ENGINEERING GEOLOGY REVIEW
INTERLAKE ROAD, APNS: 080-034-027 AND -028
LAKE NACIMIENTO - LAKE SAN ANTONIO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PROJECT SL08247-1

Prepared for

Brian Holland
4179 Oak Place Drive
Westlake Village, California 91362

Prepared by

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May 20, 2013

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May 20, 2013
Project No. SL08247-1

Brian Holland
4179 Oak Place Drive
Westlake Village, California 91362

RE: Engineering Geology Review
Lots on Interlake Road, APN: 080-034-027 and -028
Lake Nacimiento Area, San Luis Obispo County, California

Dear Mr. Holland,

This Engineering Geology Review has been prepared for APNs: 080-034-027 and -028, two lots along Interlake Road, in the Lake Nacimiento - Lake San Antonio area of San Luis Obispo County, California. This report includes a discussion of geological hazardsand provides general recommendations.

Generally, Monterey and Vaqueros Formation units are located throughout the site. Both parcels have landslides and further investigation is recommended on parcel -028 to determine landslide potential to affect proposed development. The Bee Rock fault is mapped traversing through the project. Conclusions and Recommendations are included in the report. .

GeoSolutions, Inc. appreciates the opportunity to provide technical services to you. Should you have any questions regarding this report, please call at (805) 5438539.

Sincerely,
GeoSolutions, Inc.

John Kammer, C.E.G. #2118
Principal

JOHN M.D. KAMMER NO. 2118 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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LAKE NACIMIENTO AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA
PROJECT SL08247-1

1.0 INTRODUCTION

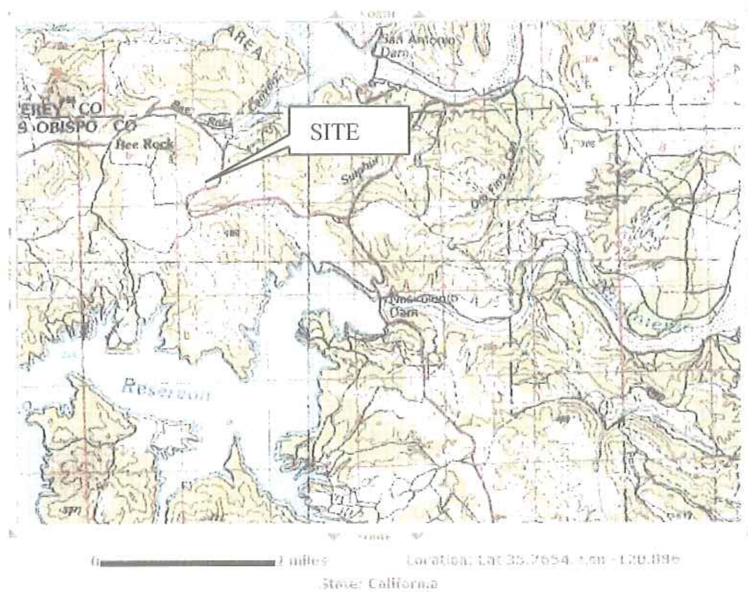

Figure 1: Area Location Map

As requested, GeoSolutions, Inc. completed an Engineering Geology Review for two proposed structures to be located at APNs: 080-034-027 and 028, in the Lake Nacimiento area of San Luis Obispo County, California. Figure 1 is an Area Location Map. Plate 1A is a Site Engineering Geologic Map that depicts local geologic conditions at the property and Plates 1B and 1C are geologic maps with cross sections that present interpretive sections through the proposed structure locations. Plates 2A, 3A, 4A, 5, and 6A Regional Geologic Maps (Burch and Durham, 1970, Dibblee, 2006 Durham, 1974, Dibblee, 1976, and Durham, 1968), depict geologic conditions in the vicinity of the property. Plates 2B, 3B, 4B, and 6B present Geologic Explanations. Plate 7A, Regional Fault Map (Jennings, 1994), depicts fault locations in the vicinity of the site. Plates 7B and 7C present the Fault explanations. Plate 8A, Historical Seismicity Map and Plate 8B, Historical Seismicity List depict significant historical earthquakes in the region. Plate 9 depicts an aerial photograph in the vicinity of the Site (Google). Plate 10, Landslide Hazards Map (San Luis Obispo County Department of Planning and Building, 1999) depicts the County of San Luis Obispo landslide hazard potential in the vicinity of the Site. The signing Engineering Geologist of GeoSolutions, Inc. conducted geological reconnaissance mapping and subsurface investigation on March 11, 2013. This report discusses geologic conditions observed at the Site and provides general engineering geologic recommendations. This report was prepared in partial accordance with San Luis Obispo County Department of Planning and Building Land Use Ordinance Section 23.07.084 and Guidelines for Engineering Geology Reports, dated December 2004. This report is in partial accordance due to the recommended additional subsurface investigation for the eastern parcel and the completion of review of plans for the proposed structures and septic fields.

2.0 CONCLUSIONS

The following conclusions are made:

2.1 Geologic Conditions

Formational units of the Monterey Formation and Vaqueros Sandstone (Plates 1A, 2A, 3A, 4A, 5, and 6A) are mapped at the site. Vaqueros Sandstone was encountered in boring B-1 and B-5 at the eastern property (borings completed by MidCoast Geotechnical, Inc.). Monterey Formation was encountered in Borings B-2, B-3, and B-4 on the western parcel. Surface materials at the property consist of dark brown silty sand termed colluvium. Underlying the colluvium are formational units. Landslide deposits are mapped at the two properties. A total of five exploratory borings were completed at the property. Based upon observations made during the field investigation, it was concluded that excavation can utilize conventional grading equipment although localized hard rock conditions may be encountered. The property is currently undeveloped and vegetated with native grass, brush, and trees.

2.2 Landslides and Liquefaction

The San Luis Obispo County Safety Element maps the subject areas as no landslide data (Plate 10). Burch and Durham, 1970, Dibblee, 1971, Durham, 1974 and Dibblee, 1976 do not map landslides extending throughout or in the immediate vicinity of the site. Plate 9 presents an aerial photograph (Google). Multiple landslides were observed during geologic mapping of the property. Landslides are recommended to be investigated.

2.3 Seismic

The potential for ground rupture at the Site during ground shaking from a fault passing through the site is considered moderate to high since the Bee Rock fault passes through the easterly parcel although this fault is not considered active and no active fault crosses the property. The closest known Holocene age active fault is the Hosgri/San Simeon fault located approximately 17 miles west of the Site (Jennings, 1994). The Site Class for the proposed structure is C. The Seismic Design Category for the proposed structure is D. The subject site is not located within an Earthquake Fault Zone. Dibblee, 2006 depicts a splay of the Rinconada fault as approximately 2 miles east of the site.

2.4 Seismically Induced Hazards

The potential for a tsunami to affect the Site is low due to the distance to the Pacific Ocean. As the property is located substantially above high water level of San Antonio Lake, the potential for a seiche to affect the proposed development is low. The potential for seismically induced settlement is recommended to be classified by the project soils engineer but as formational units are within the subsurface and due to densities within the subsurface, the potential for settlement is assumed to be low. Seismic activity has a high potential to activate landslides at the site.

2.5 Groundwater and Drainage

No evidence of groundwater was encountered during the sub-surface investigation to a depth of 20 feet below land surface. Natural surface drainage is directed north. No springs or seeps were observed in the vicinity of the property. It is recommended that proposed design of the site drainage improvements be completed by a civil engineer knowledgeable in surface drainage control.

2.6 Asbestos

As the property is within units of the Monterey Formation and Vaqueros Sandstone, with no source rocks containing asbestos bearing minerals, no asbestos containing materials are anticipated.

3.0 RECOMMENDATIONS

The following are recommended for implementation at the Site.

1. Since no final development plans were prepared for the structures or reviewed for this project, it is recommended that this information be presented to the project engineering geologist for review when available. A determination at that time can be made if the proposed structures are geologically suitable.

2. As the Bee Rock Fault is mapped as trending through the property, additional subsurface investigation is recommended on the eastern parcel. Subsurface investigation would include pits to locate the fault.

3. Subsurface investigation is recommended to investigate depth and extent of landslides at the eastern parcel (parcel 028).

4. Although the Bee Rock fault is not an active fault, it is recommended no habitable structure be placed over the fault. Development setbacks can be applied when additional subsurface information can be obtained.

5. Septic systems are not recommended within or near landslides. Location of septic leach lines are recommended to be established on a map and the location to be reviewed by the Engineering Geologist.

6. Radon gas may be present within Monterey shale units at the property. Mitigation of Radon gas may be accomplished by ventilation in the subfloor area under the structure (Churchill, 1997). A passive system (no fan) can be incorporated into design of the subfloor. If a slab is utilized, some ventilation of the bottom story of the structure is recommended. Radon testing may indicate if an active system is required at a later date following construction. A consultant experienced in radon gas testing and mitigation is recommended to be consulted prior to construction to determine if radon gas is even present in site soils.

7. It is recommended that the soils engineer and engineering geologist review the project plans prior to construction (plan review).

8. It is recommended that the engineering geologist and soils engineer observe foundation excavations during construction.

9. The potential for seismically induced settlement and the potential for subsidence at the project.is recommended to be classified by the project soils engineer.

10. It is recommended that numerical slope stability analyses be conducted on soil or rock slopes constructed steeper than 2-to-1 (horizontal to vertical). Due to the presence of competent formational units in the subsurface, un-retained cut slopes exposing formational material, may be considered for slopes up to 1.5-to-1 (horizontal to vertical) under the supervision of the Engineering Geologist or Soil Engineer after determining rock quality and performing a stability analysis at that particular location. Locally steeper slopes may be allowed depending on further study and the results of a slope stability analysis. Stability of colluvial deposits along cut slopes is recommended to be determined by the Soils Engineer.

11. Seepage is anticipated along the interface of the surface colluvial materials and the underlying formational units. Isolated seepage within formational units should also be anticipated. Surface drainage facilities (graded swales, gutters, positive grades, etc) are recommended at the base of cut slopes that allow surfacing water to be transferred away from the base of the slope. The project designer is recommended to offer specific design criteria for mitigation of water drainage behind walls and other areas of the site. This is especially imperative upslope of retaining walls for residences. Material such as Akwadrain or Ameridrain or equivalent should to be installed on the wall per manufacturer's specifications. A contractor experienced in this type of installation should be consulted for this work. Drainage from the subsurface should not be connected into conduit from surface drains and should not connect to downspout drainage pipes.

12. The Soils Engineer is recommended to comment on the potential for corrosive soils at the project Site.

13. It is recommended that the Engineering Geologist review the site-grading plan prior to construction for conformance with the intent of the recommendations of this report.

14. It is recommended that the foundations for the proposed residence be in conformance with California Building Code guidelines (1806.5.3, 1806.5.6, and Figure 18-I-1). Face of the foundation setback distance should be a minimum of H/3 (measured horizontally) from the face of the slope where H is the height of slope. This setback distance need not exceed 40 feet. The Soils Engineer can provide recommendations that supersede this recommendation.

15. Surface drainage should be controlled to prevent concentrated water-flow discharge onto either natural or constructed slopes. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks or natural or man-made slopes. For soil areas we recommend that a minimum of two (2) percent gradient be maintained.

16. Excavation, fill, and construction activities should be in accordance with appropriate codes and ordinances of the County of San Luis Obispo. In addition, unusual subsurface conditions encountered during grading such as springs or fill material should be brought to the attention of the Engineering Geologist and Soils Engineer.

17. Rock rip-rap is recommended for concentrated drainage outfall locations that do not discharge onto paved or exposed rock surfaces. It is recommended that geotextile fabric (Enkamat 7010 or similar) be placed underneath the rip-rap and installed per the manufacturer's recommendations.

18. Gutters are recommended to be installed along all sloped rooflines. Gutter downspouts should not allow concentrated drainage to discharge near the residence foundations but rather should convey the water in solid piping away from the residence and toward drainage facilities. Roof and surface drainage facilities are recommended to be in separate conduit from subsurface drains.

19. Recommendations within the Soils Engineering Report are recommended to be incorporated into design.

4.0 SITE DESCRIPTION

The property is composed of two parcels approximately 10 acres each in size with frontage along Interlake Road. Parcel 027 is approximately rectangular and Parcel 028 is curved on the south and east side along Interlake Road. The site is sparsely vegetated with grasses, brush, and trees. A drainage is along the center between the two parcels. The area maintains large acre properties with single family homes. Site coordinates are approximately 35.781574 latitude and -120.918735 longitude. Elevation is approximately 1,105 feet above sea level. The signing Certified Engineering Geologist conducted a site investigation on March 11, 2013.

Two structures, one on each parcel, are proposed. Estimated cut is 33,600 cubic yards and estimated fill is 26,700 cubic yards for parcel 027. Estimated cut is 660 cubic yards and estimated fill is 560 cubic yards for parcel 028. Locations of the structures are approximate at this time.

5.0 PURPOSE AND SCOPE

The purpose of this study was to evaluate engineering geologic hazards at the Site and to develop conclusions and recommendations regarding site development. The scope of this investigation consisted of:

1. A review of available published and unpublished geologic data, geotechnical publications, maps, reports and an aerial photograph pertinent to the project Site.
2. A field study consisting of site reconnaissance to verify soil and geologic conditions.
3. Observation of subsurface drilling with MidCoast Geotechnical for subsurface investigation information.
4. A review of regional faulting and seismicity hazards.
5. A review of landslide potential, surface water and groundwater conditions, and liquefaction hazards.
6. Development of general recommendations for site preparation.
7. Preparation of this report that summarizes our findings, conclusions, and recommendations regarding engineering geology aspects of the project.

6.0 PRELIMINARY ENGINEERING GEOLOGY INVESTIGATION

6.1 Regional Geology

The site is located in the vicinity of the San Luis Range of the Coast Range Geomorphic Province of California. The Coast Ranges lie between the Pacific Ocean and the Sacramento-San Joaquin Valley and trend northwesterly along the California Coast for approximately 600 miles between Santa Maria and the Oregon border.

The Site lies within a geologic terrain unit known as the Salinian block (Burch and Durham, 1970). The block is characterized by a basement of Cretaceous age (145 to 65 million years before present) Granitic rock. The block is bounded by the San Andreas Fault located approximately 25 miles to the east and the Nacimiento Fault approximately 7 miles to the southwest.

6.2 Local Geology

Locally, the site is located within Monterey Formation shale (Tm) and Vaqueros Formation sandstone (Tvq). Plates 2A, 3A, 4A, 5, and 6A are Regional Geologic Maps of the general vicinity of the Site and Plates 2B, 3B, 4B and 6B provide descriptions of these Regional Geologic Maps (Burch and Durham, 1970, Dibblee, 2006, Durham, 1974, Dibblee, 1976, and Durham 1968). Burch and Durham, 1970 mapped the specific site as within Upper Cretaceous and Paleocene age (99-54.8 million years before present {mybp}) Paleocene and Upper Cretaceous Deposits and Miocene age (23 million years before present) Monterey Shale. Dibblee, 2006 mapped the site as within Vaqueros Formation and Monterey Formation. Durham, 1974 mapped the specific site as within Cretaceous and Paleocene age (144-54.8 million years before present {mybp}) Unnamed Formation and Miocene Monterey Formation. Dibblee, 1976 mapped the specific site as within Vaqueros Formation and Monterey Formation. Durham, 1968 mapped the site as within Monterey Shale and Unnamed Formation. The subsurface drilling exploration of the area encountered sandstone on Parcel 028 that is interpreted to be the Vaqueros Formation (Tvq) and on Parcel 027 that is interpreted to be

Monterey Formation. Information derived from the preliminary subsurface exploration was used to classify subsurface soil and formational units and to supplement geologic mapping. Plate 1A depicts the approximate location of borings.

6.2.1 Surficial Units

Within Boring B-1 on Parcel 028, brown clay was observed as surficial deposits along slopes of the development site and within the boring, which is interpreted as colluvium (Qc). Boring log B-1 exposed approximately 9 feet of surficial colluvium. Beneath the colluvium, Vaqueros sandstone is interpreted from 9 to 11 feet (total depth drilled). Boring B-5, drilled on parcel 028, encountered dark brown to brown sandy clay (interpreted as colluvium) from ground surface to approximately 5 feet bgs. Plate 1A and 1B depict this material as colluvium.

On Parcel 027, borings B-2, B-3, and B-4 were drilled. Boring B-2 encountered dark brown clay (interpreted as colluvium) from ground surface to approximately 2 feet below ground surface (bgs). Boring B-3 encountered dark brown clay from ground surface to 2 feet bgs interpreted as colluvium. Boring B-4 encountered dark brown clay (interpreted as colluvium) from ground surface to approximately 16 feet bgs.

6.2.2 Formational Units

Plates 1A, 1B, and 1C Site Engineering Geology Maps, depict the property as within Vaqueros and Monterey Formation u0nits. A cross section is also depicted on Plates 1B and 1C through the property with assumed depths of units.

The Monterey Formation at the site is described by Dibblee, 2006 as claystone, gray, soft, weathered to clay soil. Durham, 1968 describes the Monterey Formation as Sandholdt Member, chiefly calcareous shale, includes porcelaneous rocks, chert, dolomitic carbonate rock, and sandstone. Thickness of this unit is uncertain.

The Vaqueros is a fine to coarse grained sandstone that is conglomeratic in some places. Sand grains are mainly feldspar and quartz. Coarser grains are subangular or subrounded. Pebbles in conglomeratic beds are well rounded and maily granitic and porphyry. The rock is generally calcareous and ranges from well cemented to friable and hackly fractured. Color is usually grayish orange or yellowish gray. Fossils are common throughout. Mudstone in units as thick as several feet is interbedded with sandstone in some places. The thickness is approximately 1,300 feet (Durham, 1968).

Five borings were completed at the two properties. Boring B-1 encountered colluvium (Qc) to a depth of approximately 9 feet bgs underlain by Vaqueros Formation to a termination depth of 11 feet bgs. Boring B-2 encountered colluvium (Qc) to a depth of approximately 2 feet bgs underlain by extremely weathered Monterey Formation to a termination depth of 18 feet bgs. Boring B-3 encountered colluvium (Qc) to a depth of 2 feet bgs underlain by Monterey Formation which was siliceous shale, hard, with fine laminations to a termination depth of 8 feet bgs. Boring B-4 encountered colluvium (Qc) to a depth of approximately 16 feet bgs underlain by Monterey Formation which was weathered brown shale. Boring B-5 encountered colluvium (Qc) to a depth of approximately 5 feet bgs underlain by Vaqueros Formation to a termination depth of 15 feet bgs. Boring logs are presented in Appendix A.

Our mapping of the site did not encounter outcrop of formational material so no structural attitudes or fractures could be measured. Dibblee, 2006 shows structural attitudes within the

Vaqueros Formation in the general area to vary from striking north/south and east/west with dips from 12 degrees north to 5 degrees east.

6.3 Surface and Groundwater Conditions

Surface drainage at the property is to the north. Rill and gully erosion was evident especially within the main drainage at the central portion of the site and within landslides. Groundwater was not encountered in borings at the site. No springs or seeps were observed in the vicinity of the property. The flood potential appears low for the property.

7.0 LANDSLIDES

The San Luis Obispo County Safety Element maps the subject areas as no landslide data (Plate 10). Burch and Durham, 1970, Dibblee, 2006, Durham, 1974 and Dibblee, 1976 do not map landslides extending throughout or in the immediate vicinity of the site. Plate 9 presents the aerial photograph (Google). Landslides were mapped at the property and were observed in the aerial photograph. Plate 1A depicts the location of the landslides. Depth or character of the landslides is recommended to be investigated prior to development.

8.0 ON-SITE SEPTIC SYSTEMS

Septic systems for each parcel are proposed although the location for a septic field is not established on parcel 028. The septic lines proposed at parcel 027 are likely too close to landslide deposits. It is recommended that percolation testing be completed for the project and that septic fields not be established in the vicinity of landslides.

9.0 HYDROCOLLAPSE OF ALLUVIAL FAN SOILS

The potential for hydrocollapse of soils is low due to absence of fanglomerate and alluvial soils that typically cause such conditions. The depth to formational units and the competent nature of the underlying formation units further serve to reduce this potential.

10.0 REGIONAL FAULTING AND SEISMICITY

Similar to the surrounding areas, the Site may be affected by moderate to major earthquakes centered on one of the known large, Holocene age active faults listed in Table 1 below. Moment magnitudes are expressed, although any significant event on these faults could result in moderate to severe ground shaking at the subject site. The potential for ground failure of any portion of the Site during ground shaking is considered moderate to high due to the Bee Rock fault crossing Parcel 028. Mitigation in the form of setback is recommended following a recommended subsurface fault investigation.

Table 1: Active Faults Near the Subject Property

Closest Holocene Age Active Faults to Site	Approximate Distance (miles)	Approximate Distance (kilometers)	Moment Magnitude (Mw)
Hosgri/San Simeon Fault	17	27.4	7.5
Los Osos Fault	35	43.4	7.0
San Andreas Fault	25	39.4	8.0

The closest known active Quaternary age fault is the Hosgri/San Simeon fault located approximately 17 miles west of the Site. However, the closest known mapped active portion of a Holocene age fault is the active Hosgri/San Simeon fault that is located approximately 17 miles west of the Site (Jennings, 1994). Plate 7A is a Regional Fault Map for the area. The San Andreas fault is the most likely active fault to produce ground shaking at the Site although it is not expected to generate the highest ground accelerations because of its distance from the Site.

10.0 Ridgetop Shattering

The site is not located along a ridgeline and therefore has an assumed low potential for ridgetop shattering.

10.2 Rinconada Fault Zone – San Marcos segment

The Rinconada fault or a splay of the Rinconada fault (San Marcos segment) has been mapped as trending approximately 2 miles northeast of the Site (Dibblee, 2006). Dibblee, 1976 states that the nearly vertical dipping Rinconada fault in the vicinity of the subject Site is termed the San Marcos segment of the Rinconada Fault. This San Marcos segment extends from Paso Robles to the San Antonio Reservoir for a distance of 23 kilometers (15 miles), and is continuous north-westward into that generally known as the Espinosa fault (Dibblee, 1976, p.23). Movement on San Marcos segment is predominantly right lateral strike-slip with local or apparent relative vertical displacement.

With the exception of the Granitic basement on the northeast side, the San Marcos segment at the surface is mainly within the middle Tertiary sedimentary sequence, with some involvement of the Paso Robles Formation. Deflection of canyons, possibly by right-lateral movement on the San Marcos and Espinosa segments of this fault may have occurred in very late Pleistocene time, because there are no breaks in alluvium. Deformation of overlying sediments suggests this fault segment was active during Miocene time (24 to 5 mybp). The Paso Robles Formation, which is generally much less deformed than the Miocene units, indicates little movement on the San Marcos segment since deposition of the Paso Robles Formation (Dibblee, 1976 p.23-25).

The Rinconada fault along its entire length is considered Quaternary active by the California Division of Mines and Geology (Jennings, 1994). According to Jennings, the San Marcos segment of the Rinconada fault is mapped as showing evidence of displacement during the last 1,600,000 years. No earthquakes attributed to the Rinconada, faults branching from it, or thrust or reverse faults considered related to the Rinconada fault have been recorded during historic time. Hart, 1986 has assigned a long-term slip rate of 3 mm/yr to the Rinconada fault.

A fault evaluation program by the California Division of Mines and Geology (Hart, Bryant, Manson, and Kahle, 1986 p. 17) was conducted to identify active faults that may be hazardous, in terms of surface rupture, to structures built astride such faults. This study concluded that the Rinconada fault exhibits "right-lateral displacement since early Miocene and early Pliocene time." Various strands offset Plio-Pleistocene units where present, but late Pleistocene and Holocene units (are) not offset. (The fault is) locally well defined in bedrock north of Nacimiento River (approximately 0.8 mile north of the Site)... suggesting later Quaternary activity, but lacks geomorphic evidence of Holocene activity. (The) fault is poorly defined south of (the) Nacimiento River."

The San Luis Obispo Safety Element describes the Rinconada Fault as "a linear, near-vertical zone of faults about 189 kilometers long that is located along the western margin of the La Panza Range...Large scale strike-slip movement along the fault zone is indicated by a predominance of right-lateral displaced drainages along various segments of this fault. The Rinconada fault clearly offsets the Paso Robles Formation indicating Pliocene to early Pleistocene activity. Late Pleistocene to Holocene activity is suggested by sag ponds, locally offset and clockwise-rotated drainages, faint aerial photographic lineaments in younger alluvium in the Rinconada drainage area, and possible crudely located, scattered seismic epicenters in the vicinity of the mapped trace of the fault zone" (San Luis Obispo County Department of Planning and Building, 1999).

10.3 Jolon Fault

Durham, 1974 identifies the Jolon fault as part of the Rinconada Fault Zone. The San Luis Obispo Safety Element states "The Rinconada fault is inferred to be part of a zone of including the Jolon, San Marcos, Espinosa, and Reliz faults that extends from Monterey Bay southward to its juncture with the Nacimiento fault (Hart 1976; 1986)" (San Luis Obispo County Department of Planning and Building, 1999). The Jolon fault has been mapped as trending approximately 1.0 mile northeast of the property (Jennings, 1994). The Jolon fault has been mapped as trending approximately 1.5 mile northeast of the property (Jennings, 1994). Durham and Burch, 1970 mapped the Jolon fault approximately 2.5 miles northeast of the site.

Durham, 1968 states that the Jolon fault is northwest-trending and varies from steeply dipping northeast to steeply dipping southwest. The dip direction is interpreted to be from structural deformation in the area. Durham, 1968 also states "strata juxtaposed across the fault suggest right-lateral displacement along the fault of at least 11 miles." Durham and Burch, 1970 describes the Jolon fault as the Jolon Fault Zone, which begins "near Paso Robles, continues northwest through the San Antonio River valley" and "is obscure southeast of Paso Robles, but its trend suggests that it continues southward to join the Rinconada fault zone." In addition, Durham and Burch, 1970 interpret the San Marcos fault is interpreted to be within the Jolon Fault Zone.

10.4 Bee Rock fault

The Bee Rock fault has been mapped through the eastern parcel (Durham, 1968, 1974). The Bee Rock fault displaces Monterey Formation shale and Unnamed Formation, Vaqueros Formation, Tierra Redonda Formation sandstone and shale. It is mapped at a thrust fault on Durham and, as such, is mapped as a thrust fault on the Plate 1A.

Durham, 1974 states "Movement of the Monterey beds relatively to the underlying sandy beds compensated for the difference on style of deformation of the shaley and sandy rocks. The movement was mainly on the Bee Rock fault zone, a system of bedding faults and thrust faults at and near the base of the Monterey." Durham, 1974 also states "The magnitude of displacement on the Bee Rock fault zone varies considerably. At some places, the Monterey and Tierra Redonda Formations are in normal stratigraphic order with little evidence of movement between them; at other places the Monterey has been thrust over much older rocks, and displacement amounts to hundreds or thousands of feet."

Although the Bee Rock fault is not an active fault, it is recommended no habitable structure be placed over the fault. Development setbacks can be applied when additional subsurface information can be obtained.

10.5 Seismic Hazard Analysis

1. According to section 1613 of the 2010 CBC (CBSC, 2010), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *Minimum Design Loads for Buildings and Other Structures* (ASCE7) (ASCE, 2006). ASCE7 considers the most severe earthquake ground motion to be the ground motion caused by the Maximum Considered Earthquake (MCE)

(ASCE, 2006), which is defined in Section 1613 of the 2010 CBC to be short period S_{MS} and 1-second period S_{M1}, spectral response accelerations.

2. The a_{max} of the Site depends on several factors, which include the distance of the Site from known active faults, the expected magnitude of the MCE, and the Site soil profile characteristics.

3. As per section 1613.5.5 of the 2010 CBC (CBSC, 2010), the Site soil profile classification is determined by the average soil properties in the upper 100 feet of the Site profile. Based on the observed subsurface formational characteristics and drilling obtained during the field investigation, the Site was defined as Site Class D, stiff soil profile per Table 1613.5.2 of the 2010 CBC (CBSC, 2010).

4. According to section 11.2 of ASCE7 (ASCE, 2006) and section 1613 of the 2010 CBC (CBSC, 2010), buildings and structures should be specifically proportioned to resist Design Earthquake Ground Motions (Design a_{max}). ASCE7 defines the Design a_{max} as "the earthquake ground motions that are two-thirds of the corresponding MCE ground motions" (ASCE, 2006, p. 109). Therefore, the **Design a_{max} for the Site is equal to S_{D1}=0.479 and S_{DS}=0.811** which are 1-second period and short period design spectral response accelerations that are equal to two-thirds of the a_{max} or MCE for the Site. Recommendations for increasing S_{D1} and S_{DS} are provided in the recommendations section of this report.

5. Site coordinates of 35.781574 degrees north latitude and approximately -120.918735 degrees west longitude.

10.6 Structural Building Design Parameters

1. Structural building design parameters within chapter 16 of the 2010 CBC (CBSC, 2010) and sections 11.4.3 and 11.4.4 of ASCE7 (ASCE, 2006) are dependent upon several factors, which include site soil profile characteristics and the locations and characteristics of faults near the Site. The Site soil profile classification was determined to be Site Class D. This Site soil profile classification and the latitude and longitude coordinates for the Site were used to determine the structural building design parameters.

2. Spectral Response Accelerations and Site Coefficients were obtained from the Seismic Hazard Curves and Uniform Hazard Response Spectra, Earthquake Ground Motion Tool computer application (USGS, 2007); this program is available from the United States Geological Survey website (USGS, 2008). This computer program utilizes the methods developed in the 1997, 2000, and 2003 editions of the NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures and user-inputted Site latitude and longitude coordinates to calculate seismic design parameters and response spectra (both for period and displacement), for Site Classifications A through E. This data is presented in tabular form in Table 2: 2010 California Building Code, Chapter 16, Structural Design Parameters. Analysis of the Design Spectral Response Acceleration Parameters for the Site and of the Occupancy Category for the proposed structure assign to this project a **Seismic Design Category of D** per Tables 1613.5.6(1) and 1613.5.6(2) of the 2010 CBC (CBSC, 2010).

Table 2: 2010 California Building Code, Chapter 16, Structural Design Parameters

Site Class - Soil Profile Type	D – Soft Soil
Mapped Spectral Response Accelerations and Site Coefficients	$S_S = 1.187$, $S_1 = 0.469$ $F_a = 1.025$, $F_v = 1.531$
Adjusted Maximum Considered Earthquake Spectral Response Accelerations	$S_{MS} = 1.217$ $S_{M1} = 0.718$
Design Spectral Response Acceleration Parameters	$S_{DS} = 0.811$ $S_{D1} = 0.479$
Occupancy Category (from Table 1604.5, 2010 CBC)	II
Seismic Design Category – Short Period Accel. (from Table 1613.5.6(1), 2010 CBC)	D

10.7 <u>Design Response Spectra – 2010 CBC</u>

According to section 11.4.5 of ASCE7 (ASCE, 2006), a design response spectrum for a site may be required in order to design structures to resist lateral forces caused by ground motions at the Site. The design spectral response acceleration parameters, listed in Table 2: 2010 California Building Code, Chapter 16, Structural Design Parameters, are used to produce the design response spectrum. The Seismic Hazard Curves and Uniform Hazard Response Spectra computer program (USGS, 2007) was used to construct constructed a design response spectrum for the Site, which is shown in Figure 2: Design Response Spectra – 2010 CBC.

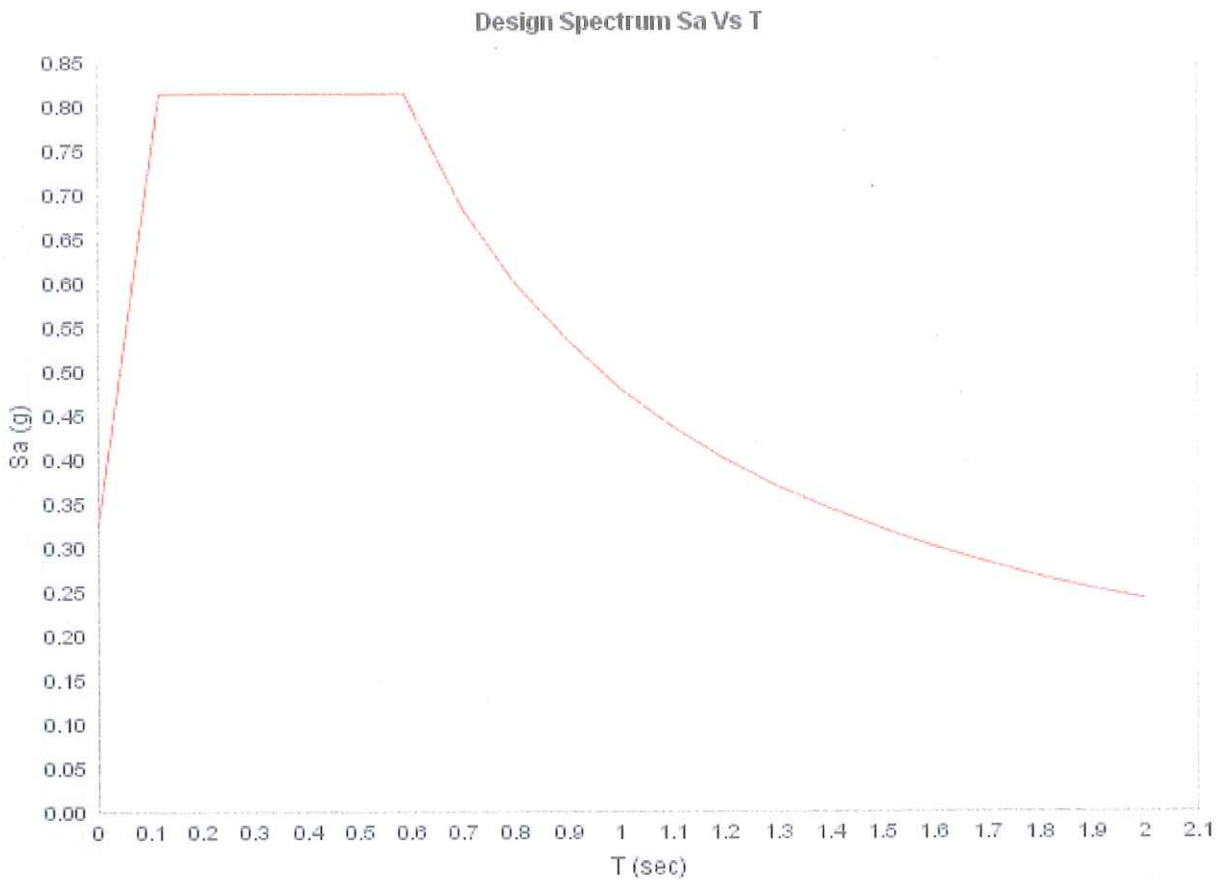

Figure 2: Design Response Spectra – 2010 CBC

For discussion purposes, ground shaking is typically reduced to ground motion components of wave velocity and acceleration. The velocity, acceleration, and predominant period of a site are dependent upon the distance to the causative fault, the magnitude and failure mechanics of the earthquake, and the nature of the formational units, alluvium, and soil through which the energy waves must travel. Generally, energy waves attenuate with distance from the focus of an earthquake.

10.8 Ground Surface Rupture Due to Faulting

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 requires that the California State Geologist establish Earthquake Fault Zones around the surface traces of active faults and to issue appropriate maps. The subject site is not located within an Earthquake Fault Zone (Jennings, 1994).

10.9 Seismically Induced Water Waves and Flooding

Tsunamis and seiches are two types of water waves that are generated by earthquake events. Tsunamis are broad-wavelength ocean waves and seiches are standing waves within confined bodies of water, typically reservoirs. The potential for a tsunami to affect the Site is low due to the distance to the Pacific Ocean. As the subject property is substantially above San Antonio Lake, the seiche potential for the proposed development is low.

10.10 Seismically Induced Settlement and Slope Failure

There is a low potential for seismically induced settlement at the Site based upon the depth to formational units and densities within the subsurface however, it is recommended that the project soils engineer comment on the settlement potential.

As there are existing landslides at both parcels, there is a high potential for slope failure at the project site. It is recommended that additional subsurface investigation be completed to investigate the landslide parameters.

11.0 LIQUEFACTION ANALYSIS

The liquefaction potential at the Site is considered low due to the presence of near-surface formational units, densities within the subsurface, and the presence of clay in the colluvium.

12.0 GEOLOGIC HAZARDS

12.1 Expansive Soils

The expansion potential of the soils is high based upon information from the project soils report..

12.2 Naturally Occurring Asbestos

There is a low potential for natural occurring asbestos to be present at the property due to the absence of Franciscan Complex or other formations with asbestos bearing units.

12.3 Radon and Other Hazardous Gases

The Monterey shale is a radon prone geologic unit and Monterey Formation units are located at the property. Radon gas is a naturally occurring radioactive gas that is invisible and odorless. It forms from the radioactive decay of small amounts of uranium and thorium naturally present in rocks and soils. Radon gas moves readily through rock and soil along micro-fractures and through pre-spaces between mineral grains. Many conditions affect how far radon can move in the subsurface but the ultimate limitation is the relatively short half-lives of radon's different isotopes (Churchill, 1997).

Radon moves from the soil into buildings in various ways. It can move though cracks in slabs or basement walls, pores and cracks in concrete blocks, through-going floor—wall joints, and openings around pipes. Radon moves into buildings from the soil when air pressure inside the buildings is lower that the air pressure outside. Because radon enters buildings from the adjacent soil, radon levels are typically highest in basements and ground floor rooms.

Radon levels in buildings can vary hour by hour, and season by season as a function of weather, climate, closed or opened windows, heating, and air conditioning. A consultant experienced in radon gas testing and mitigation is recommended to be consulted prior to construction to determine if radon gas is even present in site soils. As the structure is to be slab-on-grade construction, subsurface aeration of soils is deemed not practical. It is recommended that the lower floor of the structure be ventilated to reduce the potential for buildup of radon gases within the building.

13.0 SUBSIDENCE

Causes of significant land subsidence in California include compaction and decreased void space as a result of reduced pore pressure due to de-watering or withdrawal of oil and gas; hydro-compaction of dry, loose, clayey soils; and oxidation of organic material and subsequent compaction of remaining soil material. Due to the character of near-surface formational units and the densities within the subsurface soils, there is a low potential for subsidence at the Site. However, the project soils engineer is recommended to comment on the potential for subsidence at the project.

14.0 VOLCANIC ERUPTION

Volcanism in California is typically associated with the Cascade Ranges Geomorphic Province in northern California, and the Basin and Range Province on the eastern side of the Sierra Nevada Mountains. Prevailing westerly winds would most likely reduce the chance of ash fallout in the central California coastal area from volcanic activity on the eastern side of the Sierra Nevada. Other hazards generally related to volcanism are not pertinent to the subject site.

15.0 ADDITIONAL SERVICES

The recommendations contained in this report are based on exploratory borings and on the continuity of the sub-surface conditions encountered. It is assumed that GeoSolutions, Inc. will be retained to perform the following services:

1. Consultation during plan development.
2. Plan review of final grading and drainage documents prior to construction.
3. Additionally, construction observation by the Project Engineering Geologist may be necessary to verify sub-surface conditions during excavation activities.

16.0 LIMITATIONS

1. The recommendations contained in this report are based on Site reconnaissance; review of sub-surface data, and partly on information, and data 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 recommendations.
2. This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information in this report be incorporated into the project plans and recommendations contained herein be brought to the attention of the architect. The owner or his/ her representative is responsible to ensure that the necessary steps are taken to verify that the contractor and subcontractors comply with recommendations in the field.
3. Our recommendations have been made in accordance with the principles and practices generally employed by the engineering professions. This is in lieu of all other warranties, expressed or implied. Reference is made to our Agreement for Professional Services, which contains additional limitations concerning this project.
4. Any person concerned with this project who observes conditions or features of the Site or surrounding area that are different from those described in this report should report them immediately to this office for evaluation as part of an additional scope of work. Should

additional evidence become available in the future that would indicate the need for additional study, this firm should be contacted.

5. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of one (1) year without our review nor should it be used or is it applicable for any properties other than those studied. However many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid in less than 1 year.

END OF TEXT

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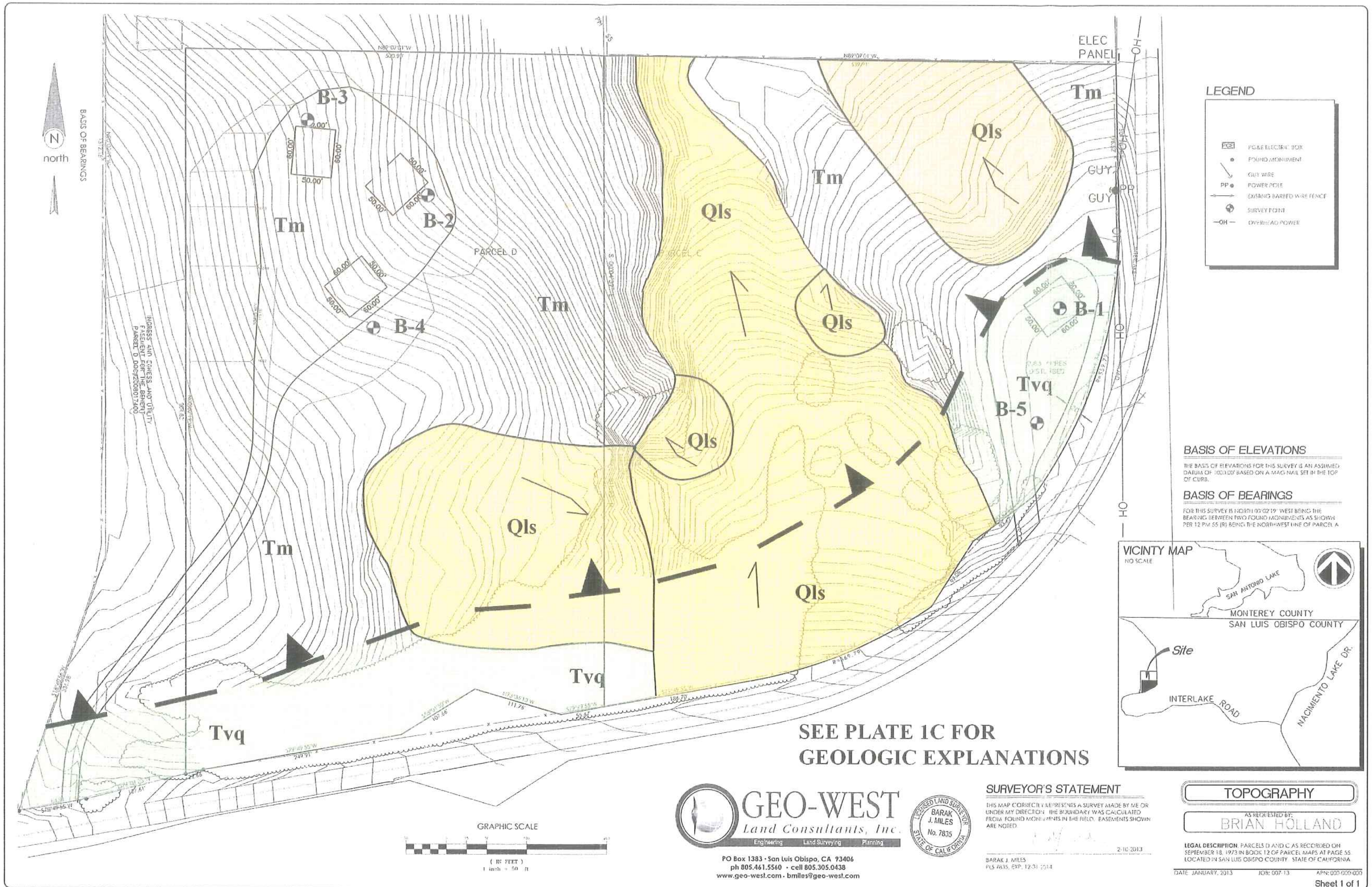
PLATES



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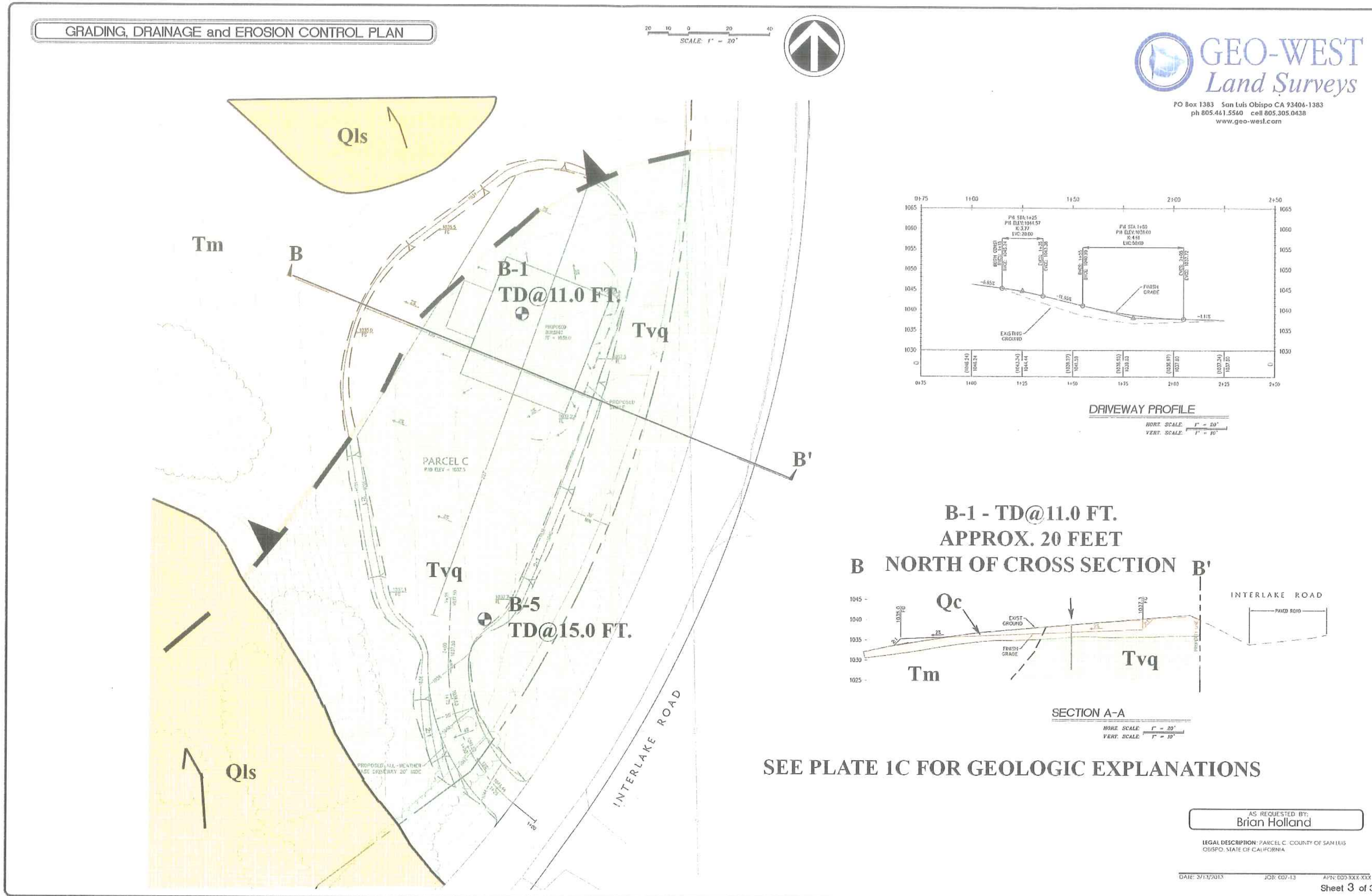
SITE ENGINEERING GEOLOGY MAP

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
1A

PROJECT NO:
SL08247-1



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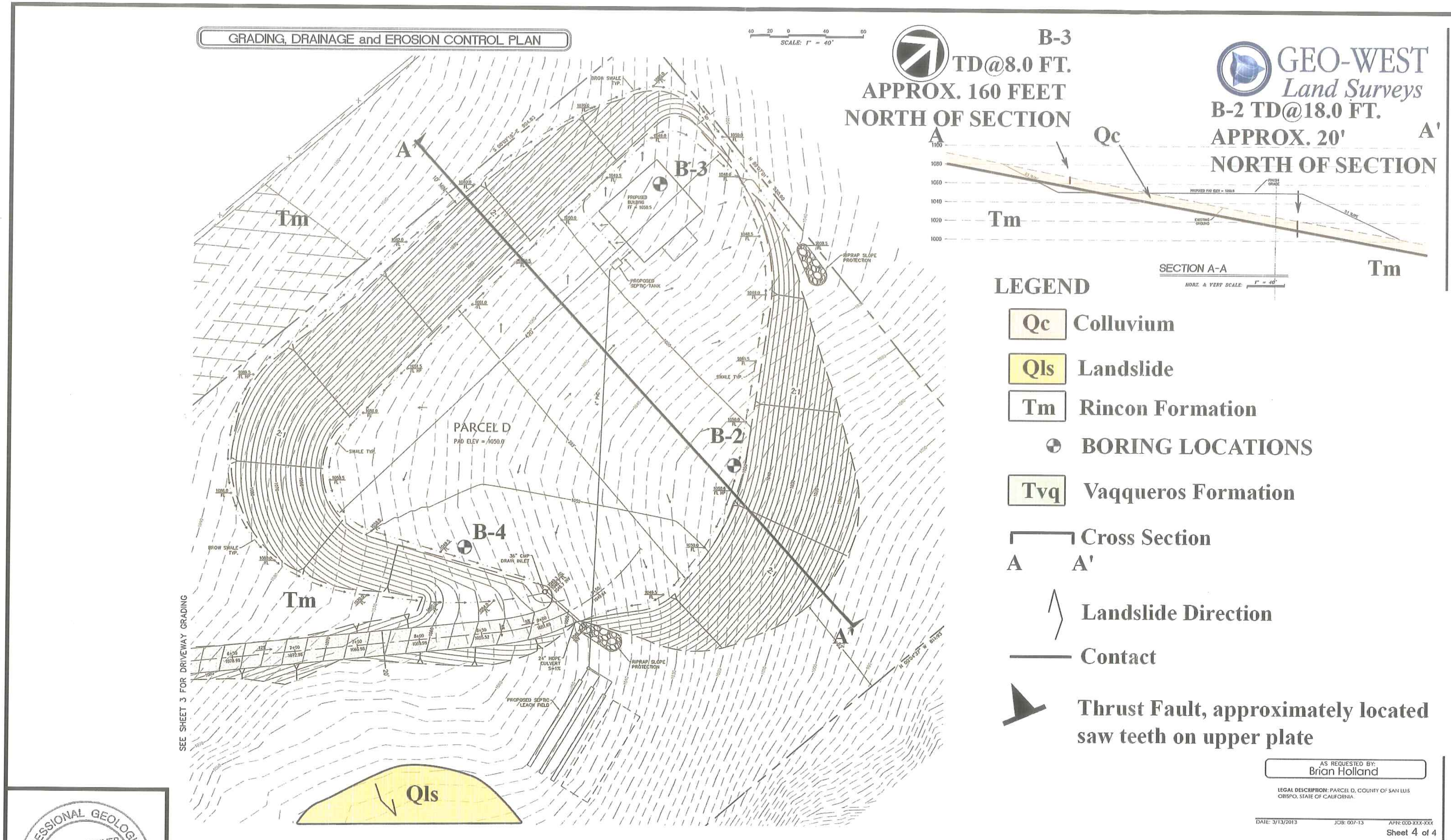
SITE ENGINEERING GEOLOGY MAP PARCEL 028

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
1B

PROJECT NO:
SL08247-1



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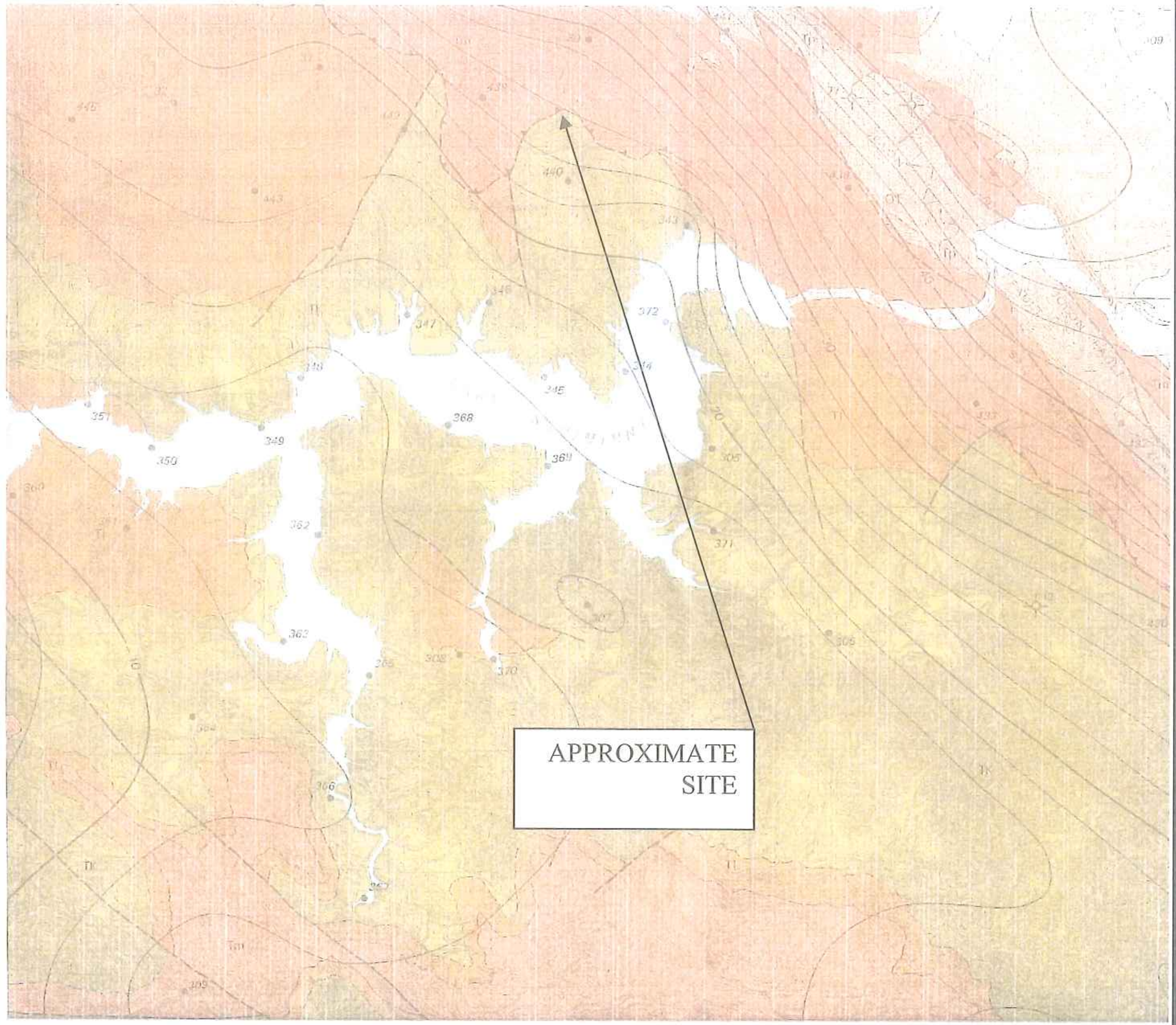
SITE ENGINEERING GEOLOGY MAP PARCEL 027

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
1C

PROJECT NO:
SL08247-1



COMPLETE BOUGUER GRAVITY AND GENERALIZED GEOLOGIC MAP OF BRADLEY SAN MIGUEL, ADELAIDA, AND PASO ROBLES QUADRANGLES, CALIFORNIA

NORTH

MAP BY BURCH AND DURHAM, 1970
SEE PLATE 2B FOR EXPLANATIONS

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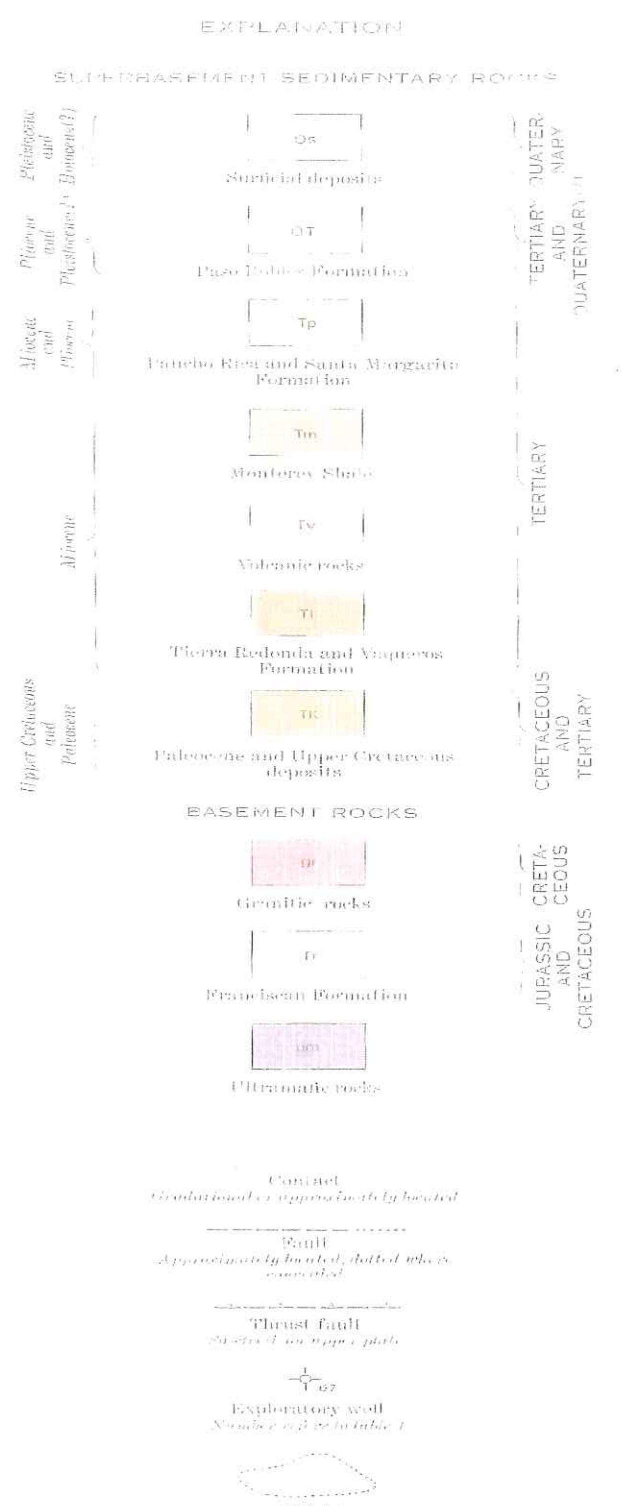
REGIONAL GEOLOGIC MAP

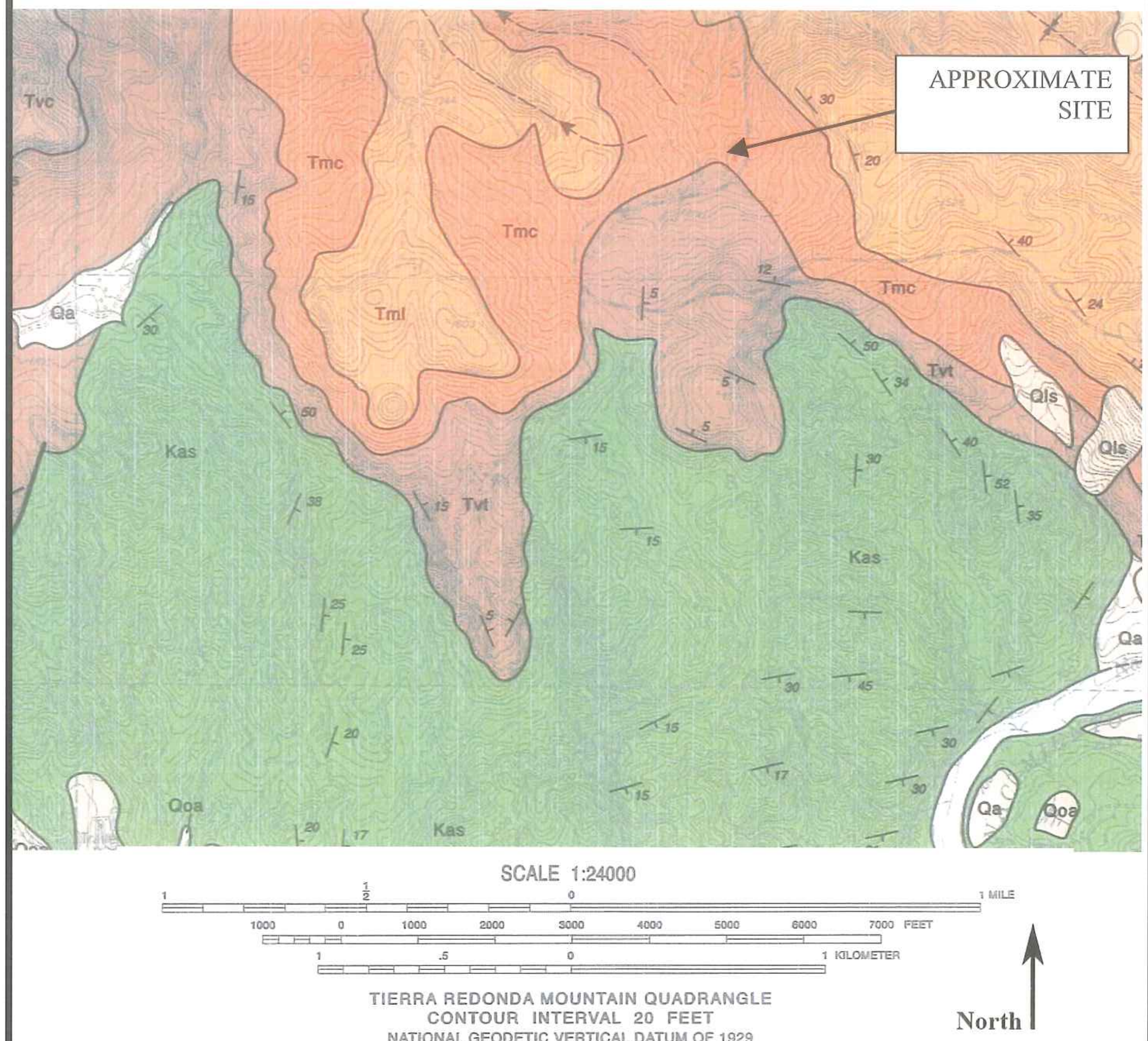
INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
2A

PROJECT NO:
SL08247-1



GeoSolutions, Inc. 220 High Street San Luis Obispo, California 93401 (805) 543-8539 fax: (805) 543-2171	PROFESSIONAL GEOLOGIST NO. 2116 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA	**GEOLOGIC EXPLANATIONS** BURCH AND DURHAM, 1970 INTERLAKE ROAD LAKE NACIMIENTO AREA SAN LUIS OBISPO COUNTY, CALIFORNIA	PLATE 2B PROJECT NO: SL08247-1



SEE PLATE 3B FOR GEOLOGIC EXPLANATIONS

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REGIONAL GEOLOGIC MAP
DIBBLEE, 2006
INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
3A

PROJECT NO:
SL08247-1

TIERRA REDONDA MOUNTAIN MAP (DF-222)

LEGEND

al / Qa / Qg

SURFICIAL SEDIMENTS

al *Artificial fill*
Qg *Alluvial sand and gravel of stream channels*
Qa *Alluvial sand and gravel of valley areas*

Qls

LANDSLIDE RUBBLE

Qoa

OLDER SURFICIAL SEDIMENTS

Qoa *Terraces of dissected alluvial gravel and sand*

— *UNCONFORMITY* —

QTp

PASO ROBLES FORMATION

Valley sediments weakly indurated; age, Pleistocene, possibly latest Pliocene

QTp *Alluvial pebble conglomerate of mostly Monterey Shale detritus in sandy to clayey matrix*

Tss

SANDSTONE OF SAN ARDO

(Pancho Rico Formation of Durham, 1968)
Shallow marine clastic, slightly indurated; age, Pliocene

Tss *Thin shallow marine sandstone, weakly indurated, with few shell fragments at base of QTp in few places*

— *UNCONFORMITY* —

Tpd

PANCHO RICO FORMATION

(Buttle Diatomite member of Monterey Formation of Mandra, 1963), marine biogenic age, late Miocene

Tpd *Diatomite, white, soft, punky, semi laminated, gradational downward into Tm; occurs only NE of Rinconada fault*

Tsm

SANTA MARGARITA FORMATION

Shallow marine biogenic and clastic, moderately lithified; age, upper Miocene

Tsm *Sandstone, white, friable, massive; includes minor calcarous hard sandstone; in places contains large shell fragments, occurs only SW of Rinconada fault*

Tm / Tml / Tmc

MONTEREY FORMATION

(of Fairbanks, 1904)

Tm *Upper part, siliceous shale, brown weathers white, thin, platy, porcelaneous, locally cherty; Mohnian Stage, upper Miocene*
Tml *Lower part (Sandholdt member of Durham, 1968) siliceous to semi-siliceous, shale, brown, weathers cream white, thin bedded, includes soft fissile shale and thin, hard dolomite layers, contains locally abundant foramimfera, Luisian-Relizian Stages, middle Miocene*
Tmc *Claystone, gray, soft, weathered to clay soil, age, Relizian-Saucesian Stages*

Holocene / Pleistocene / QUATERNARY / Pliocene / Miocene / TERTIARY / CENOZOIC

GEOLOGIC SYMBOLS

not all symbols shown on each map

FORMATION CONTACT *dashed where inferred or indefinite dotted where concealed*

MEMBER CONTACT *between units of a formation* .... **Prominent bed**

CONTACT BETWEEN SURFICIAL SEDIMENTS *located only approximately in places*

FAULT: *Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful. Parallel arrows indicate inferred relative lateral movement. Relative vertical movement is shown by U/D (U=upthrown side, D=downthrown side). Short arrow indicates dip of fault plane. Sawteeth are on upper plate of low angle thrust fault.* U D 25 ?

FOLDS: *overturned* ANTICLINE SYNCLINE
arrow on axial trace of fold indicates direction of plunge; dotted where concealed by surficial sediments

Strike and dip of sedimentary rocks: 18 *inclined*; 20 *inclined (approximate)*; 80 *overturned*; *horizontal*; *vertical*

Strike and dip of metamorphic or igneous rock foliation or flow banding or compositional layers: 75 *inclined*; *inclined (approximate)*; *vertical*; 80 *overturned*

OTHER SYMBOLS: *Direction of landslide movement*; *outline of water bodies shown on map*; *water well*; *oil well*; *springs*

Tvc / Tvt / Tvg / Tvq

VAQUEROS FORMATION

Includes Tierra Redonda Formation of Durham, 1968; semi-lithified, marine clastic
Tvc, Tvt & Tvg *Tierra Rodonda member Saucesian Stage, Relizian Stage*

Tvc *Hard calcareous sandstone*
Tvt *Sandstone similar to Tvq*
Tvg *Conglomerate of granitic cobbles & boulders*
Tvq *Sandstone, tan-light gray, massive to crudely bedded*

Trb

RED BEDS

(Berry Formation? of Thorup, 1943) semi lithified; age, Oligocene

Trb *Sandstone pink to light gray & tan, includes red beds, claystone & conglomerate*

— *UNCONFORMITY* —

Kas

UNNAMED FORMATION

(Atascadero? Formation of Fairbanks, 1904) lithified, marine clastic; age, late Cretaceous to Paleocene

Kas *Sandstone, light brown, thick bedded to massive, arkosic micaceous, includes conglomerate of granitic detritus and gray micaceous clay shale locally*

Oligocene / Paleocene / Cretaceous / MESOZOIC

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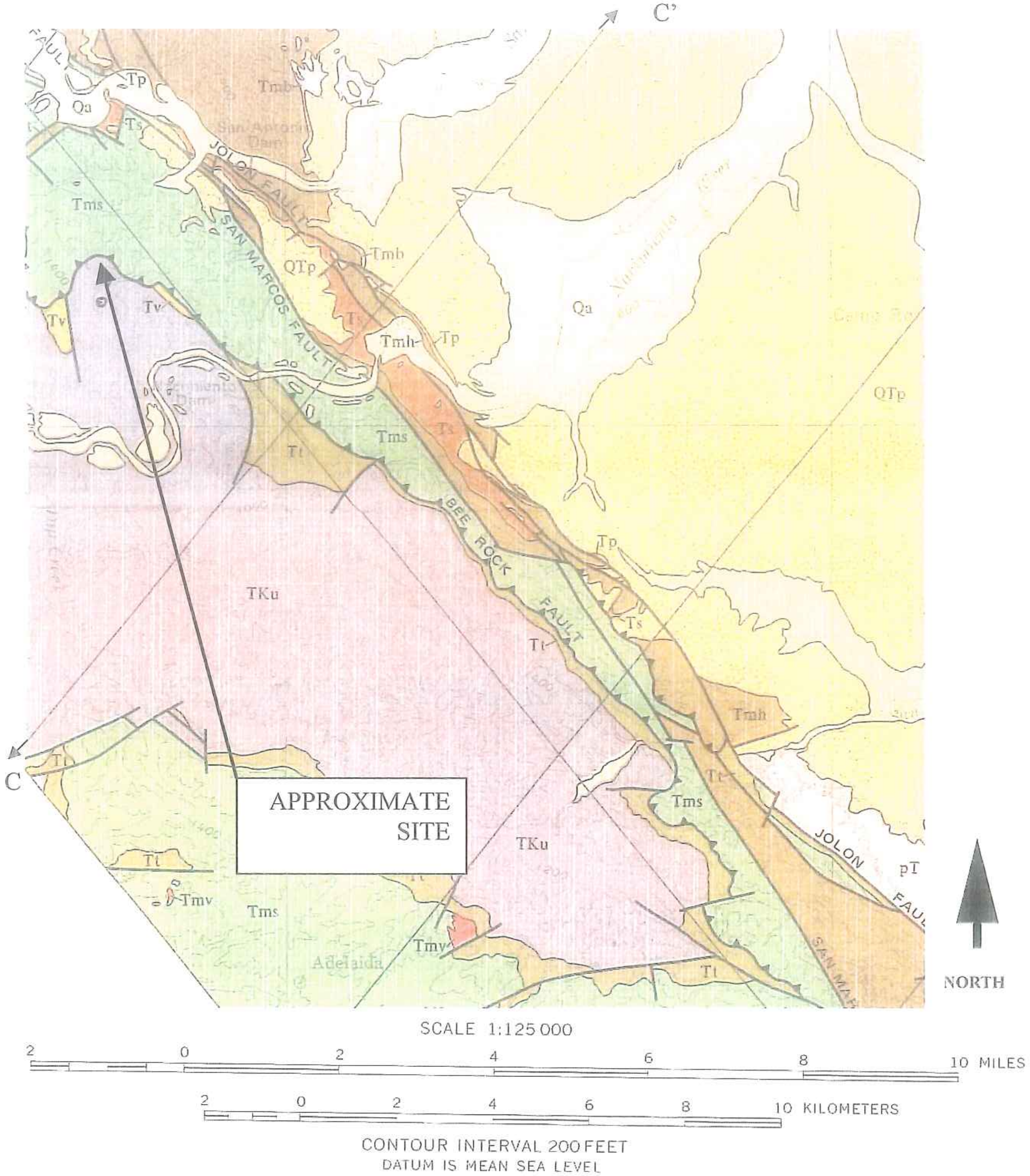
GEOLOGIC EXPLANATIONS

DIBBLEE, 2006
INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
3B

PROJECT NO:
SL08247-1



MAP BY DURHAM, 1974
SEE PLATE 4B FOR EXPLANATIONS
SEE PLATE 5C FOR CROSS SECTION C-C'

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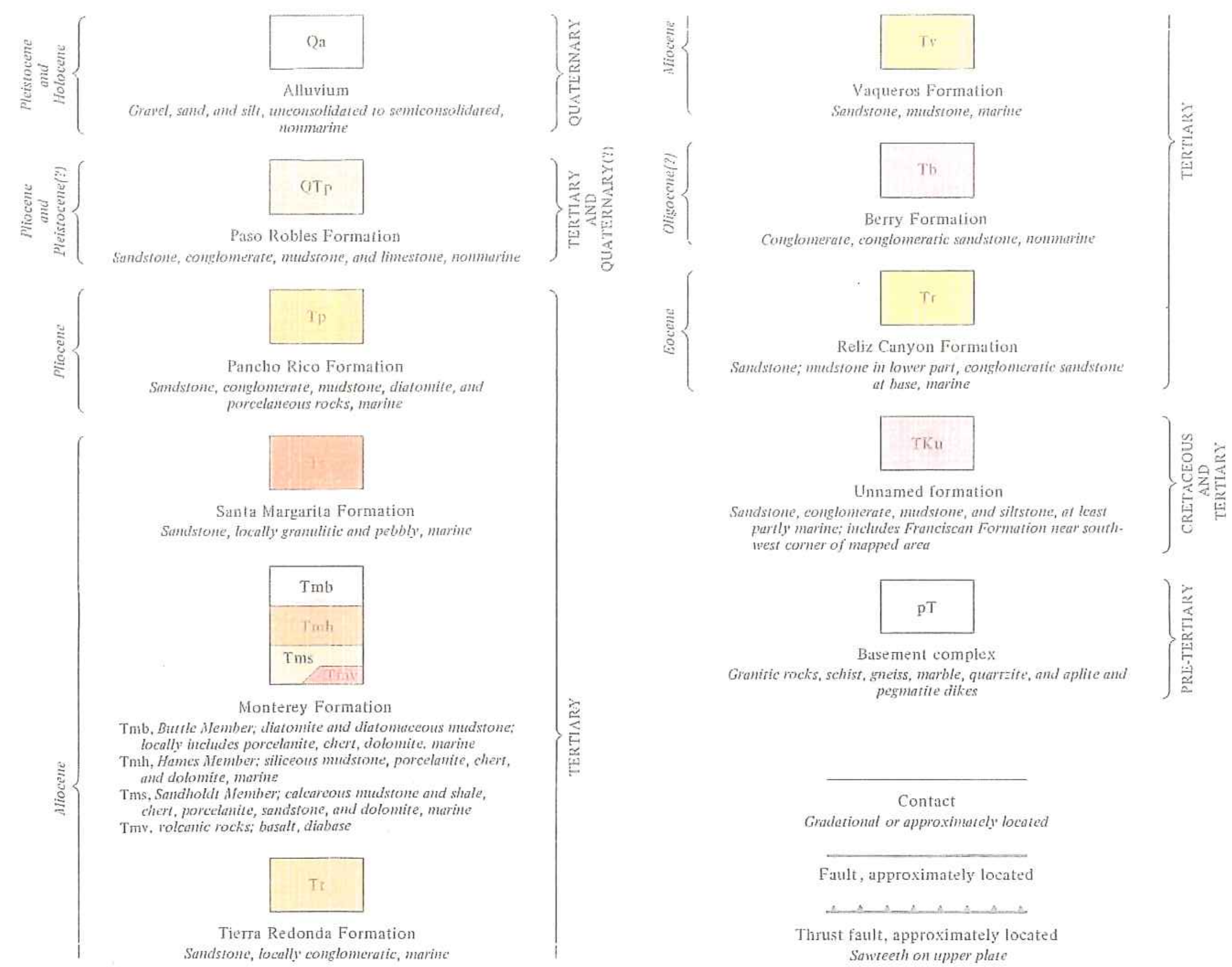
REGIONAL GEOLOGIC MAP

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
4A

PROJECT NO:
SL08247-1



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REGIONAL GEOLOGIC MAP

DURHAM, 1974
INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
4B

PROJECT NO:
SL08247-1

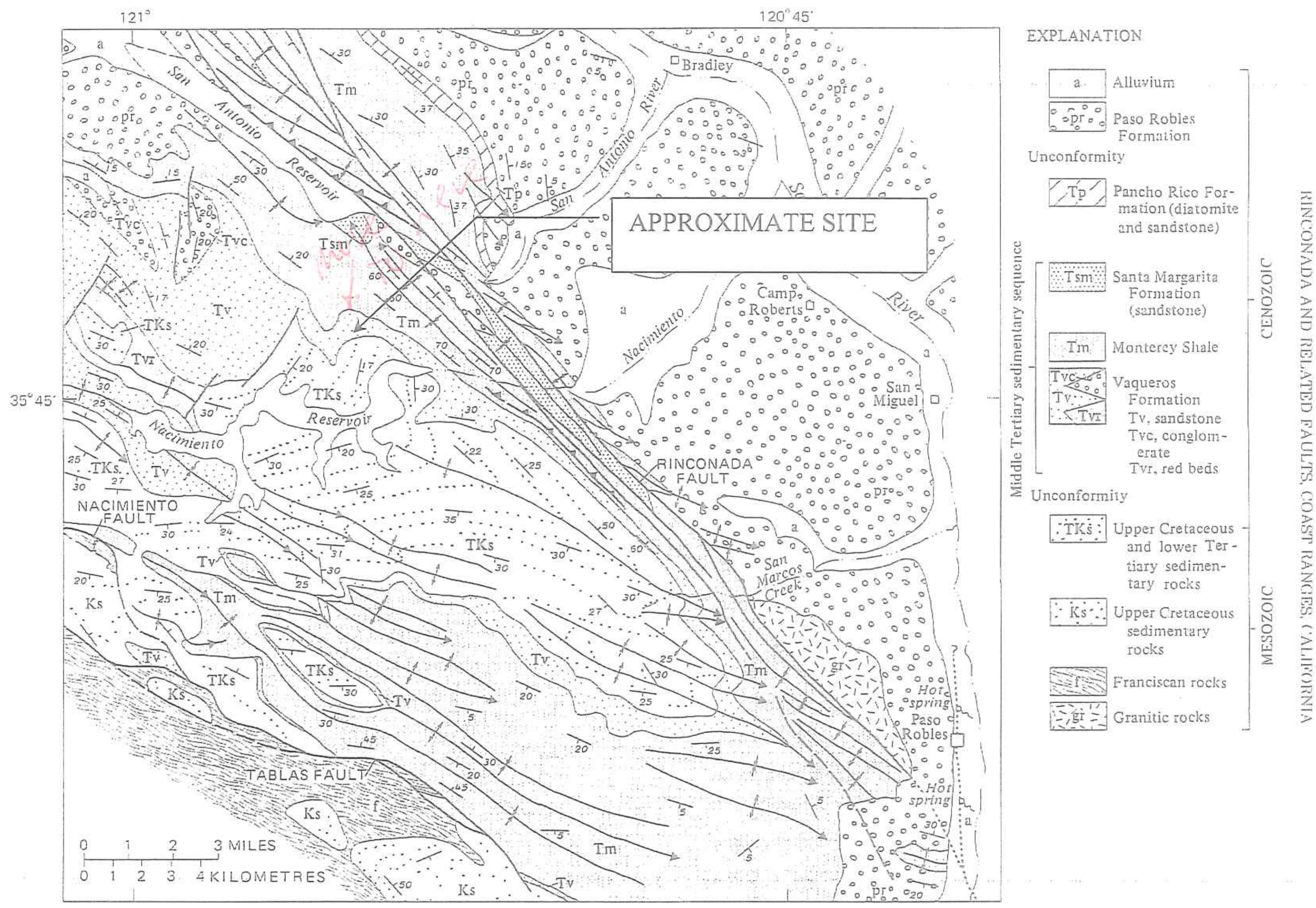

FIGURE 10.—Geology along and near the Rinconada fault (San Marcos segment) from Paso Robles to San Antonio Reservoir.

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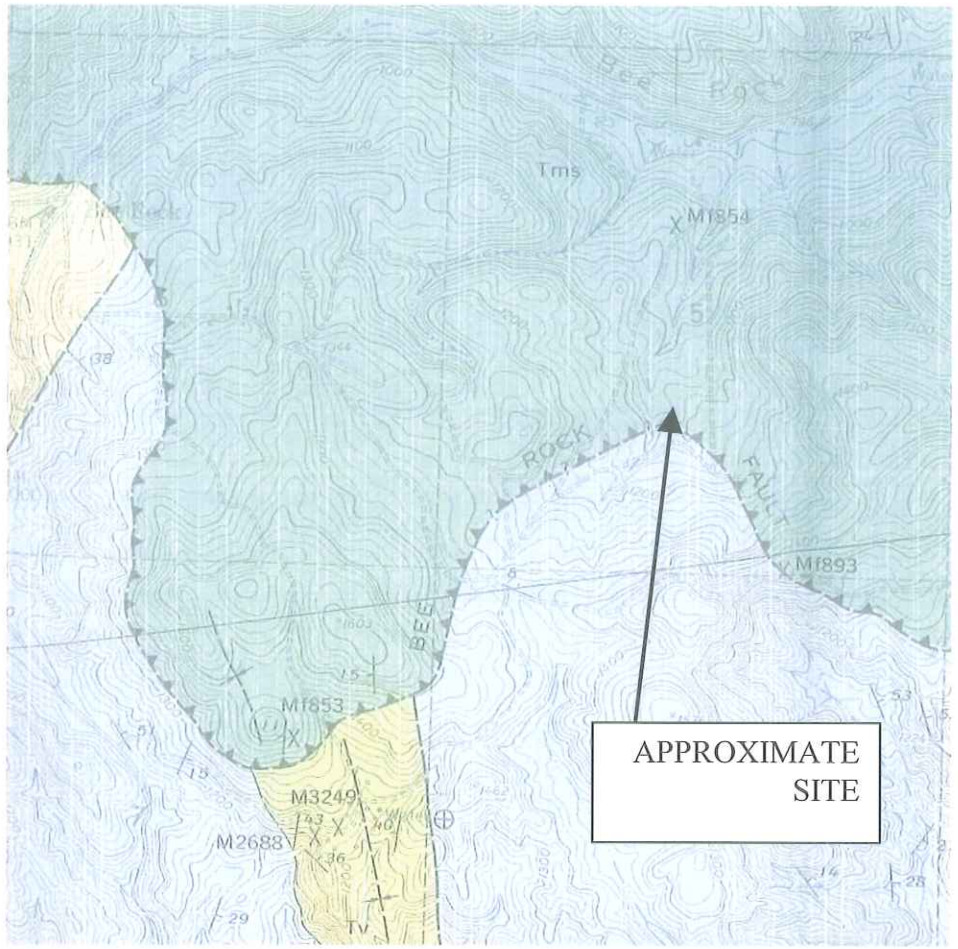
REGIONAL GEOLOGIC MAP

DIBBLEE, 1976
INTERLAKE ROAD, LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
5

PROJECT NO:
SL08247-1



SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

MAP BY DURHAM, 1974
SEE PLATE 6B FOR EXPLANATIONS

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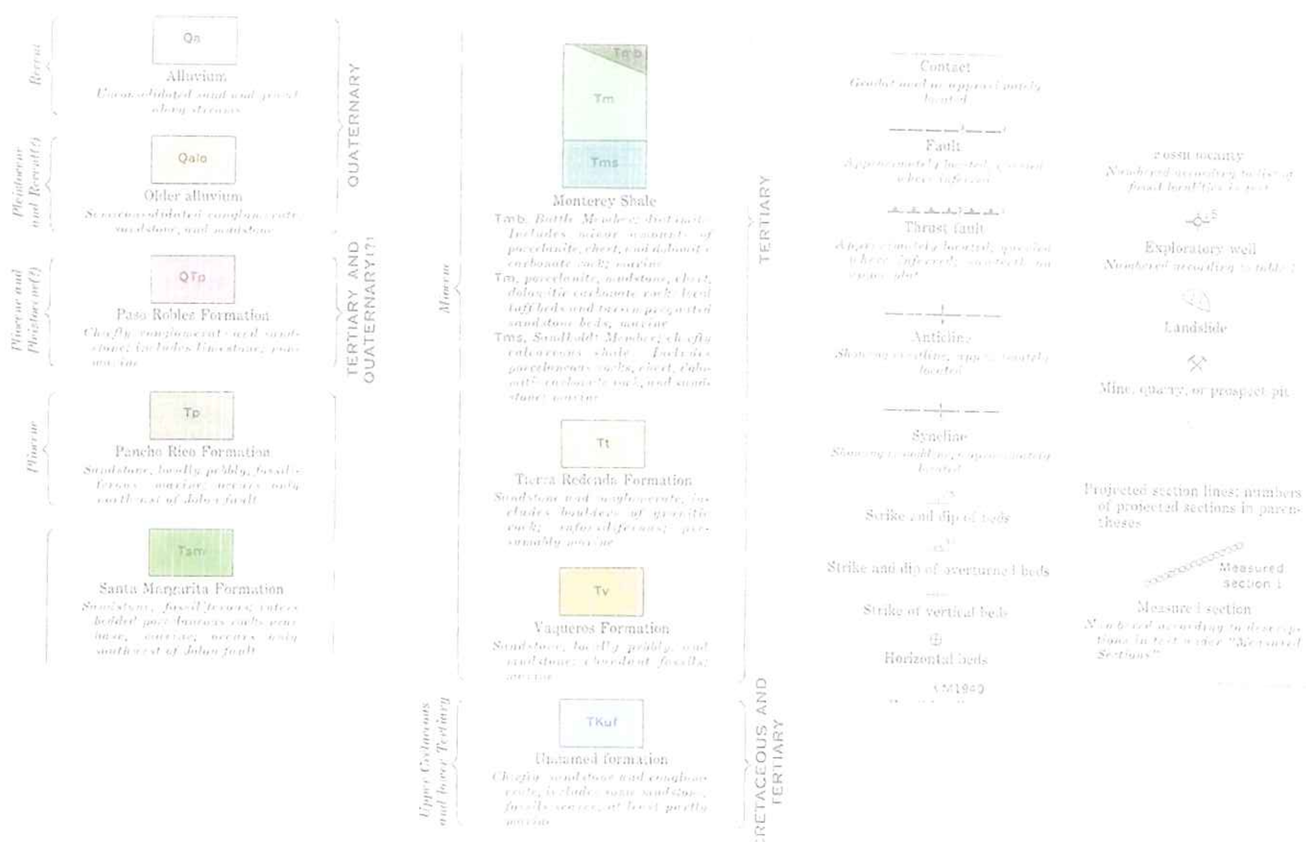
REGIONAL GEOLOGIC MAP

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE 6A

PROJECT NO: SL07885-1



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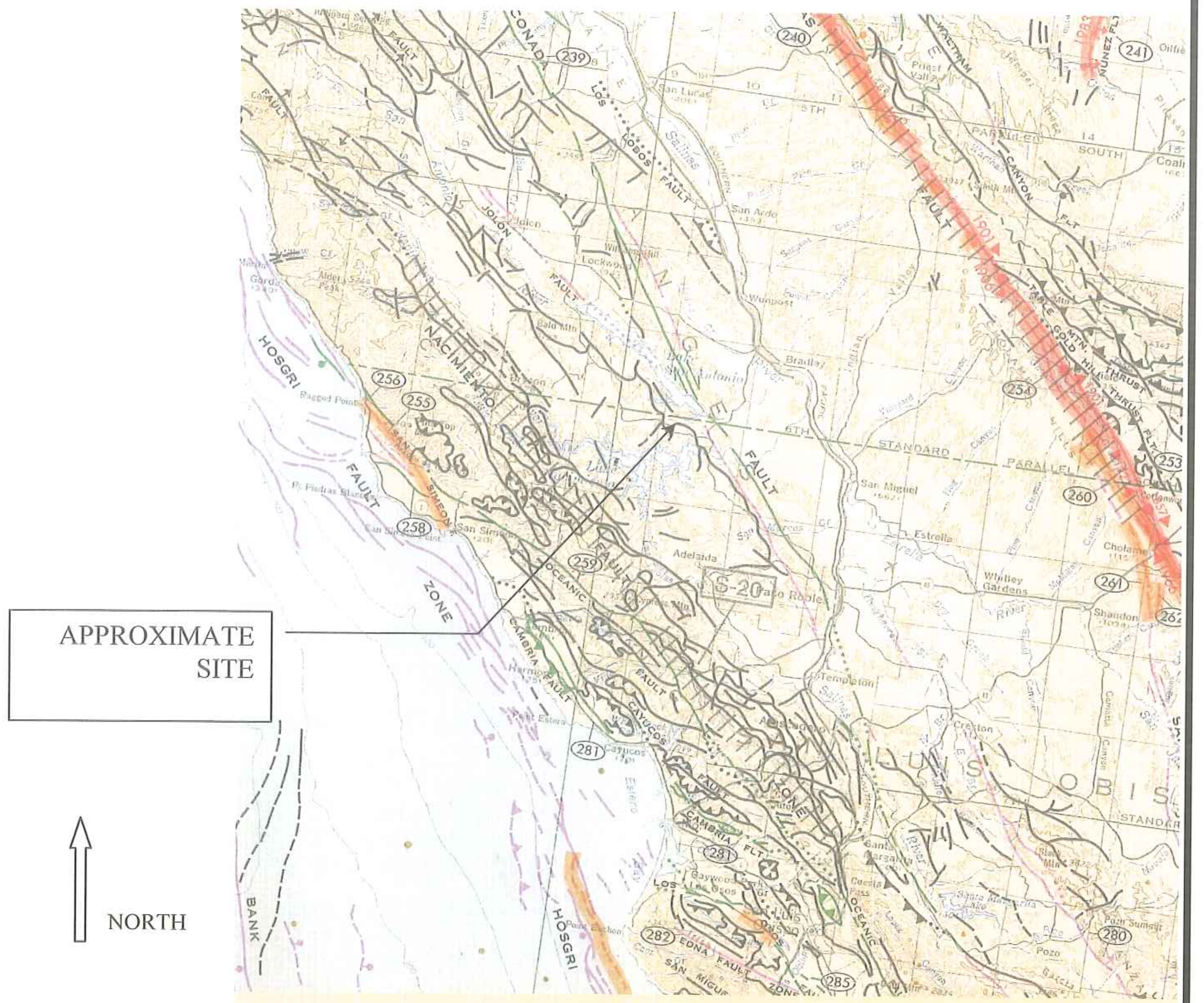
REGIONAL GEOLOGIC MAP

DURHAM, 1974
INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
6B

PROJECT NO:
SL08247-1



SCALE 1:750,000
(1 INCH EQUALS APPROXIMATELY 12 MILES)

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 60 Kilometers

GRAPHICS BY ROSS MARTIN

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JENNINGS, 1994, SEE PLATE 6B AND 6C FOR EXPLANATIONS

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REGIONAL FAULT MAP

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
7A

PROJECT NO:
SL08247-1

Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Historic	200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
Quaternary	Late Quaternary	Holocene	10,000		? ? ? ?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
Quaternary	Late Quaternary	Pleistocene	700,000		? ? ?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Pleistocene age.
Quaternary	Early Quaternary	Pleistocene	1,600,000		? ?	Undivided Quaternary faults – most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
						Late Cenozoic faults within the Sierra Nevada, including parts of, but not restricted to, the Foothills fault system. These faults may have been active in Quaternary time.	
Pre-Quaternary			4.5 billion (Age of earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive. Pre-Quaternary faults not shown in Nevada and Oregon.	Fault cuts strata of Pliocene or older age.

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

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

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

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

(c) displaced survey lines.

Pink band added to emphasize location of historic fault displacement.

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REGIONAL FAULT EXPLANATIONS

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE 7B

PROJECT NO: SL08247-1

SPECIAL NOTATIONS

A triangle to the right or left of the date indicates termination point of observed surface displacement.

Date bracketed by triangles indicates local fault break.

No triangle by date indicates an intermediate point along fault break.

Dot on fault indicates location where fault creep slippage has been observed and recorded.

Square on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

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

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

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

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

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

S-25

Fault segment associated with a significant linear trend of accurately located earthquake epicenters (magnitude 0.2 or greater). Generally aligned along strike slip faults having Quaternary displacement, but not necessarily with historic surface rupture. Lack of seismic activity along any fault is no indication that the fault may not be active in the future (e.g. San Andreas fault north of San Francisco). Epicenter data are derived from closely spaced seismic stations and include either continuing microseismicity or aftershocks associated with relatively large earthquakes.

Aligned seismicity on fault segments are referenced in Appendices C and E .

ADDITIONAL FAULT SYMBOLS

U = Upthrown side (relative or apparent)
D = Downthrown side (relative or apparent)

Bar and ball on downthrown side (used where space is limited).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened. On offshore faults, barbs simply indicate a reverse fault regardless of steepness of dip.

OTHER SYMBOLS

529

Numbers refer to annotations listed in the Appendices of the accompanying report. Annotations include fault name, age of fault movement, and pertinent references including Earthquake Fault Zone maps where a fault has been zoned by the Alquist-Priolo Earthquake Fault Zoning Act. This Act requires the State Geologist to delineate zones to encompass all potentially and recently active faults.

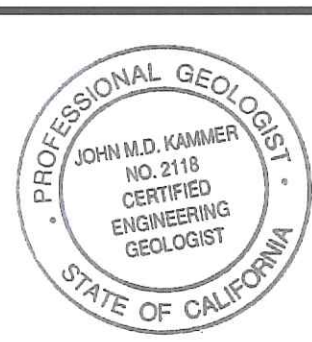
Cinder cone and other types of volcanoes. Most were active in Pleistocene time, some are Holocene, a few are historic.

21 8 Number in box or circle refers to Table 4 (Recent Volcanic Eruptions) in accompanying report. (Box refers to California, circle to Nevada.)

(1786 A.D.) = Date of historic volcanic eruption.

(9,500 B.P.) = Eruption occurrence in years before present (B.P.).

(0.5 m.y.) = Age of volcanic flow or eruption in million years (m.y.).



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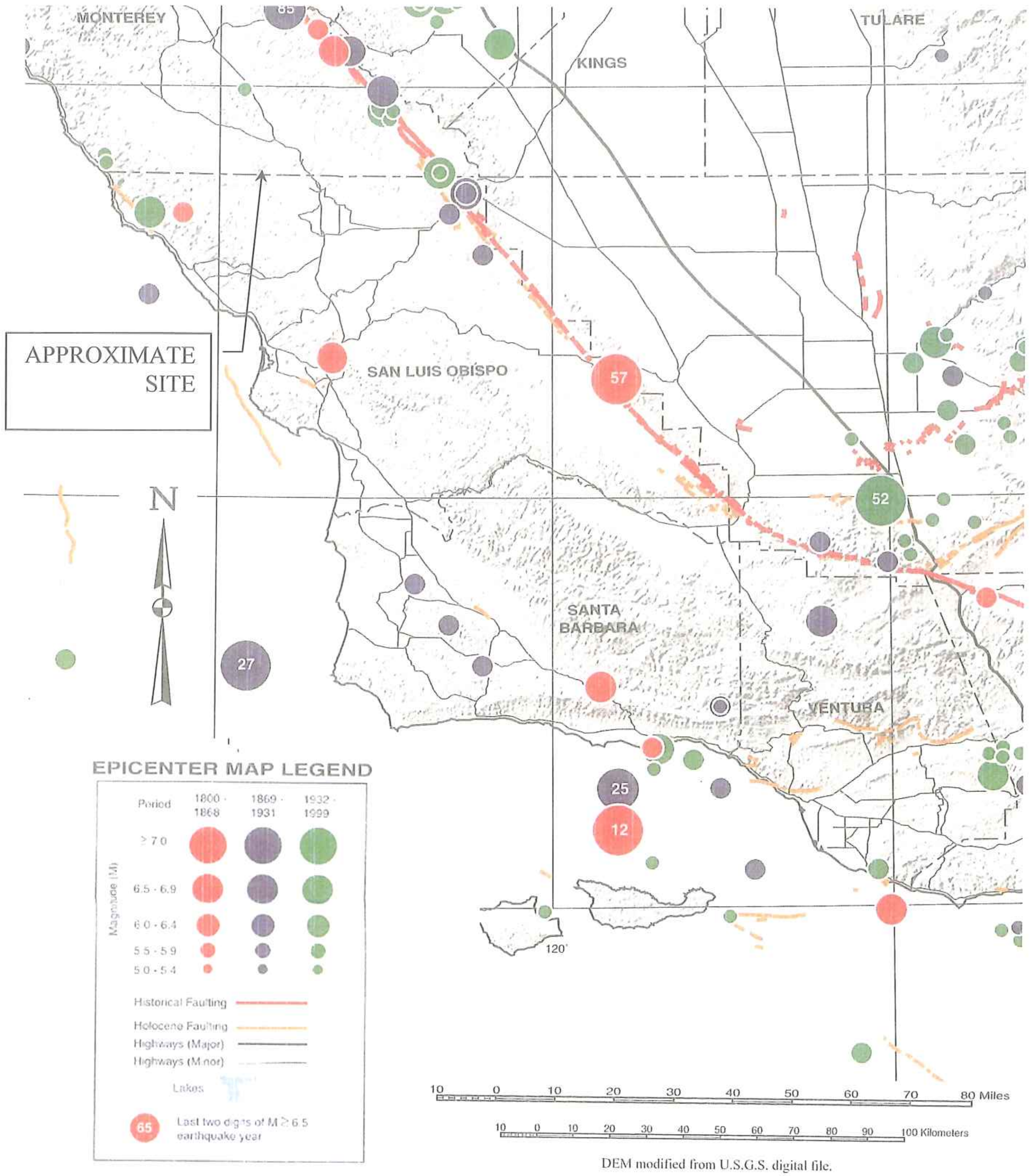
REGIONAL FAULT EXPLANATIONS

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
7C

PROJECT NO:
SL08247-1



T. TOPPOZADA, D BRANUM, M PETERSEN, C HALLSTROM, C. CRAMER, M. REICHLE, 2000

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HISTORICAL SEISMICITY MAP

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
8A

PROJECT NO:
SL08247-1

Significant Earthquakes That May Have Affected the Site in the Last 200 Years

DATE			TIME (GMT)	LATITUDE	LONGITUDE	MAG	LOCATION
Year	mth	day	hr	(N)	(W)		
1812	12	21	19:00	34 12.00	119 54.00	7.0	Santa Barbara Channel
1830	?	?		35 3	120 6	5.0	San Luis Obispo area (?)
1853	2	1		35 6	121 1	5.0	San Simeon area (?)
1857	1	9	16:00	35 42.00	120 18.00	8.25	Great Fort Tejon earthquake
1866	7	15	06:30	37 30.00	121 18.00	6.0	W. San Joaquin Valley
1881	2	2	00:11	36 0.	120 30.00	5.75	Parkfield
1881	4	10	10:00	37 24.00	121 24.00	6.0	W. San Joaquin Valley
1882	3	6	21:45	36 54	121 12.	5.75	Hollister
1883	9	5	12:30	34 12.00	119 54.00	6.25	Santa Barbara Channel
1885	3	31		36 7	121 3	5.5	San Andreas Fault (?)
1885	4	2		36 8	121 4	5.4	San Andreas Fault (?)
1885	4	12		36 4	121 0	6.2	San Andreas Fault (?)
1892	4	21	17:43	38 30.00	121 54.00	6.25	Winters
1892	11	13		36 8	121 5	5.5	San Andreas Fault (?)
1892	11	13	12:45	36 48.00	121 30.00	5.75	Hollister
1897	6	20	20:14	37 0.	121 30.00	6.25	Gilroy
1899	7	22		34 2	117 4	5.5	San Andreas Fault (?)
1899	7	22		34 3	117 5	6.5	San Andreas Fault (?)
1901	3	3	07:45	36 0.	120 30.00	6.4	Parkfield
1901	3	3		36 0	120 5	5.5	Parkfield Area
1902	7	28		34 75	120 33	5.4	Los Alamos area
1902	12	12		34 76	120 37	5.0	Los Alamos area
1906	4	18	13:12	37 42.00	122 30.00	8.25	Great 1906 earthquake
1907	9	20		34 2	117 1	6.0	San Andreas Fault (?)
1910	3	11	06:52	36 54.00	121 48.00	5.8	Watsonville
1910	12	31		36 8	121 4	5.0	Hollister Area
1913	10	20		35 12	120 58	5.0	Arroyo Grande area
1915	1	20		34 73	120 23	5.8	Los Alamos area
1916	8	6		36 7	121 3	5.5	Paicines area
1916	10	23	02:44	34 54.00	118 54.00	5.3	Tejon Pass region
1916	10	23		34 6	118 9	6.0	Tejon Pass Area
1916	10	23		34 7	119 0	5.5	Tejon Pass Area
1916	12	1		35 18	120 73	5.0	Avila area
1917	7	9		35 25	120 48	5.0	Lopez Canyon area
1919	2	16		35 0	119 0	5.0	Tejon Pass Area
1922	3	10	11:21	6 0.	120 30.00	6.3	Parkfield
1922	3	10		35 75	120 25	6.5	Cholame Valley Area
1922	8	18		35 75	120 3	5.0	Cholame Valley Area
1925	6	29	14:42	34 18.00	119 48.00	6.3	Santa Barbara
1926	7	25		36 6	120 8	5.0	Idria area
1926	12	27		36 2	120 3	5.0	Coalinga area
1927	11	4	13:50	34 42.00	120 48.00	7.3	SW of Lompoc
1932	2	26		36 0	121 0	5.0	San Ardo area
1934	6	8	04:47	36 0	120 30.00	6.0	Parkfield
1934	6	5		35 80	120 33	5.0	Parkfield Area
1934	6	8		35 80	120 33	6.0	Parkfield Area
1934	12	24		35 93	120 48	5.0	Parkfield Area
1939	6	24		36 80	121 45	5.5	Hollister Area
1939	9	21		34 87	118 93	5.2	Cuddy Valley Area
1939	12	28		35 80	120 33	5.0	Parkfield Area

San Luis Obispo County Department of Planning and Building, December 1999) Safety Element

DATE			TIME (GMT)	LATITUDE	LONGITUDE	MAG	LOCATION
Year	mth	day	hr	(N)	(W)		
1941	7	1	07:50	34 22.00	119 35.00	5.9	Carpenteria
1951	7	29		36 58	121 18	5.0	Southeast of Mulberry
1952	7	21	11:52	35 0.	119 1.00	7.7	Kern County earthquake
1952	11	22	07:46	35 44.00	121 12.00	6.0	Bryson
1955	11	02		35 96	120 92	5.1	San Ardo area
1956	11	16		35 95	120 47	5.0	Southwest of Coalinga
1960	1	20		36 78	121 43	5.0	South of Hollister
1966	6	28	04:26	36 0.	120 30.00	6.0	Parkfield
1966	6	28		120 50		5.1	Parkfield Sequence
1966	6	28		35 95	120 50	5.5	Parkfield Sequence
1970	9	12		34 27	117 54	5.4	Lytle Creek Area
1971	2	9	14:00	34 25.00	118 24.00	6.5	San Fernando
1972	2	24		36 58	121 21	5.0	Southeast of Hollister
1980	5	29		34 94	120 78	2.1	Orcutt Frontal Fault
1981	9	4	15:50	33 40.00	119 7.00	5.9	N. of Santa Barbara Island
1982	10	25		36 32	120 52	5.4	New Idria area
1983	5	2	23:42	36 14.00	120 19.00	6.5	Coalinga
1983	7	22	00:23	36 14.00	120 25.00	5.7	Coalinga
1983	8	29		35 84	121 34	5.4	San Simeon area
1984	1	23		36 35	121 91	5.2	Point Sur area
1984	4	24	21:15	37 19.00	121 39.00	6.1	Morgan Hill
1985	8	4	12:10	36 8.00	120 10.00	5.9	North Kettleman Hills
1989	10	18	00:04	37 2.19	121 52.98	7.1	Loma Prieta
2003	12	22	19:16	35 41.98	121 5.84	6.5	San Simeon
2004	09	28	10:15	35 8.15	120 3.74	6.0	Parkfield

S:\Misc Drawings\Geology\locallargefaults.doc

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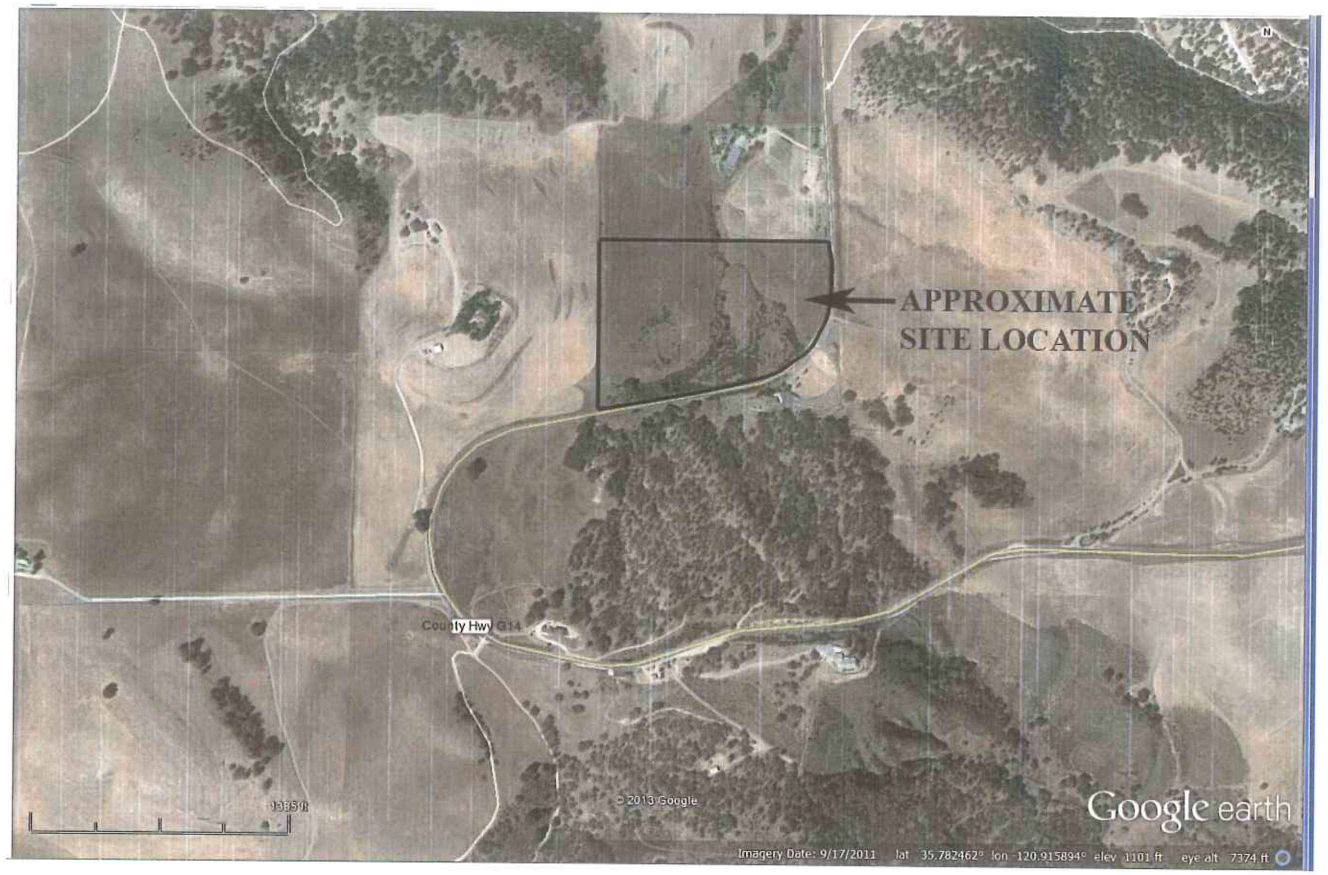
HISTORICAL SEISMCITY LIST

INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
8B

PROJECT NO:
SL08247-1



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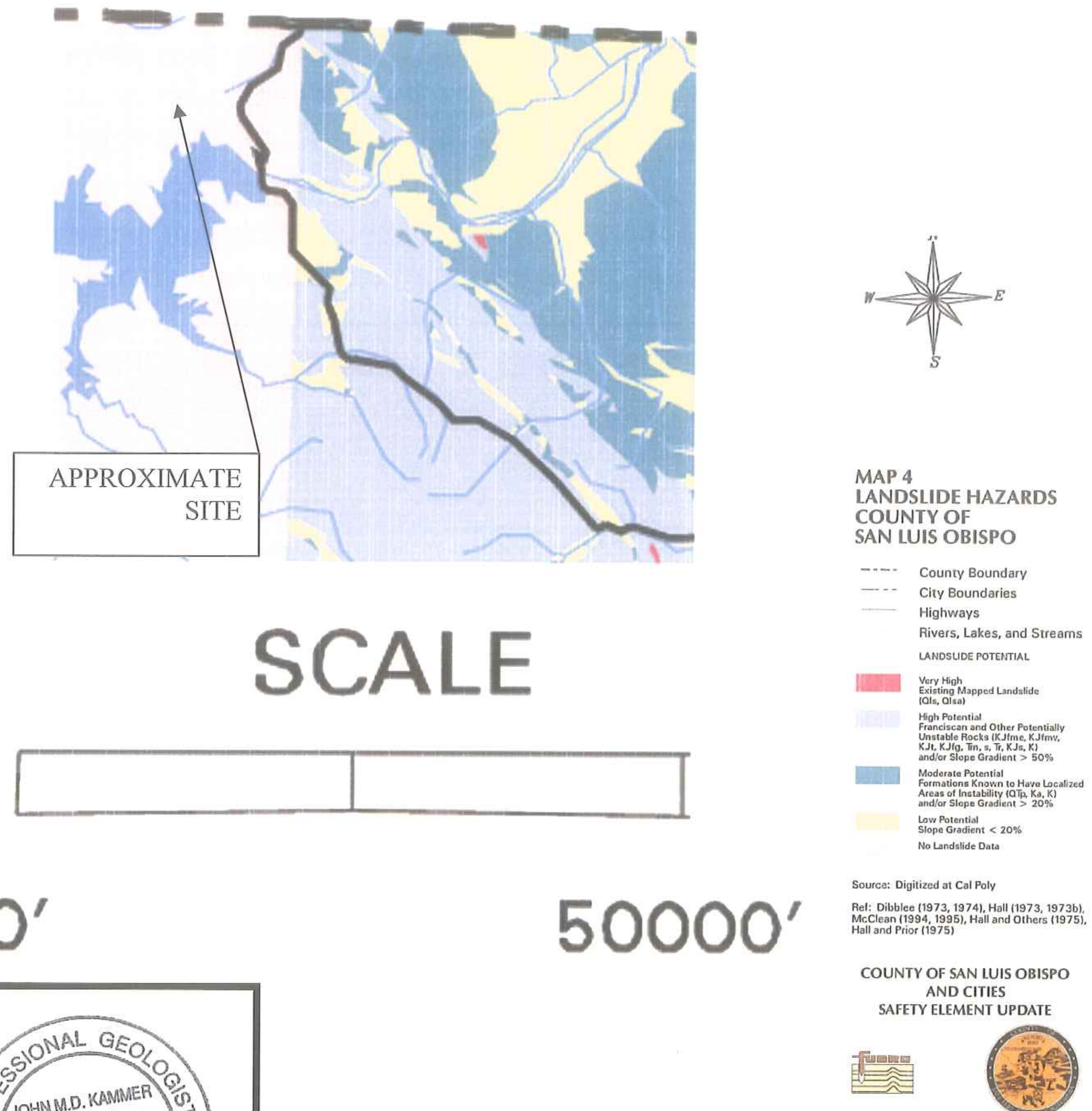
AERIAL PHOTOGRAPH
INTERLAKE ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
9

PROJECT NO:
SL08247-1



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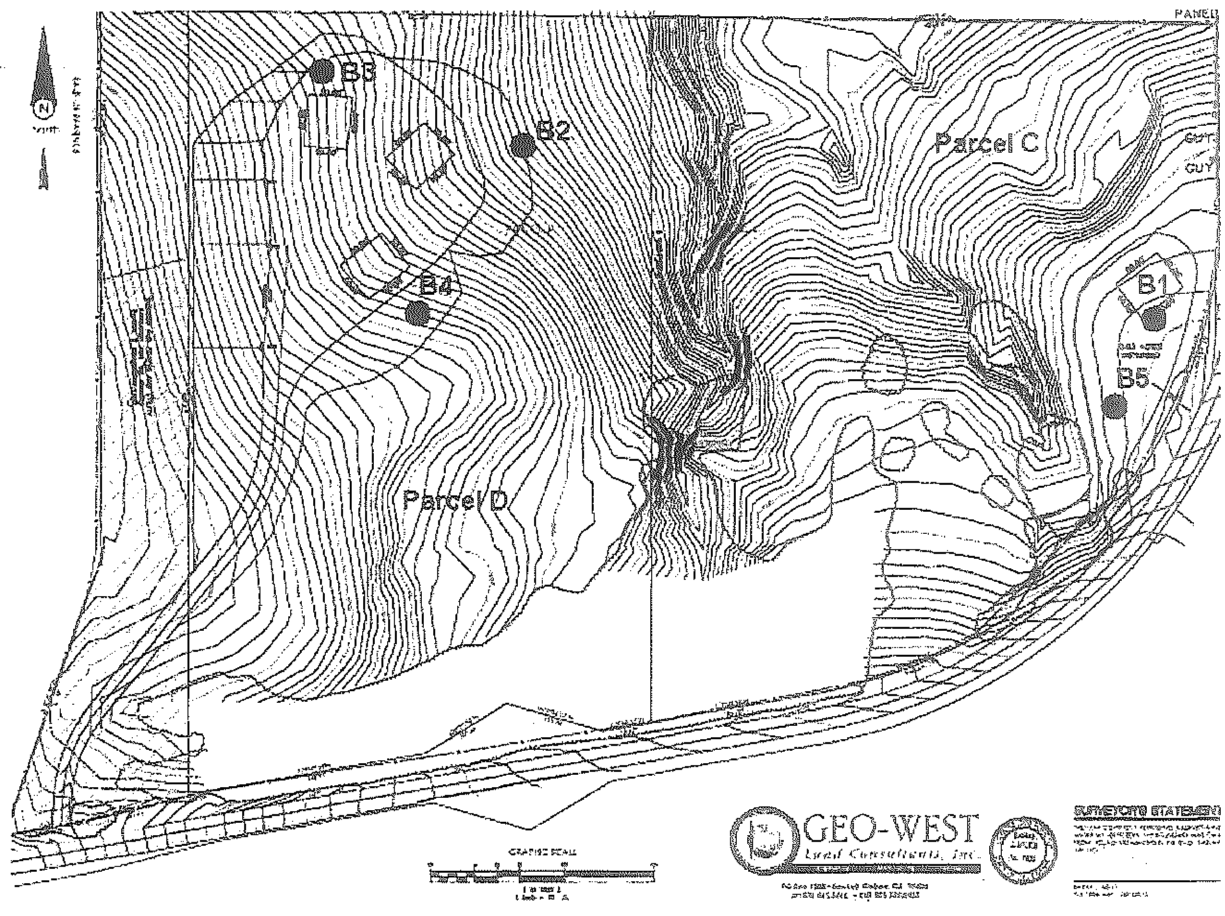
LANDSLIDE HAZARDS MAP
COUNTY OF SAN LUIS OBISPO DEPARTMENT OF
BUILDING AND PLANNING, 1999
INTERLAKE ROAD, LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
10

PROJECT NO:
SL08247-1

APPENDIX A

Boring logs



Legend N.T.S.

● Exploratory Soils Boring

*PLAN PROVIDED BY OTHERS

MCG MID-COAST GEOTECHNICAL, INC.	Brian & Natashia Holland Proposed Barn Structures Interlake Road Paso Robles vicinity of San Luis Obispo County California	Date: 03/26/2013 **Plate 2**

10 LABORATORY TEST RESULTS

10.1 MOISTURE-DENSITY DETERMINATIONS

Maximum Density-Optimum Moisture data were determined in the laboratory from soil samples using the ASTM D-1557-07 Method of Compaction.

SOIL TYPE	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (lbs/cu.ft)	OPTIMUM MOISTURE (%)
C4	Reddish brown sandy CLAY	100.0	20.0

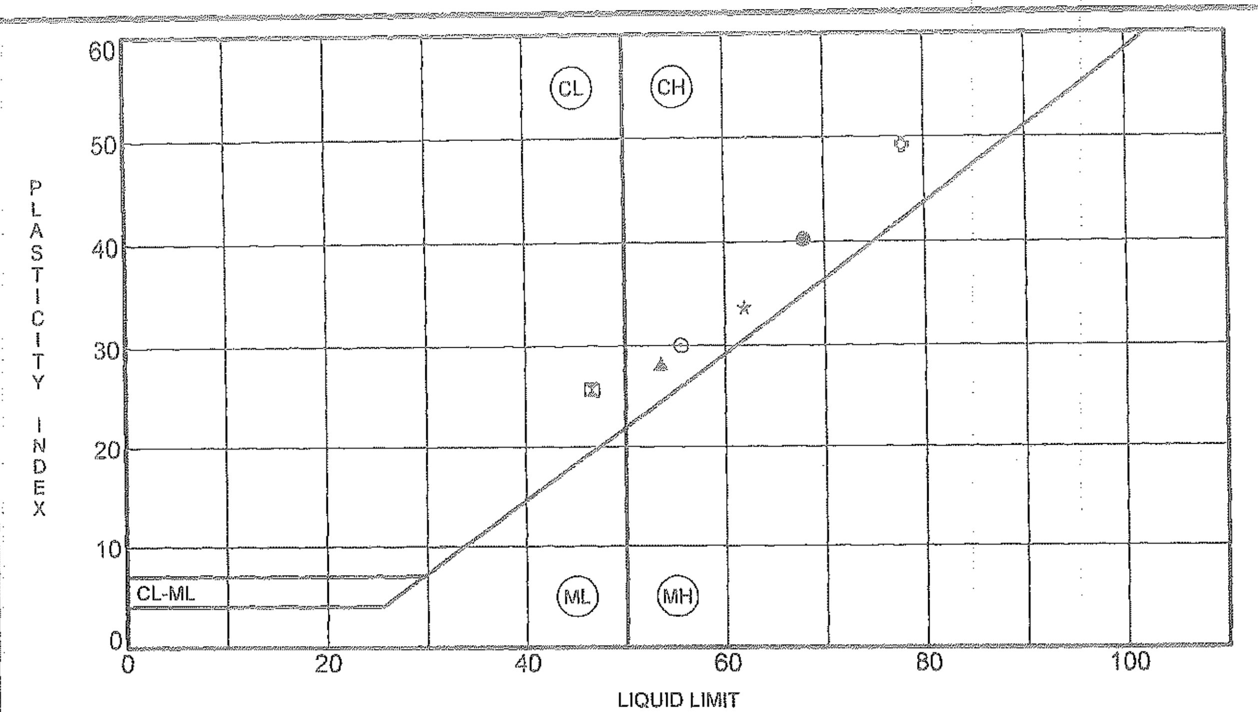
10.2 FIELD DENSITY SUMMARY (Ring Density Method)

TEST NO.	DEPTH (FT)	SOIL TYPE	FIELD MOISTURE CONTENT (%)	DRY DENSITY (lbs/cu.ft)	% OF MAX. DRY DENSITY
B2	2	C4	16.8		
B2	5	C4	17.0		
B2	10	M1	21.6		
B2	15	C5	28.9		
B3	5	S2	19.0		
B4	5	C3	19.4		
B4	10	C6	22.2		
B4	15	M2	28.2		
B4	20	M1	31.6		

10.3 EXPANSION INDEX TEST

An Expansion Index Test was performed on a representative bulk sample of the soil collected during our investigation. Expansion index test procedure is performed in accordance with ASTM D4289-03. The results follow:

SOIL TYPE	LOCATION	EXPANSION INDEX
C4	B2 @ 2-8'	53



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B1	2.3	68	28	40		Light brown sandy CLAY
⊠	B1	10.3	47	21	26		Dark brown sandy CLAY
▲	B2	2.3	54	25	29		Brown sandy CLAY
★	B2	15.3	62	28	34		Brown sandy CLAY
⊙	B4	10.3	56	26	30		Light brown sandy CLAY
✿	B4	19.8	78	29	49		Light brown sandy CLAY

US ATTERBERG LIMITS 12-6814 SOILS PERC.GPJ MIDCOAST.GDT 3/22/13

MID-COAST GEOTECHNICAL, INC.
3124 El Camino Real Atascadero, CA 93422
Telephone: 805-237-1462 Fax: 805-237-1483

ATTERBERG LIMITS' RESULTS

Client: Brian and Natashia Holland
Project: Proposed Barn Structure
Location: Interlake Rd, Paso Robles
Number: 12-6814

LOG OF BORING B1

MID-COAST GEOTECHNICAL, INC.

3124 El Camino Real Atascadero, CA 93422
Telephone: 805-461-0965 Fax: 805-461-0161

CLIENT: Brian and Natashia Holland
PROJECT: Proposed Building Sites
LOCATION: Parcel C, Interlake Rd, Paso Robles
NUMBER: 12-6814

DATE(S) DRILLED: 3/11/2013

DRILLING METHOD(S):
Mobile B24 Auger Drill Rig

GROUNDWATER INFORMATION:
No groundwater was encountered at time of drilling

SURFACE ELEVATION:

FIELD DATA			LABORATORY DATA								CLASS.			
						ATTERBERG LIMITS								
DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	RELATIVE COMPACTION (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	EXPANSION INDEX	MINUS NO. 200 SIEVE (%)	USCS	SOIL SYMBOL	SOIL TYPE	DESCRIPTION OF STRATUM
0														Dark brown sandy CLAY, firm, moist to damp
2	X	N = 26	19	88	82	68	28	40	135		CH		C1	
4.5														Brown sandy CLAY with caliche, stiff, damp
5	X	N = 40	24	97	96									
7									118				C2	
10														Brown fractured SANDSTONE, hard, damp
10			19			47	21	26			GM			
11.5														Boring terminated at 11.5' below grade

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring was backfilled with auger clippings

LOG OF BORING 12-6814 SOILS PERC.GPJ MIDCOAST.GDT 3/30/13

LOG OF BORING B5

MID-COAST GEOTECHNICAL, INC.
3124 El Camino Real Atascadero, CA 93422
Telephone: 805-461-0965 Fax: 805-461-0161

CLIENT: Brian and Natashia Holland
PROJECT: Proposed Building Sites
LOCATION: Parcel D, Interlake Rd, Paso Robles
NUMBER: 12-6814
DATE(S) DRILLED: 3/11/2013

DRILLING METHOD(S):
Mobile B24 Auger Drill Rig

GROUNDWATER INFORMATION:
No groundwater was encountered at time of drilling

SURFACE ELEVATION:

DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	RELATIVE COMPACTION (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	EXPANSION INDEX	MINUS NO. 200 SIEVE (%)	USCS	SOIL SYMBOL	SOIL TYPE	DESCRIPTION OF STRATUM
0														Dark brown sandy CLAY, firm, moist to damp
2														Brown sandy CLAY with caliche, stiff, damp
5														Reddish brown clayey SAND, hard, damp
15														Total Depth - 15 feet below grade
20														

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring was backfilled with auger cuttings

LOG OF BORING B2

MID-COAST GEOTECHNICAL, INC.

3124 El Camino Real Atascadero, CA 93422
Telephone: 805-461-0965 Fax: 805-461-0161

CLIENT: Brian and Natashia Holland
PROJECT: Proposed Building Sites
LOCATION: Parcel D, Interlake Rd, Paso Robles
NUMBER: 12-6814
DATE(S) DRILLED: 3/11/2013

DRILLING METHOD(S):
Mobile B24 Auger Drill Rig

GROUNDWATER INFORMATION:
No groundwater was encountered at time of drilling

SURFACE ELEVATION:

DEPTH (FT)	SAMPLES	N: BLOWS/FT, P: TONS/SQ FT, T: TONS/SQ FT, PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	RELATIVE COMPACTION (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	EXPANSION INDEX	MINUS NO. 200 SIEVE (%)	USCS	SOIL SYMBOL	SOIL TYPE	DESCRIPTION OF STRATUM
0–2													C3	Dark reddish brown sandy CLAY, soft, moist
2	sample		17			54	25	28						Reddish brown sandy CLAY, firm, damp
5	SPT	N = 9	17						53		CH		C4	
8														Weathered SILTSTONE, firm, damp
10	sample		22										M1	
15	sample		29			62	28	34			CH		C5	Dark brown sandy CLAY with shale fragments, stiff, dry
18														Boring was terminated at 18' below grade on shale

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring was backfilled with auger clippings

LOG OF BORING B3

MID-COAST GEOTECHNICAL, INC.

3124 El Camino Real Atascadero, CA 93422
Telephone: 805-461-0965 Fax: 805-461-0161

CLIENT: Brian and Natashia Holland
PROJECT: Proposed Building Sites
LOCATION: Parcel D, Interlake Rd, Paso Robles
NUMBER: 12-6814

DATE(S) DRILLED: 3/11/2013

DRILLING METHOD(S):
Mobile B24 Auger Drill Rig

GROUNDWATER INFORMATION:
No groundwater was encountered at time of drilling

SURFACE ELEVATION:

FIELD DATA			LABORATORY DATA								CLASS.			
DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	RELATIVE COMPACTION (%)	ATTERBERG LIMITS: LIQUID LIMIT (LL)	ATTERBERG LIMITS: PLASTIC LIMIT (PL)	ATTERBERG LIMITS: PLASTICITY INDEX (PI)	EXPANSION INDEX	MINUS NO. 200 SIEVE (%)	USCS	SOIL SYMBOL	SOIL TYPE	DESCRIPTION OF STRATUM
0–2													C3	Dark brown sandy CLAY with shale, firm, moist
2–8														Light brown silty SAND with shale, hard, damp
5			19										S1	Shale Lens at 5'
8														Shale Lens at 8'
8														Refusal at 8' below grade

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring was backfilled with auger clippings

LOG OF BORING B4

MID-COAST GEOTECHNICAL, INC.
3124 El Camino Real Atascadero, CA 93422
Telephone: 805-461-0965 Fax: 805-461-0161

CLIENT: Brian and Natashia Holland
PROJECT: Proposed Building Sites
LOCATION: Parcel D, Interlake Rd, Paso Robles
NUMBER: 12-6814
DATE(S) DRILLED: 3/11/2013

DRILLING METHOD(S):
Mobile B24 Auger Drill Rig

GROUNDWATER INFORMATION:
No groundwater was encountered at time of drilling

SURFACE ELEVATION:

DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	RELATIVE COMPACTION (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	EXPANSION INDEX	MINUS NO. 200 SIEVE (%)	USCS	SOIL TYPE	DESCRIPTION OF STRATUM
0–7												C3	Dark reddish brown sandy CLAY, firm, moist to damp
5	sample		19										
7–12											CH	C6	Light brown sandy CLAY with shale fragments, stiff, damp
10	sample		22			56	26	30					
12–16												M2	Dark brown sandy SILT with shale fragments, stiff, damp
15	sample		28										
16–20											CH	M1	Light brown sandy CLAY (weathered siltstone), stiff, damp
20	sample		32			78	29	49					
													Boring terminated at 20' below grade

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring was backfilled with auger clippings