REPORT

GEOTECHNICAL AND GEOLOGIC HAZARDS INVESTIGATION MOUNTAIN SPRINGS GRADE AREA SUNRISE POWERLINK SOUTHERN ROUTE SAN DIEGO AND IMPERIAL COUNTIES, CALIFORNIA

PREPARED FOR:

SARGENT & LUNDY ENGINEERS, LTD.

URS PROJECT NO. 27668031.00030

JUNE 30, 2009

R E P O R T

GEOTECHNICAL AND GEOLOGIC HAZARDS INVESTIGATION MOUNTAIN SPRINGS GRADE AREA SUNRISE POWERLINK SOUTHERN ROUTE SAN DIEGO AND IMPERIAL COUNTIES, CALIFORNIA

Prepared for

Sargent & Lundy Engineers, Ltd.
Mr. Brian Wood
55 East Monroe Street
Chicago, IL 60603-5780

URS Project No. 27668031.00030

June 30, 2009

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
619.294.9400 Fax: 619.293.7920

URS

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Mr. Brian Wood
Sargent & Lundy Engineers, Ltd.
55 East Monroe Street
Chicago, IL 60603-5780

Subject: Geotechnical and Geologic Hazards Investigation
Mountain Springs Grade Area
Sunrise Powerlink Southern Route
San Diego and Imperial Counties, California
URS Project No. 27668031.00030

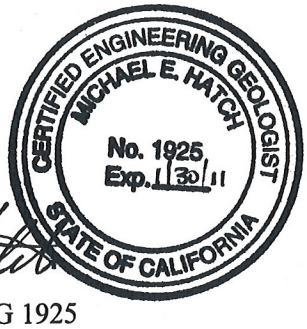
Dear Mr. Wood:

URS Corporation Americas (URS) is pleased to present this Geotechnical and Geologic Hazards report to support the proposed Sunrise Powerlink Southern Route. Our work is intended to assist Sargent & Lundy Engineers, Ltd. (Sargent & Lundy), San Diego Gas & Electric (SDG&E) and their consultants with project planning and design.

The results of our investigation indicate that the project is not impacted by geologic hazards or geotechnical issues that cannot be mitigated by design and construction. If you have any questions regarding this report, please contact us.

Sincerely,

URS CORPORATION



Michael E. Hatch, C.E.G 1925
Principal Engineering Geologist

Jennifer L. Nevius, G.E. 2825
Project Geotechnical Engineer

MEH/JLN:ml

URS Corporation
1615 Murray Canyon Road
Suite 1000
San Diego, CA 92108
Tel: 619.294.9400
Fax: 619.293.7920

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CGS	California Geological Survey
CUFAD	Compression Uplift Foundation Analysis and Design
EPRI	Electric Power Research Institute
ft/sec	feet per second
g	Gravity or gravitational acceleration
GIS	Geographic Information Systems
Klp	Granitic Rocks of the LaPosta Pluton
km	kilometers
kV	kilovolts
m	meters
M_L	Richter or local magnitude
mm/yr	millimeters/year
MSL	Mean Sea Level
Mw	Moment Magnitude
MzPzm	Rocks of Jacumba Mountains
PGA	peak ground acceleration
Qal	Alluvium and Older Alluvium
Qt/f	Older Alluvium/Fan or Talus Deposits
Sargetn & Lundy	Sargent & Lundy Engineers, Ltd.
SCEC	Southern California Earthquake Center
SDG&E	San Diego Gas & Electric
SWPL	Southwest Powerlink 500 kV Transmission Line
Tj	Volcanic Rocks
USCS	Unified Soil Classification System
USGS	United States Geological Survey

SECTION 1 INTRODUCTION

1.1 BACKGROUND AND PROJECT DESCRIPTION

The Southern Route alignment for the Sunrise Powerlink Project is a proposed 230/500 kilovolt (kV) transmission line that would extend from the San Diego Gas & Electric (SDG&E) Sycamore Substation eastward to the SDG&E Imperial Valley Substation. Figure 1 presents a vicinity map that includes the locations of the various project elements and identifies the Mountain Springs Grade area.

The western portion of the proposed route would be a 230kV transmission line beginning at Sycamore Substation and extending to the proposed Suncrest Substation located east of Alpine and south of Interstate 8 in the Bell Bluff area. From the Suncrest Substation, a 500 kV transmission line would extend eastward, crossing Interstate 8 twice between the Suncrest Substation and the Jacumba area. From the Jacumba area eastward, the proposed route generally parallels the existing Southwest Powerlink 500 kV Transmission Line (SWPL) to the Imperial Valley Substation. Noteworthy elements of the SWPL parallel alignment include the Mountain Springs Grade area and two Interstate 8 crossings. Mountain Springs Grade represents a steeply descending transition from the Peninsular Ranges to the desert floor.

Mountain Springs Grade extends from an elevation of approximately 3,300 feet Mean Sea Level (MSL) in the In Koh Pah area to about 850 feet MSL at the base of the mountain front. For the purposes of this report, we have considered the project elements that extend from the In Koh Pah area at the top of the grade down to the second Interstate 8 crossing near the desert floor. This includes the eastern portion of transmission line Section 9C and all of Section 10A, incorporating proposed Structures P255 to P281.

1.2 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to provide geotechnical design information and geologic hazard evaluations to assist with project planning and engineering design of tower foundations. The scope of our work included site reconnaissance, terrain analysis based on interpretations of available imagery, review of in-house and published sources of information, review of previous geotechnical investigations for the SWPL transmission line, review of as-built information from SDG&E files, and preparation of this report. No subsurface investigations were performed for this scope of work.

SECTION 2 AVAILABLE INFORMATION

This section summarizes the available information reviewed to develop the conclusions and recommendations presented in this report. The information included published geologic maps, aerial imagery, topographic information, previous geotechnical investigations, and available construction records. Detailed references are presented in Section 6 of this report.

2.1 GEOLOGIC MAPS AND AERIAL IMAGERY

Published geologic maps were used to evaluate the geologic units anticipated at the proposed tower sites. The primary geologic mapping performed by Kennedy and Tan (2005) was used as the base for the Site Plan and Generalized Geologic Maps (Figures 2a and 2b). Figure 2c presents a Key to Geologic Maps. Table 1 presents a summary of the tower site geology. Aerial imagery used included digital information from Google Earth Pro and historic stereographic aerial photographs.

2.2 GEOTECHNICAL INVESTIGATIONS

Geotechnical investigations performed by URS (formerly Woodward-Clyde Consultants) for the SWPL Transmission Line in 1980, 1981, and 1982 provided information regarding subsurface conditions and foundation design information for this previous project.

The geotechnical investigations performed for the SPWL project along the proposed transmission line in the Mountain Springs Grade area included geologic reconnaissance, seismic refraction traverses, and borings. Information from the borings and seismic refraction traverses is summarized in Table 2.

Figures 2a and 2b present the locations of the seismic refraction traverses and borings performed for the previous investigations. Copies of the seismic refraction traverses and boring logs from these investigations are presented in Appendix A.

2.3 FOUNDATION CONSTRUCTION RECORDS

SDG&E provided construction records from the SWPL tower sites. The records indicate the depth and diameter of each of the four tower foundations, as well as a general description of the subsurface conditions encountered. Information from these foundation construction records is summarized in Table 2 and copies of the pertinent records are presented in Appendix B.

SECTION 3 SITE AND GEOLOGIC CONDITIONS

This section provides an overview of the geologic setting and geologic hazards for the proposed Mountain Springs Grade portion of the Southern Route Sunrise Powerlink project. The Mountain Springs Grade area includes portions of the Southern Route transmission line Section 9C and all of Section 10A. Figure 1 shows the Southern Route and the various transmission line section locations and the approximate location of the Mountain Springs Grade area. Our knowledge of the site conditions has been developed from site reconnaissance, a review of area geology, geologic hazards information and previous investigations. No subsurface investigations have been performed for this portion of the Southern Route.

3.1 PHYSIOGRAPHIC AND GEOLOGIC SETTING

The Mountain Springs Grade area extends from the northeastern edge of Oneill Valley along a notch in mountain front cut by Boulder Creek eastward across a steeply descending mountain front. This mountain front is characterized by extensive boulder outcrops of granitic rock and deeply incised drainages including Boulder Creek and Myer Creek. This is an arid area with sparse desert vegetation. The steep rocky terrain provides habitat for Big Horn Sheep.

The Mountain Springs Grade area represents the transition from the Peninsular Ranges physiographic province to the Colorado Desert physiographic province. The majority of this transmission line segment is underlain by granitic rock of the Peninsular Range batholith. There are minor occurrences of metamorphic rock and some Tertiary-age volcanic rocks and various Quaternary-age alluvial or colluvial deposits. Figures 2a and 2b illustrate the generalized geology along the alignment in this area.

3.2 GENERAL SURFACE AND GEOLOGIC CONDITIONS

As described above, the proposed Sunrise southern route alignment traverses varied terrain and diverse geologic conditions. A brief description of the site and geologic conditions along Mountain Springs Grade follows.

3.2.1 Mountain Springs Grade

Mountain Springs Grade is dominated by the bold outcrop terrain developed within the granitic rocks of the Peninsular Ranges. Alluvial deposits, including valley fill, alluvial fan deposits and rock talus are encountered within the project alignment. The only significant area of alluvial deposits is located at the top of the grade between Structures 255 and 258 as shown on Figure 2a.

The proposed structures in the upper reaches of the grade are underlain entirely by granitic rocks of the La Posta pluton, described below. A small zone of older metamorphic rocks is present within the central portion of the grade as shown on Figure 2b. Structure 272 is located within this rock unit and Structure 273 is underlain by mixed rock conditions in a linear zone of pegmatitic dikes and bands of this older metamorphic rock. The remainder of the central and lower portions of the grade are underlain by the granitic rocks of the La Posta pluton and characterized by the bold relief and bouldery surface expression. At the very bottom of the grade, the alignment crosses a zone of Tertiary-age volcanic rock of the Jacumba Volcanics.

3.3 GEOLOGIC UNITS

The bedrock geologic units and surficial deposits along the alignment in the Mountain Springs Grade area are discussed briefly below starting with the youngest in geologic age to the oldest. The approximate aerial extent of the soil/rock zones and corresponding geologic map symbols are shown on Figures 2a and 2b.

3.3.1 Alluvium and Older Alluvium, (Qal and Qt/f)

Alluvium deposits are present in the upper portion of the Mountain Springs Grade area and locally within some of the drainages crossed within the descending portion of the grade. The composition and strength of these materials are variable depending on the local parent sources, geologic age and mode of deposition. The alluvial deposits include younger alluvium and older alluvium, which includes terrace, fan and talus deposits. The composition of the alluvium or talus typically reflects its granitic source as it contains granitic cobbles and boulders in a silty sand matrix. Clayey sand or sandy clay matrix material may be encountered locally. Coarse-grained alluvial fan deposits that contain very large clastic material may be encountered near the mountain fronts.

Large boulders that result from exfoliation and differential weathering processes are also present at the ground surface throughout much of the area underlain by granitic terrain. Material from the rocky outcrops is subject to some down slope movement; thus, some of the rock at the surface has been transported short distances by gravity.

3.3.2 Volcanic Rocks (Tj)

Minor outcrops of volcanic rock are mapped along the lower slopes of the grade as part of the Jacumba Volcanics geologic unit. This unit contains andesitic flow rocks as well as volcanic tuffs and breccias.

3.3.3 Granitic Rocks of the La Posta Pluton (Klp)

Cretaceous-age granitic rocks of the La Posta pluton dominate the geology of the Mountain Springs Grade. These granitic rocks are light colored and of felsic and intermediate compositions (*e.g.*, contains a large percentage of quartz and feldspar) referred to as granite, granodiorite and tonalite. Relative to shallow excavations and foundation design, the degree of weathering and fracturing, rather than granitic rock composition, has a more significant affect on rock quality and engineering properties. The granitic rock in the Mountain Springs Grade area tends to be pervasively fractured and jointed; hence, the degree of weathering can be highly variable locally.

3.3.4 Metamorphic Rocks

A small body of older metamorphic rocks is present in the central portion of the grade. These are primarily metasedimentary rocks consisting of interlayered quartzite, metasandstone, schist, and phyllite. Smaller bodies and inclusions of metamorphic rocks are present locally within the La Posta plutonic rocks.

3.4 STRUCTURE AND TECTONICS

The current tectonic setting of southern California is controlled by its location within the plate boundary zone between the Pacific and North American tectonic plates. The Pacific plate, which includes the San Diego and western Imperial Valley area, is traveling northwest relative to the North American plate at a rate of about 50 millimeters per year (mm/yr) (deMets *et al.*, 1994). Most of this plate motion is accommodated on a series of strike-slip fault zones that constitute the San Andreas Fault System, which includes the San Andreas, San Jacinto, Elsinore fault zones. This crustal interaction of predominantly dextral (right-slip) faults spans from the Salton Trough across the Peninsular Ranges, and extends west approximately 60 miles offshore into the Continental Borderland Province.

Over geologic time, uplift and tilting of the Peninsular Ranges followed by erosion have resulted in the relatively modest mountainous terrain seen today. Episodic Miocene-aged volcanism developed in parts of the eastern margins of the Peninsular Ranges resulting in localized lava flows and a variety of volcanic deposits, including those traversed by the route in the Jacumba area. This period of volcanic upheaval also resulted in some faulting and fracturing of the older crystalline rocks in the area. Later the rifting of the Gulf of California (Todd *et al.*, 2003) resulted in marine and nonmarine deposits in the Salton Trough, including the Imperial and Palm Springs Formations traversed in Section 10B.

3.4.1 San Andreas Fault System

The San Andreas Fault System is the main component of the transform boundary between the Pacific and North American plates in California. It is about 1,100 kilometers (km) long and links the Mendocino fracture zone and the Cascadia subduction zone in northern California to the spreading center in the Gulf of California. The system is broad and complex in its northern and southern reaches but relatively simple in the central section. The San Andreas fault zone is the easternmost and largest of the faults in the San Andreas Fault System.

In southern California, the San Andreas Fault System comprises a suite of northwest-striking, sub-parallel, right-lateral strike-slip faults that occupy a 200-km-wide swath straddling the coast of southern California. Cumulatively, these faults, which occur both on- and offshore, carry about two-thirds of the total relative plate motion. The primary onshore faults include the San Andreas, San Jacinto, Imperial, and Elsinore faults (Figure 3). The Newport-Inglewood and Rose Canyon fault zones are located west of the aforementioned faults and have both onshore and offshore components. Significant offshore faults include the San Diego Trough and San Clemente fault zones.

3.4.1.1 San Andreas Fault Zone

The southern San Andreas fault zone with its high slip rate generates frequent large earthquakes. Figure 4 presents a Regional Earthquake Epicenter Map showing the distribution of earthquakes in the San Diego and Imperial County areas. The 1857 Mw 7.9 Fort Tejon earthquake was caused by rupture of 360 km of the fault from Parkfield in central California to Cajon Pass. In this event, the amount of slip varied along strike, with about 5 meters (m), 10 m, and 4 m on the Cholame, Carrizo, and Mojave segments, respectively. An estimated $M_w \cong 7$ to 7.5 earthquake in 1812 ruptured the Mojave and northern San Bernardino segments (SCEC, 2008). South of Cajon Pass, paleoseismic evidence indicates that the San

Andreas sustains great earthquakes but also has moderate earthquakes such as the historical 1986 Mw 5.6 North Palm Springs earthquake and the 1948 Mw 6.0 Desert Hot Springs earthquake on the southern branch of the San Andreas fault (Banning fault).

The San Andreas fault zone ends in the Salton Trough, an extensional basin that is the transition between the San Andreas transform system and the Gulf of California spreading center. In the Salton Trough, the slip generated at the spreading center is transferred from the Imperial fault through the Brawley Seismic Zone to the San Andreas fault zone. The Imperial fault links the Salton Trough, the northernmost ridge segment, with the rest of the rift system that continues offshore in the Gulf of California. About 5 of its 20 mm/yr of slip is accommodated by creep, and the rest is released in moderate earthquakes (M 6 to 7). The Imperial fault has experienced two historical surface-rupturing earthquakes in 1940 (Mw 7.1) and 1979 (Mw 6.6) (Sharp *et al.*, 1982). The 1979 event ruptured part of the 1940 rupture. The Brawley Seismic Zone has frequent shallow microseismicity and is prone to seismic swarms.

3.4.1.2 San Jacinto Fault Zone

The 210-km-long San Jacinto fault zone splays from the San Andreas fault near Cajon Pass, (Figure 3) and has the highest slip rate of any fault in southern California besides the San Andreas and Imperial faults. The fault is complex and highly segmented comprising numerous subparallel and en echelon strands separated by up to several kilometers. The San Jacinto fault zone is extremely seismically active and has Mw ≅ 6 earthquakes on average every 10 years (Hutton *et al.*, 1991). Recent historical earthquakes have included the 1968 Mw 6.5 Borrego Mountain, 1987 Mw 6.6 Superstition Hills, and 1954 Mw 6.4 San Jacinto earthquakes (SCEC, 2008).

A southern extension of the San Jacinto has been postulated based on previous investigations in the Salton Trough. The State map sheet includes a very lengthy projection of a buried fault that extends from near the southern end of the Superstition Mountain fault to the US-Mexico border. Subsequent site specific studies on faults in Mexico and in the Imperial Valley as well as regional seismicity studies have lead to the idea of a Cerro Prieto-San Jacinto fault zone. This fault's location is inferred based on seismicity studies and preliminary geomorphic evidence.

3.4.1.3 Elsinore Fault Zone

The Elsinore fault is a 250-km-long right-lateral strike-slip fault that is a significant part of the San Andreas Fault System. It strikes northwest and runs west of the Salton Trough near the Mexican border to Corona where it branches into the Whittier and Chino faults. The central part comprises several segments, separated by step-overs, which include, from north to south, Glen Ivy, Temecula, Julian, and Coyote Mountain segments. The southern end of the Coyote Mountains segment is located approximately 4 miles northeast of the Mountain Springs Grade area. The Laguna Salada fault extends from the southern end of the Elsinore fault into Mexico.

An M_L 6 earthquake in 1910 occurred on the northern end of the Elsinore fault, and its Mexican extension, the Laguna Salada fault, had an estimated Mw 7 earthquake in 1892 (SCEC, 2008 and Petersen and Wesnousky, 1994).

The Elsinore fault zone is the nearest active fault segment to the Mountain Springs Grade area. The slip rate on the Elsinore fault is about 3 to 5 mm/yr (Pinault and Rockwell, 1984; Rockwell and Pinault, 1986). The Coyote Mountain segment has a Holocene slip rate of about 3 mm/yr (WGCEP, 2008). The Julian segment has two strands and a late Quaternary slip rate of 3 to 6 mm/yr based on soil chronostratigraphy (Vaughan and Rockwell, 1986; Petersen and Wesnousky, 1994; Wills *et al.*, 2008). The multi-strand Temecula segment has a minimum late Holocene slip rate of about 2.5 mm/yr along one strand (Wills *et al.*, 2008). Drainage offsets and estimated ages from soil development have yielded an average slip rate of about 5.5 mm/yr for the Glen Ivy segment (Millman and Rockwell, 1986; Wills *et al.*, 2008). The Laguna Salada fault has a right-lateral slip-rate of 2 to 3 mm/yr, with a similar component of dip-slip motion (Mueller and Rockwell, 1995).

Yuha Wells and Jacume Faults

The Yuha Wells fault and the informally named Jacume fault east of the Jacumba area are relatively minor geologic structures located in the western portion of Salton Trough and eastern portion of the Peninsular Ranges, respectively. Both faults appear to be northeasterly striking left lateral faults that are considered secondary features that may accommodate stresses developed between the major northwesterly striking faults.

The Yuha Wells fault consists of a complex zone of short, branching and stepping strands generally located between the northern terminus of the Laguna Salada fault and the southern end of the Elsinore fault (Rockwell, *et al.*, 1990). This fault is located approximately 8 miles east of the Mountain Spring Grade area. There is little published information on this fault.

Similarly, the Jacume fault is a short series of stepping fault traces that appears to be associated with a moderate level of microseismicity and no definitive evidence of recent surface rupture. Neither fault is considered active based on the State of California's review of fault rupture hazard.

SECTION 4 GEOLOGIC HAZARDS

This section addresses potential geologic and seismic hazards in the Mountain Springs Grade area. The primary geologic hazard in this reach is strong ground motion from a seismic event centered on one of several nearby or more distant active faults. Evaluations of major faults crossings, seismic shaking, liquefaction and seismic settlement, landslides, rockfalls and slope stability along the route are discussed below.

4.1 FAULT CROSSINGS

The proposed Mountain Springs Grade portion of the southern route does not cross any active faults. The Elsinore fault zone east of the Mountain Springs Grade area is the nearest active fault located approximately 4 miles northeast of the bottom of Mountain Springs Grade. The proposed transmission line does cross the projection of the Jacume fault between Structures 256 and 257, as shown on Figure 2a. The Jacume fault is considered a potentially active fault for the purposes of this evaluation. There is no evidence of Holocene surface faulting along the Jacume fault and the potential for moderate or large displacement surface rupture of the Jacume fault is judged to be very low.

4.2 SEISMIC SHAKING

Figure 3 presents the peak horizontal ground acceleration (PGA) as a percentage of the acceleration of gravity (g) along the southern route alignment. The hazard level depicted represents the PGA associated with a 10 percent probability of being exceeded in 50 years. The map is derived from seismic hazard curves calculated on a grid of sites across the southwestern United States that describe the frequency of exceeding a set of ground motions within delineated fault sources. The ground motions relate the source characteristics of the earthquake and propagation path of seismic waves through the ground at a particular site or vicinity. The predicted ground motion is typically quantified in terms of a medium value (*i.e.,* a function of magnitude, distance, type of faulting, the geologic or subsurface characteristics, and other factors) and a probability density function of peak horizontal ground acceleration (Peterson *et al.,* USGS 2008). For the Mountain Springs Grade area, the ground motions associated with the 10 percent probability of exceedance in 50 years hazard level range from a PGA of 0.25g to 0.30g as shown on Figure 3.

4.3 LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction and seismic settlement are secondary effects associated with seismic shaking. Liquefaction is a phenomenon in which loose to medium dense, saturated, granular materials undergo matrix rearrangement, develop high pore water pressure, and lose shear strength because of cyclic ground vibrations induced by earthquakes. This rearrangement and strength loss is followed by a reduction in bulk volume of the liquefied soils. The secondary effects of liquefaction can include the loss of bearing capacity below foundations, settlement in level ground, and instability in areas of sloping ground (also known as lateral spreading). Typically, liquefaction effects in granular materials are considered to a depth of 50 feet below ground surface.

Liquefaction is not considered a significant hazard in the Mountain Springs Grade area. Only the western most structures are underlain by alluvial deposits and these are older alluvial fan and very coarse grained talus deposits. This setting is less conducive to liquefaction events of major consequence because of the anticipated depth to water and the tendency for the materials to be only moderately susceptible to liquefaction due to their very coarse-grained nature and relative density.

Seismic settlement results from the densification of granular soils during earthquake-induced shaking in dry or partially saturated soils. The potential for seismic settlement is present in younger alluvial deposits along the alignment and most significant in Jacumba Valley to the west of the Mountain Springs Grade area and in the Imperial Valley to the east of the Mountain Springs Grade area. Seismic settlement is not considered a significant hazard for the Mountain Springs Grade area.

4.4 LANDSLIDES, ROCKFALLS AND DEBRIS FLOWS

Landslides are a significant geologic hazard in southern California. Within San Diego County, the areas of greatest landslide hazard are generally located in the coastal plain area where layered sedimentary deposits contain inherently weak layers that may be exposed by natural erosion or grading activities. When unfavorable geologic and topographic conditions coincide, landsliding may result.

The majority of the Southern Route is underlain by crystalline rocks with minor alluvial deposits and a minor occurrence of sedimentary and layered volcanic rocks in the Jacumba area. Landslides are possible, but relatively rare in the crystalline rock setting. Based on our field reviews and terrain analysis of the route, no landslides were mapped in or adjacent to the transmission line in the Mountain Springs Grade area.

In addition to landslides, areas of intense erosion, debris flows and soil slips, and rock falls occur in areas of sloping terrain in San Diego and Imperial Counties. Areas of intense erosion or recent debris flows or soil slips are evidenced by fresh scarps and slopes barren of vegetation. Given the sparse vegetation and generally very thin soil cover in the Mountain Springs Grade area, the potential for debris flows and soil slips is low. This assessment was supported by our field investigation and terrain analysis for the Mountain Springs Grade area.

Rockfalls occur in areas with bold rock outcrops and steep natural slopes. Additionally, jointed rock may undergo rockfalls if construction slopes were to undercut a rock slope or if subjected to seismic shaking. In general, the rock fall hazard is greatest in areas with slope inclinations in excess of 60 degrees from horizontal. Extensive boulder outcrops and steep slopes are encountered locally along the route within the Mountain Springs Grade area, and rockfalls have occurred in this area during the geologic past. Based on our review of the structure sites, there are no structures located within zones characterized as having a high risk of rock fall hazard. Based on of our field investigations, there are not large, precarious boulders that pose a significant risk to the proposed structure sites. In general, most of the structure sites are located near the upper reaches of slopes or minor ridges and areas of large precarious boulders have not been identified above these proposed structures.

4.5 EXPANSIVE AND COLLAPSIBLE SOILS

The soil conditions observed at the ground surface and in the two previous borings performed for the SWPL transmission line indicate coarse-grained soils. Based on the five seismic refraction surveys for the SWPL transmission line, the coarse-grained surficial soils are underlain by weathered rock at relatively shallow depths.

Changes in moisture can cause shrinkage and swelling of clayey fine grained soils. Collapse can occur in dry soils that have unstable soil structure due to decomposition or irrigation processes, typically with a skeletal structure that is weakly cemented by soluble salts or clays. Increases in moisture content can cause the interparticle cementation to reduce, causing changes in volume (collapse), especially when loaded.

The coarse-grained soils and weathered rock at the tower sites in the Mountain Springs Grade area are not considered to have significant expansion or collapse potential.

SECTION 5 TOWER FOUNDATION RECOMMENDATIONS

The tower foundation recommendations presented in this report are based on information provided to us, review of available information, empirical correlations, engineering and geologic analyses, and professional judgment.

We understand that the proposed tower foundations may consist of four cast-in-place drilled pier or rock anchor foundations. These foundations may be subject to high downward and upward loads, overturning moments, and lateral forces. This report provides preliminary drilled pier foundation design information for each of the tower sites, however, we understand that the rock anchors will be considered for many sites in the Mountain Springs Grade area.

5.1 GENERAL FOUNDATION CONDITIONS

The Site Plan and Generalized Geologic Maps presented on Figures 2a and 2b indicate the primary geologic units observed and mapped along the transmission line corridor. The characteristics of the foundation materials anticipated during construction are based on the geologic conditions described in Section 3 and the results of previous subsurface investigations for the existing SWPL transmission line.

Most of the transmission line within Mountain Springs Grade will encounter variably weathered rock, and predominantly granitic rock, that is highly fractured. In our opinion, these materials should provide sound foundation conditions for the new towers as has been the case for the existing SWPL.

Other conditions that may influence the design of the tower foundations include the inclination of adjacent slopes and the depth of relatively disturbed or weak materials. Disturbed or weak materials may include residual soils, alluvium and slopewash.

5.2 FOUNDATION EXCAVATION CHARACTERISTICS

To provide insight regarding excavation augerability, we have considered the seismic refraction data and boring data at the existing structure sites. Further, we have reviewed the actual pier drilling conditions during construction of the SWPL.

Shafts are expected to be relatively easy to excavate to design depths within alluvial deposits and completely weathered granitic materials. Caving of the drilled holes was noted during construction of the SWPL foundations and is likely in the alluvial deposits. Caving may be exacerbated where perched groundwater is present. In the majority of the new alignment, there may be several feet of surficial material that may slough back into the excavated hole. Such materials should be cased or sloped back to a stable inclination during construction.

In general, we anticipate that many of the locations along the Mountain Springs Grade will encounter fractured rock and that large-diameter rock coring equipment may be more suited for the proposed excavations.

In rock areas that indicate refusal to drilling conditions, it may be required to use controlled blasting techniques or to utilize rock bolted foundations. Blasting should be performed by an experienced and

qualified blasting engineer/contractor familiar with local conditions and pole foundation excavation requirements. All blasting should be performed to minimize overbreakage in the foundation zone. It should be anticipated that blasting will produce excavations with irregular sidewall conditions.

5.3 DRILLED PIER FOUNDATION DESIGN

We understand that the drilled pier foundations will be designed using the Electric Power Research Institute (EPRI) computer program *Compression Uplift Foundation Analysis and Design* (CUFAD). The design soil parameters required to use the CUFAD program include:

- Soil Layer Depths
- Groundwater Depth
- Total Unit Weight
- Friction Angle
- Cohesion
- Horizontal Stress Coefficient
- Surficial Material Discount Depth

Estimates of these parameters were developed based on the results of the previous investigations and construction records, engineering evaluation and analysis, empirical correlation, literature research, and professional judgment.

5.3.1 Soil Layer Depths

Stratigraphic profiles at the proposed tower locations were developed based on the seismic refraction traverses, borings, and foundation construction records from the SWPL tower sites. These profiles are presented in the Interpretive Seismic Velocity Profiles illustrated in Figure 5. We have developed soil and rock design parameter sets using correlations, indirect theoretical elastic methods, and engineering judgment.

5.3.2 Design Groundwater

Based on the geologic setting and the absence of groundwater reported during construction of the SWPL foundations, groundwater is not a foundation design consideration in the Mountain Springs Grade area.

5.3.3 Soil Parameters

The foundation design parameters for soil and rock presented in Table 3 are based on our understanding of the geologic setting and subsurface conditions encountered in previous investigations. The design parameters are intended for use in the CUFAD computer program and may not reflect actual strengths. The structural design should also evaluate the values of displacement required by CUFAD to mobilize tip resistance.

5.3.4 Foundation Design Coefficients

The CUFAD computer program also requires the values of two horizontal stress coefficients 1) the operative/in-situ horizontal stress ratio and 2) the horizontal stress coefficient which converts vertical to horizontal effective stress.

Based on the type of construction anticipated for typical drilled pier construction in the Mountain Springs Grade area including no casing, dense soils, concrete slump of greater than 5 inches, and foundation excavations being left open for greater than 12 hours, we recommend an operative/insitu horizontal stress coefficient of 0.9. We recommend an effective stress horizontal stress coefficient of 0.60 for initial design. We recommend an interface-to-soil friction angle coefficient of 1.0.

5.3.5 Discount of Surficial Materials

We recommend that a depth of surface material be discounted in all cases of the foundation analyses. This recommendation is based on the presumption that the weathered near surface materials inherently have lower strengths with a higher potential for erosion. The recommended depth of surficial material discounting is presented in Table 3. These discount depths do not account for discount depth (or reduction in resistance) due to descending ground adjacent to the tower foundations.

SECTION 6 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

This section presents a discussion of the general impacts to project as a result of geologic and seismic hazards and general recommendations and conclusions regarding geologic and seismic hazards.

6.1 FAULTING CROSSINGS

The project does not cross any active faults and the risk of fault rupture within the Mountain Springs Grade area is considered low. The nearest active fault is the Elsinore fault zone within Section 10A located approximately 4 miles northeast of the Mountain Springs Grade area.

The transmission line crosses a projection of the Jacume fault within the Mountain Springs Grade area. This fault is not an active fault and is not considered a significant ground rupture hazard relative to the proposed transmission line structures.

6.2 SEISMIC SHAKING

Seismic shaking levels and the subsequent hazard varies across the project as shown by the peak bedrock accelerations presented on Figure 3. Transmission line structures and their foundations are designed with seismic and wind loads as part of their structural design. Therefore, hazards associated with seismic shaking are mitigated by design level engineering studies and the subsequent construction.

6.3 LIQUEFACTION AND SEISMIC SETTLEMENT

Overall, the exposure to liquefaction and seismic settlement hazards within the Mountain Springs Grade area is considered to be very low. Based on our field review and the geologic setting of the tower sites, liquefaction and seismic settlement are not significant hazards in the Mountain Springs Grade area which is dominated by crystalline rock or older fan and talus slope deposits.

6.4 LANDSLIDES, DEBRIS FLOWS, AND ROCKFALLS

Based on our field review, landslides and debris flows are not a significant hazard to the proposed structure locations within the Mountain Springs Grade area. Areas of higher erosion potential are present locally along the alignment. These areas tend to be relatively small and localized, although areas of steeper terrain have an increased potential for such problems. Erosional areas have been avoided during the structure locating process.

The rockfall hazard is considered low or non existent for most of the structures along Mountain Springs Grade. However, given the locally steep slopes and bold rock outcrops some potential for rockfalls exists. Perhaps the most dramatic area of possible rock fall hazard within the area lies along the upper reaches of Boulder Creek in the In Koh Pah area. The upper portions of the northwesterly facing slopes of Carries Mountain has a very steep, rock face that over geologic time, has shed some large boulders that have accumulated along the toe of the slope. Structures 256 and 257 are located downslope from this area where rockfalls have occurred in the geologic past. However, given the distance away from the rock fall

source and the distance out away from the toe of the slope the potential for large damaging rock falls to reach either Structure 256 or 257 is considered low.

Additionally, some low to moderate rockfall hazard has been identified at Structures 265, 266 and 269. The setting for these three areas is rather different than the In Koh Pah area, however. In these areas, smaller locally steep slopes above the structures have some potential for rock fall in closer proximity to the structures. These areas do not have the potential to generate rock of any significant size relative to the structural integrity of proposed structures. These areas are characterized by a natural fracture pattern in the rock that results in relatively small boulders and cobble sized on the slope face. The potential for any significant damage to the structures in these locations as a result of rockfall is considered low. However, these areas should be evaluated during construction and any loose rock above the work areas should be dislodged to provide appropriate worker safety.

6.5 EXPANSION AND COLLAPSE POTENTIAL

Based on our field review and review of two SWPL borings, expansion and collapse potential is not a significant hazard to the structure locations within the Mountain Springs Grade area. The site materials are not generally susceptible, and drainage design should direct water away from foundations.

6.6 CORROSION POTENTIAL

We anticipate that the granitic soils in the Mountain Springs Grade area will be slightly to moderately corrosive, based on our experience with similar granitic soils in San Diego County. Similarly, we anticipate that sulfate attack to concrete should be negligible.

SECTION 7 UNCERTAINTIES AND LIMITATIONS

The recommendations made herein are based on the assumption that soil conditions do not deviate appreciably from those observed during our field review and found during the previous investigations reviewed for this study. We recommend that URS review the foundation plans to verify that the intent of the recommendations presented herein has been properly interpreted and incorporated into the contract documents. We further recommend that foundation excavations be observed by a qualified engineer or geologist to verify that site conditions are as anticipated, or to provide revised recommendations, if necessary.

Geotechnical engineering and the geologic sciences are characterized by uncertainty. Professional judgments presented herein are based partly on our understanding of the proposed construction, and partly on our general experience. Our engineering work and judgments rendered meet current professional standards; we do not guarantee the performance of the project in any respect.

Specific details for the proposed project are not available at this time. The recommendations presented in this report are intended to assist Sargent & Lundy, SDG&E, and their subconsultants in the planning and design of the project. The professional judgments and interpretations presented in this report are based on our current knowledge of the proposed project, our interpretations of the subsurface conditions in the project area, and our understanding of the geologic and tectonic setting of the project site. This knowledge is based on the information provided to us, published literature, previous studies, and our investigations referenced in this report.

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Table 1
Tower Site Geology
Mountain Springs Grade Area

Geologic Unit	Tower Number
Alluvium (Qal)	255
Older Alluvium/Fan or Talus Deposits (Qt/f)	256, 257, 258
Jacumba Volcanics (Tj)	280, 281
Tonalite of La Posta (Klp)	259, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 273, 274, 275, 276, 277, 278, 279
Rocks of Jacumba Mountains (MzPzm)	272

Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area

Mountain Springs Grade Area Proposed Structure Designation [a]	Structure Type [a]	Closest SWPL Structure Designation	Nearby Subsurface Information	Geologic Unit [b]	Previous Boring Information		Previous Seismic Refraction Information		As-Built Design Information			Notes
					Profile (feet)	USCS Symbol	Profile [d] (feet)	Average P-Wave Velocity (ft/sec)	Shaft Diameter (inches)	Belled Shaft Diameter (inches)	Average Foundation Depth (feet)	
P255	Dead End	213	Seismic Refraction and Boring	Qal	0 to 11	SP	0 to 5	1,500	72	114	28.6	Actual diameter 77 inches-80 inches. Some cobbles in all Structures.
					11 to 12	GP	5 to 15	2,500				
					12 to 20	SP	15 to 30	5,000				
P256	Tangent	214		Qt/f					42, 48	78, 84	13.5	Actual diameter 44 inches-60 inches. Cementation. Rock reported at 7.5 feet bgs in Structure D.
P257	Tangent	215	Seismic Refraction	Qt/f			0 to 5	1,750	54	NA	13.0	Structures A and B - no drilling information.
							5 to 18	3,500				
							18 to 30	5,250				
P258	Tangent	216	Seismic Refraction and Boring	Qt/f	0 to 4	SM	0 to 4	1,250	42	78	11.3	Rock reported at 2 feet bgs in Structures A and D, and 4 feet bgs in Structure C.
					4 to 10	SM	4 to 10	2,500				
							10 to 30	3,750				
P259	Tangent	217		Klp					54	NA	13.5	Rock encountered 4 feet-10 feet bgs in Structures A, C, and D.

Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area
(Continued)

Mountain Springs Grade Area Proposed Structure Designation [a]	Structure Type [a]	Closest SWPL Structure Designation	Nearby Subsurface Information	Geologic Unit [b]	Previous Boring Information		Previous Seismic Refraction Information		As-Built Design Information			Notes
					Profile (feet)	USCS Symbol	Profile [d] (feet)	Average P-Wave Velocity (ft/sec)	Shaft Diameter (inches)	Belled Shaft Diameter (inches)	Average Foundation Depth (feet)	
P261	Tangent	219		Klp					54	NA	11.8	Rock encountered 1 foot-5 feet bgs in all Structures.
P262	Tangent	220		Klp					54	NA	13.1	Rock encountered 2 feet-6 feet bgs in all Structures.
P263	Angle	221		Klp					54	NA	14.3	Rock encountered at surface in all Structures.
P264	Tangent	223		Klp					60	102	17.2	Rock encountered at surface in all Structures.
P265	Tangent	224		Klp					42	NA	6.1	Rock encountered at surface in Structures B and D.
P266	Tangent	225		Klp					30	NA	10.0	Actual diameter 32 inches. Rock encountered 3 feet bgs in Structure A and 8 feet bgs in Structure D.

Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area
(Continued)

Mountain Springs Grade Area Proposed Structure Designation [a]	Structure Type [a]	Closest SWPL Structure Designation	Nearby Subsurface Information	Geologic Unit [b]	Previous Boring Information		Previous Seismic Refraction Information		As-Built Design Information			Notes
					Profile (feet)	USCS Symbol	Profile [d] (feet)	Average P-Wave Velocity (ft/sec)	Shaft Diameter (inches)	Belled Shaft Diameter (inches)	Average Foundation Depth (feet)	
P267	Tangent			Klp								
P269	Dead End	227	Seismic Refraction	Klp	1,500			0 to 4	54	NA	13.5	Fractured rock encountered at the surface in Structures A and B, and at 5 feet bgs in Structure D.
					3,750			4 to 15				
					7,500			15 to 30				
P270	Tangent	229	Seismic Refraction	Klp			0 to 4	1,200	30	NA	10.0	Rock reported 1.5 feet-3 feet bgs in all Structures.
							4 to 10	3,000				
							10 to 23	4,000				
							23 to 30	4,500				
P271	Tangent	230		Klp					42	NA	7.8	Rock anchor Structures A, Rock reported at 2 feet-3 feet bgs in Structures B, C, and D.
P272	Tangent	232		MzPzm					42	NA	8.2	Fractured Rock reported 4 feet-6 feet bgs in all Structures.

Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area
(Continued)

Mountain Springs Grade Area Proposed Structure Designation [a]	Structure Type [a]	Closest SWPL Structure Designation	Nearby Subsurface Information	Geologic Unit [b]	Previous Boring Information		Previous Seismic Refraction Information		As-Built Design Information			Notes
					Profile (feet)	USCS Symbol	Profile [d] (feet)	Average P-Wave Velocity (ft/sec)	Shaft Diameter (inches)	Belled Shaft Diameter (inches)	Average Foundation Depth (feet)	
P273	Tangent	233		Klp/MzPzm								
P274	Tangent	234		Klp					42	NA	9.3	Rock reported 3.5 feet-5 feet bgs in Structures A and C. Rock anchor Structures B and D.
P275	Tangent	235		Klp								
P276	Tangent	236		Klp					30	NA	10.0	Rock reported 1 feet-3 feet bgs in Structures A, C and D.
P277	Tangent	237		Klp								
P278	Tangent	238		Klp					36	NA	10.5	Rock reported 7 feet-9 feet bgs in Structures A and B, and at the ground surface in Structures C and D.
P279	Tangent	240		Klp								

Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area
(Continued)

Mountain Springs Grade Area Proposed Structure Designation [a]	Structure Type [a]	Closest SWPL Structure Designation	Nearby Subsurface Information	Geologic Unit [b]	Previous Boring Information		Previous Seismic Refraction Information		As-Built Design Information			Notes
					Profile (feet)	USCS Symbol	Profile [d] (feet)	Average P-Wave Velocity (ft/sec)	Shaft Diameter (inches)	Belled Shaft Diameter (inches)	Average Foundation Depth (feet)	
P280	Tangent	241	Seismic Refraction	Tj			0 to 5	1,900	42	78	18.0	Rock reported 15 feet bgs in Structure A. Cobbles from ground surface in all Structures.
							5 to 28	3,000				
							28 to 30	5,000				
P281	Dead End	242	Seismic Refraction	Tj			0 to 20	1,300	42	78	18.5	
							20 to 30	4,000				

Notes:

a. Proposed structure name and type provided by SDG&E.

b. Site Plan and Generalized Geologic Maps are presented as Figures 2a and 2b.

c. SPT blowcount is calculated as 80 percent of the modified California blowcount for the last 12 inches of driving.

d. Interpretive Seismic Velocity Profiles presented in Figure 5.

Table 3
Soil and Rock Design Parameter Sets
Mountain Springs Grade Area

Design Parameter Set	Compression Wave Velocity, Vp (ft/sec)	Total Unit Weight, γ (pcf)	Friction Angle, ϕ' (degrees)	Cohesion, C' (psf)	Adhesion Factor	Discount Depth [b] (ft)
Soil / Sedimentary Rock / Weathered Granitic and Metamorphic Rock						
1	1,000-2,000	120	33	0	0	2
2	2,000-3,000	125	35	250	0	1
3	3,000-4,000	130	37	500	0	0
4	>4,000	135	39	1,000	0.8	0
Granitic Rock and Metamorphic Rock						
5	5,000-6,000	145	45	1,500	0.6	0
6	> 6,000	155	47	2,000	0.5	0

Notes:

a. These soil/rock parameters are intended for input for the computer program CUFAD and may not reflect actual strengths.

b. Discount depth does not include discount for sloping ground.

LEGEND

- Sections 9C, 10A, and 10B
- Other Sections
- City
- Major Roads
- Map Index Guide
- County Boundary
- State Boundary

California

San Diego County

Imperial County

Salton Sea

Poway

Lakeside

Alpine

Brawley

El Centro

Calexico

Section 9C

Section 10A

Section 10B

Fig. 2a

Fig. 2b

Mountain Springs Grade Area

Baja California Norte

SOURCES:
ESRI (Cities, Major Roads, County and State Boudaries); SDGE (Sunrise Power Link Route 2009); USDA NAIP (Aerial 2005)

VICINTY MAP
SUNRISE POWERLINK SOUTHERN ROUTE
MOUNTAIN SPRINGS GRADE AREA

URS

4 0 4 8 Miles

SCALE: 1" = 8 Miles (1:506,880
SCALE CORRECT WHEN PRINTED AT 11X17

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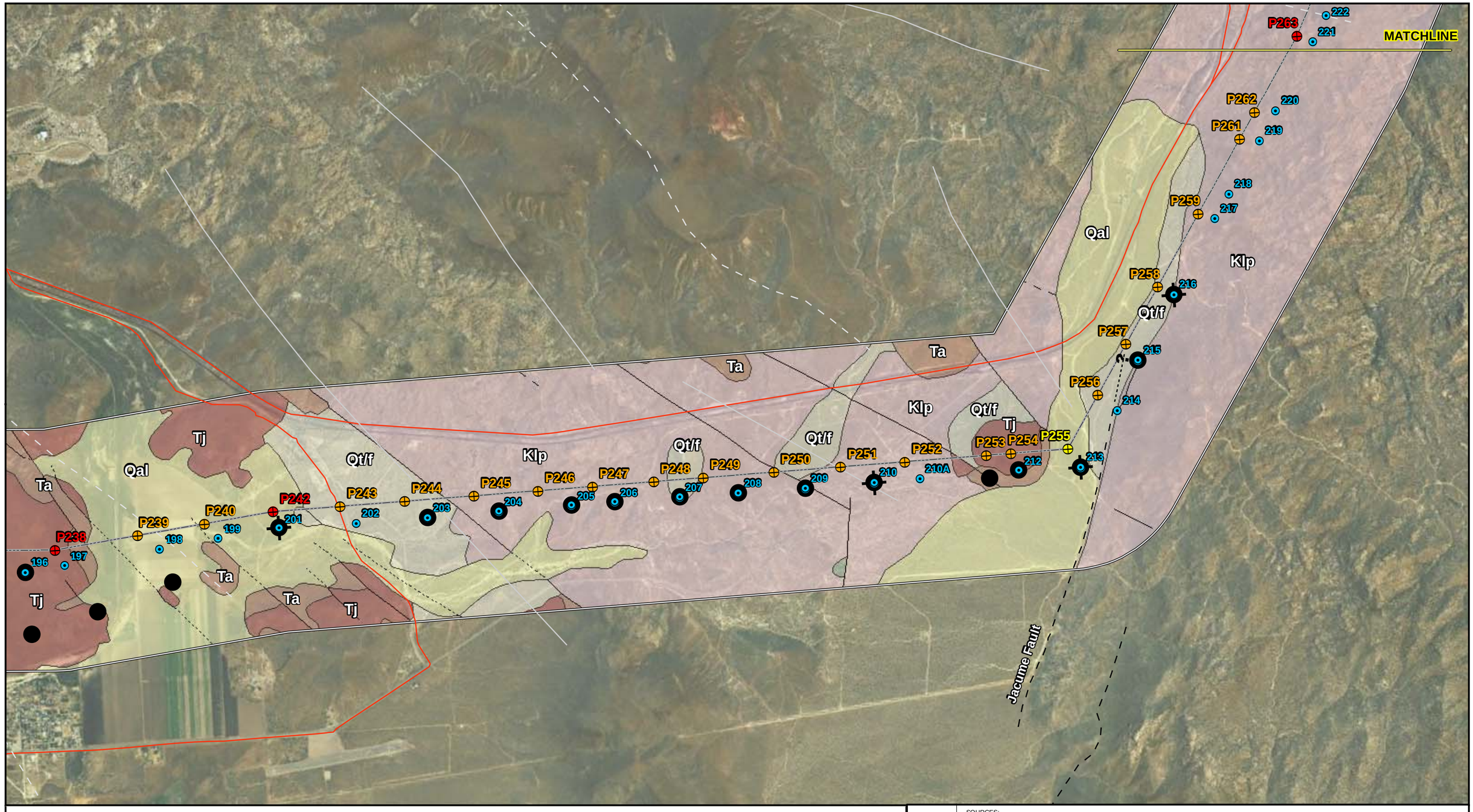

Existing Structures
- Existing Tower
- Proposed Route Center Line

Previous Geotechnical Investigations
- Boring
- Seismic Line
- Seismic Line and Boring

Alquist Priolo (EFZ) Faults
- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Inferred Fault Trace
- Concealed Fault Trace

Quaternary Faults
- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Concealed Fault Trace

Pre-Quaternary Faults
- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Concealed Fault Trace

Geologic Contacts
- Accurately Located Contact
- Approximately Located Contact
- Concealed Contact

For Geologic Symbol Index See Fig 9

SOURCES:
ESRI (Cities, Major Roads, County and State Boudaries); SDGE (Sunrise Power Link Route 2009); USDA NAIP (Aerial 2005)

SITE PLAN AND GENERALIZED GEOLOGIC MAP
SUNRISE POWERLINK SOUTHERN ROUTE
MOUNTAIN SPRINGS GRADE AREA

URS

1000 0 1000 2000 Feet

SCALE: 1" = 8 Miles (1:506,880
SCALE CORRECT WHEN PRINTED AT 11X17

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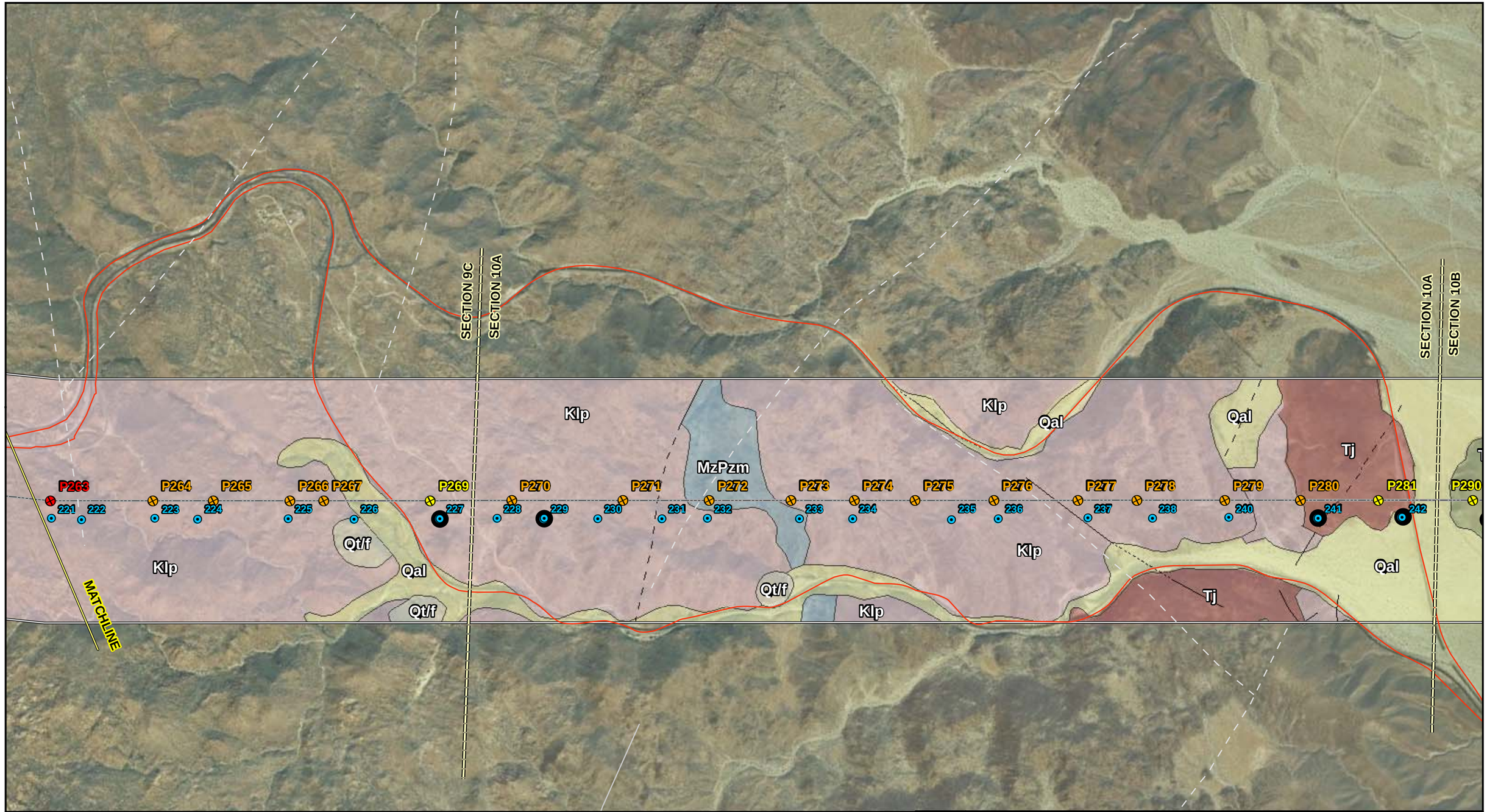

Existing Structures
- Existing Tower
- Proposed Route Center Line

Previous Geotechnical Investigations
- Boring
- Seismic Line
- Seismic Line and Boring

Alquist Priolo (EFZ) Faults
- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Inferred Fault Trace
- Concealed Fault Trace

Quaternary Faults
- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Concealed Fault Trace

Pre-Quaternary Faults
- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Concealed Fault Trace

Geologic Contacts
- Accurately Located Contact
- Approximately Located Contact
- Concealed Contact

For Geologic Symbol Index See Fig 9

SOURCES:
ESRI (Cities, Major Roads, County and State Boudaries); SDGE (Sunrise Power Link Route 2009); USDA NAIP (Aerial 2005)

SITE PLAN AND GENERALIZED GEOLOGIC MAP
SUNRISE POWERLINK SOUTHERN ROUTE
MOUNTAIN SPRINGS GRADE AREA

URS

1000 0 1000 2000 Feet

SCALE: 1" = 8 Miles (1:506,880
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: CL	DATE: 6-30-09	FIG. NO:
PM: MEH	PROJ. NO: 27668031.00030	2b

KEY TO GEOLOGIC MAPS
SUNRISE POWERLINK SOUTHERN ROUTE
MOUNTAIN SPRINGS GRADE AREA

URS	CREATED BY: RC	DATE: 6-30-09	FIG. NO: 2c
	PM: MEH	PROJ. NO: 27668031.00030	

LEGEND

- City
- Substation
- Sunrise Powerlink Southern Route (color coded by section)
- County Boundary

Alquist Priolo (EFZ) Faults

- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Inferred Fault Trace
- Concealed Fault Trace

Quaternary Faults

- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Concealed Fault Trace

Pre-Quaternary Faults

- Accurately Located Fault Trace
- Approximately Located Fault Trace
- Concealed Fault Trace

PEAK GROUND ACCELERATION (PGA)

- 08-09
- 09-10
- 10-15
- 15-20
- 20-25
- 25-30
- 30-40
- 40-60
- 60-80
- 80-100

PGA associated with 10% probability of exceedance in 50 years

Riverside County
San Diego County
Imperial County
Baja California Norte
Poway
Sycamore
Lakeside
Alpine
MRDA (Proposed)
San Diego
National City
Brawley
El Centro
Imperial Valley
Calexico
4A
4
5
7
8B
8C
8D
8E
9A
9B
9C
10A
10B
San Andreas Fault Zone
ATEV Fault Zone
Elsinore Fault Zone
Elsinore Fault
San Jacinto Fault Zone
Elmore Ranch Fault
Superstition Hills Fault
Superstition Mountain Fault
Brawley Fault Zone
Imperial Fault
Yuha Wells Fault
Laguna Salada Fault
Jacume Fault
Rose Canyon Fault Zone
San Diego Trough Fault Zone
Coronado Banks Fault Zone
La Nacion Fault Zone

SOURCES:
California Department of Conservation, California Geological Survey (Fault data 2000, AP (EFZ) Fault data 1991, 2003); Platts, McGraw- Hill Companies (Substations 2007); ESRI (County boundaries, Cities); SDGE (Sunrise Power Link Route 2008); USGS (PGA data 2008); USDA NAIP (Aerial 2005).

FAULT AND PEAK GROUND ACCELERATION MAP
SUNRISE POWERLINK SOUTHERN ROUTE
MOUNTAIN SPRINGS GRADE AREA

URS

4 0 4 8 Miles

SCALE: 1" = 8 Miles (1:506,880)
SCALE CORRECT WHEN PRINTED AT 11X17

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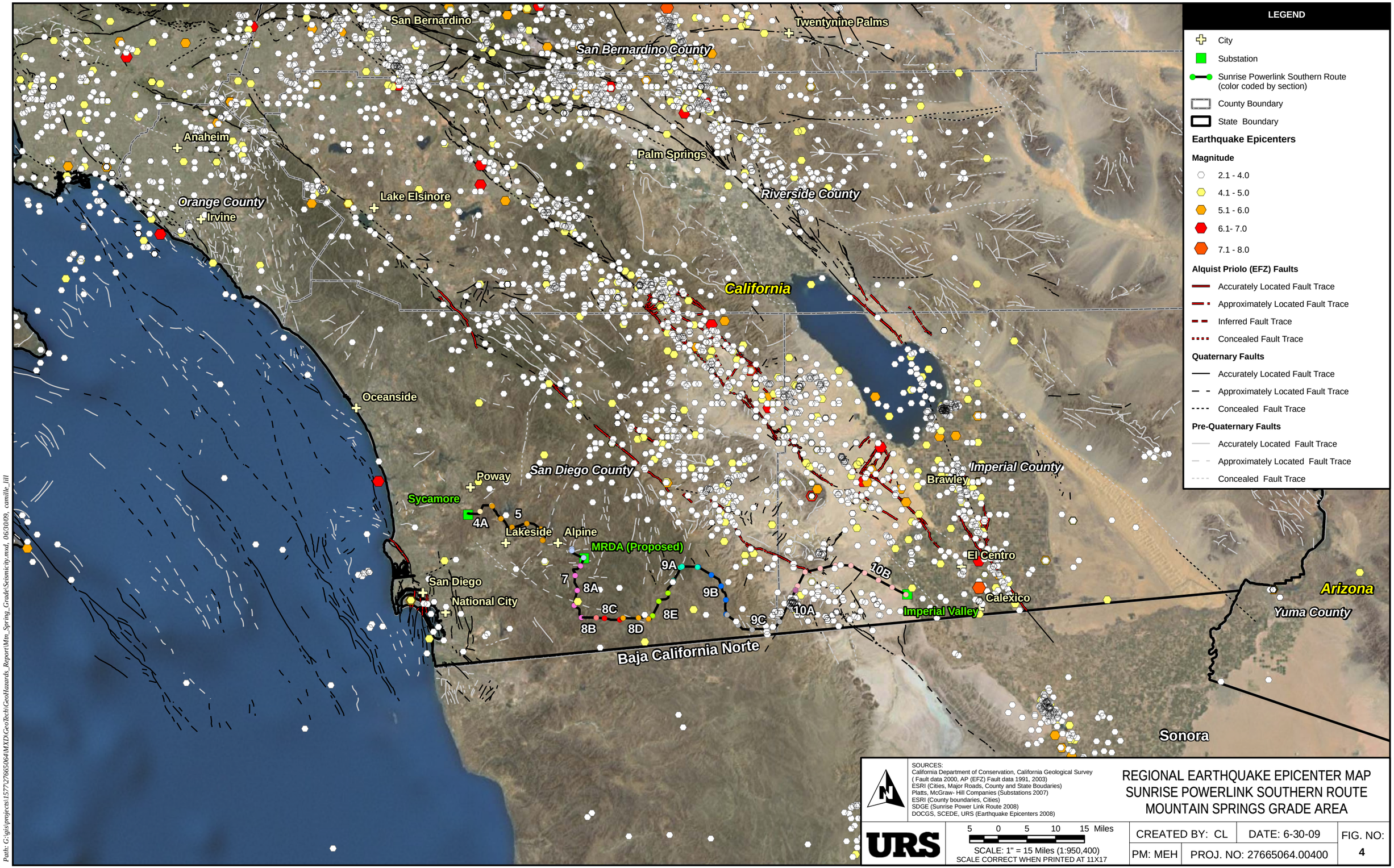


SOURCES:
California Department of Conservation, California Geological Survey
(Fault data 2000, AP (EFZ) Fault data 1991, 2003)
ESRI (Cities, Major Roads, County and State Boudaries)
Platts, McGraw- Hill Companies (Substations 2007)
ESRI (County boundaries, Cities)
SDGE (Sunrise Power Link Route 2008)
DOCGS, SCEDE, URS (Earthquake Epicenters 2008)

REGIONAL EARTHQUAKE EPICENTER MAP
SUNRISE POWERLINK SOUTHERN ROUTE
MOUNTAIN SPRINGS GRADE AREA

URS

5 0 5 10 15 Miles

SCALE: 1" = 15 Miles (1:950,400)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: CL	DATE: 6-30-09	FIG. NO: 4
PM: MEH	PROJ. NO: 27665064.00400	

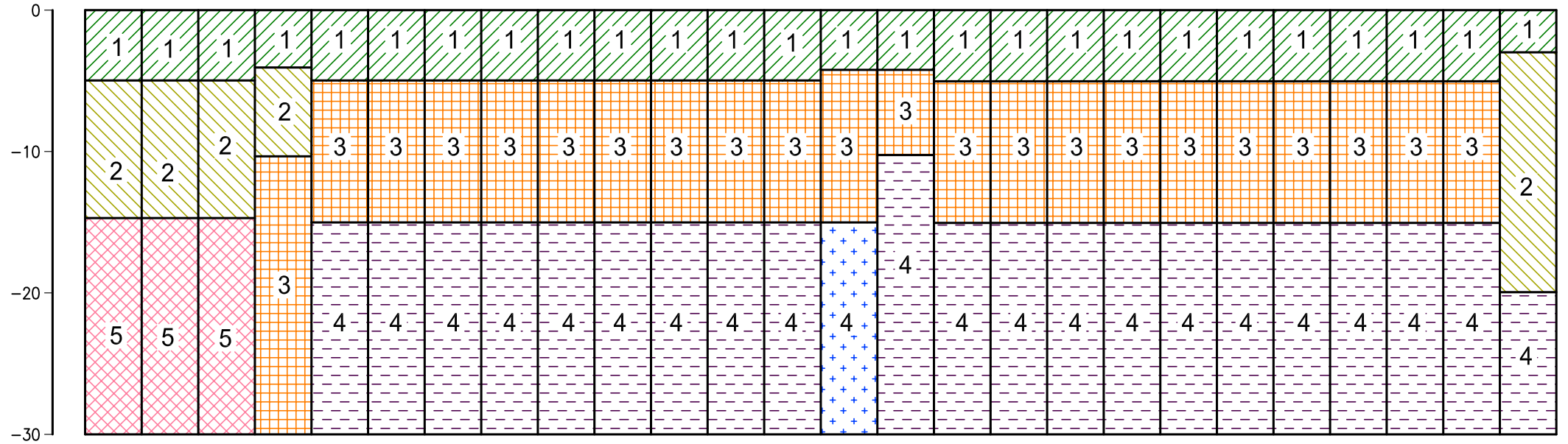
Path: G:\gis\projects\1577\27665064\MXD\GeoTech\GeoHazards_Report\Mtn_Spring_Grade\Seismicity.mxd, 06/30/09, camille_hll

GENERALIZED SOIL/ROCK ZONE
(SEE FIGURE 2a AND 2b)

SECTION 9C | SECTION 10A

W — Qal | Qt/f | Klp | MzPzm | Klp | Tj — E

TOWER 255 (PB PSL) | TOWER 256 | TOWER 257 (PSL) | TOWER 258 (PB PSL) | TOWER 259 | TOWER 261 | TOWER 262 | TOWER 263 | TOWER 264 | TOWER 265 | TOWER 266 | TOWER 267 | TOWER 268 | TOWER 269 (PSL) | TOWER 270 (PSL) | TOWER 271 | TOWER 272 | TOWER 273 | TOWER 274 | TOWER 275 | TOWER 276 | TOWER 277 | TOWER 278 | TOWER 279 | TOWER 280 | TOWER 281



HORIZONTAL: NOT TO SCALE

LEGEND:

APPARENT P–WAVE VELOCITY (Vp), feet per second

- 1,000 ≤ Vp < 2,000
- 2,000 ≤ Vp < 3,000
- 3,000 ≤ Vp < 4,000
- 4,000 ≤ Vp < 5,000
- 5,000 ≤ Vp < 6,000
- 6,000 ≤ Vp < 7,000
- 7,000 ≤ Vp

RED – DESIGNATES ANGLE TOWER
ORANGE – DESIGNATES DEAD END TOWER
BLACK – DESIGNATES TANGENT TOWER

1 INDICATES PARAMETER SET (SEE TABLE 3)

PSL DENOTES SEISMIC LINE PERFORMED FOR PREVIOUS PROJECT

PB DENOTES BORING PERFORMED FOR PREVIOUS PROJECT

INTERPRETIVE SEISMIC VELOCITY PROFILES
MOUNTAIN SPRINGS GRADE AREA
SUNRISE POWERLINK SOUTHERN ROUTE

URS	CHECKED BY: JLN	DATE: 06/30/09	FIG. NO: 5
	PM: MEH	PROJ. NO: 27668031.00030	

X:\27668031\mtn spring grade velocity profile.dwg Jun 30, 2009 – 3:19pm

Project No. 59125S-TST1

GEOTECHNICAL INVESTIGATION FOR THE MIGUEL-IMPERIAL VALLEY 500 KV TRANSMISSION LINE (TOWER SITES 25 THROUGH 213)

APPENDIX H

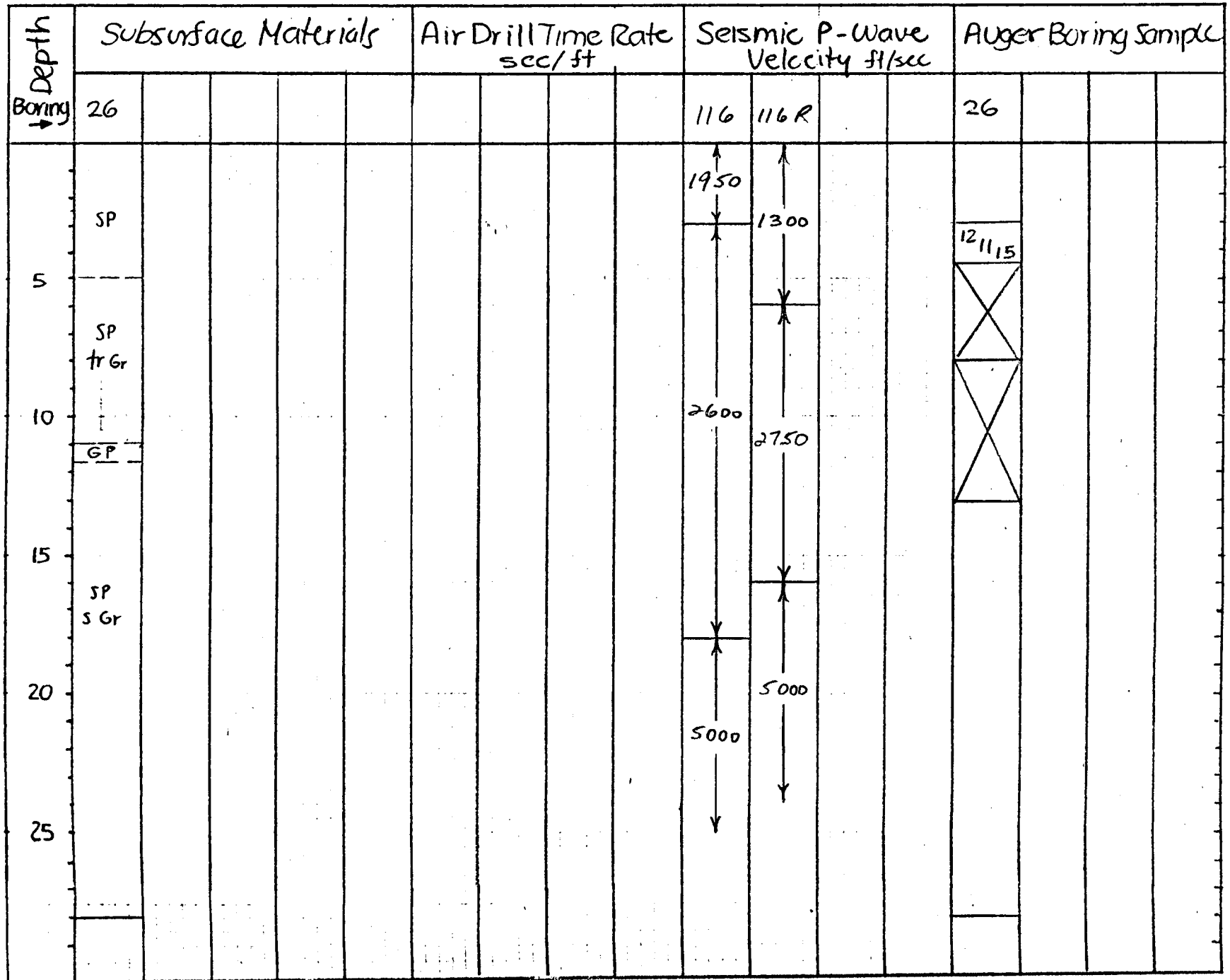
February 22, 1980

APPENDIX H

SUBSURFACE INVESTIGATION DATA

The information from field geologic reconnaissance have been recorded on the Tower Site Inspection Summary sheets for each site. These sheets are included in this Appendix. In addition, the information from seismic refraction traverses, augered borings, and air-drill borings have been consolidated into a single sheet and follow the inspection summary sheets for each site. Where applicable, the summary sheets include the material type encountered in each boring, the air-drill time rates, the seismic p-wave velocities and the depth range for each velocity, the depth of each sample obtained by augered borings, and the standard penetration resistance of the sampler. Field coring logs logs are also included for Tower Sites 26 and 177.

SUBSURFACE INVESTIGATION SUMMARY - TOWER SITE 213



WCC, 59125S

APPENDIX D

SUBSURFACE INVESTIGATION DATA

The information from field geologic reconnaissance has been recorded on the Tower Site Inspection Summary Sheets for each site. These sheets are included in this Appendix. In addition, the information from seismic refraction traverses and augered borings have been consolidated into a single sheet and follow the inspection summary sheets for each corresponding site. Where applicable, the summary sheets include the material type encountered in each boring, the seismic p-wave velocities and the depth range for each velocity, the depth of each sample obtained by augered borings, and the standard penetration resistence of the sampler.

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 214 Station: 2854+89 699

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Talus slope at toe - Surface covered with 1' to 8' diameter boulders

Thickness estimated 25' to 50'

Anticipated Groundwater Conditions: None within in depths of 50' to 100'

Site Slope Conditions: 26° to 15° (estimated)

Erosion Potential and Possible Erosion Control Techniques: Small gullies down Slope No major problems

Geologic Hazards: None except possible rock fall from cliff above

Boring Recommendation: None

Access: None except by foot drive to within 100' to 150'

Pictures:

Notes:

Sketch:

Inspection Team: ERA plus S.D.G&E party of 5

Date: 9-20-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 215 Station: 2865 + 90

Tower Type: Tangent Geophysical Survey: Yes ✓ No ____

Soil Description of Surface and Anticipated Subsurface Conditions: Talus slope - surface covered by subrounded to subangular 1' to 3' diameter boulders - talus could be 50 to 100 feet thick

Anticipated Groundwater Conditions: None expected within depths of 50' to 100'

Site Slope Conditions: 26°-33° north westerly slope (estimated) max uniform talus slope - average 20° slope

Erosion Potential and Possible Erosion Control Techniques: None under present conditions

Geologic Hazards: None - possible rock falls from above

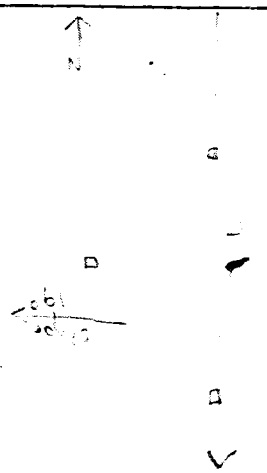
Boring Recommendation: None -

Access: None except by foot

Pictures:

Notes: traverse E-W from to south reversed to north

Sketch:

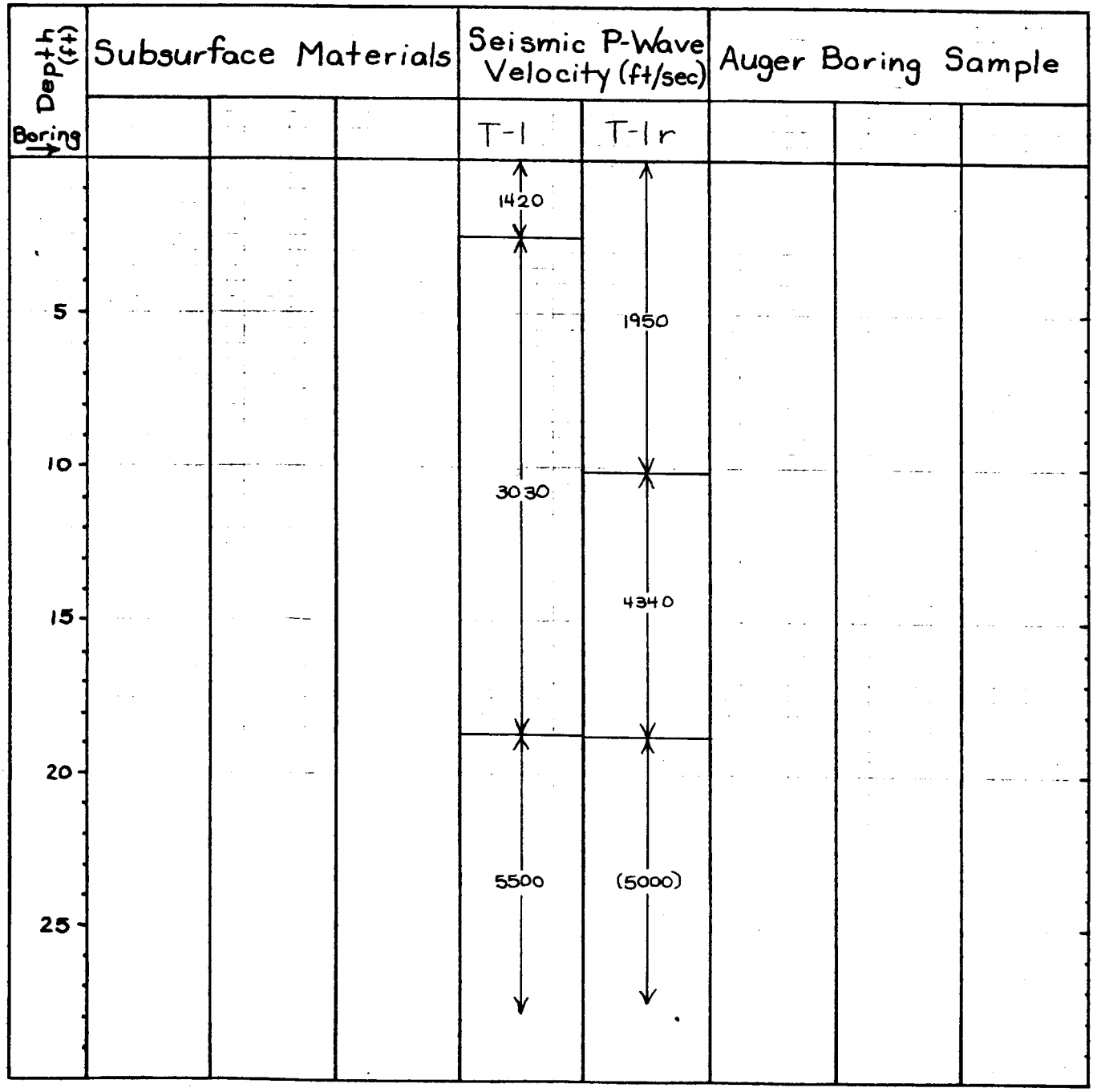


Inspection Team: ERA plus S.D.G+E pers. of 5

Date: 9-20-79

SUBSURFACE INVESTIGATION SUMMARY

Tower Site 215



LEGEND:

- Bag Sample
- 5 6 7 Mod.CA Blowcount

} Auger Boring Sample

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 216 Station: not given

Tower Type: Tangent Geophysical Survey: Yes ✓ No ____

Soil Description of Surface and Anticipated Subsurface Conditions: loose gravelly

Silty coarse Sand (SP) Slopewash

Anticipated Groundwater Conditions: None within depths of 25' to 50'

Site Slope Conditions: gently sloping coalescing fans

40 to northwest

Erosion Potential and Possible Erosion Control Techniques: possible in present

location (small drainage channel) - move str northward ~ 50 feet

Geologic Hazards: None except for possible erosion

Boring Recommendation: auger borings

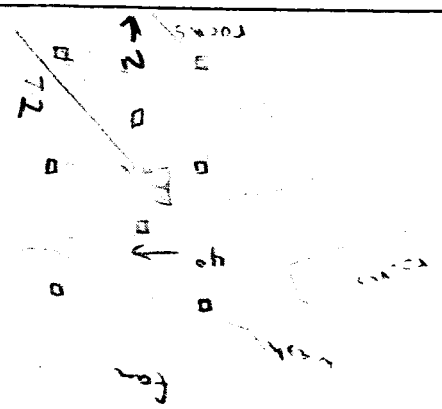
Access: relatively good - jeep truck road to tower

Pictures: 5-1-27

Notes: Site is to be moved approximately 50' to 60' northerly

Seismic Traverse T-2 & T-2r

Sketch:



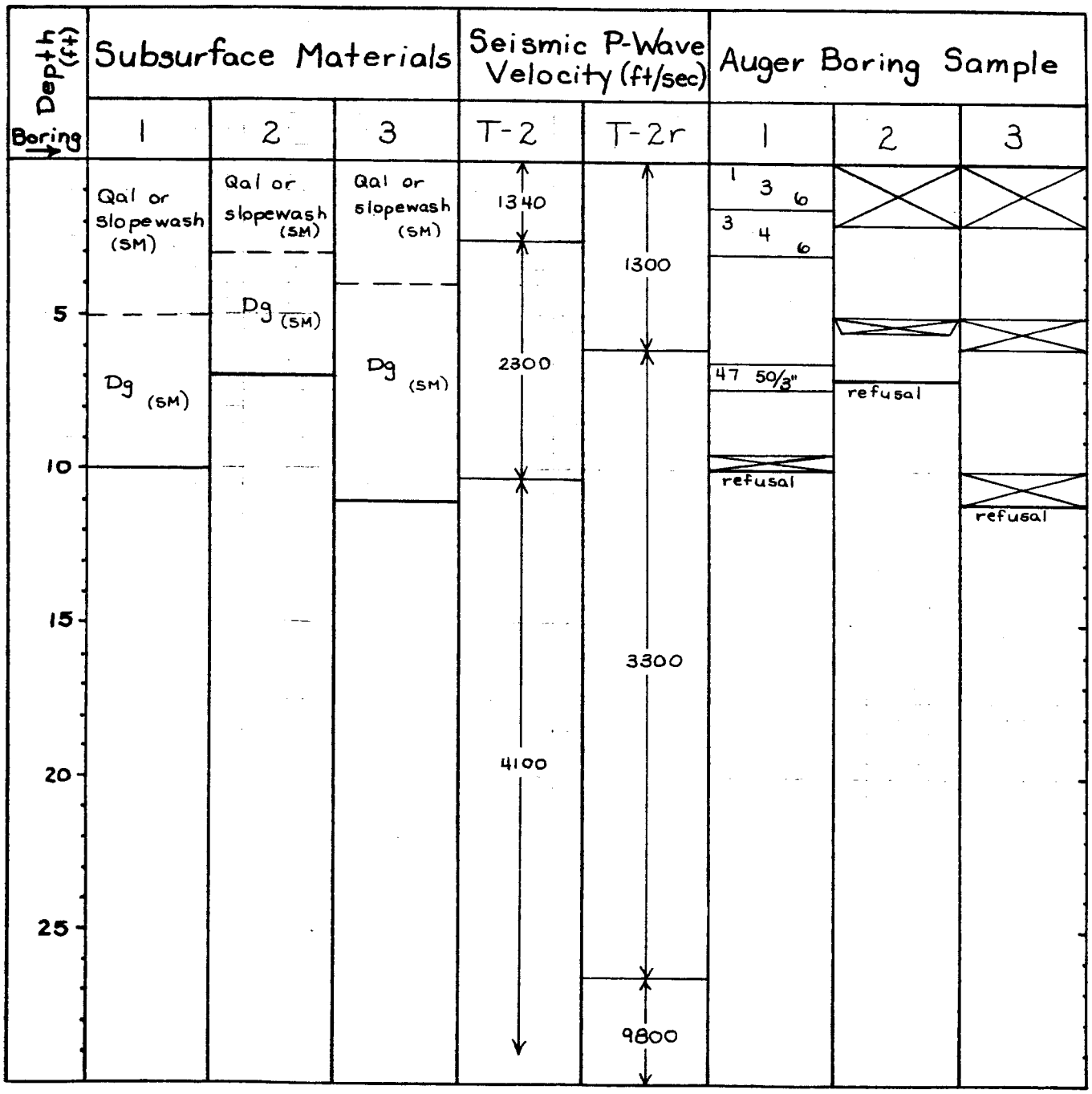
Seismic Traverse run at 216-1 T-2 & T2r

Inspection Team: ERT plus S.D.G.&E. party of 6

Date: 9-14-79

SUBSURFACE INVESTIGATION SUMMARY

Tower Site 216-1



LEGEND:

Bag Sample

5 6 7 Mod.CA Blowcount

} Auger Boring Sample

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 217 Station: 2902 + 35

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Some [illegible]

of decomposition of surface over weathered quartz diorite/[illegible]

Anticipated Groundwater Conditions: None within depths of 50' to 100'

Site Slope Conditions:

16°-20° northwest - medium slope

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: Possibly could be augered

Access: None

Pictures: 5-1-25

Notes: Site to be marked Sketch:

~40 feet on line to south

Inspection Team: ERA plus S.D.G+E party of 6

Date: 9-14-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 218 Station: 3908 + 10

Tower Type: Tangent Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: boulders of decomposing over silty course sand (Qg)

Anticipated Groundwater Conditions: None within depths of 50' to 100'

Site Slope Conditions: 33° around site - 6° to northwest on site is located in a small eroded bench or hillside

Erosion Potential and Possible Erosion Control Techniques: None

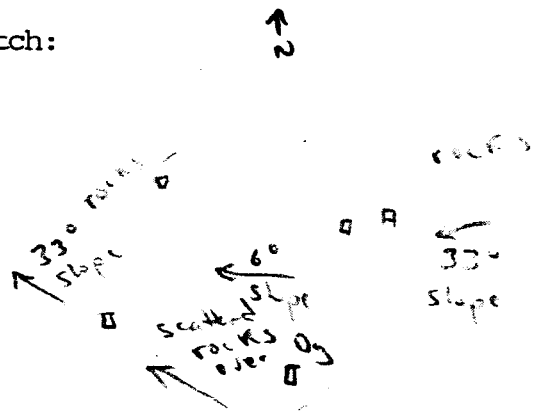
Geologic Hazards: None

Boring Recommendation: Could be augered to 5' to 10' ?

Access: None at present except by foot

Pictures: R-1-26

Notes: _____ Sketch:



Inspection Team: ERA + SDG+E party of 6

Date: 9-14-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 219 Station: 2921 + 50

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: legs C + D in rock outcrop of Quartz diorite - legs A + B at base of rock outcrop in loose surface boulders probably 2' to 3' thick

Anticipated Groundwater Conditions: None within depths of 50' to 100'

Site Slope Conditions: 33° to east breaks up to locally 70° to 80° at west (legs C + D) located near ridge line in small swale

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

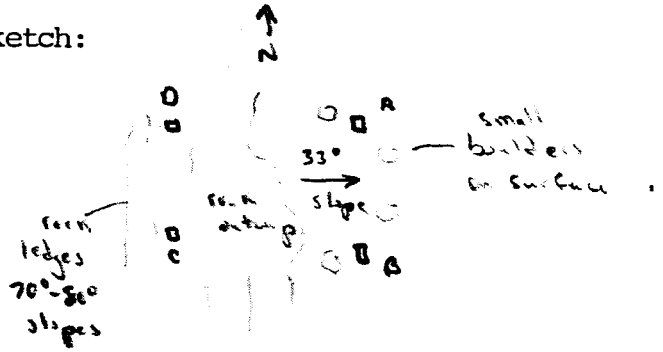
Boring Recommendation: None rock anchor site ?

Access: None except by foot

Pictures: ____

Notes: Possible rock anchor site

Sketch:



Inspection Team: 9-20-79 ERA plus

Date: 9-20-79 S.D.G.&E. part

of 5

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 220 Station: _____

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Rock outcrops of Quartz diorite some loose surface boulders of q.d. 1'-2' diameter

Anticipated Groundwater Conditions: None

Site Slope Conditions: estimated 5°-7° northeast located on small relatively flat topped knoll outcrops of rock around site

Erosion Potential and Possible Erosion Control Techniques: None

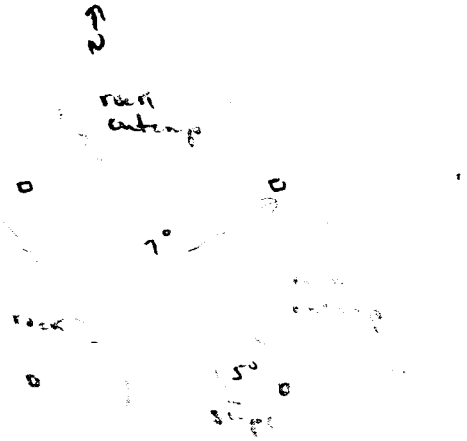
Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: _____

Notes: Good site! Sketch:



Inspection Team: FRA plus S.D.G&E party of 5

Date: 9-20-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 221 Station: Sta 2945 + 83.53

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Some loose, silty fine to coarse sand scattered between boulders of decomposition - Outcrops of granodiorite/quartz diorite on and around s.t. -

Anticipated Groundwater Conditions: None - G.W.T. expected at very deep depths

Site Slope Conditions: located in small swale along east-west. trending ridge - 2' to 6' diameter boulders of decomposition over slightly to moderately weathered rock - slope inclinations are low in vicinity of site

Erosion Potential and Possible Erosion Control Techniques: low to very low erosion potential

Geologic Hazards: None

Boring Recommendation: not drillable with W.C.C. type rig

Access: None except by foot

Pictures: none

Notes: Texture of rock is course to very course; rock is cut by small pegmatites of quartz

Sketch:

Inspection Team: ERA and S.D.G+E party of 10

Date: 9-4-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 222 Station: 2953 + 00

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Similar rock type as at 21 - loose boulders of decomposition up to 12' diameter on site near prior center

Anticipated Groundwater Conditions: None within depths of 50 to 100 Feet

Site Slope Conditions: Located on side of 2:1 slope (20°-26°) drops off to 1:1 (33°-45°) within 100 feet of site

Erosion Potential and Possible Erosion Control Techniques: Virtual very low potential

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: _____

Notes: Discussion on site to move site on line northward approximately 25 feet

Sketch:

Inspection Team: ERA plus S.D.G&E party of 10

Date: 9-4-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 223 Station: 2968 + 51

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Scattered surface soils a few inches thick around boulders and outcrops of granodiorite/Quartz diorite - Surface boulders 2' to 4' diameter

Anticipated Groundwater Conditions: None within depths of 50 to 100 Feet

Site Slope Conditions: Surface slopes approximately 12° to 20° northeast with small benches

Erosion Potential and Possible Erosion Control Techniques: None

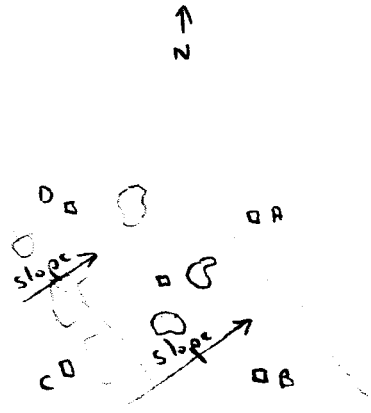
Geologic Hazards: None

Boring Recommendation: Probably not drillable with auger rig deeper than 5-10'

Access: None except by foot

Pictures: _____

Notes: _____ Sketch:



Inspection Team: ERA plus S.D.G&E party of 10

Date: 9-4-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 224 Station: 2978 + 13.83

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: quartz diorite/granodiorite rock outcrops surround the site - large boulders of decomposition located in the swale - some coarse sand soil

Anticipated Groundwater Conditions: None within depths of 50' to 100'

Site Slope Conditions: located in small swale in massive rock outcrop less than 10° in the swale

Erosion Potential and Possible Erosion Control Techniques: Very low

Geologic Hazards: None

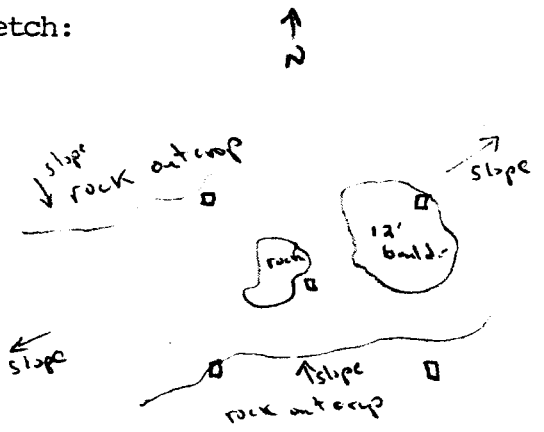
Boring Recommendation: None

Access: None except by foot

Pictures: 1

Notes: Possible seismic profile

Sketch:



Inspection Team: ERA plus S.D.G+E party of 10

Date: 9-4-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 225-1 Station: 2997 +52

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Silty coarse sand filling a low swale area - surrounded by rocks of quartz diorite granodiorite

Anticipated Groundwater Conditions: None within depths of 50 to 100 Feet

Site Slope Conditions: Relatively Flat site

Erosion Potential and Possible Erosion Control Techniques: low

Geologic Hazards: None

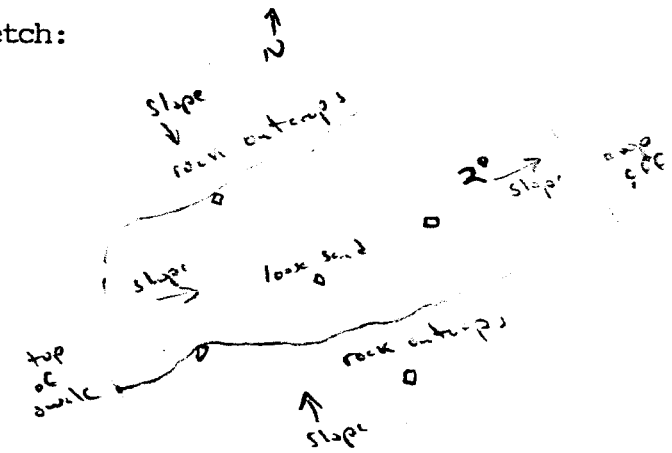
Boring Recommendation: Possibility of augering footings for this tower

Access: None except by foot

Pictures: _____

Notes: Possible Seismic profile site

Sketch:



Inspection Team: ERA plus S.D.G+E party of 10

Date: 9-4-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 226 Station: 3011 + 65

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Rock Outcrops of Quartz Diorite

Anticipated Groundwater Conditions: None within depths of 100 feet

Site Slope Conditions: Site located on crest of northwest plunging ridge

Erosion Potential and Possible Erosion Control Techniques: None

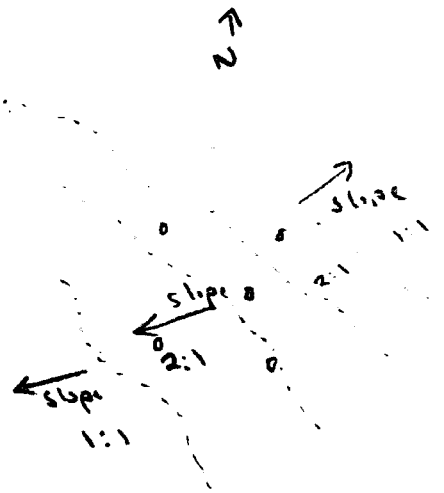
Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: _____

Notes: _____ Sketch:



Inspection Team: ERA plus S.D.G.&E. party of 10

Date: 9-4-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 227 Station: _____

Tower Type: Tangent Geophysical Survey: Yes ✓ No _____

Soil Description of Surface and Anticipated Subsurface Conditions: rock outcrops of quartz diorite/granodiorite with coarse sand in and around rocks - sand is decomposed rock

Anticipated Groundwater Conditions: None within depths of 50 feet

Site Slope Conditions: relatively flat site located in low saddle area - 6°-8° southerly slopes

Erosion Potential and Possible Erosion Control Techniques: low

Geologic Hazards: None

Boring Recommendation: Possibility of augering 5' to 12'

Access: None at present except by foot

All-Terrain type rig could drill

Pictures: r-1-1

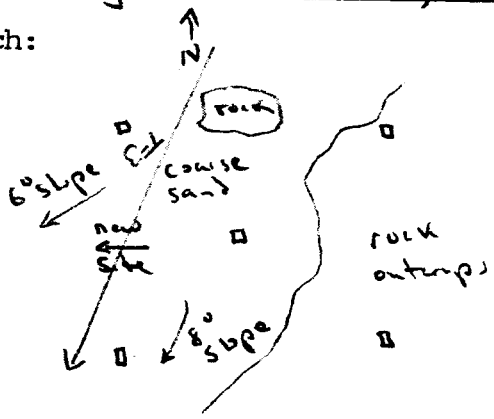
r-1-2 new center of site (green tee shirt)

Notes: Site is to be moved ~ 15' to west to move legs out of rocks

possible Seismic site

T-3 & T-3r

Sketch:

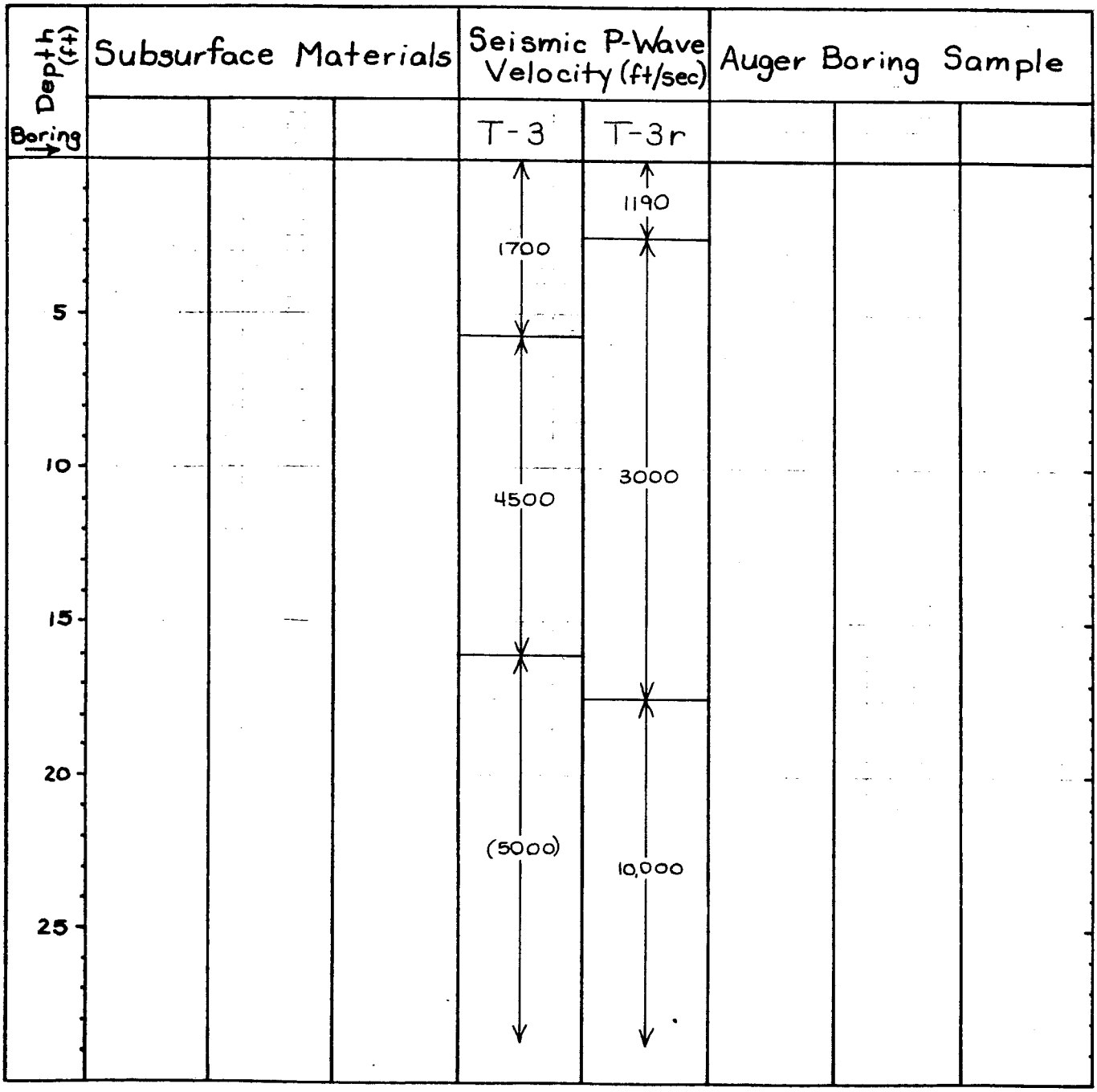


Inspection Team: ERA plus SDG&E part of 9

Date: 9-5-79

SUBSURFACE INVESTIGATION SUMMARY

Tower Site 227



LEGEND:

Bag Sample

5 6 7 Mod CA Blowcount

} Auger Boring Sample

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 228 Station: 3041 + 80

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Bold massive rock outcrop of quartz diorite - virtually no loose soil - 3'-12' diameter boulders on site

Anticipated Groundwater Conditions: None within depths of 50 feet

Site Slope Conditions: low profile

Erosion Potential and Possible Erosion Control Techniques: low to very low

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: r-1-3

new site r-1-4

Notes: low swale area - decomposed rock to silty coarse sand - auger site

Site not confirmed as to precise location

Sketch:

new legs C + D auger to 10'

new legs A + B auger to 7'-8'

?

Inspection Team: ERA plus S.D.G+E party of 9

Date: 9-5-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 229 Station: 3053 + 00

Tower Type: Tangent Geophysical Survey: Yes ✓ No ____

Soil Description of Surface and Anticipated Subsurface Conditions: decomposed granitics - slopewash covers most of site

Anticipated Groundwater Conditions: None within depths of 50 Feet

Site Slope Conditions: relatively flat site 5° south may move site 5' south to get leg D away from rocks

Erosion Potential and Possible Erosion Control Techniques: low

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

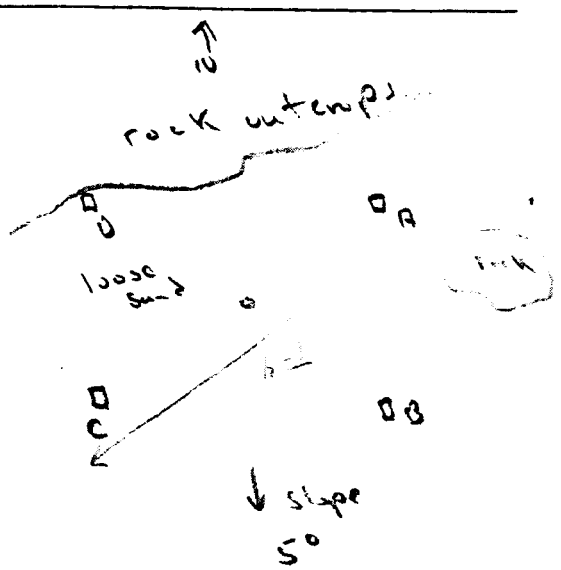
Pictures: r-1-5

Notes: Surface conditions indicate possible auger 5 to 15 feet deep - expect to encounter some scattered boulders

Possible Seismic site

T-4 & T-4r

Sketch:

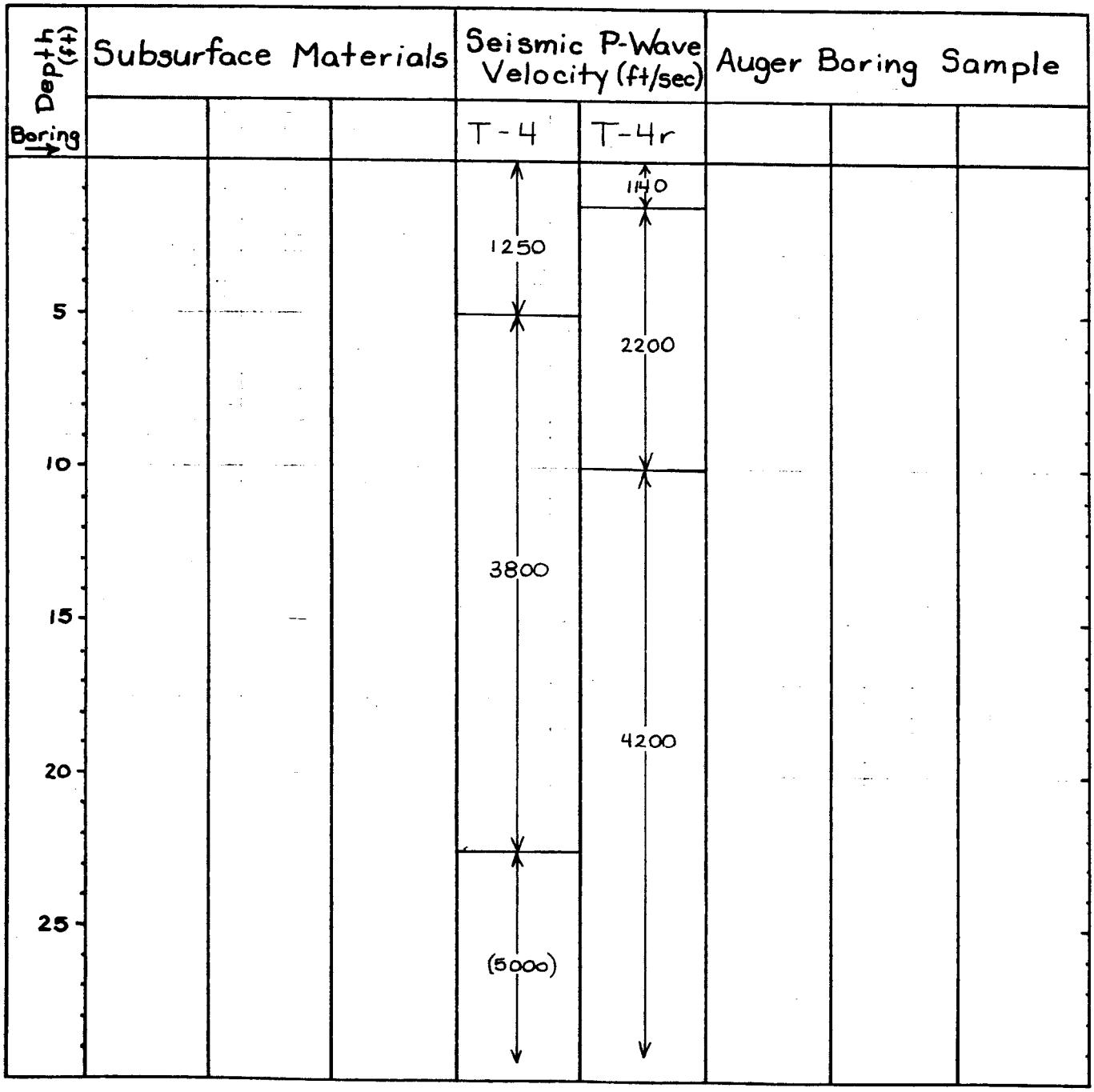


Inspection Team: ERA plus S.D.G+E part of 9

Date: 9-5-79

SUBSURFACE INVESTIGATION SUMMARY

Tower Site 229



LEGEND:

Bag Sample

5 6 7 Mod.CA Blowcount

} Auger Boring Sample

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 230 Station: 3064 + 80

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Entire site covered by outcrops of granodiorite gneiss with a few inches of coarse sandy soils around rocks — rock is gneissic - outcrop of schist

Anticipated Groundwater Conditions: None within depths of 50' ~100 south of site

Site Slope Conditions: in a low swale at crest of two swales + 2 ridges

Erosion Potential and Possible Erosion Control Techniques: low

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 5-1-6

Notes: may move site 20' south to avoid large rock at leg A + drop off at leg D

Sketch:

Inspection Team: ERA plus S.D.G+E partly of 9

Date: 9-5-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 231 Station: 3078 + 30[78]

Tower Type: Tangent ? Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Virtually no soil - possibly several inches of coarse sand over slightly weathered fractured Quartz diorite / granodiorite

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: Site is a small bench near ridge top

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 5-1-7

Notes: Some discussion to move site Sketch:

Inspection Team: ERA plus S.D.G+E party of 9

Date: 9-5-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 232 Station: 3088 + 20

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: gneissic rock.
next Canyon to north schist - surface covered with 3" to 1'
231 granitoid gneiss diameter rocks

Anticipated Groundwater Conditions: None within 50 to 100 feet

Site Slope Conditions: located on east sloping ridge - 5° to 8° east

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 1-1-20

Notes: many more with Guard
~ 15' to center tower
on middle of ridge

Sketch: N

Inspection Team: ERA plus S.D.G+E part of

Date: 9-13-79 6

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 233 Station: _____

Tower Type: Tangent Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Slightly weathered surface on metamorphic rock - last 500 to 700 feet between 233 & 234 were east-west striking marble, skarn, schist beds possible drill to 5'

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: Flat to 2° easterly

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 1-1-19

Notes: _____ Sketch:

Inspection Team: ERA plus S.D. G+E party of 6

Date: 9-13-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 234 Station: 3120+40

Tower Type: _____ Geophysical Survey: Yes _____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Boulder outcrops of diorite/granodiorite - some boulders of decomposition 1' to 4' diameter

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: located on top of easterly sloping ridge 2° to 10° slopes boulder layer 1 thick on ridge top Canyon filled with 50' boulders

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: r-1-18

Notes: Rock anchor site
Site to be moved 40' to 45'
on line to south
maybe 50' south on line

Sketch:

Inspection Team: ERA plus S.D.G+E ppl. of 6

Date: 9-13-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 235 Station: 3140 + 98 243

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: loose boulders 1 to 3' diameter - granodiorite - Northeast corner deeper weathered

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: 25° slope break
8°-10°

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

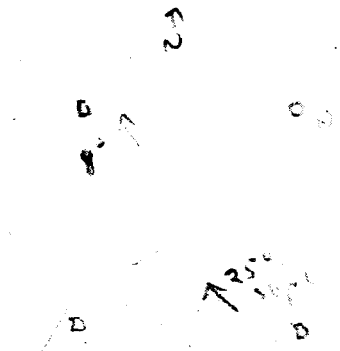
Boring Recommendation: None

Access: None except by foot

Pictures: T-1-17

Notes: Move s.t. northerly 35 Feet to avoid steep S.E. corner to develop on 8°-10° slope

Sketch:



Inspection Team: ERA plus C.O.G+E part of 6

Date: 9-13-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 236 Station: 3151 + 30

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: granodiorite / diorite with thin quartz stringers - 1' to 6' diameter boulders loose on surface over fractured slightly weathered bedrock Virtually no soil

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: 5° to 10° northwesterly

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

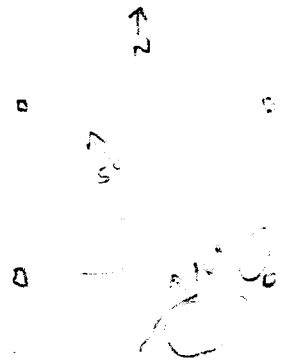
Boring Recommendation: None

Access: None except by foot

Pictures: 5-1-16

Notes: Remove loose boulders rock anchor site

Sketch:



Inspection Team: ERA plus S.D.G+E personnel of 6

Date: 9-13-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 237 Station: 3170 + 05

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: loose 1'-3' boulders on surface of weathered gneissic granite

Anticipated Groundwater Conditions: None within depths of 50' to 100'

Site Slope Conditions:

30°-32° southeast

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None but probably drillable to 7' 10"

Access: None except by foot

Pictures: 1-1-24

Notes: Sketch:

Inspection Team: ERA plus S.D.G&E party of 6

Date: 9-14-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 238 Station: 3183 + 49.09

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions:

Talus slope of scree or similar type deposit
mostly quartz [illegible] except the underlying rock to be [illegible]

Anticipated Groundwater Conditions: None within depths of 50 to 100 Feet

Site Slope Conditions: 40° to southeast
site located on side (middle) of 300 Foot high [illegible]

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 1-1-22

Notes: Sketch:

Inspection Team: ERA

Date: 9-14-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 239 Station: 3198+32.5

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Boulders 10' — 20' diameter over weathered Quartz diorite

no soil

Anticipated Groundwater Conditions: None with depths of 50' to 100'

Site Slope Conditions: located on top of relatively flat topped ridge of boulders of decomposed [illegible]

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None except for boulders

Boring Recommendation: None

Access: None except by foot

Pictures: 5-1-22

Notes: ____ Sketch:

Inspection Team: ERA plus S.D.G&E party of 6

Date: 9-14-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 240 Station: 3204 + 08 663

Tower Type: Tangent Geophysical Survey: Yes ____ No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: 3'-15' diameter boulders over weathered rock - layer of boulders single thick

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: See sketch

ridge is relatively flat beneath boulders - both slopes steep north slope 45° south slope steeper than 45°

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None except for steep slopes

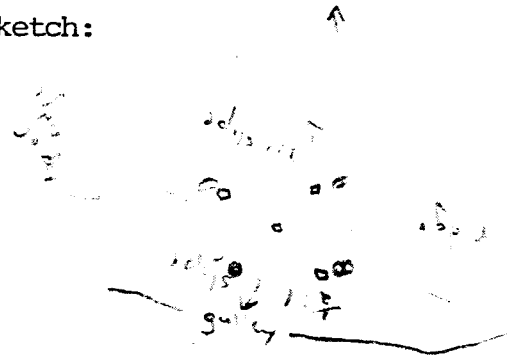
Boring Recommendation: None

Access: None except by foot

Pictures: 1-1-21

Notes: Move str forward 10 feet to center str on top of ridge

Sketch:



Inspection Team: ERA plus SDG+E party of 6

Date: 9-14-79

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 241 Station: _____

Tower Type: Tangent Geophysical Survey: Yes ✓ No _____

Soil Description of Surface and Anticipated Subsurface Conditions: boulder Conglomerate (desert pavement) covers surface; nearby gully indicates site underlain by bedded sand and gravel (fluvial) deposits

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: uniform northwest slope inclination of 10° to 12°

Erosion Potential and Possible Erosion Control Techniques: None or very low potential unless desert pavement is completely removed

Geologic Hazards: None - see above

Boring Recommendation: Possible drill with W.C.C. rig if access road is built

Access: None at present except by foot

Pictures: (T-1-11)

Notes: Some boulders up to 5 foot diameter

Seismic Traverse T-5 + T5r at 241-1

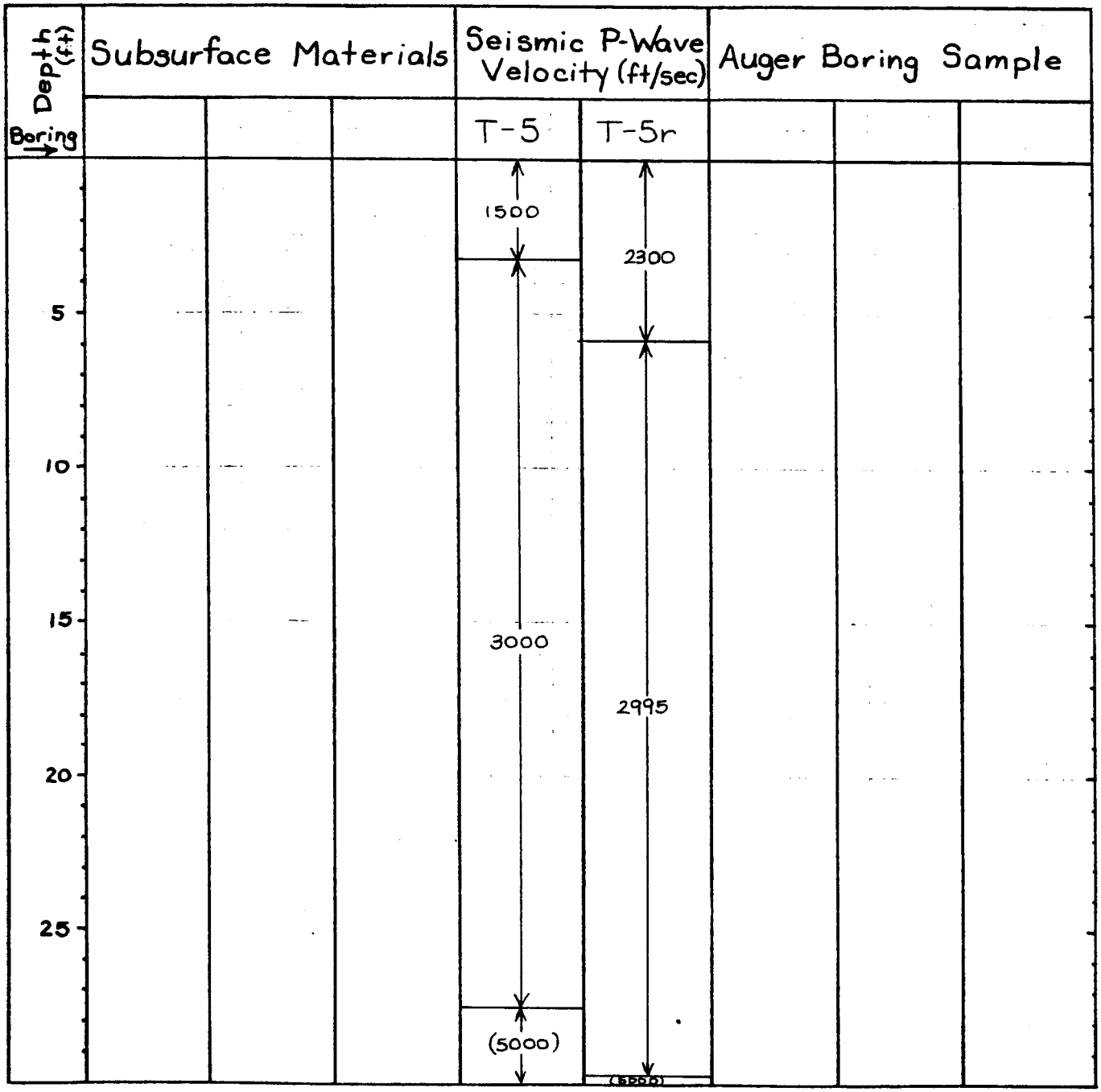
Sketch:

Inspection Team: ERA plus S.D.G+E party of 8

Date: 9-5-79

SUBSURFACE INVESTIGATION SUMMARY

Tower Site 241-1



LEGEND:

Bag Sample

5 6 7 Mod.CA Blowcount

} Auger Boring Sample

PRINTED ON BLUEPRINT

TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 242 Station: 3233 + 90

Tower Type: Tangent Geophysical Survey: Yes ✓ No ____

Soil Description of Surface and Anticipated Subsurface Conditions: boulder conglomerate (desert pavement) covers surface; nearby gully indicates site underlain by bedded sand gravel (fluvial) deposits

Anticipated Groundwater Conditions: None within depths of 50 to 100 Feet

Site Slope Conditions: gentle (5°) slope to the west -

Erosion Potential and Possible Erosion Control Techniques: None or very low potential unless desert pavement is completely removed

Geologic Hazards: None - see above

Boring Recommendation: Possible drill with W.C.C. rig if access road built

Access: None at present except by foot

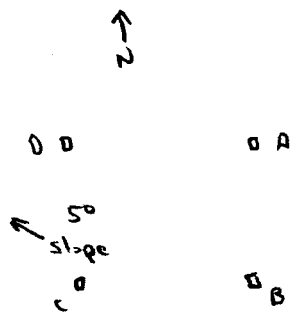
Pictures: photo (r-1-10)

Notes: Should expect some limy material in upper 4 to 5 Feet

Seismic Traverse T-6 + T6r

Tower 242-2 Sta 3238+65

Sketch:

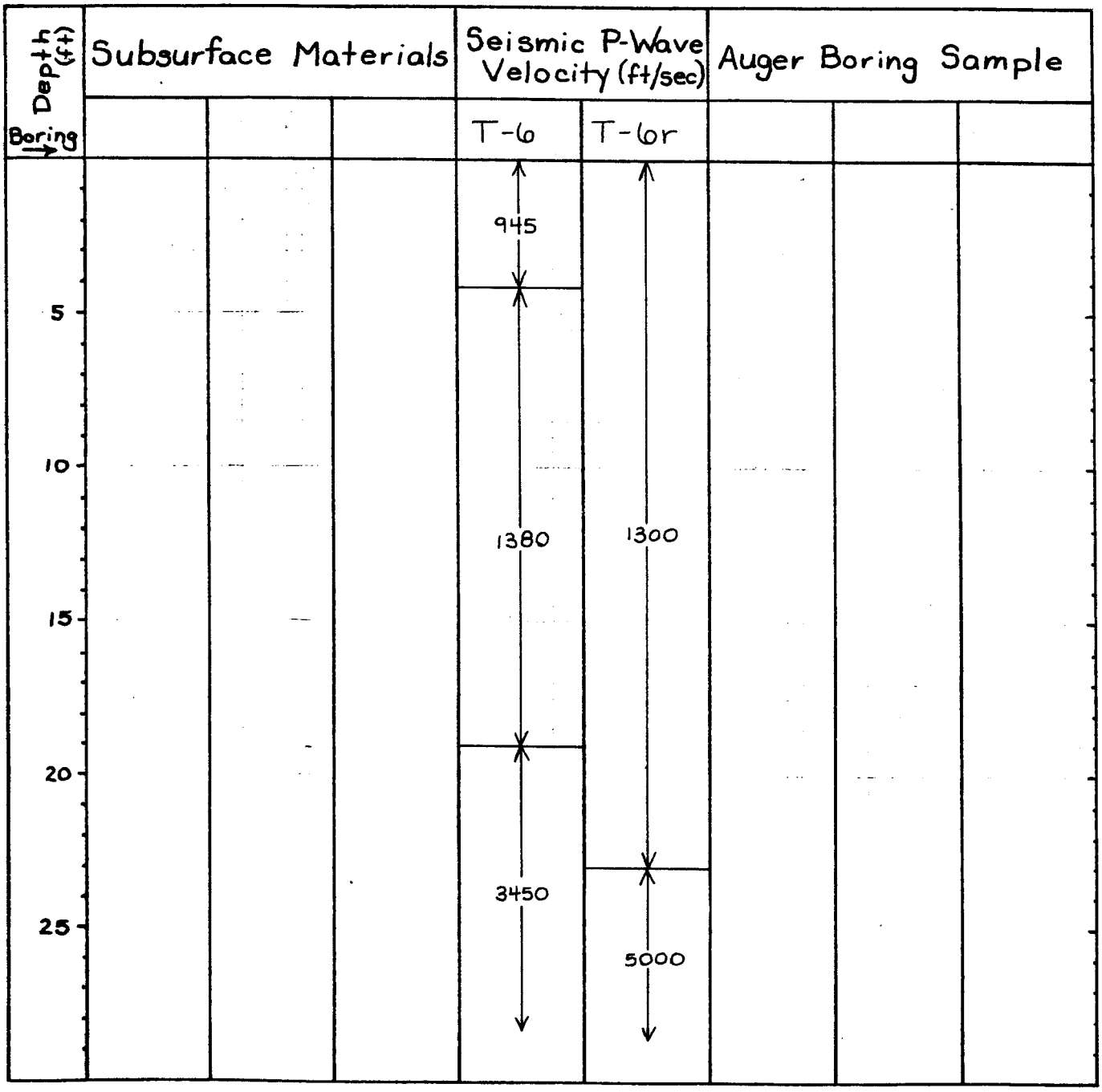


Inspection Team: ERA plus S.D.G.&E. party of 8

Date: 9-5-79

SUBSURFACE INVESTIGATION SUMMARY

Tower Site 242-2



LEGEND:

Bag Sample

5 6 7 Mod.CA Blowcount

} Auger Boring Sample

FOUNDATION BORING REPORT

Str. No. 213

LEMCO ENGINEERS, INC.

RECEIVED MAR 10 1983 LEMCO ENGINEERS

PROJECT TITLE 500 K.V. M.G - E.V. SUBSTATION JOB NO. 5583970

CONTRACTOR Common Wealth (Cowl) TEMPERATURE [illegible] WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ____ HILLY ✓ LEVEL ____

WOODS/ORCHARD ✓ CULTIVATED ____ OTHER (DESCRIPTION) ____

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. (YES) NO

FDN. TYPE (SPEC.): STR. A DJBI 6.0'/27.0' 9.5' BELL; STR. B DJBI 6.0'/27.0' 9.5' BELL; STR. C DJBI 6.0'/27.0' 9.5' BELL; STR. D DJBI 6.0'/27.0' 9.5' BELL

Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
8.15 AM Ft. 3.8.83	6.4'ϕ	10.30 AM Ft. 3.8.83	6.7'ϕ	1.05 PM Ft. 3.8.83	6.7'ϕ	9.10 AM Ft. 3.9.83	6.6'ϕ
DARK BROWN SANDY/CL. SOIL	SA. CL.	DARK BROWN SANDY/CL. SOIL	SA. CL.	DARK BROWN SANDY/CL. SOIL	SA.	DARK BROWN SANDY/CL. SOIL	CL. SA.
1FT. D.G. SOME CEMENTING. YELLOW/GREEN. SOME SMALL CO. 4"-8" ϕ. SOME CLAY & GR. EASY DRILLING	D.G. CO. GR.	2FT D.G. SOME CEMENTING YELLOW/DARK GREEN SOME GR & CLAY	SA. D.G. GR.	1FT D.G. SOME CEMENTING IN CHUNKS 4"-10" ϕ YELLOW/DARK GREEN MATERIAL SOME GR. AND SMALL COBBLES 2"-6" ϕ	D.G. GR. CO.	1FT D.G. CEMENTING IN CHUNKS 1FT ± ϕ. DARK BROWN/DARK GREEN IN COLOR.	SA. CL. D.G.
10FT. MORE SAND WITH D.G.	SA. D.G.	13 FT MED/COARSE SAND. DARK YELLOW STILL SOME D.G. THAT IS CEMENTING	SAND	15' SAND W/ D.G. MEDIUM TO COARSE GRAINS - SOME CEMENTING IN SMALL CHUNKS 1"-3" ϕ	SA. GR.	10 FT. UTILES SAND MIXING W/ D.G. SOME GR. 1"-2" ϕ SEEMS MOIST.	SA. D.G. GR.
13FT LOOSE COARSE/MED. SAND. SOME BOULDERS.	SA.	21FT SAND APPEARS DRYER W/ STILL SOME CEMENTING. VERY COARSE TO SILTY.	SA. SI.	SOME GRANITE IN LOOSE CO. 6" ϕ SOME GR.	CO.	20' SAND IS SILTY TO COARSE. SOME CEMENTING SMALL GR. 1" ϕ	SA. GR.
20FT - MORE DRY SAND	SA.	SHAFT COMPL 11 AM-3.8.83 BELL COMPL 12.45PM 3.8.83.		23' COARSE TO SILTY SOME CEMENTING SOME GR.	SA.	7.50 AM 3.9.83 BELL COMPL. 8.45AM. 3.9.83	
SHAFT DONE 9.15-3.8.83 BELL COMPL 11.00-3.8.83				SHAFT COMPL. 2.40PM-3.8.83. BELL COMPL 2.20PM 3.8.83			

Bell Height 60" — 28.5' — 28.6' — 28.7' — 28.4' — Bell Height

in. of Bell 114" IN. Bell Dia. 114 in. Bell Dia 114 in. Bell Dia 114 in.

Bell Height 60" in. Bell Height 80" in. Bell Height 60 in. Bell Height 64 in.

L.F. Rock L.F. Rock L.F. Rock L.F. Rock

WATSON 3000

REMARKS: LEG "A" - BELL IS VERY CLEAN. LEG "B" - BELL CLEAN LEG "C" - BELL CLEAN LEG "D" - BELL CLEAN. SOIL TYPE IS COMPARABLE WITH SOIL TYPE "D" WITH EXCEPTION OF UPPER 10FT. WHICH IS A COMPACTED D.G.

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References ✓ AMD 3/11/83

CONT. REPR. [signature]

LEMCO REPR. [signature]

DMD 3-11-83

Str. No. 213

Sta. No. 2840+37.08

Str. Type EMD

DATE 3.9.83

FOUNDATION BORING REPORT RECEIVED Str. No. 214

LEMCO ENGINEERS, INC. MAR 18 1983

02A

PROJECT TITLE 500 K.V. M.G - I.V. SUBSTATION W.O. NO. 5583978

CONTRACTOR COMMON WEALTH (CWL) TEMPERATURE LEMCO-[illegible] WEATHER Clear

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ______ HILLY X LEVEL ______

WOODS/ORCHARD ______ CULTIVATED ______ OTHER (DESCRIPTION) Brush

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. (YES) NO

FDN. TYPE (SPEC.):

	STR. A	STR. B	STR. C	STR. D
FDN. TYPE (SPEC.)	AG[illegible] ~~EMT~~ 42" / 13'	AG[illegible] ~~EMT~~ 42" / 13'	AGG2 ~~EMT~~ 42" / 13'	AGG2 EMT 48" / 13'
	78" ØG	6.5' Bell	6.5' Bell	54" Ø13

STR. A Description	STR. A Sketch	STR. B Description	STR. B Sketch	STR. C Description	STR. C Sketch	STR. D Description	STR. D Sketch
STARTED 3-16-83 11:15 AM Ft.	54" Ø 3-16-83	SOME SURFACE SOIL Ft.	3.8' Ø	SOME SURFACE SOIL Ft.	3.7' Ø	STARTED 3-16-83 1:30 P.M. Ft.	60" Ø
SANDY TEXT. MED-DARK IN COLOR MIXED WITH CO. SMALL AMOUNTS OF D.G. SAME TEXT THROUGH OUT SHAFT	S.D. Ø B'	D.G. VERY FIRM DARK YELLOW IN COLOR	SA	D.G. VERY FIRM DARK YELLOW IN COLOR	SAME AS "B"	FC. Co. LARGE ROCKS 0'-3'6"	Co
FINISHED SHAFT @ 11:40 A.M. 3-16						3'6" SANDY TEXT MED BROWN IN COLOR	
BELL STARTED @ 11:45 A.M.						HIT ROCK @ 7½'	FR
BELL FINISHED @ 12:05 P.M.						ROCKY THROUGH @ 8½" CO MIXED WITH SAND D.G. MOSTLY SAND ALL THE WAY TO 13'0"	
						FINISHED SHAFT @ 2:40 P.M. 3/16/83	
						STARTED BELL @ 2:35 P.M. 3-16-83	
						FINISHED BELL @ 3:00 P.M. 3-16-83	

Depth

Bell Height

	STR. A	STR. B	STR. C	STR. D
Depth	13'-4"	13.9'	13.8'	
Dia. of Bell	78 IN.	Bell Dia. 78 IN.	Bell Dia. 78 IN.	Bell Dia. 84 IN.
Bell Height	30 IN.	Bell Height 48 IN.	Bell Height 48 IN.	Bell Height 36 IN.
L.F. Rock	—	L.F. Rock	L.F. Rock	L.F. Rock 4'-0"

PAY ROCK 4' @ 48"

REMARKS: LEGS "B" & "C" DRILLED ON

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel

CO - Cobbles BO - Boulders F.R. - Fractured Rock

RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References DMS 3-18-83

APRD 3/21/83

CONT. REPR. C. E. George

LEMCO REPR. [illegible signature]

Str. No. 214

Sta. No. 2554+81.70

Str. Type EMT

DATE 3-16-83

FOUNDATION BORING REPORT

Str. No. 215

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. M.G - F.V. SUBSTATION W.O. NO. 5583870

CONTRACTOR COMMON WEALTH (CWL) TEMPERATURE 60s± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ✓ HILLY _____ LEVEL _____

WOODS/ORCHARD ✓ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. (YES) NO

FDN. TYPE (SPEC.): ADA2 4.5'/13.0' ADA2 4.5'/13.0' ADA2 4.5'/13.0' ADA2 4.5'/13.0'

RECEIVED
APR 5 1983
LEMCO-JAMUL

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.		Ft.		3-11-83 2:40 AM Ft.	54" ϕ	Ft. 3-7-83 2:07 PM	77" X 100"
				0-3' GRAVEL D.G.	72" ϕ D.G.	SOME COBBLES 8"-16" ϕ, D.G. SOME GR., SLOW DRILLING	CO. BO. GR.
				3'-4' PT. OF ROCK	RO	3' HIT ROCK SLOW DRILLING MASSIVE BOULDERS TO 8'	STOPPED DRILLING @ 5:30 - 3-7-83
				4'-6.7' D.G. STOPPED 3-11-83	3:20PM		
				STARTED 3/11/83 7:30 A.M.	72" ϕ		
				STARTED 6-7' E.R. & CA		STARTED 7:30 AM 3-8-83	
					D.G. CO SA	STOPPED 9:45 AM 3-8-83	
				COBBLES, D.G. LIGHT IN COLOR MIXED WITH SAND 7'-7'-11'-6	CO D.G.	STARTED 11 PM 3-11-83 STOPPED 2:30 P.M. 3-11-83.	
				SILTY SAND W/ FEW COBBLES 11'-0"-12'-0"	SI CO	STARTED 8 AM 10:00 3-16-83	
				12'-0" HIT HARD CEMENTED MIXED W/SAND F.R. SLOWED DRILLED @ 12'-6"	RO	SEE NEXT SHEET	
				FINISHED SHAFT @ 4:21 A.M. 3-16-83 PAY ROCK 2' @ 54" ϕ			

Depth

Bell Height

in. of Bell	in.	Bell Dia.	in.	Bell Dia.	in.	Bell Dia.	in.
Bell Height	in.	Bell Height	in.	Bell Height	in.	Bell Height	in.
F. Rock		L.F. Rock		L.F. Rock 2'		L.F. Rock	

REMARKS: 3-7-83 - STOPPED DRILLING @ SET DEPTH - TIME 5.30PM.
3-8-83 HAD TO Ream Hole 3-8', Bits Moved Off & Down to Rock

DMS 4-5-83

✓ AMD 4/6/83

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References _____

Str. No. 215

Sta. No. 2866+80

Str. Type ETT

CONT. REPR. Charles Bloomberg DM

LEMCO REPR. Charles W. Hayes

DATE 4/4/83.

FOUNDATION BORING REPORT

Str. No. 216 OZA

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 K.V. M.G - F.V. SUBSTATION W.O. NO. 5593970

CONTRACTOR COMMONWEALTH (COWL) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

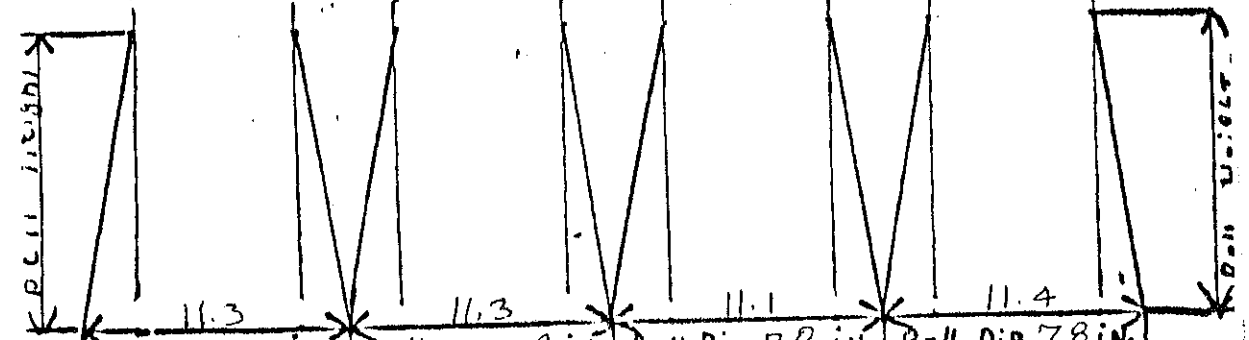
WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): STR. A ADBL 3.5 FT/11.0 FT 6.5 FT ØB; STR. B ADBL 3.5 FT/11 FT 6.5 FT ØB; STR. C ADBL 3.5 FT/11 FT 6.5 FT ØB; STR. D ADBL 3.5 FT/11 FT 6.5 FT ØB

RECEIVED
JUL 15 1983
LEMCO-JAMUL

Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.		Ft.		Ft.		Ft.	
0 FT D.G. VERY FIRM 4 FT	D.G.	D.G. MIXED WITH SMALL ROCKS	D.G.	0 FT D.G. 4 FT	D.G.	0 FT SOIL	SOIL
ROCK (2 FT)	RO			ROCK (2 L.F.)	RO	2 FT HIT ROCK (5 L.F.)	RO
7 FT BROKE THROUGH ROCK BACK INTO VERY FIRM D.G.	D.G.			7 FT BROKE THROUGH ROCK, BACK INTO D.G.	D.G.	7 FT BROKE THROUGH ROCK, D.G. MIXED WITH SOME ROCK	D.G.
Depth		Depth		Depth		Depth	



B. of Bell 78 IN. Bell Dia. 78 IN. Bell Dia 78 IN. Bell Dia 78 IN.

Bell Height 42 IN. Bell Height 42 IN. Bell Height 42 IN. Bell Height 42 IN.

L.F. Rock 3 L.F. Rock 0 L.F. Rock 3 L.F. Rock 5

REMARKS: ALL SHAFTS HAND DUG

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References ✓ AMD 7/15/83

Str. No. 216

Sta. No. 2883+20

Str. Type ETT

DATE 7-13-83

CONT. REPR. _____

LEMCO REPR. _____

FOUNDATION BORING REPORT

Str. No. 217

LEMCO ENGINEERS, INC.

02A

PROJECT TITLE 500 K.V. H-G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (COWL) TEMPERATURE 90± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS _____ HILLY X LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): 54"/13' ABA2 | 54"/13' ABA2 | 54"/13' ABA2 | 54"/4' ABA2

RECEIVED
AUG 4 1983
LEMCO-JAMUL

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.	54" ϕ	Ft.	54" ϕ	Ft.	54" ϕ	Ft.	54" ϕ
0 Ft DG		0 Ft DG		0 Ft DG		0 Ft DG	
				4 Ft		5 Ft	
10 Ft Rock	Depth RO	Depth	Depth	Rock	Depth RO	Rock	Depth RO
13.0 Ft		13 Ft		13 Ft		14 Ft	
13.3 Ft		13.3 Ft		13.1 Ft		14.1 Ft	

Drill Height

Drill Width

B. of Bell 0 IN. Bell Dia. 0 IN. Bell Dia 0 IN. Bell Dia 0 IN.

Bell Height 0 IN. Bell Height 0 IN. Bell Height 0 IN. Bell Height 0 IN.

E. Rock 3 Ft L.F. Rock 0 Ft L.F. Rock 9 Ft L.F. Rock 9 Ft

REMARKS: _____

RECEIVED
AUG 3 1983
LEMCO-MIGUEL

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

References ✓ AND 8/04/83

Str. No. 217

Sta. No. 2901+93

Str. Type EMT

CONT. REPR. T. David Crump

LEMCO REPR. Robert W. Lemert

DATE 7-29-83

FOUNDATION BORING REPORT

Str. No. 218

LEMCO ENGINEERS, INC.

024

PROJECT TITLE 500 KV. M-G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (CWL) TEMPERATURE 90± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): 42"/13' ABB2 42"/13' ABB2 42"/13' ABB2 42"/13' ABB2

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.	42"ϕ	Ft.	42"ϕ	Ft.	42"ϕ	Ft.	42"ϕ
0 Ft Rock	RO	0 Ft Rock	RO	0 Ft Rock	RO	0 Ft Rock	RO
9 Ft Depth		9 Ft Depth		10 Ft Depth		10 Ft Depth	
10 Ft DA		DA		DA		DA	
13 Ft		13 Ft		13 Ft		13 Ft	

Bell Height

Drill Height

A. of Bell 78 in. Bell Dia. 78 in. Bell Dia 78 in. Bell Dia 78 in.

Bell Height 36 in. Bell Height 36 in. Bell Height 36 in. Bell Height 36 in.

E. Rock 10 Ft L.F. Rock 9 Ft L.F. Rock 10 Ft L.F. Rock 10 Ft

REMARKS: _____

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

RECEIVED
AUG 8 1983
LEMCO-MIGUEL

References ✓ AUD 8/09/83

Str. No. 218
Sta. No. 2908 +10
Str. Type EMT
DATE 8-9-83

CONT. REPR. _____

LEMCO REPR. _____

FOUNDATION BORING REPORT

Str. No. 219

LEMCO ENGINEERS, INC.

02A

PROJECT TITLE 500 KV. M.G - F.V. SUBSTA W.O. NO. 5593970

CONTRACTOR COMMONWEALTH (CWL) TEMPERATURE 90± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): 54"/13' ABR3 54"/6' ABR3 54"/14' ABR3 54"/13' ABR3

RECEIVED

JUL 26 1983

LEMCO-JAMUE

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.	54"ϕ	Ft.	54"ϕ	Ft.	54"ϕ	Ft.	54"ϕ
DG & Rock 3FT	B	DG 1FT		DG 1 FT		DG & Rock 5FT	
FRACT Rock 13FT	RO	FRACT Rock 6FT	RO	LAYERED Rock 14FT	RO	FRACT Rock 13FT	RO
13.3 FT		6.2 FT		14.2 FT		13.5'	
Depth		Depth		Depth		Depth	
B. of Bell ___ IN.		Bell Dia. ___ IN.		Bell Dia ___ IN.		Bell Dia ___ IN.	
Bell Height ___ IN.		Bell Height ___ IN.		Bell Height ___ IN.		Bell Height ___ IN.	
L.F. Rock 10 FT		L.F. Rock 5FT		L.F. Rock 13 FT		L.F. Rock 8 FT	

REMARKS: _____

RECEIVED

JUL 26 1983

LEMCO-MIGUEL

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References FCO 108F ✓ A/D 7/28/83 Str. No. 219

Sta. No. 2921+50

CONT. REPR. Doug Guy Str. Type EHT

LEMCO REPR. Robert W. Schmidt DATE 7-28-83

FOUNDATION BORING REPORT

Str. No. 220

LEMCO ENGINEERS, INC.

02A

PROJECT TITLE 500 KV. H.G - I.V. SUBSTATION W.O. NO. 5593970

CONTRACTOR COMMONWEALTH (CWL) TEMPERATURE 90± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): 54"/13' ABRI 54"/13' ABRI 54"/13' ABRI 54"/13 ABRI

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.	54"Φ	Ft.	54"Φ	Ft.	54"Φ	Ft.	54" Φ
0 FT DG & Rock 4 FT FRACT. Rock 13 FT	Depth RO RO	0 DG & Rock 2 FT FRACT Rock 13 FT	Depth RO RO	0 DG & Rock 1 FT FRACT. Rock 13 FT	Depth RO RO	0 DG 6 FT Rock 13 FT	Depth RO
13.1 FT		13.2 FT		13.0		13.2	

Bell Height

B. of Bell 0 IN. Bell Dia. IN. Bell Dia IN. Bell Dia IN.

Bell Height 0 IN. Bell Height IN. Bell Height IN. Bell Height IN.

E. Rock 9 FT L.F. Rock 11 FT L.F. Rock 9 FT L.F. Rock 7 FT

REMARKS:

RECEIVED

JUL 26 1983

LEMCO-MIGUEL

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel

CO - Cobbles BO - Boulders F.R. - Fractured Rock

RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References 9/0104-P ✓ AND 7/24/83

Str. No. 220

Sta. No. 2929+00

Str. Type EMT

CONT. REPR. Dave Cruz

LEMCO REPR. Robert W. Schmidt

DATE 7-28-83

FOUNDATION BORING REPORT

Str. No. 221 (02A)

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. M.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (OWL) TEMPERATURE 90± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ____ HILLY ✓ LEVEL ____

WOODS/ORCHARD ____ CULTIVATED ____ OTHER (DESCRIPTION) ____

RECEIVED RIGHT-OF-WAY CLEARED YES NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES N

JUN 20 1983 FDN. TYPE (SPEC.): 54"/14' AEA2 | 54"/14' | 54"/14' | 54"/14'

LEMCO-JAMUL

	STR. A		STR. B		STR. C		STR. D	
	Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
	5-23 Ft.		5-23-83 Ft.		5-26-83 Ft.		5-26-83 Ft.	
	0'		0'		0		0	
	RO.	RO.	RO.	RO.	RO.	RO.	RO	RO
Depth								
	14.0'		14.0'		14.0'		14.0'	

Bell Height

Complete 6-7-83 — 14.4'
Complete 6-10-83 — 14.2'
Complete 6-14-83 — 14.2
Complete 6-16-83 — 14.5'

B. of Bell — IN.	Bell Dia — IN.	Bell Dia — IN.	Bell Dia — IN.
Bell Height — IN.	Bell Height — IN.	Bell Height — IN.	Bell Height — IN.
L.F. Rock 14.0	L.F. Rock 14.0	L.F. Rock 14.0	L.F. Rock 14.0

REMARKS: HAND DUG HOLES
54" DIA. HOLES

RECEIVED
JUN 20 1983
LEMCO-MIGUEL

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

✓ AM 6/23/83

References ____

Str. No. 221

Sta. No. 2945+83.53

Str. Type ELA

CONT. REPR. David Cruz

LEMCO REPR. James J. Relph

DATE 6-17-83

FOUNDATION BORING REPORT

Str. No. 222 024

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. Mic - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (OWL) TEMPERATURE 80± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RECEIVED RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

JUL 5 1983 FDN. TYPE (SPEC.): 54"/13' ABAZ 54"/14' ABAZ 54"/13' ABAZ 54"/13' ABAZ

LEMCO-JAMUL

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.	54" ϕ	Ft.	54" ϕ	Ft.	54" ϕ	Ft.	54" ϕ
0 FT D.G + Rock 6FT		0FT DG 3FT Rock 6FT DG 8FT Rock 14FT		0FT D.G + Rock 4FT Rock 8FT D.G + Rock 10FT Rock 13FT		DG Rock	
Rock 13FT	Ro		Ro		Ro		Ro
Depth		Depth		Depth		Depth	
13.0'		14.0'		13 FT		13 FT	

Bell Height

Dell Dia

B. of Bell ___ IN. Bell Dia. ___ IN. Bell Dia ___ IN. Bell Dia ___ IN.

Bell Height ___ IN. Bell Height ___ IN. Bell Height ___ IN. Bell Height ___ IN.

E Rock (7FT) L.F. Rock (9FT) L.F. Rock (7FT) L.F. Rock (11FT)

REMARKS: _____

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

✓ pnA 7/09/83

References _____

Str. No. 222

Sta. No. 2953+20.41

CONT. REPR. David Ray

Str. Type EHT

LEMCO REPR. Robert W Schmidt

DATE 6-30-83

LM 7/1/83

FOUNDATION BORING REPORT

Str. No. 223

LEMCO ENGINEERS, INC.

OCA

PROJECT TITLE 500 KV. M.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (COWL) TEMPERATURE 90± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): 60"/17' AHBZ 60"/17' AHBZ 60"/17' AHBZ 60"/17' AHBZ

STR. A 102" BELL STR. B 102" BELL STR. C 102" BELL STR. D 102" BELL

Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.	60"ϕ	Ft.	60"ϕ	Ft.	60"ϕ	Ft.	60"ϕ
0 FT		0 FT		0 FT		0 FT	
FRACT. ROCK	RO	FRACT ROCK	RO	FRACT ROCK	RO	FRACT ROCK	RO
12 FT		12 FT		12 FT		13 FT	
DG W/ ROCKS		DG W/ ROCKS					
17 FT		17 FT		17 FT		17 FT	
17.1 FT		17.3 FT		17.1 FT		17.2 FT	

Depth

Drill Height

A. of Bell 102 IN. Bell Dia. 102 IN. Bell Dia. 102 IN. Bell Dia. 102 IN.

Bell Height 48 IN. Bell Height 48 IN. Bell Height 48 IN. Bell Height 48 IN.

L.F. Rock 13 FT L.F. Rock 12 FT L.F. Rock 12 FT L.F. Rock 13 FT

REMARKS: _____

RECEIVED
AUG 4 1983
LEMCO-JAMUL

RECEIVED
AUG 3 1983
LEMCO-MIGUEL

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Drill Rate in Sketch Space if Rock Anchor(s)

References ✓ P/D 8/04/83

CONT. REPR. Donald Knapp

LEMCO REPR. Robert W. Schmidt

Str. No. 223

Sta. No. 2968+56.99

Str. Type ELD

DATE 8-1-83

FOUNDATION BORING REPORT

Str. No. 224

LEMCO ENGINEERS, INC.

02A

PROJECT TITLE 500 KV. M.G - F.V. SUBSTATION W.O. NO. 5593970

CONTRACTOR COMMONWEALTH (COWL) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RECEIVED

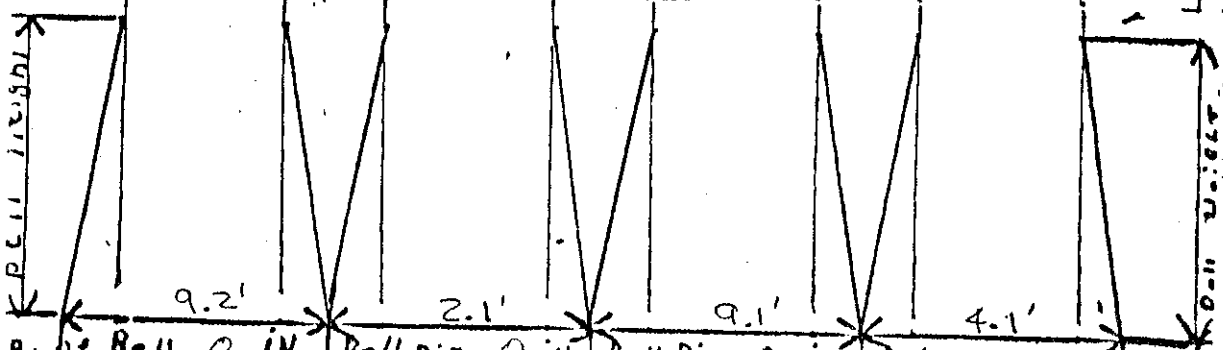
JUL 15 1983

LEMCO-JAMUL

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): AAR2 42"Φ/9' AAR2 42"Φ/2' AAR2 42"Φ/9' AAR2 42"Φ/4'

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.		Ft.		Ft.		Ft.	
0 FT D.G. VERY FIRM	D.G.	0 FT HIT ROCK	RO	0 FT D.G. VERY FIRM	D.G.	0 FT HIT ROCK	RO



A. Bell 0 IN. Bell Dia. 0 IN. Bell Dia 0 IN. Bell Dia 0 IN.

B. Height 0 IN. Bell Height 0 IN. Bell Height 0 IN. Bell Height 0 IN.

C. Rock 0 L.F. Rock 2 L.F. Rock 0 L.F. Rock 4

REMARKS: ALL SHAFTS HAND DUG

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References _____

Str. No. 224

Sta. No. 2928+13.99

Str. Type ELT

CONT. REPR. _____

LEMCO REPR. _____

DATE 7-13-83

FOUNDATION BORING REPORT

Str. No. 225

LEMCO ENGINEERS, INC.

02A

TITLE 500 KV. Mid-Z.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (COWL) TEMPERATURE _____ WEATHER _____

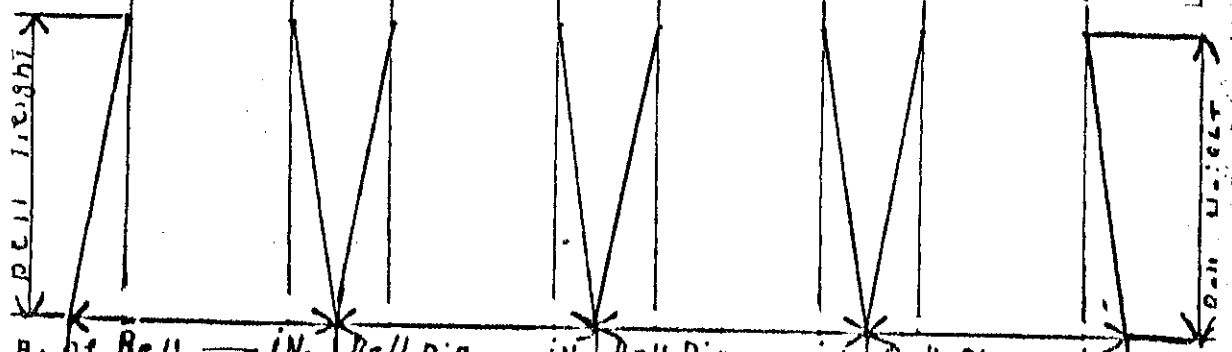
DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): AAA1 30" 10 STR. A | AAA1 30" 10 STR. B | AAA1 30" 10 STR. C | AAA1 30" 10 STR. D

Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
6/14 32"ø Ft.	5/14	5/14 32"ø Ft.	5/14	5/14 32"ø Ft.	5/14	5/14 32"ø Ft.	5/14
3' of MEDIUM HARD D.G.	D.G.	4' of MEDIUM HARD D.G.	D.G.	10' of MEDIUM HARD D.G.		8' of MEDIUM HARD D.G.	
7' of FRACTURED ROCK	F.R.	6' of FRACTURED ROCK				2' of ROCK	
10' Complete 5/18/83		10' Complete 5/20/83		10' Complete 5/17/83		10' Complete 5/19/83	



B. of Bell ___ IN. Bell Dia. ___ IN. Bell Dia ___ IN. Bell Dia ___ IN.

Bell Height ___ IN. Bell Height ___ IN. Bell Height ___ IN. Bell Height ___ IN.

F. Rock 7 I.F. Rock 6 I.F. Rock ___ I.F. Rock 2

REMARKS: Rock No Good For Rock Anchors

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References ✓ AHD 5/25/83

Str. No. 225

Sta. No. 2997+52

CONT. REPR. David Cruz

Str. Type ELT

LEMCO REPR. Ray Baightwell

DATE 5-23-83

LEMCO-JAMUL

FOUNDATION BORING REPORT

Str. No. 226 (226A)

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. M.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (CWL) TEMPERATURE 80± WEATHER SUNNY

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): 5.5'/5' 5.5'/5' 5.5'/3' 5.5'/3'

RECEIVED JUN 24 1983 LEMCO-JAMUL

STR. A ACR1		STR. B ACR1		STR. C ACR1		STR. D ACR1	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
START 5/25/83 Ft.	66"ϕ	START 5/25/83 Ft.	66"ϕ	START 6/16/83 Ft.	66"ϕ	START 6/16/83 Ft.	66"ϕ
Rock	Ro	Rock	Ro	Rock	Ro	Rock	Ro
Depth	Ro	Depth	Ro	Depth	Ro	Depth	Ro
FINISH 6/25/83		FINISH 6/6/83		FINISH 6/20/83		FINISH 6/21/83	
5.0'		5.0'		3.0'		5.0'	

Bell Height — Ball Height

Dia. of Bell 0 IN. Bell Dia. 0 IN. Bell Dia 0 IN. Bell Dia 0 IN.

Bell Height 0 IN. Bell Height 0 IN. Bell Height 0 IN. Bell Height 0 IN.

L.F. Rock (5FT) L.F. Rock (5FT) L.F. Rock (3FT) L.F. Rock (5FT)

REMARKS: DEPENDING ON HARDNESS OF ROCK, HOLES FOR ROCK ANCHOR WERE TAKING 5-7 MINUTES PER FOOT BY JACKHAMMER

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

RECEIVED JUN 23 1983 LEMCO-MIGUEL

References C/L 100 P ✓ RMB 6/24/83

CONT. REP'R. David Cain

LEMCO REP'R. Robert W. Schmidt

Str. No. 226

Sta. No. 3011 + 65

Str. Type EHT

DATE 6-22-83

FOUNDATION BORING REPORT

Str. No. 227 024

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 K.V. Mic - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (CWL) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): ACA2 54"/13' ACA2 54"/13' ACA2 54"/13' ACA2 54"/13'

RECEIVED MAY 23 1983 LEMCO-JAMUL

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
5-5-83 Ft.		5-5-83 Ft.		5-5-83 Ft.		5-5-83 Ft.	
FRACTURED Rock	R.O. Depth	FRACTURED Rock	R.O. Depth	MEDIUM Soft to HARD D.G.	D.G. Depth	Soft to HARD DG 5' Rock 2' HARD D.G. 5.6' Rock	D.G. R.O. D.G. R.O. Depth
Completed Shaft 5-18-83		Completed Shaft 5-17-83		Completed Shaft 5-11-83		Completed Shaft 5-11-83	
13.4'		13.4'		13.6'		13.6'	
Dia. of Bell — IN.		Bell Dia. — IN.		Bell Dia — IN.		Bell Dia. — IN.	
Bell Height — IN.		Bell Height — IN.		Bell Height — IN.		Bell Height — IN.	
L.F. Rock 13'		L.F. Rock 13'		L.F. Rock —		L.F. Rock 3'	

Bell Height

REMARKS: HAND DUG HOLES

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

RECEIVED MAY 20 1983 LEMCO-MIGUEL

References V AND 5/25/83

Str. No. 227

Sta. No. 3030+30

Str. Type EHT

CONT. REPR. David Cruz

LEMCO REPR. Ray Brightwell DATE 5-18-83

FOUNDATION BORING REPORT

Str. No. 228

02A

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 K.V. M.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (CWI) TEMPERATURE _____ WEATHER _____

RECEIVED DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

MAY 11 1983 WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

LEMCO-JAMUEL RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

EDN. TYPE (SPEC.): STR. A AAA1 30" 10' STR. B AAA1 30" 10' STR. C AAA1 30" 10' STR. D AAA1 30" 10

Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
5-4 Ft. Hard DG Blasted Rock 3' Hard D.G. 3' PAY Rock	30" ϕ DG Depth Shaft Finished 5/9/83	5-4 Ft. Soft to medium Hard D.G.	30" ϕ DG Depth Shaft Finished 5/6/83 DEPTH 10'.0	5-4 Ft. Soft to medium Hard D.G.	30" ϕ D.G. Depth Shaft Finished 5/5/83 DEPTH 10'.1	5-4 Ft. Soft to medium Hard DG.	30" ϕ D.G. Depth Shaft Finished 5/6/83 DEPTH 10'.2

Bell Height — IN. Bell Dia. — IN. | Bell Height — IN. Bell Dia. — IN. | Bell Height — IN. Bell Dia. — IN. | Bell Height — IN. Bell Dia. — IN.

E. Rock 3 L.F. Rock | L.F. Rock | L.F. Rock

REMARKS: All Four holes were Hard D.G.

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

RECEIVED

MAY 10 1983

LEMCO-MIGUEL

References ✓ Ams 5/16/83

Str. No. 228

Sta. No. 3042+74.42

Str. Type ELT

CONT. REPR. David Cruz

LEMCO REPR. Ray Brightwell

DATE From 5-4 To 5-9-83 (5-9-83)

FOUNDATION BORING REPORT

Str. No. 229'
02A

LEMCO ENGINEERS, INC.

RECEIVED
MAY 03 1983
LEMCO-JAMUL

PROJECT TITLE 500 K.V. M.G - E.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (CWL) TEMPERATURE _____ WEATHER _____

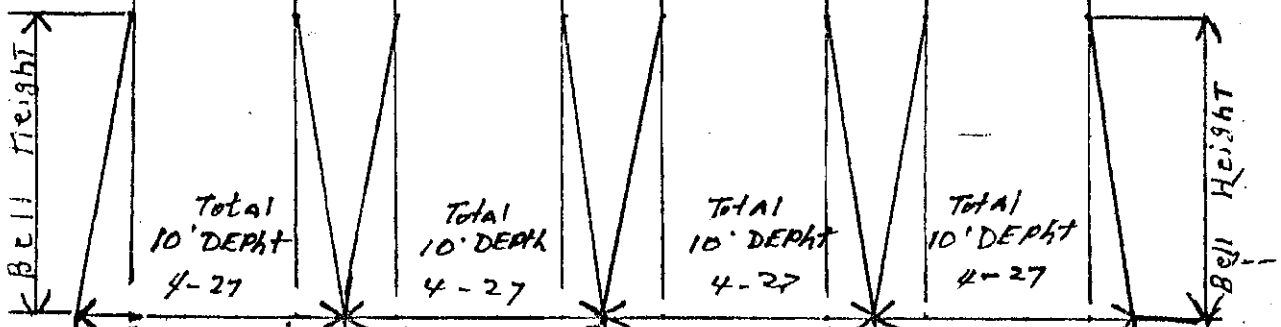
DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): ELT 30" 10' ELT 30" 10' ELT 30" 10' ELT 30" 10'

4/22/83 STR. A		4/22/83 STR. B		4/22/83 STR. C		4/22/83 STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Dirt & D.G. LARGE BOULDERS 2.5 Ft.	S.A. D.G. B.O.	Dirt & D.G. 1.5 Ft.	S.A. D.G.	Dirt & D.G. 3 Ft.	S.A. D.G.	Dirt & D.G. 3 Ft.	S.A. D.G.
D.G. AND HARD ROCK Depth	D.G. R.O.	D.G. AND HARD ROCK Depth	D.G. R.O.	D.G. AND HARD ROCK Depth	D.G. R.O.	D.G. AND HARD ROCK Depth	D.G. R.O.
Bottom 2' WAS PAY ROCK 7.5		LAST 3' WAS PAY ROCK 8.5		LAST 3' WAS PAY ROCK 7'		Bottom 3' WAS PAY ROCK 7'	
Bottom of hole		Bottom of hole		Bottom of hole		Bottom of hole	



Dia. of Bell — IN. Bell Dia. — IN. Bell Dia. — IN. Bell Dia. — IN.

Bell Height IN. Bell Height IN. Bell Height IN. Bell Height IN.

L.F. Rock 2' L.F. Rock 3' L.F. Rock 3' L.F. Rock 3'

REMARKS: PAY ROCK WAS IN Bottom of holes

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

References V AND 5/10/83

CONT. REPR. David Cary

LEMCO REPR. Ray Brightwell

Str. No. 229
Sta. No. 30052+95
Str. Type ELT
DATE 4-27-83

RECEIVED
APR 29 1983
LEMCO-MIGUEL

FOUNDATION BORING REPORT

Str. No. 230

LEMCO ENGINEERS, INC.

02A

PROJECT TITLE 500 KV. M.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (COWL) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RECEIVED RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

MAY 25 1983 FDN. TYPE (SPEC.): AAR/ 42" 9' AAR/ 42" 9' AAR/ 42" 9' AAR/ 42" 9'

LEMCO-JAMUL

	STR. A		STR. B		STR. C		STR. D	
	Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
	4-27-83 Ft.	Ø42"	4-27-83 Ft.	Ø42"	4-27-83 Ft.	Ø42"	4-27-83 Ft.	Ø42"
0	4' Boulders & F Rock		2' Boulders & D.B.		2' Boulders & D6		3' Boulders & D6	
4	R/A		7' Fractured Rock		7' Rock & Fr. Rock		6' F. Rock	
9			9' DEEP		9' DEEP		9' DEEP.	
			Comp 5/17/83		Comp 5/20/83		Comp 5/17/83	

Depth

Bell Height

Bell Dia.

B. of Bell — IN. Bell Dia. — IN. Bell Dia — IN. Bell Dia — IN.

Bell Height — IN. Bell Height — IN. Bell Height — IN. Bell Height — IN.

F. Rock 4 J.F. Rock 7 J.F. Rock 7 J.F. Rock 6

REMARKS: _____

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel

CO - Cobbles BO - Boulders F.R. - Fractured Rock

RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References FCD 60F V and S25/63 Str. No. 230

Sta. No. 306+55

Str. Type ELT

CONT. REPR. David Cass

LEMCO REPR. Ray Brightwell

DATE 5-20-83

FOUNDATION BORING REPORT

Str. No. 231

LEMCO ENGINEERS, INC.

02A

PROJECT TITLE 500 K.V. M.G - E.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (COWL) TEMPERATURE _____ WEATHER _____

RECEIVED

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

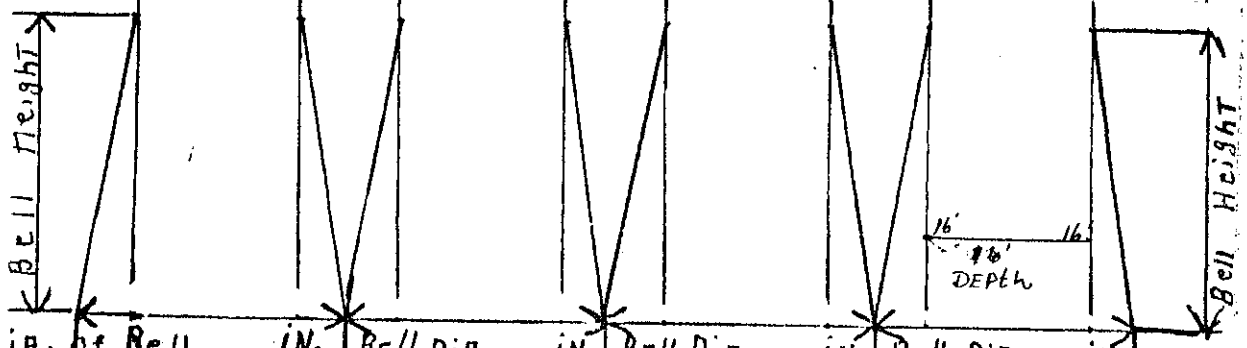
APR 25 1983 WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

LEMCO-JAMUL RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): ELT 42" 8' ELT 42" 8' ELT 42" 8' ELT R/A

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
0 Ft. Surface Sand and Soft D.G. with small Cobbles 4'	S.A. D.G. C.O.	0 Ft. Sand, D.G and small Cobbles 3'	S.A. D.G. C.O.	0 Ft. Soft D.G. Mixed with Sand 2½	D.G. S.A.	0 Ft. Sand D.G. 5½	S.A. D.G.
		Soft Rock 5'	R.O.	Seams in Hard Rock	R.O.	Rock	R.O.
Fractured Rock with Small Seams Depth	R.O.	Hard Rock with Seams Depth	R.O.	Depth		Depth	
8' 8'	8' 8'	8' 8'	8' 8'	8' 8'	8' 8'		
8' DEEP		8' DEEP		8' DEEP			

ROCK ANCHOR



IA. of Bell	IN.	Bell Dia.	IN.	Bell Dia	IN.	Bell Dia	IN.
Bell Height	IN.	Bell Height	IN.	Bell Height	IN.	Bell Height	IN.
L.F. Rock 4'		L.F. Rock 3'		L.F. Rock 5.5'		L.F. Rock R/A.	

REMARKS: ROCK ANCHORS INSTALLED ON 4-19-83 4 # 11 BARS WERE INSTALLED @ BIDD=12.5' B62=1 B63=4

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

Bond 4-25-83

References FCO 64F ✓ AMD 4/27/83 Str. No. 231

Sta. No. 3076+30.46

CONT. REPR. Ronald Cuyo Str. Type ELT

LEMCO REPR. Ray Brightwell DATE 4-21-83

Str. No. 232

(02A)

RECEIVED
11 1983
LEMCO-JAMU

FOUNDATION BORING REPORT

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. M.G - I.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (CWL) TEMPERATURE ______ WEATHER ______

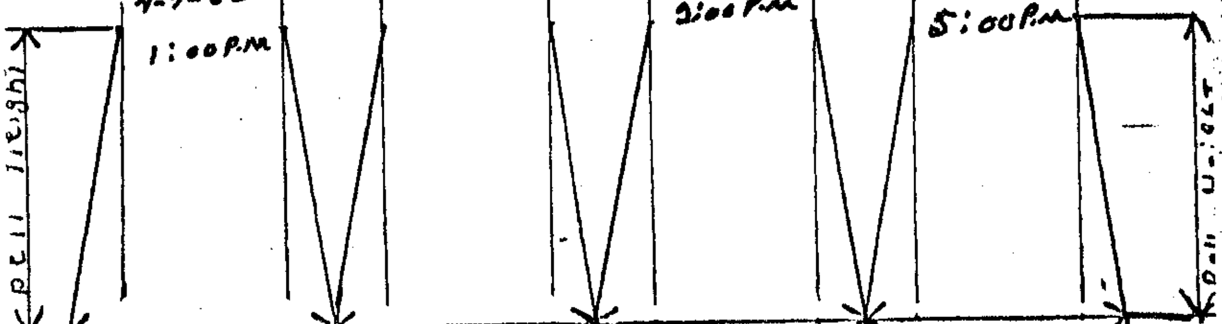
DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ______ HILLY ______ LEVEL ______

WOODS/ORCHARD ______ CULTIVATED ______ OTHER (DESCRIPTION) ______

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): CAAI 48" 8' | CAAI 48" 8' | CAAI 48" 8' | CAAI 48" 8'

STR. A Description (Ft.)	STR. A Sketch	STR. B Description (Ft.)	STR. B Sketch	STR. C Description (Ft.)	STR. C Sketch	STR. D Description (Ft.)	STR. D Sketch
Sand and silt 6"	S.A. SI	Sand and silt 6"	SA SI	Sand and silt 6"	SA SI	decomposed granet	decomposed granet FR
decomposed granet with seams sand and clay light brown in color and fractured rock 4'6"	decomposed granet SA CL FR	decomposed granet and boulders 4'6"	decomposed granet B.O	fractured rock decomposed granet boulders with seams sand and clay light brown in color 5'6"	FR. decomposed granet BO SA CL	fractured rock and boulders with seams sand and clay light brown in color 4'	B.O SA CL
Fractured rock 2'	F.R	Fractured rock and boulders 3'	F.R. BO	Fractured rock 2'	FR	Fractured rock and boulders 4'	FR BO
Rock 1'	R.O.	8'2"		8'2"		8'1"	
8'2"		4-6-83		4-8-83		4-7-83	
4-7-83		4:00 P.M.		2:00 P.M.		5:00 P.M.	
1:00 P.M.							



Bell Dia. ___ IN.	Bell Dia. ___ IN.	Bell Dia. ___ IN.	Bell Dia. ___ IN.
Bell Height ___ IN.	Bell Height ___ IN.	Bell Height ___ IN.	Bell Height ___ IN.
L.F. Rock 3'	L.F. Rock 3'	L.F. Rock 2	L.F. Rock 4'

REMARKS: ______

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s) and 4/12/83

References 10MS 4-11-83

Str. No. 232
Sta. No. 3008+35
Str. Type ELT

CONT. REPR. David Chu
LEMCO REPR. Grant Timbermon
DATE 4-6-83 TO 4-8-83

FOUNDATION BORING REPORT

Str. No 233 (02A)

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. Mig - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (COM) TEMPERATURE _____ WEATHER _____

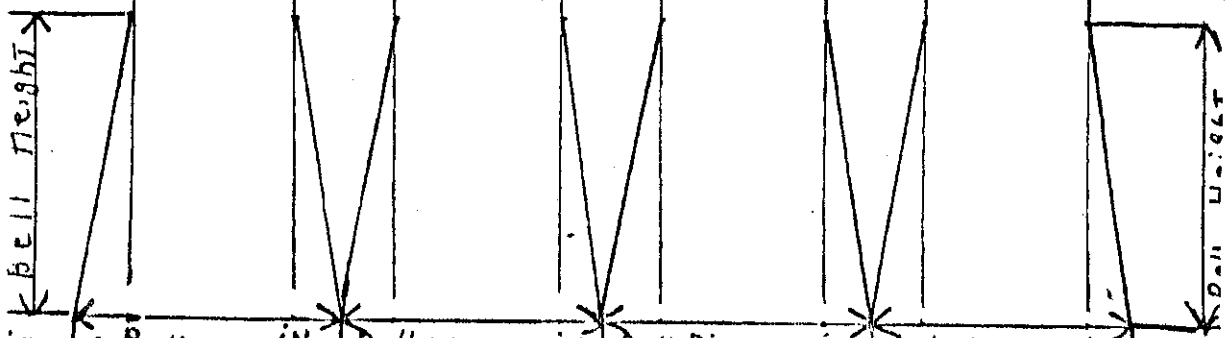
DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ✓ HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): CAAI 36" 8' | CAAI 36" 8' | CAAI 36" 8' | CAAI 36" 8'

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft.		Ft.		Ft.		Ft.	
6" SAND	S.A.	6" SAND	S.A.	6" SAND	S.A.	6" SAND	S.A.
SAND AND FRACTURED ROCK 4'6"	S.A. F.R.	DECOMPOSED GRANET AND BOULDERS WITH SEAMS SAND AND CLAY LIGHT BROWN IN COLOR. 7'6"	DECOMP OSED GRANET B.O C.A. C.L.	GRANET BOULDERS WITH SEAMS SAND CLAY LIGHT BROWN COLOR. AND FRACTURED ROCK 7'6"	B.O S.A. C.L F.R.	GRANET BOULDERS SEAMS. SAND AND CLAY LIGHT BROWN IN COLOR 7'6"	B.O S.A C.L.
ROCK AND BOULDERS 3'	R.O. B.O						
8' Depth		8'3" Depth		8'1" Depth		8' Depth	
4-7-83 1:00 P.M.		4-6-83 3:30 P.M.		4-5-83 4:30 P.M.		4-8-83 2:30 P.M.	



IN. of Bell	IN.	Bell Dia.	IN.	Bell Dia	IN.	Bell Dia	IN.	Bell Dia	IN.
Bell Height	IN.	Bell Height	IN.	Bell Height	IN.	Bell Height	IN.	Bell Height	IN.
F. Rock 3'		L.F. Rock 1'		L.F. Rock 2'		L.F. Rock 3'6"			

REMARKS: B.C. 6" SAND. 7'6" OF SOME HARD ROCK BOULDERS AND FRACTURED ROCK. A-LEG BLASTED LAST 3'

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References WMS 4-11-83 ✓ PMD 4/12/83

CONT. REPR. David Cruz

LEMCO REPR. Robert Timmerman

Str. No. 233

Sta. No. 3108+3778

Str. Type E.L.T.

DATE 4-4-83 To 4-7-83

FOUNDATION BORING REPORT

Str. No. 234 (02A)

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 K.V. M.G - F.V. SUBSTATION W.O. NO. 5583870

CONTRACTOR COMMONWEALTH (OWL) TEMPERATURE _____ WEATHER _____

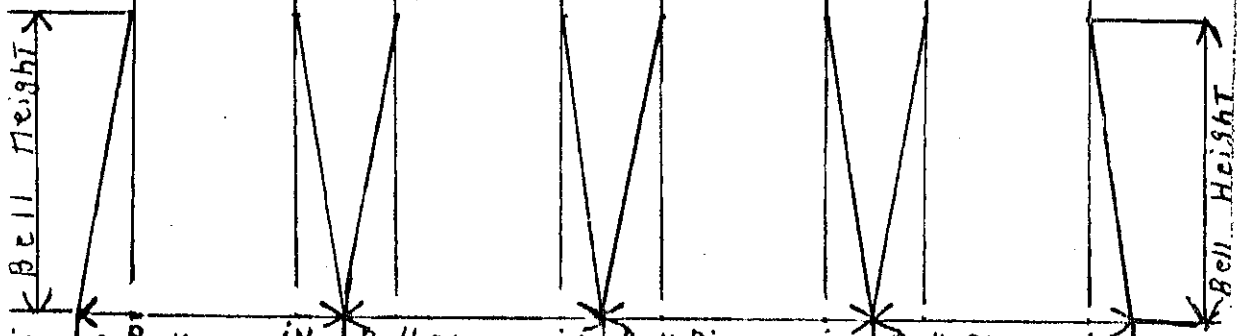
DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): AAA3 42" 9' AAA3 R/A AAA3 42" 9' AAA3 R/A

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft. D.G. SAND FRA. ROCK SEEMS 5'	D.G. S.A. F.R.	Ft. D.G. FRA. ROCK SEEMS 4'	D.G. S.A. F.R.	Ft. SAND D.G. FRA. ROCK 3½	S.A. D.G. F.R.	Ft. SAND F. ROCK SEEMS 4'	S.A. F.R.
ROCK 9'	RO'	ROCK ANCHOR		RO' ½ RO 9½'		ROCK ANCHOR	
DEPTH 9'	Depth	Depth 16'		DEPTH 9.5'	Depth	Depth 16'	



IN. of Bell	IN.	Bell Dia.	IN.	Bell Dia	IN.	Bell Dia.	IN.
Bell Height	IN.	Bell Height	IN.	Bell Height	IN.	Bell Height	IN.
L.F. Rock 5' (FIVE)		L.F. Rock		L.F. Rock 6' (SIX)		L.F. Rock	

REMARKS:

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References VMS 4-20-83 ✓ AMS 4/27/83

CONT. REPR. David Cruz

LEMCO REPR. Ray Brightwell

Str. No. 234.

Sta. No. 3119+93.07

Str. Type ELT

DATE 4-19-83

FOUNDATION BORING REPORT

Str. No. 235 (02A)

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. Mic - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMONWEALTH (COM) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ← HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): AARI 30"/10' | AARI 30"/10' | AARI 30"/10' | AARI 30"/10'

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft. GRANET ROCK 2'	R.O	Ft. DECOMPOSED GRANET WITH SEAMS OF SAND AND CLAY MIXED LIGHT BR IN COLOR 3'	DECOMPOSED GRANET SA CL	Ft. 3' Decomp Rock	3' DG	Ft. DECOMPOSED GRANET 4'	DECOMPOSED GRANET
GRANET R.O. WITH SEAMS OF SAND AND CLAY MIXED LIGHT BROWN IN COLOR 8' 3"	B.O SA. C.L.	HARD BOULDERS 7'6"	B.O	R/O & Hard Boulders	R/O	HARD GRANET BOULDERS AND HARD ROCK 6' 3"	B.O R.O
Depth 10' 3"		Depth 10'6"		Depth 10' Depth 30" DIA		Depth 10' 3"	
3-30-83 2:00 P.M.		3-31-83 1:00 P.M.				4-4-83 12:00 P.M.	
30" dia. 10' DEPTH		30" dia 10' DEPTH				30" dia 10' DEPTH	

Bell Height

Dia. of Bell IN. Bell Dia. IN. Bell Dia IN. Bell Dia IN.

Bell Height IN. Bell Height IN. Bell Height IN. Bell Height IN.

L.F. Rock 8' L.F. Rock 7' L.F. Rock 7' L.F. Rock 6'

REMARKS: A. FIRST 2' ROCK 3' HARD BOULDERS. B. 3' DISABLE MATERIAL 6' HARD BOULDERS. D. 4' DISABLE MATERIAL 6' HARD ROCK.

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

✓ AMD 4/19/83

References _____

Str. No. 235

Sta. No. 314+36.75

Str. Type ELT

CONT. REPR. David Cruz

LEMCO REPR. Ray Bright

DATE 4-22-83 Fa 4-15-83

FOUNDATION BORING REPORT

Str. No. 236 (02A)

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 K.V. Mic - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR Common Wealth (Cowl) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

JAMUL WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): AAA2 30" / 10'. AAA2 30" / 10'. AAA2 30' / 10'. AAA2 30 / 10.

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
D.C. Ft. Boulders 3	D.C. R.O.	Ft. Boulders R.O. Some Sand & Clay Mixed Full Depth of Sha-ft.	S.A. C.L.	D.C. Soft Rock Ft. 10"	DC R.O. R.O. F.R. Seems	DC Rock Ft. 2'0"	D.C. R.O. R.O.
Rock	R.O. R.O. .45			Rock with Seams and Fractured Rock		Rock with Seams	
Depth 10'0"		Depth		Depth		Depth	
DEPTH 10'0"		DEPTH 10'6"		DEPTH 9'4"		DEPTH 10'2"	

Bell Height

Bell Height

in. of Bell in. Bell Dia. in. Bell Dia in. Bell Dia. in.

Bell Height in. Bell Height in. Bell Height in. Bell Height in.

L.F. Rock 7' (SEVEN) L.F. Rock 2 (TWO) L.F. Rock 8 (EIGHT) L.F. Rock 8 (EIGHT)

REMARKS: B98=25.0' B61=1 B61a=1

Wmd 4-25-83

AHD 4/29/83

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References LEGS A B D FCO 59F Str. No. 236
LEG C FCO 49F & 62F Sta. No. 315/+33.12

CONT. REPR. David Cruz Str. Type ELT

LEMCO REPR. Ray Braghtwell DATE 4-19-83

12

FOUNDATION BORING REPORT

Str. No 237 (02A)

LEMCO ENGINEERS, INC.

G 1983 PROJECT TITLE 500 KV. H.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (COW) TEMPERATURE _____ WEATHER _____

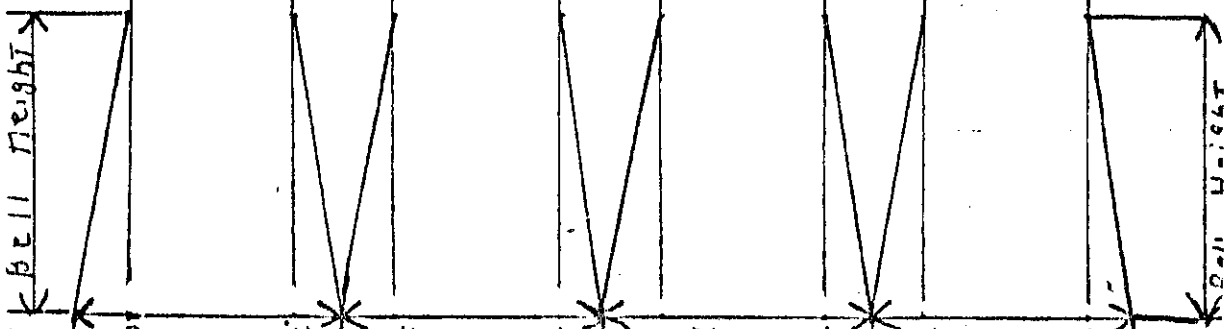
LEMCO-JAMU DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS ✓ HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED (YES) NO STR. STAKED (YES) NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): AAA2 30" dia. 10' DEPTH. AAA2 30"/10' AAA2 30"/10 AAA2 30"/10

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft. DECOMPOSED GRANET AND GRANET BOULDERS WITH SAND AND CLAY SEAMS 8'	DECOMPOSED GRANET BO SA. CL.	Ft. DECOMPOSED GRANET AND GRANET BOULDERS 1'6"	DECOMPOSED GRANET B.O.	Ft. DECOMPOSED GRANET 2'	DECOMPOSED GRANET.	Ft. SAND 6"	SA
GRANET BOULDERS 9'2"	B.O	GRANET BOULDERS WITH SEAMS OF SAND AND CLAY. GRAY IN COLOR 8'10"	B.O SA. CL.	HARD GRANET BOULDERS 8' ↓	B.O	DECOMPOSED GRANET. 2'6" ↓	DECOMPOSED GRANET.
10'2" Depth		Depth		Depth		HARD ROCK BOULDERS 7'3"	B.O
5:00 P.M. 4-4-83 30" dia. 10' DEPTH		1:00 P.M. 4-4-83 30" dia. 16' DEPTH		10' 3-29-83 1:00 P.M. 30" dia 10' DEPTH		10'3" Depth 3-22-83 2:00 P.M. 30" dia. 10' DEPTH	



IN. of Bell IN.	Bell Dia. IN.	Bell Dia IN.	Bell Dia IN.
Bell Height IN.	Bell Height IN.	Bell Height IN.	Bell Height IN.
F. Rock 9'	L.F. Rock 8'6"	L.F. Rock 8'	L.F. Rock 7'

REMARKS: A. FIRST 1' BRAKEABLE. 6' HARD BOULDERS 3' VERRY HARD B.O. B. FIRST 1'6" BRAKEABLE. 8'6" HARD B.O. C. 2' BRAKABLE DECOMPOSED GRANET. 8' HARD B.O. D. 6" d.g ABLE SAND 2'6" BRAKABLE DECOMPOSED GRANET. 7' HARD B.O.

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

DMS 4-5-83

Note Drill Rate in Sketch Space if Rock Anchor(s)

References VMD 4/20/83

Str. No. 237

Sta. No. 3120+65

CONT. REPR. David Cm

Str. Type ELT

LEMCO REPR. Grant Z

DATE 3-16-83 TO 4-4-83

FOUNDATION BORING REPORT

Str. No. 238

LEMCO ENGINEERS, INC.

02A

PROJECT TITLE 500 KV. M.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (CAWL) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RECEIVED
MAY 11 1983
LEMCO-JAMUL

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): AAA3 36/11 | AAA3 36/11 | AAA3 36/9 | AAA3 36/11

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
3-15-83 Ft.	36"ϕ	3-15-83 Ft.	36"ϕ	3-15-83 Ft.	36'ϕ	3-15-83 Ft.	36'ϕ
9' of DECOMPOSED GRANET with LAYERS of SAND MIXED with CLAY	DG SA CL	7' of DECOMP. GRANET MIXED with SAND AND CLAY.	D.G. SA. CL	9' of HARD BLUE GRANET with SEAMS AND FRACT. ROCK	R.O. F.R. SEAMS	11' of HARD BLUE GRANET with FR. ROCK AND SEAMS	R.D. SEAMS
Depth		Depth		Depth		Depth	
2' of HARD BLUE GRANET PAY Rock		4' HARD BLUE GRANET PAY Rock		Complete Hole is PAY Rock		Complete Hole is PAY Rock	
11.0' 3-22-83		11.0 3-29-83		FCO 74F 9.0' 4-29-83		11.0'	
Bell Height							Bell Height
DIA. of Bell IN.		Bell DIA. IN.		Bell DIA IN.		Bell DIA. IN.	
Bell Height IN.		Bell Height IN.		Bell Height IN.		Bell Height IN.	
L.F. Rock 2.0		L.F. Rock 4.0		L.F. Rock 9.0		L.F. Rock 11.0	

REMARKS: _____

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

RECEIVED
MAY 10 1983
LEMCO-MIGUEL

References FCO 74F ✓ RMA 5/16/83

CONT. REPR. David Cary

LEMCO REPR. Ray Brightwell

Str. No. 238

Sta. No. 3183+49.10

Str. Type E11

DATE 5/15/83 4/29/83 5-9-83

FOUNDATION BORING REPORT

Str. No. 240

LEMCO ENGINEERS, INC.

024

PROJECT TITLE 500 K.V. H.G - I.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (CWL) TEMPERATURE _____ WEATHER _____

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RECEIVED RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

MAY 25 1983 FDN. TYPE (SPEC.): ABR2 54"/13' ABR2 54"/13' ABR2 Rock Anchor ABR2 Rock Anchor

LEMCO-JAMUL

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
4-22 Ft.	56"Ø	4-22 Ft.	56"Ø	4-22 Ft.	56"Ø	4-22 Ft.	56"Ø
0-3' SOFT TO MEDIUM HARD D.G.	D.G.	0-6' SOFT TO MEDIUM D.G.	D.G.	0-5' ROCK	RO	0-6' ROCK	RO
3-5' HARD ROCK	RO						
5-9' MEDIUM HARD D.G.	D.G.	6-11' ROCK	RO	5.0' COMP 5-3-83		6.0' COMP. 5-11-83	
9-13 ROCK	RO	11-13' MEDIUM HARD D.G.	D.G.				
13' COMPLETE 4-28-83		13' COMP 4-28-83					

Depth

Bell Height

Bell Dia.

A. of Bell in. Bell Dia. in. Bell Dia in. Bell Dia. in.

Bell Height in. Bell Height in. Bell Height in. Bell Height in.

L.F. Rock 6' L.F. Rock 5' L.F. Rock 5' L.F. Rock 6'

REMARKS: PIER-1 PIER-2 PIER-3 & 4

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References FCO 72 F VOID 5/25/83 Str. No. 240

FCO 73 F Sta. No. 3201+20.44

CONT. REPR. David Cruz Str. Type EMT

LEMCO REPR. James J. Relph DATE 5-16-83

FOUNDATION BORING REPORT

Str. No. 240

LEMCO ENGINEERS, INC.

02A

VED

2 1983

PROJECT TITLE 500 K.V. M.G - F.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (COWL) TEMPERATURE _____ WEATHER _____

ICO-JAMBE DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY _____ LEVEL _____

WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) _____

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): BBB1 42" 18' BBB1 42" 18' BMB1 42" 18 BBB1 42" 18'

STR. A		STR. B		STR. C		STR. D	
Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
4/19 Ft. SA. & RO. Wit H 4" to 8" cobbles Comp 5/3		4/19 Ft. SA. RO. With 4" to 8" Cobbles Comp 5/3		4/19 Ft. SA. D.G. With 4" to 8" Cobbles Comp 5/3		4/19 Ft. SA. Small Cobbles 4" to 8" Comp 5/3	
ROCK 16							
DEPTH 18'		DEPTH 18'		DEPTH 18'		DEPTH 18'	

Bell Height

18' DEPTH

Bell Height

18' DEPTH

18' DEPTH

18' DEPTH

Dia. of Bell 78 IN. Bell Dia. 78 IN. Bell Dia 78 IN. Bell Dia. 78 IN.

Bell Height 42" IN. Bell Height 42 IN. Bell Height 42 IN. Bell Height 42 IN.

L.F. Rock 1.0' L.F. Rock L.F. Rock L.F. Rock

REMARKS: Rock was just before Belling area on A Leg

RECEIVED

MAY 11 1983

LEMCO-MIGUEL

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s) ✓ AMD 5/16/83

References Field change order # 52F

Str. No. 241

Sta. No. 3220+45

Str. Type EMT

CONT. REPR. David Cruz

LEMCO REPR. Ray Brightwell

DATE 4/9 - 5-3-83.

FOUNDATION BORING REPORT

Str. No. 242
02A

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 K.V. M.G - I.V. SUBSTATION W.O. NO. 5583970

CONTRACTOR COMMON WEALTH (OWL) TEMPERATURE _____ WEATHER _____

MAY 23 1983

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS _____ HILLY _____ LEVEL X

LEMCO-JAMUL WOODS/ORCHARD _____ CULTIVATED _____ OTHER (DESCRIPTION) SANDY

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): DCBI 42" 18' STR. A | DCBI 42" 18' STR. B | DCBI 42" 18' STR. C | DCBI 42" 18' STR. D

Description	Sketch	Description	Sketch	Description	Sketch	Description	Sketch
Ft. 4-29-83	42"ϕ	Ft. 4-29-83	42"ϕ	Ft. 4-29-83	42"ϕ	Ft. 4-29-83	42"ϕ
SAND	SA	SAND	SA	SAND	SA	SAND	SA
Depth	SA	Depth	SA	Depth	SA	Depth	SA
Shaft & Bell Complete 5-11-83		Shaft & Bell Complete 5-6-83		Shaft & Bell Complete 5-18-83		Shaft & Bell Complete 5-10-83	
Bell Height	18.2'		18.6'		18.5'		18.6' Bell Height
Dia. of Bell 78 IN.		Bell Dia. 78 IN.		Bell Dia 78 IN.		Bell Dia. 78 IN.	
Bell Height 42 IN.		Bell Height 42 IN.		Bell Height 42 IN.		Bell Height 42 IN.	
L.F. Rock		L.F. Rock		L.F. Rock		L.F. Rock	

REMARKS: HAND DUG HOLES

SKETCH LEGEND: SA - Sand SI - Silt CL - Clay GR - Gravel
CO - Cobbles BO - Boulders F.R. - Fractured Rock
RO - Rock W.T. - Water Table
Note Drill Rate in Sketch Space if Rock Anchor(s)

RECEIVED
MAY 26 1983
LEMCO-MIGUEL

References VAM 5/25/83

Str. No. 242
Sta. No. 3238+65
Str. Type EHT
DATE 5/18/83

CONT. REPR. David Cruz
LEMCO REPR. Ray Baightwell