APPENDIX D

GEOLOGY

GEOLOGIC
AND
SOIL ENGINEERING FEASIBILITY REPORT
FOR
PARAISO HOT SPRINGS SPA RESORT
MONTEREY COUNTY, CALIFORNIA

PROJECT LSW-0337-01

Prepared for

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File No.: LSW-0337

Mr. John M. Thompson
Thompson Holdings, L.L.C.
P.O. Box 2367
Horsham, PA 19044

SUBJECT: GEOLOGIC AND SOIL ENGINEERING FEASIBLITY REPORT
Paraiso Hot Springs Spa Resort
Paraiso Springs Road
Soledad Greenfield Area of Monterey County, California

Dear Mr. Thompson:

In accordance with your authorization, Landset Engineers, Inc has completed a geologic and soil engineering feasibility report for a proposed spa resort located west of the Soledad Greenfield area of Monterey County, California. This report presents the results of our field investigation and laboratory testing, along with our conclusions and recommendations for site development.

It is our opinion that the proposed spa resort is feasible from a soil engineering and geologic standpoint. However, portions of the site have a *high potential for liquefaction susceptibility*. We recommend that an additional site-specific supplemental liquefaction study be performed in accordance with the guidelines of the California Division of Mines & Geology, Special Publication 117.

The recommendations included in this report are preliminary and contingent upon the findings of the recommended supplemental liquefaction study. Additionally, it is recommended that design level soil engineering and engineering geologic investigation(s) should be performed once preliminary development plans have been completed and proposed land use, types of structures, and anticipated loads are known. The conclusions and recommendations included herein are based upon applicable standards at the time this report was prepared.

It has been a pleasure to be of service to you on this project. If you have any questions regarding the attached report, please contact the undersigned at (831) 443-6970

Respectfully submitted,
LandSet Engineers, Inc.

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INTRODUCTION

This report summarizes the findings, conclusions, and recommendations for our geologic and soil engineering feasibility report for a proposed spa resort on an approximate 280-acre site located at Paraiso Hot Springs west of the Soledad/Greenfield area of Monterey County, California (see Vicinity Map, Figure 1).

We utilized the following plan during the course of the investigation:

Aerial Topo Map, Scale 1"=100', prepared by Bestor Engineers, Inc.

PURPOSE AND SCOPE OF SERVICES

Geologic Report. This report addresses the feasibility of the planned resort development from a geologic viewpoint, with emphasis on the potential for geologic/seismic-related hazards. Our studies included the following:

A. Research, review, and evaluation of data from published and unpublished geologic reports and maps pertaining to the site and vicinity. Most of the previously published geologic information on this area is preliminary in nature, and is based on reconnaissance techniques and extrapolation of data.

B. Examination and interpretation of 4 sets of stereo aerial photographs from 1949, 1956, 1997, & 2000, that cover the site and its vicinity. These photographs were scrutinized for site geology, terrain features characteristic of active fault zones and for landsliding features.

C. Geological site reconnaissance and mapping of the site to observe outcrops and identify those geologic features indicative of existing and potential geologic hazards.

D. Analysis of the data generated and preparation of a written report and maps presenting our findings, conclusions and recommendations addressing the following:

- Site geology
- Faulting
- Liquefaction Potential
- Landsliding
- Ground Shaking
- Erosion

Soil Engineering Feasibility Investigation. This soil engineering feasibility investigation has been prepared to explore surface and subsurface soil and groundwater conditions at the site, and provide preliminary soil-engineering criteria for construction of the project.

The conclusions and recommendations of this report were accomplished in general conformance with the standards noted, as modified by standard soil engineering practice in this area. Our scope of services included:

1. A visual site reconnaissance.
2. Review of available soil engineering data in our files pertinent to the site.
3. Exploration, sampling and classification of the surface and subsurface soils by means of drilling 29 exploratory borings.
4. Laboratory testing of selected soil samples collected from the exploratory borings and surface locations to determine their pertinent engineering and index properties.
5. Engineering analysis of the information collected based on the results of the field exploration including a laboratory testing program and review of published and unpublished studies in the general area of the site.
6. Preparation of this report summarizing our findings, soil engineering conclusions, and recommendations for site preparations, grading and compaction, foundations, utility trenches, slabs-on-grade, general site drainage, and erosion control.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The site is located at approximately 36º19.878' N latitude, 121º22.059' W longitude in the southwest quarter of the northwest quadrant of the Paraiso Springs 7.5’ minute quadrangle in Monterey County, California. The site is sectionalized and is located in the southwest quarter of Sect. 30, T 18S, R 6E, and the southeast quarter of Sect. 25, T 18S, R 5E. Access to the site is gained via Paraiso Road. Surrounding land uses are agricultural and rural residential (Figure 1, Vicinity Map).

The site consists of a rectangular shaped parcel encompassing approximately 280 acres. The site is predominantly steep southwest and northeast facing slopes. Two northeast / southwest trending valleys occupy the approximate center of the site, Paraiso Springs Valley to the south, and Indian Valley to the north. The site is located between the crest of the Sierra De Salinas and the Salinas Valley (Figures 1 & 5). Existing site improvements include a barn, a “clubhouse”, many small shacks, and mobile homes. An active hot spring and associated spa and pools are also located on site. Many wells, operative and inoperative, are located on the site.

Vegetative cover on the 280-acre site consists of native grasses, weeds, trees, and chaparral in the bottoms of Paraiso Springs Valley and Indian Valley. The slopes to the south of Paraiso Springs Valley and Indian Valley are generally oak woodland. Slopes on the north side of Paraiso Springs Valley and Indian Valley are chaparral. Drainage of the site is by sheet flow to the drainages of Paraiso Springs Valley and Indian Valley. In the Paraiso Springs Valley drainage of site water also occurs through spring and seep discharge. These drainages are unnamed and flow to the east where they join the Arroyo Seco River. Drainage of the Arroyo Seco River is north to the Salinas River, which eventually discharges into the Monterey Bay.

We understand that the proposed site development will consist of the construction of a destination spa resort with residential structures, restaurants, and shops. Preliminary architectural drawings were available for our review at the time of this report. Other site improvements will consist of new access roads, sewage effluent disposal systems, underground utility and landscaping improvements (see Relative Geologic Hazards Map, Sheet 3).

FIELD EXPLORATION

The site was mapped in the field on August 10, 11, and 12, 2004 on the Aerial Topo Map prepared by Bestor Engineers, Inc. The field and aerial photograph mapping was then compiled on the Aerial Topo Map at a scale of 1”=200’ (Site Geologic Map, Sheet 1).

As part of our soil engineering feasibility report 29 exploratory borings were drilled on August 23, 24, 25, 2004. The approximate locations of the exploratory borings are shown on the Site Geologic Map, Sheet 1, located in the map pocket at the back of this report. The borings were drilled using a truck mounted drill rig equipped with an 8-inch outside diameter hollow stem hydraulic powered auger and a truck mounted drill rig with a 4-inch outside diameter solid stem hydraulic powered auger. The exploratory borings were drilled to depths ranging from 5.5 to 60.0 feet below the ground surface. A Certified Engineering Geologist and a staff geologist from our office logged the exploratory borings. Soils encountered in each test boring were visually classified in the field and a continuous log was recorded. Visual classifications were made in general accordance with the Unified Soil Classification System and ASTM D2487. Logs of the soil engineering borings can be found in Appendix A.

LABORATORY TESTING

Laboratory tests were performed to determine some of the physical and engineering characteristics of selected soil samples considered pertinent to the design of the project. The tests performed were selected on the basis of the probable design requirements as correlated to the site subsurface profile. A summary of the laboratory test results is presented in Appendix C. A brief generalized description of the tests performed is presented below.

- Moisture-Density Determinations: This test was conducted on samples taken with fiberglass liners to measure their in-situ moisture contents and dry unit weights. The test results are used to assess the distribution of subsurface pressures and to calculate degrees of in-situ relative compaction.

- Atterberg Limits: This test was performed on two disturbed bulk samples and four liner samples to determine their liquid limit and plastic limit index values. This test provides water content values for the sample’s liquid and plastic phases. This test aids in determining the expansive potential and other engineering characteristics of the soil.

- Grain Size Distribution (Gradation) Analysis: A grain size distribution analysis was performed on selected 2.5”, 1.0”, and bulk soil samples. The grain size distribution is used to determine the classification of the site soils. This information is used for foundation design analysis.

REGIONAL GEOLOGY

The site is situated on the east flank of the Sierra De Salinas on the west side of the Salinas Valley and is part of the Coast Ranges Geomorphic Province of California (Figure 2, Regional Geologic Map). The Coast Ranges Geomorphic Province consists of a series of mountain ranges paralleling the northwest-southeast structural orientation of the San Andreas fault, San Gregorio-Palo Colorado fault, Rinconada fault, Monterey Bay/Tularcitos fault, and other faults within the central coast of California (Figure 5, Regional Fault and Seismicity Map). These faults are characterized by a combination of strike-slip and reverse displacement and show horizontal displacements from tens to hundreds of miles. Several periods of continuous and semi-continuous strike-slip or “transform” movement throughout the late Cenozoic Era has occurred on the San Andreas and related fault systems causing compressional uplift of the mountains of the Coast Ranges Geomorphic Province. The region continues to be characterized by moderate to high rates of seismic and tectonic activity (Figure 5).

The San Andreas fault forms the boundary between the North American and Pacific plates. The site is located on the Pacific Plate on the southwest side of the San Andreas fault. The southwest side of the San Andreas fault is underlain by Pre Cretaceous Sierra De Salinas Schist and Cretaceous age Salinian Block granitic rocks with older Paleozoic Era (?) Sur Series metamorphic rocks that occur as roof pendants. These roof pendants predominantly consist of marble and dolomite (Compton, 1966). Overlying the granitic rocks of the Salinian Block is a series of folded and faulted Tertiary age (Oligocene to middle Miocene) sandstones, conglomerates, and volcanics (Dibblee, 1974).

During very late Tertiary (?) to mid Quaternary times, extensive alluvial and fluvial sediments were shed off of Tertiary uplands and deposited as extensive alluvial fans and the Paso Robles Formation, (Dibblee, 1974). These sediments unconformably overlie all older formations with which they are in contact. Holocene activity has consisted of continued tectonic uplift and down cutting and deposition of the local area streams, mass wasting of upland areas by landslides and erosion, and fault creep along the San Andreas and related fault systems. The geology of the site and its vicinity is depicted on the Geologic Vicinity Map, Figure 3.

REGIONAL FAULTING AND SEISMICITY

The closest faults that would most likely effect the site are the San Andreas, Rinconada, San Gregorio – Palo Colorado, and Monterey Bay Tularcitos faults (Figure 5).

San Andreas Fault

The San Andreas Fault is located about 30-km northeast of the site (Figure 5) and is the major seismic hazard in northern California. The San Andreas fault is a major right-lateral strike-slip fault that generally delineates the transform plate boundary between the North American and Pacific Plates. Trending to the northwest southeast, the San Andreas fault is nearly vertical as evidenced by the relatively straight outcrop pattern across topography of noticeable relief. Historic earthquakes on the San Andreas fault have caused extensive damage and very strong ground shaking in Monterey County. The 1906 (M_w~8.0) "San Francisco earthquake" ruptured a portion of the active San Andreas fault from approximately San Juan Bautista to Cape Mendocino, causing severe damage in parts of the Monterey-San Francisco Bay area. The earthquake occurred on April 18, 1906 and caused severe ground shaking and structural damage to buildings in Monterey and San Benito Counties (Lawson, 1908). The 1989 (M_w 7.1) Loma Preita earthquake also caused significant damage in the Monterey Bay area.

The San Andreas fault has been divided into several different segments that are characterized by varying slip rates, earthquake intensities, and earthquake recurrence intervals. The closest segment of the San Andreas fault to the site is the (Creeping Segment) at 30-km. The San Andreas fault Creeping Segment can expect a (M6.2) earthquake with a recurrence interval of approximately 61 years (Cao et al, 2003). The next closest segment is the (Santa Cruz Mtn. segment) at 56-km from the site. This segment can expect a (M7.0) with a recurrence interval of 218 years (WGCEP, 2002). Stronger earthquakes could be experienced at the site similar to the 1906 event with a maximum magnitude of (M7.9).

Rinconada Fault

The Rinconada Fault is a major structural feature along which granitic rocks of the Sierra de Salinas were uplifted to form the western border of the Salinas Valley and is located about 1.5-km. east of the site. The Rinconada fault in the vicinity of the site is within the Salinian Block and movement began during early Cenozoic time (Paleocene) and remained active to late Pleistocene time (Dibblee, 1976). The Rinconada fault is primarily a right lateral strike slip fault (Petersen et al, 1996) with a smaller component of vertical movement. Right lateral movement of the Rinconada Fault zone in the area of Paraiso Springs is illustrated by folded Tertiary sediments west of the fault (Dibblee, 1976). Here the Tertiary Monterey formation is extensively folded. Axis of the folds is east west near the fault where they are truncated. The younger Tertiary sediments of the Pancho Rico and Paso Robles formations on the west side of the fault do not show the extensive east-west oriented folds of the Monterey Formation. Orientations for these younger sediments are roughly a northwest strike with an easterly dip. Vertical displacement in the area of Paraiso Hot Springs is illustrated by the juxtaposition Quaternary alluvium with Pre-Tertiary granitic rocks. Vertical displacement in the Sierra de Salinas may be as much as 10,000 feet (Dibblee, 1976). Slip rate for the Rinconada fault is estimated at 1.0mm/yr. Maximum magnitude is expected to be (M7.5) (Cao et al, 2003) with a recurrence interval of 1,764 years (Petersen et al, 1996).

San Gregorio – Palo Colorado Fault

Like the San Andreas fault, the San Gregorio fault has been divided into several different segments that are characterized by varying slip rates, earthquake intensities, and earthquake recurrence intervals. The San Gregorio (Sur Region) is the closest segment, located offshore about 24-km southwest of the site and is classified as a Type B fault (CDMG, 1998). The San Gregorio (Sur region) is a northwest trending right lateral strike slip fault about 80 km long (Petersen et al, 1996). The San Gregorio fault is part of the San Andreas fault system and is expressed as a complex series of en echelon right lateral strike slip faults (San Gregorio, Palo Colorado, San Simeon, & Hosgri faults) in the offshore and nearshore environments. The San Gregorio and related faults are several hundred kilometers long extending from the Santa Barbara Channel in the south, to its juncture with the San Andreas fault near Bolinas Bay in the north. Strong evidence supports that the San Gregorio fault (Sur region) has been active during Holocene time (Greene et al, 1973). Slip rate for the San Gregorio fault (Sur region) is estimated at 3.0mm/yr. Maximum magnitude is expected to be (M7.0) with a recurrence interval of 411 years (Petersen et al, 1996).

Monterey Bay-Tularcitos Fault

Located about 12.6-km northwest of the site, the Monterey Bay-Tularcitos fault zone is a complex series of northwest trending reverse, right lateral, and oblique faults which include the Tularcitos, Chupines, and Navy faults (Petersen et al, 1996). The Monterey Bay-Tularcitos fault zone lies within a fault bounded wedge of granitic basement rocks belonging to the Salinian block and is bounded on the west by the San Gregorio fault and on the east by the San Andreas fault (McKittrick, 1987). The Monterey Bay-Tularcitos fault is 84 km. long (Petersen et al, 1996) and extends from Paloma Creek in upper Carmel Valley (Clark et al, 1997) to the offshore environment within the Monterey Bay. Post Miocene vertical displacement of the Tularcitos fault is about 380 m and 3.2km to as much as 16 km of right lateral displacement (Clark et al, 1997). Offsets of Holocene age colluvial and fluvial terrace deposits indicates that the Tularcitos fault is active (Clark et al, 1997). The Monterey Bay fault is the offshore extension of the Tularcitos fault and comprises a discontinuous series of en echelon faults in the inner Monterey Bay between Monterey and Santa Cruz (Greene et al, 1973). The Monterey Bay fault zone displaces late Tertiary and Pleistocene sediments and in a few locations appears to cut Holocene sediments (Greene et al, 1973). Slip rate for the Monterey Bay-Tularcitos fault is estimated at 0.5mm/yr. Maximum magnitude is expected to be (M7.1) with a recurrence interval of 2,841 years (Petersen et al, 1996).

SITE GEOLOGY

Previous Work

Previous published mapping of the site and its vicinity has been performed by Durham, 1970, Dibblee, 1974, and Tinsley, 1975. Durham, 1970 mapped the site at a scale of 1:24,000. Durham maps the sloped upland areas of the site as Miocene Tierra Redonda Formation (Tt). The upper elevations of the northwest portion of the site are mapped as Pre Tertiary Basement complex (pt). The low lying valley portions of the site, Paraiso Springs Valley and Indian Valley are mapped as Pleistocene Fanglomerate (Qf). An unnamed fault is mapped by Durham trending northeast across the northwest corner of the site. The fault juxtaposes Tertiary Tierra Redonda Formation and Pre Tertiary Basement.

Dibblee, 1974 maps the site at a scale of 1:62,500. Dibblee maps the upland sloped areas of the site as Miocene Unnamed Red Beds (Trb). The upper elevations of the northwest corner of the site are mapped as Mesozoic or older Schist (ms). Also mapped in the northwest corner of the site is an unnamed fault juxtaposing schist and Unnamed Red Beds. The fault is buried by Quaternary Older Fan Gravels (Qog) at the northern central border of the site. South of the unnamed fault a large Quaternary landslide (Qls) is mapped. The low lying valley portions of the site, Paraiso Springs Valley and Indian Valley are mapped as Quaternary Older Alluvium (Qoa). In the center of the site Dibblee maps a small outcrop of Mesozoic basement rock (gdx). Dibblee also proposes the possible existence of subsidiary fractures related to the Rinconada fault under Paraiso Hot Springs (Dibblee, 1976). Dibblee proposes that these fractures may be the conduit by which rising hot water from the Rinconada Fault is sent westward to Paraiso Springs.

Tinsley, 1975 mapped the site at a scale of 1:62,500. Tinsley's mapping focused on Quaternary geology. Mapping of pre-quaternary geology is identical to Dibblee, 1974. Tinsley's mapping differs from Dibblee, 1974 in the mapping of the low-lying valley floor sediments. Tinsley maps the northern and southern borders of Paraiso Springs and Indian valleys as Pleistocene Chualar alluvial fan surfaces (Qch). The central portion of these valleys is mapped as Holocene Arroyo

Seco alluvial fan surface (Qas). The quaternary deposits in the upper elevations of the northwestern portion of the site are mapped as Pleistocene Placentia alluvial fan surfaces (Qp). Tinsley's map also shows a large Quaternary landslide in the southwestern area of the site that is congruent with Dibblee, 1974.

Geology for this report was mapped in the field on August 10, 11, and 12, 2004. Field mapping was done on a base topographic map at a scale of 1"=200'. During our investigation, mapping performed by Dibblee, 1974 was found to be accurate. Changes made by our investigation include mapping the Tertiary Unnamed Red Beds (Trb) as Tertiary Tierra Redonda Formation (Tt), and mapping many areas showing landslides and debris flows. As part of our geologic mapping we examined and interpreted four sets of stereo aerial photographs, taken in 1949, 1956, 1997, and 2000 covering the site and its vicinity. These photographs were scrutinized for site geology, terrain features characteristic of fault and landslide features. We also reviewed two water well logs drilled on the site in December 1976 & July 1992 (Appendix B). Based on the above referenced techniques, it is our opinion that the geology as mapped by Dibblee, 1974 is the most accurate published map. However, variations between the published mapping and the actual site geology exist, see Site Geologic Map, Sheet 1, and Geologic Cross Sections, Sheet 2, located in the map pocket at the back of this report. Description of the site geology is as follows:

Site Geologic Model

The right-lateral strike-slip Rinconada fault is the dominant and controlling structural feature of the western Salinas Valley (Figures 2 and 3) and is located approximately 1.5-km. east of the site. The Rinconada has an estimated slip rate of 1.0 mm/yr and a maximum magnitude earthquake of 7.5 (Cao et al, 2003). An unnamed fault likely related to the Rinconada is located on site. This fault trends northeast southwest across the northwestern corner of the site. According to Dibblee, 1974 this fault has shows no evidence of significant offset since the Miocene. Maximum magnitude, slip rate, and the recurrence interval are unknown for this fault. The structure of the Tertiary deposits on site is that of a northwest southeast trending openly folded anticline (See Sheet 2, Geologic Cross Sections). Quaternary deposits on site are relatively flat lying.

It has been proposed by Dibblee, 1976 that the hot water of Paraiso Springs may rise from the Rinconada fault in the east along fractures under the site. During our investigation no evidence for fracturing or faulting in the area of the hot springs was noted. However the subsurface structure of the unnamed fault is not known. This fault may provide the conduit for which the hot water is transferred. Minor slickensided fractures that are roughly parallel with the unknown fault were noted in the Tierra Redonda Formation (Sheet 1, note 4 and 5). The presence of fractures under the site cannot be denied nor confirmed with the data available. In the approximate center of the site an outcrop of granitic basement rock (Kgd) has been mapped (Sheet 1). This unit was also encountered at 10.5 feet below the ground surface in boring B-15, see Sheet 1 and appendix A. The presence of this basement rock at shallow depths could also contribute the geothermal gradient of the area and be responsible for the hot springs at the site. Description of the site stratigraphic section is as follows.

(Hf) Fill (Holocene): Man made fill deposits consisting of unconsolidated to semi-consolidated sand, silt, clay, and gravel. Fill deposits are found in many areas of the site where previous grading has occurred.

(Qyls) Landslide Deposits (Holocene): Recent landslide deposits, mostly occurring in the steeper slopes of the Tierra Redonda Formation (Tt). Deposits consist of unconsolidated sand silt and clay. These deposits are found flanking the site drainages where steep slopes are present.

(Qydf) Debris Flow (Holocene): Recent debris flow deposits, mostly occurring in the Tierra Redonda Formation (Tt). Deposits consist of unconsolidated sand silt and clay. These deposits are found flanking the site drainages where steep slopes are present.

(Qodf) Older Debris Flow (Holocene): Older debris flow deposits, mostly occurring in the Tierra Redonda Formation (Tt). Deposits consist of unconsolidated sand, silt, and clay. These deposits are found flanking the site drainages where steep slopes are present.

(Qal 1) Alluvium (Holocene): Unconsolidated to semiconsolidated sand, silt, gravel, and cobbles. Qal 1 is found in the upper reaches of Paraiso Springs and Indian Valleys and is coarser grained and younger than alluvial deposits to the east (Qal 2).

(Qal 2) Alluvium (Holocene): Unconsolidated sand, silt, and trace gravel. Qal 2 is found in the eastern portions of Paraiso Springs and Indian Valleys. Qal 2 is finer grained and older than alluvial deposits to the west

(Qols) Older Landslide (Pleistocene): Older landslide deposits consisting of unconsolidated to semi-consolidated boulders and cobbles supported by a sand and clay matrix. Clasts are of Sierra De Salinas Schist (ms) and granitic (Kgd) provenance. Located in the southwest corner of the site the slide buries Tierra Redonda deposits on the existing road

(Qoa) Older Alluvium (Pleistocene): older alluvial deposits consisting of unconsolidated to semi-consolidated cobbles and boulders. Older alluvial deposits are located in upper elevations of the northwest quarter of the site.

(Tt) Tierra Redonda Formation (Miocene): Marine sandstone, conglomerate and some mudstone. Deposits consist of slightly cemented fine to coarse grained, subangular to subrounded sand with subrounded to subangular fine to coarse gravels up to 6 inches in diameter. Sands and gravel clasts are composed of reworked granitic basement rock and Sierra De Salinas Schist. Deposits of Tierra Redonda are found flanking the site on the north and south sides.

(Kgd) Granitic Basement Rock (Cretaceous): Hornblende granodiorite with phenocrysts of feldspar. Kgd crops out in the central portion of the site.

(ms) Sierra De Salinas Schist (Pre-Cretaceous): Biotite schist of the Salinian Block. This unit is found in the upper elevations of the northwest corner of the site, west of the unnamed fault.

Landsliding

Landsliding on site consists of the debris avalanche and small rock slump type failures concentrated in the Tierra Redonda Formation (Tt), with one large debris slide off of the Sierra De Salinas Schist (ms). Slope failures are found on the steep northern slopes of Indian Valley, the steep southern slopes of Paraiso Springs Valley, and the northwestern slope of the western extent of Paraiso Springs Valley (Sheet 1).

Slope failures along the northern slope of Indian valley are of the debris avalanche (Qydf &Qodf) and small rock slump (Qyls) type, as classified by Varnes, 1978. The slides mapped were found during aerial photo review and during field mapping. Relative ages of slope failures were given based on geomorphic evidence. Young debris avalanche failures (Qydf) are expressed as elongate, shallow failures that expose unvegetated bedrock. Older debris flow avalanche failures (Qodf) are also expressed as elongate, shallow failures, but show regrowth of vegetation and softening of geomorphic features. Recent rock slump failures (Qyls) are expressed as lobate failures with rotated, intact blocks. These failures are shallow and lack regrowth of vegetation in the scarp areas.

Landsliding on the southern slopes of Paraiso Springs Valley consists entirely of the debris avalanche type (Qydf &Qodf). Relative ages of the slides were given using the criteria outlined above. Failures in this area are more extensive than those of Indian Valley in width and depth. The younger debris avalanches (Qydf) mapped are recent failures from March of 1995 (locality 1 and 6, Sheet 1). These events were rapid, and occurred on steep vegetated slopes after heavy rains for multiple days. Deposits on the valley floor were approximately 0.5 to 1.0 foot of mud and sand.

A large, old (Pleistocene) debris slide (Qols) is mapped in the southwestern portion of the site. This slide is approximately 800 feet wide and a minimum of 100 feet thick. The slide buries the Tierra Redonda Formation and the unnamed fault that crosses the northwestern corner of the site

(Sheet 1). The slide debris is made up of breciated gravels and cobbles in a sand and clay matrix. Lithology of the gravels and cobbles is granitic basement (Kgd) and Sierra De Salinas Schist (ms).

For purposes of zoning for our relative geologic hazard map, areas with identified landsliding were given the designation of zone 4 (High Geologic Hazard Potential). The steep slopes surrounding the areas of landsliding that do not show evidence of slope failure was also designated zone 4. These areas were classified as zone 4 due to similar earth materials and slope gradients.

SUBSURFACE CONDITIONS

A total of 29 exploratory borings were drilled on site. Subsurface constituents were fairly uniform and consistent with the published geologic mapping. Eleven different geologic units were encountered on site, all with varying subsurface conditions. To generalize, the site soil conditions of the upland areas are composed of bedrock and landslide deposits, while the valley areas are underlain by unconsolidated to semiconsolidated alluvium. The proposed development area is predominantly underlain by alluvium composed of unconsolidated to semiconsolidated sand, silt and clay with minor gravels and cobbles. Subsurface conditions are shown in the boring logs found in Appendix A at the back of this report.

GROUNDWATER

The Paraiso Springs Valley has a long history of ground water use. Native Californians were the first to utilize this resource, hence the name of Indian Valley given to the drainage to the north of Paraiso Springs Valley. The Spaniards and early Californians also took advantage of the groundwater resources of the area. In the southeast corner of Paraiso Springs Valley the Mission Soledad had its vineyard. The mission eventually sold the property. After the sale, the site was used for its hot spring mineral baths circa 1880's.

Numerous wells and hot springs are located on site. The Main Well is 104 feet deep and currently in use for domestic water, pumping at a rate of 20-30 gallons per minute (Geoconsultants, 2004). The Fluoride well is 640 feet deep and pumps at a rate of 200-300 gallons per minute, but is not used for domestic water (Geoconsultants, 2004). The Soda Springs well is currently being used for hot water. This well is 37 feet deep and produces 30-40 gallons per minute at +/- 115° F (Geosolutions, 1998).

The abundant groundwater resource of this valley was verified by our investigation. Of the 15 borings drilled in Paraiso Springs Valley, 10 borings encountered groundwater (See Table 1 & Sheet 1). Depths to ground water ranged from 11.0 to 55.0 feet below the ground surface. Depths to ground water and temperatures can be found in Table 1. Ground water in the area of the current hot springs was found to be 11.0 to 18.5 feet below the ground surface. The borings west of the current hot springs encounter ground water at greater depths the farther west they were drilled. Depth to ground water increases from 18.5 feet below the ground surface just west of the current hot springs in B-11 to 55.0 feet below the ground surface in B-19. All borings that encountered ground water were drilled in Quaternary alluvium, Qal 2. A slight to moderate sulfur odor was noted in some of the borings and was noted in the boring logs. Hydrophilic vegetation was also noted in the area east of the Great Lawn. The presence of this type of vegetation is indicative of springs and shallow ground water. Ground water was not found in borings outside of the Paraiso Springs Valley or in any other geologic unit.

TABLE 1

Ground Water Depth & Temperature

Boring	Initial Depth to Ground Water	Depth to Ground Water After 30m	Temperature F°
1	18.5´	6.5´	73.4
3	15.0´	19.0´	73.0
5	21.0´	11.5´	79.0
7	11.0´	8.0´	--
9	12.0´	7.0´	80.9
11	18.5´	18.2´	94.1
13	12.0´	9.7´	95.0
17	31.5´	41.3	95.7
19	55.0´	58.3´	95.0
23	14.0´	5.5´	73.0

Local groundwater levels can fluctuate over time depending on but not limited to factors such as seasonal rainfall, site elevation, groundwater withdrawal, and construction activities at neighboring sites. The influence of these time dependent factors could not be assessed at the time of our investigation.

SITE SOIL CLASSIFICATION

Because of the variability of geologic materials found on the site, multiple soil classifications could be applied. The ridges and slopes underlain by Tierra Redonda Formation (Tt) could be classified as soil type S_C, Very Dense Soil and Soft Rock. Alluvium in Indian Valley and alluvium west of locality 1 (Sheet 1) could be classified as S_C / $S_{D,}$ Very Dense Soil and Soft Rock/Stiff Soil Profile. In the alluvium east of locality 1 high groundwater conditions and low blow counts were encountered. These soils are given soil type $S_{E,}$ Soft Soil Profile. A majority of the development of the site is proposed to occur in the area east of locality in soil type S_E. For this reason we are designating the soil type for the site as S_E as defined by the guidelines in the

2001 edition of the California Building Code (CBC). As per Chapter 16, Section 1636.2 The Soft Soil Profile (S_E) is classified as having an average shear wave velocity of less than 180 m/sec.

GEOLOGIC AND SOIL ENGINEERING CONCLUSIONS

Seismic Hazards: The site is located in the seismically active Monterey Bay region of the Coast Ranges Geomorphic Province (Figure 5). The closest earthquake fault zone is the San Andreas fault, located 30-km to the northeast. The California Division of Mines and Geology has classified the San Andreas fault (Creeping segment) as a Type A Fault for purposes of the 2001 CBC (CDMG, 1998). The San Andreas fault Creeping segment can expect a (M6.2) earthquake with an approximate 61 year recurrence interval (Cao et al, 2003). Stronger earthquakes could be experienced at the site similar to the 1906 event with a maximum magnitude of (M7.9) with a recurrence interval of 210 years (Petersen et al, 1996).

Surface Fault Rupture: The site is not located within an Earthquake Fault Zone as established in accordance with the Alquist-Priolo Earthquake Fault Zoning Act of 1972. However a fault of unknown activity has been mapped on site. The northwestern portion of the site where the fault is mapped has been designated Zone 4F for our Relative Geologic Hazard Map (Sheet 3). This area has moderate potential for surface fault rupture. The remaining portion of site has low potential for surface fault rupture.

Historical Earthquakes: During recent historic times moderate to large earthquakes have caused significant damage to man made structures in the greater Monterey Bay area. These include the following:

1857 San Andreas Fault: A large quake occurred on the San Andreas fault, rupturing from Parkfield south to Wrightwood, on January 9, 1857. The quake had an estimated magnitude of 7.8. Very severe shocks were felt in Sacramento and a cabin was knocked down in the Cholame area (Rosenberg, 2001).

1881 Parkfield: On February 2, 1881 a 5.6 magnitude quake occurred in the Parkfield area knocking down several adobe structures and chimneys. Springs and cracks were also noted in the area of the quake (Rosenberg, 2001).

1901 Parkfield: A magnitude 5.8 struck the Parkfield area on March 2, 1901. Again many chimneys were damaged and cracks in the ground were noted. A small tsunami also occurred in the Monterey Bay. (Rosenberg, 2001)

1906 California: The 1906 (M_w~8.0) "San Francisco earthquake", which ruptured a portion of the active San Andreas fault from approximately San Juan Bautista to Cape Mendocino, caused severe damage in parts of the Monterey-San Francisco Bay area and throughout California. The earthquake occurred on April 18, 1906 and caused severe ground shaking, ground settlement, liquefaction, and structural damage to buildings in Monterey, Santa Cruz, and San Benito Counties (Lawson, 1908). The most significant earthquake effects in the area of the site and vicinity were the sinking of the Salinas River bed in the areas of King City and San Ardo. (Rosenberg, 2001). Ground water flow changes were also common. At Paraiso Springs the temperature and flow of water had been decreasing for "some time" before the quake (Lawson, 1908). After the quake the temperature and flow of the springs returned too its previous values (Lawson, 1908).

1922 Parkfield: The March 10, 1922 earthquake that struck the Parkfield area was a magnitude 6.1. It caused ground cracks six to twelve inches in width and a quarter-mile long in the Chalome Valley (Rosenberg, 2001). Chimneys were knocked down and some housed suffered structural damage. An oil pipeline was also damaged in the area.

1926 Monterey Bay Doublet: On October 22, 1926 two magnitude 6.1 earthquakes an hour apart occurred in southern Monterey Bay. Numerous buildings experienced damage and cracking on the Monterey Peninsula and in Salinas. It is postulated that the earthquakes occurred on either the San Gregorio fault or Monterey Bay fault zone (Rosenberg, 2001).

1934 Parkfield: A magnitude 6.1 earthquake again struck the Parkfield area on June 7, 1934. Again this quake caused fracturing of the ground surface and broke the oil pipeline in the area. Chimneys and houses were also damaged in the area (Rosenberg, 2001).

1938 Stonewall Canyon: On September 27, 1938 a magnitude 5.0 quake occurred in the Stonewall Canyon area northeast of Soledad. Details of the damage caused by this quake are unknown. This is the closest quake of magnitude 5.0 or greater to the site at approximately 17-km away.

1989 Loma Prieta: The October 17, 1989 (M_w 7.1) Loma Prieta earthquake, which is believed to have occurred on an oblique-slip blind thrust closely associated with the San Andreas fault, also caused significant damage in the San Francisco and Monterey Bay areas. It was the largest earthquake to strike this region of California since the California earthquake of 1906. The effects of this earthquake was felt over an area of 400,000 square miles and resulted in 74 deaths, 3,757 injuries, 12,000 homeless, and over $6 billion in property damage (Plafker & Galloway, 1989). In Monterey County 19 homes were destroyed, 341 homes damaged, two deaths and 14 people injured, and causing approximately $118 million in damages (Rosenberg, 2001). The southern Salinas Valley suffered little damage as a result of this quake. The liquefaction experienced in the 1906 quake was absent during this event. The explanation given by Rosenberg, 2001 for the differences in liquefaction occurrence is differences in ground water table at the time of rupture. Groundwater was likely higher in 1906 as they had a wet winter, and the 1989 quake occurred after several years of drought.

As part of our historical earthquake research, we performed a database search of the Northern California Earthquake Data Center catalog for earthquakes with magnitudes greater than 5.0 within an approximate 100km radius of the site for the years between 1910 to 2004. The database research indicated a total of 87 events within our search parameters. The December 22, 2003 Paso Robles earthquake and the September 28, 2004 Parkfield earthquake were within the search radius. The closest earthquake was the Stonewall Canyon earthquake of 1938.

<u>Ground Shaking:</u> The 1906 (M_w~8.0) “San Francisco earthquake”, which ruptured a portion of the active San Andreas fault from approximately San Juan Bautista to Cape Mendocino, caused

severe damage in parts of the Monterey-San Francisco Bay area. Its epicenter was located directly west of the Golden Gate, approximately 183 kilometers northwest of the site. The earthquake occurred on April 18, 1906 and caused severe ground shaking and structural damage to buildings in Monterey and San Benito Counties (Lawson, 1908). The 1989 (M_w 7.1) Loma Prieta earthquake, which is believed to have occurred on an oblique-slip blind thrust closely associated with the San Andreas fault, also caused significant damage in Monterey County. The epicenter of this event was located in the Forest of Nicene Marks State Park, approximately 80 kilometers northwest of the site. Strong ground shaking associated with major earthquakes along the San Andreas and related faults will undoubtedly occur at the site in the future. The State of California estimates the peak ground acceleration with a 10 percent probability of being exceeded in a 50-year period in the vicinity of the site to be >0.35 to 0.45g (Petersen et al, 1996)

Seismic Design Parameters: As previously stated we have classified the soil profile as Soft Soil Profile (S_E) as defined in the guidelines in the 2001 CBC, Section 1636.2 (average shear wave velocity for the upper 30 meters is less than 180 m./sec.). We have determined the appropriate seismic coefficients to be used for the design of the structure according to the 2001 CBC.

TABLE 2
Near Source Factors & Seismic Coefficients

Seismic Source	Fault Type	Distance	N_a	N_v	C_a	C_V
Rinconada Fault	B	1.5 km E	1.3	1.6	0.47	1.54

Liquefaction, Lateral Spreading, and Dynamic Compaction: Liquefaction is the transformation of soil from a solid to a liquid state as a consequence of increased pore-water pressures, usually in response to strong ground shaking, such as those generated during a seismic event (earthquake). Liquefaction is most commonly associated with Holocene age deposits where the groundwater is less than 30 feet below the surface and the anticipated peak ground acceleration (PGA) having a 10% probability of being exceeded in 50 years is greater than 0.2g (Arulmoli et. al., 1999). Liquefaction most often occurs in Holocene age loose saturated silts, and saturated poorly graded fine-grained sands. However, some cohesive clay soils can be subject to strength loss even under relatively minor strains. All but two borings, B-17 and B-19, that encountered ground water meet the above stated criteria of a PGA higher than a 0.2 and ground water at less than 30 feet below the ground surface. Data collected from exploratory borings were used to evaluate the liquefaction potential of the site using the “Liquefy 2”computer program developed by Thomas F. Blake. Each boring which encountered ground water, Borings 1, 3, 5, 7, 9, 11, 13, 17, 23, was evaluated using a peak ground acceleration of 0.47g, and a maximum magnitude earthquake of 7.5. Of the nine borings evaluated, only boring B-23 has a factor of safety greater than 1.0 for the entire depth of the boring. Therefore it is our opinion that the potential for liquefaction at the site is high. As a result we are recommending a supplemental liquefaction study be conducted in the areas where high ground water was encountered (Zone 3L) to quantify the hazards associated with soil settlement due to liquefaction.

Dynamic compaction occurs when loose, unsaturated soils densify in response to ground shaking during a seismic event. Because loose soils were encountered on the site, it is our opinion that the potential for dynamic compaction is high in areas designated as Zone 3L.

Ridge-Top Shattering: Ridge-top shattering was well documented after the 1971 San Fernando earthquake and also occurred during the 1989 Loma Prieta earthquake in the Santa Cruz Mountains. The phenomenon occurs most commonly on the crests of sharp ridges, where seismic shaking energy is concentrated as in the chimney of a building. Shattering can effect both soil and the underlying bedrock and gives the appearance of plowed ground (Barrows, 1975; Kahle, 1975). The site lacks sharp ridgelines typical of ridge-top shattering failures, therefor the potential for ridge-top shattering is considered to be low.

Landsliding and Slope Stability: The steep slopes underlain by the Tierra Redonda Formation that flank Paraiso Springs Valley and Indian Valley are very prone to slope failure. Numerous debris avalanches and debris slides of varying ages are present on these slopes. All steep slopes of the Tierra Redonda have been given the designation Zone 4D or 4S, major geologic hazard potential for debris flow and sliding, on our Relative Geologic Hazards Map (Sheet 3).

Flood Hazards: According to the National Flood Insurance Program map Panel Number 060195 0350 D (FEMA, 1984) the site is not located within a flood zone. However flooding of the site near the current hot spring did occur in March of 1995. This flood was the result of channeling the drainage into a culvert of insufficient diameter. Brush, rocks and other stream debris clogged the culvert and caused the drainage to overflow (Sheet 1, Locality 2). The flood that resulted caused significant damage to the road and pools below. To help prevent future incidences like the 1995 flood, on site stream channels may need to be enlarged. On site stream channels will also need to be cleared and maintained. Culverts and bridges should be designed to not cause restrictions to flow in the stream channel.

Erosion: The site soils and earth materials are erodible. Stringent erosion control measures should be implemented to provide surficial stability of existing and proposed graded cut/fill slopes.

Soil Expansion: Expansive soils experience volumetric changes with changes in moisture content, swelling with increases in moisture content and shrinking with decreasing moisture content. These volumetric changes that the soil undergoes in this cyclic pattern can cause distress resulting in damage to concrete slabs and foundations. The Atterberg limits tests performed on a near surface soil samples resulted in plasticity indexes of 9 to 23. These values indicate that the near surface soil (upper 5-feet) typically has a low expansion potential. No special measures are required to mitigate soil expansion.

GEOLOGIC CONSTRAINTS & PROPOSED DEVELOPMENT

One of the purposes of this report was to evaluate the site geologic constraints and develop a relative geologic hazard assessment, within the framework of the proposed development. For the purposes of land use planning, the term geologic hazard indicates a naturally occurring surface or subsurface constraint caused by existing site geologic conditions. Potential risks can usually be assessed and mitigated to an acceptable level by analyzing these constraints.

Preparing a relative geologic hazards map involves interpreting site topography, soil and rock type, groundwater conditions and geologic structure. In order to provide a useful framework for project planners, we have prepared a map depicting the relative geologic hazards (Sheet 3). This map is a result of the interpretation and compellation of our findings from site geologic mapping, subsurface exploration, aerial photographic review, and literature review.

The relative geologic hazards map (Sheet 3) has been divided into for zones of relative geologic risk from low (Area 1) to high (Area 4). These zones have been further subdivided into areas of specific hazards related to potential risk for faulting (F), liquefaction (L), debris flow (D) and landsliding (S). The project planners must understand that the geologic hazards map should be utilized as a guideline for planning purposes, and ***is not*** a substitute for the recommended design level site specific investigations. While solid or dashed lines delineate the hazard areas, the actual boundaries between the hazard areas are gradational. The following presents an overview of the relative geologic hazards for the areas of proposed site development, and their potential mitigative measures.

Area 1 – Low Geologic Hazard Potential

Proposed development within this area includes; the Estate Lots, northern portion of the Paraiso Institute, the majority of the Hillside Village Condominiums, western portion of the Casitas area, northern portion of the Teahouse Complex and western portion of the Sports Center. No special mitigative grading or foundation measures are required for site development in this area. Building foundations may consist of either conventional cast-in-place footings or pier and grade beam foundations depending on slope gradients. A site-specific design level soil engineering investigation is recommended once the actual building locations and preliminary grading plans have been completed. This hazard area associated with an “ordinary level of risk”. (See Appendix D)

Area 2D – Minor Geologic Hazard Potential – Debris Flow

Proposed development within this area includes the western portion of the Sports Center. Mitigation measures to protect development in this area should include adequate design of site storm drain facilities for post-development runoff, and debris flow walls and basins in the upstream drainages. Building foundations may consist of conventional cast-in-place footings. A site-specific design level engineering geologic and soil engineering investigation is recommended once the actual building locations and preliminary grading plans have been completed. This hazard area associated with an “ordinary level of risk”. (See Appendix D)

Area 2S – Minor Geologic Hazard Potential - Landslide

Proposed development within this area includes the northwestern portion of the Hillside Village Condominiums. Mitigation measures to protect development in this area should include appropriate grading techniques & methodology and adequate design of site drainage facilities for post-development runoff. Building foundations should consist drilled pier and grade beam foundations. A site-specific design level engineering geologic and soil engineering investigation is recommended once the actual building locations and preliminary grading plans have been completed. This hazard area associated with an “ordinary level of risk”. (See Appendix D)

Area 3L – Moderate Geologic Hazard – Liquefaction Potential

Proposed development within this area includes the Biolarium, Living Machine, Nursery, Winery, Day Spa, Hamlet Town Square, Hotel, Conference Center and eastern portion of the Casitas. Mitigation measures to protect development in this area could include structural strengthening of buildings to resist predicted ground settlements (if small), placement of a sufficiently thick layer of engineered fill to resist predicted ground settlement, utilization of post tension or mat slab foundations, or a combination of the above noted measures. A site-specific supplemental liquefaction investigation prepared in accordance with CDMG Special Publication 117 should be performed prior to the completion of preliminary grading plans. This hazard area associated with an “ordinary level of risk”. (See Appendix D)

Area 3D – Moderate Geologic Hazard – Debris Flow Potential

Proposed development within this area includes the southern portion of the Casitas and Teahouse areas. Mitigation measures to protect development in this area should include appropriate grading techniques & methodology and adequate design of site drainage facilities for post-development runoff. Debris flow basins and diversion structures are recommended to protect future development from debris flow source areas. Building foundations may consist of conventional cast-in-place footings. A site-specific design level engineering geologic and soil engineering investigation is recommended once the actual building locations and preliminary grading plans have been completed. This hazard area associated with an “ordinary level of risk”. (See Appendix D)

Area 3S – Moderate Geologic Hazard – Landslide Potential

Proposed development within this area includes the southwestern portion of the Hillside Village Condominiums. Mitigation measures to protect development in this area should include appropriate grading techniques & methodology and adequate design of site drainage facilities for post-development runoff. Building foundations should consist drilled pier and grade beam foundations. A site-specific design level engineering geologic and soil engineering investigation is recommended once the actual building locations and preliminary grading plans have been completed. This hazard area associated with an “ordinary level of risk”. (See Appendix D)

Area 3DS – Moderate Geologic Hazard – Debris Flow and Landslide Potential

Proposed development within this area includes the north-central portion of the Hillside Village Condominiums. Mitigation measures to protect development in this area should include appropriate grading techniques & methodology and adequate design of site drainage facilities for post-development runoff. Debris flow basins and diversion structures are recommended to protect future development from debris flow source areas. Building foundations should consist of drilled pier and grade beam foundations. A site-specific design level engineering geologic and soil engineering investigation is recommended once the actual building locations and preliminary grading plans have been completed. This hazard area associated with an “ordinary level of risk”. (See Appendix D)

RECOMMENDATIONS

The following recommendations are drawn from the data acquired and evaluated during this investigation for the proposed project.

Geologic

In our opinion, the site is suitable for the proposed development provided that the recommendations contained herein are strictly adhered to and implemented in the design and construction. These recommendations have been prepared assuming that Landset Engineers, Inc. will be commissioned to review proposed site development and grading plans prior to construction and provide design level engineering geologic recommendations. Soil and groundwater conditions can deviate from the conditions encountered in the exploratory borings, if significant variations in the subsurface conditions are encountered during construction, it may be necessary for Landset Engineers, Inc. to review the recommendations presented herein, and recommend adjustments as necessary.

1. An additional site-specific supplemental liquefaction study should be performed for proposed development located in Zone 3L. The supplemental liquefaction study should be performed in accordance with the guidelines contained within the California Division of Mines & Geology Special Publication 117, as adopted by the State Mining and Geology Board in accordance with the State of California Seismic Hazards Mapping Act of 1990. It is recommended that the supplemental liquefaction study should include cone penetrometer test (CPT) borings and additional laboratory testing in order to more accurately characterize the site subsurface conditions and estimate potential ground settlements as a result of liquefaction.

2. Prior to construction, the location of proposed areas to be developed including building envelopes, roadways, drainage, utilities, and leachfield improvements should be reviewed by the project geologist for proposed development located in geologic hazard zones 2, 3 and 4.

The purpose of this review is to provided additional engineering geologic design level criteria verify setbacks from slopes, landslides and other identified geologic hazards.

3. Structures designed for human occupancy shall be designed according to the current edition of the CBC. Structures should be designed for a mean peak horizontal ground acceleration of 0.47g.

4. The project geologist **must** review and approve all project grading plans prior to submittal to the governing jurisdiction. The purpose of this review is to examine the slopes for overall stability and to provide additional recommendations if site conditions differ from those identified during the course of this investigation.

Soil Engineering

In our opinion, the site is suitable from a soil engineering standpoint for the proposed development provided that the recommendations contained herein are implemented in the design and construction. The following preliminary recommendations are presented as guidelines to be used by project planners and designers for the soil engineering aspects of the project design and construction. These recommendations have been prepared assuming that Landset Engineers, Inc. will be commissioned to perform additional design level investigations, review proposed grading and foundation plans before construction, and to observe, test and advise during earthwork and foundation construction. Soil and groundwater conditions can deviate from the conditions encountered at the boring locations. If significant variations in the subsurface conditions are encountered during construction, it may be necessary for Landset Engineers, Inc. to review the recommendations presented herein, and recommend adjustments as necessary.

Site Preparation and Grading

1. The soil engineer should be notified **at least ten (10) working days prior to any site clearing or grading** so that the work in the field can be coordinated with the grading contractor, and arrangements for testing and observation services can be made. The recommendations contained in this report are based on the assumption that Landset Engineers, Inc. will perform the required testing and observation services during grading and construction. It is the owner's responsibility to make the necessary arrangements for these required services.

2. Prior to grading, construction areas should be cleared of obstructions, buried structures & utilities, and other deleterious materials. Site clearing should be observed by a field representative of Landset Engineers, Inc. Voids created by removal of material as described above should be called to the attention of the soil engineer. No fill should be placed unless a representative of this firm has observed the underlying soil.

3. Following site clearing, the upper 1 to 4-feet of native soil should be overexcavated from the building areas. The actual depth of subexcavation should be determined by additional design level soil engineering investigations. Building areas are defined as the soils within and extending a minimum of 5 feet beyond the foundation perimeters and structural fill areas.

4. The soils exposed by overexcavation should be scarified 8 inches; moisture conditioned to above optimum moisture content, and compacted to at least 90% of maximum dry density. Where referenced in this report, percent relative compaction and optimum moisture content shall be based on ASTM test D1557-91. Areas to receive structural fill outside the building pad should be scarified and recompacted in a similar manner.

5. In order to limit the potential for differential settlement of conventional footings, foundations should not be supported on both fill and cut. Therefore, we recommend that the cut side of the building area should be overexcavated (undercut). The proposed grading within the building area should be designed so that no more than 5 feet of differential fill thickness exists below foundations. The portion of the building foundations bearing on cut should be undercut at least 3 feet below the proposed building pad so that the entire foundation is bearing on a uniform layer of compacted fill. Deeper overexcavation may be necessary in order to satisfy the differential fill thickness recommendations. The use of post-tensioned slabs may reduce or eliminate the need to undercut cut/fill pads

6. If structural fill is to be placed on slopes steeper than 6:1 (horizontal to vertical), keyways should be established at the toe of the proposed fill slopes. The keyways should have minimum widths of 10-feet and should be sloped approximately 2% back into the hillsides. The keyways and subsequent upslope benches should penetrate into sufficiently stable material at determined by the soil engineer at the time of grading.

7. If structural fill is to be placed on slopes steeper than 10:1, the slopes should be benched. The benches should have a minimum width of 10-feet and should be sloped approximately 2% back into the hillsides. The soil engineer will determine the depth, scarification, and recompaction of the bench bottoms at the time of grading.

8. If fill over cut slopes are to be constructed, keyways should be established at the cut/fill daylight lines. The keyways should have minimum widths of 10-feet and should be sloped approximately 2% back into the hillsides. The keyways and subsequent upslope benches should penetrate into sufficiently stable material as determined by the soil engineer at the time of grading.

9. The soil engineer should also observe keyways and benches to assess the need for subsurface drains (subdrains). Subdrains in other areas may also be recommended depending on the grading plan and site conditions observed at the time of grading.

10. Fill slopes should be constructed at a maximum finished slope inclination of 2:1 (horizontal to vertical). Fill slopes should be overfilled and trimmed back to competent material. Further compaction of exposed fill slope faces using sheepsfoot rollers or tracked equipment may be recommended by the soil engineer. Cut slopes should be constructed at an inclination of 2:1.

11. Fill, material should be placed in thin lifts, moisture conditioned to a level above optimum moisture content, and compacted to a minimum of 90 percent of maximum dry density. Prior to compaction, the soil should be cleaned of any rock, debris, and irreducible material larger than 3-inches in diameter.

12. Fill material should consist of non-expansive Select Structural Fill. Select Structural Fill is defined herein as a native or import fill material which, when properly compacted, will support foundations, pavements, and other fills without detrimental settlement or expansion. Select Structural Fill is specified as follows:

Select Structural Fill

- Clean native soil may be utilized, but import fill shall have a Plasticity Index of less than 12;
- Be free of debris, vegetation, and other deleterious material;
- Have a maximum particle size of 3-inches in diameter;
- Contain no more than 15% by weight of rocks larger than 21/2-inches in diameter;
- Have sufficient binder to allow foundation and unshored excavation stand without caving;
- Prior to delivery to the site, a representative sample of proposed import should be provided to Landset Engineers, Inc. for laboratory evaluation.

13. In areas to be paved, the upper 12-inches of subgrade soils and all aggregate base should be compacted to a minimum of 95 percent of maximum dry density. Aggregate base and subgrade should be firm and unyielding when proofrolled by heavy rubber-tired equipment prior to paving.

Foundations

14. The buildings may be supported by conventional continuous and spread (pad) footings, drilled pier & grade beam, or by post-tensioned slab foundations (see Geologic Constraints and Proposed Development section of this report for recommended foundation type).

Conventional Footings

15. The buildings may be supported by conventional continuous and spread (pad) footings supported on recompacted soil. Footings should have minimum depths of 12-inches below lowest adjacent grade for single story structures, and 18-inches below lowest adjacent grade for two story structures, and 24-inches below lowest adjacent grade for three story structures. For the above conditions, the footings for a proposed structure may be designed for an allowable bearing pressure range of 1,000 to 3,000ft^2 for dead plus live loads. Footings should be reinforced as directed by the architect/structural engineer.

16. Post construction total and differential settlements of foundations are expected to be about ½ to 1½-inch from static loading. Estimated foundation movements due to seismically induced settlement as a result of earthquakes could be higher.

17. Footing excavations should be observed by a representative of this firm prior to placement of formwork or reinforcement. Concrete should be placed only in foundation excavations that have been kept moist, and contain no loose or soft soil debris.

18. Footings located adjacent to other footings or utility trenches should have their bearing surfaces founded below an imaginary 1:1 (horizontal to vertical) plane projected upward from the bottom edge of the adjacent footings or utility trenches.

Pier & Grade Beam Foundations

19. Drilled friction and/or end bearing pier and grade beam foundations should penetrate through any engineered fill and/or topsoil and bear entirely into the dense native bedrock materials.

20. Foundation piers should be 12 to 18-inches in diameter and should be spaced apart at least 3 pier diameters, center to center. These cast-in-place concrete piers should be reinforced as directed by the project architect/structural engineer.

21. The piers should penetrate through any fill or topsoil, and a minimum of 5 feet into bedrock material as verified by a representative of this firm at the time of drilling. Overall piers depths should be at least 8 to 10-feet below lowest adjacent grade.

22. For the above conditions, the piers for a proposed structure may be designed for an allowable skin-friction range of 250 to 500 psf. for pier lengths in bedrock for dead plus live loading. This value may be increased by one-third when considering temporary additional short-term wind or seismic loading. The support from end bearing of the piers should be neglected. Due to possible disturbance during drilling, skin friction on the upper 2-feet of the piers should be discounted in the calculations. Piers should be

structurally connected to grade beams designed to transfer imposed loads to the foundation piers.

23. For calculating resistance to lateral loading, a passive resistance equal to an equivalent fluid weight range of 250 to 350 pcf. can be used (ultimate value). For pier foundations, this lateral resistance can be used over two times the cross sectional area of the pier. Only competent bedrock and engineered structural fill may be utilized in calculating lateral passive resistance. Additionally, the upper 2-feet of the pier should be ignored in providing lateral passive resistance.

24. Post construction total and differential settlements of foundations are expected to be about ½-inch from static loading. Estimated foundation movements due to seismically induced settlement as a result of earthquakes could be higher.

25. Perimeter foundation piers and piers adjacent to structural concrete slabs-on-grade should be laterally restrained by concrete grade beams penetrating a minimum of 12-inches below lowest adjacent grade. Grade beams between interior piers are not considered necessary. Grade beams should be reinforced as directed by the project architect/structural engineer.

Post-Tensioned Slab Foundations

26. Post-tensioned slabs may be utilized to resist differential settlement of the fill material and/or potentially liquefiable soils. Post-tensioned slabs should be designed in accordance with the 2001 edition of the California Building Code and the latest design recommendations by the Post-Tensioning Institute utilizing the following design criteria:

27. For the above conditions, the post-tensioned slabs may be designed for an allowable bearing pressure range of 1,000 to 3,000 pounds per square foot for dead plus live loads. A qualified structural engineer should design post-tensioned slabs.

28. A minimum of 4 inches of clean sand should be provided beneath the post-tensioned slabs. The building pad subgrade should be pre-moistened to a level at or slightly above optimum moisture content prior to the placement of the clean sand cushion. Clean sand is defined as a sand (ASTM D 2488-93) of which less than 3 percent passes the No. 200 sieve.

29. To minimize floor dampness, such as where moisture sensitive floorings will be present, a membrane vapor barrier should be placed at the midsection of the clean sand cushion. The membrane vapor barrier should be a minimum 10 mil in thickness, and care should be taken to properly lap and seal the vapor barrier, particularly around utilities.

30. To limit the potential for subsurface moisture to enter the underlying sand cushion, the perimeters of the post-tensioned slabs should be thickened to penetrate below the bottom of the sand cushion layer.

31. Post-tensioned slabs should be constructed and maintained in accordance with the latest procedures as specified by the Post-Tensioning Institute. Plumbing through the slabs, utility connections, exterior flatwork, and drainage systems should be designed to accommodate the specified differential settlement conditions as determined by additional design level investigations.

Conventional Slabs-on-Grade and Exterior Flatwork

32. For buildings utilizing conventional footings, interior slabs-on-grade should have a thickness of 4 to 6-inches. It should be noted that the project structural engineer might require thicker slab sections to provide the necessary support for the anticipated structural loads. Conventional concrete slabs-on-grade should be reinforced with steel as specified by the structural engineer.

33. To minimize floor dampness, such as where moisture sensitive floorings will be present, a section of capillary break material at least 4-inches thick covered with a membrane

vapor barrier should be placed between the floor slab and the compacted soil subgrade. The capillary break should consist of a clean, free draining material such as ½ to ¾-inch drainrock with not more than 10 percent of the material passing a No. 4 sieve. The drainrock should be free of sharp edges that might damage the membrane vapor barrier. The membrane vapor barrier should be a minimum 10 mil in thickness, and care should be taken to properly lap and seal the vapor barrier, particularly around utilities. The sand cushion should be lightly moistened immediately prior to concrete placement.

34. Exterior concrete flatwork such as driveways, patios and sidewalks should be designed to act independently of building foundations. Exterior flatwork should be constructed on compacted soil subgrade moisture conditioned to over optimum moisture content. Reinforcement and joint spacing should be at the direction of the architect/structural engineer.

Utility Trenches

35. On-site soils should be properly shored and braced during construction to prevent sloughing and caving of trench sidewalls. The contractor should comply with the Cal/OSHA and local safety requirements and codes dealing with excavations and trenches.

36. A select non-corrosive, granular, material should be used as bedding and shading immediately around underground utility pipes and conduits. Native soils may be used for trench backfill above the select material.

37. Trench backfill in landscaped or unimproved areas should be compacted to a minimum of 85 percent of maximum dry density. Trench backfill beneath asphalt and concrete pavements should be compacted to a minimum of 95 percent of maximum dry density. Trench backfill in other areas should be compacted to a minimum of 90 percent of maximum dry density.

38. The bottoms of utility trenches that are parallel to foundations should not extend below an imaginary plane sloping downward at a 1:1 (horizontal to vertical) angle from the bottom outside edges of foundations.

Site Drainage

39. The site soils are highly erodible and a drainage & erosion control plan is essential to the project. Fluctuations of moisture contents are a major consideration, both before and after construction. Site runoff will be substantially increased due to the large paved and surfaced areas. A comprehensive drainage & erosion control plan is essential to the long-term sustainability of the project.

40. Surface drainage should provide for positive drainage so that runoff is not permitted to pond adjacent to foundations, concrete slabs-on-grade, and pavements. Surface drainage should be directed away from site improvements at a minimum 2 percent grade for a minimum distance of 5-feet. Surface drainage facilities should be armored or hard-scaped to limit erosion potential. If this is not practicable due to the terrain or other site features, swales with improved surfaces should be provided to divert drainage away from improvements.

41. Roof gutters should be utilized around the building eaves. Roof gutters should be connected to downspouts, which in turn should be connected to pipes leading to the site storm drain system. Runoff from downspouts, planter drains and other improvements should discharge in a non-erosive manner away from site improvements in accordance with the requirements of the governing agencies.

42. The migration of water or spread of root systems below foundations, slabs, or pavements may cause differential movement and subsequent damage. Landscaping runoff collection facilities should be incorporated in the project design.

43. Cut-off drainage swales should be constructed at the top of all cut and fill slopes. These drainage swales should be of adequate size to collect surface runoff and flow to an approved point of discharge in a non-erosive manner. Proper drainage and re-vegetation of graded slopes is essential to ensure stability.

QUALITY CONTROL

The conclusions and recommendations contained in this geologic report and soil engineering feasibility investigation are preliminary in nature. We recommend that Landset Engineers, Inc. be retained to review preliminary plans once they are available. Additionally, we should provide final engineering geologic, grading, foundation, and retaining wall design criteria based on a site specific design level investigations once the proposed site usage, construction type, locations and anticipated loads are known. These services are beyond the scope of this investigation.

The following items should be performed, reviewed, tested, or observed by this firm:

- Design level engineering geologic and soil engineering investigation(s)
- Final grading and foundation plans
- Site stripping and clearing
- Overexcavation
- Scarification and recompaction
- Fill placement and compaction
- Foundation excavations
- Underground utility backfill and compaction.
- Compaction of subgrade and Class 2 A.B. in areas to be paved.

If Landset Engineers, Inc. is not retained to provide design level engineering geologic services, design level soil engineering services, or construction observation and compaction testing, we shall not be responsible for the interpretation of the information by others or any consequences arising therefrom.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

The preliminary recommendations contained in this report are based, in part, on certain plans, information, and data that has been provided to us. Any changes in those plans, information, and data will render our recommendations invalid unless we are commissioned to review the changes and to make any necessary modifications and/or additions to our recommendations. The criteria in this report are considered preliminary until such time as they are modified or verified by the engineering geologist or soil engineer in the field during construction. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client and the client's architect/engineer. Application beyond the stated intent is strictly at the user's risk.

The recommendations of this report are based upon the assumption that the soil/rock conditions do not deviate from those disclosed in the borings or geologic maps. If any variations or undesirable conditions are encountered during construction, Landset Engineers, Inc. should be notified so that supplemental recommendations can be given.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are called to the attention of the Architects and Engineers for the project and incorporated into the plans, and that the necessary steps are taken to ensure that the Contractor and Subcontractors carry out such recommendations. The conclusions and recommendations contained herein are professional opinions derived in accordance with current and local standards of professional practice.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or in part, by changes outside of our control. Therefore, this report should not be relied upon after a period of three years, without being reviewed by Landset Engineers, Inc. from the date of issuance of this report.

This report does not address issues in the domain of the contractor such as, but not limited to, loss of volume due to stripping of the site, shrinkage of fill soils during compaction, excavatability, and construction methods. The scope of our services did not include any determination or evaluation of soil corrosion potential, environmental assessment of wetlands, radioisotopes, hydrocarbons, hazardous or toxic materials, or other chemical properties in the soil, surface water, groundwater or air, on or below or around the site.

REFERENCES

Arulmoli, K., Baez, J.I., Blake, T.F., Earnest, J., Gharib, J., Goldhammer, J., Hsu, D., Kupferman, S., O'Tousa, J., Real, C.R., Reeder, W., Simantob, E., and Youd, T.L., 1999, Recommendations For Implementation of DMG Special Publication 117, Guidelines for Analyzing And Mitigating Liquefaction Hazards in California, Southern California Earthquake Center, University of Southern California, 63p.

Barrows, A.G., 1975, Surface effects and related geology of the San Fernando earthquake in the foothill region between Little Tujunga and Wilson Canyons, *in* Oakeshott, G.B., *ed*., San Fernando, California, Earthquake of 9 February 1971: California Division of Mines and Geology Bulletin 196, pp. 97-117.

Blake, T.F., 2004, Liquefy 2, version 1.50, computer software.

CDMG, 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada: International Conference of Building Officials, map scale ¼ inch ~ 1 km.

Cao, T., Bryant, W.A., Rowshandel, B., Branum, D., and Wills, C.J., 2003, The Revised 2002 California Probabilistic Seismic Hazards Maps, California Division of Mines and Geology, 11p.

Clark, J.C., Dupre, W.R., Rosenberg, L.I., 1997, Geologic map of the Monterey and Seaside quadrangles, Monterey County, California: U.S. Geological Survey Open File Report 97-30, 26 p. 2 plates scale 1:24,000.

Clark, J.C. and Rietman, J.D., Oligocene stratigraphy, tectonics, and paleogeography southwest of the San Andreas fault, Santa Cruz Mountains and Gabilan Range, California Coast Ranges, U.S. Geological Survey Professional Paper 783, 18 p., 1 plate scale 1:125,000.

Compton, R.R., 1966, Granitic and metamorphic rocks of the Salinian block, California Coast Ranges *in* Bailey, E.H., *ed*., Geology of northern California: California Division of Mines and Geology Bulletin 190, p. 277-287.

Dibblee, T.W., 1974, Geologic Map of the Soledad Quadrangle, California, U.S.G.S Open File 74-1021, scale 1:62,500.

Dibblee, T.W., 1976, The Rinconada and related faults in the Southern Coast Ranges, California, and their tectonic significance, U.S. Geological Survey Professional Paper 981.

Durham, D.L., 1970, Geology of the Sycamore Flat and Paraiso Springs Quadrangles, Monterey County, California, Geological Survey Bulletin 1285, 4 plates, scale 1:24,000.

Federal Emergency Management Agency (FEMA), 1984, Flood insurance rate map, Monterey County, California (unincorporated areas), Panel 350 of 1025, (Community-Panel Number 06195 0350 D): National Flood Insurance Program Map, scale 1:12,000.

Geoconsultants, 2004, Summary Report, Geological and geophysical exploration, Paraiso Springs, Monterey County, California: Unpublished consultants report to Paraiso, LLC.

Geosolutions, 1998, Percolation Evaluation Report, Paraiso Springs Resort, Paraiso Springs Road, Soledad Area of Monterey County, Paraiso Springs California: Unpublished consultants report to King Ventures.

Greene, H.G., Lee, W.H., McCullough, D.S., and Brabb, E.E., 1973, Faults and earthquake epicenters in the Monterey Bay region, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-518, 3 plates, scale 1:125,000.

Hart, E.W., Bryant, W.A., 1997 (revised 1999), Fault-rupture hazard zones in California: California Division of Mines and Geology Special Publication 42, 38 p.

Kahle, J.E., 1975, Surface effects and related geology of the Lakeview fault segment of the San Fernando fault zone, *in* Oakeshott, G.B., *ed*., San Fernando, California, Earthquake of 9 February 1971: California Division of Mines and Geology Bulletin 196, p. 120-135.

Lawson, A.C., chairman, 1908, The California earthquake of April 18, 1906: Report of the California State Earthquake Investigation Commission: Washington D.C., Canegie Institution of Washington, Publication 87, 1, 2 parts, 451 p.

McCann, J.Z., 1990, Aftershock: the Loma Preita earthquake and its impact on San Benito County: Hollister, California, Seismic Publications, 80 p.

McKittrick, M.A., 1987, Geologic map of the Tularcitos fault zone, Monterey County, California, Monterey County Planning Department Files.

Northern California Earthquake Data Center Catalog, December 2004, contributed by Northern California Seismic Network and U.S. Geological Survey, Menlo Park, California, http://quake.geo.berkeley.edu.

Page, B.M., 1966, Geology of the Coast Ranges of California *in* Bailey, E.H., *ed*., Geology of northern California: California Division of Mines and Geology Bulletin 190, p.255-276.

Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, Tianqing, Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.S., and Schwartz, D.P., 1996, Probabilistic seismic hazard assessment for the State of California: California Division of Mines and Geology Open-

File Report 96-08 (U.S. Geological Survey Open-File Report 96-706), 33p., map scale 1 inch=107 miles.

Plafker, G., Galloway, J.P., Lessons learned from the Loma Prieta earthquake of October 17, 1989: U.S. Geological Survey Circular 1045.

Rosenberg, L.I., 2001, Geologic Resources And Constraints Monterey County California, Under County of Monterey Contrac R29402-0001, 167p.

REFERENCES (Continued)

Stover, C.W., 1984, Intensity distribution and isoseismal map for the Morgan Hill, California, earthquake of April 24, 1984 in Bennett, J.H., and Sherburne, R.W., eds., The 1984 Morgan Hill, California earthquake: California Division of Mines and Geology Special Publication 68, p. 1-4.

Tinsley, J.C., 1975, Quaternary Geology Of The Northern Salinas Valley, Monterey County, California, (Ph.D dissertation) Stanford University, 195p.

Transportation Research Board, 1978, Landslides Analysis and Control, Special Report 176, 234p.

Varnes, D.J., 1978, Slope movement types and processes, in Schuster, R.L., and Krizek, R.J., eds., Landslides –analysis and control: Transportation Research Board, National Academy of Sciences Special Report 176, p. 11-33

WGECP (Working Group on California Earthquake Probabilities), 2002, Earthquake probabilities in the San Francisco Bay region: 2002-2031: U.S. Geological Survey Circular 1189

AERIAL PHOTOGRAPH REFERENCES

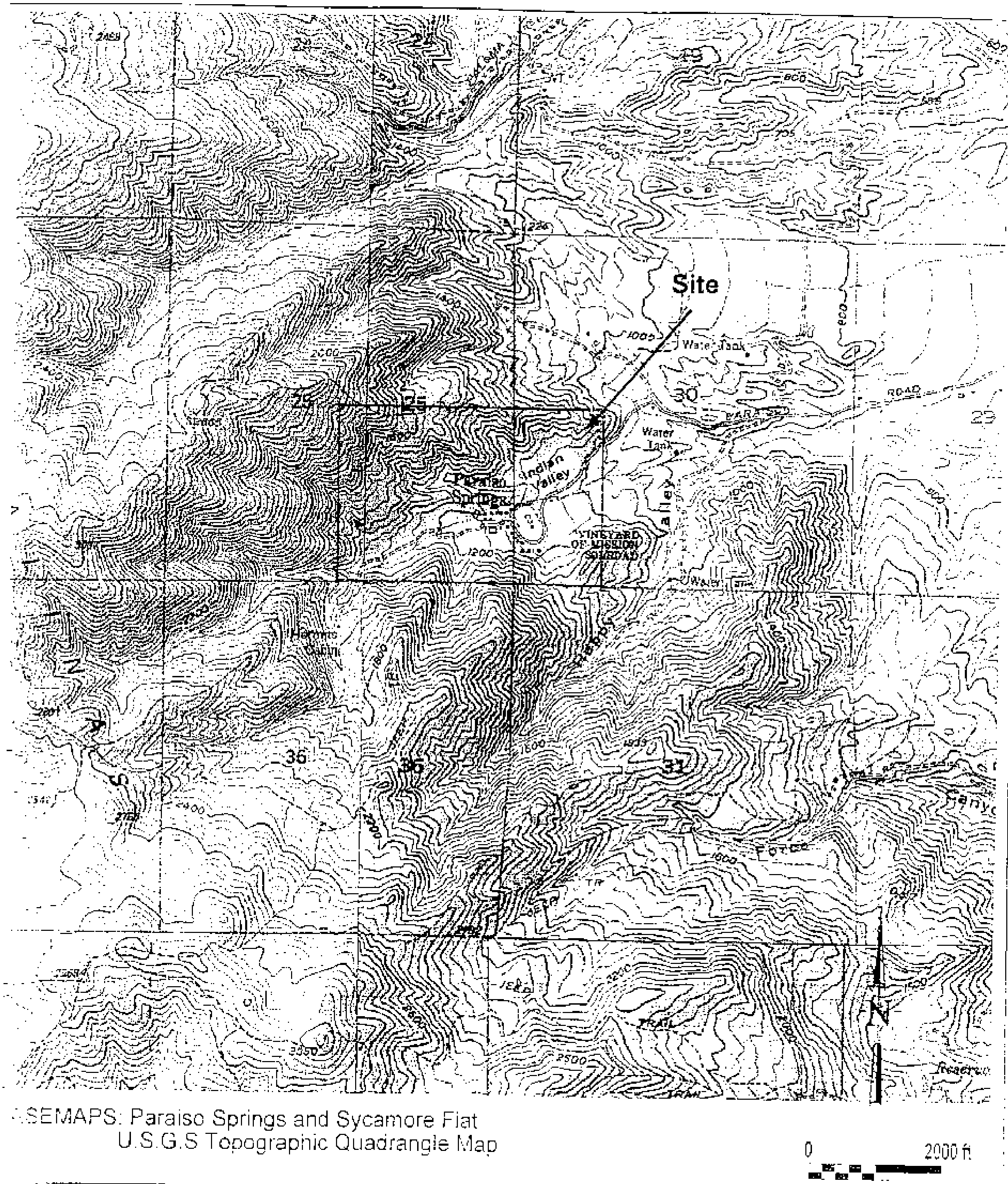
Aero Service Corp., August 24, 1956, ABG, 19R-106 & 107, vertical black and white, approximate scale 1:20,000

Park Aerial Survey, August 1, 1949, ABG/BUX, 12F-45 & 45, vertical black and white, approximate scale 1:20,000

Western Aerial Contractors, September 21, 1997, WAC-97CA, 17-71 & 72, vertical black and white, approximate scale 1:24,000

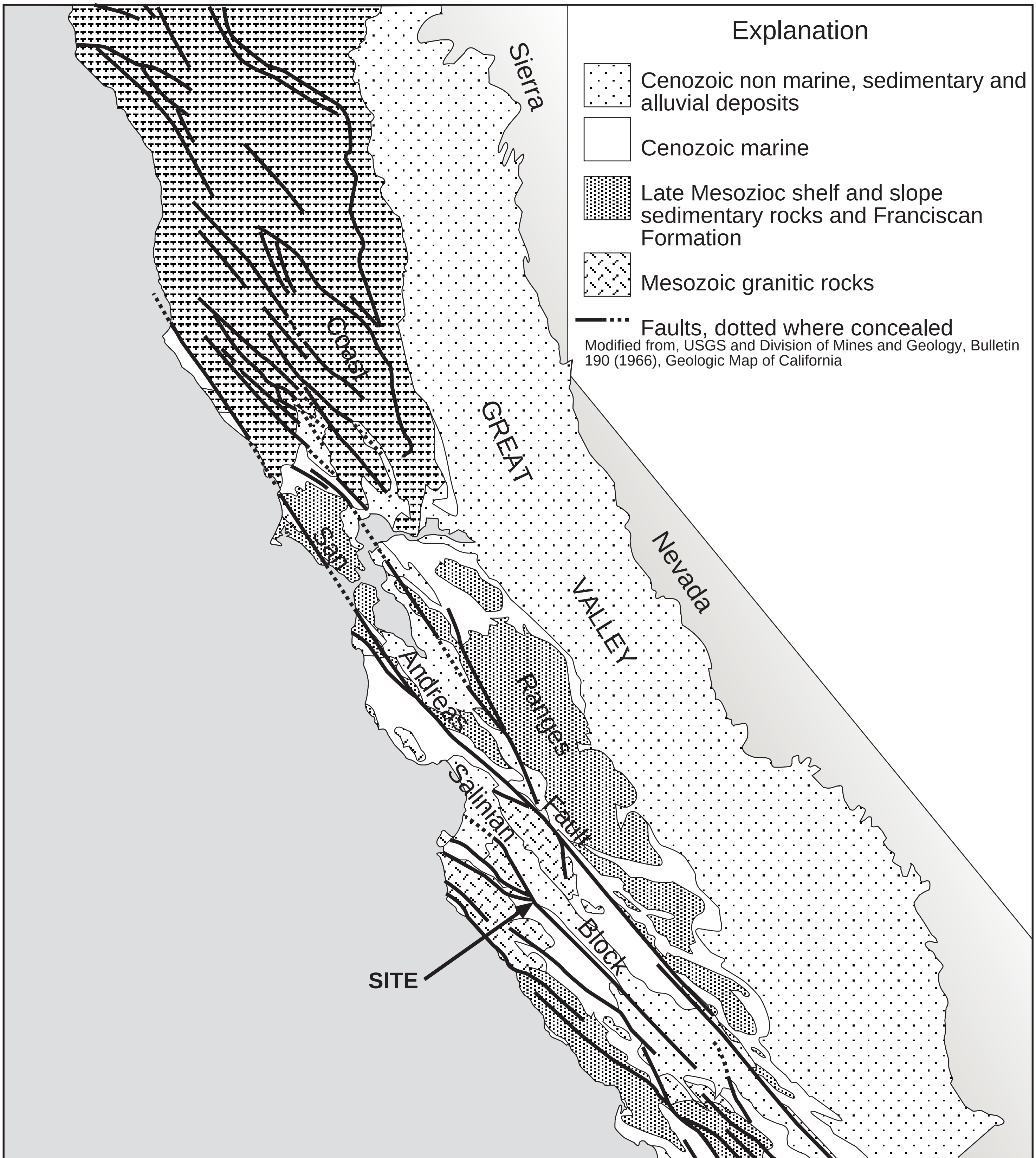
Western Aerial Contractors, October 24, 2000, WAC 00-CA, 29-147 & 148, vertical black and white, approximate scale 1:24,000

FIGURES



BASEMAPS: Paraiso Springs and Sycamore Flat
U.S.G.S Topographic Quadrangle Map

LANDSET ENGINEERS, INC.	**Vicinity Map** Paraiso Hot Springs Paraiso Springs Road Greenfield/Soledad Area Monterey County, CA	FIGURE 1 PROJECT LSW-0337-01



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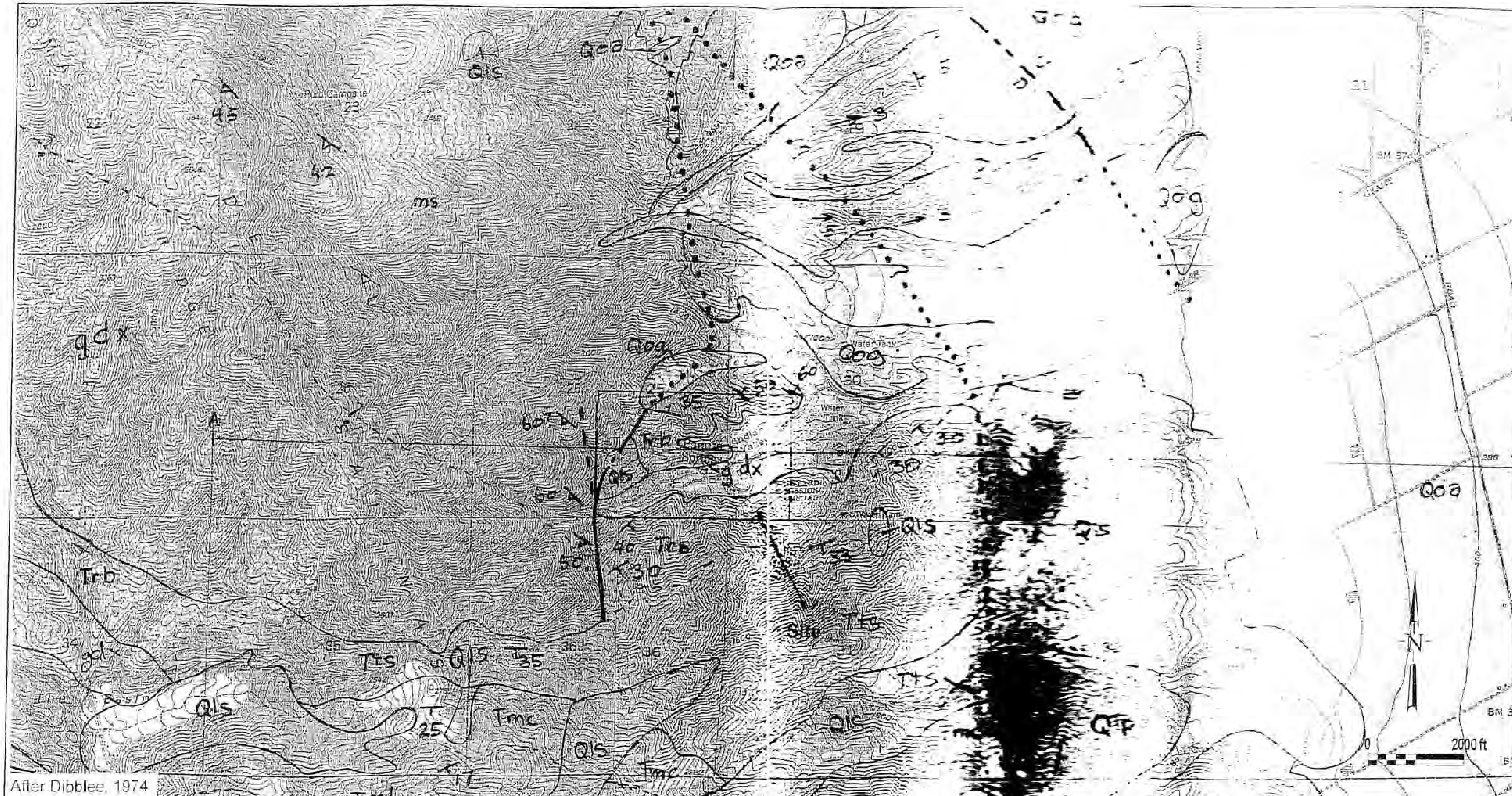
Regional Geologic Map
Paraiso Hot Springs
Paraiso Springs Road
Greenfield/Soledad Area
Monterey County, CA

FIGURE
2

PROJECT
LSW-0337-01



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Geologic Vicinity Ma
aiso Hot Springs
aiso Springs Roa
field/Soledad A
terey County, C

FIGURE
3

PROJECT
LSW-0337-01

Qg, Qs, Qa	Surficial deposits Qg, river gravel and sand Qs, dune sand Qa, alluvium	Holocene	Quaternary
Qls	Landslide debris		
Qoa	Older alluvium	Pleistocene	
Qog	Older fan gravel		
	UNCONFORMITY		
QTp, QTc	Paso Robles Formation QTp, pebble conglomerate, sand and clay QTc, clay		
	LOCAL UNCONFORMITY		
Tus	Unnamed marine sandstone buff white, fine grained	Pliocene	Tertiary
Tpo	Pancho Rico Formation (marine) diatomaceous mudstone, shale and fine sandstone		

Tm, Tml, Tmc	Monterey shale (m... Tm, siliceous shale (Upper Miocene) Tml, semisiliceous sh... foram. shale and ... carbonate beds Tmc, clay shale (M. M...	Mio...	Tertiary
Tts	Marine sandsto... (light gray, M. & L.T.M...	Oligocene? & Miocene	
Trb	Unnamed red be... (non marine red sa... conglom., M. & L.T.M...		
	UNCONFORMITY		
ga, gr, grd, gqd, bq...	Granitic rocks ga, aplite, alaskite ... gr, quartz monzon... grd, granodiorite gqd, granodiorite-... bqd biotite quartz... massive to gnei... gdx, hornblende gr... with phenocryst...		Mesozoic
msc, ms	Metamorphic roc... msc, schist ms, schist-gnei... m, marble		Mesozoic or older

...ational
...ocated

...ertain
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...de
...rate
...movement
...ates
...fault plane

syncline
...showing
...plunge

...of strata

...slope of
...deposition

...foliation

...downward
...landslide

...test hole
...or gas

...locality

After Dibblee, 1974

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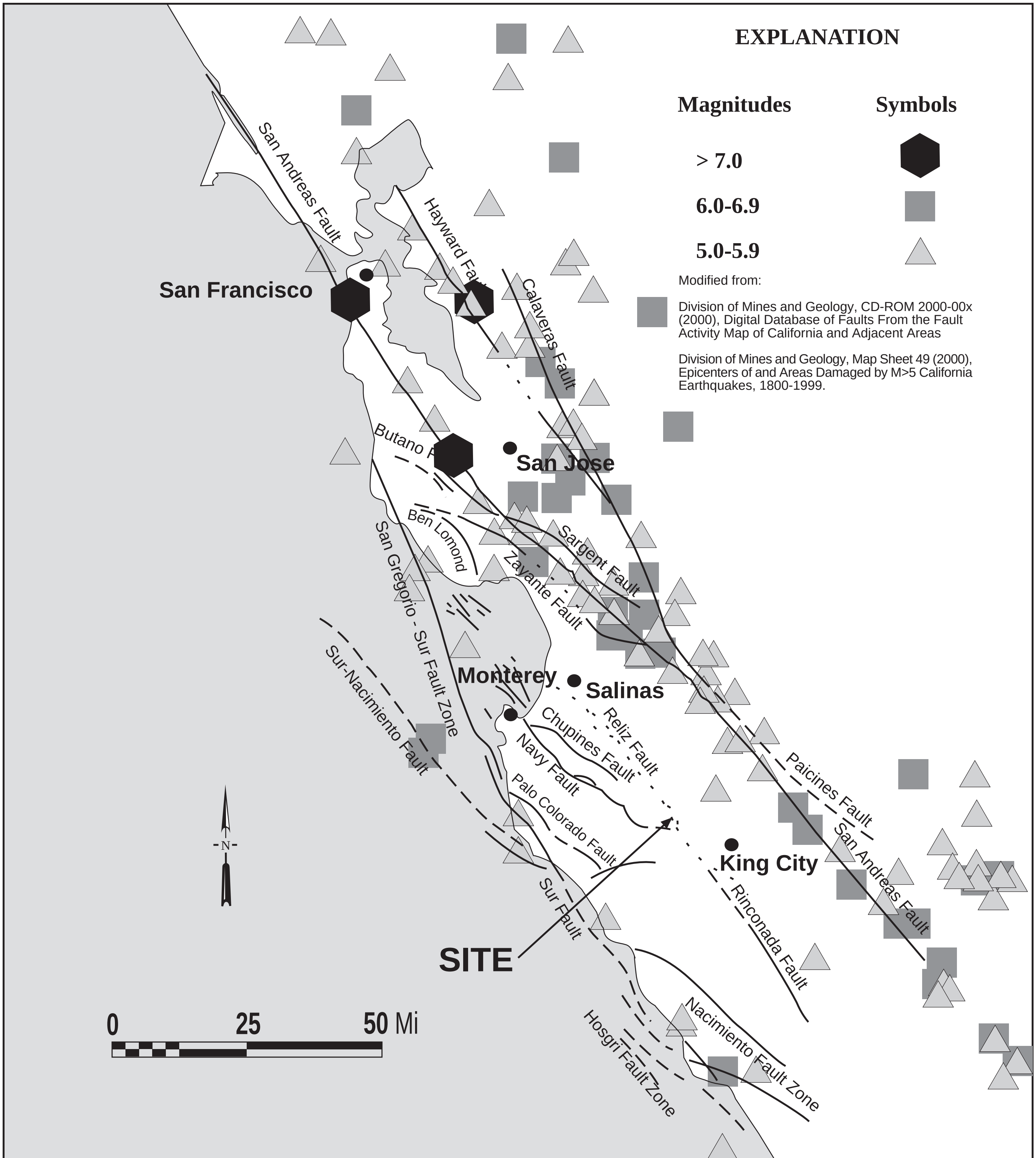
Explanati... to Geologic Vicin... Ma...
...raiso Hot Springs
...aiso Springs Roa...
...enfield/Soledad Are...
...nterey County, CA

FIGURE 4

PROJECT LSW-0337-01



LANDSET ENGINEERS, INC. ENGINEERING - LANDPLANNING SURVEYING - ENVIRONMENTAL CONSULTING 520-B Crazy Horse Canyon Road, Salinas, CA 93907	**Regional Fault and Seismicity Map** Paraiso Hot Springs Paraiso Springs Road Greenfield/Soledad Area Monterey County, CA	**FIGURE** **5** **PROJECT** **LSW-0337-01**

APPENDIX A

Unified Soil Classification System
Key to Logs of Borings
Soil Terminology
Exploratory Boring Logs B-1 through B-29

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	More than 50 % of coarse fraction retained on No. 4 sieve.	GRAVELS WITH FINES		GM	Silty gravel, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
More than 50 % of material is larger than No. 200 sieve size	SAND AND SANDY SOILS	CLEAN SAND (Little or no fines)		SW	Well graded sands, gravelly sands little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
	More than 50 % of coarse fraction passing No. 4 sieve.	SAND WITH FINES (Appreciable amount of fines)		SM	Silty sands, sand-silt mixtures.
				SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	Inorganic silts and very fine sands rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clay of low plasticity
More than 50 % of material is smaller than No. 200 sieve size		LIQUID LIMIT GREATER THAN 50		MH	Inorganic silty, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
	HIGHLY ORGANIC SOILS			PT	Peat, humus, swamp soils with high organic contents
	VARIOUS SOILS AND MAN MADE MATERIALS				Fill materials
	MAN MADE MATERIALS				Asphalt and concrete

[illegible] Engineers, Inc.
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Figure A1

KEY TO LOG OF BORINGS

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)

Shelby Sampler
Thin walled, 3" diameter, 3 ft long, hydraulically advanced.

Modified California Sampler
3" diam. split-barrel sampler with brass liners driven by a 140 lb hammer with a drop of 30"

Standard Penetration Test (SPT) Sampler
2" diam. split-barrel sampler driven by a 140 lb hammer with a drop of 30"

Bulk Sample
Loose soil removed for testing.

California Sampler
2.5" diam. split-barrel sampler with brass liners driven by a 140 lb hammer with a drop of 30".
Shaded area denotes sample taken.

Hand Sampler (2.5" diam. driven by hand).

Continuous Core Sampler
94 mm Christianson Sampler

Groundwater encountered during drilling

Groundwater after drilling

Seepage

75 Approximate blows per foot

Solid line denotes soil or lithologic change

Dashed line denotes gradiational or approximate soil or lithologic change

Heavy line denotes termination of boring

N.R. = No sample recovered
D.S. = Disturbed sample

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SOIL TERMINOLOGY

SOIL TYPES (Ref. 1)

Boulders:	Particles of rock that will not pass a 12 inch screen
Cobbles	Particles of rock that will pass a 12 inch screen, but not a 3 inch sieve
Gravel:	Particles of rock that will pass a 3 inch sieve, but not a No 4 sieve
Sand.	Particles that will pass a No. 4 sieve, but not a No. 200 sieve
Silt	Soil that will pass a No. 200 sieve, that is non-plastic or very slightly plastic, and that exhibits little or no strength when dry
Clay.	Soil that will pass a No. 200 sieve, that can be made to exhibit plasticity (putty-like properties) within a range of water contents, and that exhibits considerable strength when dry

MOISTURE AND DENSITY

Moisture Condition:	An observational term; dry, slightly moist, moist, very moist, saturated
Moisture Content:	The weight of water in a sample divided by the weight of dry soil in the soil sample, expressed as a percentage
Dry Density:	The pounds of dry soil in a cubic foot of soil

DESCRIPTORS OF CONSISTENCY (Ref. 3)

Liquid Limit:	The water content at which a No. 40 soil is on the boundary between exhibiting liquid and plastic characteristics. The consistency feels like soft butter.
Plastic Limit:	The water content at which a No. 40 soil is on the boundary between exhibiting plastic and semi-solid characteristics. The consistency feels like stiff putty
Plasticity Index:	The difference between the liquid limit and the plastic limit, i.e. the range in water contents over which the soil is in a plastic state.

MEASURES OF CONSISTENCY OF COHESIVE SOILS (CLAYS) (Refs. 2 & 3)

Very soft	N=0-1 *	C=0-250 psf	Squeezes between fingers
Soft	N=2-4	C=250-500 psf	Easily molded by finger pressure
Medium Stiff	N=5-8	C=500-1000 psf	Molded by strong finger pressure
Stiff	N=9-15	C=1000-2000 psf	Dented by strong finger pressure
Very Stiff	N=16-30	C=2000-4000 psf	Dented slightly by finger pressure
Hard	N>30	C>4000 psf	Dented slightly by a pencil point

* N = Blows per foot in the Standard Penetration Test. In cohesive soils, with the 3" diameter sampler, 140 pound weight, divide the blows count by 1.2 to get N (Ref. 4).

MEASURES OF RELATIVE DENSITY OF GRANULAR SOILS (GRAVELS, SANDS AND SILTS) (Refs. 2 & 3)

Very Loose	N=0-4 **	RD=0-30	Easily push a 1/2" reinforcing rod by hand
Loose	N=5-10	RD=30-50	Push a 1/2" reinforcing rod by hand
Medium Dense	N=11-30	RD=50-70	Easily drive a 1/2" reinforcing rod
Dense	N=31-50	RD=70-90	Drive a 1/2" reinforcing rod 1 foot
Very Dense	N>50	RD=90-100	Drive a 1/2" reinforcing rod a few inches

** N = Blows per foot in the Standard Penetration Test. In granular soils, with the 3" diameter sampler, 140 pound weight, divide the blows count by 2 to get N (Ref. 4). RD = Relative Density

Ref. 1 ASTM Designation: D 2487-93, Standard Classification of Soils for Engineering Purposes (Unified Soils Classification System)

Ref. 2 Terzaghi, Karl, and Peck, Ralph B., Soil Mechanics in Engineering Practice, John Wiley & Sons, New York, 2nd Ed., 1967, pp. 30, 341, 347

Ref. 3 Sowers, George F., Introductory Soil Mechanics and Foundations: Geotechnical Engineering, Macmillan Publishing Company, New York, 4th Ed., 1979, pp. 80-81 and 312.

Ref. 4 Lowe, John III, and Zaccheo, Philip F., Subsurface Explorations and Sampling, Chapter 1 in "Foundation Engineering Handbook," Hsai-Yang Fang, Editor, Van Nostrand Reinhold Company, New York, 2nd Ed., 1991, p. 39

EXPLORATORY BORING LOG

No. B-1 pg 1 of 2

PROJECT: Paraiso Hot Springs | DATE DRILLED: 23-Aug-04 | FILE No. LSW-0337-01

DRILLER: Exploration Geoservice | DRILLING METHOD: B-56 | LOGGED BY: IMS

BORING DIAMETER: 8" HS | BORING DEPTH: 45.0' | GROUNDWATER DEPTH: 6.5'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
	BULK				**Qal 2: Alluvium (Holocene)**	SC		
1	A				Dark yellowish brown clayey SAND, medium dense, dry to slightly moist, well graded			
2								
3								
	1-1		32	>4.5	Dense, slightly moist		6.9	117.8
4								
5								
6								
	1-2		19	2.5	Medium dense, slightly moist, increase fines content		4.1	123.2 ▼
7								
8								
9								
					Mottled light gray and brownish orange well grade SAND with clay, medium dense, very moist	SW		
10								
11								
	1-3		18	3.0			8.2	117.7
12								
13								
14								
15								
16								
	1-4		18		Occasional interbeds of discontinuous coarse grained angular poorly graded sand and clay		12.3	
17								
18								▼
19								
20								
21								
	1-5		13		Medium dense, saturated		14.1	
22								
23								
24					- - - - - - - - - - - -			
					Color changed to light grayish olive, trace fines			
25								
26								
	1-6		22				[illegible]	
27								

EXPLORATORY BORING LOG

No. B-1 pg 2 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04	FILE No.	LSW-0337-01
DRILLER:	Exploration Geoservice	DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER:	8" HS	BORING DEPTH:	45.0'	GROUNDWATER DEPTH:	6.5'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
27					Light grayish olive well graded SAND, medium dense saturated, trace fines	SW		
28								
29								
30								
31								
32	1-7		14				[illegible]	
33								
34					Color changed to moderate gray			
35								
36	1-8		16				[illegible]	
37								
38								
39	1-9		5		Loose		18.0	
40								
41								
42								
43								
44	1-10		17		Medium dense		[illegible]	
45								

TD @ 45.0'
GROUNDWATER ENCOUNTERED @ 18.0'
GROUNDWATER ENCOUNTERED @ 6.5'
30 MINUTES AFTER DRILLING

Water temperature 73.4 F
Slight sulfur odor

EXPLORATORY BORING LOG

No. B-2

PROJECT: Paraiso Hot Springs **DATE DRILLED:** 23-Aug-04 **FILE No.** LSW-0337-01
DRILLER: California Geotech **DRILLING METHOD:** B-24 **LOGGED BY:** IMS
BORING DIAMETER: 4" SS **BORING DEPTH:** 21.5' **GROUNDWATER DEPTH:** N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0					**Qal 2: Alluvium (Holocene)**	SC		
1					Dark reddish brown clayey SAND, dense dry 10-20% fines, fine to coarse sand			
2								
3	2-1		46	>4.5			2.3	109.6
4								
5					Color change to pinkish brown			
6	2-2		50/5"				1.8	103.1
7					Color change to dark reddish brown			
8								
9								
10								
11	2-3		77		Driller added water, trace fine angular gravel, fines clayey		1.9	
12								
13								
14								
15					Drilling hard			
16	2-4		85				5.4	
17								
18								
19								
20								
21	2-5		25		Sample is moist		10.4	
22					**TD @ 21.5'**			
					NO GROUNDWATER ENCOUNTERED			
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-3 pg 1 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04
DRILLER:	Exploration Geoservices	DRILLING METHOD:	B-56
BORING DIAMETER:	8" HS	BORING DEPTH:	30.0'
FILE No.	LSW-0337-01	LOGGED BY:	BP
GROUNDWATER DEPTH:	15.0'		

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Yellowish brown silty SAND, loose, slightly moist, well graded, trace gravel	SM		
2								
3	3-1		10	3.25			[illegible]	104.0
4								
5								
6	3-2		17	>4.5	Medium dense, slightly moist to moist		[illegible]	112.2
7								
8								
9								
10					Light yellowish brown well graded SAND, medium dense moist to very moist	SW		
11	3-3		17	1.25			9.[illegible]	106.3
12								
13								
14								
15								▼
16	3-4		9		Loose, saturated		15.3	
17								
18								
19					Color change to dark gray, slightly clayey, very loose to loose, saturated			▼
20								
21	3-5		6				[illegible]	
22								
23					Common stiff clay interbeds			
24								
25					Dark yellowish brown clayey SAND, medium dense, saturated trace gravel	SC		
26	3-6		15				[illegible]	
27								

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Engineers, Inc.
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Figure
A-6

EXPLORATORY BORING LOG

No. B-3 pg 2 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04	FILE No.	LSW-0337-01
DRILLER:	Exploration Geoservices	DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER:	8" HS	BORING DEPTH:	30.0'	GROUNDWATER DEPTH:	15.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
26					Dark gray well graded SAND with clay medium dense saturated. trace of gravel	SW		
29								
	3-7		15				18.0	
30								

TD @ 30.0'
GROUNDWATER ENCOUNTERED @ 15.0'
GROUNDWATER ENCOUNTERED @ 19.0'
30 MINUTES AFTER DRILLING

Water Temp 73.0 F
No Odor

EXPLORATORY BORING LOG

No. B-4

PROJECT: Paraiso Hot Springs
DRILLER: California Geotech
BORING DIAMETER: 4" SS
BORING DEPTH: 21.5'
DATE DRILLED: 23-Aug-04
DRILLING METHOD: B-24
GROUNDWATER DEPTH: N/A
FILE No. LSW-0337-01
LOGGED BY: IMS

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture % dry weight	Dry Density (pcf)
0								
1	BULK C				**Qal 2: Alluvium (Holocene)** Dark reddish brown clayey SAND, medium dense, dry 10-20% fines, fine to coarse sand	SC		
2								
3								
4	4-1		23	1.5			[illegible]	107.7
5								
6								
7	4-2		89	>4.5			3.4	115.8
8								
9								
10								
11	4-3		50/6	>4.5	Color change to pinkish brown		[illegible]	115.1
12								
13								
14								
15								
16					Pinkish brown clayey sand with gravel dense, dry 10-20% fines, fine to coarse sand, 10-20% fine gravel			
17	4-4		43				3.5	
18								
19								
20								
21								
22	4-5		56				[illegible]	

TD @ 21.5'
NO GROUNDWATER ENCOUNTERED

23
24
25
26
27

EXPLORATORY BORING LOG

No. B-5 pg 1 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04	FILE No.	LSW-0337-01
DRILLER:	Exploration Geoservices	DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER:	8" HS	BORING DEPTH:	40.0'	GROUNDWATER DEPTH:	11.5'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
	BULK				**Qal 2: Alluvium (Holocene):**	SW		
1	B				Yellowish brown well graded SAND, medium dense, dry, 5-15% fines			
2								
3								
	5-1		30	>4.5			2.6	126.2
4								
5								
6								
	5-2		20	>4.5	Very moist		15.[illegible]	118.8
7								
8								
					Dark yellowish brown clayey SAND, medium dense, very moist well graded	SC		
9								
10								
11								
	5-3		22	2.25			14.0	112.[illegible]
12								
13								
14								
15								
16								
	5-4		25	2.0			12.4	115.1
17								
18								
19								
20								
	5-5		9				14.0	
21					Light olive well graded SAND, loose, saturated	SW		
22								
23								
24								
25					Light olive sandy lean CLAY, stiff, very moist	CL		
26								
	5-6		10				[illegible]	
27								

EXPLORATORY BORING LOG

No. B-5 pg 2 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04	FILE No.	LSW-0337-01
DRILLER:	Exploration Geoservice	DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER:	8" HS	BORING DEPTH:	40.0'	GROUNDWATER DEPTH:	11.5'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
27					Light olive sandy lean CLAY, stiff, very moist, well graded sand fraction	CL		
28								
29								
30					Light olive poorly graded SAND, medium dense, saturated,	SP		
31	5-7		16		very fine to medium grained		14.8	
32								
33								
34								
35								
36	5-8		36		Common discontinuous clay lenses		[illegible]	
37					Dense			
38								
39	5-9		31				17.8	
40								

TD @ 40.0'

GROUNDWATER ENCOUNTERED @ 21.0'

GROUNDWATER ENCOUNTERED @ 11.5'

30 MINUTES AFTER DRILLING

Water Temp 79.0 F No Odor

EXPLORATORY BORING LOG

No. B-6

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04	FILE No.	LSW-0337-01
DRILLER:	California Geotech	DRILLING METHOD:	B-24	LOGGED BY:	IMS
BORING DIAMETER:	4" SS	BORING DEPTH:	21.5'	GROUNDWATER DEPTH:	N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U S C S Soil Group	Moisture % dry weight	Dry Density (pcf)
0								
					Qal 2: Alluvium (Holocene):	SC		
1					Reddish brown (5YR4/3) clayey SAND, very dense			
					dry 10 20% fines, fine to coarse sand			
2								
3								
	6-1		52				3.0	113.6
4								
5								
6	6-2		50/6"				3.0	116.2
7								
8								
9								
10								
11								
	6-3		35				3.1	
12								
13								
14								
15					Driller added water, drilling difficult			
16								
	6-4		35		Fine to medium sand, trace coarse sand		3.5	
17								
18								
19								
20								
21								
	6-5		45				3.9	
22					**TD @ 21.5'**			
					NO GROUNDWATER ENCOUNTERED			
23								
24								
25								
26								

EXPLORATORY BORING LOG

No. B-7pg 1 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04	FILE No.	LSW-0337-01
DRILLER:	Exploration Geoservice	DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER:	8" HS	BORING DEPTH:	55.0'	GROUNDWATER DEPTH:	8.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Dark yellowish brown silty SAND, loose, moist, well graded	SM		
2								
3								
4	7-1		14				[illegible]	[illegible]
5					Light yellowish brown well graded SAND, loose to medium dense	SW		
6								
7	7-2		15				[illegible]	105.6
8								▼
9								
10					Dark gray silty SAND, loose, very moist, well graded, slight odor, saturated @ 11.0'	SM		
11								▼
12	7-3		9				24.0	[illegible]
13					Dark gray well graded SAND, loose, saturated	SW		
14								
15								
16								
17	7-4		6				28.3	
18								
19								
20					Color change to light gray			
21								
22	7-5		6				[illegible]	
23								
24								
25								
26								
27	7-6		11		Loose to medium dense			
28					Light gray well graded sand, medium dense, saturated		[illegible]	

EXPLORATORY BORING LOG

No. B-7 pg 2 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	23-Aug-04	FILE No.	LSW-0337-01
DRILLER:	Exploration Geoservice	DRILLING METHOD:	B-56	LOGGED BY:	IMS
BORING DIAMETER:	8" HS	BORING DEPTH:	55.0'	GROUNDWATER DEPTH:	8.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
29						SW		
30								
31	7-7		26		Common thin stiff clay lenses		[illegible]	
32								
33								
34								
35								
36	7-8		11		Medium dense		33.6	
37								
38								
39								
40								
41	7-9		11				22.5	
42								
43								
44								
45								
46	7-10		13				19.0	
47								
48								
49								
50	7-11		28				[illegible]	
51								
52								
53								
54	7-12		43		Dense		14.3	
55								

TD @ 55.0'
GROUNDWATER ENCOUNTERED @ 11.0'
GROUNDWATER ENCOUNTERED @ 8.0'
30 MINUTES AFTER DRILLING

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Figure
A-10

EXPLORATORY BORING LOG

No. B-8

PROJECT: Paraiso Hot Springs	DATE DRILLED: 23-Aug-04	FILE No. LSW-0337-01	
DRILLER: California Geotech	DRILLING METHOD: B-24	LOGGED BY: IMS	
BORING DIAMETER: 4" SS	BORING DEPTH: 21.5'	GROUNDWATER DEPTH: N/A	

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
	BULK				**Qal 2: Alluvium (Holocene):**	SF		
1	D				Yellowish brown (10YR5/3) SAND with clay and gravel, dry, <10% fines, fine to coarse sand fine to medium gravel			
2								
3								
	B-1		28				[illegible]4	112.3
4								
5								
6					Color change to reddish brown (10YR4/3), fines, 10-20%			
	B-2		70				[illegible]	[illegible]
8								
9								
10								
11								
	B-3		49				[illegible]	
12								
13								
14								
15								
16								
	B-4		65		Drilling difficult		[illegible]	
17								
18								
19					Cobbles			
20								
21								
	B-5		[illegible]				[illegible]	
22					TD @ 21.5' NO GROUNDWATER ENCOUNTERED			
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-9 pg 1 of 2

PROJECT: Paraiso Hot Springs | DATE DRILLED: 23-Aug-04 | FILE No. LSW-0337-01

DRILLER: Exploration Geoservice | DRILLING METHOD: B-56 | LOGGED BY: BP

BORING DIAMETER: 8" HS | BORING DEPTH: 30.0' | GROUNDWATER DEPTH: 7.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
	BULK				**HF: Fill (Holocene):**	SC		
1	C				Dark yellowish brown clayey SAND loose, slightly moist to moist, well graded			
2								
3					**Qal 2: Alluvium (Holocene):**	SM		
	9-1		13		Yellowish gray silty SAND, loose, slightly moist well graded		2.5	84.1
4								
5								
6								
	9-2		10				11.2	108.7
7								
8								
9					Color change to yellowish brown very moist to saturated			
10								
11								
	9-3		14				17.2	109.1
12								
					Dark gray clayey SAND, loose saturated, moderate odor	SC		
13								
14								
15								
16								
	9-4		8				16.8	100.3
17								
18								
19								
					Orange brown well graded SAND, loose, saturated	SW		
20								
21								
	9-5		13				16.5	106.7
22								
23								
24								
25								
26								
	9-6		12				[illegible]	
27								

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Figure A-12

EXPLORATORY BORING LOG

No. B-9 pg 2 of 2

PROJECT: Paraiso Hot Springs | DATE DRILLED: 23-Aug-04 | FILE No. LSW-0337-01
DRILLER: Exploration Geoservice | DRILLING METHOD: B-56 | LOGGED BY: BP
BORING DIAMETER: 8" HS | BORING DEPTH: 30.0' | GROUNDWATER DEPTH: 7.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (dry weight)	Dry Density (pcf)
28					Orange brown well graded SAND, loose saturated	SW		
29	9-7		2		Color change to dark gray, very loose		[illegible]	
30								

TD @ 30.0'

GROUNDWATER ENCOUNTERED @ 12.0'
GROUNDWATER ENCOUNTERED @ 7.0'
15 MINUTES AFTER DRILLING

Water Temp 80.9 F No Odor

EXPLORATORY BORING LOG

No. B-10

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	24-Aug-04	FILE No.	LSW-0337-01
DRILLER:	California Geotech	DRILLING METHOD:	B-24	LOGGED BY:	IMS
BORING DIAMETER:	4" SS	BORING DEPTH:	10.5'	GROUNDWATER DEPTH:	N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil-Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Reddish brown (5YR4/4) Clayey SAND very dense dry 15-25% fines, fine to coarse sand	SC		
2								
3	10-1		50/3"				2.1	119.4
4								
5					**Tt: Tierra Redonda Fm (Miocene)** Light yellowish brown (10YR6/4) SANDSTONE, very dense, moist, slightly weathered, friable, plastic when wet, rock hardness firm, fracture and bedding unknown, grain size fine to coarse sandy, subrounded to subangular abundant biotite, slightly cemented			
6	10-2		50/3"				9.1	112.7
7								
8								
9								
10	10-3		50/6"				6.5	
11					**TD @ 10.5'** **NO GROUNDWATER ENCOUNTERED**			
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-11 pg 1 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	24-Aug-04
DRILLER:	Exploration Geoservice	DRILLING METHOD:	
BORING DIAMETER:	8" HS	BORING DEPTH:	46.5'
FILE No.	LSW-0337-01	LOGGED BY:	BP
GROUNDWATER DEPTH:	18.2'		

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	USCS Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Yellowish brown silty SAND, medium dense, dry, well graded	SM		
2								
3								
	11-1		20				1.3	
4								
5								
6								
	11-2		30	>4.5			3.0	95.9
7								
8								
9								
10								
11								
	11-3		15	>4.5	Color change to light yellowish gray, loose to medium dense, slightly moist increase fines		4.6	104.6
12								
13								
14								
15								
16	11-4		11		Very moist Dark gray poorly graded SAND medium dense, very moist	SP	20.9	
17								
18								
19					Brown gray poorly graded SAND medium dense, very moist	SW		
20								
21								
	11-5		12				13.9	
22								
23								
24								
25								
26								
	11-6		15		Common thin silty sand and clayey sand interbeds		11.8	
27								

EXPLORATORY BORING LOG

No. B-11 pg 2 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	24-Aug-04
FILE No.	LSW-0337-01	DRILLER:	Exploration Geoservice
DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER:	8" HS	BORING DEPTH:	46.5'
GROUNDWATER DEPTH:	18.2'		

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture % dry weight	Dry Density (pcf)
28						SW		
29					Color change to greenish gray, medium dense, saturated			
30								
31	11-7		29				[illegible]	
32								
33								
34					Grayish brown silty SAND medium dense, saturated, trace pea gravel	SM		
35								
36	11-8		27				18.9	
37								
38								
39								
40								
41	11-9		23				[illegible]	
42								
43					Color change to dark gray, medium dense to dense			
45								
46	11-10		33				[illegible]	
47								

TD @ 46.5'
GROUNDWATER ENCOUNTERED @ 18.5'
DURING DRILLING
GROUNDWATER ENCOUNTERED @ 18.2'
30 MINUTES AFTER DRILLING

Water Temp 94.1 F
No Odor

EXPLORATORY BORING LOG

No. B-12

PROJECT: Paraiso Hot Springs	DATE DRILLED: 24-Aug-04	FILE No. LSW-0337-01	
DRILLER: California Geotech	DRILLING METHOD: B-24	LOGGED BY: IMS	
BORING DIAMETER: 4"SS	BORING DEPTH: 15.25'	GROUNDWATER DEPTH: N/A	

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Soil:** Reddish brown for first 2" then becomes brown (10YR5/3) clayey SAND, very dense, moist, 15-25% fines, fine to coarse sand	SC		
2	12-1		50/3"				[illegible]	[illegible]
3								
4					**Tt: Tierra Redonda Fm (Miocene)** Light yellowish brown (2.5Y6/4) SANDSTONE, very dense, dry, slightly weathered, friable, plastic when wet, firm rock hardness, fracture spacing and bedding unknown, slightly to moderately cemented			
5								
6	12-2		85/9"				2.0	
7								
8								
9								
10								
11	12-3		97/9"				2.7	
12								
13								
14								
15	12-4		50/3"				2.3	
16					**TD @ 15.25'** **NO GROUNDWATER ENCOUNTERED**			
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

LandSet Engineers, Inc.

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EXPLORATORY BORING LOG

No. B-13 pg 1 of 2

PROJECT: Paraiso Hot Springs | DATE DRILLED: 24-Aug-04 | FILE No. LSW-0337-01

DRILLER: Exploration Geoservice | DRILLING METHOD: B-56 | LOGGED BY: BP

BORING DIAMETER: 8" HS | BORING DEPTH: 50.0' | GROUNDWATER DEPTH: 9.7'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
					Qal 2: Alluvium (Holocene)	SW		
1					Light yellowish brown well graded SAND, medium dense, dry			
2								
3	13-1		25	>4.5			3.1	105.2
4								
5								
6	13-2		19		Dry		3.4	102.6
7								
8								
9					Color change to orange brown, very moist			▼
10								
11	13-3		16		Saturated @ 11.5'		16.7	101.6 ▼
12								
13								
14					Grayish olive silty SAND with clay, loose, saturated, common thin well graded sand, silt and clay interbeds, slight odor	SM		
15								
16	13-4		8				20.7	
17								
18								
19								
20								
21	13-5		5				[illegible]	
22								
23					Color change to dark gray, moderate odor			
24								
25								
26	13-6		7				17.6	
27								
28								

EXPLORATORY BORING LOG

No. **B-13 pg 2 of 2**

PROJECT: Paraiso Hot Springs — DATE DRILLED: 24-Aug-04 — FILE No. LSW-0337-01

DRILLER: Exploration Geoservice — DRILLING METHOD: B-56 — LOGGED BY: BP

BORING DIAMETER: 8" HS — BORING DEPTH: 50.0' — GROUNDWATER DEPTH: 9.7'

Depth (ft)	Sample	[illegible]	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
29								
30					Dark gray silty SAND, with clay loose to medium dense, saturated trace gravels	SV		
31	N/R		11					
32								
33								
34								
35								
36	13-7		13				18.3	
37								
38								
39								
40								
41	13-8		22		Dense		21.9	
42								
43								
44					Occasional poorly graded, very coarse grained sand interbeds			
45								
46	13-9		16				18.9	
47								
48								
49								
50	13-10		12				[illegible]	

TD @ 50.0'

GROUNDWATER ENCOUNTERED @ 12.0'
WHILE DRILLING
GROUNDWATER ENCOUNTERED @ 9.7'
45 MINUTES AFTER DRILLING

Water Temp 95 F
Slight Odor

EXPLORATORY BORING LOG

No. B-14

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	24-Aug-04	FILE No.	LSW-0337-01
DRILLER:	California Geotech	DRILLING METHOD:	B-24	LOGGED BY:	IMS
BORING DIAMETER:	4"SS	BORING DEPTH:	26.5'	GROUNDWATER DEPTH:	N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen. (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Soil:** Reddish brown (5YR4/4) clayey SAND, very dense, dry, 15-25% fines, fine to coarse sand	SC		
2								
3	14-1		50/6				5.7	126.9
4					**Tt: Tierra Redonda Fm (Miocene)** Yellowish brown (10YR5/4) SANDSTONE, very dense, dry, slightly weathered, friable, plastic when wet, rock hardness firm, fracture and bedding unknown, grain size fine to coarse, subrounded to subangular, slightly cemented			
5								
6	14-2		50/6"				[illegible]	
7								
8								
9					Sand is clean, no cementing			
10								
11	14-3		45				[illegible]	
12								
13								
14								
15					Fines down to 10-20%			
16	14-4		68				[illegible]	
17								
18								
19								
20								
21	14-5		97/11"				[illegible]	
22								
23								
24								
25								
26	14-6		86				[illegible]	

TD @ 26.5'

NO GROUNDWATER ENCOUNTERED

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Figure A-17

EXPLORATORY BORING LOG

No. B-15

PROJECT: Paraiso Hot Springs — DATE DRILLED: 24-Aug-04 — FILE No. LSW-0337-01

DRILLER: Exploration Geoservice — DRILLING METHOD: B-56 — LOGGED BY: BP

BORING DIAMETER: 8" HS — BORING DEPTH: 18.75' — GROUNDWATER DEPTH: N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Light orange brown well graded SAND, medium dense, slightly moist	SW		
2								
3	N/R		16					
4								
5								
6	15-1			3.0	Grayish brown SILT, stiff, moist	ML	15.4	93.3
	15-2		18	3.0	Dusky yellowish brown organic SILT, stiff, very moist	MH	33.9	75.8
7					Light gray silty SAND, medium dense, very moist, 40-45% fines	SM		
8								
9								
10								
11					**Kgd: Granite (Cretaceous):**			
	15-3		50	>4.5	Red, dense		10.0	100.5
12								
13								
14								
15	15-4		50/2		Color change to gray		0.6	
16								
17								
18	15-5		50/3				3.5	
19					**TD @ 18.75'** **NO GROUNDWATER ENCOUNTERED**			
20								
21								
22								
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-16

PROJECT: Paraiso Hot Springs
DATE DRILLED: 24-Aug-04
FILE No. LSW-0337-01
DRILLER: California Geotech
DRILLING METHOD: B-24
LOGGED BY: IMS
BORING DIAMETER: 4" SS
BORING DEPTH: 16.5'
GROUNDWATER DEPTH: N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Soil:** Reddish brown (5YR4/4) clayey SAND very dense, dry, 10-20% fines, fine to coarse sand	SC		
2								
	16-1		50-6"	>4.5			4.6	[illegible]
3								
4								
5					**Tt: Tierra Redonda Fm (Miocene)** Yellowish brown (10YR5/4) SANDSTONE, very dense dry slightly weathered, friable, plastic when wet, firm rock hardness fracture and bedding unknown, fine to coarse sand slightly cemented			
	16-2		50/6"				[illegible]	
6								
7								
8								
9								
10					Drilling becomes difficult			
11	16-3		50-6				[illegible]	
12								
13								
14								
15								
16	16-4		79				[illegible]	
17					TD @ 16.5' NO GROUNDWATER ENCOUNTERED			
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-17 pg 1 of 2

PROJECT: Paraiso Hot Springs	DATE DRILLED: 24-Aug-04	FILE No. LSW-0337-01	
DRILLER: Exploration Geoservice	DRILLING METHOD: B-56	LOGGED BY: BP	
BORING DIAMETER: 8" HS	BORING DEPTH: 50.0'	GROUNDWATER DEPTH: 31.5'	

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture % dry weight	Dry Density (pcf)
0								
	BULK				**Qal 2: alluvium (Holocene)**	SM		
1	F				Pale reddish brown silty SAND, dense, dry, very fine to fine grained			
2								
3								
	17-1		43	>4.5	Slightly moist		3.8	112.6
4								
5								
6								
	17-2		33		Medium dense, well graded		20.5	[illegible]
7								
8								
					Light yellowish brown well graded SAND, medium dense slightly moist, rare gravels	SW		
9								
10								
11								
	17-3		23				1.3	[illegible]
12								
13								
14								
15								
16								
	17-4		35				1.3	
17								
18								
19								
20								
21								
	17-5		15				2.1	
22								
23								
24								
25								
26								
	17-6		41		Abundant gravels from 24.0 to 26.0		1.9	
27								
					Dense			
28								

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Figure A-20

EXPLORATORY BORING LOG

No. B-17 pg 2 of 2

PROJECT: Paraiso Hot Springs | DATE DRILLED: 24-Aug-04 | FILE No. LSW-0337-01

DRILLER: Exploration Geoservice | DRILLING METHOD: B-56 | LOGGED BY: BP

BORING DIAMETER: 8" HS | BORING DEPTH: 50.0' | GROUNDWATER DEPTH: 31.5'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
29					Light yellowish brown well graded SAND, dense, slightly moist, trace of gravel	SW		
30								
31	17-7		45				2.5	▼
32								
33								
34								
35								
36	17-8		51		Very dense, saturated		5.9	
37								
38								
39					Color change to olive gray, medium dense, saturated, very slight odor			
40								
41	17-9		28				14.5	▼
42								
43								
44								
45								
46	17-10		24				11.4	
47								
48								
49	17-11		18				10.4	
50								

TD @ 50.0'
GROUNDWATER ENCOUNTERED @ 31.5'
DURING DRILLING
GROUNDWATER ENCOUNTERED @ 41.3'
10 MINUTES AFTER DRILLING

Water Temp 95.7 F No odor

EXPLORATORY BORING LOG

No. B-18

PROJECT: Paraiso Hot Springs		DATE DRILLED: 24-Aug-04	FILE No. LSW-0337-01
DRILLER: California Geotech		DRILLING METHOD: B-24	LOGGED BY: IMS
BORING DIAMETER: 4"SS	BORING DEPTH: 11.0'	GROUNDWATER DEPTH: N/A	

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Soil:** Reddish brown (5YR4/4) clayey SAND, very dense dry, 10-20% fines, fine to coarse sand	SC		
2								
	18-1		50/5				[illegible].1	97.5
3								
4								
5					**Tt: Tierra Redonda Fm (Miocene)** Yellowish brown (10YR5/4) SANDSTONE, very dense, dry, slightly weathered, friable, plastic when wet, firm rock hardness fractured and bedding unknown, fine to coarse sand, slightly cemented			
	18-2		50/5				2.[illegible]	
6								
7								
8								
9								
10								
11	18-3		50/4				1.2	
12					**TD @ 11.0'** **NO GROUNDWATER ENCOUNTERED**			
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

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EXPLORATORY BORING LOG

No. B-19

PROJECT: Paraiso Hot Springs | DATE DRILLED: 24-Aug-04 | FILE No. LSW-0337-01

DRILLER: Exploration Geoservice | DRILLING METHOD: B-56 | LOGGED BY: BP

BORING DIAMETER: 8" HS | BORING DEPTH: 60.0' | GROUNDWATER DEPTH: 55.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Yellowish brown silty SAND, loose, dry, well graded	GM		
2								
3	19-1		9				2.4	103.3
4								
5								
6	19-2		22	3.0	Medium dense, dry, common 1/2" diameter angular granitic gravels		2.9	100.8
7								
8								
9								
10								
11	N/R		19					
12								
13								
14								
15								
16	19-3		13	3.25	Loose, slightly moist		[illegible]	101.2
17								
18								
19								
20								
21	19-4		16		Medium dense		1.8	
22								
23								
24								
25								
26	19-5		13				[illegible]	

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EXPLORATORY BORING LOG

PROJECT: Paraiso Hot Springs DATE DRILLED: 24-Aug-04 FILE No. LSW-0337-01
DRILLER: Exploration Geoservice DRILLING METHOD: B-56 LOGGED BY: BP
BORING DIAMETER: 8" HS BORING DEPTH: 60.0' GROUNDWATER DEPTH: 55.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
27					Yellowish brown silty SAND medium dense moist, well graded occasional subangular to angular granitic gravels	SM		
28								
29								
30								
31	19-6		13				4.1	
32								
33								
34								
35								
36	19-7		25				3.5	
37								
38								
39								
40								
41	19-8		24				3.8	
42								
43								
44								
45								
46	19-9		18				3.0	
47								
48								
49								
50								
51	19-10		37				3.9	
52								
53								

EXPLORATORY BORING LOG

No. 19 pg 3 of 3

PROJECT: Paraiso Hot Springs | DATE DRILLED: 24-Aug-04 | FILE No. LSW-0337-01
DRILLER: Exploration Geoservice | DRILLING METHOD: B-56 | LOGGED BY: BP
BORING DIAMETER: 8" HS | BORING DEPTH: 60.0' | GROUNDWATER DEPTH: 55.0'

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
54								
55								▼
56	19-11		17				[illegible]	
57								
58								▼
59								
	19-12		11				[illegible]	
60								

TD @ 60.0
GROUNDWATER ENCOUNTERED @ 55.0'
WHILE DRILLING
GROUNDWATER ENCOUNTERED @ 58.3'
30 MINUTES AFTER DRILLING

Water Temp 95 F

EXPLORATORY BORING LOG

No. B-20

PROJECT: Paraiso Hot Springs	DATE DRILLED: 24-Aug-04	FILE No. LSW-0337-01	
DRILLER: California Geotech	DRILLING METHOD: B-24	LOGGED BY: IMS	
BORING DIAMETER: 4" SS	BORING DEPTH: 16.5'	GROUNDWATER DEPTH: N/A	

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Soil:** Yellowish brown (10YR5/4). SAND with silt, very dense dry <10% fines, fine to coarse angular sand, no mica's	SW		
2								
3	20-1		50/3				[illegible]	[illegible]
4								
5								
6	20-2		50/5		Mica's in sample		4.3	
7								
8								
9								
10								
11	20-3		50/6		Color change to reddish brown fines increases to 15-25% Drilling hard and slow		4.3	
12								
13								
14					**Kgd: Granite (Cretaceous)** Reddish brown granite extremely weathered, friable, firm rock hardness, grain size fine to coarse			
15								
16	20-4		82				3.5	
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

TD @ 16.5'

NO GROUNDWATER ENCOUNTERED

EXPLORATORY BORING LOG

No. B-21

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	24-Aug-04
DRILLER:	Exploration Geoservice	DRILLING METHOD:	B-56
BORING DIAMETER:	8" HS	BORING DEPTH:	24.0'
FILE No.	LSW-0337-01	LOGGED BY:	BP
GROUNDWATER DEPTH:	N/A		

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Light yellowish brown silty SAND, medium dense, dry well graded			
2								
3								
	21-1		16				1.4	142.6
4								
5								
6								
	21-2		34				1.5	
7								
8								
9								
10								
11					**Tt: Tierra Redonda Fm (Micocene)** Grayish red arkosic sandstone dense, slightly moist, friable			
	21-3		51		weakly indurated, severely weathered		6.1	113.9
12								
13								
14								
15								
16								
	21-4	‖	39				5.0	
17								
18								
19								
20								
21								
	21-5	‖	39		Moderately weathered		3.6	
22								
23								
24		‖	50.5		Slightly weathered, very dense		2.4	
					TD @ 24.0' **NO GROUNDWATER ENCOUNTERED**			
25								
26								
27								

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EXPLORATORY BORING LOG

No. B-22

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	24-Aug-04	FILE No.	LSW-0337-01
DRILLER:	California Geotech	DRILLING METHOD:	B-24	LOGGED BY:	IMS
BORING DIAMETER:	4" SS	BORING DEPTH:	10.5'	GROUNDWATER DEPTH:	N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
					Tt: Tierra Redonda Fm (Miocene)			
1					Yellowish brown (10YR5/4) SANDSTONE, very dense slightly moist, slightly weathered, friable, plastic when wet firm, rock hardness, fracture and bedding unknown, fine to coarse sand, slightly cemented			
2								
3	22-1		50/5	>4.5			[illegible]	118.0
4								
5								
6	22-2		50/6				[illegible]	
7								
8								
9								
10								
	22-3		50/5				3.2	
11					**TD @ 10.5'** **NO GROUNDWATER ENCOUNTERED**			
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

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EXPLORATORY BORING LOG

No. B-23 pg 1 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	25-Aug-04
FILE No.	LSW-0337-01	DRILLER:	Exploration Geoservice
DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER:	8" HS	BORING DEPTH:	39.5'
GROUNDWATER DEPTH:	14.0'		

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Hf: fill (Holocene)** Grayish brown silty SAND, medium dense, slightly moist	SM		
2								
3	23-1		34	>4.5			9.8	107.3
4								
5					Color change to reddish brown			▼
6	23-2		26	>4.5			7.8	115.0
7								
8					**Qal 2: Alluvium (Hollocene)** Dark olive brown silty SAND, medium dense moist	SM		
9								
10								
11	23-3		34				11.5	111.1
12								
13								
14					Color change to reddish brown, loose, saturated very fine to medium grained			▼
15								
16	23-4		8				19.4	
17								
18								
19								
20								
21	23-5		11		Loose to medium dense		11.6	
22								
23								
24					Reddish brown CLAY stiff, very moist	CL		
25								
26	23-6		14				12.7	

EXPLORATORY BORING LOG

No. B-23 pg 2 of 2

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	25-Aug-04	FILE No.	LSW-0337-01
DRILLER:	Exploration Geoservice	DRILLING METHOD:	B-56	LOGGED BY:	BP
BORING DIAMETER: 8" HS	BORING DEPTH: 39.5'	GROUNDWATER DEPTH:	14.0'		

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
27					Reddish brown CLAY, hard very moist	CL		
28								
29								
30								
31	23-7		32					
32								
33								
34					Tt: Tierra Redonda Fm			
35								
36	23 8		65					
37								
38								
39			50/5					
40								

TD @ 39.5'
GROUNDWATER ENCOUNTERED @ 14.0'
DURING DRILLING
GROUNDWATER ENCOUNTERED @ 5.5'
30 MINUTES AFTER DRILLING

Water temp 73 F No Odor

EXPLORATORY BORING LOG

No. B-24

PROJECT: Paraiso Hot Springs
DATE DRILLED: 25-Aug-04
FILE No. LSW-0337-01
DRILLER: California Geotech
DRILLING METHOD: B-24
LOGGED BY: IMS
BORING DIAMETER: 4"SS
BORING DEPTH: 21.5'
GROUNDWATER DEPTH:

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 1: Alluvium (Holocene)** Dark yellowish brown (10YR4/4) SAND with gravel and silt, medium dense dry, <10% fines, fine to coarse angular sand, fine to medium angular gravel clast entirely of granitic provenance			
2								
3								
4	24-1		40				1.8	
5								
6								
7	24-2		27				1.0	
8								
9					Boring caved to 8' @ 10' Cleared out to 9' before sampling Sand clear			
10								
11								
12	24-3		42				1.6	
13								
14					Caved to 13.5'			
15								
16								
17	24-4		36				1.5	
18					Drilling becomes difficult @ 17' - fine gravel abundant in cuttings			
19								
20								
21								
22	24-5		29		Trace monterey clasts in sample		2.1	
23								
24								
25								
26								
27								

TD @ 21.5'
NO GROUNDWATER ENCOUNTERED

EXPLORATORY BORING LOG

No. **B-25**

PROJECT: Paraiso Hot Springs
DRILLER: California Geotech
BORING DIAMETER: 4"SS
BORING DEPTH: 21.5'
DATE DRILLED: 25-Aug-04
DRILLING METHOD: B-24
GROUNDWATER DEPTH: N/A
FILE No. LSW-0337-01
LOGGED BY: IMS

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 1: Alluvium (Holocene)** Brown (10YR4/3) SAND with gravel medium dense, dry, fine to coarse sand, angular, 20-30% fine to coarse angular gravel, clasts are granite and schist	SW		
2								
3	25-1		38	4.0			2.5	102.9
4								
5					Gravel encountered			
6	25-2		15				1.8	
7								
8								
9								
10					Gravel encountered			
11	25-3		51				0.9	
12								
13								
14					Gravel encountered			
15								
16	25-4		56				2.0	
17								
18								
19					Drilling very difficult, cobbles			
20								
21	25-5		68				[illegible]	
22					TD @ 21.5' NO GROUNDWATER ENCOUNTERED			
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-26

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	25-Aug-04	FILE No.	LSW-0337-01
DRILLER:	California Geotech	DRILLING METHOD:	B-24	LOGGED BY:	IMS
BORING DIAMETER:	4"SS	BORING DEPTH:	19.5'	GROUNDWATER DEPTH:	N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Qal 2: Alluvium (Holocene)** Yellowish brown (10YR5/4), SAND with gravel, dense dry to coarse sand fine to medium gravel 20-30% angular to sub rounded mostly fine, mix of Tt and Qal	SP		
2								
3	26-1		66				1.5	103.7
4								
5								
6	26-2		36				0.9	
7								
8								
9								
10					**Tt: Tierra Redonda Fm (Miocene)** Brown (5YR3/2) SANDSTONE, very dense, dry, 20-30% fines, fine to coarse sand mostly fine to medium, mica and plag rich			
11	26-3		61				2.7	
12								
13								
14								
15					Drilling difficult			
16	26-4		64		Color change to dark brown (7.5YR4/2) fine content decreases to 10-20%		3.7	
17								
18					Drilling very difficult - refusal			
19	26-5		63				1.8	
20					**TD @ 19.5'** NO GROUNDWATER ENCOUNTERED			
21								
22								
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-27

PROJECT: Paraiso Hot Springs	DATE DRILLED: 25-Aug-04	FILE No. LSW-0337-01	
DRILLER: California Geotech	DRILLING METHOD: B-24	LOGGED BY: IMS	
BORING DIAMETER: 4" SS	BORING DEPTH: 6.5'	GROUNDWATER DEPTH: N/A	

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Soil:** Dark brown (10YR4/1) clayey SAND, very dense, dry, 25-35% fines, fine to medium sand	SC		
2								
3	27-1		76/11"	>4.5			[illegible]	[illegible]
4					**Tt: Tierra Redonda Fm (Miocene)** Light gray (210YR7/1) SANDSTONE, very dense, dry, slightly weathered to fresh, cemented, weak firm to moderately hard rock hardness, very closely fractured			
5								
6	27-2		70				[illegible]	
7					**TD @ 6.5'** **NO GROUNDWATER ENCOUNTERED**			
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-28

PROJECT:	Paraiso Hot Springs	DATE DRILLED:	25-Aug-04	FILE No.	LSW-0337-01
DRILLER:	California Geotech	DRILLING METHOD:	B-24	LOGGED BY:	IMS
BORING DIAMETER: 4" SS	BORING DEPTH: 5.5'	GROUNDWATER DEPTH:	N/A		

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Class	Moisture (% dry weight)	Dry Density (pcf)
0								
					Soil:	SC		
1					Dark brown (10YR4/1) clayey SAND, very dense dry 25-35%			
					fines fine to medium sand			
2								
3	28-1		50/6	3.25			[illegible]	112.4
					Tt: Tierra Redonda Fm (Miocene)			
4					Light gray (10YR7/1) SANDSTONE, very dense dry slightly			
					weathered to fresh cemented, weak, firm to moderately			
5					hard rock hardness, very closely fractured			
	28-2	‖	50/5				0.7	
6					**TD @ 5.5'**			
					NO GROUNDWATER ENCOUNTERED			
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

EXPLORATORY BORING LOG

No. B-29

PROJECT: Paraiso Hot Springs — DATE DRILLED: 24-Aug-04 — FILE No. LSW-0337-01

DRILLER: California Geotech — DRILLING METHOD: B-24 — LOGGED BY: IMS

BORING DIAMETER: 4" SS — BORING DEPTH: 6.5' — GROUNDWATER DEPTH: N/A

Depth (ft)	Sample	Graphic Log	Blows per foot	Pocket Pen (tsf)	Description	U.S.C.S. Soil Group	Moisture (% dry weight)	Dry Density (pcf)
0								
1					**Soil:** Reddish brown (5YR4/3) clayey SAND, very dense dry, 20-30% fine fine to medium sand	SC		
2								
3	29-1		53.5	>4.5			[illegible]	[illegible]
4								
5					**Tt: Tierra Redonda Fm (Miocene)** Reddish brown SANDSTONE, moderately weathered slightly cemented, weak firm to moderately hard, fracture unknown			
6	29-2		67				[illegible]	
7					TD @ 6.5' NO GROUNDWATER ENCOUNTERED			
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

APPENDIX B

Water Well Drillers Reports

DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

WELL LOG:

Paradise Springs — 109

Paradise Springs Rd.

Oakland, Co. — 83960

0 — 5' Top

ON OF WELL:

15' - 80' Sand

80' - 95' Brown Sand

Paradise Springs Rd — 95' - 105' Rock

105'-109' Rock

WORK (check):

USE (check): — EQUIPMENT:

Industrial ☐ Municipal ☐ — Rotary ☒

Cable ☐

Other ☐

INSTALLED:

If gravel packed

Diam	Gage or Wall	Diameter of Bore	From ft	To ft
8"	8 Ga.	22"	0	104

1/4 Dea

RATIONS OR SCREEN:

104	6	6	1/8 Std Louvre

60

Bentonite w/gravel Table

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

GALVERT DRILL CO.

FLOURIDE WELL

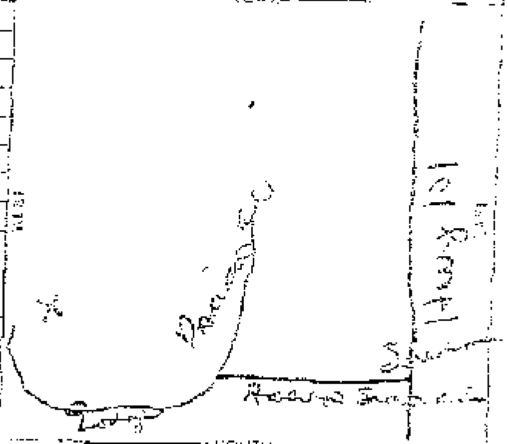
WELL LOCATION

Paraiso Springs

Monterey

LOCATION SKETCH

NORTH



SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

DRILLING METHOD Rotary

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ______ (Ft.) & DATE MEASURED

ESTIMATED YIELD* ______ (GPM) & TEST TYPE

TEST LENGTH ______ (Hrs.) TOTAL DRAWDOWN ______

* May not be representative of a well's long-term yield.

CASING(S)

ANNULAR MATERIAL

DEPTH FROM SURFACE

CERTIFICATION STATEMENT

A11878

WELL LOCATION

Page ____ Parcel ____

Township ____ Range ____ Section ____

Latitude ____ DEG. MIN. SEC. NORTH Longitude ____

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE

DRILLING METHOD ____ FUEL ____

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ____ (Ft.) & DATE MEASURED ____

ESTIMATED YIELD * ____ (GPM) & TEST TYPE ____

TEST LENGTH ____ (Hrs.) TOTAL DRAWDOWN ____

* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING ____ (Feet)

TOTAL DEPTH OF COMPLETED WELL ____ (Feet)

CASING (S)

DEPTH FROM SURFACE	BORE HOLE DIA. (Inches)	TYPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
[illegible]	10	[illegible]	[illegible]	5		
[illegible]	10	[illegible]	[illegible]	5		
[illegible]	10	[illegible]	[illegible]	5		
[illegible]	10	[illegible]	[illegible]	5		
[illegible]	10	[illegible]	[illegible]	5		
[illegible]	10	[illegible]	[illegible]	5		

DEPTH FROM SURFACE

CERTIFICATION STATEMENT

APPENDIX C

Laboratory Test Results

Table C-1
Summary of Laboratory Test Results

Sample No.	Depth (ft.)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)	Swell (%)	Moisture Increase (%B)	Angle of Internal Friction	Unit Cohesion (pcf)
1-1	3.0-3.5	117.8	5.9	>4.5				
1-2	6.0-6.5	123.2	4.1	2.5				
1-3	11.0-11.5	117.7	8.8	3.0				
1-4	15.0-16.5		12.3					
1-5	20.0-21.5		14.1					
1-6	25.0-26.5		15.2					
1-7	31.0-32.5		17.8					
1-8	35.0-36.5		20.0					
1-9	38.5-40.0		18.0					
1-10	43.5-45.0		20.8					
2-1	3.0-3.5	109.5	2.3	>4.5				
2-2	5.5-6.0	113.1	1.8	>4.5				
2-3	10.0-11.5		1.8					
2-4	15.0-16.5		5.4					
2-5	20.0-21.5		10.4					
3-1	3.0-3.5	104.0	7.4	3.25				
3-2	6.0-6.5	112.2	6.2	>4.5				
3-3	11.0-11.5	106.3	9.1	1.25				
3-4	15.0-16.5		18.3					
3-5	20.0-21.0		19.3					
3-6	25.0-26.5		14.2					
3-7	28.5-30.0		18.0					
4-1	3.0-3.5	107.7	3.1	1.5				
4-2	6.0-6.5	118.6	3.4	>4.5				
4-3	10.5-11.0	115.1	3.2	>4.5				
4-4	15.0-16.5		3.3					
4-5	20.0-21.5		2.3					

Table C-1 Continued
Summary of Laboratory Test Results

Sample No.	Depth (ft.)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)	Swell (%)	Moisture Increase (%B)	Angle of Internal Friction	Unit Cohesion (pcf)
5-1	3.0-3.5	106.2	2.6	>4.5				
5-2	6.0-6.5	118.8	15.1	>4.5				
5-3	11.0-11.5	112.2	14.0	2.25				
5-4	16.0-16.5	115.1	12.4	2.0				
5-5	19.5-21.0		14.0					
5-6	25.0-26.5		17.8					
5-7	30.0-31.5		16.8					
5-8	35.0-36.5		17.0					
5-9	38.5-40.0		17.8					
6-1	3.0-3.5	113.6	3.0					
6-2	5.5-6.0	116.2	3.2					
6-3	10.0-11.5		3.1					
6-4	15.0-16.5		3.5					
6-5	20.0-21.5		2.9					
7-1	3.0-3.5	108.7	7.7					
7-2	6.0-6.5	105.6	7.4					
7-3	11.0-11.5	93.0	24.0					
7-4	15.0-16.5		28.3					
7-5	20.0-21.5		17.7					
7-6	25.0-26.5		17.2					
7-7	30.0-31.5		17.2					
7-8	35.0-36.5		38.6					
7-9	40.0-41.5		23.5					
7-10	45.0-46.5		19.0					
7-11	48.5-50.0		17.9					
7-12	53.0-54.5		14.2					
8-1	3.0-3.5	112.3	1.4					

Table C-1 Continued
Summary of Laboratory Test Results

Sample No.	Depth (ft.)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)	Swell (%)	Moisture Increase (%B)	Angle of Internal Friction	Unit Cohesion (pcf)
8-2	6.0-6.5	116.9	1.0					
8-3	10.0-11.5		0.9					
8-4	15.0-16.5		1.6					
8-5	20.0-21.5		1.2					
9-1	3.0-3.5	84.1	8.3					
9-2	6.0-6.5	108.7	15.2					
9-3	11.0-11.5	109.1	17.2					
9-4	16.0-16.5	100.3	16.8					
9-5	21.0-21.5	106.7	16.5					
9-6	25.0-26.5		19.6					
9-7	28.5-30.0		18.1					
10-1	2.5-3.0	119.4	8.1	>4.5				
10-2	5.5-6.0	112.7	9.1	>4.5				
10-3	9.5-10.5		0.6					
11-1	3.0-3.5		1.3					
11-2	6.0-6.5	95.5	3.0	>4.5				
11-3	11.0-11.5	104.6	6.6	>4.5				
11-4	15.0-16.5		20.9					
11-5	20.0-21.5		13.8					
11-6	25.0-26.5		11.8					
11-7	30.0-31.5		14.0					
11-8	35.0-36.5		18.9					
11-9	40.0-41.5		17.9					
11-10	45.0-46.5		19.1					
12-1	2.0-2.5	88.5	8.3					
12-2	5.0-6.5		2.0					

Table C-1 Continued
Summary of Laboratory Test Results

Sample No.	Depth (ft.)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)	Swell (%)	Moisture Increase (%B)	Angle of Internal Friction	Unit Cohesion (pcf)
12-3	10.0-11.5		2.7					
12-4	15.0-15.5		2.3					
13-1	3.0-3.5	105.2	3.1	>4.5				
13-2	6.0-6.5	102.6	3.4					
13-3	11.0-11.5	101.6	16.7					
13-4	15.0-16.5		20.7					
13-5	20.0-21.5		27.7					
13-6	25.0-26.5		17.6					
13-7	35.0-36.5		19.3					
13-8	40.0-41.5		21.9					
13-9	45.0-46.5		18.9					
13-10	48.5-50.0		11.8					
14-1	2.5-3.0	125.9	5.7					
14-2	5.0-6.0		2.9					
14-3	10.0-11.5		1.9					
14-4	15.0-16.5		6.0					
14-5	20.0-21.5		1.9					
14-6	25.0-26.5		2.7					
15-1	5.5-6.0	93.3	11.4	3.0				
15-2	6.0-6.5	76.8	33.9	3.0				
15-3	11.0-11.5	109.5	10.0	>4.5				
15-4	15.0-15.5		0.6					
15-5	18.0-18.7		3.5					
16-1	2.0-2.5	119.7	4.8	>4.5				
16-2	5.0-5.5		1.3					
16-3	10.0-11.0		5.4					

Table C-1 Continued
Summary of Laboratory Test Results

Sample No.	Depth (ft.)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)	Swell (%)	Moisture Increase (%B)	Angle of Internal Friction	Unit Cohesion (pcf)
16-4	15.0-16.5		3.2					
17-1	3.0-3.5	112.8	3.8	>4.5				
17-2	6.0-6.5	91.2	20.8					
17-3	11.0-11.5	101.1	1.3					
17-4	16.0-16.5		1.3					
17-5	20.0-21.5		2.1					
17-6	25.0-26.5		1.8					
17-7	30.0-31.5		2.5					
17-8	35.0-36.5		9.9					
17-9	40.0-41.5		14.8					
17-10	45.0-46.5		17.9					
17-11	48.5-50.0		12.6					
18-1	2.0-2.5	97.5	5.1					
18-2	5.0-5.5		2.3					
18-3	10.5-11.0		1.2					
19-1	3.0-3.5	103.3	2.4					
19-2	6.0-6.5	100.8	2.9	3.0				
19-3	16.0-16.5	101.2	3.1	3.25				
19-4	20.0-21.5		1.8					
19-5	25.0-26.5		4.7					
19-6	30.0-31.5		4.1					
19-7	35.0-36.5		3.5					
19-8	40.0-41.5		3.8					
19-9	45.0-46.5		3.0					
19-10	50.0-51.5		2.9					
19-11	55.0-56.5		8.9					
19-12	58.5-60.0		10.0					

Table C-1 Continued
Summary of Laboratory Test Results

Sample No.	Depth (ft.)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)	Swell (%)	Moisture Increase (%B)	Angle of Internal Friction	Unit Cohesion (pcf)
20-1	2.0-2.5	111.7	5.9					
20-2	5.0-6.0		4.3					
20-3	10.0-11.0		4.0					
20-4	15.0-16.5		3.8					
21-1	3.0-3.5	146.6	1.4					
21-2	6.0-6.5		1.3					
21-3	11.0-11.5	113.9	6.1	>4.5				
21-4	15.0-16.5		5.0					
21-5	20.0-21.5		3.6					
21-6	23.5-24.0		2.4					
22-1	2.5-3.0	118.0	6.1	>4.5				
22-2	5.0-6.0		2.0					
22-3	10-10.5		3.2					
23-1	3.0-3.5	107.3	9.8	>4.5				
23-2	6.0-6.5	115.0	7.8	>4.5				
23-3	11.0-11.5	117.1	11.5					
23-4	15.0-16.5		19.4					
23-5	20.0-21.5		11.9					
23-6	25.0-26.5		12.7					
24-1	3.0-3.5		1.8					
24-2	5.0-6.5		2.0					
24-3	10.0-11.5		1.6					
24-4	15.0-16.5		1.5					
24-5	20.0-21.5		2.1					
25-1	3.0-3.5	102.9	2.5	4.0				

Table C-1 Continued
Summary of Laboratory Test Results

Sample No.	Depth (ft.)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)	Swell (%)	Moisture Increase (%B)	Angle of Internal Friction	Unit Cohesion (pcf)
25-2	5.0-6.5		1.8					
25-3	10.0-11.5		0.8					
25-4	15.0-16.5		2.0					
25-5	20.0-21.5		2.0					
26-1	3.0-3.5	103.7	1.5					
26-2	5.0-6.5		0.9					
26-3	10.0-11.5		2.7					
26-4	15.0-16.5		2.7					
26-5	18.0-19.5		1.8					
27-1	2.5-3.0	107.3	7.4	>4.5				
27-2	5.0-6.5		3.1					
28-1	2.5-3.0	112.4	2.7					
28-2	5.0-5.5		2.7					
29-1	2.5-3.0	105.2	5.5					
29-2	5.0-6.5		7.6					

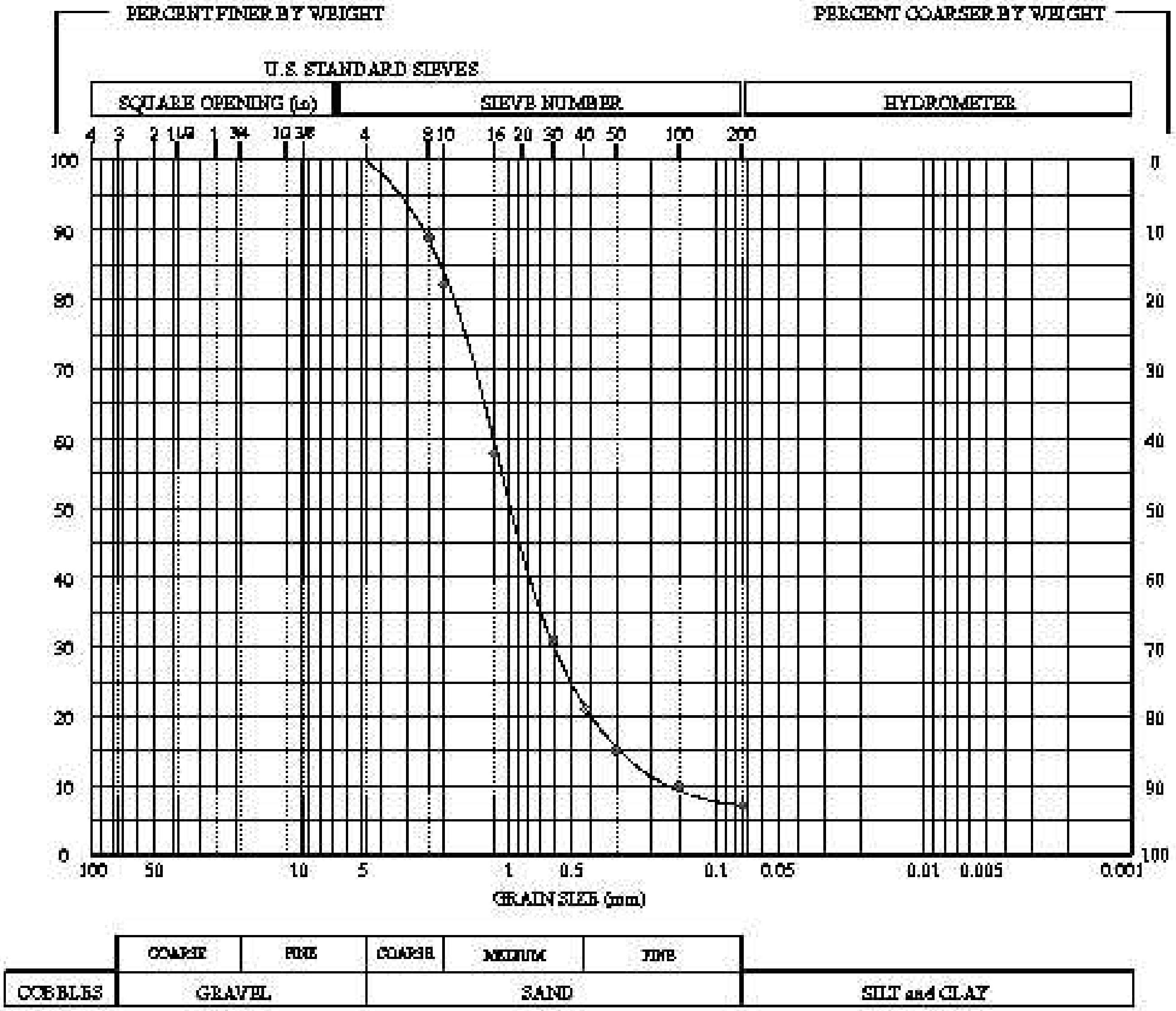
Summary of Atterberg Limits Test Results

Sample No.	Depth (ft.)	Liquid Limit	Plastic Limit	Plasticity Index
5-6	25.0-26.5	14	25	11
9-4	16.0-16.5	27	18	9
23-6	25.0-26.5	36	13	23
28-1	2.5-3.0	19	33	14
Bulk A	0.0-5.0	27	18	9
Bulk G	0.0-5.0	27	15	12

C7

GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariaso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-1	**DEPTH (ft)**	38.0 - 38.5'	**SAMPLE**	1-9	**DATE OF TEST**	9/13/04
DESCRIPTION OF SOIL	grey SAND W/CLAY: loose, saturated, 5-10% fines, fine to coarse sand						



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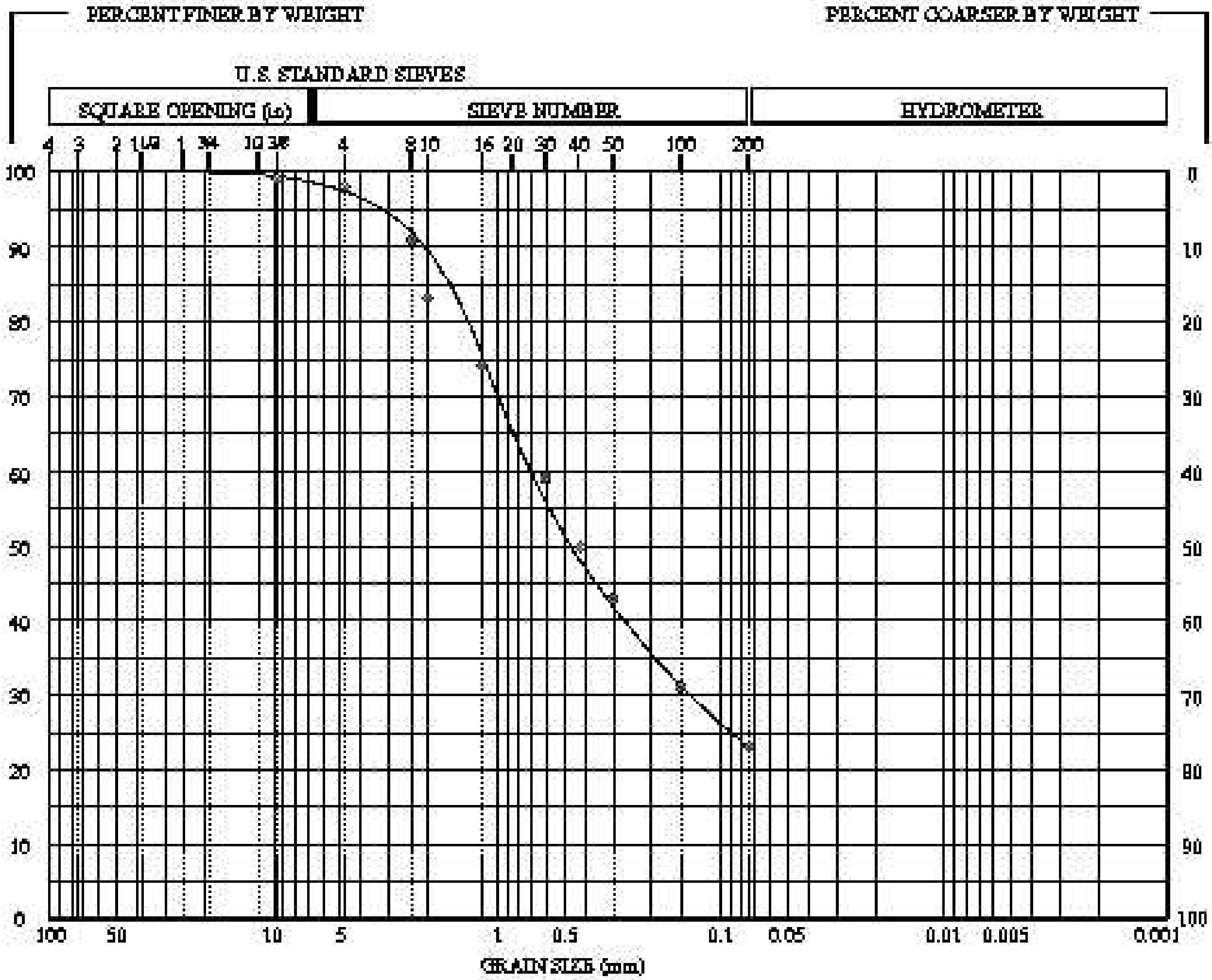
GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariaso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-3	**DEPTH (ft)**	30.0 - 31.5'	**SAMPLE**	3-5	**DATE OF TEST**	9\11\04
DESCRIPTION OF SOIL	dark grey well gradded SAND: loose, saturated, 20-30% fines, fine to coarse sand						



	COARSE	FINE	COARSE	MEDIUM	FINE	
COBBLES	GRAVEL		SAND			SILT and CLAY

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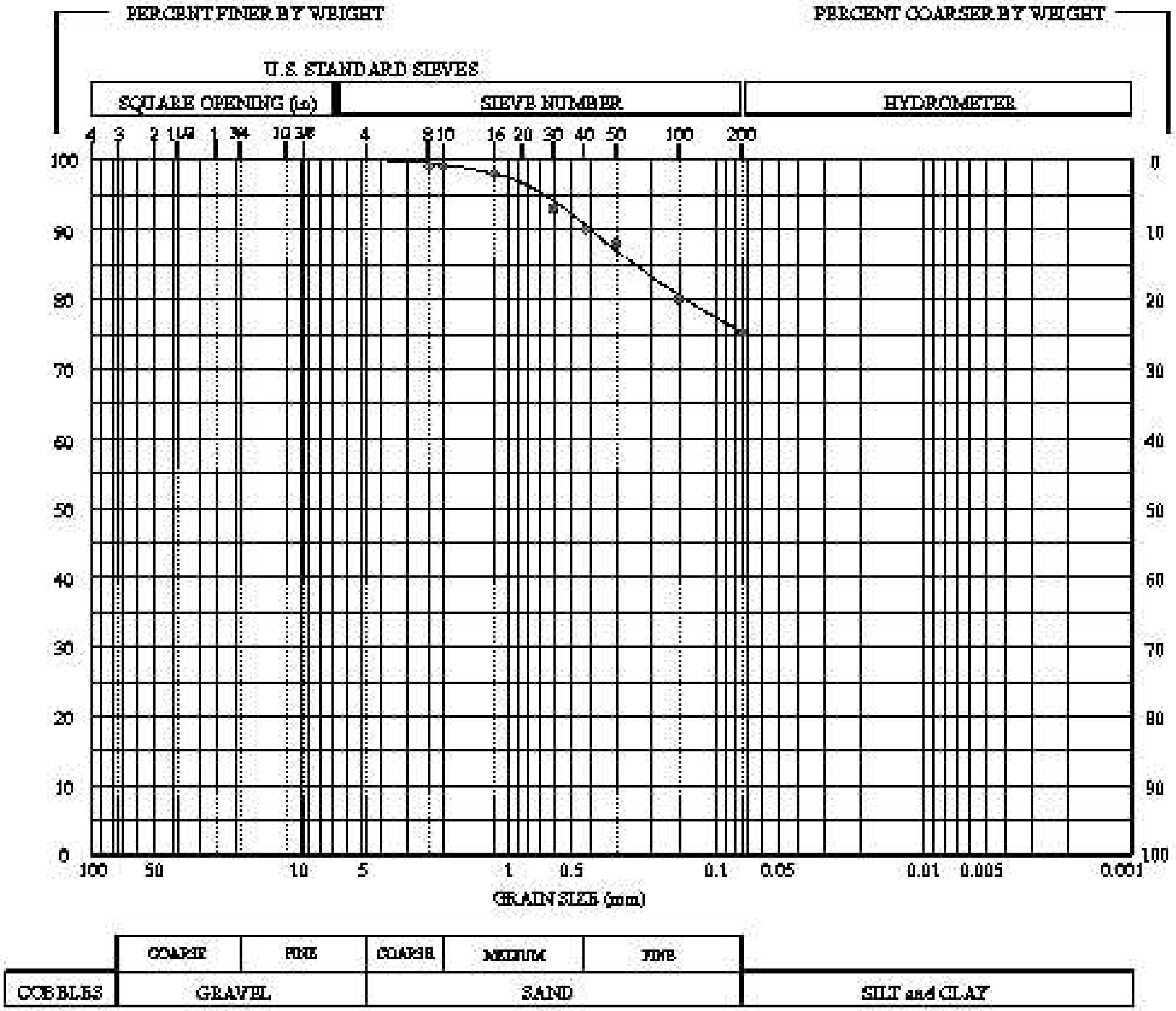
GRAIN SIZE TEST RESULTS

PROJECT NAME	Paraiso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-5	**DEPTH (ft)**	26.0 - 26.5'	**SAMPLE**	S-6	**DATE OF TEST**	9/16/04
DESCRIPTION OF SOIL	Light Olive SANDY LEAN CLAY: stiff, very moist, 70-80% fines, fine to coarse sand						



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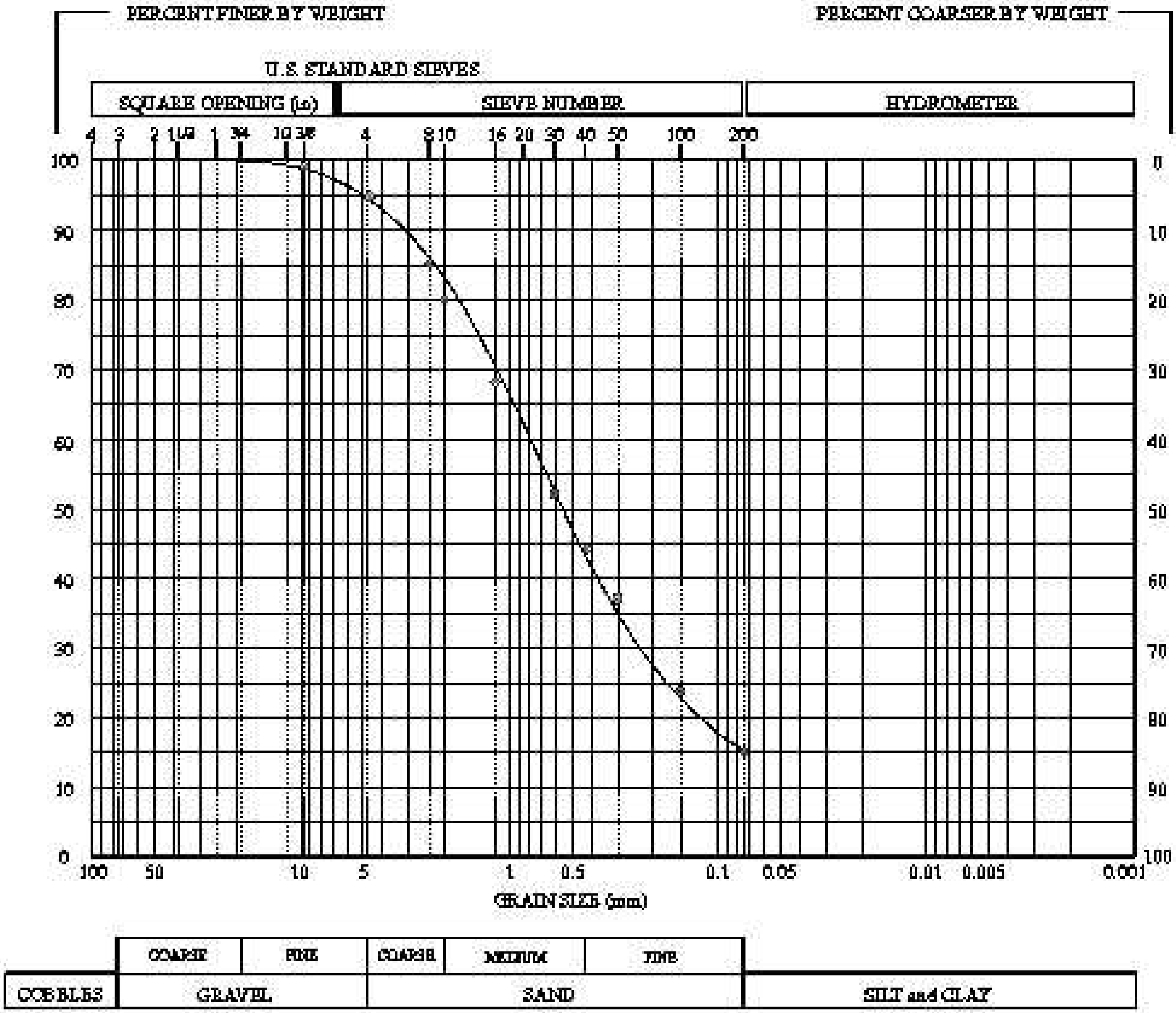
GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariaso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-7	**DEPTH (ft)**	15.0 - 16.5'	**SAMPLE**	7-4	**DATE OF TEST**	9/13/04
DESCRIPTION OF SOIL	Dark grey well gradded SAND: loose, saturated, fine to coarse sand, trace fine gravel, 15-25% fines.						



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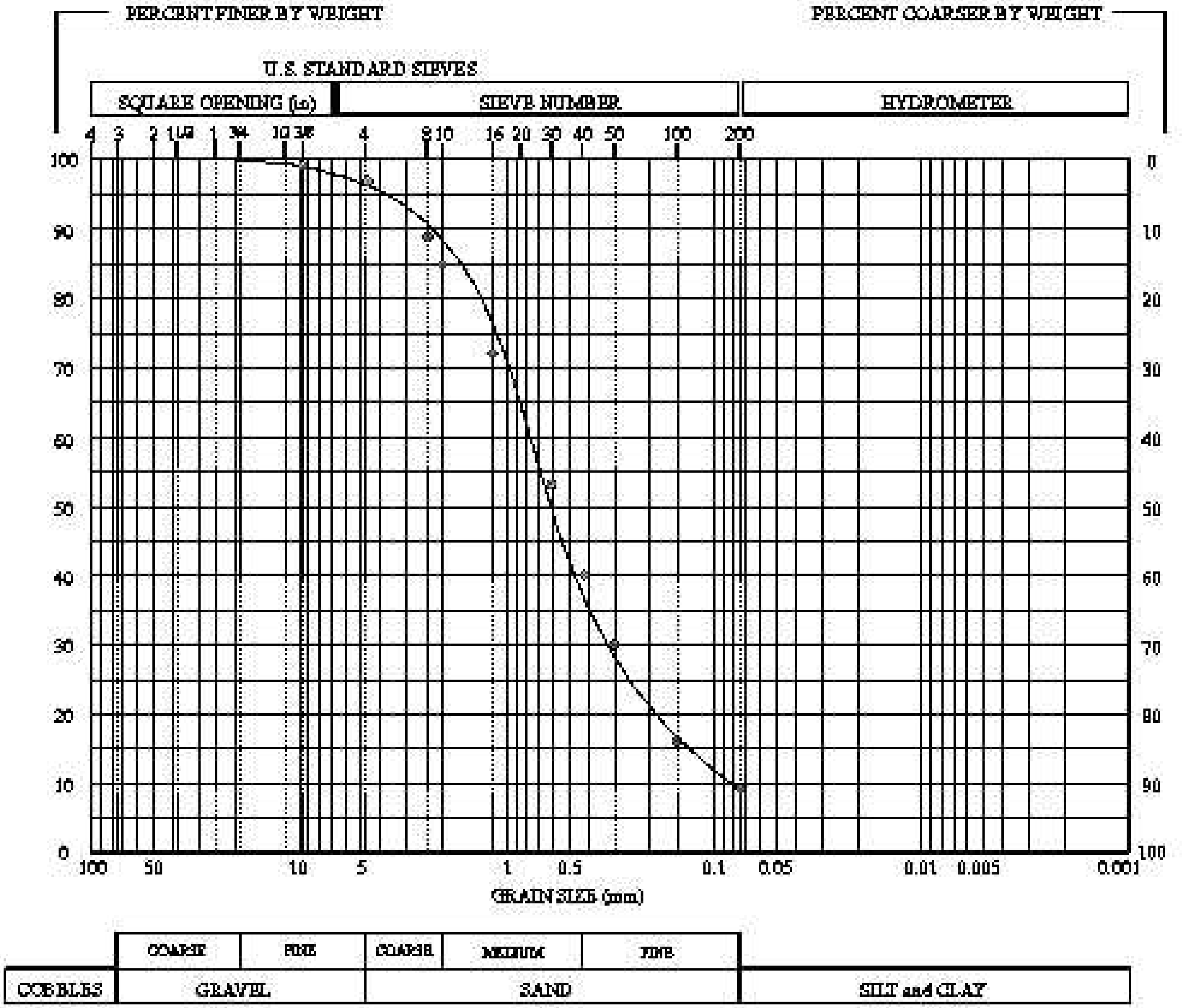
GRAIN SIZE TEST RESULTS

PROJECT NAME	Paraiso Hot Springs					PROJECT No.	LSW-0337-01
DRILL HOLE No.	B-7	DEPTH (ft)	20.0 - 21.5'	SAMPLE	7-5	DATE OF TEST	9/11/04
DESCRIPTION OF SOIL	Light grey well graded SAND: loose, saturated, fine to coarse sand, trace fine gravel, 5-15% fines.						



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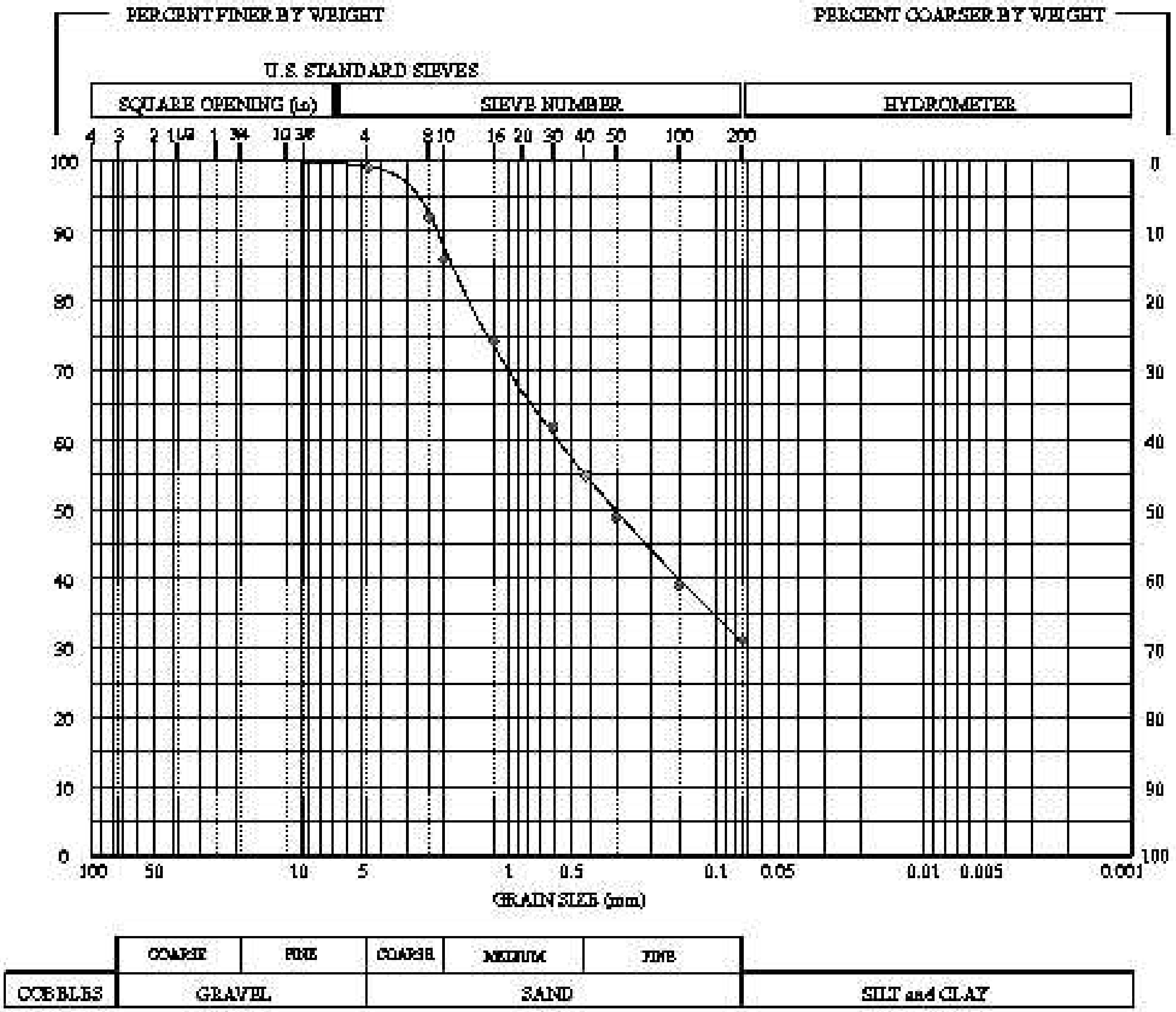
520-B Crazy Horse Canyon Road, Salinas, CA 93907

GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariaso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-9	**DEPTH (ft)**	15.0 - 16.5'	**SAMPLE**	9-4	**DATE OF TEST**	9/21/04
DESCRIPTION OF SOIL	Dark grey CLAYEY SAND: loose, saturated, 31% fines, fine to coarse sand, trace fine gravel						



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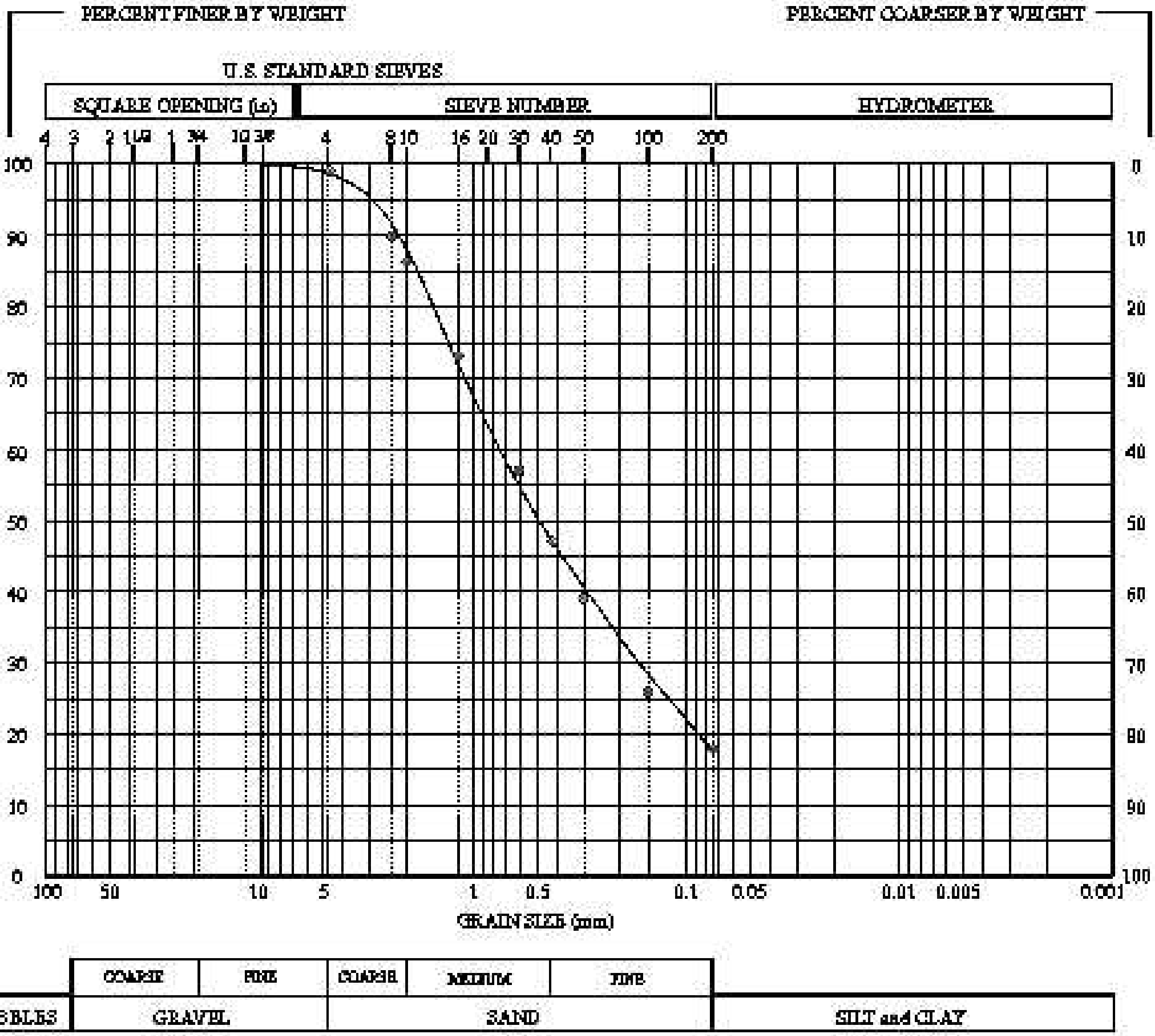
GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariaso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-9	**DEPTH (ft)**	28.5 - 30.0'	**SAMPLE**	9-7	**DATE OF TEST**	9/13/04
DESCRIPTION OF SOIL	Dark grey well gradded SAND: loose, saturated, 15-25% fines, fine to coarse sand, trace fine gravel						



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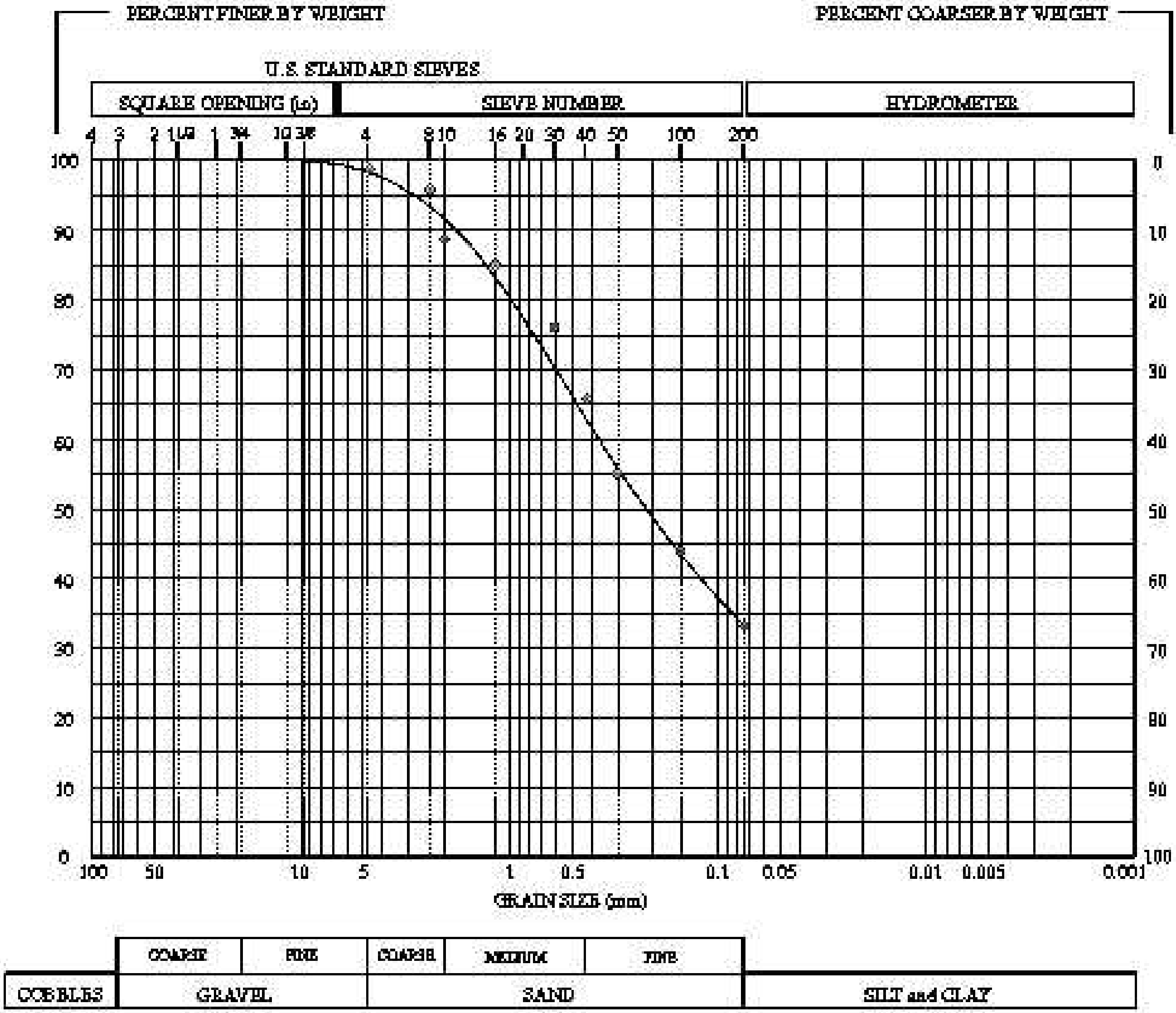
GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariaso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-13	**DEPTH (ft)**	15.0-16.5'	**SAMPLE**	13-4	**DATE OF TEST**	9/13/04
DESCRIPTION OF SOIL	greyish olive SILTY SAND W/CLAY: loose, saturated, interbedded well graded sand, silt and clay, 25-35% fines, fine to coarse sand, trace fine gravel						



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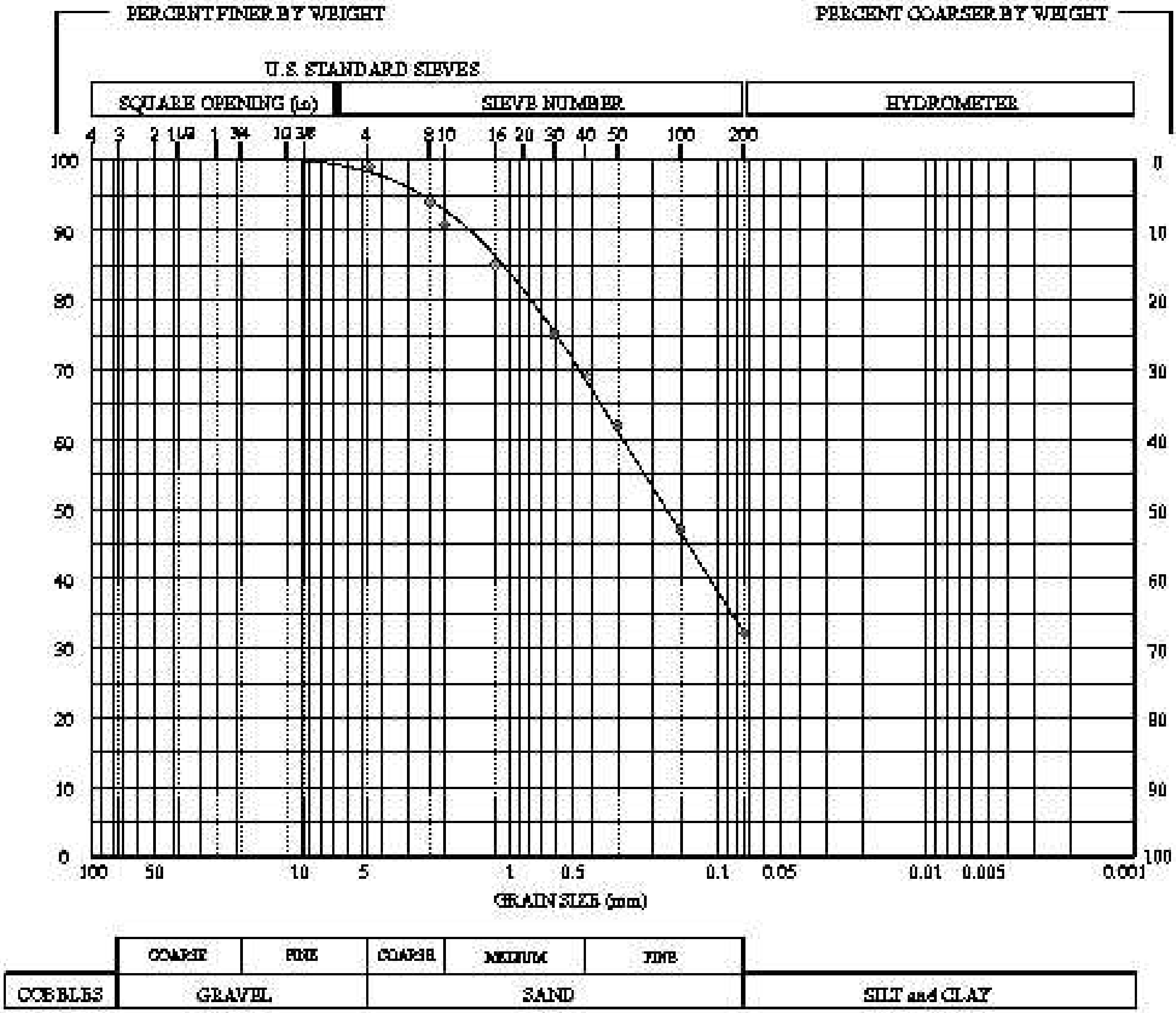
GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-13	**DEPTH (ft)**	20.0-21.5'	**SAMPLE**	13-5	**DATE OF TEST**	9/13/04
DESCRIPTION OF SOIL	greyish olive SILTY SAND W/CLAY: loose, saturated, interbedded well graded sand, silt and clay, 25-35% fines, fine to coarse sand, trace fine gravel						



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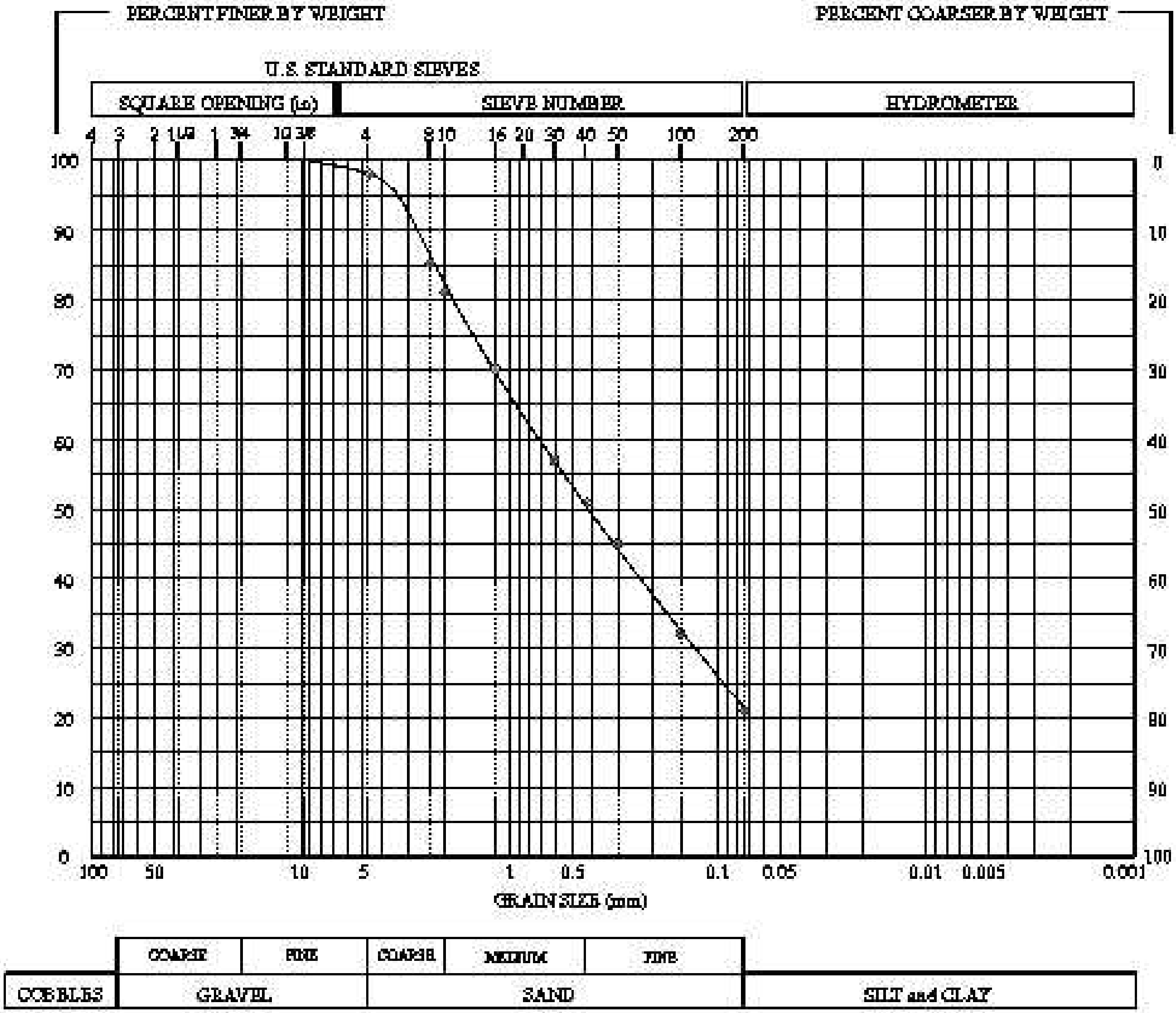
GRAIN SIZE TEST RESULTS

PROJECT NAME	Pariso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-19	**DEPTH (ft)**	58.5-60.0'	**SAMPLE**	19-12	**DATE OF TEST**	9/11/04
DESCRIPTION OF SOIL	yellowish brown SILTY SAND: medium dense, moist, well graded, fine to coarse sand, 15-25% fines.						



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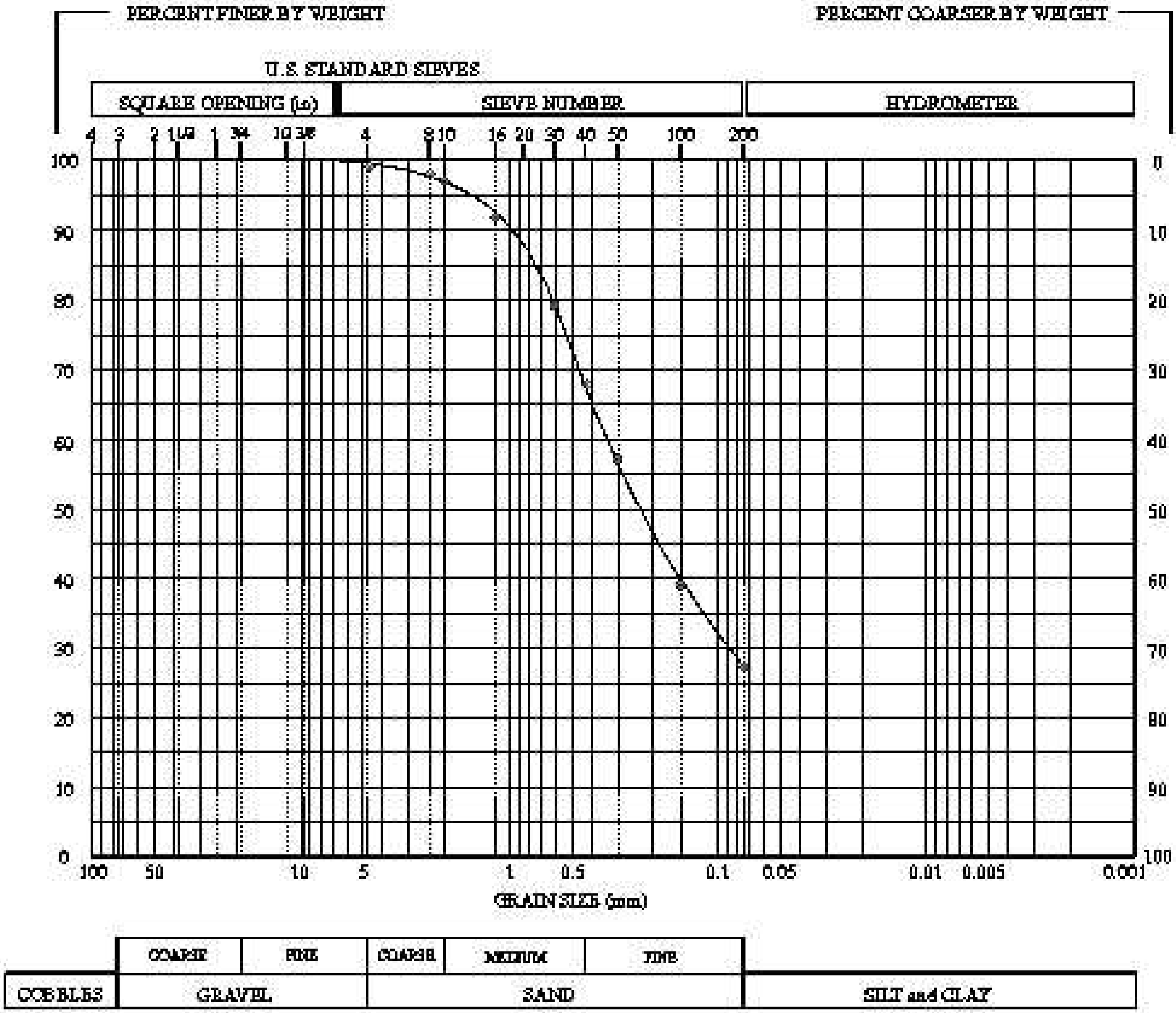
GRAIN SIZE TEST RESULTS

PROJECT NAME	Paraiso Hot Springs					**PROJECT No.**	LSW-0337-01
DRILL HOLE No.	B-23	**DEPTH (ft)**	15.0-16.5'	**SAMPLE**	23-4	**DATE OF TEST**	9/13/04
DESCRIPTION OF SOIL	reddish brown SILTY SAND: medium dense, saturated, fine to medium grained sand, 20-30% fines						



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APPENDIX D

SCALE OF ACCEPTABLE RISKS FROM GEOLOGIC HAZARDS

SCALE OF ACCEPTABLE RISKS FROM SEISMIC GEOLOGICAL HAZARDS

Level of Acceptable Risk	Kinds of Structure	Extra Project Cost Probably Required to Reduce Risk to an Acceptable Level
Extremely low [1]	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intake systems, plants manufacturing or storing explosives or toxic materials.	No set percentage (whatever is required for maximum attainable safety)
Slightly higher than under extremely low level [1]	Structures whose use is critically needed after a disaster: important utility centers; hospitals; fire, police and emergency communication facilities; fire station; and critical transportation elements such as bridges and overpasses; also dams.	5 to 25 percent of project cost [2]
Lowest possible risk to occupants of the structure [3]	Structures of high occupancy, or whose use after disaster would be particularly convenient : schools, churches, theaters, large hotels, and other high rise buildings housing large numbers of people, other places normally attracting large concentrations of people, civic buildings such as fire stations, secondary utility structures, extremely large commercial enterprises, most roads, alternative or non-critical bridges and overpasses.	5 to 15 percent of project cost [4]
An ordinary level of risk to occupants of the structure [3,5]	The vast majority of structure: most commercial and industrial buildings, small hotels and apartment buildings, and single family residences.	1 to 2 percent of project cost, in most cases (2 to 10 percent of project in a minority of cases) [4]

[1] Failure of a single structure may affect substantial populations

[2] These additional percentages are based on the assumptions that the base cost is the total cost of the building or other facility when ready for occupancy. In addition, it is assumed that the structure would have been designed and built in accordance with current California practice. Moreover, the estimated additional cost presumes that structures in this acceptable risk category are to embody sufficient safety to remain functional following an earthquake.

[3] Failure of a single structure would affect primarily only the occupants.

[4] These assumptions are based on the assumption that the base cost is the total cost of the building or facility when ready for occupancy. In additions, it is assumed that the structures would have been designed and built in accordance with current California practice. Moreover the estimated additional cost presumes that structures in this acceptable-risk category are to be sufficiently safe to give reasonable assurance of preventing injury or loss of life during and following an earthquake, but otherwise not necessarily to remain functional.

[5] "Ordinary risk". Resist minor earthquakes without damage: resist moderate earthquakes without structural damage, but with some non-structural damage; resist major earthquakes of the intensity or severity of the strongest experienced in California, without collapse, but with some structural damage as well as non-structural damage. In most structures it is expected that structural damage, even in a major earthquake, could be limited to repairable damage. (Structural Engineers Association of California)

Source: Meeting the Earthquake, Joint Committee on Seismic Safety of the California Legislature, Jan. 1974, p.9.

SCLALE OF ACCEPTABLE RISKS FROM NON-SEISMIC GEOLOGIC HAZARD[6]

Risk Level	Structure Type	Risk Characteristics
Extremely low risks	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intake systems, plants manufacturing or storing explosives or toxic materials	1. Failure affects substantial populations, risk equals nearly zero
Very low risks	Structures whose use is critically needed after a disaster: important utility centers; hospitals; fire, police and emergency communication facilities; fire station; and critical transportation elements such as bridges and overpasses; also dams.	1. Failure affects substantial populations. Risk slightly higher than 1 above.
Low risks	Structures of high occupancy, or whose use after disaster would be particularly convenient : schools, churches, theaters, large hotels, and other high rise buildings housing large numbers of people, other places normally attracting large concentrations of people, civic buildings such as fire stations, secondary utility structures, extremely large commercial enterprises, most roads, alternative or non-critical bridges and overpasses.	1. Failure of single structure would affect primarily only the occupants.
"Ordinary" risks	The vast majority of structure: most commercial and industrial buildings, small hotels and apartment buildings, and single family residences.	1. Failure only affects owners/occupants of a structure rather than a substantial population. 2. No significant potential for loss of life or serious physical injury. 3. Risk level is similar or comparable to other ordinary risks (including seismic risks) to citizens in a similar setting. 4. No collapse of structures; structural damage limited to repairable damage in most cases. This degree of damage is unlikely as a result of storms with a repeat time of 50 years or less.
Moderate risks	Fences, driveways, non-habitable structures, detached retaining walls, sanitary landfills, recreation areas and open space.	1. Structure is not occupied or occupied infrequently. 2. Low probability of physical injury. 3. Moderate probability of collapse.

[6] Non-seismic geologic hazards include flooding, landslides, erosion, wave runup and sinkhole collapse

EXPLANATION

Hf: Fill (Holocene): Fill deposits consisting of unconsolidated to semiconsolidated sand silt, clay, and trace gravel

Qyls: Landslide (Holocene): Recent landslide depostits, mostly occuring in the steeper slopes of the Tierra Redonda Formation (Tt)

Qydf: Debris flow (Holocene): Recent debris flow deposits, mostly occuring in the Tierra Redanda Formation (Tt)

Qodf: Debris flow (Holocene): Older debris flow deposits, mostly occuring in the Tierra Rodonda Formation (Tt)

Qal $_1$: Alluvium (Holocene): Unconsolidated sand, silt, gravels, and cobbles

Qal $_2$: Alluvium (Holocene): Unconsolidated sand, silt, and trace gravel

Qols: Landslide (Pleistocene): Older landslide deposits consisting of unconsolidated to semiconsolidated boulders and cobbles supported by a sand and clay matrix

Qoa: Alluvium (Pleistocene): Older alluvial deposits consisting of unconsolidated to semiconsolidated cobbles and boulders

Tt: Tierra Redonda Formation (Miocene): Marine sandstone, conglomerate, and some mudstone

Kgd: Granitic Basement Rock (Cretaceous): Hornblende granodiorite with phenocrysts of feldspar

ms: Sierra De Salinas Schist (Paleozoic ?): Biotite quartzofeldspathic schist

Contact: dashed were approximate, querried were unknown

U / D **Fault:** dashed where approximate, dotted where concealed
U= upthrown side
D= downthrown side

Water well

Strike and dip

B-29 **Boring Location**

Cut ▽ and Fill ▼ Slope

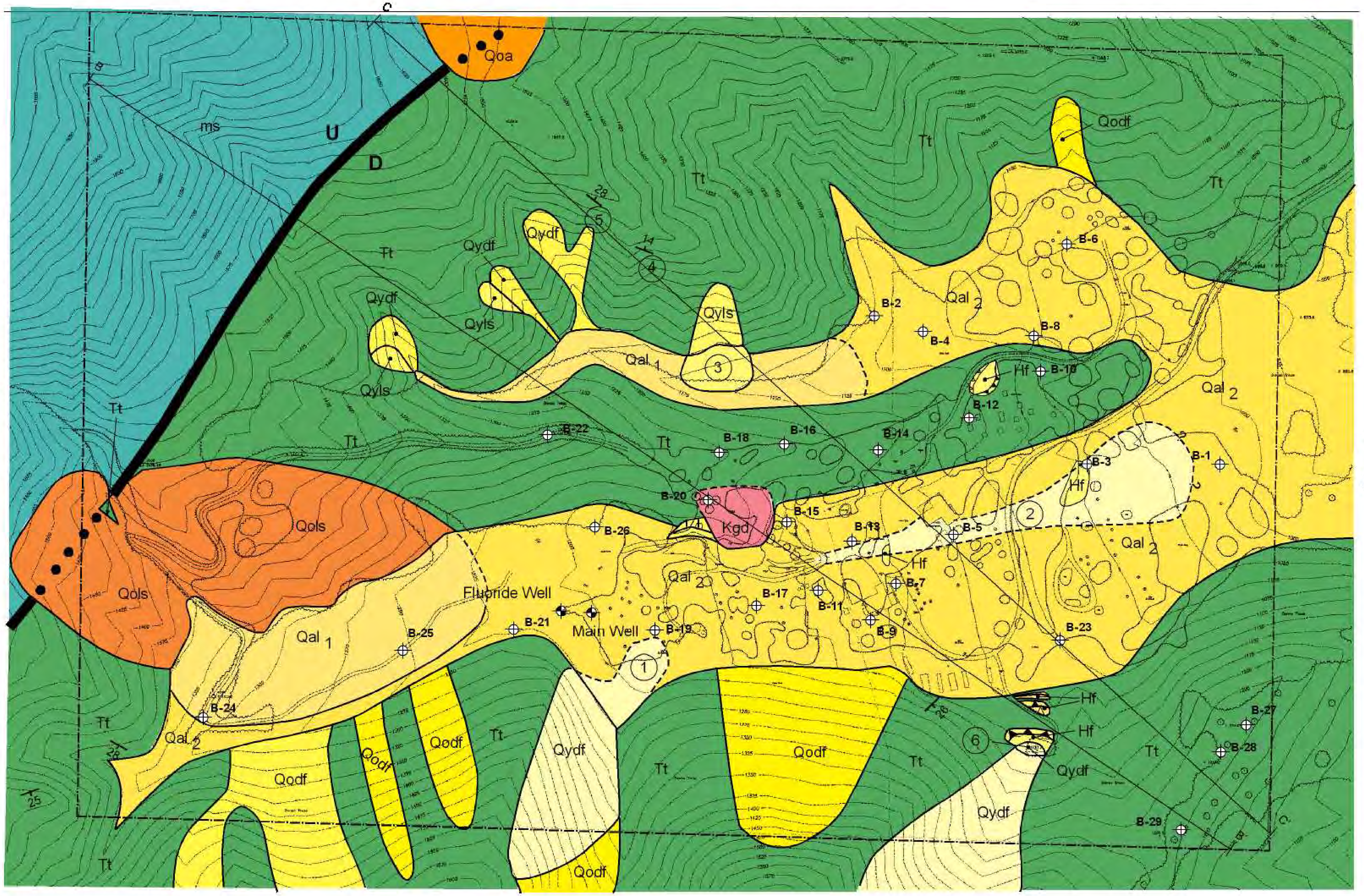
Notes:
1: Debris flow deposit of March 1995 event
2: Flooding of March 1995 event
3: Recent landslide deposit
4: Location of slickenside surface trending N85W 66S, S80W 14
5: Location of slickenside surface trending N79W 40S, W10
6: Debris flow of March 1995 event

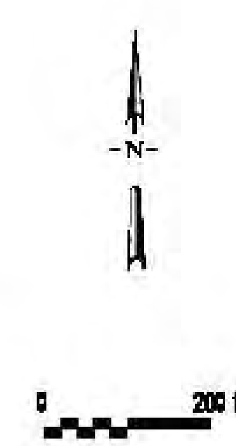
Qal 1	Qydf	Qyls	Hf	Holocene	Quaternary
Qal 2	Qodf				
Qoa		Qols		Pleistocene	

Tt — Miocene — Tertiary

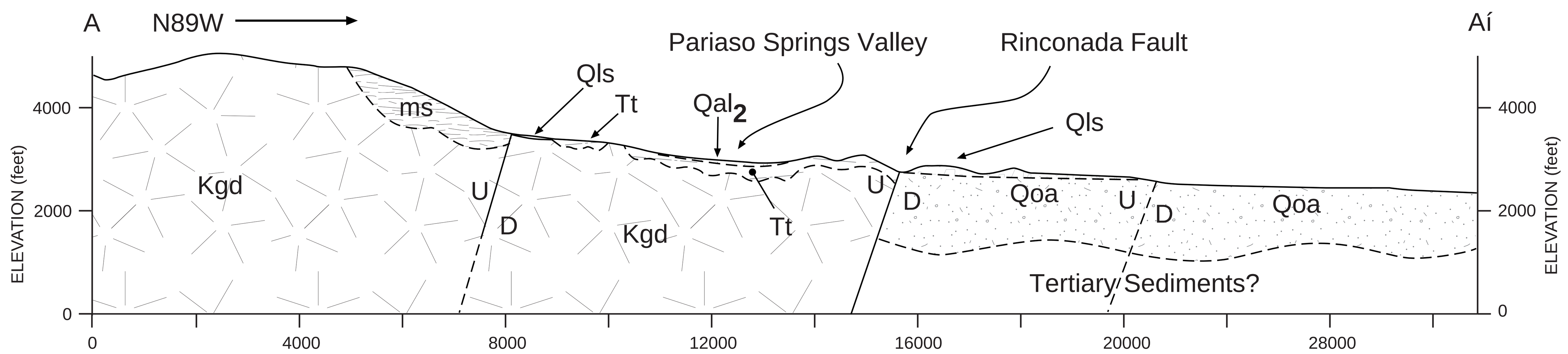
Kgd — Cretaceous — Mesozoic

Ms — Paleozoic ?

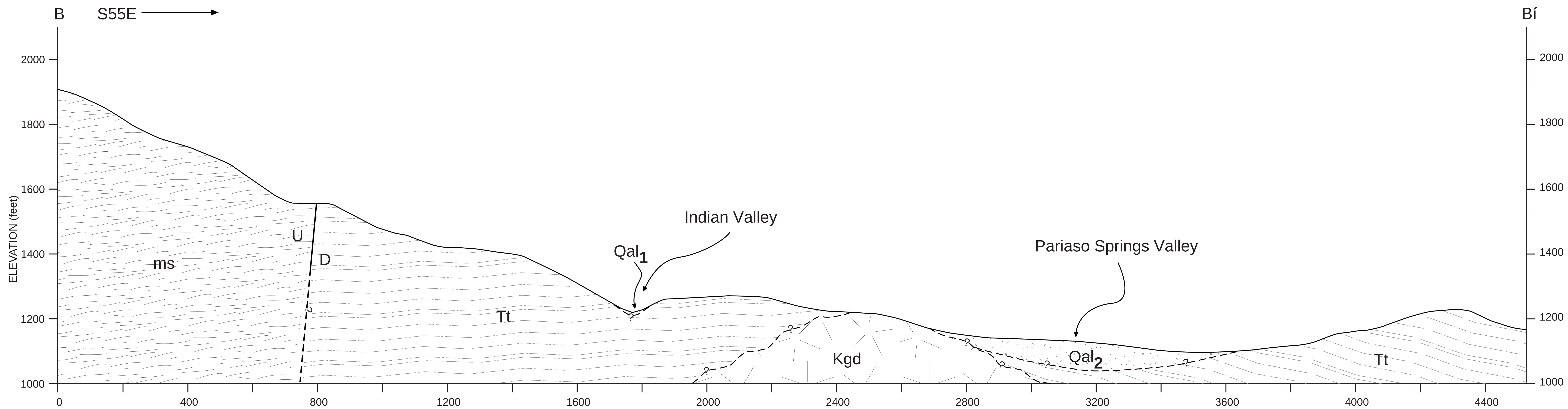




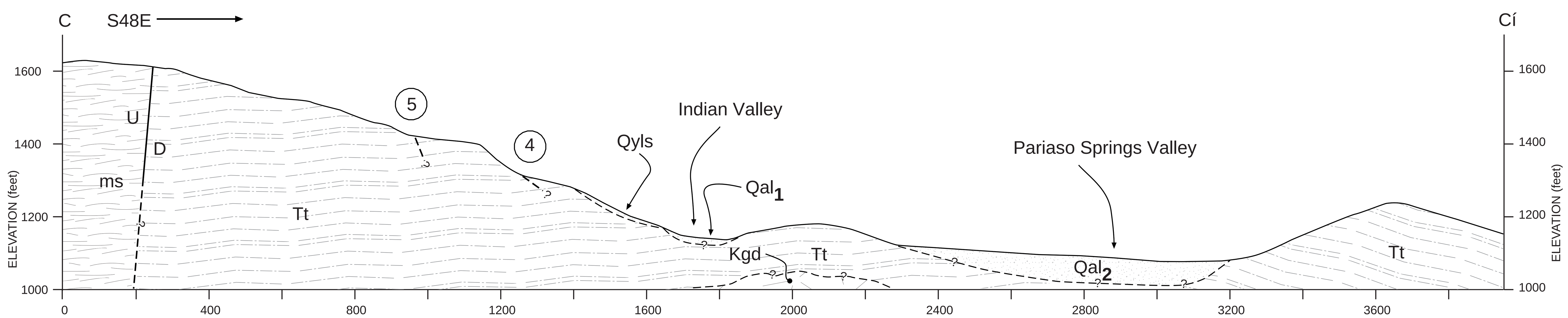
LANDSET ENGINEERS, INC. ENGINEERING · LANDPLANNING SURVEYING · ENVIRONMENTAL CONSULTING 520-B Crazy Horse Canyon Road, Salinas, CA 93907	**SITE GEOLOGIC MAP** Paraiso Hot Springs Resort Paraiso Springs Road Soledad/Greenfield Area, Monterey County, CA	SHEET 1 PROJECT LSW-0337-01



Scale: 1:24,000 (See Figure 3)



Scale: 1:2,400 (See Sheet 1)



Scale: 1:2,400 (See Sheet 1)

EXPLANATION

Qyls: **Landslide (Holocene):** Recent landslide depostits, mostly occuring in the steeper slopes of the Tierra Redonda Formation (Tt)

Qal $_1$: Alluvium (Holocene): Unconsolidated sand, silt, gravels, and cobbles

Qal $_2$: Alluvium (Holocene): Unconsolidated sand, silt, and trace gravel

Qols: Landslide (Pleistocene): Older landslide deposits consisting of unconsolidated to semiconsolidated boulders and cobbles supported by a sand and clay matrix

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Geologic Contact: dashed were approximate, querried were unknown

U / D
Fault: dashed where approximate, dotted where concealed querried where unknown
U= upthrown side
D= downthrown side

C Cí
Geologic Cross Section

(5) **Note**: Refers to location noted on Sheet 1

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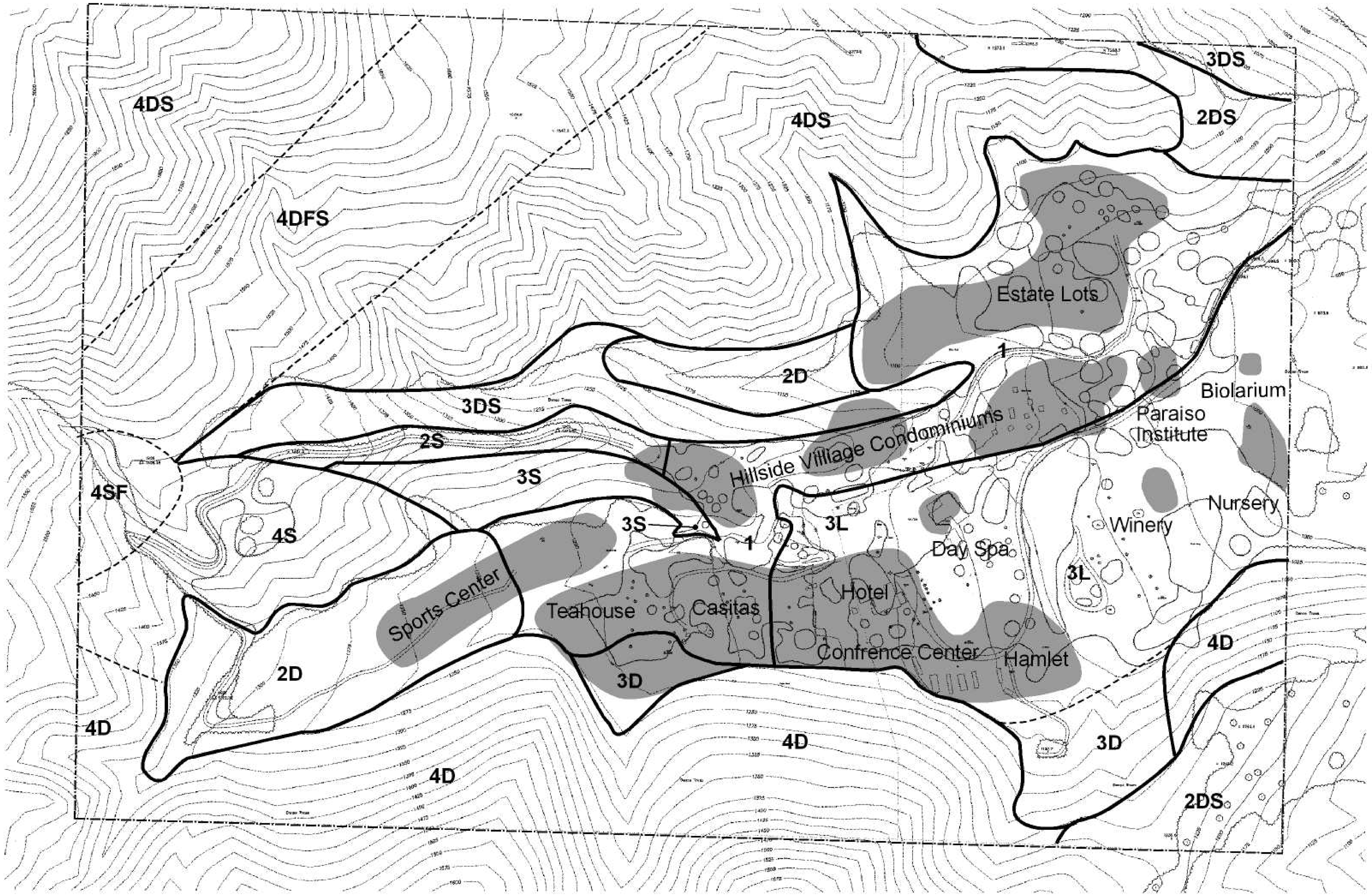
GEOLOGIC CROSS SECTIONS
Paraiso Hot Springs Resort
Paraiso Springs Road
Soledad/Greenfield Area, Monterey County, CA

SHEET
2

PROJECT
LSW-0337-01



EXPLANATION

Hazard Areas:

- Area 1: Low geologic hazard potential
- Area 2: Minor geologic hazard potential
- Area 3: Moderate geologic hazard potential
- Area 4: High geologic hazard potential

Hazard Descriptors:

- F: Faulting
- L: Liquefaction
- D: Debris flow
- S: Landslide

Proposed Developmet Areas

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RELATIVE GEOLOGIC HAZARDS MAP

Paraiso Hot Springs Resort

Paraiso Springs Road

Soledad/Greenfield Area, Monterey County, CA

SHEET 3

PROJECT LSW-0337-01