK

FORM OE2A SC



DESIGN LOADS - POUNDS

	CONDUCTOR	GRD. WIRE	REMARKS
V	2200	850	
T	950	650	
L	9000	5000	
SPEC. VERT	6000	4000	DOWNWARD

WEIGHT

MAIN TOWER (9 DSS)	-17,636#
MAIN TOWER W/G.W.P. (8 DSS)	-18,150#
EA. 5' LEG EXTENSION	- 187#
EA. 30' LEG EXTENSION	- 961#

LOCATIONS USED

UNION VALLEY - JAYBIRD
UNION VALLEY - CAMINO

DRAWING NUMBERS

STRESS ANALYSIS	-M-887- M-888
STRUCTURAL DESIGN	-M-1100
EREC. DIAG. TOWER BODY	-M-983
BILL OF MATERIAL TOWER BODY	-M-983
EREC. DIAG. LEG EXTENSION	-M-984- M-985
BILL OF MATERIAL LEG EXTEN.	-M-984- M-985
STUB SETTING DIM. & DESIGN	-M-980
FOOTING DESIGNS	-C-290

BOTTOM CONDUCTOR HEIGHTS AT CROSSARM

MIN. W/5' LEG EXTENSION	-62'-6"
MAX. W/30' LEG EXTENSION	-87'-6"

MAXIMUM REACTION

UPLIFT	46.4 KIPS
COMPRESSION	68.6 KIPS

NOTE:

THIS TOWER IS IDENTICAL TO 2 & 3 DSS TOWERS.

THE TOWER SHALL SUPPORT ITS OWN WEIGHT PLUS THE FOLLOWING LOADS OR COMBINATION OF LOADS WHICH GIVE MAXIMUM STRESS TO THE MEMBERS:

1. ALL LOADS AS SHOWN.
2. ANY TWO CONDUCTORS OR ANY CONDUCTOR AND THE GROUND WIRE BROKEN.
3. A TRANSVERSE WIND LOAD OF 10# PER SQ. FT. ON 1-1/2 TIMES THE PROJECTED AREA OF ONE FACE OF THE TOWER SHALL BE ADDED IN THE TRANSVERSE DIRECTION.

THE "SPECIAL VERTICAL" LOADS ARE TO BE APPLIED INDEPENDENTLY OF OTHER LOADS.
ALL MEMBERS SHALL WITHSTAND 1-1/2 TIMES DESIGN LOADS WITHOUT FAILURE.
BROKEN WIRES OCCUR IN THE SAME SPAN.
"T" LOADS ACT IN EITHER DIRECTION.
THE COMPLETE SYSTEM OF FORCES ON ONE SIDE IS REMOVED FOR A BROKEN WIRE.

8DSS = 2B52LG0925 9DSS = 2B52LN0925

NO.	C.E.	E.G.S.	P.E.	DATE	DESCRIPTION	FILM

REVISIONS

SC. NONE | DWG. SIZE A
DR. BY KAKAVAS | DATE 3-78
CHKD. BY TL | DATE 3-78
DESIGN ENGR.

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

TITLE **INFORMATION SUMMARY**
230KV 8DSS-9DSS
65° SUSPENSION TOWER

LOCATION U.V. - JAYBIRD/CAMINO

SUPV. ENGR. | PROJ. ENGR. | ENGR. MGR. | RELEASE DATE
W.K. Latham 17APR1978

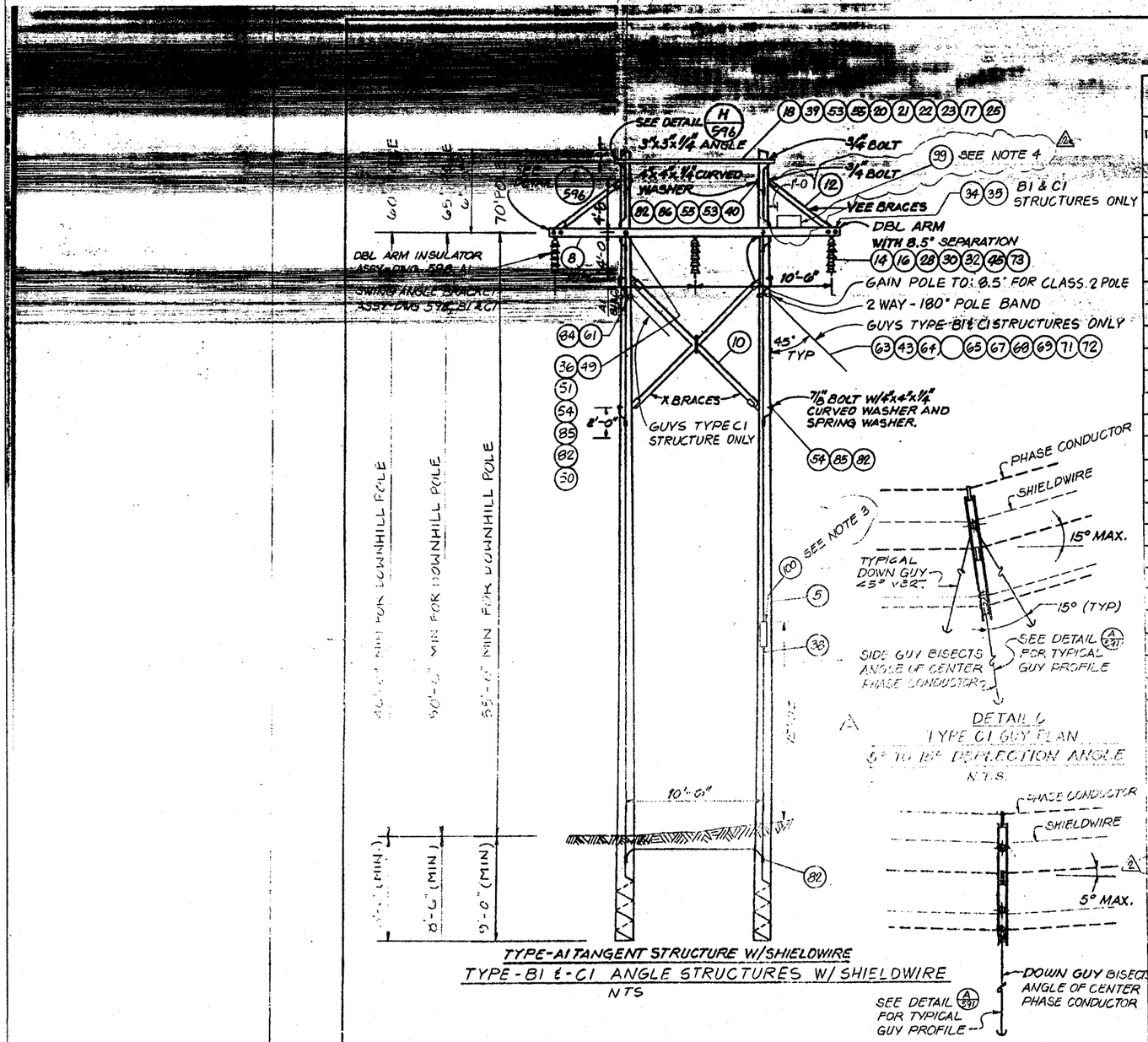
INVT. NO.
W.O. NO.
MICROFILM ✓

DWG. NO. A-1977
SHT. NO. of SHTS.

REV. 0

D 4/78 JK

TLO TRANSMISSION LINE OVERHEAD

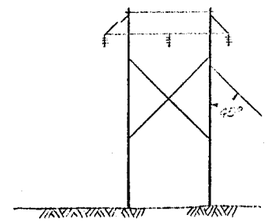


MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC.	QTY. TOTAL	SMUD STOCK NO.
		TYPE A1/60 STRUCTURE		8	
		TYPE A1/65 STRUCTURE (1-C1/65)		18	
		TYPE B1/65 STR. (STA. 180+24 78)		1	
		TYPE A1 65/70 STRUCTUEE		2	
		TYPE A1/70 STRUCTURE		7	
		TYPE A1 60/65 STRUCTURE		2	
5	-	60' CLASS 2 POLE	2	18	
6	-	65' CLASS 2 POLE	2	42	
7	-	70' CLASS 2 POLE	2	16	
8	-	CROSSARM, 5 5/8" x 7 1/2" x 22'	2	76	
10	-	X-BRACE, 3 3/8" x 4 3/8" (10'-6 POLE SPACING)	1	38	
12	-	VEE BRACE, 2 3/4" x 3 1/2"	2	76	
14	598	SUSPENSION INSULATOR (BALL-SOCKET)	15	570	
16	598	ARMOR ROD SET (203.2 KCM CONDUCTOR)	3	114	
17	596	ARMOR ROD SET (1/2" E.H.S. STL. STRAND)	2	76	
18	596	3" x 3" x 1/4" L x 12'-6	1	38	
20	596	DOWNLEAD TERMINAL (FOR #4 AWG WIRE)	2	76	
2	596	5/8" U-BOLT (INCL. NUTS & LOCK NUTS)	2	76	
22	596	5/8" CHAIN LINK	2	76	
23	596	MALEABLE IRON SUSPENSION CLAMP (FOR 1/2" STRAND W/ ARMOR RODS	2	76	
25	596	CLEVIS EYE	2	76	
28	598	ARMOR GRIP SUSPENSION CLAMP	3	114	
30	598	BALL Y-CLEVIS	3	114	
32	596	ADJUSTABLE METAL SPACER FITTING (3.5"-6.5" CROSSARM SPACING)	3	114	
34	596	GALV. GAIN PLATES (7/8" BOLT)	4	152	
38	596, 597	NO. 4 AWG S.D. COPPER WIRE	174'	6612'	
39	596	MACHINE BOLT 3/4" x 10" (INCL. NUT)	2	76	
40	-	MACHINE BOLT 3/4" x 12" (INCL. NUT)	2	76	
45	596	MACHINE BOLT 3/4" x 6" (INCL. NUTS & LOCK NUTS)	2	76	
47	596	THREADED ROD 7/8" x 26"	2	76	
50	596	7/8" SQUARE NUT	4	152	
51	596	4" x 4" x 1/4" SQUARE WASHER (7/8" BOLT)	4	152	
53	596	4" x 4" x 1/4" CURVED WASHER (3/4" BOLT)	4	152	
54	596	DOUBLE COILED SPRING WASHER (7/8" BOLT)	8	152	
55	596	DOUBLE COILED SPRING WASHER (3/4" BOLT)	4	152	
43	597	MACHINE BOLT 7/8" Φ x 3" (INCL. NUT)		8	
61	597	2-WAY 180° POLE BAND (7" TO 10" POLE)		4	
63	597	7" CONNECTING LINK (DOWN GUY)		4	
64	597	GUY ROLLER (1/2" STRAND - 7/8" BOLT)		4	

MATERIAL L

ITEM NO.	REF. DWG. NO.	DESCRIPTION
65	597	PREFORMED GUY GRIP (FOR 1/2"
67	597	GROUND CONNECTOR (1" TO #4 AWG,
68	597	KEARNY SPLIT BOLT CONNECTOR (
89	598	HOLD DOWN WEIGHT SHACKLE.
90	598	HOLD DOWN WEIGHT, 11"/180#
69	597	1" THIMBLEYE ANCHOR ROD
71	597	ANCHOR
72	597	1/2" E.H.S. STEEL GUY STR
82	597	SPLIT BOLT SVC CONNECTOR (NO
85	596	BONDING CLIP W NUTS (7/8"Φ B
86	596	BONDING CLIP W NUTS (3/4"Φ B
73	598	SOCKET EYE
34	598	SWINGING ANGLE BRACKET 8.
35	598	SUPPLEMENTARY SADDLE 8.5" S
84	596	POLE BAND BONDING CLIP W/BO
34	598	SWING ANGLE BRACKET (TYPE
35	598	SUPPLEMENTARY SADDLE (T
99	591	AERIAL ID STRUCTURE NUM
100	591	GROUND STRUCTURE NUMBER



DETAIL A
GUY PROFILE
TYPE BI, CI STRUCTU
NTS

NOTES:
1. SEE GENERAL NOTES, DWG. 151.
2. FOR GROUNDING DETAILS, SEE DWGS. 5
3. GROUND ID STRUCTURE NUMBER PLAT AT LOCATION SHOWN, ON POLE NEAREST LOOKING IN DIRECTION OF INCREASIN
4. AERIAL ID STRUCTURE NUMBER PLATE A LABELED "AERIAL ID" ON DWGS. 592 ON SIDE OF STRUCTURE NEAREST TO

NO.	DATE	REVISION	DR. BY	CHKD. BY	ENGINEER	SUPV ENGR. ENG. DEPT.
0	4/1/86	SMUD FINAL APPROVAL	N/A	N/A		N/A

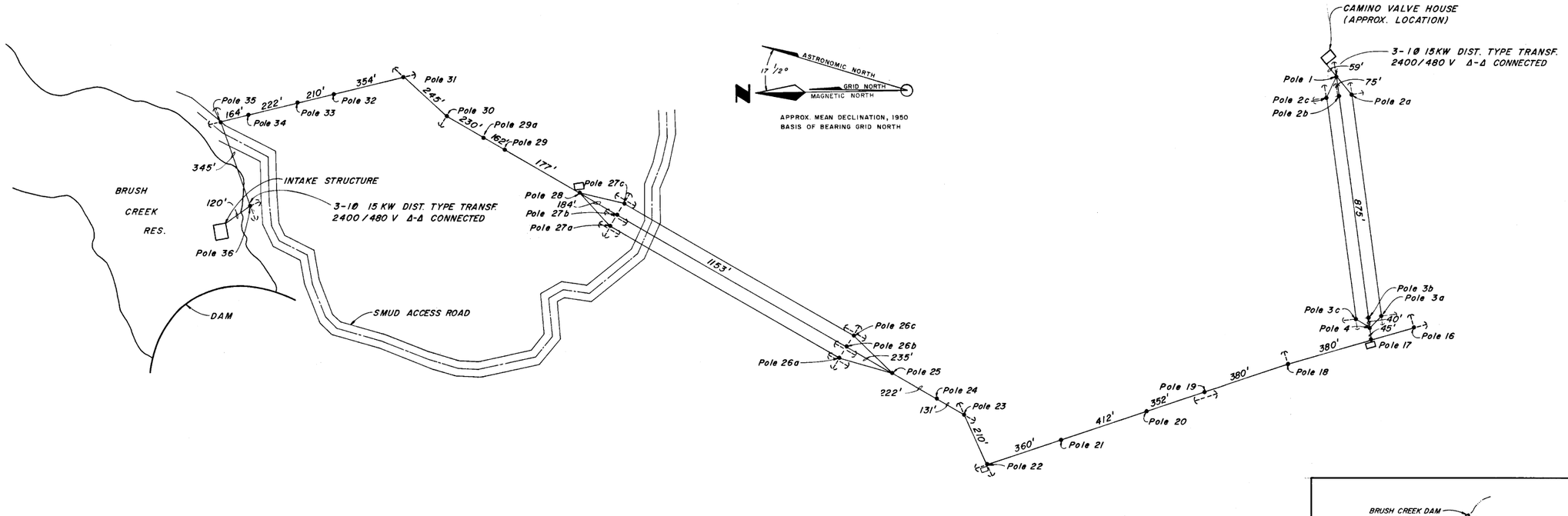
REV.	DATE	BY SUB	DESCRIPTION	APP.
Δ5	5-9-83	JM	ADD STRUC. NO. PLATES & NOTES 3,4; REV. ITEM 45	GR
Δ4	3-17-83	JM	GENERAL SHEET REVISION	GR

DESIGNED T. MACLENNAN
DRAWN D. ALEXANDER
CHECKED A. LEA
IN RESPONSIBLE CHARGE

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO — CALIFORNIA
SUBMITTED — APPROVED

SMUD — SACRAMENTO MUNICIPAL UTILITY DISTRICT
APPROVED — APPROVED

JONES FORK HYDROELECTRIC
TRANSMISSION LINE
STRUCTURE DETAILS
TYPES A1, BI, CI



Material List By Pole

POLE 16, 40' Cl.2
- 1-8' DHA, DDE, ANG. C-336-6
- 1-20M AG, 25'L
- 1- 5M AG, 25'L

POLE 17, 40' Cl.2
- 1-8' SLA, LSP TAN. C-305-1
- 1-PT 8, POLE TOP PIN

POLE 18, 35' Cl.6 DOWNSTRAIN
- 1-8' DLA, LSP ANG. C-312-1
- 1-5M AG, 20'L, 1-PT 8 POLE TOP PIN

POLE 19, 35' Cl.4 UPSTRAIN
- 1-8' DLA, DDE TAN. C-333-0
- 2-5M AG, 10'L

POLE 20, 35' Cl.1
- 1-8' SLA, LSP TAN. C-305-1
- 1-PT 8, POLE TOP PIN

POLE 21, 35' Cl.1
- 1-8' SLA, LSP TAN. C-305-1
- 1-PT 8, POLE TOP PIN

POLE 22, 45' Cl.1
- 2-8' DHA, DDE ANG. C-336-6
- 2-20M AG, 25'L

POLE 23, 45' Cl.1
- 2-8' DHA, DDE ANG. C-336-6
- 2-20M AG, 25'L

POLE 24, 45' Cl.4 DOWNSTRAIN
- 1-8' DLA, LSP TAN. C-311-1
- 1-PT 8, POLE TOP PIN

POLE 25, 40' Cl.3
- 1-8' DLA, LSP TAN. C-311-1
- 1-PT 8, POLE TOP PIN

2 - 3 POLE STRUCTURES

POLE 26a 40' Cl.2 TAN.
- 1-5M AG (SIDE GUY) 10'L
- 2-5M AG DDE, 25'L
- 3-12KV DE INSUL.

POLE 26b 40' Cl.1 TAN.
- 2-15M AG DDE, 25'L
- 5/16 BRIDLE GUYS TO POLES a & c
- 3-12KV DE INSUL.

POLE 26c 40' Cl.2 TAN.
- 1-5M AG (SIDE GUY) 10'L
- 2-5M AG, DDE, 25'L
- 3-12KV, DE, INSUL.

POLE 27a 35' Cl.3 TAN.
- 1-5M AG (SIDE GUY) 10'L
- 2-5M AG, DDE, 25'L
- 3-12KV, DE, INSUL.

POLE 27b 35' Cl.2 TAN.
- 2-15M, AG, DDE, 25'L
- 5/16" BRIDLE GUYS TO POLES a & c
- 3-12KV, DE, INSUL.

POLE 27c 35' Cl.3 TAN.
- 1-5M, AG (SIDE GUY) 10'L
- 2-5M, AG, DDE, 25'L
- 3-12KV, DE, INSUL.

POLE 28, 45' Cl.2
- 1-8' DLA, LSP TAN. C-311-1
- 1-PT 8, POLE TOP PIN

POLE 29, 40' Cl.1
- 1-8' SLA, LSP TAN. C-305-1
- 1-PT 8, POLE TOP PIN

POLE 30, 35' Cl.6
- 1-8' DLA, LSP, ANG. C-312-1
- 1-PT 8, POLE TOP PIN
- 1-5M AG, 25'L

POLE 31, 45' Cl.1
- 2-8' DHA, DDE, C-336-6
- 2-20M AG, 25'L

POLE 32, 40' Cl.2
- 1-8' SLA, LSP TAN. C-305-1
- 1-PT 8, POLE TOP PIN

POLE 33, 35' Cl.3
- 1-8' SLA, LSP, TAN. C-305-1
- 1-PT 8, POLE TOP PIN

POLE 34, 35' Cl.4
- 1-8' SLA, LSP TAN. C-305-1
- 1-PT 8, POLE TOP PIN
- 1-9' SLA, LA
- 3-12KV LIGHTNING ARRESTERS
- 1-GROUND
- 1-UAB & P.C.

POLE 35, 45' Cl.2
- 1-8' DHA, DE, TAN. C-444-9
- 1-20M AG, 25'L
- 1-10'-6" DHA, (SW) C-496-0
- 1-8' SLA, 12KV BUS, C-421-9
- 2-10'-6" DLA, MTRG. & 2.4KV BUS
- 2-GRDS. MTRG.
- 2-UAB & F.C. MTRG.
- MOULDING & WIRE FOR METERING

POLE 36, 50'
- 3-DIST. TYPE TRANSF.

POLE 29a, 35'

POLE 1, 50'
- 3- DIST. TYPE TRANSF.

POLE 2a, 50'

POLE 2b, 50'

POLE 2c, 50'

POLE 3a, 50'

POLE 3b, 50'

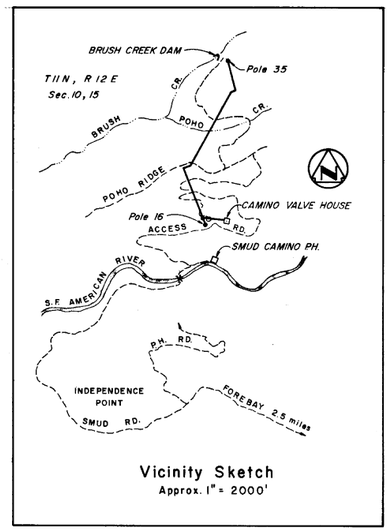
POLE 3c, 50'

POLE 4, 50'

NOTES:
1. 2400 V POWER CONDUCTOR IS #2 ACSR.
2. A 12 PAIR #19 COMMUNICATION CABLE IS STRUNG APPROX. 48" BELOW POWER CONDUCTOR.
3. THE COMMUNICATION CABLE IS LASHED BY .045 S.S. WIRE TO 3/8" EHS GALV. STRAND MESSENGER.

LEGEND:
- • APPROXIMATE POLE LOCATION
- --→ GUYS
- □ COMMUNICATION CABLE TERMINAL BOX

REFERENCE DRAWINGS:
- E-242-304
- P.G. & E. #LE.931E-ELD
- E-232-419
- E-482-315

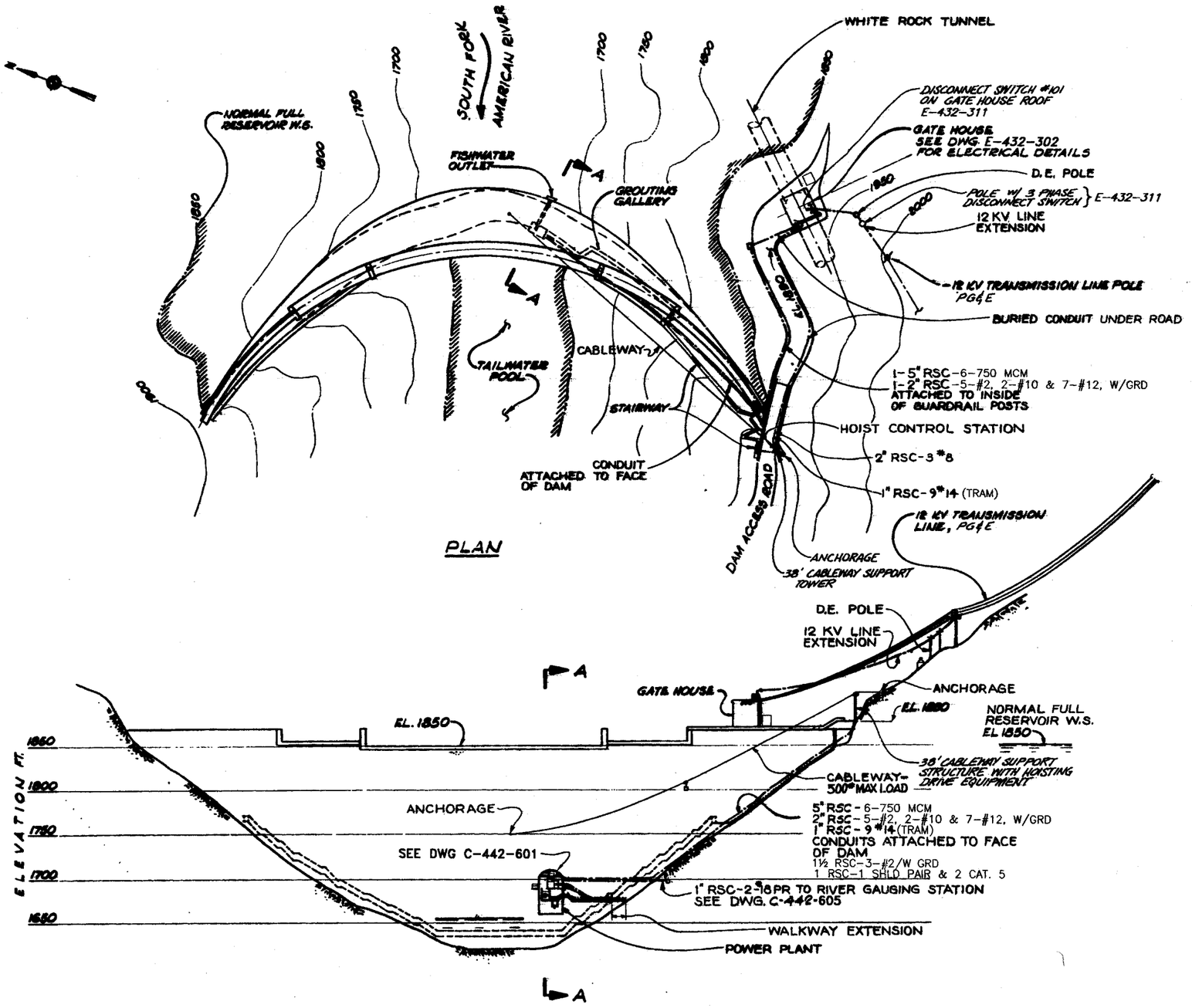


Vicinity Sketch
Approx. 1" = 2000'

NO	DATE	REVISION	DR BY	CHK'D BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
3	7/99	INCORP. DCN H-506	SRH				

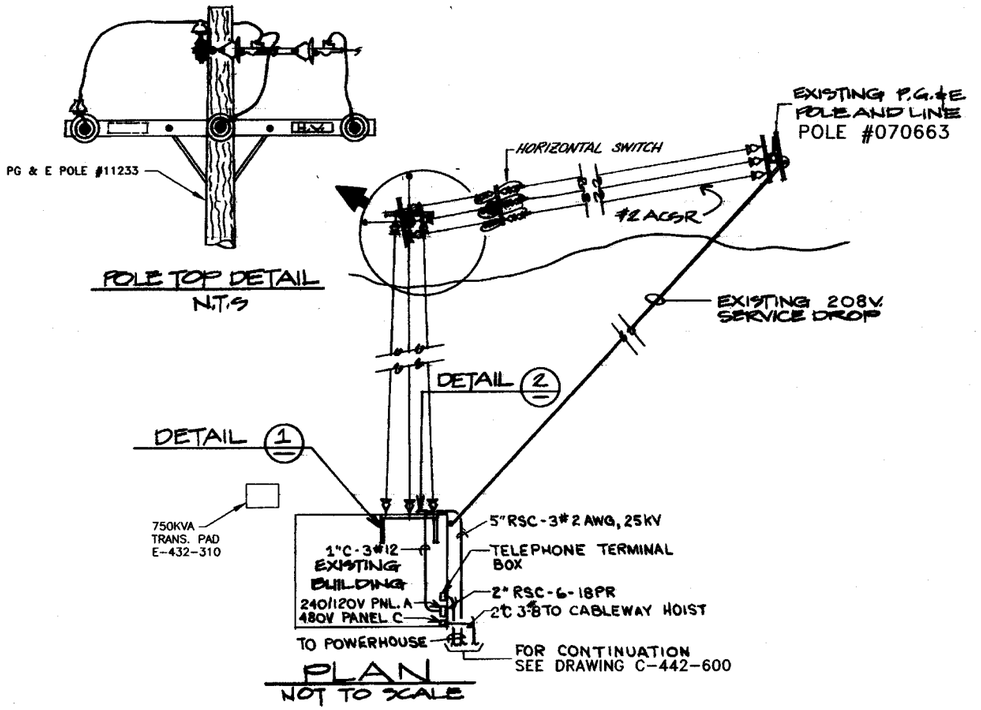
SCALE: NONE	INDEX:	TITLE: POWER & COMMUNICATION POLE LINE	
DR BY: CHAUVET	DATE: 8/70		
CHK'D BY	DATE	LOCATION: BRUSH CR. RES. TO CAMINO VALVE HOUSE	
W.O. NUMBER	DESIGNER/ENGINEER	OVERLAY	SUPERVISOR / RELEASE DATE / DCN
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT	DRG NO: 2088-DE-9152	REVISION: 3	

K:\Drafting\tlot424\relicensing stuff\9152.dwg, 2/4/2004 3:43:59 PM



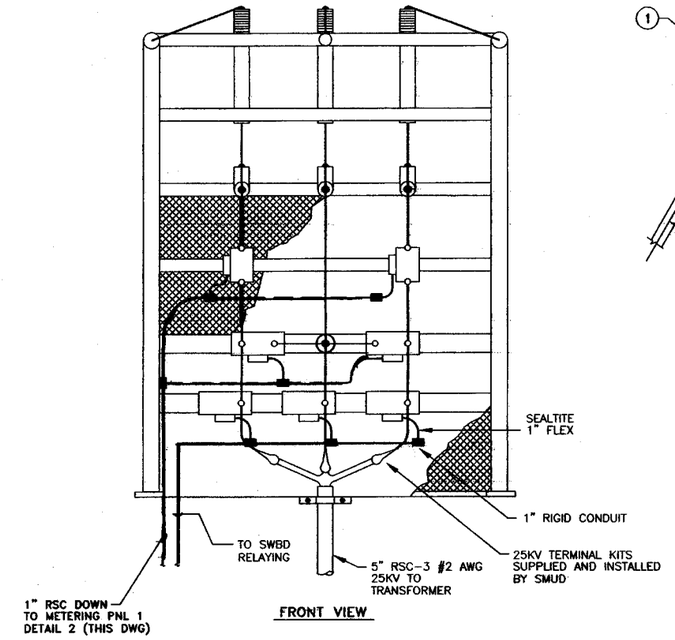
NO	DATE	REVISION	DR BY	CHK'D BY	DESIGNER/ ENGINEER	SUPERVISOR	SAP
1	2/03	INCORP DCN H-1054	RN	JA	BC	BC	X

SCALE: AS-NOTED | INDEX
DR BY: R NAVARRETE | DATE: 2/03
CHK'D BY: JIM ASTIN | DATE: 2/03
W.O. NUMBER: 20006907
TITLE: SLAB CREEK DAM GENERAL LAYOUT
LOCATION: SLAB CREEK POWERHOUSE
DESIGNER/ENGINEER: BRIAN GORRELL | OVERLAY: YES | SUPERVISOR: BRIAN GORRELL | RELEASE DATE | DCN: H-1054
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT
DWG NO: C-442-600
REVISION: 1

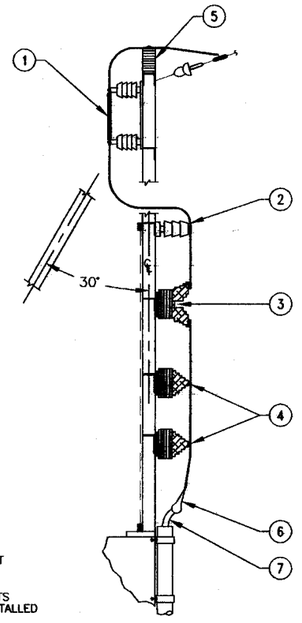


POLE TOP DETAIL
N.T.S

PLAN
NOT TO SCALE

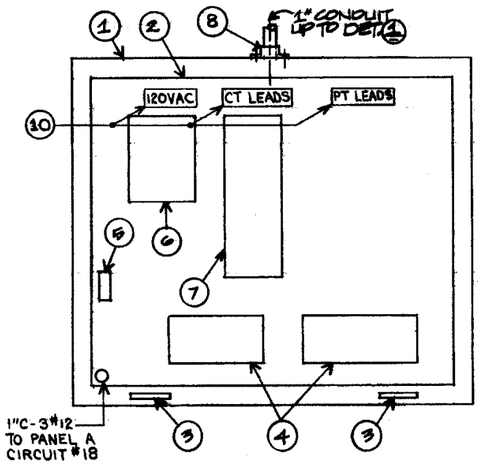


FRONT VIEW



SIDE VIEW

1 DETAIL-DEAD END STRUCTURE
SCALE: 1/2" = 1'



2 DETAIL-METERING PANEL
(SHOWN WITH DOUBLE DOOR REMOVED)
SCALE: 1" = 1'
E-432-312

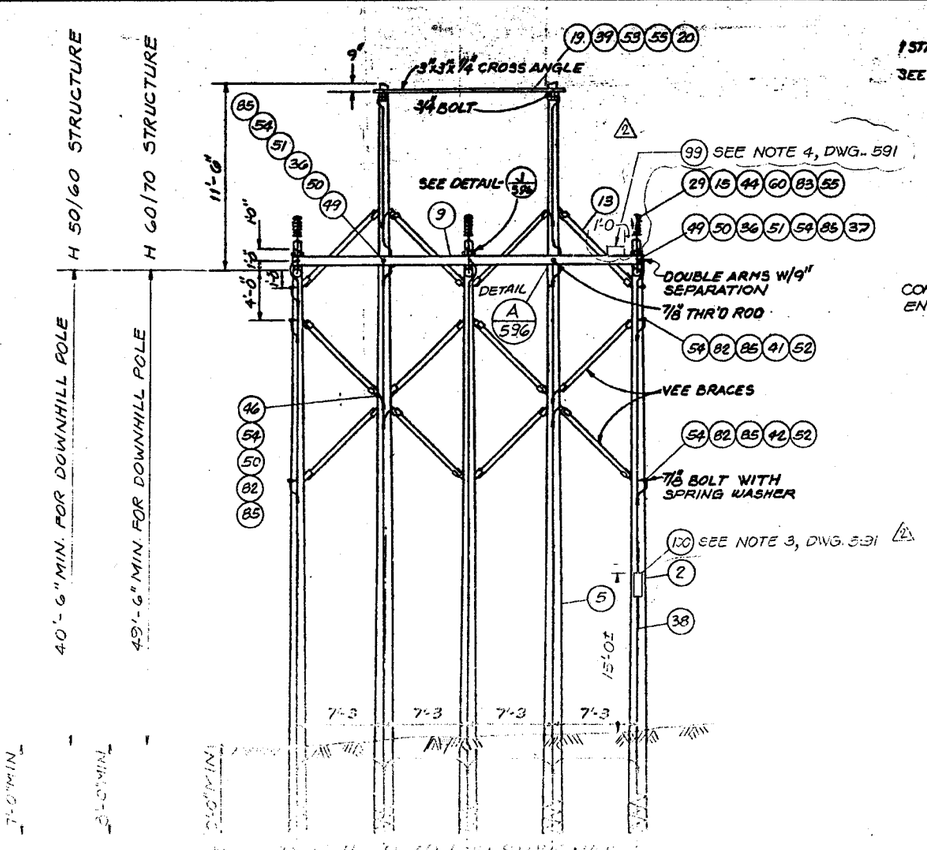
MATERIAL LIST FOR DETAIL 2		
ITEM	QTY.	DESCRIPTION
1	1	HOFFMAN A3642J2 W/LP ENCLOSURE MODIFY TO W/?
2	1	HOFFMAN A42P3G PANEL W/1.5" STANDOFFS
3	2	HOFFMAN ADSTOPK DOOR STOP
4	2	SUPERIOR #940 TEST SWITCH
5	1	GENERAL ELECTRIC #EB25A049C SHORT CKT TB.
6	1	SCIENTIFIC COLUMBUS: JEM 202 E,F, D(60 MIN.)
7	1	WESTINGHOUSE #WR4C-P3 STUD, 24 HOUR DIAL
8	1	1" CONDUIT HUB
9	1	HOFFMAN TYPE L1 HANDLE (NOT SHOWN)
10	3	GENERAL ELECTRIC EB25A12JNC 12PT TERM.

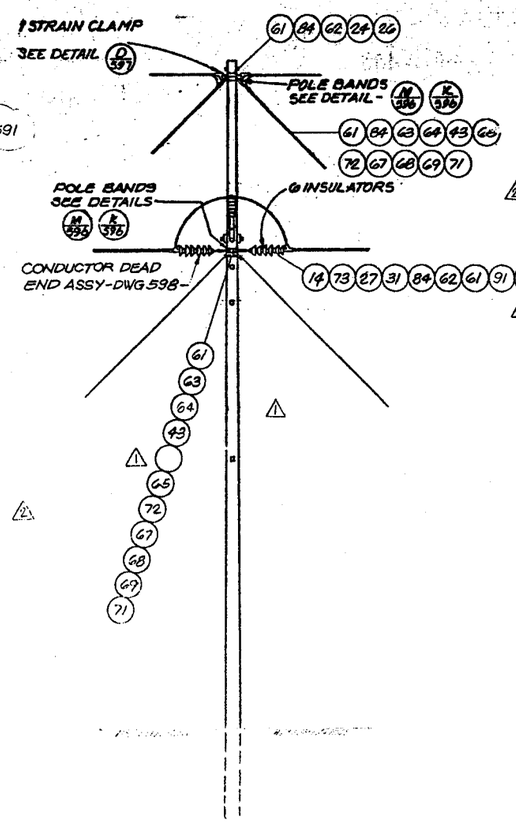
MATERIAL LIST FOR DETAIL 1			SMUD S/C #
ITEM	QUANTITY	DESCRIPTION NOTE 1,2	
1	3	OPEN CUTOUT 21 KV 100 AMP LOADBREAK	000794
2	3	LIGHTNING ARRESTOR OHIO BRASS GPSA #43140	
3	2	CURRENT TRANSFORMER GE JKW-6 756X300:5	
4	5	POTENTIAL TRANSFORMER GE JVW-5 7620X300:45	
5	7	PIN CAP INSULATOR STEEL PIN	001029 001122
6	3	25 KV TERMINAL KIT, #2 AWG STRAND ALUMINUM	028461
7	AS REQ'D.	25 KV, SINGLE CONDUCTOR INSULATED SHIELDED CABLE #2 AWG	000488
8	AS REQ'D	#2 ACSR	000426

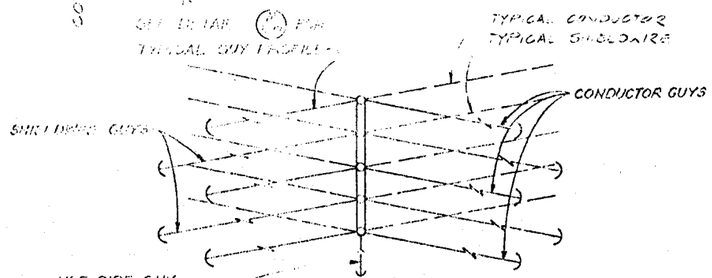
NO	DATE	REVISION	DR BY	CHKD BY	DESIGNED/ ENGINEER	SUPERVISOR	SAP
0	1/03	INCORP DCN H-1054	RN	JA	BC	BC	X

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

SCALE	NONE
INDEX	
DR BY	R. NAVARRETE
DATE	1/03
CHKD BY	JIM ASTIN
DATE	1/03
W.O. NUMBER	20006907
DESIGNER/ENGINEER	BRIAN GORRELL
OVERLAY	YES
SUPERVISOR	BRIAN GORRELL
RELEASE DATE	
DCN	H-1054
TITLE	DISTRIBUTION LINE DETAIL
LOCATION	SLAB CREEK
DWG NO	E-432-311
REVISION	0







MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC.	QTY. TOTAL	SMUD STOCK NO.
		TYPE H 50/60 STRUCTURE		1	
		TYPE H 50/60 STR. (STA. 4+20)		1	
		TYPE H 60/10 STRUCTURE		8	
101	–	35' CLASS 4 POLES		5	
2	–	50' CLASS 2 POLE	3	6	
5	–	60' CLASS 2 POLE	2	28	
7	–	70' CLASS 2 POLE		16	
9	–	CROSS ARM, 5 5/8" x 7 1/2" x 30'	2	21	
13	–	VEE BRACE, 3 3/8" x 4 3/8"	12	120	
14	598	SUSPENSION INSULATOR (BALL-SOCKET)	36	360	
15	598	69 KV PIN INSULATOR W. 3/4" PIN	3	30	
73	598	SOCKET EYE	6	60	
19	597	3"x3"x1/4" L x 16'-6	1	10	
20	596	DOWNLEAD TERMINAL (FOR #4 AWG WIRE)	2	20	
24	597	MALEABLE IRON STRAIN CLAMP (FOR 1/2" STRAND)	4	40	
26	597	U-BOLT GUY CLAMP (FOR 1/2" STRAND)	4	44	
27	598	COMPRESSION DEAD END, CLEVIS END (FOR 1 ACSR CONDUCTOR)	6	66	
29	598	POLE TOP BRACKET	3	30	OOC
31	598	BALL CLEVIS	6	60	
36	596	FLAT GAIN PLATE (7/8" BOLT)	5	50	
37	596	1" POLE SHIM (7/8" BOLT)	3	30	
38	596,597	NO. 4 AWG S.D. COPPER WIRE	405'	4250'	
39	596	MACHINE BOLT, 3/4" x 10" (INCL. NUT)	2	20	
41	595	MACHINE BOLT, 7/8" x 12" (INCL. NUT)	4	40	
42	595	MACHINE BOLT, 7/8" x 15" (INCL. NUT)	2	20	
43	595	MACHINE BOLT, 7/8" x 8" (INCL. NUT)	10	109	
44	596	MACHINE BOLT, 5/8" x 10" (INCL. NUT)	6	60	
46	596	THROUGH BOLT, 7/8" x 12"	3	30	
49	596	THROUGH BOLT, 7/8" x 26"	5	50	
50	596	7/8" SQ WASH. NUT	28	280	
51	596	4" x 4" x 7/8" SQUARE WASHER (7/8" BOLT)	10	100	
52	596	4" x 4" x 7/8" CURVED WASHER (7/8" BOLT)	6	60	
53	596	4" x 4" x 3/4" CURVED WASHER (3/4" BOLT)	2	20	
54	596	SPRING WASHER (7/8" BOLT)	34	340	
55	596	SPRING WASHER (3/4" BOLT)	5	50	
60	596	SPRING WASHER (5/8" BOLT)	6	60	
61	597	2-WAY 10.9° POLE BAND (7"-10" POLE)	10	109	
62	596,597	7" CONNECTING LINK (CONDUCTOR DEAD END)	10	100	
63	597	7" CONNECTING LINK (DOWN GUY)	10	109	
64	597	GUY ROLLER (1/2" STRAND - 7/8" BOLT)	10	100	
65	597	PREFORMED GUY GRIP (FOR 1/2" STRAND)	20	218	
67	597	GROUND CONNECTOR (1" TO #4 AWG)	10	99	
68	597	KEARNY SPLIT BOLT CONNECTOR (2/0 TO 250)	10	99	
16	598	ARMOR ROD SET (203.2 KCM CONDUCTOR)	3	30	
87	598	4" x 4" x 1/4" CURVED WASHER (5/8" BOLT)	6	60	

MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC.	QTY. TOTAL	SMUD STOCK NO.
93	595	AERIAL ID STRUCTURE NO. PLATE		9	
100	595	GROUND ID STRUCTURE NO. PLATE	1	10	
69	597	1" THIMBLEYE ANCHOR ROD x 10'	10	99	
71	597	ANCHOR	10	99	
72	597	1/2" E.H.S. STEEL GUY STRAND	800'	SEE DWG. 598	
82	597	SPLIT BOLT SVC CONNECTOR (NO. 4 AWG)	22	220	
83	596	INSULATOR TIE	3	30	
84	596	POLE BAND BONDING CLIP (W BOLT & NUTS)	10	100	
85	596	BONDING CLIP W NUTS (7/8" ø BOLT END)	20	200	
91	598	BALL EYE	AS REQ	-	
92	598	SOCKET CLEVIS	AS REQ	-	

FOR GROUNDING DETAILS, SEE DWG'S. 596 & 597.
SEE GENERAL NOTES, DWG. 151.

NO.	DATE	REVISION	DR. BY	CHKD BY	ENGINEER	SUPV. ENGR. ENG. DEPT.
0	7-1-83	SMUD FINAL APPROVAL	N/A	N/A		N/A

REV.	DATE	BY SUB	DESCRIPTION	APP
1	5-9-83		ADD STRUC. NO. PLATE & REV. ITEM NO. 101	
0	3-17-83		REV. GUY PLAN, POLE HT. & MAT'L QUANTS	

DESIGNED T. MAC LENNAN
DRAWN D ALEXANDER
CHECKED A. LEA
IN RESPONSIBLE CHARGE

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GIESE No. 5528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO — CALIFORNIA

SMUD — SACRAMENTO MUNICIPAL UTILITY DISTRICT

SUBMITTED — APPROVED — APPROVED — APPROVED

JONES FORK HYDROELECTRIC PROJECT
TRANSMISSION LINE
STRUCTURE DETAILS
TYPE H

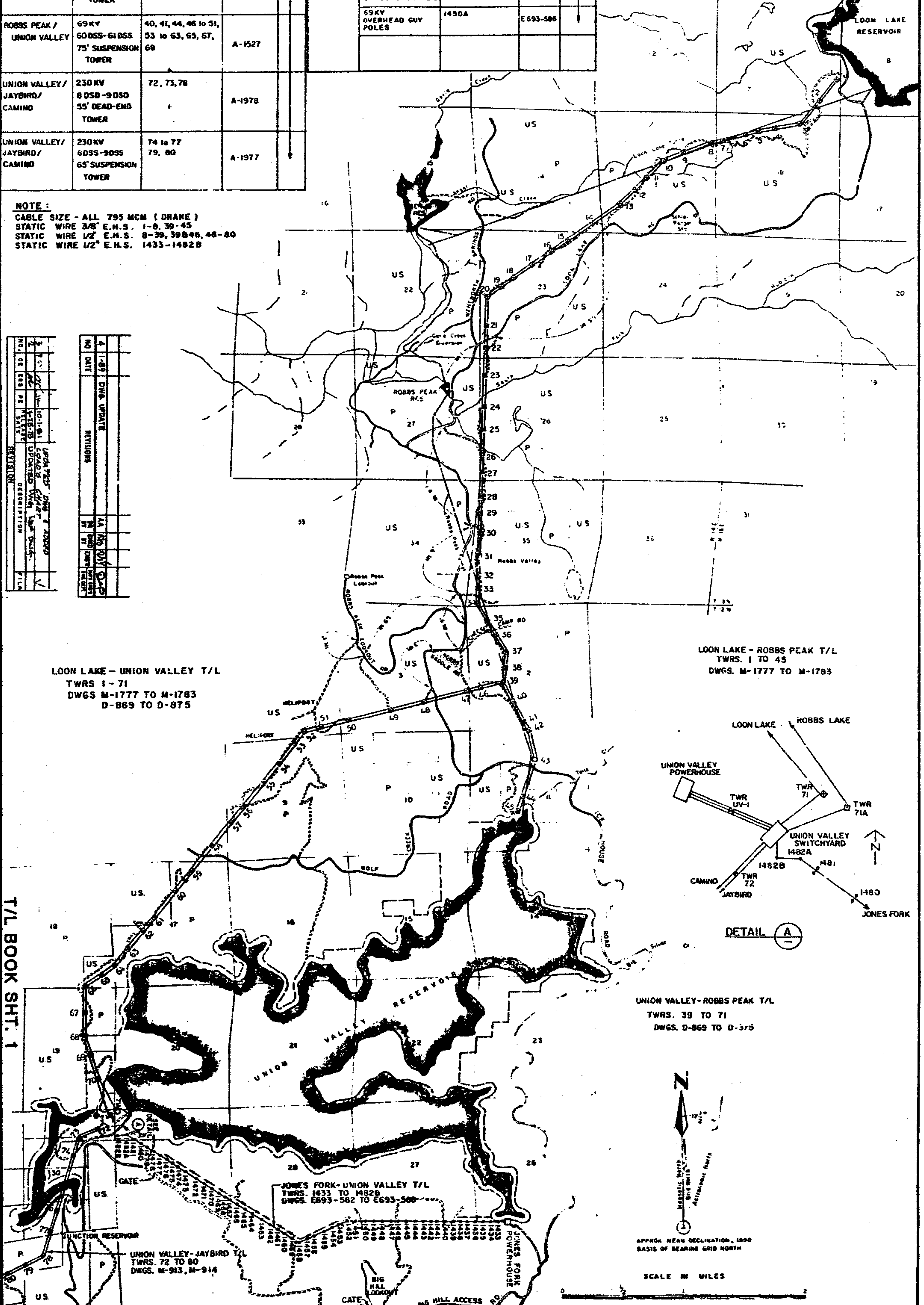
DATE OCT 1
DRAWING E693
R
SHEET

DESIGN CRITERIA: (TWRS 1-80)
1. DEADEND TOWERS ARE DESIGNED FOR BROKEN WIRE CONDUCTORS & GROUND WIRE ALL ON THE SAME FACE OF THE TOWER.
2. SUSPENSION TOWERS ARE DESIGNED FOR ONE BROKEN WIRE PER CIRCUIT.
3. TOWER ARMS ARE DESIGNED FOR A BROKEN WIRE CONDITION.

T/L	TOWER TYPE	TOWER NUMBER	INFO. SUMMARY DRAWING	CABLE SIZE
LOON LAKE/ ROBBS PEAK; LOON LAKE/ UNION VALLEY	69 KV 62 DSD 63 DSD 75' DEAD-END TOWER	1, 3, 5, 8, 10, 13, 20, 26, 34, 37, 35(SPECIAL)	A-1914	795 MCM (DRAKE)
LOON LAKE/ ROBBS PEAK; LOON LAKE/ UNION VALLEY	69 KV 62 DSS 63 DSS 75' SUSP. TWR.	1 THRU 38 (EXCEPT DSD ABOVE)	A-1915	
ROBBS PEAK/ UNION VALLEY	69 KV 60 DSD-61 DSD 75' DEAD-END TOWER	42, 43, 45, 52, 64, 66, 68, 70, 71	A-1528	
ROBBS PEAK/ UNION VALLEY	69 KV 60 DSS-61 DSS 75' SUSPENSION TOWER	40, 41, 44, 46 to 51, 53 to 63, 65, 67, 69	A-1527	
UNION VALLEY/ JAYBIRD/ CAMINO	230 KV 8 DSD-9 DSD 55' DEAD-END TOWER	72, 73, 78	A-1978	
UNION VALLEY/ JAYBIRD/ CAMINO	230 KV 8 DSS-9 DSS 65' SUSPENSION TOWER	74 to 77 79, 80	A-1977	

T/L	TOWER TYPE	TOWER NO.	STRUCTURE DETAILS DWG. NO.	CABLE SIZE
JONES FORK-UNION VALLEY	69 KV 2 POLE TANGENT STRUCTURE TYPE A1	1434, 1435, 1437-1439, 1441-1446, 1448, 1449, 1451, 1453-1457, 1459-1461, 1465, 1466, 1468-1473, 1475-1479	E 693-591	203.2 ACSR (BRAHMA)
	69 KV 2 POLE ANGLE STRUCTURE TYPE B1	1436, 1474		
	69 KV 2 POLE ANGLE STRUCTURE TYPE C1	1463		
	69 KV 3 POLE DEAD END STRUCTURE TYPE G	1452	E 693-594	
	69 KV 5 POLE DEAD END STRUCTURE TYPE H	1433, 1440, 1447, 1450, 1458, 1462, 1464, 1467, 1480, 1481, 1482A	E 693-595	
	69 KV SINGLE POLE ANGLE STRUCTURE TYPE D	1482B	E 693-582	
	69 KV OVERHEAD GUY POLES	1450A	E 693-586	

NOTE:
CABLE SIZE - ALL 795 MCM (DRAKE)
STATIC WIRE 3/8" E.H.S. 1-8, 30-45
STATIC WIRE 1/2" E.H.S. 8-39, 39B46, 46-80
STATIC WIRE 1/2" E.H.S. 1433-1482B



NO	DATE	REVISIONS				
4	1-89	DWG. UPDATE	AA	RO	DAY	D.P.

NO.	CK	SUB	PE	RELEASE DATE	DESCRIPTION	FILM
				10-1-81	UPDATED DWG & ADDED LOADS CHART	✓
				5-18-85	UPDATED DWG.	

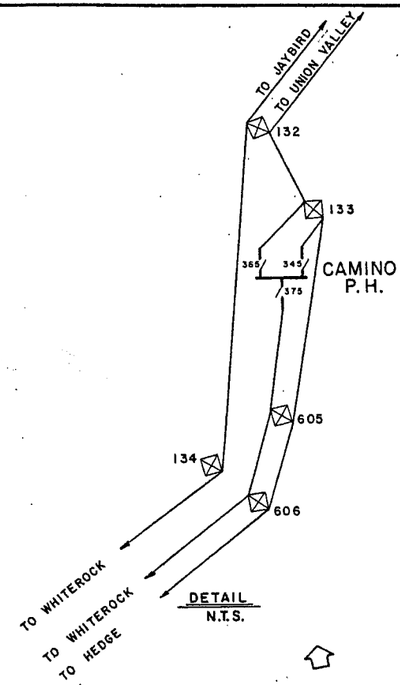
NO.	REV. DATE	INITIALS
1	12-27-77	JLW

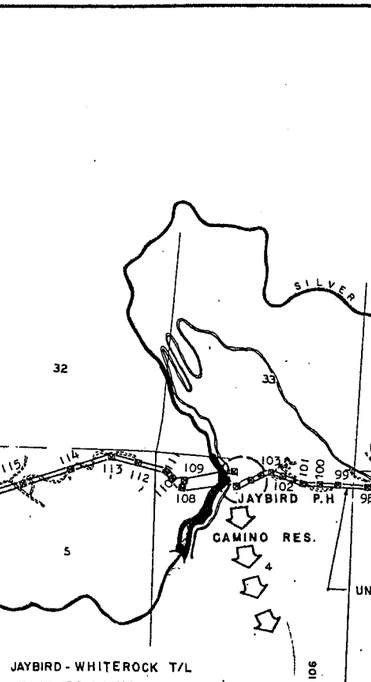
DRAWN: Chauvet, L. 2-16-66
J.C. Linn 3-25-66
SCALE: 1" = 2,000'
SACRAMENTO MUNICIPAL UTILITY DISTRICT

T/L BOOK SHT. 1
LOCATION MAP
TOWERS & ACCESS ROADS
U. A. R. P.

34D1088

I.D. 4/78





T/L	TOWER TYPE	TOWER NO.	INFO. SUM. SHTS. DWG. NO.	CABLE SIZE
UNION VALLEY - ROBBS PEAK LOON LAKE - U.V. (69 KV)	230KV 2DSS - 3DSS 65' SUSPENSION TOWER	70, 71, 71A	A-1499	795 MCM (TERM)
U.V. - CAMINO U.V. - JAYBIRD	230KV 8DSD - 9DSD 55' DEADEND TOWER	72, 73, 78, 86, 92, 99 to 105	A-1978	795 MCM (TERM)
	230KV 8 DSS - 9 DSS 65' SUSPENSION TOWER	74 to 77, 79 to 85, 87 to 91, 93 to 98	A-1977	795 MCM (DRAKE)
CAMINO - WHITEROCK CAMINO - HEDGE	230 KV 2DSS - 3DSS 65' SUSPENSION TOWER	607, 609, 611 to 617	A-1499	954 MCM ACSR (RAIL)
	230 KV 2DSD - 3DSD 55' DEADEND TOWER	605, 606, 608	A-1500	954 MCM ACSR (RAIL)
	230 KV 5DSS GWP DEADEND 65' SUSPENSION TOWER	610	A-1494	954 MCM ACSR (RAIL)
JAYBIRD - WHITEROCK	230KV 2DSS-3DSS 65' SUSPENSION TWR.	135 to 137 139 to 145	A-1499	954 MCM ACSR (RAIL)
	230KV 2DSD-3DSD 55' DEADEND TOWER	134, 138	A-1500	954 MCM ACSR (RAIL)

T/L	TOWER/POLE TYPE	TOWER/POLE NO.	INFO. SUMM. SHTS. DR. NO.	CABLE SIZE
JAYBIRD - WHITEROCK U.V. - CAMINO	230 KV 2DSD - 3DSD 55' DEADEND TOWER	106 to 112	A-1500	795 MCM (TERM)
	2-3DSD 55' DEADEND TOWER	113, 116, 119, 131, 132	A-1500	795 MCM (TERM)
	2-3DSS 65' SUSPENSION TOWER	114, 115, 117, 118, 120 to 130	A-1499	795 MCM (TERM)

TWRS 72 - 112, 3/8" E.H.S. STATIC WIRE
TWRS 605 - 609, 3/8" E.H.S. STATIC WIRE

NO.	CE	EGS	PE	RELEASE DATE	DESCRIPTION	FILM
4				10-1-81	CORRECTED DWG.	
3				3-29-78	UPDATED DWG T/L DESIGNATION	
2				11-8-76	ADDED ACCESS RDS.	

REVISION

T/L BOOK SHT. 2

REV. 1 ADDED TOWER 71A @ U.V. RES

NO.	REV. DATE	INITIALS	NO.	REV. DATE	INITIALS
1	5-22-73	LC			

DRAWN	DATE	APPROVED	DATE
J. KAKAVAS & T. KIYAMA DR	3-15-67		
J. C. Lum CE	5-23-67		

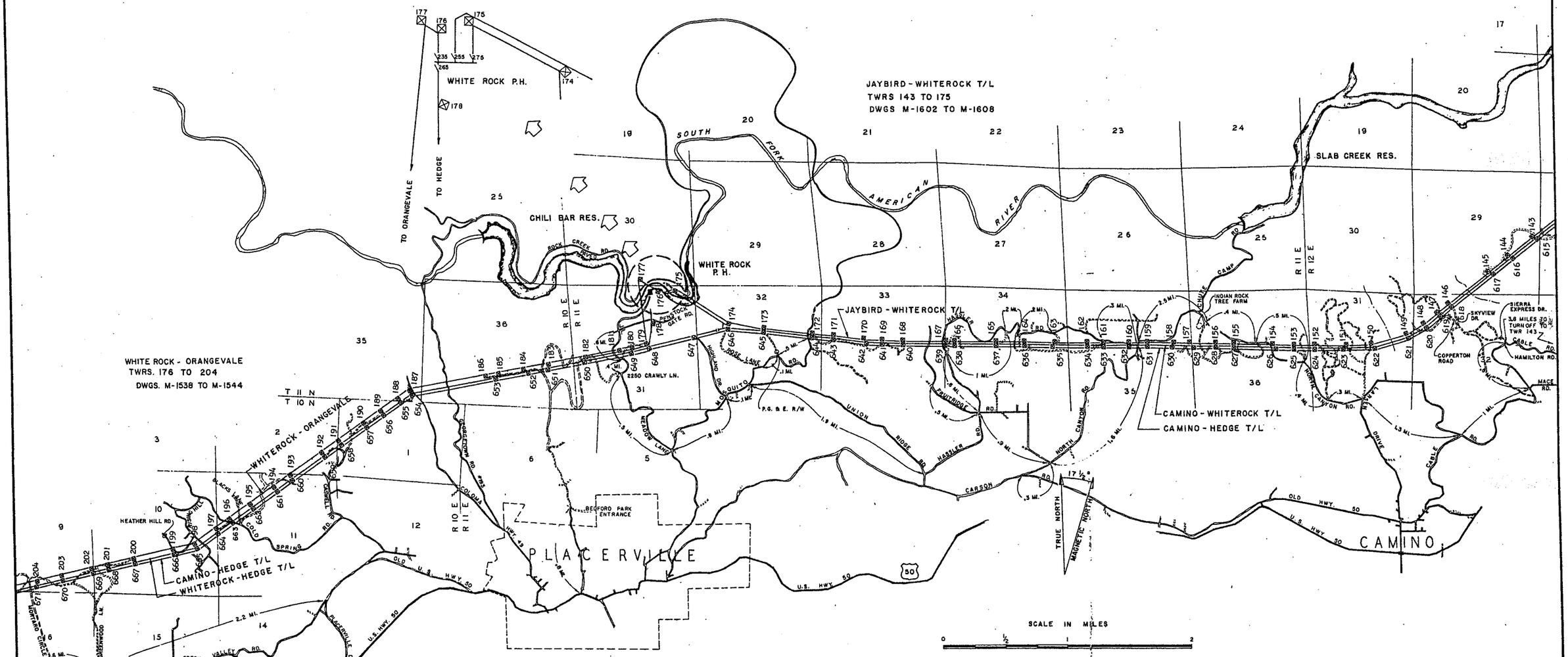
SC 1" = 2000'

SACRAMENTO MUNICIPAL UTILITY DISTRICT

LOCATION MAP
TOWERS & ACCESS ROADS
U. A. R. P.

341D1087

ID 11-16-76



T/L	TOWER TYPE	TOWER NO.	INFO. SUM. SHTS. DWG. NO.	CABLE SIZE
JAYBIRD / WHITEROCK	230 KV 2DSS-3DSS 65' SUSPENSION TOWER	143 to 147, 149, 151 to 154, 156 to 163, 165, 166, 168, 170, 171, 172	A-1499	954 MCM ACSR (RAIL)
	230 KV 2DSD-3DSD 55' DEADEND TOWER	148, 150, 155, 164, 167, 169, 174, 175	A-1500	954 MCM ACSR (RAIL)
	230 KV 5 DSS GWP DEADEND 65' SUSPENSION TOWER	173	A-1494	954 MCM ACSR (RAIL)
WHITEROCK - ORANGEVALE	230 KV 1DSD-4DSD 55' DEADEND TOWER	176 to 179, 182, 186, 187, 198	A-1495	1024.5 MCM (ACAR) EXC 198
	230 KV 1DSS-4DSS 65' SUSPENSION TOWER	180, 181, 184, 185, 190 to 197, 199 to 204	A-1496	1024.5 MCM (ACAR) EXC. 190 to 204

T/L	TOWER TYPE	TOWER NO.	INFO. SUM. SHTS. DWG. NO.	CABLE SIZE
WHITEROCK - ORANGEVALE	230 KV 6DSS-7DSS 75° LIGHT SUSPENSION TOWER	188, 189	A-1501	954 MCM (MAG)
CAMINO - HEDGE WHITEROCK - HEDGE CAMINO - WHITEROCK	230 KV 2DSS-3DSS 65' SUSPENSION TOWER	615 to 619, 621, 623 to 640, 642, 643, 649, 651, 652	A-1499	954 MCM ACSR (RAIL)
	230 KV 2DSD-3DSD 55' DEADEND TOWER	620, 622, 641, 645 to 647, 650, 653, 654, 665	A-1500	954 MCM (RAIL)
	230 KV 1DSS-4DSS 65' SUSPENSION TOWER	655 to 664, 666 to 671	A-1496	954 MCM (MAG)
	230 KV 1DSD-4DSD 55' DEADEND TOWER	665	A-1495	954 MCM (MAG)

T/L	TOWER TYPE	TOWER NO.	INFO. SUM. SHTS. DWG. NO.	CABLE SIZE
CAMINO - HEDGE WHITEROCK - HEDGE	230 KV 5 DSS GWP DEADEND 65' SUSPENSION TOWER	664, 648	A-1494	664 954 MCM (MAG); 648 954 MCM ACSR (RAIL)

TWRS. 177 - 183, 3/8" E.H.S. STATIC WIRE
TWRS. 644 - 648, 3/8 E.H.S. STATIC WIRE

T/L BOOK SHT. 3

NO.	DATE	REVISIONS	DR BY	CHK'D BY	ENG'R	SUPV. ENG'R ENG. DEPT.
3	5-11-81	ADDED CHARTS & ACCESS RDS.				

NO.	CE	EQS	PE	RELEASE DATE	DESCRIPTION	FILM
2		M M	M	4-10-78	UPDATED DWG. T/L DESIGNATION	
1				11-5-76	ADDED NOTES & ROAD NAME	

REVISION

NO.	REV. DATE	INITIALS	NO.	REV. DATE	INITIALS

DRAWN	DATE	APPROVED	DATE
J. KAKAVAS & T. KIYAMA DR	3-15-67		
J.C. Evans CK	3-23-67		

SCALE 1" = 2000'

SACRAMENTO MUNICIPAL UTILITY DISTRICT

LOCATION MAP TOWERS & ACCESS ROADS U.A.R.P.

34ID1086

I.D. 11-16-76 TK

DESIGN CRITERIA: (TWRS 1–80)
1. DEADEND TOWERS ARE DESIGNED FOR BROKEN WIRE CONDUCTORS & GROUND WIRE ALL ON THE SAME FACE OF THE TOWER.
2. SUSPENSION TOWERS ARE DESIGNED FOR ONE BROKEN WIRE PER CIRCUIT.
3. TOWER ARMS ARE DESIGNED FOR A BROKEN WIRE CONDITION.

T/L	TOWER – POLE TYPE	TOWER – POLE NUMBER	INFO. SUMMARY SHEETS	INFO. SUMMARY DWG. NO.	CABLE SIZE
LOON LAKE–ROBBS PEAK LOON LAKE–UNION VALLEY	69 KV 62DSD–63DSD 75' DEADEND TOWER	1, 3, 5, 8, 10, 13, 20, 26, 34, 37, 39 (SPECIAL)	A–1914		795 MCM ACSR (DRAKE)
	69 KV 62DSS–63DSS 75' SUSPENSION TOWER	1 THRU 38 (EXCEPT DSD ABOVE	A–1915		
ROBBS PEAK–UNION VALLEY	69 KV 60DSD–61DSD 75' DEADEND TOWER	42, 43, 45, 52, 64, 66, 68, 70, 71	A–1528		
	69 KV 60DSS–61DSS 75' SUSPENSION TOWER	40, 41, 44, 46 TO 51, 53 TO 63, 65, 67, 69	A–1527		
UNION VALLEY–JAYBIRD–CAMINO	230 KV 80SD–90SD 55' DEADEND TOWER	72, 73, 78	A–1978		
	230 KV 80DS–90SS 65' SUSPENSION TOWER	74 TO 77, 79, 80	A–1977		
JONES FORK–UNION VALLEY	69 KV 2 POLE TANGENT STRUCTURE TYPE A1	1434, 1435, 1437 TO 1439, 1441 TO 1446, 1448, 1449, 1451, 1453 TO 1457, 1459 TO 1461, 1465, 1466, 1468 TO 1472, 1475 TO 1479	TLO–S3C–M001		203.2 MCM ACSR (BRAHMA)
	69 KV 2 POLE ANGLE STRUCTURE TYPE B1	1436, 1474			
	69 KV 2 POLE TANGENT STRUCTURE TYPE C1	1463			
	69 KV 2 POLE ANGLE STRUCTURE TYPE G	1452	TLO–S3C–M002		
	69 KV 5 POLE DEADEND STRUCTURE TYPE H	1433, 1440, 1447, 1450, 1458, 1462, 1464, 1467, 1480, 1481, 1482A	TLO–S3C–M003		
	69 KV SINGLE POLE ANGLE STRUCTURE TYPE D	1482 B	TLO–C3S–M001		
	69 KV OVERHEAD GUY POLES	1450A	TLO–C3S–M005		

NOTE:
STATIC WIRE 3/8" E.H.S. 1–8, 39–45
STATIC WIRE 1/2" E.H.S. 8–39, 45–80

JONES FORK T/L
STATIC WIRE 1/2" E.H.S.

LOON LAKE–ROBBS PEAK T/L
TWRS. 1 TO 45
DWGS. M–1777 TO M–1783
D–874 & D–875

ROBBS PEAK–UNION VALLEY T/L
TWRS. 39 TO 71
DWGS. D–869 TO D–875

LOON LAKE–UNION VALLEY T/L
TWRS. 1 TO 71
DWGS. M–1777 TO M–1783
D–869 TO D–875

JONES FORK–UNION VALLEY T/L
TWRS. 1433 TO 1482B
DWGS. TLO–C3S–M001 TO TLO–C3S–M007

UNION VALLEY–CAMINO T/L

UNION VALLEY–JAYBIRD T/L

DETAIL A NTS

SCALE IN MILES 0 1/2 1 2

THIS DRAWING SUPERSEDES DWG. NO. D1088

T/L BOOK SHEET 2 of 17

NO	DATE	REVISION	DR BY	CHKD BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
1	05–02	UPDATED & REDRAWN PER DCN # T–424	RSD	RWW	RWW	TVS	

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

SCALE	1" = 2000'
INDEX	
DR BY	R Santo Domingo
DATE	12–01
CHKD BY	WEITZENBERG
DATE	05–02
W.O. NUMBER	4000173
LOCATION	U.A.R.P.
DESIGNER/ENGINEER	R W WEITZENBERG
OVERLAY	
SUPERVISOR	T SHAW
RELEASE DATE	06–01–02
DCN	T–424

TITLE: TRANSMISSION LINE TOWER BOOK
TOWERS & ACCESS ROADS

DWG NO: TLO–C2T–D001 REVISION: 1

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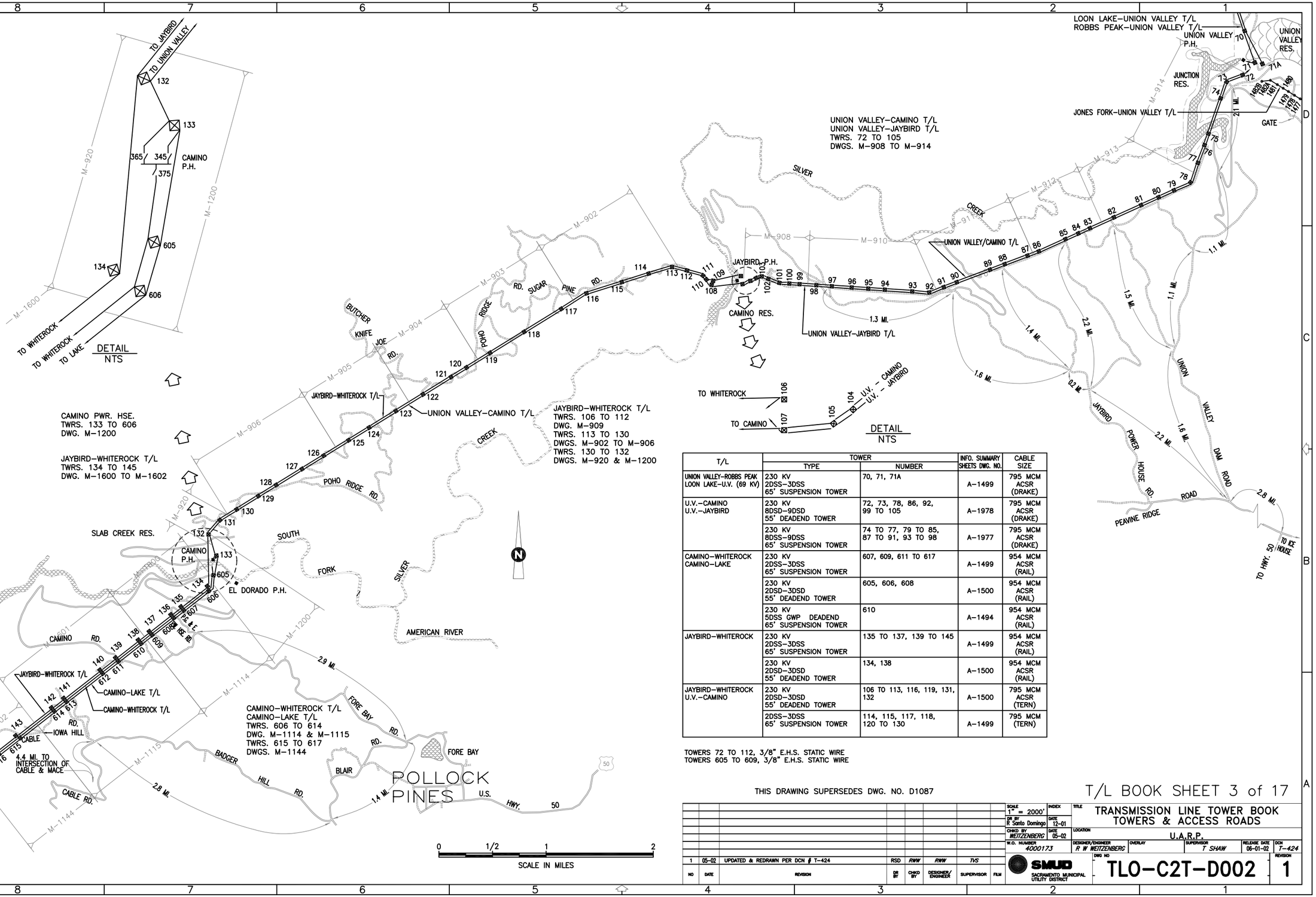

T/L	TOWER		INFO. SUMMARY	CABLE
	TYPE	NUMBER	SHEETS DWG. NO.	SIZE
UNION VALLEY-ROBBS PEAK LOON LAKE-U.V. (69 KV)	230 KV 2DSS-3DSS 65' SUSPENSION TOWER	70, 71, 71A	A-1499	795 MCM ACSR (DRAKE)
U.V.-CAMINO U.V.-JAYBIRD	230 KV 8DSD-9DSD 55' DEADEND TOWER	72, 73, 78, 86, 92, 99 TO 105	A-1978	795 MCM ACSR (DRAKE)
	230 KV 8DSS-9DSS 65' SUSPENSION TOWER	74 TO 77, 79 TO 85, 87 TO 91, 93 TO 98	A-1977	795 MCM ACSR (DRAKE)
CAMINO-WHITEROCK CAMINO-LAKE	230 KV 2DSS-3DSS 65' SUSPENSION TOWER	607, 609, 611 TO 617	A-1499	954 MCM ACSR (RAIL)
	230 KV 2DSD-3DSD 55' DEADEND TOWER	605, 606, 608	A-1500	954 MCM ACSR (RAIL)
	230 KV 5DSS GWP DEADEND 65' SUSPENSION TOWER	610	A-1494	954 MCM ACSR (RAIL)
JAYBIRD-WHITEROCK	230 KV 2DSS-3DSS 65' SUSPENSION TOWER	135 TO 137, 139 TO 145	A-1499	954 MCM ACSR (RAIL)
	230 KV 2DSD-3DSD 55' DEADEND TOWER	134, 138	A-1500	954 MCM ACSR (RAIL)
JAYBIRD-WHITEROCK U.V.-CAMINO	230 KV 2DSD-3DSD 55' DEADEND TOWER	106 TO 113, 116, 119, 131, 132	A-1500	795 MCM ACSR (TERN)
	2DSS-3DSS 65' SUSPENSION TOWER	114, 115, 117, 118, 120 TO 130	A-1499	795 MCM (TERN)

TOWERS 72 TO 112, 3/8" E.H.S. STATIC WIRE
TOWERS 605 TO 609, 3/8" E.H.S. STATIC WIRE

THIS DRAWING SUPERSEDES DWG. NO. D1087

T/L BOOK SHEET 3 of 17

NO	DATE	REVISION	DR BY	CHK'D BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
1	05-02	UPDATED & REDRAWN PER DCN # T-424	RSD	RWW	RWW	TVS	

SCALE: 1" = 2000'
DR BY: R Santo Domingo
CHK'D BY: WEITZENBERG
W.O. NUMBER: 4000173
INDEX
DATE: 12-01
DATE: 05-02
DESIGNER/ENGINEER: R W WEITZENBERG
OVERLAY
SUPERVISOR: T SHAW
RELEASE DATE: 06-01-02
DCN: T-424

TITLE: TRANSMISSION LINE TOWER BOOK
TOWERS & ACCESS ROADS
LOCATION: U.A.R.P.

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

DWG NO: TLO-C2T-D002
REVISION: 1

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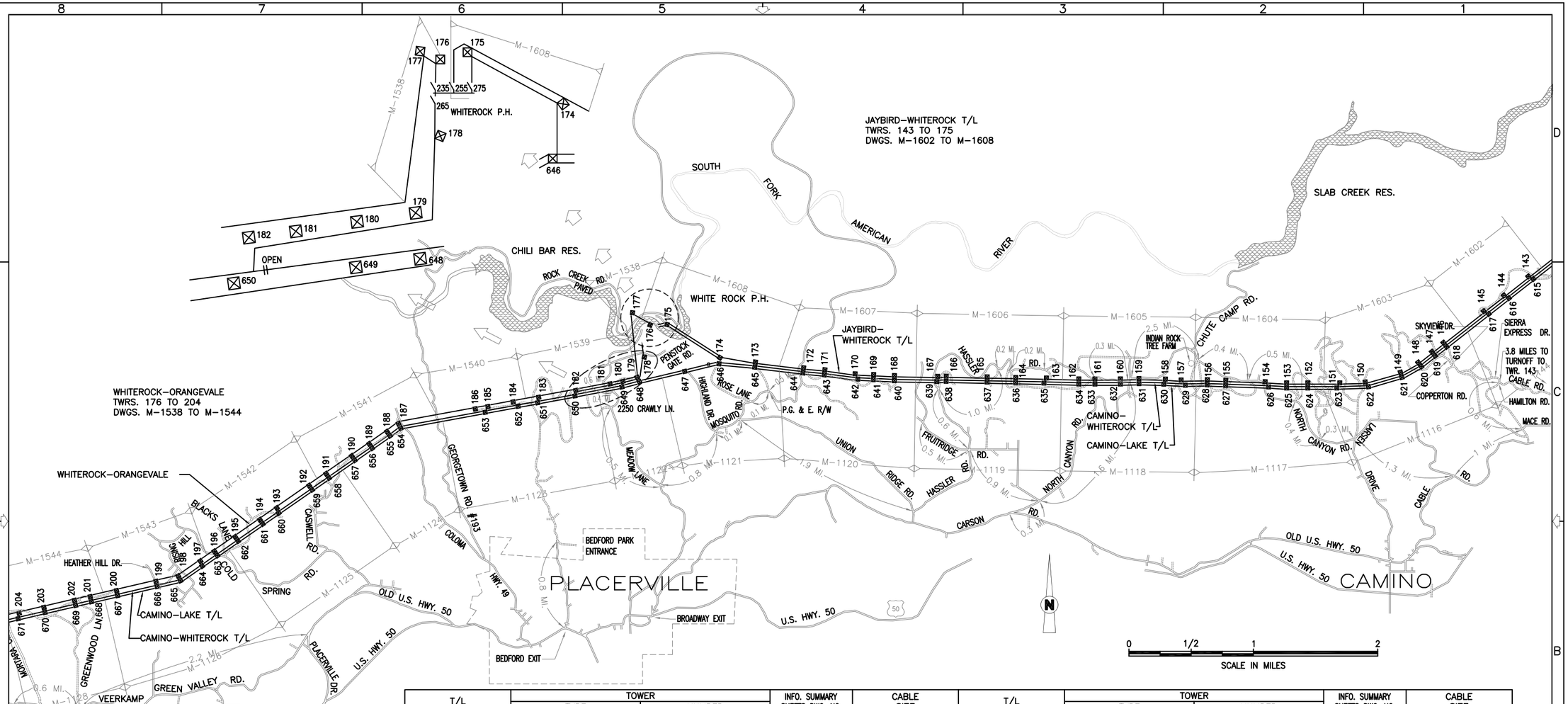

T/L	TOWER TYPE	TOWER NUMBER	INFO. SUMMARY SHEETS DWG. NO.	CABLE SIZE
JAYBIRD–WHITE ROCK	230 KV 2DSS–3DSS 65' SUSPENSION TOWER	143 TO 147, 149, 151 TO 154, 156 TO 163, 165, 166, 168 170, 171, 172	A–1499	954 MCM ACSR (RAIL)
	230 KV 2DSD–3DSD 55' DEADEND TOWER	148, 150, 155, 164, 167, 169, 174, 175	A–1500	
	230 KV 5DSS GWP DEADEND 65' SUSPENSION TOWER	173	A–1494	
WHITEROCK–ORANGEVALE	230 KV 1DSD–4DSD 55' DEADEND TOWER	176 TO 179, 182, 186, 187, 198	A–1495	176 TO 186 –1024.5 MCM (ACAR), 186 TO 187 – 954 ACSR (RAIL), 187 – 954 MCM (MAG)
	230 KV 2DSS–3DSS 65' SUSPENSION TOWER	180, 181, 184, 185, 190 TO 197, 199 TO 204	A–1496	180 TO 185 –1024.5 MCM (ACAR), 190 TO 204 – 954 MCM (MAG)
	230 KV 6DSS–7DSS 75' LIGHT SUSPENSION TOWER	188, 189	A–1501	954 MCM (MAGNOLIA)

T/L	TOWER TYPE	TOWER NUMBER	INFO. SUMMARY SHEETS DWG. NO.	CABLE SIZE
CAMINO–LAKE WHITEROCK–HEDGE CAMINO–WHITEROCK	230 KV 2DSS–3DSS 65' SUSPENSION TOWER	615 TO 619, 621, 623 TO 640, 642, 643, 649, 651, 652	A–1499	954 MCM ACSR (RAIL)
	230 KV 2DSD–3DSD 55' DEADEND TOWER	620, 622, 641, 645 TO 647, 650, 653, 654, 665	A–1500	620 TO 654 – 954 MCM (RAIL) 654 TO 665 – 954 MCM (MAG)
	230 KV 1DSS–4DSS 65' SUSPENSION TOWER	655 TO 664, 666 TO 671	A–1496	954 MCM (MAGNOLIA)
	230 KV 1DSD–4DSD 55' DEADEND TOWER	665	A–1495	954 MCM (MAGNOLIA)
CAMINO–LAKE WHITEROCK–HEDGE	230 KV 5DSS GWP DEADEND 65' SUSPENSION TOWER	664, 648	A–1494	664 – 954 MCM (MAG) 648 – 954 MCM ACSR (RAIL)

THIS DRAWING SUPERSEDES DWG. NO. D1086

TOWERS 177 TO 189, 3/8" E.H.S. STATIC WIRE
TOWERS 664 TO 656, 3/8" E.H.S. STATIC WIRE

T/L BOOK SHEET 4 of 17

NO	DATE	REVISION	DR BY	CHKD BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
1	05–02	UPDATED & REDRAWN PER DCN # T–424	RSD	RWW	RWW	TVS	

SCALE 1" = 2000' | INDEX | DR BY R Santo Domingo | DATE 12–01 | CHKD BY WEITZENBERG | DATE 05–02 | W.O. NUMBER 4000173

TITLE: TRANSMISSION LINE TOWER BOOK TOWERS & ACCESS ROADS

LOCATION: U.A.R.P.

DESIGNER/ENGINEER: R W WEITZENBERG | OVERLAY | SUPERVISOR: T SHAW | RELEASE DATE 06–01–02 | DCN T–424

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

DWG NO TLO–C2T–D003 | REVISION 1

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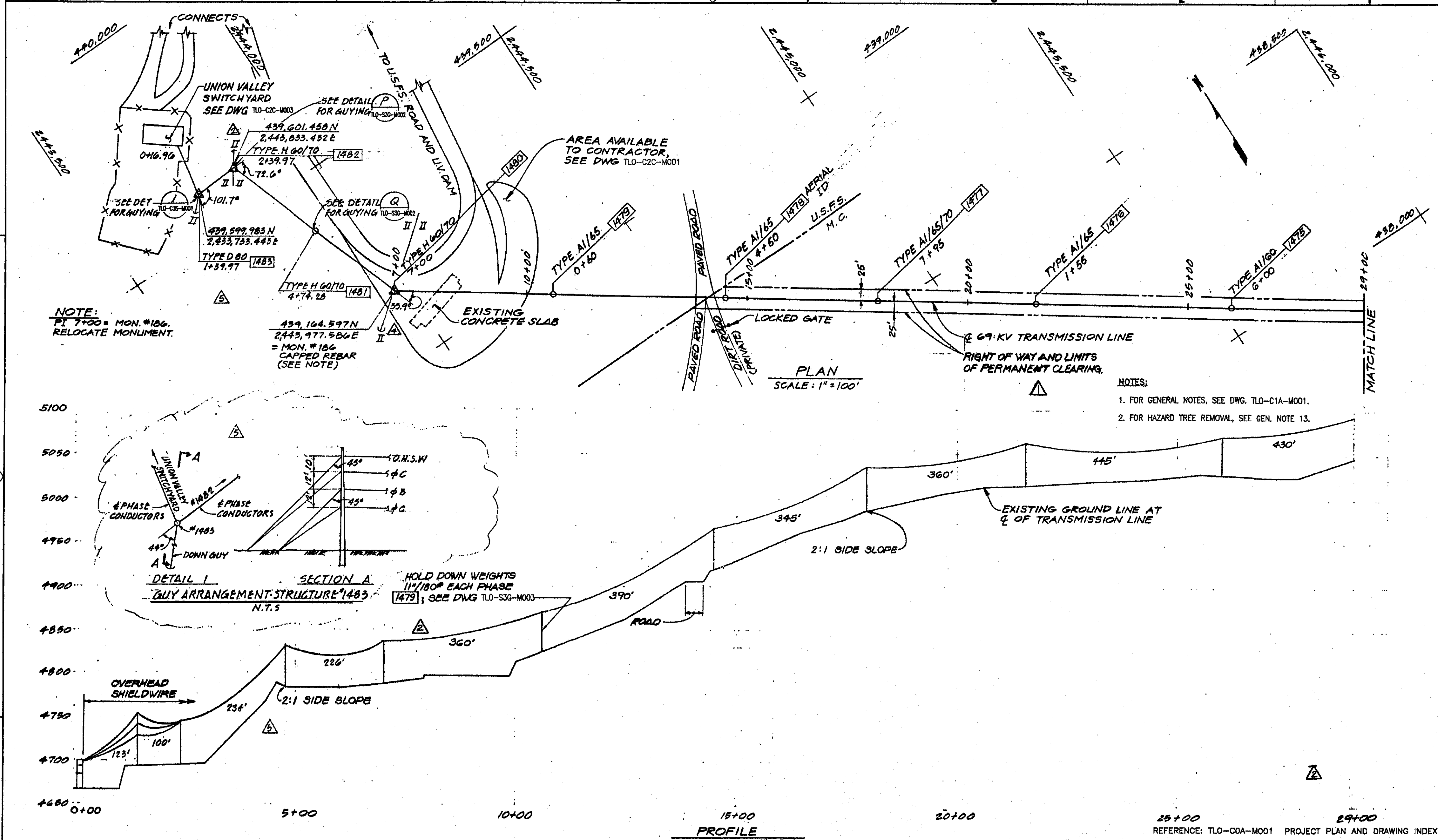
CONNECTS
UNION VALLEY SWITCHYARD SEE DWG TLO-C2C-M003
SEE DETAIL P FOR GUYING TLO-S3G-M002
TO U.S.F.S. ROAD AND U.V. DAM
AREA AVAILABLE TO CONTRACTOR, SEE DWG TLO-C2C-M001
439,601.458 N
2,443,833.432 E
TYPE H 60/70
2+39.97
1482
72.6°
101.7°
SEE DET 1 FOR GUYING TLO-C3S-M001
439,599.983 N
2,443,793.445 E
TYPE D 80
1+39.97
1483
SEE DETAIL Q FOR GUYING TLO-S3G-M002
TYPE H 60/70
4+74.28
1481
TYPE H 60/70
7+00
1480
439,164.597 N
2,443,977.586 E
= MON. #186
CAPPED REBAR
(SEE NOTE)
EXISTING CONCRETE SLAB
NOTE:
PI 7+00 = MON. #186.
RELOCATE MONUMENT.
TYPE A1/65
0+60
1479
PAVED ROAD
DIRT ROAD (PRIVATE)
LOCKED GATE
TYPE A1/65
4+60
1478
AERIAL TD
U.S.F.S. M.C.
TYPE A1/65/70
7+95
1477
TYPE A1/65
1+55
1476
TYPE A1/60
6+00
1475
℄ 69 KV TRANSMISSION LINE
RIGHT OF WAY AND LIMITS OF PERMANENT CLEARING
MATCH LINE
PLAN
SCALE: 1" = 100'
440,000
439,500
439,000
438,500
438,000
2,444,000
2,444,500
2,445,000
2,445,500
2,446,000
2,443,500
O.H.S.W
ϕC
ϕB
ϕC
45°
℄ PHASE CONDUCTORS
UNION VALLEY SWITCHYARD
#1482
#1483
DOWN GUY
DETAIL 1
SECTION A
GUY ARRANGEMENT STRUCTURE #1483
N.T.S
HOLD DOWN WEIGHTS
11#/180# EACH PHASE
1479 ; SEE DWG TLO-S3G-M003
OVERHEAD SHIELDWIRE
2:1 SIDE SLOPE
ROAD
EXISTING GROUND LINE AT ℄ OF TRANSMISSION LINE
123'
100'
234'
226'
360'
390'
345'
360'
445'
430'
5100
5050
5000
4950
4900
4850
4800
4750
4700
4680
0+00
5+00
10+00
15+00
20+00
25+00
29+00
PROFILE
SCALE: VERT 1" = 50'
HORIZ 1" = 100'

NOTES:

1. FOR GENERAL NOTES, SEE DWG. TLO-C1A-M001.
2. FOR HAZARD TREE REMOVAL, SEE GEN. NOTE 13.

REFERENCE: TLO-C0A-M001 PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO.

SHEET 7 of 21

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO, CALIFORNIA

NO	DATE	REVISION	BY	CHKD BY	DESIGN/ENGR	SUPERVISOR
1	6-18-02	UPDATED DRAWING PER DCN # T-436	RSD	RWW	RWW	
0	6-25-88	SMUD FINAL APPROVAL	N/A	N/A		N/A

SCALE: AS SHOWN — DR BY: VENDOR, DATE 10-82 — CHKD BY: VENDOR, DATE 10-82 — W.O. NUMBER 4000173 — RELEASE DATE 10-12-82

STRUCTURE LOCATIONS PLAN AND PROFILE

JONES FORK TRANSMISSION LINE

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

DWG NO: TLO-C3S-M001 — REVISION: 1

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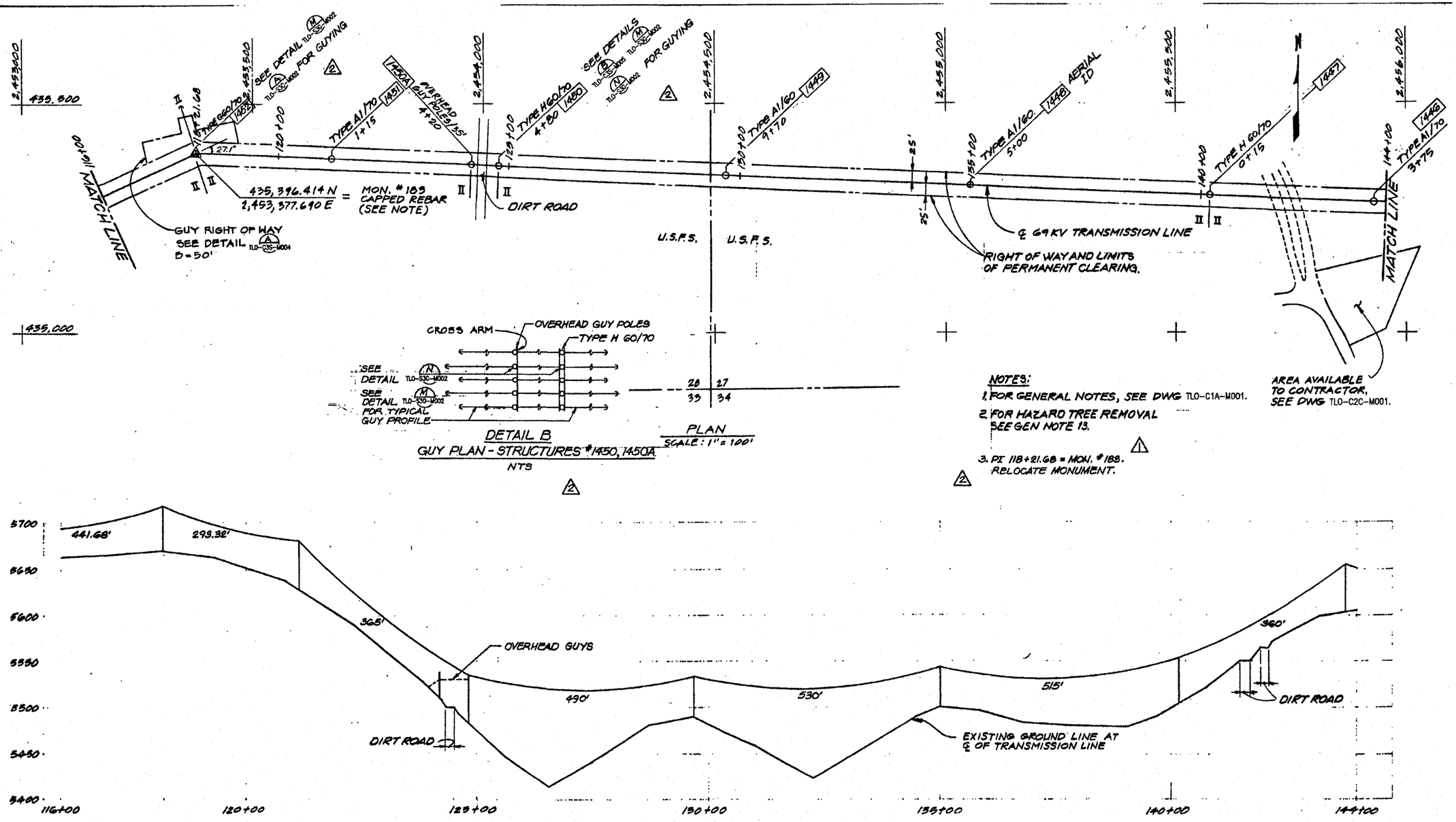

DETAIL B
GUY PLAN - STRUCTURES #1450, 1450A
NTS

PLAN
SCALE: 1" = 100'

NOTES:
1. FOR GENERAL NOTES, SEE DWG TLO-C1A-M001.
2. FOR HAZARD TREE REMOVAL SEE GEN NOTE 13.
3. PI 118+21.68 = MON. #188. RELOCATE MONUMENT.

PROFILE
SCALE: VERT 1" = 50'
HORIZ 1" = 100'

REFERENCE: TLO-C0A-M001 PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO. E [illegible]

SHEET 11 of 21

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GAUNCE No. 8528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO, CALIFORNIA

SUBMITTED [signature] APPROVED R.W. Gaunce

NO	DATE	REVISION	DR BY	CHKD BY	DESIGNER/ENGINEER	SUPERVISOR	FILM
1	6-19-02	UPDATED DRAWING PER DCN # T-438	RSD	RWW	RWW	TVS	
0	6-25-86	SMUD FINAL APPROVAL	N/A	N/A		N/A	

SCALE AS SHOWN	INDEX	TITLE	STRUCTURE LOCATIONS PLAN AND PROFILE
DR BY VENDOR	DATE 10-82		
CHKD BY VENDOR	DATE 10-82	LOCATION	JONES FORK TRANSMISSION LINE
W.O. NUMBER 4000173		DESIGNER/ENGINEER –	OVERLAY – SUPERVISOR – RELEASE DATE 10-12-82 DCN
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT		DRG NO	TLO-C3S-M005 REVISION 1

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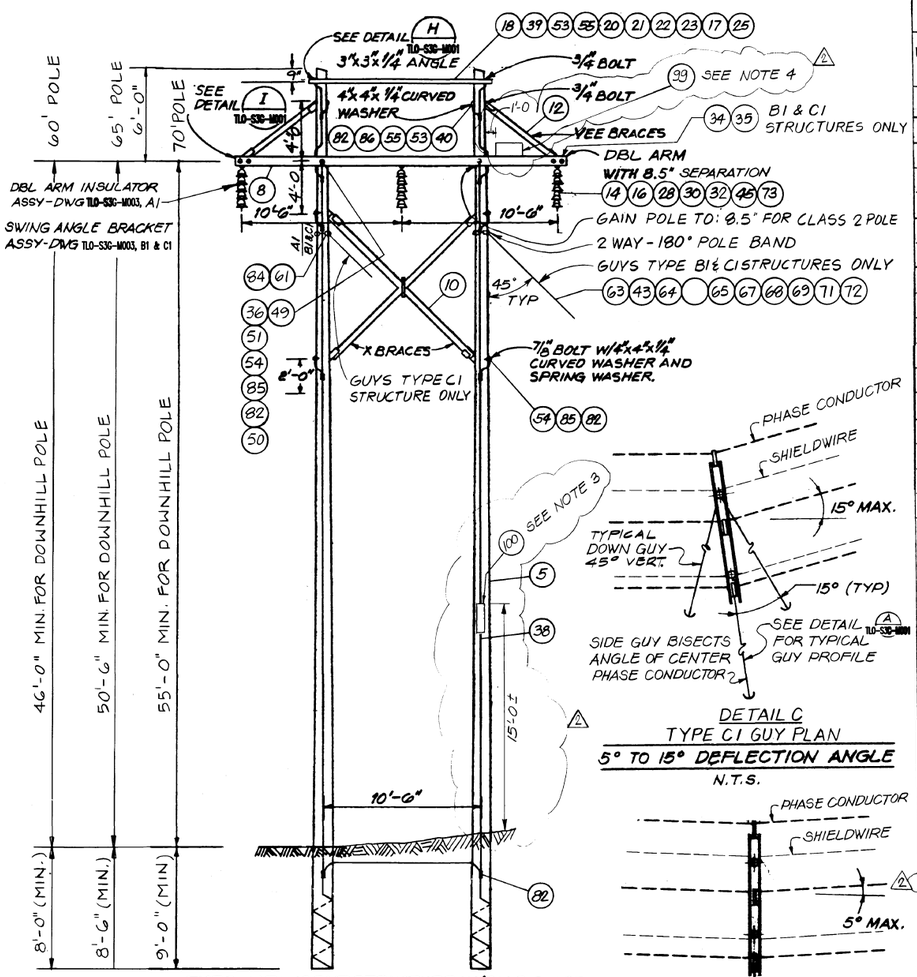
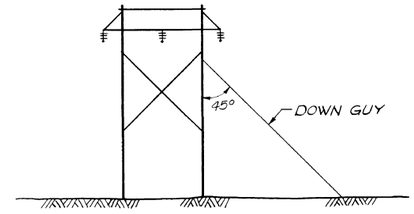


MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC.	QTY. TOTAL	SMUD STOCK NO.
		TYPE A1/60 STRUCTURE		8	
		TYPE A1/65 STRUCTURE (1-C1/65)		18	
		TYPE B1/65 STR. (STA. 180+24 98)		1	
		TYPE A1 65/70 STRUCTURE		2	
		TYPE A1/70 STRUCTURE		7	
		TYPE A1 60/65 STRUCTURE		2	
5	–	60' CLASS 2 POLE	2	18	
6	–	65' CLASS 2 POLE	2	42	
7	–	70' CLASS 2 POLE	2	16	
8	–	CROSSARM, 5 5/8" x 7 1/2" x 22'	2	76	
10	–	X-BRACE, 3 3/8" x 4 3/8" (10'-6 POLE SPACING)	1	38	
12	–	VEE BRACE, 2 3/4" x 3 1/2"	2	76	
14	TLO-S3G-M003	SUSPENSION INSULATOR (BALL-SOCKET)	15	570	
16	TLO-S3G-M003	ARMOR ROD SET (203.2 KCM CONDUCTOR)	3	114	
17	TLO-S3G-M001	ARMOR ROD SET (1/2" E.H.S. STL. STRAND)	2	76	
18		3" x 3" x 1/4" L x 12'-6	1	38	
20		DOWNLEAD TERMINAL (FOR #4 AWG WIRE)	2	76	
21		5/8" U-BOLT (INCL. NUTS & LOCK NUTS)	2	76	
22		5/8" CHAIN LINK	2	76	
23		MALEABLE IRON SUSPENSION CLAMP (FOR 1/2" STRAND W/ ARMOR RODS)	2	76	
25	TLO-S3G-M001	CLEVIS EYE	2	76	
28	TLO-S3G-M003	ARMOR GRIP SUSPENSION CLAMP	3	114	
30	TLO-S3G-M003	BALL Y-CLEVIS	3	114	
32	TLO-S3G-M001	ADJUSTABLE METAL SPACER FITTING (8.5"-12.5" CROSSARM SPACING)	3	114	
36	TLO-S3G-M001	FLAT GAIN PLATE (7/8" BOLT)	4	152	
38	TLO-S3G-M001 TLO-S3G-M002	NO. 4 AWG S.D. COPPER WIRE	174'	6612'	
39	TLO-S3G-M001	MACHINE BOLT 3/4" x 10" (INCL. NUT)	2	76	
40	–	MACHINE BOLT 3/4" x 12 (INCL. NUT)	2	76	
45	TLO-S3G-M001	MACHINE BOLT 3/4" x 6" (INCL. NUTS & LK. WSHR)	2	76	
49	TLO-S3G-M001	THREADED ROD 7/8" x 26"	2	76	
50		7/8" SQUARE NUT	4	152	
51		4" x 4" x 1/4" SQUARE WASHER (7/8" BOLT)	4	152	
53		4" x 4" x 1/2" CURVED WASHER (3/4" BOLT)	4	152	
54		DOUBLE COILED SPRING WASHER (7/8" BOLT)	8	152	
55		DOUBLE COILED SPRING WASHER (3/4" BOLT)	4	152	
43	TLO-S3G-M002	MACHINE BOLT 7/8" ϕ x 3" (INCL. NUT)		8	
61		2-WAY 180° POLE BAND (7" TO 10" POLE)		4	
63		7" CONNECTING LINK (DOWN GUY)		4	
64		GUY ROLLER (1/2" STRAND - 7/8" BOLT)		4	

MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC.	QTY. TOTAL	SMUD STOCK NO.
65	TLO-S3G-M002	PREFORMED GUY GRIP (FOR 1/2" STRAND)		8	
67		GROUND CONNECTOR (1" TO #4 AWG)		4	
68		KEARNY SPLIT BOLT CONNECTOR (2/0 TO 250)		4	
89	TLO-S3G-M003	HOLD DOWN WEIGHT SHACKLE		12	
90	TLO-S3G-M003	HOLD DOWN WEIGHT, 11"/180#		12	
69	TLO-S3G-M002	1" THIMBLEYE ANCHOR ROD x 10'		4	
71		ANCHOR		4	
72		1/2" E.H.S. STEEL GUY STRAND		SEE DWG. TLO-S3G-M003	
82		SPLIT BOLT SVC CONNECTOR (NO. 4 AWG)	10	380	
85	TLO-S3G-M001	BONDING CLIP W NUTS (7/8"ϕ BOLT END)	9	342	
86	TLO-S3G-M001	BONDING CLIP W NUTS (3/4"ϕ BOLT END)	2	76	
73	TLO-S3G-M003	SOCKET EYE	3	114	
34		SWINGING ANGLE BRACKET 8.5" SPACING	3	6	
35		SUPPLEMENTARY SADDLE 8.5" SPACING	3	6	
84	TLO-S3G-M001	POLE BAND BONDING CLIP W/BOLTS & NUTS	–	3	
34	TLO-S3G-M003	SWING ANGLE BRACKET (TYPE B&C)	3	6	
35	TLO-S3G-M001	SUPPLEMENTARY SADDLE (TYPE B&C)	3	6	
99	TLO-S3G-M001	AERIAL ID STRUCTURE NUMBER PLATE		8	
100	TLO-S3G-M001	GROUND STRUCTURE NUMBER PLATE	1	38	



DETAIL A
GUY PROFILE
TYPE B1, C1 STRUCTURES (TYP)
NTS

NOTES:
1. SEE GENERAL NOTES, DWG. TLO-C1A-M001.
2. FOR GROUNDING DETAILS, SEE DWGS. TLO-S3G-M001 & TLO-S3G-M002.
3. GROUND ID STRUCTURE NUMBER PLATE ATTACHED TO EACH STRUCTURE AT LOCATION SHOWN, ON POLE NEAREST TO PHASE A, VISIBLE WHEN LOOKING IN DIRECTION OF INCREASING STRUCTURE NUMBERS.
4. AERIAL ID STRUCTURE NUMBER PLATE ATTACHED TO EACH STRUCTURE LABELED "AERIAL ID" ON DWGS. TLO-C3S-M001 THRU TLO-C3S-M007 AT LOCATION SHOWN, ON SIDE OF STRUCTURE NEAREST TO PHASE A.

REFERENCE: TLO-C0A-M001 – PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO. E 693-591

SHEET 14 of 21

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GRASE No. 8528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO CALIFORNIA

NO	DATE	REVISION	DR BY	CHKD BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
1	6-19-02	UPDATED DRAWING PER DCN # T-438	RSD	RWW	RWW	TVS	
0	6-25-86	SMUD FINAL APPROVAL	N/A	N/A		N/A	

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SCALE	NONE
INDEX	
DR BY	VENDOR
DATE	10-82
CHKD BY	VENDOR
DATE	10-82
W.O. NUMBER	4000173
DESIGNER/ENGINEER	–
OVERLAY	
SUPERVISOR	–
RELEASE DATE	10-12-82
DCN	

TITLE: STRUCTURE DETAILS TYPES A1, B1, C1

LOCATION: JONES FORK TRANSMISSION LINE

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

DWG NO: TLO-S3C-M001

REVISION: 1

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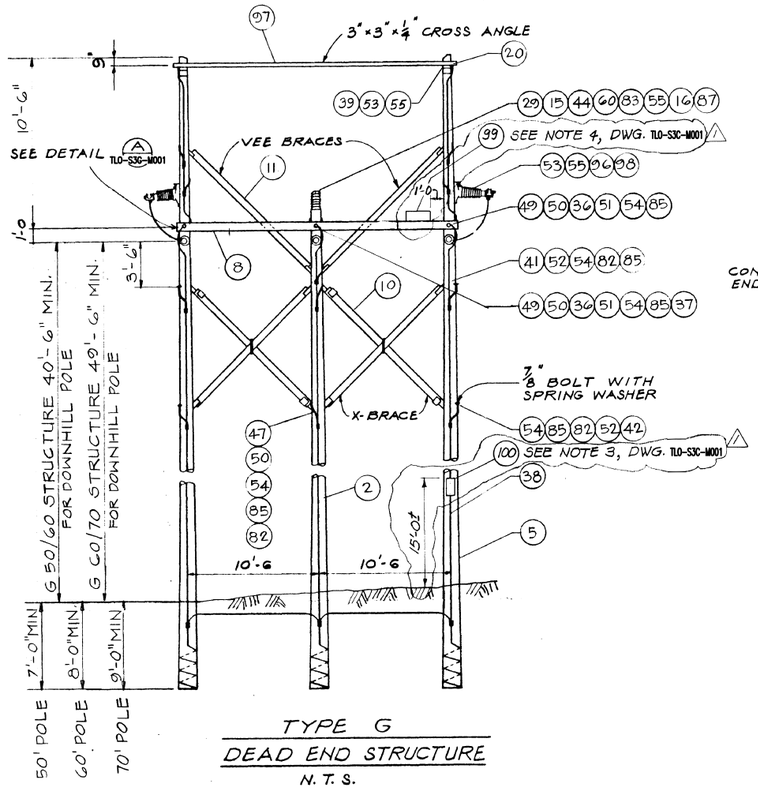
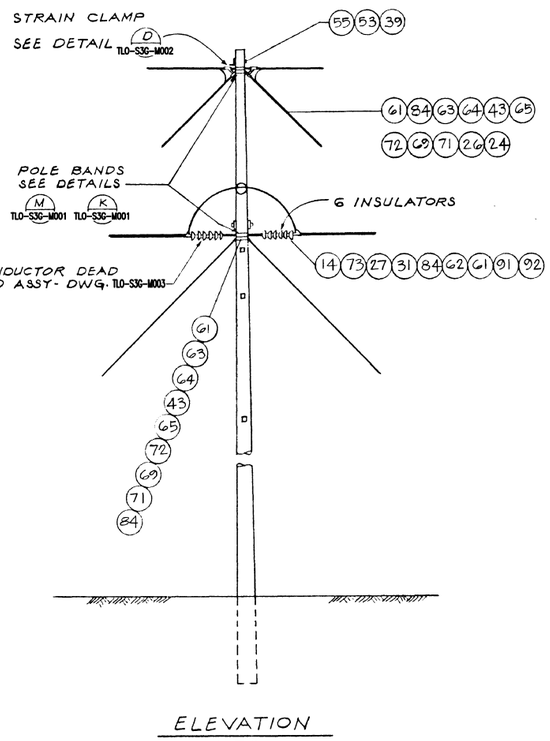
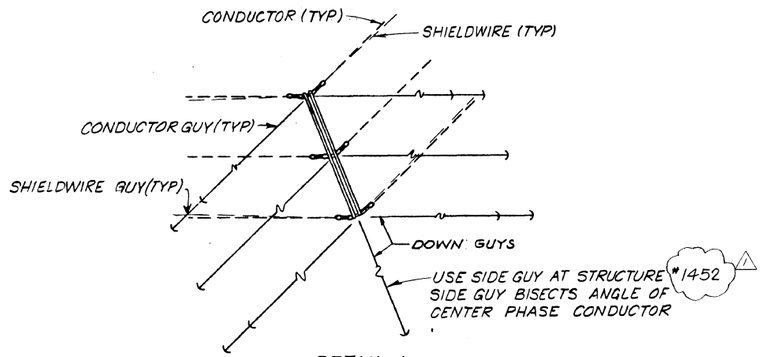


TYPE G
DEAD END STRUCTURE
N. T. S.



ELEVATION
N. T. S.



DETAIL A
GUY PLAN - TYPE G
DEAD END STRUCTURE
N. T. S.

MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC	QTY. TOTAL	SMUD STOCK NO.
		TYPE G 50/60 STRUCTURE		1	
		TYPE G 60/70 STRUCTURE		1	
2	—	50' CLASS 2 POLE		1	
5	—	60' CLASS 2 POLE		3	
7	—	70' CLASS 2 POLE		2	
8	TLO-S3C-M003	CROSSARM, $5\frac{5}{8}$" x 7½" x 22'	2	4	
10	—	X-BRACE, $3\frac{3}{8}$" x $4\frac{3}{8}$" (10'-6 POLE SPACING)	2	4	
11	—	VEE BRACE, $3\frac{3}{8}$" x $4\frac{3}{8}$" (10'-6 POLE SPACING)	2	4	
14	TLO-S3C-M003	SUSPENSION INSULATOR (BALL-SOCKET)	36	72	
15		69 KV PIN INSULATOR W. ¾" PIN	1	2	
96		69 KV HORZ. LINE POST INSULATOR (CLAMP TOP)	2	4	
73		SOCKET EYE	6	12	
27		COMPRESSION DEAD END, CLEVIS END (FOR 203.2 KCM CONDUCTOR)	6	12	
29	TLO-S3C-M003	POLE TOP BRACKET	1	2	000365
97	TLO-S3C-M002	3" x 3" x ¼" L x 23'	1	2	
20	TLO-S3C-M001	DOWNLEAD TERMINAL (FOR #4 AWG WIRE)	2	4	
24	TLO-S3C-M002	MALLEABLE IRON STRAIN CLAMP (FOR ½" STRAND)	4	8	
26	TLO-S3C-M002	U-BOLT GUY CLAMP (FOR ½" STRAND)	4	8	
16	TLO-S3C-M003	ARMOR ROD SET (203.2 KCM CONDUCTOR)	1	2	
83		INSULATOR TIE	1	2	
31		BALL CLEVIS	6	12	
36	TLO-S3C-M001	FLAT GAIN PLATE ($\frac{7}{8}$" BOLT)	6	12	
38		NO. 4 AWG S.D. COPPER WIRE	285'	570'	
39		MACHINE BOLT, ¾" x 10" (W. NUT)	2	4	
98	TLO-S3C-M003	MACHINE BOLT, ¾" x 14" (W. NUT)	4	8	
41	TLO-S3C-M002	MACHINE BOLT, 7/8" x 12" (W. NUT)	2	4	
42		MACHINE BOLT, 7/8" x 14" (W. NUT)	4	8	
43		MACHINE BOLT, 7/8" x 3" (W. NUT)	11	21	
44	TLO-S3C-M003	MACHINE BOLT, 5/8" x 14" (W. NUT)	2	4	
47	TLO-S3C-M002	THREADED ROD, 7/8" x 16"	3	6	
49	TLO-S3C-M001	THREADED ROD, 7/8" x 26"	3	6	
50		7/8" SQUARE NUT	12	24	
37		1" POLE SHIM ($\frac{7}{8}$" BOLT)	1	2	
67	TLO-S3C-M002	GROUND CONNECTOR (1" TO #4 AWG)	10	21	
68		KEARNY SPLIT BOLT CONNECTOR (2/0 TO 250)	10	21	
69		1" THIMBLEYE ANCHOR ROD x 10'	11	21	
71		ANCHOR	11	21	
72	TLO-S3C-M003	½" E.H.S. STEEL GUY STRAND	848'	SEE DWG. TLO-S3C-M003	
82	TLO-S3C-M001	SPLIT BOLT SVC. CONNECTOR (NO.4 AWG)	17	34	
84	TLO-S3C-M001	POLE BAND BONDING CLIP (W. BOLT & NUTS)	11	21	
85	TLO-S3C-M003	BONDING CLIP W. NUTS ($\frac{7}{8}$" Ø BOLT END)	11	21	
91		BALL EYE	AS REQ'D.		
92		SOCKET CLEVIS	AS REQ'D.		

MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC	QTY. TOTAL	SMUD STOCK NO.
51	TLO-S3C-M001	4"x4"x ⅛" SQUARE WASHER ($\frac{7}{8}$" BOLT)	6	12	
52	TLO-S3C-M002	4"x4"x ¼" CURVED WASHER ($\frac{7}{8}$" BOLT)	6	12	
53	TLO-S3C-M001	4"x4"x ¼" CURVED WASHER ($\frac{3}{4}$" BOLT)	10	20	
87	TLO-S3C-M003	4"x4"x ¼" CURVED WASHER ($\frac{5}{8}$" BOLT)	2	4	
54	TLO-S3C-M001	SPRING WASHER ($\frac{7}{8}$" BOLT)	18	36	
55	TLO-S3C-M001	SPRING WASHER ($\frac{3}{4}$" BOLT)	10	20	
60	TLO-S3C-M003	SPRING WASHER ($\frac{5}{8}$" BOLT)	2	4	
61		2-WAY 180° POLE BAND (7'-10" POLE)	11	21	
62		7" CONNECTING LINK (CONDUCTOR DEAD END)	6	12	
63	TLO-S3C-M001	7" CONNECTING LINK (DOWN GUY)	11	21	
64	TLO-S3C-M002	GUY ROLLER (½" STRAND - ⅞" BOLT)	11	21	
65	TLO-S3C-M002	PREFORMED GUY GRIP (FOR ½" STRAND)	22	42	
99	TLO-S3C-M002	AERIAL ID STRUCTURE NUMBER PLATE		1	
100	TLO-S3C-M002	GROUND ID STRUCTURE NUMBER PLATE	1	2	

REFERENCE: TLO-C0A-M001 PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO. E 693-594

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GANOE No. 8528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS
SAN FRANCISCO CALIFORNIA

NO	DATE	REVISION	DR BY	CHK'D BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
1	6-19-02	UPDATED DRAWING PER DCN # T-438	RSD	RWW	RWW	TVS	
0	6-25-86	SMUD FINAL APPROVAL	N/A	N/A		N/A	

K:\Drafting\Jones Fork_L\SUBMITTED.dwg K:\Drafting\Jones Fork_L\APPROVED.dwg

SHEET 15 of 21

SCALE NONE	INDEX	TITLE	STRUCTURE DETAILS TYPE G
DR BY VENDOR	DATE 10-82		
CHK'D BY VENDOR	DATE 10-82	LOCATION	JONES FORK TRANSMISSION LINE
W.O. NUMBER 4000173	DESIGNER/ENGINEER —	OVERLAY	SUPERVISOR — RELEASE DATE 10-12-82 DCN

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT — DWG NO TLO-S3C-M002 — REVISION 1

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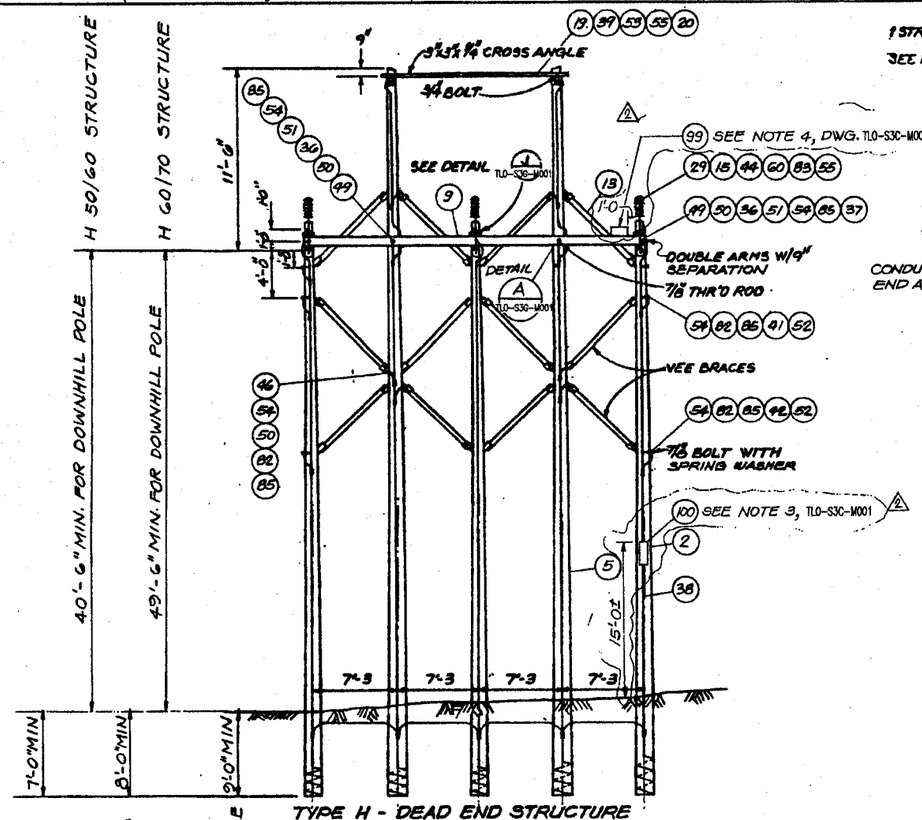
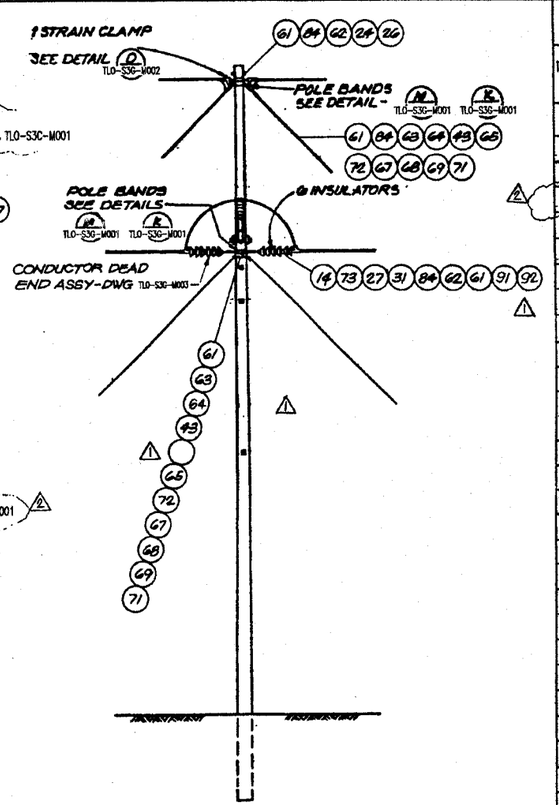
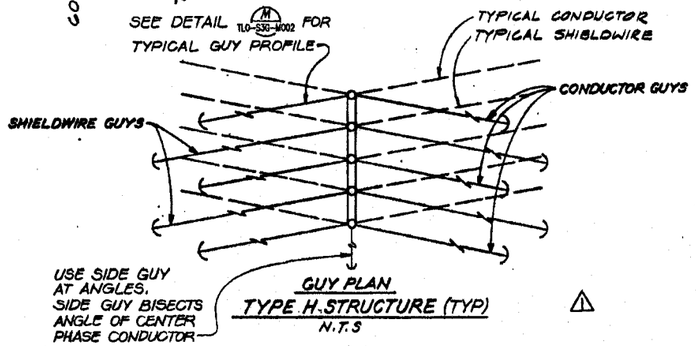


TYPE H - DEAD END STRUCTURE
N.T.S.



TYPE H
ELEVATION



GUY PLAN
TYPE H STRUCTURE (TYP)
N.T.S

MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC.	QTY. TOTAL	SMUD STOCK NO.
		TYPE H 50/60 STRUCTURE		1	
		TYPE H 50/60 STR. (STA. 4+20)		1	
		TYPE H 60/70 STRUCTURE		8	
101	–	35' CLASS 4 POLES		5	
2	–	50' CLASS 2 POLE	3	6	
5	–	60' CLASS 2 POLE	2	28	
7	–	70' CLASS 2 POLE		16	
9	–	CROSSARM, 5 5/8" x 7 1/2" x 30'	2	21	
13	–	VEE BRACE, 3 3/8" x 4 3/8"	12	120	
14	TLO-S3C-M003	SUSPENSION INSULATOR (BALL-SOCKET)	36	360	
15		69 KV PIN INSULATOR W. 3/4" PIN	3	30	
75		SOCKET EYE	6	60	
19	TLO-S3C-M003	3" x 3" x 1/4" L x 16'-6	1	10	
20	TLO-S3C-M001	DOWNLEAD TERMINAL (FOR #4 AWG WIRE)	2	20	
24	TLO-S3C-M002	RELEASABLE IRON STRAIN CLAMP (FOR 1/2" STRAND)	4	40	
26	TLO-S3C-M002	U-BOLT GUY CLAMP (FOR 1/2" STRAND)	4	44	
27	TLO-S3C-M003	COMPRESSION DEAD END, CLEVIS END (FOR 1 KCM CONDUCTOR)	6	66	
29		POLE TOP BRACKET	3	30	000368
31		BALL CLEVIS	6	60	
36	TLO-S3C-M001	FLAT GAIN PLATE (7/8" BOLT)	5	50	
37	TLO-S3C-M001	1" POLE SHIM (7/8" BOLT)	3	30	
38	TLO-S3C-M001 TLO-S3C-M002	NO. 4 AWG S.D. COPPER WIRE	405'	4250'	
39	TLO-S3C-M001	MACHINE BOLT, 3/4" x 10" (INCL. NUT)	2	20	
41	TLO-S3C-M003	MACHINE BOLT, 7/8" x 12" (INCL. NUT)	4	40	
42		MACHINE BOLT, 7/8" x 14" (INCL. NUT)	2	20	
43		MACHINE BOLT, 7/8" x 3" (INCL. NUT)	10	109	
44	TLO-S3C-M003	MACHINE BOLT, 5/8" x 14" (INCL. NUT)	6	60	
46	TLO-S3C-M001	THREADED ROD, 7/8" x 14"	3	90	
49		THREADED ROD, 7/8" x 26"	5	50	
50		7/8" SQUARE NUT	28	280	
51		4" x 4" x 1/4" SQUARE WASHER (7/8" BOLT)	10	100	
52		4" x 4" x 1/4" CURVED WASHER (7/8" BOLT)	6	60	
53		4" x 4" x 1/4" CURVED WASHER (3/4" BOLT)	2	20	
54		SPRING WASHER (7/8" BOLT)	34	340	
55		SPRING WASHER (5/8" BOLT)	5	50	
60		SPRING WASHER (5/8" BOLT)	6	60	
61	TLO-S3C-M002	2-WAY 180° POLE BAND (7'-10" POLE)	10	109	
62	TLO-S3C-M001 TLO-S3C-M003	7" CONNECTING LINK (CONDUCTOR DEAD END)	10	100	
63	TLO-S3C-M003	7" CONNECTING LINK (DOWN GUY)	10	109	
64	TLO-S3C-M002	GUY ROLLER (1/2" STRAND - 7/8" BOLT)	10	109	
65	TLO-S3C-M002	PREFORMED GUY GRIP (FOR 1/2" STRAND)	20	218	
67	TLO-S3C-M002	GROUND CONNECTOR (1" TO #4 AWG)	10	99	
68	TLO-S3C-M002	KEARNY SPLIT BOLT CONNECTOR (2/0 TO 250)	10	99	
16	TLO-S3C-M003	ARMOR ROD SET (203.2 KCM CONDUCTOR)	3	30	
87	TLO-S3C-M003	4" x 4" x 1/4" CURVED WASHER (5/8" BOLT)	6	60	

MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER STRUC.	QTY. TOTAL	SMUD STOCK NO.
99	TLO-S3C-M003	AERIAL ID STRUCTURE NO. PLATE		2	
100	TLO-S3C-M003	GROUND ID STRUCTURE NO. PLATE	1	10	
69	TLO-S3C-M002	1" THIMBLEYE ANCHOR ROD x 10'	10	99	
71	TLO-S3C-M002	ANCHOR	10	99	
72	TLO-S3C-M002	1/2" E.H.S. STEEL GUY STRAND	800'	SEE DWG. TLO-S3C-M003	
82	TLO-S3C-M002	SPLIT BOLT SVC CONNECTOR (NO. 4 AWG)	22	220	
85	TLO-S3C-M001	INSULATOR TIE	3	30	
84	TLO-S3C-M001	POLE BAND BONDING CLIP (W BOLT & NUTS)	10	100	
85	TLO-S3C-M001	BONDING CLIP W NUTS (7/8" ø BOLT END)	20	200	
91	TLO-S3C-M003	BALL EYE	AS REQ	–	
92	TLO-S3C-M003	SOCKET CLEVIS	AS REQ	–	

FOR GROUNDING DETAILS, SEE DWG'S. TLO-S3C-M001 & TLO-S3C-M002.
SEE GENERAL NOTES, TLO-C1A-M001.

REFERENCE: TLO-COA-M001 PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO. [redacted]

SHEET 16 of 21

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GUNZ No. 8528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO — CALIFORNIA

SUBMITTED [signature] APPROVED R.W. Gunz

NO	DATE	REVISION	DR BY	CHKD BY	DESIGNER/ ENGINEER	SUPERVISOR	PLN
1	9-18-02	UPDATED DRAWING PER DCN # T-438	RSD	RWW	RWW	TPS	
0	6-25-82	SMUD FINAL APPROVAL	N/A	N/A		N/A	

SCALE NONE	INDEX	TITLE	STRUCTURE DETAILS TYPE H
DR BY VENDOR	DATE 10-82		
CHKD BY VENDOR	DATE 10-82	LOCATION	JONES FORK TRANSMISSION LINE
W.O. NUMBER 4000173	DESIGNER/ENGINEER –	OVERLAY	SUPERVISION – RELEASE DATE 10-12-82 DCN
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT	DWG NO	TLO-S3C-M003	REVISION 1

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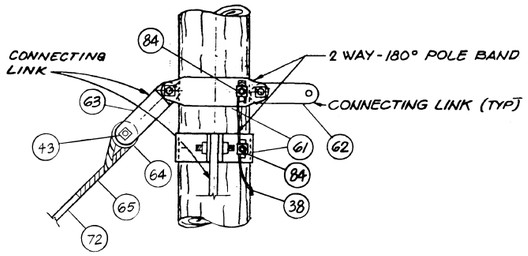
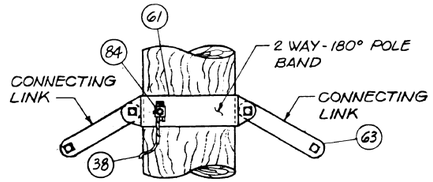
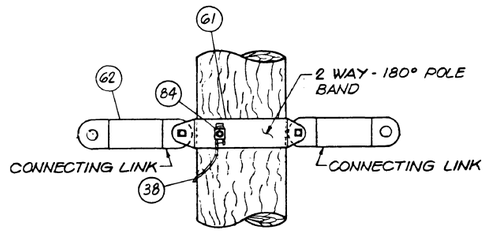


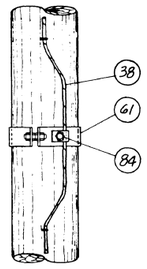
DETAIL G
POLE BANDS
N.T.S.



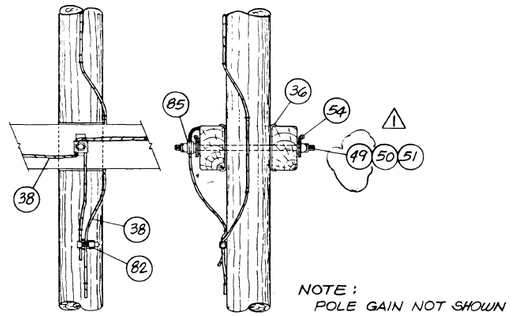
DETAIL K
DOWN GUY POLE BAND
N.T.S.



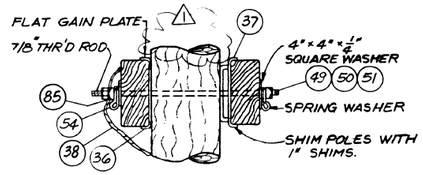
DETAIL M
CONDUCTOR OR SHIELD WIRE
POLE BAND
N.T.S.



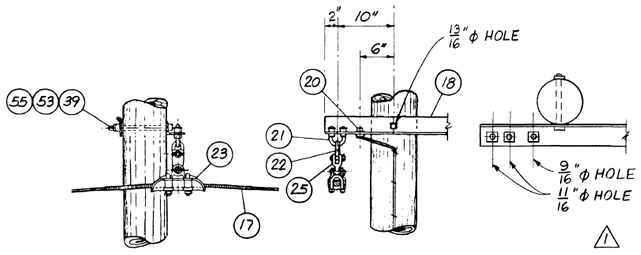
TYPICAL POLE BAND
BONDING DETAIL
N.T.S.



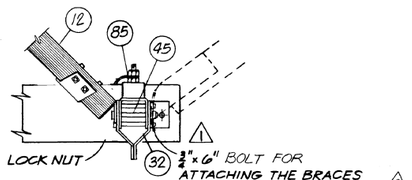
DETAIL A
CROSSARM CONNECTION WITH
TYPICAL BONDING DETAIL
N.T.S.



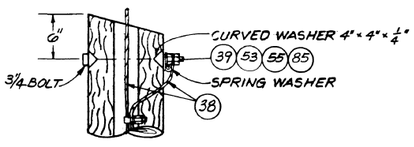
DETAIL J
CROSSARM CONNECTION
N.T.S.



DETAIL H
SHIELD WIRE ATTACHMENT
N.T.S.



DETAIL I
SECTION AT SPACER FITTING
SHOWING VEE BRACE ATTACHMENT
N.T.S.



DETAIL-C
N.T.S.

REFERENCE: TLO-C0A-M001 PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO. E 693-596

SHEET 17 of 21

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GRASE No. 8528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO CALIFORNIA

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NO	DATE	REVISION	DR BY	CHKD BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
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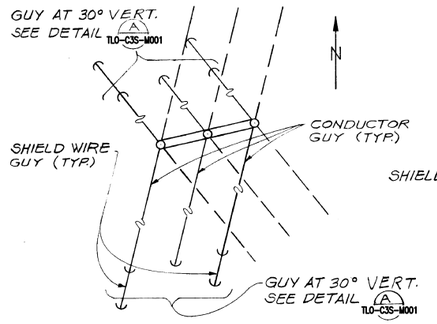
0	6-25-86	SMUD FINAL APPROVAL	N/A	N/A		N/A	

SCALE NONE	INDEX	TITLE	STRUCTURE DETAILS HARDWARE
DR BY VENDOR	DATE 10-82		
CHKD BY VENDOR	DATE 10-82	LOCATION	JONES FORK TRANSMISSION LINE
W.O. NUMBER 4000173	DESIGNER/ENGINEER –	OVERLAY	SUPERVISOR – RELEASE DATE 10-12-82 DCN
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT	DWG NO TLO-S3G-M001		REVISION 1



DETAIL K
GUY PLAN - STRUCTURE #1482
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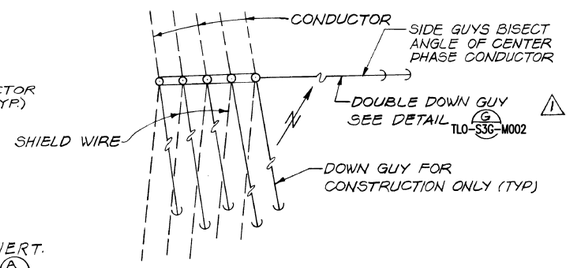
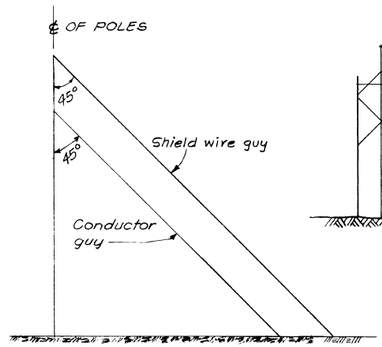
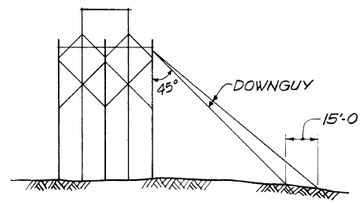


DETAIL J
GUY PLAN - STRUCTURE #1481
N.T.S.



DETAIL M
GUYING PROFILE
TYPE G & H STRUCTURE (TYP)
N.T.S.

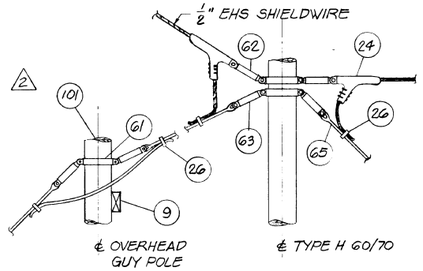


DETAIL G
GUYING PROFILE
STRUCTURE #1481
NTS

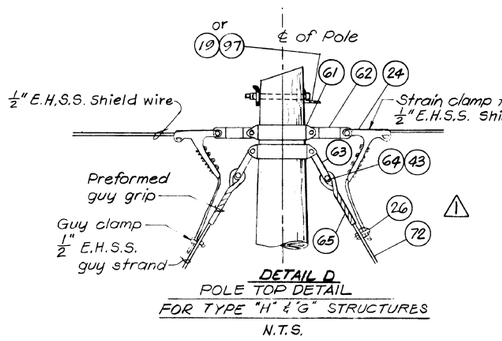
ANCHOR CLASS	TYPE OF GUY ANCHOR		
	POOR SOIL	GOOD SOIL	ROCK
I	B	B	A
II	C	B	A
III	B	B	A

SEE NOTE 1

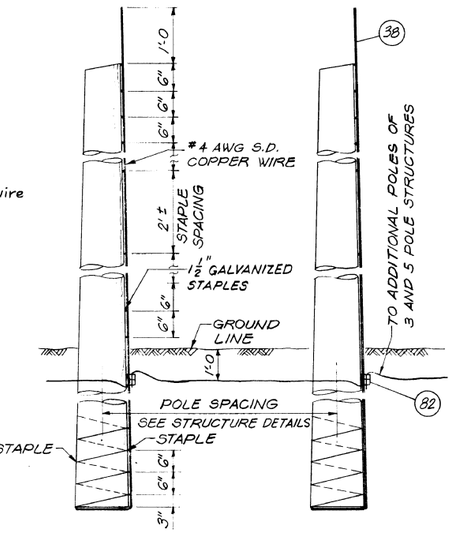
TABLE 1
GUY ANCHOR APPLICATION



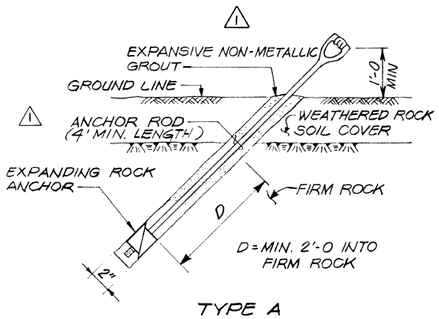
DETAIL N
POLE TOP DETAIL
STRUCTURES 1450, 1450A
NTS



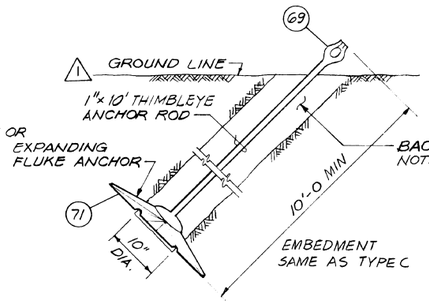
DETAIL D
POLE TOP DETAIL
FOR TYPE "H" & "G" STRUCTURES
N.T.S.



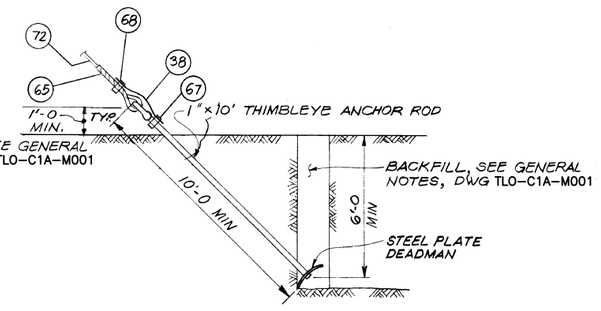
POLE GROUNDING ASSEMBLY
N.T.S.



TYPE A
GUY ANCHOR - ROCK CONDITION
N.T.S.



TYPE B
GUY EXPANDING ANCHOR
N.T.S.



TYPE C
GUY STEEL PLATE DEADMAN ANCHOR
N.T.S.

NOTES:
1. FOR SOIL CONDITION DESCRIPTIONS FOR GUY ANCHOR APPLICATION, SEE GENERAL NOTES, DRAWING TLO-C1A-M001.
2. STAPLE DOWNLEAD TO POLE. CARRY DOWNLEAD UNDER BOTTOM OF POLE AND TAKE FOUR WRAPS BACK UP POLE WITH A STAPLE AT EACH WIRE CROSSING AND ON OPPOSITE SIDE OF POLE. STAPLE DOWNLEAD SO THAT IT DOES NOT COME IN CONTACT WITH CROSSARMS OR THROUGH BOLTS. STAPLES ON DOWNLEAD SHALL BE 2 FEET APART, EXCEPT FOR A DISTANCE OF 8 FEET ABOVE GROUND AND 8 FEET FROM TOP OF POLE WHERE THEY SHALL BE 6 INCHES APART.
3. FOR GENERAL NOTES, SEE DRAWING TLO-C1A-M001.

REFERENCE: TLO-C0A-M001 PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO. E 693-597

SHEET 18 of 21

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GRASE No. 8528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS
SAN FRANCISCO CALIFORNIA

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NO	DATE	REVISION	DR BY	CHKD BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
1	6-19-02	UPDATED DRAWING PER DCN # T-438	RSD	RWW	RWW	TVS	
0	6-25-86	SMUD FINAL APPROVAL	N/A	N/A		N/A	

SCALE NONE	INDEX	TITLE	STRUCTURE DETAILS GUYS AND GROUNDING
DR BY VENDOR	DATE 10-82		
CHKD BY VENDOR	DATE 10-82	LOCATION	JONES FORK TRANSMISSION LINE
W.O. NUMBER 4000173	DESIGNER/ENGINEER —	OVERLAY	SUPERVISOR — RELEASE DATE 10-12-82 DCN
SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT	DWG NO TLO-S3G-M002		REVISION 1

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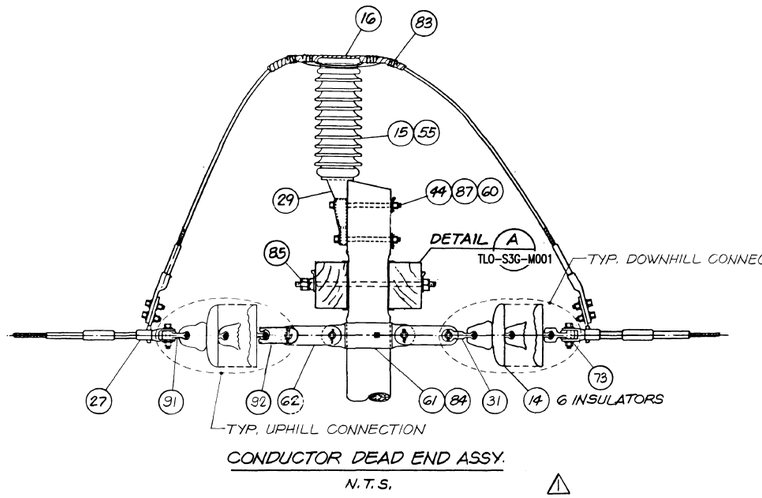
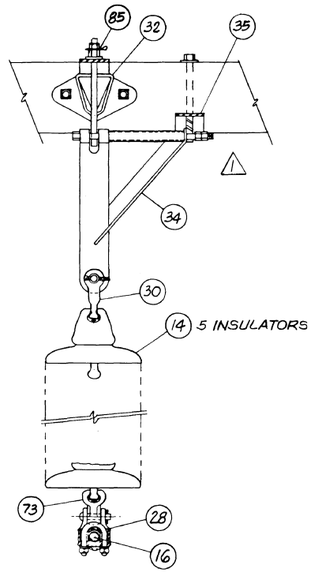


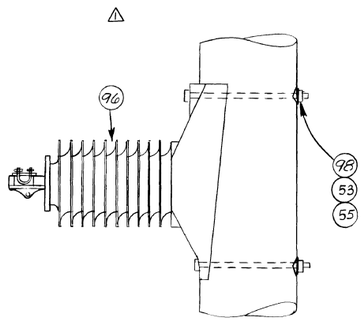
CONDUCTOR DEAD END ASSY.

N.T.S.



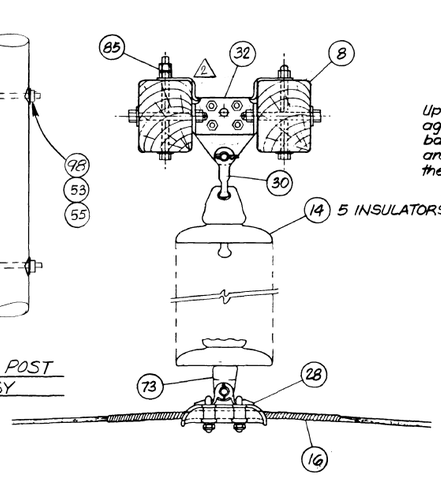
SWINGING ANGLE BRACKET ASSY.

N.T.S.



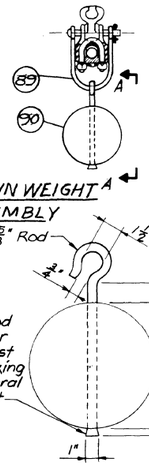
HORIZONTAL LINE POST INSULATOR ASSY

NTS



DOUBLE ARM INSULATOR ASSY.

N.T.S.



VIEW A-A HOLD DOWN WEIGHT

HOLD DOWN WEIGHT ASSEMBLY

NOTE: Location of hold down weights are shown on Dwgs **TLO-C3S-M001, TLO-C3S-M002, TLO-C**3S-M004 & TLO-C3S-M006

MATERIAL LIST

ITEM	DESCRIPTION		QUANTITY (FEET)	SMUD STOCK NO.
A	PHASE CONDUCTOR - 203.2 KCM EXTRA HIGH STRENGTH ACSR, BRAHMA		60,000	
B (72)	1/2 INCH EXTRA HIGH STRENGTH STRAND, GALVANIZED	SHIELDWIRE	40,000	
		GUY STRAND	12,000	
		TOTAL	52,000	
93	COMPRESSION JOINTS FOR 203.2 EHS ACSR			
94	REPAIR SLEEVES FOR 203.2 EHS ACSR			
95	COMPRESSION JOINTS FOR 1/2 INCH EHS, GALVANIZED SHIELDWIRE STRAND			

MATERIAL LIST

ITEM NO.	REF. DWG. NO.	DESCRIPTION	QTY. PER ASSY.	QTY. TOTAL	SMUD STOCK NO.
		CONDUCTOR DEAD END ASSY.			
	THIS SHEET				
14		SUSPENSION INSULATOR (BALL-SOCKET)	12		
15		69 KV PIN INSULATOR W. 3/4" PIN	1		
16		ARMOR ROD SET (203.2 KCM CONDUCTOR)	1		
27		COMPRESSION DEAD END (CLEVIS END)	2		
29		POLE TOP BRACKET	1		
31		BALL CLEVIS	2		
44		MACHINE BOLT 5/8"Ø x 14" (INCL. NUT)	2		
55		SPRING WASHER (3/4" BOLT)	1		
60		SPRING WASHER (5/8" BOLT)	2		
61		2-WAY 180° POLE BAND (7" TO 10" POLE)	1		
62		7" CONNECTING LINK (CONDUCTOR DEAD END)	2		
73		SOCKET EYE	2		
83		INSULATOR TIE	1		
84		POLE BAND BONDING CLIP (INCL. BOLT & NUTS)	1		
87		4" x 4" x 1/4" CURVED WASHER (5/8" BOLT)	2		
91		BALL EYE	AS REQ		
92		SOCKET CLEVIS	AS REQ		
		SWINGING ANGLE BRACKET ASSY.			
14		SUSPENSION INSULATOR (BALL-SOCKET)	5		
16		ARMOR ROD SET (203.2 KCM CONDUCTOR)	1		
28		ARMOR GRIP SUSPENSION CLAMP	1		
30		BALL Y-CLEVIS	1		
32		METAL SPACER FITTING (8.5"-12.5" ADJUSTABLE)	1		
34		SWINGING ANGLE BRACKET (8.5" SPACING)	1		
35		SUPPLEMENTARY SADDLE (8.5" SPACING)	1		
73		SOCKET EYE	1		
85		BONDING CLIP			
		DOUBLE ARM INSULATOR ASSY.			
85		BONDING CLIP			
8		5 5/8" x 7 1/2" x 22' CROSSARM	2		
14		SUSPENSION INSULATOR	5		
16		ARMOR ROD SET (203.2 KCM CONDUCTOR)	1		
28		ARMOR GRIP SUSPENSION CLAMP	1		
30		BALL Y-CLEVIS	1		
32		METAL SPACER FITTING (8.5-12.5" ADJUSTABLE)	1		
73		SOCKET EYE	1		
89		HOLD DOWN WEIGHT SHACKLE	1		
90		HOLD DOWN WEIGHT, 11"/180#	1		
78	TLO-C2C-M003	COMPRESSION TYPE TERMINAL FOR 203.2 E.H.S. ACSR "BRAHMA TO NEMA STANDARD TWO BOLT PAD	6	12	
79	TLO-C2C-M003	OPEN RUN COMPRESSION TYPE "T" TAPS CABLE TO CABLE FOR 203.2 E.H.S. ACRS "BRAHMA	2	4	
96	TLO-S3G-M003	69 kV HORZ LINE POST INSULATOR	1		
98	TLO-S3G-M003	MACHINE BOLT, 3/4" x 14" (W-NUT)	2		
53	TLO-S3G-M003	4" x 4" x 1/4" CURVED WASHER (3/4" BOLT)	2		
55	TLO-S3G-M003	SPRING WASHER (3/4" BOLT)	2		

REFERENCE: TLO-C0A-M001 PROJECT PLAN AND DRAWING INDEX

THIS DRAWING SUPERSEDES DWG. NO. E 693-598

SHEET 19 of 21

REGISTERED PROFESSIONAL ENGINEER ROBERT W. GANZ No. 8528 CIVIL STATE OF CALIFORNIA

TUDOR ENGINEERING COMPANY — CONSULTING ENGINEERS AND PLANNERS — SAN FRANCISCO — CALIFORNIA

NO	DATE	REVISION	DR BY	CHK'D BY	DESIGNER/ ENGINEER	SUPERVISOR	FILM
1	6-19-02	UPDATED DRAWING PER DCN # T-438	RSD	RWW	RWW	TVS	
0	6-25-86	SMUD FINAL APPROVAL	N/A	N/A		N/A	

K:\Drafting\Jones Fork\T_L\SUBMITTED.bmp K:\Drafting\Jones Fork\T_L\APPROVED.bmp

SCALE NONE	INDEX	TITLE	STRUCTURE DETAILS ASSEMBLY DETAILS & CONDUCTOR QUANTITIES
DR BY VENDOR	DATE 10-82		
CHK'D BY VENDOR	DATE 10-82	LOCATION	JONES FORK TRANSMISSION LINE
W.O. NUMBER 4000173	DESIGNER/ENGINEER —	OVERLAY	SUPERVISOR — RELEASE DATE 10-12-82 DCN

SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT

DWG NO TLO-S3G-M003 REVISION 1

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APPENDIX C

REPRESENTATIVE PHOTOGRAPHS OF THE SUPPORT STRUCTURES AND RIGHTS-OF WAY CONDTIONS FOR THE UPPER AMERICAN RIVER PROJECT TRANSMISSION SYSTEM

C-1. Aerial view of White Rock – Folsom Junction

C-2. Brush Creek tap above intake – January 24, 2003

C-3. Brush Creek tap at Brush Creek Reservoir – January 24, 2003

C-4. Brush Creek tap line looking north – January 24, 2003

C-5. Brush Creek tap line looking south – January 24, 2003

C-6. Brush Creek transformer pole.

C-7. Representative photo of the Camino, Lake and Camino and White Rock segment of the UARP transmission line (1)

C-8. Representative photo of the Camino, Lake and Camino and White Rock segment of the UARP transmission line (2)

C-9. Jones Fork/Union Valley type H jumper wire.

C-10. Jones Fork/Union Valley type H structure.

C-11. Loon Lake/Union Valley 65 kV.

C-12. Representative photo of the Union Valley/Camino segment of the UARP transmission line.

C-13. Representative photo of the White Rock/Folsom Junction segment of the UARP transmission line (1).

C-14.. Representative photo of the White Rock/Folsom Junction segment of the UARP transmission line (2)

C-15. White Rock/Folsom Junction near Blue Ravine Road.

APPENDIX D

INCIDENTAL OBSERVATIONS OF BIRDS AND MAMMALS DURING THE UPPER AMERICAN RIVER PROJECT RELICENSING STUDIES, 2002-2003

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
Various	Lower Transmission Line	Acorn woodpecker		
Various	Lower Transmission Line	American crow		
N/A	Silver Creek	American dipper		
N/A	Lower Transmission Line	American goldfinch		
Various	Lower Transmission Line	American kestrel		
04/09/03	Union Valley Reservoir	American pipit	1	Near Wolf Creek CG
05/14/02	Robbs Powerhouse	American robin		
05/15/02	Jaybird Springs Road	American robin		
06/10/02	Various	American robin		
06/11/02	Various	American robin		Partially albino with all white tail feathers at Wolf Ck CG
06/12/02	Various	American robin		
06/13/02	Various	American robin		
06/14/02	Jaybird Springs Road	American robin		
06/20/02	Union Valley Reservoir	American robin		
07/09/02	Union Valley Reservoir	American robin		
04/08/03	Ice House Road	American robin		
04/09/03	Union Valley Reservoir	American robin		
05/06/03	Peavine Ridge Road	American robin		
05/13/03	Iowa Hill	American robin		
05/09/03	Union Valley Reservoir	American white pelican	8	
05/13/03	Iowa Hill	Anna's hummingbird		
06/12/02	Union Valley Reservoir	Bald eagle	2	Adults perched on tree across from Fashoda Beach
06/12/02	Various	Bald eagle		
06/17/02	Union Valley Reservoir	Bald eagle	1	
06/26/02	Loon Lake	Bald eagle	1	Perched on pine east of boat ramp
08/28/02	Loon Lake	Bald eagle	1	Perched between Main and Auxillary dams
10/01/02	Union Valley Reservoir	Bald eagle	1	On south shore across from Sunset Boat ramp
10/01/02	Ice House Reservoir	Bald eagle	1	Soaring above Strawberry CG
10/28/02	Union Valley Reservoir	Bald eagle	2	Pair in Granlee's Point nest stand
11/14/02	Union Valley Reservoir	Bald eagle	2	
11/27/02	Ice House Reservoir	Bald eagle	3	2 adults and 1 juvenile at SFSC inlet
01/07/03	Union Valley Reservoir	Bald eagle	6	Adults and subadults

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
01/08/03	Union Valley Reservoir	Bald eagle	2	
01/09/03	Union Valley Reservoir	Bald eagle	1	Caught "muk-luk", Adult non-resident bird
02/04/03	Union Valley Reservoir	Bald eagle	Several	
02/06/03	Union Valley Reservoir	Bald eagle	2	
02/14/03	Union Valley Reservoir	Bald eagle	1	
03/27/03	Union Valley Reservoir	Bald eagle	Several	Copulation and territory defense
04/09/03	Union Valley Reservoir	Bald eagle	2	Adults incubating
04/22/03	Union Valley Reservoir	Bald eagle	1	Incubating
05/06/03	Union Valley Reservoir	Bald eagle	1	
05/07/03	Union Valley Reservoir	Bald eagle	1	On nest
05/07/03	Loon Lake	Bald eagle	3	1 ad., 2 juv. Near boat ramp
05/19/03	Ice House Reservoir	Bald eagle	1	Foraging
05/20/03	Loon Lake	Bald eagle	3	Ad. On possible nest tree, subadult in Pleasant area
06/17/03	Union Valley Reservoir	Bald eagle	1	
06/24/03	Slab Creek Reservoir	Bald eagle	1	
05/24/01	South Fork Silver Creek	Band-tailed pigeon	50-70	Observed during helicopter reconnaisance
06/26/02	Trail to Rubicon Reservoir	Band-tailed pigeon	20-30	
05/14/02	Gerle Creek Reservoir	Barn swallow	1	
05/14/02	Gerle Canal	Barn swallow		Nesting under bridge
05/14/02	Robbs Powerhouse	Barn swallow		
N/A	Buck Island Reservoir	Beaver		
10/21/02	Chili Bar Reach	Belted kingfisher	Several	
06/19/03	Loon Lake	Belted kingfisher	1	
07/28/03	Union Valley Reservoir	Belted kingfisher	4	
07/10/02	Jaybird Springs Road	Black bear	1	Approximately 1 year old near Jaybird Tunnel Adit
04/08/03	Gerle Creek Canal	Black bear		Tracks in snow appear to enter and exit canal
04/09/03	Union Valley Reservoir	Black bear		Tracks on shoreline near Camino Cove
N/A	Lower Transmission Line	Black phoebe		
05/15/02	Jaybird Springs Road	Black-headed grosbeak		
05/13/03	Iowa Hill	Black-headed grosbeak		
04/09/03	Peavine Ridge Road	Black-tailed hare	1	
05/15/02	Jaybird Springs Road	Black-throated gray warbler		

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
05/13/03	Iowa Hill	Black-throated gray warbler		
05/15/02	Jaybird Springs Road	Blue grouse	1	
07/09/02	Union Valley Reservoir	Blue grouse		
06/17/02	Union Valley Reservoir	Blue-winged teal	2	Male-female pair
05/06/03	Union Valley Reservoir	Blue-winged teal	2	Probable pair
07/17/03	Ice House Road	Bobcat	1	Crossing road near Robbs Resort
04/09/03	Union Valley Reservoir	Bonaparte's gull	3	1 in adult plumage
Various	Various	Brazilian free-tailed bat		See Technical Report on Bats
06/10/02	Various	Brewer's blackbird		
06/19/02	Gerle Creek Reservoir	Brewer's blackbird		
07/09/02	Union Valley Reservoir	Brewer's blackbird		
07/28/03	Union Valley Reservoir	Brewer's blackbird		
06/13/02	Various	Brown creeper		
06/20/02	Union Valley Reservoir	Brown creeper		
07/08/02	Various	Brown creeper		
07/09/02	Union Valley Reservoir	Brown creeper		
06/12/02	Various	Brown-headed cowbird	1	Wench Creek Campground
06/19/02	Gerle Creek Reservoir	Brown-headed cowbird	1	
06/03/03	Gerle Creek Reservoir	Brown-headed cowbird	2	
05/14/02	Gerle Creek Reservoir	Bufflehead	2	
05/29/02	Bufflehead Pond	Bufflehead	2	2 males
06/11/02	Bufflehead Pond	Bufflehead	1	1 male
06/13/02	Ice House Reservoir	Bufflehead	3	1 male, 2 females
06/18/02	Bufflehead Pond	Bufflehead	2	2 females
07/16/02	Bufflehead Pond	Bufflehead	2	Females
10/28/02	Gerle Creek Reservoir	Bufflehead	6	1 male, 5 females
11/04/02	Gerle Creek Reservoir	Bufflehead	4	2 males, 2 females
11/18/02	Gerle Creek Reservoir	Bufflehead	3	Females
02/04/03	Ice House Reservoir	Bufflehead	6	
02/04/03	Union Valley Reservoir	Bufflehead	10	5 in Jones Fk; 4 m. & 1 f. in Cam. Cove. In courtship flight
02/06/03	Union Valley Reservoir	Bufflehead	Several	
03/26/03	Gerle Creek Reservoir	Bufflehead	4	Courtship flight with 3 males

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
03/26/03	Union Valley Reservoir	Bufflehead	2	Male-female pair at Fashoda Beach
03/27/03	Union Valley Reservoir	Bufflehead	2	Male-female pair
04/08/03	Gerle Creek Reservoir	Bufflehead	20+	About equal numbers of both sexes and some pairs
04/08/03	Loon Lake	Bufflehead	Several	
04/09/03	Union Valley Reservoir	Bufflehead	13	
04/22/03	Gerle Creek Reservoir	Bufflehead	7	3 males, 4 females
05/06/03	Union Valley Reservoir	Bufflehead	6	4 males, 2 females
05/07/03	Wood Duck Pond	Bufflehead	1	Male
05/07/03	Gerle Creek Reservoir	Bufflehead	4	Pairs
05/20/03	Loon Lake	Bufflehead	9	4 males, 5 females
05/21/03	Loon Lake	Bufflehead	4	
05/21/03	Gerle Creek Reservoir	Bufflehead	4	2 pairs with males in post-breeding plumage
06/03/03	Bufflehead Pond	Bufflehead	2	Males
06/03/03	Gerle Creek Reservoir	Bufflehead	1	Male
10/07/03	Union Valley Reservoir	Bufflehead	2	
05/14/02	Robbs Powerhouse	California ground squirrel		
10/28/02	Ice House Road	California ground squirrel	1	Road kills
11/18/02	Ice House Road	California ground squirrel		
02/04/03	Ice House Reservoir	California gull	1	
Various	Various	California myotis		See Technical Report on Bats
Various	Lower Transmission Line	California quail		
Various	Various	California spotted owl		See Report on California spotted owl
05/14/02	Gerle Creek Reservoir	Canada goose	3	Including 1 gosling
05/14/02	Gerle Canal	Canada goose	1	Swimmin in canal. Tracks on levee.
05/29/02	Union Valley Reservoir	Canada goose	Approx. 60	Camino cove
06/11/02	Union Valley Reservoir	Canada goose	110-120	Grazing in shallow water at Camino Cove
06/11/02	Gerle Creek Reservoir	Canada goose		Scat along Gerle Canal
06/12/02	Union Valley Reservoir	Canada goose	65	Granlee's Point Cove
06/17/02	Union Valley Reservoir	Canada goose	320	Including 1 gosling
06/19/02	Gerle Creek Reservoir	Canada goose	3	2 adults with 1 gosling
07/09/02	Union Valley Reservoir	Canada goose	60-70	Adults feeding in meadow east of Camino Cove CG
03/26/03	Gerle Creek Reservoir	Canada goose	5	

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
03/27/03	Union Valley Reservoir	Canada goose	5	2 pairs and a single
04/08/03	Gerle Creek Reservoir	Canada goose	8	
04/08/03	Ice House Reservoir	Canada goose	1	
04/09/03	Union Valley Reservoir	Canada goose	22+/-	Scattered around north shore coves
04/22/03	Gerle Creek Reservoir	Canada goose	Several	Heard only
05/06/03	Union Valley Reservoir	Canada goose	62	Mostly pairs around Camino Cove
05/07/03	Gerle Canal	Canada goose	2	Pair
05/07/03	Loon Lake	Canada goose	2	
05/07/03	Ice House Reservoir	Canada goose	2	
05/20/03	Loon Lake	Canada goose	10	8 in Pleasant arm
05/21/03	Loon Lake	Canada goose	2	
05/21/03	Gerle Creek Reservoir	Canada goose	4	2 pair
06/17/03	Union Valley Reservoir	Canada goose	303	
06/17/03	Ice House Reservoir	Canada goose	36	Including 5 goslings
06/19/03	Loon Lake	Canada goose	53	Including 1 gosling
06/19/03	Gerle Creek Reservoir	Canada goose	4	Adults being fed by campers
07/28/03	Union Valley Reservoir	Canada goose	80	
07/28/03	Ice House Reservoir	Canada goose	24	Including 4 YOY
07/29/03	Loon Lake	Canada goose	26	
10/07/03	Union Valley Reservoir	Canada goose	40	One with black on white neck collar #2/38
05/15/02	Jaybird Springs Road	Canyon wren	1	
05/14/02	Robbs Powerhouse	Cassins finch	4	Non-breeding plumage
09/23/02	Ice House Road	Chipmunk sp		Road kills
11/18/02	Ice House Road	Chipmunk sp		
06/20/02	Union Valley Reservoir	Chipping sparrow		
07/08/02	Various	Chipping sparrow		
07/09/02	Union Valley Reservoir	Chipping sparrow		
05/06/03	Peavine Ridge Road	Chipping sparrow		
07/28/03	Union Valley Reservoir	Chipping sparrow		
06/17/03	Union Valley Reservoir	Cinnamon teal	2	Pair in cove east of Camino Cove
05/15/02	Jaybird Springs Road	Cliff swallow		
05/15/02	White Rock Powerhouse	Cliff swallow		Nesting beneath crane facility

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
07/10/02	Jaybird Springs Road	Common bushtit		
02/04/03	Ice House Reservoir	Common goldeneye	1	
03/26/03	Gerle Creek Reservoir	Common goldeneye	3	Females
12/30/02	Union Valley Reservoir	Common loon	1	
05/07/03	Loon Lake	Common loon	1	
05/07/03	Ice House Reservoir	Common loon	1	
05/14/02	Gerle Creek Reservoir	Common merganser	30-50	
06/11/02	Union Valley Reservoir	Common merganser	10	1 female with 9 YOY
06/13/02	Ice House Reservoir	Common merganser	2	2 females near dam
06/17/02	Union Valley Reservoir	Common merganser	9	Including 8 YOY
06/19/02	Gerle Creek Reservoir	Common merganser	10	1 female with 9 YOY
06/26/02	Rubicon Reservoir	Common merganser		
09/16/02	Gerle Creek Reservoir	Common merganser	6	
09/23/02	Gerle Creek Reservoir	Common merganser	2	
10/01/02	Union Valley Reservoir	Common merganser	4	
10/01/02	Loon Lake	Common merganser	4	
10/28/02	Loon Lake	Common merganser	2	Male-female pair
11/04/02	Loon Lake	Common merganser	2	Male-female pair
11/11/02	Loon Lake	Common merganser	2	Males
11/11/02	Gerle Creek Reservoir	Common merganser	2	Males
11/18/02	Gerle Creek Reservoir	Common merganser	1	Female perched on log boom then flew to north end
11/18/02	Ice House Reservoir	Common merganser	4	Males
12/30/02	Gerle Creek Reservoir	Common merganser	1	Male
12/30/02	Union Valley Reservoir	Common merganser	1	Female
02/04/03	Ice House Reservoir	Common merganser	1	Male
02/04/03	Union Valley Reservoir	Common merganser	5	Females
02/06/03	Union Valley Reservoir	Common merganser	Several	
03/26/03	Gerle Creek Reservoir	Common merganser	2	Females
04/08/03	Loon Lake	Common merganser	2	
04/08/03	Ice House Reservoir	Common merganser	2	
04/09/03	Union Valley Reservoir	Common merganser	8	Scattered around north shore coves
05/06/03	Union Valley Reservoir	Common merganser	4	

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
05/07/03	Loon Lake	Common merganser	3	
05/20/03	Loon Lake	Common merganser	10	5 males, 5 females
05/21/03	Loon Lake	Common merganser	2	
06/03/03	Gerle Creek Reservoir	Common merganser	1	Female
06/17/03	Union Valley Reservoir	Common merganser	2	Females
06/17/03	Ice House Reservoir	Common merganser	11	
06/19/03	Loon Lake	Common merganser	11	
07/17/03	Gerle Creek Canal	Common merganser	7	1 female with 6 YOY about 300 yards n. of Forebay
07/28/03	Union Valley Reservoir	Common merganser	16	Including 10 YOY
07/28/03	Ice House Reservoir	Common merganser	19	Including 15 YOY
07/29/03	Loon Lake	Common merganser	52	Including 31-32 YOY
10/07/03	Union Valley Reservoir	Common merganser	8	
11/25/03	Union Valley Reservoir	Common merganser	3	
N/A	Rubicon Reservoir	Common nighthawk		
06/03/03	Loon Lake	Common poorwill	1	
05/14/02	Ice House Road	Common raven		
06/10/02	Various	Common raven		
06/11/02	Various	Common raven		
06/12/02	Various	Common raven		
06/13/02	Various	Common raven		
07/08/02	Various	Common raven		
07/09/02	Union Valley Reservoir	Common raven		
04/08/03	Ice House Road	Common raven		
04/09/03	Union Valley Reservoir	Common raven		
05/06/03	Peavine Ridge Road	Common raven		
05/13/03	Iowa Hill	Common raven		
07/28/03	Union Valley Reservoir	Common raven		
10/22/03	Iowa Hill	Common raven	20	
09/23/02	Gerle Creek Reservoir	Cooper's hawk	1	
09/30/02	Gerle Creek Reservoir	Cooper's hawk	1	
07/09/02	Union Valley Reservoir	Coyote		
07/10/02	Union Valley Reservoir	Coyote	1	

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
10/07/02	Union Valley Reservoir	Coyote	1	
11/11/02	Ice House Road	Coyote		Tracks
05/15/02	Jaybird Springs Road	Dark-eyed junco		
06/10/02	Various	Dark-eyed junco		
06/12/02	Various	Dark-eyed junco		
06/13/02	Various	Dark-eyed junco		
06/20/02	Union Valley Reservoir	Dark-eyed junco		
07/08/02	Various	Dark-eyed junco		
07/09/02	Union Valley Reservoir	Dark-eyed junco		Nest with young in meadow east of Camino Cove CG
07/10/02	Jaybird Springs Road	Dark-eyed junco		
05/06/03	Peavine Ridge Road	Dark-eyed junco		
05/13/03	Iowa Hill	Dark-eyed junco		
07/28/03	Union Valley Reservoir	Dark-eyed junco		
10/22/03	Iowa Hill	Dark-eyed junco		
10/01/02	Loon Lake	Double-crested cormorant	1	
06/20/02	Union Valley Reservoir	Douglas squirrel		
07/08/02	Various	Douglas squirrel		
07/09/02	Union Valley Reservoir	Douglas squirrel		
09/03/02	Ice House Road	Douglas squirrel		Road kills
09/09/02	Ice House Road	Douglas squirrel		Road kills
10/14/02	Ice House Road	Douglas squirrel	2	Road kills
10/28/02	Ice House Road	Douglas squirrel	2	Road kills
11/18/02	Ice House Road	Douglas squirrel		
04/08/03	Ice House Road	Douglas squirrel	1	
11/25/03	Union Valley Reservoir	Douglas squirrel		
11/18/02	Loon Lake	Duck sp.	12	Too distant to identify but probably Common mergansers
02/06/03	Union Valley Reservoir	Eared grebe	1	
04/09/03	Union Valley Reservoir	Eared grebe	3	Non-breeding plumage
10/07/03	Union Valley Reservoir	Eared grebe	1	
Various	Lower Transmission Line	European starling		
Various	Union Valley Reservoir	Flammulated owl		
06/10/02	Various	Fox sparrow		

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
07/09/02	Union Valley Reservoir	Fox sparrow		
Various	Various	Fringed myotis		See Technical Report on Bats
N/A	Ice House Road	Golden eagle		
06/12/02	Various	Golden-crowned kinglet		
06/13/02	Various	Golden-crowned kinglet		
06/14/02	Jaybird Springs Road	Golden-crowned kinglet		
Various	Ice House Road	Golden-mantled ground squirrel		
06/14/02	Jaybird Springs Road	Gray fox		
05/24/01	South Fork Silver Creek	Great blue heron	1	Observed during helicopter reconnaisance
06/17/02	Union Valley Reservoir	Great blue heron	1	Camino cove
10/01/02	Union Valley Reservoir	Great blue heron	1	
10/21/02	Chili Bar Reach	Great blue heron	Several	
06/17/03	Union Valley Reservoir	Great blue heron	1	
07/28/03	Union Valley Reservoir	Great blue heron	4	
07/28/03	Ice House Reservoir	Great blue heron	3	On south shore
07/29/03	Loon Lake	Great blue heron	1	Pleasant area
11/25/03	Union Valley Reservoir	Great blue heron	1	
Various	Jaybird Springs Road	Great horned owl		
09/30/02	Loon Lake	Grebe sp.	1	Probably eared grebe
10/01/02	Union Valley Reservoir	Green heron	1	
06/12/02	Road 12N0XA	Hairy woodpecker		
07/09/02	Union Valley Reservoir	Hairy woodpecker		
06/10/02	Various	Hammond's flycatcher		
N/A	Lower Transmission Line	Hermit thrush		
06/20/02	Union Valley Reservoir	Hermit warbler		
Various	Lower Transmission Line	House finch		
05/06/03	Union Valley Reservoir	Killdeer		
06/19/03	Loon Lake	Killdeer	1	
05/14/02	Gerle Creek Reservoir	Kinglet sp.		
06/11/02	Various	Kinglet sp.		
06/12/02	Various	Kinglet sp.		
06/20/02	Union Valley Reservoir	Kinglet sp.		

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
07/08/02	Various	Kinglet sp.		
07/09/02	Union Valley Reservoir	Kinglet sp.		
04/09/03	Union Valley Reservoir	Lesser scaup	1	Jones Fork arm
06/12/02	Various	Lewis' woodpecker		
06/19/02	Gerle Creek Reservoir	MacGillvray's warbler		
06/20/02	Union Valley Reservoir	MacGillvray's warbler		
06/11/02	Union Valley Reservoir	Mallard		Several in eclipse plumage
06/17/02	Union Valley Reservoir	Mallard	25	Including 18 YOY
06/18/02	Bufflehead Pond	Mallard	1	female
09/09/02	Bufflehead Pond	Mallard	2	1 male - 1 female
10/07/02	Union Valley Reservoir	Mallard	1	Camino cove
03/27/03	Union Valley Reservoir	Mallard	13	Flying low over water
04/08/03	Ice House Reservoir	Mallard	1	Male
04/09/03	Union Valley Reservoir	Mallard	36	Many pairs and at least one flock of 27 flying
04/22/03	Wood Duck Pond	Mallard	6	3 pairs
05/06/03	Union Valley Reservoir	Mallard	23	
05/20/03	Loon Lake	Mallard	2	Pair
05/21/03	Loon Lake	Mallard	2	
06/17/03	Union Valley Reservoir	Mallard	46	Including 25 YOY
06/17/03	Ice House Reservoir	Mallard	3	
07/28/03	Union Valley Reservoir	Mallard	39	Including 15 YOY
10/07/03	Union Valley Reservoir	Mallard	7	
06/13/02	Various	Mountain bluebird		
05/14/02	Gerle Creek Reservoir	Mountain chickadee		
06/11/02	Various	Mountain chickadee		
06/12/02	Various	Mountain chickadee		
06/20/02	Union Valley Reservoir	Mountain chickadee		
07/08/02	Various	Mountain chickadee		
N/A	Union Valley Reservoir	Mountain lion		Tracks
06/10/02	Various	Mountain quail		
06/11/02	Various	Mountain quail		
06/12/02	Road 12N0XA	Mountain quail		

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
06/13/02	Various	Mountain quail		
10/22/03	Iowa Hill	Mountain quail		
06/13/02	Various	Mourning dove		
06/14/02	Jaybird Springs Road	Mourning dove		
05/06/03	Peavine Ridge Road	Mourning dove		
09/09/02	Ice House Road	Mule deer		Adult crossed road 0.2 mi east of Loon Lake dump station
11/25/02	Highway 50	Mule deer	6	Road kills at lower elevations including many bucks
03/26/03	Peavine Ridge Road	Mule deer	2	Young deer
04/09/03	Ice House Road	Mule deer	4	Cleveland Corral
05/06/03	Peavine Ridge Road	Mule deer	5	At least 1 small buck
07/17/03	Ice House Road	Mule deer	1	Road kill. Small buck with 2-in antlers in velvet
10/22/03	Iowa Hill	Mule deer	1	3-point buck near edge of clear-cut on NE side of area
06/13/02	Various	Nashville warbler		
06/14/02	Various	Nashville warbler		
05/13/03	Iowa Hill	Nashville warbler		
06/10/02	Various	Northern flicker		
06/12/02	Road 12N0XA	Northern flicker		
06/13/02	Various	Northern flicker		
06/20/02	Union Valley Reservoir	Northern flicker		
07/09/02	Union Valley Reservoir	Northern flicker		
05/06/03	Peavine Ridge Road	Northern flicker		
05/13/03	Iowa Hill	Northern flicker		
10/22/03	Iowa Hill	Northern flicker		
07/15/03	Jaybird Springs Road	Northern goshawk	1	Responded to broadcast call
N/A	Lower Transmission Line	Northern harrier		
N/A	Lower Transmission Line	Northern mockingbird		
N/A	Lower Transmission Line	Northern pocket gopher		
N/A	Lower Transmission Line	Oak titmouse		
05/14/02	Gerle Creek Reservoir	Olive-sided flycatcher	1	
06/11/02	Various	Orange-crowned warbler		
06/20/02	Union Valley Reservoir	Orange-crowned warbler		
05/14/02	Jones Fork Powerhouse	Osprey		Active nest about 150-200 m east of powerhouse

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
06/12/02	Jones Fork Powerhouse	Osprey		Incubating
06/12/02	Road 12N0XA	Osprey	2	Nests near Ice House Road and near end of road
06/13/02	Ice House Reservoir	Osprey	4	Active nest at southeast arm of reservoir
06/17/02	Union Valley Reservoir	Osprey	2	Nest located between Jones Fk and Lone Rock CG
06/17/02	Union Valley Reservoir	Osprey	2	Nest in Dam Grove
06/26/02	Loon Lake	Osprey	1	
07/06/02	Loon Lake	Osprey	2	Near Pleasant CG
07/15/02	Loon Lake	Osprey	1	Foraging near PH and flying westward with fish
03/26/03	Big Hill	Osprey	1	Flying over big hill to the northeast
04/08/03	Ice House Reservoir	Osprey	2	
04/09/03	Union Valley Reservoir	Osprey	3	Pair in Jones Fork arm and 1 on Ice House Rd. nest
05/06/03	Union Valley Reservoir	Osprey	4	Nests at various locations
05/07/03	Ice House Reservoir	Osprey	1	Foraging
05/07/03	Ice House Road	Osprey	2	Adding sticks to nest near road
05/20/03	Loon Lake	Osprey	1	Foraging
05/21/03	Gerle Creek Reservoir	Osprey	1	Flying high overhead
06/03/03	Loon Lake	Osprey	1	Carrying fish westward near aux. Boat ramp
06/05/03	Union Valley Reservoir	Osprey	1	Incubating on nest along south shore in burn area
06/17/03	Union Valley Reservoir	Osprey	2	
06/17/03	Ice House Reservoir	Osprey	2	Incubating
06/19/03	Loon Lake	Osprey	1	
06/24/03	Slab Creek Reservoir	Osprey	1	
07/14/03	Union Valley Reservoir	Osprey	Several	Nests active
07/17/03	Union Valley Reservoir	Osprey	3	Ad. Feeding 2 young on south side of reservoir
07/28/03	Union Valley Reservoir	Osprey	Several	Nestlings in at least 2 nests
07/28/03	Ice House Reservoir	Osprey	2	On nest
07/29/03	Loon Lake	Osprey		
06/14/02	Jaybird Springs Road	Pacific-slope flycatcher		
07/10/02	Jaybird Springs Road	Pacific-slope flycatcher		
04/09/03	Union Valley Reservoir	Pied-billed grebe	2	South shore near burn area and Sunset beach
10/07/03	Union Valley Reservoir	Pied-billed grebe	1	
06/11/02	Gerle Dam Access Road	Pileated woodpecker	1	Responded in agitated manner to goshawk call

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
07/10/02	Jaybird Springs Road	Pileated woodpecker		
10/28/02	Union Valley Reservoir	Pileated woodpecker	1	
12/30/02	Ice House Road	Pileated woodpecker	1	Near Big Creek CG
06/04/03	Jaybird Springs Road	Pileated woodpecker	1	
06/18/02	Wentworth Springs	Pine grosbeak	Several	
05/15/02	White Rock Powerhouse	Pygmy owl		Heard only
07/28/03	Union Valley Reservoir	Raccoon		Tracks
N/A	Union Valley Reservoir	Red crossbill		
05/14/02	Gerle Creek Reservoir	Red-breasted nuthatch		
06/11/02	Various	Red-breasted nuthatch		
06/20/02	Union Valley Reservoir	Red-breasted nuthatch		
07/09/02	Union Valley Reservoir	Red-breasted nuthatch		
04/08/03	Ice House Road	Red-breasted nuthatch		
04/09/03	Union Valley Reservoir	Red-breasted nuthatch	1	
11/25/03	Union Valley Reservoir	Red-breasted nuthatch		
N/A	Ice House Road	Red-breasted sapsucker		
N/A	Lower Transmission Line	Red-shouldered hawk		
06/11/02	Gerle Canal	Red-tailed hawk	2	Soaring above canal
06/17/02	Union Valley Reservoir	Red-tailed hawk	1	
07/09/02	Union Valley Reservoir	Red-tailed hawk		
12/30/02	Union Valley Reservoir	Red-tailed hawk	1	Perched on dam
02/14/03	Union Valley Reservoir	Red-tailed hawk	1	
04/09/03	Union Valley Reservoir	Red-tailed hawk	1	Near Robbs Peak PH
05/06/03	Union Valley Reservoir	Red-tailed hawk	4	Juvenile near osprey nest in Dam Grove; 1 ad. In Camino
07/28/03	Union Valley Reservoir	Red-tailed hawk		
07/09/02	Union Valley Reservoir	Red-winged blackbird		
10/28/02	Loon Lake	Ringed-bill gull	1	
05/14/02	Gerle Creek Reservoir	Ring-necked duck	2	
11/11/02	Highway 50	Ringtail	1	Road kill on Hwy 50 1.7 miles west of Fresh Pond
N/A	South Fork American River	River otter		
05/15/02	Camino Powerhouse	Rough-winged swallow		
N/A	Union Valley Reservoir	Ruby-crowned kinglet		

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
06/11/02	Gerle Creek Reservoir	Ruddy duck	2	Male-female pair
10/14/02	Gerle Creek Reservoir	Ruddy duck	1	female
06/12/02	Various	Scrub jay		Ice House Road near Hwy 50
06/11/02	Gerle Canal	Sharp-shinned hawk	2	Soaring above canal
02/04/03	Ice House Road	Snowshoe hare	1	Near cleveland corral
03/27/03	Union Valley Reservoir	Snowshoe hare	1	On road between Camino Cove and Wolf Creek CG
06/05/03	Union Valley Reservoir	Snowshoe hare	1	In transitional pelage - brown w/white feet and tail
06/13/02	Silver Creek	Song sparrow	Several	Sparrows in streamside meadow below Ice House Dam
06/20/02	Union Valley Reservoir	Song sparrow		
06/19/02	Gerle Creek Reservoir	Spotted sandpiper	1	
06/17/03	Union Valley Reservoir	Spotted sandpiper		
07/28/03	Ice House Reservoir	Spotted sandpiper	2	In southeast arm
07/29/03	Loon Lake	Spotted sandpiper	4	
05/15/02	Jaybird Springs Road	Spotted towhee		
05/14/02	Gerle Creek Reservoir	Steller's jay		
06/10/02	Various	Steller's jay		
06/11/02	Various	Steller's jay		
06/12/02	Various	Steller's jay		
06/13/02	Various	Steller's jay		
06/20/02	Union Valley Reservoir	Steller's jay		
07/08/02	Various	Steller's jay		
07/09/02	Union Valley Reservoir	Steller's jay		
04/08/03	Ice House Road	Steller's jay		
05/06/03	Peavine Ridge Road	Steller's jay		
05/13/03	Iowa Hill	Steller's jay		
07/28/03	Union Valley Reservoir	Steller's jay		
N/A	Lower Transmission Line	Striped skunk		
06/12/02	Road 12N0XA	Townsend's solitaire		
11/18/02	Ice House Road	Townsend's solitaire	1	On Loon Lake Road
02/04/03	Union Valley Reservoir	Tundra swans	3	Flying over reservoir
06/10/02	Various	Turkey vulture		
06/11/02	Various	Turkey vulture		

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
06/12/02	Various	Turkey vulture		
05/06/03	Peavine Ridge Road	Turkey vulture		
N/A	White Rock Powerhouse	Violet-green swallow		
11/18/02	Ice House Road	Western bluebird	10	On Loon Lake Road
07/08/02	Various	Western gray squirrel		
09/03/02	Ice House Road	Western gray squirrel		Road kills
09/23/02	Ice House Road	Western gray squirrel		Road kills
10/28/02	Ice House Road	Western gray squirrel	1	Road kills
05/13/03	Iowa Hill	Western gray squirrel		
11/25/03	Union Valley Reservoir	Western gray squirrel		
03/06/03	Union Valley Reservoir	Western grebe	2	
05/15/02	White Rock Powerhouse	Western kingbird		
Various	Lower Transmission Line	Western meadowlark		
Various	Various	Western screech owl		
05/15/02	Jaybird Springs Road	Western tanager		
06/11/02	Various	Western tanager		
06/20/02	Union Valley Reservoir	Western tanager		
07/08/02	Various	Western tanager		
05/13/03	Iowa Hill	Western tanager		
06/19/03	Bufflehead Pond	Western tanager	1	
05/13/03	Iowa Hill	White-breasted nuthatch		
06/19/03	Bufflehead Pond	White-breasted nuthatch	1	
Various	Loon Lake	White-crowned sparrow		
06/11/02	Various	White-headed woodpecker		
06/12/02	Wench Creek Campground	White-headed woodpecker		Nesting in Campground sign
07/08/02	Various	White-headed woodpecker		
Various	Lower Transmission Line	White-tailed kite		
07/09/02	Union Valley Reservoir	Wild turkey		
06/13/02	Various	Williamson's sapsucker		
06/13/02	Various	Wilson's warbler		
06/20/02	Union Valley Reservoir	Wilson's warbler		
11/25/02	Union Valley Tunnel Adit	Winter wren	1	

APPENDIX D. INCIDENTAL OBSERVATIONS OF 140 +/- BIRDS AND MAMMALS DURING UARP RELICENSING STUDIES, 2002-2003

Date (YR-MO-DY)	General Location	Species	Number Seen	Comments
04/22/03	Wood Duck Pond	Wood duck	2	Male-female pair
05/07/03	Wood Duck Pond	Wood duck	2	Male-female pair
05/21/03	Wood Duck Pond	Wood duck	2	Pair
06/05/03	Junction Reservoir	Wood duck	1	Male in non-breeding plumage
07/09/02	Union Valley Reservoir	Yellow-headed blackbird		
05/14/02	Gerle Creek Reservoir	Yellow-rumped warbler		
05/15/02	Jaybird Springs Road	Yellow-rumped warbler		
06/12/02	Various	Yellow-rumped warbler		
06/13/02	Various	Yellow-rumped warbler		
06/20/02	Union Valley Reservoir	Yellow-rumped warbler		
07/09/02	Union Valley Reservoir	Yellow-rumped warbler		
05/06/03	Peavine Ridge Road	Yellow-rumped warbler		
Various	Various	Yuma myotis		