REPORT OF UPDATE ENGINEERING GEOLOGIC STUDY

PROPOSED CUSTOM SINGLE-FAMILY RESIDENTIAL DEVELOPMENT

1420 BELLA DRIVE
BEVERLY HILLS AREA, CITY OF LOS ANGELES, CALIFORNIA

PREPARED FOR GABRIEL PEREZ

JANUARY 7, 2015 Project No.: LP1174

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LANDPHASES INC
CONSULTING ENGINEERING GEOLOGISTS

January 7, 2015 Project No.: LP1174

Gabriel Perez
1032 N. Cove Way
Beverly Hills, CA 90210

SUBJECT: REPORT OF UPDATE ENGINEERING GEOLOGIC STUDY, PROPOSED CUSTOM SINGLE-FAMILY RESIDENTIAL DEVELOPMENT, 1420 BELLA DRIVE, BEVERLY HILLS AREA, CITY OF LOS ANGELES, CALIFORNIA

Dear Mr. Perez,

Land Phases, Inc. (LP) is pleased to report the findings of our update engineering geologic study performed with respect to the proposed custom single-family residential development at 1420 Bella Drive which is located in the Beverly Hills area of the City of Los Angeles, California. Work performed as part of our update engineering geologic study was in general accordance with the authorized scope of work presented in our proposal, dated July 31, 2014, which was formally authorized by you on November 3, 2014.

This report summarizes our scope of work and presents the results of our research, our analyses and interpretation of surficial and subsurface geologic data, and presents our engineering geologic conclusions and recommendations concerning the subject property and the proposed project. Based on the results of our update engineering geologic study, it is currently our opinion that the proposed project is feasible from an engineering geologic standpoint provided the recommendations presented in this report, and those presented by the Project Geotechnical Engineer, are properly incorporated in the design and implemented during construction.

We appreciate the opportunity to provide you with our professional engineering geologic services. It is strongly recommended that you read this report from cover to cover in order to understand the assumptions and limitations of this study and to avoid taking a finding or recommendation out-of-context. Please avoid misunderstandings or misinterpretation of this report by calling the undersigned with any questions you may have.

Respectfully Submitted,
LAND PHASES, INC.

Jake W. Holt
PG 7404, CEG 2282, CHG 816 exp. 11-30-16
Principal Engineering Geologist and Hydrogeologist

PROFESSIONAL GEOLOGIST JACOB W. HOLT No. 2282 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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Distribution: (1) Addressee
(4) SIA Architectural Design (3 for City submittal, 1 unbound, plus 1 pdf copy on CD)
(1) CalWest Geotechnical (via email)

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INTRODUCTION

General Remarks and Purpose

The following report summarizes findings of our update engineering geologic study concerning the subject property. The purpose of this study was to determine and evaluate the geologic conditions of the subject property with respect to the proposed custom single-family residential development at the site. Our update engineering geologic study of the subject property was performed in conjunction with an update geotechnical engineering study of the site by CalWest Geotechnical. To clarify, LP is the *Project Engineering Geologist* and CalWest Geotechnical is the *Project Geotechnical Engineer* with respect to the proposed project.

Proposed Development

Information concerning the proposed development was provided by the client. In addition, a preliminary plan was also provided. This information and plan review was the basis for our update engineering geologic study. Based on the provided information and current plan, it is our understanding that it is proposed to construct a custom single-family residence and related ancillary structures (i.e. swimming pool, decks, driveway, retaining walls) on the northeast portion of the site. It is also proposed to construct a guest house and related ancillary structures (i.e. swimming pool, decks, driveway, retaining walls) on the north-central portion of the property. The approximate locations of the proposed structures are illustrated on the *Geologic Map* which is attached to this report as Plate 1. Grading required as part of the proposed project is anticipated to include the construction of temporary excavations, retaining wall backfilling, and the removal and recompaction of unstable materials (where present within the subject property) to a code-conforming condition. Deepened foundations will be utilized for support of the proposed structures per the recommendations of the Project Geotechnical Engineer. Formal plans have not been prepared and await, in part, the conclusions and recommendations of this report.

Please Note: For new construction projects, the City of Los Angeles Department of Building and Safety requires a minimum slope stability factor of safety of 1.5 (static)/1.0(pseudo-static) be demonstrated for the entire subject property, or mitigation or construction measures (i.e. deepened footings, soldier piles, pile-supported retaining walls, corrective grading, or a combination of measures) must be implemented as part of the proposed project which provides the 1.5 (static)/1.0(pseudo-static) slope stability factor of safety for the subject property. Due to the geologic and topographic conditions of the subject property (to be discussed), it is anticipated that portions of the subject property do not currently possess the minimum required slope stability factor of safety (to be confirmed by the Project Geotechnical Engineer). As a result, the implementation of site stabilization measures will be required as part of the proposed project as specified by the Project Engineering Geologist and Project Geotechnical Engineer.

Scope of Work

Our update engineering geologic study of the subject property was conducted from November 3, 2014 to January 7, 2015 and included the following tasks:

- Review of the preliminary site development plans which were provided to our office.

- Research and review of available City files and archives for geologic data pertinent to the subject property and adjacent area.

- Review of selected aerial photographs, published engineering geologic references, and available published and unpublished engineering geologic and geotechnical engineering reports. The references cited or utilized as part of this study are listed in the **REFERENCES** section of this report.

- Geologic field mapping of the surficial deposits and/or outcrops located within and adjacent to the subject property.

- Preparation of a site-specific *Geologic Map* (scale: 1" equals 20') which utilizes the provided topographic survey and site plan as a base. The *Geologic Map* illustrates the proposed project, the locations of any previous exploratory excavations located within or near the subject property, the locations of the geologic cross-sections constructed as part of this study, and the interpreted geologic conditions of the site based on the findings of our update engineering geologic study. The *Geologic Map* is attached to this report as Plate 1.

- Preparation of site-specific *Geologic Sections A-A', B-B', C-C', D-D', E-E', F-F', and G-G'* (scale: 1" equals 20') which illustrate the topographic and interpreted geologic and hydrogeologic conditions of selected portions of the subject property based on the findings of our update engineering geologic study. The locations and orientations of the geologic sections are typically intended to illustrate the interpreted geologic and hydrogeologic conditions underlying the "worst-case" or steepest slope of the area of the proposed project for use by the Project Geotechnical Engineer. However, the locations and orientations of the geologic sections may also illustrate other portions of the site or specific geologic conditions deemed pertinent to this study. *Geologic Sections A-A', B-B', C-C', D-D', E-E', F-F', and G-G'* are attached to this report as Plates 2-5.

- Analysis of the geologic and hydrogeologic data obtained from the aforementioned tasks.

- Preparation of this report that presents our engineering geologic findings, conclusions, and recommendations with respect to the subject property and proposed project.

- All aspects of this study were performed by, or under the direct supervision of, a State of California Certified Engineering Geologist.

SITE DESCRIPTION

Site Location

The subject property is located on the southern flank of the Santa Monica Mountains in the Beverly Hills area of the City of Los Angeles, California. Specifically, the subject property is located east of the San Diego (405) Freeway, east of Beverly Glen Blvd., west of Benedict Canyon Drive, north of Sunset Blvd., north and upslope of Cielo Drive, on the south and downslope side of Bella Drive in a residentially developed hillside area (see Figure 1). Custom hillside residences are present on the adjacent properties located to the north, east, and across the street (Cielo Drive) to the south.

Regional Geomorphology

The property is located within the geographic area known as the Santa Monica Mountains. The geomorphic conditions of this area have been sculpted by factors associated with geographic location, the underlying geologic conditions, tectonics, climate, erosion, and man. Based on our observations of the area, and our review of the *United States Geological Survey (USGS) Topographic Map of the Beverly Hills Quadrangle,* the general topographic conditions of the surrounding area consist of a south-facing mountain front which has been incised by south-trending drainage courses (see Figure 2). The prominent geomorphic features in the area of the subject property are Brown Canyon located to the west, Benedict Canyon located to the east, the crest of a northwest/southeast-trending ridge located upslope to the north, and the bottom of a southeast-trending canyon which is located along the southern margin of the site.

Site Geomorphology

Locally, the subject property is situated on a south/southwest-facing slope which is a part of the north wall of the aforementioned southeast-trending canyon. Based on the findings of this study, past grading on the site appears to have consisted of cutting and filling along the northern and southern margins of the site performed in association with the construction of Bella Drive and Cielo Drive. In addition, a graded access road was cut across the central portion of the site in years past. This access road has been converted to a drainage bench on which a concrete V-drain has been constructed.

Total physical relief within the subject property is on the order of 165 feet. Slope gradients within the site vary from nearly horizontal to as steep as 1(h):1(v). However, localized areas of steeper terrain are present along the cut-slope located along the northern margin of the drainage bench which traverses the central portion of the site. The existing topographic conditions of the subject property are presented on the attached *Geologic Map* (Plate 1) which utilizes the provided topographic survey as a base.

Existing Structures

The subject property is currently vacant. However, a steel I-beam and wood-lagging retaining wall slightly encroaches onto the extreme northeast portion of the site (see attached *Geologic Map* - Plate 1). It appears that this structure was constructed as part of prior construction activities performed within the adjacent property to the east (1436 Bella Drive) and was apparently constructed in order to provide lateral support of a temporary access road from Bella Drive to the rear yard portion of 1436 Bella Drive. Details concerning the design and construction of this retaining device (i.e. design parameters, plans, permit, as-built pile embedment, etc.) could not be located by LP at the City of Los Angeles during the course of this study.

A concrete retaining wall is present along the extreme southeast margin of the subject property, on the north side of Cielo Drive (see attached *Geologic Map* - Plate 1). It is our understanding that this retaining wall was constructed by the City of Los Angeles Department of Public Works on order to protect Cielo Drive from a landslide which activated on the adjacent ascending slope in 1993. Details concerning the construction of this retaining wall (i.e. design parameters, footing type, footing embedment, etc.) could not be located by LP at the City of Los Angeles during the course of this study.

Site Drainage

Site drainage is by sheet flow runoff directed toward the south via the existing contours. A concrete drainage swale traverses the central portion of the site which transfers collected runoff to a concrete down-drain located within the adjacent lot to the east. This down-drain releases water to Cielo Drive. Street drainage is partially controlled via asphaltic berms, curbs, and the existing street contours.

Site Vegetation

Vegetation on the subject property consists of primarily of natural grasses and shrubs. However, domestic trees are present on the southeast portion of the site, adjacent to Cielo Drive.

PREVIOUS STUDIES

General

Available engineering geologic/geotechnical engineering records on file at our office and the City of Los Angeles Department of Building and Safety were researched as part of our update engineering geologic study of the subject property. Pertinent engineering geologic and geotechnical engineering data presented in the available reports was utilized, as deemed appropriate, in our engineering geologic analysis of the site and preparation of this report. The references cited or utilized as part of this study are listed in the **REFERENCES** section of this report.

Subject Property

Based on our research, the subject property was previously explored by Mountain Geology, Inc. (MGI), West Coast Soils (WCS), Coastline Geotechnical Consultants, Inc. (CGC), and West Coast Geotechnical (WCG).

Specifically, MGI (1989), in conjunction with WCS, performed an engineering geologic and geotechnical engineering study of the subject property in 1989 with respect to the previously proposed custom single-family residential development of the site. This study included, in part, the excavation, logging, and sampling of 3 hand-dug test pits (Test Pits # 1-3). A copy of the geologic logs of the aforementioned exploratory excavations is included in Appendix A of this report. The geologic information obtained from this study has been incorporated into our update engineering geologic study of the subject property and is illustrated, as appropriate, on the attached *Geologic Map* (Plate 1). To briefly summarize, MGI/WCS concluded that the site was underlain by artificial fill and colluvium over slate bedrock. Landslide debris was not interpreted by MGI to underlie the subject property and MGI/WCS concluded that the subject property was suitable for the previously proposed project provided the presented recommendations were implemented during design and construction. The detailed findings, conclusions, and recommendations of this study are presented in the referenced report which is on file at the City of Los Angeles Department of Building and Safety.

MGI (1990), in conjunction with WCS, performed an update engineering geologic and geotechnical engineering study of the subject property in 1990 with respect to the previously proposed custom single-family residential development of the site. This study included, in part, the excavation, logging, and sampling of 7 hand-dug borings (Borings # 1-7). A copy of the geologic logs of the aforementioned exploratory excavations is included in Appendix A of this report. The geologic information obtained from this study has been incorporated into our update engineering geologic study of the subject property and is illustrated, as appropriate, on the attached *Geologic Map* (Plate 1). To briefly summarize, MGI/WCS again concluded that the site was underlain by artificial fill and colluvium over slate bedrock. Landslide debris was not interpreted by MGI to underlie the subject property and MGI/WCS concluded that the subject property was suitable for the previously proposed project provided the presented recommendations were implemented during design and construction. The detailed findings, conclusions, and recommendations of this study are presented in the referenced report which is on file at the City of Los Angeles Department of Building and Safety. It should be noted that the referenced reports were reviewed and approved by the City of Los Angeles Department of Building and Safety as stated on the referenced geology and soils report approval letter dated September 21, 1990.

A landslide occurred on the south-facing slope located adjacent and upslope of Cielo Drive in 1993. This landslide adversely affected the southeast portion of the subject property, the adjacent property to the east, and the City street (i.e. Cielo Drive). MGI (1993) and CGC (1993) performed an engineering geologic and geotechnical engineering study of the subject property in 1993 with respect to the proposed stabilization of the landslide. This study included, in part, the excavation, logging, and sampling of an additional 6 borings (i.e. Borings # 8-13) within the site. These borings were drilled with a hollow-stem auger drill-rig and a track-mounted flight-auger drill-rig. A copy of the geologic logs of the aforementioned exploratory excavations is included in Appendix A of this report. The geologic information obtained from this study has been incorporated into our update engineering geologic study of the subject property and is illustrated, as appropriate, on the attached *Geologic Map* (Plate 1). To briefly summarize, MGI and CGC concluded that the landslide occurred due to "over-saturation of the bedrock and concentrated drainage from above." MGI and CGC concluded that the repair/stabilization of the landslide was feasible provided the presented recommendations were implemented during design and construction. The detailed findings, conclusions, and recommendations of this study are presented in the referenced reports which are on file at the City of Los Angeles Department of Building and Safety.

Beginning in 1994, MGI (1994-1998) and CGC (1994-1997) performed an engineering geologic and geotechnical engineering study of the subject property in with respect to the proposed stabilization of the landslide and construction of a 6-lot residential subdivision. These studies ultimately included, in part, the excavation, logging, and sampling of an additional 3 borings (i.e. Borings # 14-16) and 12 test pits (Test Pits # 4-12 and Test Pits # X, Y, and Z) within the site. The additional borings were drilled with a bucket-auger drill-rig and a track-mounted flight-auger drill-rig. The test pits were dug with a backhoe and hand-labor. A copy of the geologic logs of the aforementioned exploratory excavations is included in Appendix A of this report. The geologic information obtained from this study has been incorporated into our update engineering geologic study of the subject property and is illustrated, as appropriate, on the attached *Geologic Map* (Plate 1). To briefly summarize, MGI and CGC concluded that the subject property was suitable for the previously proposed project provided the presented recommendations were implemented during design and construction. The detailed findings, conclusions, and recommendations of this study are presented in the referenced reports which are on file at the City of Los Angeles Department of Building and Safety.

In late 1998, West Coast Geotechnical (WCG, 1998-2000) assumed the responsibility as the Project Geotechnical Engineer of Record for the proposed project. WCG prepared update and addendum geotechnical engineering reports which presented additional geotechnical engineering data, analysis, and recommendations requested by the City of Los Angeles Department of Building and Safety. MGI (1998-1999) continued on as the Project Engineering Geologist of Record and geologically assisted WCG in their efforts. To briefly summarize, MGI and WCG again concluded that the subject property was suitable for the previously proposed project provided the presented recommendations were implemented during design and construction. The detailed findings, conclusions, and recommendations of this work are presented in the referenced reports which are on file at the City of Los Angeles Department of Building and Safety. However, based on our research, it does appear that geologic/geotechnical approval was ever granted by the City of Los Angeles Department of Building and Safety for the previously proposed landslide stabilization and residential development project as a department approval letter could not be located in the City records during the course of this study.

Adjacent Properties

In addition to the aforementioned site-specific study of the subject property, several engineering geologic and geotechnical engineering studies have been performed concerning the adjacent properties located to the north (1435 Bella Drive) and to the east (1436 Bella Drive). The geologic information obtained from these studies has been incorporated into our update engineering geologic study of the subject property and is illustrated, as appropriate, on the attached *Geologic Map* (Plate 1). The detailed findings, conclusions, and recommendations of these studies are presented in the referenced reports which are on file at the City of Los Angeles Department of Building and Safety.

GEOLOGIC CONDITIONS

Regional Geologic Setting

The subject property is located within the Transverse Ranges geologic province of California. The general geologic structures and conditions of the Transverse Ranges geologic province are a direct result of lateral and compressional tectonics. Due to the bend in the San Andreas Fault, located to the northeast, this region of California is experiencing compressional stresses in addition to right-lateral strike-slip motion associated with the Pacific and North American plate boundary. This stress has produced a region characterized by east/west-trending mountain ranges, valleys, geologic structures, and numerous active faults which is in contrast to the overall north/northwest structural trend elsewhere in the state. Faulting of the Transverse Ranges, due to the relatively high compressional forces, is primarily thrust or reverse-dip-slip faulting usually with lateral components.

Regional Geologic Mapping

Part of our update engineering geologic study of the subject property involved the review of available geologic publications and regional geologic maps as the review of regional geologic data is often very useful in determining and analyzing the geologic conditions of a particular site. A brief summary of the pertinent data presented by available geologic publications and regional geologic maps is as follows:

Regional geologic mapping by Dibblee (1991) indicates that the subject property is underlain by slate bedrock mapped as part of the Santa Monica Slate (**sms**) of Jurassic age. Dibblee's mapping indicates that foliation within the bedrock present in the area of the subject property strikes generally northeast and dips towards the northwest. Faults are not mapped by Dibblee within the subject property. However, Dibblee maps the Hollywood Fault at a distance of approximately 4,500 feet to the south of the subject property (see Figure 3).

Regional geologic mapping by the City of Los Angeles (1960-70) indicates that the subject property is underlain by slate bedrock mapped as part of the Santa Monica Slate (**Jsm**) of Jurassic age. A questionably mapped landslide area has also been mapped in the central portion of the site. Their mapping indicates that foliation within the bedrock present in the area of the subject property strikes generally north-south and dips towards the west. In regards to faulting, north/south-trending shear zones and faults have been mapped within the site. In addition, an east/west-trending fault is mapped in close proximately to the northern margin of the site (see Figure 4).

Site Geology

The geologic conditions (i.e. earth materials and structure) beneath the subject property have been interpreted and characterized based upon our review of published and unpublished geologic references, review of available engineering geologic and geotechnical engineering reports, our observations of isolated exposures available during surface mapping of the site and adjacent area, and the findings of the prior subsurface exploration of the site by MGI. It should be noted that our interpretations of the geologic conditions of the subject property involve projections of data and require that geologic conditions remain reasonably constant between points of observation and/or exposure.

Geologic Units

Based on the findings of our update engineering geologic study, the geologic units (i.e. earth materials) underlying the subject property consist of artificial fill, colluvium, landslide debris, and bedrock. The mapped distribution of the geologic units underlying the subject property, based on the geologic data collected to date, is presented on the attached *Geologic Map* (Plate 1).

Artificial Fill (af)

A minor to moderate amount of artificial fill, which was generated in association with the construction of Bella Drive and Cielo Drive, is present along the northern and southern margins of the site. In addition, minor amount of fill appears to have been generated and placed during construction of the graded access road (now a drainage bench) that was constructed across the central portion of the site in years past.

Based on the findings of our update engineering geologic study, the artificial fill consists of an admixture of soil and bedrock and is described as silty sand with gravel which is mottled brown and gray, dry to slightly moist, and is loose to medium dense. The gravel component consists of angular, pebble- to cobble-size clasts of slate.

It should be noted that based on the findings of our update engineering geologic study of the subject property, the existing artificial fill was not placed under geotechnical control or supervision and is thus considered uncertified. It follows that the existing artificial fill is not considered suitable for foundation support or the support of any slabs on grade.

Colluvium (Qcol)

Natural colluvial deposits mantle the majority of the subject property. Based on the findings of our update engineering geologic study, the colluvium is described as silty sand with gravel which is dark reddish brown to dark brown, dry to slightly moist, and is loose to dense.

Landslide Debris (Qlsr and Qls)

Based on the findings of our update engineering geologic study, LP has concluded that historically-active and prehistoric landslide debris underlies the south-facing slope present within the eastern portion of the subject property. These landslides were previously mapped within the site by MGI (1993-1999). In addition, the same landslide masses were also mapped by The J. Byer Group, Inc. (later re-named Byer Geotechnical, Inc.) as part of their geologic/geotechnical studies of 1436 Bella Drive (Byer, 1993-2012). As previously discussed in this report, landslide movement occurred on the south-facing slope located adjacent and upslope of Cielo Drive in 1993 (map symbol **Qlsr**). This landslide adversely affected the southeast portion of the subject property, the adjacent property to the east, and the City street (i.e. Cielo Drive). The portion of the 1993 landslide present within the subject property was explored and analyzed by Mountain Geology, Inc., Coastline Geotechnical, Inc., and West Coast Geotechnical while the portion of the landslide located within 1436 Bella Drive was explored and analyzed by The J. Byer Group, Inc. / Byer Geotechnical, Inc. Based on these studies, it was determined that prehistoric (ancient) landslide debris (map symbol **Qls**) was also present within the subject property and 1436 Bella Drive in the areas located upslope of the 1993 landslide.

Based on the findings of the subsurface exploration performed by the referenced geologic/geotechnical consultants, the landslide debris of the subject property consists of relict colluvium (near surface grade) and fractured, sheared, and weathered slate. The basal slip surface of the mapped landslides (i.e. the landslide plane) was identified in the majority of the borings and test pits excavated by MGI in the mapped landslide area. In general, the landslide plane consists of an abrupt, southerly-dipping plane between relict colluvium and the underlying in-place bedrock where the landslide plane occurs near surface grade. Where the landslide plane is present at deeper depths, it consists of a southerly-dipping zone of sheared clay between fractured, sheared, and weathered slate and the underlying in-place slate bedrock. A description of the identified landslide debris and identified landslide plane(s) are presented in the attached geologic logs for those test pits and borings which were excavated within the mapped landslide area.

It should be noted that MGI reported that in-place bedrock was observed in their Boring # 12 to the total depth explored. However, based on our review of this boring log, coupled with the findings of our geologic field mapping, analysis of aerial photographs, and analysis of the geologic logs of the numerous borings and test pits from the site, LP interprets that landslide debris was present in this excavation to a depth of 23.5 feet. The southerly-dipping clay shear zone identified at a depth of 22.5 to 23.5 feet in Boring # 12 is interpreted to be the landslide plane. Our re-interpretation of this boring is noted on the attached geologic log of this excavation and on the attached *Geologic Map* (Plate 1).

The mapped limits of landslide debris within the subject property and adjacent area were determined by our review of the referenced geologic/geotechnical reports, detailed geologic field mapping of the area, the findings of MGI's prior subsurface exploration of the subject property, and our analysis of the referenced aerial photographs. The mapped limits of landslide debris are illustrated on the attached *Geologic Map* (Plate 1). The subsurface geometry of the mapped landslide debris was interpreted by our review of the referenced geologic/geotechnical reports, the findings of MGI's prior subsurface exploration of the subject property, and our analysis of the prepared geologic sections. The interpreted subsurface geometry of the mapped landslide of the subject property is illustrated on the attached *Geologic Sections C-C', D-D', E-E', F-F', and G-G'* (Plates 3-5).

While the landslide debris underlying the area of the proposed main residence of the site is interpreted to be a prehistoric failure of the slope (map symbol **Qls**), as previously discussed in this report, the south-facing slope located to the southeast of the proposed residence experienced documented historic movement in 1993 (map symbol **Qls**) which necessitated mitigation by the City of Los Angeles Department of Public Works in order to protect Cielo Drive.

It should be noted that a conclusive determination as to the presence/absence of landslide debris for those areas located outside of the legal limits of the subject property was not performed by LP and is beyond the scope of this study. To clarify, LP's current mapping, interpretations, or assumptions as to the presence or possible presence of landslide debris in areas located outside the limits of the subject property is based on the findings presented in the referenced geologic/geotechnical reports as well as LP's subjective review of the referenced data, analysis of available aerial photographs, and regional geologic maps. Based on the aforementioned work, it is LP's professional opinion that landslide debris exists or *may* exist on certain portions of the adjacent offsite slopes and, for purposes of this particular study, shall be "assumed" to be present for conservative geologic/geotechnical of the slopes which ascend or descends from the project area of the subject property.

Bedrock (Jsm)

Based on the findings of our update engineering geologic study, bedrock underlying the subject property consists of Santa Monica Slate of Jurassic age. The slate bedrock is exposed on outcrops and cut-slopes present within the subject property and the adjacent area and was encountered in the various borings and test pits of the referenced engineering geologic studies of the site by MGI (1993-1999).

Based on the findings of our update engineering geologic study, the slate bedrock is bluish gray to dark gray with iron-oxide staining, thinly to thickly foliated, non-friable to strong, hard to very hard, fractured to moderately fractured with depth, and is moderately weathered to slightly weathered with depth. Very hard quartzite veins/beds are also occasionally present within the subsurface.

Geologic Structure

The bedrock present within the subject property is common to this area of the Santa Monica Mountains and the geologic structure is generally consistent with regional trends.

Foliation

Foliation is the planar arrangement of textural or structural features in metamorphic and igneous rock and is most commonly evident by the parallel alignment of grains or minerals. The parallel alignment of grains or minerals typically developed in an orientation perpendicular to the applied tectonic stresses. A *foliation plane* is defined as the division plane in metamorphic or igneous rock that separates each successive layer of aligned minerals or grains.

Foliation planes mapped within the underlying bedrock generally strike north-south and dip towards the west. The locations, depths (if obtained from a subsurface excavation), and orientations of the mapped foliation planes are presented on the attached *Geologic Map* (Plate 1). The structural interpretation of foliation within the underlying bedrock is illustrated on the attached geologic section(s) based on the measured true and/or calculated apparent dip of foliation.

Joints

A *joint plane* is the surface of a fracture or parting at which no appreciable movement has occurred parallel to the fracture, and only slight movement has occurred normal to the fracture. Joint surfaces can be systematic with subparallel orientations and regular spacing or non-systematic which irregular orientations, shape, and spacing. A *joint set* is a group of joint surfaces which are more or less parallel. A *joint system* is two or more *joint sets* which are subparallel to each other and intersect. Joints may be unfilled; that is, the fracture may be open and void of mineral infilling or an open joint surface may be occupied with some form of mineral infilling. Joints can occur in bedrock as well as in unlithified sedimentary deposits. The development of joint surfaces in bedrock is most commonly in response to burial, unburial, application of regional deformational forces, application of local deformational forces, and the cessation of regional or local deformational forces.

Joint planes mapped within the underlying bedrock dip steeply in various directions. The locations, depths (if obtained from a subsurface excavation), and orientations of the mapped joint planes are presented on the attached *Geologic Map* (Plate 1). The mapped joint surfaces are also illustrated, where appropriate, on the attached geologic section(s) based on the measured true and/or calculated apparent dip of the joint.

Shears

Shear is defined as a ductile deformation resulting from stresses that cause contiguous parts of a body, or material, to slide relative to each other in a direction parallel to their contact. A shear plane is defined as the surface or zone along which differential movement, by shear, has taken place. It should be noted that a shear plane is also synonymous with the definition of a fault. However, the term shear plane or shear zone is used when movement is interpreted to be in the "micro-sense" as compared to a "macro-sense" of displacement associated with a fault or fault zone. The development of a shear plane or shear zone in subsurface materials is most commonly related to regional or local faulting and folding. Simply, the subsurface stresses and pressures associated with faulting and folding can deform the adjacent bedrock or portions thereof. The deformation and/or movement at the shear surface often results in the presence of a zone of gouge or breccia typically consisting of clay, silt, or pulverized material derived from the surrounding parent material. Shear planes can develop within bedrock along pre-existing parting surfaces such as bedding, foliation, or joints planes but can also develop between parting planes, within massive bedrock, and/or in orientations which cross-cut the pre-existing bedrock structures. Shear planes can also develop during mass slope movements such as landslide. In instances where the basal failure surface of a landslide (i.e. landslide plane) did not fail along a pre-existing shear surface, the pressures and stresses at the basal surface of a slope failure can form a shear plane by the grinding of subsurface materials as the landslide develops followed by decomposition of the materials at the shear surface aided by the interaction between the sheared materials and groundwater.

Shear planes mapped within the underlying bedrock dip towards the west and south. Shear planes related to landslide movement (i.e. the landslide plane) generally dip towards the south and southwest. The locations, depths (if obtained from a subsurface excavation), and orientations of the mapped shear planes are presented on the attached *Geologic Map* (Plate 1). The mapped shear surfaces are also illustrated, where appropriate, on the attached geologic section(s) based on the measured true and/or calculated apparent dip of the shear.

It should be noted that adversely oriented shear planes within the underlying bedrock were identified by MGI in their Boring # 16 at a depth of 22 feet and 26 feet below existing grade, respectively. These shears are interpreted to be laterally pervasive within the slope on which the proposed residence will be constructed as there is currently no conclusive geologic data to refute or confine the subsurface lateral extent of these shears. Furthermore, based on the location, depth, and orientation of these shears, these features are very similar to the general depth and orientation of the landslide plane(s) identified within the deeper portions of mapped landslide of the site. It is possible that these south-dipping shear planes controlled the depth or otherwise contributed to the deeper landsliding which has occurred within the eastern portion of the subject property and offsite area to the east. The interpreted locations and orientations of the adversely oriented shear planes observed in MGI's Boring # 16 are illustrated (by structural geology projection techniques) on the attached *Geologic Sections C-C', D-D', and E-E'* (see Plates 3 and 4).

Folds

Analysis of structural geologic data obtained during our update engineering geologic study indicates that a significant fold feature is not present within the subsurface of the subject property.

Faults

A *fault* is a fracture, or zone of closely related fractures, along which there has been significant relative displacement of the materials, on opposite sides of the fault, in a direction parallel to the fracture. Sudden movement along a fault releases energy in the form of seismic waves and is commonly known as an earthquake. A fault can be present as a single plane of fracture or shear, or a broad zone of deformation or distributed tectonic movement ranging in width from a few feet to several miles. A *fault trace* is the line formed by the intersection of a fault with the Earth's surface.

Faults are classified as either active, potentially active, or inactive. The State of California defines an "active" fault as a fault that has exhibited surface displacement within the Holocene epoch of geologic time (i.e. the last 11,000 years). Potentially active faults are defined by the State of California as those which display evidence of surface displacement movement in the Pleistocene epoch of geologic time (i.e. between 11,000 and 1.6 million years before present). Inactive faults are those which do not display evidence of surface displacement within the Pleistocene and Holocene (i.e. the last 1.6 million years).

The Alquist-Priolo Special Studies Act of 1972, with subsequent amendments and revisions (i.e. name revision in 1993 to the Alquist-Priolo Earthquake Fault Zoning Act), prohibits locating most structures planned for human occupancy across known active faults. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. Under the Alquist-Priolo Earthquake Fault Zoning Act, the State Geologist designates "California Earthquake Fault Zones", previously known as "Special Studies Zones", around faults that are known to be *sufficiently active* and *well-defined*. A *sufficiently active* fault is defined as a fault that has exhibited surface displacement, along one or more of its segments or branches, within the Holocene epoch of geologic time (i.e. the last 11,000 years). A *well-defined* fault is defined as a fault whose trace is clearly detectable by a trained Geologist as a physical feature at or just below the ground surface. Most new development projects located within designated California Earthquake Fault Zones are required to demonstrate the absence of active faults underneath building areas. Furthermore, the Alquist-Priolo Earthquake Fault Zoning Act specifies that it be assumed that active faults underlie the area located within 50 feet of the fault splays which are illustrated on the California Earthquake Fault Zone maps. No structures planned for human occupancy shall be permitted in this setback area unless detailed geologic investigation of this area indicates that active faults are not present. It should be noted that most local City and/or County governmental agencies are permitted to, and have adopted policies and/or criteria which are stricter than those established by the Alquist-Priolo Earthquake Fault Zoning Act. Specifically, most local City and/or County governmental agencies prohibit the construction of a structure planned for human occupancy within 50 feet of an active fault once the exact location of the fault has been determined by a detailed geologic study.

The subject property is not located within a California Earthquake Fault Zone (see Figure 6) and no known potentially active or active faults cross the site. However, as previously discussed in this report, regional geologic mapping by the City of Los Angeles (1960-70) indicates that north/south-trending shear zones and faults traverse portions of the subject property. In addition, an east/west-trending fault is mapped in close proximately to the northern margin of the site (see Figure 4). During our recent geologic field mapping of the subject property and adjacent area, conclusive evidence as to the presence or absence of these faults was not apparent. Regardless, faults are common in this area of the Santa Monica Mountains and based on the findings of our update engineering geologic study, the local faults mapped by the City of Los Angeles (if indeed present) are not interpreted to be potentially active or active tectonic features.

Due to the fact that the subject property is not located within a California Earthquake Fault Zone, the performing of a detailed surface fault rupture hazard evaluation in order to conclusively determine the surface fault rupture hazard for the project area is not required. However, regardless of the project exemption for a detailed surface fault rupture hazard evaluation, LP did perform a general seismic hazard evaluation of the site in consideration of the proposed project as part of our update engineering geologic study of the subject property. Please refer to the **SEISMIC CONSIDERATIONS** section of this report for a complete discussion of our seismic hazard evaluation performed as part of our update engineering geologic study of the subject property.

HYDROGEOLOGY

Introduction

Hydrogeology is defined as the application of the science of geology to the study of the occurrence, distribution, quantity, movement, and quality of water below the surface of the earth and the interrelationship between the geologic conditions and groundwater. With respect to proposed project and our update engineering geologic study of the subject property, our hydrogeologic analysis of the site primarily involved the determination of the presence and distribution of groundwater (current and/or historic) within the subsurface in order for LP and/or the other project consultants to perform appropriate analysis of the site so that proper recommendations (mitigative or otherwise) can be made with respect to the proposed project.

Current and historic groundwater conditions of the subject property were determined by our observations and measurements in the exploratory excavations of this update engineering geologic study (if applicable) and/or our review of the referenced engineering geologic publications and reports. Off-site groundwater interpretations, performed when necessary by LP as part of our preparation of the geologic section(s), are based collectively on the groundwater conditions observed within the subject property, our review of groundwater data presented in the referenced engineering geologic publications and reports, and our analysis of the regional topographic and geologic conditions of the area.

Groundwater Defined

All water that is present beneath the surface of the Earth is referred to as subsurface water or *groundwater*. Groundwater most commonly occurs in two different zones within the subsurface. One zone, which usually occurs immediately below the ground surface, contains both water and air in the available pore space of the surrounding sediment or rock materials and is referred to as the *unsaturated zone*. And most often, the zone located beneath the *unsaturated zone* is an area in which all the available pore space is filled with water. This zone is referred to as the *saturated zone*. In the *unsaturated zone*, groundwater is most often present as moisture which is retained within the surrounding sediment or rock as a film on the grain surfaces or water which is percolating downward through the subsurface towards the *saturated zone*.

In the subsurface, groundwater can be unconfined, confined, semi-confined, or perched. A *confining bed* is a rock unit or layer which has a low hydraulic conductivity and thus restricts the movement of groundwater. The presence of a *confining bed*, or beds, within the subsurface can result in the presence of a confined, semi-confined, or perched groundwater condition.

In an unconfined subsurface condition, the upper surface of the saturated zone is referred to as the *potentiometric surface*. The *potentiometric surface* is commonly referred to as the "level of groundwater" or "groundwater table" and is the elevation in the subsurface at which the hydraulic pressure of the subsurface water is equal to atmospheric pressure. This is also the level or elevation at which water will be observed in a well, or exploratory excavation, which penetrates into the saturated zone. In a confined subsurface condition, the saturated zone is overlain by a *confining bed* and the upper surface of the saturated zone is referred to as the *piezometric surface.* The *piezometric surface* usually possesses a hydraulic pressure which is greater than atmospheric pressure and is the level or elevation at which water will be observed in a well, or subsurface excavation, which penetrates through the *confining bed* into the saturated zone.

Factors controlling the presence, elevation, and movement of groundwater include regional climatic conditions, geomorphology, distance to rivers, lakes, and oceans, geologic structure, hydraulic conductivity of the subsurface materials, dynamic characteristics of the water, strength of the gravitational field, irrigation, and land use. Thus, the presence, elevation, and movement of groundwater can vary significantly over short distances and can also fluctuate. Therefore, groundwater levels at the time of construction and during the life of the structures may vary from the observations or conditions encountered at the time of the field exploration.

Observed Site Groundwater Conditions

Based on the findings of our update engineering geologic study, generally unconfined conditions are interpreted to the present within the subsurface of the subject property. Thus, the underlying level of groundwater, for purposes of this study, shall be is referred to as the *potentiometric surface*.

The underlying potentiometric surface was encountered during the referenced engineering geologic study of the site by MGI. Specifically, the date, time, depth, and corresponding elevation of their potentiometric surface observations from a particular excavation is presented in the following table.

GROUNDWATER MEASUREMENTS TABLE					
Excavation No.	**Date of Observation**	**Surface Elev. (ft)**	**Total Depth of Excavation (ft)**	**Depth to Groundwater (ft)**	**Groundwater Elevation (ft)**
B-8	6/7/93	640	15	10	630
B-11	6/7/93	619	25	23	596

In addition to the observed potentiometric surface, slight water seepage was encountered in MGI's Boring # 4 at a depth of 14 feet, in their Boring # 5 at a depth of 12 feet, and in Boring # 8 at a depth of 3 feet below existing grade. Based on the findings of our engineering geologic study, the observed seepage is attributed to the natural percolation of water downward through the unsaturated zone and is not interpreted to be the underlying potentiometric surface. The location and elevation of the observed water seep is illustrated, where appropriate, on the attached geologic section(s). LP's interpretation of the underlying potentiometric surface beneath the subject property, based on the groundwater observations of MGI's Borings # 8 and 11, is illustrated on the attached geologic section(s). For simplification purposes and for those not readily familiar with hydrogeologic terms, the underlying potentiometric surface is labeled as "groundwater level" or "assumed groundwater level" on the geologic section(s).

Historic Site Groundwater Conditions

Evidence of a historically higher potentiometric surface (i.e. at an elevation higher than what was observed and previously discussed) was not observed by LP during our update engineering geologic study. In addition, the referenced Seismic Hazard Evaluation Report for the Beverly Hills Quadrangle does not indicate the presence of a historically high groundwater level within the subsurface of the subject property (DOC DMG; now referred to as the California Geological Survey - CGS, 1998).

Highest Anticipated Site Groundwater Conditions

As previously stated, the underlying potentiometric surface was encountered during MGI's prior exploration of the subject property and is illustrated, where appropriate, on the attached geologic section(s). However, as also stated in this report, evidence of a historically higher potentiometric surface (i.e. at an elevation higher than what was observed and previously discussed) was not observed by LP during our update engineering geologic study. In addition, the referenced Seismic Hazard Evaluation Report does not indicate the presence of a historically high groundwater level within the subsurface of the subject property. While it is known that the presence, elevation, and movement of groundwater can vary significantly over short distances and can also fluctuate; based upon the location, elevation, topographic and geologic conditions of the subject property, the underlying potentiometric surface is not currently anticipated to rise to an elevation significantly higher than what was observed on the site and described herein.

SEISMIC CONSIDERATIONS

Introduction

Earthquakes create the greatest hazard to life and property in California. This is due to their frequency of occurrence and their numerous and widespread effects in the region. The primary negative effects of earthquakes to life and property include *surface fault rupture* and *ground shaking*. However, there are also numerous secondary effects associated with earthquakes which are equally hazardous. These include phenomena known as *ground failures* and *triggered water movements*. Ground failures are induced by earthquake motion and typically involve the loss of strength or failure of the underlying materials. Examples of seismically-induced ground failure include *liquefaction*, *landsliding*, *ground lurching*, *rockfall, bedrock shattering,* and *differential settlement.* Seismically-triggered water movements include *tsunamis* and *seiches*.

A seismic hazard evaluation was performed as part of our update engineering geologic study of the subject property in order to access the hazards to the site and proposed project from the aforementioned primary and secondary earthquake effects. A thorough discussion of earthquakes, the potential hazards, our method of analysis, and our opinions concerning the hazard risk follows this introduction. If a particular hazard was determined to be present within the site, appropriate disclosure and/or recommendations for mitigation have been provided. In addition, the recommended 2013 California Building Code (CBC) structural *Seismic Design Criteria* is provided at the end of this section in regards to the proposed project.

Earthquakes

In order to perform a seismic hazard evaluation concerning a particular site, an understanding of earthquakes, among other things, is required. When significant and rapid movement along a fault occurs in the subsurface, seismic energy is released in the form of waves in all directions from the source. The propagation of seismic waves through the subsurface and interaction of these waves with the subsurface materials causes ground shaking which is commonly known as an *earthquake*. The point on the fault where rupture initiates in the subsurface is referred to as the *focus* or *hypocenter* of an earthquake. The hypocenter is described by its depth, its location in latitude and longitude, its date and time of occurrence, and its magnitude (a measure of the amount of energy radiated as seismic waves). The term *epicenter*, which is more commonly used to refer to an earthquake location, is the point on the earth's surface directly above the hypocenter. The description of an epicenter is the same as for a hypocenter except the depth is omitted. Vibrations produced by earthquakes are detected, recorded, and measured by instruments called *seismographs*. These devices may amplify ground motions beneath the instruments to over 1 million times, transcribing the ground motion into a zig-zag or wiggly trace called a *seismogram*. From the data expressed in seismograms, the time, epicenter, and focal depth of an earthquake can be determined. Also, estimates can be made of its relative size and amount of energy it released.

The strength of an earthquake is generally expressed in two ways: *magnitude* and *intensity*. The magnitude is a measure that depends on the seismic energy radiated by the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (i.e. 6.7). The intensity at a specific location is a measure that depends on the effects of the earthquake on buildings, land features, and people. Intensity is expressed in Roman numerals or whole numbers (i.e. VI or 6). Although there is only one magnitude for a specific earthquake, there may be many values of intensity for that earthquake at different sites.

Earthquake Magnitude

With respect to earthquake *magnitude*, several magnitude scales have been developed by seismologists in order to quantify the "size" of an earthquake event. However, the most commonly used scale today is the Moment Magnitude (Mw) scale, jointly developed in 1978 by Dr. Thomas C. Hanks of the United States Geological Survey (USGS) and Dr. Hiroo Kanamori, a professor at CalTech. Moment Magnitude is related to the physical size of fault rupture and the movement (displacement) across the fault, and is thus a more uniform measure of the strength of an earthquake. The seismic moment of an earthquake is determined by the strength or resistance of rocks to faulting (shear modulus) multiplied by the fault area undergoing slip and by the average displacement that occurs across the fault during the earthquake. The seismic moment determines the energy that can be radiated by an earthquake and hence the seismogram recorded by a modern seismograph. A seismologist determines the seismic moment of an earthquake from a seismogram by using a computer to plot the seismogram's amplitude of motion as a function of period (wave length). The amplitude of the long period motions in a seismogram, when corrected for the distance from the earthquake, is a measure of the seismic moment for that earthquake. The Moment Magnitude of an earthquake is defined relative to the seismic moment for that event (DOC CGS, 2002).

Earthquake Intensity

The use of an *intensity scale* is a subjective way to categorize the effects of an earthquake by observing the impact on structures, land features, and people. The intensity of an earthquake at a particular site is affected by the earthquake magnitude, the distance between the site and the hypocenter of the earthquake, the geologic conditions between the site and the hypocenter, site topographic conditions, and the geologic and groundwater conditions of the site. A range of intensity values is produced by an earthquake, typically with the highest intensity generated at or near the epicenter and lower intensities progressing outward from the epicenter. Intensity generally increases with increasing magnitude and decreases with increasing distance from the epicenter. Intensity is also usually greater in areas underlain by unconsolidated alluvium than areas underlain by bedrock. In 1902, the Italian seismologist Mercalli devised an intensity scale on a I to XII range. The *Mercalli Intensity Scale* was modified in 1931 by American seismologists Harry O. Wood and Frank Neumann to take into account modern structural features. The *Modified Mercalli Intensity Scale* measures the intensity of an earthquake's effects in a given locality and is perhaps much more meaningful to the layperson because it is based on observations of earthquake effects at specific places. It should be noted that because the data used for assigning intensities is obtained from direct accounts for the earthquake's effects at numerous towns, considerable time (weeks to months) is sometimes needed before an intensity map can be assembled for a particular earthquake (DOC CGS, 2002).

Ground Acceleration

For purposes of geotechnical and structural analysis and design, the quantification of the intensity of ground shaking is typically required. As previously discussed, when an earthquake occurs, seismic energy is released in the form of waves in all directions from the source. The propagation of seismic waves through the subsurface and interaction of these waves with the subsurface materials causes motion at the ground surface, or ground shaking. As seismic waves propagate away from the source, they generally attenuate as they travel through various geologic materials within the subsurface. However, certain topographic, geologic, and groundwater conditions can locally amplify the seismic waves. The degree of ground shaking at a particular site is typically quantified in terms of *ground acceleration* which is measured as a percentage of the acceleration of gravity (g). Ground acceleration can be in the horizontal and/or vertical directions. Synonymous with intensity, the ground acceleration at a particular site is affected by the earthquake magnitude, the distance between the site and the hypocenter of the earthquake, the geologic conditions between the site and the hypocenter, site topographic conditions, and the geologic and groundwater conditions of the site. However, the influence and interaction of all these parameters on site response is not well understood at this time. In general, ground accelerations produced by an earthquake are typically the highest at or near the epicenter with lower ground accelerations occurring in areas progressing outward from the epicenter. However, variations in ground conditions within short distances can lead to substantial differences in ground accelerations between two close sites. For example, ground acceleration is usually greater in areas underlain by unconsolidated alluvium than areas underlain by bedrock. In addition, topography can also affect ground acceleration. Specifically, anomalously high ground accelerations have been recorded in ridge-top locations which are underlain by hard bedrock. The anomalous high ground accelerations are attributed to the "focusing" of seismic waves due to the topographic conditions.

Surface Fault Rupture

Surface Fault Rupture Defined

Surface fault rupture occurs when movement along a fault is sufficient to cause a rupture where the fault or fault zone intersects the earth surface. Surface fault rupture typically occurs along the causative fault during earthquakes which are of magnitude 5.5 and larger. However, surface fault rupture was documented for the magnitude 3.6 El Centro earthquake of 1966 (Jennings, 1975). Surface fault rupture may also occur by *fault creep*. *Fault creep* is generally defined as the very slow and uniform movement along a fault. Fault creep may be of tectonic origin or can be induced by withdrawal of subsurface fluids. Tectonic fault creep may be triggered or aseismic. Triggered fault creep is movement that occurs along a particular fault when there is an earthquake centered on a nearby fault. Aseismic fault creep is fault movement that occurs without accompanying earthquakes and is typically caused by the withdrawal of subsurface fluids such as water or oil.

When associated with normal dip-slip and strike-slip faults, the surface fault rupture typically occurs as a single break or is confined to a narrow zone. This is typically not the case for reverse dip-slip and thrust faults. When the dip of the fault surface is shallow (i.e. less than 45 degrees), surface rupture associated with reverse faulting is often characterized by relatively short segments of synthetic and antithetic faulting that occur over a broad area of the hanging wall.

The primary danger associated with surface fault rupture deals with the proximity of structures to the area of surface rupture. Specifically, a structure could be destroyed or could suffer severe structural damage if located over an area of surface fault rupture.

Surface Fault Rupture Hazard

Based on the findings of our update engineering geologic study, the subject property is not located within a California Earthquake Fault Zone (see Figure 6) and no known potentially active or active faults traverse the site. Thus, LP considers the possibility of surface fault rupture within the subject property to be extremely low.

Ground Shaking

Introduction

In populated areas, the greatest potential for property damage and loss of life during an earthquake is from ground shaking. Based on the tectonic environment of this region of the world, a ground shaking hazard exists throughout all of California, especially in Southern California as this area is located within the range of influence of several fault systems that are considered potentially active or active. Thus, there is a significant potential that the site will experience slight to very strong ground shaking during the design life of the proposed structures.

Ground Shaking Hazard Analysis

Estimating the potential ground shaking at a particular site requires knowledge of the faults surrounding the site, the magnitude of earthquakes that each fault can generate, and the attenuation or magnification of ground acceleration that may occur as seismic waves propagate from an earthquake hypocenter to a site. Mathematical attenuation relationships are typically used to model how the amplitudes of ground motions decrease with distance from the hypocenter.

Our ground shaking hazard analysis of the site involved utilizing available computer databases, software, and published resources to perform an on-site historical, deterministic, and probabilistic evaluation of ground motion. Specifically, we used earthquake ground motion data presented by the California Geological Survey (CGS), United States Geological Survey (USGS), and data obtained utilizing the computer programs EQSEARCH and EQFAULT (Blake, 2000, 2000a).

It should be noted that the ground accelerations presented herein are only <u>approximations</u> based on available fault data and attenuation relationships which do not account for the possibility of the amplification of ground motion due to the location and orientation of the causative earthquake fault as well as local topographic, geologic, and groundwater conditions. Also, it is possible that unknown active faults (namely “blind thrust faults”), not accounted for in the ground shaking hazard analysis, underlie the Southern California region which are capable of producing large earthquakes. Specifically, the 1994 Northridge (Mw 6.7) earthquake occurred on a previously unrecognized fault. Upon further investigation, it was discovered that the seismic hazard from blind thrust faults in the southern California region may be very high. Specifically, the ground shaking hazard caused by an earthquake along a blind thrust fault is greater than that from a strike-slip fault of the same magnitude because the low angle of dip of the thrust fault places the fault plane at shallow depths underlying a larger area. Also, the ground motion generated by movement along a blind thrust fault is more vertical than horizontal. These faults are believed to be undetected under much of the Los Angeles Basin and the Santa Clara

Valley. It follows that there is also a possibility of strong ground motion within the site should an earthquake occur due to movement along an unknown fault.

Historical Seismicity Analysis

The program EQSEARCH (Blake, 2000) estimates the peak horizontal ground acceleration (PHGA) at a specified site using a database of historical earthquakes and specified attenuation relationships. If an earthquake hypocenter is found within a user-selected radius, the closest distance between the site and digitized hypocenter is computed and then the specified attenuation relationship is used to compute the estimated PHGA or the estimated repeatable horizontal high ground acceleration (RHGA) experienced at the site for that particular earthquake event. Modified Mercalli intensities are also computed for the site for each earthquake. The output consists of a map showing the locations of the earthquake epicenters and a tabulation of the latitude, longitude, date and time of the event, depth, magnitude, site acceleration, site intensity, and the distance between the site and the epicenter for each earthquake event. EQSEARCH is an analysis of the historical seismicity of the site.

The historical seismicity analysis of our update engineering geologic study utilized the EQSEARCH program to determine all the historical earthquakes with magnitudes ranging from 4.0 to 9.0 within a 50-mile radius over the past 100 years. Based on the computer analysis, the largest historical earthquake within the specified search radius and time period occurred on January 17, 1994 (the Northridge Earthquake) with an epicenter located approximately 10 miles from the subject property. The earthquake had a magnitude of 6.7 (Mw) which produced an estimated peak horizontal ground acceleration at the subject property of 0.244 g. The estimated earthquake intensity at the site for that earthquake was IX on the Modified Mercalli Scale. The complete results and maps generated by the EQSEARCH program are included in Appendix B of this report.

It should be noted that the computed PHGA is an estimate of past ground motion based on mean attenuation behavior and may not reflect actual accelerations experienced at a given site. In addition, the computed historical PHGA does not give an accurate estimate of the PHGA that the site may experience in the future. Current design practices use a deterministically or probabilistically derived ground acceleration which is usually higher than those generated by the historical analysis.

Deterministic Seismic Hazard Analysis

Two terms are used to describe earthquakes with respect to estimating future ground motion and for seismic structural design. They are the maximum capable earthquake (MCE) and design basis earthquake (DBE). The MCE refers to the maximum earthquake that appears capable of occurring under the presently known tectonic framework. In California, it is also referred to as the earthquake which will produce ground motion that has only a 10% probability of being exceed in 100 years. The DBE refers to the earthquake that will produce ground motion that has only a 10% probability of being exceeded in 50 years.

The program EQFAULT (Blake, 2000a) estimates the peak horizontal ground acceleration (PHGA) at a specified site using a database of digitized potentially active and active faults and specified attenuation relationships. Maximum capable earthquakes are assigned to each fault. If a fault is found within a user-selected radius, the closest distance between the site and digitized fault is computed and then the specified attenuation relationship is used to compute the PHGA or the repeatable horizontal high ground acceleration (RHGA). Modified Mercalli intensities are also computed for the site for each fault. The output consists of a map showing the locations of the faults, a plot of the computed accelerations as a function of the distance to the fault, a plot of the earthquake magnitudes and distances to the faults, and a tabulation of the calculated distances between nearby faults and the site, estimated maximum earthquake magnitude, as well as the estimated ground acceleration and site intensities for the maximum earthquake event for each fault. Please note that the EQFAULT program utilizes the California Division of Mines and Geology (now referred to as the California Geological Survey – CGS) data catalog of digitized California faults for calculating site/fault distance. The locations of these fault zones, defined in the computer database, are each represented by a single surface and do not necessarily coincide with the zones shown on the California Earthquake Fault Zone maps, where the fault zones may include a main trace and several splays. As such, the calculated distance does may not necessarily represent the actual horizontal distance from the subject property to the surface trace of the particular fault. The results of EQFAULT are a deterministic analysis of the seismicity of the site.

The deterministic seismic hazard analysis of our update engineering geologic study utilized the EQFAULT program in order to estimate the PHGA at the subject property caused by maximum capable earthquakes along faults located within a 50-mile search radius of the site. Based upon the deterministic analysis, the estimated maximum PHGA that may impact the site is 0.660 g based upon a magnitude 6.6 (Mw) earthquake on the Santa Monica Fault. The calculated horizontal distance between this fault and the subject property is 2.2 miles and the estimated earthquake intensity at the site is XI on the Modified Mercalli Scale. The complete results and maps generated by the EQFAULT program are included in Appendix B of this report.

Probabilistic Seismic Hazard Analysis (PSHA)

The ground motion typically required for the design of structures is a ground motion that has a 10% (minimum) probability of being exceeded in 50 years which corresponds to a 475-year average return period. In order to estimate this ground motion, a probabilistic seismic hazard analysis (PSHA) was performed for the site by obtaining ground motion data presented by the California Geological Survey (CGS).

The referenced Seismic Hazard Evaluation Report for the Beverly Hills Quadrangle provides an estimated peak site acceleration of approximately 0.43 g for unweighted magnitudes and firm rock site conditions (DOC DMG; now referred to as the California Geological Survey - CGS, 1998). Based on inputting the latitude and longitude of the subject property into the CGS's *Ground Motion Interpolator* application of the CGS's current probabilistic seismic hazards assessment model (revised 2008), and after assuming a shear wave velocity of the underlying earth materials (270 m/s for valley floor sites or 560 m/s for sites underlain by near-surface bedrock) the subject property is within an area having an estimated peak ground acceleration of 0.482 g with a 10% probability of being exceeded in 50 years. It should be noted that the estimated site acceleration results presented by these maps are in general agreement with each other.

Repeatable High Horizontal Ground Acceleration (RHGA)

It should be noted that the ground accelerations generated from the deterministic and probabilistic seismic hazard analysis are estimated **peak** horizontal ground accelerations based upon maximum capable or design-level earthquake events. Analyses performed by the Project Geotechnical and/or Structural Engineer may require a value different from the peak as input. Ploessel and Slosson (1974) indicate that the several repeatable high ground accelerations (RHGA) below the peak, along with the duration of the ground motion, better approximate a design acceleration than the maximum or peak acceleration. For sites within 20 miles of the earthquake epicenter, Ploessel and Slosson (1974) found the RHGA as 65% of the peak ground acceleration. However, a more recent study has shown that the RHGA is about 75% of the peak ground acceleration regardless of the distance between the site and seismic event (Naeim and Anderson, 1993).

With respect to the geotechnical analysis and structural design performed in association with the proposed project, the Project Geotechnical and/or Structural Engineer shall determine which of the presented ground accelerations or design parameters to utilize.

Estimated Duration of Strong Ground Shaking

The degree of damage incurred by a structure during an earthquake typically depends on the intensity and the duration of the ground shaking. More often than not, the damage caused by an earthquake is not due to the peak ground acceleration but to the duration of the strong ground motion. This is due to the fact that moderate to high ground accelerations over a longer period of time produce higher velocities and thus higher relative displacements in the structure.

The Santa Monica Fault is the closest known potentially active or active fault to the subject property. Should the estimated maximum capable earthquake (Mw 6.6) occur on this fault, the duration of strong ground shaking (sustained site acceleration > 0.05 g) is estimated to be 20 to 30 seconds.

If needed, the duration of strong ground shaking within the subject property, caused by earthquakes along other faults, can be estimated utilizing the following table.

Distance from Site (km)	Moment Magnitude (Mw)		
	6	7	8
10	12 sec.	26 sec.	34 sec.
50	3 sec.	22 sec.	28 sec.
100	0	4 sec.	6 sec.

*Compiled from table of Estimated Duration of Strong Ground Shaking as a function of distance and magnitude from Bolt and others (1975). Data assumes seismic wave frequency of > 2 Hz.

Secondary Effects Due to Seismic Activity

The intensity and duration of ground shaking during an earthquake, in combination with the geomorphic and subsurface geologic and groundwater conditions, can result in a number of phenomena classified as *ground failure* or *triggered water movements*. Ground failures are induced by earthquake motion and typically involve the loss of strength or failure of the underlying materials. Examples of seismically-induced ground failure include *liquefaction*, *landsliding*, *ground lurching*, *rockfall, bedrock shattering,* and *differential settlement.* Seismically-triggered water movements include *tsunamis* and *seiches*.

Liquefaction

Liquefaction Defined

In general, liquefaction is described a phenomena in which subsurface stresses produced by ground shaking cause a loss of shear strength in the underlying soil. Specifically, seismic motion of saturated and cohesionless soils can increase the pore water pressure to a level near or equal to the total stresses acting on the soil which results in a soil have little or no shear strength. Under these conditions, the soil can behave as a viscous fluid. Liquefied soils may thereby acquire a high degree of mobility leading to damaging ground deformations.

The liquefaction susceptibility of subsurface soils is related to the gradation and relative density characteristics of the soil, the in-situ stresses prior to ground motion, and the depth to the saturated zone, among other factors. As a general rule, sites susceptible to liquefaction are those which are in seismically active areas, contain cohesionless soils with a relative density less than about 70%, and have a groundwater level, or highest anticipated groundwater level (including perched conditions) within 50 feet of the surface.

Closely related to liquefaction is phenomena known as *lateral spreading*, *ground oscillation*, *flow failure*, *reduction of bearing strength*, *ground fissuring*, and *sand boils*. Manifestations of these phenomena within a site during an earthquake can also cause damage to structures.

Liquefaction Hazard Zones

The Seismic Hazards Mapping Act of 1990 directs the California Department of Conservation, Division of Mines and Geology (now referred to as the California Geological Survey – CGS) to delineate Seismic Hazard Zones. The purpose of the Act is to reduce the threat to public health and safety and to minimize the loss of life and property by identifying and mitigating seismic hazards including liquefaction, earthquake-induced landsliding, and ground shaking. Cities, counties, and state agencies are directed to use the Seismic Hazard Zone maps developed by CGS in their land-use planning and permitting processes. The Act requires that site-specific geotechnical investigations be performed prior to permitting most urban development projects located within the Seismic Hazard Zones. They must withhold development permits for a site within a zone until the geologic and soil conditions of the project site are investigated and appropriate mitigation measures, if any, are incorporated into development plans. The Act also requires sellers (and their agents) of real property within a mapped hazard zone to disclose at the time of sale that the property lies within such a zone. Evaluation and mitigation of seismic hazards are to be conducted under guidelines adopted by the California State Mining and Geology Board.

The designated liquefaction hazard zones are described as: “Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in the Public Resources Code Section 2693(c) would be required.”

The subject property is not located within a liquefaction hazard zone as designated by the CGS (see Figure 7).

Liquefaction Potential

Due to the level of groundwater within the subject property, underlying geologic conditions, distance to potentially active and/or active faults, and estimated duration of strong ground shaking, it is LP's opinion that there is no potential for liquefaction of the materials underlying the project area of the site.

Seismically-Induced Landsliding

Seismically-Induced Landsliding Defined

Seismically-induced (i.e. earthquake-induced) induced landslides are slope failures that occur where the forces generated by earthquake motion act to induce downslope failure of the subsurface materials.

Seismically-Induced Landsliding Hazard Zones

The Seismic Hazards Mapping Act of 1990 directs the California Department of Conservation, Division of Mines and Geology (now referred to as the California Geological Survey – CGS) to delineate Seismic Hazard Zones. The purpose of the Act is to reduce the threat to public health and safety and to minimize the loss of life and property by identifying and mitigating seismic hazards including liquefaction, earthquake-induced landsliding, and ground shaking. Cities, counties, and state agencies are directed to use the Seismic Hazard Zone maps developed by CGS in their land-use planning and permitting processes. The Act requires that site-specific geotechnical investigations be performed prior to permitting most urban development projects located within the Seismic Hazard Zones. They must withhold development permits for a site within a zone until the geologic and soil conditions of the project site are investigated and appropriate mitigation measures, if any, are incorporated into development plans. The Act also requires sellers (and their agents) of real property within a mapped hazard zone to disclose at the time of sale that the property lies within such a zone. Evaluation and mitigation of seismic hazards are to be conducted under guidelines adopted by the California State Mining and Geology Board.

The designated earthquake-induced landslide hazard zones are described as: "Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in the Public Resources Code Section 2693(c) would be required."

The subject property is located within an earthquake-induced landslide hazard zone as designated by the CGS (see Figure 7).

Seismically-Induced Landsliding Potential

A quantitative determination of the seismically-induced landsliding potential within the project area shall be performed, as necessary or required, by the Project Geotechnical Engineer.

Ground Lurching

Ground lurching is defined as the phenomena where the forces generated by earthquake motion cause failure of a cliff, bluff, stream/river bank, or artificial embankment usually in the direction in which it is unsupported. This type of ground failure most commonly occurs when the aforementioned topographic settings are underlain by low density and fine-grained soils which are saturated.

Based on the topographic and underlying geologic conditions of the subject property, it is LP's opinion that there is an extremely low potential for ground lurching in the area of the proposed project.

Rockfall

During an earthquake, the associated ground motion is often strong enough to dislodge cobble- to boulder-size clasts present on the surface of a slope. Cobble- to boulder-size clasts can also be generated if a surficial exposure of bedrock shatters due to earthquake motion. If the adjacent topographic terrain is steep enough, the dislodged clasts may travel in the downslope direction which is commonly known as a *rockfall*. Aside from being earthquake-induced, a rockfall can also occur during periods of precipitation if the soil supporting a clast gives way. The destructive power of a rockfall typically depends on the size and shape of the falling clast(s), the height from which the rockfall originates, the steepness of slope, and the amount and type of vegetation present on the slope. If conditions are right, a rockfall can cause severe damage to a structure and is also a hazard to life and limb.

Based on the topographic and underlying geologic conditions of the subject property, it is LP's opinion that there is no threat of a rockfall, earthquake-induced or otherwise, which could have an adverse effect on the proposed project.

Bedrock Shattering

Bedrock shattering is defined as the phenomena where the earthquake motion causes the underlying bedrock to intensely fracture and/or dilate. This type of ground failure most commonly occurs on slopes or ridges underlain by very hard bedrock and at which there is a local "focusing" of seismic waves.

Based on the topographic and underlying geologic conditions of the subject property, it is LP's opinion that there is only a minor threat of bedrock shattering which could have an adverse effect on the proposed project. However, it should be noted that there is currently no practical way to accurately analyze and/or predict the location or degree of bedrock shattering during an earthquake. In addition, this hazard is not typically evaluated or mitigated for commercial and residential developments and is not specifically addressed in the building code. If desired, the potential hazard can be reduced by ground improvements, strengthened and/or deepened foundations, and flexible utility connections at the site.

Seismically-Induced Differential Settlement

During an earthquake, the associated ground shaking combined with certain geologic conditions can cause varying degrees of settlement of the subsurface materials. Granular soils, in particular, are susceptible to settlement during seismic shaking. It should be noted that a qualitative or quantitative determination of the hazard of seismically-induced differential settlement within the site pertains to geotechnical engineering and shall be performed, as necessary or required, by the Project Geotechnical Engineer.

Tsunamis

Tsunamis are large waves or ocean surges caused by offshore earthquakes, large underwater landslides, and submarine volcanic eruptions which can travel for thousands of miles from the source. Some scientists also speculate that there is also a threat of a large tsunami being generated in the event that a meteorite impacts the ocean. However, based on known historical data, tsunamis are typically earthquake-induced. From the point of origin, the tsunami waves travel outward in all directions at speeds up to 450 miles per hour. In the open ocean, the tsunami waves may be imperceptible to an observer. However, as the waves approach the coastline, the shallowing sea floor decreases the wave speed which causes the waves to grow in height. If the wave energy and resulting wave heights are substantial, significant destruction and death can occur upon their impact with a populated coastline. As a relatively recent example, the December 26, 2004 Sumatra-Andaman Islands earthquake (Mw 9.0) generated a series of large tsunami waves in the Indian Ocean which devastated coastline areas and killed over 225,000 people from south Asia to east Africa. As recently evident in the Indian Ocean, tsunamis typically arrive as a series of successive "crests" (high water levels) and "troughs" (low water levels). These successive crests and troughs can occur anywhere from 5 to 90 minutes apart. However, they usually occur 10 to 45 minutes apart. Recent studies indicate that there is no upper limit of the height of a tsunami wave and heights of more than 100 feet have been previously recorded. Areas at greatest risk of the effects of a tsunami are typically those located within one mile of the shoreline and an elevation less than 50 feet above sea level.

In California, tsunamis may be generated by earthquakes occurring at the Peru-Chile trench, the Columbia-Ecuador trench, the Aleutian trench, and any one of the local offshore faults. One such tsunami was generated by the 1812 Santa Barbara earthquake which reportedly generated ten 10- to 12-foot-high sea waves at Gaviota. The 1927 Point Arguello earthquake produced sea wave on the order of 6 feet high. The 1964 Alaskan earthquake generated tsunamis which hit Crescent City, California with waves having a run-up height of 19.7 feet above mean sea level (Bolt and others, 1977). The same earthquake reportedly produced sea waves of less than 4 feet in the Los Angeles Harbor.

It is thought that the topography of the seafloor off the coast of southern California and the presence of the Channel Islands tend to reduce the risk of a large tsunami impacting this area of California. However, should a large earthquake occur due to movement along one of the aforementioned faults, or a large underwater landslide or submarine volcanic eruption occur in the Pacific Ocean, it is possible for a tsunami to develop, travel towards, and impact the coast of southern California.

Due to the elevation and site/coast distance of the subject property, it is LP's opinion that there is no threat of inundation and damage to the site should a large tsunami develop and collide with the west coast.

Seiches

Seiches are large waves or oscillations of the surface of a lake or reservoir caused by earthquakes, large underwater landslides, or large landslides which fail into the lake or reservoir. Seiches can cause damage to structures and flooding along the shoreline and can also cause damage or "overtopping" of a dam. For example, in 1963 a large landslide into Vaiont Reservoir, located in Italy, caused a seiche that traveled 800 feet up the opposite bank of the lake and swept over both abutments of the dam. The resulting downstream flow of water and flooding completely destroyed the town of Longarone and killed almost 3,000 people. On a smaller scale, seiches have also been generated in swimming pools during an earthquake. If the swimming pool is large enough, a seiche from a swimming pool could possibly flood and/or cause structural damage to an adjacent structure. At the time of this study, LP is not aware of any catastrophic damage to a residential structure, and resulting loss of life, due to a seiche occurring in a lake or reservoir located in the southern California area.

Due to the fact that the subject property is not located adjacent to a lake or reservoir, it is LP's opinion that there is no threat of inundation and damage to the site from a seiche.

Seismic Design Criteria

The 2013 California Building Code (CBC) is often followed for seismic structural design. The 2013 CBC states that forces due to earthquake loading may be calculated utilizing formulas presented in Section 1613 of the 2013 CBC and/or the other sources referenced therein. Specifically, Section 1613 states that the *Seismic Design Category* is a classification assigned to a structure based on its occupancy category and the severity of the design earthquake ground motion at the site. This section also states that the *Seismic Design Category* for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7 (ICC, 2013).

With respect to the site parameters needed for seismic structural design associated with the proposed project, the *Spectral Response Accelerations* (S_s - short-period of 0.2 seconds; S_1 - long-period of 1 second) and *Site Class* (formerly referred to as the *Soil Profile Type*) are typically provided by the Project Engineering Geologist and/or the Project Geotechnical Engineer for use by the Project Structural Engineer. The *Spectral Response Accelerations* (S_s and S_1) for a particular site located within the United States or U.S. Territories are determined based on the location of the subject site and acceleration data presented on Figures 1613.3.1(1 through 6) of the 2013 CBC. The *Spectral Response Accelerations* can also be obtained by inputting the longitude and latitude of the subject property into the *Ground Motion Parameter Calculator* provided by the United States Geological Survey (USGS) or various other programs. The remaining site characteristic needed for seismic structural design is the *Site Class.* The 2013 CBC states that the *Site Class* is a classification assigned to a site based on the types of soils present and their engineering properties as defined in ASCE 7, Chapter 20, Section 20.3, and the accompanying Table 20.3-1. For reference, a copy of Table 20.3-1 is provided below.

ASCE 7 CHAPTER 20 TABLE 20.3-1 – SITE CLASSIFICATION

Site Class	Soil Profile Name	Average Properties in Top 100 feet, See Section 20.4		
		Shear Wave Velocity, v_s feet/second (m/s)	Standard Penetration Test , N [or N_{ch} for cohesionless soil layers] (blows/foot)	Undrained Shear Strength, s_U psf (kPa)
A	Hard Rock	> 5,000 (1,500)	----	----
B	Rock	2,500 to 5,000 (760 to 1,500)		
C	Very Dense Soil and Soft Rock	1,200 to 2,500 (360 to 760)	> 50	> 2,000 (100)
D	Stiff Soil Profile	600 to 1,200 (180 to 360)	15 to 50	1,000 to 2,000 (50 to 100)
E [1]	Soft Soil Profile	< 600 (180)	< 15	< 1,000 (50)
F [2]	Profile Requiring Site-Specific Evaluation.			

NOTES: [1] Site Class E also includes any profile with more than 10 feet of soil having the following characteristics: A plasticity index, *PI* > 20, Moisture Content *w* ≥ 40%, and Undrained Shear Strength s_u <500 psf (24 kPa). The Plasticity Index, *PI*, and the moisture content, *w*, shall be determined in accordance with approved national standards.

[2] Site Class F includes any profile containing soils having one or more of the following characteristics: 1.) Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils, 2.) Peats and/or highly organic clays (*H* >10 feet of peat and/or highly organic clay where *H* = thickness of soil), 3.) Very high plasticity clays (*H* >25 feet with plasticity index, *PI* > 75), and 4.) Very thick soft/medium stiff clays (H > 120 feet).

Additional site characteristics needed for seismic structural design include the *Site Coefficients, Maximum Considered Earthquake Spectral Response Accelerations,* and *Design Spectral Response Accelerations*. The 2013 CBC states that the *Site Coefficients* (F_a - short-period of 0.2 seconds; F_v - long-period of 1 second) can be determined in accordance with Section 1613.3.3 and Tables 1613.3.3(1) and 1613.3.3(2) utilizing the *Site Class* and the *Spectral Response Accelerations* (S_s and S_1) determined for the subject site. With the appropriate *Site Coefficients* (F_a and F_v) and *Spectral Response Accelerations* (S_s and S_1), the *Maximum Considered Earthquake Spectral Response Accelerations* (S_{MS} - short-period of 0.2 seconds; S_{M1} - long-period of 1 second) can be determined in accordance with Section 1613.3.3 of the 2013 CBC. With the calculated *Maximum Considered Earthquake Spectral Response Accelerations* (S_{MS} and S_{M1}), the *Design Spectral Response Accelerations* (S_{DS} - short-period of 0.2 seconds; S_{D1} - long-period of 1 second) can be determined in accordance with Section 1613.3.4 of the 2013 CBC. With the calculated *Design Spectral Response Accelerations* (S_{DS} andS_{D1}), the *Seismic Design Category* can then be determined by the Project Structural Engineer in accordance with Section 1613.3.5 and Tables 1613.3.5(1) and 1613.3.5(2) of the 2013 CBC.

It should be noted that most structures of the type of the proposed project are designed in part utilizing methods and formulas presented in Section 1613 of the 2013 CBC and/or the other sources referenced therein. If the procedures presented in Section 1613 are to be utilized, based on the findings of our update engineering geologic study it is our opinion that the Project Structural Engineer should incorporate the parameters presented in the following chart in determining the *Seismic Design Category* for the proposed structure(s) of the subject property. However, it is recommended that the Project Structural Engineer independently verify the accuracy of <u>all</u> of the following parameters, excluding *Site Class*, prior to use.

Site Latitude		Site Longitude
34.0959°		-118.4342°
2013 CBC Section/Table	**Seismic Parameter**	**Recommended Value**
ASCE 7 Table 20.3-1	Site Class[1]	C
USGS[2]	Spectral Response Acceleration (Short Period: 0.2 seconds)	S_s = 2.352 g
USGS[2]	Spectral Response Acceleration (Long Period: 1 second)	S_1 = 0.839 g
Table 1613.3.3(1)	Site Coefficient (Short Period: 0.2 seconds)	F_a = 1.0
Table 1613.3.3(2)	Site Coefficient (Long Period: 1 second)	F_v = 1.3
Section 1613.3.3	Maximum Considered Earthquake Spectral Response Acceleration (Short Period: 0.2 seconds)	S_{MS} = 2.352 g
Section 1613.3.3	Maximum Considered Earthquake Spectral Response Acceleration (Long Period: 1 second)	S_{M1} = 1.091 g
Section 1613.3.4	Design Spectral Response Acceleration (Short Period: 0.2 seconds)	S_{DS} = 1.568 g
Section 1613.3.4	Design Spectral Response Acceleration (Long Period: 1 second)	S_{D1} = 0.727 g

NOTES: [1] A more conservative Site Class shall be utilized by the Project Structural Engineer if deemed necessary by the Project Geotechnical Engineer. In this case, all of the resulting seismic parameter values shall be provided by the Project Geotechnical Engineer and/or the Project Structural Engineer.

[2] The presented Spectral Response Accelerations were obtained by inputting the location (longitude and latitude) of the subject property into the *Ground Motion Parameter Calculator* provided by the United States Geological Survey (USGS).

It should be noted that conformance with the presented criteria for seismic structural design does not constitute any kind of warranty, guarantee, or assurance that significant structural damage, or ground failure, will not occur in the event of a maximum level earthquake. The primary goal of the code-required minimum seismic design is to protect life and limb, and catastrophic failure, and not to avoid all damage, as such design may be economically prohibitive. The Project Structural Engineer and owner must decide if the level of risk associated with utilizing the minimum required code values is acceptable and, if not, assign appropriate seismic values above the minimum code values for use in the structural design.

SITE/SLOPE STABILITY

Past Slope Performance (Landslides and Rain Damage)

As stated in the **Site Geology** section of this report, prehistoric and historically-active landslide debris underlies the eastern portion of the subject property, including the area of the proposed residence. The mapped limits of the landslide debris within the subject property and adjacent area are illustrated on the attached *Geologic Map* (Plate 1). In addition, several small-scale surficial failures are present within the site, primarily on the cut-slope located on the north side of the existing drainage bench which traverses the property. The surficial failures are also illustrated on the attached *Geologic Map* (Plate 1). Recommendations to correct and/or eliminate these failures are presented in the **RECOMMENDATIONS** section of this report.

Quantitative Surficial and Gross Stability

This update engineering geologic study did not include quantitative engineering analysis or calculations associated with a determination of surficial and/or gross slope stability. A quantitative determination of slope stability of the subject property and/or the project area shall be performed, as necessary, by the Project Geotechnical Engineer, utilizing the geologic map(s) and geologic section(s) which are included herein.

CONCLUSIONS

General Findings

Based on the findings of our update engineering geologic study, and our experience with similar projects, LP has concluded that the proposed project is feasible from an engineering geologic standpoint, provided the recommendations presented in this report, and those presented by the Project Geotechnical Engineer, are properly incorporated into the plans and implemented during construction.

Geologic Conditions

The engineering geologic conditions, hydrogeologic conditions, and geologic hazards of the subject property that can impact the engineering analysis and/or design requirements associated with the proposed project are described in detail in the previous sections of this report. It is recommended that the property owner, developer, Project Engineers (i.e. Geotechnical, Civil, and/or Structural), Project Architect, and Contractor be familiar with the site engineering geologic conditions, hydrogeologic conditions, and geologic hazards presented in this report as well as the following engineering geologic recommendations concerning the proposed project.

RECOMMENDATIONS

Site Stabilization

As initially discussed in this report, for new construction projects the City of Los Angeles Department of Building and Safety requires a minimum slope stability factor of safety of 1.5 (static)/1.0(pseudo-static) be demonstrated for the entire subject property, or mitigation or construction measures (i.e. deepened footings, soldier piles, pile-supported retaining walls, corrective grading, or a combination of measures) must be implemented as part of the proposed project which provides the 1.5 (static)/1.0(pseudo-static) slope stability factor of safety for the subject property. Due to the geologic and topographic conditions of the subject property (as discussed herein), it is anticipated that portions of the subject property do not currently possess the minimum required slope stability factor of safety (areas to be determined by the Project Geotechnical Engineer). As a result, the implementation of site stabilization measures will be required within those portions of the subject property which are determined by the Project

Geotechnical Engineer to possess substandard stability in order to provide a code-conforming condition.

Soldier Piles

It should be noted that the installation of slope retaining/stabilization devices (i.e. soldier pile rows or pile-supported retaining walls) is anticipated as part of the proposed project as a means to provide the minimum required slope stability factor of safety for the subject property, or to provide stability for temporary excavations. The slope retaining/stabilization devices shall be designed by the Project Civil/Structural Engineer as per the detailed design criteria provided by the Project Geotechnical Engineer.

Mitigation of Landslide Debris

It is recommended that the mapped landslide mass of the subject property, be removed via slope trimming (i.e. cutting), removed and recompacted to a certified condition, or otherwise retained in accordance with the following grading requirements and those presented by the Project Geotechnical Engineer.

Mitigation of Surficial Failures

It is recommended that the mapped surficial failures, be removed via slope trimming (i.e. cutting), removed and recompacted to a certified condition, or retained in accordance with the following grading requirements and those presented by the Project Geotechnical Engineer.

Mitigation of Existing Cut-Slope

Portions of the existing cut-slope, located on the north side of the existing drainage bench, exceed a slope gradient of 1.5(h):1(v). It is recommended that the existing cut-slope be trimed to a code-conforming gradient or supported by an engineered retaining wall as specified by the Project Geotechnical Engineer.

Grading

General

General engineering geologic guidelines are presented below to provide a basis for quality control during any proposed site grading. We recommend that all structural fills be placed and compacted under observation and testing by the Project Geotechnical Engineer in accordance with the following requirements and those presented by the Project Geotechnical Engineer.

Site Preparation

It is recommended that all brush, vegetation, loose soil, and other deleterious materials be removed prior to fill placement. The general depth of stripping shall be sufficiently deep to remove the root systems and organic topsoils. A careful search shall be made for subsurface trash, abandoned masonry, abandoned tanks and septic systems, and other debris (including uncertified fill) during grading. All such materials, which are not acceptable fill material, shall be removed prior to fill placement. The removal of trees and large shrubs shall include complete removal of their root structures.

Fill-Slopes

If the construction of fill-slopes is desired as part of the proposed project, they shall be limited to heights and gradients specified by the local regulatory agency and the Project Geotechnical Engineer. For reference, a typical 2(h):1(v) fill-slope keyway, benching, and subdrain detail is included in Appendix C of this report.

Cut-Slopes

If the construction of cut-slopes is desired as part of the proposed project, they shall be limited to heights and gradients specified by the local regulatory agency and the Project Geotechnical Engineer.

Based on the findings of our update engineering geologic study, south-, southwest- and west-facing cut-slopes may unsupport or "daylight" foliation planes of the underlying bedrock. If a proposed cut-slope unsupports or "daylights" foliation planes of the bedrock, the cut-slope shall be trimmed to the angle of bedding or shall be supported by an engineered retaining wall or buttress fill as specified by the Project Geotechnical Engineer.

Removal Bottoms, Keyways, and Benches

In areas to receive compacted fill, the existing earth materials shall be removed and recompacted as structural fill as specified by the Project Geotechnical Engineer.

Removal bottom, keyway, and bench excavations constructed during grading shall expose competent bedrock in the bottom and shall be observed and approved by the Project Engineering Geologist prior to fill placement. Keyways constructed at the toes of fill-slopes shall be a minimum of 2 feet deep into competent bedrock, as measured on the downhill side of the keyway, and shall be a minimum of 15 feet wide. The exposed, approved bottom of a removal area, keyway, or bench shall be scarified, mixed, and moisture conditioned to a minimum depth of 8 inches or as specified by the Project Geotechnical Engineer. During construction of removal bottom, keyway, and bench excavations, a careful search shall be made for zones of loose soil and uncertified fill. The bottom of removal areas should be proof-rolled, in the presence of the Project Engineering Geologist and Project Geotechnical Engineer, with appropriate rubber-tire mounted heavy construction equipment or a loaded dump truck to detect loose, yielding soils that must be removed to stable material. If encountered, these loose zones shall be properly removed to the firm underlying soil or bedrock and properly backfilled and compacted as directed by the Project Geotechnical Engineer.

Bottom Stabilization

If earth materials with a high moisture content, or shallow groundwater is encountered in a removal bottom, keyway, or bench excavation, additional stabilization of the bottom may be required. If the bottom is unstable, the use of track-mounted equipment and/or excavators should be considered to reduce the potential for disturbing the soils in the excavations near the groundwater level. If the bottom is highly disturbed, deeper removals may be required. Acceptable stabilization methods include using (1) float rock worked into the soft soils and encapsulated with a filter fabric, (2) geofabric, such as Mirafi Fabric 600X, with a 24-inch-wide overlap, or (3) a combination of the above. Some compaction effort shall be used when working thin lifts of float rock into the excavation bottom. A 12- to 24-inch thick zone may be required to adequately bridge an unstable bottom when using geofabric, and this zone is not to be included in the required thickness of fill beneath either slabs or footings unless it meets the compaction requirements. Another alternative is to stabilize the bottom by drying out the soils with the use of either lime or cement additives (about 5% by weight), moisture conditioning, mixing, and compacting to a minimum relative compaction of 90%.

Subdrains

The installation of subdrains is recommended in association with the construction of any proposed fill-slopes, buttress fill-slopes, and canyon fills. During construction of a fill-slope, it is recommended that a subdrain be installed in the bottom of the keyway excavation and at the heal of bench excavations as necessary so that the fill-slope is provided a subdrain at vertical intervals not exceeding 20 feet. If topographic and/or property line constraints prevent the installation of subdrain in the bottom of the keyway excavation, the subdrain should be placed at the heal of the lowest removal bench. The canyon “cleanouts” constructed in association with a canyon fill shall also be provided with a subdrain for the entire length of the cleanout.

The subdrain shall consist of a 4-inch-diameter (minimum) Schedule 40, or better, perforated PVC pipe with the perforations placed downward surrounded in a minimum of 3 cubic feet, per linear foot, of ¾-inch-diameter durable aggregate. Accordion or similar type pipe is not acceptable for subdrain pipe. The gravel and perforated pipe shall be wrapped with geosynthetic fabric such as Mirafi 140, or approved equivalent, in order to protect the subdrain from clogging. The subdrain shall be daylighted utilizing a solid pipe to the slope face or to a location specified by the Project Civil Engineer. In locations where seasonal or constant water flow from a subdrain is anticipated, the subdrain outlet should be connected to the surficial drainage control system of the site (if feasible), to a storm drain, or to the street as specified by the Project Civil Engineer. If a subdrain outlet is to be connected to the subsurface piping of a surficial drainage control system, or to a storm drain, an observation vault and/or cleanout must be installed near the connection point so that the water discharge from the subdrain can be observed.

Suitable Fill Material

The suitability of the on-site soils for use as compacted fill, and the requirements for any import material desired to be utilized as compacted fill, shall be determined and/or provided by the Project Geotechnical Engineer.

Fill Placement and Testing

All fill placed within the subject property shall contain a moisture content and be compacted to a degree as specified by, and shall be performed under the observation of, the Project Geotechnical Engineer. If either the moisture content or relative compaction does not meet the criteria of approval of the Project Geotechnical Engineer, the Contractor shall rework the fill until it does meet the prescribed criteria.

Inclement Weather and Construction Delays

If construction delays or the weather result in the surface of the fill drying, the surface shall be scarified and moisture conditioned before slabs are constructed or before the next layer of fill is added. Each new layer of fill shall be placed on a rough surface so planes of weakness are not created in the fill.

During periods of wet weather and before stopping work, all loose material shall be spread and compacted, surfaces shall be sloped to drain to areas where water can be removed, and erosion protection or drainage provisions shall be made in accordance with plans provided by the Project Civil Engineer. After the rainy period, the Project Engineering Geologist and Project Geotechnical Engineer shall review the site for authorization to resume grading and to provide any specific recommendations that may be required. As a minimum, however, surface materials previously compacted before the wet weather shall be scarified, brought to the proper moisture content, and recompacted prior to placing additional fill.

During foundation construction, including any concrete flatwork, construction sequences shall be scheduled to reduce the time interval between subgrade preparation and concrete placement to avoid drying and cracking of the subgrade or the surface shall be covered or periodically wetted to prevent drying and cracking. If the surficial soils dry out due to delays between grading and foundation construction, it may be necessary to recondition the surficial soils (scarification, moisture condition, and recompaction) just prior to foundation and slab construction.

Utility Trench Backfill

The backfilling of utility trenches shall be performed as required by the local regulatory agency and the Project Geotechnical Engineer.

Pavement Areas

Removal depths and subgrade criteria for pavement areas (if proposed) shall be specified by the Project Geotechnical Engineer.

Foundations

Design Criteria

Foundations shall be designed by the Project Civil/Structural Engineer as per the detailed design criteria provided by the Project Geotechnical Engineer.

Recommended Foundation Bearing Material

Based on the findings of our update engineering geologic study of the subject property, the recommended bearing material for the proposed residence and guest house is the underlying **bedrock** per the recommendations of the Project Geotechnical Engineer. The recommended bearing material can be reached with deepened foundation systems following site preparation.

Please Note: As discussed in the **Geologic Structure** section of this report, adversely oriented shear planes are interpreted to underlie the area of the proposed residence and are illustrated on the attached *Geologic Sections C-C', D-D', and E-E'* (see Plates 2 and 3). At a minimum, foundation embedment for all structures planned in this portion of site should begin within the bedrock located below the lowest shear plane illustrated on the aforementioned geologic sections, or at any deeper depth specified by the Project Geotechnical Engineer.

Slabs On Grade

Design Criteria

It is recommended that any proposed slabs on grade be reinforced. In addition, care should be taken to insure that slabs on grade are not constructed across cut/fill transitions, on uncertified fill, or native materials which have been significantly disturbed by construction activities. Removal depths and subgrade criteria for the areas where slabs on grade are planned shall be provided by the Project Geotechnical Engineer. Slabs on grade shall be designed by the Project Civil/Structural Engineer as per the detailed design criteria provided by the Project Geotechnical Engineer.

It should be noted that cracking of concrete slabs on grade can occur and is relatively common. Steel reinforcement and crack control joints are intended to reduce the risk of concrete slab cracking, as is the use of fiber reinforced concrete and proper concrete curing. If cracks develop in concrete slabs during construction (for example, due to shrinkage), your Civil/Structural Engineer shall evaluate the integrity of the slab and determine if the design has been compromised. Also, concrete slabs are generally not perfectly level, but they should be within tolerances included in the project specifications.

It should be noted that even soils with low expansion characteristics can lift exterior flatwork such as walkways, patio slabs, and decking. This lifting will likely vary over the area covered by the flatwork, causing differential slab movements that could result in either a safety hazard or an obstruction to outwardly opening doors. Therefore, we recommend that exterior walkways and patio areas abutting the structure be doweled into the structure at entrances and at joints to prevent differential movement of such flatwork due to soil expansion.

If interior or exterior tile or stone flooring is planned over slabs on grade, it is recommended that special care be taken in the slab design, construction, and the tile/stone installation process as a crack in the underlying slab on grade will most likely translate to the overlying tile/stone. If tile/stone flooring is desired, the slab designer shall consider additional steel reinforcement, above minimum requirements, in the design of the concrete slab on grade where tile/stone will be installed. Furthermore, the tile/stone installer shall consider installation methods, such as using a vinyl crack isolation membrane (i.e. a slip sheet) between the tile/stone and concrete slab, to reduce the potential for cracking.

Moisture Barrier

We recommend that a ten-mil (or thicker) plastic moisture barrier be used under all proposed slabs on grade. The moisture barrier shall be placed between a 4-inch thick bed of clean sand which contains less than 5% fines. Seams of the moisture barrier shall be overlapped and sealed. Where pipes extend through the moisture barrier, the barrier shall be sealed to the pipes. Tears or punctures in the moisture barrier shall be completely repaired prior to placement of concrete.

Retaining Walls

Design Criteria

Retaining wall design criteria shall be provided by the Project Geotechnical Engineer.

Recommended Bearing Material

Based on the findings of our update engineering geologic study of the subject property, the recommended bearing material for retaining walls is the underlying **bedrock** per the recommendations of the Project Geotechnical Engineer. The recommended bearing material can be reached with deepened foundation systems following site preparation.

Retaining Wall Backfilling and Drainage

General engineering geologic guidelines with respect to retaining wall backfilling and wall drainage are presented below to provide a basis for quality control during the backfilling of any site retaining wall. Retaining walls shall be provided with a proper drainage system and backfill placed and compacted under observation and testing by the Project Geotechnical Engineer in accordance with the following requirements and those presented by the Project Geotechnical Engineer.

Retaining walls shall be provided with adequate waterproofing and a subdrainage system, as specified by the Project Architect and/or Project Civil Engineer, in order to mitigate the potential for hydrostatic surcharge and efflorescence on the face of the walls. Except for the upper two feet, the area immediately adjacent to a retaining wall shall be provided with a subdrainage system. While various subdrainage products are now available for retaining walls which could be utilized if specified by design professional and accepted by the local government agency, a typical subdrainage system consists of 1 foot wide (minimum) zone of ¾-inch-diameter durable aggregate placed around and above a subdrain pipe located at the base of the wall. If a typical subdrainage system is to be utilized, the subdrain pipe shall consist of a 4-inch-diameter (minimum) Schedule 40, or better, perforated PVC pipe with the perforations placed downward. *Accordion* or similar type pipe is not acceptable for subdrain pipe. The gravel and perforated pipe shall be protected from clogging with the use of geosynthetic fabric such as Mirafi 140, or approved equivalent, placed between the gravel and the adjacent certified backfill or natural material. The subdrain outlet shall be daylighted from behind the retaining wall in a location where it can be kept free and clear of obstructions and can also be easily observed. Retaining wall subdrain outlets should not be connected to subsurface piping of the surficial drainage control system. The outlet locations should be carefully noted and extreme care should be taken to insure that the outlets do not become buried or blocked. Measures should be undertaken to insure that rodents or small animals can not enter or reside in a subdrain outlet. If a retaining wall subdrain outlet becomes buried or blocked, it must be located and/or the obstruction must be removed immediately so that water is able to freely drain from the retaining wall subdrainage system. It should be noted that a buried or blocked retaining wall subdrain outlet could prevent groundwater from draining from behind the retaining wall thus causing the saturation of the earth materials adjacent to the wall and the development of a hydrostatic surcharge on the wall. This condition could possibly lead to failure of the retaining wall and the adjacent slope. If the installation and/or daylighting of a retaining wall subdrain pipe is not feasible, adequately spaced weep holes may be installed at the base of the wall in lieu of a perforated subdrain pipe. The top two feet of the retaining wall shall be backfilled with less permeable compacted fill to reduce infiltration. A concrete-lined V-shaped drainage swale shall be constructed behind retaining walls with ascending backslopes in order to intercept runoff and debris. A typical retaining wall backfilling and drainage detail is included in Appendix C of this report.

During grading and backfilling operations adjacent to any retaining wall, heavy equipment shall not be allowed to operate within 5 feet laterally of the wall or within a lateral distance equal to the wall height, whichever is greater, in order to avoid developing excessive lateral pressures. Within this zone, only hand-operated equipment shall be used to compact the backfill.

Recommended Retaining Wall Freeboard

Rear yard retaining walls should be provided with a minimum of 1 foot of freeboard for slough protection. It should be noted that additional retaining wall freeboard may be required if deemed necessary by the Project Geotechnical Engineer or Project Civil Engineer.

Swimming Pool and Spa

Design Criteria

The swimming pool/spa shell shall be designed by the Project Civil/Structural Engineer as per the detailed design criteria provided by the Project Geotechnical Engineer.

Recommended Bearing Material

The proposed swimming pool/spa shell and any adjacent structural decking shall be supported entirely upon the underlying **bedrock** per the recommendations of the Project Geotechnical Engineer. The recommended bearing material can be reached with deepened foundation systems following site preparation.

Swimming Pool and Spa Subdrainage

The swimming pool/spa should be provided with a subdrain system or a hydrostatic pressure relief valve. The subdrain system, if utilized or required, should consist of a 4-inch-diameter Schedule 40, or better, perforated PVC pipe encased in 2 cubic feet per lineal foot of ¾-inch-diameter durable aggregate running the longitudinal length of the pool. Where the subdrain exits from beneath the pool shell, a non-perforated (solid) pipe should extend to an outlet discharge location specified by the Project Civil Engineer.

Foundation Setback Distances

Proposed Residence and Guest House

Residential structures built on or near a descending slope which is 3(h):1(v) or steeper shall be founded to a depth such that the horizontal distance from the bottom of the footing to the slope face is equal to 1/3 the height of the adjacent descending slope. For a descending slope which is steeper than 1(h):1(v), the slope face shall be assumed to be a 1(h):1(v) plane as projected upward from the toe of the slope. The minimum required horizontal foundation setback distance is 5 feet and the maximum is 40 feet.

Proposed Retaining Walls

Retaining walls built on or near a descending slope which is 3(h):1(v) or steeper shall be founded to a depth such that the horizontal distance from the bottom of the footing to the slope face is equal to 1/3 the height of the adjacent descending slope. For a descending slope which is steeper than 1(h):1(v), the slope face shall be assumed to be a 1(h):1(v) plane as projected upward from the toe of the slope. The minimum required horizontal foundation setback distance is 5 feet and the maximum is 40 feet.

Proposed Swimming Pool and Spa

Swimming pools and spas built on or near a descending slope which is 3(h):1(v) or steeper shall be founded to a depth such that the horizontal distance from the bottom of the pool/spa or footing to the slope face is equal to 1/6 the height of the adjacent descending slope. For a descending slope which is steeper than 1(h):1(v), the slope face shall be assumed to be a 1(h):1(v) plane as projected upward from the toe of the slope. The minimum required horizontal foundation setback distance is 2.5 feet and the maximum is 20 feet.

Greater Foundation Setback Distances

Examples of the code-required foundation setback distances are presented on the *Examples of Slope Setback Requirements* sheet which is included in Appendix C of this report. It should be noted that greater foundation setback distances than those required by the code, resulting in deeper foundation depths, may be required as part of the proposed project if deemed necessary by the Project Geotechnical Engineer.

Hydraugers

If deemed necessary by the Project Geotechnical Engineer, the installation of hydraugers (i.e. horizontal drains) may be required as part of the landslide stabilization project of the subject property as a precautionary measure intended to mitigate a rise in the underlying groundwater level or to remove excess water from the slope thus promoting slope stability. Any hydraugers recommended by the Project Geotechnical Engineer as part of the proposed project should be connected to the surficial drainage control system of the site (if feasible), to a storm drain, or to the street as specified by the Project Civil Engineer.

Drainage

General

The proper control of all surface runoff is and must remain a crucial element of site maintenance. Proper drainage and irrigation control within the site are important in order to reduce the potential for damaging ground/foundation movements due to hydroconsolidation, soil expansion or shrinkage, and landslides. It is recommended that the Project Civil Engineer and Landscape Architect be retained to prepare a detailed grading, drainage, and landscaping plan which utilize the following general engineering geologic guidelines, and any recommendations of the Project Geotechnical Engineer, with respect to site drainage control, landscaping, and irrigation.

Drainage Control During Grading or Construction

During grading or construction, proper drainage shall be provided away from the building site, footings, and temporary excavations. This is especially important when construction takes place during the rainy season. A storm water erosion control plan should be prepared by the Project Civil Engineer and implemented during the rainy season as required by the local regulatory agency.

Fine Grading

The project area shall be fine graded so as to provide positive drainage away from footings in compliance with the local regulatory agency's grading requirements or the 2013 California Building Code (CBC), whichever is more restrictive.

For reference, Section 1804.3 of the 2013 CBC states that the ground immediate adjacent to the foundation shall be sloped away from the building at a slope of not less than 5% for a minimum distance of 10 feet as measured perpendicular to the face of the structure. If physical obstructions or lot lines prohibit 10 feet of horizontal distance, a 5% slope shall be provided to an approved alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2% where located within 10 feet of the building foundation. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2% away from the building. *Exemption*: Where climatic or soil conditions warrant, the slope of the ground away from the building foundation is permitted to be reduced to not less than 2%. The procedure used to establish the final ground level adjacent to the foundation shall account for additional settlement of the backfill (ICC, 2013).

Drainage Control Devices

All pad drainage shall be collected and diverted away from proposed buildings and foundations in non-erosive devices as specified by the Project Civil Engineer. Pad drainage shall not be allowed to flow uncontrolled over slopes. Rain gutters and downspouts should be provided, properly maintained, and discharged directly into a drainage system or over paved areas which are sloped to the street. A drainage system consisting of area drains, catch basins, and connecting lines shall be provided to capture landscape and hardscape sheet flow discharge water. All drainage system piping shall be watertight and discharge directly to the street, storm drain, or to a location specified by the Project Civil Engineer.

Underground Water and Drainage Lines

All underground water lines and drainage lines shall be absolutely leak free. It is recommended that water mains, irrigation lines, and drainage lines be periodically checked for leaks for early detection of water infiltrating the underlying soils that could cause detrimental soil movements. If a leak is detected at any time, it must be repaired immediately.

Site Vegetation and Irrigation

Seepage of surface irrigation water or the spread of extensive root systems into the subgrade of footings, slabs, or pavements can cause differential movements resulting in distress and/or damage to the adjacent structures. Trees and large shrubbery shall not be planted so that roots grow under foundations and flatwork when they reach maturity.

Where landscaping is planned adjacent to structures or paved areas, it is recommended that design measures be taken by the Project Civil Engineer and Landscape Architect to restrict excessive landscape water from infiltrating the subgrade supporting foundations or the subgrade and base supporting paved areas. Design alternatives to restrict the infiltration of excessive landscape water for vegetation located adjacent to structures and paved areas include the implementation of landscape watering plans, the use of higher gradient ground slopes near structures and paved areas, the use of drains to collect and transmit excess irrigation water to drainage structures, or installing a *French Drain* extending at least 12 inches below the subgrade along the edge of the structure or pavement.

Care shall be taken to not over- or under-irrigate the site. Landscape watering shall be held to a minimum while maintaining a uniformly moist condition without allowing the soil to dry out. Irrigation systems should be turned off when significant rain is in the forecast. During extreme hot and dry periods, adequate watering may be necessary to keep soil from separating or pulling back from the foundations or slabs.

Maintenance of Drainage Devices

Site area drains, catch basins, roof gutters, downspouts, and any subdrain outlets should be inspected periodically to insure that they are not clogged, damaged, and that they are functioning properly. In addition, cracks in paved surfaces shall be sealed to limit infiltration of surface waters.

Slope Maintenance

A rigorous slope maintenance program should be adopted to maintain the existing and any proposed slopes. The following recommendations should provide guidelines for maintenance of the slopes:

- The slopes should be landscaped. An experienced Landscape Architect could be consulted for recommendations regarding the type of landscape to use on the slope that would help to reduce surface erosion and would need minimum amount of irrigation such as drought resistant plants. Trees with rooting systems that could severely disturb the outer slope materials should be avoided and/or removed.

- The moisture content of the slope outer face materials should be maintained close to the optimum throughout the year. Excessive watering or drying of the slope face must be avoided. Irrigation systems should be turned off when significant rain is in the forecast.

- Proper surface drainage should be maintained. Drainage swales should be inspected and cleaned before the rainy season. Any erosion around and underneath the swales should be repaired to prevent further undermining of the subgrade around the swales.

- If slope subdrain outlets are present on a slope, their locations should be carefully noted and extreme care should be taken to insure that the subdrain outlets do not become buried or blocked. Measures should be undertaken to insure that rodents or small animals can not enter or reside in a subdrain outlet. If a subdrain outlet becomes buried or blocked, it must be located and/or the obstruction must be removed immediately so that water may freely drain from the subdrainage system. It should be noted that a buried or blocked subdrain outlet could prevent groundwater from draining from within the slope thus causing the saturation of the earth materials as well as a rise in the hydrostatic pressures within the slope. This condition could possibly lead to failure of the slope.

- If hydrauger outlets are present on a slope, their locations should be carefully noted and extreme care should be taken to insure that the hydrauger outlets do not become buried or blocked. If a hydrauger outlet becomes buried or blocked, it must be located and/or the obstruction must be removed immediately so that water may freely drain from the subdrainage system. It should be noted that a buried or blocked hydrauger outlet could prevent groundwater from draining from within the slope thus causing the saturation of the earth materials as well as a rise in the hydrostatic pressures within the slope. This condition could possibly lead to failure of the slope.

- Burrowing by rodents disturbs the surficial materials and surface drainage conditions. If burrowing rodents are observed on or within the slope, they should be exterminated immediately and any disturbance to the slope should be corrected.

Excavation Characteristics

Based on the findings or our update engineering geologic study, very hard bedrock is present within the subsurface of the site and will most likely be encountered during construction of any proposed subsurface excavations. Should a very hard layer be encountered, the use of very heavy grading or drilling equipment, coring, or the use of high-impact hammers may be necessary.

The use of casing will most likely be necessary during the drilling operation (for the deepened foundation elements) as localized portions of the underlying landslide debris and bedrock are subject to caving. If the subsurface caving is observed to be severe, or there is difficulty in advancing the casing to a suitable depth, the use of "driller's mud" and/or other ground improvement measures (i.e. pressure grouting or permeation grouting) may also be required.

Excavations encountering groundwater or seepage should be immediately brought to the attention of the Project Engineering Geologist and Project Geotechnical Engineer. Based on the findings of our update engineering geologic study, it is anticipated that the underlying potentiometric surface (i.e. groundwater level) will be encountered in a foundation excavation *if* a foundation excavation is planned for a depth near or greater than the groundwater level illustrated on the provided geologic section(s). Once encountered, the presence of groundwater may hinder the drilling of deep excavations. If water is encountered in a foundation excavation, it shall be pumped from the excavation prior to the placement of concrete <u>or</u> the water column can be displaced/removed from the excavation by pumping concrete into the excavation from the "bottom up" through a pumping line which has been lowered to the bottom of the foundation excavation. In addition, the strength of concrete should be increased as specified by the Project Geotechnical Engineer and Project Civil/Structural Engineer.

Temporary Excavations and Shoring

All temporary excavations, including overexcavations and utility trench excavations should comply with Cal/OSHA and any other applicable regulatory agency requirements. Excavations deeper than 5 feet shall be constructed as specified by the Project Geotechnical Engineer. No surcharge loads should be placed, nor should equipment operate, within a setback distance from the top of excavation side slopes equal to the depth of excavations. All excavations shall be stabilized within 30 days of initial excavation. Water should not be allowed to pond near the top of the excavation, nor be allowed to flow toward it.

If the installation of shoring is required in order to provide stability for any temporary excavations, the shoring system(s) shall be designed by a qualified Civil/Structural Engineer as specified by the Project Geotechnical Engineer.

Site Observations and Testing

Prior to the start of site preparation and/or construction, we recommend that a pre-construction meeting be held with the owner or developer, contractor, project engineers, City/County Inspector, and LP to discuss the project. In addition, we recommend that LP be retained to perform the following tasks prior to and/or during construction.

- Review the grading, drainage, and/or foundation plans to verify that the recommendations contained in this report have been properly incorporated into the project plans and specifications. If LP is not provided the opportunity to review these documents, we can take no responsibility for misinterpretation of our findings, conclusions, and recommendations.

- Observe and advise during all grading activities including, but not limited to, site preparation, observation of all removal bottom, keyway, bench excavations and backcuts, observation of cut-slopes, and observation of the placement of slope subdrains and/or canyon cleanout subdrains and outlets.

- Observe all foundation excavations prior to the placement of steel and concrete to confirm that the footing excavations are properly embedded into the recommended bearing material and that the excavations are free of loose and disturbed materials. All footing excavations into certified compacted fill, as well as the subgrade for any slabs on grade, shall be observed by the Project Geotechnical Engineer before steel is placed.

- Observe the installation of all retaining wall subdrains and outlets.

- Observe all swimming pool and spa foundation excavations prior to the placement of steel and concrete to confirm that the excavations are properly embedded into the recommended bearing material and that the excavations are free of loose and disturbed materials.

- All fill which is placed for engineering purposes shall be observed and tested by the Project Geotechnical Engineer to confirm proper site preparation, suitability of removal excavations, scarification, selection of suitable fill materials, and placement and compaction of fill.

Should any site observation reveal any unforeseen geologic or geotechnical hazard, the Project Engineering Geologist and/or the Project Geotechnical Engineer will recommend treatment. Please advise LP at least 24 hours prior to any required site observation. A complete set of approved plans should be provided to the Project Engineering Geologist and Project

Geotechnical Engineer prior to site grading and/or construction, and a set of signed and approved plans should be available on-site for review.

Responsibilities and Site Control

As a reminder, LP is not a licensed Land Surveyor, Civil Engineer, or Contractor and LP can not perform the duties of a Land Surveyor, Civil Engineer, or Contractor. As such, the client, property owner, and/or developer should fully understand and acknowledge that LP is not responsible for the performance of work by third parties including, but not limited to, the project surveyor, civil engineer, grading contractor, construction contractor, and/or subcontractors. LP's observation of the work of other parties on a project shall not relieve such parties of their responsibility to perform their work in accordance with applicable plans, specifications, and safety requirements. It should be noted that continuous or periodic monitoring by LP's employees does not mean that LP is observing or verifying all site work. In addition, the engineering geologic observation services performed by LP do not include establishing or verifying "lines and grades." LP will only make on-site observations appropriate to the field services provided by LP and will not relieve others of their responsibilities to perform, observe, or test the work.

It should be clearly understood and acknowledged that it is the responsibility of the client, property owner, developer, and/or their authorized agent(s) to insure that the engineering geologic information and recommendations provided by LP in association with the project are properly and thoroughly conveyed to the project architect(s), engineer(s), and/or contractor(s) so that they may be properly incorporated into the plan and that the necessary steps are taken to see that the contractor(s) carries out such recommendations in the field. LP is not and will not be responsible for the acts, errors, or omissions of contractors or other parties associated with the project and the subject site.

Plan Review

This update engineering geologic study was performed and this report was prepared on the basis of the furnished project plans and/or information. Formal plans should be reviewed by LP. Should the plans differ substantially from the provided plans or information, additional engineering geologic exploration and analysis may be required.

ASSUMPTIONS and LIMITATIONS

General

This report presents the results of our update engineering geologic study concerning the subject property and the proposed project. It is strongly recommended that this report be read in its entirety in order for the reader to completely and clearly understand LP's engineering geologic findings, conclusions, and recommendations concerning the subject property and the proposed project. In addition, it is also recommended that the following sections be carefully read and completely understood as they provide information concerning the assumptions of this study and the limitations of this report. It should be noted that the following "Assumptions and Limitations" also pertain to any future addendum, supplemental, update, or final engineering geologic reports prepared by LP concerning the subject property and proposed project as well as any additional or revised "Assumptions and Limitations" presented therein. Any questions the reader may have concerning any portion of this report, or any portion of any future addendum, supplemental, update, or final reports concerning the site should be presented to LP prior to use of this or future reports.

Report Intent

It is the intent of this report to aid in the design and completion of the described project. Implementation of the advice presented in the "Conclusions" and "Recommendations" sections of this report is intended to reduce risk associated with the proposed project and should not be construed to imply total performance of the project. As previously stated, this report is issued with the understanding that it is the sole responsibility of the client, or their authorized agent(s), to insure that the engineering geologic information and recommendations provided in this report are conveyed to the project architect, engineers, and contractors so that they may be properly incorporated into the plan and that the necessary steps are taken to see that the contractor carries out such recommendations in the field.

Report Use

LP has prepared this report concerning the subject property for the exclusive use of the client and their authorized agents and shall not be considered transferable. Prior to use by others, the subject site and this report must be reviewed by our office. Following review, additional work may be required to update and/or supplement this report. In addition, this report should not be utilized in order to form an opinion concerning the geologic/geotechnical conditions of the adjacent or surrounding properties as the findings presented in this report apply only to the explored area of the subject property and may not accurately reflect the underlying conditions of the surrounding area and/or the adjacent properties.

This report is not intended for use as a bid document. Any company or person using this report for bidding or construction purposes shall perform such independent investigation, as they deem necessary, to satisfy themselves as to the surficial and subsurface conditions of the project site.

Accuracy of Topographic Base Map(s)

The engineering geologic and geotechnical engineering analysis of a particular site and subsequent conclusions and recommendations with respect to a proposed project are, in some cases, highly dependent on certain factors which include, but are not limited to, the topographic conditions of the subject site, the adjacent slopes, and/or the locations of property lines. It should be noted that, at the time of this study, it is LP's assumption that the provided topographic survey, grading plan, and/or site plan (utilized as a base for the geologic map(s) and geologic section(s) constructed as part of this study) accurately present the current topographic conditions of the site, adjacent slopes, and also accurately depict the locations of the existing structures (if present), easements, property lines, proposed structures, and/or proposed grades. It should be clearly understood that LP's use of the provided topographic survey, grading plan, or site plan does not imply or verify the accuracy of the provided topographic survey, grading plan, or site plan. If at a time subsequent to the completion of this update engineering geologic study and report, a revision is made to the site topographic survey, grading plan, or site plan, the findings, conclusions, and recommendations of this report may be partially invalidated, wholly invalidated, or revised. In addition, supplemental engineering geologic exploration and analysis concerning the subject property and proposed project may also be necessary upon our review of the revised topographic survey, grading plan, or site plan.

Locations of Exploratory Excavations

The locations and elevations of the exploratory excavations of this study (if applicable), as presented on the various geologic illustrations contained in this report, were determined by use of a steel tape, brunton pocket transit, and interpolation between contours, topographic features, fixed monuments and/or structures illustrated on the supplied topographic map. The locations and elevations of the exploratory excavations of other consultants, if applicable, were approximately determined by our review and analysis of the various geologic maps and illustrations presented in the referenced reports containing the exploration data. The presented locations and elevations should be considered accurate only to the degree implied by the method used. If a more accurate method of determining the locations and elevations of the exploratory excavations was performed as part of this study, the particular method and degree of accuracy was discussed in the "Scope of Work" section of this report.

Variation in Subsurface Conditions

The engineering geologic conclusions and recommendations contained within this report concerning the proposed project are based on the findings of the tasks described in the "Introduction" section of this report with the assumption that the subsurface conditions within the site do not deviate appreciably from those observed or encountered during our geologic study. In view of the general geologic conditions described herein, based on our limited observations of the site and/or surrounding area, it should be understood that there is a possibility that different subsurface conditions exist within the site and/or adjacent area. Simply, if observation or exploration was performed at a particular location, it may not be indicative of the portions of the site not observed or explored. The nature and extent of variations in subsurface conditions may not become evident until grading or construction. As such, it should be clearly understood that it is the responsibility of the client, their authorized agent(s), or contractor(s) to bring any deviations or unexpected conditions observed during grading or construction to the attention of the Project Engineering Geologist and the Project Geotechnical Engineer of record. In this way, supplemental recommendations can be made with a minimum delay to the project.

Site Risks

It should be noted that all building sites are subject to a certain degree of risk that cannot be wholly identified and/or entirely eliminated. Building sites are subject to many detrimental engineering geologic and/or geotechnical hazards including, but not limited to, the effects of water infiltration, erosion, concentrated drainage, settlement, expansive soil movement, expansive bedrock movement, seismic shaking, fault rupture, landsliding, and slope creep. Risks from these hazards can typically be reduced by employing qualified engineering geologic and geotechnical engineering professionals. However, even with a thorough subsurface exploration and testing program performed by a qualified engineering geologist and/or geotechnical engineer, significant variability of the underlying earth materials may be present within the site. In addition, it is possible that latent (hidden) geologic hazards are present within the site which are concealed by earth materials, vegetation, existing structures, and hardscaping. If such defects are present, they are beyond the evaluation of the Project Engineering Geologist and/or the

Project Geotechnical Engineer. In addition, the level of risk and/or the potential for negative site effects from many geologic/geotechnical hazards are highly dependent on the property owner or developer properly developing and maintaining the site, drainage facilities, slopes, and by correcting any deficiencies found during occupancy or use of the property. It should be clearly understood that owner and/or developer is responsible for retaining appropriate and qualified design professionals and contractors in developing the property and for properly maintaining the site and structures. Retaining the services of an engineering geologic and/or geotechnical engineering consultant shall not be construed to relieve the owner, developer, or contractors of their responsibilities or liabilities.

Hazardous Materials

It should be clearly understood that the identification, sampling, testing, excavation, handling, and/or disposal of any hazardous materials, that may or may not be present within the site, is beyond the scope of this study. In the event such materials are discovered by additional site studies or are encountered during grading or construction, appropriate environmental studies and site mitigation/remediation work may be required. In addition, the client and/or property owner shall acknowledge and/or accept that LP has neither created nor contributed to the creation or existence of any hazardous, radioactive, toxic, irritant, pollutant, substance or constituent, or otherwise dangerous conditions at the site. All site generated non-hazardous and/or hazardous materials, including but not limited to samples, soil/rock cuttings, drilling fluids, decontamination fluids, development fluids, and used disposable protective gear and equipment are the property of the client and/or property owner.

Additional Work

Please be aware that the contract fee for our services to perform an update engineering geologic study and prepare this report does not include additional work that may be required in association with the proposed project such as responses to report and/or plan review letters prepared by the building department or appropriate regulatory agency in association with you obtaining a grading/building permit, meetings, plan review by this firm, grading/construction observations, and/or any necessary geologic observation of the site with respect to the proposed project. Where additional services are requested or required, you will be billed on an hourly basis for our engineering geologic observation, exploration, consultation, and/or analysis in accordance with LP's current *Fee Schedule.*

Report Expiration

The findings, conclusions, and recommendations of this report are valid as of the date of issuance. However, it should be noted that changes in the surficial or subsurface conditions of a property may occur with the passage of time due to natural processes or works of man within the site or the adjacent area. Furthermore, changes in industry standards periodically occur due to code revisions, legislation, and broadening of knowledge. Accordingly, the findings, conclusions, and/or recommendations of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to our review and remains valid for a maximum period of one (1) year from the date of issuance unless LP issues a written opinion of its continued validity thereafter.

Warrantee

The professional opinions and engineering geologic advice contained in this report are based on LP's understanding of the proposed project, LP's evaluation of available information, and LP's general experience in the field of engineering geology. It should be noted that LP does not guarantee the engineering geologic interpretations presented in this report, only that the methods of this update engineering geologic study and the professional engineering geologic opinions and advice provided in this report are generally consistent with the standard of care of the engineering geologic profession at this time for studies performed in the same locality and under similar project conditions. Simply, no warranty is expressed, implied, is made, or intended concerning this report, by furnishing of this report, or by any other oral or written statement by LP.

REFERENCES

Site-Specific References (Subject Property, 1420 Bella Drive - aka 1400 Bella Drive):

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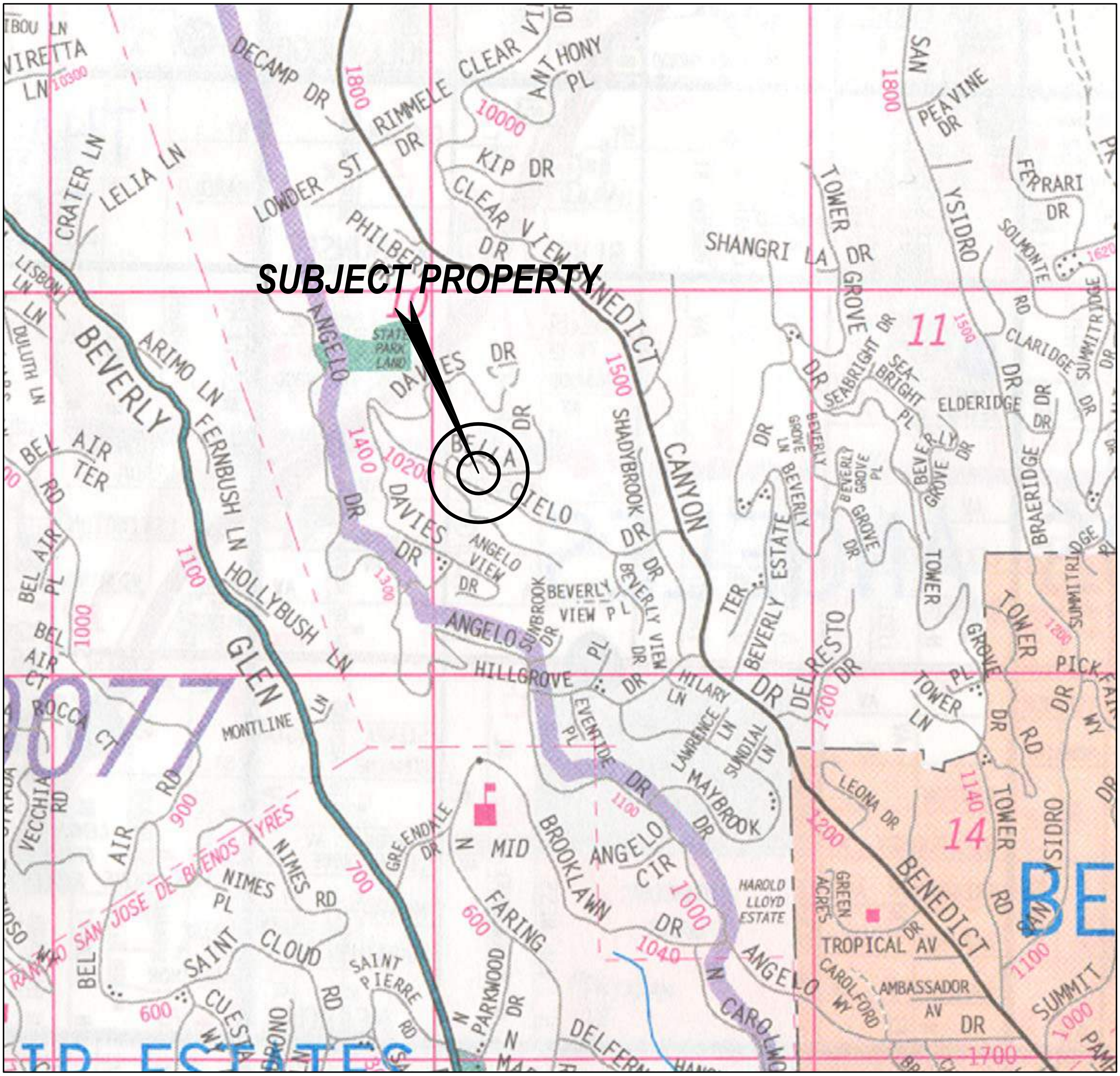
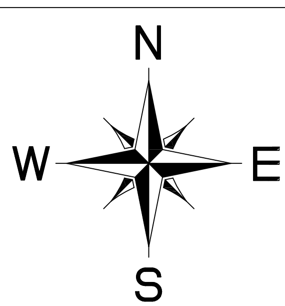
FIGURES

SITE LOCATION MAP



REFERENCE: *THOMAS GUIDE MAP, PAGE 592-C5*



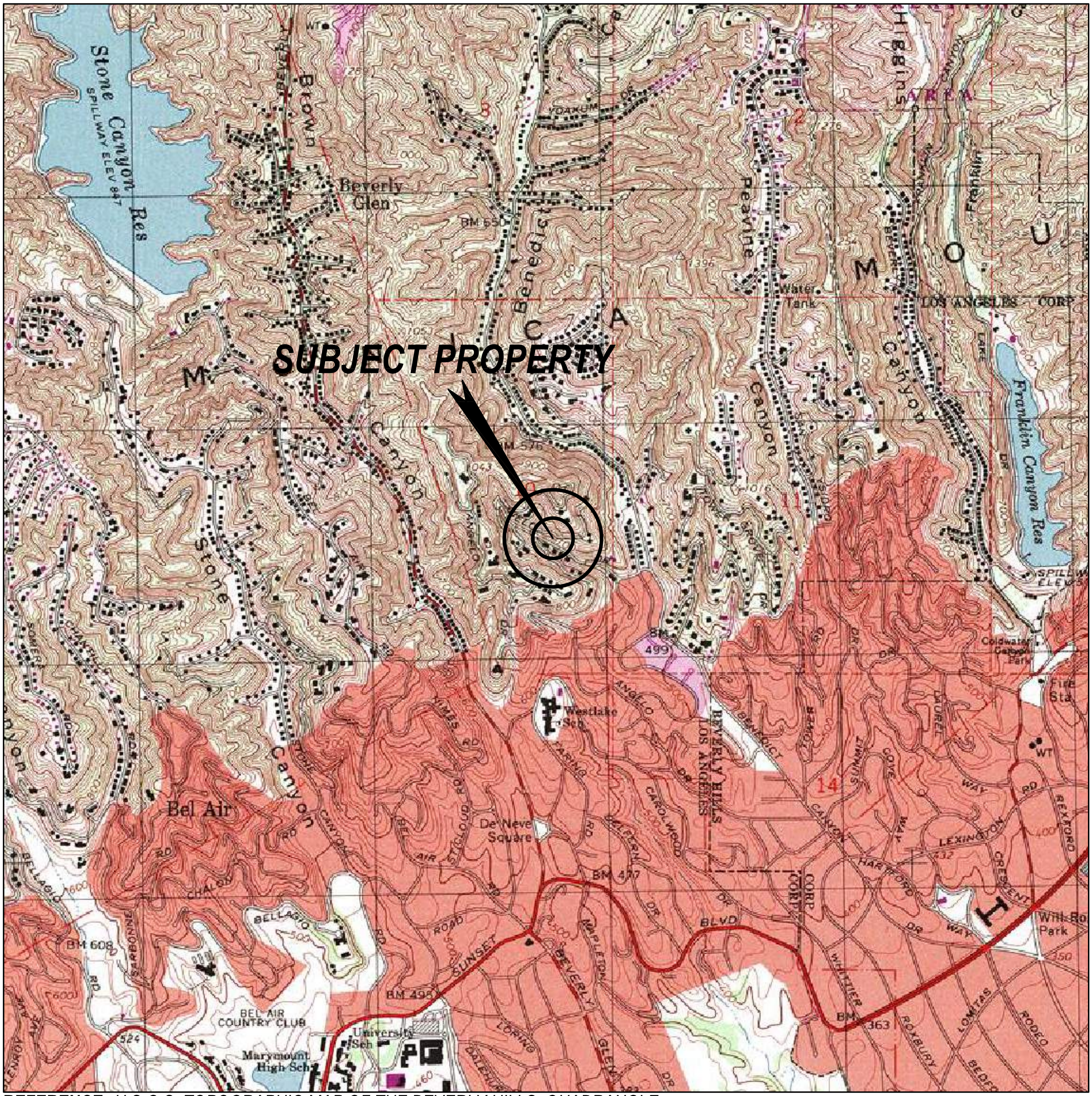
LANDPHASES INC
CONSULTING ENGINEERING GEOLOGISTS

JOB NUMBER:	LP 1174
JOB NAME:	PEREZ

0 | 500 | 1000 | 1500 | 2000 | 3000 feet

FIGURE 1

SITE LOCATION MAP



REFERENCE: *U.S.G.S. TOPOGRAPHIC MAP OF THE BEVERLY HILLS QUADRANGLE*

N
W E
S

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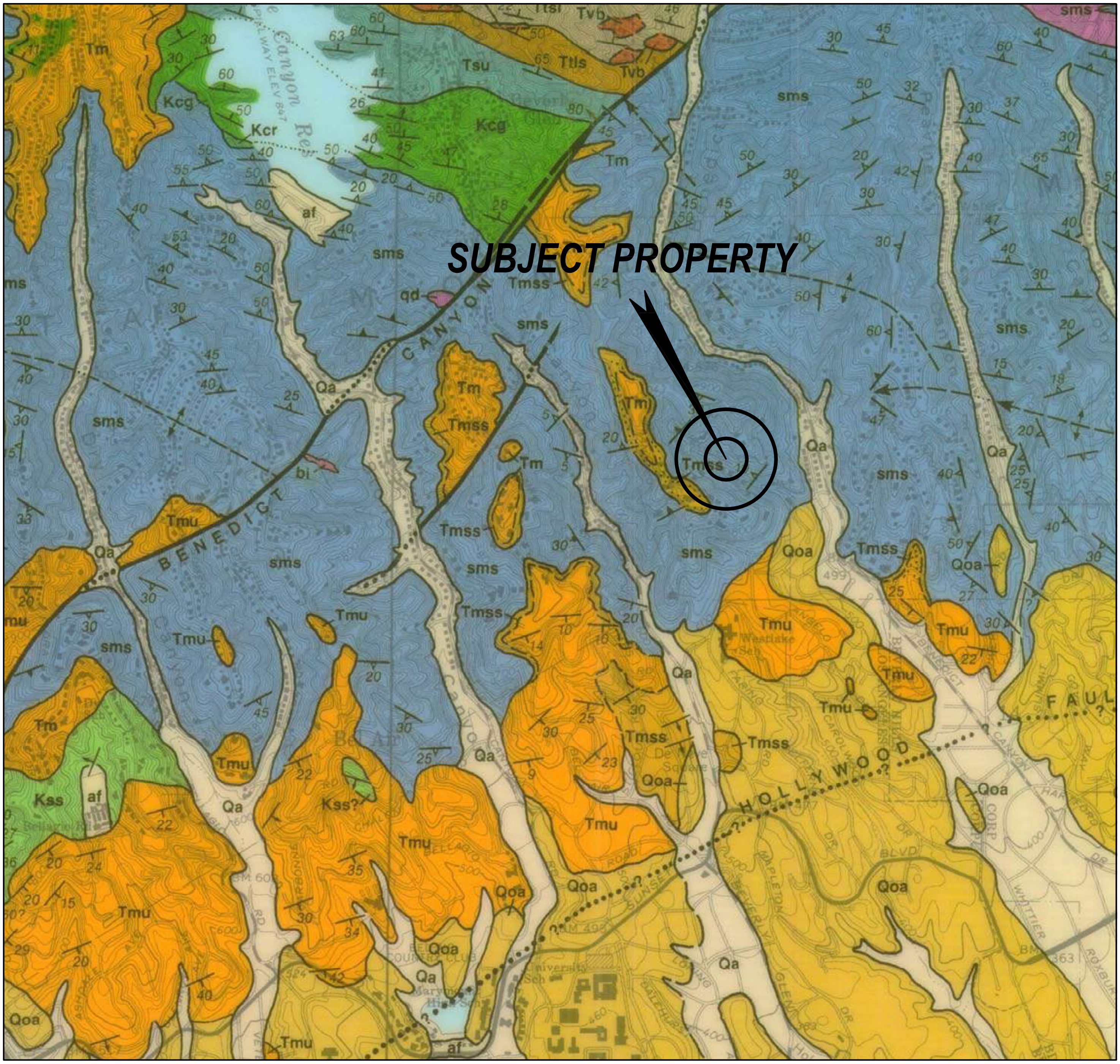
0 1000 2000 3000 4000 6000 feet

JOB NUMBER:
LP 1174

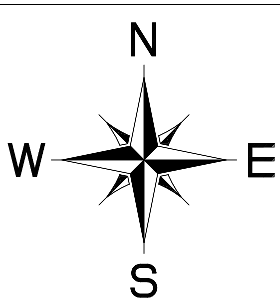
JOB NAME:
PEREZ

FIGURE 2

REGIONAL GEOLOGIC MAP



REFERENCE: *GEOLOGIC MAP OF THE BEVERLY HILLS AND VAN NUYS (SOUTH ½) QUADRANGLES, LOS ANGELES COUNTY, CA., BY T.W. DIBBLEE, JR., 1991*



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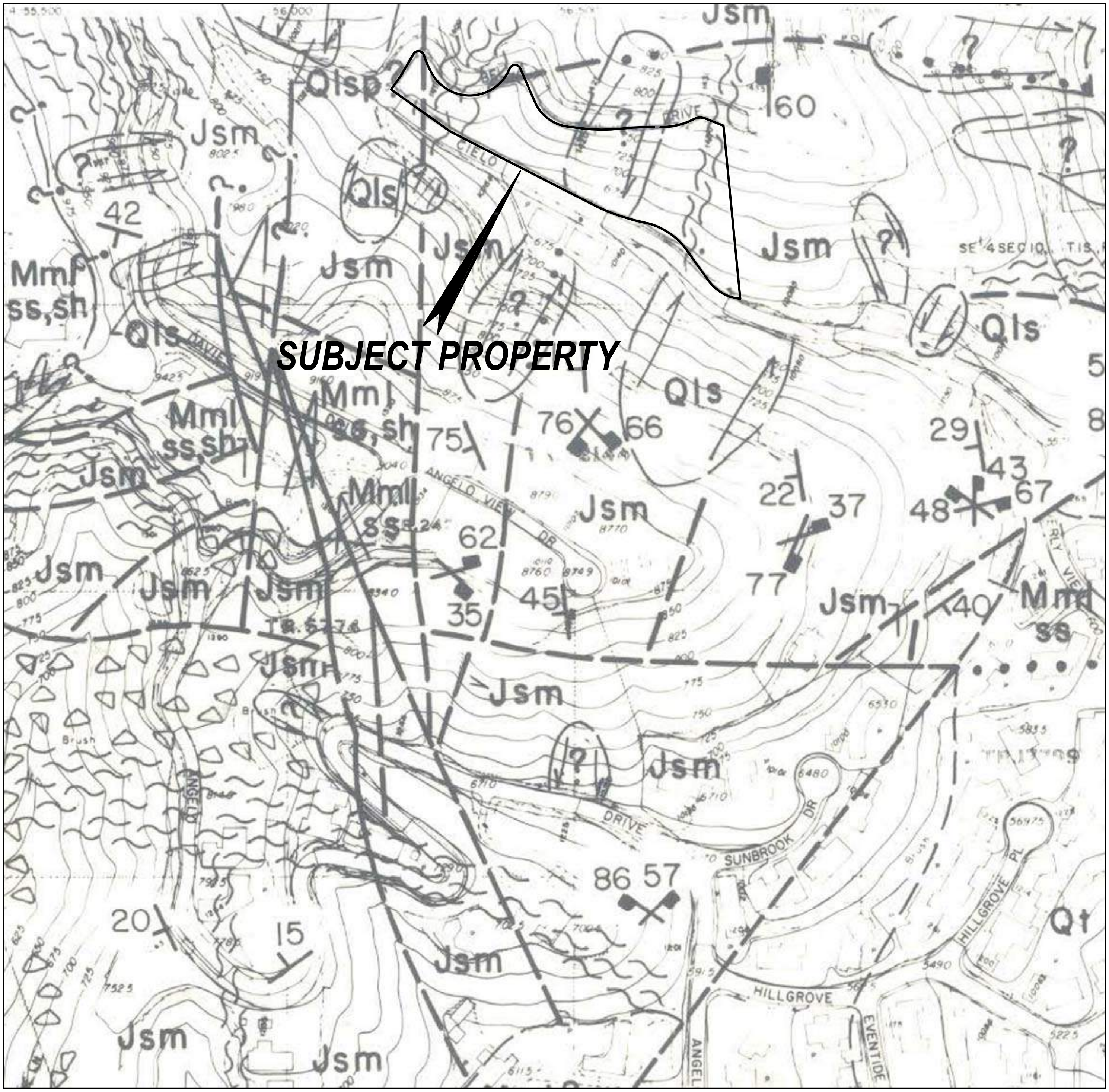
0 1000 2000 3000 4000 6000 feet

JOB NUMBER:
LP 1174

JOB NAME:
PEREZ

FIGURE 3

REGIONAL GEOLOGIC MAP



REFERENCE: *PRELIMINARY GEOLOGIC MAP, CITY OF LOS ANGELES, 1960, SHEET #217*

N
W E
S

LANDPHASES INC
CONSULTING ENGINEERING GEOLOGISTS

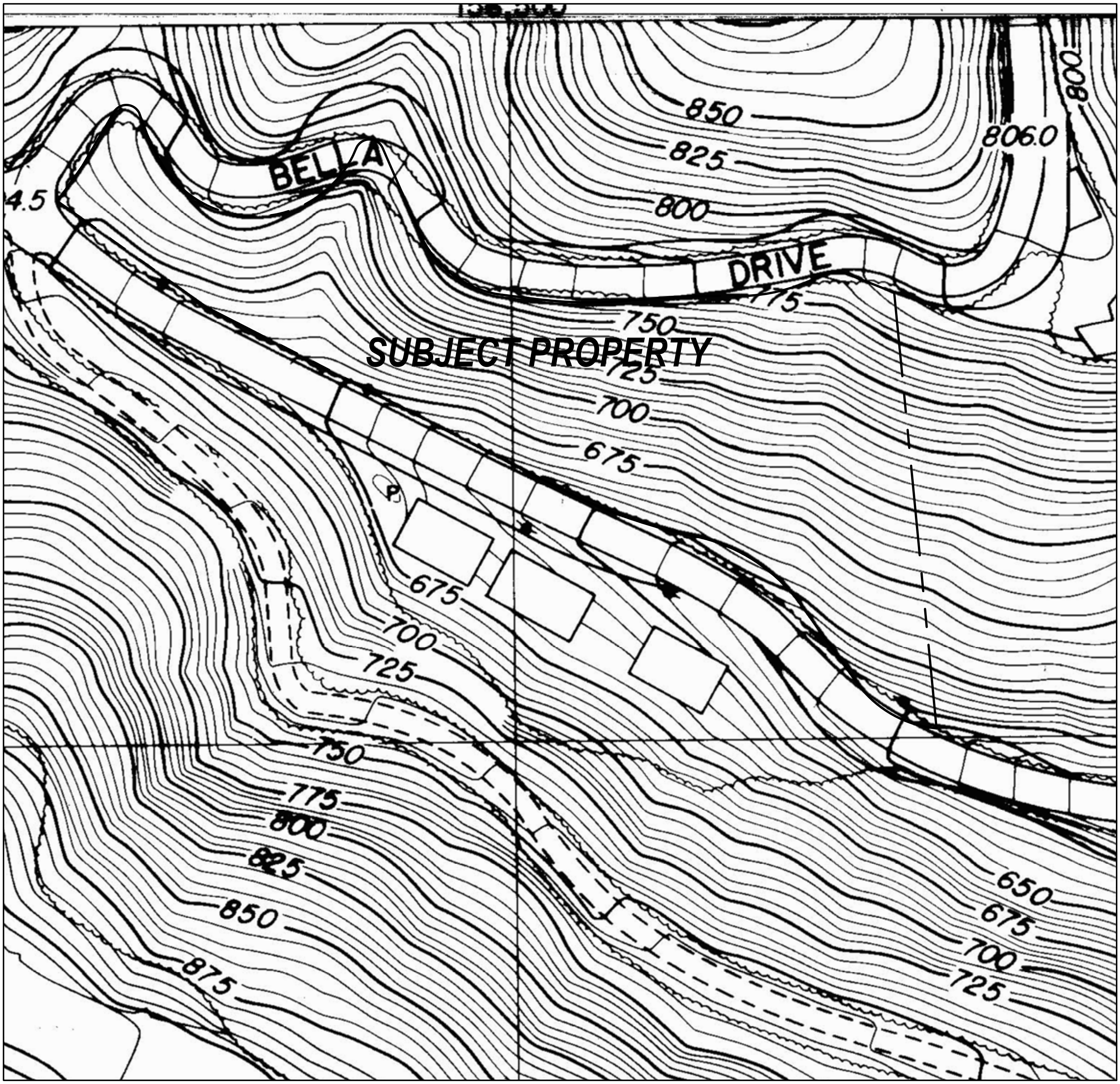
0 125 250 375 500 750 feet

JOB NUMBER: LP 1174

JOB NAME: PEREZ

FIGURE 4

SITE LOCATION MAP



REFERENCE: *SANTA MONICA TOPOGRAPHIC MAP, CITY OF LOS ANGELES, 1960, SHEET #217*

N

W E

S

LANDPHASES INC
CONSULTING ENGINEERING GEOLOGISTS

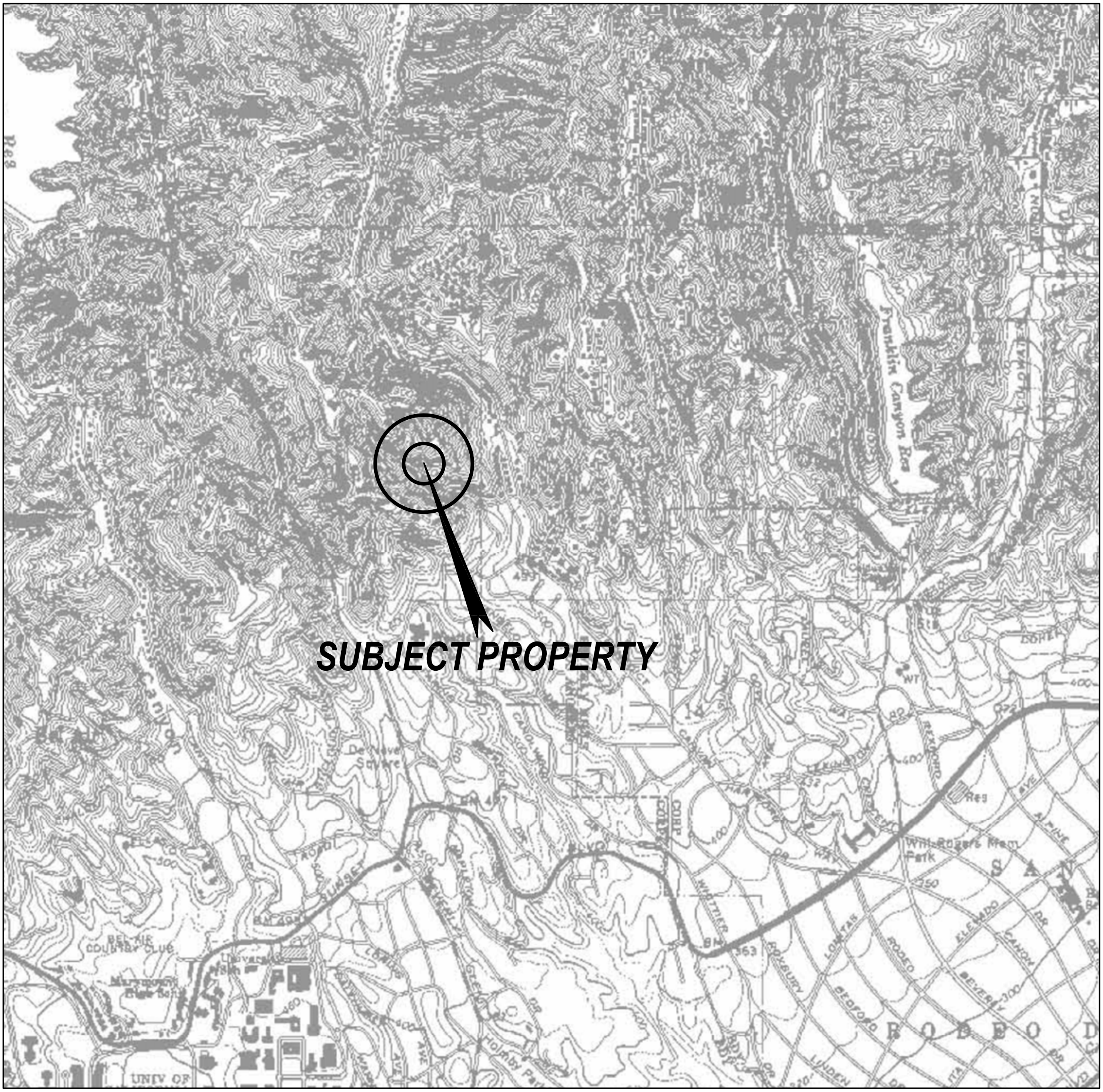
0 50 100 150 200 300 feet

JOB NUMBER:
LP 1174

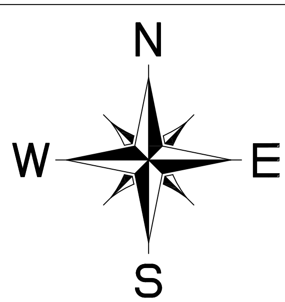
JOB NAME:
PEREZ

FIGURE 5

EARTHQUAKE FAULT ZONE MAP



REFERENCE: *EARTHQUAKE FAULT ZONE MAP OF THE BEVERLY HILLS QUADRANGLE, LOS ANGELES COUNTY, CA., C.D.M.G., 1986*



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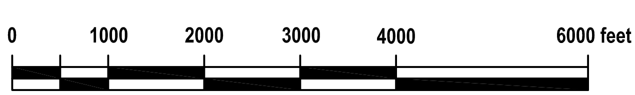
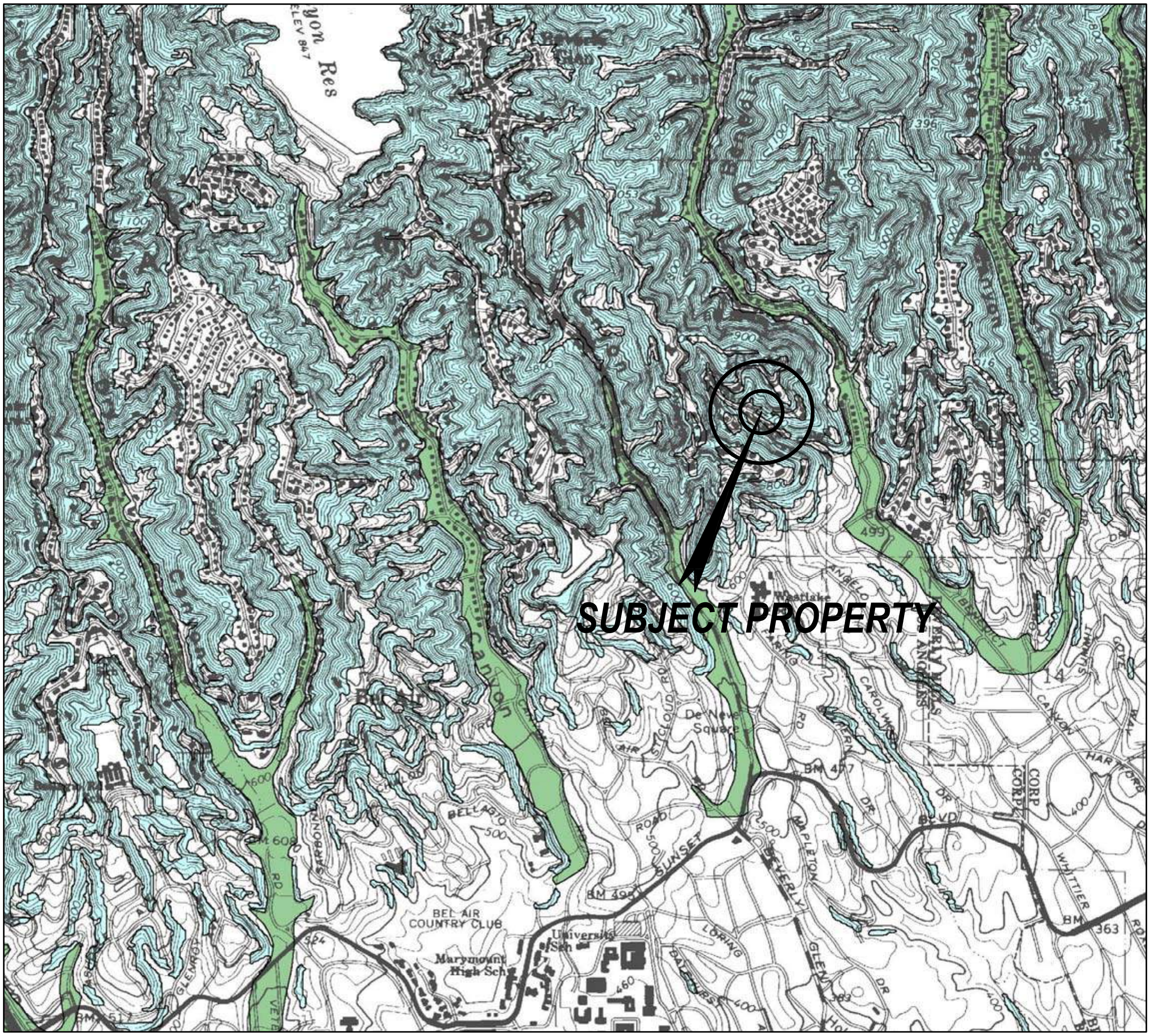


JOB NUMBER:
LP 1174

JOB NAME:
PEREZ

FIGURE 6

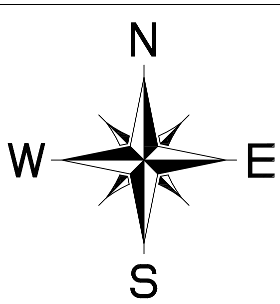
SEISMIC HAZARD MAP



REFERENCE: *SEISMIC HAZARDS ZONE MAP OF THE BEVERLY HILLS QUADRANGLE, LOS ANGELES COUNTY, CA.: C.D.M.G., 1999*

Liquefaction: *Areas where occurance of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potencial for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.*

Earthquake-induced Landslides: *Areas where previous occurrence of landslide movement, or local topographic, geological and subsurface water conditions indicate a potencial for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.*



LANDPHASES INC
CONSULTING ENGINEERING GEOLOGISTS

0 1000 2000 3000 4000 6000 feet

JOB NUMBER:
LP 1174

JOB NAME:
PEREZ

FIGURE 7

APPENDIX A

LOGS OF EXPLORATORY EXCAVATIONS

LOG OF BORING ONE

CLIENT--MIKE MIKLENDA JH-2348

JOB LOCATION--1420 BELLA DRIVE DATE-6/20/90

DRAFTED BY--JEFF PYLE CONSULTANT-JH

BORING EXCAVATION BY -- MIKE MIKLENDA METHOD--HAND LABOR

DOWNHOLE OBSERVATION BY--GEOLOGIST SHORING--NONE

SURFACE CONDITIONS--EASTERN PORTION OF PROPERTY ON ACCESS ROAD

DEPTH -(ft.)	EARTH MATERIAL	DESCRIPTION
0 - 6"	FILL	SILTY SAND WITH SLATE; MOTTLED BROWN AND GREY, MEDIUM DENSE, DRY.
6" - 4'	COLLUVIUM/ Qls	SILTY SAND AND SLATE; DARK RED BROWN, DENSE, DRY.
4' - 16'	BEDROCK	SLATE; DARK GREY, VERY HARD, FOLIATED, MODERATELY WEATHERED.
		END AT @ 16'

NO WATER
NO CAVING
6" FILL

ATTITUDES
FOLIATION N10W, 67SW

LOG OF BORING TWO

CLIENT--MIKE MIKLENDA JH-2348

JOB LOCATION--1420 BELLA DRIVE DATE-6/20/90

DRAFTED BY--JEFF PYLE CONSULTANT-JH

BORING EXCAVATION BY --MIKE MIKLENDA METHOD--HAND LABOR

DOWNHOLE OBSERVATION BY--GEOLOGIST SHORING--NONE

SURFACE CONDITIONS--CENTRAL PORTION OF PROPERTY ON ACCESS ROAD

DEPTH -(ft.)	EARTH MATERIAL	DESCRIPTION
0 - 2.5'	FILL	SILTY SAND; MOTTLED BROWN AND GRAY, MEDIUM DENSE, DRY.
2.5'- 8'	COLLUVIUM	SILTY SAND AND SLATE; DARK RED BROWN, DENSE, DRY.
8' - 15'	BEDROCK	SLATE; DARK GREY, VERY HARD, FOLIATED, SLIGHTLY WEATHERED.
		END AT 15'

NO WATER
NO CAVING
2.5' FILL

ATTITUDES
FOLIATION N25E, 39NW

LOG OF BORING THREE

CLIENT--MIKE MIKLENDA | JH-2348

JOB LOCATION--1420 BELLA DRIVE | DATE-6/20/90

DRAFTED BY--JEFF PYLE | CONSULTANT-JH

BORING EXCAVATION BY --MIKE MIKLENDA | METHOD--HAND LABOR

DOWNHOLE OBSERVATION BY--GEOLOGIST | SHORING--NONE

SURFACE CONDITIONS--CENTRAL PORTION OF PROPERTY ON ACCESS ROAD

DEPTH (ft.)	EARTH MATERIAL	DESCRIPTION
0 - 1.5'	FILL	SILTY SAND; MOTTLED BROWN AND GRAY, MEDIUM DENSE, DRY.
1.5 - 4'	COLLUVIUM	SILTY SAND AND SLATE; DARK RED BROWN, DENSE, DRY.
4 - 12'	BEDROCK	SLATE; DARK GREY, VERY HARD, FOLIATED, SLIGHTLY WEATHERED.
		END AT 12

NO WATER
NO CAVING
1 1/2' FILL

ATTITUDES
FOLIATION N50E,27NW

LOG OF BORING #4

CLIENT--MIKE MIKLENDA — JH-2348

JOB LOCATION--1420 BELLA DRIVE — DATE-6/20/90

DRAFTED BY--JEFF PYLE — CONSULTANT-JH

BORING EXCAVATION BY--MIKE MIKLENDA — METHOD--HAND LABOR

DOWNHOLE OBSERVATION BY--GEOLOGIST — SHORING--NONE

SURFACE CONDITIONS--N.E. PORTION OF PROPERTY TWELVE FEET BELOW BELLA DRIVE

DEPTH -(ft.)-	EARTH MATERIAL	DESCRIPTION
0 - 4'	FILL	SILTY SAND; MEDIUM BROWN, DRY, DENSE. CONTAINS ABUNDANT ANGULAR SLATE FRAGMENTS AND ROOTS.
4' - 14'	COLLUVIUM /Qls	SILTY SAND AND SLATE; RED BROWN TO DARK BROWN, DRY, DENSE.
14'- 18'	BEDROCK	SLATE; DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED. SOME JOINTING.
		END AT @ 18'

SEEP AT 14'
NO CAVING
4'OF FILL

ATTITUDES
FOLIATION; N27W, 20SW @ 14'
N84E, 44SE @ 15'

JOINTING N65W, 62NE @ 14'

LOG OF BORING NUMBER 5

CLIENT--MIKE MIKLENDA	JH-2348
JOB LOCATION--1420 BELLA DRIVE	DATE-6/20/90
DRAFTED BY--JEFF PYLE	CONSULTANT-JH
TEST PIT EXCAVATION BY--MIKE MIKLENDA	METHOD--HAND LABOR
DOWNHOLE OBSERVATION BY--GEOLOGIST	SHORING--NONE

SURFACE CONDITIONS-- N.E. PORTION OF PROPERTY, BELOW BELLA DRIVE.

DEPTH -(ft.)-	EARTH MATERIAL	DESCRIPTION
0 - 12'	COLLUVIUM /Qls	SILTY SAND AND SLATE; RED BROWN TO DARK BROWN, DRY DENSE, CONTAINS ABUNDANT ROOTS.
12 - 15'	BEDROCK	SLATE; DARK GREY ON FRESH SURFACE, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED. SOME JOINTING.
		END AT @ 15'

SEEP AT 12'
NO CAVING
NO FILL

ATTITUDES

FOLIATION;	N15W, 45SW @ 12'
	N12W, 60SW @ 14'
JOINTING	N69E, 88NE @ 12'

LOG OF BORING NUMBER 6

CLIENT--MIKE MIKLENDA | JH-2348

JOB LOCATION--1420 BELLA DRIVE | DATE-6/20/90

DRAFTED BY--JEFF PYLE | CONSULTANT-JH

TEST PIT EXCAVATION BY--MIKE MIKLENDA | METHOD--HAND LABOR

DOWNHOLE OBSERVATION BY--GEOLOGIST | SHORING--NONE

SURFACE CONDITIONS-- N.W. PORTION OF PROPERTY BELOW BELLA DRIVE.

DEPTH -(ft.)-	EARTH MATERIAL	DESCRIPTION
0 - 3.5'	FILL	SILTY SAND; MEDIUM BROWN, DRY, DENSE, CONTAINS ABUNDANT ANGULAR SLATE FRAGMENTS AND ROOTS.
3.5'- 6'	COLLUVIUM	SILTY SAND AND SLATE; RED BROWN TO DARK BROWN, DRY, DENSE.
6' - 10'	BEDROCK	SLATE; DARK GREY TO ORANGE BROWN, VERY HARD, THINLY FOLIATED, MODERATELY WEATHERED.
		END AT 10'

NO WATER
NO CAVING
3.5' OF FILL

ATTITUDES
FOLIATIONS; N78W, 36SW @ 6'
N86W, 35SW @ 9'

LOG OF BORING NUMBER 7

CLIENT--MIKE MIKLENDA — JH-2348

JOB LOCATION--1420 BELLA DRIVE — DATE-6/20/90

DRAFTED BY--JEFF PYLE — CONSULTANT-JH

TEST PIT EXCAVATION BY--MIKE MIKLENDA — METHOD--HAND LABOR

DOWNHOLE OBSERVATION BY--GEOLOGIST — SHORING--NONE

SURFACE CONDITIONS-- N.W. PORTION OF PROPERTY BELOW BELLA DRIVE.

DEPTH -(ft.)-	EARTH MATERIAL	DESCRIPTION
0 - 2'	FILL	SILTY SAND; MEDIUM BROWN, DRY, DENSE, CONTAINS ABUNDANT ANGULAR SLATE FRAGMENTS.
2 - 8'	COLLUVIUM	SILTY SAND AND SLATE; RED BROWN TO DARK BROWN, DRY, DENSE.
8 - 9'	BEDROCK	SLATE; DARK GREY TO ORANGE BROWN, VERY HARD, THINLY FOLIATED, MODERATELY WEATHERED.
		END AT 9'

NO WATER
NO CAVING
2'OF FILL

LOG OF BORING # 8

CLIENT--VICTOR ROGERS

JH2348

JOB LOCATION--CIELO DRIVE AND BELLA DRIVE, BEVERLY HILLS, CALIFORNIA

DATE-6/7/93

CONSULTANT-- Jeff Holt

DRAFTED BY--JEFFREY W. HOLT

METHOD--HOLLOW STEM AUGER

BORING DRILLED BY WESTEX DRILLING

BORING LOGGED BY GEOLOGIST AND ENGINEER

SHORING-- None

SURFACE CONDITIONS--SHOULDER OF CEILO DRIVE AT TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
1' - 3'	*FILL*	*SILTY SAND WITH GRAVEL, GREY AND BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
3'- 15'	*BEDROCK*	*SLATE, GREY, HARD FOLIATED, MODERATELY WEATHERED*
		END AT 15 FEET *WATER AT 10 FEET*

LOG OF BORING # 9

CLIENT--VICTOR ROGERS

JH2348

JOB LOCATION--CIELO DRIVE AND BELLA DRIVE, BEVERLY HILLS, CALIFORNIA

DATE-6/7/93

DRAFTED BY--JEFFREY W. HOLT

CONSULTANT-- Jeff Holt

BORING DRILLED BY WESTEX DRILLING

METHOD--HOLLOW STEM AUGER

BORING LOGGED BY GEOLOGIST AND ENGINEER

SHORING-- None

SURFACE CONDITIONS--SHOULDER OF CEILO DRIVE AT TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
1' - 3'	*FILL*	*SILTY SAND WITH GRAVEL, GREY AND BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
3'- 10'	*BEDROCK*	*SLATE, GREY, HARD FOLIATED, MODERATELY WEATHERED*
		END AT 10 FEET

LOG OF BORING # 10

CLIENT--VICTOR ROGERS | JH2348

JOB LOCATION--CIELO DRIVE AND BELLA DRIVE, B.H. | DATE-6/7/93

DRAFTED BY--JEFFREY W. HOLT | CONSULTANT--Jeff Holt

BORING DRILLED BY--WESTEX DRILLING | METHOD-HOLLOW STEM AUGER

BORING LOGGED BY GEOLOGIST AND ENGINEER

SURFACE CONDITIONS--SHOULDER OF CEILO DRIVE AT TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 3'	*FILL*	*SILTY SAND WITH GRAVEL, GREY AND BORWN, SLIGHTLY MOIST, MEDIUM DENSE*
3' - 15'	*BEDROCK*	*SLATE, GREY, HARD, FOLIATED, MODERATELY WEATHERED*
		VERY HARD QUARTZ VEIN AT 15 FEET
		END AT 15 FEET *NO WATER* *NO CAVING* *3 FEET OF FILL*

LOG OF BORING # 11

CLIENT--VICTOR ROGERS | JH2348

JOB LOCATION--CIELO DRIVE AND BELLA DRIVE, B.H. | DATE-6/7/93

DRAFTED BY--JEFFREY W. HOLT | CONSULTANT--Jeff Holt

BORING DRILLED BY--WESTEX DRILLING | METHOD-HOLLOW STEM AUGER

BORING LOGGED BY GEOLOGIST AND ENGINEER

SURFACE CONDITIONS--SHOULDER OF CEILO DRIVE AT TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 25'	*BEDROCK*	*SLATE, RUSTED BROWN, HARD, FOLIATED, MODERATELY WEATHERED* *BROWN AND GREY BELOW 3 FEET* *GREY AND GOLDEN BROWN BELOW 5 FEET* *GREY BELOW 7 FEET* *DARK GREY AND VERY HARD BELOW 10 FEET* *END AT 25 FEET* *WATER AT 23 FEET* *SLIGHTLY SEEPAGE AT 3 FEET*

LOG OF BORING # 12

CLIENT-- Mr. Victor Rogers | JH-- 2348

JOB LOCATION-- Slope between Bella & Cielo Dr. | DATE-- August 3, 1993

DRAFTED BY-- Jake W. Holt | CONSULTANT-- Jeff Holt

BORING DRILLED BY-- August Const., Inc. | METHOD-- Hillside Drill Rig

DOWNHOLE OBSERVATION BY-- Geologist | SHORING-- None

SURFACE CONDITIONS-- On level backhoe cut pathway, 47' west of B-13

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0-22.5'	~~BEDROCK~~ Qls	*Slate, dark grey, hard to very hard, thinly foliated, slightly weathered, contains quartz veins* *FOLIATION @3' NS 53W* *FOLIATION @8' N22W 33SW* *FOLIATION @10' N30W 43SW* *FOLIATION @13' N13W 38SW* *FOLIATION @17' N11E 49NW*
22.5'-23.5'	*SHEAR ZONE*	*Fractured slate with clay, tan to light brown, slightly moist* *SHEAR @22.5' N70E 27SE* Qls
23.5'-41.5'	*BEDROCK*	*Slate, dark grey, very hard, thinly foliated* *FOLIATION @26' N18W 47SW* *FOLIATION @30' N32W 56SW* *FOLIATION @34' NS 51W* *FOLIATION @38' N5E 63NW* *End at 41.5'* *No water* *No caving* *No fill*

LOG OF BORING # 13

CLIENT-- Mr. Victor Rogers | JH-- 2348

JOB LOCATION-- Slope between Bella & Cielo Dr. | DATE-- August 3, 1993

DRAFTED BY-- Jake W. Holt | CONSULTANT-- Jeff Holt

BORING DRILLED BY-- August Const., Inc. | METHOD-- Hillside Drill Rig

DOWNHOLE OBSERVATION BY-- Geologist | SHORING-- None

SURFACE CONDITIONS-- On level backhoe cut pathway, 25' southwest of powerpole

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0-9.5'	*LANDSLIDE DEBRIS*	*Fractured slate and soil matrix, mottled grey and brown, moist, medium dense*
9.5'-17'	*LANDSLIDE DEBRIS*	*Fractured slate, pale olive green and grey, moist, medium dense* *RELIC FOLIATION @10' N10E 51NW* *SLIDE PLAIN @17' N80W 37SW*
17'-21'	*BEDROCK*	*Slate, dark grey, very hard, foliated, slightly weathered* *FOLIATION @18' NS 43W*
		End at 21' *No water* *No caving* *No fill*

LOG OF BORING # 14

CLIENT--VICTOR ROGERS — JH-2348

JOB LOCATION--BELLA DR. AND CIELO DR. — DATE-9/18/95

DRAFTED BY--JEFFREY W. HOLT — CONSULTANT--JEFF HOLT

BORING DRILLED BY--J.S.CONSTRUCTION — METHOD--DRILL RIG

DOWNHOLE OBSERVATION BY--JEFF HOLT, GEOLOGIST — SHORING--NONE

SURFACE CONDITIONS--SHOULDER OF PRIVATE STREET

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 2'	*FILL*	*2 INCHES OF ASPHALT OVER SILTY SAND WITH GRAVEL, MOTTLED BROWN AND GREY, SLIGHTLY MOIST, MEDIUM DENSE*
2' - 3 1/2'	*COLLUVIAL SOIL*	*GRAVELLY SAND, GREY AND BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
3 1/2'-15 1/2'	*PREHISTORIC LANDSLIDE DEBRIS*	*SLATE, GREY, FRACTURED, MODERATELY WEATHERED, MODERATELY WEATHERED* *RELICT FOLIATION AT 5' NS 44W* *1 INCH SHEARED CLAY BED AT 9'* *FOLIATION PARALLEL TO SHEAR AT 9' N30W 34SW* *CLAY IS BLUE GREY, SLIGHTLY MOIST, STIFF, SHEARED* *FRACTURED SLATE BELOW* *HARD GREY SLATE FROM 11'*
		FOLIATION AT 13' N32W 47SW *FOLIATION AT 13 1/2' N5W 59SW* *6 INCH SHEARED CLAY BED AT 15'* *GREENISH GREY, SLIGHTLY MOIST, STIFF* *SHEAR PARALLEL TO FOLIATION AT 15 1/2' N25W 36SW (SLIDE PLANE)*
15 1/2-28'	*BEDROCK*	*SLATE, GREY, VERY HARD, THINLY TO THICKLY FOLIATED, SLIGHTLY WEATHERED* *FOLIATION AT 16' N10E 55NW*
*	*	*QUARTZ VEIN AT 19 TO 21'*

LOG OF BORING # 14

CLIENT--VICTOR ROGERS — JH-2348

JOB LOCATION--BELLA DR. AND CIELO DR. — DATE-9/18/95

DRAFTED BY--JEFFREY W. HOLT — CONSULTANT--JEFF HOLT

BORING DRILLED BY--J.S.CONSTRUCTION — METHOD--DRILL RIG

DOWNHOLE OBSERVATION BY--JEFF HOLT, GEOLOGIST — SHORING--NONE

SURFACE CONDITIONS--SHOULDER OF PRIVATE STREET

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
15 1/2-28'	*BEDROCK*	*BELOW THE QUARTZ VIEN, VERY HARD SLATE, GREY, FOLIATED, SLIGHTLY WEATHERED*
*	*	*FOLIATION AT 23' N5E 57NW*
		END AT 28 FEET *NO WATER* *MINOR CAVING WITH PREHISTORIC LANDSLIDE DEBRIS* *2 FEET OF FILL*
		UNABLE TO DEEPEN DUE TO VERY HARD BEDROCK
		CORING REQUIRED TO ADVANCE FROM 20 TO 23 FEET

*

MOUNTAIN GEOLOGY, INC.
LOG OF BORING # 15

CLIENT— Mr. Victor Rogers

JH— 2348

JOB LOCATION— Bella/Cielo Drive, Beverly Hills

DATE— 7/28/97

DRAFTED BY— Jake Holt

CONSULTANT— Jeffrey Holt, M.G.I.

BORING DRILLED BY— Roy Bros. Drilling

METHOD— Hillside Drill-Rig

WEATHER CONDITIONS— Sunny, warm

DOWNHOLE OBSERVATION BY—Geologist

SURFACE CONDITIONS— Top of vegetated descending slope, 2-3 ft below street grade

SHORING— None

DEPTH	***EARTH MATERIALS***	***DESCRIPTION***
0-6.5'	***Fill***	*Silty sand with slate fragments: moderate brown, dry, loose to medium dense, lower contact is parallel to slope*
6.5'-11.5'	***Colluvium/ Pre-Historic Landslide Debris***	*Silty sand with slate fragments: moderate brown, dry to slightly moist, loose to medium dense, lower contact is parallel to slope*
11.5'-17'	***Bedrock (Santa Monica Slate)***	*Slate: bluish gray with orange brown iron-oxide staining, thinly to thickly foliated, strong, hard, very fractured* *-caving from 14-17 ft* *-unable to advance* *-unable to downhole log due to dangerous conditions* *End at 17'* *No water* *No caving* *6.5 ft of fill*

MOUNTAIN GEOLOGY, INC.
LOG OF BORING # 16

CLIENT— Mr. Victor Rogers

JH— 2348

JOB LOCATION— Bella/Cielo Drive, Beverly Hills

DATE— 7/28/97

DRAFTED BY— Jake Holt

CONSULTANT— Jeffrey Holt, M.G.I.

BORING DRILLED BY— Roy Bros. Drilling

METHOD— Hillside Drill-Rig

WEATHER CONDITIONS— Sunny, warm

DOWNHOLE OBSERVATION BY—Geologist

SURFACE CONDITIONS— Level area at top of vegetated descending slope, adjacent to asphalt street

SHORING— None

DEPTH	***EARTH MATERIALS***	***DESCRIPTION***
0-3.5'	***Fill***	*Silty sand with slate fragments: moderate brown, dry, loose to medium dense*
3.5'-10'	***Colluvium/ Pre-Historic Landslide Debris***	*Silty sand with clay binder: moderate brown, dry to slightly moist, medium dense to dense with depth, abundant slate fragments* *-2 ft thick brecciated zone from 8 to 10 ft, very fractured slate, probable slide plane* *Slide Plane @10' N 50°E, 60°SE*
10'-45'	***Bedrock (Santa Monica Slate)***	*Slate: bluish gray with orange brown iron-oxide staining, thinly to thickly foliated, moderately strong, moderately hard to hard, very fractured* *Foliation @10' N 40°W, 46°SW* *Foliation @17' N 25°E, 41°NW* *Shear @22' N 75° W, 14° SW; Clay, green, 1 inch thick* *Foliation @22' N 22°E, 30°NW* *Shear @26' N 60° W, 29° SW; Clay, green, 2 inches thick* *Foliation @29' N 22°E, 32°NW* *Foliation @38' N 30°E, 27°NW* *End at 45'* *No water* *No caving* *3.5 ft of fill*

LOG OF TEST PIT NUMBER 1

CLIENT--MIKE MIKLENDA	JWH--2348
JOB LOCATION--CIELO AND BELLA DRIVE	DATE--4/13/89
DRAFTED BY--JOHN LIDQUIST	CONSULTANT--JWH
TEST PIT EXCAVATION BY--MIKE MIKLENDA	METHOD--HAND LABOR
DOWNHOLE OBSERVATION BY--GEOLOGIST	SHORING--NONE
SURFACE CONDITIONS--ON ACCESS ROAD	

DEPTH -(ft.)-	EARTH MATERIAL	DESCRIPTION
0 - 5'	SOIL	SILTY SAND WITH GRAVEL; REDDISH BROWN, SLIGHTLY MOIST, DENSE, POROUS, CONTAINS SCATTERED FRAGMENTS OF BEDROCK.
		END @ 5'

NO GROUNDWATER
NO CAVING
NO FILL

LOG OF TEST PIT NUMBER 2

CLIENT--MIKE MIKLENDA	JWH--2348
JOB LOCATION--CIELO AND BELLA DRIVE	DATE--4/13/89
DRAFTED BY--JOHN LIDQUIST	CONSULTANT--JWH
TEST PIT EXCAVATION BY--MIKE MIKLENDA	METHOD--HAND LABOR
DOWNHOLE OBSERVATION BY--GEOLOGIST	SHORING--NONE
SURFACE CONDITIONS--ON ACCESS ROAD	

DEPTH -(ft.)-	EARTH MATERIAL	DESCRIPTION
0 - 18"	FILL	GRAVELLY SAND; MEDIUM BROWN, SLIGHTLY MOIST, DENSE, CONTAINS ABUNDANT FRAGMENTS OF SLATE ROCK.
18" - 5'	BEDROCK	SLATE; DARK GREY, VERY HARD, THINLY FOLIATED, MODERATELY WEATHERED, CONTAINS MEDIUM-SPACED JOINTS.
		END @ 5'

NO GROUNDWATER
NO CAVING
18" FILL

ATTITUDES
FOLIATION; N04W,215W
JOINTING; N86W,88NE
N05W,79NE

LOG OF TEST PIT NUMBER 3

CLIENT--MIKE MIKLENDA	JWH--2348
JOB LOCATION--CIELO AND BELLA DRIVE	DATE--4/13/89
DRAFTED BY--JOHN LIDQUIST	CONSULTANT--JWH
TEST PIT EXCAVATION BY--MIKE MIKLENDA	METHOD--HAND LABOR
DOWNHOLE OBSERVATION BY--GEOLOGIST	SHORING--NONE
SURFACE CONDITIONS--ON ACCESS ROAD	

DEPTH -(ft.)-	EARTH MATERIAL	DESCRIPTION
0- 18"	FILL	GRAVELLY SAND; MEDIUM BROWN, SLIGHTLY MOIST, DENSE, CONTAINS ABUNDANT FRAGMENTS OF SLATE BEDROCK.
18" - 2 1/2'	VERY WEATHERED BEDROCK	SILTY SAND; MOTTLED ORANGE BROWN TAN, AND GRAY, SLIGHTLY MOIST, DENSE, CONTAINS UNWEATHERED FRAGMENTS OF BEDROCK.
2 1/2-4'	BEDROCK	SLATE; DARK GRAY, VERY HARD, THINLY FOLIATED, MODERATELY WEATHERED, CONTAINS MEDIUM-SPACED JOINTS.
		END @ 4'

NO GROUNDWATER
NO CAVING
18" FILL

ATTITUDES:
FOLIATION; N31W,45SW
JOINTING; N87W,89NE

LOG OF TEST PIT # 4

CLIENT--VICTOR ROGERS

JH-2348

JOB LOCATION--BELLA AND CEILO

DATE-3/17/94

DRAFTED BY--J.W.HOLT

CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE

METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST

SHORING--NONE

SURFACE CONDITIONS--TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 7'	*LANDSLIDE DEBRIS*	*GRAVELLY SAND WITH CLAY, RED BROWN, SLIGHTLY MOIST, LOOSE* *MOSTLY SHEARED AND FRACTURED SLATE BELOW 4', SHEARED, WEATHERED* *SLIDE PLANE IS 6" OF GOUGE, SLIGHTLY MOIST, FIRM N60E 33SE*
7'- 11'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED* *FOLIATION AT 9' N10E 19NW* *END AT 11 FEET* *NO WATER* *NO CAVING* *NO FILL*

LOG OF TEST PIT # 5

CLIENT--VICTOR ROGERS | JH-2348

JOB LOCATION--BELLA AND CEILO | DATE-3/17/94

DRAFTED BY--J.W.HOLT | CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE | METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST | SHORING--NONE

SURFACE CONDITIONS--TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 2'	*SOIL*	*GRAVELLY SAND, BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
2'- 8'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED* *FOLIATION AT 6' NS 34W* *END AT 8 FEET* *NO WATER* *NO CAVING* *NO FILL*

LOG OF TEST PIT # 6

CLIENT--VICTOR ROGERS | JH-2348

JOB LOCATION--BELLA AND CEILO | DATE-3/17/94

DRAFTED BY--J.W.HOLT | CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE | METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST | SHORING--NONE

SURFACE CONDITIONS--TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 2'	*SOIL*	*GRAVELLY SAND, BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
2'- 7'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED* *FOLIATION AT 5' N15W 36SW* *END AT 7 FEET* *NO WATER* *NO CAVING* *NO FILL*

LOG OF TEST PIT # 7

CLIENT--VICTOR ROGERS | JH-2348

JOB LOCATION--BELLA AND CEILO | DATE-3/17/94

DRAFTED BY--J.W.HOLT | CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE | METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST | SHORING--NONE

SURFACE CONDITIONS--TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 1'	*SOIL*	*GRAVELLY SAND, BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
1'- 8'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED, MODERATELY FRACTURED* *FOLIATION AT 6' N10W 25SW* *END AT 8 FEET* *NO WATER* *NO CAVING*

NO FILL

LOG OF TEST PIT # 8

CLIENT--VICTOR ROGERS | JH-2348

JOB LOCATION--BELLA AND CEILO | DATE-3/17/94

DRAFTED BY--J.W.HOLT | CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE | METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST | SHORING--NONE

SURFACE CONDITIONS--TOE OF ASCENDING SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 1'	*SOIL*	*GRAVELLY SAND, BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
1'- 11'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED* *FOLIATION AT 8' N10E 18NW* *END AT 11 FEET* *NO WATER* *NO CAVING* *NO FILL*

LOG OF TEST PIT # 9

CLIENT--VICTOR ROGERS — JH-2348

JOB LOCATION--BELLA AND CEILO — DATE-3/17/94

DRAFTED BY--J.W.HOLT — CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE — METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST — SHORING--NONE

SURFACE CONDITIONS--TOE OF SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 2 1/2'	*FILL*	*GRAVELLY SAND, MOTTLED GREY AND BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
2 1/2'-5 1/2'	*SOIL*	*GRAVELLY SAND, BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
5 1/2'-10 1/2'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED* *FOLIATION AT 8' NS 25W* *END AT 10 1/2 FEET* *NO WATER*

NO CAVING
2 1/2' FILL

LOG OF TEST PIT # 10

CLIENT--VICTOR ROGERS

JH-2348

JOB LOCATION--BELLA AND CEILO

DATE-3/17/94

DRAFTED BY--J.W.HOLT

CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE

METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST

SHORING--NONE

SURFACE CONDITIONS--TOP OF SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 4'	*FILL*	*GRAVELLY SAND, MOTTLED GREY AND BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
4'- 6 1/2'	*SOIL*	*GRAVELLY SAND, BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
6 1/2'-10'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED, UPPER 1 1/2' OF BEDROCK VERY WEATHERED*

END AT 10 FEET
NO WATER
NO CAVING
4' FILL

LOG OF TEST PIT # 11

CLIENT--VICTOR ROGERS JH-2348

JOB LOCATION--BELLA AND CEILO DATE-3/17/94

DRAFTED BY--J.W.HOLT CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST SHORING--NONE

SURFACE CONDITIONS--TOP OF SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 1'	*FILL*	*GRAVELLY SAND, MOTTLED GREY AND BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
1'- 7 1/2'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED, UPPER 3 1/2' OF BEDROCK VERY WEATHERED*
		END AT 7 1/2 FEET *NO WATER* *NO CAVING* *1' FILL*

LOG OF TEST PIT # 12

CLIENT--VICTOR ROGERS

JH-2348

JOB LOCATION--BELLA AND CEILO

DATE-3/17/94

DRAFTED BY--J.W.HOLT

CONSULTANT--JEFF HOLT

TEST PIT EXCAVATION BY--BUZZA BACKHOE

METHOD--BACKHOE

DOWNHOLE OBSERVATION BY--J.HOLT, GEOLOGIST

SHORING--NONE

SURFACE CONDITIONS--TOP OF SLOPE

DEPTH	*EARTH MATERIAL*	*DESCRIPTION*
0 - 2'	*REMNANT LANDSLIDE DEBRIS*	*FRACTURED SLATE, MOTTLED GREY AND BROWN, SLIGHTLY MOIST, MEDIUM DENSE*
2'- 5'	*BEDROCK*	*SLATE, DARK GREY, VERY HARD, THINLY FOLIATED, SLIGHTLY WEATHERED* *FOLIATION PARALLEL TO SHEAR N5W 13SW* *END AT 5 FEET* *NO WATER* *NO CAVING*

NO FILL

MOUNTAIN GEOLOGY, INC.
LOG OF TEST-PIT X

CLIENT— Rogers

JOB LOCATION— Cielo Drive and Bella Drive, Beverly Hills, California

DRAFTED BY— Jake Holt

EXCAVATED BY— Mountain Geology, Inc.

WEATHER CONDITIONS— Sunny

SURFACE CONDITIONS— Base of slope, adjacent to Cielo Drive.

JH— 2348

DATE— 12/17/96

CONSULTANT— Jeffrey Holt, M.G.I.

METHOD— Hand-labor

DOWNHOLE OBSERVATION BY— Geologist

SHORING— None

DEPTH	***EARTH MATERIALS***	***DESCRIPTION***
0-1'	***FILL***	*Sandy gravel: dark yellowish brown, moist, loose to medium dense, pebble to cobble base composed of slate and asphalt, slight rooting in upper 6"*
1'-3.5'	***COLLUVIUM***	*Sandy gravel with clay binder: dark yellowish brown, moist, loose to medium dense, abundant bedrock clasts, porous, moderately coherent*
3.5'-4'	***BEDROCK***	*Slate: dark gray, thickly foliated, hard to very hard* *Foliation @ 3.8', N 27° W, 59° SW* *Foliation @ 4', N 21° W, 34° SW* *End at 4'* *No water* *No caving* *1' of fill*

MOUNTAIN GEOLOGY, INC.
LOG OF TEST-PIT Y

CLIENT— Rogers

JOB LOCATION— Cielo Drive and Bella Drive, Beverly Hills, California

DRAFTED BY— Jake Holt

EXCAVATED BY— Mountain Geology, Inc.

WEATHER CONDITIONS— Sunny

SURFACE CONDITIONS— Base of slope, adjacent to Cielo Drive.

JH— 2348

DATE— 12/17/96

CONSULTANT— Jeffrey Holt, M.G.I.

METHOD— Hand-labor

DOWNHOLE OBSERVATION BY— Geologist

SHORING— None

DEPTH	***EARTH MATERIALS***	***DESCRIPTION***
0-3'	***COLLUVIUM***	*Sandy gravel with clay binder: moderate brown, moist, soft, incoherent, contains abundant randomly oriented bedrock clasts, asphalt paving is located at 3'*
3'-3.5'	***FILL***	*Sandy gravel: dark yellowish brown, moist, loose to medium dense, abundant bedrock clasts*
3.5'-5.5'	***LANDSLIDE DEBRIS***	*Sandy gravel with clay binder: dark yellowish brown, moist, loose to medium dense, abundant bedrock clasts*
5.5'-6'	***BEDROCK***	*Slate: dark gray, thickly foliated, hard to very hard*

Contact @ 3', N 54°W, 25°SW
Slide plane @ 5.5', N 42°W, 22°NE
Foliation @ 6', N 58°W, 12°SW
Jointing @ 6', N 48°E, 82°NW
Note: 6" thick asphalt paving on south wall

End at 6'
No water
No caving
0.5' of fill

MOUNTAIN GEOLOGY, INC.
LOG OF TEST-PIT Z

CLIENT— Rogers

JOB LOCATION— Cielo Drive and Bella Drive, Beverly Hills, California

DRAFTED BY— Jake Holt

EXCAVATED BY— Mountain Geology, Inc.

WEATHER CONDITIONS— Sunny

SURFACE CONDITIONS— Base of slope, adjacent to Cielo Drive.

JH— 2348

DATE— 12/17/96

CONSULTANT— Jeffrey Holt, M.G.I.

METHOD— Hand-labor

DOWNHOLE OBSERVATION BY— Geologist

SHORING— None

DEPTH	***EARTH MATERIALS***	***DESCRIPTION***
0-3.5'	***COLLUVIUM***	*Sandy gravel: moderate brown, moist, loose, incoherent, abundant randomly oriented bedrock clasts*
3.5'-5.5'	***LANDSLIDE DEBRIS***	*Sandy gravel with clay binder: dark yellowish brown, moist, loose to medium dense, abundant bedrock clasts, 2" thick zone of highly fractured bedrock with clay binder @ 5.5'*
5.5'-7'	***BEDROCK***	*Slate: dark gray to yellowish orange, moderately fractured, moderately weathered, hard to very hard*

End at 7'
No water
No caving
Underground gas line @ 4'

APPENDIX B

SEISMIC ANALYSIS DATA OUTPUT

E Q F A U L T

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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: LP 1174

DATE: 11-20-2014

JOB NAME: PEREZ

CALCULATION NAME: PEREZ

FAULT-DATA-FILE NAME: CDMGFLTE.DAT

SITE COORDINATES:
SITE LATITUDE: 34.0959
SITE LONGITUDE: 118.4342

SEARCH RADIUS: 50 mi

ATTENUATION RELATION: 9) Bozorgnia Campbell Niazi (1999) Hor.-Hard Rock-Uncor.
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
DISTANCE MEASURE: cdist
SCOND: 1
Basement Depth: 5.00 km Campbell SSR: 0 Campbell SHR: 1

COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: CDMGFLTE.DAT

MINIMUM DEPTH VALUE (km): 3.0

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
ANACAPA-DUME	16.8(27.0)	7.3	0.211	VIII
CHANNEL IS. THRUST (Eastern)	47.8(77.0)	7.4	0.071	VI
CHINO-CENTRAL AVE. (Elsinore)	37.7(60.6)	6.7	0.049	VI
CLAMSHELL-SAWPIT	24.7(39.7)	6.5	0.072	VI
COMPTON THRUST	11.7(18.8)	6.8	0.255	IX
CUCAMONGA	39.0(62.7)	7.0	0.060	VI
ELSINORE-GLEN IVY	48.6(78.2)	6.8	0.032	V
ELYSIAN PARK THRUST	14.4(23.2)	6.7	0.186	VIII
HOLLYWOOD	2.3(3.7)	6.4	0.627	X
HOLSER	21.9(35.2)	6.5	0.084	VII
MALIBU COAST	7.1(11.5)	6.7	0.348	IX
MONTALVO-OAK RIDGE TREND	49.5(79.6)	6.6	0.036	V
NEWPORT-INGLEWOOD (L.A.Basin)	5.9(9.5)	6.9	0.377	IX
NEWPORT-INGLEWOOD (Offshore)	45.9(73.8)	6.9	0.037	V
NORTHRIDGE (E. Oak Ridge)	11.2(18.0)	6.9	0.286	IX
OAK RIDGE (Onshore)	25.5(41.0)	6.9	0.095	VII
OAK RIDGE(Blind Thrust Offshore)	46.3(74.5)	6.9	0.050	VI
PALOS VERDES	11.2(18.1)	7.1	0.238	IX
RAYMOND	12.4(20.0)	6.5	0.169	VIII
SAN ANDREAS - 1857 Rupture	36.4(58.5)	7.8	0.102	VII
SAN ANDREAS - Carrizo	42.0(67.6)	7.2	0.053	VI
SAN ANDREAS - Mojave	36.4(58.5)	7.1	0.059	VI
SAN CAYETANO	31.2(50.2)	6.8	0.068	VI
SAN GABRIEL	17.8(28.6)	7.0	0.133	VIII
SAN JOSE	31.6(50.8)	6.5	0.052	VI
SANTA MONICA	2.2(3.5)	6.6	0.660	XI
SANTA SUSANA	17.0(27.3)	6.6	0.125	VII
SANTA YNEZ (East)	42.8(68.8)	7.0	0.044	VI
SIERRA MADRE	16.1(25.9)	7.0	0.179	VIII
SIERRA MADRE (San Fernando)	15.5(25.0)	6.7	0.150	VIII
SIMI-SANTA ROSA	25.4(40.9)	6.7	0.081	VII
VENTURA - PITAS POINT	44.3(71.3)	6.8	0.043	VI
VERDUGO	11.6(18.7)	6.7	0.211	VIII
WHITTIER	25.0(40.3)	6.8	0.075	VII

-END OF SEARCH-

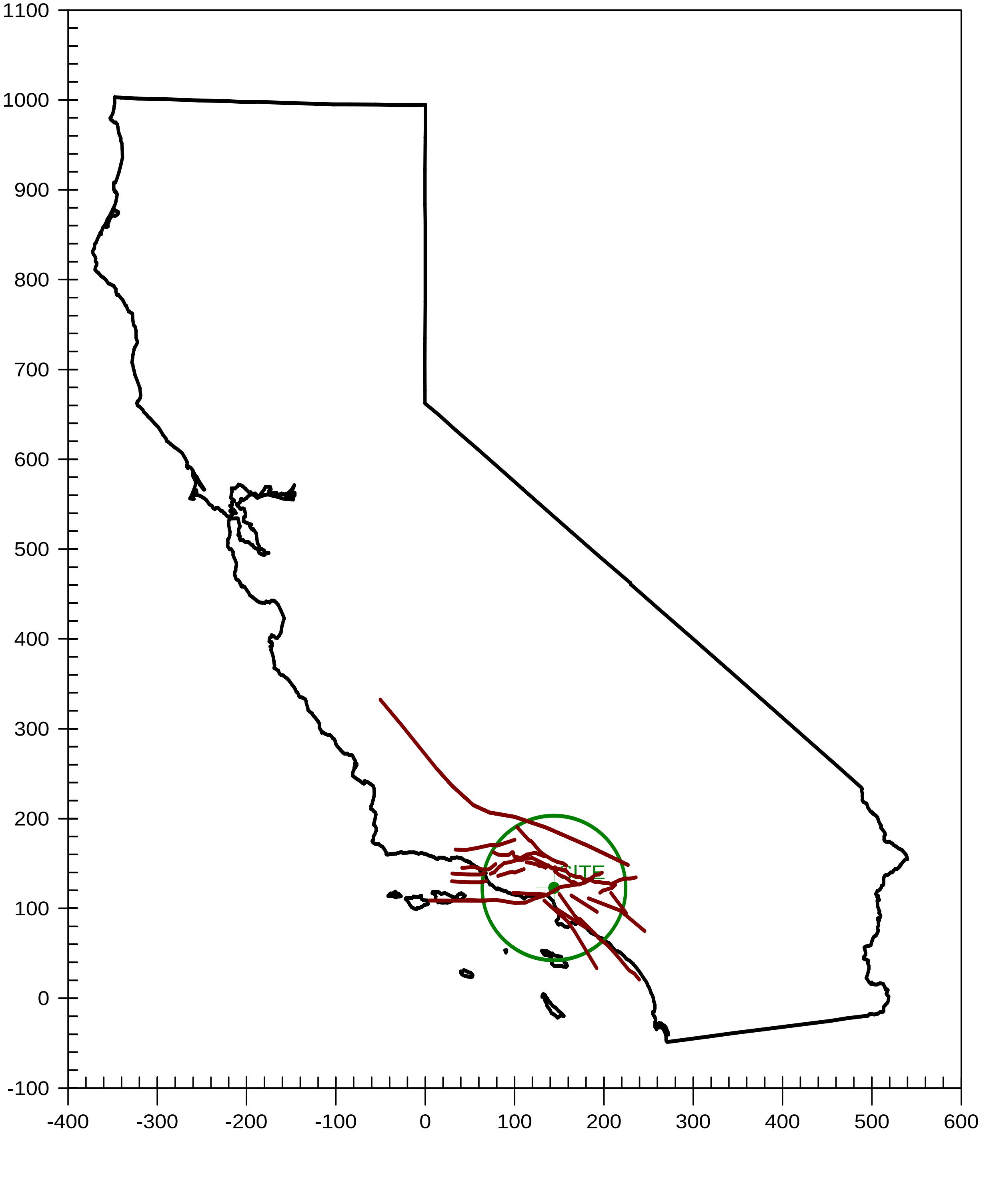
34 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE SANTA MONICA FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 2.2 MILES (3.5 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.6603 g

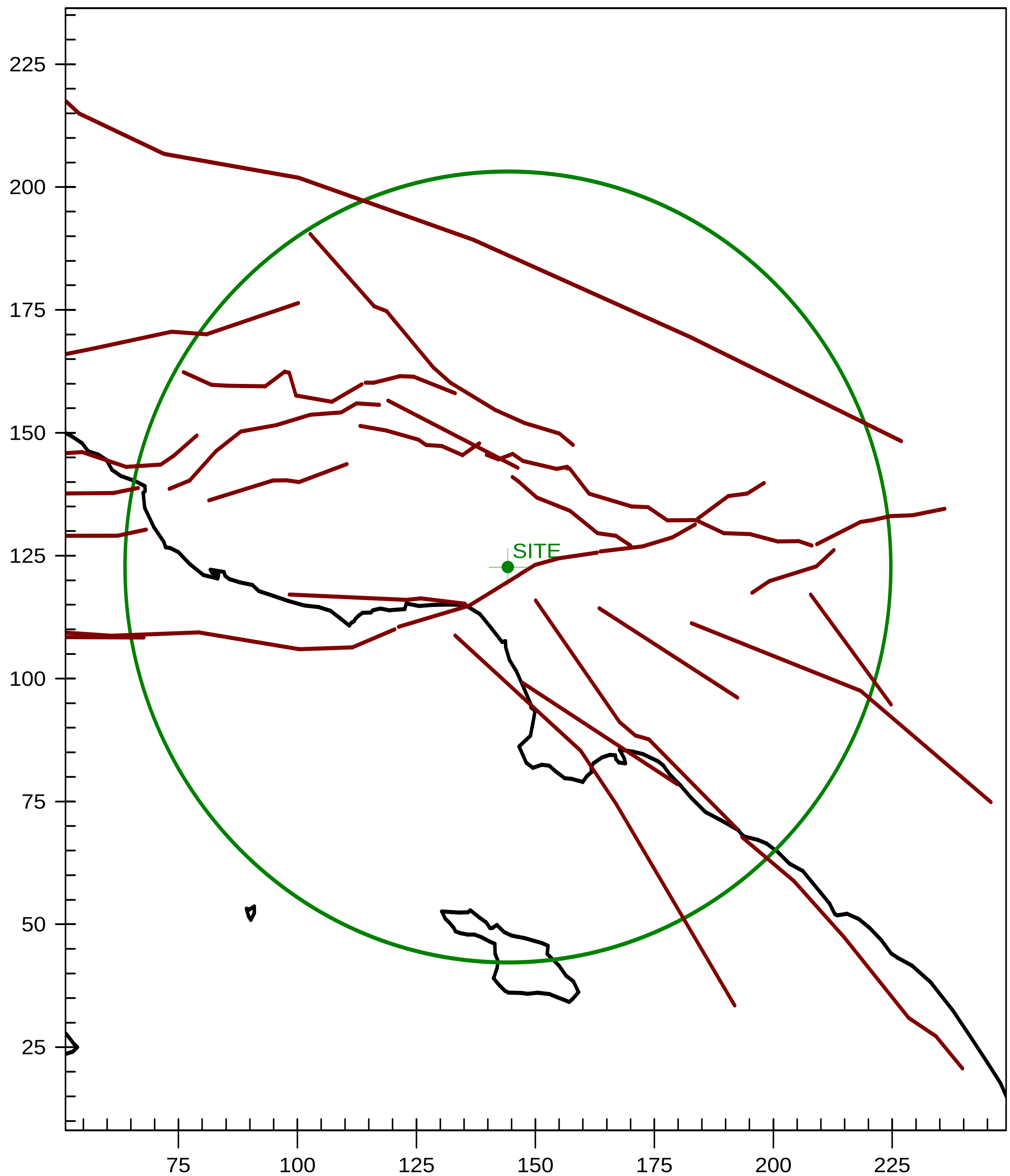
CALIFORNIA FAULT MAP

PEREZ



CALIFORNIA FAULT MAP

PEREZ



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ESTIMATION OF PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: LP 1174

DATE: 11-20-2014

JOB NAME: PEREZ

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

SITE COORDINATES:
SITE LATITUDE: 34.0959
SITE LONGITUDE: 118.4342

SEARCH DATES:
START DATE: 1914
END DATE: 2014

SEARCH RADIUS:
50.0 mi
80.5 km

ATTENUATION RELATION: 9) Bozorgnia Campbell Niazi (1999) Hor.-Hard Rock-Uncor.

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: 1 Depth Source: A
Basement Depth: 5.00 km Campbell SSR: 0 Campbell SHR: 1

COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 3.0

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]
MGI	34.2000	119.2000	06/16/1914	1052 0.0	0.0	4.60	0.007	II	44.3(71.4)
DMG	34.0000	118.5000	11/08/1914	1140 0.0	0.0	4.50	0.055	VI	7.6(12.2)
MGI	33.8000	118.5000	06/18/1915	15 5 0.0	0.0	4.00	0.012	III	20.8(33.4)
MGI	34.1000	118.2000	05/02/1916	1432 0.0	0.0	4.00	0.020	IV	13.4(21.5)
MGI	34.0000	118.2000	02/13/1917	13 5 0.0	0.0	4.60	0.029	V	14.9(24.0)
T-A	34.4200	118.9200	03/29/1917	8 6 0.0	0.0	4.30	0.007	II	35.6(57.3)
MGI	33.8000	117.8000	05/19/1917	635 0.0	0.0	4.00	0.005	II	41.7(67.1)
MGI	33.8000	117.8000	05/19/1917	719 0.0	0.0	4.00	0.005	II	41.7(67.1)
MGI	33.8000	117.8000	05/20/1917	945 0.0	0.0	4.00	0.005	II	41.7(67.1)
MGI	34.0000	118.2000	06/26/1917	424 0.0	0.0	4.00	0.018	IV	14.9(24.0)
MGI	34.0000	118.2000	06/26/1917	2115 0.0	0.0	4.60	0.029	V	14.9(24.0)
MGI	34.0000	118.2000	06/26/1917	2120 0.0	0.0	4.60	0.029	V	14.9(24.0)
MGI	34.0000	118.2000	06/26/1917	2130 0.0	0.0	4.60	0.029	V	14.9(24.0)
DMG	34.0000	118.5000	03/06/1918	1820 0.0	0.0	4.00	0.037	V	7.6(12.2)
MGI	34.0000	118.5000	03/08/1918	1230 0.0	0.0	4.00	0.037	V	7.6(12.2)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.082	VII	7.6(12.2)
MGI	34.0000	118.4000	02/22/1920	1610 0.0	0.0	4.60	0.065	VI	6.9(11.1)
DMG	33.5000	118.2500	06/18/1920	10 8 0.0	0.0	4.50	0.007	II	42.5(68.4)
DMG	34.0000	118.5000	06/22/1920	248 0.0	0.0	4.90	0.076	VII	7.6(12.2)
MGI	34.0000	118.3000	06/22/1920	2035 0.0	0.0	4.00	0.028	V	10.1(16.3)
MGI	34.0000	118.5000	06/23/1920	1220 0.0	0.0	4.00	0.037	V	7.6(12.2)
MGI	34.0000	118.3000	06/30/1920	350 0.0	0.0	4.00	0.028	V	10.1(16.3)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.062	VI	10.0(16.1)
MGI	34.1000	118.3000	07/16/1920	2022 0.0	0.0	4.60	0.059	VI	7.7(12.3)
MGI	34.1000	118.3000	07/16/1920	2127 0.0	0.0	4.60	0.059	VI	7.7(12.3)
MGI	34.1000	118.3000	07/16/1920	2130 0.0	0.0	4.60	0.059	VI	7.7(12.3)
MGI	34.1000	118.3000	07/26/1920	1215 0.0	0.0	4.00	0.037	V	7.7(12.3)
MGI	34.2000	118.0000	01/09/1921	530 0.0	0.0	4.60	0.014	IV	25.8(41.6)
MGI	34.1000	118.2000	04/21/1921	1538 0.0	0.0	4.00	0.020	IV	13.4(21.5)
MGI	33.8000	117.8000	11/04/1926	2238 0.0	0.0	4.60	0.008	II	41.7(67.1)
MGI	33.8000	117.8000	11/07/1926	1948 0.0	0.0	4.60	0.008	II	41.7(67.1)
MGI	33.8000	117.8000	11/09/1926	1535 0.0	0.0	4.60	0.008	II	41.7(67.1)
MGI	33.8000	117.8000	11/10/1926	1723 0.0	0.0	4.60	0.008	II	41.7(67.1)
MGI	34.0000	118.4000	01/29/1927	2324 0.0	0.0	4.00	0.041	V	6.9(11.1)
MGI	34.0000	118.4000	02/07/1927	429 0.0	0.0	4.60	0.065	VI	6.9(11.1)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.082	VII	7.6(12.2)
MGI	33.9000	118.2000	10/08/1927	1914 0.0	0.0	4.60	0.021	IV	19.0(30.6)
MGI	33.8000	118.3000	12/31/1928	1045 0.0	0.0	4.00	0.011	III	21.8(35.1)
MGI	34.0000	118.0000	05/05/1929	1 7 0.0	0.0	4.60	0.015	IV	25.7(41.4)
MGI	34.0000	118.0000	05/05/1929	735 0.0	0.0	4.00	0.009	III	25.7(41.4)
DMG	33.9000	118.1000	07/08/1929	1646 6.7	13.0	4.70	0.018	IV	23.4(37.7)
DMG	33.6300	118.2000	09/13/1929	132338.2	0.0	4.00	0.006	II	34.9(56.1)
MGI	34.0000	117.7000	12/03/1929	9 5 0.0	0.0	4.00	0.005	II	42.5(68.4)
MGI	34.1000	118.0000	01/27/1930	2026 0.0	0.0	4.60	0.015	IV	24.8(39.9)
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.046	VI	15.1(24.4)
MGI	34.0000	118.4000	10/01/1930	040 0.0	0.0	4.60	0.065	VI	6.9(11.1)
DMG	34.1000	117.8000	03/31/1931	2033 0.0	0.0	4.00	0.006	II	36.3(58.3)
DMG	33.7700	118.4800	04/24/1931	182754.8	0.0	4.40	0.015	IV	22.6(36.4)
DMG	33.8000	118.3000	11/03/1931	16 5 0.0	0.0	4.00	0.011	III	21.8(35.1)

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]
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.030	V	42.6(68.5)
DMG	33.7500	118.0830	03/11/1933	2 4 0.0	0.0	4.90	0.014	IV	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	2 5 0.0	0.0	4.30	0.009	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.016	IV	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	210 0.0	0.0	4.60	0.011	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	211 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	216 0.0	0.0	4.80	0.013	III	31.2(50.2)
DMG	33.6000	118.0000	03/11/1933	217 0.0	0.0	4.50	0.007	II	42.3(68.1)
DMG	33.7500	118.0830	03/11/1933	222 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	227 0.0	0.0	4.60	0.011	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.017	IV	31.2(50.2)
DMG	33.6000	118.0000	03/11/1933	231 0.0	0.0	4.40	0.007	II	42.3(68.1)
DMG	33.7500	118.0830	03/11/1933	252 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	257 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	258 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	259 0.0	0.0	4.60	0.011	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	3 5 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	3 9 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	311 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.016	IV	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	336 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	339 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	347 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	436 0.0	0.0	4.60	0.011	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	439 0.0	0.0	4.90	0.014	IV	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	440 0.0	0.0	4.70	0.012	III	31.2(50.2)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.015	IV	34.5(55.5)
DMG	33.7500	118.0830	03/11/1933	513 0.0	0.0	4.70	0.012	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	515 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.012	III	44.3(71.3)
DMG	33.7500	118.0830	03/11/1933	521 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	524 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	553 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	555 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	611 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	618 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.8500	118.2670	03/11/1933	629 0.0	0.0	4.40	0.018	IV	19.5(31.4)
DMG	33.7500	118.0830	03/11/1933	635 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.020	IV	36.0(58.0)
DMG	33.7500	118.0830	03/11/1933	751 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	759 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	8 8 0.0	0.0	4.50	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	832 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	837 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.015	IV	34.5(55.5)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.017	IV	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	911 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	926 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	1025 0.0	0.0	4.00	0.007	II	31.2(50.2)

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	1045 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	11 0 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.1330	03/11/1933	11 4 0.0	0.0	4.60	0.012	III	29.5(47.4)
DMG	33.7500	118.0830	03/11/1933	1129 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	1138 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	1141 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	1147 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.6830	118.0500	03/11/1933	1250 0.0	0.0	4.40	0.008	III	36.0(58.0)
DMG	33.7330	118.1000	03/11/1933	1350 0.0	0.0	4.40	0.010	III	31.5(50.7)
DMG	33.7500	118.0830	03/11/1933	1357 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.029	V	19.5(31.4)
DMG	33.7330	118.1000	03/11/1933	1447 0.0	0.0	4.40	0.010	III	31.5(50.7)
DMG	33.8830	118.3170	03/11/1933	1457 0.0	0.0	4.90	0.033	V	16.2(26.0)
DMG	33.7330	118.1000	03/11/1933	15 9 0.0	0.0	4.40	0.010	III	31.5(50.7)
DMG	33.7500	118.0830	03/11/1933	1547 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	1653 0.0	0.0	4.80	0.013	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	1944 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	1956 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	22 0 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	2231 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	2232 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	2240 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/11/1933	23 5 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	027 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	034 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	448 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	546 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	6 1 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	616 0.0	0.0	4.60	0.011	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	740 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	835 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	15 2 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	1651 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	1738 0.0	0.0	4.50	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	1825 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	2128 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/12/1933	2354 0.0	0.0	4.50	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/13/1933	343 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/13/1933	432 0.0	0.0	4.70	0.012	III	31.2(50.2)
DMG	33.7500	118.0830	03/13/1933	617 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.020	IV	31.2(50.2)
DMG	33.7500	118.0830	03/13/1933	1532 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/13/1933	1929 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/14/1933	036 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/14/1933	1219 0.0	0.0	4.50	0.010	III	31.2(50.2)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.012	III	40.8(65.7)
DMG	33.7500	118.0830	03/14/1933	2242 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/15/1933	2 8 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/15/1933	432 0.0	0.0	4.10	0.008	II	31.2(50.2)

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	03/15/1933	540 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.6170	118.0170	03/15/1933	111332.0	0.0	4.90	0.010	III	40.8(65.7)
DMG	33.7500	118.0830	03/16/1933	1456 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	03/16/1933	1529 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/16/1933	1530 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/17/1933	1651 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/18/1933	2052 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/19/1933	2123 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	03/20/1933	1358 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/21/1933	326 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/23/1933	840 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/23/1933	1831 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/25/1933	1346 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	03/30/1933	1225 0.0	0.0	4.40	0.010	III	31.2(50.2)
DMG	33.7500	118.0830	03/31/1933	1049 0.0	0.0	4.10	0.008	II	31.2(50.2)
DMG	33.7500	118.0830	04/01/1933	642 0.0	0.0	4.20	0.008	III	31.2(50.2)
DMG	33.7500	118.0830	04/02/1933	8 0 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.0830	04/02/1933	1536 0.0	0.0	4.00	0.007	II	31.2(50.2)
DMG	33.7500	118.1670	05/16/1933	205855.0	0.0	4.00	0.008	II	28.4(45.6)
DMG	33.7500	118.1830	08/04/1933	41748.0	0.0	4.00	0.008	III	27.9(44.9)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.025	V	27.6(44.5)
DMG	33.6170	118.0170	10/02/1933	1326 1.0	0.0	4.00	0.005	II	40.8(65.7)
DMG	33.9500	118.1330	10/25/1933	7 046.0	0.0	4.30	0.016	IV	20.0(32.1)
DMG	33.8670	118.2000	11/13/1933	2128 0.0	0.0	4.00	0.012	III	20.7(33.3)
DMG	33.7830	118.1330	11/20/1933	1032 0.0	0.0	4.00	0.008	III	27.6(44.5)
DMG	34.1000	117.6830	01/09/1934	1410 0.0	0.0	4.50	0.007	II	42.9(69.1)
DMG	34.1000	117.6830	01/18/1934	214 0.0	0.0	4.00	0.005	II	42.9(69.1)
DMG	33.6170	118.1170	01/20/1934	2117 0.0	0.0	4.50	0.008	III	37.7(60.7)
DMG	33.5670	117.9830	04/17/1934	1833 0.0	0.0	4.00	0.004	I	44.8(72.0)
DMG	33.6330	118.4000	10/17/1934	938 0.0	0.0	4.00	0.007	II	32.0(51.5)
DMG	33.7500	118.0000	11/16/1934	2126 0.0	0.0	4.00	0.006	II	34.5(55.5)
DMG	34.2000	117.9000	07/13/1935	105416.5	0.0	4.70	0.012	III	31.4(50.5)
DMG	33.6000	118.0170	12/25/1935	1715 0.0	0.0	4.50	0.007	II	41.8(67.2)
DMG	33.7670	117.8170	08/22/1936	521 0.0	0.0	4.00	0.005	II	42.0(67.6)
DMG	34.3800	118.6230	10/29/1936	223536.1	10.0	4.00	0.011	III	22.4(36.0)
DMG	33.5610	118.0580	01/15/1937	183547.0	10.0	4.00	0.005	II	42.8(68.8)
DMG	33.5670	117.9830	07/07/1937	1112 0.0	0.0	4.00	0.004	I	44.8(72.0)
DMG	33.6170	118.0330	05/21/1938	944 0.0	0.0	4.00	0.005	II	40.3(64.8)
DMG	33.7590	118.2530	08/31/1938	31814.2	10.0	4.50	0.014	III	25.5(41.0)
DMG	33.9030	118.4310	11/29/1938	192115.8	10.0	4.00	0.020	IV	13.3(21.4)
DMG	34.0000	118.4170	12/07/1938	338 0.0	0.0	4.00	0.042	VI	6.7(10.8)
DMG	33.7670	118.1170	11/04/1939	2141 0.0	0.0	4.00	0.008	II	29.1(46.8)
DMG	33.7830	118.2000	12/27/1939	192849.0	0.0	4.70	0.016	IV	25.4(40.9)
DMG	33.7830	118.1330	01/13/1940	749 7.0	0.0	4.00	0.008	III	27.6(44.5)
DMG	33.7000	118.0670	02/08/1940	165617.0	0.0	4.00	0.006	II	34.5(55.5)
DMG	33.9830	118.3000	02/11/1940	192410.0	0.0	4.00	0.025	V	10.9(17.6)
DMG	34.6000	118.9000	05/18/1940	91512.0	0.0	4.00	0.004	I	43.8(70.4)
DMG	33.7000	118.0670	07/20/1940	4 113.0	0.0	4.00	0.006	II	34.5(55.5)
DMG	33.7670	118.4500	10/11/1940	55712.3	0.0	4.70	0.018	IV	22.7(36.6)

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	33.7830	118.4170	10/12/1940	024 0.0	0.0	4.00	0.011	III	21.6(34.8)
DMG	33.7830	118.4170	10/14/1940	205111.0	0.0	4.00	0.011	III	21.6(34.8)
DMG	33.7830	118.4170	11/01/1940	725 3.0	0.0	4.00	0.011	III	21.6(34.8)
DMG	33.6330	118.2000	11/01/1940	20 046.0	0.0	4.00	0.006	II	34.7(55.8)
DMG	33.7830	118.4170	11/02/1940	25826.0	0.0	4.00	0.011	III	21.6(34.8)
DMG	33.9670	118.0500	01/30/1941	13446.9	0.0	4.10	0.011	III	23.7(38.2)
DMG	33.5170	118.1000	03/22/1941	82240.0	0.0	4.00	0.004	I	44.3(71.3)
DMG	33.9500	117.5830	04/11/1941	12024.0	0.0	4.00	0.004	I	49.7(80.0)
DMG	33.8170	118.2170	10/22/1941	65718.5	0.0	4.90	0.021	IV	22.9(36.9)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.030	V	24.0(38.7)
DMG	34.4830	118.9830	09/03/1942	14 6 1.0	0.0	4.50	0.007	II	41.2(66.2)
DMG	34.4830	118.9830	09/04/1942	63433.0	0.0	4.50	0.007	II	41.2(66.2)
DMG	33.8670	118.2170	06/19/1944	0 333.0	0.0	4.50	0.018	IV	20.1(32.4)
DMG	33.8670	118.2170	06/19/1944	3 6 7.0	0.0	4.40	0.017	IV	20.1(32.4)
DMG	34.4000	117.8000	02/24/1946	6 752.0	0.0	4.10	0.005	II	41.8(67.3)
DMG	34.4170	118.8330	06/01/1946	11 631.0	0.0	4.10	0.007	II	31.8(51.1)
DMG	34.0170	118.9670	04/16/1948	222624.0	0.0	4.70	0.012	III	31.0(49.8)
DMG	34.1830	117.5830	10/03/1948	24628.0	0.0	4.00	0.004	I	49.0(78.9)
DMG	33.9390	118.2050	01/11/1950	214135.0	0.4	4.10	0.016	IV	17.0(27.4)
DMG	34.6670	118.8330	01/24/1950	215659.0	0.0	4.00	0.004	I	45.5(73.2)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.015	IV	32.2(51.8)
DMG	34.5000	119.1170	11/17/1954	23 351.0	0.0	4.40	0.006	II	47.9(77.1)
DMG	33.9900	119.0580	05/29/1955	164335.4	17.4	4.10	0.006	II	36.4(58.6)
DMG	34.5290	118.6440	02/07/1956	21656.5	16.0	4.20	0.008	II	32.2(51.8)
DMG	34.5860	118.6130	02/07/1956	31638.6	2.6	4.60	0.010	III	35.3(56.9)
DMG	34.1180	119.2200	03/18/1957	185628.0	13.8	4.70	0.008	II	44.9(72.3)
DMG	33.8540	117.7520	10/04/1961	22131.6	4.3	4.10	0.005	II	42.5(68.4)
DMG	33.6540	117.9940	10/20/1961	194950.5	4.6	4.30	0.007	II	39.6(63.7)
DMG	33.6590	117.9810	10/20/1961	20 714.5	6.1	4.00	0.005	II	39.8(64.1)
DMG	33.6650	117.9790	10/20/1961	214240.7	7.2	4.00	0.005	II	39.6(63.7)
DMG	33.6710	118.0120	10/20/1961	223534.2	5.6	4.10	0.006	II	38.0(61.2)
DMG	33.6800	117.9930	11/20/1961	85334.7	4.4	4.00	0.005	II	38.3(61.6)
DMG	33.5430	118.3400	09/14/1963	35116.2	2.2	4.20	0.006	II	38.6(62.0)
DMG	34.2680	118.4450	08/30/1964	225737.1	15.4	4.00	0.023	IV	11.9(19.1)
DMG	34.4850	118.5210	07/16/1965	74622.4	15.1	4.00	0.008	III	27.3(44.0)
DMG	33.6320	118.4670	01/08/1967	73730.4	11.4	4.00	0.007	II	32.1(51.6)
DMG	33.6630	118.4130	01/08/1967	738 5.3	17.7	4.00	0.007	II	29.9(48.1)
DMG	33.9960	117.9750	06/15/1967	458 5.5	10.0	4.10	0.009	III	27.2(43.7)
DMG	34.5650	118.1130	02/28/1969	45612.4	5.3	4.30	0.007	II	37.2(59.9)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.078	VII	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.048	VI	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 133.0	8.0	4.20	0.013	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 140.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 150.0	8.0	4.50	0.017	IV	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 154.0	8.0	4.20	0.013	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 159.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 2 3.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 230.0	8.0	4.30	0.014	IV	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 231.0	8.0	4.70	0.019	IV	21.8(35.1)

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]
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.048	VI	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 325.0	8.0	4.40	0.015	IV	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 346.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 4 7.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 434.0	8.0	4.20	0.013	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 439.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 444.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 446.0	8.0	4.20	0.013	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 541.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 550.0	8.0	4.10	0.012	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 710.0	8.0	4.00	0.011	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 730.0	8.0	4.00	0.011	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 745.0	8.0	4.50	0.017	IV	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 8 4.0	8.0	4.00	0.011	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 8 7.0	8.0	4.20	0.013	III	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 838.0	8.0	4.50	0.017	IV	21.8(35.1)
DMG	34.4110	118.4010	02/09/1971	14 853.0	8.0	4.60	0.018	IV	21.8(35.1)
DMG	34.3610	118.3060	02/09/1971	141021.5	5.0	4.70	0.022	IV	19.7(31.7)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.032	V	21.8(35.1)
DMG	34.3390	118.3320	02/09/1971	141612.9	11.1	4.10	0.015	IV	17.8(28.6)
DMG	34.3570	118.4060	02/09/1971	141950.2	11.8	4.00	0.014	IV	18.1(29.1)
DMG	34.3440	118.6360	02/09/1971	143436.1	-2.0	4.90	0.024	V	20.6(33.2)
DMG	34.3870	118.3640	02/09/1971	143917.8	-1.6	4.00	0.012	III	20.5(33.0)
DMG	34.4330	118.3980	02/09/1971	144017.4	-2.0	4.10	0.011	III	23.4(37.6)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.048	VI	14.7(23.6)
DMG	34.3350	118.3310	02/09/1971	155820.7	14.2	4.80	0.028	V	17.5(28.2)
DMG	34.4570	118.4270	02/09/1971	161926.5	-1.0	4.20	0.011	III	24.9(40.1)
DMG	34.3700	118.3020	02/10/1971	31212.0	0.8	4.00	0.012	III	20.4(32.8)
DMG	34.4110	118.3290	02/10/1971	5 636.0	4.7	4.30	0.013	III	22.6(36.3)
DMG	34.4260	118.4140	02/10/1971	518 7.2	5.8	4.50	0.016	IV	22.8(36.7)
DMG	34.3840	118.4550	02/10/1971	113134.6	6.0	4.20	0.015	IV	19.9(32.1)
DMG	34.3990	118.4190	02/10/1971	134953.7	9.7	4.30	0.015	IV	20.9(33.7)
DMG	34.3610	118.4870	02/10/1971	143526.7	4.4	4.20	0.016	IV	18.5(29.8)
DMG	34.3960	118.3660	02/10/1971	173855.1	6.2	4.20	0.014	III	21.1(33.9)
DMG	34.4460	118.4360	02/10/1971	185441.7	8.1	4.20	0.011	III	24.2(38.9)
DMG	34.3970	118.4390	02/21/1971	55052.6	6.9	4.70	0.021	IV	20.8(33.5)
DMG	34.3920	118.4270	02/21/1971	71511.7	7.2	4.50	0.018	IV	20.4(32.9)
DMG	34.3530	118.4560	03/07/1971	13340.5	3.3	4.50	0.021	IV	17.8(28.6)
DMG	34.3560	118.4740	03/25/1971	2254 9.9	4.6	4.20	0.016	IV	18.1(29.1)
DMG	34.2960	118.4640	03/30/1971	85443.3	2.6	4.10	0.021	IV	13.9(22.4)
DMG	34.2860	118.5150	03/31/1971	145222.5	2.1	4.60	0.031	V	13.9(22.4)
DMG	34.4280	118.4130	04/01/1971	15 3 3.6	8.0	4.10	0.011	III	23.0(36.9)
DMG	34.2840	118.5280	04/02/1971	54025.0	3.0	4.00	0.019	IV	14.0(22.6)
DMG	34.2650	118.5770	04/15/1971	111432.0	4.2	4.20	0.022	IV	14.2(22.9)
DMG	34.3680	118.3140	04/25/1971	1448 6.5	-2.0	4.00	0.012	III	20.0(32.2)
DMG	34.2730	118.5320	06/21/1971	16 1 8.5	4.1	4.00	0.020	IV	13.4(21.6)
DMG	34.0650	119.0350	02/21/1973	144557.3	8.0	5.90	0.029	V	34.4(55.4)
DMG	34.3990	118.4730	03/09/1974	05431.9	24.4	4.70	0.020	IV	21.0(33.9)
DMG	34.4310	118.3690	08/14/1974	144555.2	8.2	4.20	0.012	III	23.4(37.7)

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	33.9650	117.8860	01/01/1976	172012.9	6.2	4.20	0.008	II	32.6(52.5)
PAS	34.3470	118.6560	04/08/1976	152138.1	14.5	4.60	0.018	IV	21.5(34.5)
PAS	34.3800	118.4590	08/12/1977	21926.1	9.5	4.50	0.019	IV	19.7(31.6)
PAS	34.4630	118.4090	09/24/1977	212824.3	5.0	4.20	0.011	III	25.4(40.8)
PAS	33.9060	119.1660	05/23/1978	91650.8	6.0	4.00	0.004	I	43.9(70.6)
PAS	33.9440	118.6810	01/01/1979	231438.9	11.3	5.00	0.032	V	17.6(28.3)
PAS	33.9330	118.6690	10/17/1979	205237.3	5.5	4.20	0.017	IV	17.5(28.2)
PAS	33.6710	119.1110	09/04/1981	155050.3	5.0	5.30	0.011	III	48.6(78.3)
PAS	33.6300	119.0200	10/23/1981	172816.9	12.0	4.60	0.007	II	46.5(74.8)
PAS	33.6370	119.0560	10/23/1981	191552.5	6.3	4.60	0.007	II	47.7(76.7)
PAS	34.0540	118.9640	04/13/1982	11 212.2	16.6	4.00	0.007	II	30.4(49.0)
PAS	33.5380	118.2070	05/25/1982	134430.3	13.7	4.10	0.005	II	40.7(65.4)
PAS	33.4710	118.0610	02/27/1984	101815.0	6.0	4.00	0.004	I	48.2(77.5)
PAS	34.5410	118.9890	06/12/1984	02752.4	11.7	4.10	0.005	II	44.1(71.0)
PAS	34.0160	118.9880	10/26/1984	172043.5	13.3	4.60	0.011	III	32.2(51.7)
PAS	34.3780	119.0350	04/03/1985	4 449.8	27.9	4.00	0.005	II	39.4(63.5)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.056	VI	20.5(32.9)
PAS	34.0490	118.1010	10/01/1987	144541.5	13.6	4.70	0.023	IV	19.3(31.1)
PAS	34.0760	118.0900	10/01/1987	1448 3.1	11.7	4.10	0.014	III	19.7(31.7)
PAS	34.0600	118.1000	10/01/1987	1449 5.9	11.7	4.70	0.023	IV	19.3(31.0)
PAS	34.0520	118.0900	10/01/1987	151231.8	10.8	4.70	0.022	IV	19.9(32.0)
PAS	34.0500	118.0870	10/01/1987	155953.5	10.4	4.00	0.012	III	20.1(32.4)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.037	V	19.3(31.0)
PAS	34.0770	118.0470	02/11/1988	152555.7	12.5	4.70	0.019	IV	22.2(35.7)
PAS	34.1360	117.7090	06/26/1988	15 458.5	7.9	4.60	0.008	II	41.5(66.9)
PAS	33.5080	118.0710	11/20/1988	53928.7	6.0	4.50	0.006	II	45.6(73.4)
PAS	34.1490	118.1350	12/03/1988	113826.4	13.3	4.90	0.030	V	17.5(28.1)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.035	V	16.5(26.5)
PAS	34.0060	117.7390	02/18/1989	717 4.8	3.3	4.30	0.006	II	40.2(64.8)
GSP	33.6200	117.9000	04/07/1989	200730.2	13.0	4.50	0.007	II	44.9(72.3)
GSP	34.0300	118.1800	06/12/1989	165718.4	16.0	4.40	0.024	IV	15.2(24.5)
GSP	34.0200	118.1800	06/12/1989	172225.5	16.0	4.10	0.018	IV	15.5(24.9)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.013	III	42.1(67.7)
GSP	34.1300	117.7000	03/01/1990	003457.1	4.0	4.00	0.005	II	42.0(67.6)
GSP	34.1500	117.7200	03/01/1990	032303.0	11.0	4.70	0.009	III	41.0(66.0)
GSP	34.1400	117.6900	03/02/1990	172625.4	6.0	4.60	0.008	II	42.6(68.6)
GSP	34.1100	117.7200	04/17/1990	223227.2	4.0	4.60	0.008	III	40.8(65.7)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.026	V	27.2(43.8)
GSP	34.2500	117.9900	06/28/1991	170055.5	9.0	4.30	0.010	III	27.5(44.3)
GSP	34.5000	118.5600	07/05/1991	174157.1	11.0	4.10	0.008	III	28.8(46.4)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.244	IX	10.0(16.1)
GSP	34.2610	118.5340	01/17/1994	123939.8	14.0	4.50	0.032	V	12.7(20.5)
GSP	34.2690	118.5760	01/17/1994	125546.8	16.0	4.10	0.020	IV	14.4(23.2)
GSP	34.2540	118.5450	01/17/1994	130627.9	0.0	4.60	0.035	V	12.6(20.3)
GSP	34.3170	118.4550	01/17/1994	132644.7	2.0	4.70	0.030	V	15.3(24.6)
GSB	34.2850	118.6240	01/17/1994	135602.4	19.0	4.70	0.027	V	17.0(27.3)
GSP	34.3310	118.4420	01/17/1994	141430.3	1.0	4.50	0.024	IV	16.2(26.1)
GSP	34.3040	118.4730	01/17/1994	150703.2	2.0	4.20	0.021	IV	14.5(23.4)
GSP	34.3740	118.6220	01/17/1994	155410.8	12.0	4.80	0.021	IV	22.0(35.4)

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	34.2280	118.5730	01/17/1994	175608.2	19.0	4.60	0.037	V	12.1(19.4)
GSP	34.3110	118.4560	01/17/1994	193534.3	2.0	4.00	0.018	IV	14.9(24.0)
GSP	34.3680	118.6370	01/17/1994	194353.4	13.0	4.10	0.012	III	22.1(35.5)
GSG	34.4080	118.5590	01/17/1994	200205.4	0.0	4.00	0.010	III	22.7(36.5)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.043	VI	16.0(25.8)
GSG	34.3040	118.7220	01/17/1994	221922.3	10.0	4.00	0.011	III	21.8(35.1)
GSG	34.3340	118.4840	01/17/1994	223152.1	10.0	4.20	0.018	IV	16.7(26.8)
GSP	34.3260	118.6980	01/17/1994	233330.7	9.0	5.60	0.040	V	21.9(35.2)
GSB	34.3430	118.6660	01/17/1994	234925.4	8.0	4.30	0.014	IV	21.6(34.7)
GSP	34.3790	118.5630	01/18/1994	003935.0	7.0	4.40	0.016	IV	20.9(33.6)
GSP	34.3770	118.6980	01/18/1994	004308.9	11.0	5.20	0.025	V	24.6(39.5)
GSB	34.3580	118.6220	01/18/1994	040126.8	1.0	4.50	0.017	IV	21.0(33.8)
GSB	34.3330	118.6230	01/18/1994	072356.0	14.0	4.30	0.016	IV	19.6(31.5)
GSP	34.2180	118.6070	01/18/1994	113509.9	12.0	4.20	0.024	V	13.0(20.9)
GSB	34.3190	118.5580	01/18/1994	132444.1	1.0	4.50	0.023	IV	16.9(27.3)
GSP	34.3790	118.5610	01/18/1994	152346.9	7.0	4.80	0.022	IV	20.8(33.5)
GSP	34.2450	118.4710	01/18/1994	155144.9	12.0	4.00	0.026	V	10.5(16.9)
GSB	34.3600	118.5710	01/19/1994	044048.0	2.0	4.50	0.019	IV	19.8(31.9)
GSP	34.3650	118.7080	01/19/1994	044314.5	12.0	4.10	0.010	III	24.3(39.1)
GSP	34.2870	118.4660	01/19/1994	071406.2	11.0	4.00	0.020	IV	13.3(21.4)
GSP	34.3040	118.7370	01/19/1994	091310.9	13.0	4.10	0.012	III	22.5(36.2)
GSP	34.2150	118.5100	01/19/1994	140914.8	17.0	4.50	0.045	VI	9.3(14.9)
GSP	34.2920	118.4660	01/19/1994	144635.2	6.0	4.00	0.020	IV	13.7(22.0)
GSB	34.3790	118.7110	01/19/1994	210928.6	14.0	5.50	0.031	V	25.1(40.4)
GSP	34.3780	118.6180	01/19/1994	211144.9	11.0	5.10	0.026	V	22.1(35.6)
GSB	34.3000	118.4660	01/21/1994	183915.3	10.0	4.70	0.033	V	14.2(22.9)
GSB	34.3100	118.4740	01/21/1994	184228.8	7.0	4.20	0.021	IV	15.0(24.1)
GSP	34.3010	118.4520	01/21/1994	185244.2	7.0	4.30	0.024	IV	14.2(22.8)
GSP	34.2970	118.4580	01/21/1994	185344.6	7.0	4.30	0.024	V	13.9(22.4)
GSB	34.2990	118.4280	01/23/1994	085508.7	6.0	4.20	0.022	IV	14.0(22.6)
GSB	34.3450	118.5520	01/24/1994	041518.8	6.0	4.80	0.026	V	18.5(29.7)
GSP	34.3590	118.6290	01/24/1994	055024.3	12.0	4.30	0.014	IV	21.3(34.3)
GSP	34.3630	118.6270	01/24/1994	055421.1	10.0	4.20	0.013	III	21.5(34.6)
GSP	34.2740	118.5630	01/27/1994	171958.8	14.0	4.60	0.030	V	14.3(23.1)
GSP	34.3740	118.4950	01/28/1994	200953.4	0.0	4.20	0.015	IV	19.5(31.4)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.038	V	16.6(26.8)
GSP	34.2780	118.6110	01/29/1994	121656.4	2.0	4.30	0.020	IV	16.1(25.9)
GSP	34.2990	118.4390	02/03/1994	162335.4	8.0	4.20	0.022	IV	14.0(22.6)
GSP	34.2910	118.4760	02/06/1994	131926.9	11.0	4.10	0.021	IV	13.7(22.0)
GSP	34.3570	118.4800	02/25/1994	125912.6	1.0	4.10	0.015	IV	18.2(29.3)
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.084	VII	9.6(15.5)
GSP	34.3120	118.3930	05/25/1994	125657.1	7.0	4.40	0.024	V	15.1(24.3)
GSP	34.3110	118.3980	06/15/1994	055948.6	7.0	4.20	0.021	IV	15.0(24.1)
GSP	34.2930	118.3890	12/06/1994	034834.5	9.0	4.50	0.029	V	13.8(22.3)
GSP	34.0490	118.9150	02/19/1995	212418.1	15.0	4.30	0.010	III	27.7(44.5)
GSP	34.3940	118.6690	06/26/1995	084028.9	13.0	5.00	0.021	IV	24.6(39.5)
GSP	34.3620	118.6150	03/20/1996	073759.8	13.0	4.10	0.012	III	21.1(33.9)
GSP	34.3540	118.7040	05/01/1996	194956.4	14.0	4.10	0.011	III	23.5(37.9)
GSP	34.3690	118.6720	04/26/1997	103730.7	16.0	5.10	0.025	V	23.2(37.4)

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	34.3770	118.6490	04/27/1997	110928.4	15.0	4.80	0.020	IV	23.0(36.9)
GSP	33.9510	117.7090	01/05/1998	181406.5	11.0	4.30	0.006	II	42.7(68.7)
GSP	34.3740	117.6490	08/20/1998	234958.4	9.0	4.40	0.005	II	48.8(78.5)
GSP	34.3970	118.6090	07/22/1999	095724.0	11.0	4.00	0.010	III	23.1(37.1)
GSP	33.8060	117.7150	03/07/2000	002028.2	11.0	4.00	0.004	I	45.8(73.7)
GSP	34.2840	118.4040	01/14/2001	022614.1	8.0	4.30	0.026	V	13.1(21.1)
GSP	34.2890	118.4030	01/14/2001	025053.7	8.0	4.00	0.020	IV	13.4(21.6)
GSP	34.0590	118.3870	09/09/2001	235918.0	4.0	4.20	0.074	VII	3.7(6.0)
GSP	33.9220	118.2700	10/28/2001	162745.6	21.0	4.00	0.017	IV	15.2(24.5)
GSP	33.9550	117.7460	12/14/2001	120135.5	13.0	4.00	0.005	II	40.6(65.3)
GSP	34.3610	118.6570	01/29/2002	055328.9	14.0	4.20	0.013	III	22.3(35.9)
GSP	33.9170	117.7760	09/03/2002	070851.9	12.0	4.80	0.010	III	39.6(63.8)
GSP	34.3000	118.6200	08/09/2007	075849.0	4.0	4.40	0.020	IV	17.6(28.4)
GSP	34.3850	117.6350	10/16/2007	085344.1	8.0	4.20	0.004	I	49.8(80.1)
GSG	33.9530	117.7610	07/29/2008	184215.7	14.0	5.30	0.015	IV	39.8(64.0)
GSP	34.0690	118.8820	05/02/2009	011113.7	14.0	4.40	0.012	III	25.7(41.3)
GSP	34.4400	119.1830	05/08/2009	202714.0	7.0	4.10	0.004	I	48.9(78.7)
GSP	33.9380	118.3360	05/18/2009	033936.3	13.0	4.70	0.039	V	12.3(19.7)
GSP	33.9920	118.0820	03/16/2010	110400.2	18.0	4.40	0.016	IV	21.4(34.4)

****

-END OF SEARCH-

411 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1914 TO 2014

LENGTH OF SEARCH TIME: 101 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 3.7 MILES (6.0 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 6.7

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.244 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:

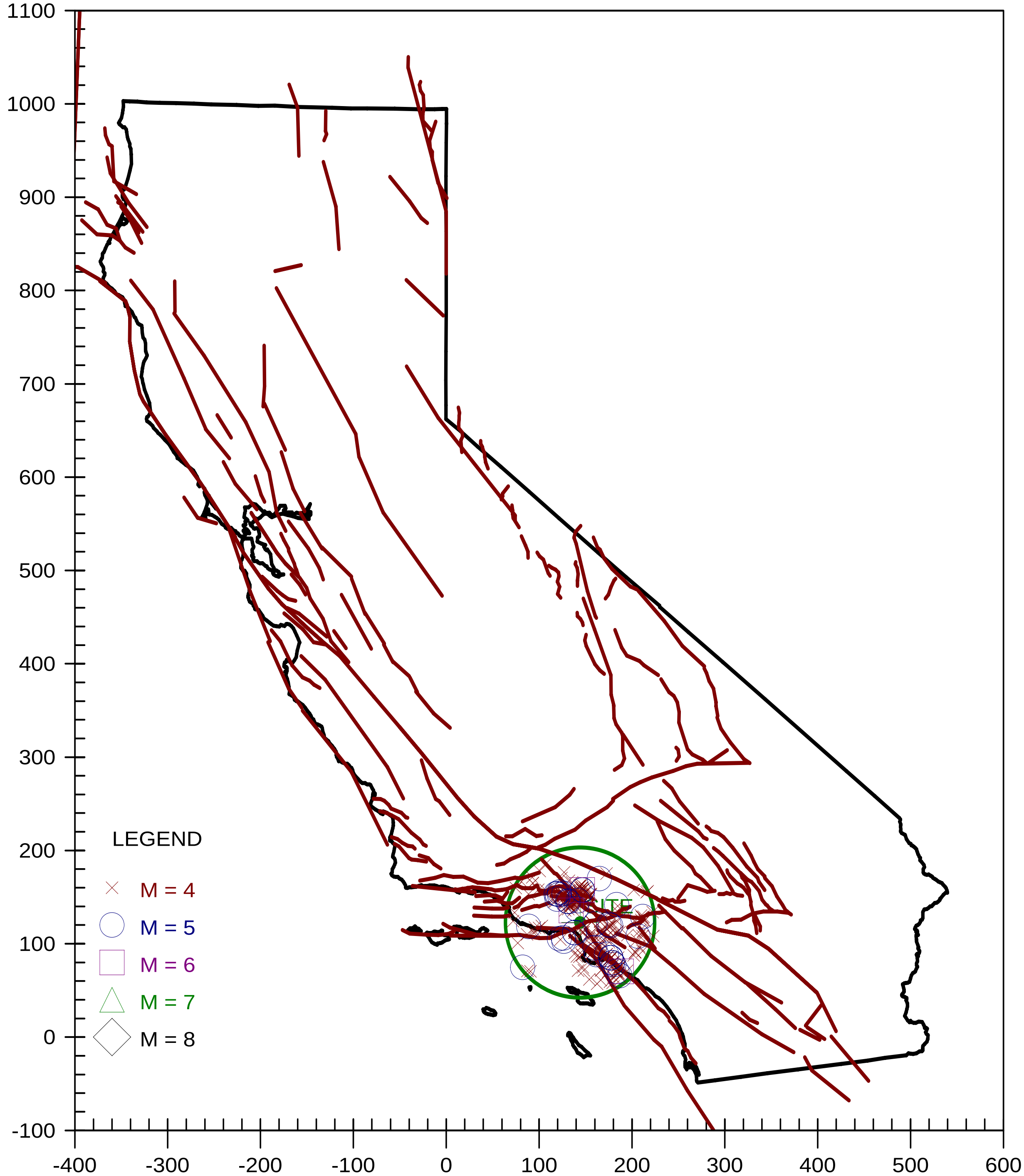
a-value= 5.022
b-value= 1.089
beta-value= 2.508

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	411	4.11000
4.5	149	1.49000
5.0	43	0.43000
5.5	10	0.10000
6.0	3	0.03000
6.5	1	0.01000

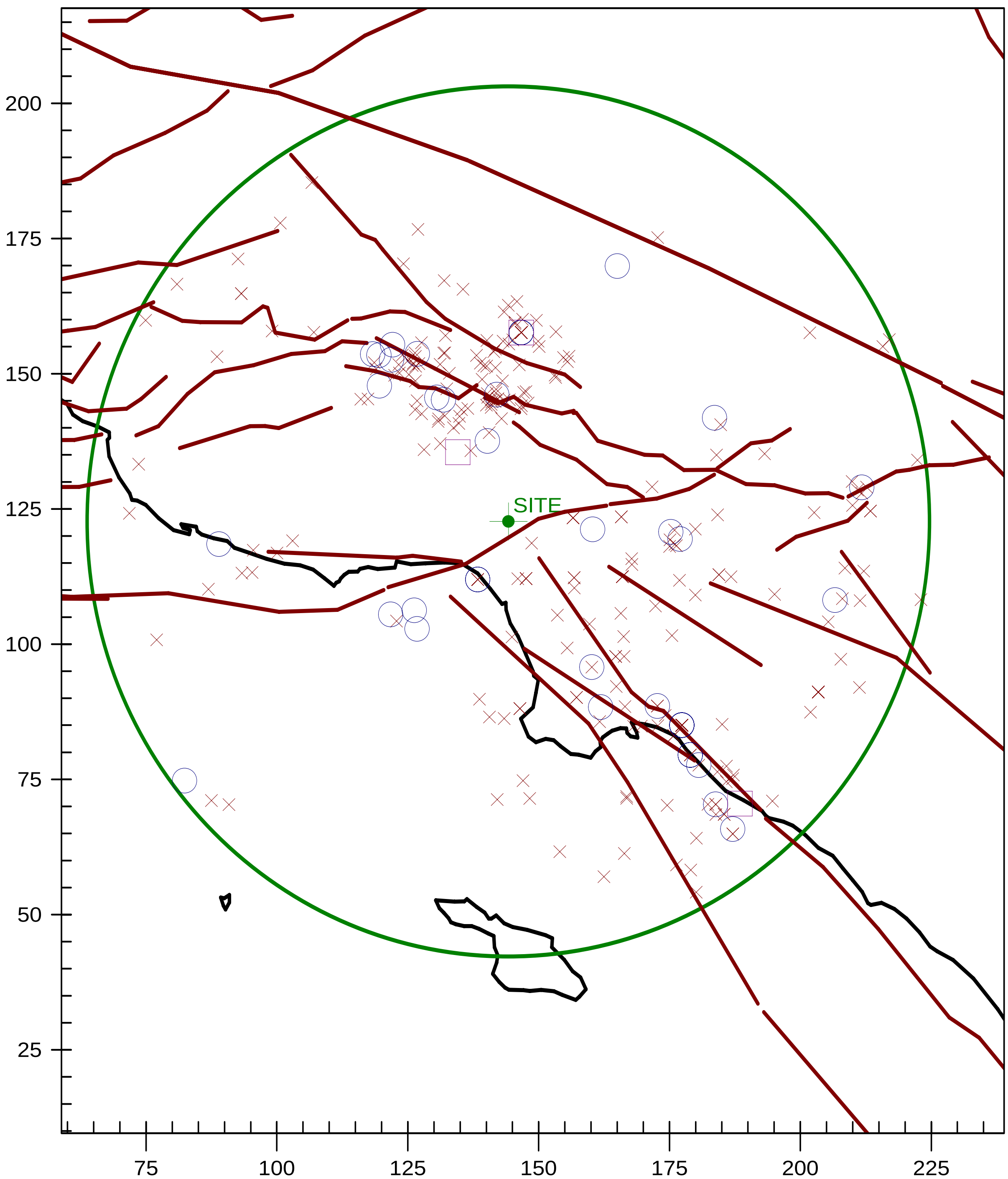
EARTHQUAKE EPICENTER MAP

PEREZ



EARTHQUAKE EPICENTER MAP

PEREZ

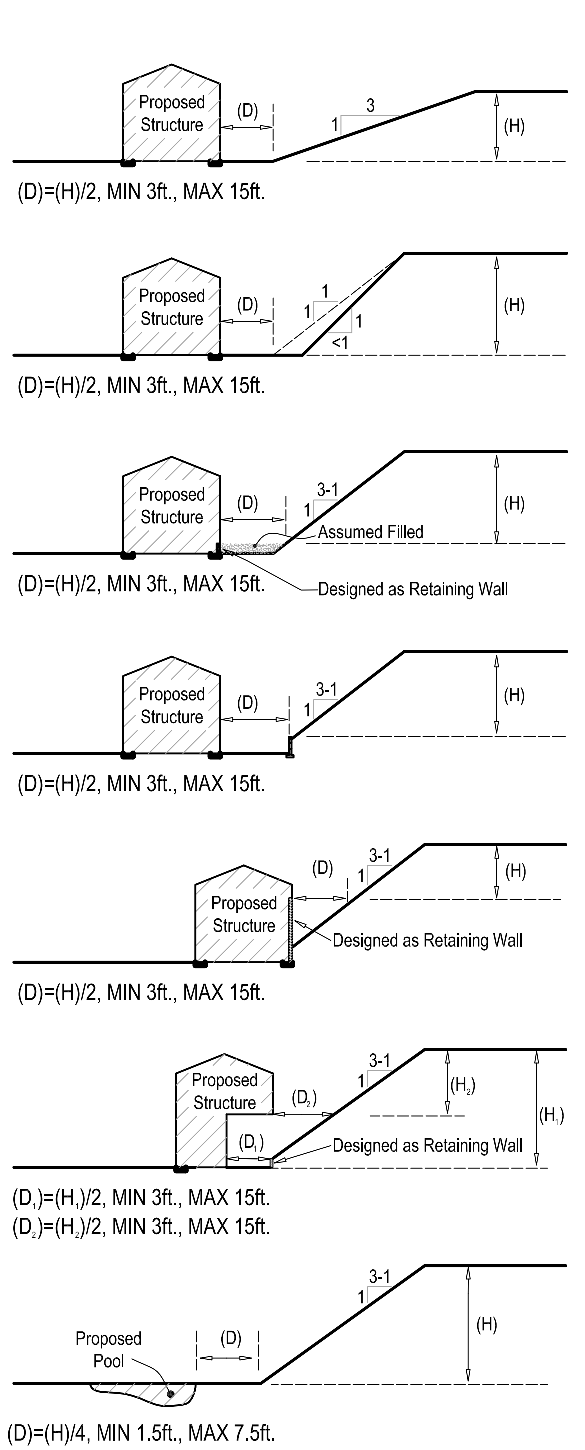


APPENDIX C

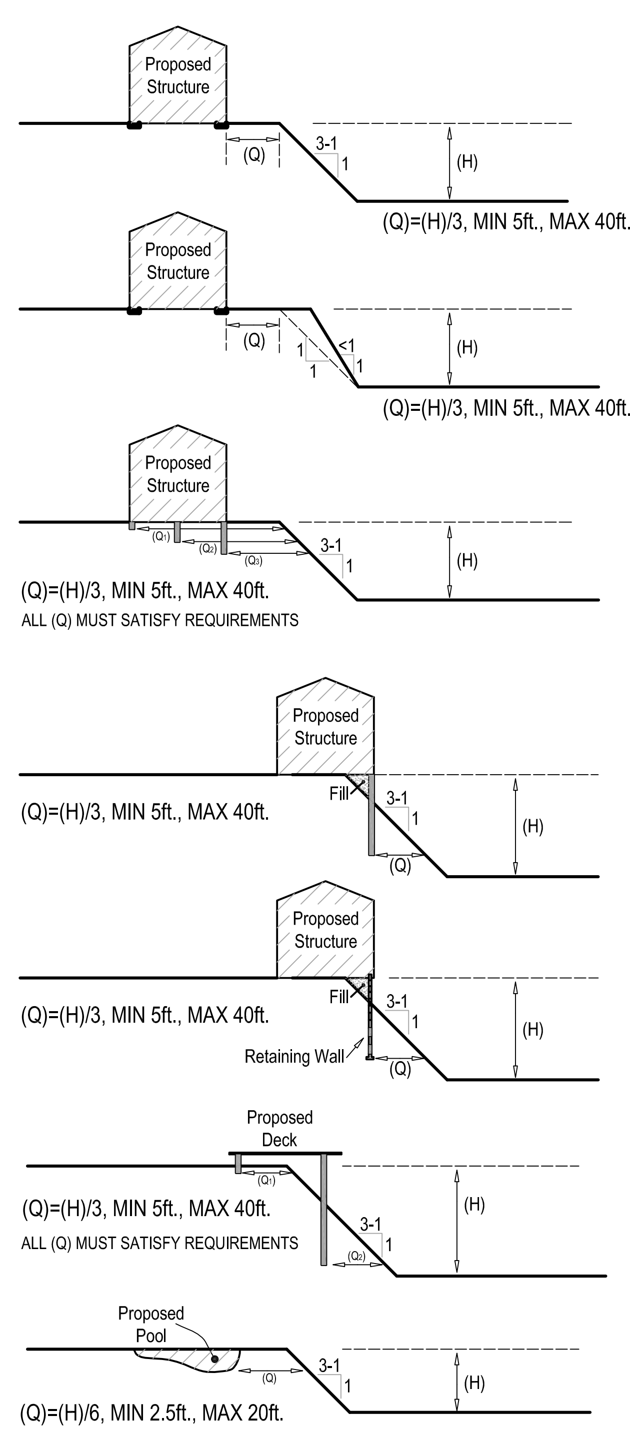
TYPICAL DETAILS and DIAGRAMS

(Based on 2013 CBC Section 1808.7)

Ascending Slopes 3(H):1(V) or Steeper



Descending Slopes 3(H):1(V) or Steeper



Examples of Slope Setback Requirements

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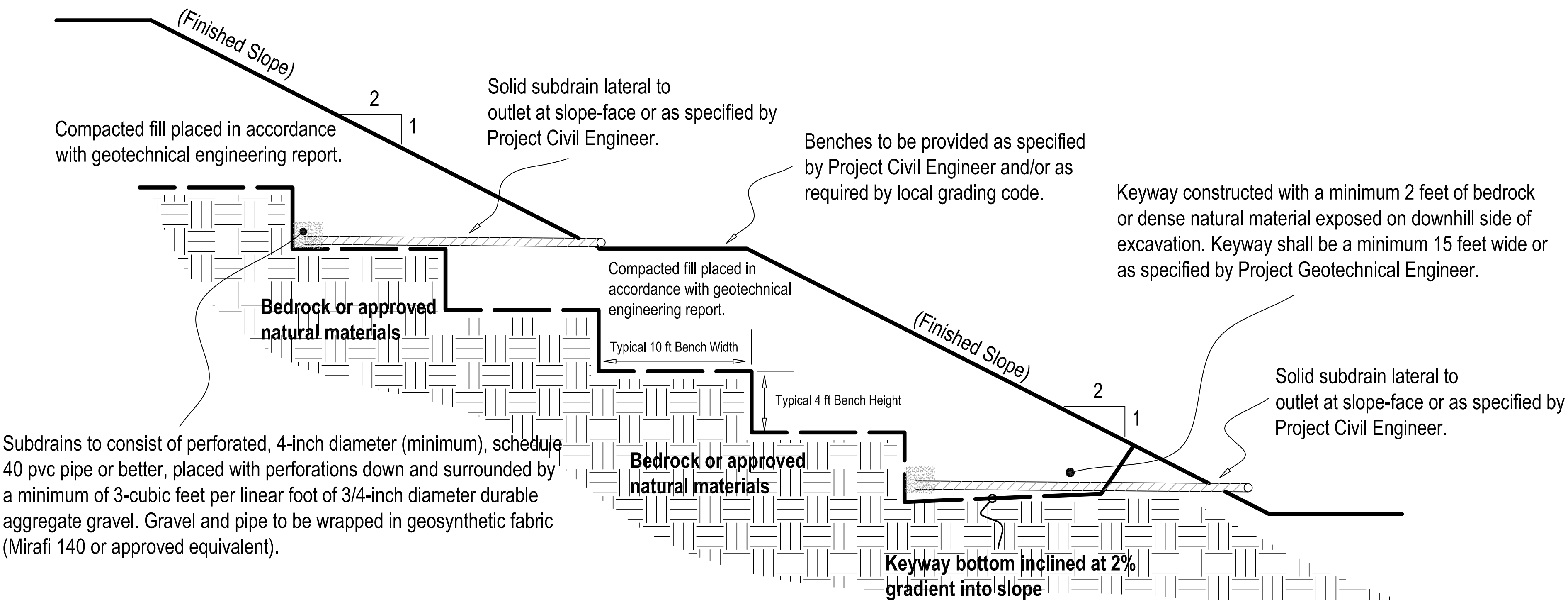
(Section J110, 2013 CBC) The faces of cut- and fill-slopes shall be prepared and maintained to control against erosion. This control shall be permitted to consist of effective planting. Erosion control for the slopes shall be installed as soon as practicable and prior to calling for final inspection.



SUBDRAIN RUN LENGTH	MINIMUM PIPE DIAMETER
0 - 200 ft	4 inches
200 - 400 ft	6 inches
400 - 800 ft	8 inches

Typical 2(H): 1(V) Fill-Slope, Keyway, Benching, and Subdrain Detail

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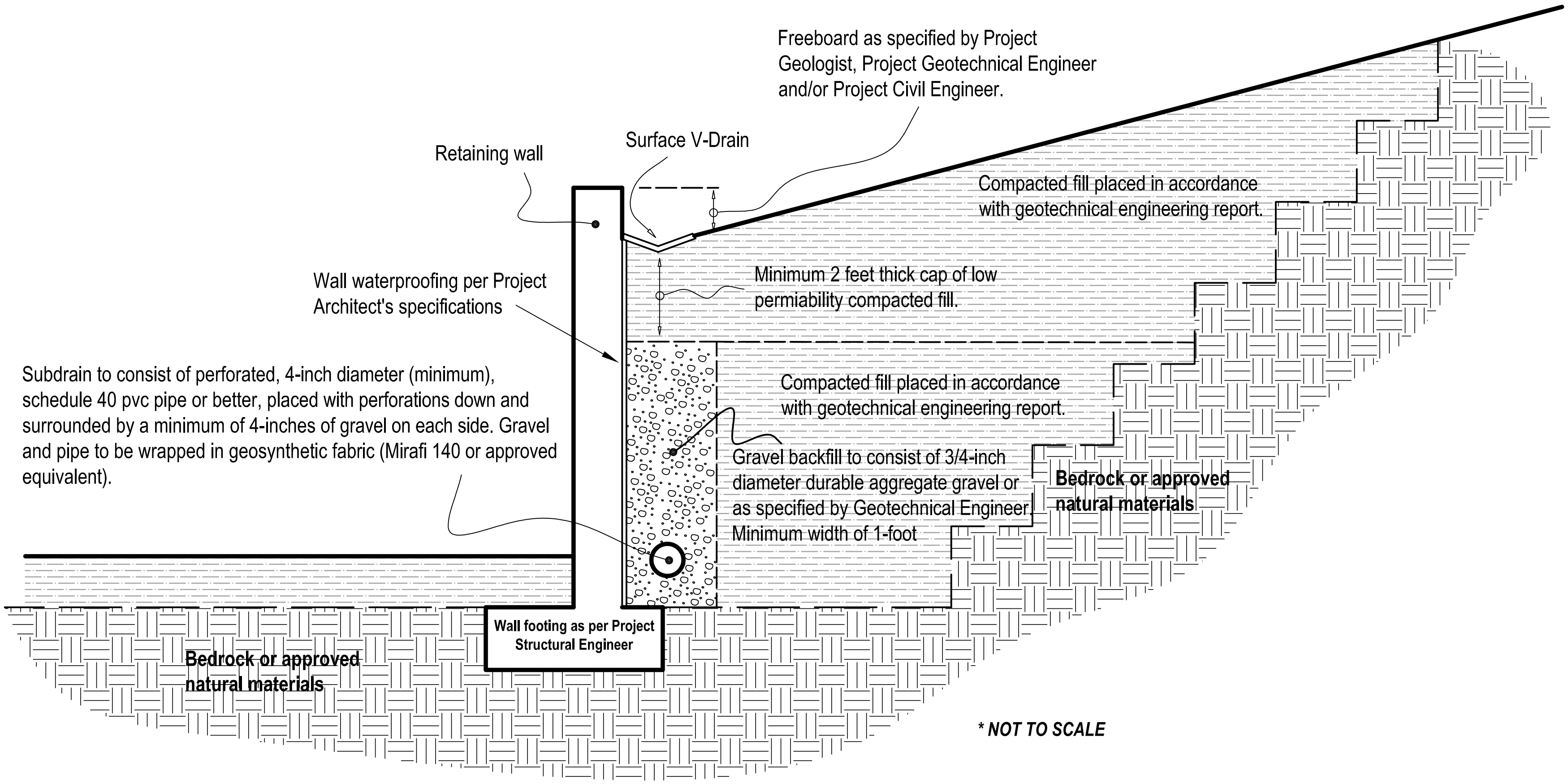

SUBDRAIN RUN LENGTH	MINIMUM PIPE DIAMETER
0 - 200 ft	4 inches
200 - 400 ft	6 inches
400 - 800 ft	8 inches

Typical Retaining Wall Drainage and Backfill Detail

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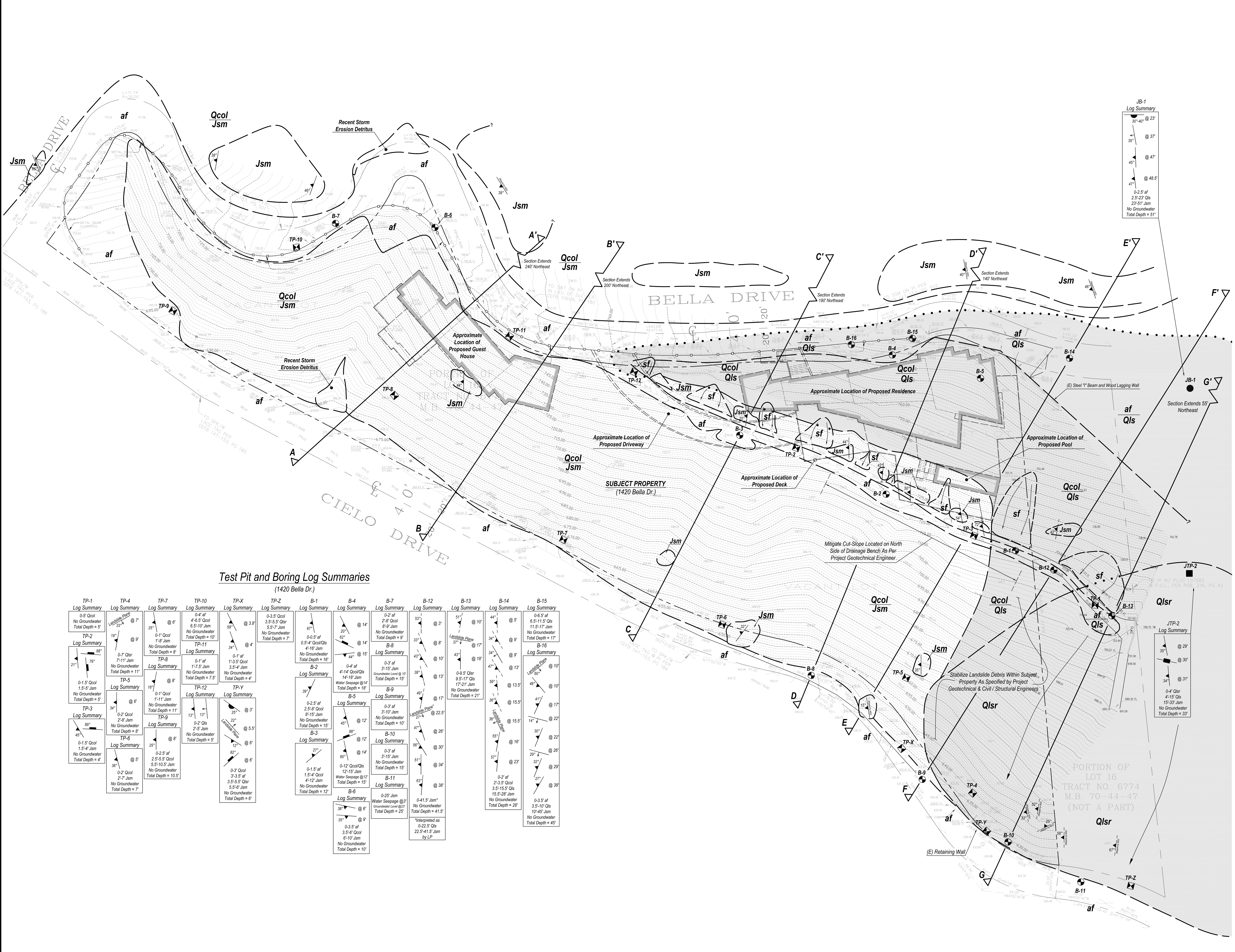
MAP POCKET

GEOLOGIC MAP



EXPLANATION

GEOLOGIC SYMBOLS

Geologic Contact - approximately located, queried where uncertain, dotted where concealed

Fault Contact - Approximately located, queried where uncertain, dotted where concealed, arrow indicates dip of fault plane

Strike and dip of foliation

Strike and dip of relict foliation

Strike and dip of shearing

Strike and dip of landslide plane

Strike and dip of contact

Strike and dip of joint plane

Strike of vertical joint plane

Subject Property
(1420 Bella Dr.)

B-16 — Location of boring - Mountain Geology, Inc., 1990-1997

B-1 Thru B-7 excavated by hand-labor
B-8 Thru B-11 excavated by hollow-stem-auger drill-rig
B-12,13,15 & 16 excavated by track-mounted drill-rig
B-14 excavated by bucket drill-rig

TP-16, TP-X,Y,Z — Location of test pit - Mountain Geology, Inc., 1989-1996

TP-1 Thru TP-3 excavated by hand-labor
TP-4 Thru TP-12 excavated by backhoe
TP-X,Y,Z excavated by hand-labor

(1436 Bella Dr.)

JB-1 — Location of boring - The J. Byer Group, Inc., 1993

JTP-2 — Location of test pit - The J. Byer Group, Inc., 1993

Arrows within mapped landslide show interpreted failure direction, barbed contacts denote interpreted limits of landslide headscarp

GEOLOGIC UNITS

Surficial Sediments:

sf	Surficial Failure
af	Artificial Fill
Qcol	Colluvium
Qlsr	Landslide Debris - Historically Active
Qls	Landslide Debris - Prehistoric

Bedrock:

Jsm	Santa Monica Slate

GEOLOGIC SHEET INDEX

Plate 1	GEOLOGIC MAP
Plate 2	GEOLOGIC SECTIONS A & B
Plate 3	GEOLOGIC SECTIONS C & D
Plate 4	GEOLOGIC SECTIONS E & F
Plate 5	GEOLOGIC SECTION G

0 10 20 30 40 60 feet
Graphic Scale: 1" equals 20'

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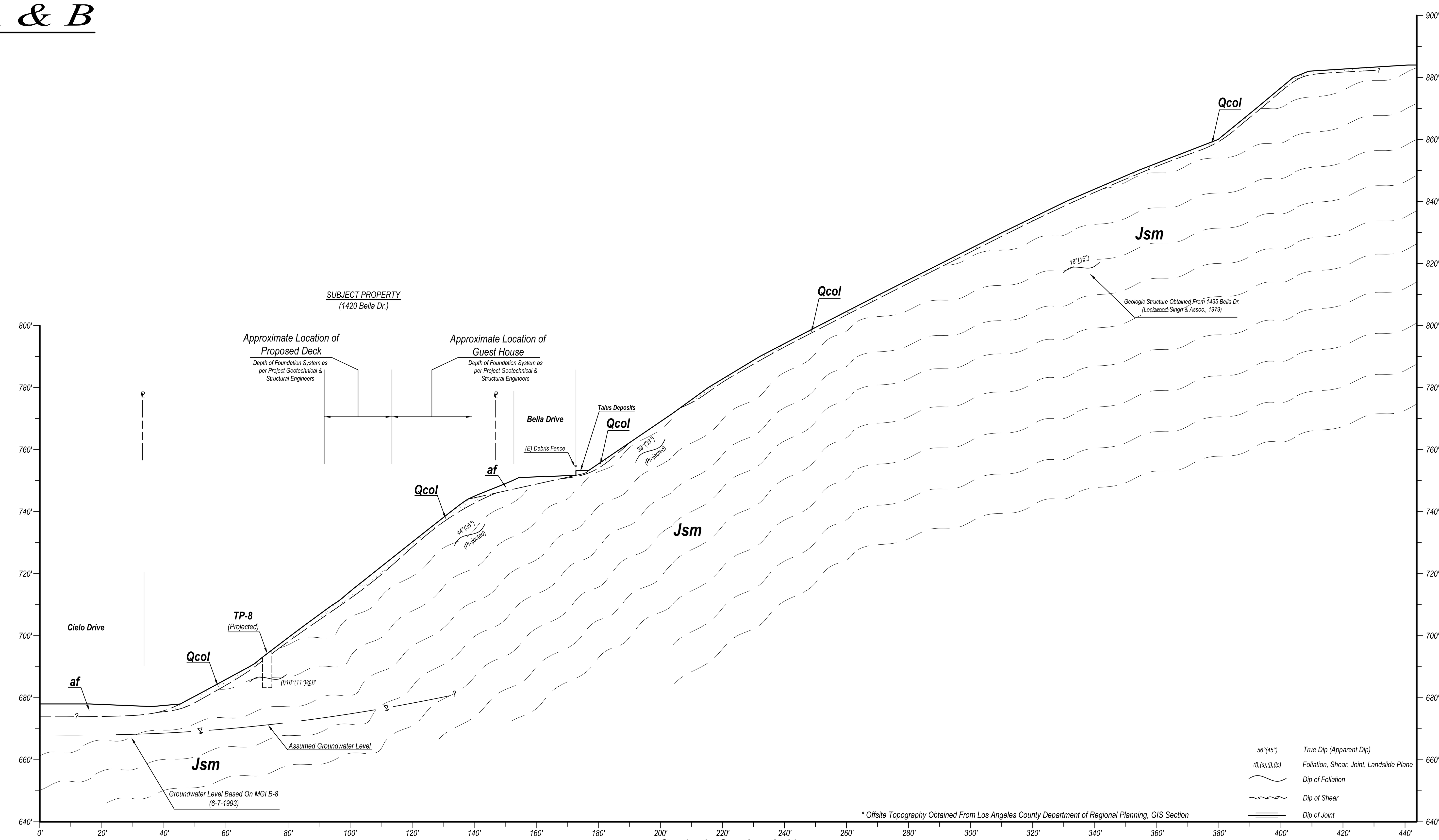
Perez	LP 1174	Jan., 2015	BAS	

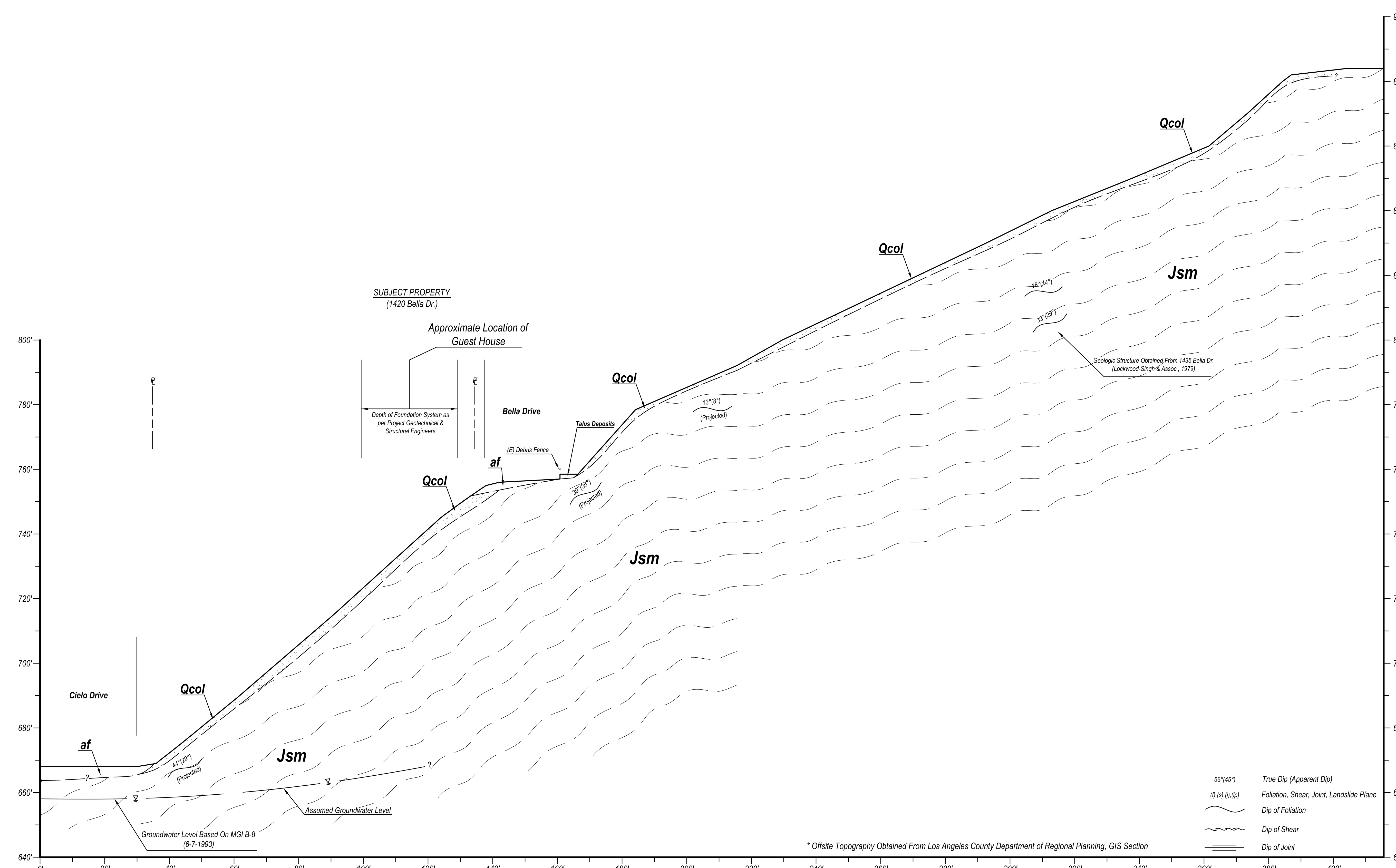
No:	DATE:	REVISION DESCRIPTION:

GEOLOGIC SECTIONS A & B



Geologic Section A-A'

Scale: 1" Equals 20'



Geologic Section B-B'

Scale: 1" Equals 20'

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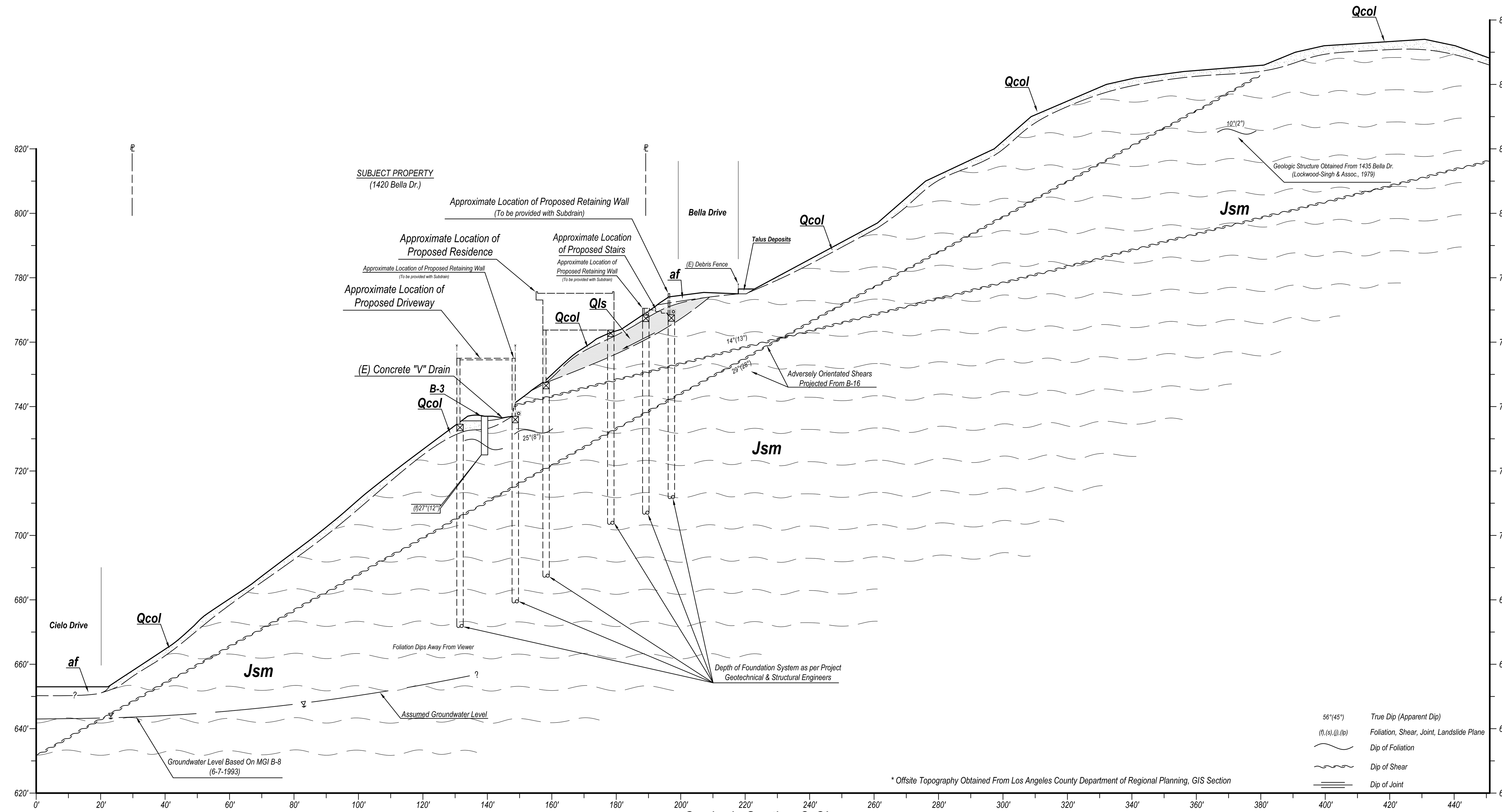
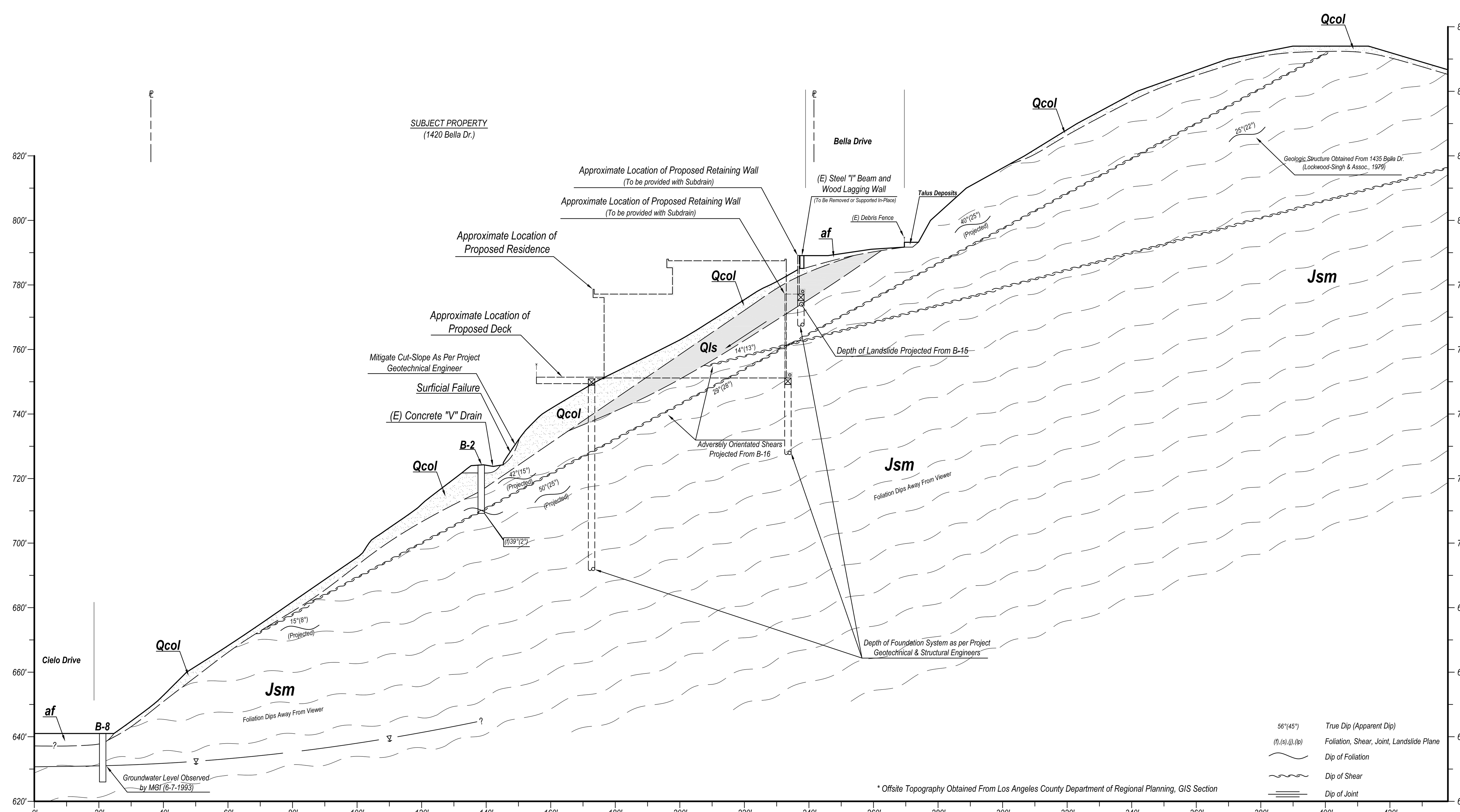
GEOLOGIC SECTIONS C & D



Geologic Section C-C'

Scale: 1" Equals 20'



Geologic Section D-D'

Scale: 1" Equals 20'

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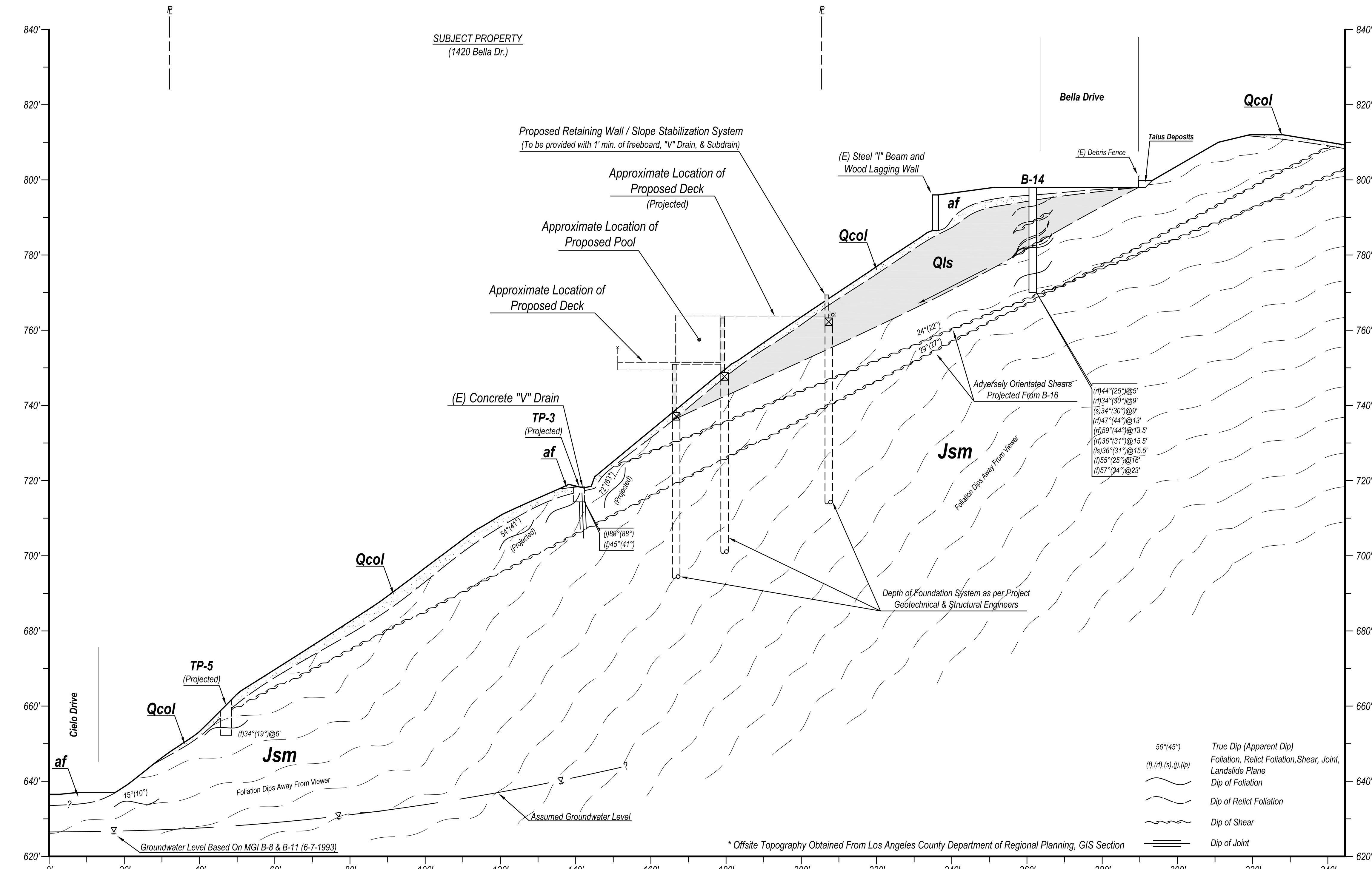
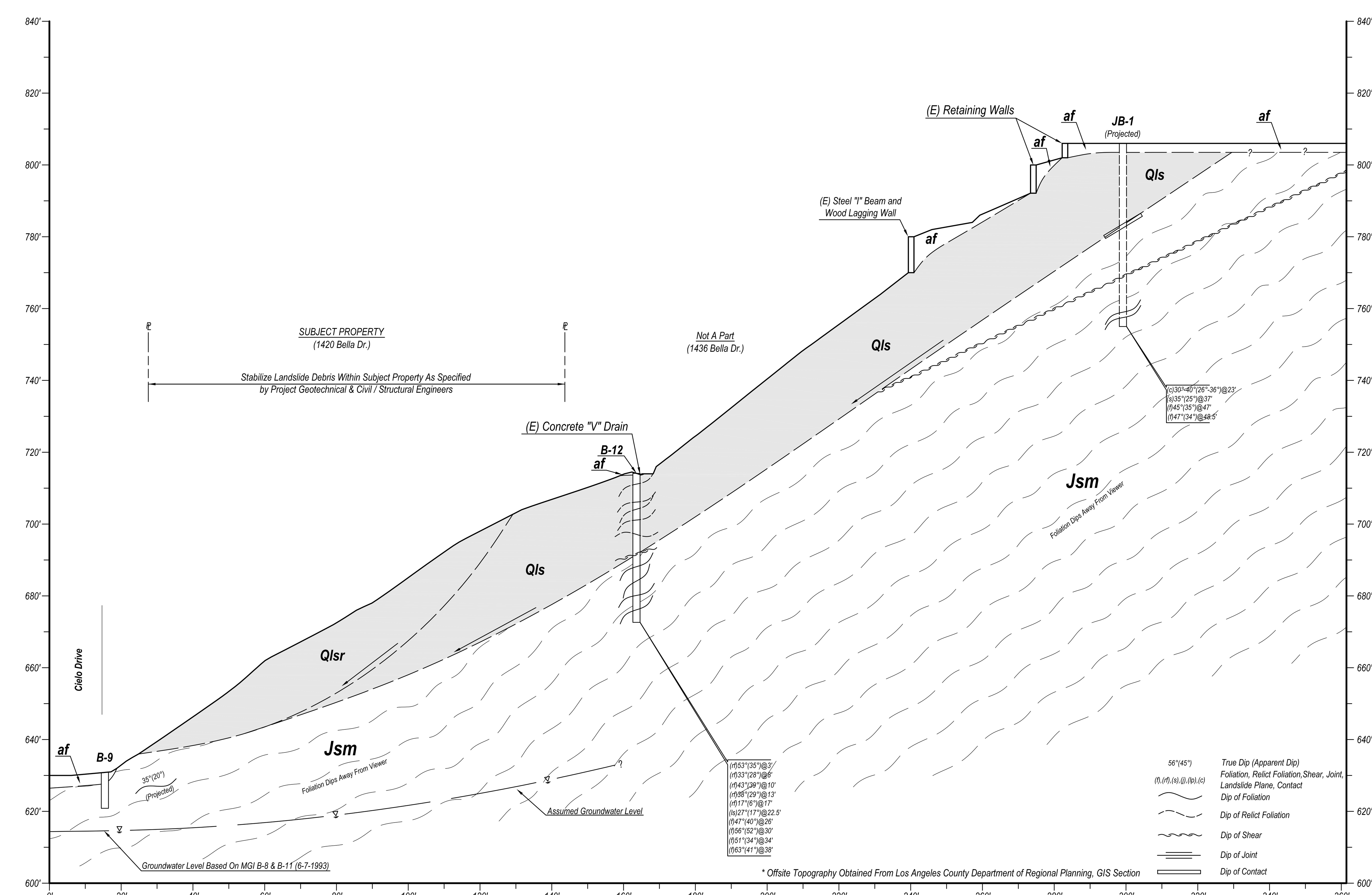
No.	DATE:	REVISION DESCRIPTION

GEOLOGIC SECTIONS E & F



Geologic Section E-E'
Scale: 1" Equals 20'



Geologic Section F-F'
Scale: 1" Equals 20'

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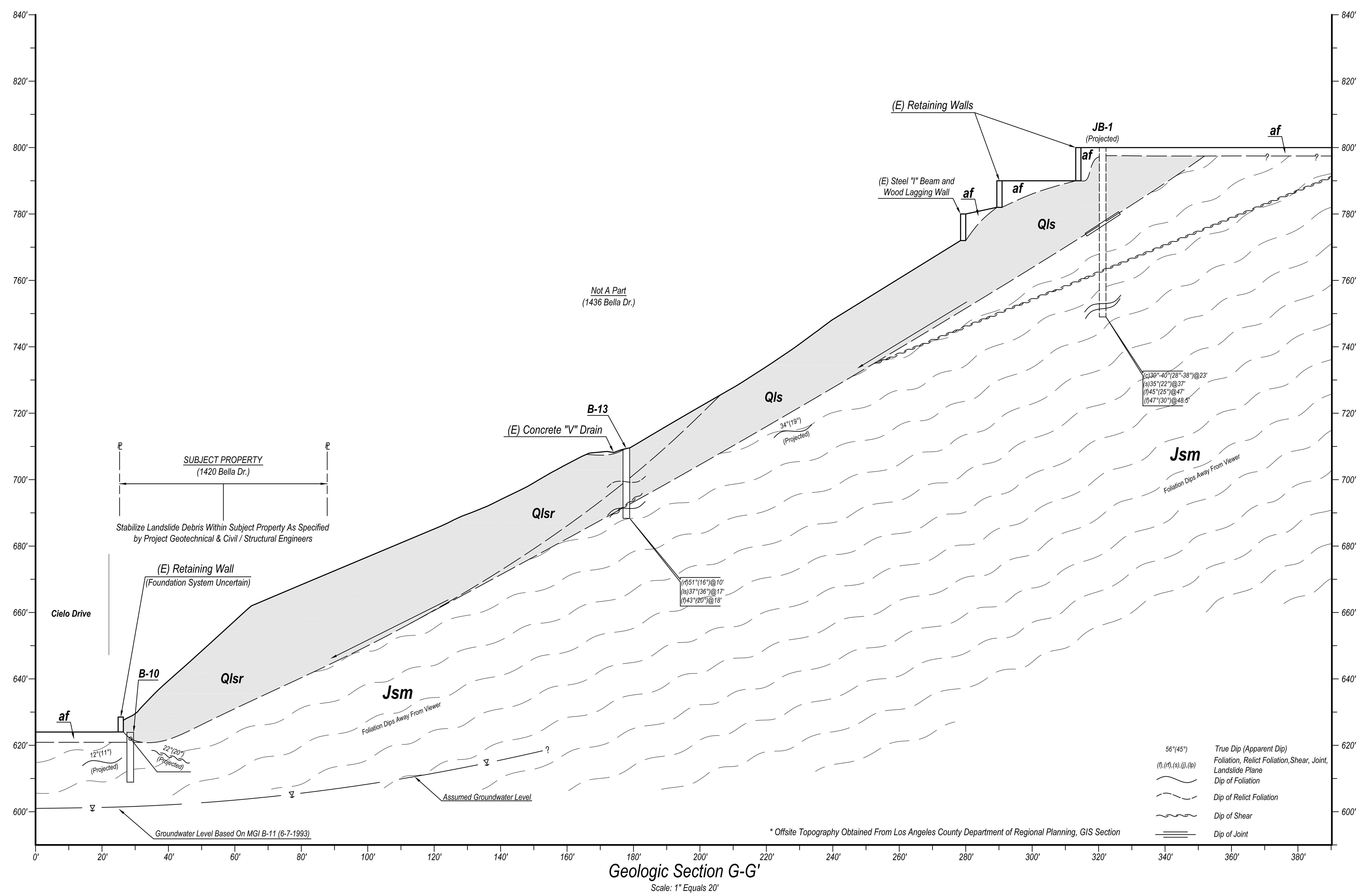
No:	DATE:	REVISION DESCRIPTION:

GEOLOGIC SECTION G



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No:	DATE:	REVISION DESCRIPTION: