Appendix F
Geological Resources

ORD MOUNTAIN SOLAR AND ENERGY STORAGE PROJECT
ENVIRONMENTAL IMPACT REPORT

Geotechnical Engineering Investigation

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED LUCERENE VALLEY PV
SUNPOWER T-0 POWERTRACKER PROJECT
DESERT LANE AND FERN ROAD
SAN BERNARDINO, CALIFORNIA

PROJECT NO. 022-09110
SEPTEMBER 17, 2010

Prepared for:

MR. RICHARD RIVERA
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Prepared by:

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Krazan & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

September 17, 2010

KA Project No. 022-09110

Mr. Richard Rivera
Worley Parsons Group, Inc.
2330 East Bidwell Street, Suite 150
Folsom, California 95630

RE: Geotechnical Engineering Investigation
Proposed Lucerene Valley PV
Sunpower T-0 Powertracker Project
Desert Lane and Fern Road
San Bernardino County, California

Dear Mr. Rivera:

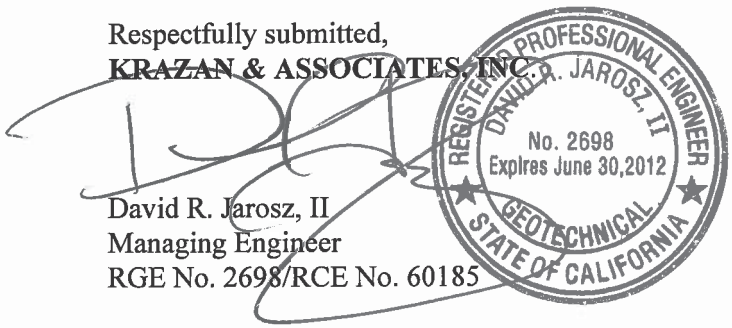
In accordance with your request, we have completed a Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

A representative of Krazan & Associates, Inc., should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. The table provided below provides the minimum testing frequencies. Krazan & Associates, Inc., will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

Recommended Compaction Control Tests:
1 Test for Each 2,000 Sq. Ft. each Lift (bldg. area)
1 Test for Each 2,500 Sq. Ft. each Lift (parking area)
Structural Fill Maximum Lift Thickness 6 inches (Measured loose)

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.



David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

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PROPOSED LUCERNE JUNCTION PV
SUNPOWER T-0 POWERTRACKER PROJECT
DESERT LANE AND FERN ROAD
SAN BERNARDINO COUNTY, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the Proposed Lucerne Junction PV, Sunpower T-0 Powertracker project to be located between Fern Road and Meridian Road at Desert Lane, in San Bernardino County, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork and retaining walls.

A site plan showing the approximate boring locations is presented following the text of this report. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A contains a description of the laboratory testing phase of this study, along with the laboratory test results. Appendix B contains a guide to earthwork specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to make geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our proposal dated November 11, 2009 (KA Proposal No. P421-09) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A review of available data for evaluation of subsurface conditions at the project site.
- Stereoscopic aerial photograph interpretation.
- A search of geologic and seismologic literature pertaining to the area of the site.

- Evaluation of potential geologic hazards.
- A field investigation consisting of drilling 10 borings and excavating 3 test pits to depths ranging from approximately 10 to 50 feet for evaluation of the subsurface conditions at the project site.
- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.
- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.
- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We understand that design of the proposed development is currently underway. Some of the final details pertaining to the structures are unavailable. However, Sunpower T-O Powertracker drawings dated September 11, 2009 are used for reference. It is understood the development will include the construction, installation and operation of solar panels and associated equipment pads for operation of the site. The proposed development will consist of approximately 436 acres. Preliminary design indicates the equipment structures will be supported on conventional shallow footings. It is understood the T-O Powertracker Units will be supported on either driven or drilled piers. Footing loads are anticipated to be light to moderate. Based on the information provided for the T-0 Powertracker Units, the anticipated horizontal loads for these structures are estimated at between 1,000 and 25,000 pounds. The higher horizontal loads are anticipated at the drive strut. On site paved areas are also planned.

In the event, these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION, SITE HISTORY, AND SITE DESCRIPTION

The proposed Lucerne Valley PV site consists of approximately 436 acres located within the south-central portion of the Mojave Desert, in the southern portion of North Lucerne Valley, in San Bernardino County, California (see Vicinity Map, Figure 1). The site is bound to the west by Fern Road and vacant land; to the south by agricultural land, Powerline Road and rural residential developments; to the east by Meridian Road, vacant land, and rural residential developments; and to the north by agricultural land and vacant land. The proposed Lucerne Valley PV site will be located at longitude 116.9360° West and latitude 34.5600° North. The US Geological Survey, White Horse Mountain, California 7.5-minute Quadrangle, dated 1993, indicates that surface elevations in the vicinity of the site are on the order of 2900 to 2960 feet above mean sea level. Unnamed seasonal drainage courses are located approximately 2000 feet east and west of the subject site.

Site history was researched by reviewing aerial photographs dated 1989, 1995, and 2006. Review of the 1989 aerial photographs indicate the Lucerne Valley PV property consisted of irrigated agricultural land surrounded by agricultural land and rural residential developments. Power lines and access roads trended southwest to northeast through the southern portion of the site. Several concrete slabs were present in the north central and southwest portions of the site. Access roads trend north to south and east to west through the site.

Review of the 1995 and 2006 aerial photographs indicate the site conditions appeared relatively similar to those noted in the 1995 aerial photographs. The conditions shown on the aerial photographs indicate the site consisted of agricultural and pasture land. Several concrete slabs were located in the north central and southwest portions of the site. No structures appeared to be present on the site. With the exception of several lineal features identified as drainage channels, fence lines, easements, vehicle trails, and streets, no distinct lineaments, tonal variations, or other potential fault related features are shown on or adjacent to the property in the aerial photographs.

Presently, the site is predominately vacant. The lineal features identified in the aerial photographs as utility lines, roads, highways and drainage courses, were still present throughout the site. Several scattered piles of debris are located throughout the site. Concrete slabs were still present in the northern and southwest portions of the site. Barbed wire fencing surrounded portions of the site. Buried utility lines are located along the edges of the site and trend throughout the site associated with the previous agricultural developments. The site is covered by a sparse weed and brush growth and the surface soils have a loose consistency. The site is relatively level with no major changes in grade. Drainage within the site trends towards the south.

No evidence of surface faulting was observed on the property during our reconnaissance. No evidence of slope failures or instabilities were observed on the subject property or adjoining properties.

GEOLOGIC SETTING

General

The Mojave Desert occupies about 25000 square miles of southeastern California. It is landlocked, enclosed on the southwest by the San Andreas fault and the Transverse Ranges and on the north and northeast by the Garlock fault, the Tehachapi Mountains, and the Basin and Range. The Nevada state line and the Colorado River form the arbitrary eastern boundary, although the province actually extends into southern Nevada and western Arizona. The San Bernardino-Riverside county line is designated as the southern boundary.

The Mojave area contains Proterozoic, Paleozoic and lower Mesozoic rocks, although Triassic and Jurassic marine sediments are scarce. The marine sediments of that age may have been eroded away, or parts of the Mojave may have been an early Mesozoic upland on which no such sediments were deposited. Jurassic and Cretaceous granitic rocks of the Nevadan orogeny are widespread throughout the region's mountain blocks.

The desert itself is a Cenozoic feature, perhaps formed as early as the Oligocene, presumably from movements related to the San Andreas and Garlock faults and their predecessors. Prior to the development of the Garlock, the Mojave was part of the Basin and Range that shares Basin and Range History possibly through the first part of the Miocene.

Today the region is dominated by broad alluviated basins that are mostly aggrading surface receiving nonmarine continental deposits from adjacent uplands. The deposits are burying the Old topography, which was previously more mountainous. In the late Tertiary, these mountains shed debris to the Pacific, but with the northward slope of the west side of the San Andreas and accompanying elevation of coastal ranges, drainage began entering interior basins.

The highest general elevation of the Mojave Desert approaches 4000 feet, but most valleys lie between 2000 and 4000 feet. A double chain of lower valleys extends northwesterly across the eastern Mojave, one from Soda Lake northwest to Death Valley including Silver and Silurian lake playas and lying at elevations slightly below 1000 feet. The other is a broad depression extending southeast from Bristol Lake near Amboy 600 feet through Cadiz and Danby lakes to the Colorado River between Parker and Blythe. Rock-Floored pediments are somewhat more extensive in the northeastern Mojave than elsewhere, and the thickness of valley fill is greatest in the Antelope Valley lying between the Garlock and San Andreas faults in the westernmost Mojave.

North of Barstow, extending to the Garlock fault, are several middle Tertiary depositional basins containing thick sections of Miocene continental rocks. Eastward, along the Mojave River valley and at progressively lower elevations, are several Quaternary depressions. Northeast from Baker, the Mojave surface is largely an erosional one, and rises rapidly to almost 4000 feet at Halloran Summit. The moist prominent erosional feature in this area is Cima Dome, an extensive granitic pediment, partly capped by Miocene to Holocene Lava flows and cinder cones. Quaternary erosion on the western side of Cima Dome has removed much of the volcanic cover and lowered the land surface as much as 600 feet.

Throughout the Mojave, small hills rise above the alluvial valley fill, islandlike in seas on gravel. These are remnants of the mountainous topography that is partly erased by erosion or buried by debris. Other prominent features of today's surface are the many playas, including Rosamond, Rogers (Muroc), Mirage, Bristol, Cadiz, and Danby. Every local internal drainage basin contains at least one playa, and the linear valleys of the eastern Mojave often have several, because drainage is blocked by an almost imperceptible rises between playas.

The Lucerne Valley area is considered a closed watershed basin in that no external surface water flows from the basin. It is typified by large mountain ranges surrounding the valley with protruding hills of basement rocks exposed throughout the region. Its borders are defined by the Ord, Rodman and Stoddard Mountains to the north, the Granite Mountains and crests of alluvial fans in the west, Fry and Cougar Buttes Mountains to the east, and the large San Bernardino Mountains to the south. Adjacent to the mountain fronts, large alluvial fans slope towards the center of the valley where ephemeral (seasonal) streams deposit alluvial materials. The Lucerne Valley area has a topographic low of 2,848 feet (ft) (amsl) in Lucerne (dry) Lake and rises to 8,248 ft in the San Bernardino Mountains.

Materials that comprise the valley are derived from the weathering and erosion of surrounding mountains and consist of igneous, metamorphic, sedimentary rocks, and alluvial deposits. Alluvial materials adjacent to mountain fronts and in the central valley consist of Tertiary formations, Quaternary stream alluvium, alluvial fan deposits, playa deposits, landslide deposits, and dune sand. The Tertiary formations and stream or alluvial fan deposits are permeable, consisting of varying porosities, with high specific yields, and comprise the aquifers in the valley. They are designated water-bearing units; typically composed of gravel and sand, with minor silt, clay, and occasional boulders that are unconsolidated to semiconsolidated. The total thickness of the water-bearing units is estimated to be approximately 1,000-1,400 ft throughout most of the Lucerne Valley groundwater basin.

A Regional Geologic Map, Regional Geologic Cross-Section, and Local Geologic Map are presented on Figures 4, 5, and 6, respectively.

Lithology

The thick accumulation of deposits within the western Mojave Desert range in age from Cretaceous to Holocene and include both marine and continental rocks and deposits. The 1986, Revised 1998 Geologic Map of the San Bernardino Quadrangle, indicates that the near-surface deposits in area of the subject site are identified as Quaternary Alluvium.

The 2008 Geologic Map of the Apple Valley and Ord Mountains, 15 Minute Quadrangles, San Bernardino, California (Thomas W. Dibblee, Jr., 2008) further defines the near-surface deposits in the area of the subject site as predominately Quaternary, Recent unconsolidated, undissected alluvial sediments consisting of silt, sand, and gravel of valley areas. A Paleozoic, marine metasedimentary schist is mapped just south of the site extending up through the surrounding alluvial sediments. In addition, a Cretaceous aged, aplitic quartz monzonite is mapped just west of the site extending up through the surrounding alluvial sediments.

The subsurface information obtained in this study indicates that the surface and near-surface soil deposits at the subject site generally consist of sandy silts, silty sands, and sands. These observed deposits are consistent with those mapped in the area, and are further described in the Soil Profile and Subsurface Conditions section of this report.

Structure and Faults

The Mojave block is approximately bounded by the San Andreas and Garlock faults. Both are at least Cenozoic, and a few geologist think the San Andreas may have originated in the middle or early Mesozoic. The western Mojave Desert is broken by major faults that roughly parallel the San Andreas and seem to be truncated by the Garlock. Many faults undoubtedly occur in the eastern Mojave also, but since most of this area is underlain by rather uniform granitic rocks, the faults are difficult to map. Some faults are known positively, but many can only be inferred.

The Garlock fault, located about 70 miles north of the site, extends from Frazier Mountain easterly for more than 150 miles. It is characterized by left-slip displacement that is variously estimated from 6-40 miles. Displacement during the Quaternary appears to be no less than 11 miles, Holocene slip is about 260 feet. Thus despite the absence of any historical earthquakes clearly attributable to this fault, it must be regarded as active. The Garlock shows the characteristic features of high-angle faults with major strike-slip comments. The fault zone is narrowly confined through most of its length and is seldom more than a mile.

East from its junction with the San Andreas, the Garlock forms two parallel segments that extend nearly 20 miles until they merge into a single structure. This single unit then extends another 20 miles to Red Rock Canyon and the El Paso Mountains. Near the junction of the Garlock and the southwest-curving Sierra Nevada fault, the El Paso fault begins, parallel to the Garlock and within the Garlock zone of faulting. The El Paso fault is well exposed at the mouth of the Red Rock Canyon.

The San Andreas fault, located about 52 miles south, appears to form as sharp a boundary on the southwest of the Mojave Desert as the Garlock fault does on the north. In fact, however, the San Andreas lies about 1 mile inside the foothill belt terminating the desert floor, and minor subparallel faults seem to be the usual boundary between the Mojave and Transverse Ranges provinces. It is important to note here that the Garlock appears possibly to have been offset by the San Andreas where the two intersect at the western end of the Mojave block.

The internal faults of the southwestern Mojave block show remarkable parallelism with the strike of the San Andreas fault and equally impressively divergence from the strike of the Garlock, but none of these faults quite reaches the Garlock, so their relationship to that important fault is not yet clear. This group of faults is regarded as part of the greater San Andreas system and all are active, right-slip faults. Both the Galway Lake and Homestead faults have generated earthquakes and produced ground breakage in 1975 and 1979, respectively. It is likely that many individually named faults are actually parts of single fault trends that are continuous in the basement beneath the deep alluvium.

Important vertical displacement occurs on the Muroc, Black Range, and Mirage Valley faults in the western Mojave and on the Johnson Valley, Pipes Canyon, and Spring faults in the central Mojave. Right-slip displacement of uncertain amount is inferred for the Cottonwood, Lockhart, and Blackwater faults in the west and for the Lenwood, Hidalgo, West Calico, and Pisgah faults in the central and south central Mojave. The extensive work of T.W. Dibblee has permitted the determination of strike-slip movement on the numerous internal faults. Strike-slip seems to follow vertical displacement in almost every case.

Vertical displacements are continuing, as shown by radiometrically dated Pleistocene basaltic flows that have been vertically displaced as much as 300 feet. Thick alluvial deposits are cut by some of the internal faults to form present-day scarps, further demonstrating continuing vertical movement. Internal faulting also is reflected by uplifted bedrock surfaces of low relief. Such a surface is the Ivanpah upland of the eastern Mojave, which might well be extended to the less continuous but nonetheless impressive surface that bevels the pre-Cenozoic rocks of the western Mojave.

The nearest active faults to the site are the Helendale-South Lockhart (about 5.8 miles southwest), Lenwood-Lockhart-Oldwoman Springs fault (about 8.3 miles northeast), and North Frontal Fault Zone (about 12.2 miles northeast). The Helendale and Lockhart faults are predominate faults of the western desert region near the communities of Lucerne Valley, Apple Valley, Victorville, Lockhart, and Kramer Junction. The Helendale fault is about 56 miles in length, and the Lockhart fault is about 22 miles in length. They may form a roughly continuous fault system approximately 68 miles long that could rupture together. Based on currently established empirical relationships, the Helendale and South Lockhart faults are considered capable of producing about a magnitude 7.3 to 7.5 earthquake.

As noted above, several dominant faults with seisomgenic structures are located in the vicinity of the subject site. Table I is a listing of active faults or seismogenic structures within 75 miles of the site, and a Fault Map is provided on Figure 7.

GEOLOGIC HAZARDS

Fault Rupture Hazard Zones in California

The Alquist-Priolo Geologic Hazards Zones Act went into affect in March, 1973. Since that time, the act has been amended 10 times (Hart, 1994). The purpose of the Act, as provided in DMG Special Publication 42 (SP 42), is to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." The act was renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994, and at that time, the originally designated "Special Studies Zones" was renamed the "Earthquake Fault Zones."

The subject site does not lie on a Fault Rupture Hazard Zones Map, and accordingly, the site is not within a Fault-Rupture Hazard Zone. The nearest zoned fault is a portion of the Helendale Fault located more than 5.8 miles northeast of the subject site.

Seismic Hazard Zones in California

In 1990, the California State Legislature passed the Seismic Hazard Mapping Act to protect public safety from the effects of strong shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The Act requires that the State Geologist delineate various seismic hazards zones on Seismic Hazards Zones Maps. Specifically, the maps identify areas where soil liquefaction and earthquake-induced landslides are most likely to occur. A site-specific geotechnical evaluation is required prior to permitting most urban developments within the mapped zones. The Act also requires sellers of real property within the zones to disclose this fact to potential buyers. The area of the subject site is not included on any of the maps released to date. It is not known whether the subject site will be within a seismic hazard zone on a future map.

Historic Seismicity/Earthquake Epicenter Distribution

The Lucerne Valley area has historically experienced a moderate degree of seismicity. A listing of historic earthquakes with magnitudes greater than 4.0 within approximately 50 miles (80 kilometers) of the subject site was obtained from the comprehensive California Geological Survey computerized

earthquake catalog for the State of California, the Townley and Allen (1939) catalog and the U.S. Geological Survey Earthquake Data Base System. In addition, a listing was obtained for all historic earthquakes with magnitudes greater than 5.0 within approximately 100 miles of the site. The listings include the date, time, location, depth, magnitude, and intensity all recorded events within the search radius between 1800 and 2009. A review of the literature for pre-1900 earthquakes (Toppozada, 1991) does not reveal any significant recorded seismic events in the vicinity of the subject site prior to the period covered by the above listing.

The historic earthquake listings are included in Appendix D. A plot of epicenters associated with historic earthquakes in the region of the site with magnitudes greater than 5 is shown on Figure 8, Epicenter Map. The earthquake data indicates that 442 events with magnitudes greater than 4.0 occurred within 50 miles of the subject site between 1800 and 2009. None of the listed events occurred within 6 miles of the site. The data indicates that 147 events exceeded magnitudes 5.0 within 100 miles of the subject site. The nearest listed event occurred approximately 6.1 miles northeast of the site in 1989 with a magnitude of 4.5. Fifty-eight of the listed earthquakes with magnitudes greater than 5.0 occurred within 50 miles of the site. Numerous earthquakes are listed with magnitudes between 5.0 and 6.0 beyond about 50 miles of the site. Ten events were recorded with magnitudes greater than 6.0 within 50 miles of the site.

On the morning of June 28, 1992, a magnitude 7.3 earthquake occurred about 37 miles southeast of the site with an epicenter near the town of Landers. The earthquake was a right-lateral strike-slip event, and involved the rupture of 5 different faults over a length of 53 miles. The quake was the largest to strike California since the Kern County M7.7 magnitude earthquake in 1952. The shaking lasted for two to three minutes. Although this earthquake was much more powerful than the 1994 Northridge earthquake, its location out in the Mojave Desert meant that damage and loss of life were significantly less than what they could have been.

Damage to the area immediately surrounding the epicenter was severe. Roads were buckled, buildings and chimneys collapsed. There were also large surface fissures. To the west in the Los Angeles Basin damage was much less severe. The majority of the damage throughout the LA area involved items knocked off shelves. Unlike the Northridge event a year and half later, no freeway bridges were knocked down because of the epicenter's remote location. Power was knocked out to thousands of residents, but generally restored within two to three hours. There was some damage to homes from water displaced from swimming pools.

Loss of life in this earthquake was minimal. Two people died as the result of heart attacks. A three-year-old boy died when the home's chimney collapsed into his living room, and more than 400 people sustained injuries as a result of the earthquake.

The quake was preceded by the 6.1 magnitude Joshua Tree earthquake on April 23, which was located to the south of the future Landers epicenter. The 6.5 magnitude Big Bear earthquake, which hit about three hours later after the Landers mainshock, was originally considered an aftershock. However, the United States Geological Survey determined that this was a separate, but related, earthquake. These two earthquakes are considered a regional earthquake sequence, rather than a main shock and aftershock.

Geologic Subgrade

Information obtained from the geologic literature, as well as data from the above-described site exploration, indicate the general soil profile at the site consists predominately of medium dense to very dense silty sands, sandy silts, and relatively clean sands underlain at a shallow depth by very dense decomposed granite and granitic rock. Assuming that any loose surface soil and fill materials on the site are removed and recompacted as recommended in our Geotechnical Engineering Investigation, the geologic subgrade of the site can be conservatively approximated as "stiff soil". A Joyner-Boore Class C subgrade classification is considered appropriate for the soil profile and corresponds with a National Earthquake Hazard Reduction Program (NEHRP) (BSSC, 1994) Site Class D. The site class definition from the 2007 California Building Code that is most consistent with the site conditions is Site Class D.

Soil Liquefaction

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs in soils such as sand in which the strength is purely friction. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic event.

To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Groundwater depth;

2) Soil type;

3) Relative density;

4) Initial confining pressure;

5) Intensity and duration of groundshaking.

The soils encountered within the project site predominately consist of medium dense to very dense sandy silts, silty sands, sandy silts with trace clay, and sands. Groundwater was not encountered within the soil borings advanced during subsurface exploration. Available groundwater data, as well as our experience in the area, indicates that historically groundwater has been located at depths greater than 79 feet within the project site vicinity. Based on our findings, it is our opinion that the potential for soil liquefaction within the project site is very low due to the moderate to high corrected standard penetration blow counts (N-Values Predominately greater than 40) and the lack of groundwater. Therefore, measures to mitigate seismic-induced liquefaction are not necessary.

Seismic Settlement

One of the most common phenomena during seismic shaking accompanying any earthquake is the induced settlement of loose unconsolidated soils. Based on the nature of the relatively dense subsurface materials, the plan to excavate and recompact the upper soils and any loose fill soils within the proposed structure areas, and although there is a potential for relatively moderate to high seismicity within the

region, we would not expect seismic settlement to represent a significant geologic hazard to the site provided that the recommendations of our referenced Geotechnical Engineering Investigation are followed.

One of the most common phenomena during seismic shaking accompanying any earthquake is the induced settlement of loose unconsolidated soils. Based on the nature of the subsurface materials, and the relatively low to moderate seismicity of the region, we would not expect seismic settlement or lateral spread to represent a significant geologic hazard to the site.

The estimated seismic settlement was determined at the site using the settlement analysis method by Tokimatsu, Seed, and Bolton (1987). The results of the settlement analysis are included as follows:

	Seismic Settlement (inches)				
Location	**Saturated Settlement**	**Unsaturated Settlement**	**Total Settlement**	**Range of Differential Settlement**	**Design for Differential Settlement**
B4	0.00	0.75	0.75	0.373 to 0.493	1 Inch in 100 Feet

The above settlement values were determined at specific boring locations. The Consolidated Settlement (under static load of specific structures) and Differential Settlement (per specified length in building area) are indicated in the Foundations section of this report.

The upper native soils within the project site are conducive to hydrocollapse. Any loose fill material at the site could be vulnerable to hydrocollapse. However, the proposed structures are planned to be supported on Engineered Fill and/or supported on piers/pipes extending below the loose fill and moderately collapsible upper native soils. Therefore the structure will not be vulnerable to major hydrocollapse. In addition, this hazard can be mitigated by following the design and construction recommendations of current and future Geotechnical Engineering Investigations (over-excavation and rework of any loose soils and/or uncertified fill materials).

Unnamed seasonal drainage courses are located approximately 1,800 feet east and 2,400 feet west of the project site. These natural channels are up to 3 feet deep with sidewalls sloping approximately 20 degrees to relatively level. The structures planned for development will be located greater than 1,800 feet away from the drainage. The potential for lateral spreading was evaluated using the "Revised Multilinear Regression Equations for Predication of Lateral Spread Displacement" by Youd, Hansen, Corbett and Bartlett (2002). Based on a lack of shallow liquefiable soils within the subject site, the distance of proposed structures from the existing channels and a lack of saturated cohesionless sediments with $(N1)_{60}$ less than 15, the site is not likely subject to lateral spreading hazards.

Subsidence Due to Fluid Withdrawal

Portions of California, such as the Mojave Desert have been subject to land subsidence due to fluid withdrawal (groundwater and petroleum). The earth has subsided as much as four inches in parts of the Mojave Desert in southern California, according to U.S. Geological Survey scientists. Using the satellite

mapping process known as interferometric synthetic aperture radar (InSAR), scientists have detected large earth surface depressions near the agricultural areas of Lucerne Valley, El Mirage, Lockhart and Newberry Springs in the southwestern portion of the Mojave Desert. The subsidence occurred between 1992 and 1999 and is linked to declining water levels. The magnitude of subsidence in some of the areas is significant, and the compaction of the aquifer systems in these areas may be permanent."

A USGS study, conducted in cooperation with the Mojave Water Agency, found that land subsidence was linked to water-level declines of more than 100 feet between the 1950s and the 1990s. Land subsidence can disrupt surface drainage, reduce aquifer storage, cause earth fissures and damage wells, building, roads and utility infrastructure. Earth fissures several feet wide and deep have been observed in the southern portion of Lucerne Valley, within the Lucerne Lake area about 2.5 to 3 miles south of the subject site. The USGS reports that continued monitoring of some areas of the Mojave Desert is warranted because ground-water levels continue to decline, and pumping-induced land subsidence, documented by the USGS study, likely will increase.

Expansive Soils

The surface and near-surface soils observed on the site surface consist of sandy silts, silty sands, relatively clean sands and clayey sands. The clayey soils are considered to be slightly expansive. Therefore, it is recommended that mitigation measures to reduce the potential problems associated with expansive soils be followed as indicated in this report, and included, as needed, in subsequent Geotechnical Engineering Investigation Report(s) for specific development and redevelopment projects at the subject site. We would not expect the expansive nature of these clayey soils to present a significant geologic hazard to the site provided that the recommendations of this report and future Geotechnical Engineering Investigation(s) are followed.

Inundation Hazards

A review of Federal Emergency Management Agency (FEMA) Flood Insurance Mapping for the area of the subject site (Non Printed Community Panel Number 06071C5900H, dated August 28, 2008) indicates that the subject site is within Flood Zone D, "an area of undetermined but possible flood hazards."

A review of San Bernardino County Dam Inundation mapping for the Desert Region, indicates the site not located within any areas susceptible to inundation from flooding caused by dam failure, lake flooding, or river flooding. The nearest area of potential flooding is located approximately 1 mile south of the site associated with the dry Lucerne Lake.

Tsunamis and Seiches

A tsunami is a series of ocean waves generated in the ocean by an impulsive disturbance. Due to the inland location of the subject site, tsunamis are not considered a threat to the site. Seiches are standing waves in a body of water such as a lake or reservoir. Because such a body of water is not located near the site, seiches are not anticipated to affect the subject site.

Slope Stability and Potential for Slope Failure

Due to the generally flat-lying nature of the site and surrounding areas, problems from landslides are not anticipated to affect this site.

Volcanic Hazards

The subject site is not within an area known to be affected by volcanic hazards (Miller, 1989, USGS Bulletin, 1847).

County Seismic Safety Element

Documentation and mapping included in the Health and Safety Element of the County of San Bernardino County General Plan, adopted March 13, 2007, and the Safety Background Report, dated June 15, 2005, were reviewed. The seismic information contained within the Safety Elements is somewhat dated and or generalized and is superseded by more recent information and analyses described herein. The referenced documents generally indicate that the site area is subject to relatively moderate to high seismicity and related hazards. According to the County of San Bernardino General Plan, the subject site is located outside areas of known flooding potential.

FIELD AND LABORATORY INVESTIGATIONS

A subsurface soil investigation consisting of exploratory drilling was performed at the site in December 2009. Subsurface soil conditions were explored by drilling 10 borings and excavating 3 test pits to depths ranging from approximately 10 to 50 feet below existing site grade, using a truck-mounted drill rig and a backhoe. The approximate boring and test pit locations are shown on the site geologic map, Figure No. 2. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsoils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, expansion potential, and moisture density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the surface soils consisted of 6 to 12 inches of very loose silty sand and silty sand with trace clay and gravel. These soils are disturbed, have low strength characteristics, and are highly compressible when saturated.

Approximately 6 to 12 inches of fill material was encountered along the edges of the site. The fill material predominately consisted of silty sand, sandy silt, and silty sand with gravel. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that the fill soils had varying strength characteristics ranging from loosely placed to compacted. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site.

Below the loose surface soils and fill material, approximately 1 to 3 feet of loose to very dense silty sand, silty sand with trace clay, sandy silt with gravel, or sand were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly to moderately compressible. Penetration resistance ranged from 19 to greater than 50 blows per foot. Dry densities ranged from 116 to 138 pcf. Representative soil samples consolidated approximately 4½ to 5½ percent under a 2 ksf load when saturated. Representative soil samples had an angle of internal friction of 30 and 32 degrees.

Below 3 to 4 feet, approximately 4 to 12 feet of dense to very dense silty sand, sand, clayey sand, sandy clayey silt, sandy silt, and sandy gravel were encountered. Penetration resistance ranged from 20 to greater than 50 blows per foot. Dry densities ranged from 112 to 129 pcf. A representative soil sample consolidated approximately 2 percent under a 3 ksf load when saturated. A representative soil sample had an angle of internal friction of 31 degrees.

Below 8 to 16 feet, alternating layers of predominately very dense silty sand, sandy silt, silty sand/sandy silt, sandy clayey silt and sand were encountered. Penetration resistance was typically greater than 50 blows per foot. Dry densities ranged from 97 to 123 pcf. These soils had similar strength characteristics as the upper soils and extended to the termination depth of our borings.

For additional information about the soils encountered, please refer to the boring logs in Appendix A.

PERCOLATION TESTING

Two percolation tests were performed within the proposed drainage area to evaluate the soils absorption characteristics. The percolation tests were performed at depths of 4 to 5 feet below the existing site grade. The tests were conducted in accordance with the criteria set in the "Manual of Septic Tank Practice" published by the Department of Health, Education, and Welfare. Results of the tests are as follows:

Test No	Depth (feet)	Percolation Rate (min/in)	Soil Type
P1	4	15	Silty Sand (SM) with Gravel
P2	3	10	Silty Sand (SM) with Gravel

The test results indicate that the soils tested have moderate absorption rates. The soils within the depths tested are classified as Soil Type III based on the Uniform Plumbing Code. The estimated soil absorption factors presented in this report are based on clear water and a factor of safety should be incorporated into the design of the water disposal to compensate for soil clogging from water impurities.

RESISTIVITY TESTING

Field resistivity testing was conducted utilizing the Wenner Four Point Method. The results of the tests are included in the following table:

Line No.	Depth (ft)	Calculated Resistivity (ohm-cm)
1	5	4059
1	10	1378
1	15	798
1	20	1128

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater encountered not encountered within the depths explored (50 feet). Review of the Department of Water Resources groundwater level readings from February 1953 to April 2008 indicates that historic high groundwater within the project site and vicinity range from 79 to 214 feet below site grade. Groundwater information was obtained from 11 groundwater wells located on and within 0.1 miles from the subject site (Well Nos.: 06N01W36J001S, 06N01W36K001S, 06N01W36K002S, 05N01W01C001S, 05N01W01F001S, 05N01W01L001S, 05N01W01E001S, 05N01E06D001S, 05N01W02H001S, 05N01W02J003S, and 05N01W02J002S). Past subsurface soil exploration performed by Krazan & Associates, Inc., in the vicinity of the site confirms this approximate groundwater depth.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions with the exception of the fill material, moderately compressible and/or collapsible upper native soils, and existing development, appear to be conducive to the development of the project. The surface soils are disturbed, have low strength characteristics, and are highly compressible when saturated. Accordingly, it is recommended that the surface soils be

recompacted in the area of structures that will be supported on shallow conventional foundations or will utilize concrete slab-on-grade construction. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Previous grading operations have been performed within the project site and vicinity to construct roads and level the land for agricultural uses. Buried utility lines trend throughout portions of the site associated with the previous agricultural development. Up to 1 foot of fill material was encountered within the project site. Fill soil has been spread along the edges of the site. The fill material predominately consists of silty sand, silty sand with gravel, silty sand with clay and sandy silt soils. The thickness and extent of fill was determined based on limited test borings, test pits, and visual observation. Thicker fill may be present at the site. Verification of the extent of fill should be determined during site grading. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that the fill soils had varying strength characteristics ranging from loosely placed to compacted. Therefore, it is recommended that the fill soils within area of structures that will not be supported on foundations extending through the fill and upper moderately collapsible soils be excavated and recompacted. The fill material will be suitable for reuse as Engineered Fill, provided it is cleansed of excessive organics and debris. The fill material should be moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to fill placement, Krazan & Associates, Inc. should inspect the bottom of the excavation to verify no additional excavation will be required.

Presently, the site is predominately vacant. Buried utility lines trend throughout portions of the site. Several water wells are located throughout the site. Demolition activities should include removal of any buried structures. Any buried structures encountered during construction should be properly removed and the resulting excavations backfilled. Water wells should be abandoned in accordance with state and local standards. It is suspected that demolition activities of the existing structures will disturb the upper soils. After demolition activities, it is recommended that the disturb soils be removed and/or recompacted. This compaction effort should stabilize the upper soils and located any unsuitable or pliant areas not found during our field investigation.

The upper native soils are moisture sensitive, moderately compressible and/or collapsible soils under saturated conditions. In order to provide uniform support and reduce the potential for differential settlement, it is recommended that following stripping, demolition, and fill removal operations, the exposed native soils within proposed building areas be excavated to a depth of at least 3 feet, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, the structure foundations should be supported by a minimum of 2 feet of Engineered Fill. Therefore, if the footings are 12 inches deep and the site grade is to remain the same, the total depth of recompaction within the proposed footing areas and 5 feet beyond in each direction should be 3 feet. The on-site, native and fill soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive debris, organics, and fragments larger than 4 inches in maximum size. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan & Associates, Inc. to verify stability. This compaction effort should stabilize the surface

soils and locate any unsuitable or pliant areas not found during our field investigation. Fill material should be compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

The upper on-site native and fill soils within the project site are identified as silty sand, sandy silt, sand, clayey sand, and sandy clayey silt. The clayey soils exhibit a low swell potential and are subject to volumetric changes if moisture contents vary. The estimated swell pressure of the clayey material may cause movement, affecting slabs and brittle exterior finishes. To minimize the potential soil movement, it is recommended that the upper 12 inches of soil within slab-on-grade and exterior flatwork areas consist of non-expansive fill. The fill material should be a well-graded silty sand or sandy silt soil. A clean sand or very sandy soil is not acceptable for this purpose. A sandy soil will allow the surface water to drain into the expansive clayey soils below, which may result in swelling. The replacement soil and/or the upper 12 inches of Imported Fill soils should meet the specifications as described under the subheading Engineered Fill. The replacement soils should extend 5 feet beyond the perimeter of the building. The non-expansive replacement soil should be compacted to at least 90 percent relative compaction based on ASTM Test Method D1557. The exposed native soils in the excavation should not be allowed to dry out and should be kept continuously moist prior to backfilling. In addition, it is recommended that slab-on-grade continuous footings and slabs be nominally reinforced to minimize cracking and vertical off-set.

As an alternative to the use of non-expansive soils, the upper 12 inches of soil supporting slab-on-grade and exterior flatwork areas consist of lime-treated clayey soils. The lime-treated soils should be recompacted to a minimum of 90 percent of maximum density. Preliminary application rate of lime should be 5 percent by dry weight. The lime material should be calcium oxide, commonly known as quick-lime. The clayey soils should be at or near optimum moisture during the mixing operations.

Trees, shrubs, and brush are located throughout the site. If not utilized for the proposed development, tree, shrub, and brush removal operations should include roots greater than 1 inch in diameter. The resulting excavations should be backfilled with Engineered Fill.

Sandy and gravelly soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

After completion of the recommended site preparation and over-excavation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing conventional footings or mat foundations with allowable bearing pressures of 2,500 and 1,800 psf, respectively, for dead-plus-live loads. Conventional footings, if utilized, should have a minimum embedment of 12 inches. Foundations supported at grade may be designed utilizing an allowable bearing capacity of 400 psf for dead-plus-live-loads. Some of the structures and equipment may be supported on drilled caissons/piers. If drilled piers will be utilized, over-excavation of the fill material and native soils in the area of the structures supported on drilled piers will not be required provided the piers extend to a minimum depth of 10 feet. Recommendations regarding drilled caissons/piers are also provided in the Foundation section of this report.

Groundwater Influence on Structures/Construction

Based on our findings and historical records it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. However, if earthwork is performed during our soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation

General site clearing should include removal of asphaltic concrete; concrete; vegetation and existing utilities; and structures; including foundations; basement walls and floors; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for reuse as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Several utility lines trend across the site. In addition, several developments are located within the project site vicinity. Associated with these structures are buried structures that extend into to the project site. Demolition activities should include proper removal of any buried structures. Areas disturbed by demolition activities should be excavated to firm ground and recompacted.

Approximately 1 foot of fill material was encountered along the edges the project site. The fill material predominately consisted of silty sand, silty sand with gravel, silty sand with clay, and sandy silt soils. The thickness and extent of fill was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Verification of the extent of fill should be determined during site grading. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that the fill soils had varying strength characteristics ranging from loosely placed to compacted. Therefore, it is recommended that these fill soils be excavated and recompacted. The fill material will be suitable for reuse as Engineered Fill, provided it is cleansed of excessive organics and debris. The fill material should be moisture-conditioned to a minimum of 2 percent above optimum moisture-content and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to fill placement, Krazan & Associates, Inc. should inspect the bottom of the excavation to verify no additional excavation will be required.

The upper native soils are moisture-sensitive, moderately compressible, and/or collapsible soils under saturated conditions. In order to provide uniform support and reduce the potential for differential settlement, it is recommended that following stripping, demolition, and fill removal operations, the exposed native soils within proposed building areas be excavated to a depth of at least 3 feet, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above

optimum moisture-content and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, the structure foundations should be supported by a minimum of 2 feet of Engineered Fill. Therefore, if the footings are 12 inches deep and the site grade was to remain the same, the total depth of recompaction within the proposed footing areas and 5 feet beyond in each direction should be 3 feet. If the site will be raised 6 inches or more, then the required over-excavation will be 3 feet. If the site will be cut in the area of the foundation and 5 feet beyond, the over-excavation will be 2 feet below the bottom of the foundation. The on-site, native and fill soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive debris, organics, and fragments larger than 4 inches in maximum size. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan & Associates, Inc. to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation. Fill material should be compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

It is recommended that the upper 12 inches of soil within proposed slab-on-grade and exterior flatwork areas consist of non-expansive or lime-treated Engineered Fill. The intent is to support slab-on-grade and exterior flatwork areas with 12 inches of non-expansive or lime-treated fill. The fill placement serves two functions: 1) it provides a uniform amount of soil which will more evenly distribute the soil pressures and 2) it reduces moisture content fluctuation in the clayey material beneath the building area. The non-expansive fill material should be a well-graded silty sand or sandy silt soil meeting the requirements for non-expansive fill provided in the Engineered Fill section of this report. A clean sand or very sandy soil is not acceptable for this purpose. A sandy soil will allow the surface water to drain into the expansive clayey soil below, which may result in soil swelling. Imported Fill should be approved by the Soils Engineer prior to placement. The fill should be placed as specified under the subheading Engineered Fill.

Following demolition, stripping, and fill removal operations, the exposed subgrade in exterior flatwork and pavement areas should be excavated/scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Limits of recompaction should extend 5 feet beyond structural elements. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

The site presently consists of predominately vacant agricultural and pasture land. Several concrete slabs and water troughs are located throughout the site. In addition, several structures are located within the project site vicinity. Associated with these developments may be buried structures that extend into the project site. Demolition activities should include the proper removal of any remaining buried structures and the resulting excavations backfilled with Engineered Fill. Disturbed areas caused by demolition activities should be removed and/or recompacted. Excavations, depressions, or soft and pliant areas extending below planned finish subgrade level should be cleaned to firm undisturbed soil, and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Water wells should be abandoned in accordance with state and local standards. Concrete footings should be removed to an equivalent depth of at least 3 feet below

proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

Trees, shrubs and brush are located throughout the site. Tree, shrub, and brush removal operations should include roots greater than 1 inch in diameter. The resulting excavations should be backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Several piles of debris are located throughout the site. This debris will not be suitable for reuse as Engineered Fill and should be removed from the site.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction and stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The upper, on-site native and fill soils are predominately silty sand, sandy silt, sand, gravelly sand, clayey sand, and sandy clayey silt. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris and fragments larger than 4 inches in dimension. Clayey soils with an expansion index greater than 15 should not be utilized as Engineered Fill within the upper 12 inches of slab on grade or exterior flatwork areas. These clayey soils will be suitable for reuse as General Engineered Fill provided they are cleansed of excessive organics and debris, are moisture-conditioned to 2 to 5 percent above optimum moisture, and compacted to between 90 and 95 percent of maximum density based on ASTM Test Method D1557. During construction, it is recommended that additional testing be performed on the on-site soils and fill material to evaluate the physical and index properties prior to reuse as Engineered Fill.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor since he has complete control of the project site at that time.

Imported non-expansive Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics:

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	20 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and compacted to achieve at least 90 percent maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1803 of the 2007 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 2 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced; especially during or following periods of precipitation.

Sandy and gravelly soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 90 percent of the maximum density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

The Contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Pipe Bedding and Envelope

Proper bedding and envelope should be provided for the proposed pipes. The bedding surface should be smooth and true to the design grade. At least 12 inches of compacted cohesionless soil bedding (100 percent passing the No. 4 Sieve and not more than 8 percent passing and No. 200 Sieve) should be provided below the pipes. An envelope of sandy backfill material should be placed along the sides of the pipe and a minimum depth of 12 inches or ⅛ H over the top of pipe (H is the height of soil backfill above the top of the pipe).

Pipe bedding and envelope should be brought to near optimum moisture content, placed in loose lifts not more than 6 inches in thickness, and compacted to achieve at least 90 percent of maximum density based on ASTM Test Method D1557. Due to space limitations, a hand compactor may be required.

Foundations – Conventional

After completion of the recommended site preparation and over-excavation, the site should be suitable for shallow footing support. The proposed structures may be supported on a shallow foundation system bearing on a minimum of 2 feet of Engineered Fill. The Engineered Fill should extend a horizontal distance of at least 5 feet beyond structural elements. Spread, continuous, or ring-wall footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	1,875 psf
Dead-Plus-Live Load	2,500 psf
Total Load, including wind or seismic loads	3,325 psf

Footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches, regardless of load. Ultimate design of foundations and reinforcement should be performed by the project Structural Engineer.

The total settlement is not expected to exceed ¾ inch. Differential settlement should be less than ½ inch. Most of the settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 240 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the value above may be used for short duration, wind, or seismic loads. The above earth pressures include a factor of safety of 1.5. The values were calculated using a θ of 30°, γ of 120 pcf, and a Kp of 3.0.

Mat Foundations

After completion of the recommended site preparation and over-excavation in the area of the foundations and 5 feet beyond, the site should be suitable for shallow footing support. The proposed structures may be supported on a thick mat foundation system, bearing on a minimum of 2 feet of Engineered Fill. The Engineered Fill should extend a minimum of 5 feet beyond structural elements. The mat foundations may be designed for the following maximum allowable soil bearing pressure:

Load	Allowable Loading
Dead Load Only	975 psf
Dead-Plus-Live Load	1,300 psf
Total Load, including wind or seismic loads	1,725 psf

The total settlement of the mat is not expected to exceed ¾ inches. The differential settlement should be less than ½ inch. The mat should have a minimum thickness of 12 inches. Reinforcement of the mat should be designed by the project's structural engineer.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 240 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads. The above earth pressures include a factor of safety of 1.5. The values were calculated using a θ of 30°, γ of 120 pcf, and a Kp of 3.0.

Foundations—Drilled Caissons or Pipe Piles

The proposed structures can be supported on caissons or pipe piles, using an allowable sidewall friction of 300 psf. This value is for dead-plus-live loads. This value may be increased ⅓ for short duration loads, such as wind or seismic. The upper 2 feet should be neglected from friction calculations. Uplift

loads can be resisted by caissons using an allowable sidewall friction of 175 psf of the surface area plus the weight of the pier. Caissons should have a minimum embedment depth of 10 feet. Caissons for lightly loaded structures can be designed using an allowable end bearing value of 3500 psf provided they have a minimum embedment depth of 5 feet. This value may be increased by ⅓ for short duration loads such as wind or seismic. The total and differential settlements of the piers are not expected to exceed ½ inch. Most of the settlement is expected to occur during construction as the loads are applied. If drilled piers will be utilized, no over-excavation of the fill material and native soils will be required.

Diagrams showing the anticipated deflections and moments for the horizontal loads provided are attached in Appendix F.

Sandy and gravelly soils were encountered at the site. This condition may result in difficulty pushing the pipe piles. Therefore, predrilling of the holes may be required for the pipe piles. These sandy and gravelly soils may be subject to caving during drilling operations. Accordingly, cased caissons may be required. The drilled holes should be left open for as short of time as possible and should be protected from run-off.

Excavation Stability

Temporary excavations planned for the construction of the building and other associated structures may be excavated, according to the accepted engineering practices following Occupational Safety and Health Administration (OSHA) standards by a Contractor experienced in such work. Open, unbraced excavations in undisturbed soils should be made according to the table below.

Recommended Excavation Slopes	
Depth of Excavation (ft)	**Slope (Horizontal:Vertical)**
	Temporary
0-5	1:1
5-10	1½:1
10-15	1¾:1
15+	2:1

If, due to space limitation, excavation near existing structures or roads is performed in a vertical position, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavation and installation. A specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction. The lateral pressures provided below may be used in the design of a braced-type shoring system.

Recommended Lateral Earth Pressure for Braced Shoring	
Depth of Excavation Below Ground Surface (feet)	**Lateral Soil Pressure (psf)**
0	0
0.25 H	30 H
H	30 H
Where H is the total depth of the excavation in feet.	

The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given above.

Since the Contractor has the ultimate responsibility for excavation stability, he may design a different shoring system for the excavation.

The excavation/shoring recommendations provided herein are based on soil characteristics derived from limited test borings within the site. Variations in soil conditions will likely be encountered during the excavations. Krazan & Associates, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation.

Floor Slabs and Exterior Flatwork

In areas were it is desired to reduce moisture-vapor transmission, concrete slab-on-grade floor should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with ASTM Specification E 1643-98. According to ASTM Guidelines, the water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 3 inches of compacted, clean, gravel of ¾-inch maximum size. To aide in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of the vapor retarder. The granular fill should consist of damp clean sand with at least 10 to 30 percent of the sand passing the 100 sieve. The sand should be free of clay, silt, or organic material. Rock dust which is manufactured sand from rock crushing operations is typically suitable for the granular fill. This granular fill material should be compacted.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with ASTM guidelines. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be

maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 60 pounds per square foot per foot of depth. Walls that are incapable of this deflection or walls that are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 90 pounds per square foot per foot per depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways. The above earth pressures include a factor of safety of 1.5. The values were calculated using a θ of 30°, γ of 120 pcf, and a Ka of 0.33.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

R-Value Test Results and Pavement Design

Two R-Value samples were obtained from the project site at the locations shown on the attached site plan. The samples were tested in accordance with the State of California Materials Manual Test Designation 301. Results of the tests are as follows:

Sample	Depth	Description	R-Value at Equilibrium
1	12-24"	Silty Sand (SM)	60
2	12-24"	Silty Sand (SM)	57

These test results are moderate and indicate fair subgrade support characteristics under dynamic traffic loads. The following table shows the recommended pavement sections for various traffic indices.

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
4.0	2.0"	4.0"	12.0"
4.5	2.5"	4.0"	12.0"
5.0	2.5"	4.0"	12.0"
5.5	3.0"	4.0"	12.0"
6.0	3.0"	4.0"	12.0"
6.5	3.5"	4.0"	12.0"
7.0	4.0"	4.0"	12.0"
7.5	4.0"	4.0"	12.0"

** 95% compaction based on ASTM Test Method D1557 or CAL 216*
*** 90% compaction based on ASTM Test Method D1557 or CAL 216*

If traffic indexes are not available, an estimated (typical value) index of 4.5 may be used for light automobile traffic, and an index of 7.0 may be used for light truck traffic.

The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

PORTLAND CEMENT PAVEMENT
LIGHT DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
4.5	5.0"	--	12.0"

HEAVY DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
7.0	6.5"	--	12.0"

** 95% compaction based on ASTM Test Method D1557 or CAL 216*
*** 90% compaction based on ASTM Test Method D1557 or CAL 216*
****Minimum compressive strength of 3000 psi*

It is recommended that any uncertified fill material encountered within pavement areas, be removed and/or recompacted. The fill materials should be moisture-conditioned to a minimum of 2 percent above optimum moisture and compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Seismic Parameters – 2007 California Building Code

The site is located less than 10 km from the Helendale Fault. Therefore, a preliminary site-specific ground motion analysis was performed using the analysis procedure defined in ASCE 7-05, Sections 21.2 through 21.4. Additional ground motion analysis should be performed during the design phase of the development. The methodologies available to assess the seismic risk include various programs. The computer simulation used for this project was EZ-FRISK, version 7.35, with enhancements and

modifications by Risk Engineering Inc. (2009). EZ-FRISK has become commonly used and is considered to be a de facto standard for studies of this kind. The enhancements to the EZ-FRISK program include the fault database, an attenuation function database, and the ability to consider dipping faults with complex geometry, such as listric faults, intercalation faults, blind faults, and rising and falling geometries.

The EZ-FRISK program includes a data base of faults with associated parameters. The database includes fault type (dip slip, strike slip, or blind fault), earthquake occurrence distributions to describe the characteristic earthquake, geologic slip-rate data, and upper-bounds earthquake magnitude values. The slip-rate database utilized for the analyses uses a considerable number of referenced sources. The slip-rate data utilized for the analyses were compared to data presented in the CGS Open File Report 96-08, Probabilistic Seismic Hazard Assessment for the State of California, and the CGS 2002 State-wide PSHA model, revised June 2003 (Coa and others, 2003) as well as other slip-rate data presented in the geologic literature. Comparison of the slip rate data indicates a general conformance of the database used to the CGS data as well as other published data. For this analysis, a search radius of 100 miles was used.

Based on the subsurface data, the upper geologic subgrade can be conservatively classified as a Site Class D. Therefore, the Next Generation Attenuation (NGA) relations developed by Boore and Atkinson (2007), Campbell and Bozorgnia (2007), and Chiou and Youngs (2006), all USGS (2008) were used in the analysis. The site-specific probabilistic MCE Spectrum and site-specific deterministic MCE spectrum are attached. The site-specific probabilistic MCE spectrum was lower than the deterministic MCE and the deterministic lower limit. Therefore, the values obtained by from the deterministic lower limit as defined in ASCE 7-05 Section 21.2.2. were determined appropriate for the project site. The seismic values that meet the requirements of Section 21.4 are as follows:

ASCE 7-05 Section 21.4	
Seismic Item	Value
Site Class	D
S_{MS}	3.375
S_{DS}	2.25
S_{M1}	2.025
S_{D1}	1.35

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

Soil samples were obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentrations detected from these soil samples were greater than 150 ppm and are above the maximum allowable values established by HUD/FHA and CBC. Therefore, it is recommended that a Type V cement be used within the concrete to compensate for sulfate reactivity with the cement.

Chemical tests were performed on a near-surface soil sample. The test results indicate that the soils are moderately corrosive to buried metal objects. Therefore, buried metal should be protected using either non-corrosive backfill, protective coatings, wrappings, sacrificial anodes, or a combination of these methods in accordance with the manufacturer's recommendations.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc., should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. The table provided below provides the minimum testing frequencies. Krazan & Associates, Inc., will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

Recommended Compaction Control Tests:
1 Test for Each 2,000 Sq. Ft. each Lift (bldg. area)
1 Test for Each 2,500 Sq. Ft. each Lift (parking area)
Structural Fill Maximum Lift Thickness 6 inches (Measured loose)

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

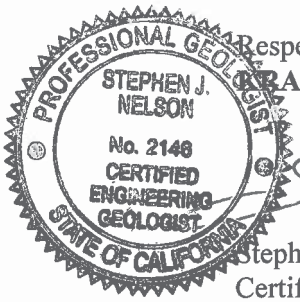
The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.



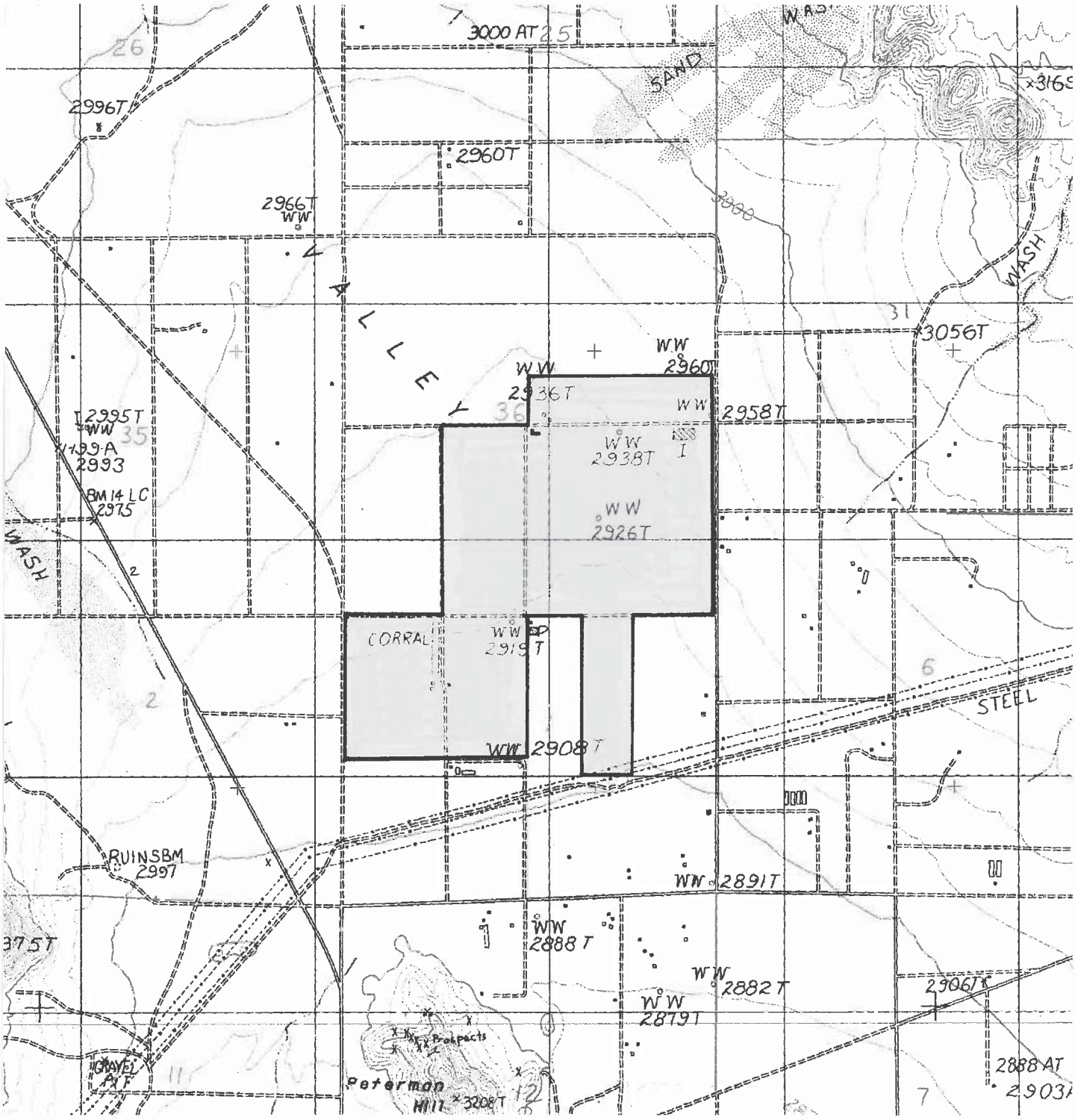
Stephen J. Nelson
Certified Engineering Geologist
CEG No. 2146

David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

SEISMIC SOURCES
PROPOSED LUCERNE VALLEY PV
SAN BERNARDINO COUNTY, CALIFORNIA

ABBREVIATED FAULT NAMES*	CLOSEST DISTANCE TO PROJECTION OF RUPTURE AREA ALONG FAULT (MILES)	SLIP RATE (mm/year)	MAXIMUM MAGNITUDE EARTHQUAKE
HELENDALE - S. LOCKHART	5.8	0.6	7.3
LENWOOD-LOCKHART-OLD WOMAN SPRGS	8.3	0.6	7.5
NORTH FRONTAL FAULT ZONE (West)	12.2	1.0	7.2
JOHNSON VALLEY (Northern)	13.5	0.6	6.7
LANDERS	14.7	0.6	7.3
NORTH FRONTAL FAULT ZONE (East)	17.3	0.5	6.7
GRAVEL HILLS - HARPER LAKE	21.6	0.6	7.1
EMERSON So. - COPPER MTN.	22.6	0.6	7.0
CALICO - HIDALGO	23.5	0.6	7.3
CLEGHORN	24.5	3.0	6.5
PISGAH-BULLION MTN.-MESQUITE LK	31.0	0.6	7.3
BLACKWATER	32.4	0.6	7.1
SAN ANDREAS - SB-Coach. M-1b-2	32.6	27.0	7.7
SAN ANDREAS - San Bernardino M-1	32.6	24.0	7.5
SAN ANDREAS - Whole M-1a	32.6	30.0	8.0
SAN ANDREAS - SB-Coach. M-2b	32.6	24.0	7.7
PINTO MOUNTAIN	36.7	2.5	7.2
SAN ANDREAS - Mojave M-1c-3	37.0	30.0	7.4
SAN ANDREAS - Cho-Moj M-1b-1	37.0	34.0	7.8
SAN ANDREAS - 1857 Rupture M-2a	37.0	34.0	7.8
SAN JACINTO-SAN BERNARDINO	38.5	12.0	6.7
CUCAMONGA	38.9	5.0	6.9
SAN JACINTO-SAN JACINTO VALLEY	41.2	12.0	6.9
BURNT MTN.	42.5	0.6	6.5
EUREKA PEAK	43.2	0.96	6.4
SAN ANDREAS - Coachella M-1c-5	51.5	25.0	7.2
SAN JOSE	52.8	0.5	6.4
SIERRA MADRE	54.8	2.0	7.2
CLAMSHELL-SAWPIT	56.3	0.5	6.5
SAN JACINTO-ANZA	56.7	12.0	7.2
CHINO-CENTRAL AVE. (Elsinore)	58.7	1.0	6.7
WHITTIER	63.0	2.5	6.8
ELSINORE (GLEN IVY)	63.0	5.0	6.8
RAYMOND	65.9	1.5	6.5
ELSINORE (TEMECULA)	67.6	5.0	6.8
PUENTE HILLS BLIND THRUST	68.7	0.4	7.1
GARLOCK (East)	70.5	7.0	7.5
OWL LAKE	72.4	2.0	6.5
PANAMINT VALLEY	72.7	2.5	7.4
UPPER ELYSIAN PARK BLIND THRUST	74.5	1.3	6.4

*These faults are used in seismic hazard analysis in accordance with the California Geological Survey



VICINITY MAP

NORTH

0 2,000' 4,000'

SCALE IN FEET (±)

MAP SOURCE:
U.S.G.S. "WHITE HORSE MTN., CA."
QUADRANGLE 7.5 MINUTE SERIES
(TOPO), DATED 1993

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10	Krazan ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SPECIALISTS *Offices Serving the Western United States*
	Drawn by: MN	Approved by: SN	
	Project No. 022-09110	Figure No. 1	

SITE GEOLOGIC MAP

Qal — QUATERNARY (RECENT) ALLUVIUM
ggm — MESOZOIC GRANITE AND QUARTZ MONZONITE
ms — PALEOZOIC SCHIST (Marine Metasedimentary Rock)
BORING LOCATION
TEST PIT LOCATION
PERCOLATION TEST LOCATION
R-VALUE LOCATION
RESISTIVITY TEST
CONDUCTIVITY TEST

NORTH

0' 1000' 2000'
SCALE IN FEET (±)

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED LUCERNE VALLEY PV
DESERT LANE AND FERN ROAD
SAN BERNARDINO COUNTY, CA

Scale:	Date:
AS SHOWN	2/10
Drawn by:	Approved by:
MN	SN
Project No.	Figure No.
022-09110	2

Krazan
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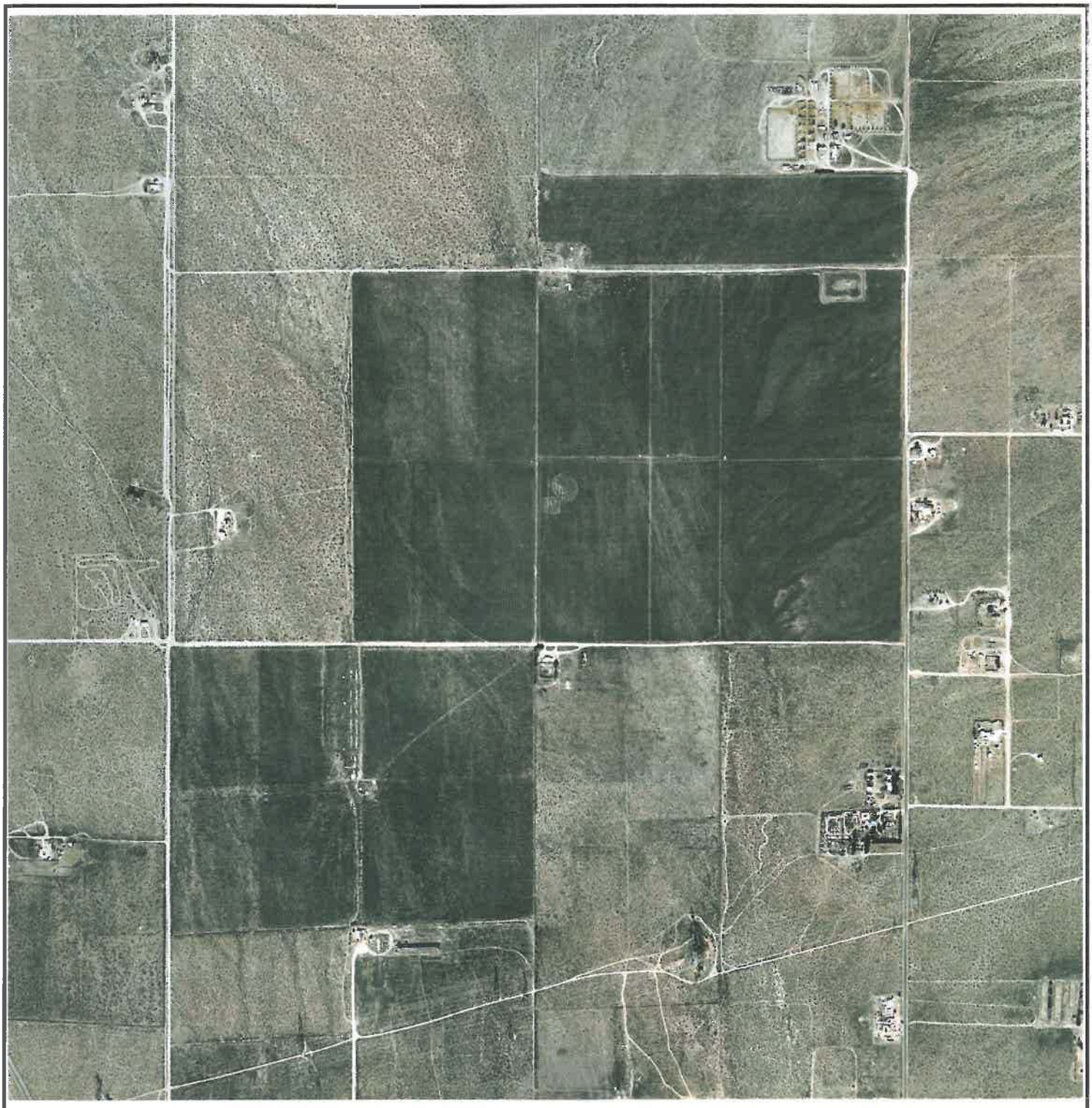
Offices Serving the Western United States



AERIAL PHOTO 2006

NORTH

0 1,000' 2000'

SCALE IN FEET (±)

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN Drawn by: MN Project No. 022-09110	Date: 2/10 Approved by: SN Figure No. 3

Krazan

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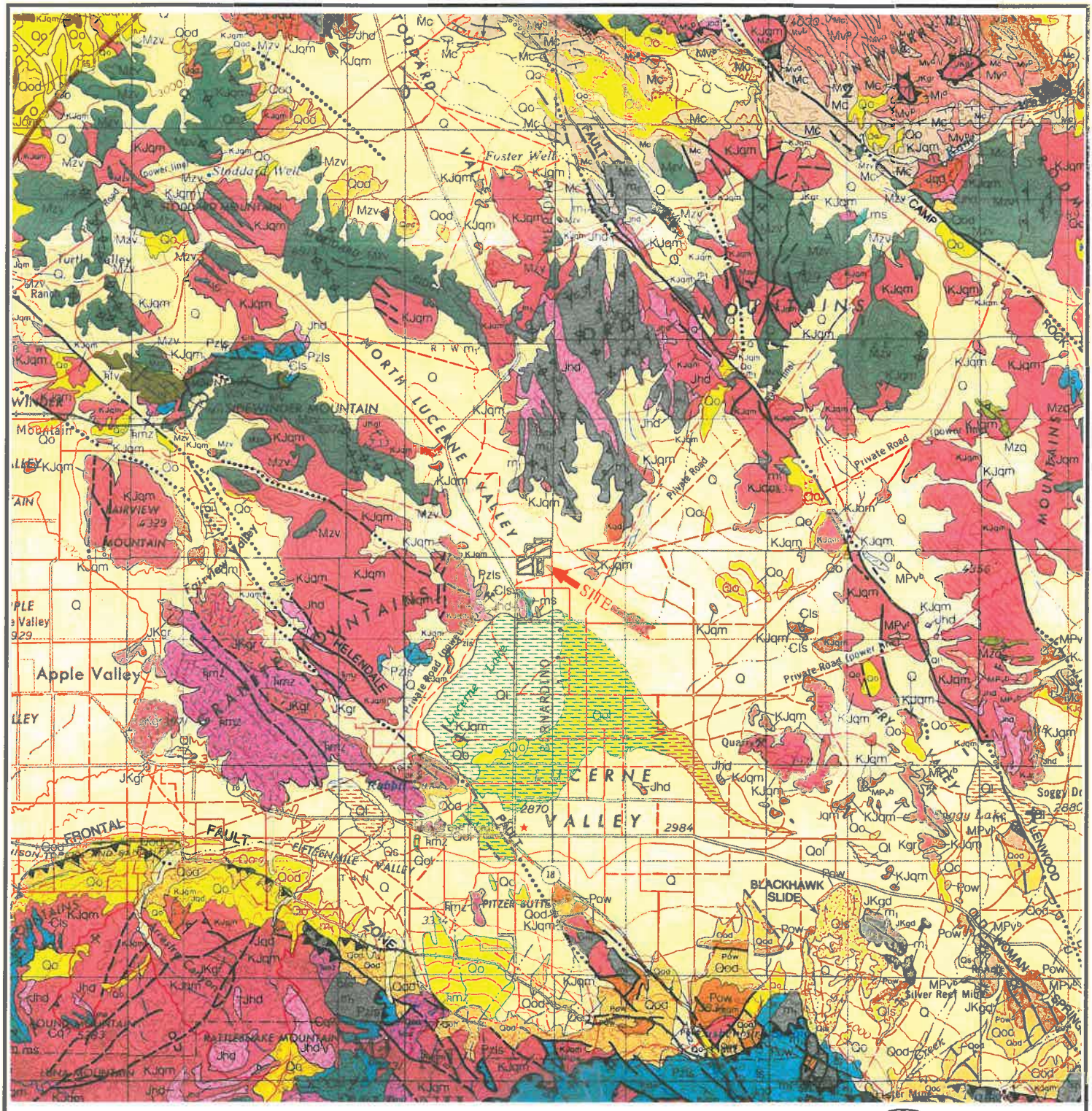

REGIONAL GEOLOGIC MAP

FROM:
GEOLOGIC MAP OF THE SAN BERNARDINO QUADRANGLE COMPILATION BY E.J. BORTUGNO AND T.E. SPITTLER, 1986, REVISED 1998.

NORTH

0 4 8

SCALE IN MILES (±)

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10
	Drawn by: MN	Approved by: SN
	Project No. 022-09110	Figure No. 4

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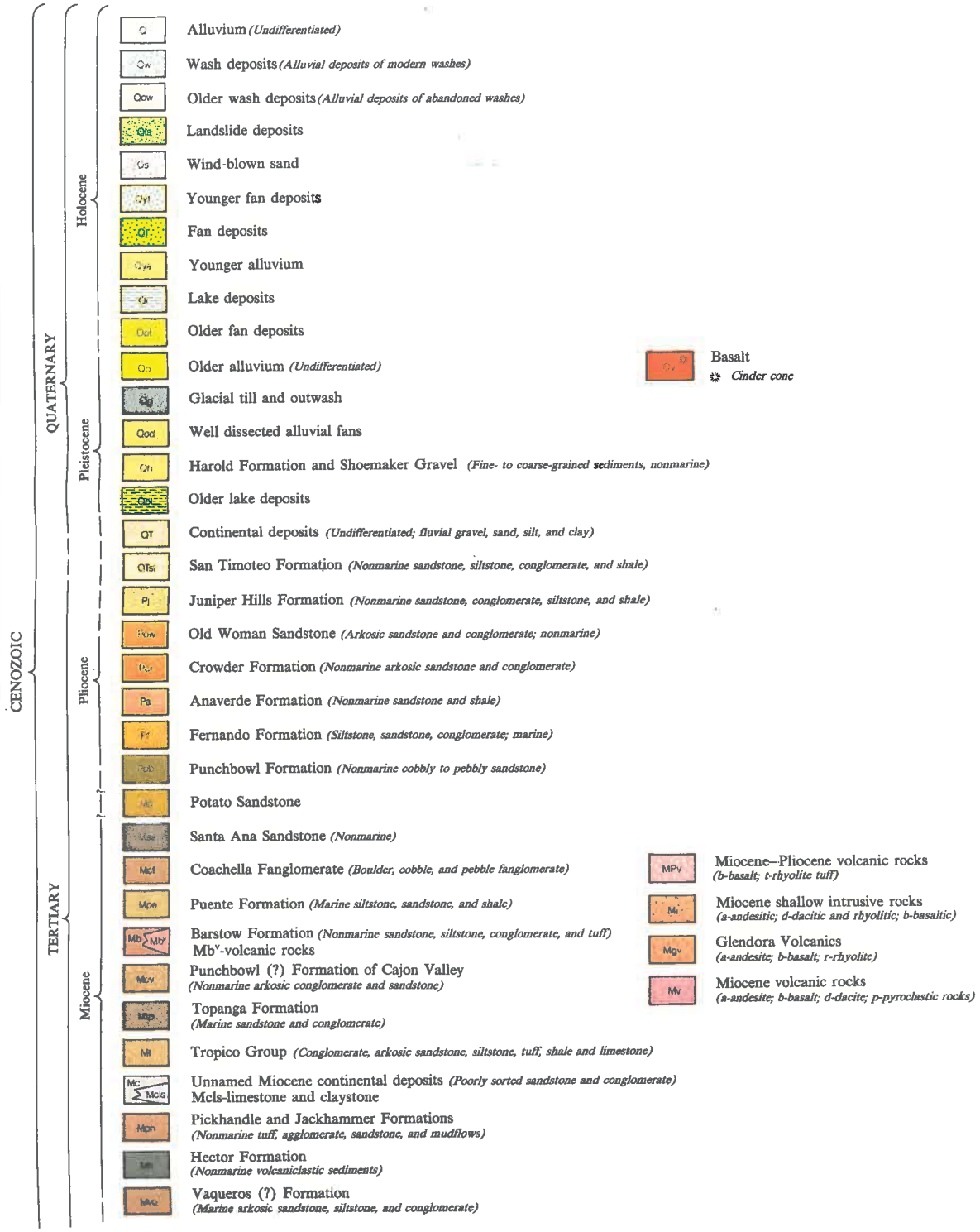

REGIONAL GEOLOGIC MAP

EXPLANATION

FROM:
GEOLOGIC MAP OF THE SAN BERNARDINO QUADRANGLE COMPILATION BY E.J. BORTUGNO AND T.E. SPITTLER, 1986, REVISED 1998.

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10
	Drawn by: MN	Approved by: SN
	Project No. 022-09110	Figure No. 4a

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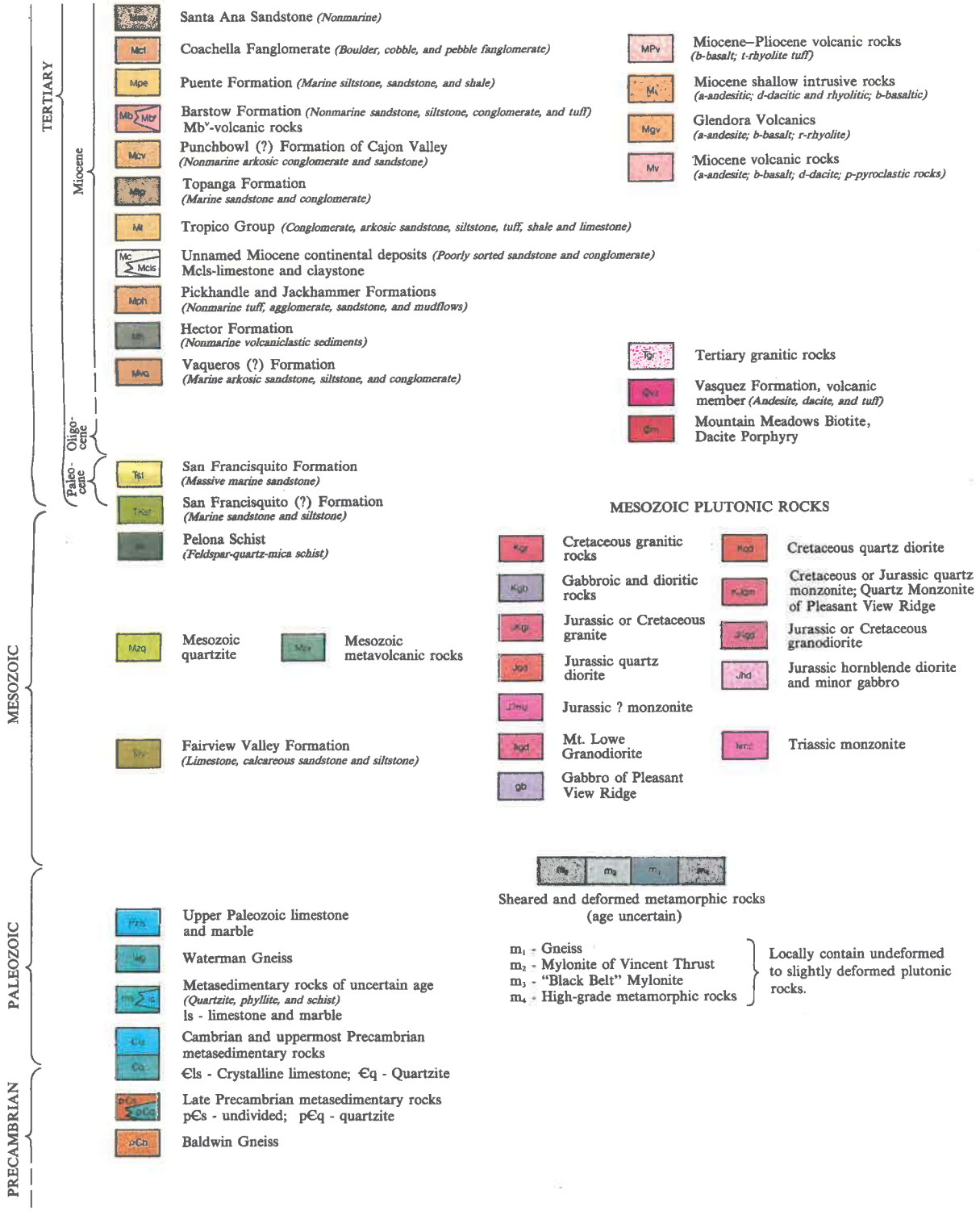
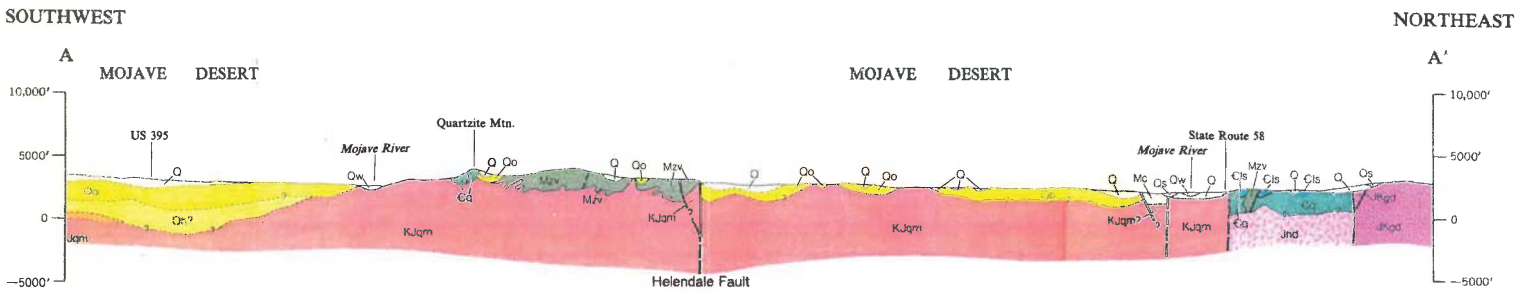


REGIONAL GEOLOGIC MAP

EXPLANATION

FROM:
GEOLOGIC MAP OF THE SAN BERNARDINO QUADRANGLE COMPILATION BY E.J. BORTUGNO AND T.E. SPITTLER, 1986, REVISED 1998.

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10	Krazan ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SPECIALISTS *Offices Serving the Western United States*
	Drawn by: MN	Approved by: SN	
	Project No. 022-09110	Figure No. 4b	



REGIONAL GEOLOGIC CROSS-SECTION A-A'

SCALE

HORIZONTAL: 1" = 4 MILES
VERTICAL: 1" = 10,000 FEET

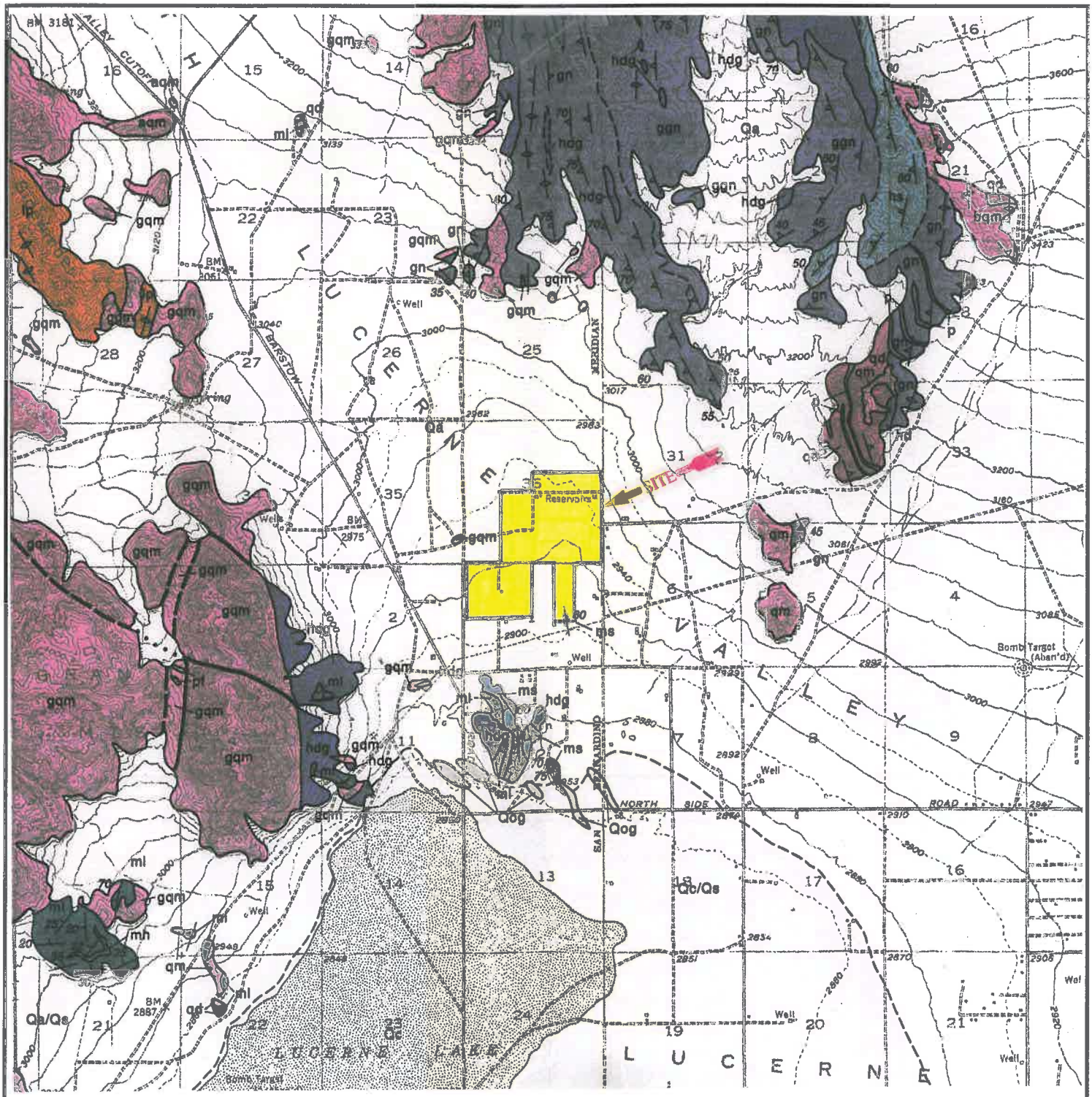
FROM:

GEOLOGIC MAP OF THE SAN BERNARDINO QUADRANGLE COMPILED BY E.J. BORTUGNO AND T.E. SPITTLER, 1986

NOTE:

SEE FAULT MAP FOR LOCATION OF GEOLOGIC CROSS-SECTION.

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10	Krazan ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SPECIALISTS *Offices Serving the Western United States*
	Drawn by: MN	Approved by: SN	
	Project No. 022-09110	Figure No. 5	



LOCAL GEOLOGIC MAP

FROM:
GEOLOGIC MAP OF THE APPLE VALLEY AND ORD MOUNTAINS, 15 MINUTE QUADRANGLES, CALIFORNIA, BY THOMAS W. DIBBLEE Jr, 2008.

NORTH

0 1 2

SCALE IN MILES(±)

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD	Scale: AS SHOWN	Date: 2/10	Krazan ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SPECIALISTS *Offices Serving the Western United States*
	Drawn by: MN	Approved by: SN	
SAN BERNARDINO COUNTY, CA	Project No. 022-09110	Figure No. 6	

SURFICIAL SEDIMENTS

Unconsolidated, undissected alluvial sediments

Qa *Alluvial silt, sand and gravel of valley areas*

Qs *Loose fine to medium sand deposited by prevailing winds as elongate dunes on alluvium and clay*

Qc *Clay of playa lakes or mud flats, light gray, with some micaceous silt*

— *UNCONFORMITY* —

OLDER SURFICIAL SEDIMENTS

Weakly consolidated, dissected where elevated; age, presumably Pleistocene, lower unit in part Tertiary

Qoa *Gray gravel of unsorted detritus, poorly bedded*

Qog *Gray gravel of rounded cobbles derived mostly from porphyry complex of Ord and East Ord Mountains*

Qof *Older fanglomerate and gravel, gray, massive, composed of poorly sorted, rounded fragments up to 3 feet in diameter in unsorted pebbly sand matrix*

— *UNCONFORMITY* —

BASALT

Localized basalt flows; age, early Pleistocene to possibly Pliocene

QTb *Basalt, black, massive, non-vesicular, with scattered phenocrysts of plagioclase and olivine, forms local flows up to 20 feet thick, more extensive in Fry Mountains to east*

— *UNCONFORMITY* —

TRAVERTINE VEIN

Probable hot spring deposit; age, presumably Tertiary or possibly Quaternary

t *Calcite travertine vein, width up to15 feet, parallel banding, mostly white, some bands iron-stained yellow, brown and red*

SEDIMENTARY ROCK SEQUENCE

Non-marine fanglomerate with local basal breccia and tuff, probable unconformity at base; age, Tertiary, probably late Miocene

Tst / Tss *Fanglomerate, coarse, nearly devoid of bedding, with some clasts of Tertiary basalt and andesite; forms bulk of sequence; locally grades into sandstone* **Tss**

Tsg *Granitic breccia, dark red, of unsorted fragments of* **bqm** *up to 3 feet in diameter in matrix of hard, ferruginous gritty arkosic sandstone*

Tst *Tuff, creamy white, massive, fine to medium grained, composed of glass shards and scattered flakes of biotite with small angular fragments of andesite or dacite*

— *UNCONFORMITY* —

INTRUSIVE (?) FELSITE

Volcanic intrusive (?) into and probably extrusive onto **bqm**, *overlain by associated tuff breccia; age, Tertiary, presumably early Miocene or older*

Tif *Felsite, pink, light-gray to tan, of rhyolite or quartz latite, hard, massive to flow laminated, with fracture parallel to flow laminae, aphanitic to very fine grained*

VOLCANIC AND SEDIMENTARY ROCKS

Extrusive volcanic flows and fanglomerates, exposed north of Kane Wash, maximum exposed thickness about 2000 feet; age, Tertiary, early Miocene or older

Tf *Fanglomerate, gray, massive to crudely bedded, of unsorted subrounded boulders, cobbles, and pebbles, derived mostly from porphyry complex and* **bqm**, *deposited by torrential downpours as alluvial fans*

Tb *Basalt, black, massive, commonly vesicular with scattered phenocrysts of olivine*

Tt *Tuff breccia, pink, crudely bedded; composed of angular felsite fragments in white matrix; includes some lenses of gray perlite breccia; grades northward into bedded wite tuff*

— *UNCONFORMITY* —

Holocene ? Pleistocene ? ? Pliocene ? ? Miocene — QUATERNARY — TERTIARY — CENOZOIC

HYPABYSSAL AND IGNEOUS ROCKS

INTRUSIVE DIKES AND VEINS

Age, presumably Mesozoic

tq *Quartz and muscovite, white, fine-grained, with numerous rosettes of fine-grained bluish-black tourmaline in part altered to limonite; forms dikes and veins in* **lpc** *and* **lps**

q *Quartz, milky-white, massive, in places brecciated and recemented by iron oxides*

a *Aplite, cream-white, homogeneous, very fine-grained, forms dikes and veins up to 400 feet wide in* **lp**

p *Pegmatite, nearly white, forms medium-grained small dikes to very coarse grained large dikes*

wqm *Bleached quartz monzonite, white zone bleached by hydrothermal action, with feldspars kaolinized and biotite leached out*

PORPHYRY COMPLEX

Metamorphosed porphyritic igneous intrusives within surrounding granitic and dioritic rocks, apparently emplaced several times; includes Ord Mountain Group of Gardner, 1940, and Sidewinder Volcanic Series of Bowen, 1954; age, probably Jurassic or Cretaceous

pf *Porphyritic felsite, gray-white, tan to pink, massive, rarely schistose, aphanitic to porphyritic, forms large masses and parallel dikes into* **lp**

sf *Siliceous felsite, white to gray-white, massive to locally flow-banded, very hard, forms dikes and pods up to 150 feet wide*

lp *Latitic porphyry, light or brownish gray to dark gray, massive to locally schistose, ranges from latite and andesite (predominant) to dacite and quartz latite (subordinate); other latitic facies include breccia (***lpb***), coarse flow-breccia or vent breccia (***lpt***), schistose latitic metaporphyry or metatuff (***lps***), chloritized latite-andesite metaporphyry (***lpc***), and latite-andesite to diorite porphyry (***lpd***)*

bp *Basalt, porphyritic, gray-black, massive.*

GRANITIC AND DIORITIC ROCKS

Age, Mesozoic

qm *Quartz monzonite, gray-white, massive, equigranular, weakly coherent where weathered, intrusive into all other pre-Tertiary rocks except quartz*

gr *Granite, white, massive, medium- to coarse-grained, inequigranular to pegmatitic*

gqm *Granite and quartz monzonite, light gray to tan, weathers gray to yellowish brown, hard, massive, fine to medium-grained, in places porphyritic; intrusive into metasedimentary and gneissic rocks*

aqm *Aplitic quartz monzonite, gray-white, tan-weathering, very hard, massive, fine-grained, grades into* **lp**, *intrusive into* **bqm**

bqm *Biotite quartz monzonite, gray to dark gray, medium- to coarse-grained; in places affected by hydrothermic altering and cataclastic shearing*

qd *Quartz diorite, dark gray, massive, medium-grained, occurs as isolated pendants with* **hd/hdg** *in* **qm**

hd/hdg *Hornblende diorite and gabbro, black, massive, medium- to coarse-grained; intrusive into, and possibly recrystallized from, gneissic and metasedimentary rocks; in Granite Mountains forms small irregular bodies within* **gqm**

d *Diorite, gray-black, massive, fine-grained, forms dikes in* **bqm**

FAIRVIEW VALLEY FORMATION

(of Bowen, 1954) Marine metasedimentary, occurs as large pendants in **lp**; *age, Paleozoic*

fh *Hornfels, greenish gray to reddish brown, hard, finely laminated, with layers of gray arkosic sandstone and conglomerate*

fl *Limestone, dark greenish-gray, weathers tan, impure, with partings of argillite or hornfels*

fdc *Conglomerate, bedded, of subrounded pebbles and cobbles of gray-white dolomite in matrix of dark brown dolomitic limestone*

METASEDIMENTARY ROCKS

Marine metasedimentary rocks (probably Oro Grande series of Hershey, 1902), exposed as pendants engulfed in plutonic rocks; age, probably Paleozoic, assigned to Carboniferous by Bowen, 1954

ml *Marble, limestone, or dolomite, thickly bedded, light gray to white, coarsely crystalline*

mh *Hornfels, pinkish to greenish gray, hard, fine-grained, indistinctly bedded*

ms *Schist, dark brown to greenish black, fine-grained, with a few thin sandstone interbeds*

mt *Tactite, brownish green, massive, fine to coarsely crystalline*

mq *Quartzite, gray, massive, fine-grained*

GNEISSIC ROCKS

Metamorphosed from sedimentary rocks; similar to, and presumably correlative with gneissic rocks of San Bernardino Mountains; age, Precambrian?

gn *Quartz diorite gneiss, gray, fine to medium grained, banded*

ggn *Granite gneiss, light gray, fine to medium grained, nearly homogeneous, faintly banded*

hs *Hornblende or biotite schist, gray-black, foliated, fine to medium grained*

CRETACEOUS — MESOZOIC

CARBONIFEROUS? — PALEOZOIC

PRECAMBRIAN

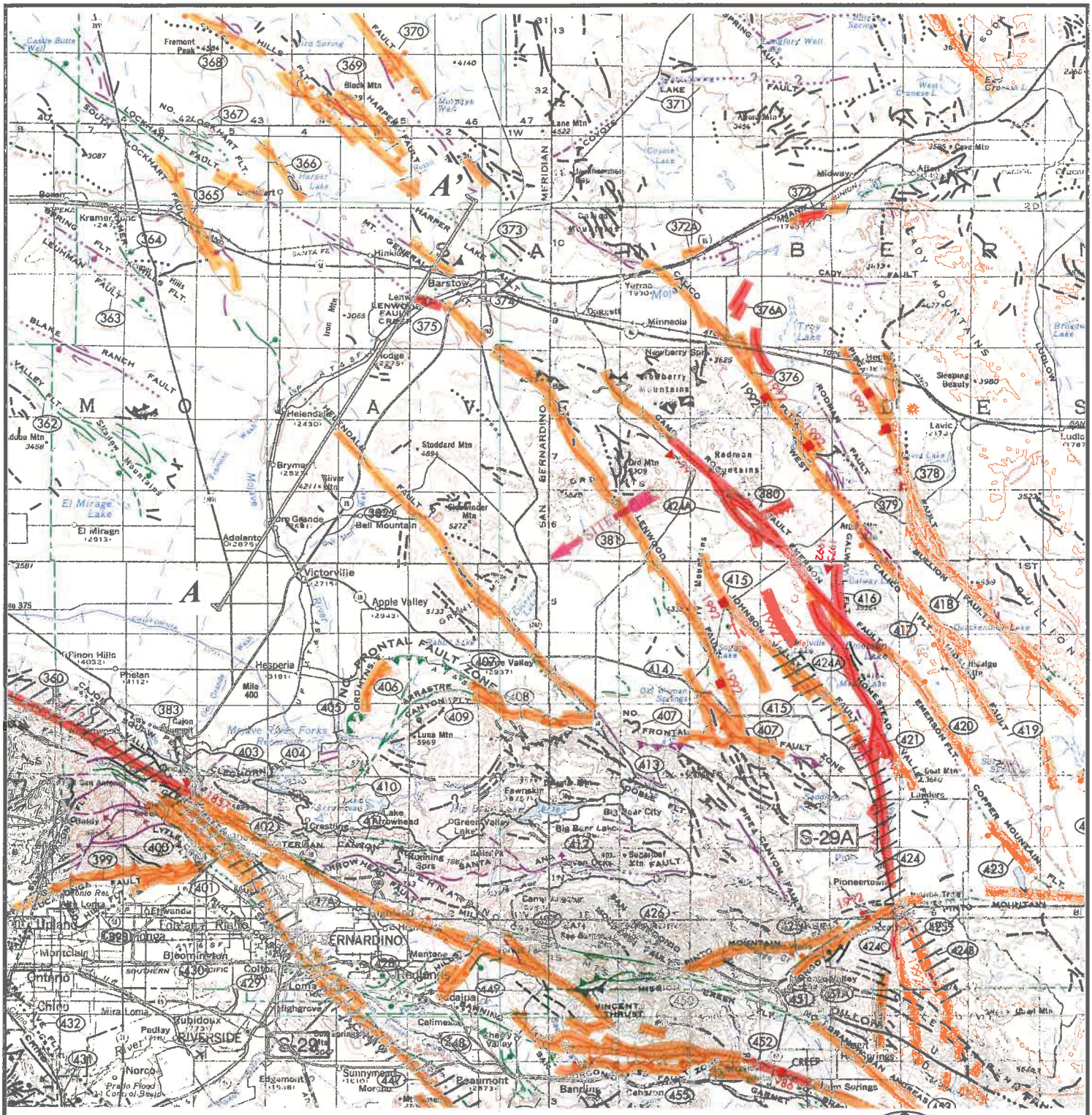
LOCAL GEOLOGIC MAP

EXPLANATION

FROM:
GEOLOGIC MAP OF THE APPLE VALLEY AND ORD MOUNTAINS, 15 MINUTE QUADRANGLES, CALIFORNIA, BY THOMAS W. DIBBLEE, Jr., 2008.

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10
	Drawn by: MN	Approved by: SN
	Project No. 022-09110	Figure No. 6a

Krazan
ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SPECIALISTS
Offices Serving the Western United States



NOTES:

PREPARED FROM THE C.D.M.G. "FAULT ACTIVITY MAP OF CALIFORNIA AND ADJACENT AREAS." JENNINGS, 1994

FAULT TRACES ON LAND ARE INDICATED BY SOLID LINES WHERE WELL LOCATED, BY DASHED LINES WHERE CONCEALED BY YOUNGER ROCKS OR BY LAKES OR BAYS. FAULT TRACES ARE QUERIED WHERE CONTINUATION OR EXISTENCE IS UNCERTAIN.

FAULT MAP

NORTH

0 12 24

SCALE IN MILES (±)

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED LUCERNE VALLEY PV
DESERT LANE AND FERN ROAD

SAN BERNARDINO COUNTY, CA

Scale:	Date:
AS SHOWN	2/10
Drawn by:	Approved by:
MN	SN
Project No.	Figure No.
022-09110	7

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Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:

(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.

(b) fault creep slippage – slow ground displacement usually without accompanying earthquakes.

(c) displaced survey lines.

Pink band added to emphasize location of historic fault displacement.

Holocene fault displacement (during past 10,000 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting. Pale orange band added to emphasize location of Holocene fault displacement.

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.

Late Cenozoic faults within the Sierra Nevada including, but not restricted to, the Foothills fault system. Faults show stratigraphic and/or geomorphic evidence for displacement of late Miocene and Pliocene deposits. By analogy, late Cenozoic faults in this system that have been investigated in detail may have been active in Quaternary time. (Data from PG&E, 1993).

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissance nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

S-25

Fault segment associated with a significant linear trend of accurately located earthquake epicenters (magnitude 0.2 or greater). Generally aligned along strike slip faults having Quaternary displacement, but not necessarily with historic surface rupture.

NOTES:

PREPARED FROM THE C.D.M.G. "FAULT ACTIVITY MAP OF CALIFORNIA AND ADJACENT AREAS." JENNINGS, 1994

FAULT TRACES ON LAND ARE INDICATED BY SOLID LINES WHERE WELL LOCATED, BY DASHED LINES WHERE CONCEALED BY YOUNGER ROCKS OR BY LAKES OR BAYS. FAULT TRACES ARE QUERIED WHERE CONTINUATION OR EXISTENCE IS UNCERTAIN.

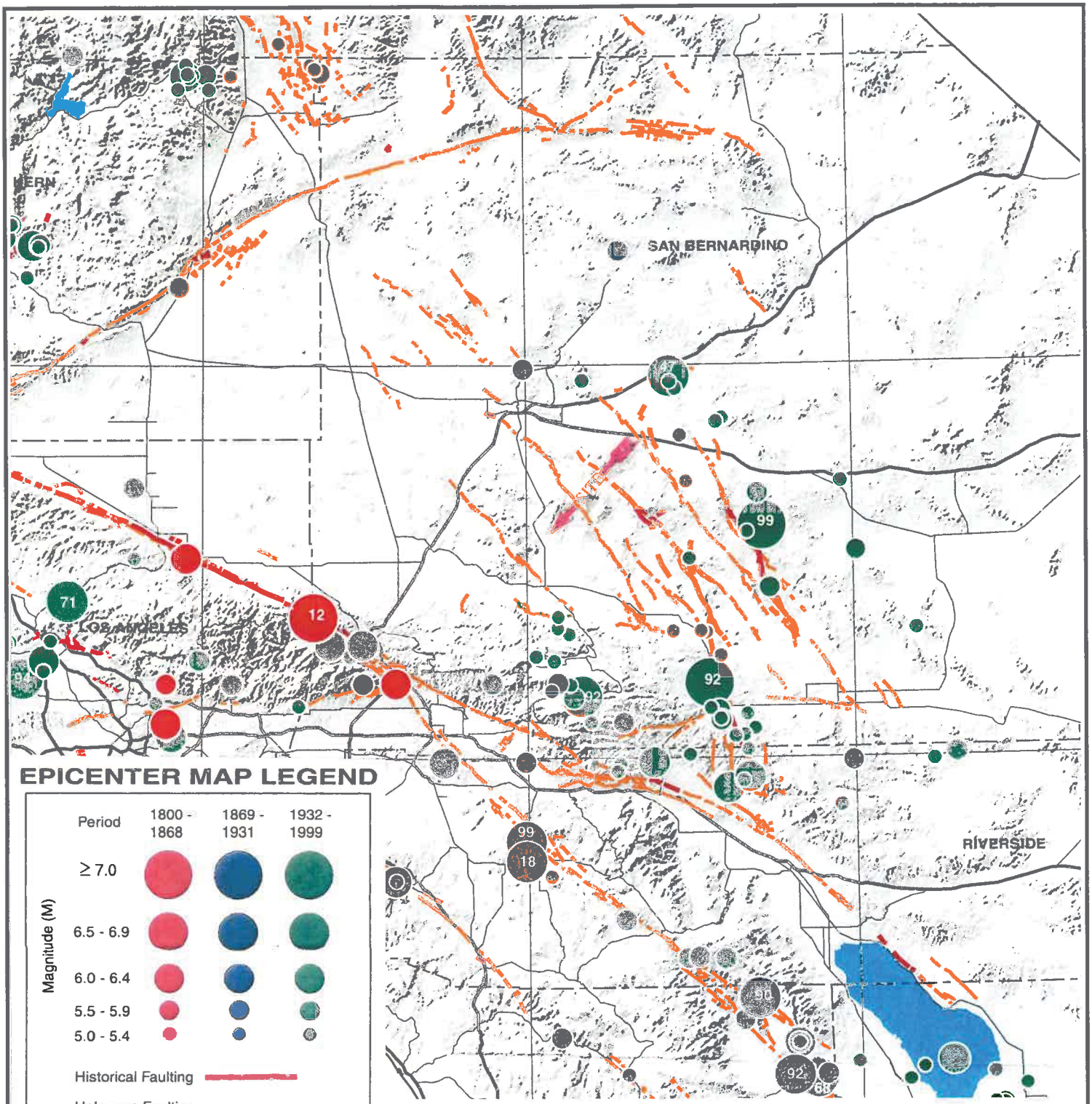
FAULT MAP

EXPLANATION

CROSS SECTION LOCATION

A——A'

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10	Krazan ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SPECIALISTS *Offices Serving the Western United States*
	Drawn by: MN	Approved by: SN	
	Project No. 022-09110	Figure No. 7a	



EPICENTER MAP LEGEND

Period	1800 - 1868	1869 - 1931	1932 - 1999
≥ 7.0			
6.5 - 6.9			
6.0 - 6.4			
5.5 - 5.9			
5.0 - 5.4			

Magnitude (M)

- Historical Faulting
- Holocene Faulting
- Highways (Major)
- Highways (Minor)
- Lakes
- 65 — Last two digits of M ≥ 6.5 earthquake year

EPICENTER MAP

MAP SOURCE:
CGS MAP SHEET 49
EPICENTERS OF AND AREAS DAMAGED BY M > 5 CALIFORNIA EARTHQUAKES, 1800–1999
BY TOPPOZADA, BRANUM, PETERSEN, HALLSTROM, CRAMER & REICHLE, 2000

NORTH

0 40' 80'

SCALE IN KILOMETERS (±)

GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED LUCERNE VALLEY PV DESERT LANE AND FERN ROAD SAN BERNARDINO COUNTY, CA	Scale: AS SHOWN	Date: 2/10	Krazan ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SPECIALISTS *Offices Serving the Western United States*
	Drawn by: MN	Approved by: SN	
	Project No. 022–09110	Figure No. 8	

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Ten 4½-inch exploratory borings and 3 test pits were advanced. The boring and test pit locations are shown on the attached site plan.

The soils encountered were logged in the field during the exploration and with supplementary laboratory test data are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests and Standard Penetration Tests were performed at selected depths. This test represents the resistance to driving a 2½-inch and 1½-inch diameter core barrel, respectively. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with the central portion of the block shaded. All samples were returned to our Clovis laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. Expansion index and R-value tests were completed for select bag samples obtained from the auger cuttings. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

Borings and Test Locations

Test	Latitude (Degrees)	Longitude (Degrees)
Boring 1	34.56478	-116.93158
Boring 2	34.56196	-116.93470
Boring 3	34.56240	-116.92945
Boring 4	34.55748	-116.93980
Boring 5	34.55736	-116.93500
Boring 6	34.55556	-116.94340
Boring 7	34.55548	-116.93890
Boring 8	34.55586	-116.93311
Boring 9	34.55161	-116.94375
Boring 10	34.55216	-116.93306
Test Pit 1	34.56240	-116.93953
Test Pit 2	34.55791	-116.92971
Test Pit 3	34.55321	-116.93906
R-Value 1	34.55748	-116.93980
R-Value 2	34.55586	-116.93311
Percolation 1	34.56478	-116.93157
Percolation 2	34.55161	-116.94375
Resistivity 1	34.55140	-116.93332

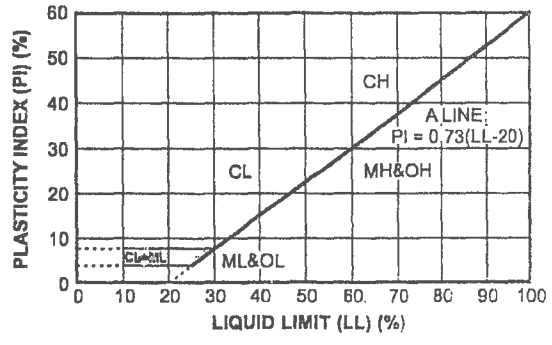
UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART			
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

CONSISTENCY CLASSIFICATION	
Description	**Blows per Foot**
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION		
Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	3 to 12 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Log of Drill Hole B1

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-1

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
		SILTY SAND (SM) Very loose, fine- to coarse-grained with GRAVEL; brown, damp, drills easily				
2		***GRAVELLY SILTY SAND (SM)*** Medium dense, fine- to coarse-grained; brown, damp, drills easily	119.1	1.1		21
4		***SILTY SAND (SM)*** Dense, fine- to coarse-grained with trace CLAY and GRAVEL; reddish-brown, damp, drills easily	124.2	2.8		43
6		Very dense below 6 feet				
8			116.8	7.1		50+
10			113.5	4.5		50+
12						
14						
		SANDY GRAVEL (GP) Very dense, fine- to coarse-grained with COBBLES; brown, damp, drills hard				50+
16		Auger refusal at 17 feet				
		End of Borehole				
18						
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 17 Feet

Sheet: 1 of 1

Log of Drill Hole B2

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-2

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace CLAY and GRAVEL; brown, damp, drills easily				
2		Loose below 12 inches Medium dense below 2 feet	116.3	1.8		25
4		Dense with increased GRAVEL below 4 feet	117.0	1.7		51
6						
8			111.8	6.7		44
10		***GRAVELLY SAND (SP)*** Medium dense, fine- to coarse-grained with trace CLAY; brown, damp, drills easily	114.4	2.5		38
12						
14		***CLAYEY SAND (SC)*** Dense, fine- to coarse-grained; reddish-brown, damp, drills firmly				
16			118.6	2.6		63
18		Very dense below 18 feet				
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B2

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-2

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
			119.8	3.0		50+		
22								
24								
		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B3

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-3

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace CLAY and GRAVEL; brown, damp, drills easily				
2		Loose below 12 inches Medium dense below 2 feet	121.9	5.0		71
4		Dense below 4 feet	116.9	1.8		43
6		Very dense below 7 feet	125.2	4.4		50+
8		With decreased GRAVEL below 9 feet				
10			116.2	6.7		50+
12		With increased GRAVEL and trace COBBLES below 14 feet				
14			105.5	6.6		50+
16						
18						
20						

Penetration Test blows/ft: 20, 40, 60

Water Content (%): 10, 20, 30, 40

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B3

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-3

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
22			111.6	5.7		50+		
24		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B4

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-4

Location: Desert Lane and Fern Road, San Bernardino County, California

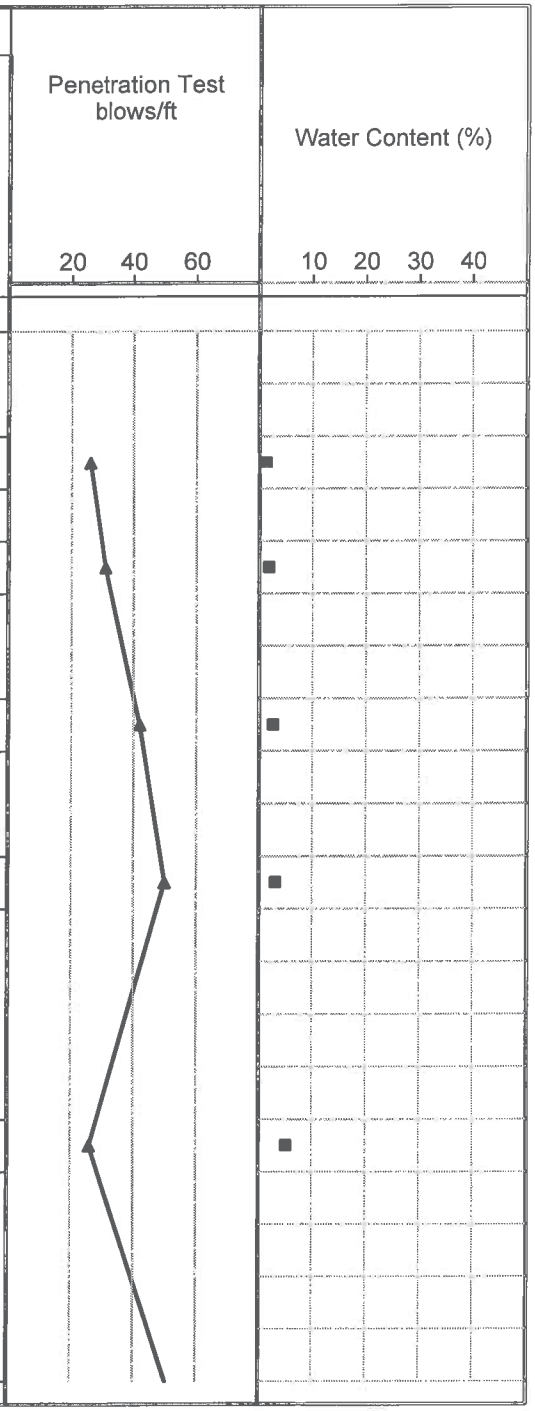
Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace CLAY and GRAVEL; brown, damp, drills easily				
2		Loose below 12 inches	138.0	1.4		26
		Medium dense below 2 feet				
		SILTY SAND (SM)				
4		Medium dense, fine- to medium-grained with trace CLAY; brown, damp, drills easily	123.6	1.9		21
6		Dense with trace GRAVEL below 7 feet				
			112.5	2.7		42
8						
10		Very dense below 10 feet	96.4	3.2		50+
12						
14		Medium dense below 15 feet				
			107.1	5.2		26
16						
18						
20		Dense below 20 feet				



Drill Method: Solid Flight

Drill Rig: CME 45

Driller: Chris Wyneken

Krazan and Associates

Drill Date: 12-22-09

Hole Size: 4½ Inches

Elevation: 25 Feet

Log of Drill Hole B4

Project: Lucerne Valley PV | **Project No:** 022-09110

Client: Worley Parsons Group, Inc. | **Figure No.:** A-4

Location: Desert Lane and Fern Road, San Bernardino County, California | **Logged By:** David Adams

Depth to Water> | **Initial:** None | **At Completion:** None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
			108.7	3.5		53		
22								
24								
		Very dense with trace GRAVEL below 25 feet	108.5	6.6		50+		
26								
28								
30			85.1	4.0		50+		
32								
34		Dense below 34 feet						
			114.1	3.7		51		
36								
38								
40								

Drill Method: Solid Flight | **Drill Date:** 12-22-09

Drill Rig: CME 45 | **Krazan and Associates** | **Hole Size:** 4½ Inches

Driller: Chris Wyneken | **Elevation:** 25 Feet

Log of Drill Hole B4

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-4

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
42		***SILTY SAND (SM)*** Very dense, fine- to coarse-grained with trace GRAVEL; brown, damp, drills firmly	111.5	3.4		50+		
44		With interbeds of CLAYEY SAND below 44 feet	99.0	3.6		50+		
46								
48								
50		End of Borehole						
52								
54								
56								
58								
60								

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Sheet: 3 of 3

Log of Drill Hole B5

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-5

Location: Desert Lane and Fern Road, San Bernardino County, California

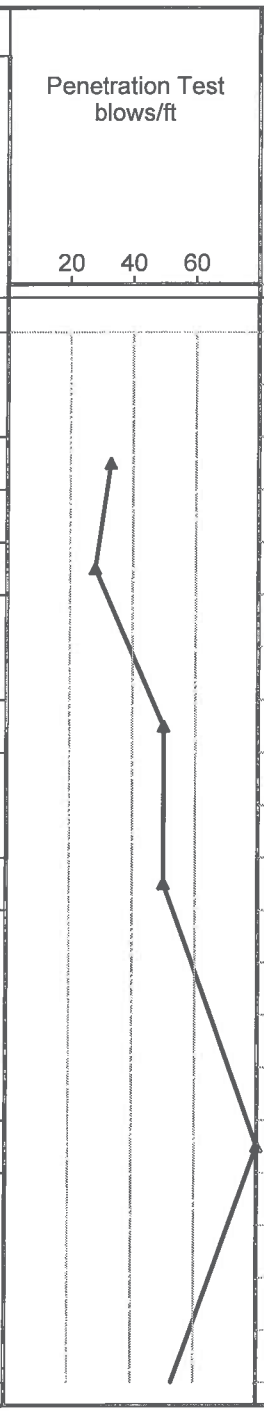
Logged By: David Adams

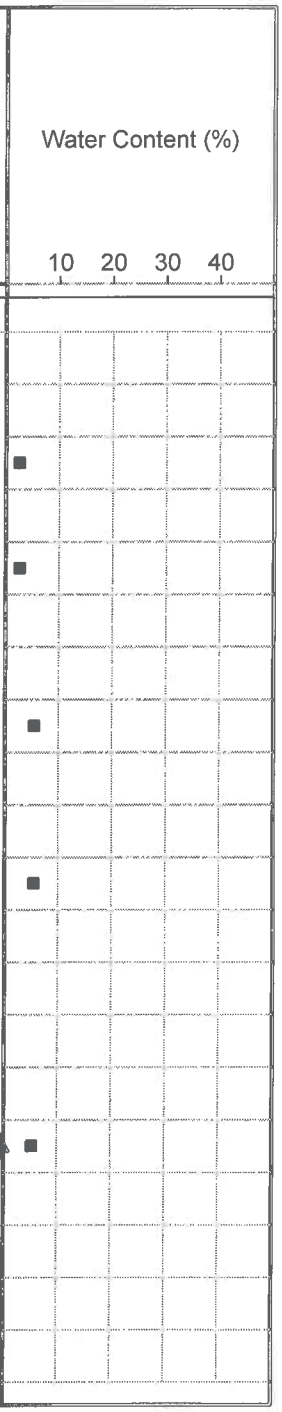
Depth to Water>

Initial: None

At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace CLAY; brown, damp, drills easily				
2		***SILTY SAND (SM)*** Medium dense, fine- to coarse-grained with trace GRAVEL and CLAY; reddish-brown, damp, drills easily	126.3	2.6		33
4			129.0	2.7		28
6		Very dense and drills firmly below 7 feet				
8			118.1	5.5		50+
10			112.3	5.5		50+
12						
14		***SILTY SAND (SM)*** Very dense, fine- to coarse-grained with trace CLAY and GRAVEL; light brown, damp, drills firmly	123.1	5.3		80
16						
18		***CLAYEY SAND (SC)*** Very dense, fine- to coarse-grained with trace GRAVEL; reddish-brown, damp, drills firmly				
20						





Drill Method: Solid Flight

Drill Rig: CME 45

Driller: Chris Wyneken

Krazan and Associates

Drill Date: 12-22-09

Hole Size: 4½ Inches

Elevation: 25 Feet

Log of Drill Hole B5

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-5

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
			118.9	4.5		50+		
22								
24								
		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Sheet: 2 of 2

Log of Drill Hole B6

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-6

Location: Desert Lane and Fern Road, San Bernardino County, California

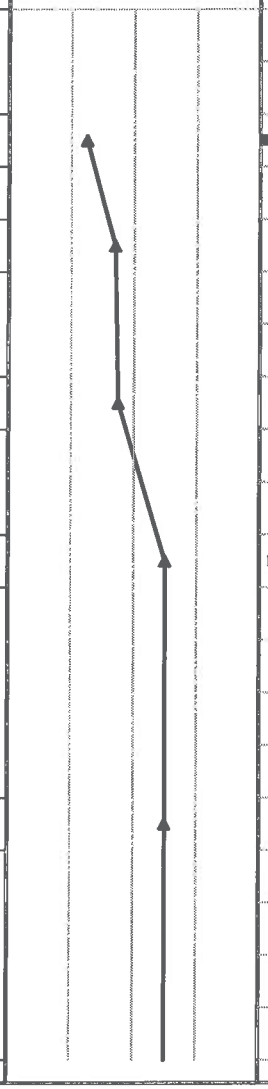
Logged By: David Adams

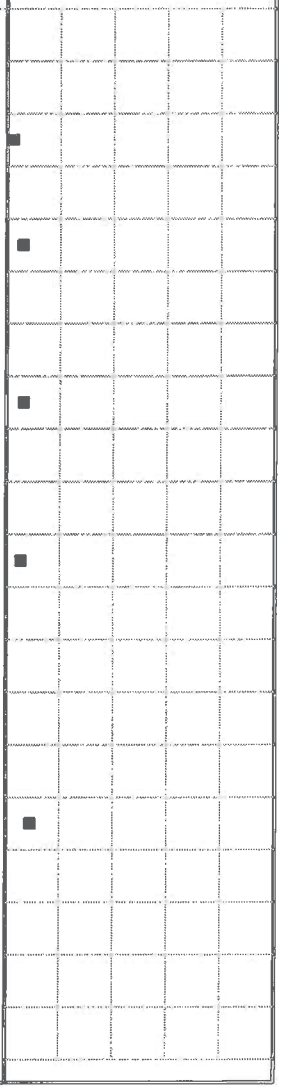
Depth to Water>

Initial: None

At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace CLAY and GRAVEL; brown, damp, drills easily				
2		Loose below 12 inches	118.9	1.3		25
4		Medium dense below 2 feet	117.7	3.1		24
6		***CLAYEY SAND (SC)*** Medium dense, fine- to coarse-grained with trace GRAVEL; reddish-brown, damp, drills easily				
8			118.6	3.3		35
10		Very dense with trace COBBLES and drills firmly below 10 feet	112.7	2.8		50+
12						
14		***CLAYEY SILTY SAND (SM)*** Very dense, fine- to coarse-grained with trace GRAVEL; brown, damp, drills firmly	121.0	4.6		50+
16						
18		***CLAYEY SAND (SC)*** Very dense, fine- to coarse-grained with trace GRAVEL and COBBLES; orangish-brown, damp, drills firmly				
20						





Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B6

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-6

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
			96.3	3.6		50+		
22								
24								
		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B7

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-7

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace CLAY and GRAVEL; brown, damp, drills easily Loose below 12 inches				
2			116.7	1.0		17
4		***CLAYEY SILTY SAND (SM)*** Medium dense, fine- to coarse-grained with trace GRAVEL; reddish-brown, damp, drills easily	118.0	1.7		20
6		***CLAYEY SAND (SC)*** Medium dense, fine- to coarse-grained; reddish-brown, damp, drills easily				
8			116.8	3.4		29
10		***SANDY CLAYEY SILT (ML)*** Dense, fine- to coarse-grained with trace GRAVEL; brown, damp, drills firmly	116.7	1.9		56
12		***CLAYEY SAND (SC)*** Very dense, fine- to coarse-grained; reddish-brown, damp, drills firmly				
14						
16			117.9	3.3		50+
18						
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B7

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-7

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
22		***CLAYEY SANDY SILT (ML)*** Very dense, fine- to coarse-grained with trace GRAVEL; brown, damp, drills firmly	97.2	7.7		50+		
24								
		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B8

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

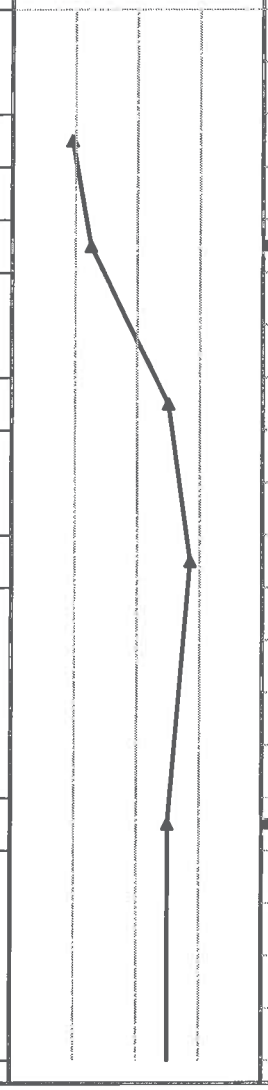
Figure No.: A-8

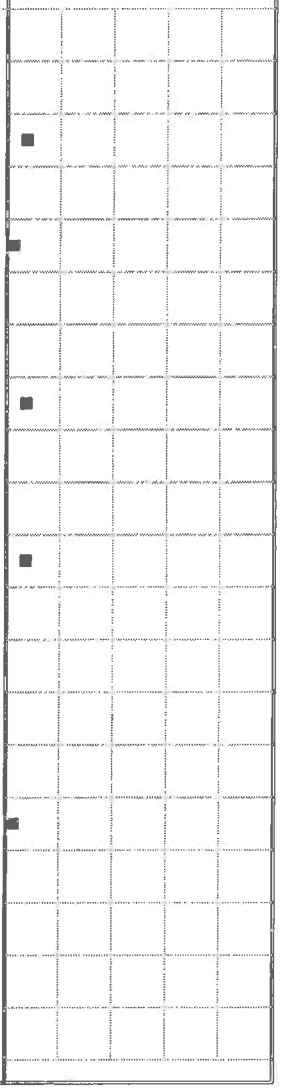
Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace GRAVEL; brown, damp, drills easily				
2		Loose below 12 inches	116.5	3.8		19
		SILTY SAND (SM) Medium dense, fine- to coarse-grained with trace CLAY and GRAVEL; reddish-brown, damp, drills easily		1.5		25
6		Very dense below 7 feet		3.8		50+
10		***SAND (SP)*** Dense, fine- to coarse-grained with trace GRAVEL and CLAY; light brown, damp, drills firmly	124.8	3.7		57
14		Very dense with trace GRAVEL below 15 feet	112.3	1.6		50+
18		***CLAYEY SAND (SC)*** Very dense, fine- to coarse-grained with trace GRAVEL; reddish-brown, damp, drills firmly				
20						





Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B8

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-8

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
			110.9	5.3		50+		
22								
24								
		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 25 Feet

Log of Drill Hole B9

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons Group, Inc.

Figure No.: A-9

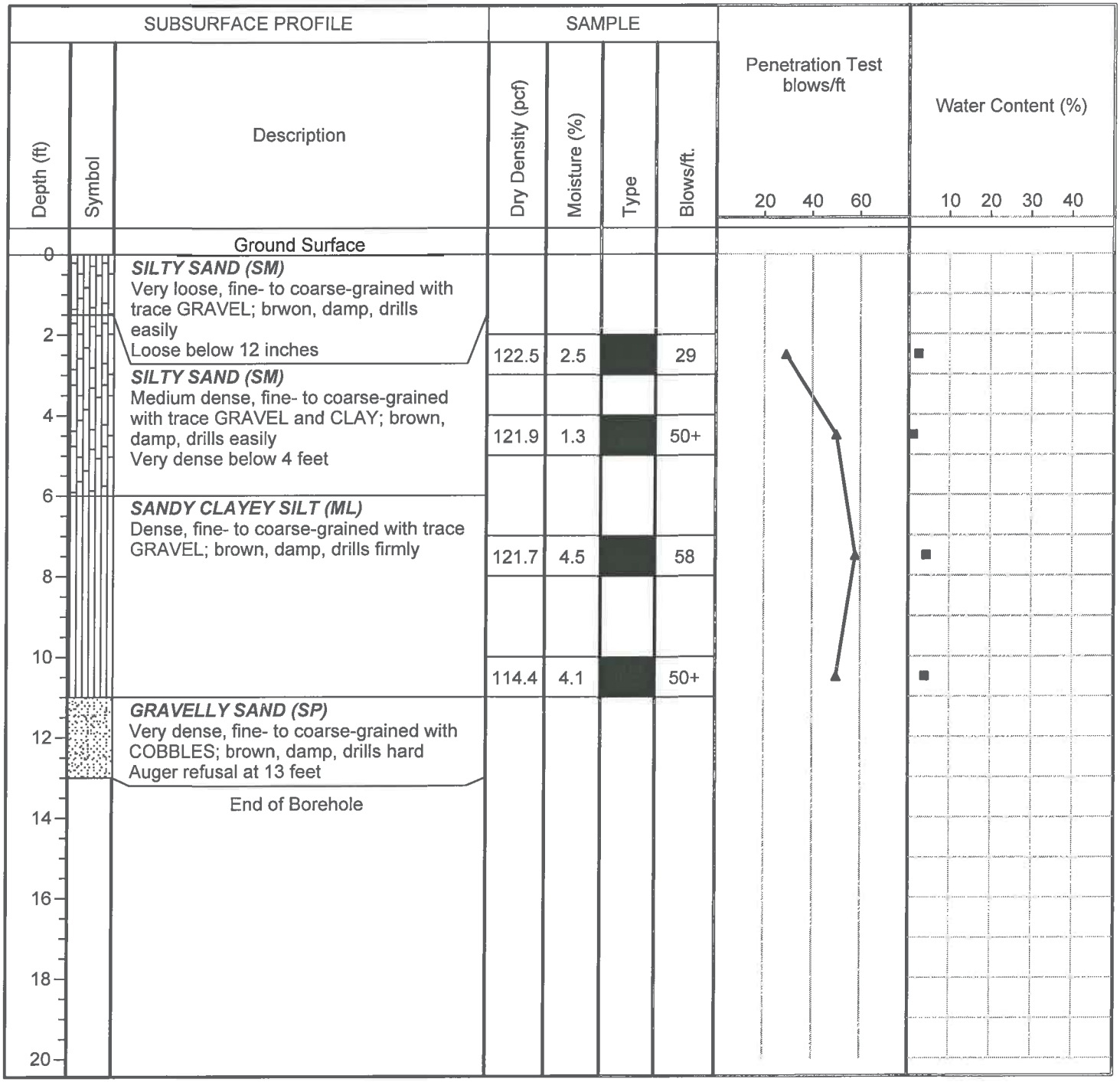
Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None



Drill Method: Solid Flight

Drill Date: 12-22-09

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

Driller: Chris Wyneken

Elevation: 13 Feet

Sheet: 1 of 1

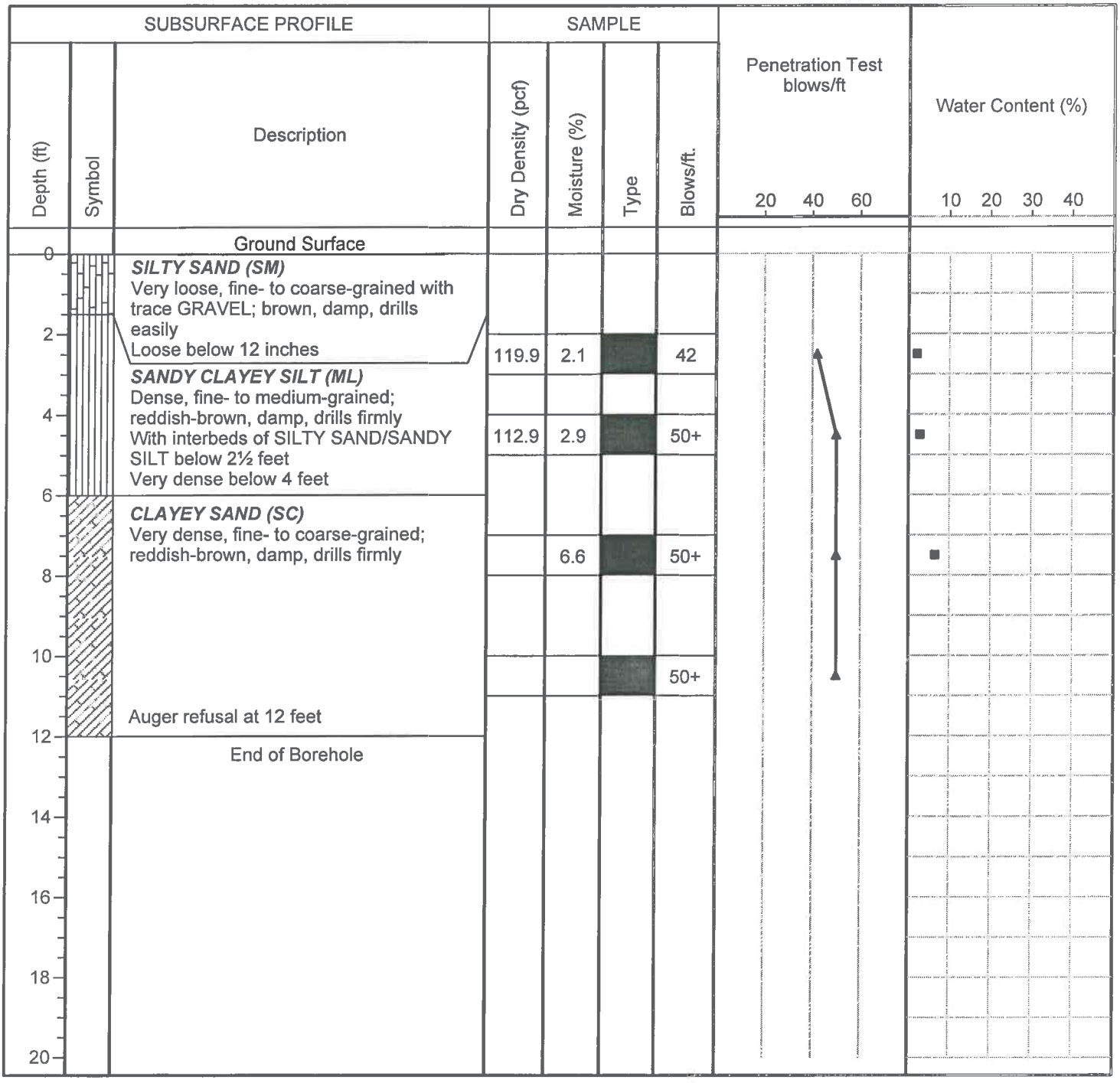
Log of Drill Hole B10

Project: Lucerne Valley PV | **Project No:** 022-09110

Client: Worley Parsons Group, Inc. | **Figure No.:** A-10

Location: Desert Lane and Fern Road, San Bernardino County, California | **Logged By:** David Adams

Depth to Water> | **Initial:** None | **At Completion:** None



Drill Method: Solid Flight | **Drill Date:** 12-22-09

Drill Rig: CME 45 | **Hole Size:** 4½ Inches

Driller: Chris Wyneken | **Elevation:** 10 Feet

Krazan and Associates

Log of Test Pit TP 1

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons, Group, Inc.

Figure No.: TP - 11

Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE					
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	Penetration Test blows/ft (20 40 60)	Water Content (%) (10 20 30 40)
0		Ground Surface						
0		***SILTY SAND (SM)*** Very loose, fine- to coarse-grained with trace CLAY and trace GRAVEL; brown, damp, digs easily Loose below 12 inches						
4		***SILTY SAND (SM)*** Medium dense, fine- to coarse-grained with trace GRAVEL; reddish-brown, damp, digs firmly						
10		End of Test Pit						

Method: Solid Flight

Backhoe/Excavator: Backhoe

Operator: Chris Wyneken

Krazan and Associates

Excavation Date: 12-22-09

Pit Size: 2½ Feet

Elevation: 10 Feet

Sheet: 1 of 1

Log of Test Pit TP 2

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons, Group, Inc.

Figure No.: TP - 12

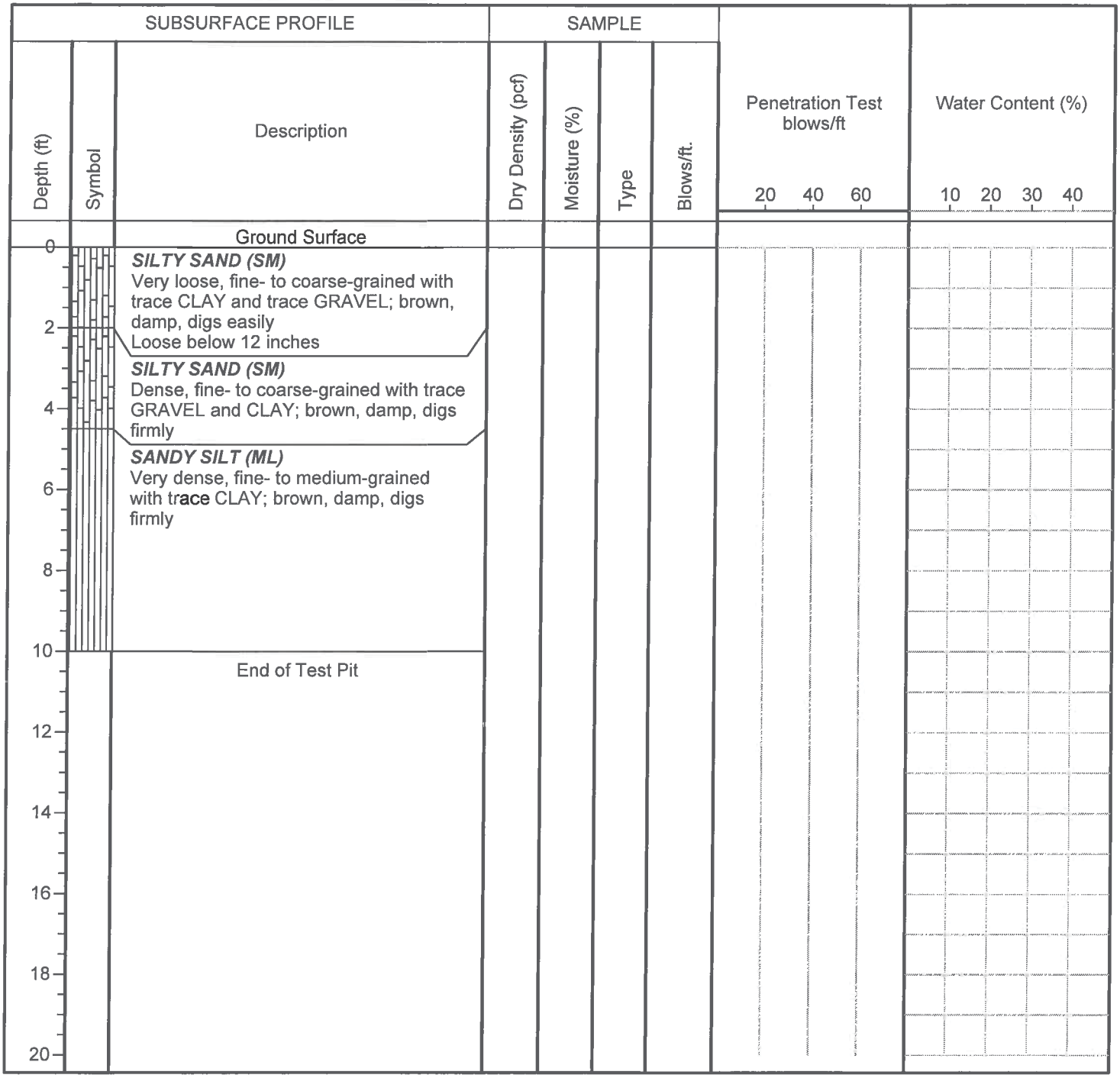
Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None



Method: Solid Flight

Backhoe/Excavator: Backhoe

Operator: Chris Wyneken

Krazan and Associates

Excavation Date: 12-22-09

Pit Size: 2½ Feet

Elevation: 10 Feet

Sheet: 1 of 1

Log of Test Pit TP 3

Project: Lucerne Valley PV

Project No: 022-09110

Client: Worley Parsons, Group, Inc.

Figure No.: TP - 13

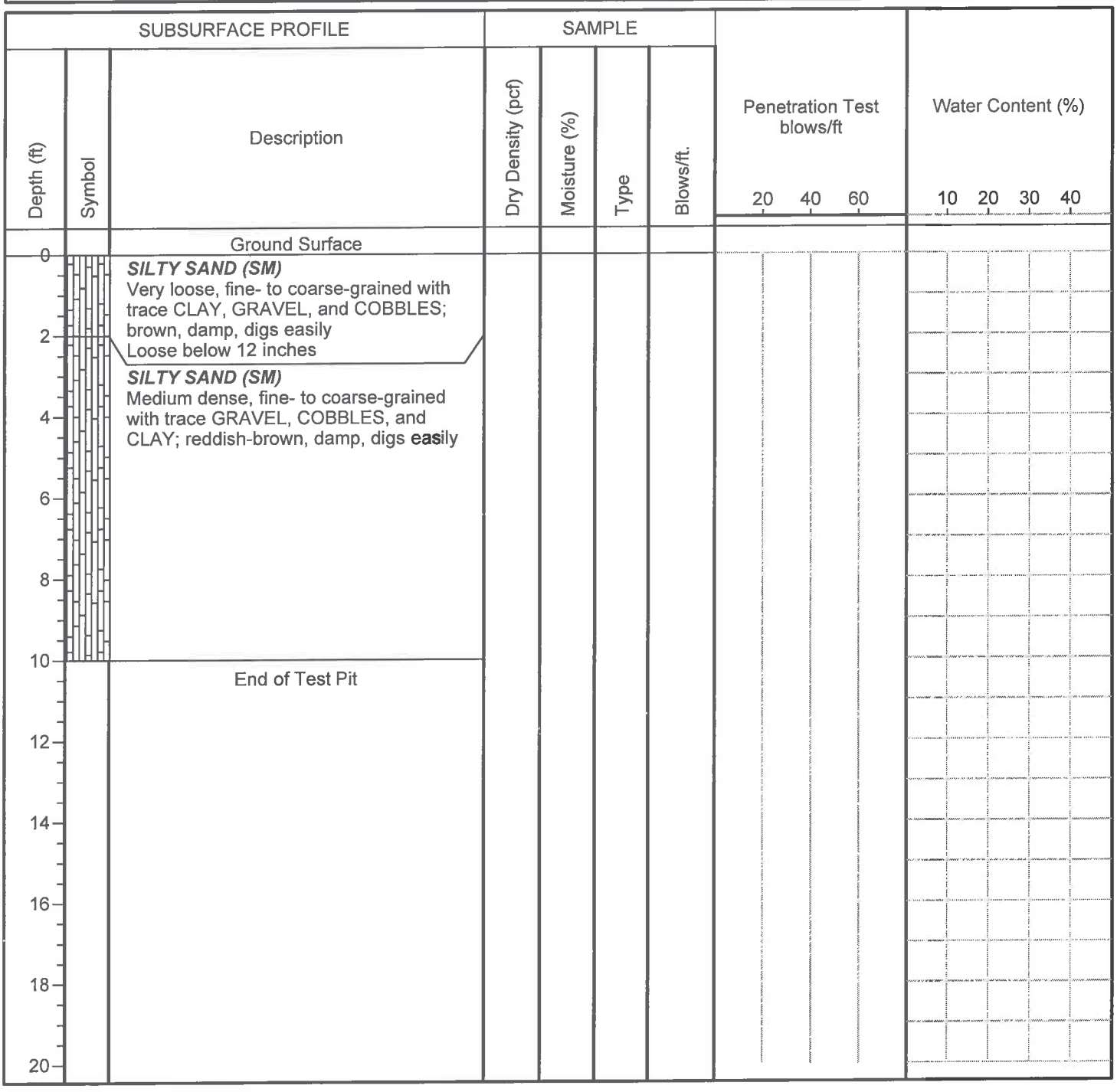
Location: Desert Lane and Fern Road, San Bernardino County, California

Logged By: David Adams

Depth to Water>

Initial: None

At Completion: None



Method: Solid Flight

Backhoe/Excavator: Backhoe

Operator: Chris Wyneken

Krazan and Associates

Excavation Date: 12-22-09

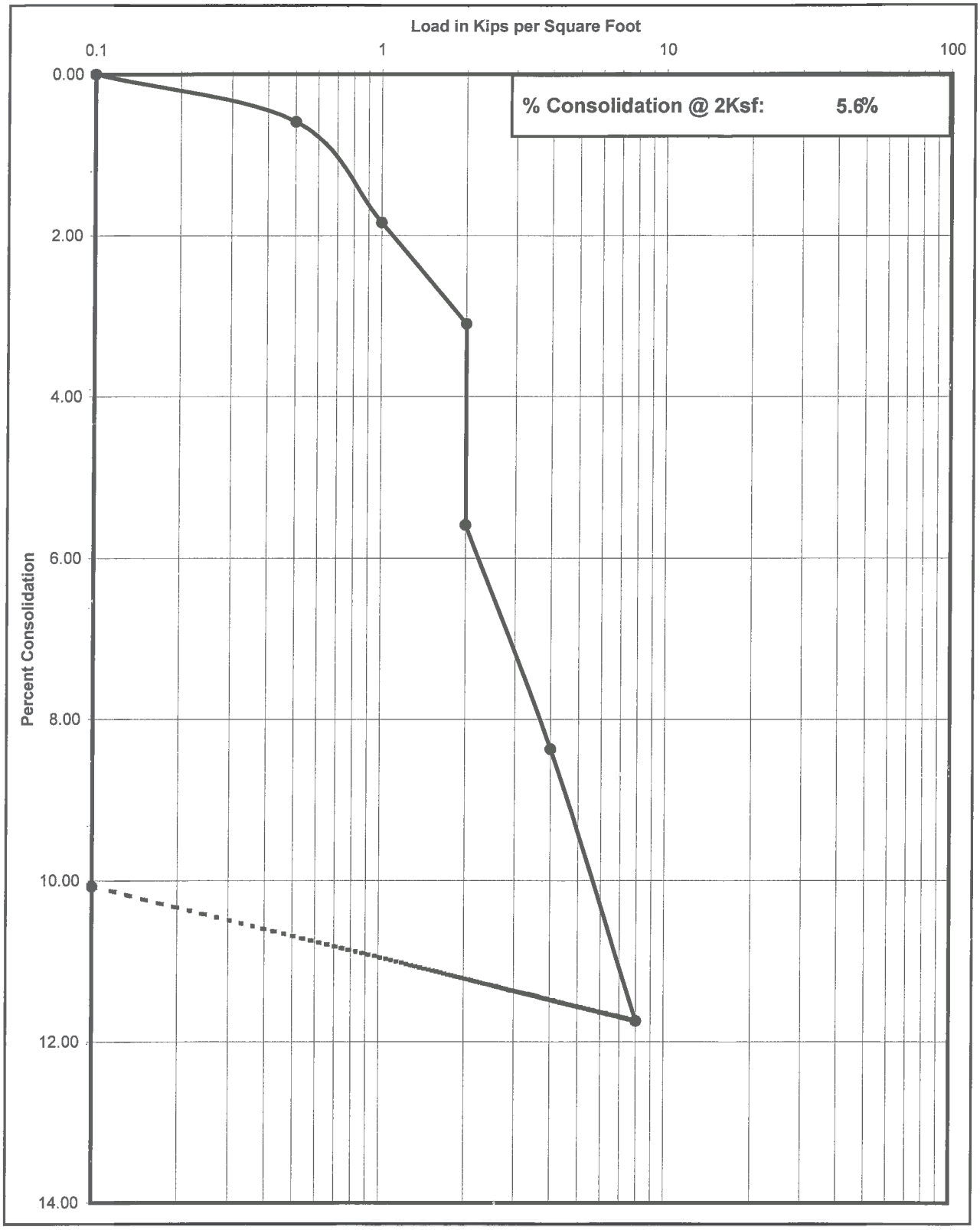
Pit Size: 2½ Feet

Elevation: 10 Feet

Sheet: 1 of 1

Consolidation Test

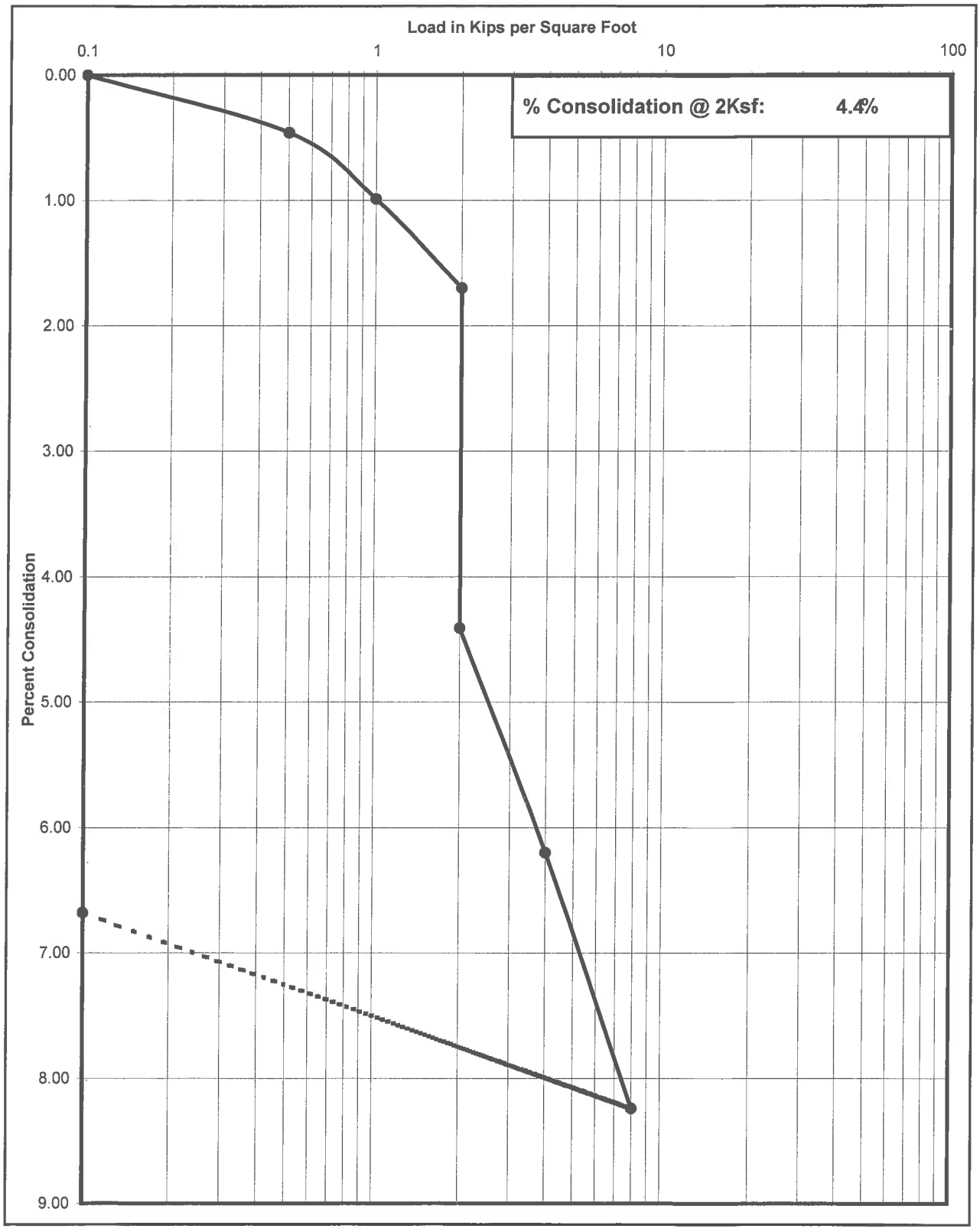
Project No	Boring No. & Depth	Date	Soil Classification
2209110	B1 @ 2-3'	1/8/2010	SM



Krazan Testing Laboratory

Consolidation Test

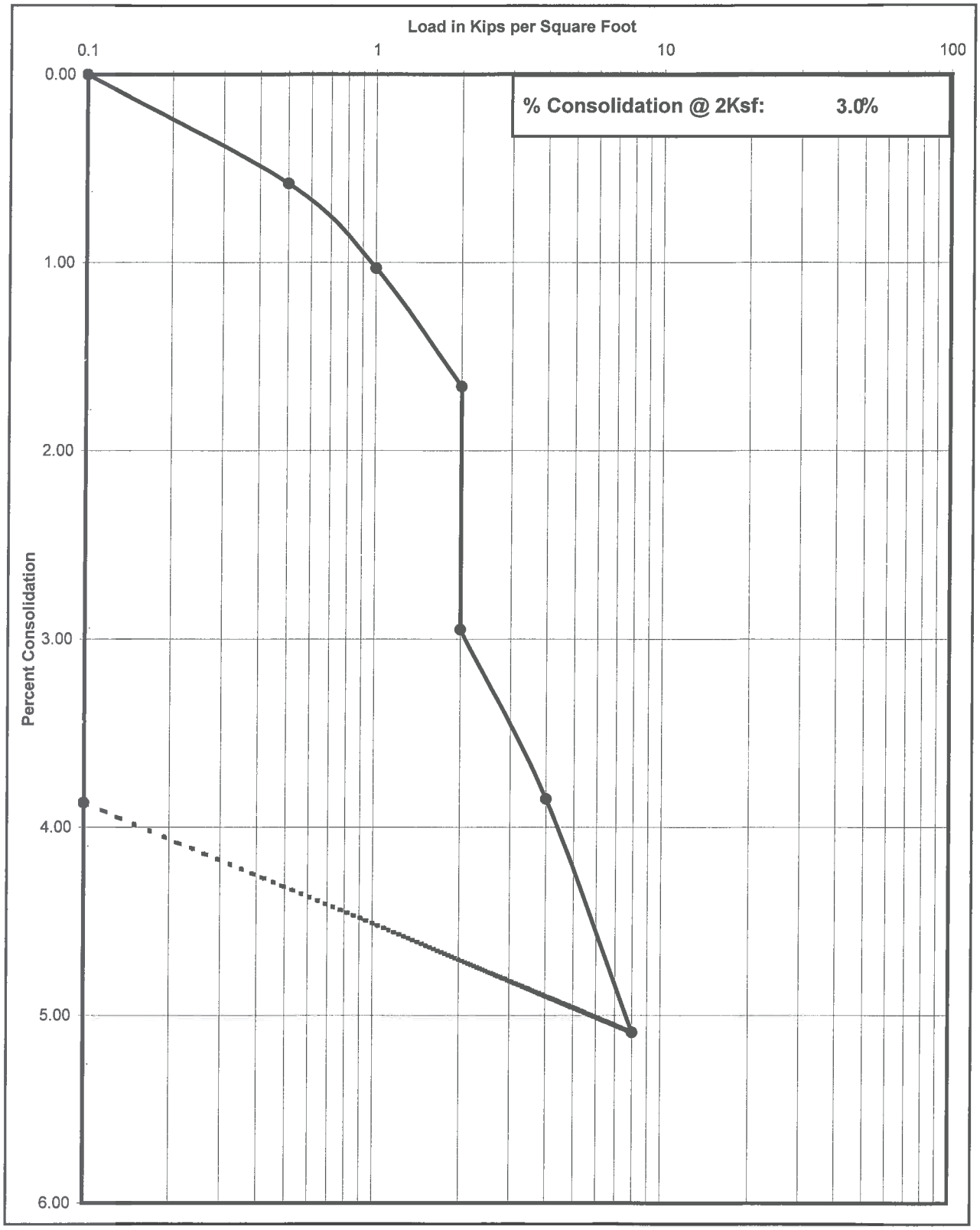
Project No	Boring No. & Depth	Date	Soil Classification
2209110	B2 @ 2-3'	1/8/2010	SM



Krazan Testing Laboratory

Consolidation Test

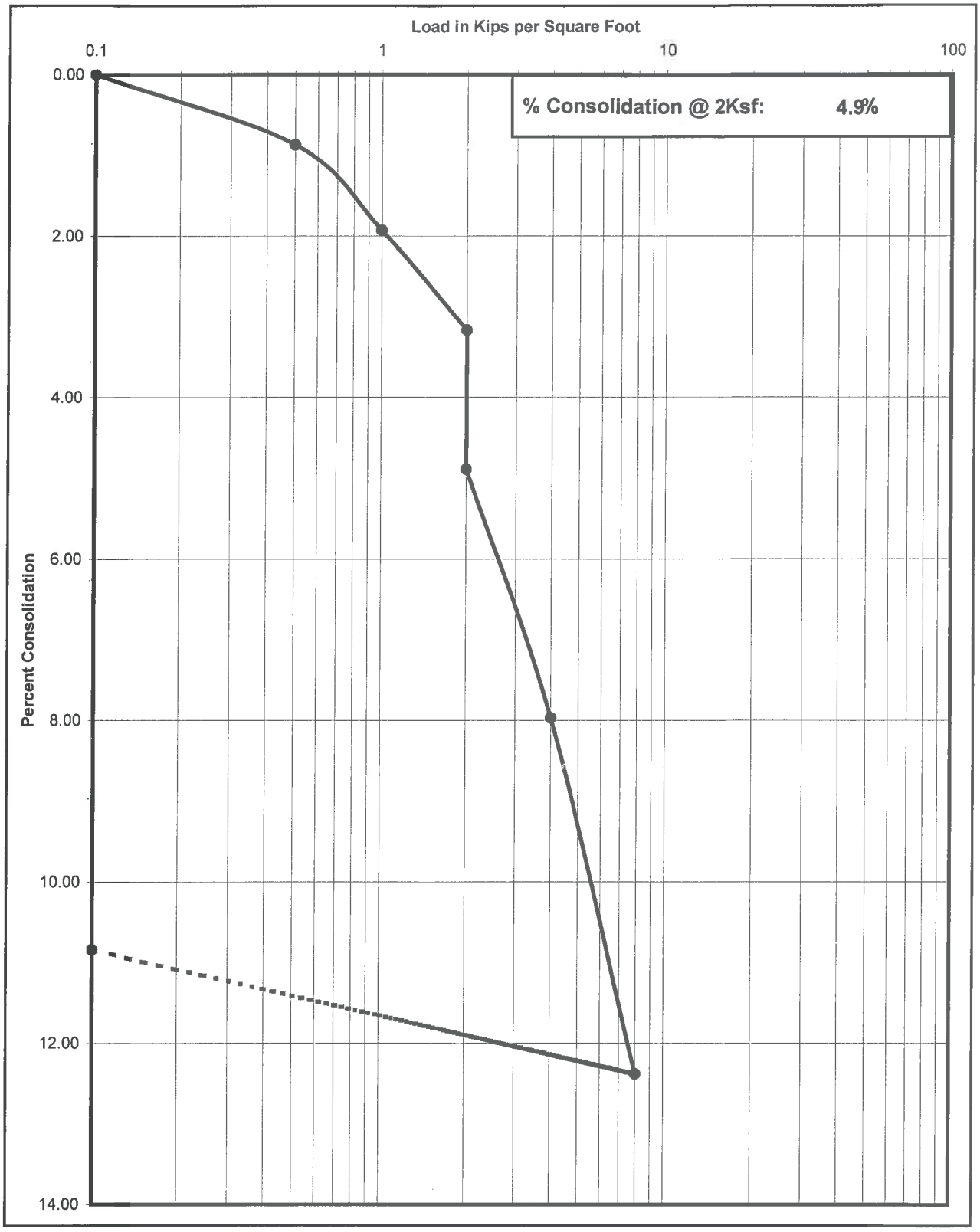
Project No	Boring No. & Depth	Date	Soil Classification
2209110	B2 @ 4-5'	1/8/2010	SM



Krazan Testing Laboratory

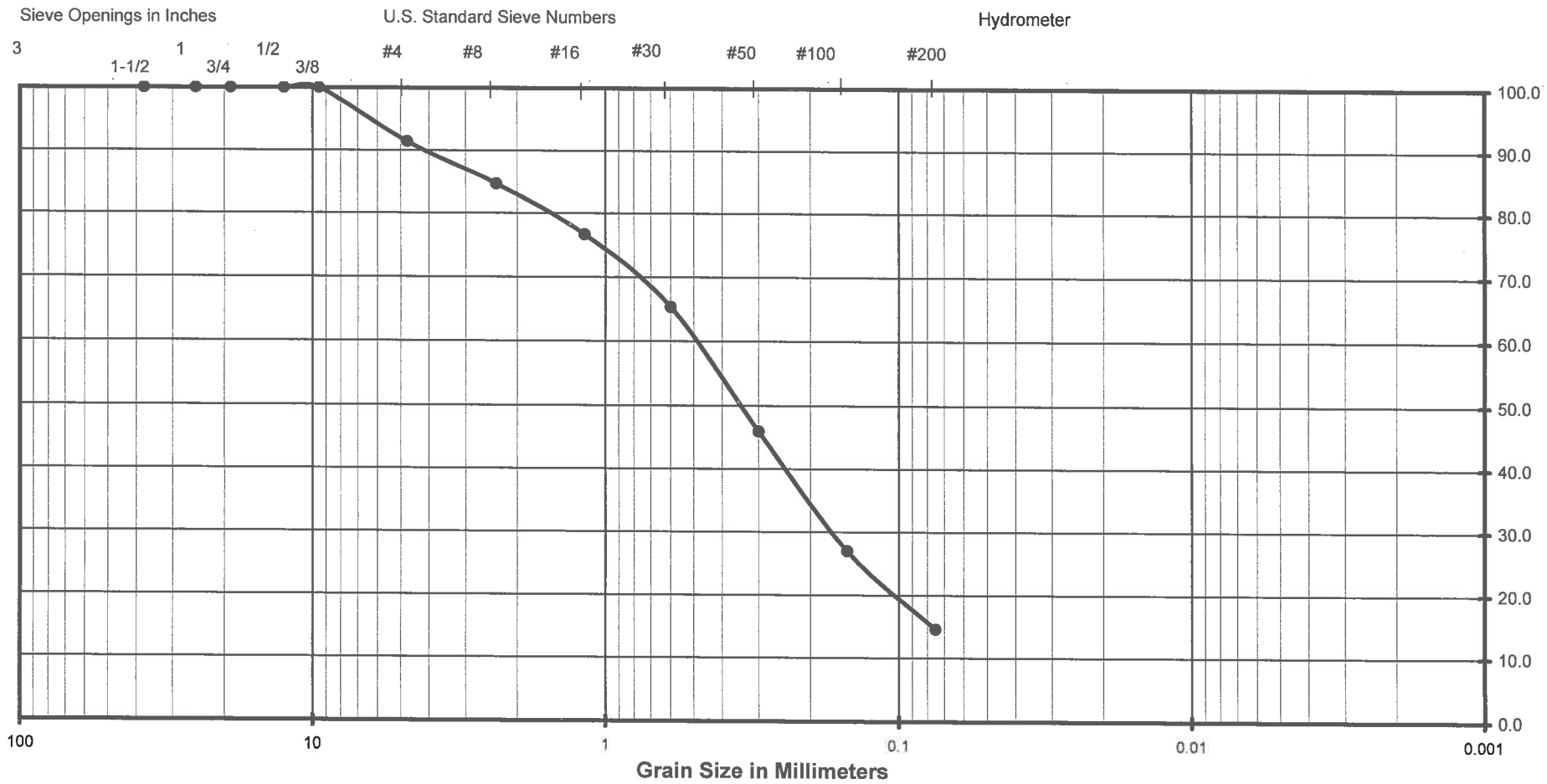
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
2209110	B7 @ 2-3'	1/8/2010	SM



Krazan Testing Laboratory

Grain Size Analysis

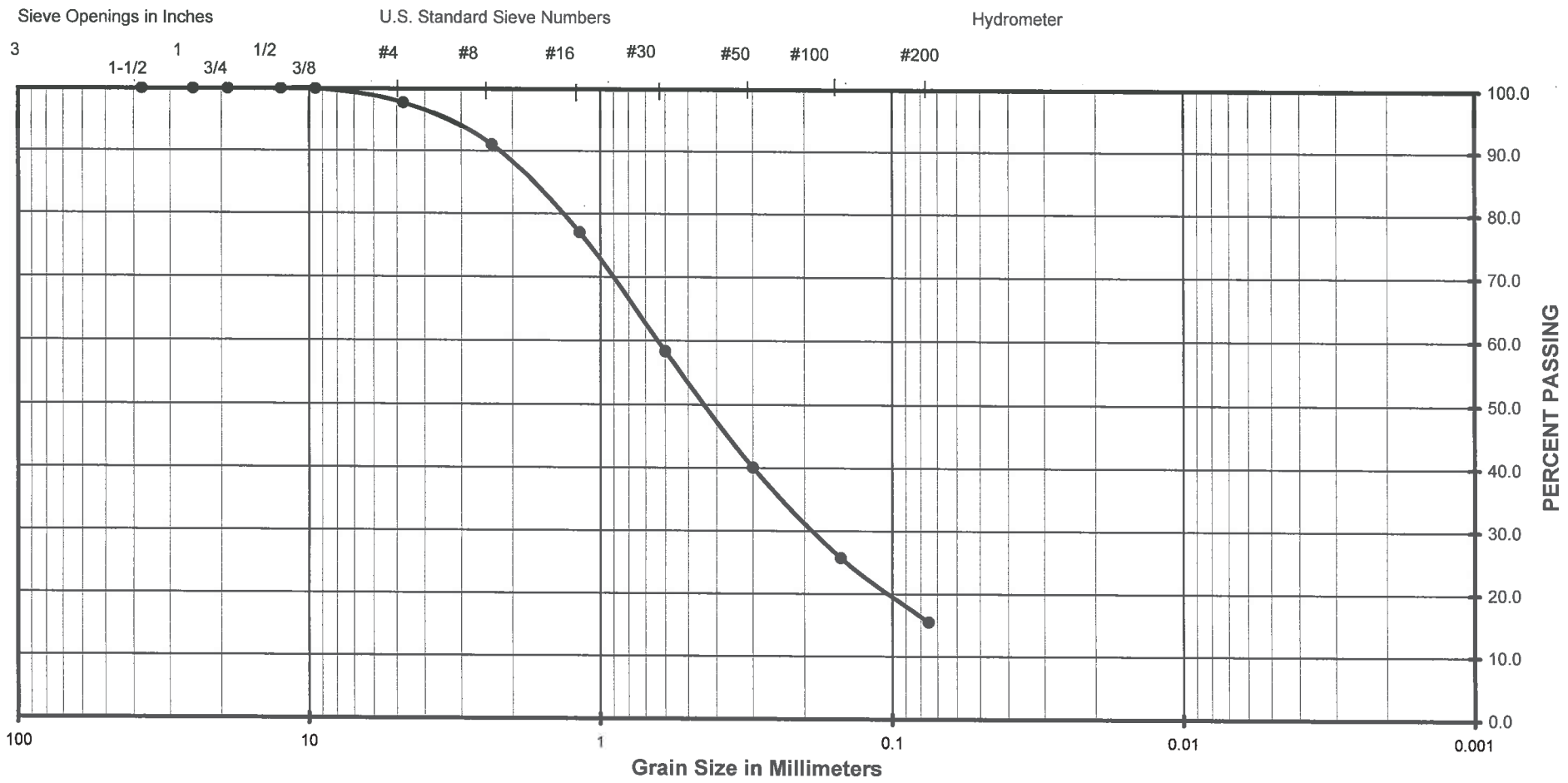


(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B1 @ 2-3'

Krazan Testing Laboratory

Grain Size Analysis



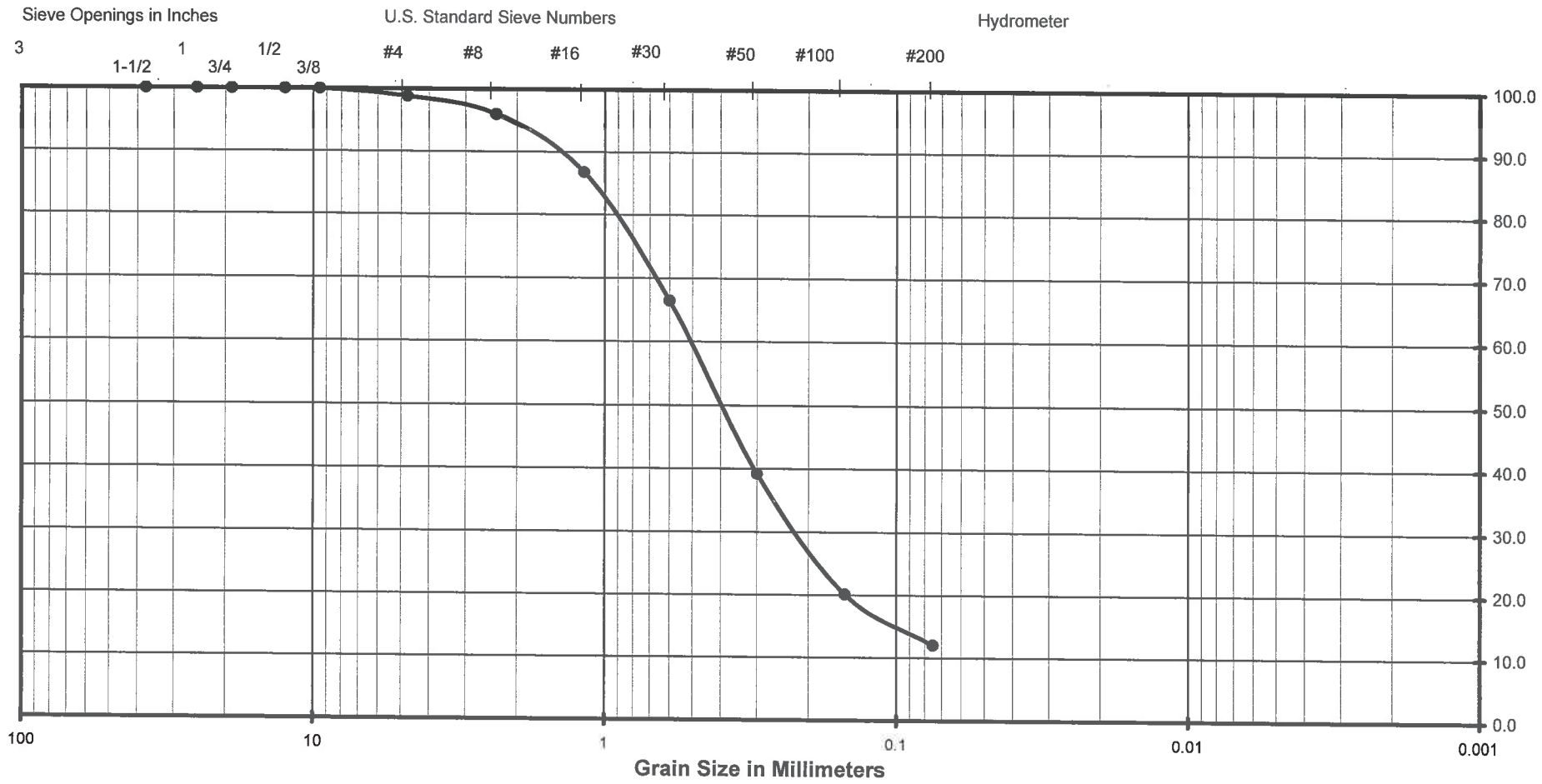
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B2 @ 2-3'

Krazan Testing Laboratory

Grain Size Analysis



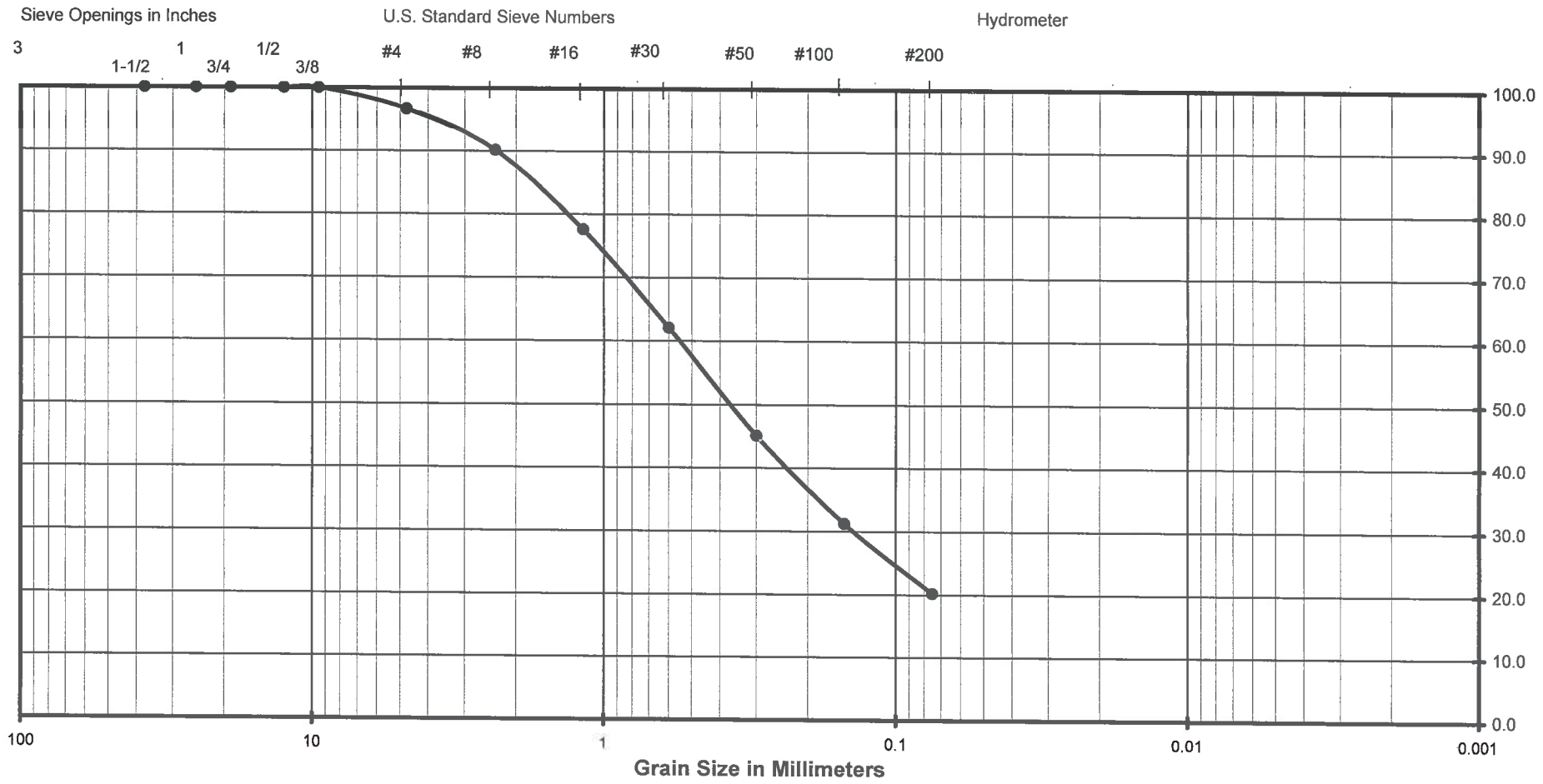
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B2 @ 4-5'

Krazan Testing Laboratory

Grain Size Analysis

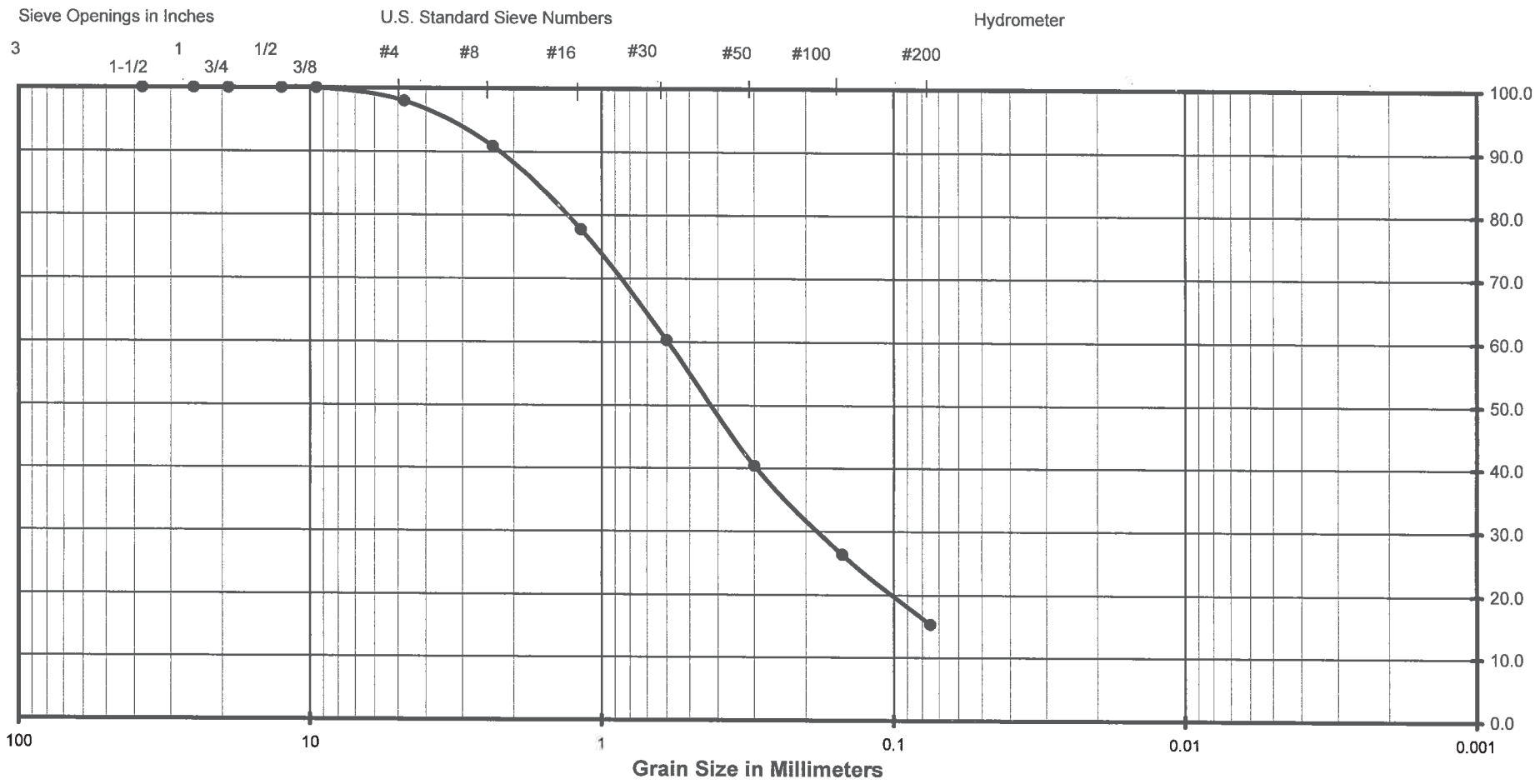


(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B4 @ 2-3'

Krazan Testing Laboratory

Grain Size Analysis



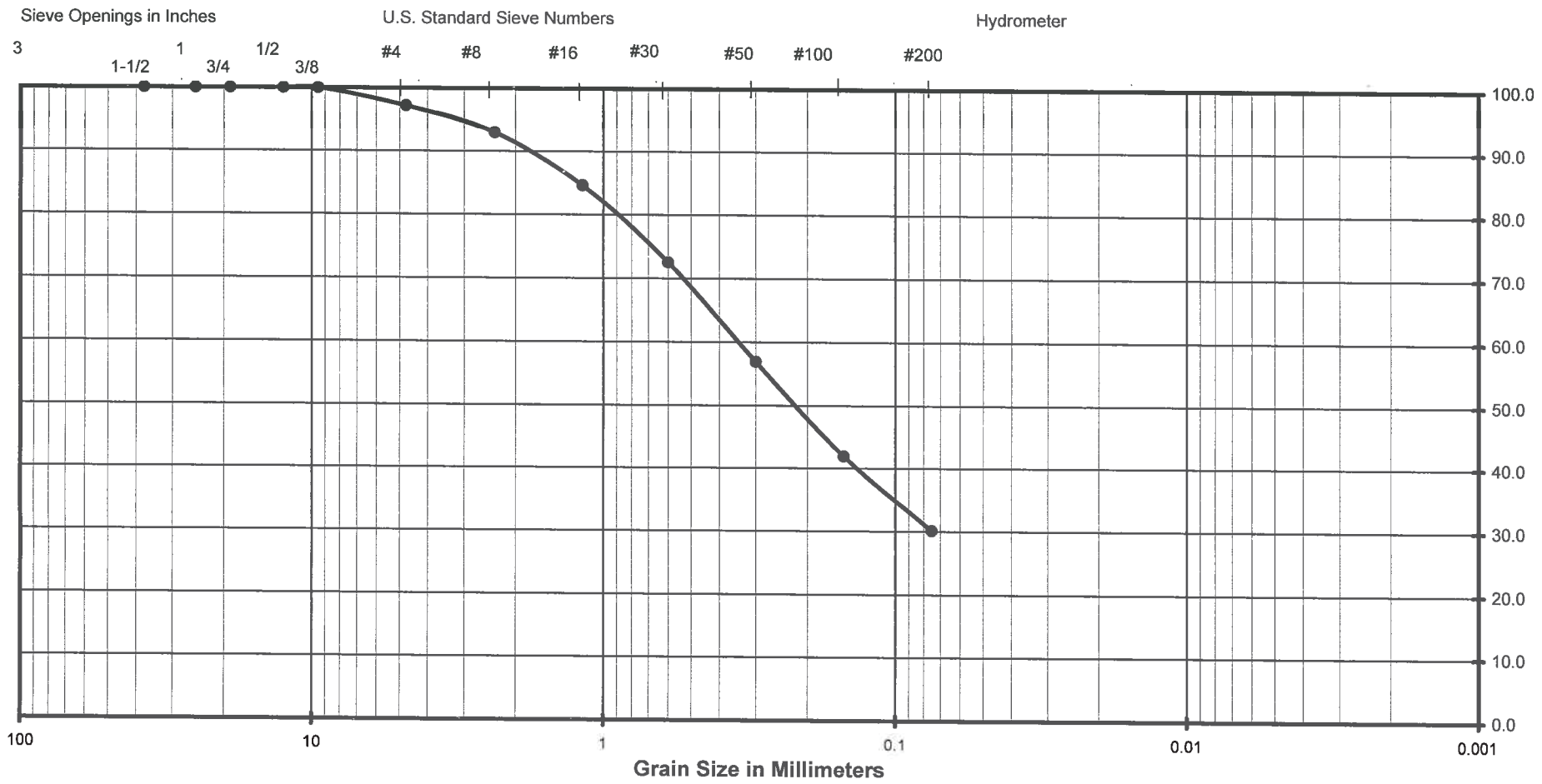
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B4 @ 20-21'

Krazan Testing Laboratory

Grain Size Analysis



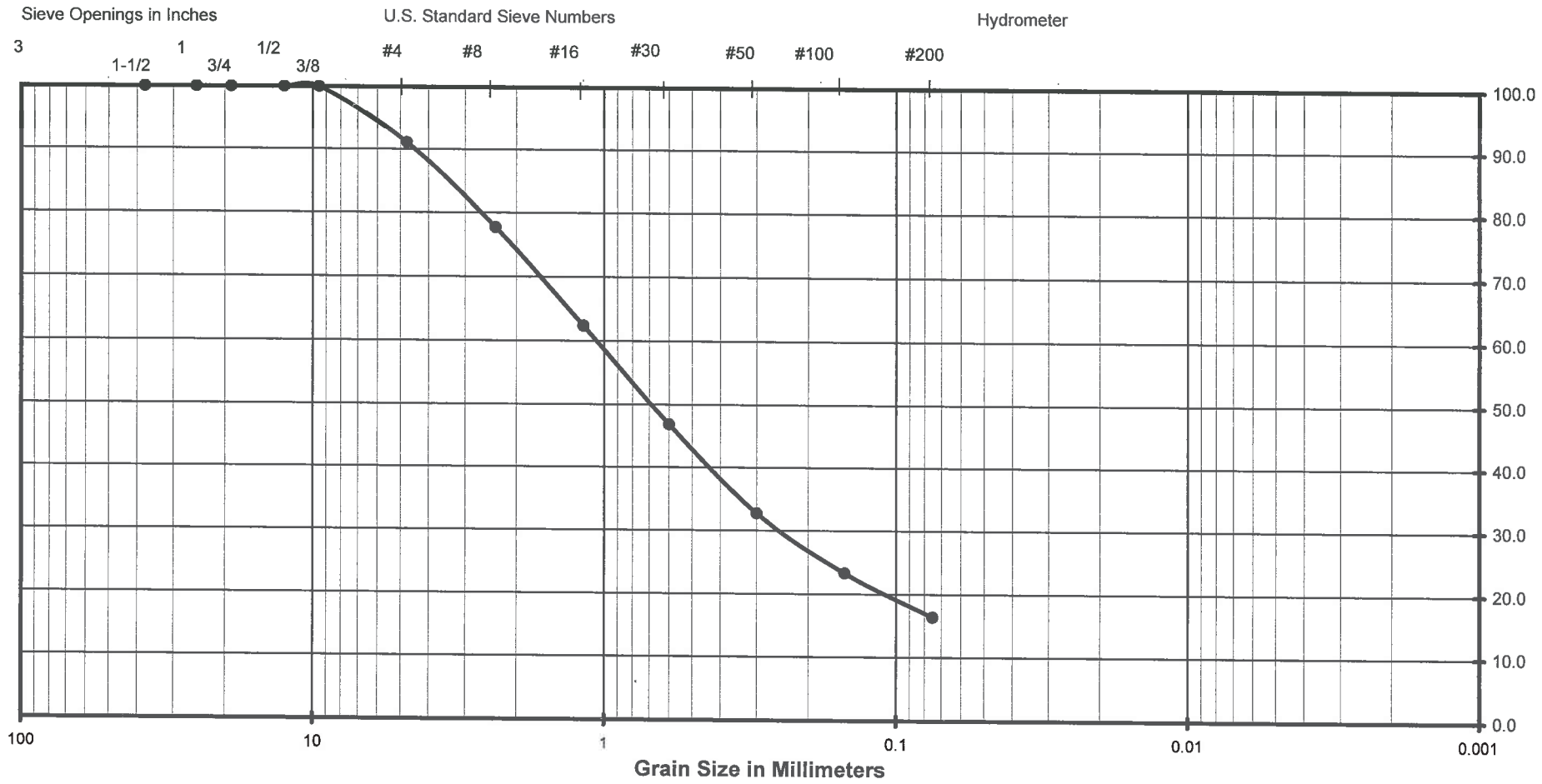
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B4 @ 30-31'

Krazan Testing Laboratory

Grain Size Analysis

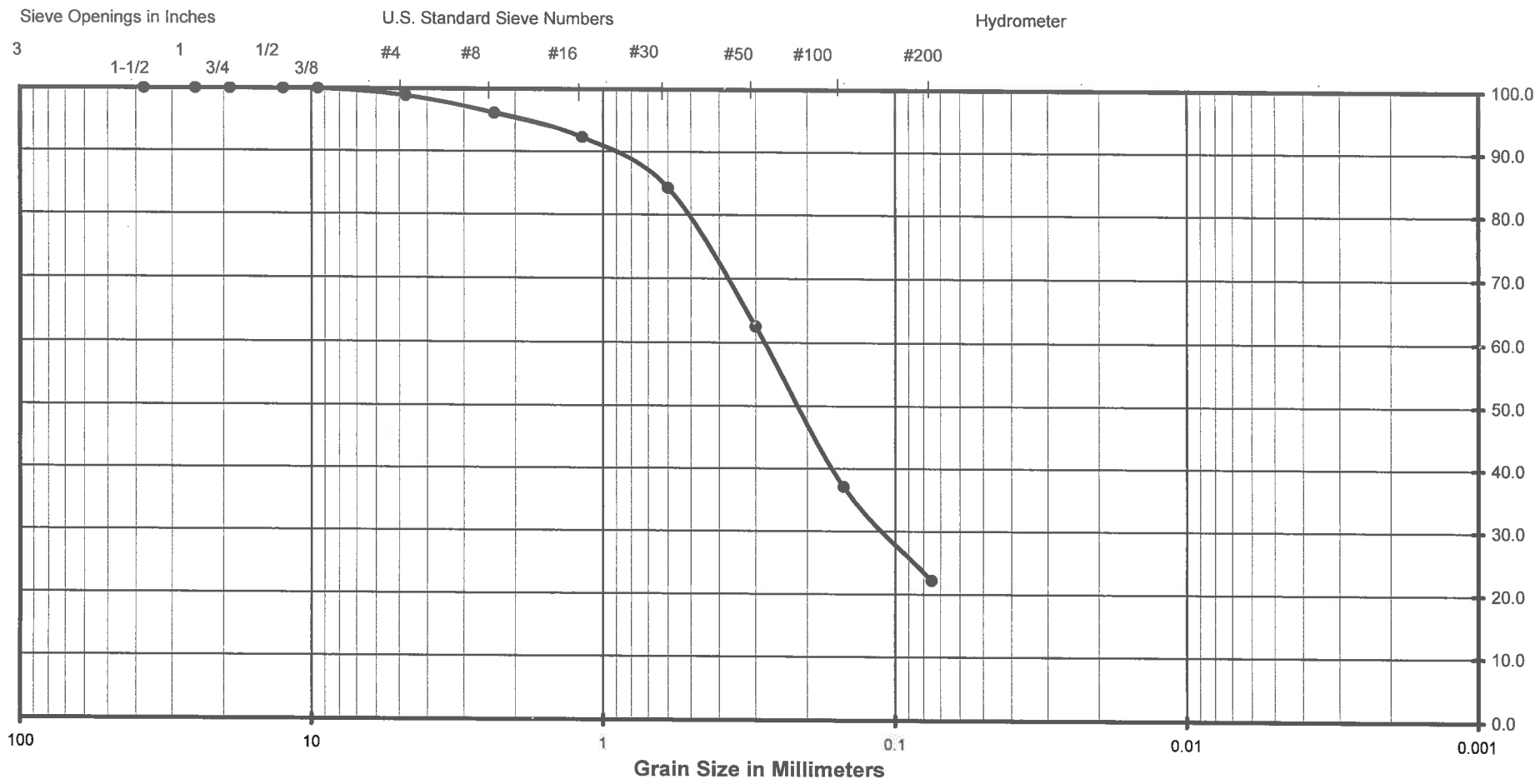


(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B4 @ 40-41'

Krazan Testing Laboratory

Grain Size Analysis



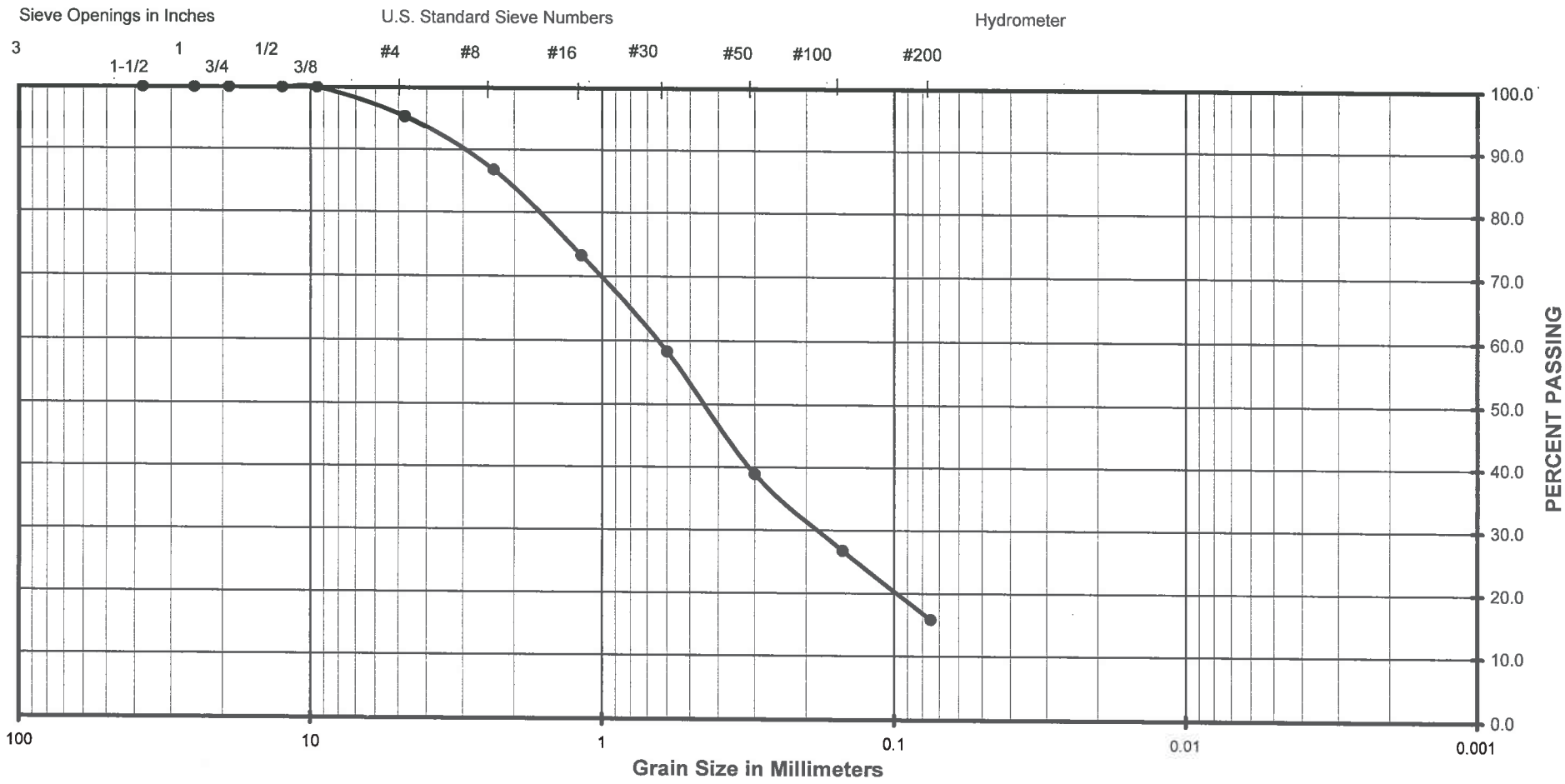
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SC
Sample Number	B4 @ 45-46'

Krazan Testing Laboratory

Grain Size Analysis



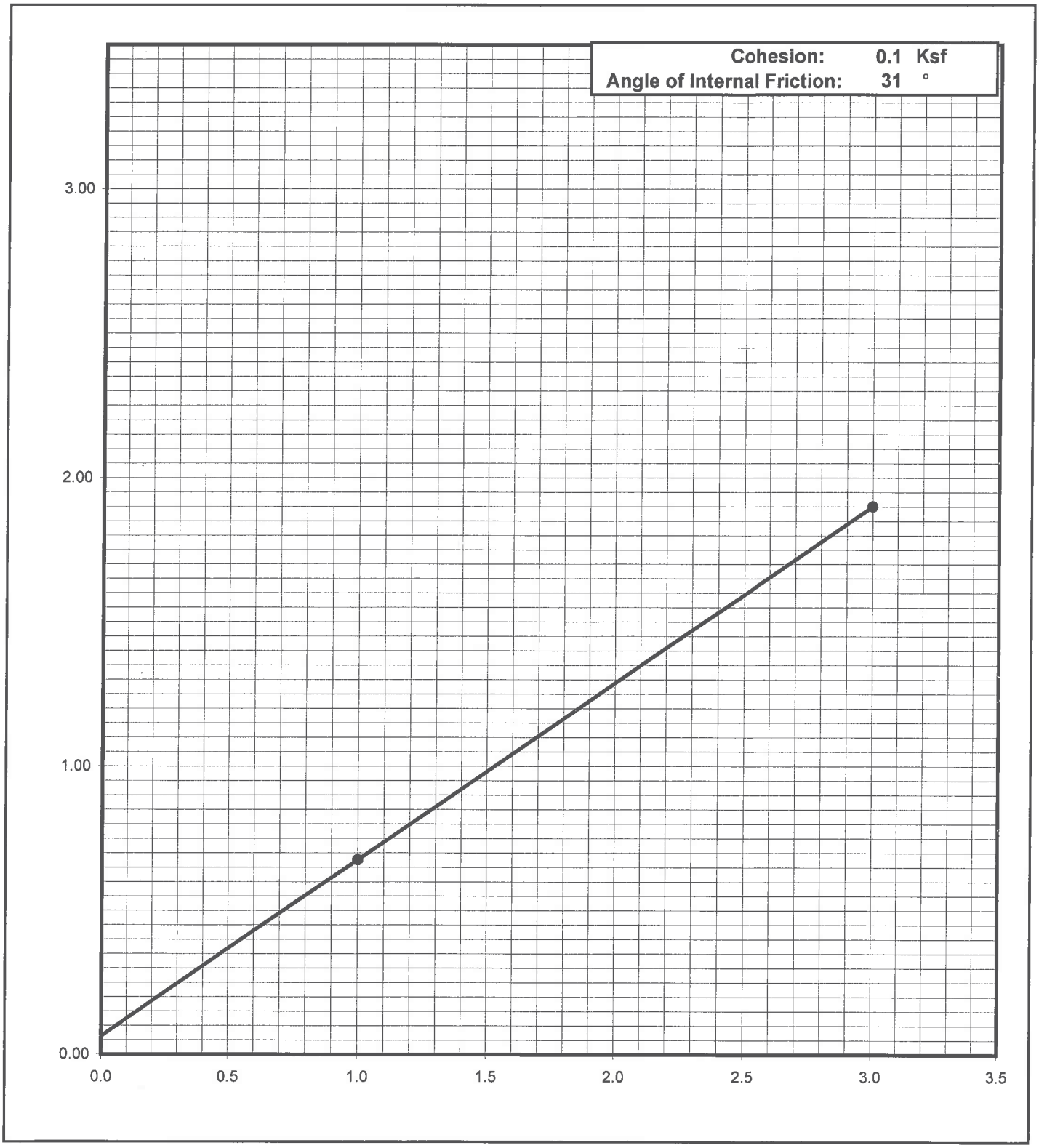
(Unified Soils Classification)

Project Name	Proposed Lucerne Valley PV
Project Number	2209110
Soil Classification	SM
Sample Number	B7 @ 2-3'

Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

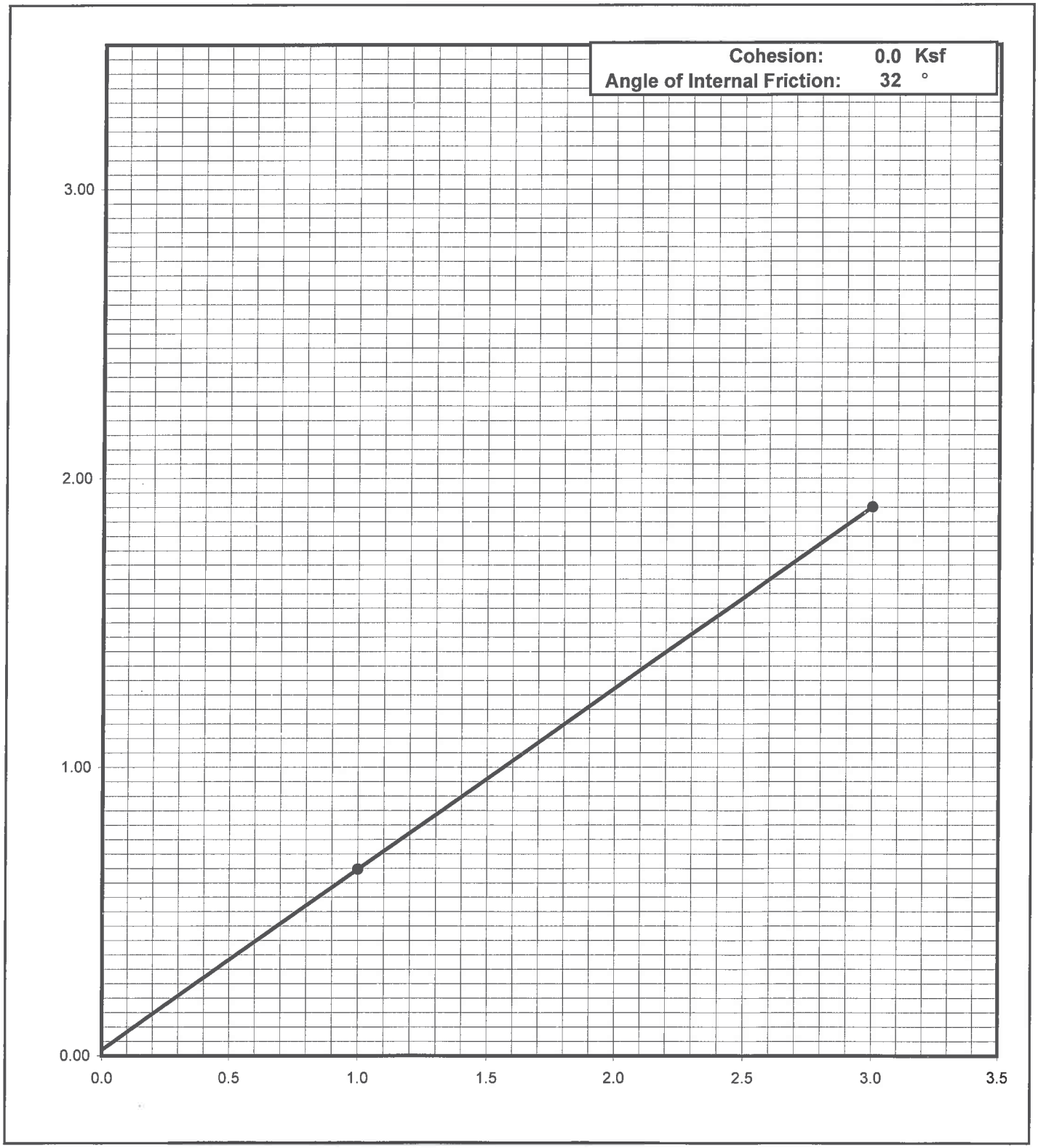
Project Number	Boring No. & Depth	Soil Type	Date
2209110	B3 @ 4-5'	SM	1/8/2010



Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

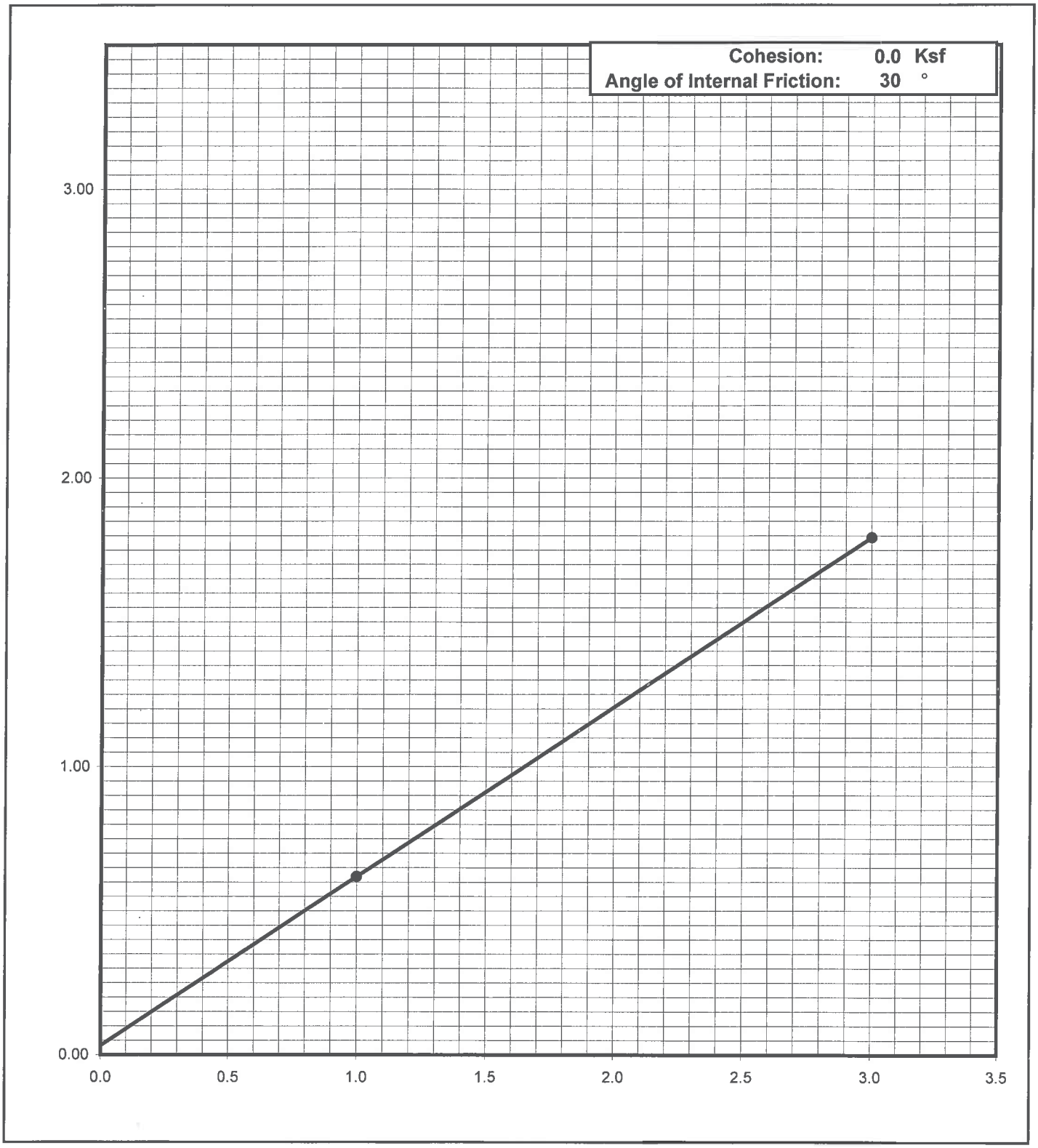
Project Number	Boring No. & Depth	Soil Type	Date
2209110	B6 @ 2-3'	SM	1/8/2010



Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
2209110	B10 @ 2-3'	SM-ML	1/8/2010



Krazan Testing Laboratory

Atterberg Limits Determination
ASTM D-4318

Project Number : *02209110*
Project Name: *Proposed Lucerne Valley PV*
Date: *1/8/2010*
Sample Number: *B1 @ 4-5'*

Plastic Limit	Liquid Limit	Plasticity Index
N.A.	*N.A.*	*Non-Plastic*

Krazan Testing Laboratory

Atterberg Limits Determination
ASTM D-4318

Project Number : *02209110*
Project Name: *Proposed Lucerne Valley PV*
Date: *1/8/2010*
Sample Number: *B3 @ 2-3'*

Plastic Limit	Liquid Limit	Plasticity Index
N.A.	*N.A.*	*Non-Plastic*

Krazan Testing Laboratory

Atterberg Limits Determination
ASTM D-4318

Project Number : *02209110*
Project Name: *Proposed Lucerne Valley PV*
Date: *1/8/2010*
Sample Number: *B4 @ 25-26'*

Plastic Limit	Liquid Limit	Plasticity Index
N.A.	*N.A.*	*Non-Plastic*

Krazan Testing Laboratory

Atterberg Limits Determination
ASTM D-4318

Project Number : *02209110*
Project Name: *Proposed Lucerne Valley PV*
Date: *1/8/2010*
Sample Number: *B4 @ 35-36'*

Plastic Limit	Liquid Limit	Plasticity Index
N.A.	*N.A.*	*Non-Plastic*

Krazan Testing Laboratory

Atterberg Limits Determination
ASTM D-4318

Project Number : *02209110*
Project Name: *Proposed Lucerne Valley PV*
Date: *1/8/2010*
Sample Number: *B5 @ 2-3'*

Plastic Limit	Liquid Limit	Plasticity Index
N.A.	*N.A.*	*Non-Plastic*

Krazan Testing Laboratory

Atterberg Limits Determination
ASTM D-4318

Project Number : *02209110*
Project Name: *Proposed Lucerne Valley PV*
Date: *1/8/2010*
Sample Number: *B8 @ 4-5'*

Plastic Limit	Liquid Limit	Plasticity Index
N.A.	*N.A.*	*Non-Plastic*

Krazan Testing Laboratory

Fine Aggregate Specific Gravity
D 854

Project Name:	**Proposed Lucerne Valley PV**	
Project Number:	**2209110**	
Date:	**11/16/2009**	
Sample Number:	**B4 @ 4-5'**	
Sampled By:	**DA**	
Oven Dry Sample	**50**	Mo
Vaccum Press.	**--**	
Weight	**377.64**	Mb
Temp	**25**	
Weight from Cal.	**346.1**	Ma
Specific Gravity:	**2.709**	Mo / (Mo + Ma - Mb)

Krazan Testing Laboratory

Fine Aggregate Specific Gravity
D 854

Project Name:	**Proposed Lucerne Valley PV**	
Project Number:	**2209110**	
Date:	**11/16/2009**	
Sample Number:	**B5 @ 4-5'**	
Sampled By:	**DA**	
Oven Dry Sample	**50**	Mo
Vaccum Press.	**--**	
Weight	**377.59**	Mb
Temp	**25**	
Weight from Cal.	**346.1**	Ma
Specific Gravity:	**2.701**	Mo / (Mo + Ma - Mb)

Krazan Testing Laboratory

Fine Aggregate Specific Gravity
D 854

Project Name:	**Proposed Lucerne Valley PV**	
Project Number:	**2209110**	
Date:	**11/16/2009**	
Sample Number:	**B8 @ 2-3'**	
Sampled By:	**DA**	
Oven Dry Sample	**50**	Mo
Vaccum Press.	**--**	
Weight	**377.71**	Mb
Temp	**25**	
Weight from Cal.	**346.1**	Ma
Specific Gravity:	**2.719**	Mo / (Mo + Ma - Mb)

Krazan Testing Laboratory

Fine Aggregate Specific Gravity
D 854

Project Name:	**Proposed Lucerne Valley PV**	
Project Number:	**2209099**	
Date:	**11/16/2009**	
Sample Number:	**B9 @ 2-3'**	
Sampled By:	**DA**	
Oven Dry Sample	**50**	Mo
Vaccum Press.	**--**	
Weight	**377.63**	Mb
Temp	**25**	
Weight from Cal.	**346.1**	Ma
Specific Gravity:	**2.707**	Mo / (Mo + Ma - Mb)

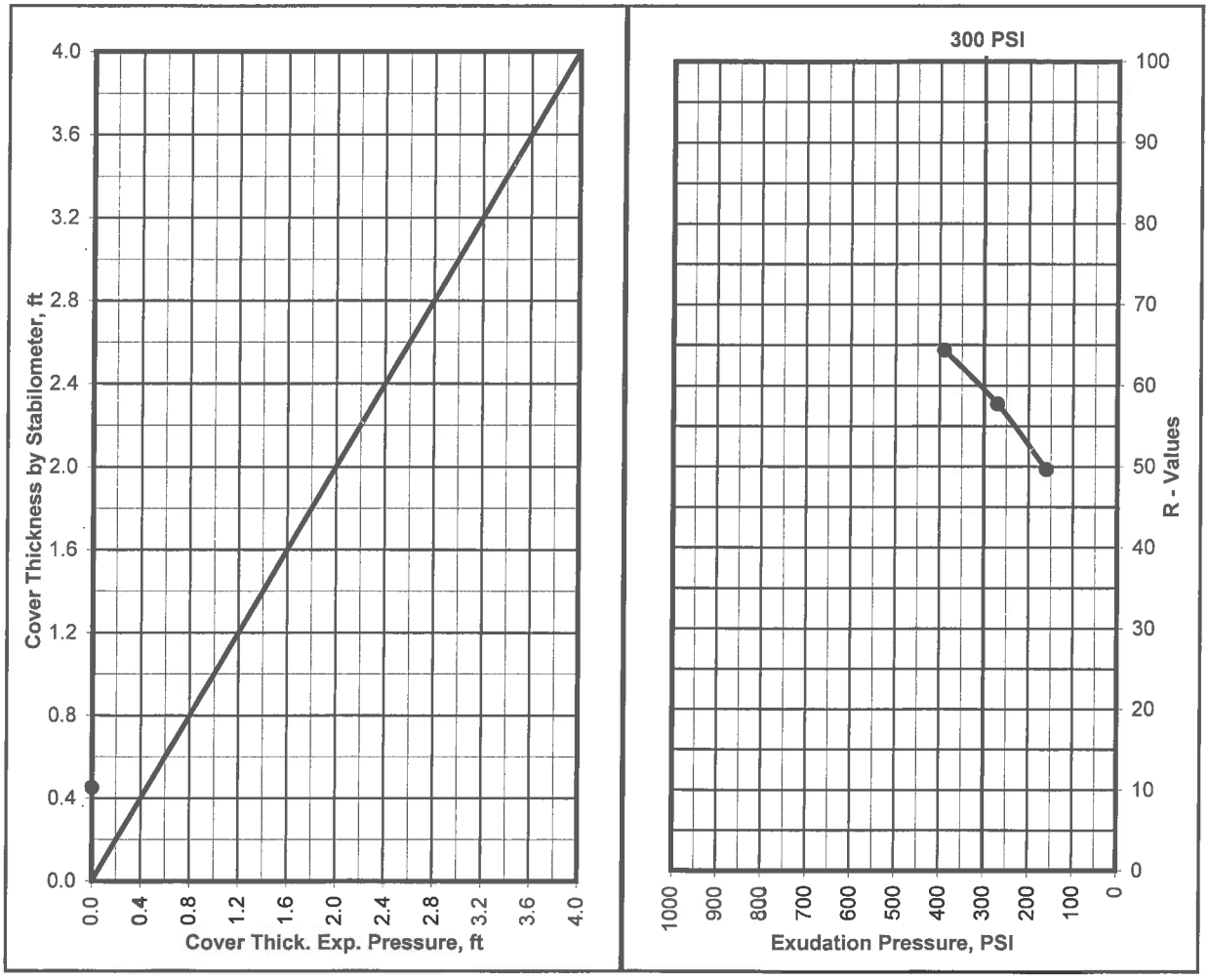
Krazan Testing Laboratory

R - VALUE TEST
ASTM D - 2844 / CAL 301

Project Number	:	2209110
Project Name	:	Proposed Lucerne Valley PV
Date	:	1/6/2010
Sample Location/Curve Number	:	RV#1
Soil Classification	:	SM

TEST	A	B	C
Percent Moisture @ Compaction, %	8.9	8.4	9.3
Dry Density, lbm/cu.ft.	127.4	127.0	127.2
Exudation Pressure, psi	270	390	160
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	58	64	50

R Value at 300 PSI Exudation Pressure	**60**
R Value by Expansion Pressure (TI =): 5	**Expansion Pressure nil**



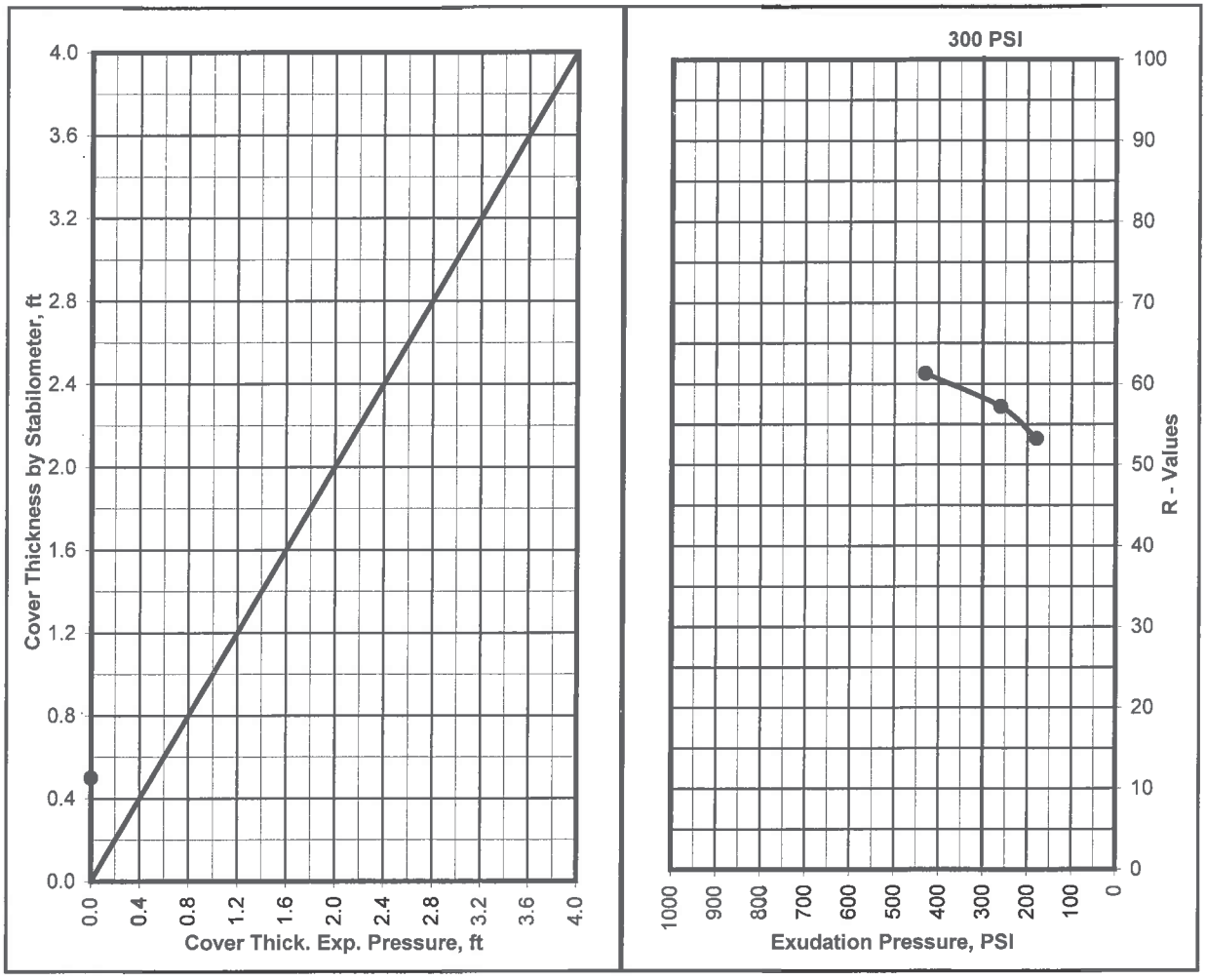
Krazan Testing Laboratory

R - VALUE TEST
ASTM D - 2844 / CAL 301

Project Number	:	2209110
Project Name	:	Proposed Lucerne Valley PV
Date	:	1/6/2010
Sample Location/Curve Number	:	RV#2
Soil Classification	:	SM

TEST	A	B	C
Percent Moisture @ Compaction, %	9.4	8.5	9.0
Dry Density, lbm/cu.ft.	125.2	125.4	125.9
Exudation Pressure, psi	180	430	260
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	53	61	57

R Value at 300 PSI Exudation Pressure	**59**
R Value by Expansion Pressure (TI =): 5	**Expansion Pressure nil**



Krazan Testing Laboratory

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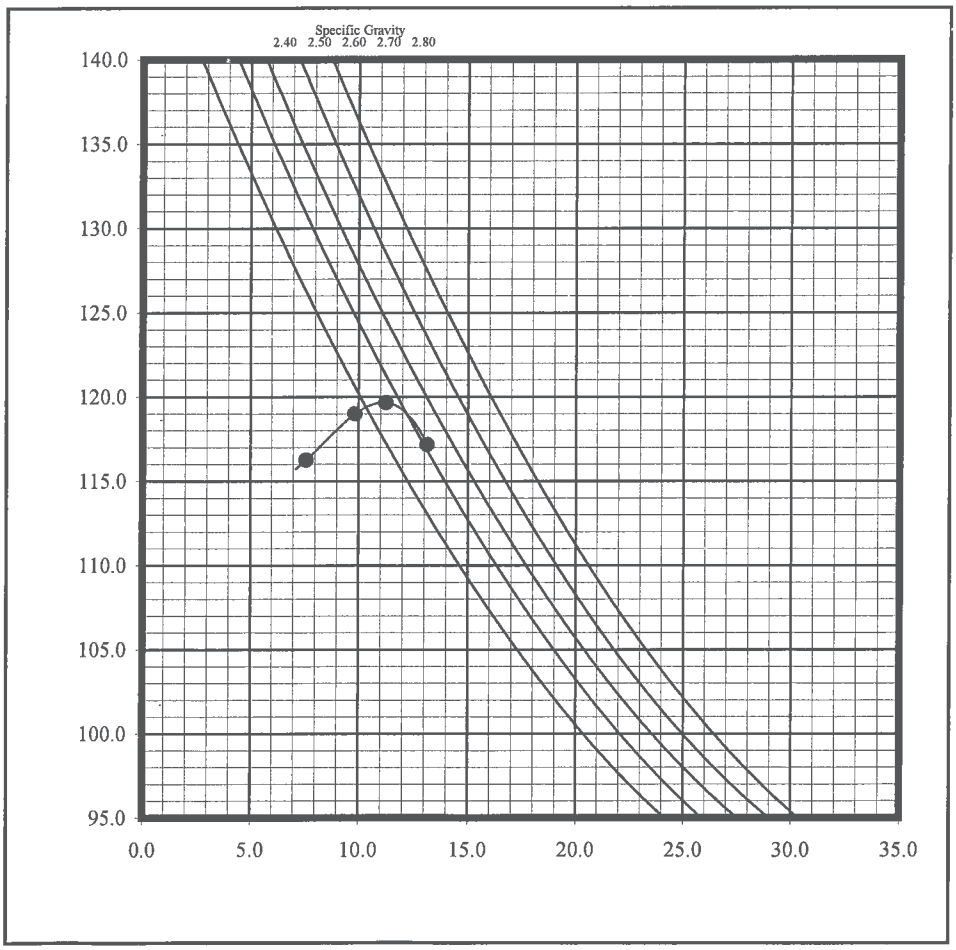
GEOTECHNICAL ENGINEERING ENVIRONMENTAL ENGINEERING CONSTRUCTION TESTING & INSPECTION

Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft. - lbf/ft^3)

ASTM D1557

Project Number	2209110	Sample Number	TC1
Project Name	Lucerne Valley	Soil Classification	SM
Technician	CP	Soil Description	Silty Sand
Date	1/8/2010	Method	D1557A
Sample Location			

	1	2	3	4
Mass of Moist Specimen & Mold, gm	4021.4	4057.8	4049.3	3936.5
Mass of Compaction Mold, gm	2047.4	2047.4	2047.4	2047.4
Mass of Moist Specimen, gm	1974.0	2010.4	2001.9	1889.1
Volume of Mold, cu./ft.	0.0333	0.0333	0.0333	0.0333
Wet Density, lbs./cu.ft.	130.7	133.1	132.5	125.1
Mass of Moisture (Wet), gm	200.0	200.0	200.0	200.0
Mass of Moisture (Dry), gm	182.1	179.8	176.8	185.9
Moisture Content (%)	9.8	11.2	13.1	7.6
Dry Density, lbs/cu.ft.	119.0	119.7	117.2	116.2



Maximum Dry Density, lbs.cu.ft.

119.7

Optimum Moisture Content

11.1%

SDS#: -

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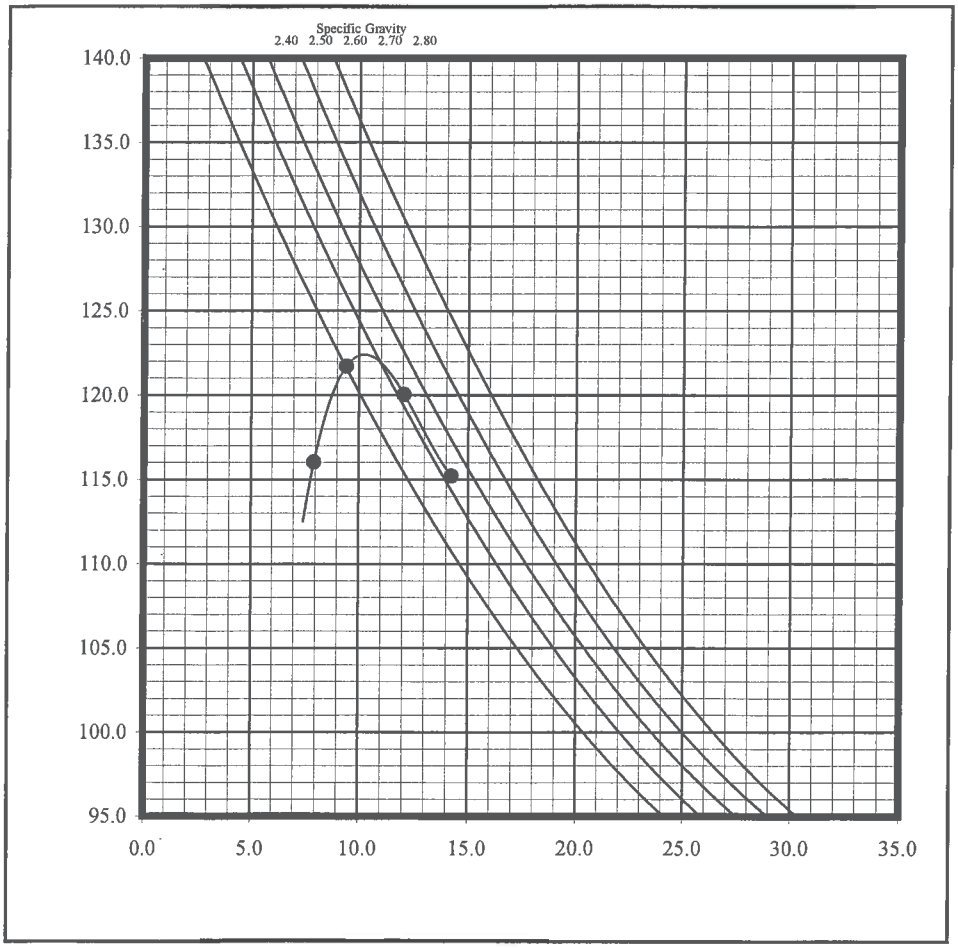
GEOTECHNICAL ENGINEERING ENVIRONMENTAL ENGINEERING CONSTRUCTION TESTING & INSPECTION

Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft. - lbf/ft^3)

ASTM D1557

Project Number	2209110	Sample Number	TC2
Project Name	Lucerne Valley	Soil Classification	SM
Technician	CP	Soil Description	Silty Sand
Date	1/8/2010	Method	D1557A
Sample Location			

	1	2	3	4
Mass of Moist Specimen & Mold, gm	4058.8	4079.1	3938.9	4035.1
Mass of Compaction Mold, gm	2047.4	2047.4	2047.4	2047.4
Mass of Moist Specimen, gm	2011.4	2031.7	1891.5	1987.7
Volume of Mold, cu./ft.	0.0333	0.0333	0.0333	0.0333
Wet Density, lbs./cu.ft.	133.2	134.5	125.2	131.6
Mass of Moisture (Wet), gm	200.0	200.0	200.0	200.0
Mass of Moisture (Dry), gm	182.8	178.5	185.3	175.1
Moisture Content (%)	9.4	12.0	7.9	14.2
Dry Density, lbs/cu.ft.	121.7	120.0	116.0	115.2



Maximum Dry Density, lbs.cu.ft.

122.4

Optimum Moisture Content

10.2%

SDS#: -

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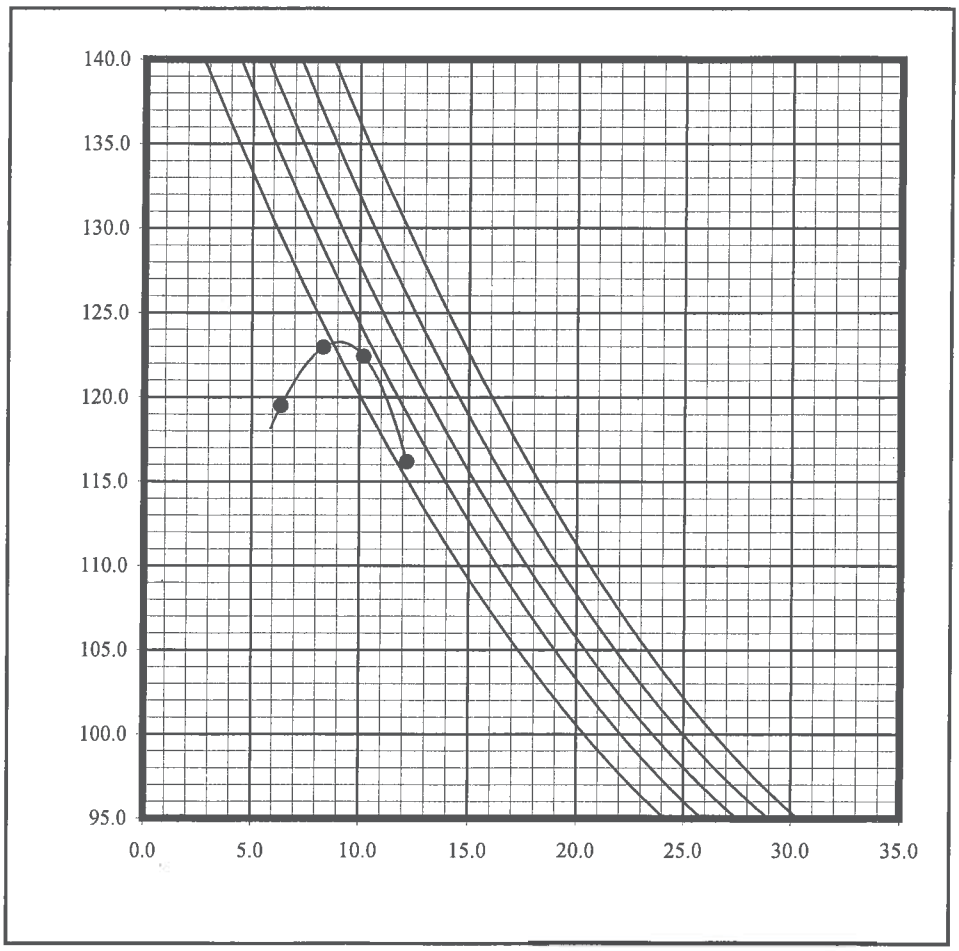
Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft. - lbf/ft^3)

ASTM D1557

Project Number	2209110	Sample Number	TC3
Project Name	Lucerne Valley	Soil Classification	SM
Technician	CP	Soil Description	Silty Sand
Date	1/8/2010	Method	D1557A
Sample Location			

	1	2	3	4
Mass of Moist Specimen & Mold, gm	4059.6	3967.6	4084.8	4015.7
Mass of Compaction Mold, gm	2047.4	2047.4	2047.4	2047.4
Mass of Moist Specimen, gm	2012.2	1920.2	2037.4	1968.3
Volume of Mold, cu./ft.	0.0333	0.0333	0.0333	0.0333
Wet Density, lbs./cu.ft.	133.2	127.1	134.9	130.3
Mass of Moisture (Wet), gm	200.0	200.0	200.0	200.0
Mass of Moisture (Dry), gm	184.6	188.0	181.5	178.3
Moisture Content (%)	8.3	6.4	10.2	12.2
Dry Density, lbs/cu.ft.	123.0	119.5	122.4	116.2



Maximum Dry Density, lbs.cu.ft.

123.3

Optimum Moisture Content

9.1%

SDS#: -

Soil Resistivity

Cal 643 & 417

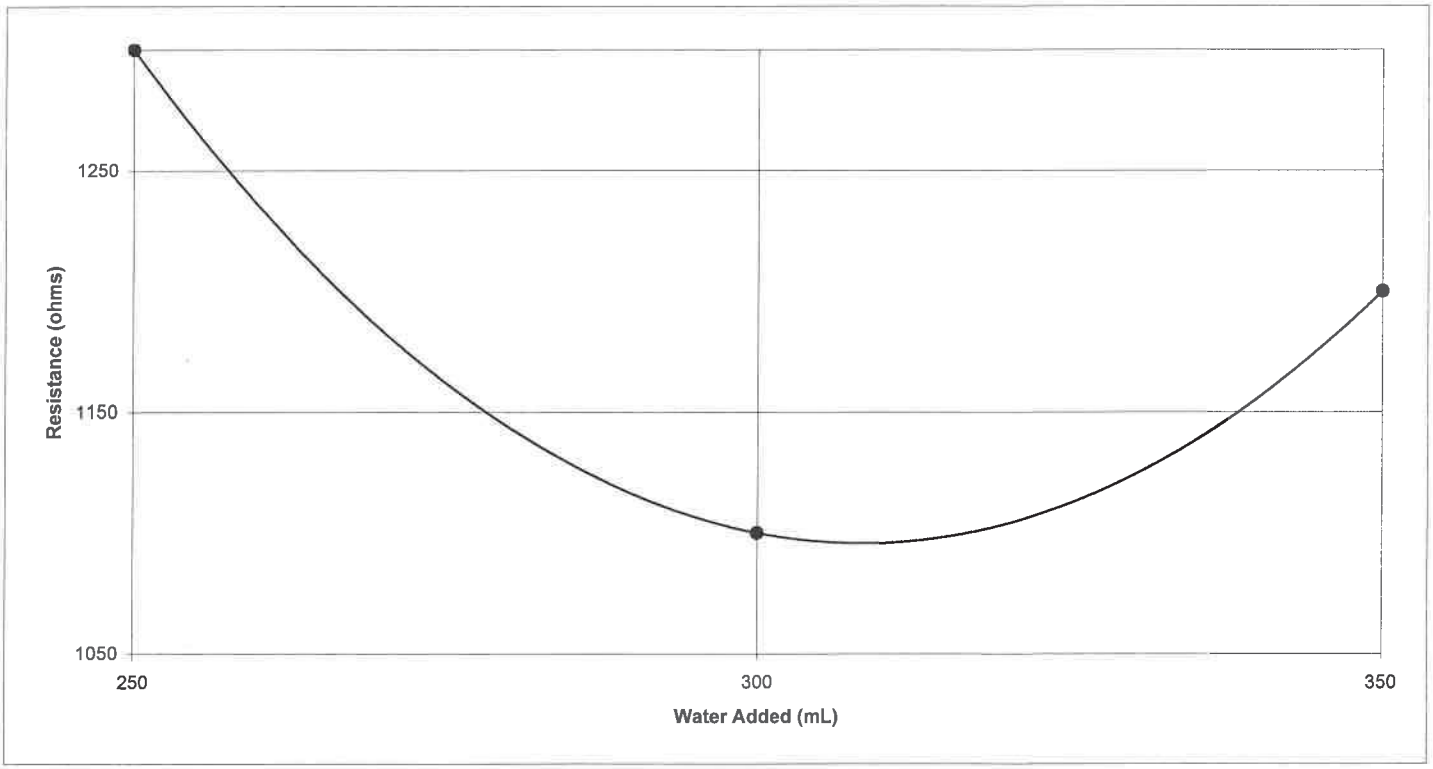
Job Name:	Proposed Lucerne Valley PV	Date Tested:	1/20/2010
Job Number:	02209110	Tested by:	JG
Date Sampled:	1/14/2010	Sample Location:	Surface
Sampled by:	DA	Sample Description:	SM

Soil pH: 6.5 Sulfate Content: Chloride Content:

Initial Sample Weight (approx 1350gms): 1300 gms
Test Box Constant: 6.6675 cm

Test Data:

Trial #	Water Added (mL)	Voltage (V)	Amperage (mA)	Resistance (ohms)	Resistivity (ohm cm)
1	250	12.0000	9.2308	1300	8668
2	300	12.0000	10.9091	1100	7334
3	350	12.0000	10.0000	1200	8001



Minimum Resistivity:	**7307** ohm cm

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Soil Resistivity

Cal 643 & 417

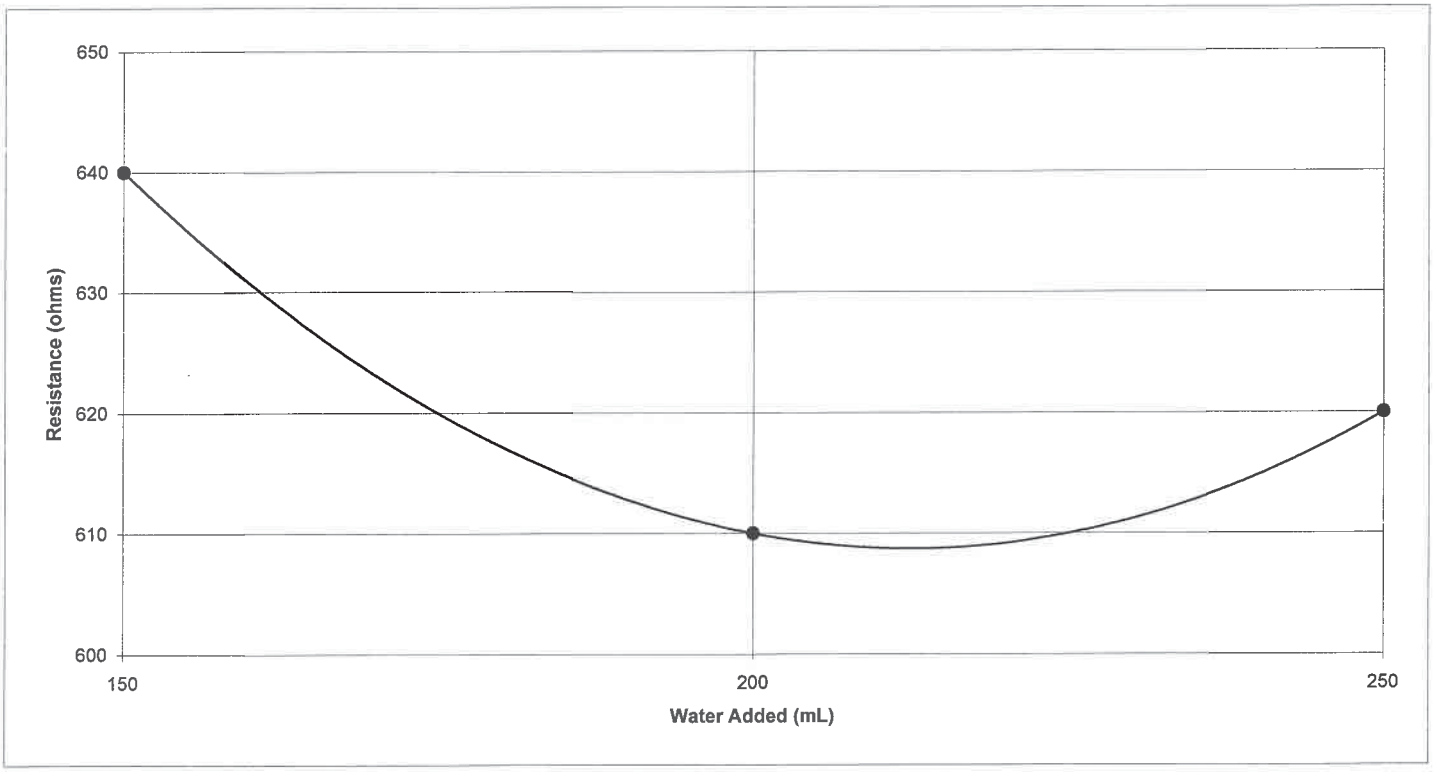
Job Name:	Proposed Lucerne Valley PV	Date Tested:	1/20/2010
Job Number:	02209110	Tested by:	JG
Date Sampled:	1/14/2010	Sample Location:	5'
Sampled by:	DA	Sample Description:	SM

Soil pH: 6.5 Sulfate Content: Chloride Content:

Initial Sample Weight (approx 1350gms): 1300 gms
Test Box Constant: 6.6675 cm

Test Data:

Trial #	Water Added (mL)	Voltage (V)	Amperage (mA)	Resistance (ohms)	Resistivity (ohm cm)
1	150	12.0000	18.7500	640	4267
2	200	12.0000	19.6721	610	4067
3	250	12.0000	19.3548	620	4134



Minimum Resistivity:	**4059** ohm cm

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Soil Resistivity

Cal 643 & 417

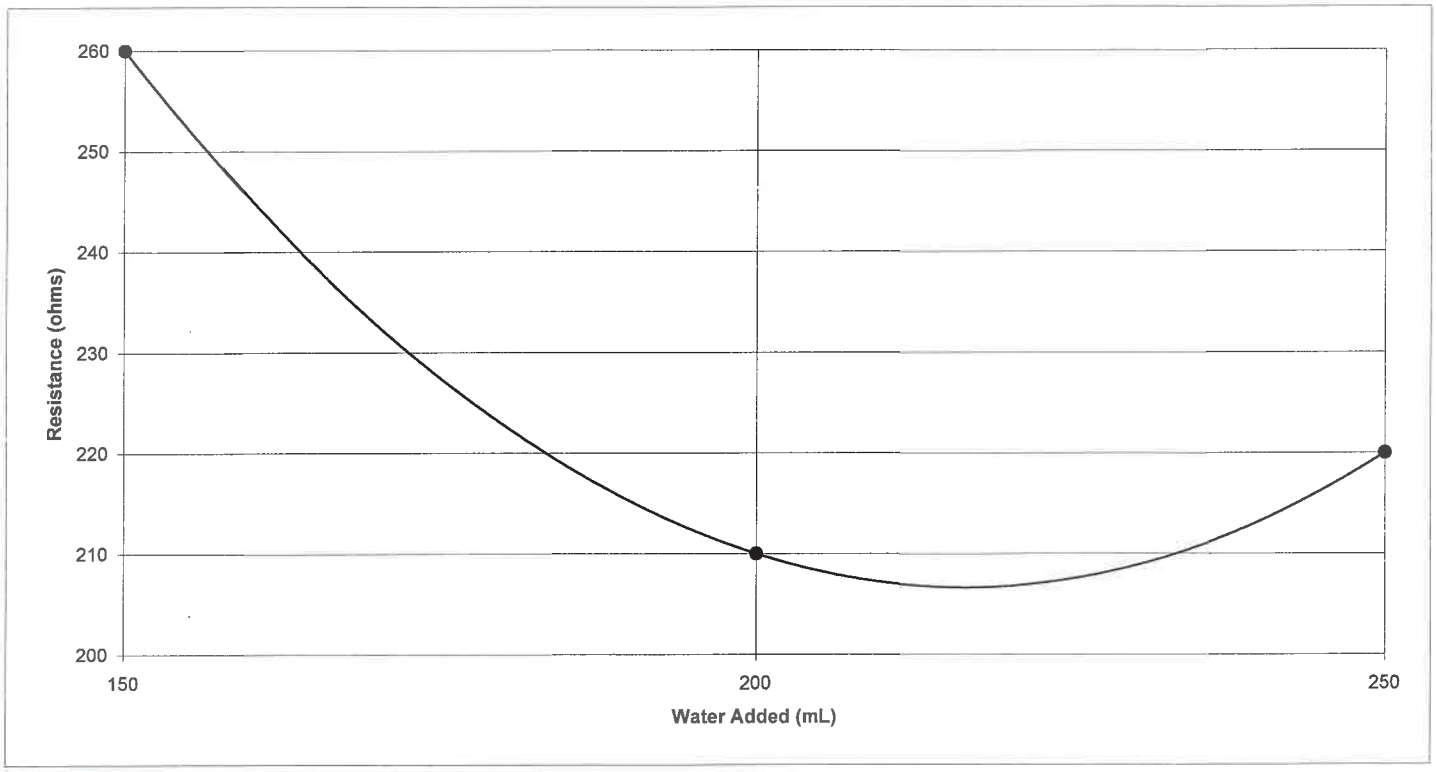
Job Name:	Proposed Lucerne Valley PV	Date Tested:	1/20/2010
Job Number:	02209110	Tested by:	JG
Date Sampled:	1/14/2010	Sample Location:	10'
Sampled by:	DA	Sample Description:	SM

Soil pH: 6.5 Sulfate Content: Chloride Content:

Initial Sample Weight (approx 1350gms): 1300 gms
Test Box Constant: 6.6675 cm

Test Data:

Trial #	Water Added (mL)	Voltage (V)	Amperage (mA)	Resistance (ohms)	Resistivity (ohm cm)
1	150	12.0000	46.1538	260	1734
2	200	12.0000	57.1429	210	1400
3	250	12.0000	54.5455	220	1467



Minimum Resistivity:	**1378** ohm cm

Krazan Testing Laboratory

Soil Resistivity

Cal 643 & 417

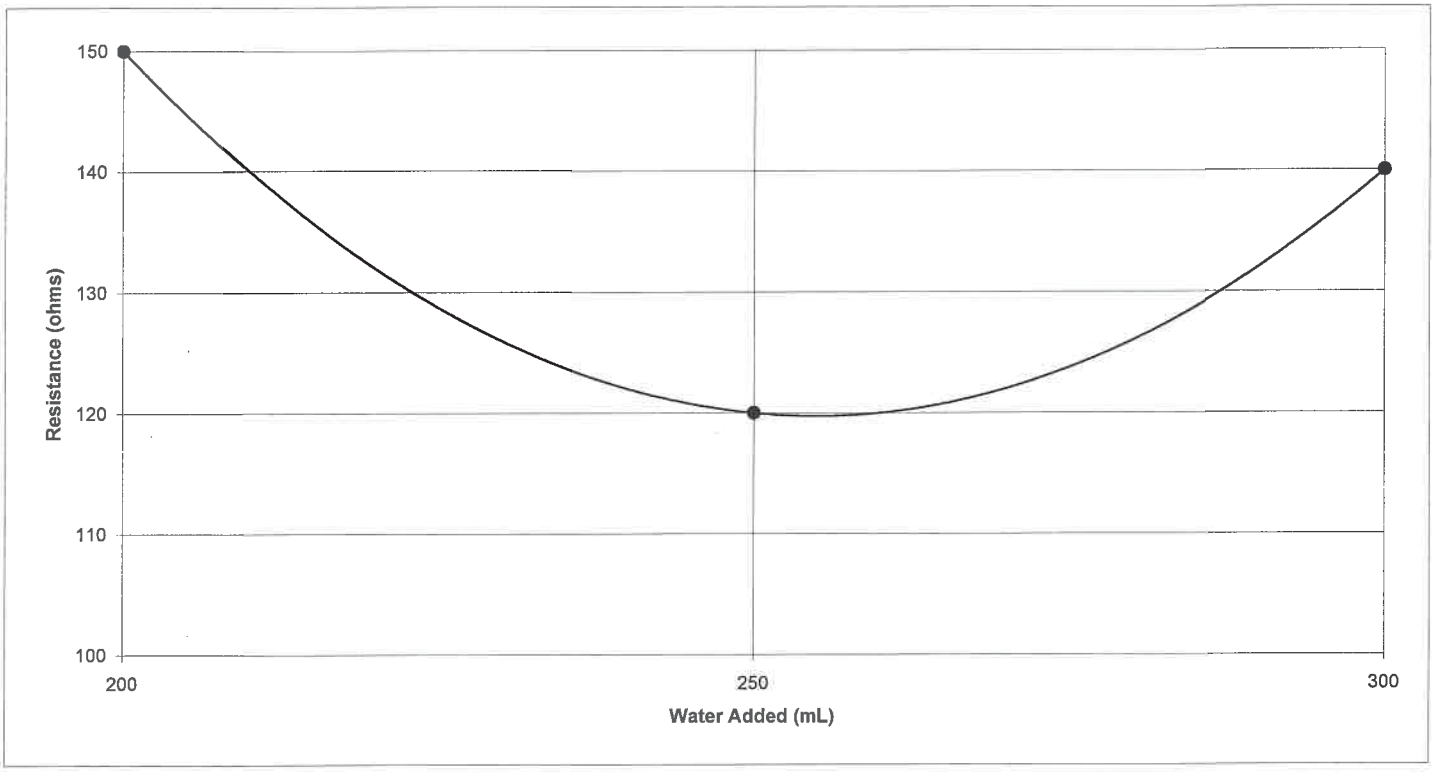
Job Name:	Proposed Lucerne Valley PV	Date Tested:	1/20/2010
Job Number:	02209110	Tested by:	JG
Date Sampled:	1/14/2010	Sample Location:	15'
Sampled by:	DA	Sample Description:	SM

Soil pH: 6.5 Sulfate Content: Chloride Content:

Initial Sample Weight (approx 1350gms): 1300 gms
Test Box Constant: 6.6675 cm

Test Data:

Trial #	Water Added (mL)	Voltage (V)	Amperage (mA)	Resistance (ohms)	Resistivity (ohm cm)
1	200	12.0000	80.0000	150	1000
2	250	12.0000	100.0000	120	800
3	300	12.0000	85.7143	140	933



Minimum Resistivity:	**798** ohm cm

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Soil Resistivity

Cal 643 & 417

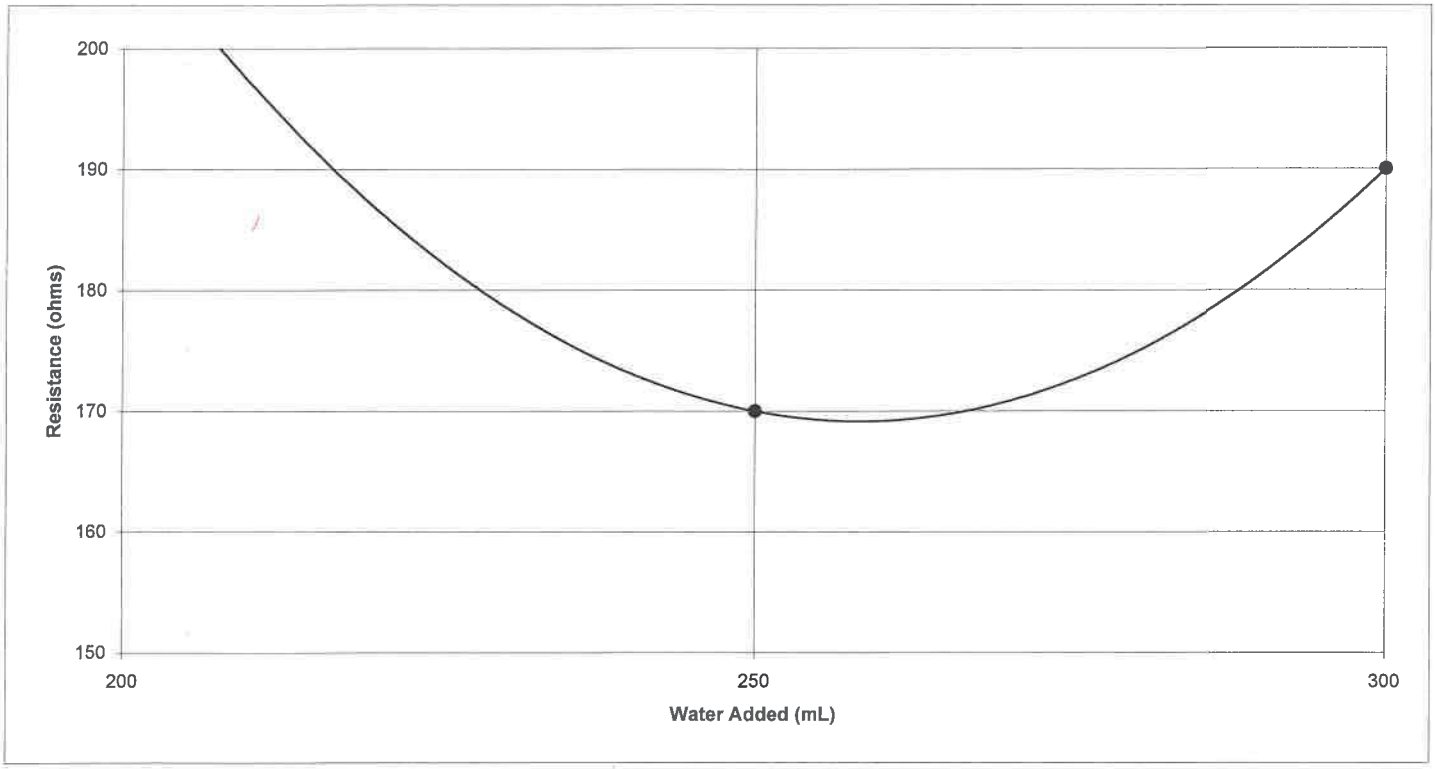
Job Name:	Proposed Lucerne Valley PV	Date Tested:	1/20/2010
Job Number:	02209110	Tested by:	JG
Date Sampled:	1/14/2010	Sample Location:	20'
Sampled by:	DA	Sample Description:	SM

Soil pH: 6.5 Sulfate Content: Chloride Content:

Initial Sample Weight (approx 1350gms): 1300 gms
Test Box Constant: 6.6675 cm

Test Data:

Trial #	Water Added (mL)	Voltage (V)	Amperage (mA)	Resistance (ohms)	Resistivity (ohm cm)
1	200	12.0000	57.1429	210	1400
2	250	12.0000	70.5882	170	1133
3	300	12.0000	63.1579	190	1267



Minimum Resistivity:	**1128** ohm cm

Krazan Testing Laboratory

Thermal Conductivity Report ASTM D:5334

Project: **Lucerne Valley #2209110** Job #: **7337**

Client: **Krazan & Associates, Inc.** Date: **2/11/10**

Boring	Specimen Type	Depth	Type	Classification	Initial Conditions			Dry
					Dry Density (PCF)	WC (%)	Thermal Conductivity (W/cm-ºC)	Thermal Conductivity (W/cm-ºC)
TC1	**Reconstituted**	**2-3**	**Bulk**	**Silty Sand (SM)**	**107.6**	**11.4%**	**0.0134**	**0.0039**
TC2	**Reconstituted**	**2-3**	**Bulk**	**Silty Sand (SM)**	**110.3**	**10.7%**	**0.0129**	**0.0044**
TC3	**Reconstituted**	**2-3**	**Bulk**	**Silty Sand (SM)**	**111.7**	**9.3%**	**0.0127**	**0.0048**
	Specimens reconstituted to approximately 90% of maximum modified proctor density near optimum moisture content. Compaction characteristics supplied by Krazan & Associates, Inc.							

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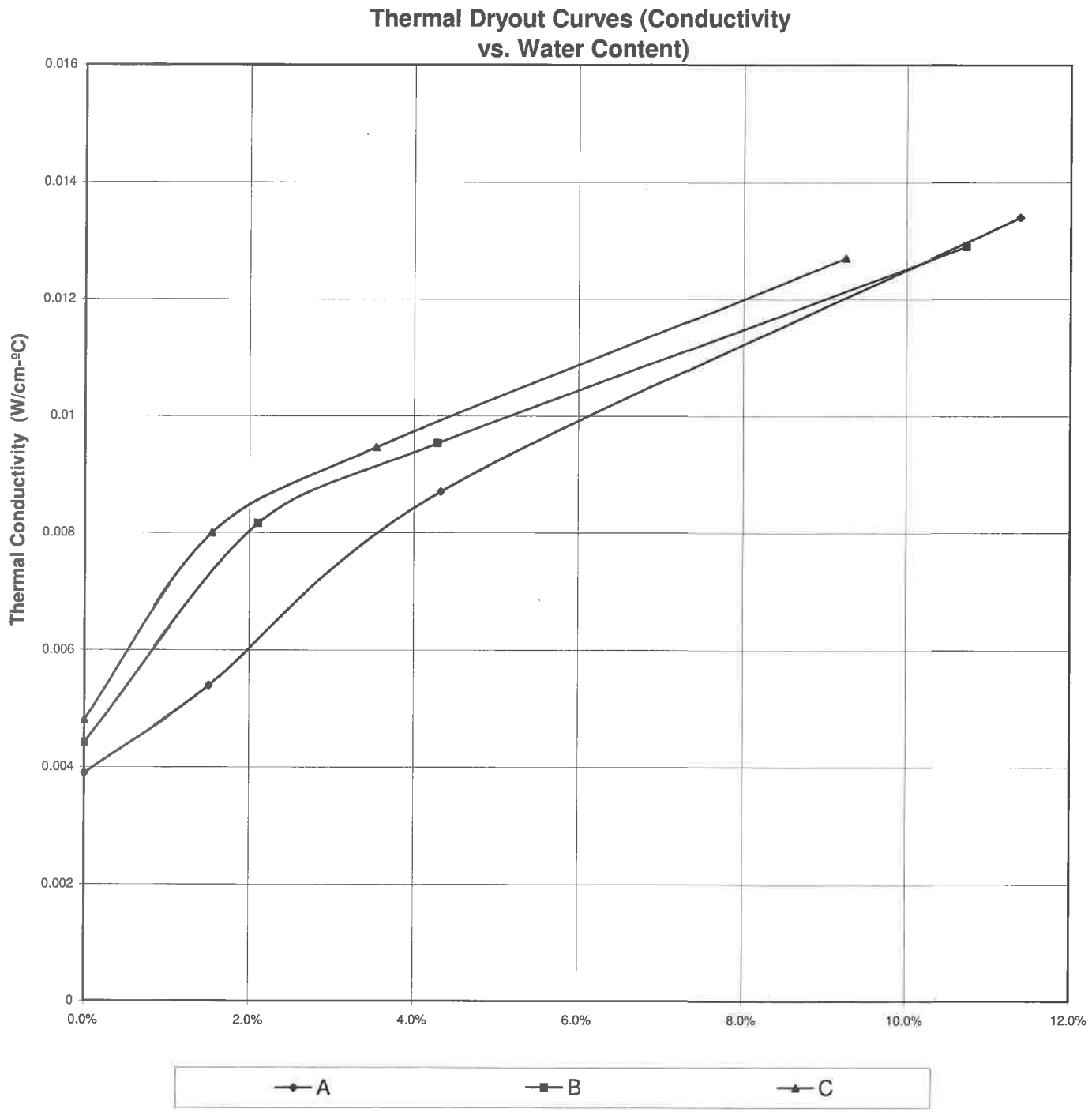
http://www.soilengineeringtesting.com

Thermal Conductivity Report ASTM D:5334

Project: Lucerne Valley #2209110 Job: 7337

Client: Krazan & Associates, Inc. Date: 2/11/10

	Boring	Depth (ft)
Specimen A:	TC1	2-3
Specimen B:	TC2	2-3
Specimen C:	TC3	2-3



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Bloomington MN 55420-3436

http://www.soilengineeringtesting.com

Thermal Resistivity Report ASTM D:5334

Project: **Lucerne Valley #2209110** Job #: **7337**

Client: **Krazan & Associates, Inc.** Date: **2/11/10**

Boring	Specimen Type	Depth	Type	Classification	Initial Conditions			Dry
					Dry Density (PCF)	WC (%)	Thermal Resistivity (ºC-cm/W)	Thermal Resistivity (ºC-cm/W)
TC1	**Reconstituted**	**2-3**	**Bulk**	**Silty Sand (SM)**	**107.6**	**11.4%**	**75**	**255**
TC2	**Reconstituted**	**2-3**	**Bulk**	**Silty Sand (SM)**	**110.3**	**10.7%**	**78**	**226**
TC3	**Reconstituted**	**2-3**	**Bulk**	**Silty Sand (SM)**	**111.7**	**9.3%**	**79**	**208**
	Specimens reconstituted to approximately 90% of maximum modified proctor density near optimum moisture content. **Compaction characteristics supplied by Krazan & Associates, Inc.**							

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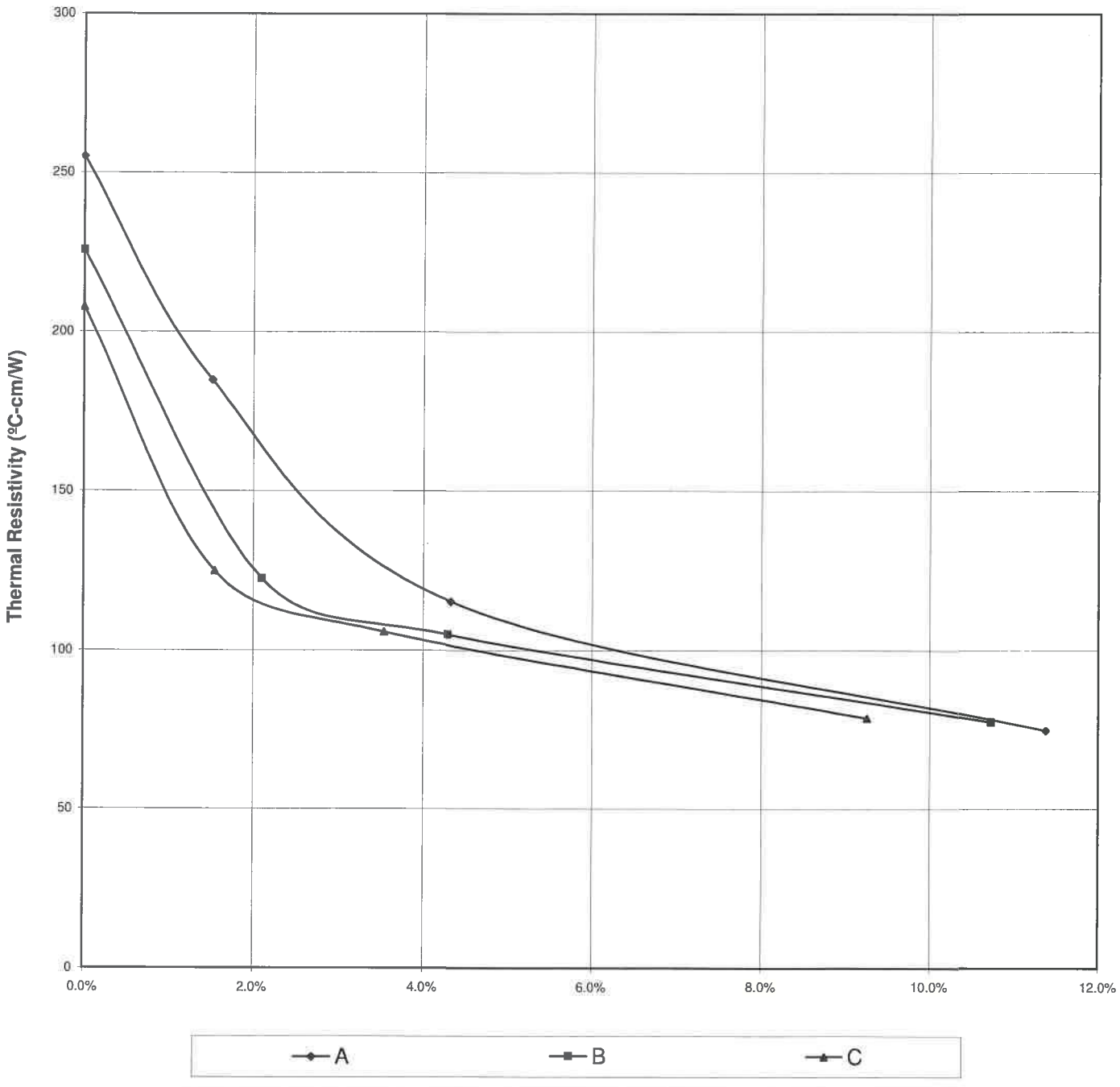
Thermal Resistivity Report ASTM D:5334

Project: Lucerne Valley #2209110 Job: 7337

Client: Krazan & Associates, Inc. Date: 2/11/10

	Boring	Depth (ft)
Specimen A:	TC1	2-3
Specimen B:	TC2	2-3
Specimen C:	TC3	2-3

Thermal Dryout Curves (Resistivity vs. Water Content)



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APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 90 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 90 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 90 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

A representative of Krazan & Associates, Inc., should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. The table provided below provides the minimum testing frequencies. Krazan & Associates, Inc., will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

Recommended Compaction Control Tests:
1 Test for Each 2,000 Sq. Ft. each Lift (bldg. area)
1 Test for Each 2,500 Sq. Ft. each Lift (parking area)
Structural Fill Maximum Lift Thickness 6 inches (Measured loose)

APPENDIX C

PAVEMENT SPECIFICATIONS

1. DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to is the May 2006 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

2. SCOPE OF WORK - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically noted as "Work Not Included."

3. PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 90 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

4. UNTREATED AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class II material, 1½ inches maximum size. The aggregate base material shall be spread and compacted in accordance with Section 26 of the Standard Specifications. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent.

5. AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class II material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent, and it shall be spread and compacted in accordance with Section 25 of the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

6. ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning and mixing of the materials shall conform to Section 39.

The prime coat, spreading and compacting equipment and spreading and compacting mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50° F. The surfacing shall be rolled with a combination of steel wheel and pneumatic rollers, as described in Section 39-6. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.

APPENDIX D

EARTHQUAKE DATA FILE AND LIQUEFACTION ANALYSIS

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*    E Q S E A R C H     *
*                        *
*     Version 3.00       *
*                        *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 02209110

DATE: 12-02-2009

JOB NAME: 02209110

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE: 4.00
   MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
   SITE LATITUDE: 34.5600
   SITE LONGITUDE: 116.9360

SEARCH DATES:
           START DATE: 1800
           END DATE: 2009

SEARCH RADIUS:
           50.0 mi
           80.5 km

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND: 0 Depth Source: A
   Basement Depth: 5.00 km   Campbell SSR: Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.6000	116.8400	06/04/1989	213358.1	2.0	4.50	0.116	VII	6.1(9.8)
DMG	34.4330	116.9830	04/18/1945	458 2.0	0.0	4.30	0.080	VII	9.2(14.7)
DMG	34.7000	117.0000	07/16/1916	1230 0.0	0.0	4.00	0.063	VI	10.3(16.6)
DMG	34.7000	117.0000	07/16/1916	1150 0.0	0.0	4.50	0.082	VII	10.3(16.6)
DMG	34.4360	116.8340	07/14/1973	8 020.1	8.0	4.80	0.096	VII	10.3(16.6)
DMG	34.4170	116.8500	02/11/1932	231120.0	0.0	4.00	0.060	VI	11.0(17.7)
DMG	34.4000	116.9170	02/01/1942	16 334.0	0.0	4.50	0.078	VII	11.1(17.9)
DMG	34.4000	116.9170	02/01/1942	151828.0	0.0	4.50	0.078	VII	11.1(17.9)
DMG	34.4000	116.9170	01/25/1942	215133.0	0.0	4.00	0.060	VI	11.1(17.9)
DMG	34.4000	116.9170	02/01/1942	151555.0	0.0	4.00	0.060	VI	11.1(17.9)
DMG	34.4500	116.7830	05/22/1942	151829.0	0.0	4.00	0.058	VI	11.5(18.6)
GSP	34.3770	116.9180	12/04/1992	052511.2	2.0	4.80	0.083	VII	12.7(20.4)
GSP	34.3690	116.8970	12/04/1992	020857.5	3.0	5.30	0.104	VII	13.4(21.5)
GSP	34.3700	116.8800	11/29/1992	142120.5	3.0	4.00	0.052	VI	13.5(21.7)
GSP	34.3640	116.9040	11/27/1992	183225.0	1.0	4.10	0.055	VI	13.6(22.0)
GSP	34.3620	116.9230	12/07/1992	033331.5	1.0	4.00	0.052	VI	13.7(22.0)
GSP	34.3610	116.9130	12/04/1992	125942.1	0.0	4.20	0.057	VI	13.8(22.2)
DMG	34.3500	116.8670	10/15/1943	1650 1.0	0.0	4.50	0.063	VI	15.0(24.2)
GSP	34.3540	116.8430	11/13/2004	173916.9	9.0	4.20	0.053	VI	15.2(24.4)
GSP	34.3400	116.9000	11/27/1992	160057.5	1.0	5.30	0.094	VII	15.3(24.7)
DMG	34.3370	116.9090	11/30/1962	2351 5.5	7.0	4.30	0.055	VI	15.5(24.9)
GSP	34.6220	116.6670	07/15/2003	061550.8	7.0	4.20	0.051	VI	15.9(25.5)
DMG	34.3330	116.8830	10/14/1943	142844.0	0.0	4.50	0.060	VI	16.0(25.7)
DMG	34.3330	117.0000	02/27/1942	1 853.0	0.0	4.00	0.046	VI	16.1(25.9)
DMG	34.3240	116.8850	12/01/1962	03548.8	9.6	4.30	0.053	VI	16.5(26.6)
DMG	34.3200	116.9250	04/18/1968	174213.4	4.7	4.00	0.045	VI	16.6(26.7)
DMG	34.3250	116.8750	12/02/1962	04138.4	6.7	4.40	0.055	VI	16.6(26.7)
DMG	34.3250	116.8650	10/29/1962	24253.9	8.6	4.80	0.068	VI	16.7(26.9)
GSP	34.3260	116.8570	02/22/2003	122513.6	9.0	4.00	0.044	VI	16.8(27.0)
GSP	34.3240	116.8580	02/22/2003	141608.4	4.0	4.10	0.047	VI	16.9(27.2)
GSP	34.6440	116.6560	06/30/1992	172629.7	0.0	4.30	0.052	VI	16.9(27.2)
GSP	34.3290	116.8320	12/03/2005	074934.6	5.0	4.10	0.046	VI	17.0(27.4)
GSP	34.6430	116.6530	06/30/1992	200025.4	0.0	4.30	0.051	VI	17.1(27.5)
GSP	34.3230	116.8440	10/27/1998	010840.7	5.0	4.90	0.070	VI	17.2(27.6)
GSP	34.3220	116.8460	09/20/1999	070249.2	2.0	4.20	0.048	VI	17.2(27.7)
GSP	34.3200	116.8500	10/27/1998	154017.1	4.0	4.10	0.046	VI	17.3(27.8)
GSP	34.6020	116.6350	10/02/1992	071957.4	3.0	4.30	0.051	VI	17.3(27.9)
DMG	34.3120	116.8790	01/31/1972	155 4.2	8.0	4.00	0.043	VI	17.4(28.0)
GSP	34.3150	116.8440	02/25/2003	040304.8	2.0	4.60	0.059	VI	17.7(28.5)
PAS	34.3220	116.8150	08/29/1985	759 8.7	6.1	4.10	0.045	VI	17.8(28.7)
GSP	34.3110	116.8510	02/22/2003	122133.1	4.0	4.30	0.050	VI	17.9(28.7)
GSP	34.3110	116.8470	02/22/2003	122015.6	4.0	4.00	0.042	VI	17.9(28.8)
GSP	34.3100	116.8500	02/22/2003	193345.8	3.0	4.50	0.055	VI	17.9(28.9)
GSG	34.3100	116.8480	02/22/2003	121910.6	1.0	5.20	0.079	VII	18.0(28.9)
GSP	34.5950	116.6220	06/28/1992	163210.2	0.0	4.40	0.052	VI	18.0(29.0)
MGI	34.3000	116.9000	12/01/1915	14 5 0.0	0.0	4.00	0.042	VI	18.1(29.1)
DMG	34.3070	116.8350	08/28/1950	194526.4	11.7	4.20	0.046	VI	18.4(29.6)
GSP	34.3040	116.8430	02/27/2003	050021.7	4.0	4.00	0.041	V	18.4(29.7)
DMG	34.3170	116.8000	08/12/1950	21717.0	0.0	4.30	0.048	VI	18.5(29.7)
GSP	34.2900	116.9460	02/10/2001	210505.8	9.0	5.10	0.073	VII	18.6(30.0)
DMG	34.4050	116.6670	07/02/1955	162938.5	10.0	4.20	0.046	VI	18.7(30.1)
GSP	34.2870	116.9420	02/11/2001	003916.0	8.0	4.20	0.045	VI	18.8(30.3)
DMG	34.5780	116.6030	06/01/1937	154144.3	10.0	4.00	0.041	V	19.0(30.5)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.3360	116.7420	03/16/1956	233456.4	1.7	4.40	0.050	VI	19.0(30.6)
GSP	34.2980	116.8040	07/05/1992	200303.1	3.0	4.00	0.040	V	19.6(31.5)
DMG	34.2990	116.7840	03/18/1956	24217.3	6.3	4.40	0.048	VI	20.0(32.2)
PAS	34.4010	116.6410	02/10/1975	125117.6	8.0	4.40	0.048	VI	20.1(32.3)
DMG	34.3060	116.7590	03/16/1956	202933.6	1.3	4.80	0.059	VI	20.2(32.5)
DMG	34.2670	116.9670	08/29/1943	35754.0	0.0	4.00	0.039	V	20.3(32.7)
DMG	34.2670	116.9670	08/29/1943	51630.0	0.0	4.00	0.039	V	20.3(32.7)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.085	VII	20.3(32.7)
GSP	34.2560	116.9120	06/28/1992	170557.5	8.0	4.60	0.051	VI	21.0(33.8)
PAS	34.2490	116.9000	06/30/1979	7 353.0	5.6	4.50	0.048	VI	21.6(34.7)
PAS	34.2460	116.9010	06/29/1979	55320.5	5.7	4.60	0.050	VI	21.8(35.0)
GSP	34.2730	116.7740	08/24/1992	135146.0	1.0	4.30	0.043	VI	21.9(35.2)
PAS	34.2430	116.8960	06/30/1979	03411.6	5.8	4.90	0.058	VI	22.0(35.4)
PAS	34.3820	116.6130	06/11/1984	222110.4	1.8	4.00	0.036	V	22.1(35.6)
GSP	34.2670	116.7750	12/02/2000	082807.4	3.0	4.10	0.038	V	22.2(35.7)
GSP	34.2810	116.7310	07/01/1992	205356.8	1.0	4.00	0.036	V	22.5(36.2)
GSP	34.2390	116.8370	07/09/1992	014357.6	0.0	5.30	0.070	VI	22.9(36.8)
DMG	34.2640	116.7550	03/16/1956	203613.6	3.3	4.00	0.035	V	22.9(36.8)
GSP	34.2750	116.7300	07/01/1992	204617.8	1.0	4.20	0.039	V	22.9(36.9)
GSG	34.4880	116.5400	06/29/1992	015808.8	5.0	4.10	0.037	V	23.1(37.1)
GSP	34.2320	116.8460	07/10/1992	012940.0	0.0	4.20	0.039	V	23.2(37.4)
DMG	34.2500	116.7700	03/16/1956	203344.3	0.8	4.00	0.035	V	23.4(37.6)
GSP	34.2370	116.8110	06/28/1992	125730.8	10.0	4.00	0.035	V	23.4(37.7)
GSP	34.2250	116.8440	07/09/1992	023435.0	0.0	4.10	0.036	V	23.7(38.2)
GSP	34.2740	116.6920	07/01/1992	170715.1	4.0	4.20	0.038	V	24.1(38.9)
DMG	34.2290	116.7950	05/11/1956	163050.5	13.3	4.70	0.049	VI	24.2(39.0)
PAS	34.4220	116.5420	07/18/1985	14 525.8	6.0	4.20	0.037	V	24.4(39.2)
GSP	34.6400	116.5170	08/01/1994	213431.1	9.0	4.90	0.054	VI	24.4(39.3)
GSP	34.2500	116.7190	06/29/1992	164141.9	1.0	4.90	0.053	VI	24.7(39.8)
MGI	34.2000	116.9000	10/10/1915	5 6 0.0	0.0	4.00	0.033	V	24.9(40.1)
PAS	34.1980	116.9590	04/01/1978	105227.4	8.0	4.00	0.033	V	25.0(40.3)
PAS	34.5160	116.4950	06/01/1975	13849.2	4.5	5.20	0.061	VI	25.3(40.7)
GSP	34.1980	116.8620	08/18/1992	094640.7	12.0	4.20	0.036	V	25.3(40.8)
GSP	34.2190	116.7710	07/21/1992	211029.0	1.0	4.10	0.034	V	25.3(40.8)
GSN	34.2030	116.8270	06/28/1992	150530.7	5.0	6.70	0.135	VIII	25.4(40.9)
GSP	34.1950	116.8620	08/17/1992	204152.1	11.0	5.30	0.064	VI	25.5(41.1)
DMG	34.9330	116.8830	04/27/1932	233518.3	0.0	4.00	0.032	V	25.9(41.7)
GSP	34.2110	116.7600	06/28/1992	152429.3	6.0	4.50	0.041	V	26.1(42.0)
GSP	34.4890	116.4830	07/24/1992	072356.1	9.0	4.00	0.032	V	26.2(42.2)
DMG	34.1800	116.9200	01/16/1930	02433.9	0.0	5.20	0.060	VI	26.2(42.2)
DMG	34.1800	116.9200	01/16/1930	034 3.6	0.0	5.10	0.057	VI	26.2(42.2)
GSP	34.1780	116.9220	06/28/1992	170131.9	13.0	4.70	0.046	VI	26.4(42.5)
GSP	34.2070	116.7570	06/28/1992	161719.2	3.0	4.20	0.035	V	26.4(42.5)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.090	VII	26.6(42.7)
GSP	34.1800	117.0200	12/04/1991	081703.5	11.0	4.00	0.031	V	26.7(42.9)
DMG	34.7120	116.5030	09/25/1965	174344.1	10.6	5.20	0.059	VI	26.7(43.0)
DMG	34.9500	116.9500	12/18/1948	234517.0	0.0	4.40	0.038	V	26.9(43.3)
GSP	34.1920	117.0950	04/06/1994	190104.1	7.0	4.80	0.047	VI	27.0(43.4)
DMG	34.8830	116.6670	09/20/1949	41411.0	0.0	4.10	0.033	V	27.0(43.5)
GSP	34.4570	116.4760	07/06/1992	180636.3	0.0	4.30	0.036	V	27.1(43.6)
GSP	34.1830	116.8020	06/28/1992	192637.6	1.0	4.00	0.031	V	27.1(43.6)
DMG	34.9540	116.9610	10/01/1953	193516.2	6.0	4.10	0.032	V	27.2(43.8)
DMG	34.1670	116.9830	10/16/1951	1241 5.0	0.0	4.00	0.031	V	27.3(43.9)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.4560	116.4690	08/31/1992	092540.6	11.0	4.30	0.036	V	27.5(44.3)
GSP	34.9440	116.7980	10/11/1992	123812.5	2.0	4.50	0.040	V	27.6(44.5)
GSP	34.3410	116.5290	06/28/1992	124053.5	6.0	5.20	0.057	VI	27.7(44.5)
DMG	34.5160	116.4510	04/05/1974	104250.7	4.8	4.10	0.032	V	27.7(44.7)
GSP	34.1630	116.8550	06/28/1992	144321.0	6.0	5.30	0.060	VI	27.8(44.7)
GSP	34.1570	116.9760	12/19/2007	121409.0	7.0	4.00	0.030	V	27.9(44.9)
DMG	34.9670	116.9330	12/30/1947	191914.0	0.0	4.00	0.030	V	28.1(45.2)
GSP	34.1630	116.8270	06/28/1992	150451.5	12.0	4.40	0.037	V	28.1(45.2)
DMG	34.7110	116.4760	09/25/1965	1748 2.4	4.8	4.90	0.048	VI	28.1(45.3)
PAS	34.1510	116.9720	11/20/1978	655 9.5	6.1	4.30	0.035	V	28.3(45.6)
DMG	34.8500	116.5830	07/30/1932	71359.7	0.0	4.50	0.039	V	28.3(45.6)
GSP	34.9710	116.9370	07/01/1992	102947.7	0.0	4.30	0.035	V	28.4(45.7)
GSP	34.9710	116.9390	07/20/1992	044801.5	4.0	4.60	0.041	V	28.4(45.7)
GSP	34.9730	116.9360	07/01/1992	103252.3	0.0	4.10	0.031	V	28.5(45.9)
GSP	34.4140	116.4610	06/28/1992	131050.5	10.0	4.80	0.045	VI	28.8(46.4)
DMG	34.9670	116.8170	08/30/1950	1659 4.0	0.0	4.20	0.033	V	28.9(46.5)
GSP	34.4050	116.4640	02/15/1993	075933.2	5.0	4.20	0.033	V	28.9(46.5)
DMG	34.9760	116.9960	11/07/1958	1738 3.7	12.2	4.10	0.031	V	28.9(46.5)
GSP	34.9790	116.9510	11/26/1992	214117.2	0.0	4.00	0.029	V	28.9(46.6)
GSP	34.9790	116.9520	08/05/1992	222240.8	0.0	4.80	0.045	VI	28.9(46.6)
DMG	34.3810	116.4740	01/06/1964	234712.8	12.3	4.50	0.038	V	29.1(46.8)
GSP	34.9700	116.8190	03/18/1997	152447.7	1.0	5.10	0.052	VI	29.1(46.8)
GSP	34.1410	116.8570	09/19/1997	223714.5	10.0	4.10	0.031	V	29.3(47.1)
DMG	34.1330	116.9500	06/10/1938	1440 0.0	0.0	4.00	0.029	V	29.5(47.5)
DMG	34.7500	116.4670	03/31/1938	17 3 0.0	0.0	4.00	0.029	V	29.7(47.8)
GSP	34.9920	116.9480	07/20/1992	131319.4	0.0	4.60	0.039	V	29.8(48.0)
GSP	34.3770	116.4580	08/08/1992	153743.3	2.0	4.40	0.035	V	30.0(48.3)
DMG	34.8300	116.5200	09/26/1929	20 022.7	0.0	5.10	0.051	VI	30.1(48.4)
GSP	34.3830	116.4520	07/02/1992	051632.2	0.0	4.00	0.029	V	30.1(48.5)
GSP	34.1210	116.9280	08/16/1998	133440.2	6.0	4.70	0.041	V	30.3(48.8)
GSP	34.1200	116.9980	06/29/1992	144126.0	4.0	4.40	0.035	V	30.6(49.2)
DMG	35.0000	117.0000	08/01/1947	154230.0	0.0	4.00	0.028	V	30.6(49.2)
PAS	34.3020	116.4990	03/31/1979	016 8.6	0.1	4.20	0.031	V	30.6(49.2)
GSP	34.3420	116.4670	07/07/1992	220928.3	2.0	4.40	0.035	V	30.6(49.3)
GSP	34.1120	116.9200	10/01/1998	181816.0	4.0	4.70	0.040	V	30.9(49.8)
PAS	34.3480	116.4530	03/15/1979	213425.6	1.5	4.50	0.036	V	31.1(50.1)
GSP	34.9470	116.6520	10/26/1993	092407.4	6.0	4.00	0.028	V	31.2(50.2)
GSP	34.3320	116.4620	07/01/1992	074029.9	9.0	5.40	0.058	VI	31.2(50.3)
GSP	34.9100	116.5800	06/29/1991	175352.0	6.0	4.00	0.028	V	31.5(50.7)
DMG	34.4000	116.4170	11/10/1947	22255.0	0.0	4.50	0.036	V	31.5(50.7)
GSP	34.1300	116.7340	06/30/1992	212254.4	12.0	4.80	0.042	VI	31.8(51.2)
DMG	34.1000	116.8830	10/24/1935	1527 0.0	0.0	4.00	0.027	V	31.9(51.3)
DMG	34.1000	116.8830	10/24/1935	1451 0.0	0.0	4.50	0.036	V	31.9(51.3)
DMG	34.1000	116.8830	10/24/1935	1452 0.0	0.0	4.50	0.036	V	31.9(51.3)
GSP	34.0970	116.9960	12/05/1997	170438.9	4.0	4.10	0.029	V	32.1(51.7)
GSP	35.0260	116.9680	08/06/1992	165060.0	4.0	4.00	0.027	V	32.2(51.9)
GSP	35.0260	116.9720	02/11/1993	123937.0	3.0	4.50	0.035	V	32.2(51.9)
PAS	34.3300	116.4430	03/15/1979	23 758.2	2.8	4.80	0.041	V	32.2(51.9)
PAS	34.3270	116.4450	03/15/1979	21 716.5	2.5	5.20	0.051	VI	32.3(51.9)
DMG	34.1170	116.7500	08/22/1942	125913.0	0.0	4.00	0.027	V	32.4(52.1)
MGI	34.2000	117.3000	04/13/1913	1045 0.0	0.0	4.00	0.027	V	32.4(52.1)
GSP	35.0300	116.9680	07/05/1992	105543.3	0.0	4.70	0.039	V	32.5(52.3)
DMG	34.1000	116.8000	10/24/1935	1448 7.6	0.0	5.10	0.048	VI	32.7(52.6)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.3130	116.4440	07/02/1992	001622.4	6.0	4.00	0.027	V	32.8(52.8)
GSP	35.0330	116.9900	08/23/1992	064044.5	4.0	4.00	0.027	V	32.8(52.8)
GSP	34.3010	116.4520	09/28/1997	155723.0	7.0	4.40	0.033	V	32.9(52.9)
DMG	35.0330	116.8670	11/10/1948	235613.0	0.0	4.10	0.028	V	32.9(52.9)
GSP	34.0840	116.9680	10/02/2008	094149.3	12.0	4.10	0.028	V	32.9(53.0)
DMG	35.0370	116.9400	08/13/1947	20 9 0.1	15.6	4.30	0.031	V	32.9(53.0)
GSP	34.0850	116.9890	06/30/1992	214900.3	3.0	4.40	0.033	V	32.9(53.0)
GSP	34.2940	116.4530	06/28/1992	173121.5	6.0	4.10	0.028	V	33.1(53.2)
PAS	34.3090	116.4400	03/15/1979	201749.9	2.0	4.90	0.043	VI	33.1(53.3)
GSP	34.6050	116.3510	07/08/1992	080538.7	10.0	4.40	0.033	V	33.4(53.7)
GSP	35.0450	116.9760	11/25/1992	024024.9	3.0	4.10	0.028	V	33.6(54.0)
GSP	34.6800	116.3600	10/20/1999	164057.0	7.0	4.20	0.029	V	33.8(54.3)
DMG	34.6260	116.3470	07/30/1974	739 7.1	8.0	4.40	0.032	V	33.8(54.4)
DMG	34.9330	116.5500	05/04/1947	25039.0	0.0	4.00	0.026	V	33.8(54.4)
GSP	34.6820	116.3570	06/12/2000	031502.7	7.0	4.00	0.026	V	34.0(54.6)
GSP	34.5760	116.3360	07/08/1992	022311.3	6.0	4.90	0.042	VI	34.1(54.9)
GSP	34.8000	116.4100	10/21/1999	015435.0	1.0	5.00	0.044	VI	34.2(55.0)
GSP	34.8130	116.4190	12/06/2008	041842.9	7.0	5.10	0.046	VI	34.2(55.0)
DMG	34.6340	116.3410	07/30/1974	83653.6	12.7	4.30	0.030	V	34.2(55.0)
GSP	34.7100	116.3600	10/16/1999	225341.0	6.0	4.60	0.035	V	34.3(55.2)
DMG	34.1000	116.7000	02/07/1889	520 0.0	0.0	5.30	0.051	VI	34.5(55.5)
PAS	34.3290	116.3980	03/16/1979	173659.1	5.0	4.00	0.026	V	34.5(55.6)
DMG	34.3000	116.4170	08/07/1942	15314.0	0.0	4.00	0.026	V	34.6(55.6)
DMG	34.3000	116.4170	08/07/1942	12358.0	0.0	4.00	0.026	V	34.6(55.6)
DMG	34.3000	116.4170	08/07/1942	11533.0	0.0	4.50	0.033	V	34.6(55.6)
T-A	34.1700	117.3200	12/02/1859	2210 0.0	0.0	4.30	0.030	V	34.7(55.8)
GSP	34.6700	116.3400	10/16/1999	211050.0	6.0	4.10	0.027	V	34.7(55.8)
GSP	34.0580	117.0100	06/16/2005	205326.0	11.0	4.90	0.041	V	34.9(56.2)
GSP	35.0170	117.2030	06/29/1992	041642.6	3.0	4.00	0.025	V	35.0(56.3)
DMG	34.9330	116.5170	05/22/1947	439 0.0	0.0	4.00	0.025	V	35.0(56.4)
DMG	34.9330	116.5170	04/12/1947	18 434.0	0.0	4.00	0.025	V	35.0(56.4)
DMG	34.9330	116.5170	04/11/1947	184340.0	0.0	4.10	0.027	V	35.0(56.4)
DMG	34.9330	116.5170	04/12/1947	234852.0	0.0	4.20	0.028	V	35.0(56.4)
DMG	34.9330	116.5170	04/21/1947	191529.0	0.0	4.40	0.031	V	35.0(56.4)
DMG	34.9330	116.5170	04/10/1947	171218.0	0.0	4.40	0.031	V	35.0(56.4)
DMG	34.9330	116.5170	04/11/1947	33210.0	0.0	4.30	0.030	V	35.0(56.4)
DMG	34.9330	116.5170	04/10/1947	222723.0	0.0	4.20	0.028	V	35.0(56.4)
GSP	34.5830	116.3190	07/05/1992	211827.1	0.0	5.40	0.053	VI	35.1(56.5)
GSP	34.1110	116.6460	06/28/1992	140928.8	7.0	4.10	0.027	V	35.1(56.5)
MGI	34.1000	117.2000	04/23/1923	2113 0.0	0.0	4.00	0.025	V	35.1(56.6)
DMG	34.9500	116.5330	04/11/1947	2 711.0	0.0	4.10	0.027	V	35.3(56.8)
DMG	34.9500	116.5330	04/10/1947	171822.0	0.0	5.00	0.043	VI	35.3(56.8)
GSP	34.0540	117.0300	06/27/2005	221733.6	12.0	4.00	0.025	V	35.3(56.9)
PAS	34.2570	116.4350	07/13/1979	226 3.5	5.0	4.00	0.025	V	35.4(56.9)
GSP	34.7100	116.3400	10/19/1999	122044.0	5.0	4.60	0.035	V	35.4(57.0)
GSP	34.1680	117.3370	06/28/1997	214525.1	9.0	4.20	0.028	V	35.4(57.0)
DMG	34.9670	116.5500	04/11/1947	747 0.0	0.0	5.00	0.042	VI	35.6(57.3)
DMG	34.9670	116.5500	04/19/1947	229 9.0	0.0	4.70	0.036	V	35.6(57.3)
DMG	34.9670	116.5500	01/03/1949	134340.0	0.0	4.80	0.038	V	35.6(57.3)
DMG	34.9670	116.5500	04/10/1947	16 3 0.0	0.0	5.10	0.045	VI	35.6(57.3)
DMG	34.9670	116.5500	04/10/1947	182759.0	0.0	4.30	0.029	V	35.6(57.3)
DMG	34.9670	116.5500	04/10/1947	1713 0.0	0.0	4.30	0.029	V	35.6(57.3)
GSP	34.8360	116.4050	11/14/1999	142009.4	6.0	4.50	0.033	V	35.7(57.4)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.2390	116.4430	06/29/1992	030156.4	7.0	4.40	0.031	V	35.8(57.6)
GSP	34.8200	116.3900	10/22/1999	164823.0	6.0	4.20	0.028	V	35.8(57.6)
GSP	35.0770	116.9960	09/09/1992	114455.0	0.0	4.20	0.028	V	35.9(57.7)
GSP	34.5830	116.3040	07/05/1992	223345.5	0.0	4.40	0.031	V	36.0(57.9)
GSP	34.8030	116.3720	02/14/2000	095742.0	2.0	4.40	0.031	V	36.1(58.2)
GSP	34.2450	116.4290	07/08/1993	225744.9	2.0	4.00	0.025	V	36.2(58.2)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.054	VI	36.3(58.4)
GSP	34.2720	116.4030	12/11/1992	013834.2	2.0	4.10	0.026	V	36.3(58.4)
GSP	34.8600	116.4100	10/22/1999	160848.0	1.0	5.00	0.042	VI	36.3(58.5)
GSP	34.1900	117.3900	12/28/1989	094108.1	15.0	4.50	0.032	V	36.4(58.5)
GSP	34.2680	116.4020	06/16/1994	162427.5	3.0	5.00	0.042	VI	36.5(58.7)
DMG	34.9830	116.5500	04/10/1947	1558 6.0	0.0	6.20	0.078	VII	36.5(58.7)
DMG	34.9830	116.5500	11/17/1947	14 710.0	0.0	4.30	0.029	V	36.5(58.7)
GSP	34.5240	116.2950	04/05/2002	080256.1	5.0	4.40	0.030	V	36.5(58.8)
GSP	34.6800	116.3080	10/16/1999	160824.6	0.0	4.10	0.026	V	36.6(58.9)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.091	VII	36.8(59.2)
GSP	34.8600	116.4000	10/21/1999	012542.0	3.0	4.30	0.029	V	36.8(59.2)
DMG	34.1400	117.3390	02/26/1936	93327.6	10.0	4.00	0.024	V	37.0(59.5)
GSP	34.8300	116.3700	10/17/1999	042248.0	6.0	4.20	0.027	V	37.1(59.8)
GSP	34.5830	116.2830	10/16/1999	110638.4	0.0	4.20	0.027	V	37.2(59.8)
GSP	34.8700	116.4000	10/21/1999	015406.0	4.0	4.50	0.032	V	37.2(59.9)
GSP	34.8600	116.3900	10/21/1999	015738.0	4.0	5.00	0.041	V	37.3(60.0)
GSP	34.8600	116.3900	10/22/1999	201730.0	2.0	4.30	0.028	V	37.3(60.0)
GSP	34.8600	116.3900	10/22/1999	201601.0	3.0	4.20	0.027	V	37.3(60.0)
GSP	34.6710	116.2920	10/16/1999	100954.6	1.0	4.00	0.024	V	37.4(60.2)
GSP	34.5990	116.2800	08/14/1996	030527.5	6.0	4.30	0.028	V	37.4(60.2)
GSP	34.7000	116.3000	10/30/1999	111857.0	6.0	4.00	0.024	V	37.4(60.2)
GSP	34.7110	116.3030	10/16/1999	114958.6	1.0	4.10	0.025	V	37.4(60.2)
GSP	34.6040	116.2780	10/20/1996	001733.4	6.0	4.10	0.025	V	37.5(60.4)
DMG	34.0290	116.7870	04/30/1954	03623.9	11.1	4.20	0.027	V	37.6(60.6)
GSP	34.7040	116.2970	10/16/1999	180157.5	2.0	4.30	0.028	V	37.6(60.6)
PDP	34.1070	117.3040	01/09/2009	034946.3	14.0	4.50	0.031	V	37.7(60.6)
T-A	34.0800	117.2500	10/07/1869	0 0 0.0	0.0	4.30	0.028	V	37.7(60.6)
DMG	34.1270	117.3380	02/23/1936	222042.7	10.0	4.50	0.031	V	37.7(60.6)
GSP	34.1990	116.4390	09/05/1995	202718.4	0.0	4.40	0.030	V	37.7(60.7)
GSP	34.6290	116.2770	10/16/1999	101048.9	0.0	4.30	0.028	V	37.8(60.8)
GSN	34.2010	116.4360	06/28/1992	115734.1	1.0	7.60	0.160	VIII	37.8(60.8)
GSP	34.7190	116.2980	10/16/1999	120318.4	0.0	4.30	0.028	V	37.9(60.9)
GSG	34.5940	116.2710	10/16/1999	094644.1	0.0	7.10	0.122	VII	37.9(60.9)
DMG	34.1000	117.3000	02/16/1931	1327 0.0	0.0	4.00	0.024	IV	37.9(61.0)
MGI	34.1000	117.3000	11/22/1911	257 0.0	0.0	4.00	0.024	IV	37.9(61.0)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.047	VI	37.9(61.0)
MGI	34.1000	117.3000	12/27/1901	11 0 0.0	0.0	4.60	0.033	V	37.9(61.0)
GSP	34.5200	116.2700	10/29/1999	123637.0	0.0	4.50	0.031	V	38.0(61.1)
GSP	34.8130	116.3410	10/16/1999	112604.8	0.0	4.70	0.034	V	38.0(61.2)
DMG	34.0170	117.0500	02/19/1940	12 655.7	0.0	4.60	0.033	V	38.0(61.2)
GSP	34.1980	116.4320	07/20/1992	040822.6	0.0	4.10	0.025	V	38.1(61.3)
GSP	34.5000	116.2700	10/22/1999	034933.0	0.0	4.00	0.024	IV	38.1(61.3)
GSP	34.6800	116.2800	10/16/1999	095935.0	8.0	5.80	0.061	VI	38.2(61.4)
GSP	34.5920	116.2650	12/23/1999	143054.4	7.0	4.10	0.025	V	38.2(61.5)
PAS	34.3040	116.3410	11/15/1975	61327.6	5.8	4.60	0.033	V	38.2(61.5)
DMG	34.1180	117.3410	09/22/1951	82239.1	11.9	4.30	0.028	V	38.3(61.6)
GSP	34.8440	116.3570	11/03/1999	032757.0	7.0	4.10	0.025	V	38.3(61.6)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.6900	116.2800	10/16/1999	201337.0	6.0	4.70	0.034	V	38.3(61.7)
GSP	34.8500	116.3600	10/30/1999	033259.0	6.0	4.20	0.026	V	38.3(61.7)
GSP	34.8290	116.3450	10/16/1999	135917.0	0.0	4.40	0.029	V	38.3(61.7)
DMG	34.2170	117.4670	03/25/1941	234341.0	0.0	4.00	0.024	IV	38.4(61.8)
GSP	34.5600	116.2600	10/22/1999	015843.0	0.0	4.00	0.024	IV	38.4(61.8)
GSP	34.5070	116.2630	10/16/1999	125509.6	0.0	4.50	0.031	V	38.4(61.9)
GSP	34.5900	116.2600	10/16/1999	100239.0	0.0	4.50	0.031	V	38.5(61.9)
USG	34.1390	117.3860	02/21/1987	231530.1	2.6	4.07	0.024	V	38.8(62.4)
GSP	34.1520	116.4680	06/28/1992	224822.9	11.0	4.10	0.025	V	38.8(62.4)
GSP	34.0140	116.7750	10/18/2005	040841.5	16.0	4.10	0.025	V	38.8(62.4)
GSP	34.8500	116.3500	10/18/1999	110220.0	6.0	4.40	0.029	V	38.8(62.5)
DMG	34.2670	117.5180	09/12/1970	141011.2	8.0	4.10	0.025	V	38.8(62.5)
DMG	34.0000	117.0000	06/30/1923	022 0.0	0.0	4.50	0.031	V	38.8(62.5)
DMG	34.0140	116.7710	06/10/1944	111150.5	10.0	4.50	0.031	V	38.9(62.5)
GSP	34.0120	116.7750	10/18/2005	073103.5	18.0	4.40	0.029	V	38.9(62.7)
GSP	34.4390	116.2620	10/16/1999	095148.3	0.0	4.90	0.037	V	39.2(63.2)
DMG	34.0430	117.2280	04/03/1939	25044.7	10.0	4.00	0.023	IV	39.4(63.4)
GSP	34.7830	116.2940	06/26/2000	154307.5	4.0	4.60	0.032	V	39.6(63.7)
PAS	34.2900	116.3220	12/14/1975	181620.1	1.8	4.70	0.033	V	39.6(63.8)
GSP	34.6160	116.2420	10/25/1999	182600.6	0.0	4.60	0.032	V	39.6(63.8)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.048	VI	39.8(64.1)
PAS	34.2300	116.3630	03/18/1979	2253 2.7	3.4	4.20	0.026	V	39.8(64.1)
GSP	34.7400	116.2700	10/19/1999	103939.0	14.0	4.10	0.024	V	39.8(64.1)
GSP	34.0470	117.2550	02/21/2000	134943.1	15.0	4.50	0.030	V	39.8(64.1)
PAS	34.0310	116.6570	07/08/1986	92412.8	6.0	4.40	0.028	V	39.8(64.1)
GSP	34.7900	116.2920	11/07/1999	064749.7	5.0	4.00	0.023	IV	39.9(64.1)
GSP	34.8660	116.3400	04/23/2008	015529.4	5.0	4.10	0.024	V	39.9(64.2)
DMG	34.3500	116.2830	09/20/1942	161414.0	0.0	4.00	0.023	IV	39.9(64.2)
DMG	34.0650	116.5740	08/26/1959	53250.2	16.7	4.30	0.027	V	39.9(64.2)
GSP	34.4420	116.2480	10/16/1999	125721.0	1.0	5.70	0.056	VI	40.0(64.3)
GSP	34.4300	116.2510	10/16/1999	173848.6	0.0	4.90	0.037	V	40.0(64.4)
DMG	34.2810	117.5520	09/13/1970	44748.6	8.0	4.40	0.028	V	40.0(64.4)
DMG	34.3500	116.2800	04/27/1931	23 758.6	0.0	4.00	0.023	IV	40.1(64.5)
GSP	35.1150	116.7230	09/22/1992	185233.3	7.0	4.10	0.024	V	40.2(64.6)
DMG	34.3040	117.5700	05/05/1969	16 2 9.6	8.8	4.40	0.028	V	40.2(64.7)
GSP	34.1710	116.4090	06/30/1992	151905.0	0.0	4.00	0.023	IV	40.3(64.8)
DMG	34.2000	117.5000	06/14/1892	1325 0.0	0.0	4.90	0.036	V	40.6(65.4)
GSP	34.0240	117.2300	03/11/1998	121851.8	14.0	4.50	0.029	V	40.6(65.4)
DMG	34.1320	117.4260	04/15/1965	20 833.3	5.5	4.50	0.029	V	40.7(65.4)
GSP	34.4510	116.2300	10/16/1999	135117.6	0.0	4.30	0.026	V	40.9(65.8)
GSP	34.1620	116.4050	06/28/1992	132605.1	6.0	4.90	0.036	V	40.9(65.8)
GSP	34.1390	116.4310	06/28/1992	123640.6	10.0	5.10	0.040	V	40.9(65.8)
DMG	34.0000	116.7000	08/25/1944	73025.0	0.0	4.20	0.025	V	40.9(65.9)
DMG	33.9680	116.8820	06/27/1959	162211.1	13.8	4.00	0.022	IV	41.0(66.0)
PAS	34.0230	117.2450	10/02/1985	234412.4	15.2	4.80	0.034	V	41.0(66.1)
DMG	34.2330	116.3330	05/11/1947	5 620.0	0.0	4.90	0.036	V	41.1(66.1)
DMG	33.9940	116.7120	06/12/1944	111636.0	10.0	5.30	0.045	VI	41.1(66.2)
DMG	35.1560	117.0040	03/20/1949	193449.7	12.8	4.40	0.028	V	41.3(66.5)
DMG	33.9760	116.7750	10/17/1965	94519.0	17.0	4.90	0.036	V	41.4(66.5)
PAS	34.1350	117.4480	01/08/1983	71930.4	4.6	4.10	0.024	IV	41.4(66.6)
GSP	34.1250	117.4380	01/06/2005	143527.7	4.0	4.40	0.028	V	41.5(66.8)
GSP	34.8030	116.2670	10/29/2002	141654.1	4.0	4.80	0.034	V	41.5(66.8)
DMG	34.2110	117.5300	09/01/1937	1348 8.2	10.0	4.50	0.029	V	41.5(66.9)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	34.2110	117.5300	10/19/1979	122237.8	4.9	4.10	0.023	IV	41.5(66.9)
GSP	34.3850	117.6350	10/16/2007	085344.1	8.0	4.20	0.025	V	41.6(66.9)
DMG	33.9730	116.7690	06/10/1944	111531.9	10.0	4.00	0.022	IV	41.6(67.0)
DMG	33.9670	116.8000	09/07/1945	153424.0	0.0	4.30	0.026	V	41.7(67.1)
DMG	34.1120	117.4260	03/19/1937	12338.4	10.0	4.00	0.022	IV	41.7(67.1)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.063	VI	41.9(67.4)
GSP	34.1390	117.4650	03/09/2008	092232.1	3.0	4.00	0.022	IV	41.9(67.4)
DMG	35.1470	117.1310	07/01/1960	221344.6	7.7	4.50	0.029	V	42.0(67.6)
DMG	33.9760	116.7210	06/12/1944	104534.7	10.0	5.10	0.039	V	42.1(67.8)
DMG	33.9810	116.7020	06/12/1944	222119.5	10.0	4.20	0.024	V	42.1(67.8)
PAS	33.9760	116.7130	08/06/1984	81436.6	14.2	4.30	0.026	V	42.3(68.0)
DMG	34.0330	117.3170	09/03/1935	647 0.0	0.0	4.50	0.029	V	42.4(68.2)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.037	V	42.4(68.2)
DMG	34.0830	116.4670	03/01/1942	104631.0	0.0	4.00	0.022	IV	42.4(68.3)
DMG	34.0830	116.4670	01/26/1934	1844 0.0	0.0	4.00	0.022	IV	42.4(68.3)
GSG	34.1570	116.3730	06/29/1992	103657.8	5.0	4.00	0.022	IV	42.5(68.3)
PAS	33.9910	116.6490	07/17/1986	215445.2	7.4	4.40	0.027	V	42.6(68.5)
GSP	34.3740	117.6490	08/20/1998	234958.4	9.0	4.40	0.027	V	42.6(68.5)
DMG	34.0000	117.2500	11/01/1932	445 0.0	0.0	4.00	0.022	IV	42.6(68.6)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.071	VI	42.6(68.6)
PAS	33.9790	116.6810	12/16/1988	553 5.0	8.1	4.80	0.033	V	42.7(68.7)
GSP	34.1750	116.3500	06/11/1992	002419.2	0.0	4.30	0.026	V	42.7(68.7)
PAS	33.9890	116.6490	07/17/1986	203515.0	6.2	4.00	0.022	IV	42.7(68.7)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.106	VII	42.7(68.7)
GSP	34.1270	116.3970	06/30/1992	000608.5	2.0	4.30	0.025	V	42.9(69.0)
GSP	34.1120	116.4150	07/28/1992	182703.9	0.0	4.60	0.030	V	42.9(69.0)
PAS	33.9980	116.6060	07/08/1986	92044.5	11.7	5.60	0.050	VI	43.1(69.4)
GSP	34.1110	116.4100	06/28/1992	135045.7	0.0	4.90	0.035	V	43.1(69.4)
DMG	34.1240	117.4800	05/15/1955	17 326.0	7.6	4.00	0.022	IV	43.2(69.5)
GSP	34.0950	116.4270	06/28/1992	211316.5	3.0	4.60	0.030	V	43.3(69.6)
DMG	33.9960	117.2700	02/17/1952	123658.3	16.0	4.50	0.028	V	43.3(69.8)
GSP	34.3700	116.2100	10/16/1999	110433.0	6.0	4.00	0.022	IV	43.4(69.8)
DMG	34.0330	117.3500	04/18/1940	184343.9	0.0	4.40	0.027	V	43.4(69.8)
DMG	34.1160	117.4750	06/28/1960	20 048.0	12.0	4.10	0.023	IV	43.4(69.8)
DMG	34.0000	117.2830	11/07/1939	1852 8.4	0.0	4.70	0.031	V	43.4(69.9)
GSP	34.1080	116.4040	06/29/1992	141338.8	9.0	5.40	0.045	VI	43.5(70.0)
DMG	34.1830	117.5480	09/01/1937	163533.5	10.0	4.50	0.028	V	43.5(70.0)
DMG	34.1670	117.5330	03/01/1948	81213.0	0.0	4.70	0.031	V	43.5(70.0)
GSP	34.0960	116.4170	07/18/1992	000611.2	2.0	4.00	0.021	IV	43.6(70.2)
GSP	34.0890	116.4260	06/28/1992	143906.9	0.0	4.30	0.025	V	43.6(70.2)
DMG	33.9500	116.7330	04/26/1942	151023.0	0.0	4.00	0.021	IV	43.7(70.3)
GSP	34.1060	116.4020	06/29/1992	140837.7	11.0	4.90	0.034	V	43.7(70.3)
GSP	34.0920	116.4140	12/21/1992	114402.9	3.0	4.00	0.021	IV	43.9(70.7)
DMG	34.1400	117.5150	01/01/1965	8 418.0	5.9	4.40	0.026	V	43.9(70.7)
GSP	34.3300	116.2100	10/22/1999	124052.0	7.0	4.30	0.025	V	44.3(71.3)
DMG	35.1060	117.3460	10/11/1966	165912.9	6.5	4.40	0.026	V	44.3(71.3)
DMG	34.0670	116.4320	12/04/1957	25144.0	3.7	4.30	0.025	V	44.5(71.7)
DMG	33.9590	116.6510	09/23/1949	214440.1	12.2	4.00	0.021	IV	44.6(71.7)
DMG	33.9330	116.7500	10/28/1944	183016.0	0.0	4.40	0.026	V	44.6(71.7)
DMG	33.9330	116.7500	08/06/1938	228 0.0	0.0	4.00	0.021	IV	44.6(71.7)
GSP	34.0880	116.4020	08/15/1992	082414.7	0.0	4.80	0.032	V	44.6(71.8)
GSP	34.1020	116.3830	08/04/1992	190612.3	0.0	4.00	0.021	IV	44.7(71.9)
PAS	33.9870	116.5690	07/09/1986	01232.1	6.0	4.40	0.026	V	44.8(72.0)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.1270	117.5210	12/27/1938	10 928.6	10.0	4.00	0.021	IV	44.8(72.1)
PAS	33.9670	116.6170	07/08/1986	102240.6	6.0	4.40	0.026	V	44.8(72.1)
PAS	33.9670	116.6170	07/08/1986	155526.2	6.0	4.00	0.021	IV	44.8(72.1)
GSP	34.0970	116.3820	07/01/1992	070149.2	0.0	4.30	0.025	V	44.9(72.3)
DMG	34.0170	116.5000	07/26/1947	24941.0	0.0	5.10	0.037	V	45.0(72.4)
DMG	34.0170	116.5000	07/24/1947	225426.0	0.0	4.90	0.034	V	45.0(72.4)
DMG	34.0170	116.5000	07/24/1947	221046.0	0.0	5.50	0.046	VI	45.0(72.4)
DMG	34.0170	116.5000	07/24/1947	225341.0	0.0	4.30	0.025	V	45.0(72.4)
DMG	34.0170	116.5000	07/29/1947	163615.0	0.0	4.20	0.023	IV	45.0(72.4)
DMG	34.0170	116.5000	07/26/1947	23 425.0	0.0	4.50	0.027	V	45.0(72.4)
DMG	34.0170	116.5000	07/26/1947	12415.0	0.0	4.20	0.023	IV	45.0(72.4)
DMG	34.0170	116.5000	07/26/1947	231351.0	0.0	4.10	0.022	IV	45.0(72.4)
DMG	34.0170	116.5000	07/25/1947	75730.0	0.0	4.20	0.023	IV	45.0(72.4)
DMG	34.0170	116.5000	07/25/1947	04631.0	0.0	5.00	0.035	V	45.0(72.4)
DMG	34.0170	116.5000	08/01/1947	17 137.0	0.0	4.10	0.022	IV	45.0(72.4)
DMG	34.0170	116.5000	08/08/1947	64745.0	0.0	4.00	0.021	IV	45.0(72.4)
DMG	34.0170	116.5000	07/25/1947	61949.0	0.0	5.20	0.039	V	45.0(72.4)
DMG	34.0170	116.5000	07/25/1947	161453.0	0.0	4.50	0.027	V	45.0(72.4)
DMG	34.0170	116.5000	07/25/1947	51752.0	0.0	4.30	0.025	V	45.0(72.4)
DMG	34.0170	116.5000	07/25/1947	15647.0	0.0	4.60	0.029	V	45.0(72.4)
DMG	34.0170	116.5000	07/30/1947	52217.0	0.0	4.20	0.023	IV	45.0(72.4)
DMG	34.1830	117.5830	10/03/1948	24628.0	0.0	4.00	0.021	IV	45.1(72.6)
GSG	34.5230	116.1430	10/16/1999	102938.2	5.0	4.30	0.024	V	45.2(72.7)
DMG	34.0500	116.4330	02/08/1938	739 0.0	0.0	4.00	0.021	IV	45.4(73.1)
GSP	34.9000	116.2500	10/16/1999	100728.0	6.0	4.70	0.030	V	45.5(73.1)
DMG	33.9170	116.7500	01/25/1933	1444 0.0	0.0	4.00	0.021	IV	45.6(73.5)
GSP	34.0920	116.3690	07/06/1992	120059.2	1.0	4.50	0.027	V	45.7(73.6)
GSP	34.0820	116.3780	07/06/1992	194137.9	3.0	4.40	0.025	V	45.8(73.8)
GSP	34.0690	116.3820	07/07/1992	082103.1	3.0	4.00	0.020	IV	46.3(74.6)
DMG	33.9170	116.7000	11/17/1943	112841.0	0.0	4.50	0.027	V	46.4(74.7)
PAS	33.9530	116.5720	10/15/1986	22847.8	8.7	4.70	0.029	V	46.8(75.3)
DMG	34.1000	116.3330	06/01/1940	65428.0	0.0	4.30	0.024	IV	46.8(75.3)
GSP	34.3630	116.1490	10/16/1999	102052.7	0.0	4.80	0.031	V	46.8(75.3)
MGI	34.0000	117.4000	05/22/1907	652 0.0	0.0	4.60	0.028	V	46.9(75.4)
DMG	34.2830	116.1830	03/29/1945	4 417.0	0.0	4.20	0.022	IV	47.0(75.6)
DMG	34.1740	116.2570	02/15/1938	74539.8	10.0	4.50	0.026	V	47.0(75.6)
DMG	34.0000	116.4670	12/06/1948	246 8.0	0.0	4.30	0.024	IV	47.0(75.7)
DMG	34.0000	116.4670	12/05/1948	05057.0	0.0	4.40	0.025	V	47.0(75.7)
GSP	34.3500	116.1500	10/18/1999	063547.0	1.0	4.60	0.028	V	47.0(75.7)
GSP	34.0610	116.3740	08/11/1992	061117.3	0.0	4.30	0.024	IV	47.1(75.7)
PAS	34.0220	116.4260	08/14/1975	8 849.8	10.9	4.00	0.020	IV	47.2(75.9)
GSP	34.0620	116.3660	05/14/1999	075403.2	1.0	4.90	0.032	V	47.3(76.1)
GSP	34.0570	116.3710	06/28/1992	160953.9	3.0	4.10	0.021	IV	47.4(76.2)
GSP	34.0640	116.3610	09/15/1992	084711.3	9.0	5.20	0.038	V	47.4(76.3)
GSP	34.3620	116.1380	10/17/1999	163253.3	0.0	4.20	0.022	IV	47.4(76.3)
T-A	34.0000	117.4200	09/10/1920	1415 0.0	0.0	4.30	0.023	IV	47.5(76.5)
T-A	34.0000	117.4200	04/12/1888	1315 0.0	0.0	4.30	0.023	IV	47.5(76.5)
GSP	34.3500	116.1400	10/17/1999	162248.0	0.0	4.30	0.023	IV	47.6(76.6)
DMG	34.0830	116.3330	06/01/1940	527 1.2	0.0	4.70	0.029	V	47.6(76.6)
DMG	34.0830	116.3330	06/02/1940	61310.2	0.0	4.50	0.026	V	47.6(76.6)
GSP	35.1610	117.3500	06/29/1992	012615.6	6.0	4.10	0.021	IV	47.7(76.7)
GSP	34.3590	116.1330	03/11/2003	192817.9	3.0	4.60	0.027	V	47.8(76.9)
GSP	35.1600	117.3620	06/29/1992	011813.4	4.0	4.70	0.029	V	47.9(77.1)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.0580	116.3550	06/28/1992	221312.0	7.0	4.00	0.020	IV	47.9(77.2)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.057	VI	48.0(77.2)
DMG	34.0670	116.3330	05/18/1940	72132.7	0.0	5.00	0.034	V	48.4(77.9)
DMG	34.0670	116.3330	05/18/1940	55120.2	0.0	5.20	0.037	V	48.4(77.9)
GSP	34.0300	116.3790	06/28/1992	160115.2	1.0	4.10	0.021	IV	48.5(78.0)
DMG	34.2500	116.1670	03/20/1945	2155 7.0	0.0	5.00	0.033	V	48.8(78.5)
GSP	34.0340	116.3600	05/14/1999	105235.2	1.0	4.20	0.022	IV	49.0(78.8)
DMG	34.0830	116.3000	05/18/1940	5 358.5	0.0	5.40	0.041	V	49.0(78.8)
DMG	34.0670	116.3170	05/18/1940	6 430.6	0.0	4.60	0.027	V	49.0(78.9)
GSP	34.0500	116.3350	04/26/1992	172138.0	0.0	4.30	0.023	IV	49.1(79.1)
DMG	34.8460	116.1430	08/18/1938	73945.4	10.0	4.50	0.025	V	49.1(79.1)
DMG	33.9670	116.4500	12/11/1948	161220.0	0.0	4.50	0.025	V	49.4(79.6)
DMG	34.0170	116.3670	06/06/1940	235637.2	0.0	4.40	0.024	V	49.6(79.8)
DMG	33.9330	117.3670	10/24/1943	02921.0	0.0	4.00	0.019	IV	49.8(80.1)
DMG	34.0000	116.3830	05/05/1944	134715.0	0.0	4.00	0.019	IV	49.9(80.3)
DMG	34.1800	116.1910	12/12/1957	8 0 7.2	16.0	4.40	0.024	IV	49.9(80.3)
DMG	34.1540	116.2100	07/30/1963	63457.3	12.9	4.70	0.028	V	50.0(80.4)
DMG	33.9670	116.4330	12/05/1948	04235.0	0.0	4.60	0.026	V	50.0(80.5)

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-END OF SEARCH- 442 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2009

LENGTH OF SEARCH TIME: 210 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 6.1 MILES (9.8 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.6

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.160 g

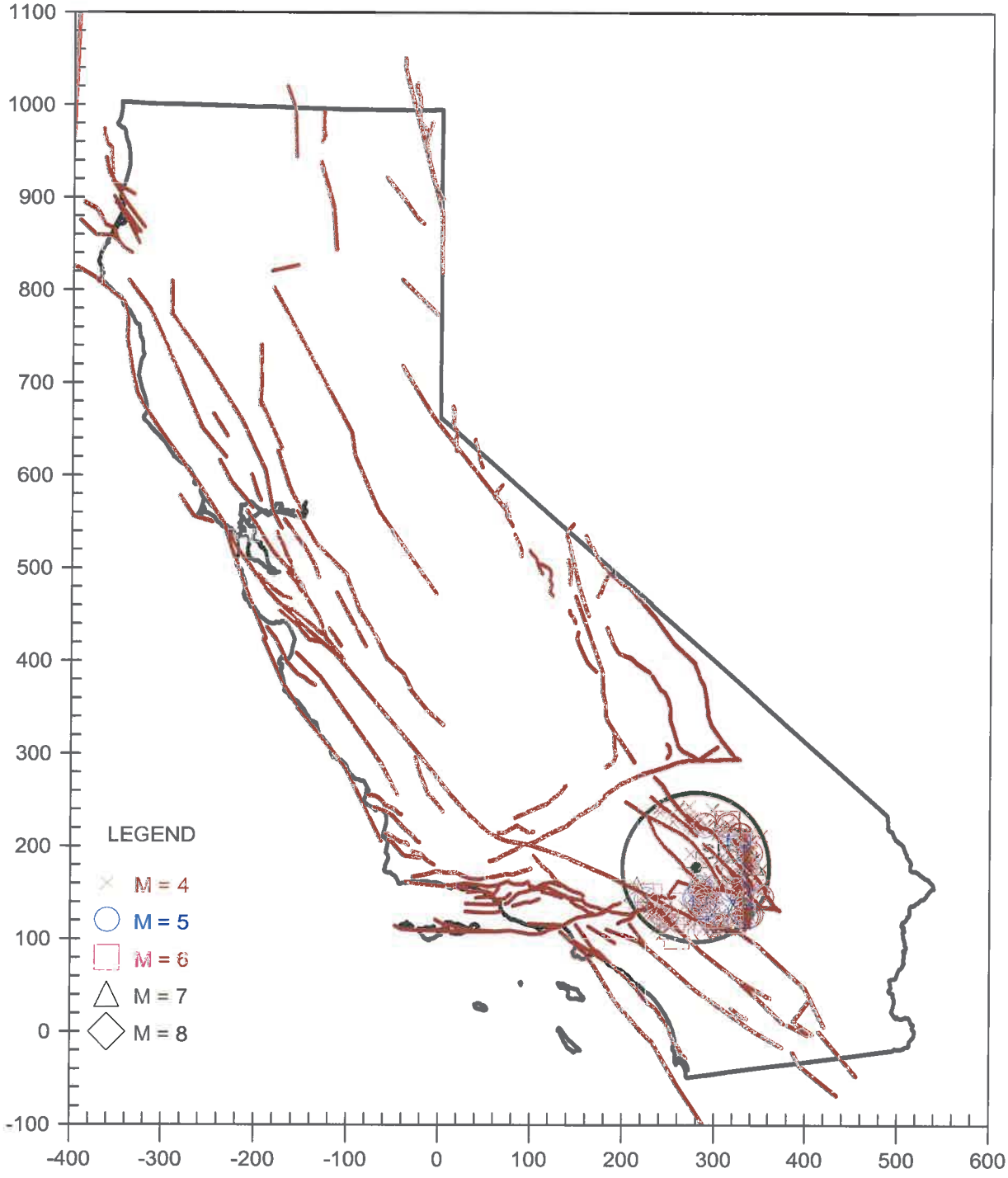
COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 3.767
b-value= 0.864
beta-value= 1.989

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	442	2.11483
4.5	171	0.81818
5.0	58	0.27751
5.5	16	0.07656
6.0	10	0.04785
6.5	5	0.02392
7.0	3	0.01435
7.5	1	0.00478

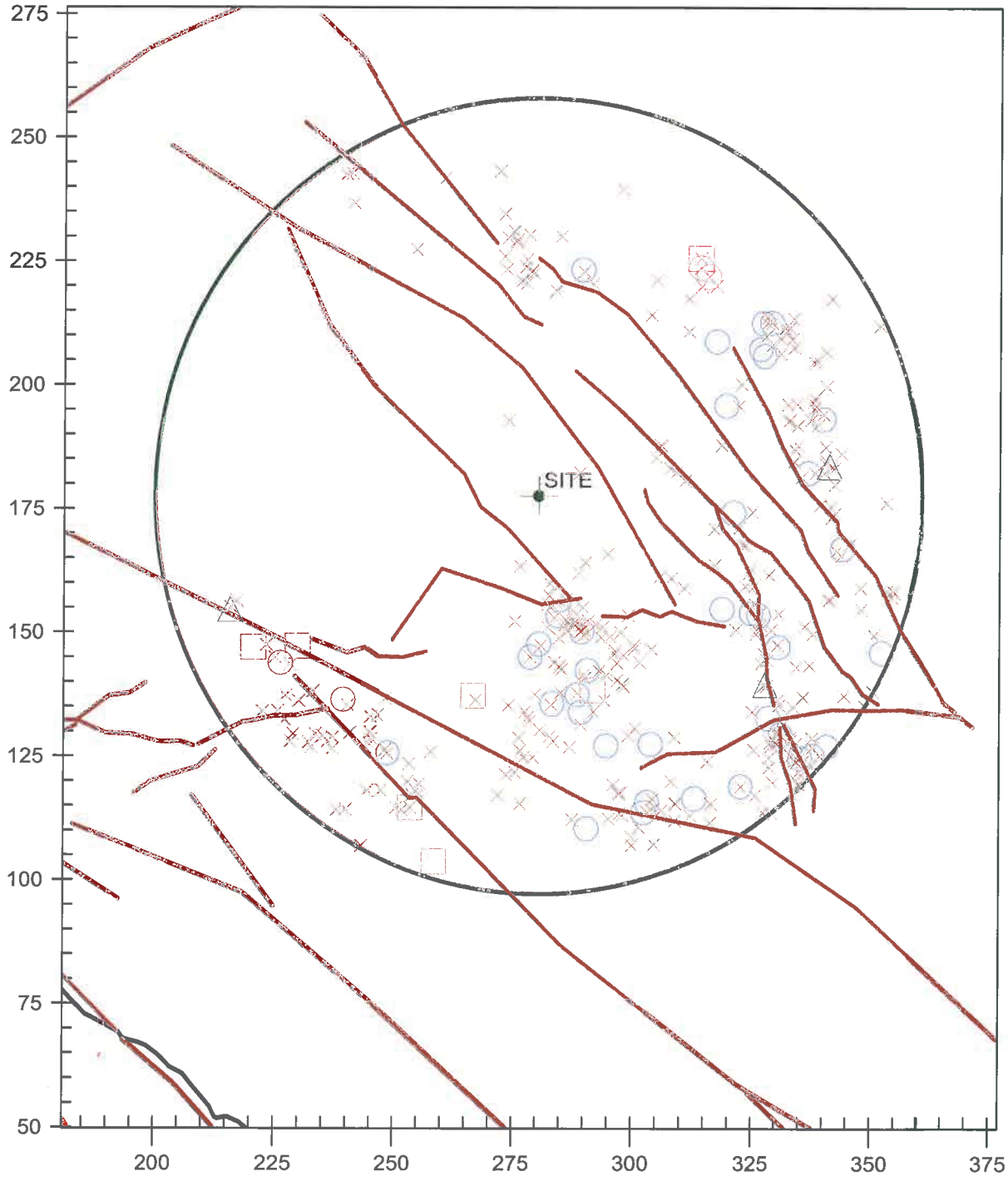
EARTHQUAKE EPICENTER MAP

02209110



EARTHQUAKE EPICENTER MAP

02209110



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*                        *
*    E Q S E A R C H     *
*                        *
*     Version 3.00       *
*                        *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 02209110

DATE: 12-02-2009

JOB NAME: 02209110

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE: 5.00
   MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
   SITE LATITUDE: 34.5600
   SITE LONGITUDE: 116.9360

SEARCH DATES:
           START DATE: 1800
           END DATE: 2009

SEARCH RADIUS:
           100.0 mi
           160.9 km

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND: 0 Depth Source: A
   Basement Depth: 5.00 km   Campbell SSR: Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.3690	116.8970	12/04/1992	020857.5	3.0	5.30	0.104	VII	13.4(21.5)
GSP	34.3400	116.9000	11/27/1992	160057.5	1.0	5.30	0.094	VII	15.3(24.7)
GSG	34.3100	116.8480	02/22/2003	121910.6	1.0	5.20	0.079	VII	18.0(28.9)
GSP	34.2900	116.9460	02/10/2001	210505.8	9.0	5.10	0.073	VII	18.6(30.0)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.085	VII	20.3(32.7)
GSP	34.2390	116.8370	07/09/1992	014357.6	0.0	5.30	0.070	VI	22.9(36.8)
PAS	34.5160	116.4950	06/01/1975	13849.2	4.5	5.20	0.061	VI	25.3(40.7)
GSN	34.2030	116.8270	06/28/1992	150530.7	5.0	6.70	0.135	VIII	25.4(40.9)
GSP	34.1950	116.8620	08/17/1992	204152.1	11.0	5.30	0.064	VI	25.5(41.1)
DMG	34.1800	116.9200	01/16/1930	034 3.6	0.0	5.10	0.057	VI	26.2(42.2)
DMG	34.1800	116.9200	01/16/1930	02433.9	0.0	5.20	0.060	VI	26.2(42.2)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.090	VII	26.6(42.7)
DMG	34.7120	116.5030	09/25/1965	174344.1	10.6	5.20	0.059	VI	26.7(43.0)
GSP	34.3410	116.5290	06/28/1992	124053.5	6.0	5.20	0.057	VI	27.7(44.5)
GSP	34.1630	116.8550	06/28/1992	144321.0	6.0	5.30	0.060	VI	27.8(44.7)
GSP	34.9700	116.8190	03/18/1997	152447.7	1.0	5.10	0.052	VI	29.1(46.8)
DMG	34.8300	116.5200	09/26/1929	20 022.7	0.0	5.10	0.051	VI	30.1(48.4)
GSP	34.3320	116.4620	07/01/1992	074029.9	9.0	5.40	0.058	VI	31.2(50.3)
PAS	34.3270	116.4450	03/15/1979	21 716.5	2.5	5.20	0.051	VI	32.3(51.9)
DMG	34.1000	116.8000	10/24/1935	1448 7.6	0.0	5.10	0.048	VI	32.7(52.6)
GSP	34.8000	116.4100	10/21/1999	015435.0	1.0	5.00	0.044	VI	34.2(55.0)
GSP	34.8130	116.4190	12/06/2008	041842.9	7.0	5.10	0.046	VI	34.2(55.0)
DMG	34.1000	116.7000	02/07/1889	520 0.0	0.0	5.30	0.051	VI	34.5(55.5)
GSP	34.5830	116.3190	07/05/1992	211827.1	0.0	5.40	0.053	VI	35.1(56.5)
DMG	34.9500	116.5330	04/10/1947	171822.0	0.0	5.00	0.043	VI	35.3(56.8)
DMG	34.9670	116.5500	04/10/1947	16 3 0.0	0.0	5.10	0.045	VI	35.6(57.3)
DMG	34.9670	116.5500	04/11/1947	747 0.0	0.0	5.00	0.042	VI	35.6(57.3)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.054	VI	36.3(58.4)
GSP	34.8600	116.4100	10/22/1999	160848.0	1.0	5.00	0.042	VI	36.3(58.5)
GSP	34.2680	116.4020	06/16/1994	162427.5	3.0	5.00	0.042	VI	36.5(58.7)
DMG	34.9830	116.5500	04/10/1947	1558 6.0	0.0	6.20	0.078	VII	36.5(58.7)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.091	VII	36.8(59.2)
GSP	34.8600	116.3900	10/21/1999	015738.0	4.0	5.00	0.041	V	37.3(60.0)
GSN	34.2010	116.4360	06/28/1992	115734.1	1.0	7.60	0.160	VIII	37.8(60.8)
GSG	34.5940	116.2710	10/16/1999	094644.1	0.0	7.10	0.122	VII	37.9(60.9)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.047	VI	37.9(61.0)
GSP	34.6800	116.2800	10/16/1999	095935.0	8.0	5.80	0.061	VI	38.2(61.4)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.048	VI	39.8(64.1)
GSP	34.4420	116.2480	10/16/1999	125721.0	1.0	5.70	0.056	VI	40.0(64.3)
GSP	34.1390	116.4310	06/28/1992	123640.6	10.0	5.10	0.040	V	40.9(65.8)
DMG	33.9940	116.7120	06/12/1944	111636.0	10.0	5.30	0.045	VI	41.1(66.2)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.063	VI	41.9(67.4)
DMG	33.9760	116.7210	06/12/1944	104534.7	10.0	5.10	0.039	V	42.1(67.8)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.037	V	42.4(68.2)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.071	VI	42.6(68.6)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.106	VII	42.7(68.7)
PAS	33.9980	116.6060	07/08/1986	92044.5	11.7	5.60	0.050	VI	43.1(69.4)
GSP	34.1080	116.4040	06/29/1992	141338.8	9.0	5.40	0.045	VI	43.5(70.0)
DMG	34.0170	116.5000	07/25/1947	61949.0	0.0	5.20	0.039	V	45.0(72.4)
DMG	34.0170	116.5000	07/25/1947	04631.0	0.0	5.00	0.035	V	45.0(72.4)
DMG	34.0170	116.5000	07/26/1947	24941.0	0.0	5.10	0.037	V	45.0(72.4)
DMG	34.0170	116.5000	07/24/1947	221046.0	0.0	5.50	0.046	VI	45.0(72.4)
GSP	34.0640	116.3610	09/15/1992	084711.3	9.0	5.20	0.038	V	47.4(76.3)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.057	VI	48.0(77.2)
DMG	34.0670	116.3330	05/18/1940	55120.2	0.0	5.20	0.037	V	48.4(77.9)
DMG	34.0670	116.3330	05/18/1940	72132.7	0.0	5.00	0.034	V	48.4(77.9)
DMG	34.2500	116.1670	03/20/1945	2155 7.0	0.0	5.00	0.033	V	48.8(78.5)
DMG	34.0830	116.3000	05/18/1940	5 358.5	0.0	5.40	0.041	V	49.0(78.8)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.093	VII	50.3(80.9)
GSP	34.0290	116.3210	08/21/1993	014638.4	9.0	5.00	0.032	V	50.7(81.7)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.035	V	52.3(84.2)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.066	VI	52.6(84.6)
DMG	34.7110	116.0270	09/26/1965	7 0 1.7	8.3	5.00	0.031	V	52.7(84.8)
DMG	33.9330	116.3830	12/04/1948	234317.0	0.0	6.50	0.068	VI	53.6(86.2)
DMG	34.5330	115.9830	07/18/1946	142758.0	0.0	5.60	0.042	VI	54.2(87.3)
GSP	33.9610	116.3180	04/23/1992	045023.0	12.0	6.10	0.055	VI	54.3(87.5)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.030	V	56.0(90.2)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.077	VII	56.0(90.2)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.029	V	58.7(94.4)
GSP	33.9020	116.2840	07/24/1992	181436.2	9.0	5.00	0.029	V	58.7(94.5)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.037	V	60.3(97.0)
GSP	33.8760	116.2670	06/29/1992	160142.8	1.0	5.20	0.031	V	60.7(97.7)
GSG	33.9530	117.7610	07/29/2008	184215.7	14.0	5.30	0.032	V	63.0(101.4)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.033	V	64.1(103.2)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.027	V	64.7(104.2)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.027	V	65.0(104.6)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.045	VI	65.0(104.6)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.027	V	65.0(104.6)
DMG	34.0000	116.0000	04/03/1926	20 8 0.0	0.0	5.50	0.034	V	65.9(106.1)
DMG	34.0000	116.0000	09/05/1928	1442 0.0	0.0	5.00	0.026	V	65.9(106.1)
DMG	34.3330	115.8000	12/22/1943	155028.0	0.0	5.50	0.034	V	66.5(107.1)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.034	V	67.9(109.3)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.025	V	71.8(115.6)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.025	V	72.0(115.8)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.048	VI	73.6(118.4)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.039	V	73.7(118.6)
GSP	33.5290	116.5720	06/12/2005	154146.5	14.0	5.20	0.027	V	74.2(119.4)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.028	V	74.3(119.6)
GSP	33.5080	116.5140	10/31/2001	075616.6	15.0	5.10	0.025	V	76.5(123.2)
PAS	33.5010	116.5130	02/25/1980	104738.5	13.6	5.50	0.030	V	77.0(123.9)
DMG	33.5000	116.5000	09/30/1916	211 0.0	0.0	5.00	0.023	IV	77.3(124.4)
DMG	34.0000	115.7500	03/03/1942	1 324.0	0.0	5.00	0.023	IV	77.9(125.4)
GSP	35.2100	118.0660	07/11/1992	181416.2	10.0	5.70	0.033	V	78.2(125.8)
DMG	34.0170	115.6830	05/02/1949	112547.0	0.0	5.90	0.036	V	80.7(129.9)
DMG	35.6310	117.5130	09/17/1938	1423 4.1	-2.0	5.00	0.023	IV	80.8(130.0)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.022	IV	82.4(132.7)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.026	V	84.0(135.2)
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.033	V	84.0(135.2)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.046	VI	84.0(135.2)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.033	V	84.0(135.2)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.022	IV	84.3(135.7)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.022	IV	84.3(135.7)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.022	IV	84.3(135.7)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.023	IV	86.2(138.6)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.021	IV	86.2(138.6)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.021	IV	86.2(138.6)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.023	IV	86.2(138.6)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.025	V	86.2(138.6)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.025	V	86.9(139.8)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.026	V	86.9(139.9)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.022	IV	87.8(141.2)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.022	IV	87.8(141.2)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.042	VI	87.8(141.3)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.027	V	87.9(141.4)
DMG	33.4000	116.3000	02/09/1890	12 6 0.0	0.0	6.30	0.042	VI	88.0(141.6)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.023	IV	88.2(141.9)
DMG	33.4080	116.2610	03/25/1937	1649 1.8	10.0	6.00	0.036	V	88.4(142.3)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.022	IV	89.8(144.5)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.021	IV	90.4(145.5)
DMG	33.3430	116.3460	04/28/1969	232042.9	20.0	5.80	0.031	V	90.6(145.7)
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.024	V	90.6(145.8)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.023	IV	90.6(145.8)
GSB	35.7610	117.6390	09/20/1995	232736.3	5.0	6.10	0.036	V	91.9(147.9)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.025	V	92.3(148.5)
GSP	35.7660	117.6490	01/07/1996	143253.1	5.0	5.20	0.023	IV	92.5(148.8)
GSP	35.7760	117.6620	08/17/1995	223959.0	5.0	5.40	0.025	V	93.4(150.3)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.049	VI	94.3(151.8)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.022	IV	94.5(152.0)
DMG	33.2000	116.7000	01/01/1920	235 0.0	0.0	5.00	0.020	IV	94.9(152.7)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.021	IV	95.2(153.2)
MGI	33.2000	116.6000	10/12/1920	1748 0.0	0.0	5.30	0.023	IV	95.9(154.3)
DMG	34.3000	118.6000	04/04/1893	1940 0.0	0.0	6.00	0.033	V	96.4(155.2)
GSP	34.3780	118.6180	01/19/1994	211144.9	11.0	5.10	0.021	IV	96.6(155.4)
T-A	33.5000	115.8200	05/00/1868	0 0 0.0	0.0	6.30	0.039	V	97.1(156.3)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.019	IV	97.2(156.5)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.019	IV	97.2(156.5)
DMG	33.2830	116.1830	03/23/1954	41450.0	0.0	5.10	0.020	IV	98.2(158.0)
DMG	33.2830	116.1830	03/19/1954	95429.0	0.0	6.20	0.036	V	98.2(158.0)
DMG	33.2830	116.1830	03/19/1954	95556.0	0.0	5.00	0.019	IV	98.2(158.0)
DMG	33.2830	116.1830	03/19/1954	102117.0	0.0	5.50	0.025	V	98.2(158.0)
DMG	35.7470	117.9080	03/18/1946	155042.6	4.4	5.30	0.023	IV	98.6(158.7)
DMG	35.7140	117.9770	03/15/1946	191853.6	0.0	5.40	0.024	IV	99.0(159.3)
GSP	34.3940	118.6690	06/26/1995	084028.9	13.0	5.00	0.019	IV	99.3(159.8)
DMG	35.8310	117.7610	10/19/1961	5 943.9	-2.0	5.20	0.021	IV	99.3(159.9)
DMG	36.0000	117.0000	11/10/1916	911 0.0	0.0	5.50	0.025	V	99.5(160.1)
DMG	36.0000	117.0000	11/04/1908	837 0.0	0.0	6.50	0.042	VI	99.5(160.1)
GSP	34.3690	118.6720	04/26/1997	103730.7	16.0	5.10	0.020	IV	99.7(160.4)

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-END OF SEARCH- 147 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2009

LENGTH OF SEARCH TIME: 210 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 13.4 MILES (21.5 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.6

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.160 g

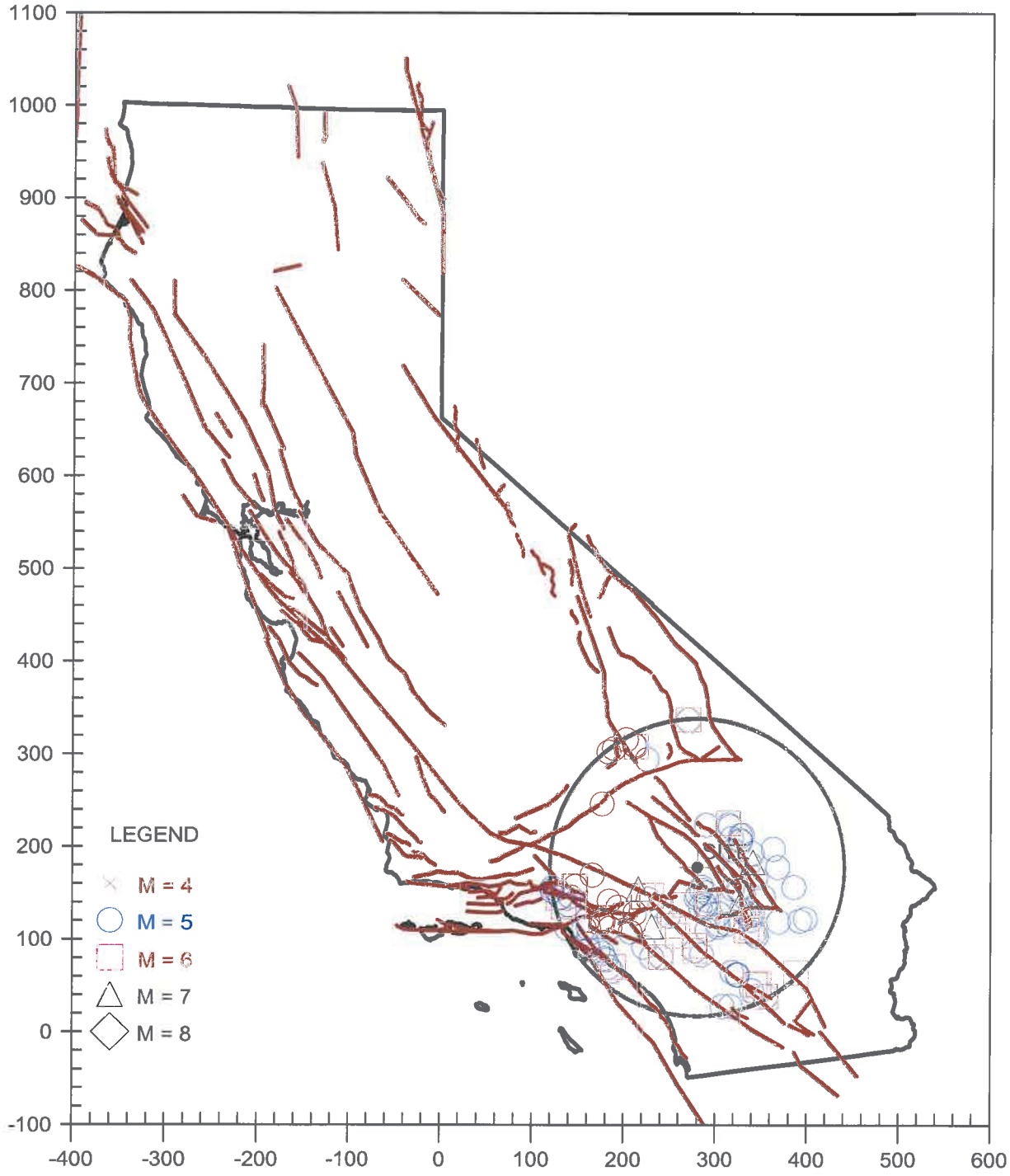
COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 1.559
b-value= 0.392
beta-value= 0.902

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	147	0.70335
4.5	147	0.70335
5.0	147	0.70335
5.5	48	0.22967
6.0	27	0.12919
6.5	10	0.04785
7.0	4	0.01914
7.5	1	0.00478

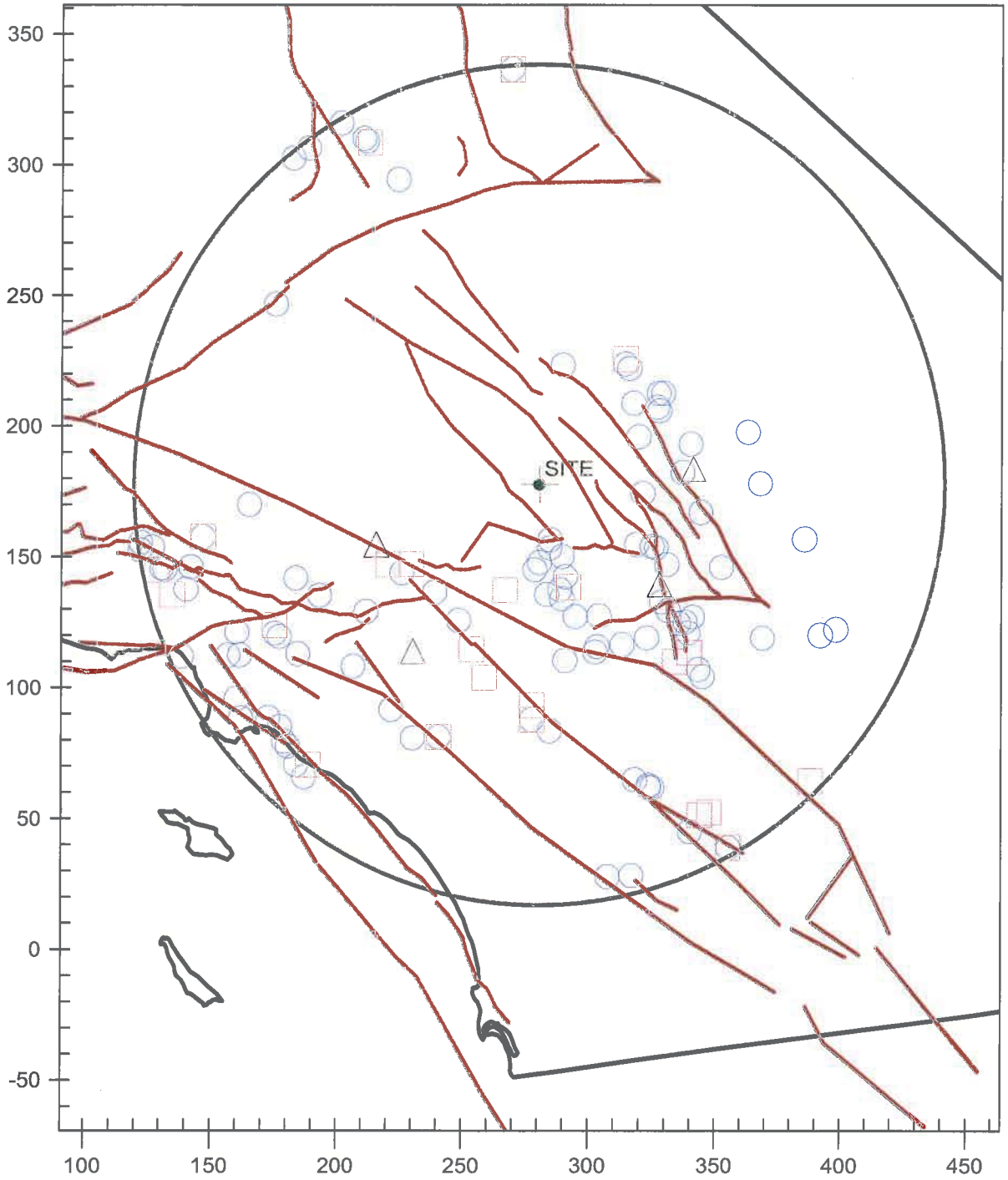
EARTHQUAKE EPICENTER MAP

02209110



EARTHQUAKE EPICENTER MAP

02209110

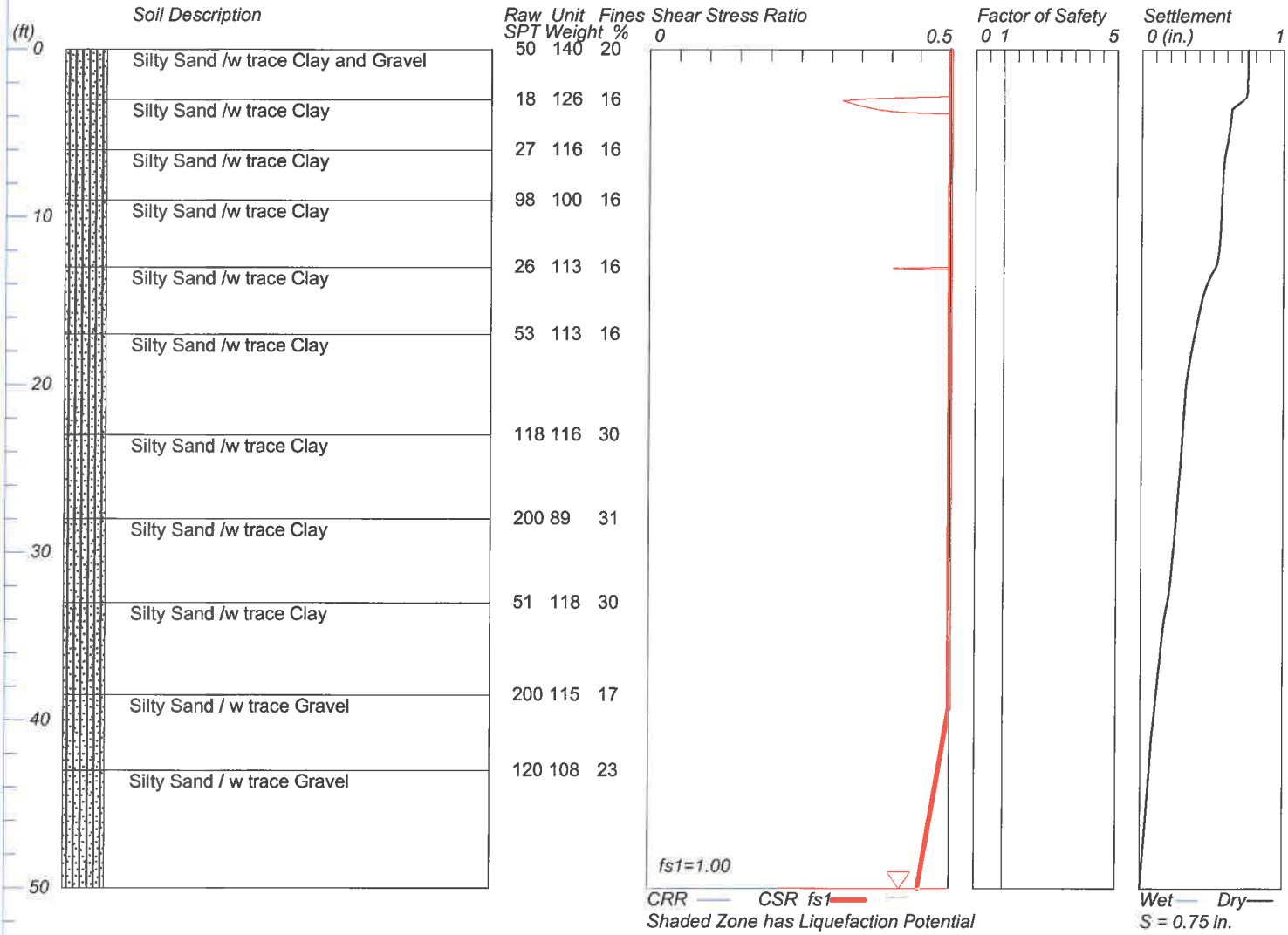


LIQUEFACTION ANALYSIS

Lucerne Valley PV

Hole No.=B4 Water Depth=50 ft

Magnitude=7.5
Acceleration=0.9g



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Input File Name: C:\Liquefy5\02209110B4.liq
Title: Lucerne Valley PV
Subtitle: Boring B4

Surface Elev.=
Hole No.=B4
Depth of Hole= 50.0 ft
Water Table during Earthquake= 50.0 ft
Water Table during In-Situ Testing= 50.0 ft
Max. Acceleration= 0.9 g
Earthquake Magnitude= 7.5

Input Data:
Surface Elev.=
Hole No.=B4
Depth of Hole=50.0 ft
Water Table during Earthquake= 50.0 ft
Water Table during In-Situ Testing= 50.0 ft
Max. Acceleration=0.9 g
Earthquake Magnitude=7.5

Earthquake Magnitude=7.5
2. Settlement Analysis Method: Tokimatsu / Seed
3. Fines Correction for Liquefaction: Idriss/Seed (SPT only)
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1
7. Borehole Diameter, Cb= 1
8. Sampeling Method, Cs= 1
9. User request factor of safty (apply to CSR) , User= 1
Plot two CSR (fs1=1, fs2=User)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
0.0	50.0	140.0	20.0
3.0	18.0	126.0	16.0
6.0	27.0	116.0	16.0
9.0	98.0	100.0	16.0
13.0	26.0	113.0	16.0
17.0	53.0	113.0	16.0
23.0	118.0	116.0	30.0
28.0	200.0	89.0	31.0
33.0	51.0	118.0	30.0
38.5	200.0	115.0	17.0
43.0	120.0	108.0	23.0
50.0	120.0	108.0	23.0

Output Results:
Settlement of saturated sands=0.00 in.
Settlement of dry sands=0.75 in.
Total settlement of saturated and dry sands=0.75 in.
Differential Settlement=0.373 to 0.493 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	in.	S_dry in.	S_all
0.00	2.00	0.58	5.00	0.00	0.75	0.75	
0.05	2.00	0.58	5.00	0.00	0.75	0.75	
0.10	2.00	0.58	5.00	0.00	0.75	0.75	
0.15	2.00	0.58	5.00	0.00	0.75	0.75	
0.20	2.00	0.58	5.00	0.00	0.75	0.75	
0.25	2.00	0.58	5.00	0.00	0.75	0.75	
0.30	2.00	0.58	5.00	0.00	0.75	0.75	
0.35	2.00	0.58	5.00	0.00	0.75	0.75	
0.40	2.00	0.58	5.00	0.00	0.75	0.75	
0.45	2.00	0.58	5.00	0.00	0.75	0.75	
0.50	2.00	0.58	5.00	0.00	0.75	0.75	
0.55	2.00	0.58	5.00	0.00	0.75	0.75	
0.60	2.00	0.58	5.00	0.00	0.75	0.75	
0.65	2.00	0.58	5.00	0.00	0.75	0.75	
0.70	2.00	0.58	5.00	0.00	0.75	0.75	
0.75	2.00	0.58	5.00	0.00	0.75	0.75	
0.80	2.00	0.58	5.00	0.00	0.75	0.75	
0.85	2.00	0.58	5.00	0.00	0.75	0.75	
0.90	2.00	0.58	5.00	0.00	0.75	0.75	
0.95	2.00	0.58	5.00	0.00	0.75	0.75	
1.00	2.00	0.58	5.00	0.00	0.75	0.75	
1.05	2.00	0.58	5.00	0.00	0.75	0.75	
1.10	2.00	0.58	5.00	0.00	0.75	0.75	
1.15	2.00	0.58	5.00	0.00	0.75	0.75	
1.20	2.00	0.58	5.00	0.00	0.75	0.75	
1.25	2.00	0.58	5.00	0.00	0.75	0.75	
1.30	2.00	0.58	5.00	0.00	0.75	0.75	
1.35	2.00	0.58	5.00	0.00	0.74	0.74	
1.40	2.00	0.58	5.00	0.00	0.74	0.74	
1.45	2.00	0.58	5.00	0.00	0.74	0.74	
1.50	2.00	0.58	5.00	0.00	0.74	0.74	
1.55	2.00	0.58	5.00	0.00	0.74	0.74	
1.60	2.00	0.58	5.00	0.00	0.74	0.74	
1.65	2.00	0.58	5.00	0.00	0.74	0.74	
1.70	2.00	0.58	5.00	0.00	0.74	0.74	
1.75	2.00	0.58	5.00	0.00	0.74	0.74	
1.80	2.00	0.58	5.00	0.00	0.74	0.74	
1.85	2.00	0.58	5.00	0.00	0.74	0.74	
1.90	2.00	0.58	5.00	0.00	0.74	0.74	
1.95	2.00	0.58	5.00	0.00	0.74	0.74	
2.00	2.00	0.58	5.00	0.00	0.74	0.74	
2.05	2.00	0.58	5.00	0.00	0.74	0.74	
2.10	2.00	0.58	5.00	0.00	0.74	0.74	
2.15	2.00	0.58	5.00	0.00	0.74	0.74	
2.20	2.00	0.58	5.00	0.00	0.74	0.74	
2.25	2.00	0.58	5.00	0.00	0.74	0.74	
2.30	2.00	0.58	5.00	0.00	0.74	0.74	
2.35	2.00	0.58	5.00	0.00	0.74	0.74	
2.40	2.00	0.58	5.00	0.00	0.74	0.74	
2.45	2.00	0.58	5.00	0.00	0.74	0.74	
2.50	2.00	0.58	5.00	0.00	0.74	0.74	
2.55	2.00	0.58	5.00	0.00	0.74	0.74	
2.60	2.00	0.58	5.00	0.00	0.74	0.74	
2.65	2.00	0.58	5.00	0.00	0.74	0.74	
2.70	2.00	0.58	5.00	0.00	0.74	0.74	
2.75	2.00	0.58	5.00	0.00	0.74	0.74	
2.80	0.45	0.58	5.00	0.00	0.73	0.73	
2.85	0.38	0.58	5.00	0.00	0.73	0.73	
2.90	0.36	0.58	5.00	0.00	0.73	0.73	
2.95	0.34	0.58	5.00	0.00	0.72	0.72	
3.00	0.32	0.58	5.00	0.00	0.72	0.72	

3.05	0.32	0.58	5.00	0.00	0.71	0.71
3.10	0.33	0.58	5.00	0.00	0.70	0.70
3.15	0.33	0.58	5.00	0.00	0.69	0.69
3.20	0.34	0.58	5.00	0.00	0.68	0.68
3.25	0.34	0.58	5.00	0.00	0.67	0.67
3.30	0.35	0.58	5.00	0.00	0.67	0.67
3.35	0.35	0.58	5.00	0.00	0.66	0.66
3.40	0.36	0.58	5.00	0.00	0.65	0.65
3.45	0.37	0.58	5.00	0.00	0.64	0.64
3.50	0.37	0.58	5.00	0.00	0.64	0.64
3.55	0.38	0.58	5.00	0.00	0.63	0.63
3.60	0.39	0.58	5.00	0.00	0.63	0.63
3.65	0.41	0.58	5.00	0.00	0.63	0.63
3.70	0.42	0.58	5.00	0.00	0.63	0.63
3.75	0.45	0.58	5.00	0.00	0.63	0.63
3.80	2.00	0.58	5.00	0.00	0.63	0.63
3.85	2.00	0.58	5.00	0.00	0.63	0.63
3.90	2.00	0.58	5.00	0.00	0.63	0.63
3.95	2.00	0.58	5.00	0.00	0.63	0.63
4.00	2.00	0.58	5.00	0.00	0.63	0.63
4.05	2.00	0.58	5.00	0.00	0.63	0.63
4.10	2.00	0.58	5.00	0.00	0.63	0.63
4.15	2.00	0.58	5.00	0.00	0.63	0.63
4.20	2.00	0.58	5.00	0.00	0.63	0.63
4.25	2.00	0.58	5.00	0.00	0.63	0.63
4.30	2.00	0.58	5.00	0.00	0.62	0.62
4.35	2.00	0.58	5.00	0.00	0.62	0.62
4.40	2.00	0.58	5.00	0.00	0.62	0.62
4.45	2.00	0.58	5.00	0.00	0.62	0.62
4.50	2.00	0.58	5.00	0.00	0.62	0.62
4.55	2.00	0.58	5.00	0.00	0.62	0.62
4.60	2.00	0.58	5.00	0.00	0.62	0.62
4.65	2.00	0.58	5.00	0.00	0.62	0.62
4.70	2.00	0.58	5.00	0.00	0.62	0.62
4.75	2.00	0.58	5.00	0.00	0.62	0.62
4.80	2.00	0.58	5.00	0.00	0.62	0.62
4.85	2.00	0.58	5.00	0.00	0.62	0.62
4.90	2.00	0.58	5.00	0.00	0.62	0.62
4.95	2.00	0.58	5.00	0.00	0.61	0.61
5.00	2.00	0.58	5.00	0.00	0.61	0.61
5.05	2.00	0.58	5.00	0.00	0.61	0.61
5.10	2.00	0.58	5.00	0.00	0.61	0.61
5.15	2.00	0.58	5.00	0.00	0.61	0.61
5.20	2.00	0.58	5.00	0.00	0.61	0.61
5.25	2.00	0.58	5.00	0.00	0.61	0.61
5.30	2.00	0.58	5.00	0.00	0.61	0.61
5.35	2.00	0.58	5.00	0.00	0.61	0.61
5.40	2.00	0.58	5.00	0.00	0.61	0.61
5.45	2.00	0.58	5.00	0.00	0.61	0.61
5.50	2.00	0.58	5.00	0.00	0.60	0.60
5.55	2.00	0.58	5.00	0.00	0.60	0.60
5.60	2.00	0.58	5.00	0.00	0.60	0.60
5.65	2.00	0.58	5.00	0.00	0.60	0.60
5.70	2.00	0.58	5.00	0.00	0.60	0.60
5.75	2.00	0.58	5.00	0.00	0.60	0.60
5.80	2.00	0.58	5.00	0.00	0.60	0.60
5.85	2.00	0.58	5.00	0.00	0.60	0.60
5.90	2.00	0.58	5.00	0.00	0.59	0.59
5.95	2.00	0.58	5.00	0.00	0.59	0.59
6.00	2.00	0.58	5.00	0.00	0.59	0.59
6.05	2.00	0.58	5.00	0.00	0.59	0.59
6.10	2.00	0.58	5.00	0.00	0.59	0.59
6.15	2.00	0.58	5.00	0.00	0.59	0.59
6.20	2.00	0.58	5.00	0.00	0.59	0.59
6.25	2.00	0.58	5.00	0.00	0.59	0.59

6.30	2.00	0.58	5.00	0.00	0.59	0.59
6.35	2.00	0.58	5.00	0.00	0.59	0.59
6.40	2.00	0.58	5.00	0.00	0.58	0.58
6.45	2.00	0.58	5.00	0.00	0.58	0.58
6.50	2.00	0.58	5.00	0.00	0.58	0.58
6.55	2.00	0.58	5.00	0.00	0.58	0.58
6.60	2.00	0.58	5.00	0.00	0.58	0.58
6.65	2.00	0.58	5.00	0.00	0.58	0.58
6.70	2.00	0.58	5.00	0.00	0.58	0.58
6.75	2.00	0.58	5.00	0.00	0.58	0.58
6.80	2.00	0.58	5.00	0.00	0.58	0.58
6.85	2.00	0.58	5.00	0.00	0.58	0.58
6.90	2.00	0.58	5.00	0.00	0.58	0.58
6.95	2.00	0.58	5.00	0.00	0.58	0.58
7.00	2.00	0.58	5.00	0.00	0.58	0.58
7.05	2.00	0.58	5.00	0.00	0.58	0.58
7.10	2.00	0.58	5.00	0.00	0.58	0.58
7.15	2.00	0.58	5.00	0.00	0.58	0.58
7.20	2.00	0.58	5.00	0.00	0.58	0.58
7.25	2.00	0.58	5.00	0.00	0.58	0.58
7.30	2.00	0.58	5.00	0.00	0.58	0.58
7.35	2.00	0.57	5.00	0.00	0.58	0.58
7.40	2.00	0.57	5.00	0.00	0.57	0.57
7.45	2.00	0.57	5.00	0.00	0.57	0.57
7.50	2.00	0.57	5.00	0.00	0.57	0.57
7.55	2.00	0.57	5.00	0.00	0.57	0.57
7.60	2.00	0.57	5.00	0.00	0.57	0.57
7.65	2.00	0.57	5.00	0.00	0.57	0.57
7.70	2.00	0.57	5.00	0.00	0.57	0.57
7.75	2.00	0.57	5.00	0.00	0.57	0.57
7.80	2.00	0.57	5.00	0.00	0.57	0.57
7.85	2.00	0.57	5.00	0.00	0.57	0.57
7.90	2.00	0.57	5.00	0.00	0.57	0.57
7.95	2.00	0.57	5.00	0.00	0.57	0.57
8.00	2.00	0.57	5.00	0.00	0.57	0.57
8.05	2.00	0.57	5.00	0.00	0.57	0.57
8.10	2.00	0.57	5.00	0.00	0.57	0.57
8.15	2.00	0.57	5.00	0.00	0.57	0.57
8.20	2.00	0.57	5.00	0.00	0.57	0.57
8.25	2.00	0.57	5.00	0.00	0.57	0.57
8.30	2.00	0.57	5.00	0.00	0.57	0.57
8.35	2.00	0.57	5.00	0.00	0.57	0.57
8.40	2.00	0.57	5.00	0.00	0.57	0.57
8.45	2.00	0.57	5.00	0.00	0.57	0.57
8.50	2.00	0.57	5.00	0.00	0.57	0.57
8.55	2.00	0.57	5.00	0.00	0.57	0.57
8.60	2.00	0.57	5.00	0.00	0.57	0.57
8.65	2.00	0.57	5.00	0.00	0.57	0.57
8.70	2.00	0.57	5.00	0.00	0.57	0.57
8.75	2.00	0.57	5.00	0.00	0.57	0.57
8.80	2.00	0.57	5.00	0.00	0.57	0.57
8.85	2.00	0.57	5.00	0.00	0.57	0.57
8.90	2.00	0.57	5.00	0.00	0.57	0.57
8.95	2.00	0.57	5.00	0.00	0.57	0.57
9.00	2.00	0.57	5.00	0.00	0.56	0.56
9.05	2.00	0.57	5.00	0.00	0.56	0.56
9.10	2.00	0.57	5.00	0.00	0.56	0.56
9.15	2.00	0.57	5.00	0.00	0.56	0.56
9.20	2.00	0.57	5.00	0.00	0.56	0.56
9.25	2.00	0.57	5.00	0.00	0.56	0.56
9.30	2.00	0.57	5.00	0.00	0.56	0.56
9.35	2.00	0.57	5.00	0.00	0.56	0.56
9.40	2.00	0.57	5.00	0.00	0.56	0.56
9.45	2.00	0.57	5.00	0.00	0.56	0.56
9.50	2.00	0.57	5.00	0.00	0.56	0.56

9.55	2.00	0.57	5.00	0.00	0.56	0.56
9.60	2.00	0.57	5.00	0.00	0.56	0.56
9.65	2.00	0.57	5.00	0.00	0.56	0.56
9.70	2.00	0.57	5.00	0.00	0.56	0.56
9.75	2.00	0.57	5.00	0.00	0.56	0.56
9.80	2.00	0.57	5.00	0.00	0.56	0.56
9.85	2.00	0.57	5.00	0.00	0.56	0.56
9.90	2.00	0.57	5.00	0.00	0.56	0.56
9.95	2.00	0.57	5.00	0.00	0.56	0.56
10.00	2.00	0.57	5.00	0.00	0.56	0.56
10.05	2.00	0.57	5.00	0.00	0.56	0.56
10.10	2.00	0.57	5.00	0.00	0.56	0.56
10.15	2.00	0.57	5.00	0.00	0.56	0.56
10.20	2.00	0.57	5.00	0.00	0.56	0.56
10.25	2.00	0.57	5.00	0.00	0.56	0.56
10.30	2.00	0.57	5.00	0.00	0.56	0.56
10.35	2.00	0.57	5.00	0.00	0.56	0.56
10.40	2.00	0.57	5.00	0.00	0.56	0.56
10.45	2.00	0.57	5.00	0.00	0.56	0.56
10.50	2.00	0.57	5.00	0.00	0.56	0.56
10.55	2.00	0.57	5.00	0.00	0.56	0.56
10.60	2.00	0.57	5.00	0.00	0.56	0.56
10.65	2.00	0.57	5.00	0.00	0.56	0.56
10.70	2.00	0.57	5.00	0.00	0.56	0.56
10.75	2.00	0.57	5.00	0.00	0.56	0.56
10.80	2.00	0.57	5.00	0.00	0.56	0.56
10.85	2.00	0.57	5.00	0.00	0.56	0.56
10.90	2.00	0.57	5.00	0.00	0.56	0.56
10.95	2.00	0.57	5.00	0.00	0.55	0.55
11.00	2.00	0.57	5.00	0.00	0.55	0.55
11.05	2.00	0.57	5.00	0.00	0.55	0.55
11.10	2.00	0.57	5.00	0.00	0.55	0.55
11.15	2.00	0.57	5.00	0.00	0.55	0.55
11.20	2.00	0.57	5.00	0.00	0.55	0.55
11.25	2.00	0.57	5.00	0.00	0.55	0.55
11.30	2.00	0.57	5.00	0.00	0.55	0.55
11.35	2.00	0.57	5.00	0.00	0.55	0.55
11.40	2.00	0.57	5.00	0.00	0.55	0.55
11.45	2.00	0.57	5.00	0.00	0.55	0.55
11.50	2.00	0.57	5.00	0.00	0.55	0.55
11.55	2.00	0.57	5.00	0.00	0.55	0.55
11.60	2.00	0.57	5.00	0.00	0.55	0.55
11.65	2.00	0.57	5.00	0.00	0.55	0.55
11.70	2.00	0.57	5.00	0.00	0.55	0.55
11.75	2.00	0.57	5.00	0.00	0.55	0.55
11.80	2.00	0.57	5.00	0.00	0.55	0.55
11.85	2.00	0.57	5.00	0.00	0.55	0.55
11.90	2.00	0.57	5.00	0.00	0.55	0.55
11.95	2.00	0.57	5.00	0.00	0.55	0.55
12.00	2.00	0.57	5.00	0.00	0.54	0.54
12.05	2.00	0.57	5.00	0.00	0.54	0.54
12.10	2.00	0.57	5.00	0.00	0.54	0.54
12.15	2.00	0.57	5.00	0.00	0.54	0.54
12.20	2.00	0.57	5.00	0.00	0.54	0.54
12.25	2.00	0.57	5.00	0.00	0.54	0.54
12.30	2.00	0.57	5.00	0.00	0.54	0.54
12.35	2.00	0.57	5.00	0.00	0.54	0.54
12.40	2.00	0.57	5.00	0.00	0.54	0.54
12.45	2.00	0.57	5.00	0.00	0.54	0.54
12.50	2.00	0.57	5.00	0.00	0.54	0.54
12.55	2.00	0.57	5.00	0.00	0.53	0.53
12.60	2.00	0.57	5.00	0.00	0.53	0.53
12.65	2.00	0.57	5.00	0.00	0.53	0.53
12.70	2.00	0.57	5.00	0.00	0.53	0.53
12.75	2.00	0.57	5.00	0.00	0.53	0.53

12.80	2.00	0.57	5.00	0.00	0.53	0.53
12.85	2.00	0.57	5.00	0.00	0.52	0.52
12.90	2.00	0.57	5.00	0.00	0.52	0.52
12.95	2.00	0.57	5.00	0.00	0.52	0.52
13.00	0.40	0.57	5.00	0.00	0.52	0.52
13.05	0.43	0.57	5.00	0.00	0.51	0.51
13.10	2.00	0.57	5.00	0.00	0.51	0.51
13.15	2.00	0.57	5.00	0.00	0.51	0.51
13.20	2.00	0.57	5.00	0.00	0.50	0.50
13.25	2.00	0.57	5.00	0.00	0.50	0.50
13.30	2.00	0.57	5.00	0.00	0.50	0.50
13.35	2.00	0.57	5.00	0.00	0.49	0.49
13.40	2.00	0.57	5.00	0.00	0.49	0.49
13.45	2.00	0.57	5.00	0.00	0.49	0.49
13.50	2.00	0.57	5.00	0.00	0.48	0.48
13.55	2.00	0.57	5.00	0.00	0.48	0.48
13.60	2.00	0.57	5.00	0.00	0.48	0.48
13.65	2.00	0.57	5.00	0.00	0.48	0.48
13.70	2.00	0.57	5.00	0.00	0.47	0.47
13.75	2.00	0.57	5.00	0.00	0.47	0.47
13.80	2.00	0.57	5.00	0.00	0.47	0.47
13.85	2.00	0.57	5.00	0.00	0.47	0.47
13.90	2.00	0.57	5.00	0.00	0.46	0.46
13.95	2.00	0.57	5.00	0.00	0.46	0.46
14.00	2.00	0.57	5.00	0.00	0.46	0.46
14.05	2.00	0.57	5.00	0.00	0.46	0.46
14.10	2.00	0.57	5.00	0.00	0.45	0.45
14.15	2.00	0.57	5.00	0.00	0.45	0.45
14.20	2.00	0.57	5.00	0.00	0.45	0.45
14.25	2.00	0.57	5.00	0.00	0.45	0.45
14.30	2.00	0.57	5.00	0.00	0.45	0.45
14.35	2.00	0.57	5.00	0.00	0.44	0.44
14.40	2.00	0.57	5.00	0.00	0.44	0.44
14.45	2.00	0.57	5.00	0.00	0.44	0.44
14.50	2.00	0.57	5.00	0.00	0.44	0.44
14.55	2.00	0.57	5.00	0.00	0.44	0.44
14.60	2.00	0.57	5.00	0.00	0.43	0.43
14.65	2.00	0.57	5.00	0.00	0.43	0.43
14.70	2.00	0.56	5.00	0.00	0.43	0.43
14.75	2.00	0.56	5.00	0.00	0.43	0.43
14.80	2.00	0.56	5.00	0.00	0.43	0.43
14.85	2.00	0.56	5.00	0.00	0.43	0.43
14.90	2.00	0.56	5.00	0.00	0.42	0.42
14.95	2.00	0.56	5.00	0.00	0.42	0.42
15.00	2.00	0.56	5.00	0.00	0.42	0.42
15.05	2.00	0.56	5.00	0.00	0.42	0.42
15.10	2.00	0.56	5.00	0.00	0.42	0.42
15.15	2.00	0.56	5.00	0.00	0.42	0.42
15.20	2.00	0.56	5.00	0.00	0.42	0.42
15.25	2.00	0.56	5.00	0.00	0.42	0.42
15.30	2.00	0.56	5.00	0.00	0.41	0.41
15.35	2.00	0.56	5.00	0.00	0.41	0.41
15.40	2.00	0.56	5.00	0.00	0.41	0.41
15.45	2.00	0.56	5.00	0.00	0.41	0.41
15.50	2.00	0.56	5.00	0.00	0.41	0.41
15.55	2.00	0.56	5.00	0.00	0.41	0.41
15.60	2.00	0.56	5.00	0.00	0.41	0.41
15.65	2.00	0.56	5.00	0.00	0.41	0.41
15.70	2.00	0.56	5.00	0.00	0.40	0.40
15.75	2.00	0.56	5.00	0.00	0.40	0.40
15.80	2.00	0.56	5.00	0.00	0.40	0.40
15.85	2.00	0.56	5.00	0.00	0.40	0.40
15.90	2.00	0.56	5.00	0.00	0.40	0.40
15.95	2.00	0.56	5.00	0.00	0.40	0.40
16.00	2.00	0.56	5.00	0.00	0.40	0.40

16.05	2.00	0.56	5.00	0.00	0.40	0.40
16.10	2.00	0.56	5.00	0.00	0.39	0.39
16.15	2.00	0.56	5.00	0.00	0.39	0.39
16.20	2.00	0.56	5.00	0.00	0.39	0.39
16.25	2.00	0.56	5.00	0.00	0.39	0.39
16.30	2.00	0.56	5.00	0.00	0.39	0.39
16.35	2.00	0.56	5.00	0.00	0.39	0.39
16.40	2.00	0.56	5.00	0.00	0.39	0.39
16.45	2.00	0.56	5.00	0.00	0.39	0.39
16.50	2.00	0.56	5.00	0.00	0.38	0.38
16.55	2.00	0.56	5.00	0.00	0.38	0.38
16.60	2.00	0.56	5.00	0.00	0.38	0.38
16.65	2.00	0.56	5.00	0.00	0.38	0.38
16.70	2.00	0.56	5.00	0.00	0.38	0.38
16.75	2.00	0.56	5.00	0.00	0.38	0.38
16.80	2.00	0.56	5.00	0.00	0.38	0.38
16.85	2.00	0.56	5.00	0.00	0.38	0.38
16.90	2.00	0.56	5.00	0.00	0.38	0.38
16.95	2.00	0.56	5.00	0.00	0.37	0.37
17.00	2.00	0.56	5.00	0.00	0.37	0.37
17.05	2.00	0.56	5.00	0.00	0.37	0.37
17.10	2.00	0.56	5.00	0.00	0.37	0.37
17.15	2.00	0.56	5.00	0.00	0.37	0.37
17.20	2.00	0.56	5.00	0.00	0.37	0.37
17.25	2.00	0.56	5.00	0.00	0.37	0.37
17.30	2.00	0.56	5.00	0.00	0.37	0.37
17.35	2.00	0.56	5.00	0.00	0.36	0.36
17.40	2.00	0.56	5.00	0.00	0.36	0.36
17.45	2.00	0.56	5.00	0.00	0.36	0.36
17.50	2.00	0.56	5.00	0.00	0.36	0.36
17.55	2.00	0.56	5.00	0.00	0.36	0.36
17.60	2.00	0.56	5.00	0.00	0.36	0.36
17.65	2.00	0.56	5.00	0.00	0.36	0.36
17.70	2.00	0.56	5.00	0.00	0.36	0.36
17.75	2.00	0.56	5.00	0.00	0.36	0.36
17.80	2.00	0.56	5.00	0.00	0.36	0.36
17.85	2.00	0.56	5.00	0.00	0.35	0.35
17.90	2.00	0.56	5.00	0.00	0.35	0.35
17.95	2.00	0.56	5.00	0.00	0.35	0.35
18.00	2.00	0.56	5.00	0.00	0.35	0.35
18.05	2.00	0.56	5.00	0.00	0.35	0.35
18.10	2.00	0.56	5.00	0.00	0.35	0.35
18.15	2.00	0.56	5.00	0.00	0.35	0.35
18.20	2.00	0.56	5.00	0.00	0.35	0.35
18.25	2.00	0.56	5.00	0.00	0.35	0.35
18.30	2.00	0.56	5.00	0.00	0.35	0.35
18.35	2.00	0.56	5.00	0.00	0.34	0.34
18.40	2.00	0.56	5.00	0.00	0.34	0.34
18.45	2.00	0.56	5.00	0.00	0.34	0.34
18.50	2.00	0.56	5.00	0.00	0.34	0.34
18.55	2.00	0.56	5.00	0.00	0.34	0.34
18.60	2.00	0.56	5.00	0.00	0.34	0.34
18.65	2.00	0.56	5.00	0.00	0.34	0.34
18.70	2.00	0.56	5.00	0.00	0.34	0.34
18.75	2.00	0.56	5.00	0.00	0.34	0.34
18.80	2.00	0.56	5.00	0.00	0.34	0.34
18.85	2.00	0.56	5.00	0.00	0.33	0.33
18.90	2.00	0.56	5.00	0.00	0.33	0.33
18.95	2.00	0.56	5.00	0.00	0.33	0.33
19.00	2.00	0.56	5.00	0.00	0.33	0.33
19.05	2.00	0.56	5.00	0.00	0.33	0.33
19.10	2.00	0.56	5.00	0.00	0.33	0.33
19.15	2.00	0.56	5.00	0.00	0.33	0.33
19.20	2.00	0.56	5.00	0.00	0.33	0.33
19.25	2.00	0.56	5.00	0.00	0.33	0.33

19.30	2.00	0.56	5.00	0.00	0.33	0.33
19.35	2.00	0.56	5.00	0.00	0.33	0.33
19.40	2.00	0.56	5.00	0.00	0.32	0.32
19.45	2.00	0.56	5.00	0.00	0.32	0.32
19.50	2.00	0.56	5.00	0.00	0.32	0.32
19.55	2.00	0.56	5.00	0.00	0.32	0.32
19.60	2.00	0.56	5.00	0.00	0.32	0.32
19.65	2.00	0.56	5.00	0.00	0.32	0.32
19.70	2.00	0.56	5.00	0.00	0.32	0.32
19.75	2.00	0.56	5.00	0.00	0.32	0.32
19.80	2.00	0.56	5.00	0.00	0.32	0.32
19.85	2.00	0.56	5.00	0.00	0.32	0.32
19.90	2.00	0.56	5.00	0.00	0.32	0.32
19.95	2.00	0.56	5.00	0.00	0.32	0.32
20.00	2.00	0.56	5.00	0.00	0.31	0.31
20.05	2.00	0.56	5.00	0.00	0.31	0.31
20.10	2.00	0.56	5.00	0.00	0.31	0.31
20.15	2.00	0.56	5.00	0.00	0.31	0.31
20.20	2.00	0.56	5.00	0.00	0.31	0.31
20.25	2.00	0.56	5.00	0.00	0.31	0.31
20.30	2.00	0.56	5.00	0.00	0.31	0.31
20.35	2.00	0.56	5.00	0.00	0.31	0.31
20.40	2.00	0.56	5.00	0.00	0.31	0.31
20.45	2.00	0.56	5.00	0.00	0.31	0.31
20.50	2.00	0.56	5.00	0.00	0.31	0.31
20.55	2.00	0.56	5.00	0.00	0.31	0.31
20.60	2.00	0.56	5.00	0.00	0.31	0.31
20.65	2.00	0.56	5.00	0.00	0.31	0.31
20.70	2.00	0.56	5.00	0.00	0.31	0.31
20.75	2.00	0.56	5.00	0.00	0.31	0.31
20.80	2.00	0.56	5.00	0.00	0.31	0.31
20.85	2.00	0.56	5.00	0.00	0.31	0.31
20.90	2.00	0.56	5.00	0.00	0.31	0.31
20.95	2.00	0.56	5.00	0.00	0.31	0.31
21.00	2.00	0.56	5.00	0.00	0.31	0.31
21.05	2.00	0.56	5.00	0.00	0.31	0.31
21.10	2.00	0.56	5.00	0.00	0.31	0.31
21.15	2.00	0.56	5.00	0.00	0.31	0.31
21.20	2.00	0.56	5.00	0.00	0.31	0.31
21.25	2.00	0.56	5.00	0.00	0.30	0.30
21.30	2.00	0.56	5.00	0.00	0.30	0.30
21.35	2.00	0.56	5.00	0.00	0.30	0.30
21.40	2.00	0.56	5.00	0.00	0.30	0.30
21.45	2.00	0.56	5.00	0.00	0.30	0.30
21.50	2.00	0.56	5.00	0.00	0.30	0.30
21.55	2.00	0.56	5.00	0.00	0.30	0.30
21.60	2.00	0.56	5.00	0.00	0.30	0.30
21.65	2.00	0.56	5.00	0.00	0.30	0.30
21.70	2.00	0.56	5.00	0.00	0.30	0.30
21.75	2.00	0.56	5.00	0.00	0.30	0.30
21.80	2.00	0.56	5.00	0.00	0.30	0.30
21.85	2.00	0.56	5.00	0.00	0.30	0.30
21.90	2.00	0.56	5.00	0.00	0.30	0.30
21.95	2.00	0.56	5.00	0.00	0.30	0.30
22.00	2.00	0.55	5.00	0.00	0.30	0.30
22.05	2.00	0.55	5.00	0.00	0.30	0.30
22.10	2.00	0.55	5.00	0.00	0.30	0.30
22.15	2.00	0.55	5.00	0.00	0.30	0.30
22.20	2.00	0.55	5.00	0.00	0.30	0.30
22.25	2.00	0.55	5.00	0.00	0.30	0.30
22.30	2.00	0.55	5.00	0.00	0.30	0.30
22.35	2.00	0.55	5.00	0.00	0.30	0.30
22.40	2.00	0.55	5.00	0.00	0.30	0.30
22.45	2.00	0.55	5.00	0.00	0.30	0.30
22.50	2.00	0.55	5.00	0.00	0.30	0.30

22.55	2.00	0.55	5.00	0.00	0.29	0.29
22.60	2.00	0.55	5.00	0.00	0.29	0.29
22.65	2.00	0.55	5.00	0.00	0.29	0.29
22.70	2.00	0.55	5.00	0.00	0.29	0.29
22.75	2.00	0.55	5.00	0.00	0.29	0.29
22.80	2.00	0.55	5.00	0.00	0.29	0.29
22.85	2.00	0.55	5.00	0.00	0.29	0.29
22.90	2.00	0.55	5.00	0.00	0.29	0.29
22.95	2.00	0.55	5.00	0.00	0.29	0.29
23.00	2.00	0.55	5.00	0.00	0.29	0.29
23.05	2.00	0.55	5.00	0.00	0.29	0.29
23.10	2.00	0.55	5.00	0.00	0.29	0.29
23.15	2.00	0.55	5.00	0.00	0.29	0.29
23.20	2.00	0.55	5.00	0.00	0.29	0.29
23.25	2.00	0.55	5.00	0.00	0.29	0.29
23.30	2.00	0.55	5.00	0.00	0.29	0.29
23.35	2.00	0.55	5.00	0.00	0.29	0.29
23.40	2.00	0.55	5.00	0.00	0.29	0.29
23.45	2.00	0.55	5.00	0.00	0.29	0.29
23.50	2.00	0.55	5.00	0.00	0.29	0.29
23.55	2.00	0.55	5.00	0.00	0.29	0.29
23.60	2.00	0.55	5.00	0.00	0.29	0.29
23.65	2.00	0.55	5.00	0.00	0.29	0.29
23.70	2.00	0.55	5.00	0.00	0.29	0.29
23.75	2.00	0.55	5.00	0.00	0.29	0.29
23.80	2.00	0.55	5.00	0.00	0.28	0.28
23.85	2.00	0.55	5.00	0.00	0.28	0.28
23.90	2.00	0.55	5.00	0.00	0.28	0.28
23.95	2.00	0.55	5.00	0.00	0.28	0.28
24.00	2.00	0.55	5.00	0.00	0.28	0.28
24.05	2.00	0.55	5.00	0.00	0.28	0.28
24.10	2.00	0.55	5.00	0.00	0.28	0.28
24.15	2.00	0.55	5.00	0.00	0.28	0.28
24.20	2.00	0.55	5.00	0.00	0.28	0.28
24.25	2.00	0.55	5.00	0.00	0.28	0.28
24.30	2.00	0.55	5.00	0.00	0.28	0.28
24.35	2.00	0.55	5.00	0.00	0.28	0.28
24.40	2.00	0.55	5.00	0.00	0.28	0.28
24.45	2.00	0.55	5.00	0.00	0.28	0.28
24.50	2.00	0.55	5.00	0.00	0.28	0.28
24.55	2.00	0.55	5.00	0.00	0.28	0.28
24.60	2.00	0.55	5.00	0.00	0.28	0.28
24.65	2.00	0.55	5.00	0.00	0.28	0.28
24.70	2.00	0.55	5.00	0.00	0.28	0.28
24.75	2.00	0.55	5.00	0.00	0.28	0.28
24.80	2.00	0.55	5.00	0.00	0.28	0.28
24.85	2.00	0.55	5.00	0.00	0.28	0.28
24.90	2.00	0.55	5.00	0.00	0.28	0.28
24.95	2.00	0.55	5.00	0.00	0.28	0.28
25.00	2.00	0.55	5.00	0.00	0.27	0.27
25.05	2.00	0.55	5.00	0.00	0.27	0.27
25.10	2.00	0.55	5.00	0.00	0.27	0.27
25.15	2.00	0.55	5.00	0.00	0.27	0.27
25.20	2.00	0.55	5.00	0.00	0.27	0.27
25.25	2.00	0.55	5.00	0.00	0.27	0.27
25.30	2.00	0.55	5.00	0.00	0.27	0.27
25.35	2.00	0.55	5.00	0.00	0.27	0.27
25.40	2.00	0.55	5.00	0.00	0.27	0.27
25.45	2.00	0.55	5.00	0.00	0.27	0.27
25.50	2.00	0.55	5.00	0.00	0.27	0.27
25.55	2.00	0.55	5.00	0.00	0.27	0.27
25.60	2.00	0.55	5.00	0.00	0.27	0.27
25.65	2.00	0.55	5.00	0.00	0.27	0.27
25.70	2.00	0.55	5.00	0.00	0.27	0.27
25.75	2.00	0.55	5.00	0.00	0.27	0.27

25.80	2.00	0.55	5.00	0.00	0.27	0.27
25.85	2.00	0.55	5.00	0.00	0.27	0.27
25.90	2.00	0.55	5.00	0.00	0.27	0.27
25.95	2.00	0.55	5.00	0.00	0.27	0.27
26.00	2.00	0.55	5.00	0.00	0.27	0.27
26.05	2.00	0.55	5.00	0.00	0.27	0.27
26.10	2.00	0.55	5.00	0.00	0.26	0.26
26.15	2.00	0.55	5.00	0.00	0.26	0.26
26.20	2.00	0.55	5.00	0.00	0.26	0.26
26.25	2.00	0.55	5.00	0.00	0.26	0.26
26.30	2.00	0.55	5.00	0.00	0.26	0.26
26.35	2.00	0.55	5.00	0.00	0.26	0.26
26.40	2.00	0.55	5.00	0.00	0.26	0.26
26.45	2.00	0.55	5.00	0.00	0.26	0.26
26.50	2.00	0.55	5.00	0.00	0.26	0.26
26.55	2.00	0.55	5.00	0.00	0.26	0.26
26.60	2.00	0.55	5.00	0.00	0.26	0.26
26.65	2.00	0.55	5.00	0.00	0.26	0.26
26.70	2.00	0.55	5.00	0.00	0.26	0.26
26.75	2.00	0.55	5.00	0.00	0.26	0.26
26.80	2.00	0.55	5.00	0.00	0.26	0.26
26.85	2.00	0.55	5.00	0.00	0.26	0.26
26.90	2.00	0.55	5.00	0.00	0.26	0.26
26.95	2.00	0.55	5.00	0.00	0.26	0.26
27.00	2.00	0.55	5.00	0.00	0.26	0.26
27.05	2.01	0.55	5.00	0.00	0.26	0.26
27.10	2.01	0.55	5.00	0.00	0.26	0.26
27.15	2.01	0.55	5.00	0.00	0.26	0.26
27.20	2.01	0.55	5.00	0.00	0.25	0.25
27.25	2.01	0.55	5.00	0.00	0.25	0.25
27.30	2.01	0.55	5.00	0.00	0.25	0.25
27.35	2.01	0.55	5.00	0.00	0.25	0.25
27.40	2.01	0.55	5.00	0.00	0.25	0.25
27.45	2.01	0.55	5.00	0.00	0.25	0.25
27.50	2.01	0.55	5.00	0.00	0.25	0.25
27.55	2.01	0.55	5.00	0.00	0.25	0.25
27.60	2.01	0.55	5.00	0.00	0.25	0.25
27.65	2.01	0.55	5.00	0.00	0.25	0.25
27.70	2.01	0.55	5.00	0.00	0.25	0.25
27.75	2.00	0.55	5.00	0.00	0.25	0.25
27.80	2.00	0.55	5.00	0.00	0.25	0.25
27.85	2.00	0.55	5.00	0.00	0.25	0.25
27.90	2.00	0.55	5.00	0.00	0.25	0.25
27.95	2.00	0.55	5.00	0.00	0.25	0.25
28.00	2.00	0.55	5.00	0.00	0.25	0.25
28.05	2.00	0.55	5.00	0.00	0.25	0.25
28.10	2.00	0.55	5.00	0.00	0.25	0.25
28.15	2.00	0.55	5.00	0.00	0.25	0.25
28.20	2.00	0.55	5.00	0.00	0.24	0.24
28.25	2.00	0.55	5.00	0.00	0.24	0.24
28.30	2.00	0.55	5.00	0.00	0.24	0.24
28.35	2.00	0.55	5.00	0.00	0.24	0.24
28.40	2.00	0.55	5.00	0.00	0.24	0.24
28.45	2.00	0.55	5.00	0.00	0.24	0.24
28.50	2.00	0.55	5.00	0.00	0.24	0.24
28.55	2.00	0.55	5.00	0.00	0.24	0.24
28.60	2.00	0.55	5.00	0.00	0.24	0.24
28.65	2.00	0.55	5.00	0.00	0.24	0.24
28.70	2.00	0.55	5.00	0.00	0.24	0.24
28.75	2.00	0.55	5.00	0.00	0.24	0.24
28.80	2.00	0.55	5.00	0.00	0.24	0.24
28.85	1.99	0.55	5.00	0.00	0.24	0.24
28.90	1.99	0.55	5.00	0.00	0.24	0.24
28.95	1.99	0.55	5.00	0.00	0.24	0.24
29.00	1.99	0.55	5.00	0.00	0.24	0.24

29.05	1.99	0.55	5.00	0.00	0.24	0.24
29.10	1.99	0.55	5.00	0.00	0.24	0.24
29.15	1.99	0.55	5.00	0.00	0.24	0.24
29.20	1.99	0.55	5.00	0.00	0.24	0.24
29.25	1.99	0.55	5.00	0.00	0.23	0.23
29.30	1.99	0.55	5.00	0.00	0.23	0.23
29.35	1.99	0.54	5.00	0.00	0.23	0.23
29.40	1.99	0.54	5.00	0.00	0.23	0.23
29.45	1.99	0.54	5.00	0.00	0.23	0.23
29.50	1.99	0.54	5.00	0.00	0.23	0.23
29.55	1.99	0.54	5.00	0.00	0.23	0.23
29.60	1.99	0.54	5.00	0.00	0.23	0.23
29.65	1.99	0.54	5.00	0.00	0.23	0.23
29.70	1.99	0.54	5.00	0.00	0.23	0.23
29.75	1.99	0.54	5.00	0.00	0.23	0.23
29.80	1.99	0.54	5.00	0.00	0.23	0.23
29.85	1.98	0.54	5.00	0.00	0.23	0.23
29.90	1.98	0.54	5.00	0.00	0.23	0.23
29.95	1.98	0.54	5.00	0.00	0.23	0.23
30.00	1.98	0.54	5.00	0.00	0.23	0.23
30.05	1.98	0.54	5.00	0.00	0.23	0.23
30.10	1.98	0.54	5.00	0.00	0.23	0.23
30.15	1.98	0.54	5.00	0.00	0.23	0.23
30.20	1.98	0.54	5.00	0.00	0.22	0.22
30.25	1.98	0.54	5.00	0.00	0.22	0.22
30.30	1.98	0.54	5.00	0.00	0.22	0.22
30.35	1.98	0.54	5.00	0.00	0.22	0.22
30.40	1.98	0.54	5.00	0.00	0.22	0.22
30.45	1.98	0.54	5.00	0.00	0.22	0.22
30.50	1.98	0.54	5.00	0.00	0.22	0.22
30.55	1.98	0.54	5.00	0.00	0.22	0.22
30.60	1.98	0.54	5.00	0.00	0.22	0.22
30.65	1.98	0.54	5.00	0.00	0.22	0.22
30.70	1.98	0.54	5.00	0.00	0.22	0.22
30.75	1.98	0.54	5.00	0.00	0.22	0.22
30.80	1.98	0.54	5.00	0.00	0.22	0.22
30.85	1.97	0.54	5.00	0.00	0.22	0.22
30.90	1.97	0.54	5.00	0.00	0.22	0.22
30.95	1.97	0.54	5.00	0.00	0.22	0.22
31.00	1.97	0.54	5.00	0.00	0.22	0.22
31.05	1.97	0.54	5.00	0.00	0.22	0.22
31.10	1.97	0.54	5.00	0.00	0.22	0.22
31.15	1.97	0.54	5.00	0.00	0.21	0.21
31.20	1.97	0.54	5.00	0.00	0.21	0.21
31.25	1.97	0.54	5.00	0.00	0.21	0.21
31.30	1.97	0.54	5.00	0.00	0.21	0.21
31.35	1.97	0.54	5.00	0.00	0.21	0.21
31.40	1.97	0.54	5.00	0.00	0.21	0.21
31.45	1.97	0.54	5.00	0.00	0.21	0.21
31.50	1.97	0.54	5.00	0.00	0.21	0.21
31.55	1.97	0.54	5.00	0.00	0.21	0.21
31.60	1.97	0.54	5.00	0.00	0.21	0.21
31.65	1.97	0.54	5.00	0.00	0.21	0.21
31.70	1.97	0.54	5.00	0.00	0.21	0.21
31.75	1.96	0.54	5.00	0.00	0.21	0.21
31.80	1.96	0.54	5.00	0.00	0.21	0.21
31.85	1.96	0.54	5.00	0.00	0.21	0.21
31.90	1.96	0.53	5.00	0.00	0.21	0.21
31.95	1.96	0.53	5.00	0.00	0.21	0.21
32.00	1.96	0.53	5.00	0.00	0.20	0.20
32.05	1.96	0.53	5.00	0.00	0.20	0.20
32.10	1.96	0.53	5.00	0.00	0.20	0.20
32.15	1.96	0.53	5.00	0.00	0.20	0.20
32.20	1.96	0.53	5.00	0.00	0.20	0.20
32.25	1.96	0.53	5.00	0.00	0.20	0.20

32.30	1.96	0.53	5.00	0.00	0.20	0.20
32.35	1.96	0.53	5.00	0.00	0.20	0.20
32.40	1.96	0.53	5.00	0.00	0.20	0.20
32.45	1.96	0.53	5.00	0.00	0.20	0.20
32.50	1.96	0.53	5.00	0.00	0.20	0.20
32.55	1.96	0.53	5.00	0.00	0.20	0.20
32.60	1.96	0.53	5.00	0.00	0.19	0.19
32.65	1.95	0.53	5.00	0.00	0.19	0.19
32.70	1.95	0.53	5.00	0.00	0.19	0.19
32.75	1.95	0.53	5.00	0.00	0.19	0.19
32.80	1.95	0.53	5.00	0.00	0.19	0.19
32.85	1.95	0.53	5.00	0.00	0.19	0.19
32.90	1.95	0.53	5.00	0.00	0.19	0.19
32.95	1.95	0.53	5.00	0.00	0.19	0.19
33.00	1.95	0.53	5.00	0.00	0.19	0.19
33.05	1.95	0.53	5.00	0.00	0.18	0.18
33.10	1.95	0.53	5.00	0.00	0.18	0.18
33.15	1.95	0.53	5.00	0.00	0.18	0.18
33.20	1.95	0.53	5.00	0.00	0.18	0.18
33.25	1.95	0.53	5.00	0.00	0.18	0.18
33.30	1.95	0.53	5.00	0.00	0.18	0.18
33.35	1.95	0.53	5.00	0.00	0.18	0.18
33.40	1.95	0.53	5.00	0.00	0.18	0.18
33.45	1.95	0.53	5.00	0.00	0.18	0.18
33.50	1.95	0.53	5.00	0.00	0.17	0.17
33.55	1.94	0.53	5.00	0.00	0.17	0.17
33.60	1.94	0.53	5.00	0.00	0.17	0.17
33.65	1.94	0.53	5.00	0.00	0.17	0.17
33.70	1.94	0.53	5.00	0.00	0.17	0.17
33.75	1.94	0.53	5.00	0.00	0.17	0.17
33.80	1.94	0.53	5.00	0.00	0.17	0.17
33.85	1.94	0.53	5.00	0.00	0.17	0.17
33.90	1.94	0.53	5.00	0.00	0.17	0.17
33.95	1.94	0.53	5.00	0.00	0.17	0.17
34.00	1.94	0.52	5.00	0.00	0.17	0.17
34.05	1.94	0.52	5.00	0.00	0.17	0.17
34.10	1.94	0.52	5.00	0.00	0.16	0.16
34.15	1.94	0.52	5.00	0.00	0.16	0.16
34.20	1.94	0.52	5.00	0.00	0.16	0.16
34.25	1.94	0.52	5.00	0.00	0.16	0.16
34.30	1.94	0.52	5.00	0.00	0.16	0.16
34.35	1.94	0.52	5.00	0.00	0.16	0.16
34.40	1.94	0.52	5.00	0.00	0.16	0.16
34.45	1.93	0.52	5.00	0.00	0.16	0.16
34.50	1.93	0.52	5.00	0.00	0.16	0.16
34.55	1.93	0.52	5.00	0.00	0.16	0.16
34.60	1.93	0.52	5.00	0.00	0.16	0.16
34.65	1.93	0.52	5.00	0.00	0.16	0.16
34.70	1.93	0.52	5.00	0.00	0.16	0.16
34.75	1.93	0.52	5.00	0.00	0.15	0.15
34.80	1.93	0.52	5.00	0.00	0.15	0.15
34.85	1.93	0.52	5.00	0.00	0.15	0.15
34.90	1.93	0.52	5.00	0.00	0.15	0.15
34.95	1.93	0.52	5.00	0.00	0.15	0.15
35.00	1.93	0.52	5.00	0.00	0.15	0.15
35.05	1.93	0.52	5.00	0.00	0.15	0.15
35.10	1.93	0.52	5.00	0.00	0.15	0.15
35.15	1.93	0.52	5.00	0.00	0.15	0.15
35.20	1.93	0.52	5.00	0.00	0.15	0.15
35.25	1.93	0.52	5.00	0.00	0.15	0.15
35.30	1.93	0.52	5.00	0.00	0.15	0.15
35.35	1.92	0.52	5.00	0.00	0.15	0.15
35.40	1.92	0.52	5.00	0.00	0.15	0.15
35.45	1.92	0.52	5.00	0.00	0.15	0.15
35.50	1.92	0.52	5.00	0.00	0.15	0.15

35.55	1.92	0.52	5.00	0.00	0.14	0.14
35.60	1.92	0.52	5.00	0.00	0.14	0.14
35.65	1.92	0.52	5.00	0.00	0.14	0.14
35.70	1.92	0.52	5.00	0.00	0.14	0.14
35.75	1.92	0.52	5.00	0.00	0.14	0.14
35.80	1.92	0.52	5.00	0.00	0.14	0.14
35.85	1.92	0.52	5.00	0.00	0.14	0.14
35.90	1.92	0.52	5.00	0.00	0.14	0.14
35.95	1.92	0.52	5.00	0.00	0.14	0.14
36.00	1.92	0.52	5.00	0.00	0.14	0.14
36.05	1.92	0.52	5.00	0.00	0.14	0.14
36.10	1.92	0.51	5.00	0.00	0.14	0.14
36.15	1.92	0.51	5.00	0.00	0.14	0.14
36.20	1.92	0.51	5.00	0.00	0.14	0.14
36.25	1.91	0.51	5.00	0.00	0.14	0.14
36.30	1.91	0.51	5.00	0.00	0.14	0.14
36.35	1.91	0.51	5.00	0.00	0.14	0.14
36.40	1.91	0.51	5.00	0.00	0.13	0.13
36.45	1.91	0.51	5.00	0.00	0.13	0.13
36.50	1.91	0.51	5.00	0.00	0.13	0.13
36.55	1.91	0.51	5.00	0.00	0.13	0.13
36.60	1.91	0.51	5.00	0.00	0.13	0.13
36.65	1.91	0.51	5.00	0.00	0.13	0.13
36.70	1.91	0.51	5.00	0.00	0.13	0.13
36.75	1.91	0.51	5.00	0.00	0.13	0.13
36.80	1.91	0.51	5.00	0.00	0.13	0.13
36.85	1.91	0.51	5.00	0.00	0.13	0.13
36.90	1.91	0.51	5.00	0.00	0.13	0.13
36.95	1.91	0.51	5.00	0.00	0.13	0.13
37.00	1.91	0.51	5.00	0.00	0.13	0.13
37.05	1.91	0.51	5.00	0.00	0.13	0.13
37.10	1.91	0.51	5.00	0.00	0.13	0.13
37.15	1.91	0.51	5.00	0.00	0.13	0.13
37.20	1.90	0.51	5.00	0.00	0.13	0.13
37.25	1.90	0.51	5.00	0.00	0.12	0.12
37.30	1.90	0.51	5.00	0.00	0.12	0.12
37.35	1.90	0.51	5.00	0.00	0.12	0.12
37.40	1.90	0.51	5.00	0.00	0.12	0.12
37.45	1.90	0.51	5.00	0.00	0.12	0.12
37.50	1.90	0.51	5.00	0.00	0.12	0.12
37.55	1.90	0.51	5.00	0.00	0.12	0.12
37.60	1.90	0.51	5.00	0.00	0.12	0.12
37.65	1.90	0.51	5.00	0.00	0.12	0.12
37.70	1.90	0.51	5.00	0.00	0.12	0.12
37.75	1.90	0.51	5.00	0.00	0.12	0.12
37.80	1.90	0.51	5.00	0.00	0.12	0.12
37.85	1.90	0.51	5.00	0.00	0.12	0.12
37.90	1.90	0.51	5.00	0.00	0.12	0.12
37.95	1.90	0.51	5.00	0.00	0.12	0.12
38.00	1.90	0.51	5.00	0.00	0.12	0.12
38.05	1.90	0.51	5.00	0.00	0.12	0.12
38.10	1.90	0.51	5.00	0.00	0.11	0.11
38.15	1.89	0.51	5.00	0.00	0.11	0.11
38.20	1.89	0.50	5.00	0.00	0.11	0.11
38.25	1.89	0.50	5.00	0.00	0.11	0.11
38.30	1.89	0.50	5.00	0.00	0.11	0.11
38.35	1.89	0.50	5.00	0.00	0.11	0.11
38.40	1.89	0.50	5.00	0.00	0.11	0.11
38.45	1.89	0.50	5.00	0.00	0.11	0.11
38.50	1.89	0.50	5.00	0.00	0.11	0.11
38.55	1.89	0.50	5.00	0.00	0.11	0.11
38.60	1.89	0.50	5.00	0.00	0.11	0.11
38.65	1.89	0.50	5.00	0.00	0.11	0.11
38.70	1.89	0.50	5.00	0.00	0.11	0.11
38.75	1.89	0.50	5.00	0.00	0.11	0.11

38.80	1.89	0.50	5.00	0.00	0.11	0.11
38.85	1.89	0.50	5.00	0.00	0.11	0.11
38.90	1.89	0.50	5.00	0.00	0.11	0.11
38.95	1.89	0.50	5.00	0.00	0.10	0.10
39.00	1.89	0.50	5.00	0.00	0.10	0.10
39.05	1.89	0.50	5.00	0.00	0.10	0.10
39.10	1.88	0.50	5.00	0.00	0.10	0.10
39.15	1.88	0.50	5.00	0.00	0.10	0.10
39.20	1.88	0.50	5.00	0.00	0.10	0.10
39.25	1.88	0.50	5.00	0.00	0.10	0.10
39.30	1.88	0.50	5.00	0.00	0.10	0.10
39.35	1.88	0.50	5.00	0.00	0.10	0.10
39.40	1.88	0.50	5.00	0.00	0.10	0.10
39.45	1.88	0.50	5.00	0.00	0.10	0.10
39.50	1.88	0.50	5.00	0.00	0.10	0.10
39.55	1.88	0.50	5.00	0.00	0.10	0.10
39.60	1.88	0.50	5.00	0.00	0.10	0.10
39.65	1.88	0.50	5.00	0.00	0.10	0.10
39.70	1.88	0.50	5.00	0.00	0.10	0.10
39.75	1.88	0.50	5.00	0.00	0.09	0.09
39.80	1.88	0.50	5.00	0.00	0.09	0.09
39.85	1.88	0.50	5.00	0.00	0.09	0.09
39.90	1.88	0.50	5.00	0.00	0.09	0.09
39.95	1.88	0.50	5.00	0.00	0.09	0.09
40.00	1.88	0.50	5.00	0.00	0.09	0.09
40.05	1.88	0.50	5.00	0.00	0.09	0.09
40.10	1.87	0.50	5.00	0.00	0.09	0.09
40.15	1.87	0.50	5.00	0.00	0.09	0.09
40.20	1.87	0.50	5.00	0.00	0.09	0.09
40.25	1.87	0.50	5.00	0.00	0.09	0.09
40.30	1.87	0.49	5.00	0.00	0.09	0.09
40.35	1.87	0.49	5.00	0.00	0.09	0.09
40.40	1.87	0.49	5.00	0.00	0.09	0.09
40.45	1.87	0.49	5.00	0.00	0.09	0.09
40.50	1.87	0.49	5.00	0.00	0.09	0.09
40.55	1.87	0.49	5.00	0.00	0.09	0.09
40.60	1.87	0.49	5.00	0.00	0.08	0.08
40.65	1.87	0.49	5.00	0.00	0.08	0.08
40.70	1.87	0.49	5.00	0.00	0.08	0.08
40.75	1.87	0.49	5.00	0.00	0.08	0.08
40.80	1.87	0.49	5.00	0.00	0.08	0.08
40.85	1.87	0.49	5.00	0.00	0.08	0.08
40.90	1.87	0.49	5.00	0.00	0.08	0.08
40.95	1.87	0.49	5.00	0.00	0.08	0.08
41.00	1.87	0.49	5.00	0.00	0.08	0.08
41.05	1.87	0.49	5.00	0.00	0.08	0.08
41.10	1.86	0.49	5.00	0.00	0.08	0.08
41.15	1.86	0.49	5.00	0.00	0.08	0.08
41.20	1.86	0.49	5.00	0.00	0.08	0.08
41.25	1.86	0.49	5.00	0.00	0.08	0.08
41.30	1.86	0.49	5.00	0.00	0.08	0.08
41.35	1.86	0.49	5.00	0.00	0.08	0.08
41.40	1.86	0.49	5.00	0.00	0.08	0.08
41.45	1.86	0.49	5.00	0.00	0.08	0.08
41.50	1.86	0.49	5.00	0.00	0.08	0.08
41.55	1.86	0.49	5.00	0.00	0.07	0.07
41.60	1.86	0.49	5.00	0.00	0.07	0.07
41.65	1.86	0.49	5.00	0.00	0.07	0.07
41.70	1.86	0.49	5.00	0.00	0.07	0.07
41.75	1.86	0.49	5.00	0.00	0.07	0.07
41.80	1.86	0.49	5.00	0.00	0.07	0.07
41.85	1.86	0.49	5.00	0.00	0.07	0.07
41.90	1.86	0.49	5.00	0.00	0.07	0.07
41.95	1.86	0.49	5.00	0.00	0.07	0.07
42.00	1.86	0.49	5.00	0.00	0.07	0.07

42.05	1.86	0.49	5.00	0.00	0.07	0.07
42.10	1.86	0.49	5.00	0.00	0.07	0.07
42.15	1.85	0.49	5.00	0.00	0.07	0.07
42.20	1.85	0.49	5.00	0.00	0.07	0.07
42.25	1.85	0.49	5.00	0.00	0.07	0.07
42.30	1.85	0.49	5.00	0.00	0.07	0.07
42.35	1.85	0.49	5.00	0.00	0.07	0.07
42.40	1.85	0.48	5.00	0.00	0.07	0.07
42.45	1.85	0.48	5.00	0.00	0.07	0.07
42.50	1.85	0.48	5.00	0.00	0.07	0.07
42.55	1.85	0.48	5.00	0.00	0.07	0.07
42.60	1.85	0.48	5.00	0.00	0.07	0.07
42.65	1.85	0.48	5.00	0.00	0.07	0.07
42.70	1.85	0.48	5.00	0.00	0.07	0.07
42.75	1.85	0.48	5.00	0.00	0.07	0.07
42.80	1.85	0.48	5.00	0.00	0.06	0.06
42.85	1.85	0.48	5.00	0.00	0.06	0.06
42.90	1.85	0.48	5.00	0.00	0.06	0.06
42.95	1.85	0.48	5.00	0.00	0.06	0.06
43.00	1.85	0.48	5.00	0.00	0.06	0.06
43.05	1.85	0.48	5.00	0.00	0.06	0.06
43.10	1.85	0.48	5.00	0.00	0.06	0.06
43.15	1.85	0.48	5.00	0.00	0.06	0.06
43.20	1.85	0.48	5.00	0.00	0.06	0.06
43.25	1.84	0.48	5.00	0.00	0.06	0.06
43.30	1.84	0.48	5.00	0.00	0.06	0.06
43.35	1.84	0.48	5.00	0.00	0.06	0.06
43.40	1.84	0.48	5.00	0.00	0.06	0.06
43.45	1.84	0.48	5.00	0.00	0.06	0.06
43.50	1.84	0.48	5.00	0.00	0.06	0.06
43.55	1.84	0.48	5.00	0.00	0.06	0.06
43.60	1.84	0.48	5.00	0.00	0.06	0.06
43.65	1.84	0.48	5.00	0.00	0.06	0.06
43.70	1.84	0.48	5.00	0.00	0.06	0.06
43.75	1.84	0.48	5.00	0.00	0.06	0.06
43.80	1.84	0.48	5.00	0.00	0.06	0.06
43.85	1.84	0.48	5.00	0.00	0.06	0.06
43.90	1.84	0.48	5.00	0.00	0.06	0.06
43.95	1.84	0.48	5.00	0.00	0.05	0.05
44.00	1.84	0.48	5.00	0.00	0.05	0.05
44.05	1.84	0.48	5.00	0.00	0.05	0.05
44.10	1.84	0.48	5.00	0.00	0.05	0.05
44.15	1.84	0.48	5.00	0.00	0.05	0.05
44.20	1.84	0.48	5.00	0.00	0.05	0.05
44.25	1.84	0.48	5.00	0.00	0.05	0.05
44.30	1.84	0.48	5.00	0.00	0.05	0.05
44.35	1.83	0.48	5.00	0.00	0.05	0.05
44.40	1.83	0.48	5.00	0.00	0.05	0.05
44.45	1.83	0.48	5.00	0.00	0.05	0.05
44.50	1.83	0.47	5.00	0.00	0.05	0.05
44.55	1.83	0.47	5.00	0.00	0.05	0.05
44.60	1.83	0.47	5.00	0.00	0.05	0.05
44.65	1.83	0.47	5.00	0.00	0.05	0.05
44.70	1.83	0.47	5.00	0.00	0.05	0.05
44.75	1.83	0.47	5.00	0.00	0.05	0.05
44.80	1.83	0.47	5.00	0.00	0.05	0.05
44.85	1.83	0.47	5.00	0.00	0.05	0.05
44.90	1.83	0.47	5.00	0.00	0.05	0.05
44.95	1.83	0.47	5.00	0.00	0.05	0.05
45.00	1.83	0.47	5.00	0.00	0.05	0.05
45.05	1.83	0.47	5.00	0.00	0.04	0.04
45.10	1.83	0.47	5.00	0.00	0.04	0.04
45.15	1.83	0.47	5.00	0.00	0.04	0.04
45.20	1.83	0.47	5.00	0.00	0.04	0.04
45.25	1.83	0.47	5.00	0.00	0.04	0.04

45.30	1.83	0.47	5.00	0.00	0.04	0.04
45.35	1.83	0.47	5.00	0.00	0.04	0.04
45.40	1.83	0.47	5.00	0.00	0.04	0.04
45.45	1.82	0.47	5.00	0.00	0.04	0.04
45.50	1.82	0.47	5.00	0.00	0.04	0.04
45.55	1.82	0.47	5.00	0.00	0.04	0.04
45.60	1.82	0.47	5.00	0.00	0.04	0.04
45.65	1.82	0.47	5.00	0.00	0.04	0.04
45.70	1.82	0.47	5.00	0.00	0.04	0.04
45.75	1.82	0.47	5.00	0.00	0.04	0.04
45.80	1.82	0.47	5.00	0.00	0.04	0.04
45.85	1.82	0.47	5.00	0.00	0.04	0.04
45.90	1.82	0.47	5.00	0.00	0.04	0.04
45.95	1.82	0.47	5.00	0.00	0.04	0.04
46.00	1.82	0.47	5.00	0.00	0.04	0.04
46.05	1.82	0.47	5.00	0.00	0.04	0.04
46.10	1.82	0.47	5.00	0.00	0.04	0.04
46.15	1.82	0.47	5.00	0.00	0.04	0.04
46.20	1.82	0.47	5.00	0.00	0.03	0.03
46.25	1.82	0.47	5.00	0.00	0.03	0.03
46.30	1.82	0.47	5.00	0.00	0.03	0.03
46.35	1.82	0.47	5.00	0.00	0.03	0.03
46.40	1.82	0.47	5.00	0.00	0.03	0.03
46.45	1.82	0.47	5.00	0.00	0.03	0.03
46.50	1.82	0.47	5.00	0.00	0.03	0.03
46.55	1.82	0.47	5.00	0.00	0.03	0.03
46.60	1.81	0.46	5.00	0.00	0.03	0.03
46.65	1.81	0.46	5.00	0.00	0.03	0.03
46.70	1.81	0.46	5.00	0.00	0.03	0.03
46.75	1.81	0.46	5.00	0.00	0.03	0.03
46.80	1.81	0.46	5.00	0.00	0.03	0.03
46.85	1.81	0.46	5.00	0.00	0.03	0.03
46.90	1.81	0.46	5.00	0.00	0.03	0.03
46.95	1.81	0.46	5.00	0.00	0.03	0.03
47.00	1.81	0.46	5.00	0.00	0.03	0.03
47.05	1.81	0.46	5.00	0.00	0.03	0.03
47.10	1.81	0.46	5.00	0.00	0.03	0.03
47.15	1.81	0.46	5.00	0.00	0.03	0.03
47.20	1.81	0.46	5.00	0.00	0.03	0.03
47.25	1.81	0.46	5.00	0.00	0.03	0.03
47.30	1.81	0.46	5.00	0.00	0.02	0.02
47.35	1.81	0.46	5.00	0.00	0.02	0.02
47.40	1.81	0.46	5.00	0.00	0.02	0.02
47.45	1.81	0.46	5.00	0.00	0.02	0.02
47.50	1.81	0.46	5.00	0.00	0.02	0.02
47.55	1.81	0.46	5.00	0.00	0.02	0.02
47.60	1.81	0.46	5.00	0.00	0.02	0.02
47.65	1.81	0.46	5.00	0.00	0.02	0.02
47.70	1.81	0.46	5.00	0.00	0.02	0.02
47.75	1.80	0.46	5.00	0.00	0.02	0.02
47.80	1.80	0.46	5.00	0.00	0.02	0.02
47.85	1.80	0.46	5.00	0.00	0.02	0.02
47.90	1.80	0.46	5.00	0.00	0.02	0.02
47.95	1.80	0.46	5.00	0.00	0.02	0.02
48.00	1.80	0.46	5.00	0.00	0.02	0.02
48.05	1.80	0.46	5.00	0.00	0.02	0.02
48.10	1.80	0.46	5.00	0.00	0.02	0.02
48.15	1.80	0.46	5.00	0.00	0.02	0.02
48.20	1.80	0.46	5.00	0.00	0.02	0.02
48.25	1.80	0.46	5.00	0.00	0.02	0.02
48.30	1.80	0.46	5.00	0.00	0.02	0.02
48.35	1.80	0.46	5.00	0.00	0.02	0.02
48.40	1.80	0.46	5.00	0.00	0.01	0.01
48.45	1.80	0.46	5.00	0.00	0.01	0.01
48.50	1.80	0.46	5.00	0.00	0.01	0.01

48.55	1.80	0.46	5.00	0.00	0.01	0.01
48.60	1.80	0.46	5.00	0.00	0.01	0.01
48.65	1.80	0.46	5.00	0.00	0.01	0.01
48.70	1.80	0.45	5.00	0.00	0.01	0.01
48.75	1.80	0.45	5.00	0.00	0.01	0.01
48.80	1.80	0.45	5.00	0.00	0.01	0.01
48.85	1.80	0.45	5.00	0.00	0.01	0.01
48.90	1.79	0.45	5.00	0.00	0.01	0.01
48.95	1.79	0.45	5.00	0.00	0.01	0.01
49.00	1.79	0.45	5.00	0.00	0.01	0.01
49.05	1.79	0.45	5.00	0.00	0.01	0.01
49.10	1.79	0.45	5.00	0.00	0.01	0.01
49.15	1.79	0.45	5.00	0.00	0.01	0.01
49.20	1.79	0.45	5.00	0.00	0.01	0.01
49.25	1.79	0.45	5.00	0.00	0.01	0.01
49.30	1.79	0.45	5.00	0.00	0.01	0.01
49.35	1.79	0.45	5.00	0.00	0.01	0.01
49.40	1.79	0.45	5.00	0.00	0.01	0.01
49.45	1.79	0.45	5.00	0.00	0.01	0.01
49.50	1.79	0.45	5.00	0.00	0.00	0.00
49.55	1.79	0.45	5.00	0.00	0.00	0.00
49.60	1.79	0.45	5.00	0.00	0.00	0.00
49.65	1.79	0.45	5.00	0.00	0.00	0.00
49.70	1.79	0.45	5.00	0.00	0.00	0.00
49.75	1.79	0.45	5.00	0.00	0.00	0.00
49.80	1.79	0.45	5.00	0.00	0.00	0.00
49.85	1.79	0.45	5.00	0.00	0.00	0.00
49.90	1.79	0.45	5.00	0.00	0.00	0.00
49.95	1.79	0.45	5.00	0.00	0.00	0.00
50.00	1.79	0.45	5.00	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units Depth = ft, Stress or Pressure = tsf (atm), Unit Weight = pcf, Settlement = in.

CRRm Cyclic resistance ratio from soils
CSRfs Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRfs
S_sat Settlement from saturated sands
S_dry Settlement from dry sands
S_all Total settlement from saturated and dry sands
NoLiq No-Liquefy Soils

APPENDIX E

REFERENCES

REFERENCES
AND BACKGROUND SOURCES
022-09110

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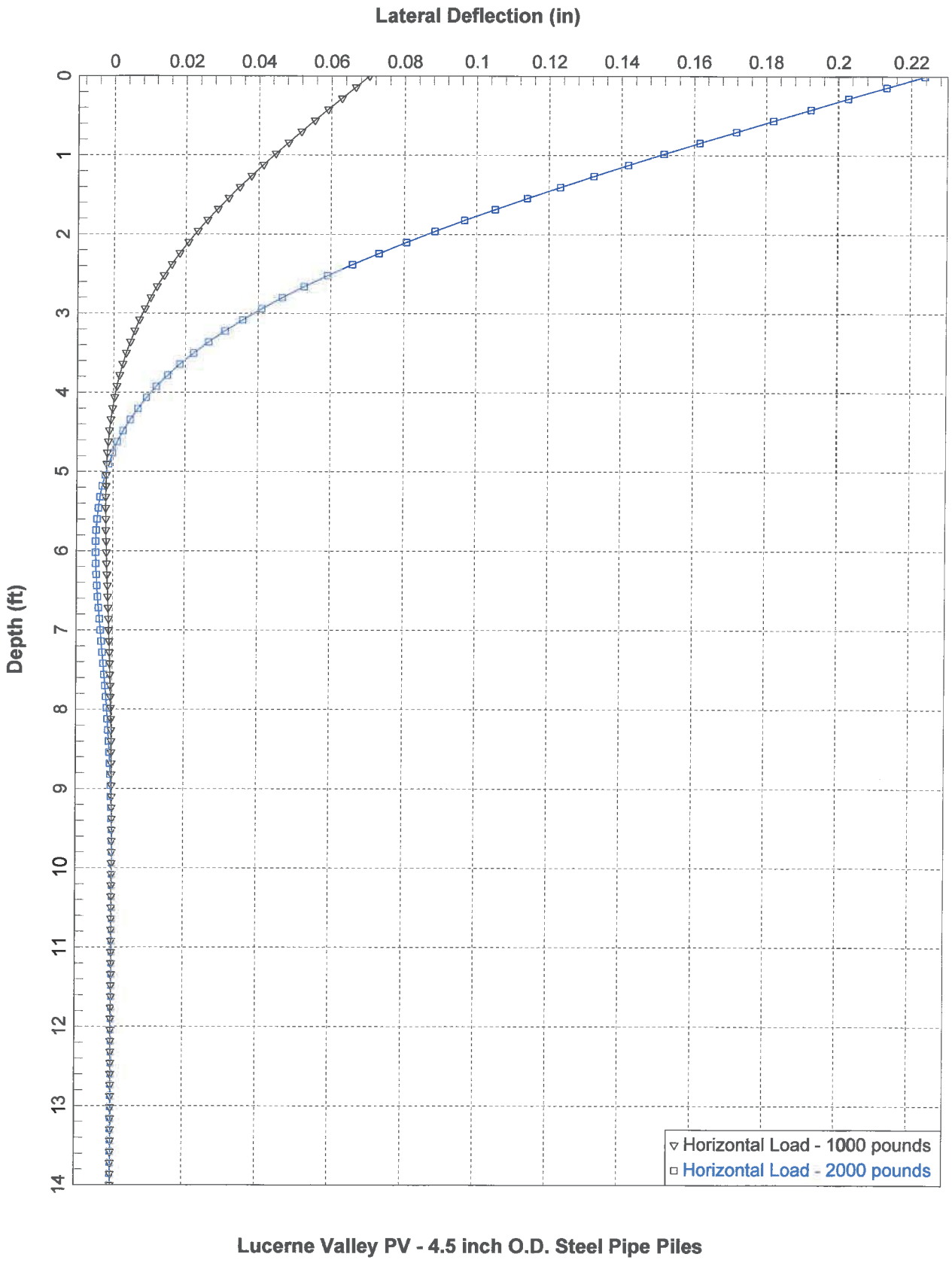
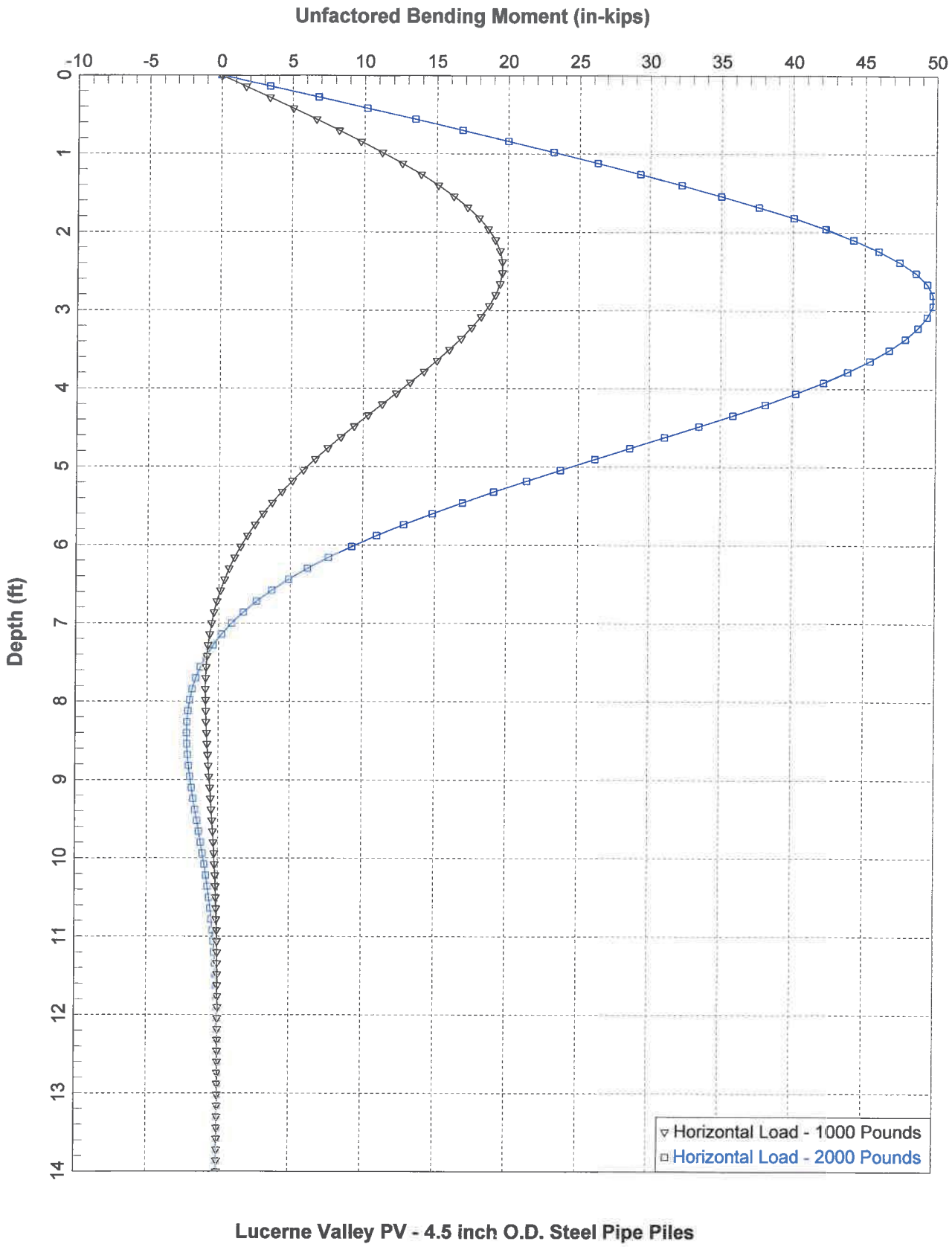
APPENDIX F

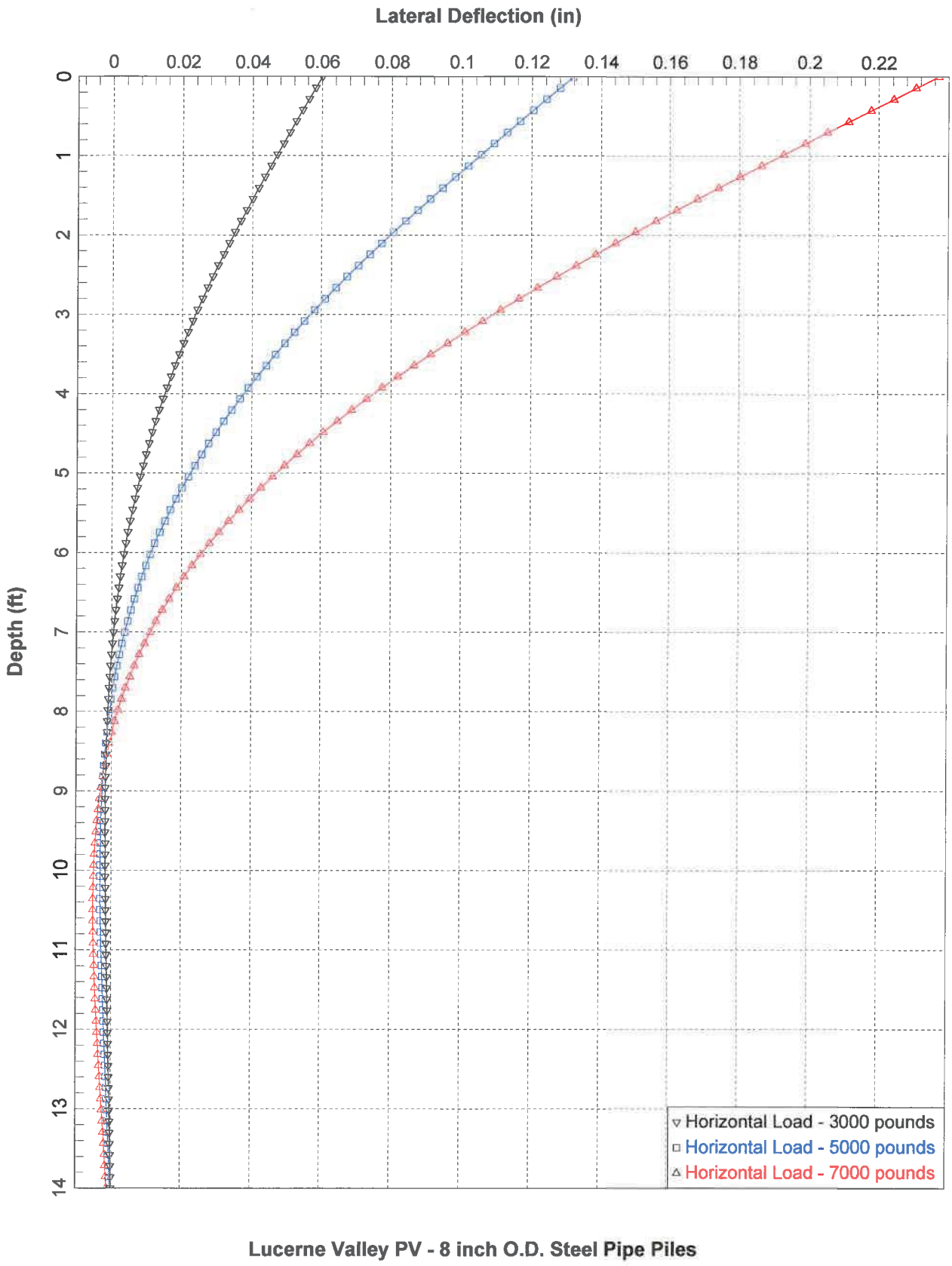
DRILLED CAISSON AND STEEL POSTS INFORMATION



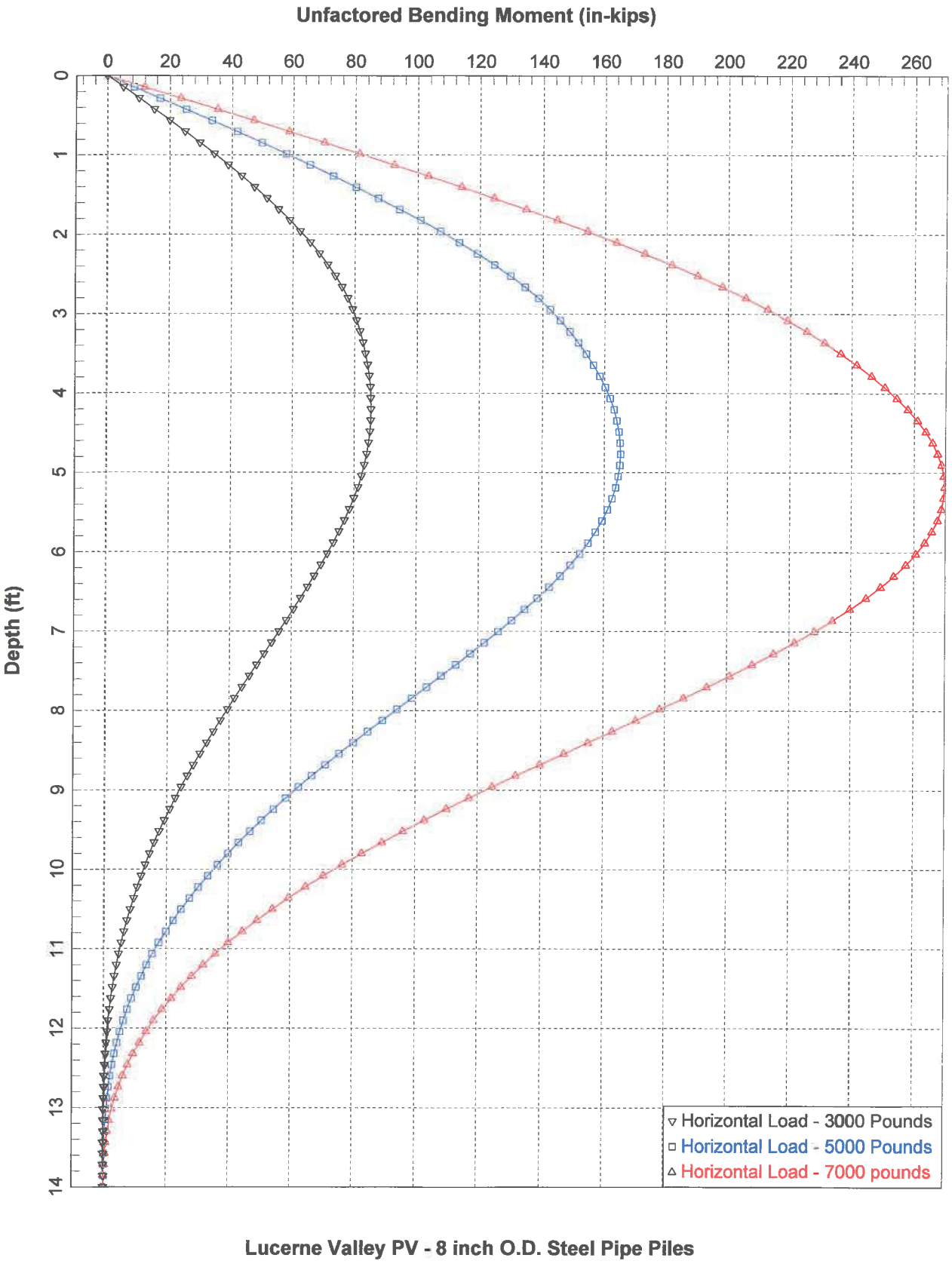
Lucerne Valley PV - 4.5 inch O.D. Steel Pipe Piles



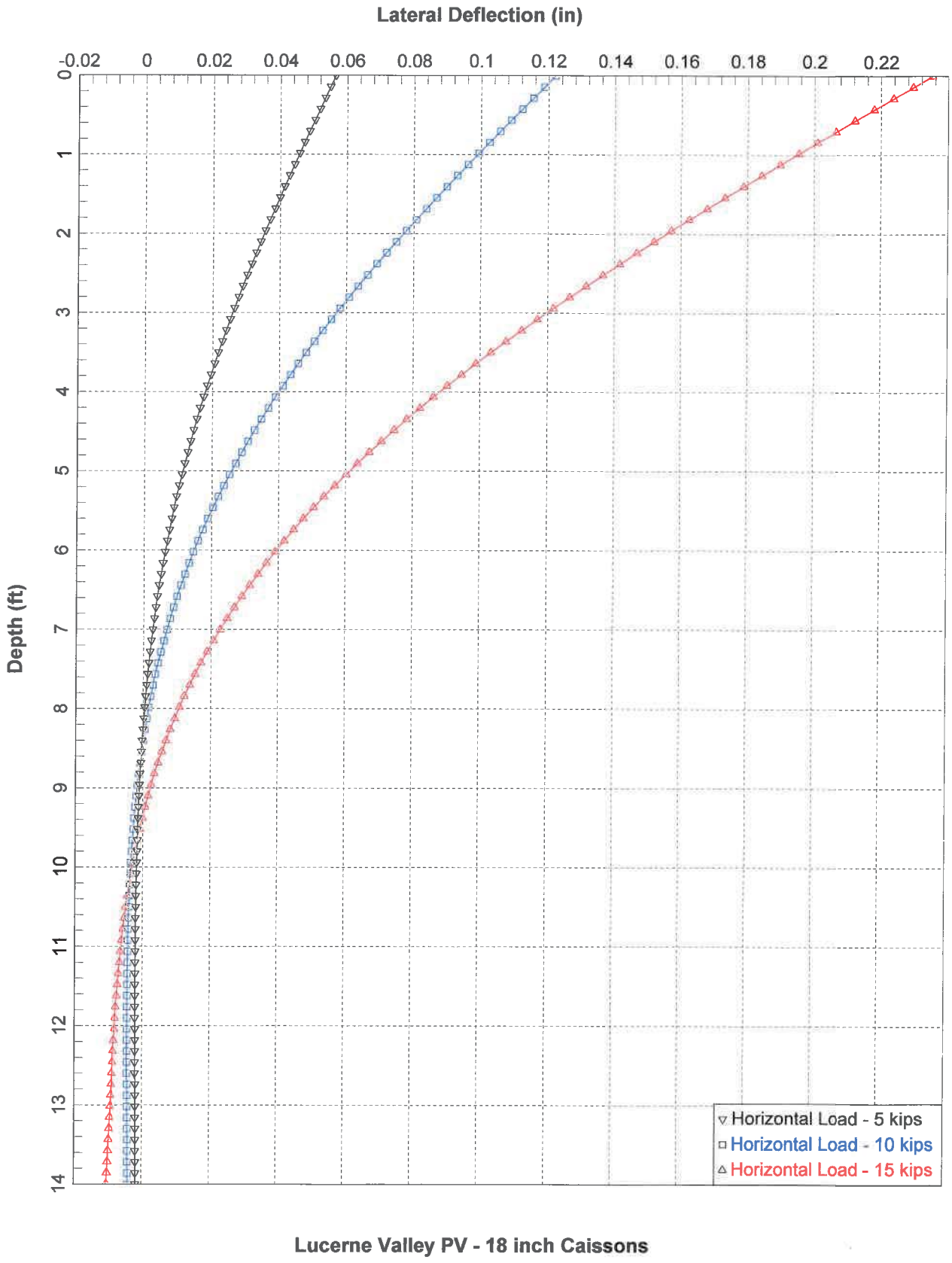
Lucerne Valley PV - 4.5 inch O.D. Steel Pipe Piles



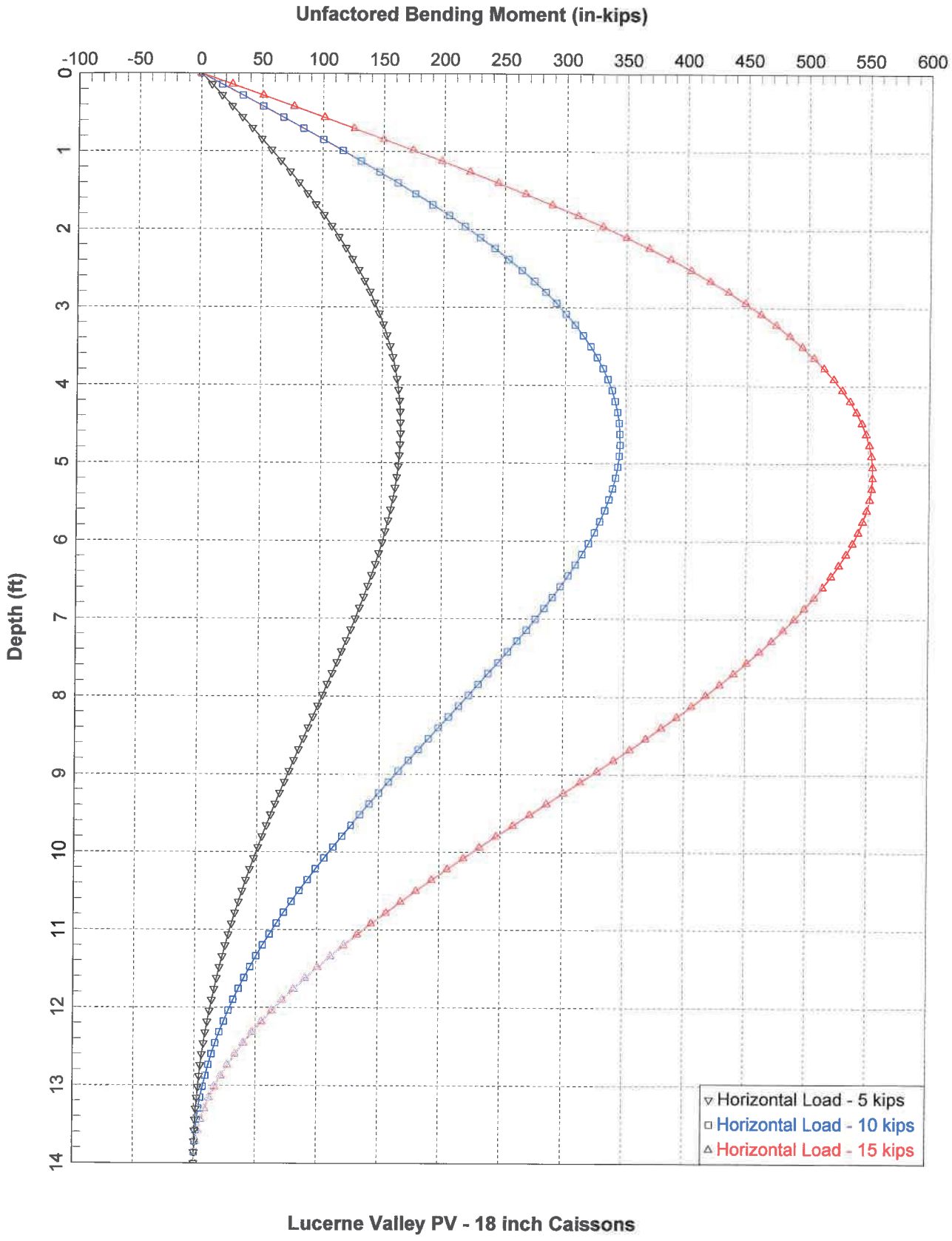
Lucerne Valley PV - 8 inch O.D. Steel Pipe Piles



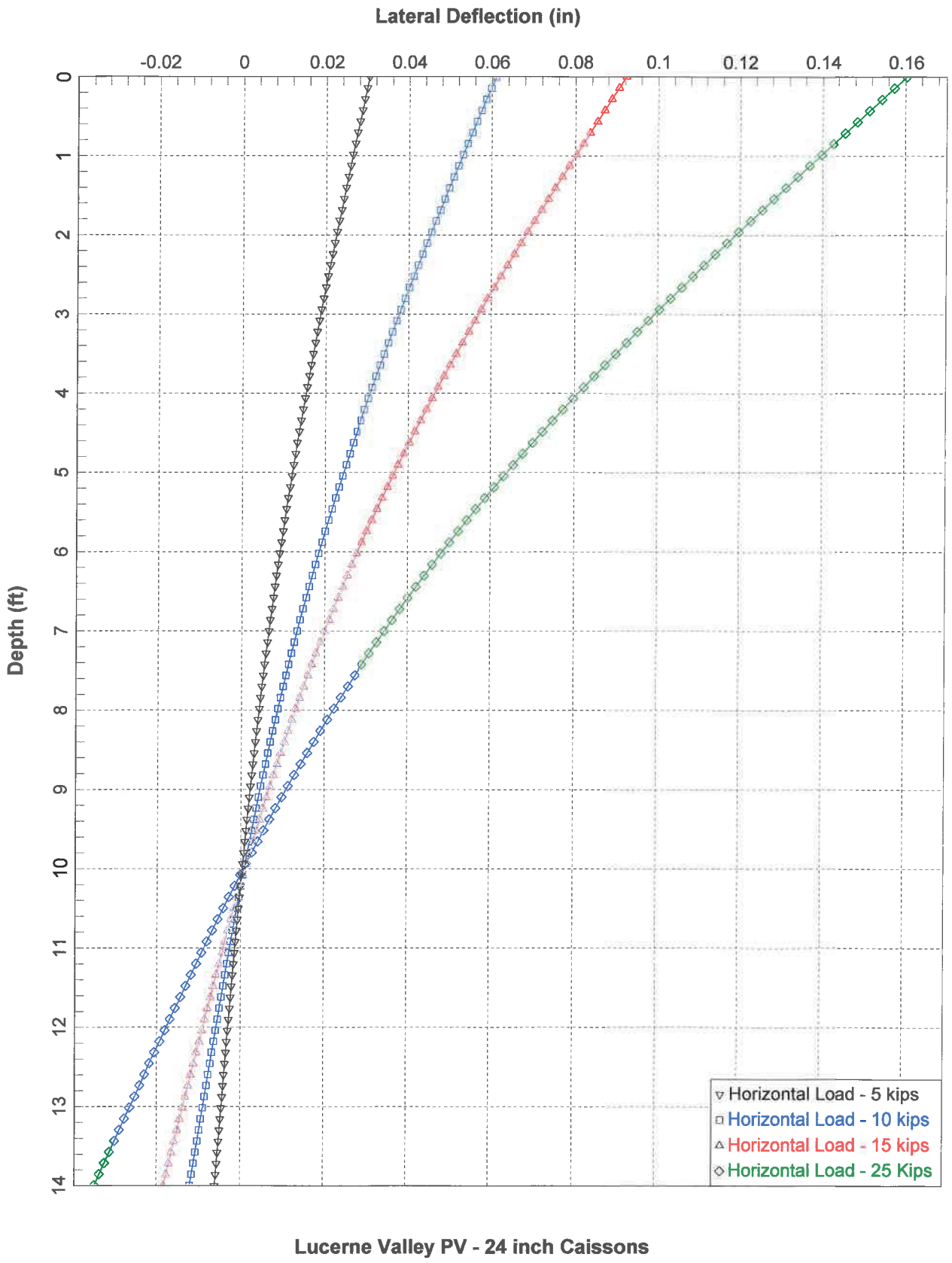
Lucerne Valley PV - 8 inch O.D. Steel Pipe Piles



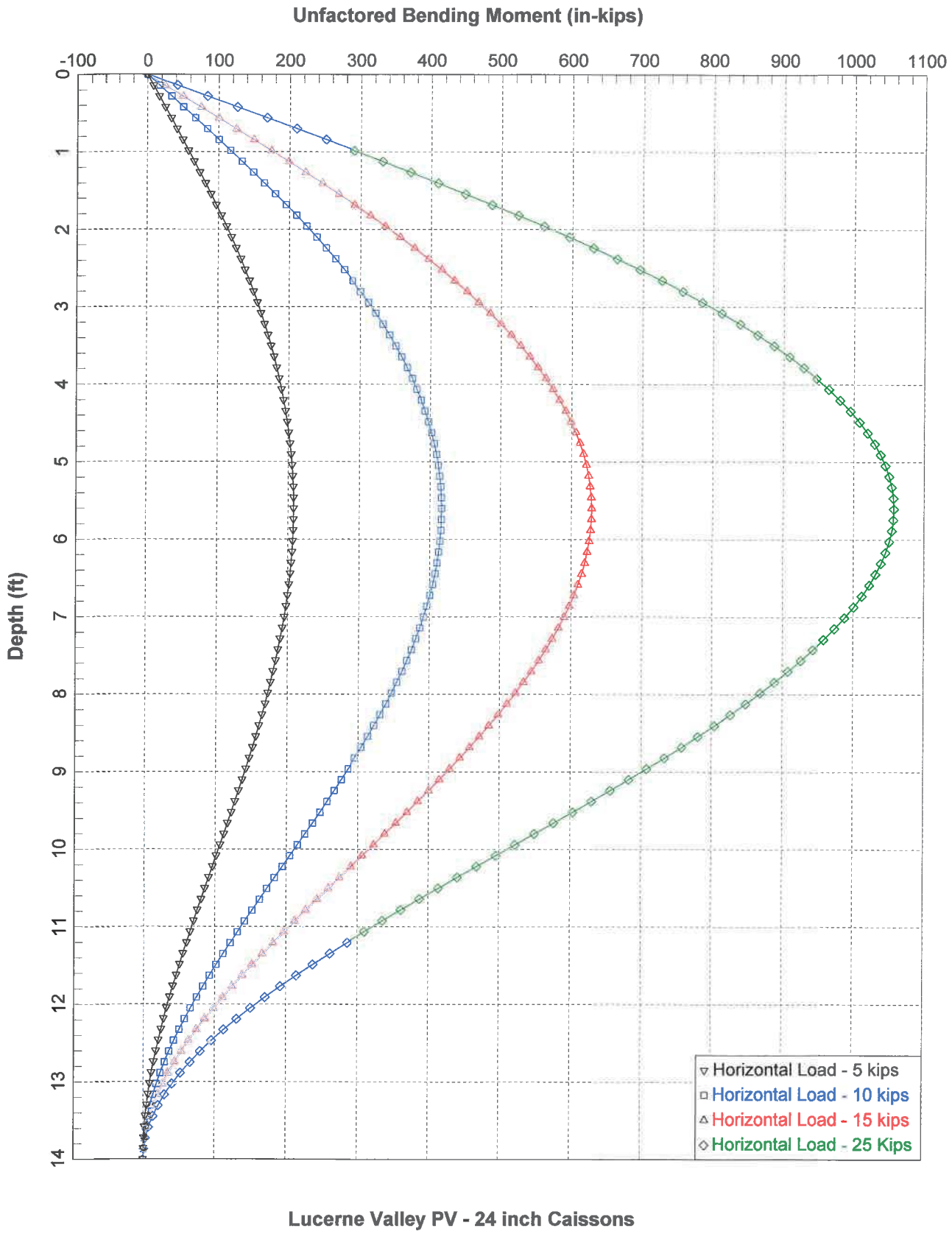
Lucerne Valley PV - 18 inch Caissons



Lucerne Valley PV - 18 inch Caissons



Lucerne Valley PV - 24 inch Caissons


Unfactored Bending Moment (in-kips)
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0
100
200
300
400
500
600
700
800
900
1000
1100
Depth (ft)
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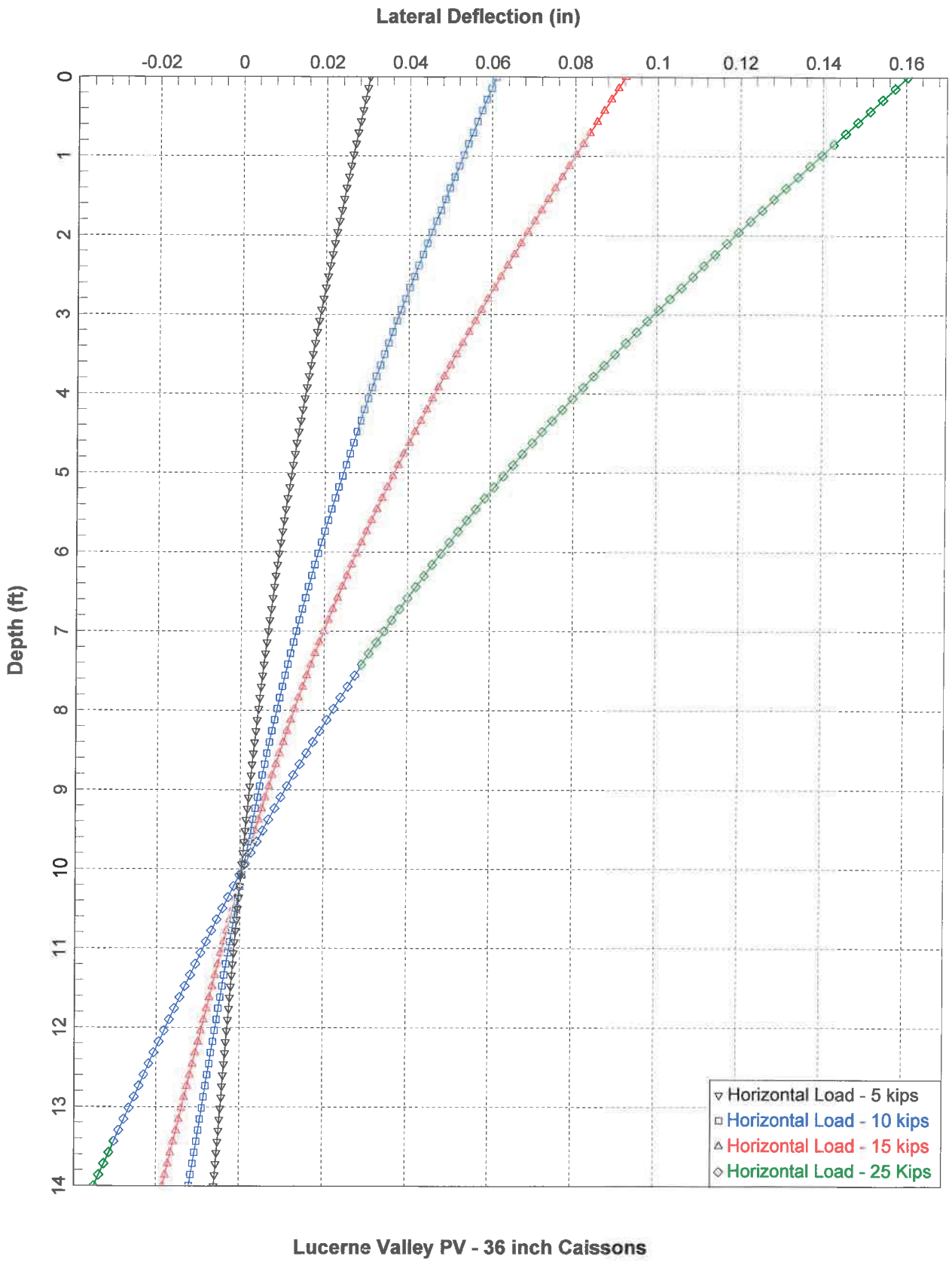
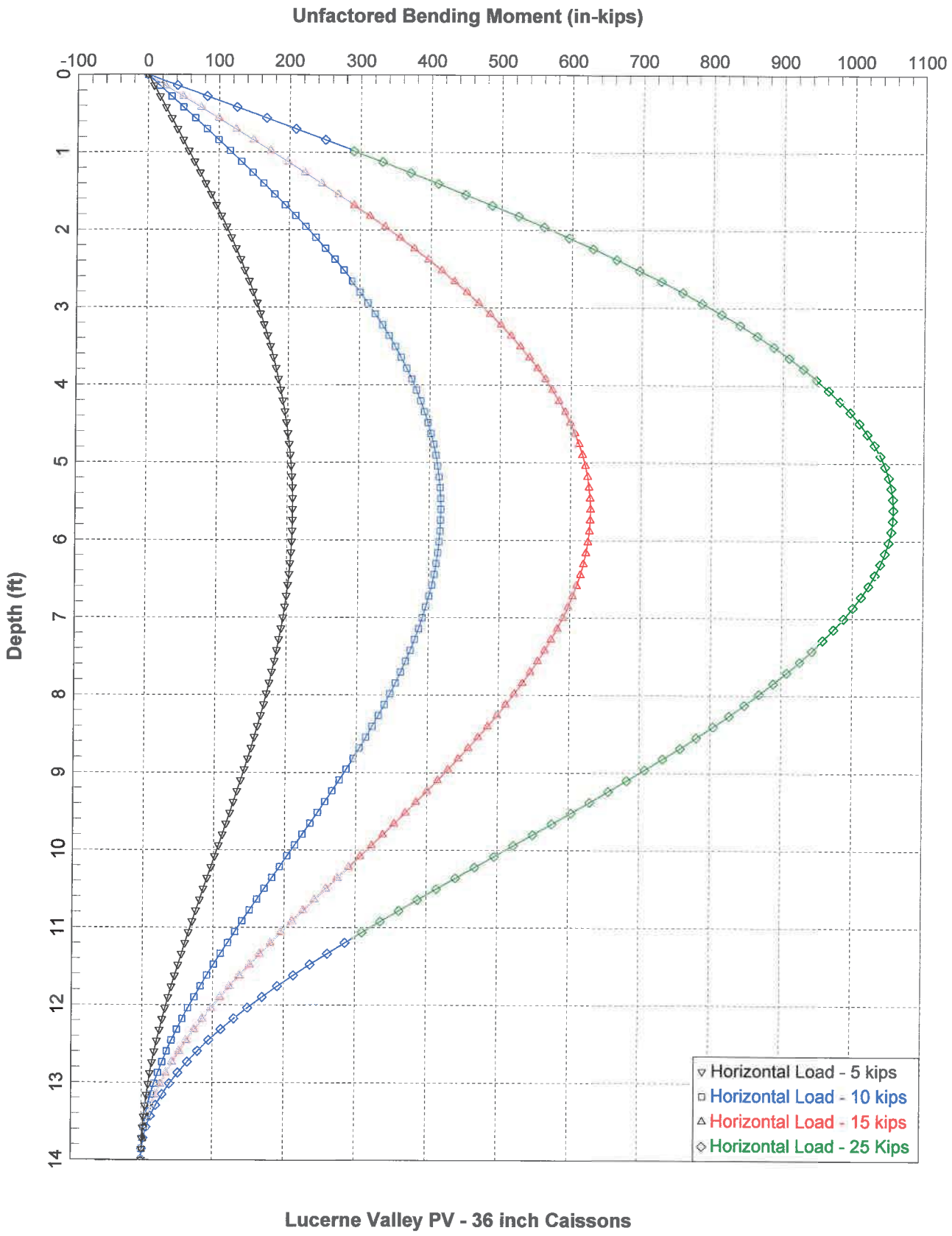
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Horizontal Load - 5 kips
Horizontal Load - 10 kips
Horizontal Load - 15 kips
Horizontal Load - 25 Kips
Lucerne Valley PV - 24 inch Caissons



Lucerne Valley PV - 36 inch Caissons



Lucerne Valley PV - 36 inch Caissons

Geotechnical Report

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

GEOTECHNICAL EVALUATION
CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA
SCE PROJECT NO. 10-256

PREPARED FOR:
Southern California Edison
One Innovation Way
Pomona, California 91768

PREPARED BY:
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March 24, 2017
Project No. 209418048

March 24, 2017
Project No. 209418048

Mr. Scott Richtmyer
Southern California Edison
One Innovation Way
Pomona, California 91768

Subject: Geotechnical Evaluation
Calcite 220kV Substation & Transmission Alignment
San Bernardino County, California
SCE Project No. 10-256

Dear Mr. Richtmyer:

In accordance with your request, we have performed a geotechnical evaluation for the Calcite 220kV Substation and Transmission Alignment project in Lucerne Valley, San Bernardino County, California. The purpose of our study was to evaluate the subsurface geotechnical conditions and to provide geotechnical design and construction recommendations for the project. This report presents our findings, conclusions, and recommendations for earthwork associated with the project.

Ninyo & Moore appreciates the opportunity to be of service on this project.

Respectfully submitted,
NINYO & MOORE

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Distribution: (1) Addressee (via e-mail)

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1. INTRODUCTION

In accordance with your request, we have performed a geotechnical evaluation for Southern California Edison's (SCE) Calcite 220kV Substation and Transmission Alignment project located in San Bernardino County, California. The project generally consists of the construction of a new substation and associated facilities to interconnect the NextEra Energy Resources (NEER) 60 megawatt (MW) Ord Mountain Solar Project to SCE's existing Lugo-Pisgah No. 1 220kV Transmission Line (TL). Our services were performed in order to evaluate the site geology and geotechnical conditions in order to provide geotechnical design and construction recommendations for the proposed project and geotechnical design parameters for the design of new tower structures. Our work was performed under the review of SCE personnel and in general accordance with Purchase Order No. 4500889587 dated November 9. This report provides our findings, conclusions, and geotechnical design and construction recommendations for the project. Our geotechnical parameters for design of project TL tower structures will be provided under separate cover.

2. SCOPE OF SERVICES

The scope of our geotechnical services included the following:

- Project planning and coordination with SCE personnel and drilling/backhoe subcontractors
- Review of readily available background data, including in-house geotechnical data, published geotechnical literature and geologic maps.
- Preparation of a Work Plan and Health & Safety Plan for our field work.
- Geotechnical site reconnaissance with a SCE representative to observe the site conditions for drill rig/backhoe access, to mark proposed boring locations for utility clearance, and to observe and map the site geologic conditions.
- Coordination with Underground Service Alert for underground utility location prior to excavation.
- Attendance at Work Environmental Awareness Protection training by field personnel with the biological and archeological monitors prior to performing field work.
- Subsurface exploration consisting of the drilling, logging, and sampling of twenty exploratory borings to depths of up to approximately 51½ feet and two test pits to a depth of

approximately 5 feet. The purposes of the borings and test pits were to observe the subsurface conditions and to collect soil samples for geotechnical laboratory testing.

- Percolation testing within the aforementioned test pits using a double-ring infiltrometer in general accordance with ASTM International (ASTM) D 2285. The testing was performed in order to evaluate the infiltration rates of the on-site soils at the proposed location of a site stormwater detention basin.

- Geotechnical laboratory testing of collected soil samples, including in-situ moisture and dry density, percentage of particles finer than the No. 200 sieve, gradation, direct shear, consolidation potential, expansion index, Proctor density, R-value, and corrosivity.

- Compilation and geotechnical analysis of the field and laboratory data.

- Preparation of this geotechnical report presenting our findings, conclusions, and recommendations pertaining to the design and construction of the proposed project.

3. SITE DESCRIPTION

The project substation will be located on an approximately 11-acre, rectangular-shaped lot located within Lucerne Valley west of the intersection of Barstow Road (State Route 247) and Haynes Road (Figure 1). The site is located in a generally undeveloped area north of Lucerne Dry Lake that is bounded on the east by the Whitehorse Mountains. The existing Lugo-Pisgah 220kV, El Dorado-Lugo 500kV, and Lugo-Mohave 500kV TLs traverse the proposed Loop-in area to be located south of the substation in a general north to south direction. A dirt access road crosses the site from Barstow Road as the west extension of Haynes Road. Other access roads are present along the existing TL alignments. Based on our review of a topographic map, the site of the proposed substation is relatively flat with a gentle slope towards the southeast (United States Geological Survey [USGS], 1993). Elevations at the substation range from approximately 2,920 feet at its northwest corner to approximately 2,900 feet at its southeast corner. South of the substation, the site generally slopes toward the south to an elevation of approximately 2,880 feet at the southern end of the proposed Loop-in.

4. PROPOSED CONSTRUCTION

As discussed, the project generally includes the construction of the proposed Calcite Substation and associated facilities to interconnect the NEER 60 MW Ord Mountain Solar Project to SCE's

existing Lugo-Pisgah No. 1 220kV Transmission Line (TL). Project components consist of the following:

- Construction of the new Calcite Substation consisting of an approximately 7-acre 220kV switchyard. We anticipate that the new switchyard will consist of various electrical equipment (i.e., transformers, switchgear, circuit breakers, etc.) and single-story buildings supported on shallow spread foundations and associated underground utilities. We also anticipate that a block wall supported by shallow spread foundations will be constructed around the perimeter of the substation.

- Grading of approximately 6 additional acres to install and construct site drainage, an asphalt concrete (AC) paved access road, and stormwater detention basin. The proposed access road will be approximately 1/3 of a mile in length and will connect the proposed substation to Barstow Road. The proposed stormwater detention basin will be located on the east side of the substation.

- Construction of a Loop-in between the Lugo-Pisgah No. 1 220kV TL and the Calcite Substation. The loop-in will consist of two new side-by-side, approximately 2,500-foot-long TLs (the new Calcite-Lugo 220kV TL and Calcite-Pisgah 220kV TL).

- Construction of two new lattice towers mid-span of the existing Eldorado-Lugo and Lugo-Mojave 500kV TLs in order to raise the existing 500kV TLs and facilitate a proposed crossing of the new TLs beneath the existing 500kV TLs. The lattice towers will be supported on cast-in-drilled-hole (CIDH) pile foundations.

- Construction of a connection between the NEER-built generation tie line and the Calcite Substation. The connection will consist of two new structures with three spans between the generator's closest structure and Calcite Substation. The new structures will be supported on CIDH pile foundations.

We anticipate that earthwork of the project will generally include relatively minor cuts and fills in order to prepare subgrade for the substation structures and site improvements, AC access road, and other dirt access roads to facilitate construction and allow future maintenance of the proposed towers. Other site work will include placement of aggregate base (AB) and AC to construct the access road and trench excavation and backfill.

5. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our subsurface exploration was performed on November 28 through December 12, 2016, and consisted of the drilling, logging, and sampling of twenty borings (B-1 through B-15, and B-17 through B-21) to depths of up to approximately 51½ feet and the excavation of two test pits

(INF-1 and INF-2) to depths of approximately 5 feet to facilitate percolation testing. The approximate locations of the borings and test pits are shown on Figures 2 and 3. Note that Boring B-16 was not drilled due to access/permitting constraints at the time of our evaluation. The borings were generally accessed using existing unpaved roads and were drilled with a truck-mounted drill rig utilizing 8-inch-diameter hollow-stem augers. The purposes of the borings was to evaluate the underlying soils in the areas of the proposed improvements and collect bulk and relatively undisturbed soil samples at selected depths for laboratory testing. Prior to drilling, each location was hand-augered to a depth of approximately 5 feet to clear the boring locations of shallow underground utilities. The test pits were excavated with a backhoe utilizing a 3-foot-wide bucket. The borings and test pits were logged by a representative of Ninyo & Moore and materials were visually classified in the field. Percolation testing was performed in test pits INF-1 and INF-2, as discussed below. Collected samples were transported to our laboratory for testing. Logs of the exploratory borings and test pits are presented in Appendix A.

Geotechnical laboratory testing was performed by our firm on representative bulk and relatively undisturbed soil samples obtained from our exploratory borings and test pits. The geotechnical laboratory testing included in-situ moisture and dry density, percentage of particles finer than the No. 200 sieve, gradation, direct shear, consolidation potential, expansion index, Proctor density, R-value, and corrosivity. The geotechnical laboratory test results are presented on the borings logs in Appendix A, and in Appendix B.

6. GEOLOGY AND SUBSURFACE CONDITIONS

The subject site is located within the western portion of the Mojave Desert geomorphic province of southern California, which is generally characterized by an area of broad alluviated basins separated by mountain ranges generally consisting of Proterozoic, Paleozoic, and lower Mesozoic-age metasedimentary and sedimentary rock and Jurassic to Cretaceous-age granitic rock (Norris and Webb, 1990). The province is generally bounded by the San Andreas fault on the southwest, the Garlock fault, Tehachapi Mountains, and Basin and Range Geomorphic province on the north, the Nevada state line and Colorado River on the east, and the arbitrary San

Bernardino-Riverside County line to the south (Norris and Webb, 1990). The western Mojave Desert is characterized by right-lateral slip faults roughly parallel to the San Andreas fault and truncated by the Garlock fault (Norris and Webb, 1990).

Based on our review of published geologic maps of the area, the site is generally underlain by Holocene-age alluvial deposits (Dibblee, 1964). According to Dibble (1964), the Whitehorse Mountains east of the site and the hill south of the proposed substation are generally underlain by granitic rocks consisting of granite, quartz monzonite, and gabbro with lesser amounts of limestone and metasedimentary rocks. The site geology is shown on Figure 4. Based on our site reconnaissance and review of published geologic maps, the site is not underlain by landslides.

Materials encountered during our subsurface exploration generally consisted of alluvial deposits to the total depths explored of approximately 51½ feet, with the exception of borings B-17 and B-18. In borings B-17 and B-18, granitic rock was encountered beneath the alluvial deposits at depths of approximately 49 and 33 feet, respectively. The alluvial deposits encountered in our borings generally consisted of interbedded reddish brown, yellowish brown, light brown, and reddish yellow, dry to moist, medium dense to very dense, silty sand, poorly graded sand with silt, clayey sand, and sandy silt with varying amounts of gravel. The deposits were observed to have varying degrees of cementation due to secondary deposition of carbonate cements (i.e., caliche). The granitic rock encountered in borings B-17 and B-18 generally consisted of dark gray and white, moist, weathered, moderately soft, granitic rock. Detailed descriptions of the materials encountered in our borings are presented on the boring logs in Appendix A.

7. GROUNDWATER

Groundwater was not encountered in the borings at the time of drilling. Based on our review of the California Department of Water Resources website (2017), multiple groundwater wells are located within the vicinity of the project. Our review of data for five of the wells ranging approximately ¼ to ¾ miles from the project site (Well Nos. 345531N1169657W001, 345494N1169482W001, 345458N1169437W001, 345531N1169479W001, and 345458N1169440W001) indicates that the depths to groundwater in the wells varied from approximately 79 feet to 143 feet between August 1954 and March 1955. It is anticipated that

similar depths to groundwater are present at the project site. However, shallower groundwater, seepage, and/or perched groundwater conditions may be encountered at the site due to local irrigation, seasonal precipitation, and other factors.

8. FIELD PERCOLATION TESTING

Our field percolation testing was performed in test pits INF-1 and INF-2 on December 6 and 7, 2016, using a double-ring infiltrometer. The testing was performed at depths of approximately 5 feet to evaluate the infiltration rate of the near-surface on-site soils in the vicinity of the proposed stormwater detention basin. The testing was performed in general accordance with the procedure described by ASTM D3385, which includes driving 24-inch-diameter stainless steel outer ring and a 12-inch-diameter stainless steel inner ring into the ground and adding water to both rings. The purpose of having an outer and inner ring is to measure the infiltration rate of the inner ring in a one-dimensional vertical steady state flow condition. Percolation testing was performed under a constant head condition where the water level in the outer and inner rings was maintained at constant level by filling up the rings with water through separate reservoirs. The drop of the water level was measured at selected time intervals. Testing was repeated multiple times until the rate of infiltration reached an equilibrium value. The test results are summarized in Table 1. As shown in Table 1, measured infiltration rates were approximately 0.3 and 0.1 inch per hour in test pits INF-1 and INF-2, respectively. Note that a correction factor is not applied to the measured field rate when using the double-ring infiltrometer test method. Also, the infiltration rate measured during the field testing is based on short-duration tests using clean water. During the design life of an infiltration system the rate of percolation may slow due to a variety of reasons, including infiltration of fine particles into the system, accumulations of trash or other debris, and other unforeseen reasons.

Table 1 – Percolation Test Results

Test Location	Depth of Test (feet)	USCS Soil Type	Field Infiltration Rate (inches per hour)
INF-1	5.0	Silty Sand (SM)	0.3
INF-2	5.0	Silty Sand (SM)	0.1
Note: USCS – Unified Soils Classification System			

9. FAULTING AND SEISMICITY

The subject site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo Special Studies Zone) (Hart and Bryant, 1997). However, the site is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed structure. Figure 5 shows the approximate site location relative to the major faults in the region.

Table 2 lists selected principal known active faults located within the fault database for the 2008 National Seismic Hazards Map (USGS, 2008). The approximate fault-to-site distances and the maximum moment magnitudes (M_{max}) provided in Table 2 were calculated using the same USGS fault database (USGS, 2008).

Table 2 – Principal Active Faults

Fault	Approximate Fault to Site Distance miles[1] (Km)	Maximum Moment Magnitude[1] (M_{max})
Helendale-Lockhart	4.5 (7.2)	7.4
Lenwood-Lockhart-Old Woman Springs	9.3 (15.0)	7.5
North Frontal West	10.0 (16.1)	7.2
Johnson Valley	14.6 (23.5)	6.9
North Frontal East	16.5 (26.6)	7.0
Landers	16.5 (26.6)	7.4
Cleghorn	22.7 (36.6)	6.8
Gravel Hills-Harper Lake	23.0 (37.1)	7.1
South Emerson-Copper Mountain	23.6 (38.0)	7.1
Calico-Hidalgo	25.1 (40.4)	7.4
San Andreas	30.8 (49.5)	8.2

The principal seismic hazards evaluated at the subject site are surface fault rupture, ground motion, and liquefaction. A brief description of these hazards and the potential for their occurrences on site are discussed in the following sections.

9.1. Surface Fault Rupture

Based on our review of the referenced literature and our site reconnaissance, no active faults are known to cross the project site. Therefore, the probability of damage from surface fault

rupture is considered to be low. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

9.2. Ground Motion

The 2016 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated as 0.57g using the USGS (USGS, 2017) seismic design tool (web-based). Spectral response acceleration parameters, consistent with the 2016 CBC, are also provided in Section 12.2 for the evaluation of seismic loads on buildings and other structures.

The 2016 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) PGA with adjustment for site class effects in accordance with the American Society of Civil Engineers 7-10 Standard. The MCE_G PGA is based on the geometric mean PGA with a 2 percent probability of exceedance in 50 years. The MCE_G PGA with adjustment for site class effects (PGA_M) was calculated as 0.53g using the USGS (USGS, 2017) seismic design tool that yielded a mapped MCE_G PGA of 0.53 for the site and a site coefficient (F_{PGA}) of 1.00 for Site Class C.

9.3. Liquefaction Evaluation

Liquefaction is the phenomenon in which loosely deposited granular soils with silt and clay contents of less than approximately 35 percent and non-plastic silts located below the water table undergo rapid loss of shear strength due to development of excess pore pressure during strong earthquake-induced ground shaking. Ground shaking of sufficient duration results in the loss of grain-to-grain contact due to a rapid rise in pore water pressure and it eventually

causes the soil to behave as a fluid for a short period of time. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

Based on our review of the County of San Bernardino 2007 General Plan (2014), the site is not located in an area mapped as being potentially susceptible to liquefaction. Our subsurface exploration and laboratory testing indicate that the site is generally underlain by relatively dense alluvium and bedrock materials, and that the depth to groundwater is in excess of 50 feet at the site. Accordingly, it is our opinion that liquefaction and liquefaction-related seismic hazards (e.g., dynamic settlement, ground subsidence, and/or lateral spreading) are not design considerations for the project.

10. POTENTIAL GEOTECHNICAL CONCERNS

Based on our understanding of the project and the results of our subsurface exploration and laboratory testing, the following sections provide additional discussion regarding the potential for hydrocollapse of natural soils at the project, expansion of site soils, and soil corrosivity.

10.1. Hydrocollapse of Site Soils

Hydrocollapse of soils can occur in naturally deposited granular soils with relatively low dry density and moisture contents. Hydrocollapse can occur when such soils are subjected to new loads, such as fills and/or foundations, followed by the introduction of water or other fluids into the soil. Hydrocollapse results in a tighter packing of the granular soils, which can result in relatively rapid ground settlement.

The potential for settlement of the site soils due to hydro-collapse was evaluated based on the results of our consolidation tests performed on representative soil samples collected during our subsurface exploration. The consolidation test results are presented in Appendix B. The test results indicate that hydro-collapse potential of site soils may range from approximately 0.1 to 6.0 percent. According to Day (2012), these values indicate a slight to

moderate degree of collapse potential. In our opinion, the hydro-collapse potential recorded in the consolidation testing apparatus largely reflects the presence of gravels and disturbance caused to the samples during transportation and handling. The hydro-collapse tendencies of near-surface site soils will be mitigated by the earthwork recommendations presented in Section 12.1.4 of this report. Hydro-collapse of soils beyond a depth of 20 feet below ground surface is not likely unless significant and sustained rise in regional groundwater takes place in the project area or the site is subjected to major long-term inundation, none of which is expected to occur. Design and proper maintenance of drainage devices (both surface and buried) are crucial in not allowing water to infiltrate into the foundation subgrade of structural improvements and cause hydro-collapse related settlement. Drainage recommendations are provided in Section 12.8 of this report.

10.2. Expansive Soil

Expansive soil consists of soil that is subject to expansion and contraction due to variations in moisture content. The introduction of water into expansive soils could lead to movement and distress to at-grade improvements such as hardscape, retaining walls, shallow foundations, etc. However, based on our subsurface exploration, the site soils are generally granular and considered to have a low potential for expansion. Laboratory testing performed on representative near-surface soil samples indicated that the tested materials had an expansion index of 0 (i.e., very low). Accordingly, expansive soils are not considered to be a design issue.

10.3. Soil Corrosivity

Corrosive soils as defined by Caltrans (2012a) can have a negative impact on ferrous materials if appropriate engineering practices are not implemented for the project. In addition, high sulfate contents in soil could also have a negative impact to site concrete if appropriate design and engineering practices, such as cement type, water to cement ratio, etc., are not used for the project. Further discussion regarding the corrosion potential of the near-surface on-site soils (i.e., pH, electrical resistivity, chloride content, and sulfate

content), along with associated geotechnical recommendations are provided in Sections 12.6 and 12.7 of this report.

11. CONCLUSIONS

Based on our review of geotechnical literature and the results of our subsurface evaluation, it is our opinion that the proposed project is feasible from a geotechnical perspective, provided our recommendations are incorporated into the design and construction of the planned project. In general, the following conclusions were made:

- The site is generally underlain by granular alluvial deposits consisting of dry to moist, loose to very dense, silty sand, sand, clayey sand, and sandy silt with varying amounts of gravel. The deposits were observed to have varying degrees of cementation due to secondary deposition of carbonate cements (i.e., caliche). Weathered granitic bedrock was encountered beneath the alluvium in borings B-17 and B-18 at depths of approximately 49 and 33 feet, respectively.

- Excavations into the underlying alluvial deposits should be feasible with grading equipment in good working order. We anticipate that excavated soils should be generally suitable for use as compacted fill provided they are free of trash, debris, roots, vegetation, deleterious materials and cobbles or hard lumps of material in excess of 3 inches in diameter. Laboratory test results indicate that on-site soils are relatively dry and will involve processing (i.e., moisture-conditioning) to approach the optimum moisture content for compaction.

- The site materials should be considered as Type C soils in accordance with Occupational Safety and Health Administration (OSHA) soil classifications.

- Groundwater was not encountered in our exploratory borings or test pits at the time of drilling. Existing California State groundwater monitoring wells located approximately ¼ to ¾ mile from the site indicate that the groundwater depth in the area ranges from approximately 79 to 143 feet in depth. The actual depth to groundwater at the site and at the time of construction is considered to be variable due to seasonal precipitation, subsurface conditions, irrigation, groundwater pumping, and other factors.

- The MCE_R PGA is estimated to be 0.57g at the site.

- The subject site is not located within a State of California EFZ (formerly Alquist-Priolo Special Studies Zone). The probability of surface fault rupture at the site is considered to be low.

- Based on our evaluation, liquefaction and liquefaction-related hazards are not design considerations for the project.

- Based on our laboratory tests, the expansion index of the on-site materials is approximately 0 (very low).
- Based on our laboratory tests, the soils have a slight to moderate degree of collapse potential (Day, 2012).
- Based on our laboratory tests, the corrosivity of the near-surface site soils is variable and consists of areas that can be classified as corrosive and areas that can be classified as non-corrosive based on California Department of Transportation (Caltrans, 2012a) corrosion guidelines.

12. RECOMMENDATIONS

The recommendations presented in the following sections provide general geotechnical criteria regarding the design and construction of the proposed project. These recommendations are based on our evaluation of the site geotechnical conditions and our understanding of the planned improvements.

12.1. Earthwork

We anticipate that the site earthwork will generally include minor cuts and fills in order to create areas suitable to support construction equipment and maintenance vehicles, and drilling for transmission tower foundations. We anticipate that the majority of the site grading will be performed during access road earthwork. General earthwork recommendations are provided below. Detailed recommendations are provided in a separate report prepared for the access road construction.

12.1.1. Construction Plan Review and Pre-Construction Conference

We recommend that the final grading and foundation plans be submitted to the project geotechnical engineer for their review to evaluate conformance to the geotechnical recommendations provided in this report. We further recommend that a pre-construction conference be held in order to discuss the grading recommendations presented in this report. The owner and/or their representative, the governing agencies' representatives, the civil engineer, project geotechnical engineer, and the contractor should be in attendance to discuss the work plan, project schedule, and earthwork requirements.

12.1.2. Site Preparation

Prior to earthwork, the work areas should be cleared of existing surface obstructions, vegetation, and loose or otherwise unsuitable soils. Existing utilities to remain in place should be located and protected from damage by construction activities. Obstructions that extend below the finished grade, including foundations and underground utilities, if present, should be removed and the resulting holes/excavations backfilled with compacted fill per our recommendations provided below. The need for, and limits of, excavation should be evaluated in the field by the project geotechnical engineer. Materials generated from the demolition and clearing operations should be removed from the project site and disposed of at a SCE-approved disposal facility.

12.1.3. Excavation Characteristics

Based on our subsurface exploration and experience, we anticipate that excavations and within alluvial soils and granitic bedrock at the site may be accomplished with grading equipment in good condition. Based on the results of our subsurface exploration, we anticipate that the materials encountered at the project site, will generally consist of alluvium consisting of dry to moist, loose to very dense, silty sand, sand, clayey sand, and sandy silt with variable amounts of gravel and cementation due to carbonate precipitation. Bedrock consisting of relatively hard granitic material is anticipated to be encountered if earthwork is performed on or near the existing hill located south of the substation. The contractor should anticipate difficult excavation where granitic rock is encountered that may require the use of specialty excavation equipment, such as rock chippers, jack hammers, or other. In the event that oversize material, including cobbles, is encountered during excavation operations, the oversized material is not suitable for backfill and should be disposed of off-site. Contractors should make their own independent evaluation of the excavatability of the on-site materials prior to submitting their bids.

12.1.4. Treatment of Near-Surface Soils

In order to provide suitable support for the substation pad, we recommend overexcavating and recompacting the pad footprint to a depth of approximately 2 feet below the existing grade or to a depth that provides 2 or more feet of compacted fill beneath the finished pad grade, whichever is deeper. The excavation should extend a distance of approximately 2 feet beyond the outside edge of the pad or a distance equal to the depth of overexcavation, whichever is farther. The overexcavation bottoms should expose relatively dense alluvial deposits and should be evaluated by the project geotechnical consultant during the excavation work. Additional overexcavation of loose, soft, and/or wet areas may be appropriate, depending on the consultant's observations during construction. Prior to placing new compacted fill, the upper approximately 8 inches of the exposed bottoms should be scarified, moisture-conditioned, and recompacted to a relative compaction of 90 percent as evaluated by ASTM D 1557. Fill placed to backfill the pad excavation should also be recompacted to a relative compaction of 90 percent as evaluated by ASTM D 1557. The following recommendations should also apply for the project:

12.1.4.1. New Structures/Buildings and Paved Access Road

In order to provide suitable support and reduce the potential settlements of proposed structures (i.e., new electrical equipment, buildings, perimeter block walls, retaining walls, etc.) supported by shallow spread foundations and the paved access road, we recommend that the existing ground surface be overexcavated and replaced with compacted fill to a depth of 3 feet or to a depth that provides 2 or more feet of compacted fill beneath the bottoms of the proposed foundations, whichever is deeper. The overexcavations should remove existing loose materials and should expose relatively dense alluvial deposits. The excavations should extend a distance of 5 feet laterally beyond the outside edge of the structure/building foundations, or to a distance equal to the depth of the excavation, whichever is farther. The lateral limits can be reduced to a distance of approximately 2 feet or the depth of excavation for the roadway. The excavation bottoms should be evaluated

by the project geotechnical consultant during the excavation work. Additional overexcavation of loose, soft, and/or wet areas may be appropriate, depending on the geotechnical consultant's observations during construction. Prior to placing new compacted fill, the upper approximately 8 inches of the exposed excavation bottoms should be scarified, moisture-conditioned, and recompacted to a relative compaction of 90 percent or more as evaluated by ASTM D 1557. Soils placed to backfill the excavations for the structures and beneath the paved roadway should be compacted to a relative compaction of 95 percent or more as evaluated by ASTM D 1557.

As an alternative to additional excavation beneath the proposed structures/buildings following preparation of the substation pad, the upper 4 feet of the entire pad can be overexcavated and replaced with fill compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557.

12.1.4.2. Dirt Access Roads

In order to provide suitable support for proposed maintenance pads and access roads associated with new tower construction, we recommend that the upper approximately 12 inches of subgrade beneath the maintenance pads and roads be scarified, moisture-conditioned, and recompacted. In areas where the grade will be raised with new compacted fill, the existing ground surface should be scarified, moisture-conditioned, and recompacted prior to the placement of new fill. The limits of the scarification should extend laterally 2 feet beyond the outside edge of the roadways and maintenance pads. The exposed subgrade should be evaluated by the geotechnical consultant during the excavation work. Areas of loose, soft, and/or wet materials may need to be overexcavated, depending on the geotechnical consultant's observations during construction.

12.1.5. Fill Material

In general, the on-site soils should be suitable for use as general and structural fills and trench backfill provided they are free of trash, debris, roots, vegetation, other

deleterious materials, and contamination. Fill should generally be free of rocks or lumps of material in excess of 3 inches in diameter and should have an organic content of 3 percent or less. Rocks or hard lumps larger than approximately 3 inches in diameter should be broken into smaller pieces or should be removed from the site. Materials with organic content of more than 3 percent should be removed from the site. The fill/cut materials should be tested to check compliance with the expansion index (EI) and organic content requirements. If the soils do not meet these requirements, the materials should be removed and replaced with fill consisting of selected site soils and/or imported materials that meet these requirements.

Import material, if used, should consist of clean, non-expansive, granular material which conforms with the latest edition of "Greenbook" Standard Specifications for Public Works Construction for structure backfill. "Non-expansive" can be defined as soil having an EI of 20 or less in accordance with ASTM D 4829 (CBC, 2016). Soil should also be tested for corrosive properties prior to importing. We recommend that the imported materials satisfy the Caltrans (2012a) criteria for non-corrosive soils (i.e., soils having a chloride concentration of 500 parts per million (ppm) or less, a soluble sulfate content of approximately 0.20 percent [2,000 ppm] or less, a pH value of 5.5 or higher and a resistivity of 1,000 ohm-centimeters [ohm-cm] or higher). Materials for use as fill should be evaluated by the project geotechnical engineer prior to importing. The contractor should be responsible for the uniformity of import material brought to the site.

12.1.6. Fill Placement and Compaction

In general, fill soils associated with the substation pad should be placed and compacted in horizontal lifts to a relative compaction of 90 percent as evaluated by ASTM D 1557. Fill soils that will be placed under various structures to provide bearing support should be compacted in horizontal lifts to a relative compaction of 95 percent as evaluated by ASTM D 1557. The lift thickness for fill soils will vary depending on the type of compaction equipment used but should generally be placed in horizontal lifts not

exceeding 8 inches in loose thickness. Fill soils should be placed at generally slightly above the optimum moisture content as evaluated by ASTM D 1557. Scarified bottoms should also be compacted to a relative compaction of 90 percent as evaluated by ASTM D 1557. Special care should be taken to avoid damage to utility lines when compacting fill and subgrade materials. Based on our subsurface evaluation and review of the laboratory test results, a shrinkage factor of 10 to 20 percent can be used for making estimates for earthwork volume.

12.1.7. Temporary Excavations

We recommend that trenches and excavations be designed and constructed in accordance with OSHA regulations. These regulations provide trench sloping and shoring design parameters for trenches up to 20 feet deep based on the soil types encountered. Trenches over 20 feet deep should be designed by the contractor's engineer based on site-specific geotechnical analyses. For planning purposes, we recommend that site fill and alluvial deposits be considered as OSHA soil Type C.

Temporary excavations should be constructed in accordance with OSHA recommendations. For trench or other excavations, OSHA requirements regarding personnel safety should be met by using appropriate shoring (including trench boxes) or by laying back the slopes no steeper than 1½:1 in site soils. Temporary excavations that encounter seepage may need shoring or may be mitigated by placing sandbags or gravel along the base of the seepage zone. Excavations encountering seepage should be evaluated on a case-by-case basis. On-site safety of personnel is the responsibility of the contractor. Recommendations for temporary shoring can be provided, if requested.

Trenching is anticipated during the placement of underground utilities. Spoils should not be placed near the edge of the open cut excavation. For open cut excavations, the spoil pile should be placed at a distance more than the depth of excavation from the top of the excavation. OSHA and other applicable agency requirements pertaining to worker safety should be met during the excavation activities.

12.1.8. Shoring

Where temporary slopes are not possible, shoring will be appropriate. For preliminary planning purposes, we anticipate that sheet pile and/or timber-braced steel or plywood sheeting, aluminum speed shoring with sheeting, and/or trench shields may be appropriate; however, the type of shoring system used for the project should be evaluated by the contractor. Reduced production rates and/or modified shoring systems may be appropriate where caving is severe, groundwater is encountered, and/or adjacent utilities are at risk. Shoring installed simultaneously with the excavation may be appropriate if caving is severe or damage to existing improvements is likely. The shoring system should be designed using the lateral earth pressure values presented on Figures 6 and 7 for braced and cantilevered shoring, respectively. The actual lateral earth pressures used may need to be adjusted based on the actual materials encountered during construction at proposed shoring locations. Parameters for surcharge loads, such as soil stockpiles and construction materials, within a 1:1 (horizontal to vertical) plane extending up and back from the base of the shoring system are not included on figures. For a shoring system subjected to the above-mentioned surcharge loads, the contractor should include the effect of these loads on the lateral earth pressures acting on the shored walls.

Settlement of the ground surface may occur behind the shoring walls during excavation. The amount of settlement depends on the type of shoring system, the contractor's workmanship, and soil conditions. If sheet pile driving is implemented, we anticipate that this may cause settlement and possible impact to structures within distances of up to approximately 50 feet from the sheet pile operation. We recommend that structures/improvements in the vicinity of the planned shoring installation be reviewed with regard to foundation support and tolerance to settlement. To reduce the potential for distress to adjacent structures and existing pipelines, we recommend that the shoring system be designed to limit the ground settlement behind the shoring system to ½ inch or less. Possible causes of settlement that should be addressed include settlement during installation of the shoring, construction vibrations, dewatering, and removal of the

shoring support system. Vibrations from the driving of sheet piles and/or soldier piles may result in some dynamic settlement and may affect adjacent structures and/or existing pipelines. We recommend that shoring installation be evaluated carefully by the contractor prior to construction and that ground vibration and settlement monitoring be performed during construction. To reduce the potential for settlement associated with shoring removal, the benefit of leaving the shoring buried in-place may be considered.

The contractor should retain a qualified and experienced engineer to design the shoring system. The shoring parameters presented in this report are minimum requirements, and the contractor should evaluate the adequacy of these parameters and make the required modifications for their design. We recommend that the contractor take appropriate measures to protect workers. OSHA requirements pertaining to worker safety should be observed.

The contractor should retain a licensed, qualified and experienced engineer to design the shoring system. The shoring parameters presented in this report are minimum requirements, and the contractor should evaluate the adequacy of these parameters and make the required modifications for their design. We recommend that the contractor take appropriate measures to protect workers. OSHA requirements pertaining to worker safety should be observed

12.1.9. Construction Dewatering

As discussed, groundwater and/or seepage were not encountered in our borings, and the anticipated depth of groundwater at the site is on the order of 79 feet or more. Accordingly, we do not anticipate that need for dewatering during construction at the site. However, dewatering could be necessary in the event that perched groundwater is encountered or where excavations are performed adjacent to the existing drainage channels if the construction occurs when or shortly after surface water flows in the channels. Disposal of groundwater should be performed in accordance with guidelines of the Regional Water Quality Control Board. Additional geotechnical

recommendations for construction dewatering can be provided in the event that subsurface water is encountered during construction.

12.2. Seismic Design Considerations

Design of the proposed structures should comply with design for structures located in seismically active areas and should be designed in accordance with the requirements of governing jurisdictions and applicable building codes. Table 3 presents the seismic design parameters for the site in accordance with the CBC and ASCE 7-10 guidelines and mapped spectral acceleration parameters (USGS, 2017).

Table 3 – 2016 California Building Code Seismic Design Criteria

Site Coefficients and Spectral Response Acceleration Parameters	Values
Site Class	C
Site Coefficient, Fa	1.0
Site Coefficient, Fv	1.5
Mapped Spectral Response Acceleration at 0.2-second Period, S_s	1.420 g
Mapped Spectral Response Acceleration at 1.0-second Period, S_1	0.526 g
Spectral Response Acceleration at 0.2-second Period Adjusted for Site Class, S_{MS}	1.420 g
Spectral Response Acceleration at 1.0-second Period Adjusted for Site Class, S_{M1}	0.684 g
Design Spectral Response Acceleration at 0.2-second Period, S_{DS}	0.947 g
Design Spectral Response Acceleration at 1.0-second Period, S_{D1}	0.456 g

12.3. Foundations

The proposed substation structures, buildings, and perimeter block walls may be supported on shallow spread footings bearing on engineered fill compacted in accordance with the recommendations presented in Section 12.1 of this report. Foundations should be designed in accordance with structural considerations, the requirements of the appropriate governing jurisdictions, and applicable building codes.

12.3.1. Spread Footings

Conventional spread footings should extend 2 feet deep or more below the lowest adjacent finished grade and bear on compacted fill. Continuous footings should have a width of 2 feet or more. Isolated pad footings should have a width of 2 feet or more and

be founded at a depth of 2 feet below the lowest adjacent finished grade. Continuous footings should be reinforced with four No. 4 steel reinforcing bars, two placed near the top and two placed near the bottom of the footings, and further detailed in accordance with the recommendations of the structural engineer.

Spread footings, as described above and bearing on compacted fill, may be designed using a net allowable bearing capacity of 2,500 pounds per square foot (psf). The net allowable bearing capacity may be increased by 350 psf for every additional foot of width and depth, respectively, up to a value of 4,000 psf. Total and differential settlements for footings designed in accordance with the above recommendations are estimated to be on the order of 1 inch and ½ inch over a horizontal span of 40 feet, respectively.

Footings bearing in compacted fill may be designed using a coefficient of friction of 0.40, where the total frictional resistance equals the coefficient of friction times the dead load. The footings may be designed using a passive resistance value of 390 psf per foot of depth up to a value of 3,900 psf. The allowable lateral resistance can be taken as the sum of the frictional resistance and passive resistance, provided the passive resistance does not exceed one-half of the total allowable resistance. The net allowable bearing capacity and passive resistance may be increased by one-third when considering loads of short duration such as wind or seismic forces.

Trenches should not be excavated adjacent to spread footings. If trenches are to be excavated near a continuous footing, the bottom of the trench should be located above a 1:1 (horizontal to vertical) plane projected downward from the bottom of the footing. In case of utility lines crossing beneath footings, the utility lines should be encased in concrete below the footings.

12.3.2. Slabs-on-Grade

Building floor slabs should be designed by the project structural engineer based on the anticipated loading conditions. Building floor slabs should be underlain by compacted

soil prepared with the recommendations presented in our geotechnical evaluation report. The slab should be underlain by a polyethylene vapor retarder, 10 mil or thicker, in areas where moisture-sensitive floor coverings are anticipated. The vapor retarder should further be underlain by a 4-inch-thick layer of sand or gravel with a particle size of approximately $^{3}/_{8}$ inch or smaller. Soils underlying the slabs should be moisture-conditioned and compacted in accordance with the recommendations presented in Section 12.1 of this report prior to concrete placement. Joints should be constructed at intervals designed by the structural engineer to help reduce random cracking of the slab.

12.4. Retaining Walls

Retaining walls, if applicable, may be supported by foundations designed in accordance with the recommendations presented in Section 12.3 of this report supported by compacted fill as discussed in Section 12.1. Lateral earth pressures recommended for the design of yielding retaining walls are provided on Figure 8. Passive pressures may be increased by one-third when considering loads of short duration, including wind and seismic loads. Further, for sliding resistance, a friction coefficient of 0.40 may be used for the concrete and soil interface. The allowable resistance may be taken as the sum of the frictional and passive resistance, provided that the passive portion does not exceed one-half of the total allowable resistance.

Retaining walls should be backfilled with free-draining, granular, imported soil with non-expansive material (EI of 20 or less). Measures should be taken to reduce the potential for build-up of moisture behind the retaining walls. Drainage design should include free-draining backfill materials and subsurface drainage provisions as shown on Figure 9.

12.5. Preliminary Pavement Design

We understand that the proposed project will include new flexible pavement (AC) for the proposed access road. We anticipate that AC will be used for general traffic areas including parking areas and driveways that are subjected to relatively light traffic consisting of light passenger vehicles and periodic heavy equipment/truck traffic.

For preliminary design of pavements, we have used traffic indices (TI) of 5.0 for pavement areas within the substation and 7.0 for the paved access road outside of the substation. The results of laboratory R-value tests performed on site soils ranged from 52 to 78. Based on these traffic indices, a design R-value of 52, and guidelines of the Caltrans Highway Design Manual (Caltrans, 2012b), we have developed the following preliminary pavement sections for the project. We recommend that these pavement sections be re-evaluated once the as-graded near-surface earth materials are further tested.

Table 4 – Preliminary Pavement Structural Sections

Traffic Index	Recommended Pavement Sections		
	Flexible Pavement Section		Rigid Pavement Section
	AC/AB (inches)	Full-Depth AC (inches)	PCC (inches)
5.0	3.0/4.5	4.5	5.0
7.0	4.5/4.5	6.5	7.0

Notes:
AC – Asphalt concrete
AB – Aggregate base
PCC – Portland Cement Concrete

Subgrade soils in areas to be paved should be prepared as recommended in Section 12.1.4 of this report and should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. To aid in drainage, Portland Cement Concrete pavements can be placed over 4 inches of compacted AB. AB material should conform to the specifications in Section 200-2.0 for crushed AB of the Greenbook and should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. AC should conform to Section 203-6 of the Greenbook and should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557.

Final pavement sections should be based on actual anticipated traffic loading conditions and evaluation of the subgrade materials at the time of construction. We recommend that the paving operations be observed and tested by the project geotechnical engineer. We further

recommend that mix designs be made for the AC by an engineering company specialized in this type of work.

12.6. Corrosivity

Laboratory testing was performed on representative soil samples to evaluate pH, electrical resistive, water-soluble chloride content, and water-soluble sulfate content. The soil pH and electrical resistivity tests were performed in general accordance with CT Method 643. Chloride content tests were performed in general accordance with CT 422. Sulfate testing was performed in general accordance with CT 417. The laboratory test results are presented in Appendix B. A summary of the test results are provided in the following Table 5.

Table 5 – Summary of Corrosivity Test Results

Boring	Sample Depth (feet)	Soil Type (USCS)	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)	Caltrans (2012a) Site Classification	Cement Type per ACI (2016)
B-1	0.0-5.0	SM	7.1	7,165	10	25	Non-Corrosive	II
B-2	0.0-5.0	SM	7.7	4,100	20	65	Non-Corrosive	II
B-3	0.0-5.0	SM	7.7	2,745	10	100	Non-Corrosive	II
	10.0-15.0	SM	8.2	1,190	110	245	Non-Corrosive	II
B-8	0.0-5.0	SM	7.5	3,725	30	80	Non-Corrosive	II
	15.0-16.5	SM	8.0	1,140	40	190	Non-Corrosive	II
B-10	0.0-5.0	SM	7.8	3,355	130	30	Non-Corrosive	II
	7.0-8.5	SM	7.7	1,280	130	185	Non-Corrosive	II
B-11	0.0-5.0	SM	7.7	7,395	10	50	Non-Corrosive	II
	15.0-16.5	SM	7.9	2,335	50	145	Non-Corrosive	II
B-13	0.0-5.0	SM	7.4	7,790	10	40	Non-Corrosive	II
B-14	0.0-5.0	SM	7.6	7,160	10	60	Non-Corrosive	II
	15.0-16.5	SM	8.0	1,630	10	175	Non-Corrosive	II
B-15	0.0-5.0	SM	7.2	8,570	10	50	Non-Corrosive	II
B-17	0.0-5.0	SM	7.7	390	150	1,365	Corrosive	II
	15.0-16.5	SM	7.5	225	70	2,310	Corrosive	II
B-18	0.0-5.0	SM	8.0	3,271	30	115	Non-Corrosive	II
	30.0-31.5	SM	7.8	3,488	10	40	Non-Corrosive	II
B-19	0.0-5.0	SM	7.2	5,842	10	35	Non-Corrosive	II
	15.0-16.5	SM	7.9	612	130	715	Corrosive	II
B-20	0.0-5.0	SM	7.4	4,573	10	40	Non-Corrosive	II
	7.0-8.5	SM	7.8	558	90	980	Corrosive	II
B-21	0.0-5.0	SM	7.8	1,789	20	220	Non-Corrosive	II
	15.0-16.5	SM	8.3	1,279	30	230	Non-Corrosive	II

The soil pH and electrical resistivity values ranged from approximately 7.1 to 8.3 and 225 to 8,570 ohm-cm, respectively. The chloride content of the samples was measured to range

from 25 to 2,310 ppm. The sulfate content of the tested samples ranged from approximately 0.001 to 0.015 percent by weight (i.e., 10 to 150 ppm). Based on the Caltrans (2012a) corrosion criteria, a site can be classified as corrosive when earth materials have more than 500 ppm chlorides, more than 0.20 percent sulfates (i.e., 2,000 ppm), a pH of 5.5 or less, or an electrical resistivity of 1,000 ohm-cm or less. Accordingly, the areas of borings B-17, B-19, and B-20 should be considered as corrosive. If corrosion susceptible improvements are planned where corrosive soils are present, we recommend that a corrosion engineer be consulted for further evaluation and recommendations.

12.7. Concrete Placement

Concrete in contact with soil or water that contains high concentrations of water-soluble sulfates can be subject to premature chemical and/or physical deterioration. The samples tested during this evaluation indicated a water-soluble sulfate content of approximately 0.001 to 0.015 percent by weight (i.e., 10 to 150 ppm). Based on the American Concrete Institute (ACI) 318-14 building code, the potential for sulfate attack is considered negligible for water-soluble sulfate contents in soils of less than 0.1 percent by weight (1,000 ppm), moderate for water-soluble sulfate contents in soils between 0.1 and 0.2 percent by weight (1,000 to 2,000 ppm), and severe for water-soluble sulfate contents in soils between 0.2 and 2 percent by weight (2,000 to 20,000 ppm). Accordingly, the on-site soils are considered to have a negligible potential for sulfate attack. Per the ACI criteria (ACI 318-14), Type II cement is considered to be appropriate for the project.

In order to reduce the potential for shrinkage cracks in the concrete during curing, we recommend that the concrete for the proposed structures be placed with a slump of 4 inches based on ASTM C 143. The slump should be checked periodically at the site prior to concrete placement. We also recommend that crack joints be provided in slabs in accordance with the recommendations of the structural engineer to reduce the potential for distress due to minor soil movement and concrete shrinkage. We further recommend that concrete cover over reinforcing steel for slabs-on-grade and foundations be provided in accordance with

Section 1907.7 of CBC (2016). The structural engineer should be consulted for additional concrete specifications.

12.8. Drainage

Adequate surface drainage is imperative for satisfactory site performance. Positive drainage should be provided and maintained to channel surface water away from structure foundations and tower footprint areas, and off-site. Positive drainage is defined as a slope of 2 percent or more for a distance of 5 feet or more away from foundations and footprint areas. Runoff should then be transported by the use of swales or pipes into a collective drainage system. Surface waters should not be allowed to pond adjacent to footings or on adjacent access roads.

13. CONSTRUCTION OBSERVATION

The recommendations provided in this report are based on our understanding of the proposed project and on our evaluation of the data collected based on subsurface conditions disclosed by widely spaced exploratory borings. It is imperative that the interpolated subsurface conditions be checked by our representative during construction. Observation and testing of compacted fill and backfill should be performed by our representative during construction. In addition, we should review the project plans and specifications prior to construction. It should be noted that, upon review of these documents, some recommendations presented in this report might be revised or modified.

During construction we recommend that services to be provided by the project geotechnical engineer to include, but not be limited to, the following:

- Observing clearing, grubbing, and removals.
- Observing excavation, placement, and compaction of fill.
- Evaluating imported materials prior to their use as fill.
- Performing field tests to evaluate fill compaction.

- Observing foundation excavations for bearing materials and cleaning prior to placement of reinforcing steel or concrete.

14. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only and may not provide sufficient data to prepare an accurate bid by some contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site can change with time

as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

15. REFERENCES

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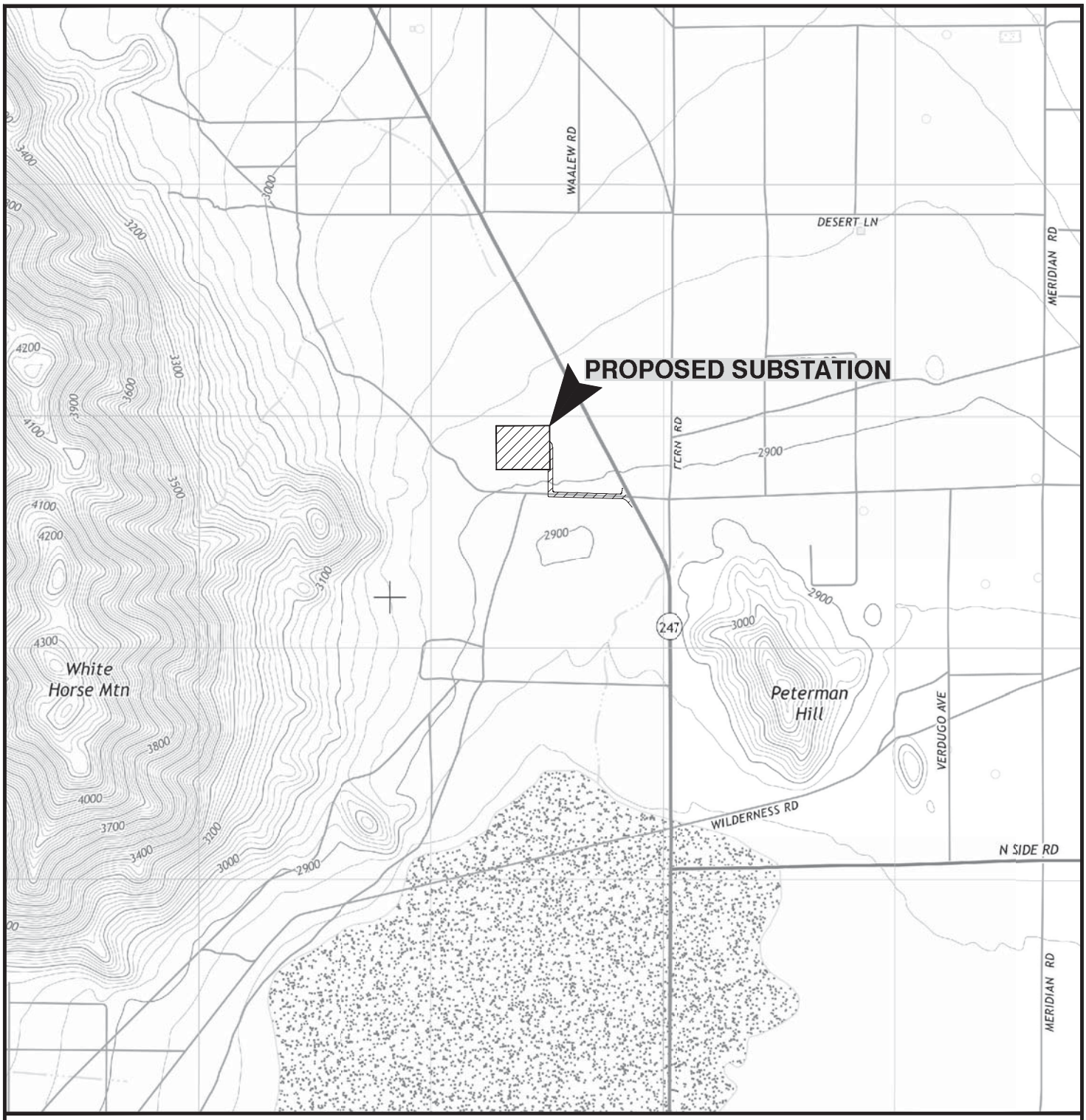

REFERENCE: 7.5 MINUTE USGS TOPOGRAPHIC MAP OF WHITE HORSE MOUNTAIN, CALIFORNIA QUADRANGLE, DATED 2015, SCALE 1:24000.

N

SCALE IN FEET

0 2,000 4,000

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

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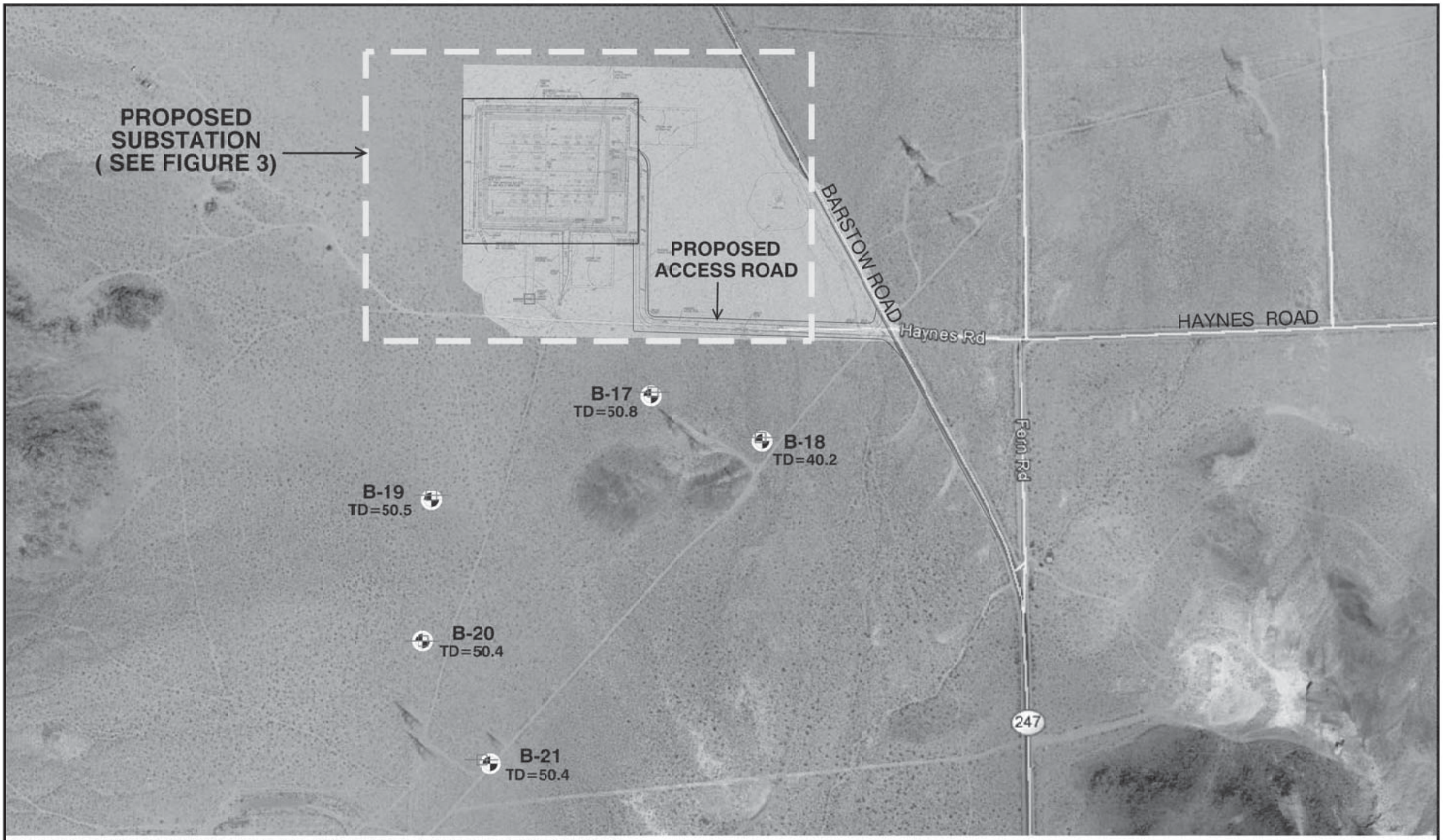
Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	1
209418048	3/17		



REFERENCE: SOUTHERN CALIFORNIA EDISON, 2016, CALCITE SUBSTATION CONCEPTUAL GRADING EXHIBIT, SAN BERNARDINO COUNTY, AND GOOGLE EARTH AERIAL PHOTO, DATED 9/4/2016.

N

SCALE IN FEET

0 600 1,200

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

LEGEND		
B-21 TD=50.4	BORING; TD=TOTAL DEPTH IN FEET	PROPOSED TRANSMISSION TOWER

Ninyo & Moore	EXPLORATION LOCATIONS	FIGURE
PROJECT NO. 209418048 / DATE 3/17	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	2

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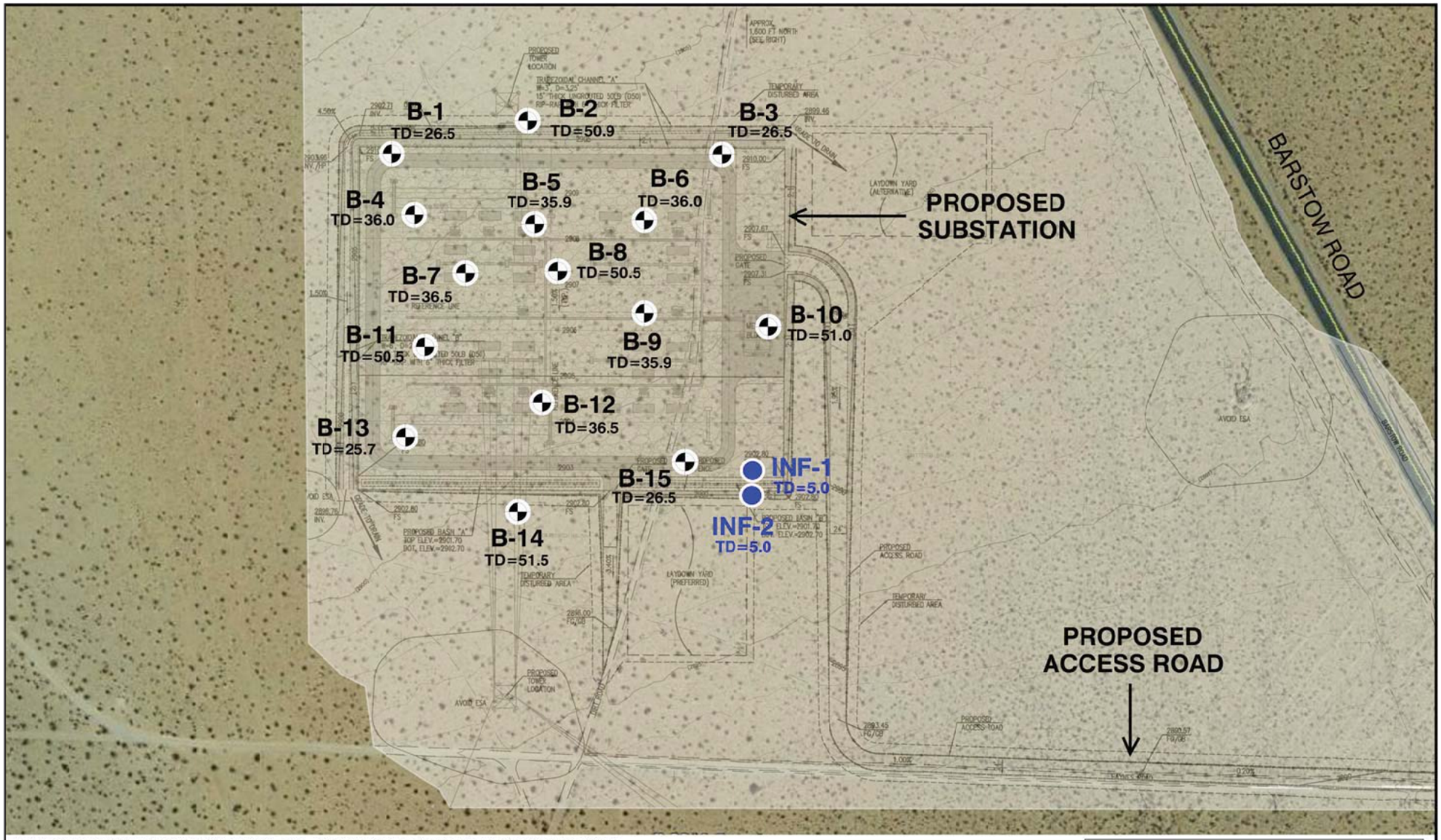

REFERENCE: SOUTHERN CALIFORNIA EDISON, 2016, CALCITE SUBSTATION CONCEPTUAL GRADING EXHIBIT, SAN BERNARDINO COUNTY, AND GOOGLE EARTH AERIAL PHOTO, DATED 9/4/2016.

N

SCALE IN FEET

0 200 400

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

LEGEND	
B-15 TD=26.5	BORING; TD=TOTAL DEPTH IN FEET
INF-2 TD=5.0	TEST PIT; TD=TOTAL DEPTH IN FEET

Ninyo & Moore		EXPLORATION LOCATIONS	FIGURE
PROJECT NO.	DATE	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	3
209418048	3/17		

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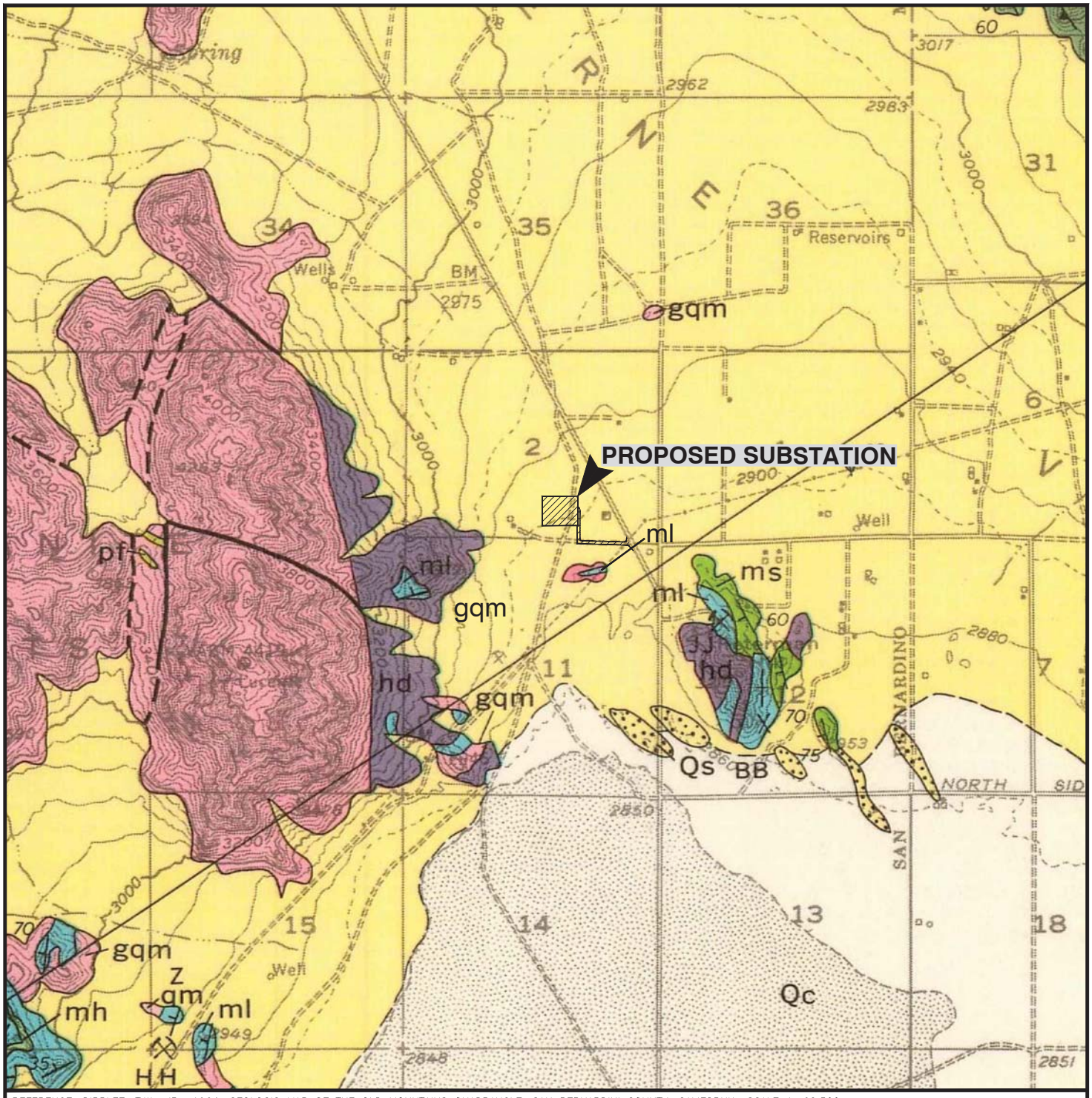

REFERENCE: DIBBLEE, T.W., JR., 1964, GEOLOGIC MAP OF THE OLD MOUNTAINS QUADRANGLE, SAN BERNARDINI COUNTY, CALIFORNIA, SCALE 1: 62,500.

N

SCALE IN FEET

0 2,400 4,800

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

LEGEND

Qa	ALLUVIUM	ms	METAMORPHIC ROCKS
gqm	GRANITE AND QUARTZ MONZONITE	ml	METASEDIMENTARY ROCKS
hd	HORNBLENDE DIORITE GABBRO		GEOLOGIC CONTACT
Qc	SURFICIAL SEDIMENTS		

Ninyo & Moore

REGIONAL GEOLOGY

FIGURE 4

PROJECT NO.	DATE
209418048	3/17

CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

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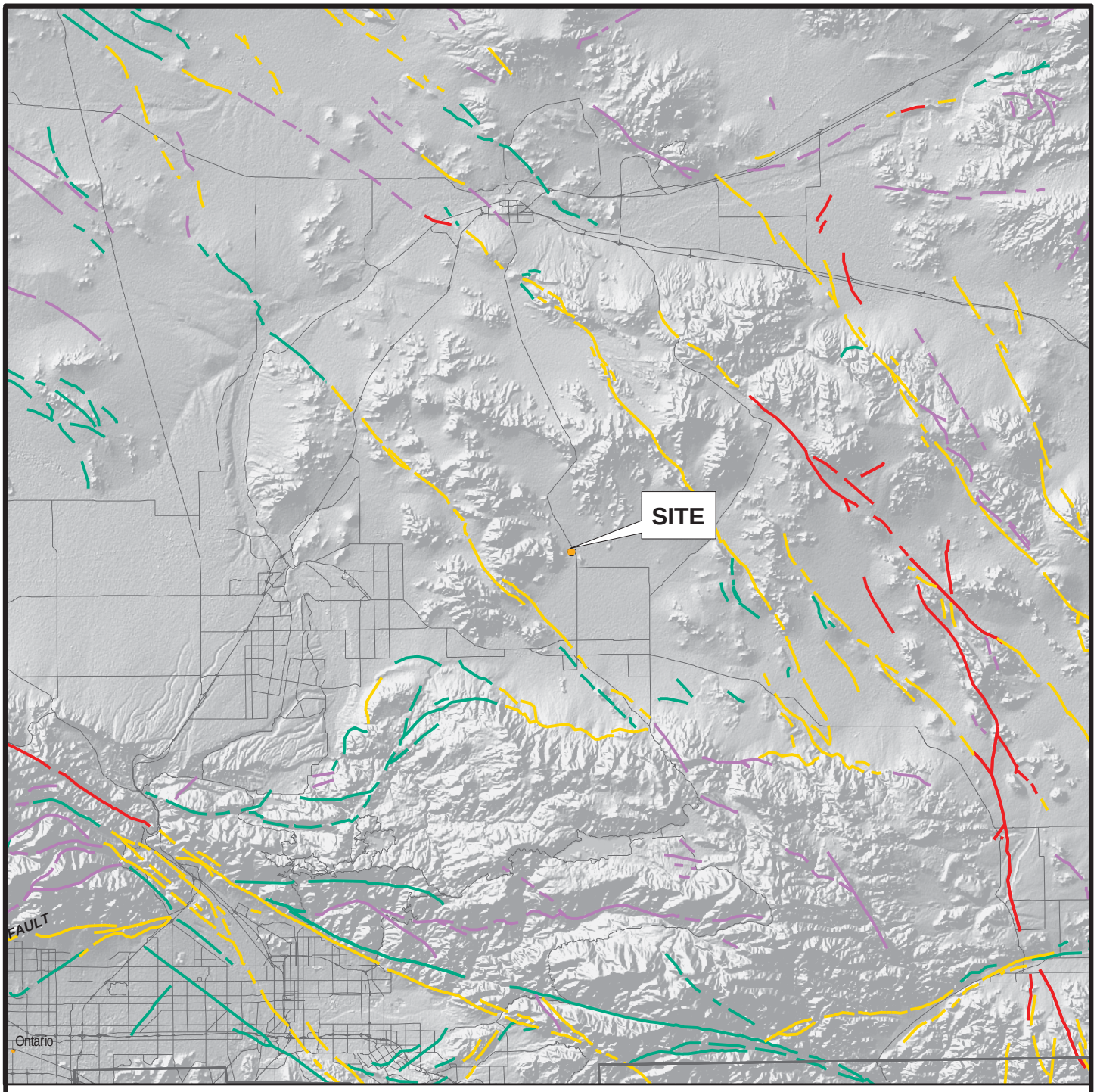


209418048_FL.....JP

GIS DATA SOURCE: CALIFORNIA GEOLOGICAL SURVEY (CGS); ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
REFERENCE: JENNINGS, C.W. AND BRYANT, W.A., 2010, FAULT ACTIVITY MAP OF CALIFORNIA.

LEGEND

FAULT ACTIVITY:

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- COUNTY BOUNDARIES
- LATE QUATERNARY
- QUATERNARY

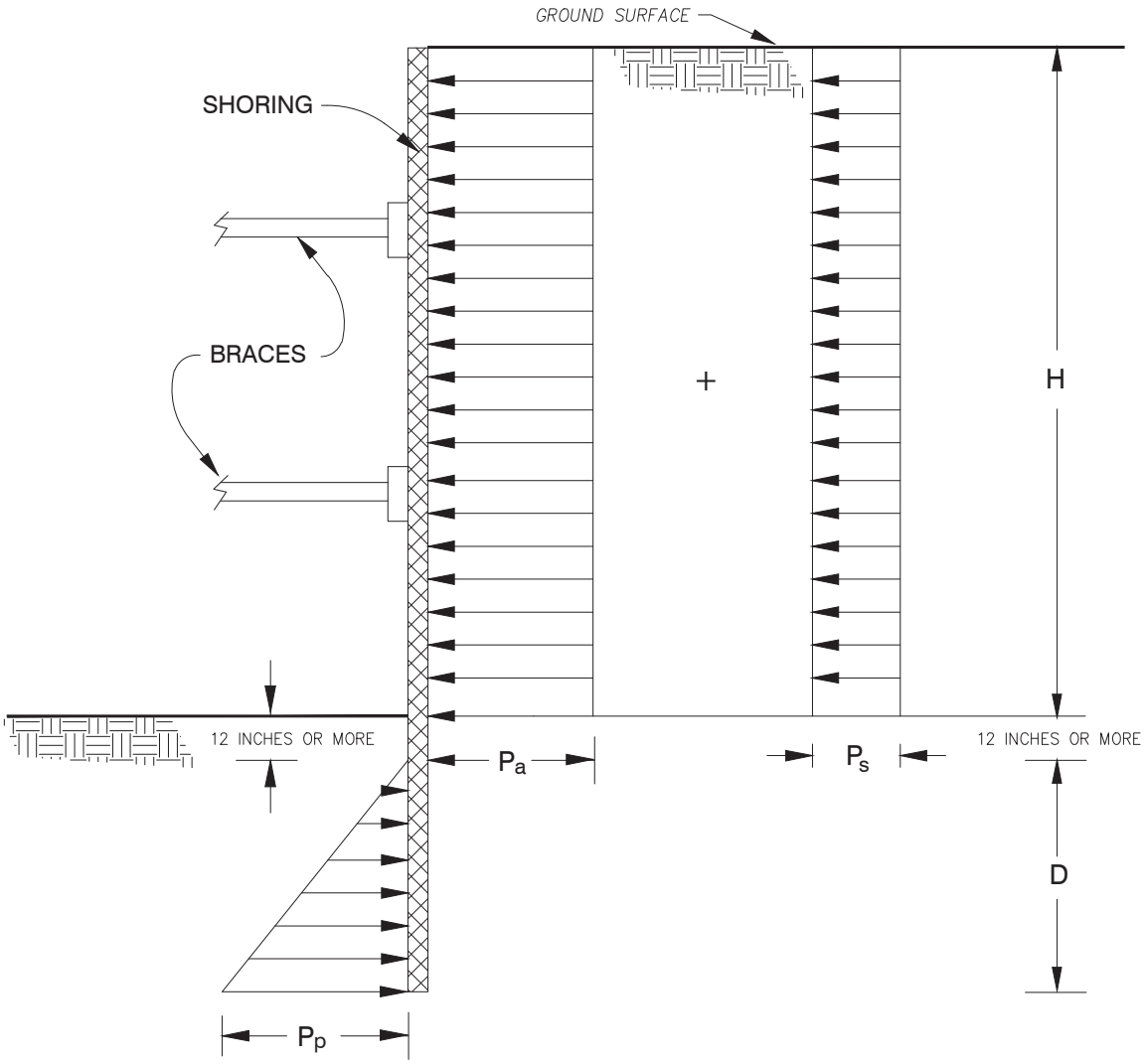
N

10 0 10

Miles

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore	FAULT LOCATIONS	FIGURE
PROJECT NO. 209418048 / DATE 3/17	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	5

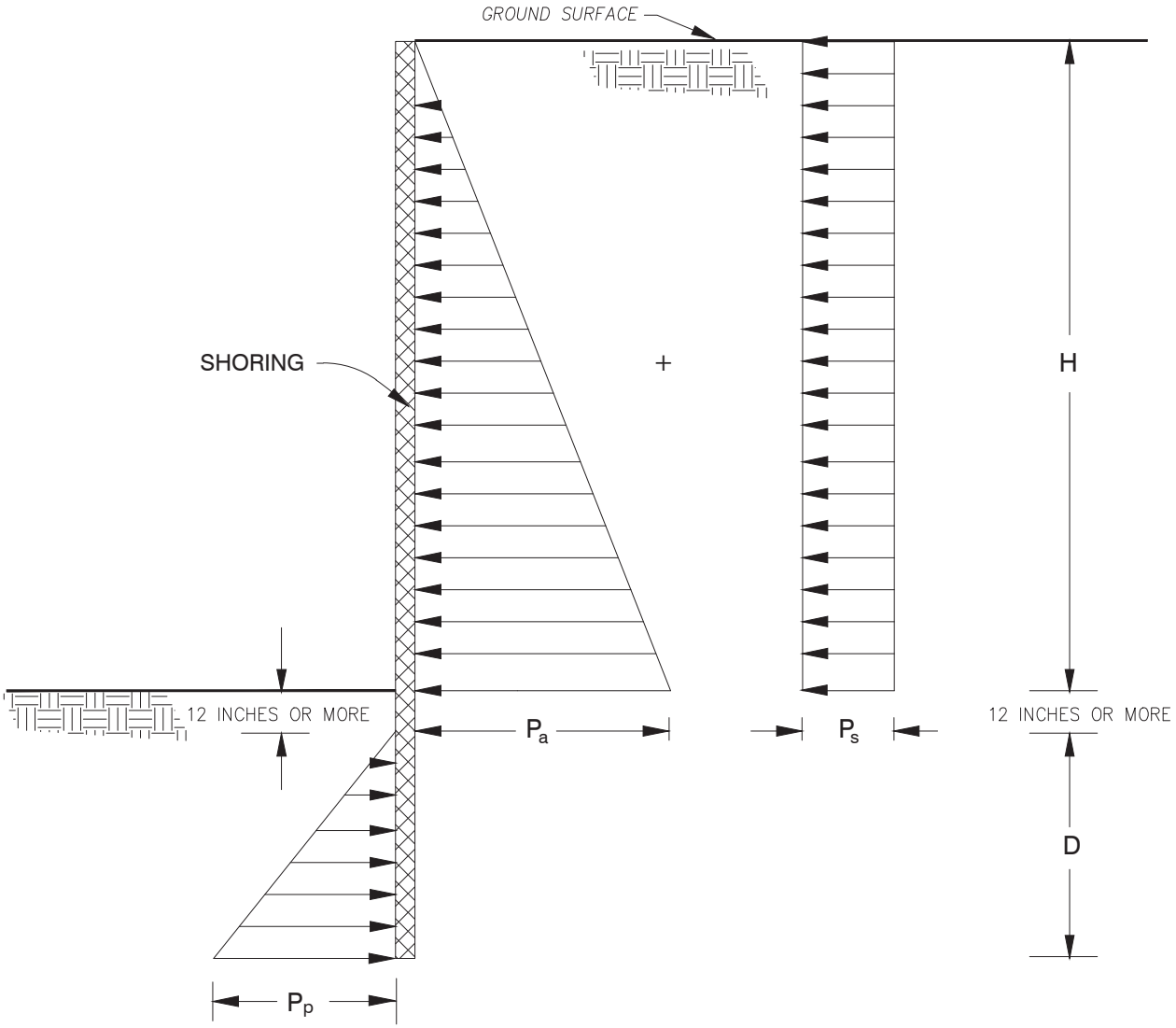


NOTES:

1. APPARENT LATERAL EARTH PRESSURE, P_a
   P_a =24H psf
2. CONSTRUCTION TRAFFIC INDUCED SURCHARGE PRESSURE, P_s
   P_s = 120 psf
3. PASSIVE LATERAL EARTH PRESSURE, P_p
   P_p =390D psf
4. ASSUMES GROUNDWATER IS NOT PRESENT
5. SURCHARGES FROM EXCAVATED SOIL OR CONSTRUCTION MATERIALS ARE NOT INCLUDED
6. H AND D ARE IN FEET

NOT TO SCALE

Ninyo & Moore		LATERAL EARTH PRESSURES FOR BRACED EXCAVATION	FIGURE
PROJECT NO.	DATE	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	6
209418048	3/17		



NOTES:

1. ACTIVE LATERAL EARTH PRESSURE, P_a
   P_a = 37H psf
2. CONSTRUCTION TRAFFIC INDUCED SURCHARGE PRESSURE, P_s
   P_s = 120 psf
3. PASSIVE LATERAL EARTH PRESSURE, P_p
   P_p = 390D psf
4. ASSUMES GROUNDWATER IS NOT PRESENT
5. H AND D ARE IN FEET

NOT TO SCALE

Ninyo & Moore		LATERAL EARTH PRESSURES FOR TEMPORARY CANTILEVERED SHORING	FIGURE
PROJECT NO.	DATE	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	7
209418048	3/17		

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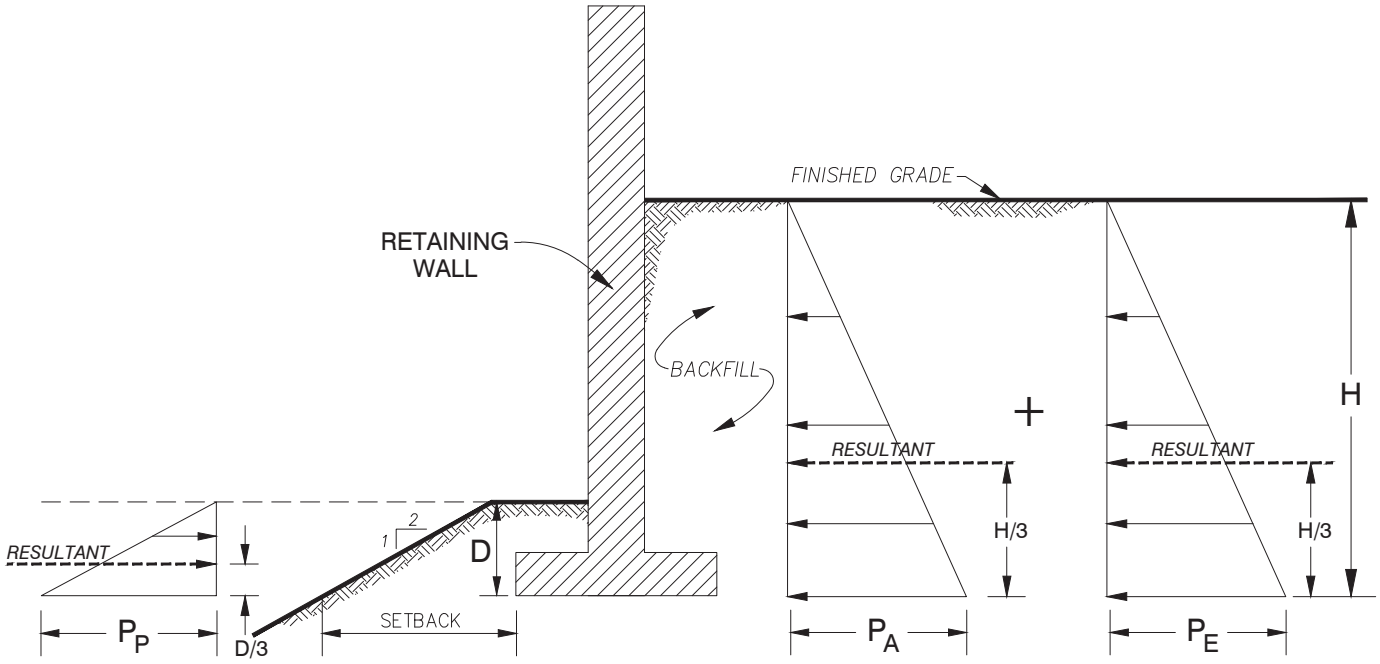

PASSIVE PRESSURE

ACTIVE PRESSURE

DYNAMIC PRESSURE

NOTES:

1. ASSUMES NO HYDROSTATIC PRESSURE BUILD-UP BEHIND THE RETAINING WALL
2. STRUCTURAL, GRANULAR BACKFILL MATERIALS AS SPECIFIED IN OUR REPORT SHOULD BE USED FOR RETAINING WALL BACKFILL
3. DRAINS AS RECOMMENDED IN THE RETAINING WALL DRAINAGE DETAIL SHOULD BE INSTALLED BEHIND THE RETAINING WALL
4. DYNAMIC LATERAL EARTH PRESSURE IS BASED ON A PEAK GROUND ACCELERATION OF 0.57g
5. P_E IS CALCULATED IN ACCORDANCE WITH THE RECOMMENDATIONS OF MONONOBE AND MATSUO (1929), AND ATIK AND SITAR (2010).
6. SURCHARGE PRESSURES CAUSED BY VEHICLES OR NEARBY STRUCTURES ARE NOT INCLUDED
7. H AND D ARE IN FEET
8. SETBACK SHOULD BE IN ACCORDANCE WITH FIGURE 1808.7.1 OF THE IBC (2015)

RECOMMENDED GEOTECHNICAL DESIGN PARAMETERS

Lateral Earth Pressure	Equivalent Fluid Pressure ($lb/ft^2/ft$)[1]
P_A	Level Backfill with Granular Soils[2]
	37H
P_E	20H
P_P	Level Ground
	390D

NOT TO SCALE

Ninyo & Moore	LATERAL EARTH PRESSURES FOR YIELDING RETAINING WALLS	FIGURE
PROJECT NO. 209418048 / DATE 3/17	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	8

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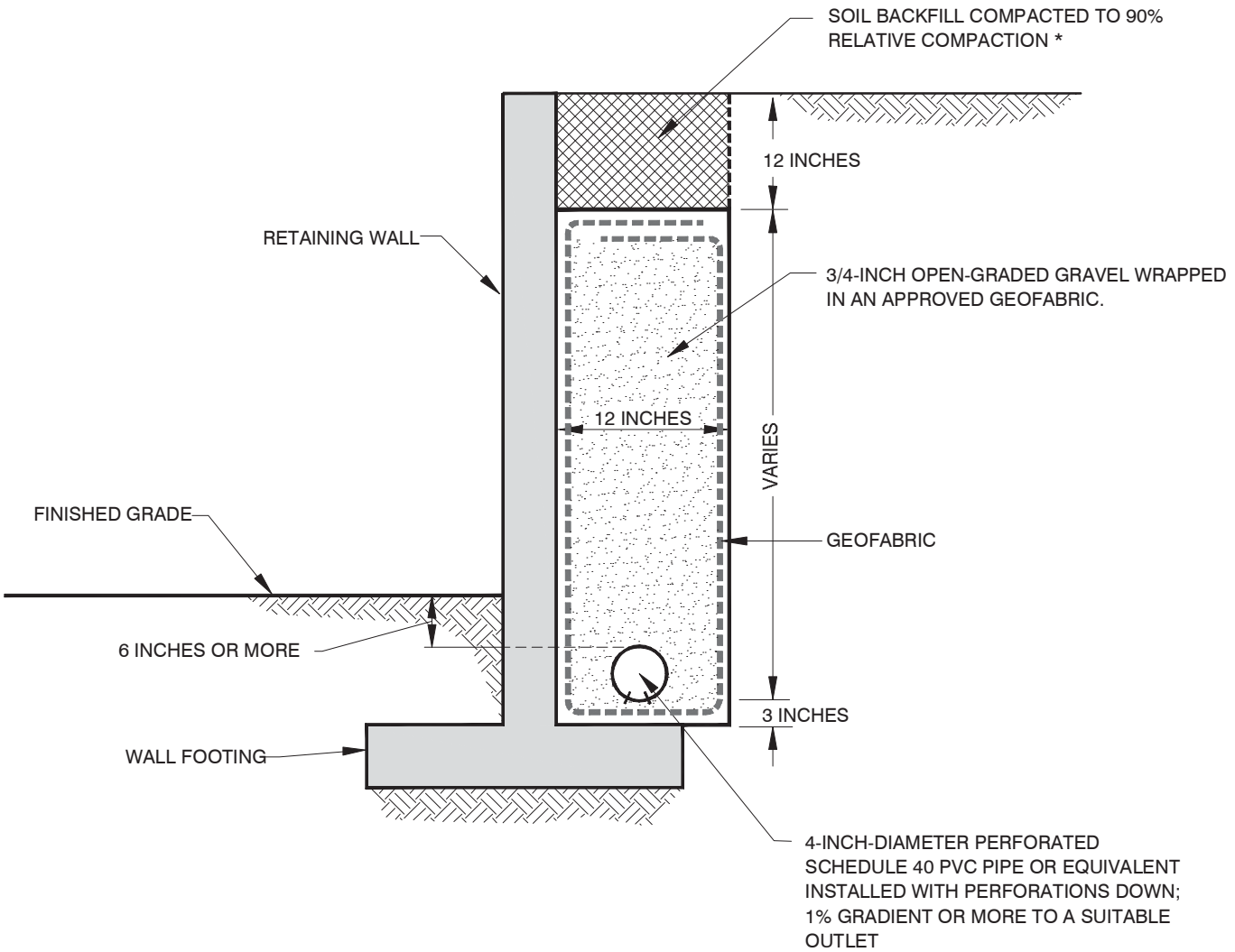


*BASED ON ASTM D1557

NOT TO SCALE

NOTE: AS AN ALTERNATIVE, AN APPROVED GEOCOMPOSITE DRAIN SYSTEM MAY BE USED.

Ninyo & Moore	RETAINING WALL DRAINAGE DETAIL	FIGURE
PROJECT NO. 209418048 / DATE 3/17	CALCITE 220KV SUBSTATION & TRANSMISSION ALIGNMENT SAN BERNARDINO COUNTY, CALIFORNIA	9

209418048_RWDD.DWG 03/21/17 JP

APPENDIX A

BORING AND TEST PIT LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory excavations. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following methods.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with a 140-pound hammer falling freely in general accordance with ASTM D 3550. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

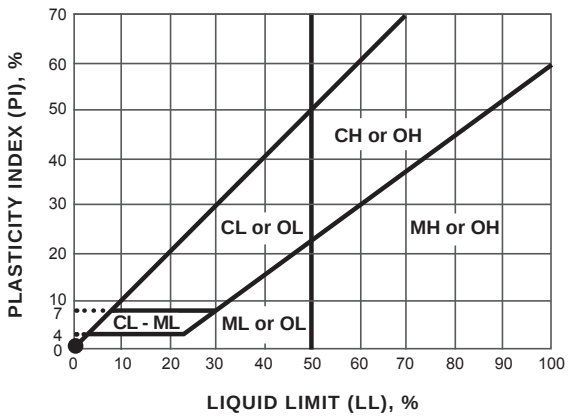
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS	
			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

BORING LOG EXPLANATION SHEET

DEPTH (meters)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/0.3 m	MOISTURE (%)	DRY DENSITY (kN/m³)	SYMBOL	CLASSIFICATION U.S.C.S.	
0	■							Bulk sample.
		■						Modified split-barrel drive sampler.
		⊠						No recovery with modified split-barrel drive sampler.
		▮						Sample retained by others.
		◪						Standard Penetration Test (SPT).
5		◫						No recovery with a SPT.
		▯	XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
		◨						No recovery with Shelby tube sampler.
		▤						Continuous Push Sample.
				⚲				Seepage.
10				▽				Groundwater encountered during drilling.
				▼				Groundwater measured after drilling.
						▨	SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
						▨	CL	Dashed line denotes material change.
15						▨		Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
20								The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

DATE DRILLED 12/5/16 BORING NO. B-1

GROUND ELEVATION 2,910' ± SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; few gravel.
		35 50/4"	2.1	115.9			Moist; very dense; trace rootlets.
		50/5"	2.1	108.7			
		35 50/3"	3.1	111.3			Reddish brown; moist.
10		50/6"	3.4	109.1			Mottled with caliche.
		32 41 50/4"					Trace to few gravel; slight cementation.
20		50/5.5"	22.5	93.7		SP-SM	Reddish brown, moist, very dense, poorly graded SAND with silt; trace to few gravel.
		24 33 41				SM	Reddish brown, moist, very dense, silty SAND; few gravel.
							Total Depth = 26.5 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/5/16.
30							Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40							

Ninyo & Moore

BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-1

DATE DRILLED 12/5/16 BORING NO. B-2

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace to few gravel.
	Driven	11 50/4"	2.1	117.9			Reddish brown; moist; very dense; trace pinhole porosity.
	Driven	34 50/4"	2.3	117.6			
	Driven	50/5"	3.3	108.0			Moist.
10	Driven	50/6"	2.8	102.2		SP-SM	Yellowish brown, moist, very dense, poorly graded SAND with silt; trace to few gravel; trace to few pinhole porosity.
	Driven	27 50/6"				SM	Yellowish brown, moist, very dense, silty SAND; trace to few gravel; stringers of caliche; slight cementation.
20	Driven	23 50/5"	5.2	114.7			Reddish yellow.
	Driven	33 26 24					
30	Driven	50/3"	4.1	103.7			Light reddish brown; mottled with caliche.
	Driven	50/6"					
40							

Ninyo & Moore

BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-2

DATE DRILLED 12/5/16 BORING NO. B-2

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40			50/4"	3.2	107.2		SM	ALLUVIUM: (Continued) Reddish brown, moist, very dense, silty SAND; few gravel; trace pinhole porosity; slight cementation.
			50/6"					Trace stringers of caliche.
50			50/5"	4.2	93.9			No recovery. Few gravel.
			50/5"					Total Depth = 50.9 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/5/16.
60								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
70								
80								

Ninyo & Moore

BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-3

DATE DRILLED 12/5/16 BORING NO. B-3

GROUND ELEVATION 2,910' ± SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Light brown, dry, loose, silty SAND; few gravel.
			36 50/2"	1.7	118.7			Yellowish brown; very dense; trace rootlets.
			50/5"	2.8	111.8			
			24 40 50/5"	3.1	117.6			Moist; trace stringers of caliche.
10			40 50/6"	3.7	107.4			Slight cementation.
			25 50/6"					Slight cementation.
20			41 50/2"	4.4	114.5			Light yellowish brown.
			32 33 28					Reddish brown; mottled with caliche.
								Total Depth = 26.5 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/5/16.
30								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-4

DATE DRILLED 12/5/16 BORING NO. B-4

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Light brown, dry, loose, silty SAND; few gravel.
			50/5"	3.0	110.0			Reddish brown; very dense; trace pinhole porosity.
			50/5"					
			50/5.5"	2.6	113.6			Little to some gravel.
10			50/5"	2.9	101.1			Slight cementation.
			23 35 32					Trace gravel; few stringers of caliche.
20			24 50/6"	2.8	116.8			Few gravel.
			22 50/4"					Mottled with caliche.
30			37 50/5"	8.0	103.1			Moist; trace pinhole porosity; few gravel.
			47 50/6"					
								Total Depth = 36.0 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/5/16.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-5

DATE DRILLED 12/5/16 BORING NO. B-4

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-6

DATE DRILLED 12/6/16 BORING NO. B-5

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; few gravel.
		41 50/3"	1.7	120.3			Moist; very dense; trace pinhole porosity; trace rootlets.
						SP-SM	Yellowish brown, dry, very dense, poorly graded SAND with silt.
		50/5"	2.5	106.9			
		44 50/5"	4.4	110.8			Reddish brown; moist.
10						SM	Reddish brown, moist, very dense, silty SAND; trace pinhole porosity.
		50/6"	4.0	101.0			
		27 38 50/5"					Slight cementation.
20		50/6"	3.0	109.7			Light brown; few gravel; mottled with caliche.
		30 32 36					Reddish yellow.
30		50/4.5"	4.8	102.1			
		41 50/5"					Total Depth = 35.9 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/6/16.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-7

DATE DRILLED 12/6/16 BORING NO. B-5

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-8

DATE DRILLED 12/6/16 BORING NO. B-6

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SC	ALLUVIUM: Yellowish brown, dry, loose, clayey SAND; few gravel.
		50/6"	1.9	117.0			Very dense.
		43 50/2.5"	7.6	106.0			Moist; trace to few stringers of caliche.
		43 50/5.5"	3.5	111.3		SM	Reddish brown, moist, very dense, silty SAND; few gravel; trace pinhole porosity.
10		50/6"	3.2	108.9			
		32 50/5"					Slight cementation.
20		40 50/5"	4.4	112.1			Light brown; trace pinhole porosity.
		36 50/6"					Reddish brown.
30		50/6"	4.8	102.0			
		37 50/6"					
							Total Depth = 36.0 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/6/16.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-9

DATE DRILLED 12/6/16 BORING NO. B-6

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-10

DATE DRILLED 12/6/16 BORING NO. B-7

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; few gravel.
			50/5.5"	2.0	115.5			Very dense; trace gravel.
			50/4"	3.0	102.3			Moist; trace pinhole porosity.
			50/5.5"	3.5	106.5			
10			50/6"	3.5	105.8			Mottled with caliche.
			36 50/5"					Reddish yellow; slight cementation.
20			50/6"	2.7	113.8			
			40 50/6"					Trace pinhole porosity.
30			26 50/6"	8.1	110.1			Reddish brown.
			16 20 35					
								Total Depth = 36.5 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/6/16.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-11

DATE DRILLED 12/6/16 BORING NO. B-7

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-12

DATE DRILLED 12/6/16 BORING NO. B-8

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace gravel.
		50/6"	2.5	107.0			Very dense; trace pinhole porosity.
		50/6"	2.1	115.8			
		50/6"	3.5	107.0			Reddish brown; moist; few to little gravel.
10		44 50/5"	3.7	109.5			
		26 30 50/6"					Trace to few stringers of caliche; slight cementation.
20		50/5"	4.5	111.1			Slight cementation.
		32 44 50/6"					Mottled with caliche.
30		50/6"	3.4	103.3			Trace pinhole porosity.
		36 50/6"					
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-13

DATE DRILLED 12/6/16 BORING NO. B-8

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		■	50/4"	3.6	105.4		SM	ALLUVIUM: (Continued) Reddish brown, moist, very dense, silty SAND; mottled with caliche; trace pinhole porosity; slight cementation.
		◢	21 50/5½"					
50		■	50/6"	3.2	104.7			Total Depth = 50.5 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/6/16. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-14

DATE DRILLED 12/7/16 BORING NO. B-9

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; few gravel.
		50/5"	2.3	143.5			Very dense; trace stringers of caliche; trace pinhole porosity; trace gravel.
		50/4.5"	3.1	95.4			Moist; few pinhole porosity.
		37 50/3"	4.7	108.5			Mottled with caliche; few gravel.
10		50/5.5"	3.9	100.0			Slight cementation.
		21 36 38					
20		50/6"	3.6	109.6			Reddish brown; slight cementation; trace to few gravel; mottled with caliche; trace pinhole porosity.
		27 50/6"					Reddish yellow; few pinhole porosity.
30		28 50/5"	7.5	109.8			Few gravel.
		29 50/5"					Reddish brown. Total Depth = 35.9 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/7/16.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-15

DATE DRILLED 12/7/16 BORING NO. B-9

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-16

DATE DRILLED 12/7/16 BORING NO. B-10

GROUND ELEVATION 2,905' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace gravel.
		50/6"	2.7	115.7			Very dense; few pinhole porosity; trace stringers of caliche.
		41 50/6"	5.0	111.8			Moist; trace pinhole porosity; few stringers of caliche.
		40 50/6"	3.7	114.5			
10		23 35 36	4.4	112.1			Light brown; trace gravel.
		20 37 50/6"					Reddish yellow; slight cementation.
20		50/3"	3.3	112.0			Trace to few gravel; few stringers of caliche; trace pinhole porosity.
		35 39 29					
30		41 50/3"	6.4	110.9			Trace gravel; oxidation staining.
		21 50/5"					
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-17

DATE DRILLED 12/7/16 BORING NO. B-10

GROUND ELEVATION 2,905' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		50/3"	3.8	104.1		SM	ALLUVIUM: (Continued) Reddish yellow, moist, very dense, silty SAND; few gravel; mottled with caliche; slight cementation.
		50/6"					Reddish brown; few stringers of caliche.
50		42 50/6"					Reddish yellow.
							Total Depth = 51.0 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/7/16. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-18

DATE DRILLED 12/9/16 BORING NO. B-11

GROUND ELEVATION 2,910' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; few gravel.
		50/5.5"	1.7	114.4			Very dense; trace pinhole pores.
		50/5"					
		50/4.5"	2.5	109.1			Reddish brown; moist; few stringers of caliche; few gravel.
10		50/5"	3.4	104.9			Mottled with caliche; few pinhole porosity.
		32 50/5"					Slight cementation.
20		40 38 42	2.4	121.6			Reddish yellow; few gravel; mottled with caliche; trace pinhole porosity.
		29 50/4"					Reddish brown.
30		50/6"	5.9	109.9			
		21 27 34					
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-19

DATE DRILLED 12/9/16 BORING NO. B-11

GROUND ELEVATION 2,910' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		50/6"	5.8	107.6		SM	ALLUVIUM: (Continued) Reddish brown, moist, very dense, silty SAND; trace to few gravel; trace pinhole porosity.
		12 20 30					Reddish yellow; mottled with caliche; slight cementation.
50		50/6"	4.7	112.3			Reddish brown.
							Total Depth = 50.5 feet. Groundwater was not encountered during drilling. Backfilled with cuttings on 12/9/16. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-20

DATE DRILLED 12/7/16 BORING NO. B-12

GROUND ELEVATION 2,905' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace gravel.
			50/6"	3.3	117.7			Moist; very dense; few to little gravel.
			50/5"	1.8	110.1			Mottled with caliche; trace pinhole porosity.
			50/5.5"	2.4	113.0			
10			38 50/6"	3.0	111.0			
			18 30 46					Slight cementation.
20			21 41 50/6"	3.2	121.6			Reddish brown; trace gravel.
			23 50/6"					
30			50/6"	5.2	106.2			Moist.
			31 33 30					Yellowish brown.
								Total Depth = 36.5 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/7/16.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-21

DATE DRILLED 12/7/16 BORING NO. B-12

GROUND ELEVATION 2,905' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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BORING LOG

CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-22

DATE DRILLED 12/9/16 BORING NO. B-13

GROUND ELEVATION 2,905' ± SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace to few gravel.
		50/6"	1.5	116.9			Very dense; trace pinhole porosity.
		50/4"	2.6				Reddish brown.
		33 50/2"	2.8	110.9			Mottled with caliche; few gravel.
10		50/6"	3.1	111.0			Moist; few gravel.
		30 50/4"					Slight cementation.
20		26 22 36	2.1	118.5			Dense; trace gravel.
		43 50/2"					Very dense.
							Total Depth = 25.7 feet. Groundwater was not encountered during drilling. Backfilled with cuttings on 12/9/16. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-23

DATE DRILLED 12/9/16 BORING NO. B-14

GROUND ELEVATION 2,905' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace gravel.
		50/6"	2.1	110.1			Very dense; trace pinhole porosity; trace rootlets.
		50/5"	1.9	106.2			Mottled with caliche.
		50/5.5"	3.8	99.3			Reddish brown; moist; pinhole porosity; few gravel.
10		50/5.5"	4.4	103.3			Slight cementation; few gravel.
		27 35 43					Yellowish brown.
20		28 50/6"	2.4	114.9			Reddish brown; trace pinhole porosity; few gravel.
		33 50/3"					
30		21 50/4.5"	9.1	108.1			
		21 50/6"					
40							

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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-24

DATE DRILLED 12/9/16 BORING NO. B-14

GROUND ELEVATION 2,905' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		■	50/5.5"	4.5	104.5		SM	ALLUVIUM: (Continued) Reddish yellow, moist, very dense, silty SAND; trace gravel; mottled with caliche; slight cementation.
		◢	50/6"					
50		■	36 43 46	3.9	122.9			Reddish brown; few gravel.
								Total Depth = 51.5 feet. Groundwater was not encountered during drilling. Backfilled with cuttings on 12/9/16. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-25

DATE DRILLED 12/7/16 BORING NO. B-15

GROUND ELEVATION 2,905' ± SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace gravel.
		50/6"	1.5	120.1			Very dense.
		50/6"	2.8	115.3			Trace stringers of caliche.
		26 28 30	5.1	110.8			Moist; mottled with caliche; few pinhole porosity.
10		21 18 20	2.4	116.5			Reddish brown; medium dense.
		28 42 50/6"					Very dense; slight cementation.
20		50/6"	4.1	109.1			Few stringers of caliche.
		32 40 40					Total Depth = 26.5 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/7/16.
30							Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-26

DATE DRILLED 12/12/16 BORING NO. B-17

GROUND ELEVATION 2,895' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; few gravel.
		22 25 34	7.2	100.6			Light brown; moist; dense; mottled with caliche; trace pinhole porosity; trace gravel.
		18 28 45	14.6	91.7			Very dense.
		11 10 9	6.4	90.9			Reddish brown; medium dense.
10		9 13 13	7.8	95.6			
		4 6 14				ML	Light brown, moist, medium dense, sandy SILT; trace gravel; mottled with caliche; trace pinhole porosity.
20		19 26 25	4.6	116.2		SM	Light brown, moist, dense, silty SAND; trace gravel; mottled with caliche; trace pinhole porosity.
		11 13 13					
30		21 24 26	8.2	114.3			Reddish brown; few gravel.
		15 25 45					Brown; very dense; few stringers of caliche.
40							

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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-27

DATE DRILLED 12/12/16 BORING NO. B-17

GROUND ELEVATION 2,895' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		50/4.5"	5.6	100.8		SM	ALLUVIUM: (Continued) Light brown, moist, very dense, silty SAND; trace fine gravel; mottled with caliche; trace pinhole porosity; few to little gravel size nodules of poorly indurated, weakly cemented, silty sand.
		50/4"					No recovery. Rig chatter from 46 feet to 50 feet.
50		50/4" 50/5"					GRANITIC ROCK: Dark gray and white, moist, weathered, moderately soft, GRANITIC ROCK.
							Total Depth = 50.8 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/12/16. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-28

DATE DRILLED 12/12/16 BORING NO. B-18

GROUND ELEVATION 2,890' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Light brown, dry, loose, silty SAND; few gravel.
		33 28 27	6.9	104.6			Moist; dense; mottled with caliche; trace pinhole porosity.
		12 14 19	7.1	99.4			Medium dense.
		12 12 18	7.7	99.4			Reddish yellow; trace gravel.
10		13 21 18	16.1	82.1		SC	Reddish yellow, moist, medium dense, clayey SAND; trace pinhole porosity; few to little gravel.
		15 19 16				ML	Light brown, moist, hard, clayey SILT; few sand; mottled with caliche; trace pinhole porosity.
20		20 26 50/4.5"	7.7	96.5		SM	Reddish yellow, moist, very dense, silty SAND; mottled with caliche; trace pinhole porosity.
		9 14 18				ML	Light brown, moist, dense, sandy SILT; mottled with caliche; trace pinhole porosity.
30		19 50/6"	2.8	121.0			Dark gray; few gravel.
		50/4"					GRANITIC ROCK: Gray, moist, weathered, moderately soft, GRANITIC ROCK.
40							

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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-29

DATE DRILLED 12/12/16 BORING NO. B-18

GROUND ELEVATION 2,890' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40			50/0"					GRANITIC ROCK: (Continued) Gray, moist, weathered, moderately soft, GRANITIC ROCK. No recovery. Refusal at 40.2 feet.
								Total Depth = 40.2 feet. Groundwater not encountered during drilling. Backfilled with cuttings on 12/12/16.
50								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-30

DATE DRILLED 12/8/16 BORING NO. B-19

GROUND ELEVATION 2,895' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; trace gravel.
			14 26 34	2.0	116.5			Dense; trace pinhole porosity; trace rootlets.
			50/5"	1.6	103.5			Very dense; trace stringers of caliche.
			50/6"	4.0	105.3			Moist.
10			27 23 26	1.9	118.2			Reddish brown; dry; dense; mottled with caliche.
			28 50/5.5"					Moist; very dense; slight cementation.
20			38 50/5"	5.7	112.6			Trace gravel.
			20 50/6"					
30			40 38 47	2.7	121.7			Trace pinhole porosity.
			39 50/5"					
40								

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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-31

DATE DRILLED 12/8/16 BORING NO. B-19

GROUND ELEVATION 2,895' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40			50/4"				SM	ALLUVIUM: (Continued) Reddish brown, moist, very dense, silty SAND; trace to few gravel; mottled with caliche; slight cementation.
			29 20 7					Dense.
50			50/6"	4.4	106.3			Very dense.
								Total Depth = 50.5 feet. Groundwater was not encountered during drilling. Backfilled with cuttings on 12/8/16. Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-32

DATE DRILLED 12/8/16 BORING NO. B-20

GROUND ELEVATION 2,890' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SC	ALLUVIUM: Yellowish brown, dry, loose, clayey SAND; few gravel.
		6 11 21	1.3	122.4			Medium dense; trace rootlets.
		28 30 50/6"	12.2	106.1			Moist; very dense; mottled with caliche; trace pinhole porosity.
		50/6"	2.6	109.8		SM	Yellowish brown, moist, very dense, silty SAND; mottled with caliche; trace pinhole porosity.
10		21 33 41	3.2	114.8			Reddish brown.
		25 25 50/6"					Slight cementation.
20		50/5.5"	6.5	104.3			Moist; few stringers of caliche; slight cementation; trace gravel.
		50/5.5"					
30		50/6"	5.0	98.1			Mottled with caliche.
		15 50/6"					
40							

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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-33

DATE DRILLED 12/8/16 BORING NO. B-20

GROUND ELEVATION 2,890' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		50/5"	5.4	94.9		SM	ALLUVIUM: (Continued) Reddish yellow, moist, very dense, silty SAND; few gravel; mottled with caliche; slight cementation.
		50/4.5"					Reddish brown.
50		50/2" 50/3"					No recovery. Total Depth = 50.4 feet. Groundwater was not encountered during drilling. Backfilled with cuttings on 12/8/16.
60							Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-34

DATE DRILLED 12/8/16 BORING NO. B-21

GROUND ELEVATION 2,880' ± SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Yellowish brown, dry, loose, silty SAND; few gravel.
		10 22 50/5"	1.5	125.6			Very dense; trace rootlets.
		30 50/4"	9.0	103.7			Reddish brown; moist; mottled with caliche.
		12 16 20	4.6	104.4			Medium dense; trace gravel.
10		13 21 36	2.3	115.1			Dense; trace pinhole porosity; trace gravel.
		21 38 50/5.5"					Very dense; slight cementation.
20		30 37 50/4"	8.3	119.2			Few gravel.
		50/5"					
30		34 50/5"	3.1	111.2			Reddish yellow.
		34 50/6"					Reddish brown.
40							

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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-35

DATE DRILLED 12/8/16 BORING NO. B-21

GROUND ELEVATION 2,880' ± SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Martini Drilling)

DRIVE WEIGHT 140 lbs. (Auto. Trip Hammer) DROP 30"

SAMPLED BY CG LOGGED BY CG REVIEWED BY GMC

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40			50/5"	4.2	111.0		SM	ALLUVIUM: (Continued) Yellow, moist, very dense, silty SAND; few gravel; mottled with caliche; trace pinhole porosity; slight cementation.
			50/6"					Reddish yellow.
50			50/5"	3.5	100.5			Reddish brown.
								Total Depth = 50.4 feet. Groundwater was not encountered during drilling. Backfilled with cuttings on 12/8/16.
60								Notes: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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CALCITE 220 kV SUBSTATION & TRANSMISSION ALIGNMENT
SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
209418048	3/17	A-36