

Coastal Geology & Soil, Inc.

- Soil and Geotechnical Engineering
- Engineering Geology
- Hydrogeology

November 10, 2010

Reference V10127

c/o: Jarret Gorin, AICP
Vanguard Planning LLC

Tony & Sharon Purpero
1213 Harbor Hills Drive
Santa Barbara CA 93109

ok

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NOV 11 2010

CITY OF SANTA BARBARA
PLANNING DIVISION

Subject: Preliminary Geologic Investigation for the Proposed Single Family Residence to be Located at 1213 Harbor Hills Drive, City of Santa Barbara, California.

Dear Mr. & Mrs. Purpero:

Per your request, Coastal Geology & Soil, Inc. is pleased to provide you with the results of our geologic investigation for the proposed single family residence to be located at 1213 Harbor Hills Drive, City of Santa Barbara, California. The project site is located in the Mesa area of the City of Santa Barbara, on a vacant parcel, west of the end of Harbor Hills Drive. The project site consists of an approximately 47,382 ft² parcel located on a moderately inclined, south facing slope. Our office is in receipt of a site plan, prepared by Mike Gones, Civil Engineer, dated 7/21/10, which shows the lot lines, topography, and layout of the proposed residence.

The location of the site is shown on Figure 1 - Site Vicinity Map. A site plan showing the location of the proposed residence and geologic borehole location is included as Figure 2 - Site Plan. A geologic log of borehole BH-1 is provided on Figure 3 - Log of Borehole BH-1. Site geology is provided on Figure 4 - Site Geology Map.

Scope of Services

The purpose of our preliminary geologic investigation for the project site was to determine and document the nature, distribution, and geologic characteristics of the earthen materials encountered in the building areas of the project site and any geologic hazards, which could adversely affect the construction of residential structures and driveway. The scope of work for this investigation included the completion of the following tasks:

- 1) Review of generally available geologic data pertaining to the site and its immediate vicinity, including: U.S. Geologic Survey (USGS) Geology Map of the Santa Barbara Quadrangle, 1986, by Thomas W. Dibblee, Jr. and Geology Map of the Eastern Santa Barbara Fold Belt, Santa Barbara, California, 2004, by Larry Gurrola.
- 2) Review of a site topographic map prepared by Mike Gones, Civil Engineer.
- 3) Geologic reconnaissance mapping of the project area.
- 4) Excavation of one deep geologic boring in the immediate vicinity of the proposed residence and driveway.
- 5) Preparation of this report to present a discussion of our procedures, findings, conclusions and preliminary recommendations.

Proposed Development

The proposed development consists of an approximately 4,217 s.f. main residence, 627 s.f. garage, private driveway, pool, and associated drainage facilities. It is our understanding that the proposed residence and pool will be supported on piles or caissons.

Field Activities

Field activities for this phase of the project included site geologic reconnaissance mapping and excavation of one boring to a depth of 48 feet below ground surface. The borehole was excavated using a 2.0 foot diameter bucket auger and downhole logged by the engineering geologist whose name appears at the end of this report. Laboratory testing of the onsite soils was performed by Coast Valley Testing, Inc. and the results of the soil testing are included in their report titled "Foundation Exploration", dated March 11, 2010, further updated October 13, 2010. The location of borehole BH-1 is shown on Figure 2 - Site Plan. A geologic log of borehole BH-1 is provided on Figure 3 - Log of Borehole BH-1.

FINDINGS

Site Description

The project site is located at the west end of Harbor Hills Drive on a moderately inclined, south-facing slope. The existing terrain is dominated by

a generally north-south trending rounded knoll with a natural valley/drainage swale area west of the knoll. Site vegetation consists of low-lying grasses and bushes. No natural drainage swales were observed in the area proposed for the residence. The proposed residence is also not in an area, which would be subject to flooding during winter storms or large rain events.

Regional Geology

The project site is located on the southern flank of the Santa Ynez Mountain range, which is part of the east-west trending Transverse Range Province of southern and central California. The Transverse range is dominated by east-west trending folds and by faults that have east-west or northwest-southeast trends. The Transverse Ranges include California's highest peaks south of the Central Sierra Nevada, the only Precambrian rocks in the coastal mountains of the United States, and four of the eight islands off the southern California coast.

The Santa Ynez mountains form a continuous, south-facing rampart along the Santa Barbara coast from Point Arguello to Ojai. The Santa Ynez mountains are bounded to the north by the Santa Ynez fault which is generally considered the northern boundary of the western Transverse Ranges. The Santa Ynez Mountains are an anticline, with the Santa Ynez fault running along it's axis. The south limb of the Santa Ynez anticline is more prominent than the north, often being described as a south dipping homocline with beds strongly overturned to the north. The Santa Ynez fault is considered to be a relatively long fault, extending approximately 75 miles west from Agua Blanca thrust, in central Ventura County, to the Pacific Coast in the Gaviota area of Santa Barbara County. Matching rock sections on the north side of the Santa Ynez fault with those on the south side suggests a vertical separation on the order of 9500 feet. The Santa Ynez fault is considered active. The strong 1927 Santa Barbara earthquake has been attributed to movement on the presumed western extension of the Santa Ynez fault.

The localized Santa Barbara formation is evidence of a small coastal plain, which developed at the base of the Santa Ynez mountains during the Pliocene and early Pleistocene times. The Santa Barbara formation was laid down in shallow marine waters and is richly fossiliferous in places. The observed Santa Barbara formation soils emerged from their marine origins during middle Pleistocene times, approximately 1 million years before present.

Geologic Structure

The project site is located on the south limb of an uplifted anticline-syncline structural complex consisting of Santa Barbara formation, massively bedded, unconsolidated, tan to yellow sand and silt. Geologic bedding in the

immediate vicinity is mapped by Dibblee as dipping to the south with inclines of 10 to 12 degrees. The anticline-syncline complex has locally created Lavigia Hill and Honda Valley to the north of the project site. Lavigia Hill is most likely a direct result of the uplift and folding associated with the development of the anticline. An extension of the Lavigia fault is thought to extend in an east/west direction approximately 200 feet to the south of the site.

Landslides

One deep geologic boring was excavated and downhole logged to observe the orientation of subsurface Santa Barbara formation bedding planes. Two geologic bedding plane contacts were observed, one at a depth of 16 feet below ground surface (bgs) with an orientation of 300 degrees/38 degrees southwest, and a second at a depth of 25 feet bgs, with an orientation of 280 degrees/22 degrees south. A small layer of seashells was observed at 31 feet bgs with an orientation of 212 degrees/48 degrees southeast. The observed geologic bedding planes and seashell layer appeared to be in place and observed bedding planes are consistent with mapped bedding planes as shown on published maps.

No surface evidence of recent landslide activity was observed onsite. Ancient or recent deep-seated landslides or past large-scale surficial slope failures were also not observed on the project site during our site investigative work. Additionally, our review of available published geologic maps of the area, prepared by T.W. Dibblee, Jr. and Larry Gurrola did not indicate the presence of landsliding on the project site.

Ground Water

Ground water was not encountered during our subsurface investigation of the site in October of 2010, to a depth of 48 feet below ground surface. Additionally, the development area of the subject parcel is not known to be located in an area affected by high ground water levels. Periodic seeps and springs may occur during periods of high rainfall in pile/caisson excavations and if cut slopes are constructed during grading operations.

Faulting and Seismicity

The site is not located within an Alquist-Priolo Special Studies Zone. Additionally, the site is not known to be underlain by active or potentially active faults. No faults or indications of possible faulting were observed in the proposed development area during our field investigation. Owing to the absence of faulting, building setbacks or building restrictions (in regards to faulting) are not required within the development area of the parcel.

The closest mapped fault to the site is the southeast-northwest trending Lavigia Fault, located about 200 feet south of the property (Gurrola, 2004). The Lavigia fault is considered to be inactive by the Santa Barbara County Seismic Safety and Safety Element (SBCSSSE).

The closest active fault to the site is the Mesa Fault located about 1 mile to the north of the site (Dibblee, 1986, Gurrola, 2004). The Mesa fault is capable of producing an estimated 5.0 magnitude maximum credible earthquake (SBCSSSE).

According to the SBCSSSE, most of Santa Barbara County, including the project site, is located in a Zone III high seismic risk area. The SBCSSSE indicates that peak ground accelerations within the Zone III classification area during a large earthquake will be in the 0.5 to 0.7 g range.

Adverse Bedding

Adverse bedding occurs where the geologic dip of bedding planes equals or is less than the surficial slope. The proposed building pad area is located in an area where adverse bedding planes on ascending and descending slopes have the potential to exist. As such, any cut slopes created during grading activities should be observed by an engineering geologist to determine if adverse bedding planes exist onsite. If adverse bedding planes are observed during grading operations, remedial actions may be recommended.

Secondary Ground Failure Due to Earthquakes

Due to the geologic consistency and structure of the Santa Barbara formation material, which underlies the site, the development area of the site is not believed to be affected by secondary ground failure phenomena such as liquefaction, or excessive ground settlement that can be caused by strong ground shaking. However the general potential does exist that in a seismically active area, such as California, landsliding and earthen failures may occur during a large scale seismic event.

Ground Lurching

Ground lurching is created by strong earth shaking which causes underlying geologic beds to separate, which in turn causes the overlying soil to differentially settle. The differential settlement has the potential to adversely affect the foundation system of structures. Since the project area is in a seismically active area, the potential does exist that the building pad area could be affected by ground lurching. As such, appropriate design measures should be incorporated into any proposed structures.

Radon

Radon gas is a naturally occurring radioactive gas that is colorless and odorless. It forms from the radioactive decay of small amounts of uranium and thorium naturally present in rocks and soils. Breathing air with concentrated levels of radon gas can result in an increased risk of developing lung cancer.

The proposed building area is in an area defined as having a high potential for indoor radon levels above four (4) picocuries per liter (Radon Mapping, Santa Barbara and Ventura Counties, by Ron Churchill, Senior Geologist, California Department of Conservation, Division of Mines and Geology, California Geology, November/December 1997). The US Environmental Protection Agency recommends four (4) picocuries per liter as the action level for radon reduction. As such, any structures constructed for human habitation on the parcel should consider adequate below slab ventilation to allow any naturally occurring radon gas emissions to ventilate, rather than accumulating indoors.

Conclusions

1) Based on the results of our geologic investigation, CGS is of the opinion that the subject parcel is suitable, from a geologic perspective, for the construction of the proposed single family residence, garage, pool, driveway, and drainage improvements. No indications of landsliding, faulting, liquefaction, or near surface ground water were observed at the discrete locations observed and tested. As such, we are of the opinion that a single family residence, pool, and driveway can safely be constructed at the site, assuming that standard soils and geologic engineering recommendations are implemented into the grading and foundation design and employed during construction activities.

2) The potential does exist for secondary ground failure, ground lurching, adverse bedding planes, and radon gas to exist at the site. Appropriate engineering design measures should be undertaken to address these potential geohazards.

Recommendations

1) Any cut slopes created during grading activities should be observed by an engineering geologist to determine if adverse bedding planes exist onsite. If adverse bedding planes are observed during grading operations, remedial actions may be recommended at that time.

2) During drilling operations for piles or caissons, and engineering geologist should be onsite to confirm our preliminary observations, conclusions, and recommendations.

Closure

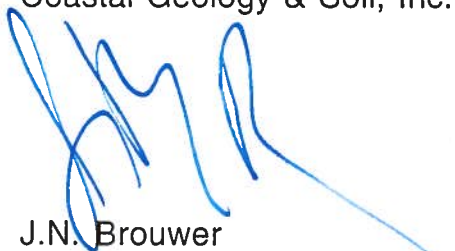
The conclusions and recommendations contained within this report are based on the preliminary investigative findings, field observations, and scope of services requested by the client. Conclusions and recommendations are based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed by the testing performed on the subject project site. If conditions are encountered during construction, which are different from those observed during our exploratory subsurface investigation or as described in this report, we must be notified so that we can consider the need for revisions or modifications to the recommendations contained herein.

The conclusions and recommendations contained within this report remain valid for a period of one year from the date of this report. After a period of one year, the conclusions and recommendations must be reviewed by this office or another qualified engineering geologist to insure conformance with industry standards and potentially changed geologic conditions.

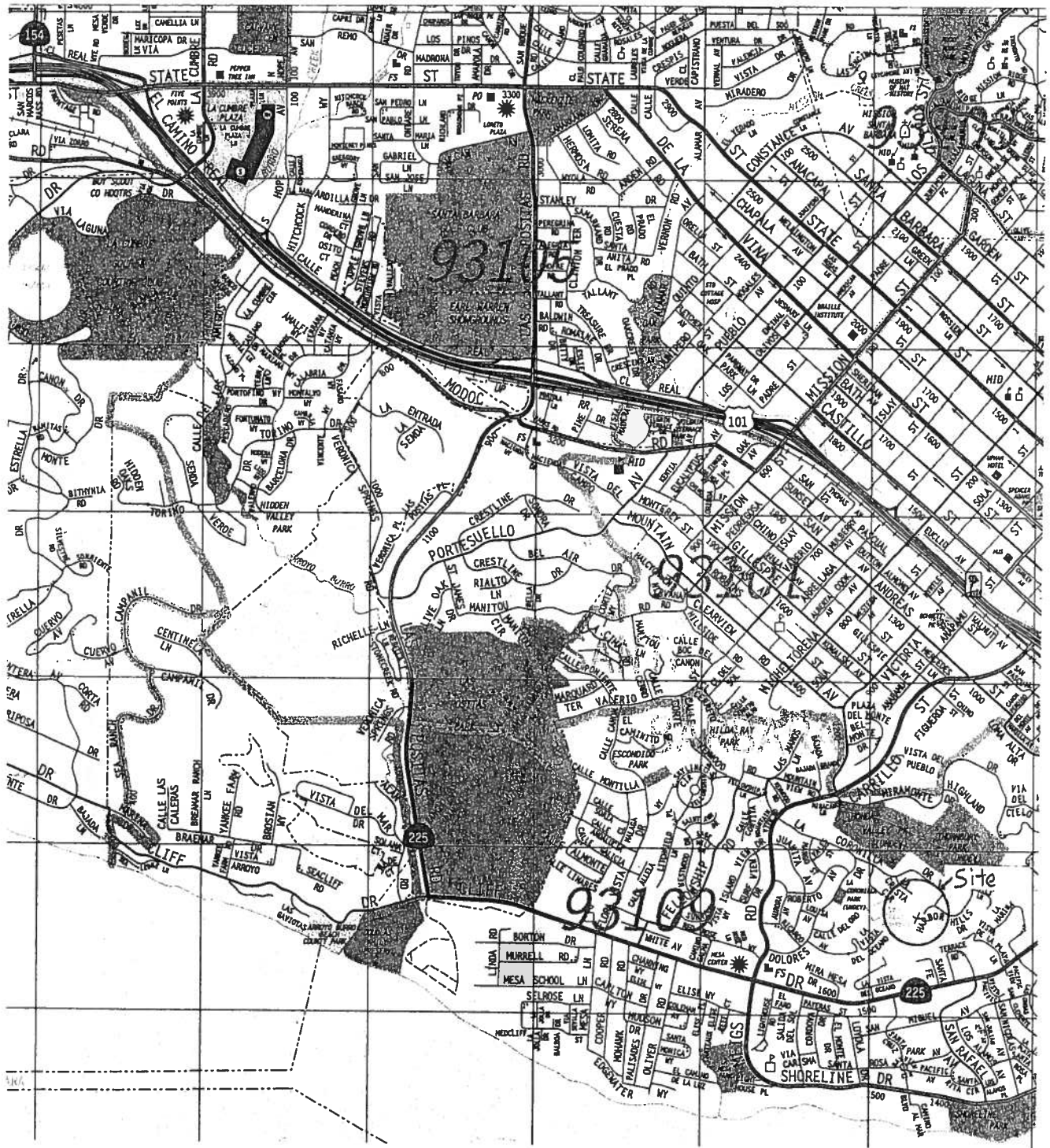
This report is issued with the understanding that it is the responsibility of the owner, or their representative, to assure that the information and recommendations contained herein are called to the attention of the designers and builders for the project. It is noted that the recommendations contained in this report may need to be revised, and additional site investigation work and soils testing performed, if conditions other than those disclosed by our field investigations are encountered during field construction operations.

If we can be of further assistance please feel free to contact us by phone at 805-218-6381 or by FAX 805-654-8658.

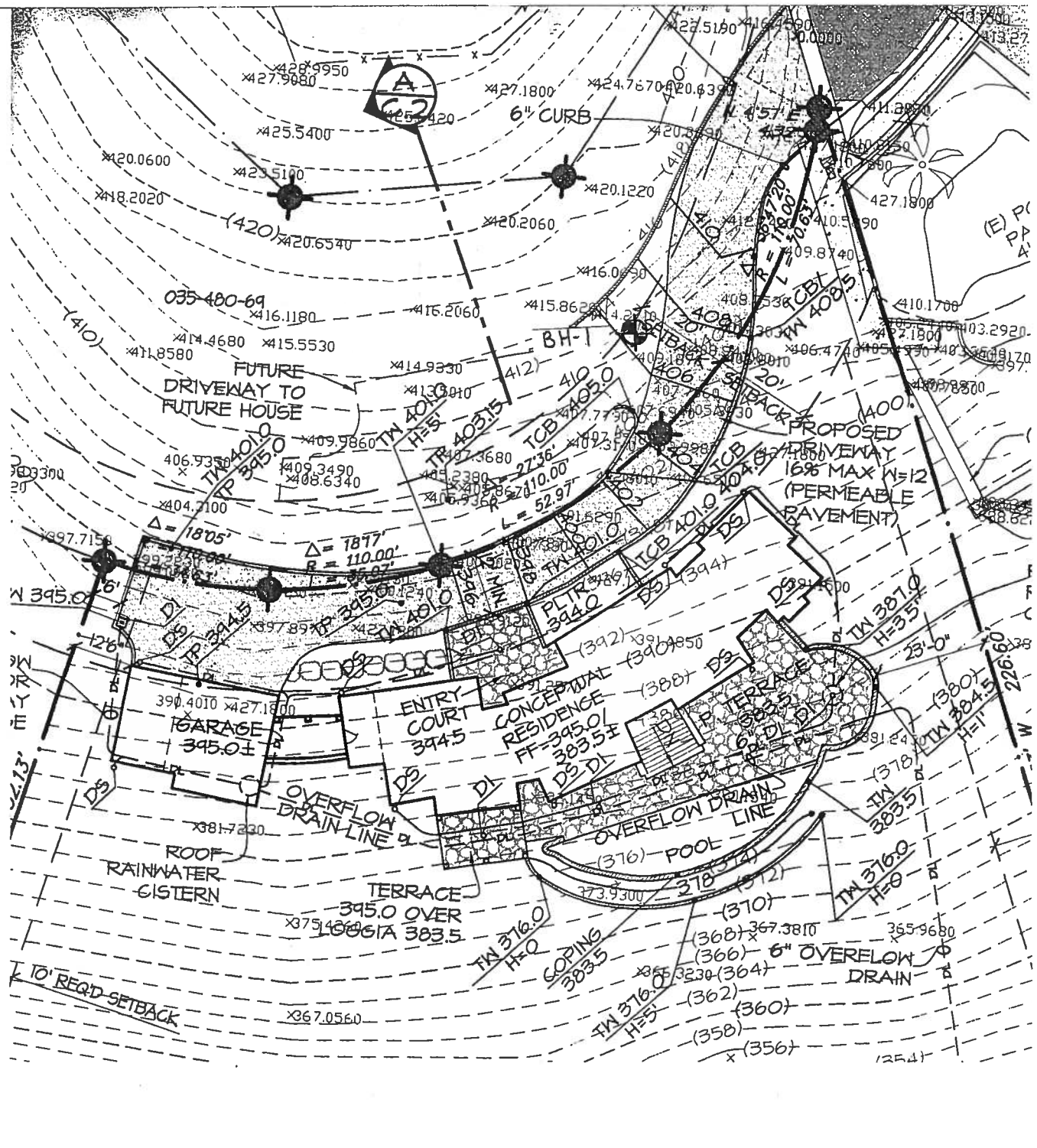
Sincerely,
Coastal Geology & Soil, Inc.




J.N. Brouwer
Certified Engineering Geologist
R.G. 6549, C.E.G. 2076



Site Vicinity Map		
1213 Harbor Hills		
Job No.:	V10127	Date: Nov 5, 2010
Drawn By:	JNB	Figure: Figure 1



Legend
 BH-1 - Borehole Location

North

 Scale
 1" = 30'

Site Plan	
1213 Harbor Hills Drive	
Job No.: V10127	Date: Nov 5, 2010
Drawn By: JNB	Figure: Figure 2

LOG OF BORE HOLE BH-1

JOB NUMBER : V10127
 PROJECT : Geology Invest.
 LOCATION : 1213 Harbor Hills
 DRILLING METHOD : 24" Bucket Auger

LOGGED BY : J. N. Brouwer, C.E.G. 2076
 DRILLED BY : TriValley Drilling
 START : 10/29/10
 STOP : 10/29/10


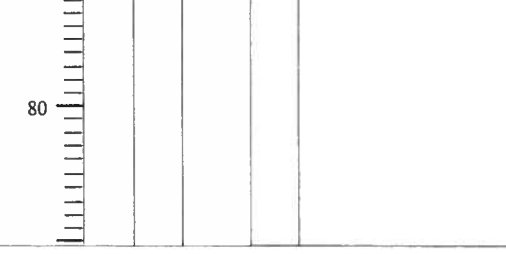
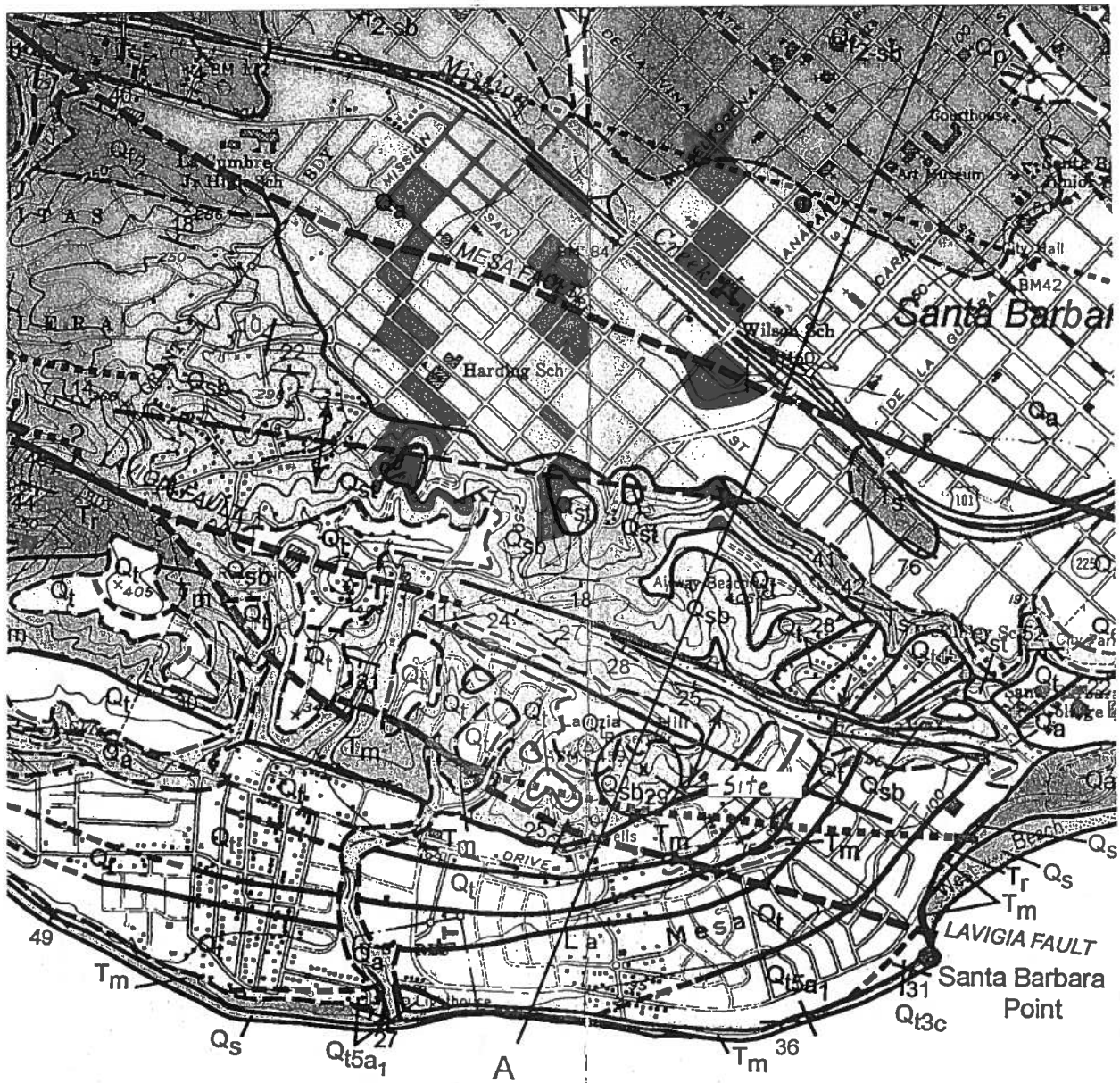
REMARKS	DRILLING DATA	ELEVATION (Feet) (Estimated)	DEPTH (Feet)	Rock Quality Designation	Recovery/Advance	Sample/Core Run No.	Graphic Log	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	BOREHOLE CONSTRUCTION DETAILS
Driller: Mario Helper: Tony Geo: J.N. Brouwer Drilling location is west of the end of Harbor Hills Drive 10/29/10, 11:30 - move drill rig onsite, setup, and start drilling with 24" bucket auger on BH-1. 12:30 - 25 feet bgs. 1:00 - Reach 48' bgs 1:15 - JNB down-hole log borehole to 48' bgs.			10 20 30 40 50 60 70 80					<p>Quaternary Colluvium (Qc) <i>Silty Clayey Sand (SC-SM), medium yellow brown, moist, soft to med firm, organics</i></p> <p>Santa Barbara Formation (Qsb) <i>SILTY SAND (SM), light yellow brown, moist, med dense, fine grained sand, caliche, mottled gray, minor clay, non plastic.</i> 12' - pebbles 16' - Sand, light gray, moist, med dense, fine grained, bedding contact = 300/38 SW. 25' - Silty Sand (SM), dark yellow brown, moist, med dense, minor clay. bedding contact = 280/22 S. 31' - Shell layer, 212/48 W</p> <p>Initial 2' diameter boring terminated at 48' bgs on 10/29/10. No groundwater or seeps observed in BH-1 borehole to 48' bgs on 10/29/10.</p>	 <p>Native backfill</p> <p>24" diameter borehole</p>

Figure 3



- Q_{af}: Artificial fill
 - Q_s: Beach Sand - Unconsolidated marine and aeolian beach sand.
 - Q_{st}: Stream Terrace Deposits - Commonly gravels, sands, and silts with minor clay interbeds.
 - Q_a: Alluvium - Undifferentiated alluvial, stream channel, and floodplain deposits composed of silty sands to sandy gravels.
 - Q_e: Estuarine Deposits - Commonly estuarine silts and clays with sand interbeds and lenses.
 - Q_{ls}: Landslide Deposits - Landslide deposits includes reworked bedrock and soil units.
 - Q_{15a2}: Marine Terrace Deposits - Second marine terrace associated with oxygen isotope substage 5a with youngest terrace associated with stage 5a; Q₁ denotes marine terrace deposit of unknown age; m marine sands with aeolian silts.
 - Q₁₃: Alluvial fan and fan terrace deposits - Third alluvial fan terrace indicating relative age with 1 index terrace deposit based on stratigraphic position, relative amount of incision, and established chron dissected fan surfaces composed of gravel to cobble to boulder conglomerates in a clayey silty silt and silty clays.
- Quaternary alluvial fan terrace deposits that are not age-dated are correlated to regional aggradat identified by Bull (1991):
- Q_{r1} - Probable age of latest Pleistocene to Holocene
 - Q_{r2} - Probable age of 60 ka to 100 ka
 - Q_{r3} - Probable age of 100 ka to 130 ka
- Q_p: Paleofluvial deposits - Undifferentiated paleostream channel and terrace deposits consisting of bc conglomerates within a silty sand matrix.
 - Q_c: Casitas Formation - Alluvial deposits composed primarily of gravel, cobble, and boulder conglomerate with minor sand and clay interbeds. Basal section of nearshore to proximal marine sands with minor conglomerates.
 - Q_{sb}: Santa Barbara Formation - Nearshore to distal marine sands with gravel to cobble conglomerates, limestone and silt interbeds; minor clay interbeds.

Map Reference: Geology Map of the Eastern Santa Barbara Fold Belt, Santa Barbara, California, 2004, by Larry Gurrola.

North



Scale
1" = 2000'

Geology Map	
1213 Harbor Hills Drive	
Job No.:	V10127
Date:	Nov 5, 2010
Drawn By:	JNB
Figure:	Figure 4

