REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION

Proposed Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, California

JOB NO. 21-13237
03 June 2021

Prepared for:

Kimberly Fanelli and Chris Huber

03 June 2021

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La Jolla, CA 92037

Job No. 21-13237

Subject: **Report of Preliminary Geotechnical Investigation**
Proposed Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, California

Dear Ms. Fanelli and Mr. Huber:

In accordance with our proposal dated April 13, 2021, ***Geotechnical Exploration, Inc.*** has performed a preliminary geotechnical investigation for the subject project in La Jolla, California. The field work was performed on April 26 and May 04, 2021.

If the conclusions and recommendations presented in this report are incorporated into the design and construction of the proposed residential development, it is our opinion that the site is suitable for the proposed project from a geotechnical perspective.

This opportunity to be of service is sincerely appreciated. Should you have any questions concerning the following report, please do not hesitate to contact us. Reference to our **Job No. 21-13237** will expedite a response to your inquiries.

Respectfully submitted,

GEOTECHNICAL EXPLORATION, INC.

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The following report presents the findings and recommendations of ***Geotechnical Exploration, Inc.*** for the subject project.

I. PROJECT SUMMARY

It is our understanding, based on communications with your project architect, Haley Duke of Island Architects, and review of the preliminary architectural plans dated April 07, 2021, that the existing residential structure at the subject site is to be completely demolished and a new two-story, single-family residential structure with attached two-car garage and associated improvements. The new structure is to be constructed of standard-type building materials utilizing conventional shallow foundations with either slabs on-grade or raised wood floors. Foundation loads are expected to be typical for this type of relatively light construction. When final architectural, engineering and/or grading plans have been prepared, they should be made available for our review. Additional or modified recommendations would be provided at that time if warranted.

Please be aware that the importance of thorough observation and testing during construction should be recognized by the client and the contractor(s) to provide appropriate documentation for any necessary as-graded reports. Recommendations for observation and testing are provided in this report under *Conclusions and Recommendations No. 6.*

Based on our current understanding of the proposed construction, it is our explicit opinion that the proposed site development would not destabilize neighboring properties or induce the settlement of adjacent structures or right-of-way improvements if designed and constructed in accordance with our recommendations.

II. SCOPE OF WORK

The scope of work performed for this investigation included a site reconnaissance and subsurface exploration program under the direction of our geologist with the placement, logging and sampling of four exploratory test pits (HP-1 to HP-4) utilizing hand tools, review of available published information pertaining to the site and nearby site geology, field observations of the geologic features exposed in the bluff face above the beach to the west, laboratory testing of sampled soils, geotechnical engineering analysis of the field and laboratory data, and the preparation of this report. The data obtained and the analyses performed were for the purpose of providing design and construction criteria for the project earthwork, building foundations, and slab on-grade or raised wood floors and pavements.

III. SITE DESCRIPTION

The subject site is addressed as 1851 Spindrift Drive, and is known as Assessor's Parcel No. 346-451-10-00, Lot 40, per Recorded Map No. 1762, in the La Jolla region of the City and County of San Diego, State of California. Refer to Figure No. I, the Vicinity Map, for the site location.

The roughly rectangular-shaped site is 4,706 square feet in size. For the purpose of this report, the front of the site faces northwest toward Spindrift Drive. The site is bordered on the northeast by a similar single-family residence at a lower elevation;

on the southeast to the rear of the home by a similar single-family residence at a slightly higher elevation; on the southwest by an alley at approximate similar elevation; and on the northwest by Spindrift Drive at lower elevation. The site is currently occupied by a single-family residential structure located centrally on the site, with a detached one-car garage in the rear, and retaining walls, flatwork, and associated improvements. The site consists of a relatively level building pad with an approximately 4- to 6-foot-high northwesterly descending slope that includes two low retaining walls in the front yard. The overall gradient of the site is gently sloping towards the northwest.

Elevations across the site range from approximately 60 feet above mean sea level (MSL) in the northern corner, to 71 feet above MSL in the southern corner. Information concerning approximate elevations across the site was obtained from Google Earth Imagery. Vegetation on the site consists of an ornamental garden with shrubbery and a few small trees.

IV. <u>FIELD INVESTIGATION</u>

The field investigation consisted of a surface reconnaissance and a subsurface exploration program at the site utilizing hand tools to investigate and sample the subsurface soils on April 26, 2021. A reconnaissance of the coastal bluff, approximately 200 to 250 feet northwest of the site, for the purpose of observing and documenting visible surface ruptures and faulting across the face of the bluff was performed on May 04, 2021.

Four exploratory handpits (HP-1 to HP-4) were excavated across the site and in the areas of the proposed new construction. The exploratory handpits were excavated to depths ranging from 4 to 9 feet in order to obtain representative soil samples and to define the soil profile across the site. The soils encountered in the exploratory handpits were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (refer to Appendix A). The approximate locations of the exploratory excavations are shown on the Plot Plan, Figure No. II.

Representative samples were obtained from the exploratory handpits at selected depths appropriate to the investigation. Sampling consisted of utilizing a thin-wall ring-lined sampler driven with a knocker bar to obtain relatively undisturbed samples. Bulk samples were also collected from the exploratory handpits to aid in classification and for appropriate laboratory testing. All samples were returned to our laboratory for evaluation and testing. Exploratory handpit logs were prepared on the basis of our observations and laboratory test results, and are attached as Figure Nos. IIIa-d.

The exploratory handpit logs and related information depict subsurface conditions only at the specific locations shown on the plot plan and on the particular date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these locations. Also, the passage of time may result in changes in the subsurface conditions due to environmental changes.

V. __LABORATORY TESTS AND SOIL INFORMATION__

Laboratory tests were performed on disturbed and relatively undisturbed soil samples in order to evaluate their physical and mechanical properties and their ability to support the proposed new structure and associated improvements. The test results are presented on the logs, Figure Nos. IIIa-d. The following tests were conducted on representative soil samples:

1. *Laboratory Compaction Characteristics (ASTM D1557-12e1)*
2. *Determination of Percentage of Particles Smaller than #200 Sieve (ASTM D1140-17)*

Laboratory compaction values (ASTM D1557-12e1) establish the optimum moisture content and the laboratory maximum dry density of the tested soils. The relationship between the moisture and density of remolded soil samples helps to establish the relative compaction of the existing fill soils and soil compaction conditions to be anticipated during any future grading operation. The test results are presented on the logs at the appropriate sample depths.

The particle size smaller than a No. 200 sieve analysis (ASTM D1140-17) aids in classifying the tested soils in accordance with the Unified Soil Classification System and provides qualitative information related to engineering characteristics such as expansion potential, permeability, and shear strength. The test results are presented on the logs at the appropriate sample depths.

The expansion potential of soils is determined, when necessary, utilizing the Standard Test Method for Expansion Index of Soils (ASTM D4829-19). In accordance with the Standard (Table 5.3), potentially expansive soils are classified as follows:

EXPANSION INDEX	***POTENTIAL EXPANSION***
0 to 20	Very low
21 to 50	Low
51 to 90	Medium
91 to 130	High
Above 130	Very high

Based on our visual and laboratory correlated classification, and our experience with similar soils in the San Diego region, it is our opinion that the existing fill and formational materials encountered in all handpits possesses a very low to low potential for expansion. Therefore, we have assigned a maximum expansion index of less than 50 to these soils.

Based on the field and laboratory test data, our observations of the primary soil types, and our previous experience with laboratory testing of similar soils, our Geotechnical Engineer has assigned values for friction angle, coefficient of friction, and cohesion for those soils that will have significant lateral support or load bearing functions on the project. These values have been utilized in determining the recommended bearing value as well as active and passive earth pressure design criteria for foundations and structures.

VI. REGIONAL GEOLOGIC DESCRIPTION

San Diego County has been divided into three major geomorphic provinces: the Coastal Plain, the Peninsular Ranges and the Salton Trough. The Coastal Plain exists west of the Peninsular Ranges. The Salton Trough is east of the Peninsular Ranges. These divisions are the result of the basic geologic distinctions between the areas. Mesozoic metavolcanic, metasedimentary and plutonic rocks predominate in the Peninsular Ranges with primarily Cenozoic sedimentary rocks to the west and east of this central mountain range (Demere, 1997).

In the Coastal Plain region, where the subject property is located, the "basement" consists of Mesozoic crystalline rocks. Basement rocks are also exposed as high relief areas (e.g., Black Mountain northeast of the subject property and Cowles Mountain near the San Carlos area of San Diego). Younger Cretaceous and Tertiary sediments lap up against these older features. These sediments form a "*layer cake*" sequence of marine and non-marine sedimentary rock units, with some formations up to 140 million years old. Faulting related to the La Naćion and Rose Canyon Fault zones has broken up this sequence into a number of distinct fault blocks in the southwestern part of the county. Northwestern portions of the county are relatively undeformed by faulting (Demere, 1997).

The Peninsular Range forms the granitic spine of San Diego County. These rocks are primarily plutonic, forming at depth beneath the earth's crust 140 to 90 million years ago as the result of the subduction of an oceanic crustal plate beneath the North American continent. These rocks formed the much larger Southern California batholith. Metamorphism associated with the intrusion of these great granitic masses affected the much older sediments that existed near the surface over that period of time. These metasedimentary rocks remain as roof pendants of marble, schist, slate, quartzite and gneiss throughout the Peninsular Ranges. Locally, Miocene-age volcanic rocks and flows have also accumulated within these mountains (e.g., Jacumba Valley). Regional tectonic forces and erosion over time have uplifted and unroofed these granitic rocks to expose them at the surface (Demere, 1997).

The Salton Trough is the northerly extension of the Gulf of California. This zone is undergoing active deformation related to faulting along the Elsinore and San Jacinto Fault Zones, which are part of the major regional tectonic feature in the southwestern portion of California, the San Andreas Fault Zone. Translational movement along these fault zones has resulted in crustal rifting and subsidence. The Salton Trough, also referred to as the Colorado Desert, has been filled with sediments to depth of approximately 5 miles since the movement began in the early Miocene, 24 million years ago. The source of these sediments has been the local mountains as well as the ancestral and modern Colorado River (Demere, 1997).

As indicated previously, the San Diego area is part of a seismically active region of California. It is on the eastern boundary of the Southern California Continental Borderland, part of the Peninsular Ranges Geomorphic Province. This region is part of a broad tectonic boundary between the North American and Pacific Plates. The actual plate boundary is characterized by a complex system of active, major, right-lateral strike-slip faults, trending northwest/southeast. This fault system extends eastward to the San Andreas Fault (approximately 70 miles from San Diego) and westward to the San Clemente Fault (approximately 50 miles off-shore from San Diego) (Berger and Schug, 1991).

In California, major earthquakes can generally be correlated with movement on active faults. As defined by the California Division of Mines and Geology, now the California Geological Survey, an "active" fault is one that has had ground surface displacement within Holocene time, about the last 11,000 years (Hart and Bryant, 1997). Additionally, faults along which major historical earthquakes have occurred (about the last 210 years in California) are also considered to be active (Association of Engineering Geologist, 1973). The California Division of Mines and Geology defines a *"potentially active"* fault as one that has had ground surface displacement during Quaternary time, that is, between 11,000 and 1.6 million years (Hart and Bryant, 1997).

During recent history, prior to April 2010, the San Diego County area has been relatively quiet seismically. No fault ruptures or major earthquakes had been experienced in historic time within the greater San Diego area. Since earthquakes have been recorded by instruments (since the 1930s), the San Diego area has experienced scattered seismic events with Richter magnitudes generally less than M4.0. During June 1985, a series of small earthquakes occurred beneath San Diego Bay, three of which were recorded at M4.0 to M4.2. In addition, the Oceanside earthquake of July 13, 1986, located approximately 26 miles offshore of the City of Oceanside, had a magnitude of M5.3 (Hauksson and Jones, 1988).

On June 15, 2004, a M5.3 earthquake occurred approximately 45 miles southwest of downtown San Diego (26 miles west of Rosarito, Mexico). Although this earthquake was widely felt, no significant damage was reported. Another widely felt earthquake on a distant southern California fault was a M5.4 event that took place on July 29, 2008, west-southwest of the Chino Hills area of Riverside County.

Several earthquakes ranging from M5.0 to M6.0 occurred in northern Baja California, centered in the Gulf of California on August 3, 2009. These were felt in San Diego but no injuries or damage was reported. A M5.8 earthquake followed by a M4.9 aftershock occurred on December 30, 2009, centered about 20 miles south of the Mexican border city of Mexicali. These were also felt in San Diego, swaying high-rise buildings, but again no significant damage or injuries were reported.

On April 04, 2010, a large earthquake occurred in Baja California, Mexico. It was widely felt throughout the southwest including Phoenix, Arizona and San Diego in California. This M7.2 event, the Sierra El Mayor earthquake, occurred in northern Baja California, approximately 40 miles south of the Mexico-USA border at shallow depth along the principal plate boundary between the North American and Pacific plates. According to the U.S. Geological Survey this is an area with a high level of historical seismicity, and it has recently also been seismically active, although this is the largest event to strike in this area since 1892. The April 04, 2010, earthquake appears to have been larger than the M6.9 earthquake in 1940 or any of the early 20th century events (e.g., 1915 and 1934) in this region of northern Baja California. The event caused widespread damage to structures, closure of businesses, government offices and schools, power outages, displacement of people from their homes and injuries in the nearby major metropolitan areas of Mexicali in Mexico and Calexico in Southern California.

This event's aftershock zone extends significantly to the northwest, overlapping with the portion of the fault system that is thought to have ruptured in 1892. Some structures in the San Diego area experienced minor damage and there were some injuries. Ground motions for the April 04, 2010, main event, recorded at stations in San Diego and reported by the California Strong Motion Instrumentation Program (CSMIP), ranged up to 0.058g.

On July 07, 2010, a M5.4 earthquake occurred in Southern California at 4:53 pm (Pacific Time) about 30 miles south of Palm Springs, 25 miles southwest of Indio, and 13 miles north-northwest of Borrego Springs. The earthquake occurred near the Coyote Creek segment of the San Jacinto Fault. The earthquake exhibited right lateral slip to the northwest, consistent with the direction of movement on the San Jacinto Fault. The earthquake was felt throughout Southern California, with strong shaking near the epicenter. It was followed by more than 60 aftershocks of M1.3 and greater during the first hour.

In the last 50 years, there have been four other earthquakes in the magnitude M5.0 range within 20 kilometers of the Coyote Creek segment: M5.8 in 1968, M5.3 on 2/25/1980, M5.0 on 10/31/2001, and M5.2 on 6/12/2005. The biggest earthquake near this location was the M6.0 Buck Ridge earthquake on 3/25/1937.

VII. <u>SITE-SPECIFIC SOIL & GEOLOGIC DESCRIPTION</u>

Our field investigation, reconnaissance and review of the geologic map by Kennedy and Tan, 2008, *"Geologic Map of San Diego, 30'x60' Quadrangle, CA"* indicate that the site is underlain at shallow depth by late to middle Pleistocene-Aged Old Paralic Deposits, Unit 6 (Qop_6) formational materials, with the upper 2 feet observed to be a weathered subsoil (Qss) profile. During the course of our field investigation, Old Paralic Deposits were encountered in all four of our exploratory handpits. The overlying fill and landscape materials are approximately 1 to 6 feet thick at the explored locations and were also encountered in all exploratory handpits. An excerpt of the geological map (Kennedy and Tan, 2008) is included as Figure No. IV, Geologic Map and Legend.

A. Stratigraphy

Artificial Fill Soils (Qaf) and Landscape Topsoil (Qts): The entire site is overlain by 1 to 6 feet of artificial fill soils and landscape topsoils that were encountered in all handpits (HP-1 to HP-4) with thicknesses in HP-1 and HP-2 limited to 1 to 3 feet. The observed fill and topsoils soils consist of fine- to medium-grained silty sands (SM) and clayey sands (SC). Approximately 4 feet of fine- to medium-grained poorly graded sands (SP) was also observed in handpit HP-4. The fill and topsoils are slightly moist to moist, dark brown and light gray. The density was qualitatively observed to be loose to medium dense. The fill and topsoils were observed to contain roots, brick and metal debris, and several utility pipes. In our opinion, the fill soils are not suitable in their current condition for support of loads from the proposed structures. The fill soils are considered to have a low expansion potential, and after selective removal of trash and organic matter, the existing fill materials are suitable for use as properly compacted new fill material on the site. Refer to Figure Nos. IIIa-d for details.

Subsoil (Qss): In all handpits, a naturally weathered profile of the formational materials was observed as a uniformly 2-foot-thick subsoil layer underlying the fill and topsoils. The observed subsoil consists of fine- to medium-grained clayey sands

(SC). The subsoil is moist, and brown to dark brown. The density was qualitatively observed to be medium dense. Caliche was also observed in the subsoil. In our opinion, the subsoil is suitable in its current condition for support of loads from the proposed structures. The subsoil is considered to have a low expansion potential and is, in our opinion, suitable for use as properly compacted new fill material on the site. Refer to Figure Nos. IIIa-d for details.

Old Paralic Deposits, Unit 6 (Qop_6): Old Paralic Deposits, Unit 6 formational materials were encountered at relatively shallow depths of 3 to 8 feet and underlying the entire site is. Old Paralic Deposit materials were encountered in all exploratory handpits. The encountered formational materials were observed to consist of fine- to medium-grained silty sands (SM). The formational materials are slightly moist and reddish brown. The density was qualitatively observed to be medium dense. Weak cementation was also observed. The formational materials are considered to have a very low to low expansion potential and are suitable in their current condition for support of loads from the proposed structures or additional fill. Refer to Figure Nos. IIIa-d for details.

Review of the *"Geologic Map of San Diego, 30'x60' Quadrangle, CA,"* by Kennedy and Tan, 2008, describes the Old Paralic Deposits, Unit 6 as *"Poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach, estuarine and colluvial deposits composed of siltstone, sandstone and conglomerate."*

B. Structure

Based on the elevations of the Paralic Deposits over Point Loma Formation contact (as observed in the bluff face to the west) and the presence of the thin section of Paralic Deposits across the subject site, the contact is relatively flat-lying and no significant structural activity has occurred since deposition of the Old Paralic Deposits Unit 6 (Qop_6). Visible geologic structure was not identified during our field investigation. As observed by our geologists in the bluff face to the west (and as observed by other geotechnical firms), the Paralic Deposits overlying the Point Loma Formation are relatively thin in vertical section. Their presence across the entire site indicates they have not been significantly offset by faulting.

Regional geologic structure was obtained by correlating data from geologic mapping and literature of the La Jolla area that indicates north-northwest strikes and 20- to 30-degree dips of Cretaceous formational materials to the south-southwest. Due to the essentially flat-lying terrain on which the property is located, these 20- to 30-degree dips do not create a stability problem for the essentially flat-lying property.

Paralic Deposits, also referred to as Marine Terrace Deposits, form on near horizontal wave-cut benches during sea-level regression and regional uplift. The geologic map by Kennedy and Tan, 2008 (refer to Figure No. IV excerpt), depicts a relatively level unconformity basal contact of the Old Paralic Deposits over the underlying Point Loma Formation (Kp).

It is our opinion that the general strength characteristics and structure of the Old Paralic Deposits, Unit 6, are favorable and suitable for bearing proposed structures and improvements.

VIII. GEOLOGIC HAZARDS

Our review of the City of San Diego Seismic Safety Study -- Geologic Hazards Map Sheet 29, dated 2008, indicates that the site is located in several geologic hazard areas designated as Categories (GHC) 11, 12 and 27. An excerpt of the map is included as Figure No. Va and an expanded excerpt is presented as Figure No. Vb. Category 11 is identified as a fault zone, described as *"Active, Alquist-Priolo Earthquake Fault Zone".* Category 12 is potentially active fault zone, described as "*Inactive, presumed inactive or activity unknown*." Category 27 is identified as a slide-prone formation *"Otay, Sweetwater and others."* We note that the subject site, located on level terrain, is not subject to potential landsliding.

Review of Figure No. Vb, an expanded portion of the City of San Diego Geologic Hazards Map (Figure No. Va), reveals that only the very northern corner of the property near the location of excavation HP-2 extends into the City-designated fault Zone 11, forming a small narrow triangle of Zone 11 on the property. The central portion of the property falls into GHC 27, i.e., no fault designations, and the southwestern edge of the property is within fault Zone 12, i.e., inactive, presumed inactive or activity unknown.

We provide on Figure No. VIa the properties in the vicinity of 1851 Spindrift Drive Fault Hazard Zone that are included in the State of California Special Studies Report (Alquist-Priolo) for the La Jolla Quadrangle. Properties requiring fault investigations are shown in yellow. We note that the 1851 Spindrift Drive property is indicated to be outside the Alquist-Priolo Zone requiring fault investigations. We provide on Figure No. VIb (an expanded scale of Figure No. VIa) the location of properties in the vicinity of the subject property upon which geotechnical/geologic investigations have been performed by GEI and other geotechnical firms. Properties investigated by GEI are shown in orange with GEI indicated, and the properties investigated by other firms are shown in blue-green.

We have utilized Figure No. VIb to show the locations of fault trenches that were placed on individual properties or on Spindrift Drive in front of investigated properties. Furthermore, we have used Figure No. VIa to show the extent of geologic observations that have been made on the bluff face exposures of the Point Loma Formation and the overlying Old Paralic Deposits (Qop_6). In addition to GEI, the firms of Southern California Soil and Testing (SCS&T, 1991) and Geosoils, Inc. (GSI, 2013 and 2017), performed evaluations of the bluff face exposures for faulting and fault-related features. All three investigating firms found no evidence of primary faulting or minor faulting offset of the overlying Paralic Deposits of the 80,000- to 120,000-year-old Bird Rock Terrace materials exposed on the bluff face. This information, along with the no-fault-found information from fault trenching on multiple private properties northeast of 1851 Spindrift Drive, strongly suggests that the primary rupture zone of the Rose Canyon Fault (well constrained by fault trenching) is located as mapped approximately paralleling the southwest side of Roseland Drive about 460 feet northeast of the subject property. The southwestern extent of geologic mapping of the bluff face exposure below 1834 Spindrift Drive by GSI (2013, 2017) indicates that the primary rupture zone of the Mount Soledad Fault would be approximately 70 feet southwest of the subject property.

All three referenced firms did observe jointing and breakage, some with minor offsets, along the bluff face exposures. We have shown the locations of the most significant features along with their strike and dip orientations on Figure No. VIb. Most such features observed were found to be trending at angles of 20 to 75 degrees to the mapped alignment of the Rose Canyon and Mount Soledad Faults. We interpret these features to be stress relief or sympathetic breakage in response to the movement that took place on the Rose Canyon and Mount Soledad Faults.

The reports by GSI and SCS&T both describe the same intraformational stress relief features, with some minor offsets and orientations, often at significant angles to the alignment to the mapped alignments of the Rose Canyon and Mount Soledad Faults. In our opinion, the sympathetic stress relief features, which can also be referred to as Riedel shear structures, do not present a significant fault offset hazard to the property and proposed construction project. Furthermore, the bluff face exposures revealed no evidence that the sympathetic response features offset materials of the overlying 80,000- to 120,000-year-old Bird Rock Terrace. It is therefore, our opinion that an active fault does not cross the property.

A. Local and Regional Faults

As described above, we performed a reconnaissance of the geologic features on the coastal bluff face across the street, approximately 300 feet from the subject site and no evidence of active faulting was observed. In addition, no intraformational breakage was observed to be trending towards the subject site. The following is a discussion of the geologic conditions and hazards common to the San Diego area, as well as project-specific geologic information relating to development of the subject site.

Rose Canyon Fault: The site is located within the Rose Canyon Fault Zone (Mount Soledad and Rose Canyon Faults). The Rose Canyon Fault is mapped trending north-south from Oceanside to downtown San Diego, from where it appears to head southward into San Diego Bay, through Coronado and offshore. The Rose Canyon Fault Zone is considered to be a complex zone of onshore and offshore, en echelon strike slip, oblique reverse, and oblique normal faults. The Rose Canyon Fault is considered to be capable of generating an M7.2 earthquake and is considered micro seismically active, although no significant recent earthquakes since 1769 are known to have occurred on the fault.

Investigative work on faults that are part of the Rose Canyon Fault Zone at the Police Administration and Technical Center in downtown San Diego, at the SDG&E facility in Rose Canyon, and within San Diego Bay and elsewhere within downtown San Diego, has encountered offsets in Holocene (geologically recent) sediments. These findings confirm Holocene displacement on the Rose Canyon Fault, which was designated an "*active*" fault in November 1991 (Hart and Bryant, 1997).

Rockwell (2010) has suggested that the RCFZ underwent a cluster of activity including 5 major earthquakes in the early Holocene, with a long period of inactivity following, suggesting major earthquakes on the RCFZ behaves in a cluster-mode, where earthquake recurrence is clustered in time rather than in a consistent recurrence interval. With the most recent earthquake (MRE) nearly 500 years ago, it is suggested that a period of earthquake activity on the RCFZ may have begun. Rockwell (2010) and a compilation of the latest research implies a long-term slip rate of approximately 1 to 2 mm/year.

Coronado Bank Fault: The Coronado Bank Fault is located approximately 12.4 miles southwest of the site. Evidence for this fault is based upon geophysical data (acoustic profiles) and the general alignment of epicenters of recorded seismic activity (Greene et al., 1979). The Oceanside earthquake of M5.3 recorded July 13, 1986, is known to have been centered on the fault or within the Coronado Bank Fault Zone. Although this fault is considered active, due to the seismicity within the fault zone, it is significantly less active seismically than the Elsinore Fault (Hileman et al., 1973). It is postulated that the Coronado Bank Fault is capable of generating a M7.6

earthquake and is of great interest due to its close proximity to the greater San Diego metropolitan area.

Newport-Inglewood Fault: The offshore portion of the Newport-Inglewood Fault Zone is located approximately 23 to 65 miles northwest of the site. A significant earthquake (M6.4) occurred along this fault on March 10, 1933. Since then, no additional significant events have occurred. The fault is believed to have a slip rate of approximately 0.6-mm/yr with an unknown recurrence interval. This fault is believed capable of producing an earthquake of M6.0 to M7.4 (Grant Ludwig and Shearer, 2004).

Elsinore Fault: The Elsinore Fault is located approximately 38 to 55 miles east and northeast of the site. The fault extends approximately 200 km (125 miles) from the Mexican border to the northern end of the Santa Ana Mountains. The Elsinore Fault zone is a 1- to 4-mile-wide, northwest-southeast-trending zone of discontinuous and en echelon faults extending through portions of Orange, Riverside, San Diego, and Imperial Counties. Individual faults within the Elsinore Fault Zone range from less than 1 mile to 16 miles in length. The trend, length and geomorphic expression of the Elsinore Fault Zone identify it as being a part of the highly active San Andreas Fault system.

Like the other faults in the San Andreas system, the Elsinore Fault is a transverse fault showing predominantly right-lateral movement. According to Hart et. al (1979), this movement averages less than 1 centimeter per year. Along most of its length, the Elsinore Fault Zone is marked by a bold topographic expression consisting of linearly aligned ridges, swales and hallows. Faulted Holocene alluvial deposits (believed to be less than 11,000 years old) found along several segments of the fault zone suggest that at least part of the zone is currently active.

Although the Elsinore Fault Zone belongs to the San Andreas set of active, northwest-trending, right-slip faults in the southern California area (Crowell, 1962), it has not been the site of a major earthquake in historic time, other than a M6.0 earthquake near the town of Elsinore in 1910 (Richter, 1958; Toppozada and Parke, 1982). However, based on length and evidence of late-Pleistocene or Holocene displacement, Greensfelder (1974) has estimated that the Elsinore Fault Zone is reasonably capable of generating an earthquake with a magnitude as large as M7.5. Study and logging of exposures in trenches placed in Glen Ivy Marsh across the Glen Ivy North Fault (a strand of the Elsinore Fault Zone between Corona and Lake Elsinore), suggest a maximum earthquake recurrence interval of 300 years, and when combined with previous estimates of the long-term horizontal slip rate of 0.8 to 7.0 mm/year, suggest typical earthquake magnitudes of M6.0 to M7.0 (Rockwell et.al, 1985). The Working Group on California Earthquake Probabilities (2008) has estimated that there is a 11 percent probability that an earthquake of M6.7 or greater will occur within 30 years on this fault.

San Jacinto Fault: The San Jacinto Fault is located approximately 60 to 81 miles northeast of the site. The San Jacinto Fault Zone consists of a series of closely spaced faults, including the Coyote Creek Fault, that form the western margin of the San Jacinto Mountains. The fault zone extends from its junction with the San Andreas Fault in San Bernardino, southeasterly toward the Brawley area, where it continues south of the international border as the Imperial Transform Fault (Rockwell et al., 2014).

The San Jacinto Fault zone has a high level of historical seismic activity, with at least 10 damaging earthquakes (M6.0 to M7.0) having occurred on this fault zone between 1890 and 1986. Earthquakes on the San Jacinto Fault in 1899 and 1918 caused fatalities in the Riverside County area. Offset across this fault is predominantly right-lateral, similar to the San Andreas Fault, although some investigators have suggested that dip-slip motion contributes up to 10% of the net slip (Ross et al., 2017).

The segments of the San Jacinto Fault that are of most concern to major metropolitan areas are the San Bernardino, San Jacinto Valley and Anza segments. Fault slip rates on the various segments of the San Jacinto are less well constrained than for the San Andreas Fault, but the available data suggest slip rates of 12 ±6 mm/yr for the northern segments of the fault, and slip rates of 4 ±2 mm/yr for the southern segments. For large ground-rupturing earthquakes on the San Jacinto fault, various investigators have suggested a recurrence interval of 150 to 300 years. The Working Group on California Earthquake Probabilities (2008) has estimated that there is a 31 percent probability that an earthquake of M6.7 or greater will occur within 30 years on this fault. Maximum credible earthquakes of M6.7, M6.9 and M7.2 are expected on the San Bernardino, San Jacinto Valley and Anza segments, respectively, capable of generating peak horizontal ground accelerations of 0.48g to 0.53g in the County of Riverside. A M5.4 earthquake occurred on the San Jacinto Fault on July 7, 2010.

The United States Geological Survey has issued the following statements with respect to the recent seismic activity on southern California faults:

> The San Jacinto fault, along with the Elsinore, San Andreas, and other faults, is part of the plate boundary that accommodates about 2 inches/year of motion as the Pacific plate moves northwest relative to the North American plate. The largest recent earthquake on the San Jacinto fault, near this location, the M6.5 1968 Borrego Mountain earthquake April 8, 1968, occurred about 25 miles southeast of the July 7, 2010, M5.4 earthquake.
>
> This M5.4 earthquake follows the 4th of April 2010, Easter Sunday, M7.2 earthquake, located about 125 miles to the south, well south of the US Mexico international border. A M4.9 earthquake occurred in the same

area on June 12th at 8:08 pm (Pacific Time). Thus, this section of the San Jacinto fault remains active.

Seismologists are watching two major earthquake faults in southern California. The San Jacinto fault, the most active earthquake fault in southern California, extends for more than 100 miles from the international border into San Bernardino and Riverside, a major metropolitan area often called the Inland Empire. The Elsinore fault is more than 110 miles long, and extends into the Orange County and Los Angeles area as the Whittier fault. The Elsinore fault is capable of a major earthquake that would significantly affect the large metropolitan areas of southern California. The Elsinore fault has not hosted a major earthquake in more than 100 years. The occurrence of these earthquakes along the San Jacinto fault and continued aftershocks demonstrates that the earthquake activity in the region remains at an elevated level. The San Jacinto fault is known as the most active earthquake fault in southern California. Caltech and USGS seismologists continue to monitor the ongoing earthquake activity using the Caltech/USGS Southern California Seismic Network and a GPS network of more than 100 stations.

B. Other Geologic Hazards

Ground Rupture: Ground rupture is characterized by bedrock slippage along an established fault and may result in displacement of the ground surface. For ground rupture to occur along a fault, an earthquake usually exceeds M5.0. If a M5.0 earthquake were to take place on a local fault, an estimated surface-rupture length 1 mile long could be expected (Greensfelder, 1974). Our investigation indicates that the subject site is not directly on a known active fault trace and, therefore, the risk of ground rupture is remote.

Ground Shaking: Structural damage caused by seismically induced ground shaking is a detrimental effect directly related to faulting and earthquake activity. Ground shaking is considered to be the greatest seismic hazard in San Diego County. The intensity of ground shaking is dependent on the magnitude of the earthquake, the distance from the earthquake, and the seismic response characteristics of underlying soils and geologic units. Earthquakes of M5.0 or greater are generally associated with significant damage. It is our opinion that the most serious damage to the site would be caused by a large earthquake originating on a nearby strand of the Rose Canyon Fault Zone. Although the chance of such an event is remote, it could occur within the useful life of the retaining wall.

Landslides: Based upon our geotechnical investigation, review of the geologic map (Kennedy and Tan, 2008), review of the referenced City of San Diego Seismic Safety Study -- Geologic Hazards Map Sheet 29 and stereo-pair aerial photographs AXN-8M-2 and 3 (04-11-1953), there are no known landslides located on the site.

Slope Stability: The site and general vicinity is relatively level terrain. Slope stability analysis has not been performed for the proposed project.

Liquefaction: The liquefaction of saturated sands during earthquakes can be a major cause of damage to buildings. Liquefaction is the process by which soils are transformed into a viscous fluid that will flow as a liquid when unconfined. It occurs primarily in loose, saturated sands and silts when they are sufficiently shaken by an earthquake.

On this site, the risk of liquefaction of foundation materials due to seismic shaking is considered to be very low due to the medium dense nature of the natural-ground material and the lack of a true shallow static groundwater surface under the site. In our opinion, the site has a very low potential for soil strength loss to occur due to a seismic event.

Tsunami and Seiche: A tsunami is a series of long waves generated in the ocean by a sudden displacement of a large volume of water. Underwater earthquakes, landslides, volcanic eruptions, meteor impacts, or onshore slope failures can cause this displacement. Tsunami waves can travel at speeds averaging 450 to 600 miles per hour. As a tsunami nears the coastline, its speed diminishes, its wave length decreases, and its height increases greatly. After a major earthquake or other tsunami-inducing activity occurs, a tsunami could reach the shore within a few minutes. One coastal community may experience no damaging waves while another may experience very destructive waves. Some low-lying areas with the potential for significant tsunami impact could experience severe inland inundation of water and deposition of debris more than 3,000 feet inland.

Historical wave heights and run-up elevations from tsunamis that have impacted the San Diego Coast have historically fallen within the normal range of the tides (Joy, 1968). The site is located approximately 300 feet from the exposed coastline and at an elevation of approximately 60 to 71 feet above MSL. Furthermore, the site is not mapped within the "tsunami inundation area" of the Tsunami Inundation Map for Emergency Panning, La Jolla Quadrangle, 2009, by the California Emergency Planning Agency, California Geological Survey and University of Southern California. An excerpt of the map and legend are presented as Figure No. VII. It is our opinion, based on the elevation of the site, that the risk of tsunami inundation is low.

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. The site is not located within immediately downstream from a lake or embayment. There are no significant bodies of water located at higher elevation or in the general vicinity of the capable of producing a seiche and inundating the site.

C. Geologic Hazards Summary

It is our opinion based on multiple investigations by ourselves and others that the actual trace of the Rose Canyon Fault within Zone 11 of the City of San Diego Geologic Hazards Maps is approximately 460 feet northeast of the subject property located at 1851 Spindrift Drive. We note that this is also the only location where the Rose Canyon Fault is actually exposed and mapped in the coastal bluff face. The only other formational joints and breakage observed in the bluff face by ourselves and others are considered to be stress relief features resulting from sympathetic response of Point Loma Formation materials to movement on the primary traces of the Rose Canyon and Mount Soledad Faults to the northeast and southwest of the property. In our opinion these breakage features do not present a significant fault offset hazard to the proposed project and an active fault does not underlie the property.

Based upon a review of the available maps, our research and our site investigation, the site is underlain at relatively shallow depth by natural topsoil and subsoils overlying formational materials and is suited for the proposed project provided the recommendations presented herein are implemented. If excavations deeper than the distance to property lines are required, then temporary shoring may be necessary. Based on our current understanding of the proposed construction, it is our explicit opinion that the proposed site development would not destabilize neighboring properties or induce the settlement of adjacent structures or City street improvements if designed and constructed in accordance with our recommendations. No significant geologic hazards are known to exist on the subject site that would prohibit the proposed construction.

Ground shaking from earthquakes on active southern California faults and active faults in northwestern Mexico is the greatest geologic hazard at the site. Design of the proposed retaining walls in accordance with the current building codes would reduce the potential for injury or loss of human life.

IX. GROUNDWATER

Groundwater was not encountered in our exploratory excavations during the field investigation. We do not anticipate significant groundwater problems to develop in the future, *if the property is developed as proposed and proper drainage is implemented and maintained.*

It should be kept in mind that grading operations can change surface drainage patterns and/or reduce permeabilities due to the densification of compacted soils. Such changes of surface and subsurface hydrologic conditions, plus irrigation of landscaping or significant increases in rainfall, may result in the appearance of surface or near-surface water at locations where none existed previously. The appearance of such water is expected to be localized and cosmetic in nature, if good positive drainage is implemented, as recommended in this report, during and at the completion of construction.

It must be understood that unless discovered during initial site exploration or encountered during site grading operations, it is extremely difficult to predict if or where perched or true groundwater conditions may appear in the future. When site formational soils are fine-grained and of low permeability, water problems may not become apparent for extended periods of time.

Water conditions, where suspected or encountered during grading operations, should be evaluated and remedied by the project civil and geotechnical consultants. The project developer and property owner, however, must realize that post-construction appearances of groundwater may have to be dealt with on a site-specific basis.

X. CONCLUSIONS AND RECOMMENDATIONS

The following recommendations are based upon the practical field investigations conducted by our firm, and resulting laboratory tests, in conjunction with our knowledge and experience with similar soils in the La Jolla area. The opinions, conclusions, and recommendations presented in this report are contingent upon ***Geotechnical Exploration, Inc.*** being retained to review the final plans and specifications as they are developed and to observe the site earthwork and installation of foundations. Accordingly, we recommend that the following paragraph be included on the grading and foundation plans for the project.

> *If the geotechnical consultant of record is changed for the project, the work shall be stopped until the replacement has agreed in writing to accept responsibility within their area of technical competence for approval upon completion of the work. It shall be the responsibility of the permittee to notify the governing agency in writing of such change prior to the recommencement of grading and/or foundation installation work and comply with the governing agency's requirements for a change to the Geotechnical Consultant of Record for the project.*

We recommend that the foundations for the proposed structure be supported and founded on medium dense formational soils or properly recompacted fill. Existing fill soils and landscape topsoils across the site are not suitable in their current condition to support the loads from structures or additional fill soils. A full removal and recompaction of all existing fill soils and topsoils will be required prior to construction of the residential structure or associated improvements. Due to the presence of existing retaining walls along the northeast and southwest property lines, temporary shoring will most likely be required along the northeast and southwest property lines to prevent excavations from caving during grading operations. Fill soils across the site will be required to be compacted to at least 90 percent relative compaction. Existing fill soil materials are suitable for use as recompacted fill soils. Topsoils should be selectively removed from the building pad area and should not be used as fill material. Any buried trash encountered during the existing wall demolition and fill soil recompaction should be removed and exported off site.

A. Site Soil Preparation and Earthwork

1. *Clearing and Stripping:* Demolition of the existing house structure along with any existing site improvements should be undertaken within the areas of the proposed new construction. This is to include the complete removal of all subsurface footings, utility lines and miscellaneous debris. After clearing, the ground surface should be stripped of existing vegetation within the areas of proposed new construction. This includes any roots from existing trees and shrubbery. Holes resulting from the removal of root systems or other buried obstructions that extend below the planned grades should be cleared and backfilled with suitable compacted material compacted to the requirements provided under Recommendation Nos. 3, 4, and 5 below after the excavation bottom has exposed dense formational soils as confirmed by our representative. Prior to any filling operations, the cleared and stripped vegetation and debris should be disposed of off-site.

2. *Shoring Installation and Excavation:* After the site has been cleared and stripped, soldier beam installation for the shoring should be performed most likely along the northeast and southeast property lines. During excavation

operations, drainage geodrain and lagging should be installed. Excavated material should be stockpiled in a safe and suitable location so as not the surcharge the top of any temporary slopes or adjacent site improvements. Topsoils should be selectively removed during excavation operations as these soils are not suitable to use as fill material. All existing fill and loose natural soils should be entirely in the building pad area until medium dense formational materials are exposed. The anticipated depth of removal will be between 3 to 8 feet below existing grade. Excavations made adjacent to property lines will require temporary shoring where the depth of the excavation exceeds the distance to the property line, and temporary shoring should be installed before grading starts.

Based on the results of our exploratory test pits, as well as our experience with similar materials in the project area, it is our opinion that the existing fill soils, topsoils and Old Paralic Deposits, Unit 6 formational materials can be excavated utilizing ordinary light to heavy weight earthmoving equipment. Contractors should not, however, be relieved of making their own independent evaluation of excavating the on-site materials prior to submitting their bids. Variability in excavating the subsurface materials should be expected across the project area.

The areal extent should extend at least 5 feet beyond the outer envelope of any new structures or improvements, or the depth of the soil removal required excavations, whichever is larger. Total depth of excavations required to remove the existing fill and loose natural soils should be confirmed by our representatives during the excavation work based on their examination of the soils being exposed.

3. *Material for Fill:* Existing on-site low-expansion potential (Expansion Index of 50 or less per ASTM D4829-19) soils with an organic content of less than 3 percent by volume are, in general, suitable for use as fill. Imported fill material, where required, should have a low-expansion potential. In addition, both imported and existing on-site materials for use as fill should not contain rocks or lumps more than 6 inches in greatest dimension if the fill soils are compacted with heavy compaction equipment (or 3 inches in greatest dimension if compacted with lightweight equipment). All materials for use as fill should be approved by our representative prior to importing to the site.

   Medium to highly expansive soils should not be used as fill material on the site. High organic content landscape topsoils existing at the site should be selectively removed during excavation operations. Backfill material to be placed behind retaining walls should be low expansive (E.I. less than 50), with rocks no larger than 3 inches in diameter.

4. *Fill Compaction:* All structural fill, wall backfill and areas to receive any associated improvements, should be compacted to a minimum degree of compaction of 90 percent based upon ASTM D1557-12e1. Fill material should be spread and compacted in uniform horizontal lifts not exceeding 8 inches in uncompacted thickness. Before compaction begins, the fill should be brought to a water content that will permit proper compaction by either: (1) aerating and drying the fill if it is too wet, or (2) watering the fill if it is too dry. Each lift should be thoroughly mixed before compaction to ensure a uniform distribution of moisture. Soil compaction testing by nuclear method ASTM D6938-17a or sand cone method ASTM D1556-15e1 should be performed every 2 feet of fill placement by a representative of ***Geotechnical Exploration, Inc.*** Furthermore, our representative should perform necessary observation of fill placement during grading operations throughout the project.

Any rigid improvements founded on the existing undocumented fill soils can be expected to undergo movement and possible damage. ***Geotechnical Exploration, Inc.*** takes no responsibility for the performance of any improvements built on loose natural soils or inadequately compacted fills. Subgrade soils in any exterior area receiving concrete improvements should be verified for compaction and moisture by a representative of our firm within 48 hours prior to concrete placement.

No uncontrolled fill soils should remain after completion of the site work. In the event that temporary ramps or pads are constructed of uncontrolled fill soils, the loose fill soils should be removed and/or recompacted prior to completion of the grading operation.

5. *Trench and Retaining Wall Backfill:* All utility trenches and retaining walls should be backfilled with properly compacted fill. Backfill material should be placed in lift thicknesses appropriate to the type of compaction equipment utilized and compacted to a minimum degree of compaction of 90 percent by mechanical means. Any portion of the trench backfill in public street areas within pavement sections should conform to the material and compaction requirements of the adjacent pavement section. Our experience has shown that even shallow, narrow trenches, such as for irrigation and electrical lines, that are not properly compacted can result in problems, particularly with respect to shallow groundwater accumulation and migration. Soil compaction testing by nuclear method ASTM D6938-17a or sand cone method ASTM D1556-15e1 should be performed for every 2 feet of fill placement by a representative of ***Geotechnical Exploration, Inc.*** in retaining wall and trench backfill areas as well in general fill or backfill areas.

Backfill soils placed behind retaining walls should be installed as early as the retaining walls are capable of supporting lateral loads. Backfill soils behind retaining walls should be low expansive (Expansion Index less than 50 per ASTM D4829).

6. Observations and Testing: As stated in CBC 2019, Section 1705.6 Soils: "*Special inspections and tests of existing site soil conditions, fill placement and load-bearing requirements shall be performed in accordance with this section and Table 1705.6 (see below). The approved geotechnical report and the construction documents prepared by the registered design professionals shall be used to determine compliance. During fill placement, the special inspector shall verify that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report." A summary of* Table 1705.6 "REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS" is presented below:

a) Verify materials below shallow foundations are adequate to achieve the design bearing capacity;
b) Verify excavations are extended to proper depth and have reached proper material;
c) Perform classification and testing of compacted fill materials;
d) Verify use of proper materials, densities and ft thicknesses during placement and compaction of compacted fill prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.

Section 1705.6 “Soils” statement and Table 1705.6 indicates that it is mandatory that a representative of this firm (responsible engineering firm) perform observations and fill compaction testing during excavation operations to verify that the remedial operations are consistent with the recommendations presented in this report. All grading excavations resulting from the removal of soils should be observed and evaluated by a representative of our firm before they are backfilled.

Quality control grading observation and field density testing for the purpose of documenting that adequate compaction has been achieved and acceptable soils have been utilized to properly support a project applies not only to fill soils supporting primary structures (unless supported by deep foundations or caissons) but all site improvements such as stairways, patios, pools and pool decking, sidewalks, driveways and retaining walls, etc. Observation and testing of utility line trench backfill also reduces the potential for localized settlement of all of the above including all improvements outside of the footprint of primary structures.

Often after primary building pad grading, it is not uncommon for the geotechnical engineer of record to not be notified of grading performed outside the footprint of the project primary structures. As a result, settlement damage of site improvements such as patios, pool and pool decks, exterior landscape walls and walks, and structure access stairways can occur. It is therefore strongly recommended that the project general contractor, grading contractor, and others tasked with completing a project with workmanship that reduces the potential for damage to the project from soil settlement, or expansive soil uplift, be advised and acknowledge the importance of adequate and comprehensive observation and testing of soils intended to support the project they are working on. The project geotechnical engineer of record must be contacted and requested to provide these services.

Failure to comply with this recommendation can result in several costly and time-consuming requirements from the governing municipality or county engineering and planning departments. For example, the geotechnical and/or civil engineer of record may be required to:

- Clarify if observation and testing services were performed for all grading shown on the Grading Plans. If not, indicate the areas NOT observed or tested on the As-Graded Geological Map.

- A construction change must be processed to indicate the revised grading recommendations by the geotechnical engineer of work on the plans.

- The geotechnical engineer must submit on addendum letter addressing the change to the grading plan specifications for the earthwork presented on the grading plans.

- The geotechnical consultant must evaluate the existing unobserved/undocumented fill as an uncontrolled embankment and provide a statement indicating the uncontrolled embankment will not endanger the public health, safety and welfare. In order to make this statement the geotechnical engineer would have to clearly define the potential problems such as damage to project improvements that could result from construction on undocumented fill soils.

- The geotechnical consultant must indicate if the unobserved fill placed during earthwork within the limits of work is suitable for the intended use. To render such an opinion the geotechnical consultant would have to place a sufficient number of test excavations and conduct enough testing to warrant such an opinion.

- If the geotechnical consultant cannot render an opinion that the unobserved fill is suitable for the purpose intended, *"…They must indicate if additional fill remedial grading is recommended*."

- The limits of the "Unobserved fill/uncontrolled embankment must be shown on revised grading plans along with the "Uncontrolled Embankment Maintenance Agreement Approval Number."

- The owner must execute an "Uncontrolled Embankment Agreement: for the portion of the undocumented fill to remain. This must be coordinated with the LDR Drainage and Grading reviewer.

- The title and date of the requested addendum letter or geotechnical investigation report must be added under note no. 1 of the "Grading and Geotechnical Specification" Certification as construction change "A".

- These changes must be made on a redline copy and submitted as a "Construction Change A" for review and approval by the geology section and Drainage and Grades Section.

- All approved changes will then be transferred to the mylars for approval and signatures by the Deputy City Engineer.

The geotechnical engineer of record, in this case ***Geotechnical Exploration, Inc.,*** cannot be held responsible for the costs and time delays associated with the lack of contact and requests for testing services by the client, general contractor, grading contractor or any of the project design team responsible for requesting the required geotechnical services. Requests for services are to be made through our office telephone number (858) 549-7222 and the telephone number of the GEI personnel assigned to the project.

B. Seismic Design Criteria

7. *Seismic Data Bases:* The estimation of the peak ground acceleration and the repeatable high ground acceleration (RHGA) likely to occur at the site is based on the known significant local and regional faults within 100 miles of the site.

8. *Seismic Design Criteria:* The proposed structure should be designed in accordance with the 2019 CBC, which incorporates by reference the ASCE 7-16 for seismic design. We have determined the mapped spectral acceleration values for the site based on a latitude of 32.8506 degrees and a longitude of -117.2622 degrees, utilizing a program titled "*Seismic Design Map Tool" and* provided by the USGS through SEAOC, which provides a solution for ASCE 7-16 utilizing digitized files for the Spectral Acceleration maps. See Appendix B.

9. *Structure and Foundation Design*: The design of the new structures and foundations should be based on Seismic Design Category D, Risk Category II.

10. *Spectral Acceleration and Design Values*: The structural seismic design, when applicable, should be based on the following values, which are based on the site location, soil characteristics, and seismic maps by USGS, as required by

the 2019 CBC. A response Spectrum Acceleration (SA) vs. Period (T) for the site is also included in Appendix B. The Site Class D (Stiff Soils) values for this property are:

TABLE I
Mapped Spectral Acceleration Values and Design Parameters

S_s	S_1	F_a	F_v	S_{ms}	S_{m1}	S_{ds}	S_{d1}
1.403g	0.491g	1.000	1.81	1.403g	0.889g	0.936g	0.592g

C. Foundation Recommendations

11. *Footings:* We recommend that the proposed structures be supported on conventional, individual-spread and/or continuous footing foundations bearing on formational or properly compacted fill material. No footings should be underlain by undocumented fill soils. All building footings should be built on formational soils or properly compacted fill prepared as recommended above in Recommendation Nos. 3, 4 and 5. All footings for one- to two-story structures should be founded at least 18 inches below the lowest adjacent finished grade and into competent soils.

The bearing surfaces of footings located adjacent to utility trenches should be situated below an imaginary 1.0:1.0 plane projected upward from the bottom edge of the adjacent utility trench. Otherwise, the utility trenches should be excavated farther from the footing locations. Footings located adjacent to the tops of slopes should be extended sufficiently deep in order to provide at least 8 feet of horizontal cover between the slope face and outside edge of the footing at the footing bearing level.

12. *Bearing Values:* At the recommended depths, footings on formational or properly recompacted fill soils may be designed for allowable bearing pressures of 2,000 pounds per square foot (psf) for combined dead and live loads and 2,660 psf for all loads, including wind or seismic. The footings should, however, have a minimum width of 18 inches and comply with the lateral footing setback of 7 feet to the slope face. An increase in soil allowable static bearing can be used as follows: 800 psf for each additional foot over 1½ feet in depth, and 500 psf for each additional foot in width over 1 foot, to a total allowable static bearing pressure not exceeding 5,000 psf. The static soil bearing value may be increased one-third for seismic and wind load analysis.

13. *Footing Reinforcement:* All footings should be reinforced as specified by the structural engineer. However, based on our field investigation findings and laboratory testing, we provide the following minimum recommendations. All continuous footings should contain top and bottom reinforcement to provide structural continuity and to permit spanning of local irregularities. We recommend that at least four No. 5 reinforcing bars be provided in the footings (two near the top and two near the bottom). A minimum clearance of 3 inches should be maintained between steel reinforcement and the bottom or sides of the footing.

    In order for us to offer an opinion as to whether the footings are founded on soils of sufficient load bearing capacity and with the necessary 7 feet of horizontal cover to the slope face, it is essential that our representative inspect the footing excavations prior to the placement of reinforcing steel or forms.

NOTE: The project Civil/Structural Engineer should review all reinforcing schedules. The reinforcing minimums recommended herein are not to be construed as structural designs, but merely as minimum reinforcement to reduce the potential for cracking and separations.

14. *Lateral Loads:* Lateral load resistance for the structure supported on footing foundations may be developed in friction between the foundation bottoms and the supporting subgrade. An allowable friction coefficient of 0.40 is considered applicable. An additional allowable passive resistance equal to an equivalent fluid weight of 270 pounds per cubic foot (pcf) acting against the foundations may be used in design provided the footings are poured neat against the dense formational or properly compacted fill materials. These lateral resistance values assume a level surface in front of the footing for a minimum distance of three times the embedment depth of the footing and any shear keys, but not less than 7 feet from a slope face, measured from effective top of foundation. Retaining walls supporting surcharge loads or affected by upper foundations should consider the effect of those upper loads.

15. *Settlement:* Settlements under the structure loads are expected to be within tolerable limits for the proposed construction. For footings designed in accordance with the recommendations presented in the preceding paragraphs, we anticipate that total settlements should not exceed 1 inch and that post-construction differential angular rotation should be less than 1/240.

16. *Retaining and Shoring Walls:* Where temporary slope recommendations cannot be met due to limitations such as close proximity to property lines or existing structures, shoring will be required. Based on the design and location of the proposed house structure and required soil removals during grading

operations, shoring will be most likely required along the northeast and southeast property lines. Geologic observations by our firm will be mandatory for excavations over 3 feet in height. If our geologist considers that soil or geologic features show potential instability for temporary excavations, additional unanticipated shoring may be required.

The active earth pressure (to be utilized in the design of cantilever, non-restrained walls) with properly compacted backfill should be based on an Equivalent Fluid Weight of 38 pcf (for level backfill only) if on-site low expansive soils are used. Additional uniform vertical loads applied within the potential failure block should be added to the active soil earth pressure by multiplying the vertical surcharge load by a 0.32 lateral earth pressure coefficient to convert them to uniform lateral loads.

For shoring design, we recommend that 43 pcf equivalent fluid pressure be used for level backfill condition. For soldier pile shoring, we recommend an allowable average shaft frictional capacity of 550 psf. The soldier piles may have an allowable passive resistance of 275 pcf applied on 2.5 times the diameter, times the effective depth of embedment. The effective depth of embedment in areas close to a descending slope face should start at a depth providing at least 8 feet of lateral cover to the pile face.

Wherever walls will be subjected to surcharge loads, they should also be designed for an additional uniform lateral pressure equal to one-third the anticipated surcharge pressure in the case of unrestrained walls and one-half the anticipated surcharge pressure in the case of restrained walls.

For seismic design of unrestrained walls over 6 feet in retaining height, we recommend that the seismic pressure increment be taken as a fluid pressure distribution utilizing an equivalent fluid weight of 17 pcf. A kh value of 0.18 may be used when designing retaining walls with a computer program such as *Retain Pro*.

The passive earth pressure of the encountered formation or properly recompacted fill soils to be used for design of shallow foundations and footings to resist the lateral forces, should be based on an allowable Equivalent Fluid Weight of 275 pcf. This passive earth pressure is valid for design only if the ground adjacent to the foundation structure is essentially level for a distance of at least three times the total depth of the foundation and is properly compacted or dense natural soil. An allowable Coefficient of Friction of 0.40 times the dead load may be used between the bearing soils and concrete foundations, walls or floor slabs.

The preceding design pressures assume that the walls are backfilled with low expansion potential materials (Expansion Index less than 50) and that there is sufficient drainage behind the walls to prevent the build-up of hydrostatic pressures from surface water infiltration. We recommend that wall drainage be provided using J-Drain 200/220 and J-Drain-SWD. No gravel or separate pipe is required with the J-Drain system. The upper edge of the geodrain board material should terminate 12 inches below the finish surface where the surface is covered by slabs or 18 inches below the finish surface in landscape areas. Gravel should only be used behind retaining walls where space constraints prohibit the proper compaction of backfill soils. For more information, refer to Figure No. VIII, Retaining Wall Drainage Recommendations.

Backfill placed behind the walls should be compacted to a minimum degree of compaction of 90 percent using light compaction equipment (95 percent if placed in the building pad area where a cut-fill transition exists beneath the structure). If heavy equipment is used, the walls should be appropriately temporarily braced. The structural plans should specify if any retaining walls should be braced as soon as they are built, prior to backfill placement.

D. Concrete Slab on-grade Criteria

Slabs on-grade may only be used on medium dense formational soils or properly compacted fill soils.

17. *Minimum Floor Slab Thickness and Reinforcement:* Based on our experience, we have found that, for various reasons, floor slabs occasionally crack. Therefore, we recommend that all slabs on-grade contain at least a minimum amount of reinforcing steel to reduce the separation of cracks, should they occur. Slab subgrade soil should be verified by a ***Geotechnical Exploration, Inc***. representative to have the proper moisture content within 48 hours prior to placement of the vapor barrier and pouring of concrete.

    In our opinion, new interior floor slabs should be at least 4 inches actual thickness and be reinforced with a minimum of No. 3 steel bars on 15-inch centers, both ways, placed at mid-height in the slab. We also opine that the lower level (basement) garage slabs be at least 6 inches thick and reinforced with No. 4 bars at 15-inch on center spacing. Soil moisture content should be kept above the optimum prior to waterproofing placement under the new concrete slab. Any interior slabs should be underlain by a vapor barrier and may be placed directly on formational soils or properly compacted subgrade surface.

We note that shrinkage cracking can result in reflective cracking in brittle flooring surfaces such as stone and tiles. It is imperative that if movement intolerant flooring materials are to be utilized, the flooring contractor and/or architect should provide specifications for the use of high-quality isolation membrane products installed between slab and floor materials.

18. *Slab Moisture Emission:* Although it is not the responsibility of geotechnical engineering firms to provide moisture protection recommendations, as a service to our clients we provide the following discussion and suggested minimum protection criteria. Actual recommendations should be provided by the project architect and waterproofing consultants or product manufacturer. It is recommended to contact the vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.

Soil moisture vapor can result in damage to moisture-sensitive floors, some floor sealers, or sensitive equipment in direct contact with the floor, in addition to mold and staining on slabs, walls and carpets. The common practice in Southern California is to place vapor retarders made of PVC, or of polyethylene. PVC retarders are made in thickness ranging from 10- to 60-mil. Polyethylene retarders, called visqueen, range from 5- to 10-mil in thickness. These products are no longer considered adequate for moisture protection and can actually deteriorate over time.

Specialty vapor retarding and barrier products possess higher tensile strength and are more specifically designed for and intended to retard moisture transmission into and through concrete slabs. The use of such products is highly recommended for reduction of floor slab moisture emission.

The following American Society for Testing and Materials (ASTM) and American Concrete Institute (ACI) sections address the issue of moisture transmission into and through concrete slabs: ASTM E1745-17 Standard Specification for Plastic Water Vapor Retarders Used in Contact Concrete Slabs; ASTM E1643-18a Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials; and ACI 302.1R-15 Guide to Concrete Floor and Slab Construction.

18.1 Based on the above, we recommend that the vapor barrier consist of a minimum 15-mil extruded polyolefin plastic (no recycled content or woven materials permitted). Permeance as tested before and after mandatory conditioning (ASTM E1745 Section 7.1 and subparagraphs 7.1.1-7.1.5) should be less than 0.01 perms (grains/square foot/hour/per inch of Mercury) and comply with the ASTM E1745-17 Class A requirements. Installation of vapor barriers should be in accordance with ASTM E1643-18a. The basis of design is 15-mil Stego Wrap vapor barrier placed per the manufacturer’s guidelines. Reef Industries Vapor Guard membrane has also been shown to achieve a permeance of less than 0.01 perms. We recommend that the slab be poured directly on the vapor barrier, which is placed directly on the prepared properly compacted smooth subgrade soil surface.

18.2 Common to all acceptable products, vapor retarder/barrier joints must be lapped at least 6 inches. Seam joints and permanent utility penetrations should be sealed with the manufacturer's recommended tape or mastic. Edges of the vapor retarder should be extended to terminate at a location in accordance with ASTM E1643-18a or to an alternate location that is acceptable to the project's structural engineer. All terminated edges of the vapor retarder should be sealed to the building foundation (grade beam, wall, or slab) using the manufacturer's recommended accessory for sealing the vapor retarder to pre-existing or freshly placed concrete. Additionally, in actual practice, stakes are often driven through the retarder material, equipment is dragged or rolled across the retarder, overlapping or jointing is not properly implemented, etc. All these construction deficiencies reduce the retarder's effectiveness. In no case should retarder/barrier products be punctured or gaps be allowed to form prior to or during concrete placement. Vapor barrier-safe screeding and forming systems should be used that will not leave puncture holes in the vapor barrier, such as Beast Foot (by Stego Industries) or equivalent.

18.3 Vapor retarders/barriers do not provide full waterproofing for structures constructed below free water surfaces. They are intended to help reduce or prevent vapor transmission and/or capillary migration through the soil and through the concrete slabs. Waterproofing systems must be designed and properly constructed if full waterproofing is desired. The owner and project designers should be consulted to determine the specific level of protection required.

18.4 Following placement of any concrete floor slabs, sufficient drying time must be allowed prior to placement of floor coverings. Premature placement of floor coverings may result in degradation of adhesive materials and loosening of the finish floor materials.

19. *Exterior Slab Thickness and Reinforcement:* Exterior slab reinforcement and control joints should be designed by the project Structural Engineer. As a minimum for protection of on-site improvements, we recommend that all exterior pedestrian concrete slabs be at least 4 inches thick, reinforced with No. 3 bars at 15-inch centers, both ways at the center of the slab, and contain adequate isolation and control joints.

The performance of on-site improvements can be greatly affected by soil base preparation and the quality of construction. It is therefore important that all improvements are properly designed and constructed for the existing soil conditions. The improvements should not be built on loose soils or fills placed without our observation and testing. Slabs on-grade may only be used on medium dense formational soils or properly compacted fill soils.

E. ***Pavements***

20. *Concrete Pavement:* In order to control shrinkage cracking, the design of concrete reinforcement and saw-cut weakened-plane joints should be provided by the project Structural Engineer, however, we recommend that as a minimum driveways subject only to automobile and light truck traffic be at least 5½ inches thick and be supported directly on properly prepared/compacted on-site subgrade sols. The upper 12 inches of the subgrade below the slab should be compacted to a minimum degree of

compaction of 95 percent just prior to paving. The concrete should conform to Section 201 of The Standard Specifications for Public Works Construction, 2018 Edition, for Class 560-C-3250.

21. *Interlocking Permeable Pavers*: If desired for use, we recommend that permeable pavement pavers for the driveway (subject only to automobile and light truck traffic), be supported on a 1½ inches of bedding No. 8 sand on a 6-inch thickness of crushed miscellaneous base conforming to Section 200-2 of the Standard Specifications for Public Works Construction, 2018 Edition or 6 inches of No. 57 crushed rock gravel per ASTM D448 gradation. The upper 6 inches of the pavement subgrade soil, as well as the aggregate base layer, should be compacted to a minimum degree of compaction of 95 percent. Preparation of the subgrade and placement of the base materials should be performed under the observation of our representative.

F. Site Drainage Considerations

22. *Surface Drainage:* Adequate measures should be taken to properly finish-grade the site after the new improvements are in place. Drainage waters from this site and adjacent properties should be directed away from the footings, slabs, and slopes, onto the natural drainage direction for this area or into properly designed and approved drainage facilities provided by the project civil engineer. Proper subsurface and surface drainage will help reduce the potential for waters to seek the level of the bearing soils under the wall footings or other extensive improvements.

Failure to observe this recommendation could result in undermining, soil expansion, and possible differential settlement of the retaining wall or other improvements or cause other moisture-related problems. Currently, the 2019 CBC requires a minimum of 1 percent surface gradient for proper drainage of building pads unless waived by the building official. Concrete pavement may have a minimum gradient of 0.5-percent. The surface gradient adjacent to structures must drain away as indicated in the 2019 CBC.

Due to the possible build-up of groundwater (derived primarily from rainfall and irrigation), excess moisture is a common problem behind retaining walls that may be planned. These problems are generally in the form of water seepage through walls and mineral staining. In order to minimize the potential for moisture-related problems to develop, the backfill side of all retaining walls must be adequately waterproofed and drained.

23. *Erosion Control*: Appropriate erosion control measures should be taken at all times during and after construction to prevent surface runoff waters from entering footing excavations or ponding on finished grade.

24. *Planter Drainage:* Planter areas and planter boxes should be sloped to drain away from the foundations. Planter boxes should be constructed with a closed bottom and a subsurface drain, installed in gravel, with the direction of subsurface and surface flow away from the footings to an adequate drainage facility.

25. *Drainage Quality Control*: It must be understood that it is not within the scope of our services to provide quality control oversight for surface or subsurface drainage construction or retaining wall sealing and base of wall drain

construction. It is the responsibility of the contractor to verify proper wall sealing, geofabric installation, protection board (if needed), drain depth below interior floor or yard surface, pipe percent slope to the outlet, etc.

G. ***General Recommendations***

26. *Cal-OSHA*: Where not superseded by specific recommendations presented in this report, trenches, excavations, and temporary slopes at the subject site should be constructed in accordance with Title 8, Construction Safety Orders, issued by Cal-OSHA.

27. *Project Start Up Notification:* In order to reduce any work delays during site excavation and development, our firm should be contacted at least 48 hours before any required observation of footing excavations or field density testing of compacted fill soils. If possible, placement of formwork and steel reinforcement in footing excavations should not occur prior to our observations of the excavations. If our observations reveal the need for deepening or re-designing foundation structures at any locations, any formwork or steel reinforcement in the affected footing excavation areas would have to be removed before the correction of the observed problem (i.e., deepening the footing excavation, compacting or removal of loose soil in the bottom of the excavation, etc.).

28. *Construction Best Management Practices (BMPs):* Sufficient BMPs must be installed to prevent silt, mud, or other construction debris from being tracked into the adjacent street(s) or stormwater conveyance systems due to construction vehicles or any other construction activity. The contractor is responsible for cleaning any such debris that may be in the street at the end

of each work day or after a storm event that causes a breach in the installed construction BMPs.

All stockpiles of uncompacted soil and/or building materials that are left unprotected for a period greater than 7 days are to be provided with erosion and sediment controls. Such soil must be protected each day when the probability of rain is 40% or higher. A concrete washout should be provided on all projects that propose the construction of any concrete improvements that are to be poured in place. All erosion/sediment control devices should be maintained and in working order at all times. All slopes that are created or disturbed by construction activity must be protected against erosion and sediment transport at all times. The storage of all construction materials and equipment must be protected against any potential release of pollutants into the environment.

XI. GRADING NOTES

It is recommended that ***Geotechnical Exploration, Inc.*** be retained to verify that soil conditions revealed during grading for the project are as anticipated in this *"Report of Preliminary Geotechnical Investigation."* In addition, the compaction of any fill soils placed during grading must be observed and tested by our field representative.

It is the responsibility of the general contractor to comply with the requirements on the approved plans and the local building ordinances. All/any retaining wall and trench backfill should be properly compacted. ***Geotechnical Exploration, Inc.*** will assume no liability for damage occurring due to improperly compacted or uncompacted backfill placed without our observations and testing.

XII. LIMITATIONS

Our conclusions and recommendations have been based on available data obtained from our field investigation, background review and laboratory analysis, as well as our experience with similar soils and natural ground materials located in the City of San Diego. Of necessity, we must assume a certain degree of continuity between exploratory excavations and/or natural exposures. It is, therefore, necessary that all observations, conclusions, and recommendations be verified at the time excavation begins. In the event discrepancies are noted, additional recommendations may be issued, if required. The work performed and recommendations presented herein are the result of an investigation and analysis that meet the contemporary standard of care in our profession within the County of San Diego. No warranty is provided.

This report should be considered valid for a period of two (2) years, and is subject to review by our firm following that time. If significant modifications are made to the foundation plans, especially with respect to the height and location of the proposed structures, this report must be presented to us for immediate review and possible revision.

As stated previously, it is not within the scope of our services to provide quality control oversight for surface or subsurface drainage construction or retaining wall sealing and base of wall drain construction. It is the responsibility of the contractor to verify proper wall sealing, geofabric installation, protection board installation (if needed), drain depth below interior floor or yard surfaces; pipe percent slope to the outlet, etc.

It is the responsibility of the owner and/or developer to ensure that the recommendations summarized in this report are carried out in the field operations and that our recommendations for design of this project are incorporated in the project plans. We should be retained to review the final project plans once they are available to verify that our recommendations are adequately incorporated in them. Additional or revised recommendations may be necessary after our review.

This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for the safety of personnel other than our own. The safety of others is the responsibility of the contractor. The contractor should notify the owner if any of the recommended actions presented herein are considered to be unsafe.

The firm of ***Geotechnical Exploration, Inc.*** shall not be held responsible for changes to the physical condition of the property, such as addition of fill soils or changing drainage patterns, which occur subsequent to issuance of this report and the changes are made without our observations, testing, and approval.

Once again, should any questions arise concerning this report, please feel free to contact the undersigned. Reference to our **Job No. 21-13237** will expedite a reply to your inquiries.

Respectfully submitted,

GEOTECHNICAL EXPLORATION, INC.

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REFERENCES
JOB NO. 21-13237
June 2021

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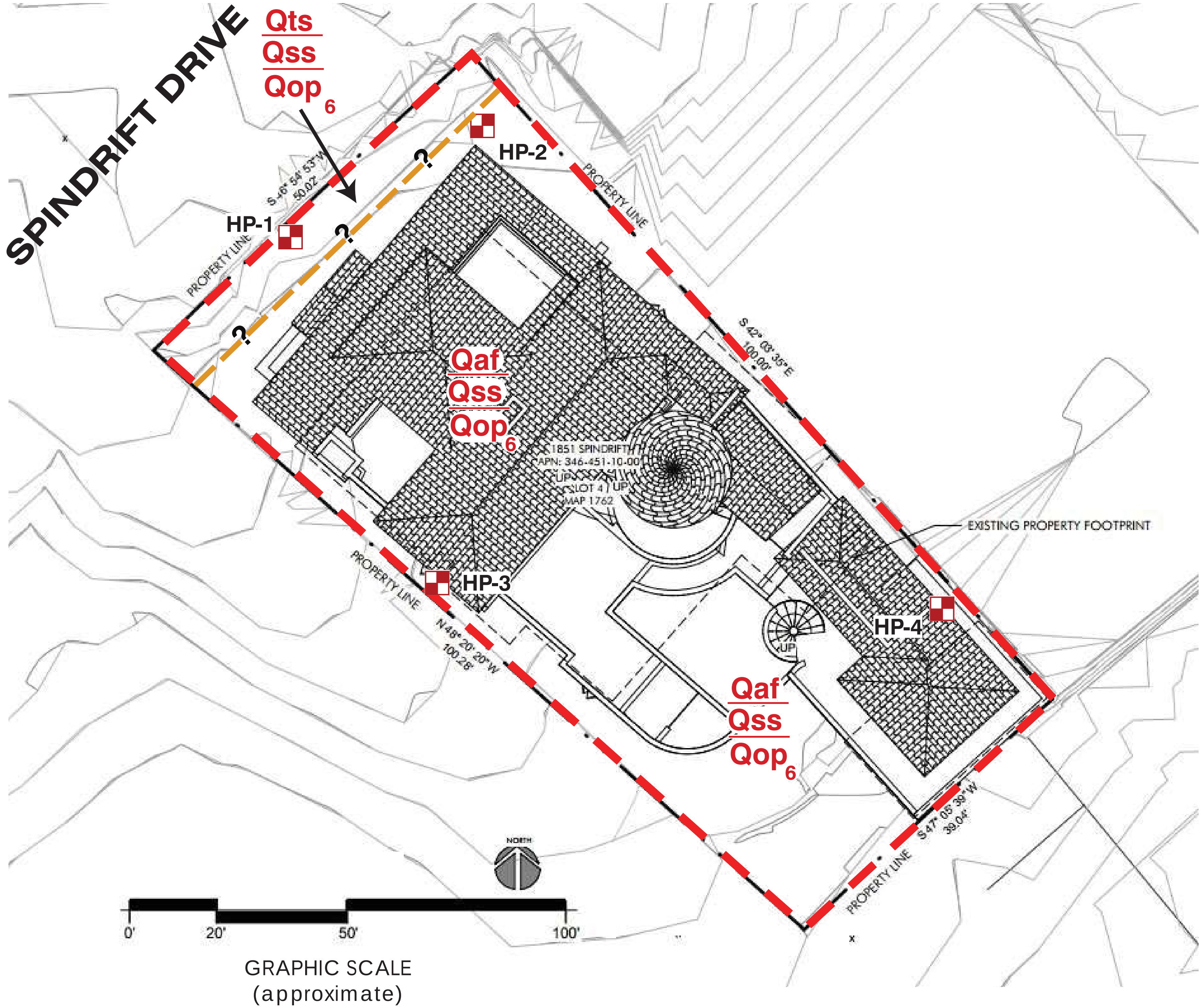
VICINITY MAP

Thomas Bros Guide San Diego County pg. 1227-G6

Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, CA.

Figure No. I
Job No. 21-13237

Geotechnical Exploration, Inc.



ISLAND ARCHITECTS
TONY CRISAFI, LISA KRIEDEMAN, R.A.
7626 HERSCHEL AVENUE, LA JOLLA, CA 92037

1851 SPINDRIFT
1851 Spindrift, La Jolla, CA 92037

A1.1
SITE PLAN
04/07/21

LEGEND

HP-1 — Approximate Location of Exploratory Handpit

Approximate Anticipated Limits of Grading

Approximate Geologic Contact

GEOLOGIC LEGEND

Qts	Landscape Topsoil
Qaf	Artificial Fill
Qss	Subsoil
Qop_6	Old Paralic Deposits (unit 6)

PLOT PLAN AND SITE SPECIFIC GEOLOGIC MAP

Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, CA.
Figure No. II
Job No. 21-13237

REFERENCE: This Plot Plan is not to be used for legal purposes. Locations and dimensions are approximate. Actual property dimensions and locations of utilities may be obtained from the Approved Building Plans or the "As-Built" Grading Plans.

REFERENCE: This Plot Plan was prepared from and existing SITE PLAN bby ISLAND ARCHITECTS dated 04/07/21 and from on-site field reconnaissance performed by GEI.

Geotechnical Exploration, Inc.

June 2021

21-13237-p.ai

Geotechnical Exploration, Inc.

DATE LOGGED: April 26, 2021	**EQUIPMENT:** Hand tools
	DIMENSION & TYPE OF EXCAVATION: 2ft. x 2ft. x 4ft. Handpit
LOGGED BY: JKH	**SURFACE ELEVATION:** ± 63' Above Mean Sea Level
REVIEWED BY: LDR	**GROUNDWATER/SEEPAGE DEPTH:** Not Encountered

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION — DESCRIPTION AND REMARKS (Grain Size, Density, Moisture, Color)	U.S.C.S	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of MDD)	EXPAN (+%) CONSOL (-%)	EXPANSION INDEX	BLOW COUNTS / FT	SAMPLE O.D. (in)
0–1			**SILTY SAND,** fine- to medium-grained. Loose. Slightly moist. Dark brown. Some roots. LANDSCAPE TOPSOIL (Qts)	SM									
1–3		1	**CLAYEY SAND,** fine- to medium-grained. Medium dense. Moist. Brown. Some caliche. -- @1' 38% passing No. 200 sieve. SUBSOIL (Qss)	SC									
3–4		2	**SILTY SAND,** fine- to medium-grained. Medium dense. Slightly moist. Reddish brown. Weak cementation. Hand auger used from 3-4'. -- @3' 24% passing No. 200 sieve. OLD PARALIC DEPOSITS, UNIT 6 (Qop_6)	SM			9.4	134.5					
			Bottom of excavation at 4 feet.										

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

PERCHED WATER TABLE
BULK BAG SAMPLE
1 **IN-PLACE SAMPLE**
MODIFIED CALIFORNIA SAMPLE
H **IN-PLACE HAND-DRIVE SAMPLE**
STANDARD PENETRATION TEST

JOB NUMBER: 21-13237	**LOG NO.** HP-1
JOB NAME: Fanelli-Huber Residence	
SITE LOCATION: 1851 Spindrift Drive, La Jolla, CA	**FIGURE NO.** IIIa

Geotechnical Exploration, Inc.

DATE LOGGED: April 26, 2021	**EQUIPMENT:** Hand tools
LOGGED BY: JKH	**DIMENSION & TYPE OF EXCAVATION:** 2ft. x 2ft. x 6ft. Handpit
REVIEWED BY: LDR	**SURFACE ELEVATION:** ± 67' Above Mean Sea Level
	GROUNDWATER/SEEPAGE DEPTH: Not Encountered

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION — DESCRIPTION AND REMARKS (Grain Size, Density, Moisture, Color)	U.S.C.S	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of MDD)	EXPAN (+%) CONSOL (-%)	EXPANSION INDEX	BLOW COUNTS / FT	SAMPLE O.D. (in)
0–3			**SILTY SAND,** fine- to medium-grained. Loose to medium dense. Slightly moist. Dark brown. With roots and several utility pipes. **FILL (Qaf)**	SM									
3–5			**CLAYEY SAND,** fine- to medium-grained. Medium dense. Moist. Dark brown. Some caliche. Hand auger used from 3-6 feet. **SUBSOIL (Qss)**	SC									
5–6			**SILTY SAND,** fine- to medium-grained. Medium dense. Slightly moist. Reddish brown. Weak cementation. **OLD PARALIC DEPOSITS, UNIT 6 (Qop_6)**	SM									

Bottom of excavation at 6 feet.

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

PERCHED WATER TABLE
BULK BAG SAMPLE
1 IN-PLACE SAMPLE
MODIFIED CALIFORNIA SAMPLE
H IN-PLACE HAND-DRIVE SAMPLE
STANDARD PENETRATION TEST

JOB NUMBER: 21-13237

JOB NAME: Fanelli-Huber Residence

SITE LOCATION: 1851 Spindrift Drive, La Jolla, CA

LOG NO. HP-2

FIGURE NO. IIIb

Geotechnical Exploration, Inc.

EQUIPMENT: Hand tools	
DIMENSION & TYPE OF EXCAVATION: 2ft. x 2ft. x 5.5ft. Handpit	
DATE LOGGED: April 26, 2021	
LOGGED BY: JKH	**SURFACE ELEVATION:** ± 67' Above Mean Sea Level
REVIEWED BY: LDR	**GROUNDWATER/SEEPAGE DEPTH:** Not Encountered

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION — DESCRIPTION AND REMARKS (Grain Size, Density, Moisture, Color)	U.S.C.S	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of MDD)	EXPAN (+%) CONSOL (-%)	EXPANSION INDEX	BLOW COUNTS / FT	SAMPLE O.D. (in)
0–2.5			**CLAYEY SAND,** fine- to medium-grained. Loose to medium dense. Moist. Dark brown. Some roots, brick and metal debris. FILL (Qaf)	SC									
2.5–4.5			**CLAYEY SAND,** fine- to medium-grained. Medium dense. Moist. Brown. Some caliche. Hand auger used from 3-5.5 feet. SUBSOIL (Qss)	SC									
4.5–5.5			**SILTY SAND,** fine- to medium-grained. Medium dense. Slightly moist. Reddish brown. Weak cementation. OLD PARALIC DEPOSITS, UNIT 6 (Qop_6)	SM									

Bottom of excavation at 5.5 feet.

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12

Legend	
▼	PERCHED WATER TABLE
☒	BULK BAG SAMPLE
1	IN-PLACE SAMPLE
■	MODIFIED CALIFORNIA SAMPLE
H	IN-PLACE HAND-DRIVE SAMPLE
▒	STANDARD PENETRATION TEST

JOB NUMBER: 21-13237

JOB NAME: Fanelli-Huber Residence

SITE LOCATION: 1851 Spindrift Drive, La Jolla, CA

LOG NO. HP-3

FIGURE NO. IIIc

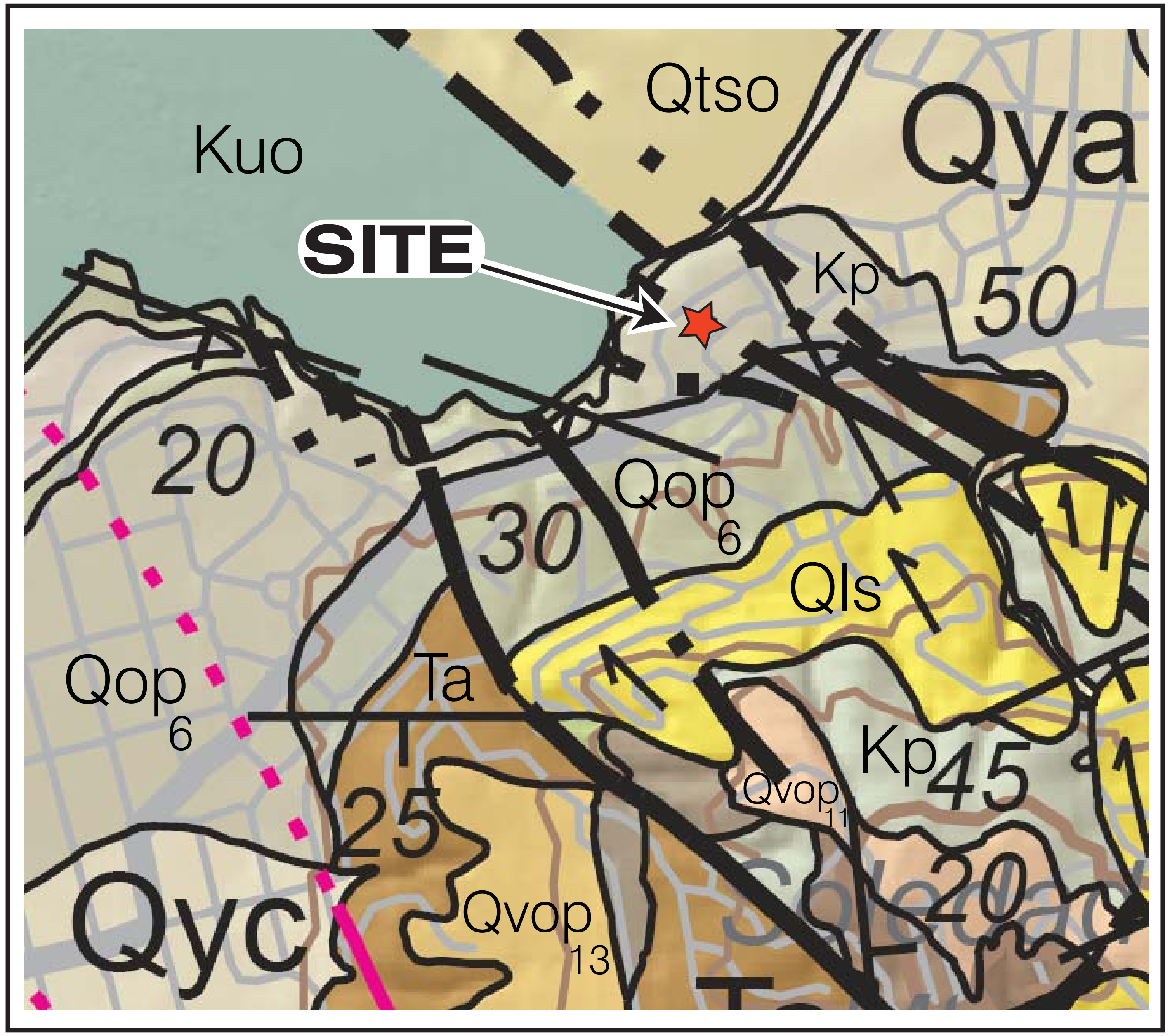
Geotechnical Exploration, Inc.

DATE LOGGED: April 26, 2021	**EQUIPMENT:** Hand tools
LOGGED BY: JKH	**DIMENSION & TYPE OF EXCAVATION:** 2ft. x 2ft. x 9ft. Handpit
REVIEWED BY: LDR	**SURFACE ELEVATION:** ± 70' Above Mean Sea Level
	GROUNDWATER/SEEPAGE DEPTH: Not Encountered

DEPTH (feet)	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION — DESCRIPTION AND REMARKS (Grain Size, Density, Moisture, Color)	U.S.C.S	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of MDD)	EXPAN (+%) CONSOL (-%)	EXPANSION INDEX	BLOW COUNTS / FT	SAMPLE O.D. (in)
0–2		**SILTY SAND,** fine- to medium-grained. Loose to medium dense. Slightly moist to moist. Dark brown. With roots. **FILL (Qaf)**	SM									
2–6	1 (at 2'); bulk bag sample (at 4')	**POORLY GRADED SAND,** fine- to medium-grained. Loose to medium dense. Slightly moist. Light gray. Some roots. -- @4' 2% passing No. 200 sieve. -- @5' brick debris. **FILL (Qaf)**	SP									
6–8		**CLAYEY SAND,** fine- to medium-grained. Medium dense. Moist. Brown. Some caliche. **SUBSOIL (Qss)**	SC									
8–9		**SILTY SAND,** fine- to medium-grained. Medium dense. Slightly moist. Reddish brown. Weak cementation. **OLD PARALIC DEPOSITS, UNIT 6 (Qop_6)**	SM									
		Bottom of excavation at 9 feet.										

Symbol	Legend
▼	**PERCHED WATER TABLE**
☒	**BULK BAG SAMPLE**
1	**IN-PLACE SAMPLE**
■	**MODIFIED CALIFORNIA SAMPLE**
H	**IN-PLACE HAND-DRIVE SAMPLE**
▒	**STANDARD PENETRATION TEST**

JOB NUMBER: 21-13237	**LOG NO.** HP-4
JOB NAME: Fanelli-Huber Residence	
SITE LOCATION: 1851 Spindrift Drive, La Jolla, CA	**FIGURE NO.** IIId



Fanelli-Huber Residence
1851 Spindrift
La Jolla, CA.

Base Map

Onshore base (hypsography, hydrography, and transportation) from U.S.G.S. digital line graph (DLG) data, San Diego 30' x 60' metric quadrangle. Shaded topographic base from U.S.G.S. digital elevation models (DEM's). Offshore bathymetric contours and shaded bathymetry from N.O.A.A. single and multibeam data. Projection is UTM, zone 11, North American Datum 1927.

This map was funded in part by the U.S. Geological Survey National Cooperative Geologic Mapping Program, STATEMAP Award no. 98HQAG2049.

Prepared in cooperation with the U.S. Geological Survey, Southern California Areal Mapping Project.

EXCERPT FROM
GEOLOGIC MAP OF THE SAN DIEGO 30' x 60' QUADRANGLE, CALIFORNIA

By
Michael P. Kennedy[1] and Siang S. Tan[1]
2008
Digital preparation by
Kelly R. Bovard[2], Anne G. Garcia[2], Diane Burns[2], and Carlos I. Gutierrez[1]

1. Department of Conservation, California Geological Survey
2. U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside

ONSHORE MAP SYMBOLS

Contact - Contact between geologic units; dotted where concealed.

70 U D — Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.

Anticline - Solid where accurately located; dashed where approximately located; dotted where concealed. Arrow indicates direction of axial plunge.

Syncline - Solid where accurately located; dotted where concealed. Arrow indicates direction of axial plunge.

Qls? — Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.

Strike and dip of beds

70 — Inclined

Strike and dip of igneous joints

60 — Inclined

Vertical

Strike and dip of metamorphic foliation

55 — Inclined

DESCRIPTION OF MAP UNITS

Qya	Young alluvial flood-plain deposits
Qls	Landslide deposits
Qop_6	Old paralic deposits Unit 6
$Qvop_{11}$	Very old paralic deposits Unit 11
$Qvop_{13}$	Very old paralic deposits Unit 13
QTso	Undivided sediments and sedimentary rocks in offshore region
Ta	Ardath Shale
Kp	Point Loma Formation
Kuo	Undivided rocks of the Rosario Group in the offshore area

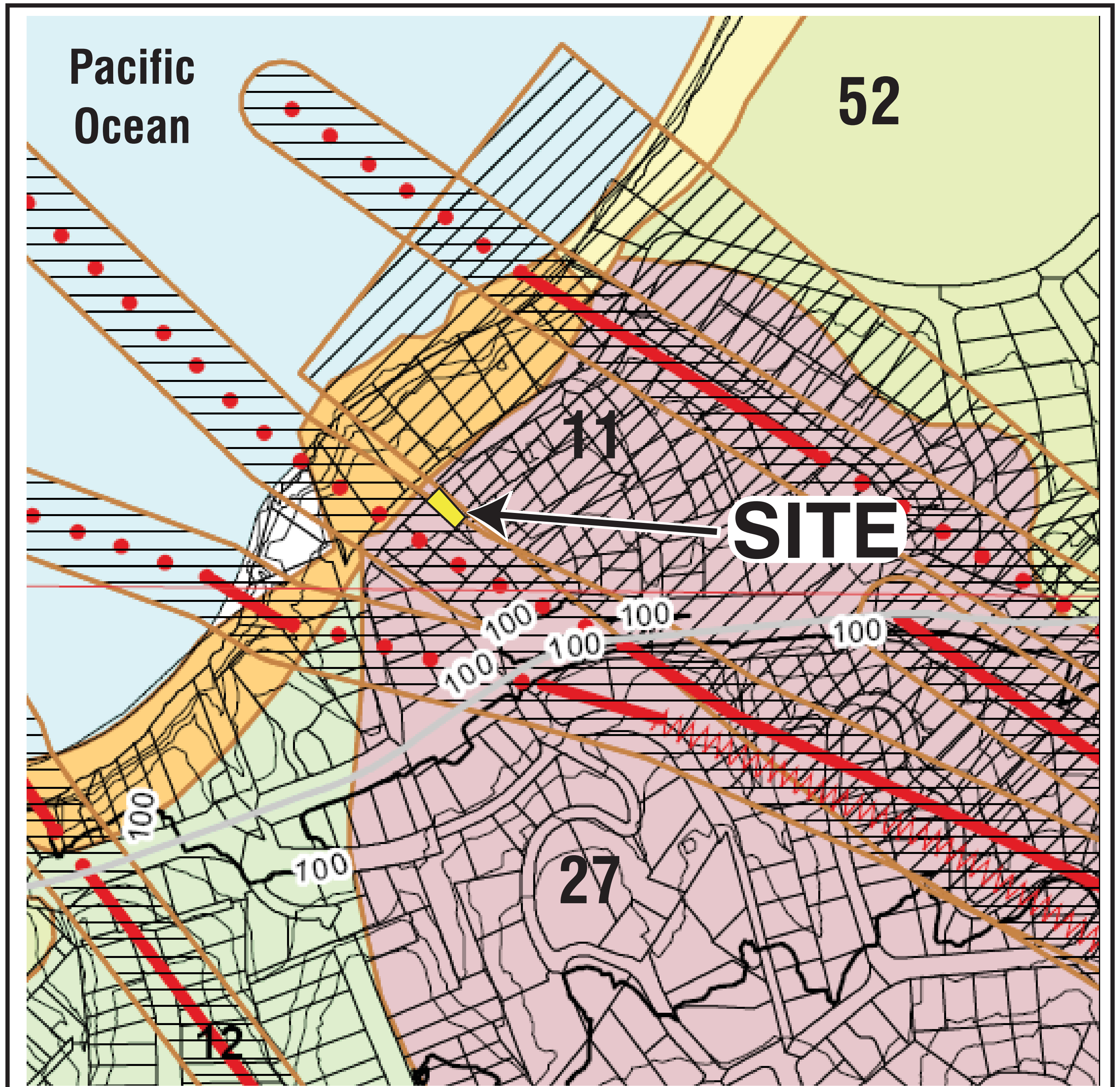
Figure No. IV
Job No. 21-13237

Geotechnical Exploration, Inc.
June 2021

Geologic Hazards Map Excerpt from City of San Diego Geologic Hazards and Fault Map Sheet 29

Development Services Department

DATE: 4/3/2008



Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, CA.

LEGEND

Geologic Hazard Categories

FAULT ZONES

11 Active, Alquist-Priolo Earthquake Fault Zone

12 Potentially Active, Inactive, Presumed Inactive, or Activity Unknown

13 Downtown special fault zone

LANDSLIDES

21 Confirmed, known, or highly suspected

22 Possible or conjectured

SLIDE-PRONE FORMATIONS

23 Friars: neutral or favorable geologic structure

24 Friars: unfavorable geologic structure

25 Ardath: neutral or favorable geologic structure

26 Ardath: unfavorable geologic structure

27 Otay, Sweetwater, and others

LIQUEFACTION

31 High Potential -- shallow groundwater major drainages, hydraulic fills

32 Low Potential -- fluctuating groundwater minor drainages

COASTAL BLUFFS

41 Generally unstable Numerous landslides, high steep bluffs, severe erosion, unfavorable geologic structure

42 Generally unstable Unfavorable bedding plains, high erosion

43 Generally unstable Unfavorable jointing, local high erosion

44 Moderately stable Mostly stable formations, local high erosion

45 Moderately stable Some minor landslides, minor erosion

46 Moderately stable Some unfavorable geologic structure, minor or no erosion

47 Generally stable Favorable geologic structure, minor or no erosion, no landslides

48 Generally stable Broad beach areas, developed harbor

OTHER TERRAIN

51 Level mesas -- underlain by terrace deposits and bedrock nomimal risk

52 Other level areas, gently sloping to steep terrain, favorable geologic structure, Low risk

53 Level or sloping terrain, unfavorable geologic structure, Low to moderate risk

54 Steeply sloping terrain, unfavorable or fault controlled geologic structure, Moderate risk

55 Modified terrain (graded sites) Nominal risk

Water (Bays and Lakes)

FAULTS

Fault

Inferred Fault

Concealed Fault

Shear Zone

Figure No. Va
Job No. 21-13237

Geotechnical Exploration, Inc.

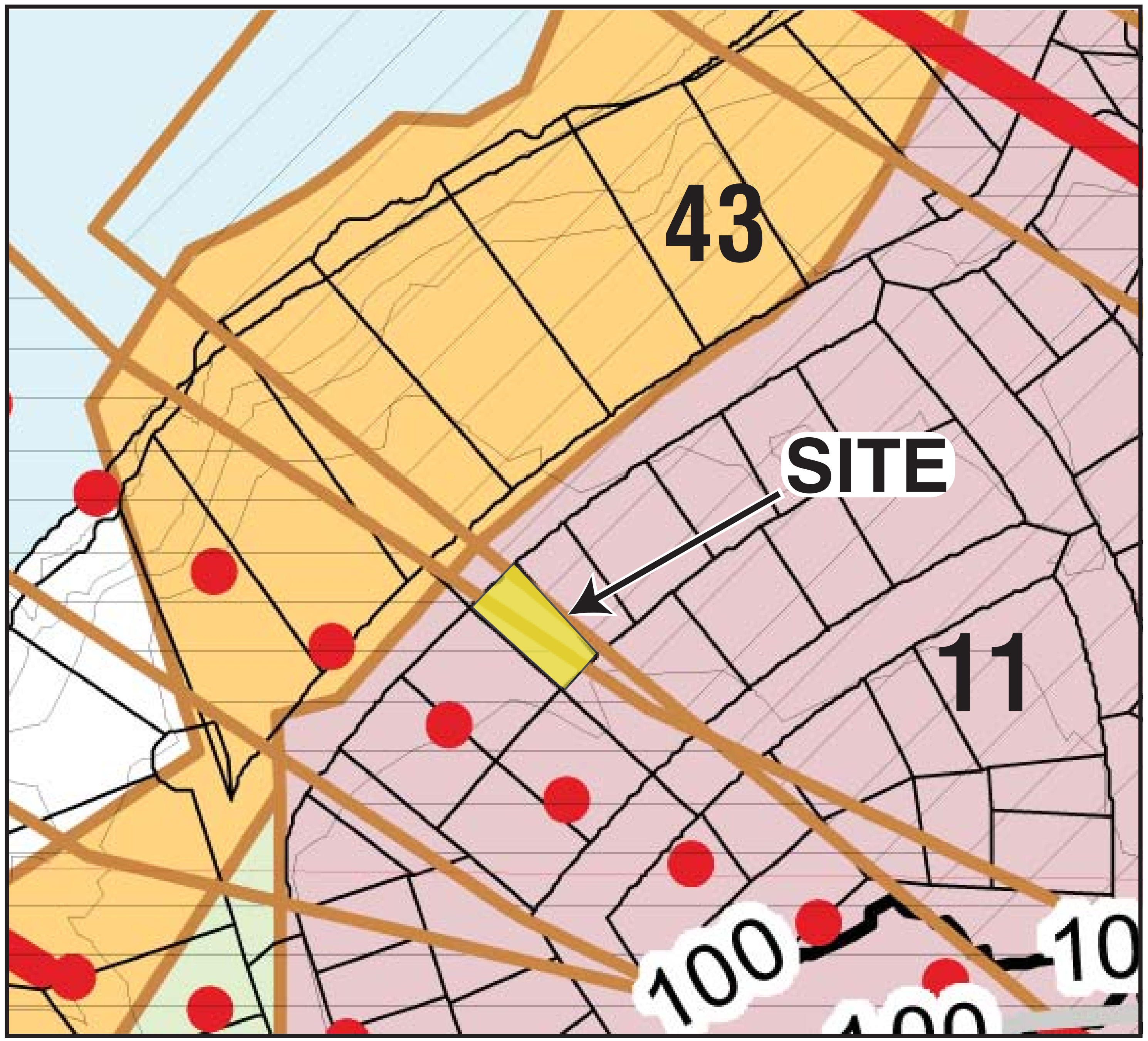
June 2021

21-13237-Va.ai

Geologic Hazards Map Excerpt from City of San Diego Geologic Hazards and Fault Map Sheet 29

Development Services Department

DATE: 4/3/2008



Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, CA.

LEGEND

Geologic Hazard Categories

FAULT ZONES

11 Active, Alquist-Priolo Earthquake Fault Zone

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53 Level or sloping terrain, unfavorable geologic structure, Low to moderate risk

54 Steeply sloping terrain, unfavorable or fault controlled geologic structure, Moderate risk

55 Modified terrain (graded sites) Nominal risk

Water (Bays and Lakes)

FAULTS

Fault

Inferred Fault

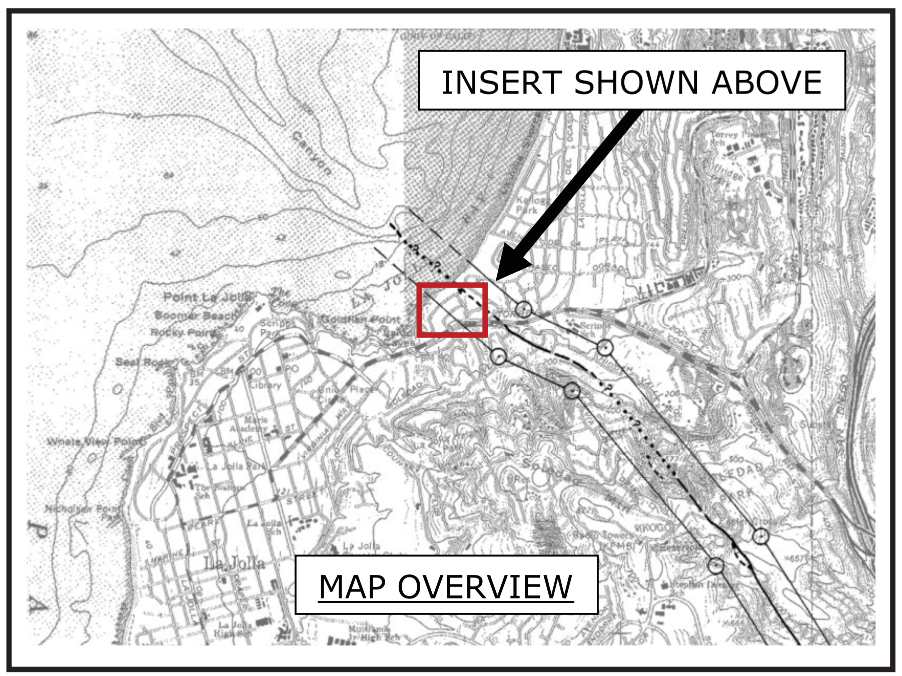
Concealed Fault

Shear Zone

Figure No. Vb
Job No. 21-13237

Geotechnical Exploration, Inc.

June 2021



Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, CA.

EXCERT FROM

STATE OF CALIFORNIA SPECIAL STUDIES ZONES

Delineated in compliance with
Chapter 7.5, Division 2 of the California Public Resources Code
(Alquist-Priolo Special Studies Zones Act)

LA JOLLA QUADRANGLE

OFFICIAL MAP

Effective: November 1, 1991

LEGEND

Active Faults

1906 C

Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Special Studies Zone Boundaries

These are delineated as straight-line segments that connect encircled turning points so as to define special studies zone segments.

Seaward projection zone boundary.

Properties within "zones of required investigation".

IMPORTANT – PLEASE NOTE

1) *This map may not show all faults that have the potential for surface fault rupture, either within the special studies zones or outside their boundaries.*
2) Faults shown are the basis for establishing the boundaries of the special studies zones.
3) The identification and location of these faults are based on the best available data. However, the quality of data used is varied. Traces have been drawn as accurately as possible at this map scale.
4) Fault information on this map is not sufficient to serve as a substitute for the geologic site investigations (special studies) required under Chapter 7.5 of Division 2 of California Public Resources Code.

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

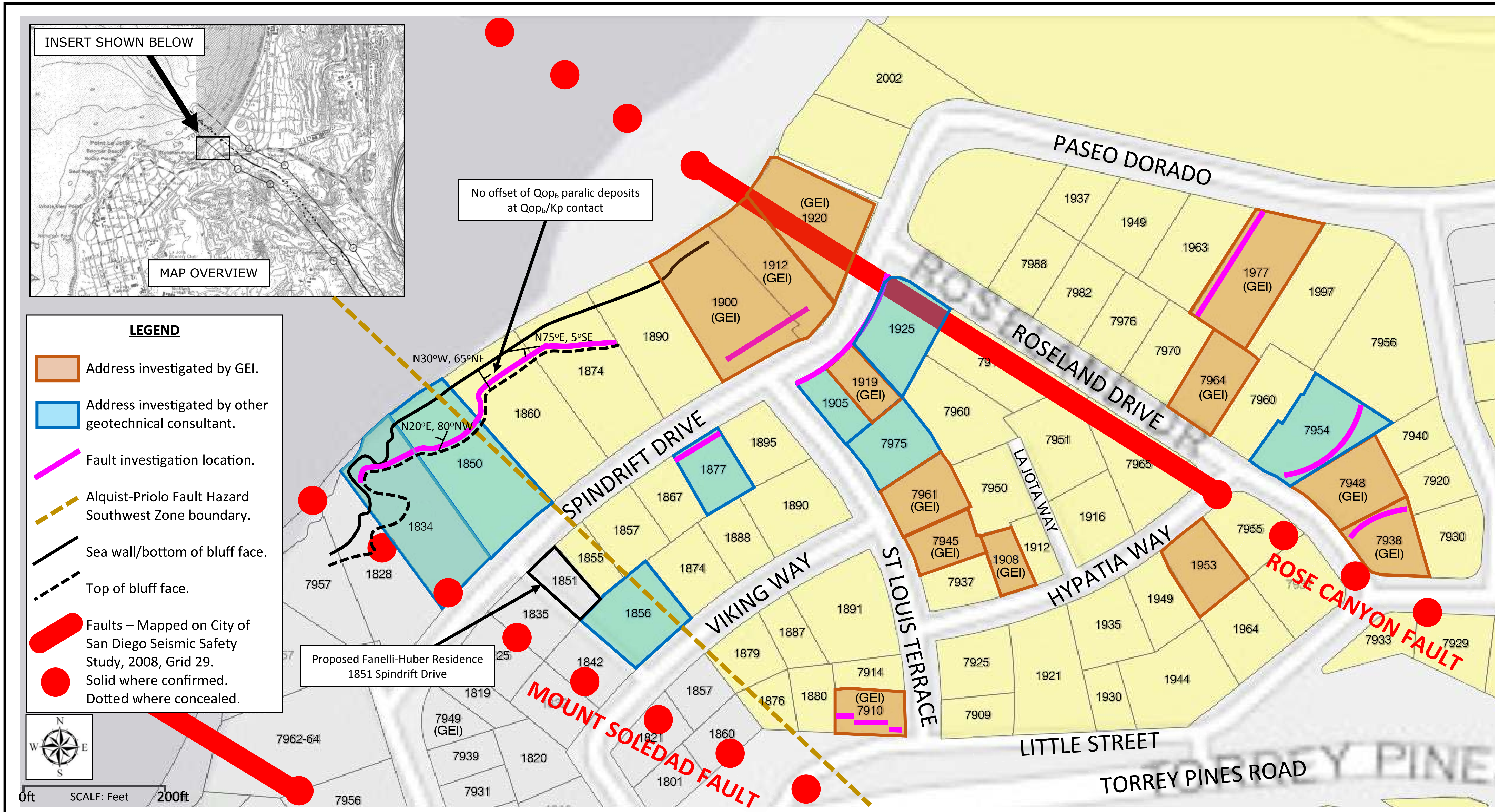
LA JOLLA QUADRANGLE
CALIFORNIA – SAN DIEGO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

CALIFORNIA GEOLOGICAL SURVEY
JAMES F. DAVIS, STATE GEOLOGIST

Figure No. VIa
Job No. 21-13237

Geotechnical Exploration, Inc.

June 2021



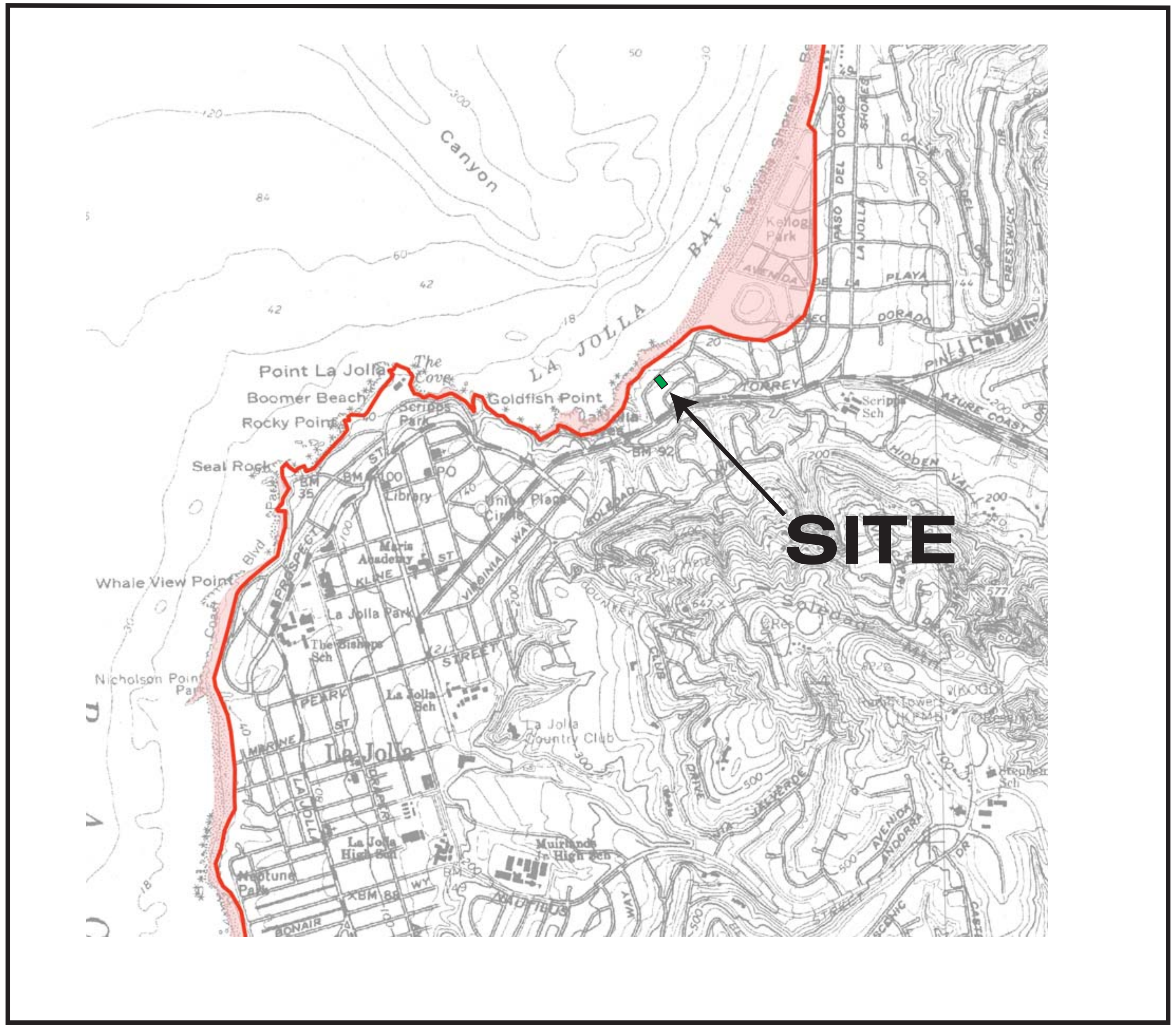
PRIOR INVESTIGATION LOCATIONS ON EXPANDED ALQUIST-PRIOLO MAP

Figure No. VIb
Job No. 21-13237

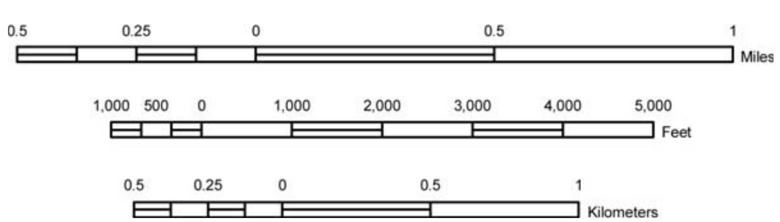
Geotechnical Exploration, Inc.

June 2021

21-13237-VIb.ai



Fanelli-Huber Residence
1851 Spindrift Drive
La Jolla, CA.



EXCERT FROM

TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

State of California ~ County of San Diego

LA JOLLA QUADRANGLE

June 1, 2009

MAP EXPLANATION

Tsunami Inundation Line

Tsunami Inundation Area

MAP BASE

Topographic base maps prepared by U.S. Geological Survey as part of the 7.5-minute Quadrangle Map Series (originally 1:24,000 scale). Tsunami inundation line boundaries may reflect updated digital orthophotographic and topographic data that can differ significantly from contours shown on the base map.

DISCLAIMER

The California Emergency Management Agency (CalEMA), the University of Southern California (USC), and the California Geological Survey (CGS) make no representation or warranties regarding the accuracy of this inundation map nor the data from which the map was derived. Neither the State of California nor USC shall be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.

Table 1: Tsunami sources modeled for the San Diego County coastline.

Sources (M = moment magnitude used in modeled event)		Areas of Inundation Map Coverage and Sources Used		
		Dana Point	Oceanside	San Diego
Local Sources	Carlsbad Thrust Fault		X	X
	Catalina Fault	X	X	X
	Coronado Bank Fault			X
	Lasuen Knoll Fault	X		X
	San Clemente Fault Bend Region			X
	San Clemente Island Fault			X
	San Mateo Thrust Fault	X	X	
	Coronado Canyon Landslide #1			X
Distant Sources	Cascadia Subduction Zone #3 (M9.2)	X		X
	Central Aleutians Subduction Zone#1(M8.9)	X	X	X
	Central Aleutians Subduction Zone#2(M8.9)	X		X
	Central Aleutians Subduction Zone#3(M9.2)	X	X	X
	Chile North Subduction Zone (M9.4)	X		X
	1960 Chile Earthquake (M9.3)	X		X
	1952 Kamchatka Earthquake (M9.0)	X		
	1964 Alaska Earthquake (M9.2)	X	X	X
	Japan Subduction Zone #2 (M8.8)	X		X
	Kuril Islands Subduction Zone #2 (M8.8)	X		X
	Kuril Islands Subduction Zone #3 (M8.8)	X		X
	Kuril Islands Subduction Zone #4 (M8.8)	X		X

Cal EMA
CALIFORNIA EMERGENCY MANAGEMENT AGENCY
CGS
CALIFORNIA GEOLOGICAL SURVEY
USC
UNIVERSITY OF SOUTHERN CALIFORNIA

PURPOSE OF THIS MAP

This tsunami inundation map was prepared to assist cities and counties in identifying their tsunami hazard. It is intended for local jurisdictional, coastal evacuation planning uses only. This map, and the information presented herein, is not a legal document and does not meet disclosure requirements for real estate transactions nor for any other regulatory purpose.

The inundation map has been compiled with best currently available scientific information. The inundation line represents the maximum considered tsunami runup from a number of extreme, yet realistic, tsunami sources. Tsunamis are rare events; due to a lack of known occurrences in the historical record, this map includes no information about the probability of any tsunami affecting any area within a specific period of time.

Please refer to the following websites for additional information on the construction and/or intended use of the tsunami inundation map:

State of California Emergency Management Agency, Earthquake and Tsunami Program:
http://www.oes.ca.gov/WebPage/oeswebsite.nsf/Content/B1EC
51BA215931768825741F005E8D80?OpenDocument

University of Southern California – Tsunami Research Center:
http://www.usc.edu/dept/tsunamis/2005/index.php

State of California Geological Survey Tsunami Information:
http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/index.htm

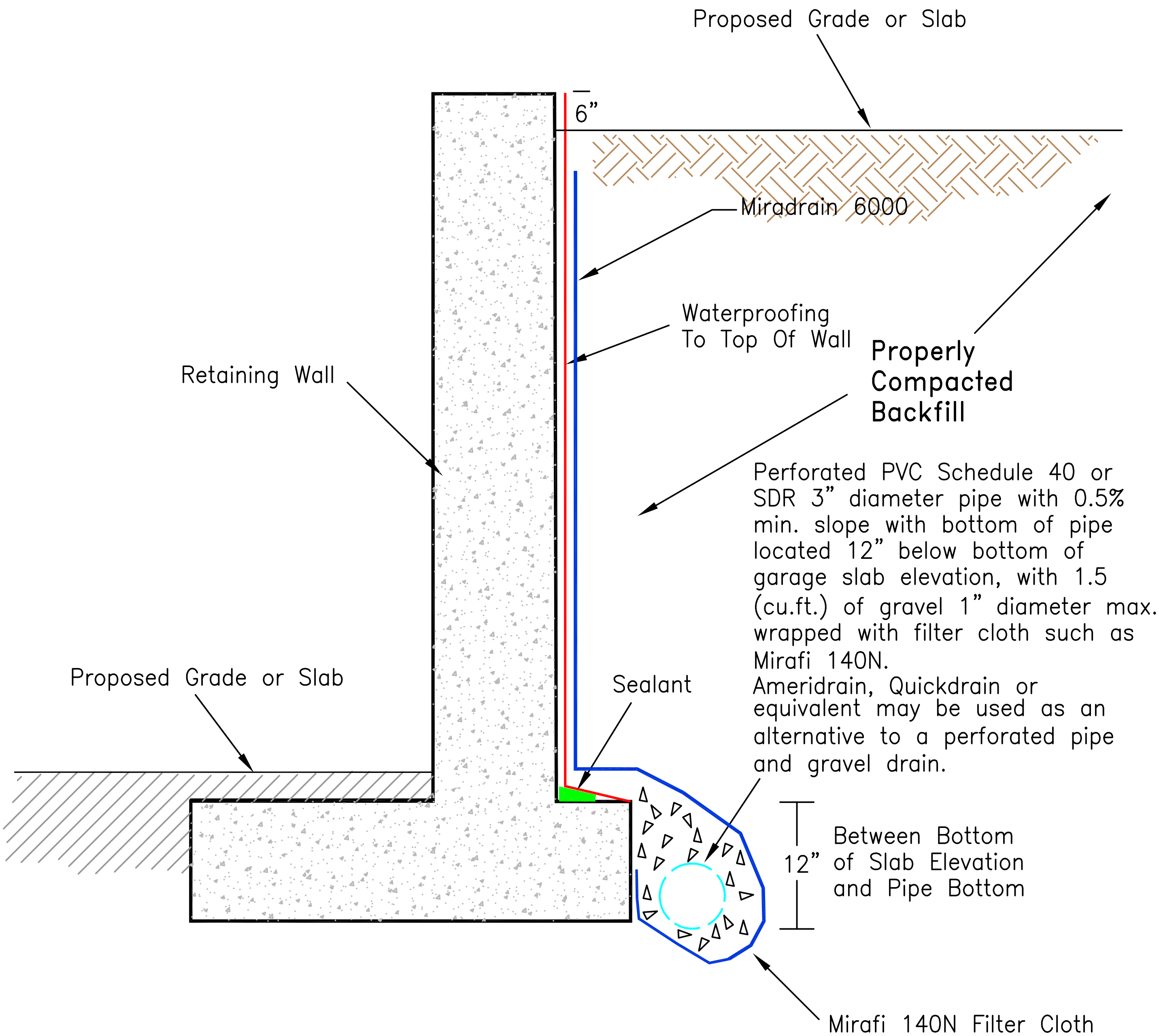
National Oceanic and Atmospheric Agency Center for Tsunami Research (MOST model)
http://nctr.pmel.noaa.gov/time/background/models.html

Figure No. VII
Job No. 21-13237

Geotechnical Exploration, Inc.

June 2021

SCHEMATIC RETAINING WALL SUBDRAIN RECOMMENDATIONS



NOT TO SCALE

Figure No. VIII
Job No. 21-13237

NOTE: As an option to Miradrain 6000, Gravel or Crushed rock 3/4" maximum diameter may be used with a minimum 12" thickness along the interior face of the wall and 2.0 cu.ft./ft. of pipe gravel envelope.

Geotechnical Exploration, Inc.

21–13237–VIII.dwg

June 2021

APPENDIX A
UNIFIED SOIL CLASSIFICATION CHART
SOIL DESCRIPTION

Coarse-grained (More than half of material is larger than a No. 200 sieve)

GRAVELS, CLEAN GRAVELS (More than half of coarse fraction is larger than No. 4 sieve size, but smaller than 3")	GW	Well-graded gravels, gravel and sand mixtures, little or no fines.
	GP	Poorly graded gravels, gravel and sand mixtures, little or no fines.
GRAVELS WITH FINES (Appreciable amount)	GC	Clay gravels, poorly graded gravel-sand-silt mixtures
SANDS, CLEAN SANDS (More than half of coarse fraction is smaller than a No. 4 sieve)	SW	Well-graded sand, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines.
SANDS WITH FINES (Appreciable amount)	SM	Silty sands, poorly graded sand and silty mixtures.
	SC	Clayey sands, poorly graded sand and clay mixtures.

Fine-grained (More than half of material is smaller than a No. 200 sieve)

SILTS AND CLAYS

Liquid Limit Less than 50	ML	Inorganic silts and very fine sands, rock flour, sandy silt and clayey-silt sand mixtures with a slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, silty clays, clean clays.
	OL	Organic silts and organic silty clays of low plasticity.
Liquid Limit Greater than 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
	CH	Inorganic clays of high plasticity, fat clays.
	OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

APPENDIX B

OSHPD

1851 Spindrift Drive, La Jolla, CA

Latitude, Longitude: 32.8506, -117.2622

Date	6/4/2021, 11:38:53 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.403	MCE_R ground motion. (for 0.2 second period)
S_1	0.491	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.403	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8 $\boxed{0.889}$	Site-modified spectral acceleration value
S_{DS}	0.936	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8 $\boxed{0.592}$	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8 $\boxed{D}$	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8 $\boxed{1.81}$	Site amplification factor at 1.0 second
PGA	0.641	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.705	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.403	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.62	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.269	Factored deterministic acceleration value. (0.2 second)
S1RT	0.491	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.554	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.799	Factored deterministic acceleration value. (1.0 second)
PGAd	0.941	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.866	Mapped value of the risk coefficient at short periods
C_{R1}	0.886	Mapped value of the risk coefficient at a period of 1 s