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Job No. 190620U
May 5, 2020

To: Mr. Sergio Nunez

Subject: Updated Report of Geotechnical Investigation for Two New, Two-Story, Single Family Residences with Basements
Bellava Small Lot Subdivision
7306 Draper Avenue
La Jolla, CA 92037

Dear Mr. Nunez:

In accordance with your request, we have prepared the following updated geotechnical investigation report for the proposed two, new, two-story single-family residences with basements to be constructed at the subject site.

The scope of work performed for this investigation was as follows:

- Review of published geologic maps and other background information,
- Review of building plans by Eos Architecture,
- Subsurface exploration,
- Laboratory soil testing,
- Geotechnical analysis and preparation of this report containing my findings, conclusions and recommendations for building foundation design, basement retaining wall design, excavation and grading, shoring and other geotechnical aspects of construction.

SITE DESCRIPTION

The site location is shown on the attached Vicinity Map, Figure 1. The site is a rectangular, corner lot with an area of approximately 7,500 square feet.

For the purpose of this report the front of the lot is assumed to face east, towards Draper Avenue. Sea Lane is located on the south side of the lot. There are other, adjacent homes on the north and west sides.

The lot is relatively flat and presently occupied by an existing residence, which will be demolshed and removed. Landscaping consists of mature shrubs and trees.

PROPOSED CONSTRUCTION

The proposed construction consists of two, new, adjacenet, two-story residences with basements. The basements will be approximately 10 feet deep. Site grading will include excavation for the basements and removal and recompaction of surface soils in non-basement areas.

SUBSURFACE EXPLORATION

The subsurface exploration was performed on June 25, 2019, and consisted of drilling two test borings with a hand auger and machine-powered, limited access tripod auger to a maximum depth of 16 feet. In addition, two test pits were hand excavated to a depth of 2.5 feet. The approximate locations of the test borings and test pits are shown on the attached Figure 2. Logs of the test borings and test pits are presented in Figures 3 and 4.

LABORATORY SOIL TESTING

Laboratory testing was performed on soil samples obtained from the subsurface exploration and consisted of moisture content, dry density and expansion index tests. The results of the tests are shown on the boring logs and on Figure 5.

SUBSURFACE FINDINGS

Undocumented fill soils (Quf) were encountered in the test borings and test pits to depths of approximately 0.5 feet in B-1 and T-1 and 1.5 feet in B-2 and T-2. The fill consisted of yellow-brown, moist, loose, fine, sandy silt with some clay and organic material.

Below the fill, natural soils (Young Colluvial Deposits-Qyc) were encountered to the maximum depth explored of 16 feet consisting of yellow-brown, moist, loose to very dense, fine, sandy silt. The soils were loose to a depth of 2.5 to 3 feet and medium dense to dense below that. The natural soils have a medium expansion potential (EI=54).

No groundwater or seepage was encountered in the test borings and test pits.

GEOLOGY

From published State of California geologic maps, the underlying, natural soils consist of Young Colluvial Deposits-Qyc (see Figures 6, 7, 8 and 9).

Based on our review of geologic maps and other information, there are no known geologic hazards such as landslides, liquefaction-prone areas, or earthquake faults. The closest fault is a concealed strand of the potentially active Muirlands Fault located less than 500 feet to the west.

The buildings are subject to ground shaking and possible damage from earthquakes on nearby, or more distant, active faults. The potential damage due to ground shaking at the site is not greater than the surrounding areas.

SEISMIC DESIGN VALUES

Seismic design values are presented on Figure 10.

CONCLUSIONS

The site is suitable for construction of the proposed two-story residences with basements provided the following recommendations are incorporated into the design and construction of the project.

RECOMMENDATIONS

A. Excavation and Grading

- **Site Preparation**

All concrete and debris from demolition of the existing residence should be removed from the site.

- **Excavation of Onsite Soils**

The onsite soils may be excavated using standard earth moving equipment.

- **Temporary Basement Slopes**

Temporary basement slopes may be excavated vertically to a maximum depth of 5 feet. The upper portions of temporary slopes over 5 feet in depth should be laid back at an inclination no steeper than 1:1 (H:V).

- **Shoring for Basement Excavation**

Alternatively, basement slopes/excavations in excess of 5 feet in depth should be shored with soldier piles and lagging. An active, equivalent fluid, soil pressure of 40 pcf should be used for cantilever shoring design. An additional uniform soil pressure of 0.3Q psf should be used where Q = the surcharge pressure of adjacent building or construction loads. Q may be assumed to be 250 psf unless otherwise determined.

A passive, equivalent fluid, soil pressure of 300 pcf to a maximum value of 2,000 psf acting against the soldier piles may be assumed. The passive pressure may be assumed to act against twice the diameter of the soldier piles.

Soils should be stockpiled no closer than 10 feet from the edge of the basement excavation or shoring.

Survey monuments should be established on the ground surface between the basement excavation or shoring and the adjacent streets and residences to monitor possible soil movement during basement excavation.

- **Recompaction of Loose, Surface Soils in Non-Basement Areas**

Within non-basement portions of the residence and exterior slab areas, the upper, loose fill and natural soils should be removed and recompacted to a minimum depth of 3 feet below existing grade. The removal depth should be approved by the Geotechnical Engineer or Geotechnical Engineer's representative.

Prior to placing new fill, the exposed subgrade sols should be scarified to a depth of 6 to 8 inches, moisture conditioned to slightly above optimum moisture content and compacted to at least 90 percent relative compaction.

- **Filling and Compaction**

All fill, trench and retaining wall backfill should be compacted to a minimum relative compaction of 90 percent as determined by ASTM D 1557. Fill should be placed slightly above optimum moisture content, in 6 to 8-inch-thick lifts, and with each lift compacted by mechanical means.

All fill placement and compaction should be performed in accordance with the grading requirements of the City of San Diego.

The on-site soils may be reused as compacted fill or backfill provided they are free of organic materials and debris, and rocks or cobbles over 6 inches in dimension. Any imported fill should be predominantly granular and approved by the Geotechnical Engineer or Geotechnical Engineer's representative.

Grading observation and fill placement and compaction should be observed and tested as necessary by the Geotechnical Engineer or Geotechnical Engineer's representative.

B. Basement Foundations-Option 1

- **Basement Wall Footings**

The basement walls may be supported on basement wall footings designed by the project structural engineer, and a conventional slab-on-grade floor constructed inside the basement walls. Recommendations for conventional floor slabs are presented later in the report.

- **Allowable Soil Bearing Value**

Basement wall footings having a minimum depth of 12 inches below basement pad elevation may be designed for an allowable, dead plus live load, bearing value of 3,000 psf, with a one-third increase for short term, wind or seismic loads. This value may be increased to 4,000 psf if the foundation depth is increased to 24 inches.

- **Lateral Load Resistance**

An equivalent fluid, passive soil pressure of 400 pcf may be used for lateral load resistance for footings supported in dense natural soils. A soil/concrete friction factor of 0.35 may also be used. When combining friction and passive resistance, the passive resistance should be reduced by one-third.

C. Basement Foundations-Option 2

- **Structural Mat**

Alternatively, the basement walls may be supported on a structural mat foundation. The mat thickness and reinforcing should be designed by the project structural engineer.

- **Allowable Soil Bearing Value**

An allowable, dead plus live load, bearing value of 2,000 psf, with a one-third increase for short term, wind or seismic loads may be use for basement wall and mat design.

- **Modulus of Subgrade Reaction**

A modulus of subgrade reaction of 100 pci may be used for mat design.

- **Mat Underlayment**

The mat foundation should be underlain by 4 inches of sand, with a 10-mil visqueen moisture barrier placed at mid height in the sand layer.

- **Anticipated Settlements**

Total and differential settlements for the mat foundation should be less than 1/2 inch.

D. Non-Basement Foundations

- **Conventional Spread Footings**

Non-basement portions of the residence may be supported on conventional, continuous and/or individual spread footings bearing in recompacted fill or medium dense to dense, natural soils. Footings should have a minimum depth of 18 inches below building pad grade. Please note, the minimum required depth of surface soil recompaction is 3 feet below existing grade, as described previously.

- **Allowable Soil Bearing Value**

Conventional footings bearing in recompacted fill may be designed for an allowable, dead plus live load, bearing value of 2,000 psf, with a one-third increase for short term, wind or seismic loads.

- **Lateral Load Resistance**

An equivalent fluid, passive soil pressure of 300 pcf may be used for lateral load resistance for footings supported in recompacted fill or medium dense natural soils. A soil/concrete friction factor of 0.35 may also be used. When combining friction and passive resistance, the passive resistance should be reduced by one-third.

- **Footing Reinforcing**

  Minimum reinforcing of continuous footings should consist of four No. 4 rebars placed two at the top and two at the bottom.

- **Anticipated Settlements**

  Total and differential building settlements should be less than ½ inch for footings designed as above.

E. Conventional Floor Slabs

Conventional floor slabs-on-grade should be at least 5 inches thick and reinforced with No. 4 rebars spaced at 18 inches in two directions and placed at mid-height in the slab. Floor slabs should be underlain by 4 inches of sand, with a 10-mil visqueen moisture barrier placed at mid height in the sand layer.

F. Inspection of Footing Excavations

All footing excavations should be inspected and approved by the Geotechnical Engineer. Footing excavations should be cleaned of loose soils prior to inspection

G. Basement Retaining Walls

Basement retaining walls should be designed for the following, drained or undrained soil pressures:

BASEMENT RETAINING WALL SOIL PRESSURES

Wall Type	Drained Condition Equivalent Fluid Pressure (pcf)	Undrained Condition Equivalent Fluid Pressure (pcf)	Additional Uniform Pressure (psf)
Cantilever (Active)	40	80	0.3Q*
Restrained (At Rest)	55	95	0.5Q*

* Q = surcharge pressure of adjacent loads in psf. Q may be assumed to be 250 psf unless otherwise determined.

A horizontal seismic coefficient Kh = SDS/2.5 should be used for seismic design of basement retaining walls. See also Figure 4 for Seismic Design Values. The resultant earthquake force F = 3/8*Kh*Soil density*Wall height (H) squared may be assumed to act at a distance of 0.6*H from the base of the wall. An inverted triangular distribution and soil density of 125 pcf should be assumed.

H. Basement Wall Waterproofing and Drainage

Basement walls should be appropriately waterproofed. The waterproofing should be determined by the project architect. If basement walls are drained, Miradrain 6000XL or equivalent drain fabric and a collector pipe should be placed behind the walls and footings, discharging to a sump-pump outlet. Alternatively, if there is sufficient space behind the walls, wall drainage should consist of a 4-inch diameter, perforated, Schedule SFR-35 or better, PVC pipe wrapped in a filter fabric sleeve, discharging to one or more sump-pump outlets. Basement walls should be backfilled with Caltrans Class 2 Permeable Material (sand/gravel mix).

I. Exterior Slabs

Exterior slabs should be constructed as for interior floor slabs, except for the visqueen layer.

J. Surface Drainage

Surface water should not be allowed to pond next to the building. Drainage water should be discharged to an approved outlet.

K. Review of Building Plans

Building plans should be reviewed by the undersigned to ensure that the recommendations presented in this report have been followed.

LIMITATIONS

The work performed and recommendations presented in this report are the result of an investigation and analysis that meets the current standard of care in the geotechnical profession.

The conclusions and recommendations presented in this report are subject to field conditions and may be modified as necessary during construction. This report should be considered valid for a period of three years and is subject to review and possible changes following that time. If significant modifications are made to the building plans, revision of this report may also be necessary.

This report provides no warranty, either expressed or implied, concerning future building performance. Future damage from geotechnical or other causes is a possibility.

This opportunity to be of service is appreciated. If you have any questions, please do not hesitate to call or contact me.

Very truly yours,

Martin R. Owen PE, GE
Geotechnical Engineer

Attachments: Figures 1 through 10

FIGURE 1
VICINITY MAP

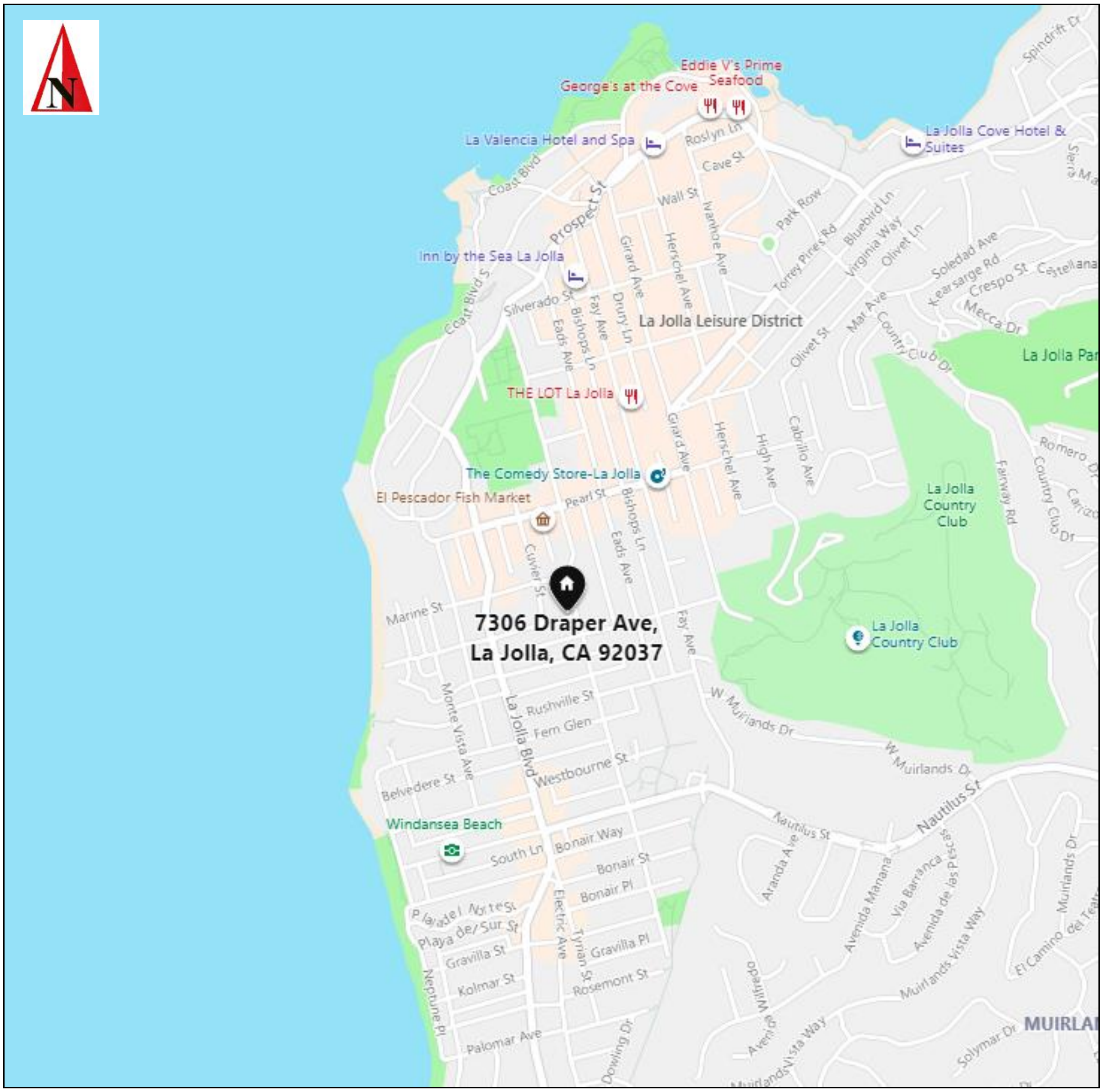
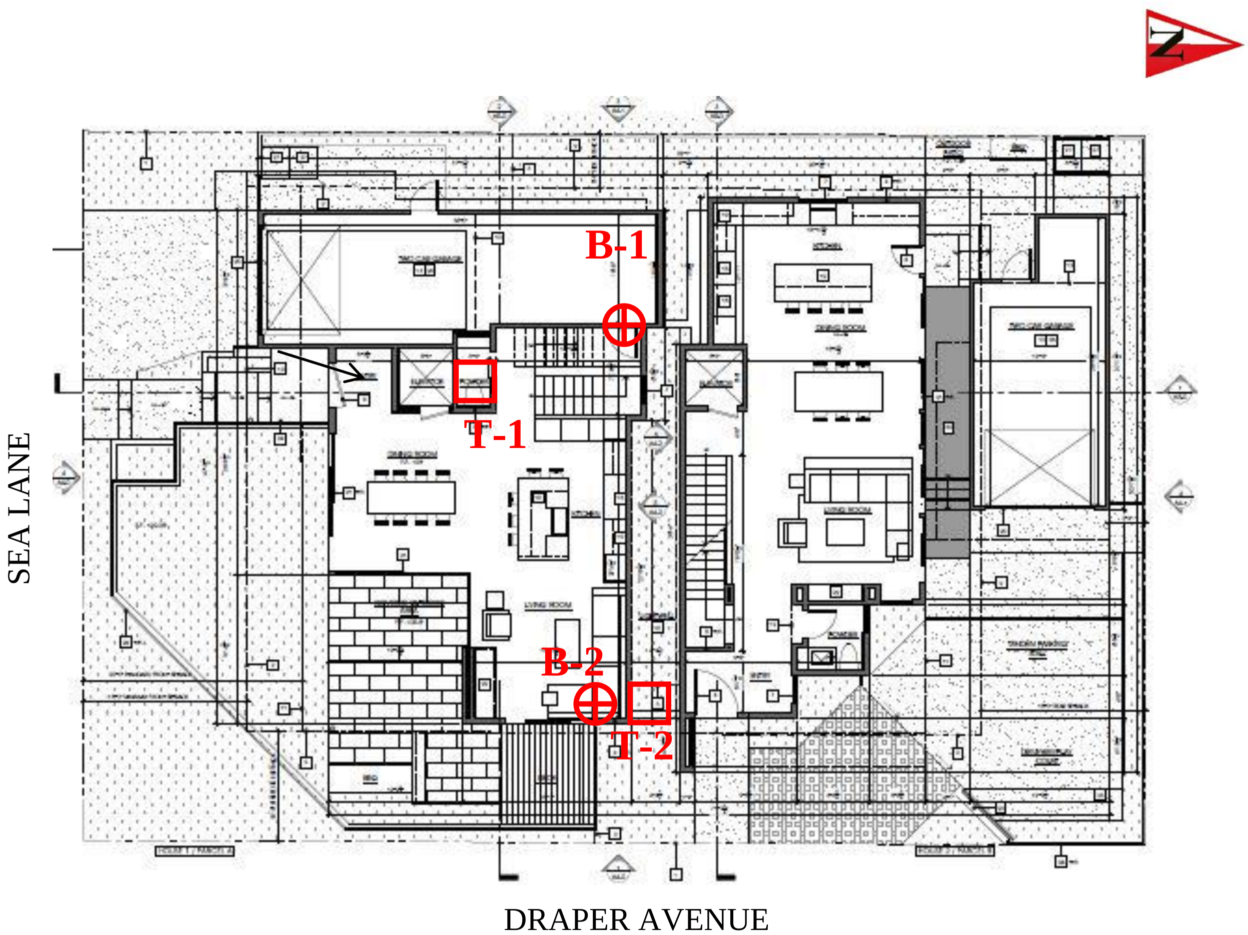


FIGURE 2
PLOT PLAN SHOWING LOCATIONS OF TEST BORINGS AND TEST PITS
SCHEMATIC ONLY



LEGEND

B-2 ⊕ APPROXIMATE LOCATION OF TEST BORING

T-2 □ APPROXIMATE LOCATION OF TEST PIT

FIGURE 3
LOGS OF TEST BORINGS

BORING B-1

Depth Feet	Drive Sample Depth Ft.	Drive Sample Blows/Ft.	Moisture Content %	Dry Density pcf	Soil Description
0-0.5’					FILL (Quf): Yellow-brown, slightly moist, loose, fine sandy silt with some clay
0.5’-16’					NATURAL SOIL (Qyc): Yellow-brown, moist to very moist, loose, fine, sandy silt with some clay
	2.5-3.5’	10	16.2	106.2	@ 2.5’ Medium dense
	4.5-5.5’	19	21.3	106.7	@ 4.5’ Yellow brown to brown
	6.5-7.5’	30	14.1	110.8	@ 6.5’ Dense
	10-11’	52	11.3	118.8	
	15-16’	46	13.8	117.4	

Bottom of Boring = 16 Feet
No Groundwater
Boring drilled, logged, and backfilled on June 25, 2019

Note: Drive samples obtained with modified CAL sampler and 140-pound Standard Penetration Test hammer, 30-inch drop

FIGURE 3
LOGS OF TEST BORINGS
(CONTINUED)

BORING B-2

Depth Feet	Soil Description
0-1.5’	FILL (Quf): Yellow-brown, slightly moist, loose, fine sandy silt, with some clay
1.5-8’	NATURAL SOIL (Qyc): Yellow-brown, moist, loose, fine, sandy silt with some clay @ 3’ Medium dense @ 8’ Dense

Bottom of Boring = 8 Feet
No Groundwater
Test boring drilled, logged and backfilled on June 25, 2019

FIGURE 4
LOGS OF TEST PITS
(CONTINUED)

TEST PIT T-1

Depth Feet	Soil Description
0-0.5’	FILL (Quf): Yellow-brown, slightly moist, loose, fine sandy silt, with some clay and organic materials
0.5-2.5’	NATURAL SOIL (Qyc): Yellow-brown, moist, loose to medium dense, fine sandy silt with some clay Existing footing depth = 12”

Bottom of Test Pit = 2.5 Feet
No Groundwater
Test pit excavated and backfilled on June 25, 2019

TEST PIT T-2

Depth Feet	Soil Description
0-1.5’	FILL (Quf): Yellow-brown, slightly moist, loose, fine sandy silt, with some clay and organic materials
1-2.5’	NATURAL SOIL (Qyc): Yellow-brown, moist, loose to medium dense, fine sandy silt with some clay Existing footing depth = 22”

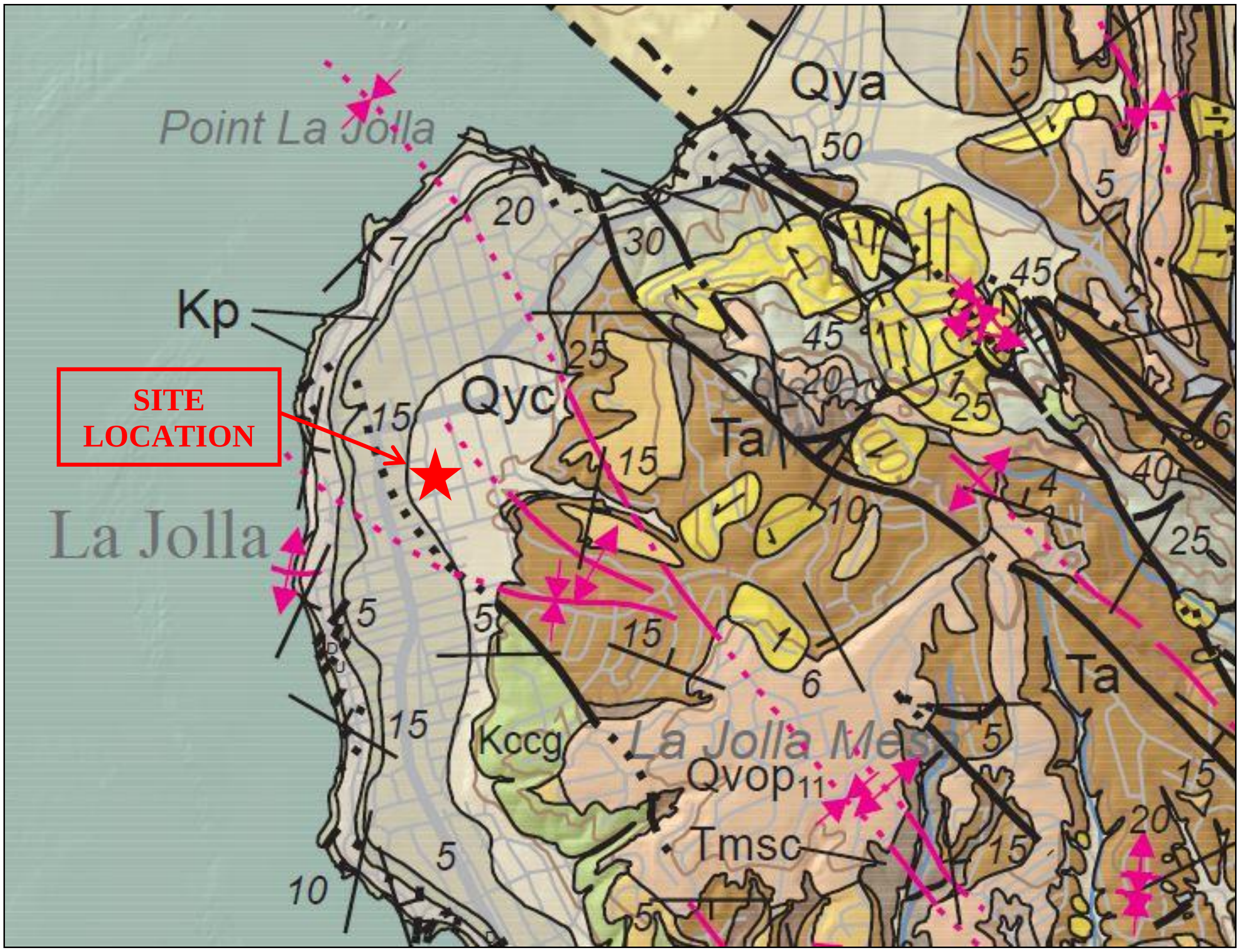
Bottom of Test Pit = 2.5 Feet
No Groundwater
Test pit excavated and backfilled on June 25, 2019

FIGURE 5
LABORATORY TEST RESULTS

EXPANSION INDEX
(ASTM D 4829)

Sample No.	Expansion Index	Expansion Classification
T-1@ 1-2’	54	Medium

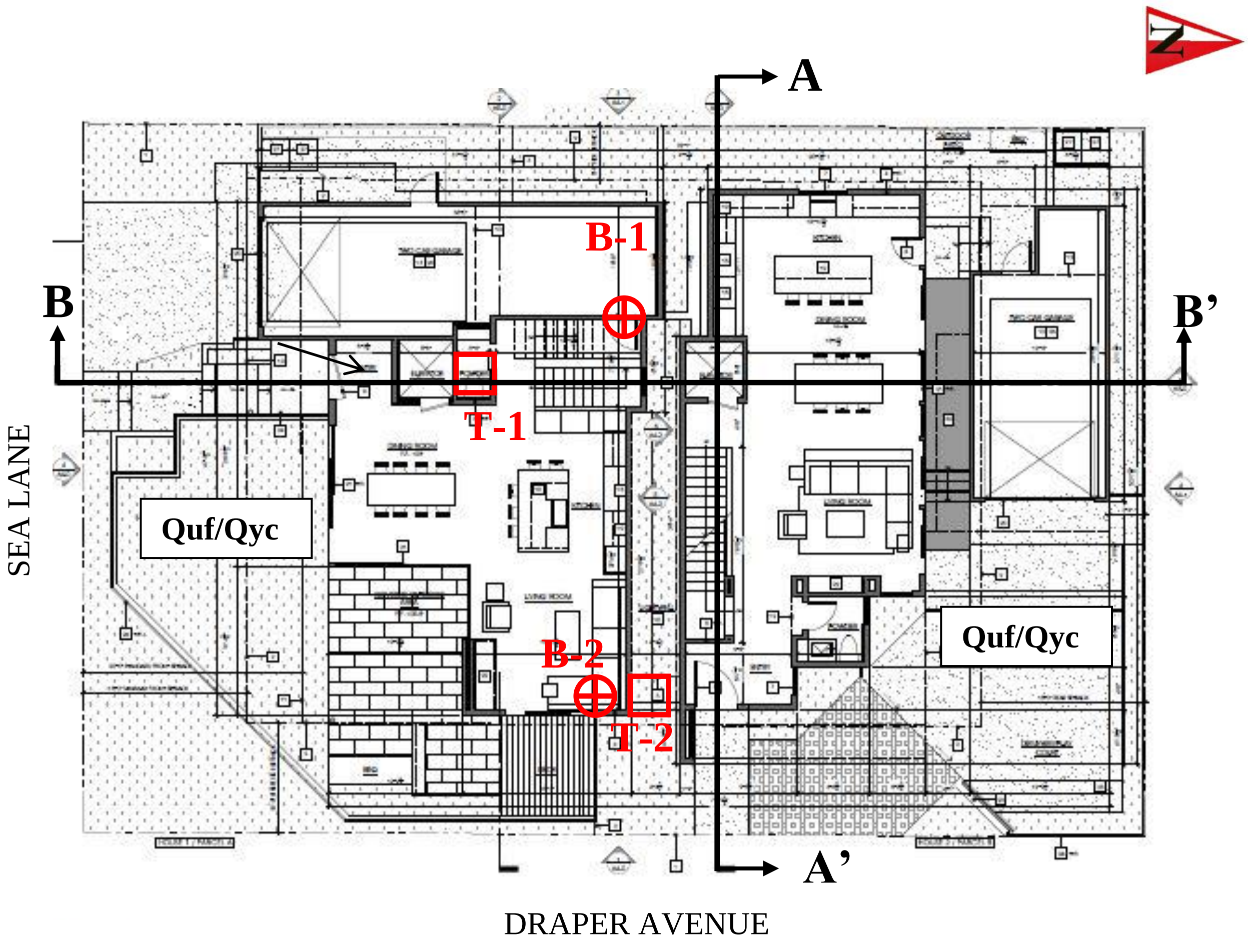
FIGURE 6
REGIONAL GEOLOGIC MAP



LEGEND: Qyc = Young Colluvial Deposits

Extract from Geologic Map of the 30' x 60' San Diego Quadrangle, by Kennedy, M.P., and Tan, S.S., 2008

FIGURE 7
GEOLOGIC MAP
SCHEMATIC ONLY



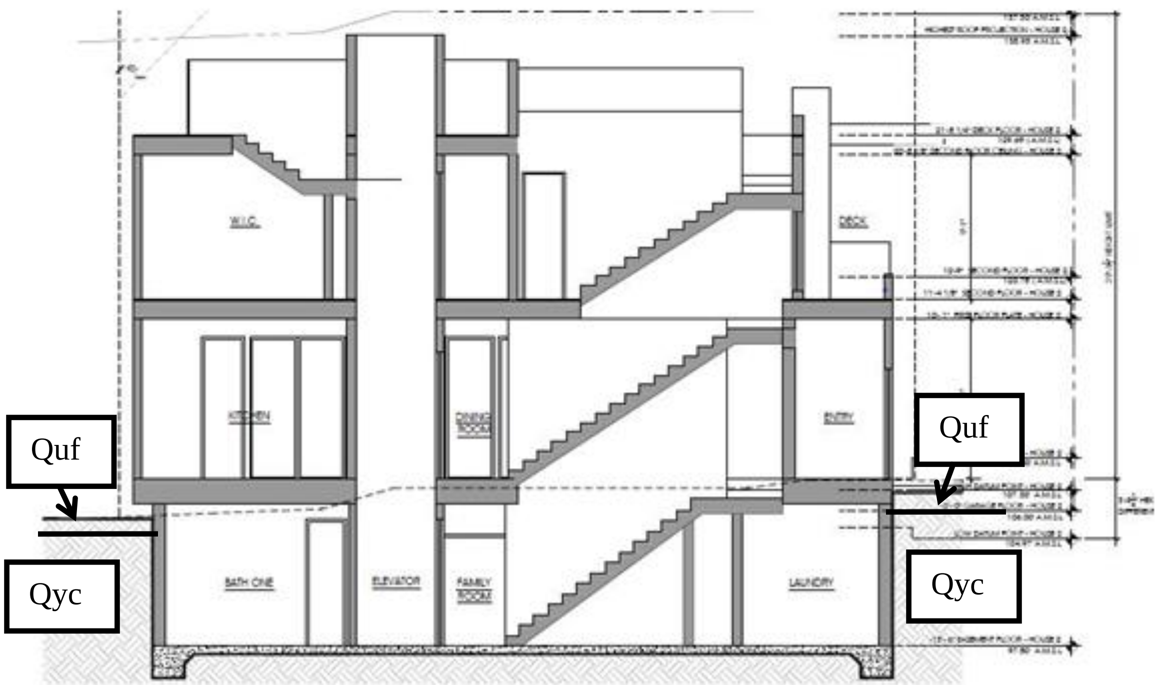
LEGEND

B-2 ⊕ APPROXIMATE LOCATION OF TEST BORING

T-2 □ APPROXIMATE LOCATION OF TEST PIT

Quf/Qyc UNDOCUMENTED FILL OVER YOUNG COLLUVIAL DEPOSITS

FIGURE 8
GEOLOGIC CROSS SECTION A-A'

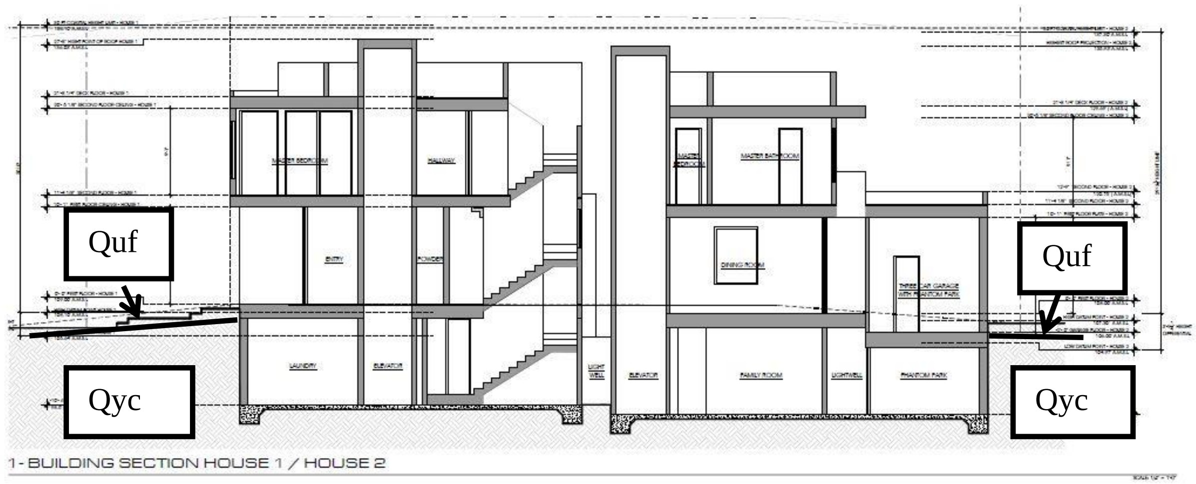


SEE FIGURE 7, GEOLOGIC MAP FOR LOCATION OF CROSS SECTION

LEGEND

Quf UNDOCUMENTED FILL
Qyc YOUNG COLLUVIAL DEPOSITS

FIGURE 9
GEOLOGIC CROSS SECTION B-B'



SEE FIGURE 7, GEOLOGIC MAP FOR LOCATION OF CROSS SECTION

<u>LEGEND</u>

Quf UNDOCUMENTED FILL
Qyc YOUNG COLLUVIAL DEPOSITS

FIGURE 10
SEISMIC DESIGN VALUES

7306 Draper Ave, La Jolla, CA 92037, USA
Latitude, Longitude: 32.8371287, -117.2759012

Date	5/2/2020, 4:44:51 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.328	MCE_R ground motion. (for 0.2 second period)
S_1	0.466	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.328	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.885	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA