

**SUPPLEMENTAL
GEOTECHNICAL INVESTIGATION**
Proposed Single Family Residence
634 Palomar Drive
Redwood City, California

Prepared for:
Mr. Darius Soltaniegh
724 Arastradero Road, Apt. 121
Palo Alto, California 94306

Dated: April 11, 2014
Job 2572.01.00

Earth Investigations Consultants
P.O. Box 795
Pacifica, California 94044
Phone 650-557-0262
Fax 650-557-0264
earthinvestigations@comcast.net



Earth Investigations Consultants

April 11, 2014
Job 2572.01.00

Mr. Darius Soltanieh
724 Arastradero Road, Apt. 121
Palo Alto, California 94306

RE: SUPPLEMENTAL GEOTECHNICAL INVESTIGATION
Proposed Single Family Residence
634 Palomar Drive
Redwood City, California

Dear Mr. Soltanieh:

INTRODUCTION

Site Location and Proposed Project

Pursuant to your authorization, we have completed the referenced project, located in the Palomar Park residential area of San Mateo County, California. The purpose of this report is update our October 17 report for the following:

- Characterization of your proposed house development area in the upper southern part of the property, and a detached guesthouse and parking area in the northern part downhill from the existing dirt road that will be improved for the paved driveway (Plate 2, Site Plan);
- Supplemental recommendations for the proposed project.

Scope of Services

The scope of services undertaken to arrive at the findings, conclusions and recommendations included:

- Review of the previous owner's project file;
- Site observations and drilling 2 supplemental borings on April 2, 2014 at selected site areas with a portable percussion rig. A continuous sample of the earth materials encountered was obtained by advancing a 1 ½ -inch O.D., split spoon sampler with a gas-powered Wacker BHF 30S hammer that imparts 35 ft. lbs. of axial force on the sampler at a rate of 1270 blows per minute. The borings were advanced to a depth of practical refusal in bedrock. The locations of the borings are illustrated on Plate 2. The Logs

Geologists & Engineers

P.O. Box 795 ● Pacifica, CA 94044 ● (650) 557-0262 ● Fax (650) 557-0264

- of Borings are contained on Plates 2. Plates 3 and 4 contain descriptions of the terms and symbols used on the logs;
- Laboratory testing of the samples collected from the explorations. Tests included moisture content, dry density, and pocket penetrometer unconfined compressive strength. Test results are tabulated on the Logs of Borings at the respective sample depths;
 - Analysis of the data and preparation of this report. Plate 5 depicts a revised cross section across the project site based upon the previous site and this site investigation.

FINDINGS

The proposed house development area will occupy a graded, cut-fill terrace in the southern part of the site. The supplemental borings indicate this area of the site is underlain by favorably oriented sandstone and shale that is either exposed on the surface from the grading or beneath a 4-foot thick mantle of low to moderately plastic, sandy clay, colluvium (Plates 2 and 5).

CONCLUSIONS

The results of this supplemental investigation indicate that the proposed residential development is feasible from a geotechnical standpoint. It is our opinion that the recommendations contained in our October 17, 2013 report remain valid with the exception of seismic design parameters, which are contained in the following section. It will be important for the project civil engineer to carefully review the *Site Preparation, Grading and Compaction* section and prepare a detailed remedial plan treating the undocumented fills across the site.

SUPPLEMENTAL RECOMMENDATION

Seismic Design

The proposed structures should be designed for the following seismic design criteria derived from the subsurface exploration data and the 2013 California Building Code (2010 ASTM 7 with July 2013 errata):

- Site Location: Latitude = 37.377; Longitude = -122.124
- Site Soil Class: C
- Spectral Response Acceleration Values (g): $F_a = 1.0$; $F_v = 1.3$; $S_s = 2.108$; $S_1 = 0.999$; $S_Ds = 1.405$; $S_{D1} = 0.866$

REFERENCE

Earth Investigations Consultants, Inc., 2013, Geotechnical investigation, proposed single family residence, 634 Palomar Park, Redwood City, California: Geotechnical consultant's October 17 report to Mr. Robert Kirk, Job 2537.01.00, 12 pgs with illustrations.

The following plates are attached and complete this report:

- Plate 1 – Site Plan
- Plate 2 – Logs of Borings 7 and 8
- Plate 3 – Key to Borings
- Plate 4 – Rock Hardness Criteria
- Plate 5 – Generalized Cross Section A-A'

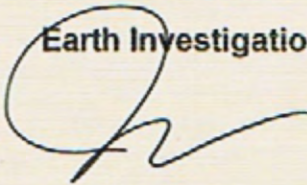
Mr. Darius Soltanieh
Job 2572.01.00

April 11, 2014
Page 4

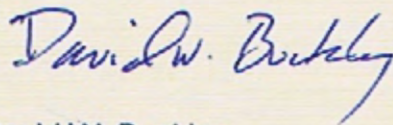
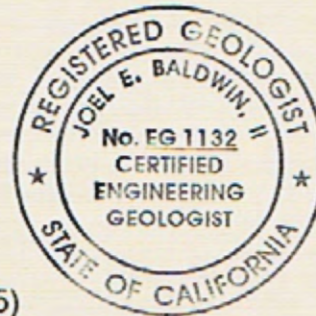
We trust that this provides you with the information you require at this time. If you have any questions, please call.

Very truly yours,

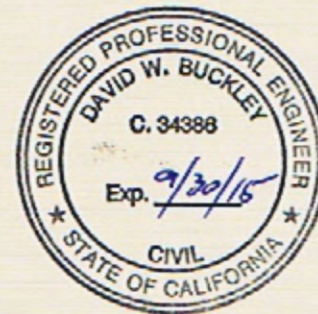
Earth Investigations Consultants



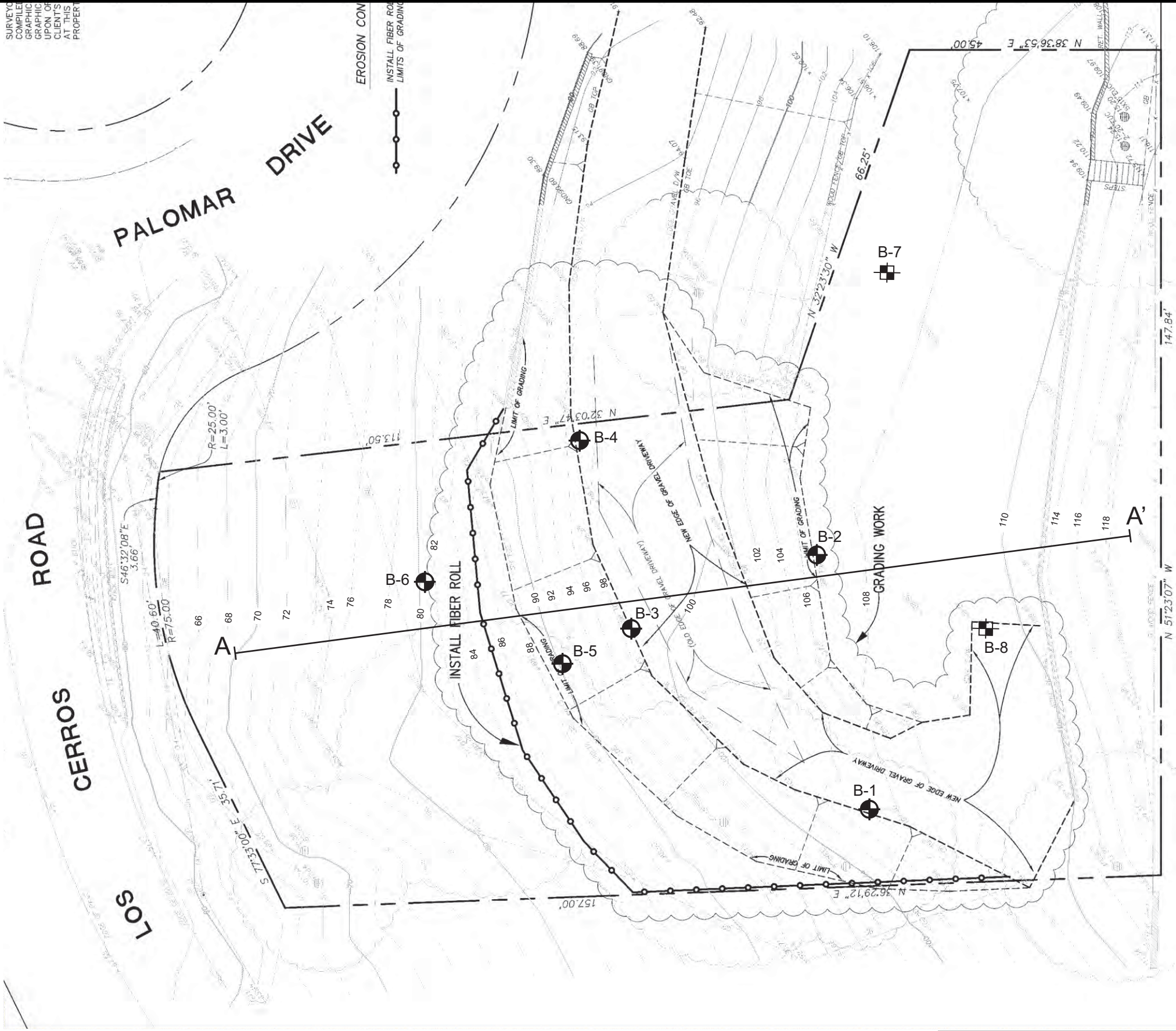
Joel E. Baldwin, II
Engineering Geologist 1132 (Renewal date 2/28/15)



David W. Buckley
Civil Engineer 34386 (Renewal date 9/30/15)



JEB:DWB:jb:gi
Distribution: e-file and 3 bound copies to addressee



EXPLANATION

- B-7** [Symbol] Approximate supplemental boring location
- B-1** [Symbol] Approximate boring location from 2013 investigation
- A — A' — Line of cross section A-A'

SURVEY COMPILATION GRAPHIC UPON CLIENTS AT THIS PROPERTY

EROSION CONTROL
 INSTALL FIBER ROLL
 LIMITS OF GRADING

Earth Investigations Consultants	Job No. 2572.01.00	SITE PLAN 634 Palomar Drive Redwood City, California	Plate 1
	Approved		
	Date 4/7/14		

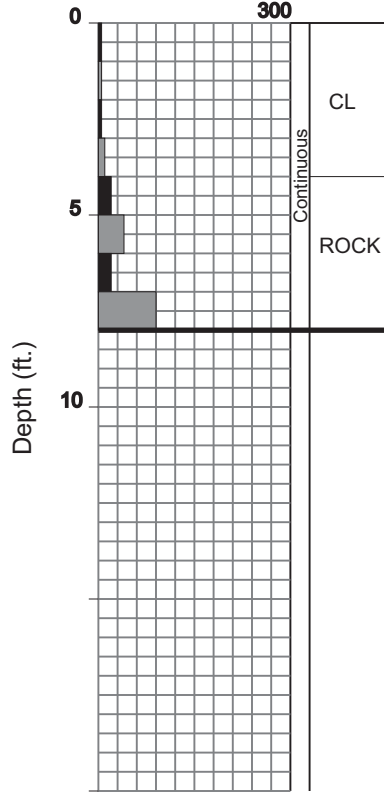
SOIL PROBE 7

Dry Density (pcf) *
Moisture Content (%)
Pocket Pen (tsf)

Penetration Rate (sec./ft.)

Sample USCS

Equipment Portable Percussion Rig
Elevation * ~108' Date 4/2/2014



Dark brown Sandy CLAY, damp, firm COLLUVIUM
color changes to dark yellowish brown at 1 1/2'

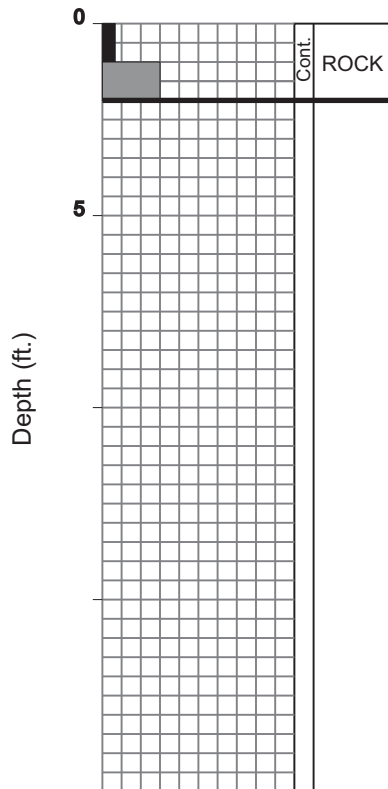
Yellowish brown, light yellowish brown and grey SHALE, very weathered, closely fractured, soft (BEDROCK)

Refusal at 8'

107.7 16.4 1.0
110.7 18.7

SOIL PROBE 8

Elevation * ~109' Date 4/2/2014



Dark yellowish brown SANDSTONE, very weathered, closely fractured, soft (BEDROCK)

Refusal at 2'

117.7 11.8

EXPLANATION

- * Elevation from Plate 1 - Vicinity Map
- * Disturbed sample

Earth Investigations
Consultants

Job No. 2572.01.00

Date 4/7/14

LOGS OF BORINGS

634 Palomar Drive
Redwood City, California

Plate

2

Primary Divisions			GROUP SYMBOL	Secondary Divisions
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

Definition of Terms

U.S. Standard Series Sieve		Clear Square Sieve Openings											
200		40		10		4		3/4"		3"		12"	
SILTS AND CLAY	SAND					GRAVEL		COBBLES	BOULDERS				
	FINE	MEDIUM	COARSE	FINE	COARSE								

Grain Sizes

Unified Soil Classification System (ASTM D-2487)

SAND AND GRAVELS	PENETRATION RATE*
VERY LOOSE	0 - 7
LOOSE	7 - 18
MEDIUM DENSE	18 - 53
DENSE	53 - 88
VERY DENSE	OVER 88

Relative Density

SILTS AND CLAYS	STRENGTH**	PENETRATION RATE*
VERY SOFT	0 - 1/4	0 - 6
SOFT	1/4 - 1/2	6 - 11
FIRM	1/2 - 1	11 - 23
STIFF	1 - 2	23 - 47
VERY STIFF	2 - 4	47 - 94
HARD	OVER 4	OVER 94

Consistency

* Seconds per foot, based on a portable percussion rig advancing a 1 1/2-inch diameter split-spoon sampler with a force of 35 ft. lb. at a rate of 1270 blows per minute.

** Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

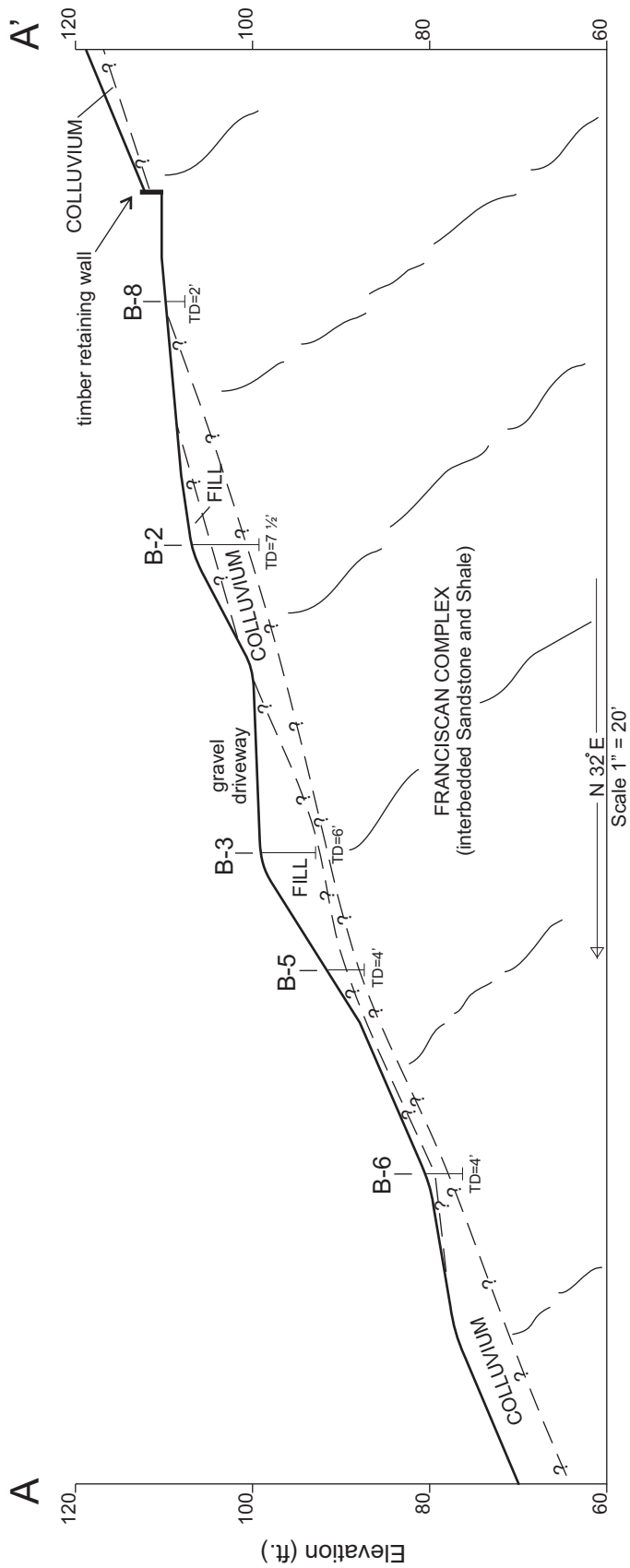
Earth Investigations Consultants	Job No.	2572.01.00	KEY TO BORINGS 634 Palomar Drive Redwood City, California	Plate 3
	Date	4/7/14		

ROCK HARDNESS CRITERIA

Very Hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimen requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to 1/4 inch deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hand blows of the point of geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of pick point. Small thin pieces can be broken by finger pressure.
Very Soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Subsurface Manual for Design and Construction of Foundations of Buildings, 1976
Published by American Society of Civil Engineers.

Earth Investigations Consultants	Job No. 2572.01.00	ROCK HARDNESS CRITERIA 634 Palomar Drive Redwood City, California	Plate 4
	Date 4/7/14		



**Earth Investigations
Consultants**

Job No. 2572.01.00

Date 4/7/14

GENERALIZED CROSS SECTION A-A'

634 Palomar Drive
Redwood City, California

Plate

5

APPENDIX B

Logs of Subsurface Exploration and Laboratory Test Results

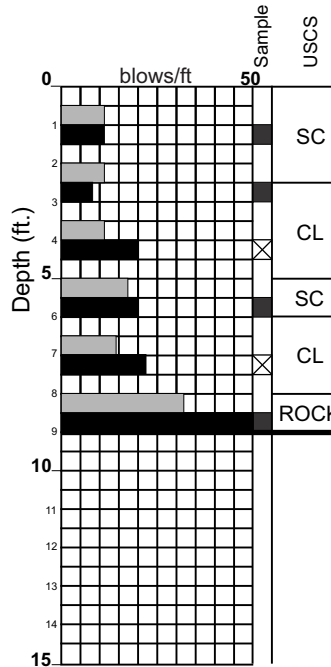
- Plate B1 – Logs of Borings 1 & 2
- Plate B2 – Logs of Soil Probes 1 & 2
- Plate B3 – Key to Borings
- Plate B4 – Rock Hardness Chart
- Plate B5 – Plasticity Chart

BORING 1

Equipment Portable Equipment

Elevation ~61' msl* Date 06/11/2020

-200 Sieve (%)	Dry Density (pcf)	Moisture Content %	Blows/Foot (SPT)	Pocket Pen (tsf)
	103.7	6.8	23	
	103.5	4.8	27	>4.50
78			35	
	116.0	8.0	36	
			36	
	94.7	14.3	82	



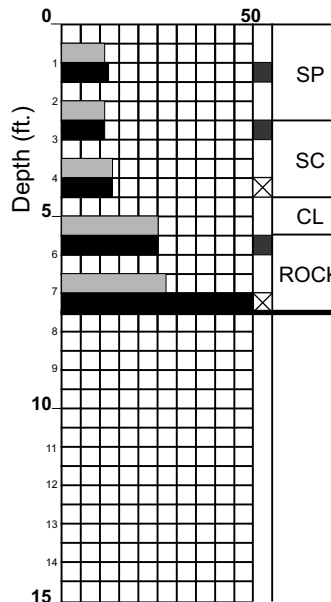
USCS	Description
SC	Dark yellow brown Gravelly Clayey SAND, moist, medium dense (af)
CL	Dark brown Gravelly Sandy CLAY, moist, very stiff to hard, low plasticity (af) (no recovery)
SC	Dark yellow brown Silty fine SAND with Gravel, moist, dense (COL)
CL	Dark yellow brown Sandy CLAY with Gravel, moist, hard/moderate plasticity (COL)
ROCK	Yellow brown SANDSTONE, very weathered, closely fractured, soft to moderately hard

Refusal @ 9'

BORING 2

Elevation ~61' msl* Date 06/11/2020

108.6	6.4	23
101.7	7.9	23
		26
114.6	5.9	50
		77



USCS	Description
SP	Dark yellow brown Gravelly Silty SAND, moist, medium dense (af)
SC	Dark yellow brown Silty fine SAND with Gravel, moist, medium dense, moderately plastic (COL)
CL	Dark yellow brown Sandy CLAY with Gravel, moist, very stiff to hard (COL)
ROCK	Yellow brown & dark yellow brown SHALE, very weathered, closely fractured, soft to moderately hard

Refusal @ 7½'

*elevation per Lea & Braze Engineering, Inc. (Sheet SU1; 02/24/16)



Geosphere Consultants, Inc.

Job No.: 91-55905-A

Approved: JEB

Date: 06.21.2020

LOGS OF BORINGS 1 & 2

634 Palomar Drive
Woodside, California

Plate

A1

SOIL PROBE 9

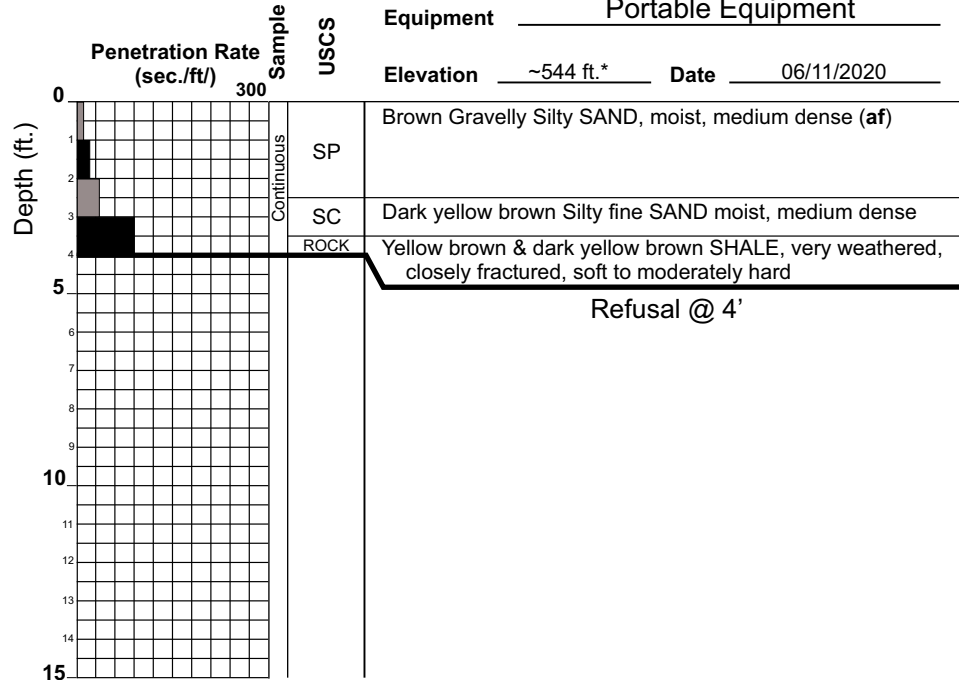
Equipment Portable Equipment

Elevation ~544 ft.* Date 06/11/2020

Dry Density (pcf)
 104.2
 110.0

Moisture Content %
 4.7
 9.1

Pocket Pen (tsf)
 >4.50

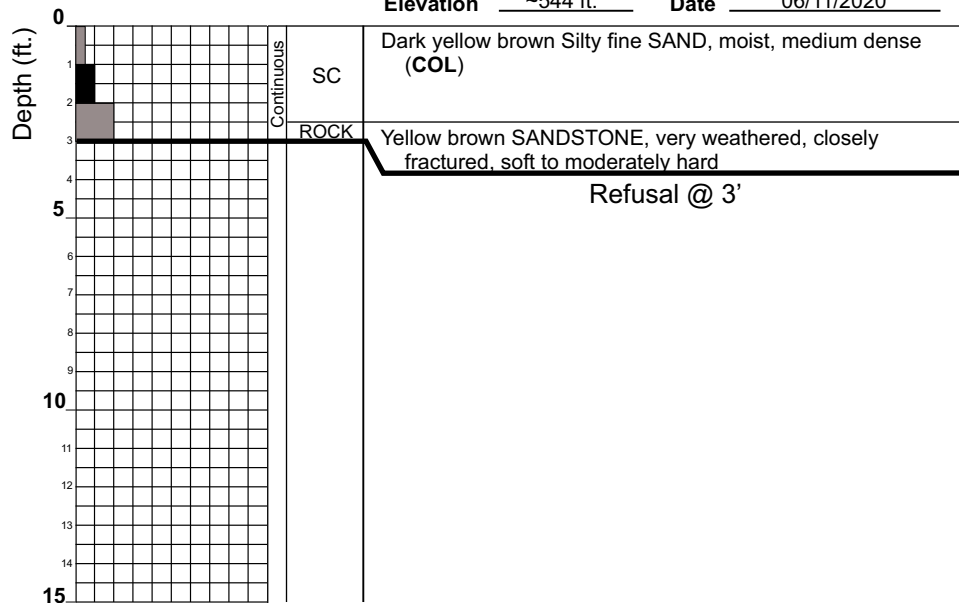


SOIL PROBE 10

Elevation ~544 ft.* Date 06/11/2020

Dry Density (pcf)
 106.7

Moisture Content %
 9.1



*elevation per Lea & Braze Engineering, Inc. (Sheet SU1; 02/24/16)



Geosphere Consultants, Inc.

Job No.: 91-55905-A

Approved: JEB

Date: 06.21.2020

LOGS OF SOIL PROBES 1 & 2

634 Palomar Drive
Woodside, California

Plate

B2

			GROUP SYMBOL	Secondary Divisions
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

		U.S. Standard Series Sieve			Clear Square Sieve Openings			
		200	40	10	4	3/4"	3"	12"
SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS	
	FINE	MEDIUM	COARSE	FINE	COARSE			

Grain Sizes

SAND AND GRAVELS	BLOWS/FOOT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

Relative Density

SILTS AND CLAYS	STRENGTH **	BLOWS/FOOT*
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

Consistency

* Number of blows of 140 pound hammer falling 30 inches to drive a split spoon, SPT sampler (ASTM D-1586)


** Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

■ Sample location; blow counts listed are from the bottom 12 inches of 18-inch drive sample.

☒ Grab sample

59  Total number of SPT blow counts for sampling interval. Bar graph represents individual 6-inch intervals.

Unified Soil Classification System (ASTM D-2487)

 Geosphere Consultants, Inc.	Job No.: 91-55905-A Approved: JEB Date: 06.21.2020	KEY TO BORINGS 634 Palomar Drive Woodside, California	Plate B3
---	---	--	-------------------------------

ROCK HARDNESS CRITERIA

Very Hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimen requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to 1/4 inch deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hand blows of the point of geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of pick point. Small thin pieces can be broken by finger pressure.
Very Soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Subsurface Manual for Design and Construction of Foundations of Buildings, 1976
Published by American Society of Civil Engineers.



Geosphere Consultants, Inc.

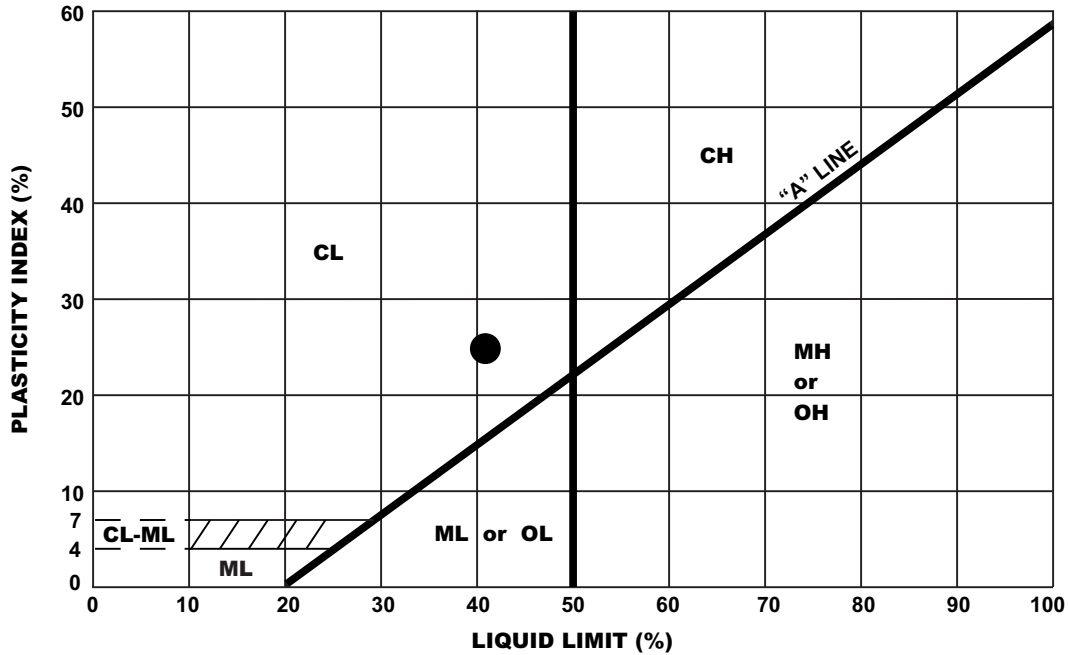
Job No.: 91-55905-A
Approved: JEB
Date: 06.21.2020

ROCK HARDNESS CHART

634 Palomar Drive
Woodside, California

Plate

B4



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING NO. 200 SIEVE (%)	LIQUIDITY INDEX	USCS
●	B-1	4½'	17	41	25	78	0.01	CL

